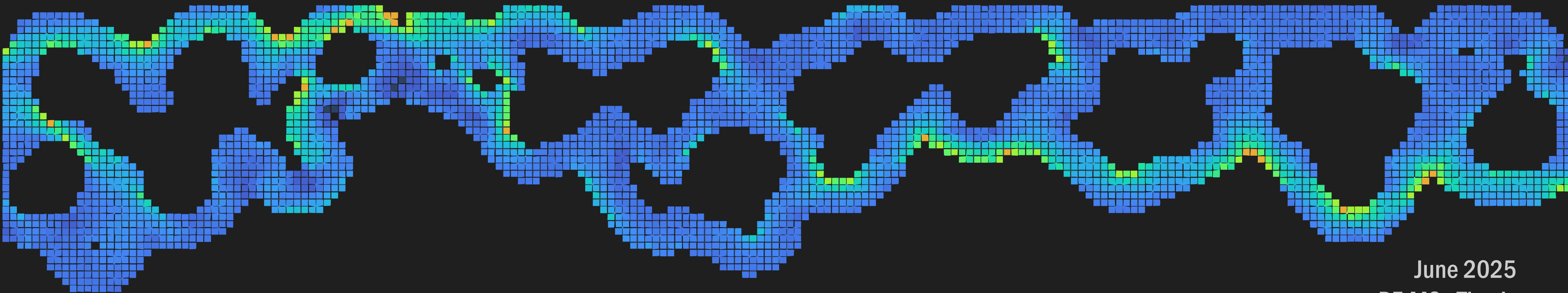


Less Stress for Glass Giants:

Stress-Based Topology Optimization Workflow for Cast Glass



June 2025
P5 MSc Thesis
Building Technology
TU Delft
E. M. Dauzacker
4688449

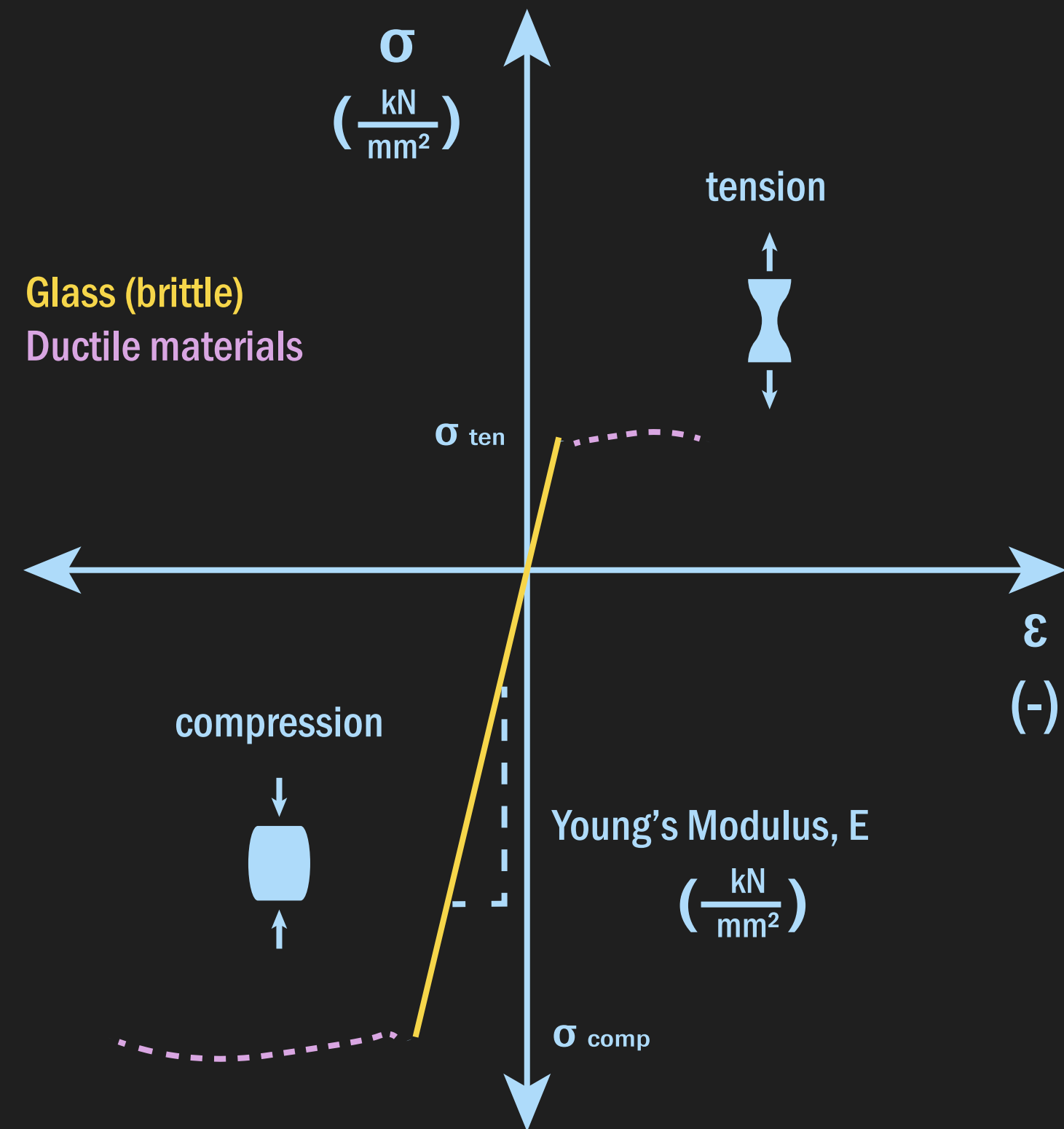
Mentors:
Dr. Charalampos Andriotis
Dr. Faidra Oikonomopoulou

INSPIRATION

Dr. Ir. Telesilla Bristogianni
Dr. Ir. Faidra Oikonomopoulou



GLASS

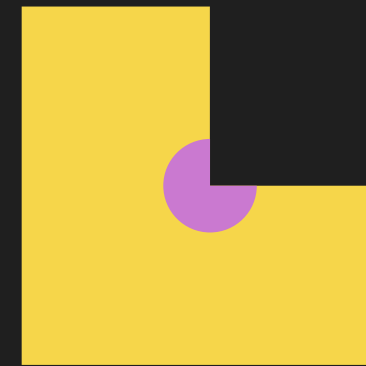


$$\sigma_{\text{ten,des}} = 6.4 \times 10^9$$
$$\sigma_{\text{comp,des}} = 500 \times 10^9$$

$$E = 70 \text{ GPa}$$
$$\text{Poisson's ratio} = 0.2$$

MATERIAL

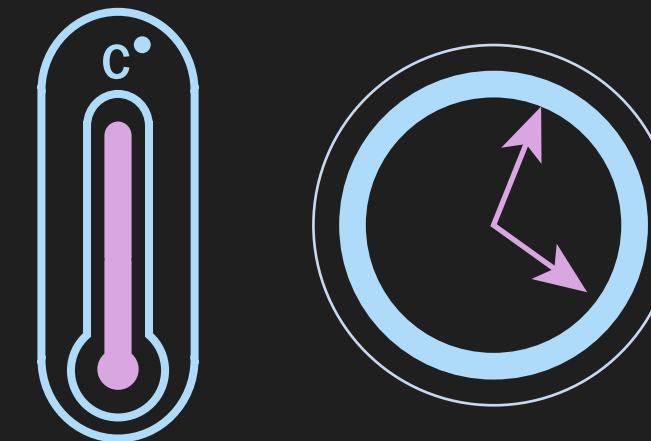
Brittle nature



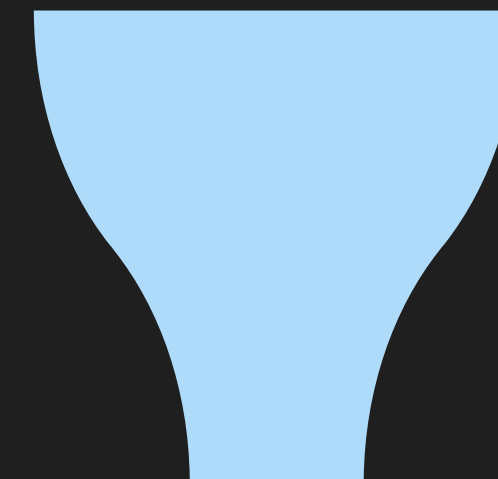
Rounded edges
and transitions

MANUFACTURING

Annealing time



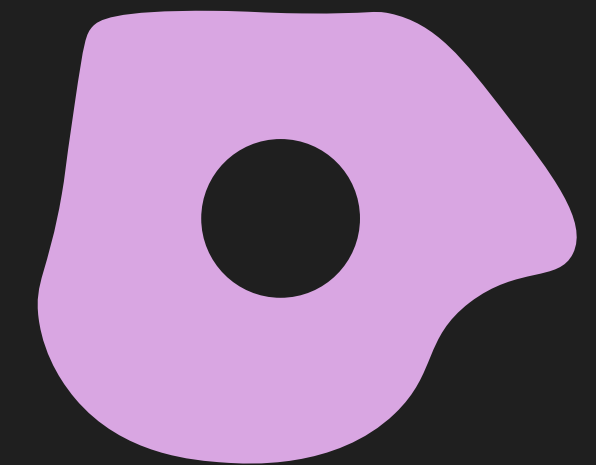
max



min

Residual stresses

Mold size



min

J.V. Carstensen et al.

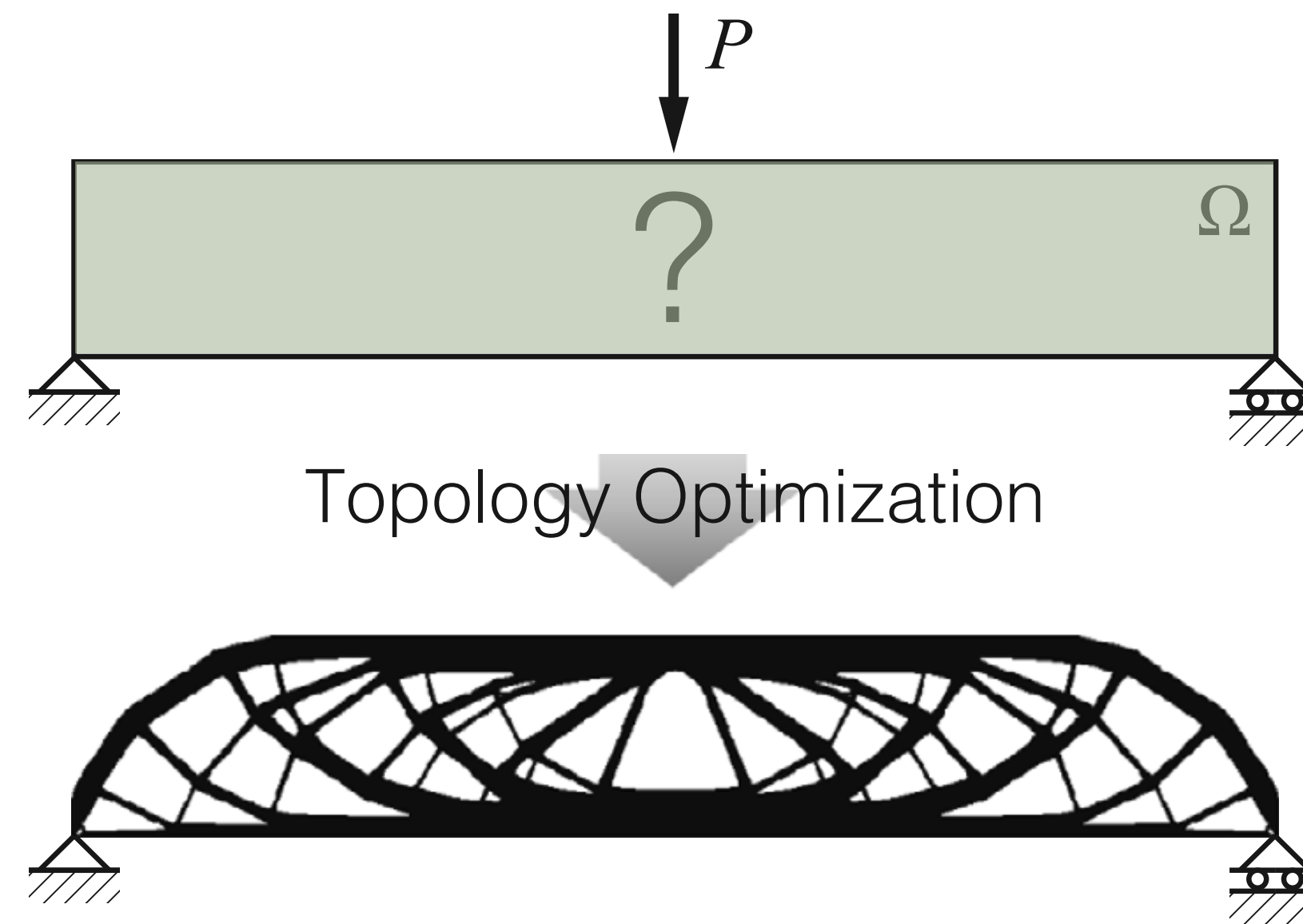


Fig. 1. Example of how topology optimization can be used to identify an efficient structure within a design domain with specified loads and boundary conditions. In this example, the design domain is discretized with solid elements. The design is generated using a density-based topology optimization framework where the material volume is restricted to be 50% of the total volume of the design domain.

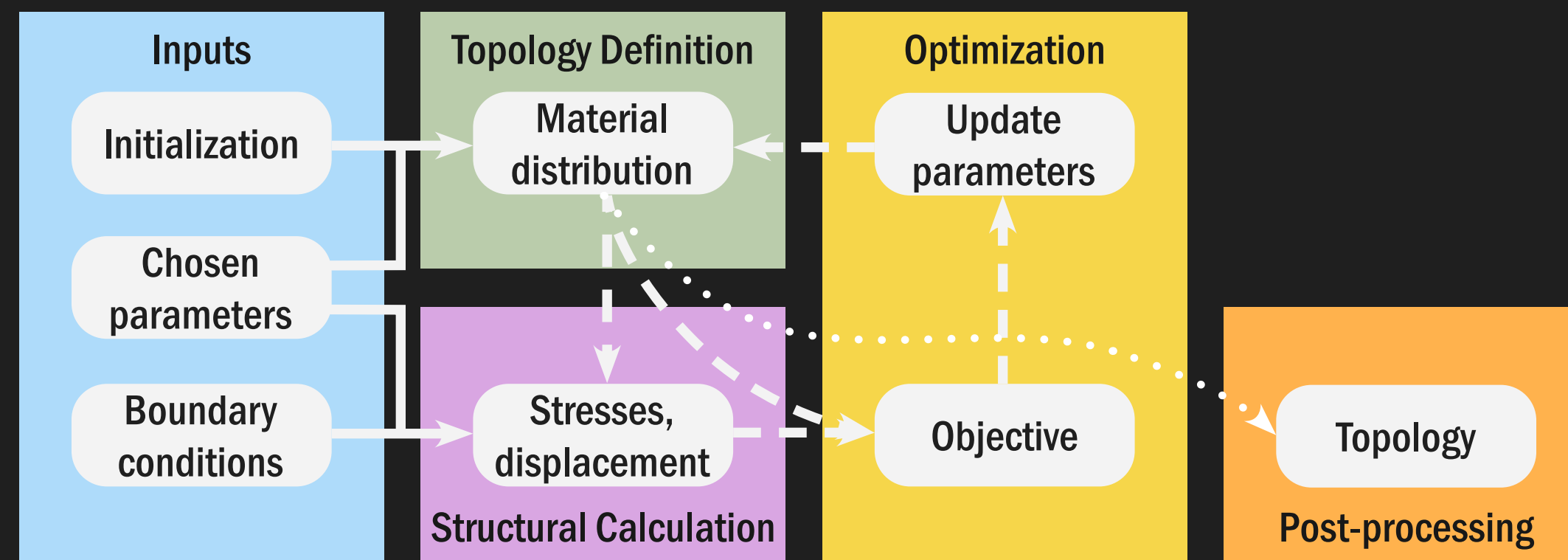
Image source:

Carstensen, J. V., Kim-Tackowiak, H., & Liang, M. Y. (2023). Improving the manufacturability of highly materially restricted topology-optimized designs with Mixed Integer Linear Programming. *Engineering Structures*, 284. <https://doi.org/10.1016/j.engstruct.2023.115955>

To design:

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- 2) An **optimization** algorithm, specifically tailored to brittle materials
- 3) A **workflow** that combines the material distribution definition, brittle material properties, and the optimization algorithm.
- 4) Use the above to inform the design of an indoor cast-glass pedestrian bridge at the British Museum, as a **case study**.

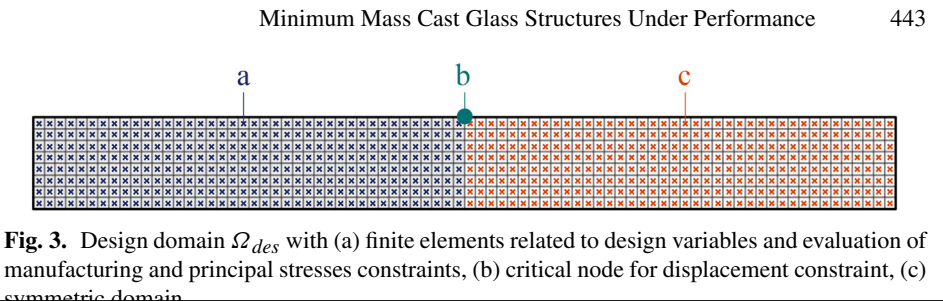
TOP OPT



CAST GLASS

Minimum Mass Cast Glass Structures Under Performance and Manufacturability Constraints

Anna Maria Koniari^(✉), Charalampos Andriotis, and Faidra Oikonomopoulou



Name	Optimization Result ^a	Volume (m ³)	Annealing time (hours : minutes) ^b
BR-PN-30		0,690	35:00
SL-PN-30		0,738	55:20
BR-FX-30		0,419	18:30
BR-PN-40		0,443	23:30
Compact slab (h = 17 cm)		0,821	83:30 (BR) 249:50 (SL)

^a The resulting shapes are illustrated in a black-white gradient that reflects the existence (black) or absence (white) of material according to the pseudo-density value of each finite element.
^b The estimated time refers only to the annealing phase proposed by [4] and not to the total cooling time needed.

Koniari, A. M., Andriotis, C., & Oikonomopoulou, F. (2023). Minimum mass cast glass structures under performance and manufacturability constraints. International Conference on Computer-Aided Architectural Design Futures , 437 –451.

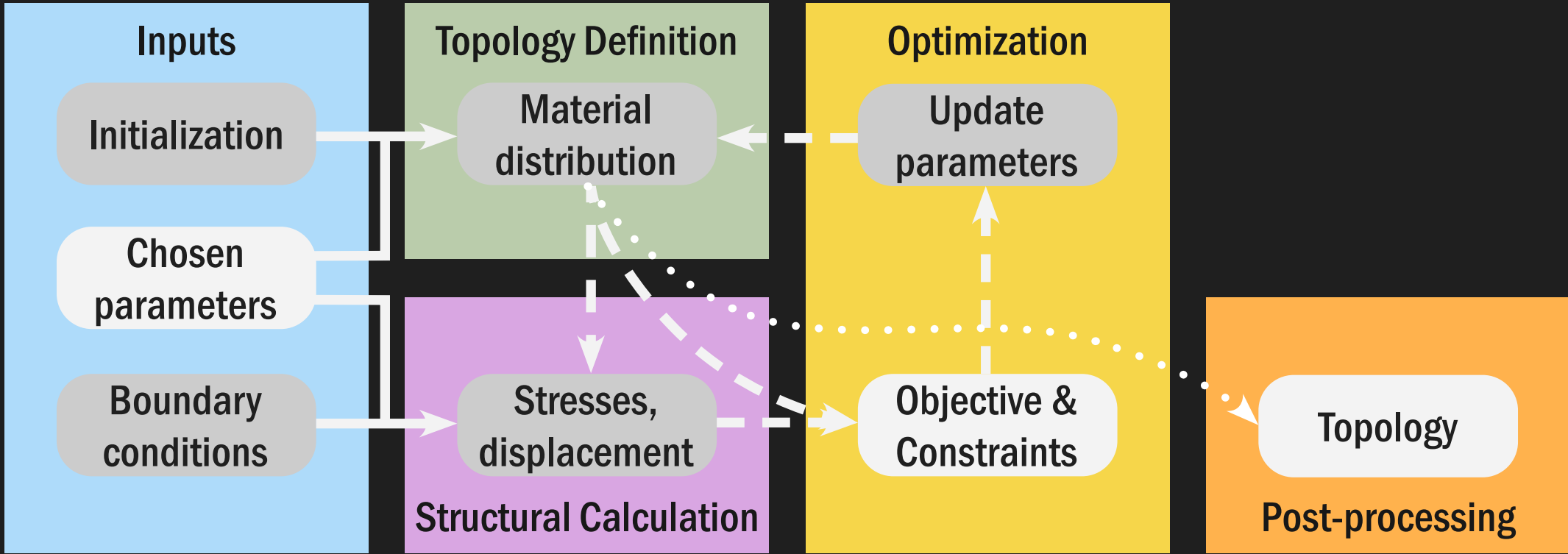
More with less: topology optimization strategies for structural glass design

Jackson L. Jewett^(✉) · Anna Maria Koniari · Charalampos P. Andriotis · Faidra Oikonomopoulou · Telesilla Bristogianni · Josephine V. Carstensen



Fig. 16 Images of fabricated waterjet cut float glass beam specimen. The volume-based is on left, the stress-based is in middle, and in a separate photo the stiffness-based is on right

Jewett, J., Koniari, A. M., Andriotis, C., Oikonomopoulou, F., Bristogianni, T., & Carstensen, J. V. (2024). More with Less: Topology Optimization Strategies for Structural Glass Design. Challenging Glass Conference Proceedings , 9.



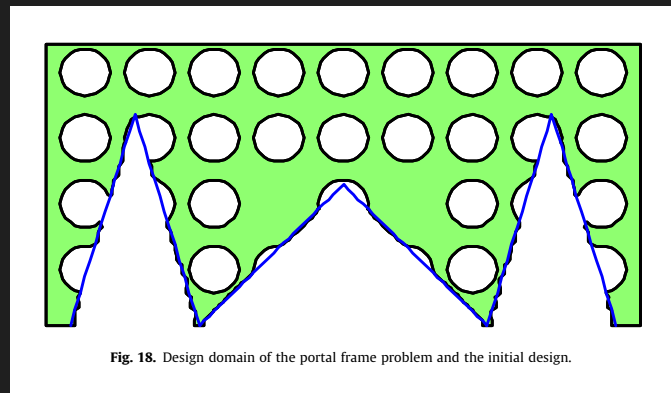
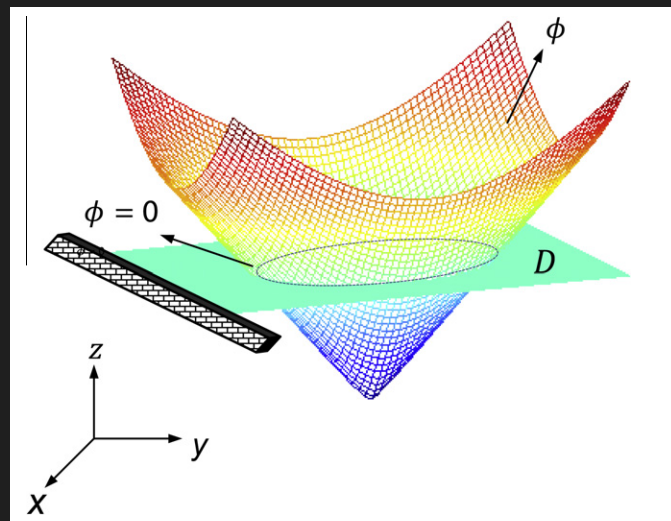


Fig. 18. Design domain of the portal frame problem and the initial design.

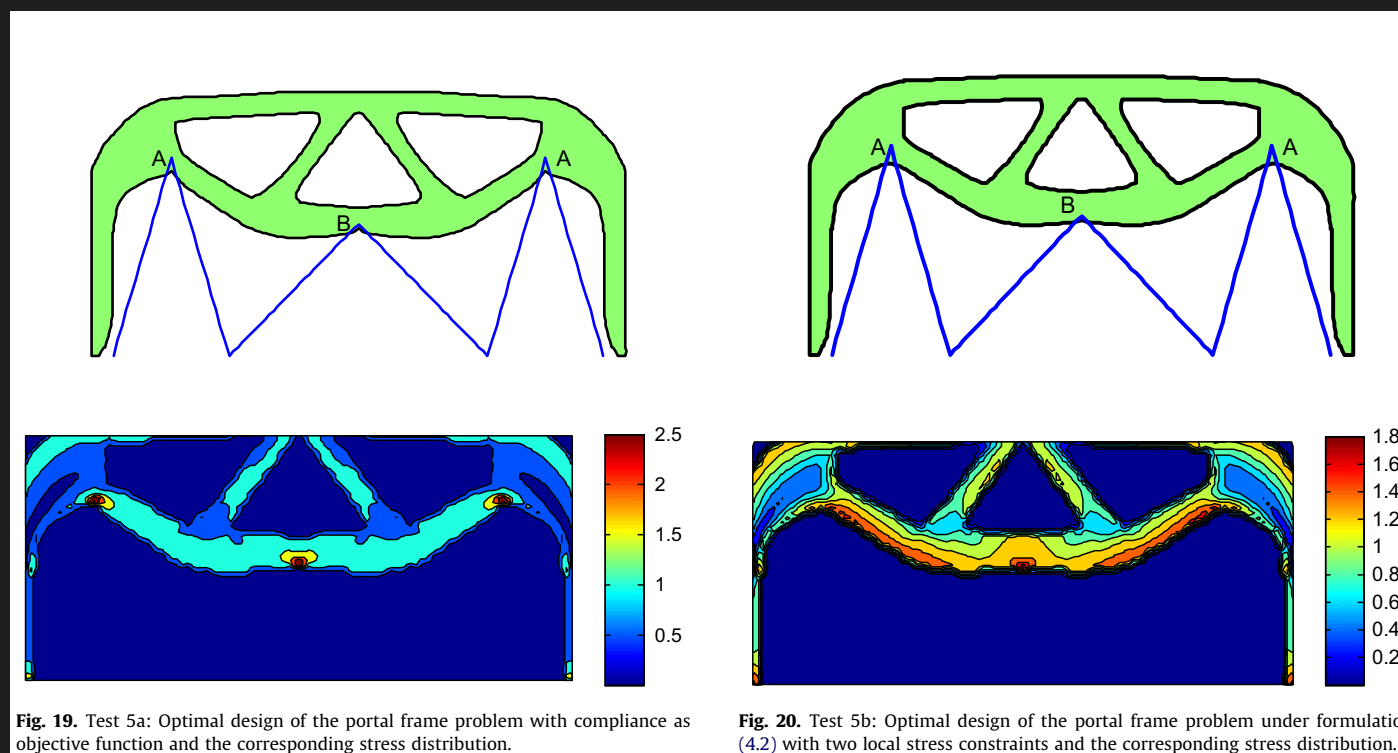
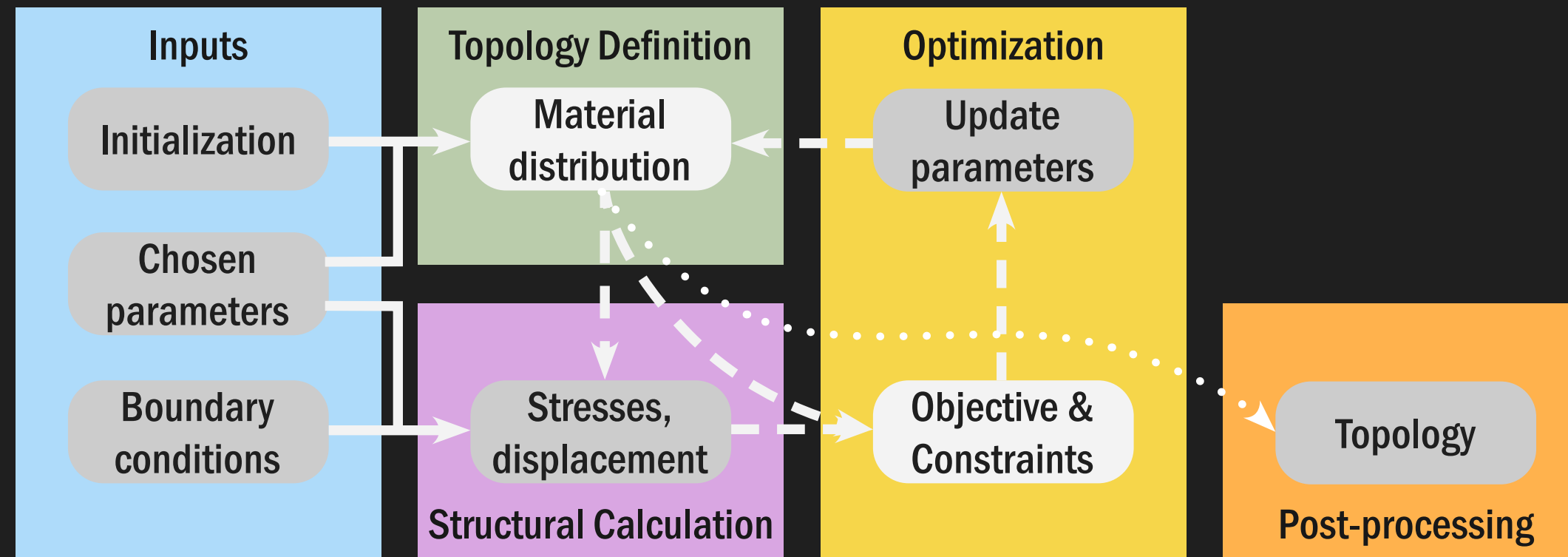


Fig. 19. Test 5a: Optimal design of the portal frame problem with compliance as objective function and the corresponding stress distribution.

Fig. 20. Test 5b: Optimal design of the portal frame problem under formulation (4.2) with two local stress constraints and the corresponding stress distribution.

LEVEL SET METHOD & STRESS-BASED

Stress-related topology optimization via level set approach

Xu Guo^{a,*}, Wei Sheng Zhang^a, Michael Yu Wang^{b,*}, Peng Wei^c

^aState Key Laboratory of Structural Analysis for Industrial Equipment, Department of Engineering Mechanics, Dalian University of Technology, Dalian 116023, PR China

^bThe Chinese University of Hong Kong, Department of Mechanical and Automation Engineering, Shatin, NT, Hong Kong

^cState Key Laboratory of Subtropical Building Science, South China University of Technology, Guangzhou, China

Guo, X., Zhang, W. S., Wang, M. Y., & Wei, P. (2011). Stress-related topology optimization via level set approach. Computer Methods in Applied Mechanics and Engineering, 200(47–48), 3439–3452. <https://doi.org/10.1016/j.cma.2011.08.016>

MACHINE LEARNING TOOLS

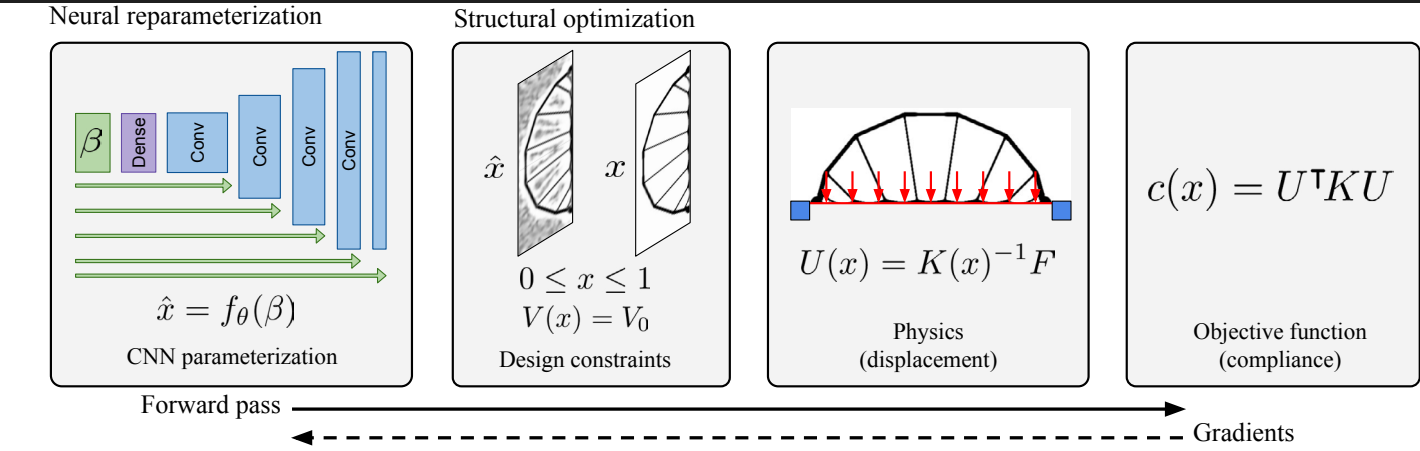
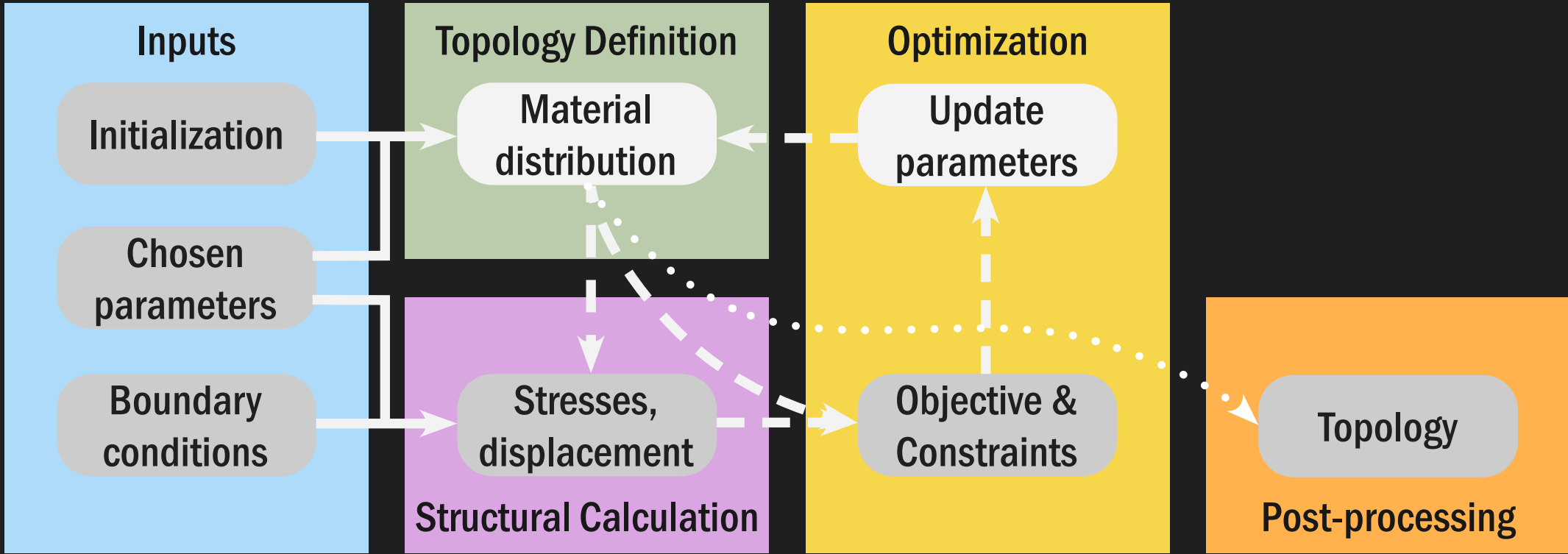


Figure 2: Schema of our approach to reparameterizing a structural optimization problem with a neural network. Each of these steps – the CNN parameterization, the constraint step, and the physics simulation – is differentiable. We implement the forward pass as a TensorFlow graph and compute gradients via automatic differentiation.

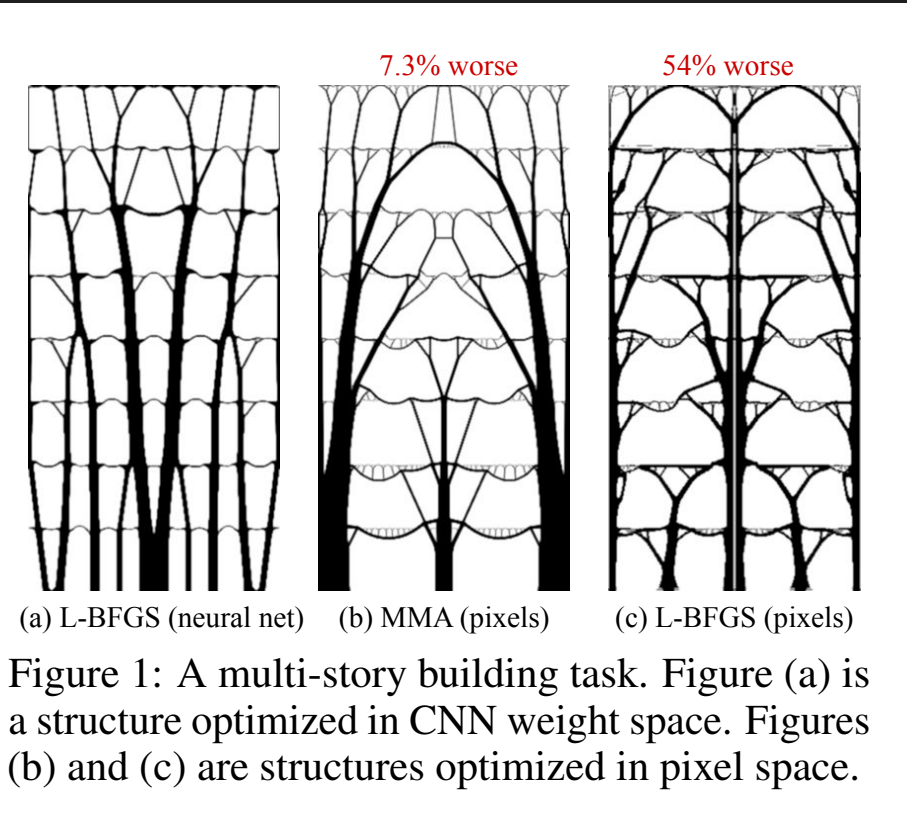


Neural reparameterization improves structural optimization

Stephan Hoyer
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Jascha Sohl-Dickstein
Google Research
jaschasd@google.com

Sam Greydanus
Google Research
sgrey@google.com



Hoyer, S., Sohl-Dickstein, J., & Greydanus, S. (2019). Neural reparameterization improves structural optimization. <http://arxiv.org/abs/1909.04240>

SOME ANSWERS

CAST GLASS

Minimum Mass Cast Glass Structures Under Performance and Manufacturability Constraints

Anna Maria Koniari^(✉), Charalampos Andriotis, and Faidra Oikonomopoulou

Minimum Mass Cast Glass Structures Under Performance

443

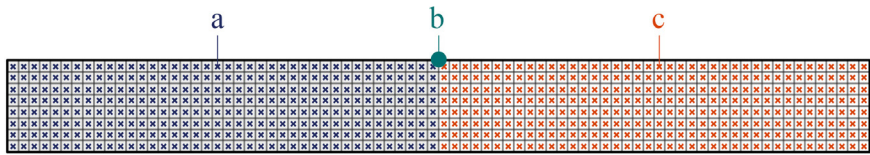


Fig. 3. Design domain Ω_{des} with (a) finite elements related to design variables and evaluation of manufacturing and principal stresses constraints, (b) critical node for displacement constraint, (c) symmetric domain

Name	Optimization Result ^a	Volume (m ³)	Annealing time (hours : minutes) ^b
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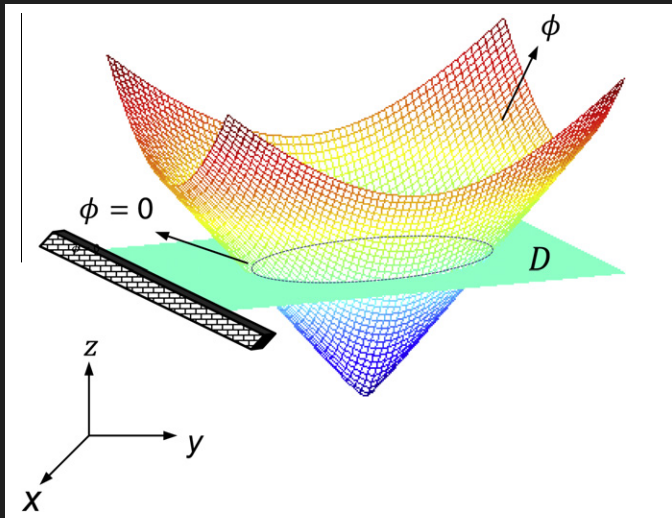


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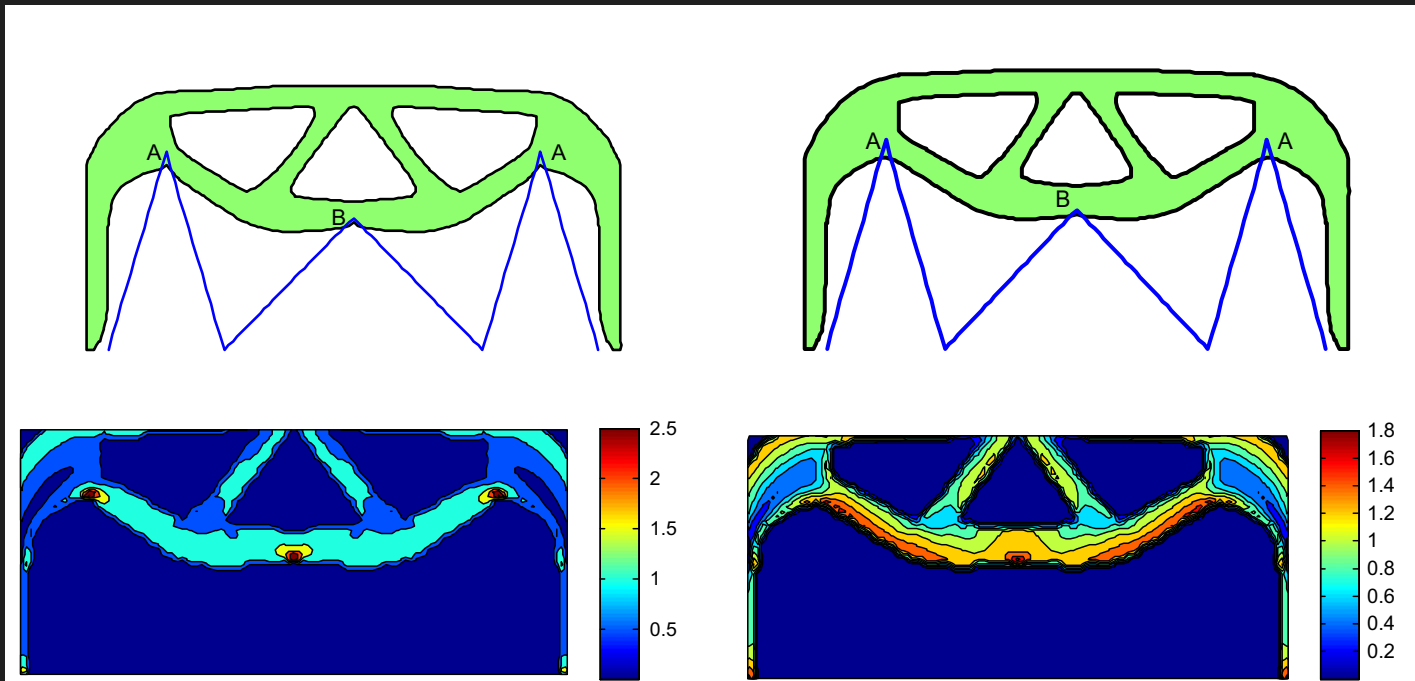
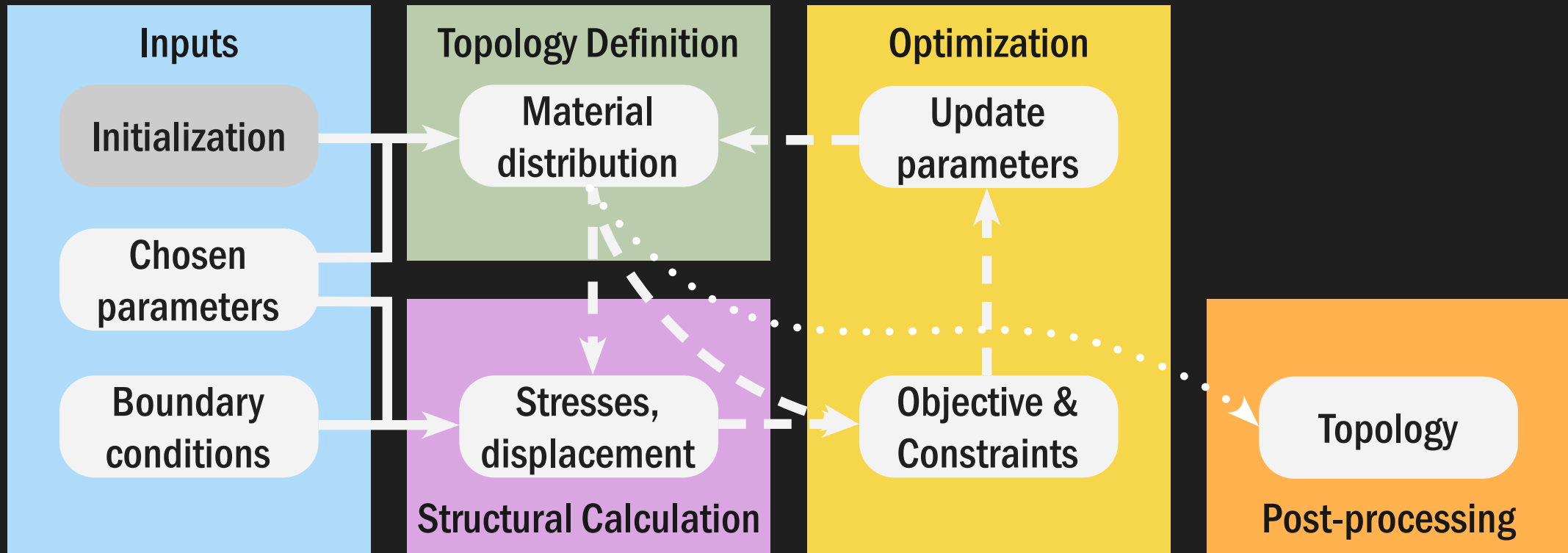


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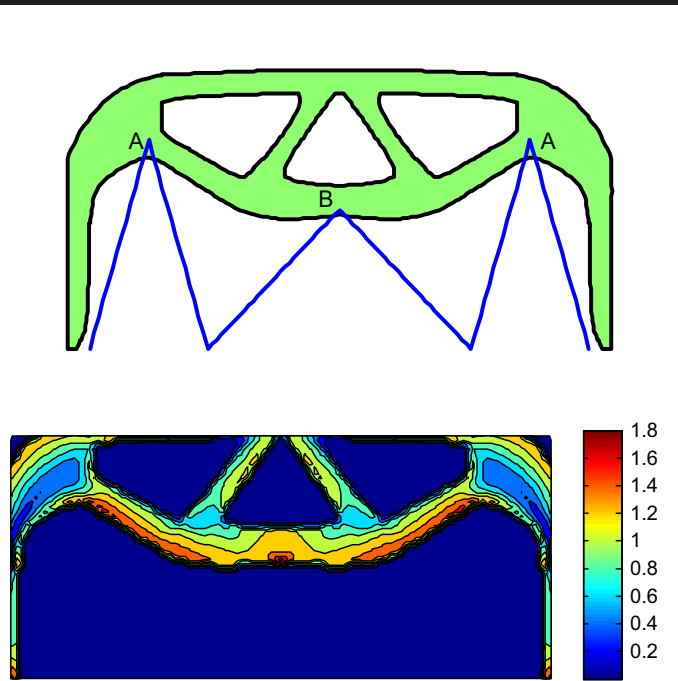


Fig. 20. Test 5b: Optimal design of the portal frame problem under formulation (4.2) with two local stress constraints and the corresponding stress distribution.

MACHINE LEARNING TOOLS

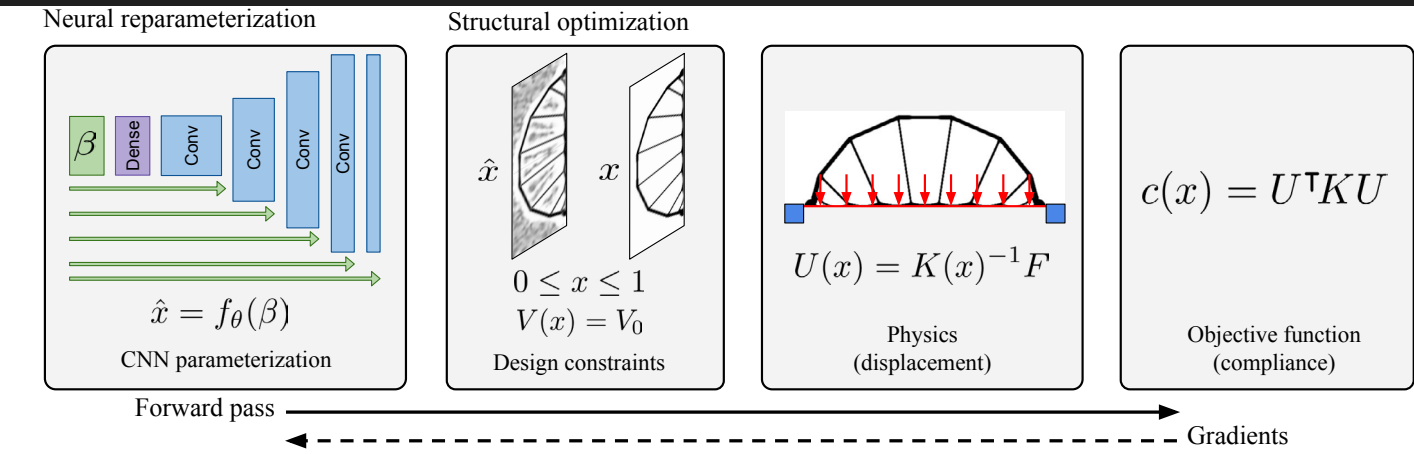


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Neural reparameterization improves structural optimization

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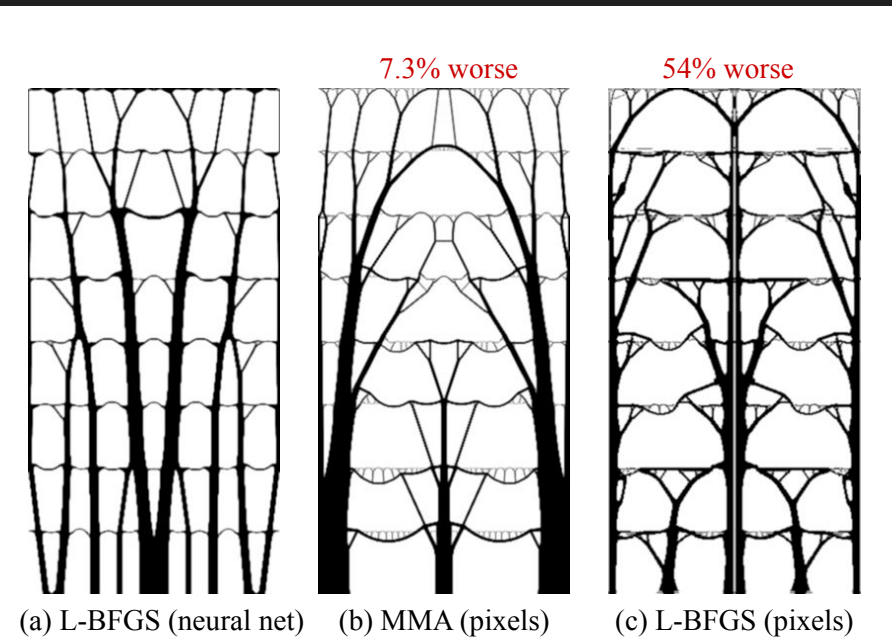


Figure 1: A multi-story building task. Figure (a) is a structure optimized in CNN weight space. Figures (b) and (c) are structures optimized in pixel space.

Hoyer, S., Sohl-Dickstein, J., & Greydanus, S. (2019). Neural reparameterization improves structural optimization. <http://arxiv.org/abs/1909.04240>

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RESEARCH GOAL

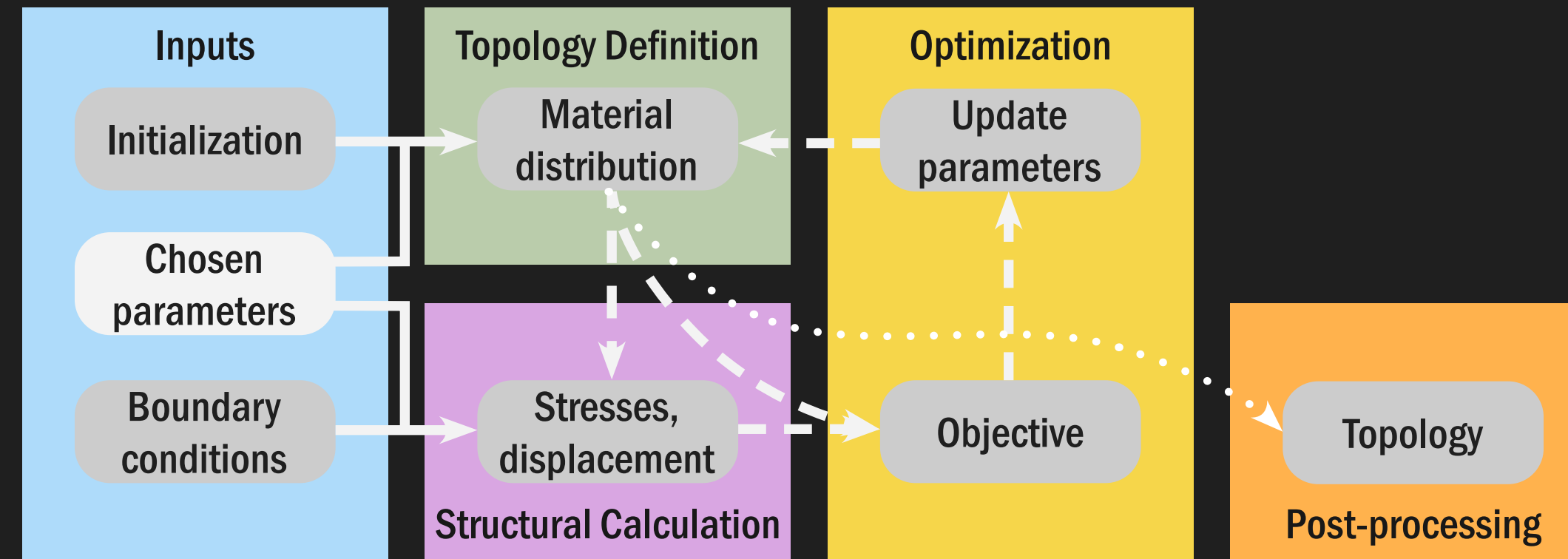
To design:

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MATERIAL DISTRIBUTION

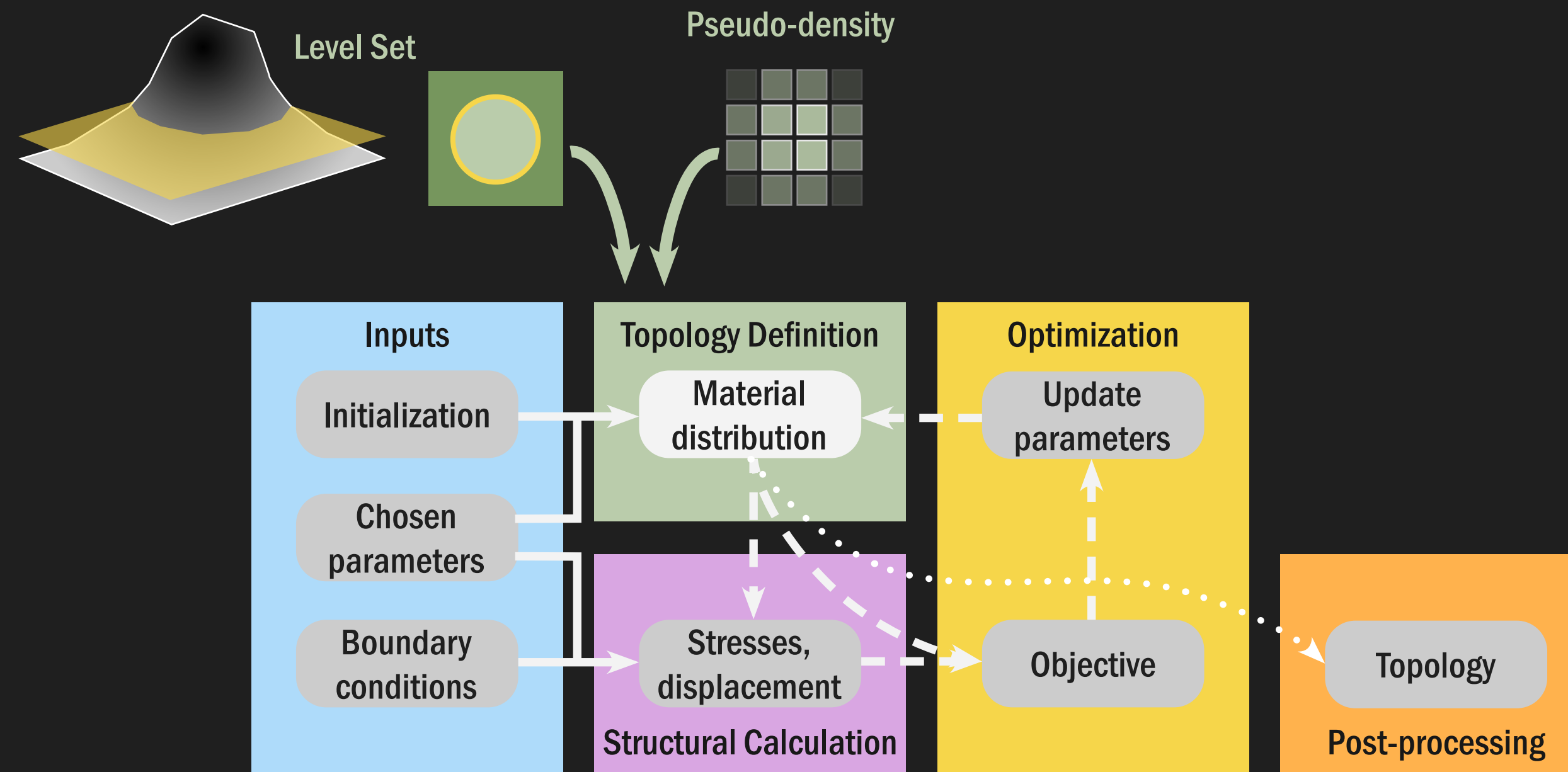
1st goal:
Material distribution definition,
specifically tailored to cast glass.

Cast Glass



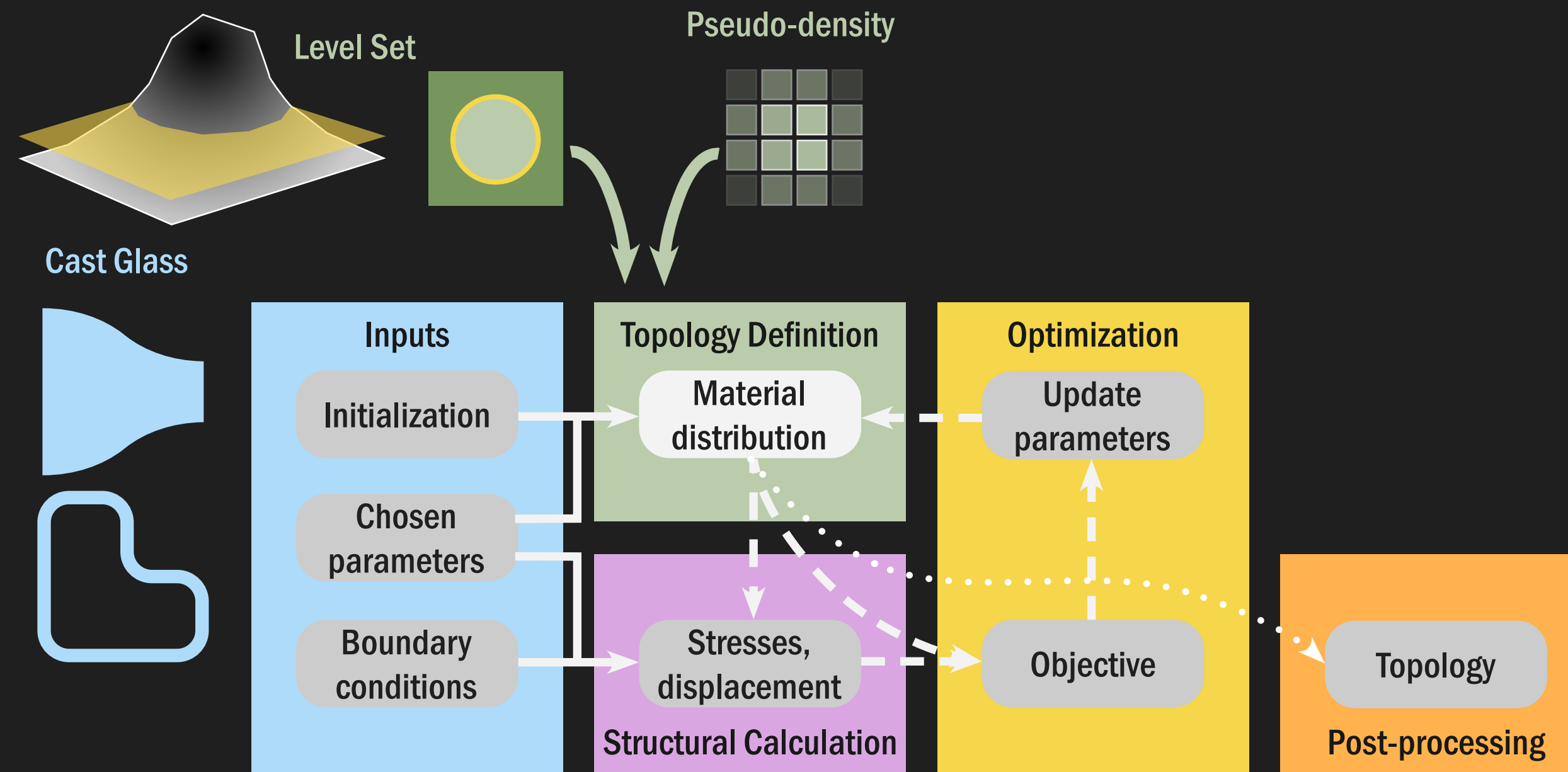
MATERIAL DISTRIBUTION

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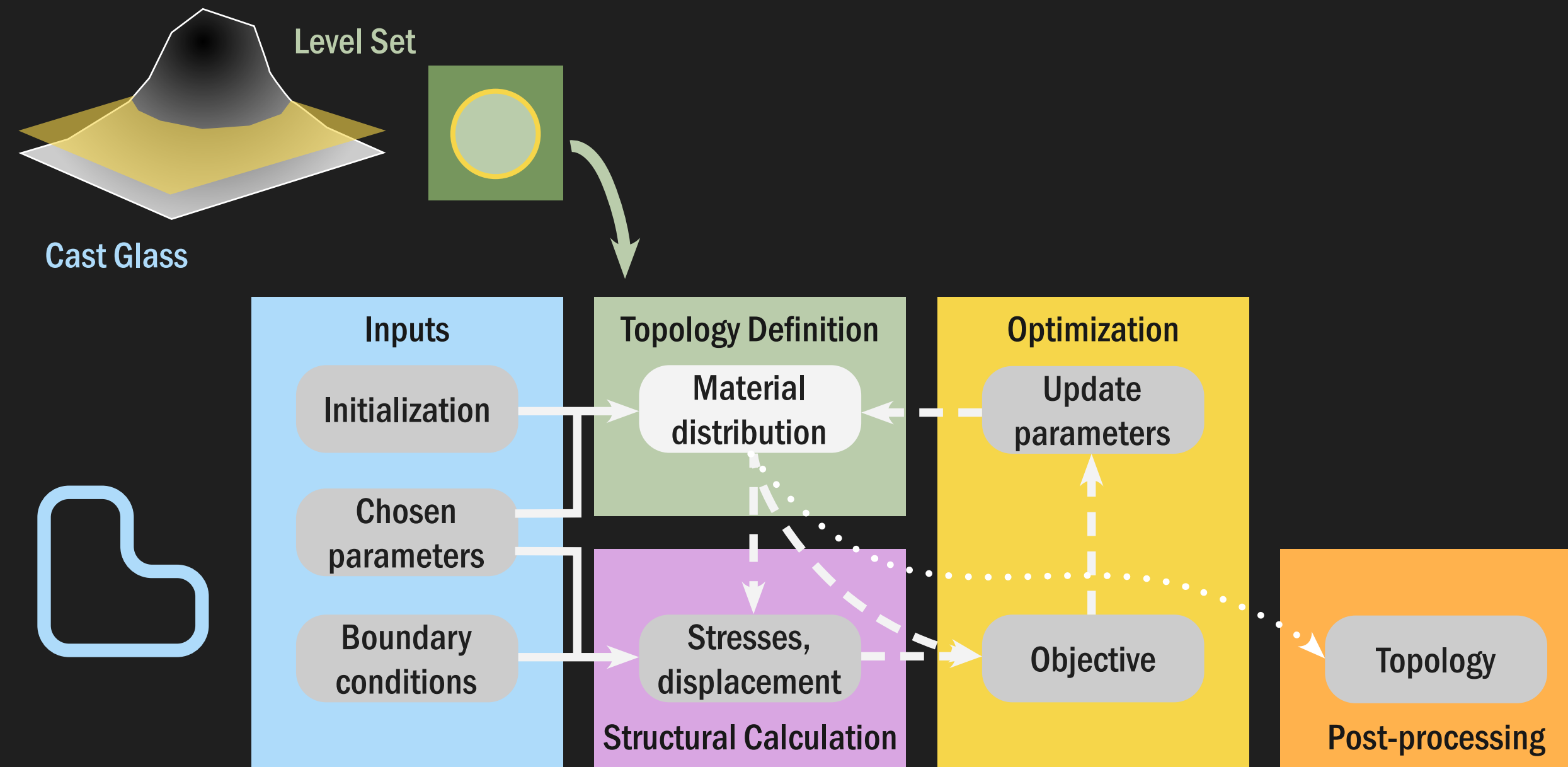
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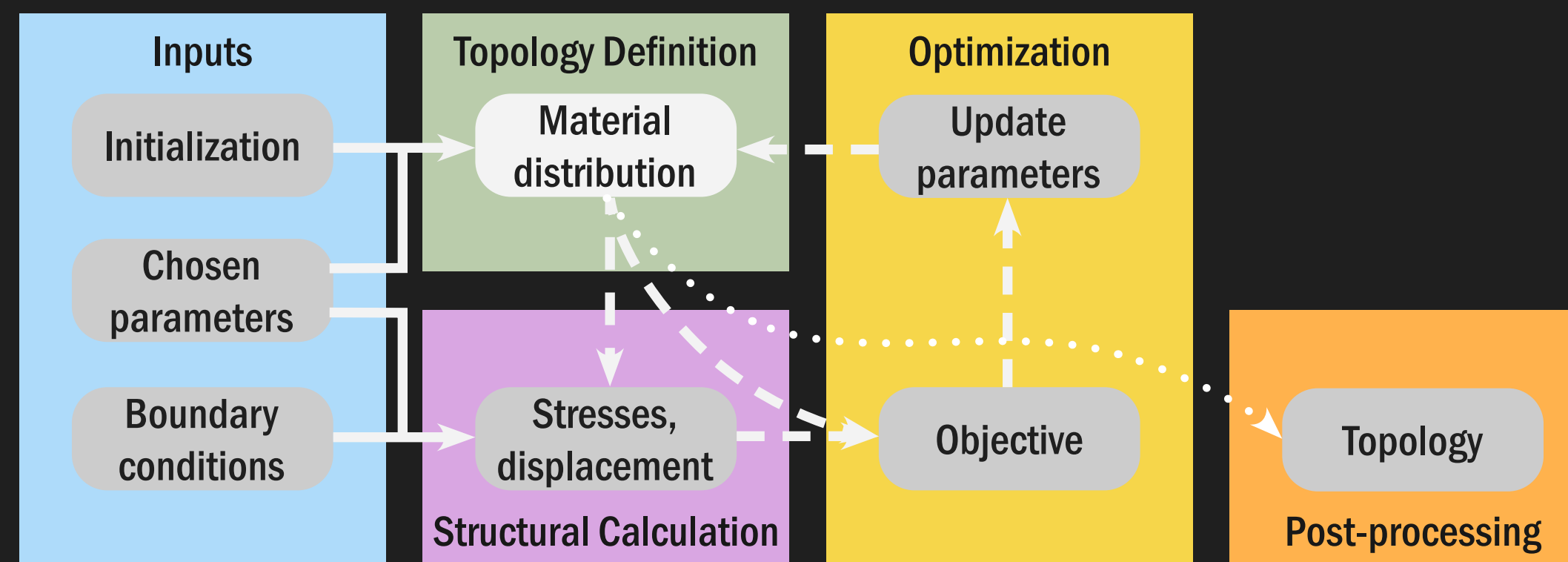
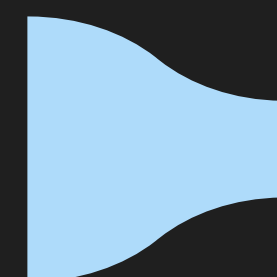
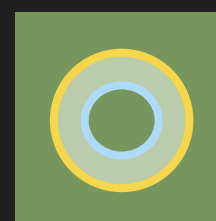
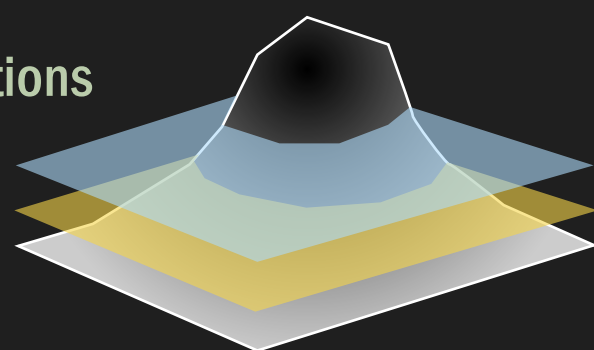
TOPOLOGY DEFINITION

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Material distribution definition,
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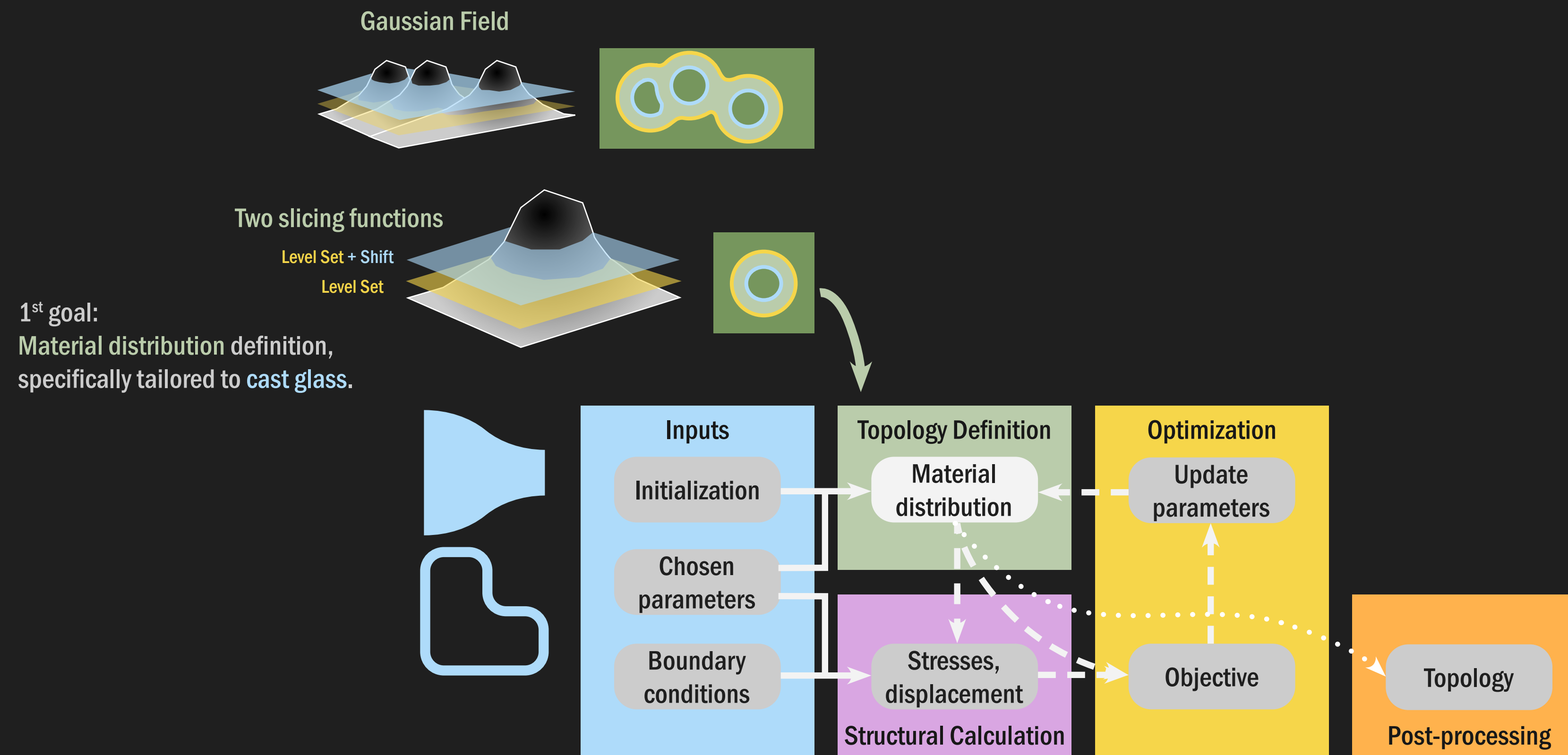
Two slicing functions

Level Set + Shift

Level Set



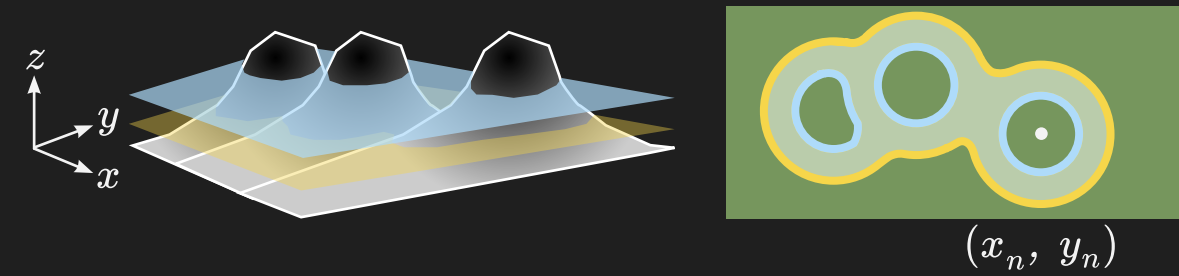
TOPOLOGY DEFINITION



TOPOLOGY DEFINITION

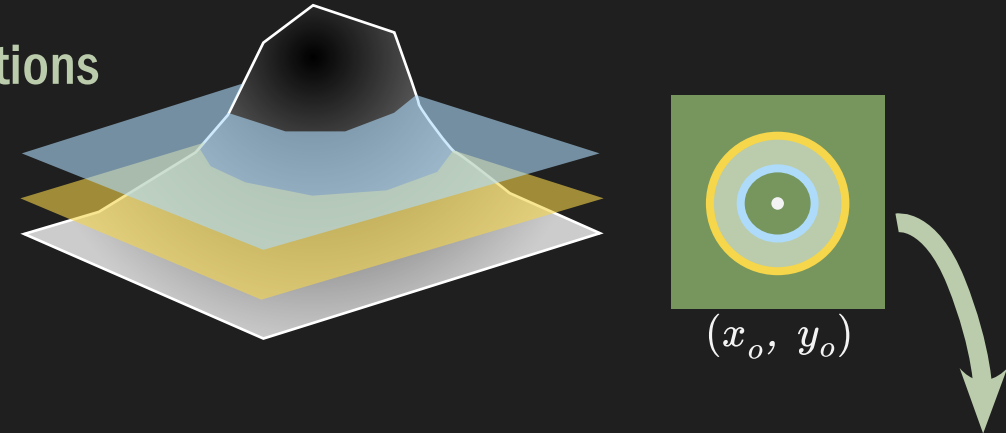
$$z = \sum_{n=1}^N A e^{-\left(\frac{(x-x_n)^2+(y-y_n)^2}{s^2}\right)}$$

Gaussian Field

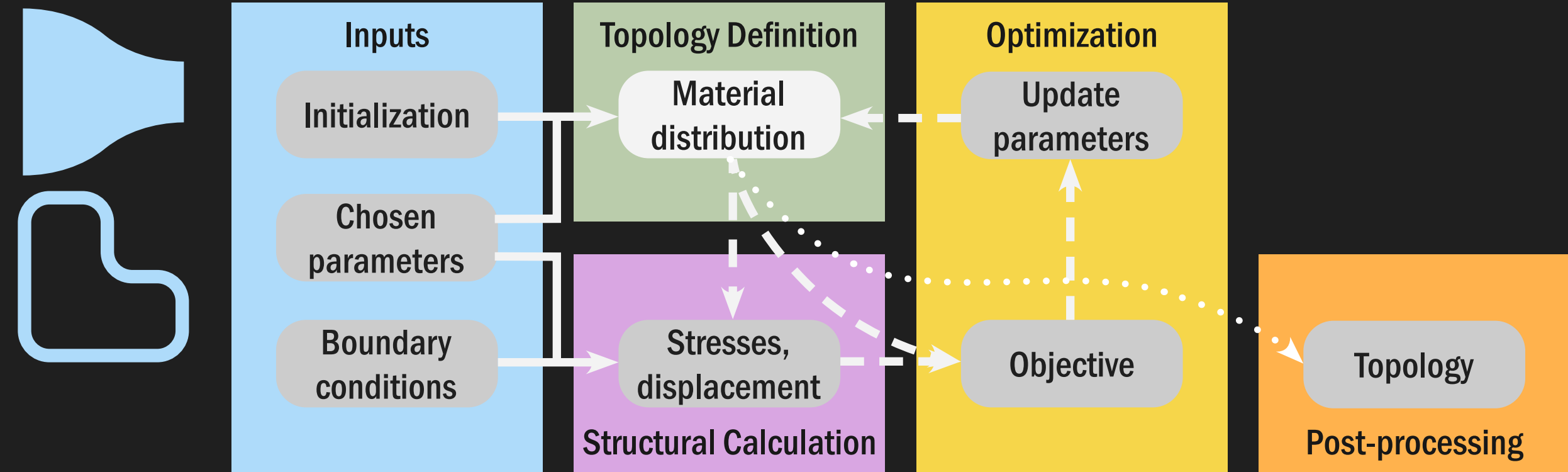


Two slicing functions

Level Set + Shift
Level Set

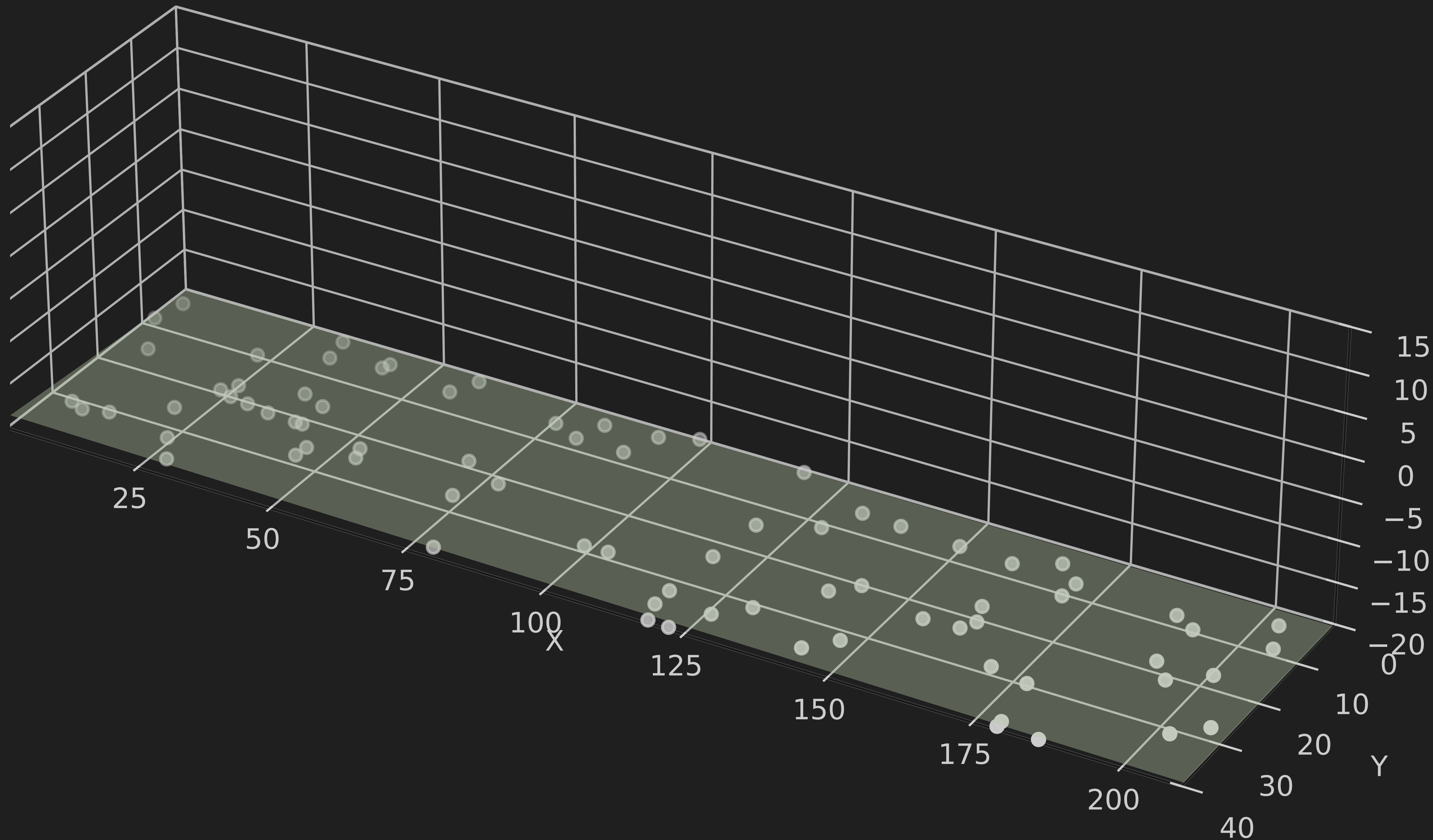


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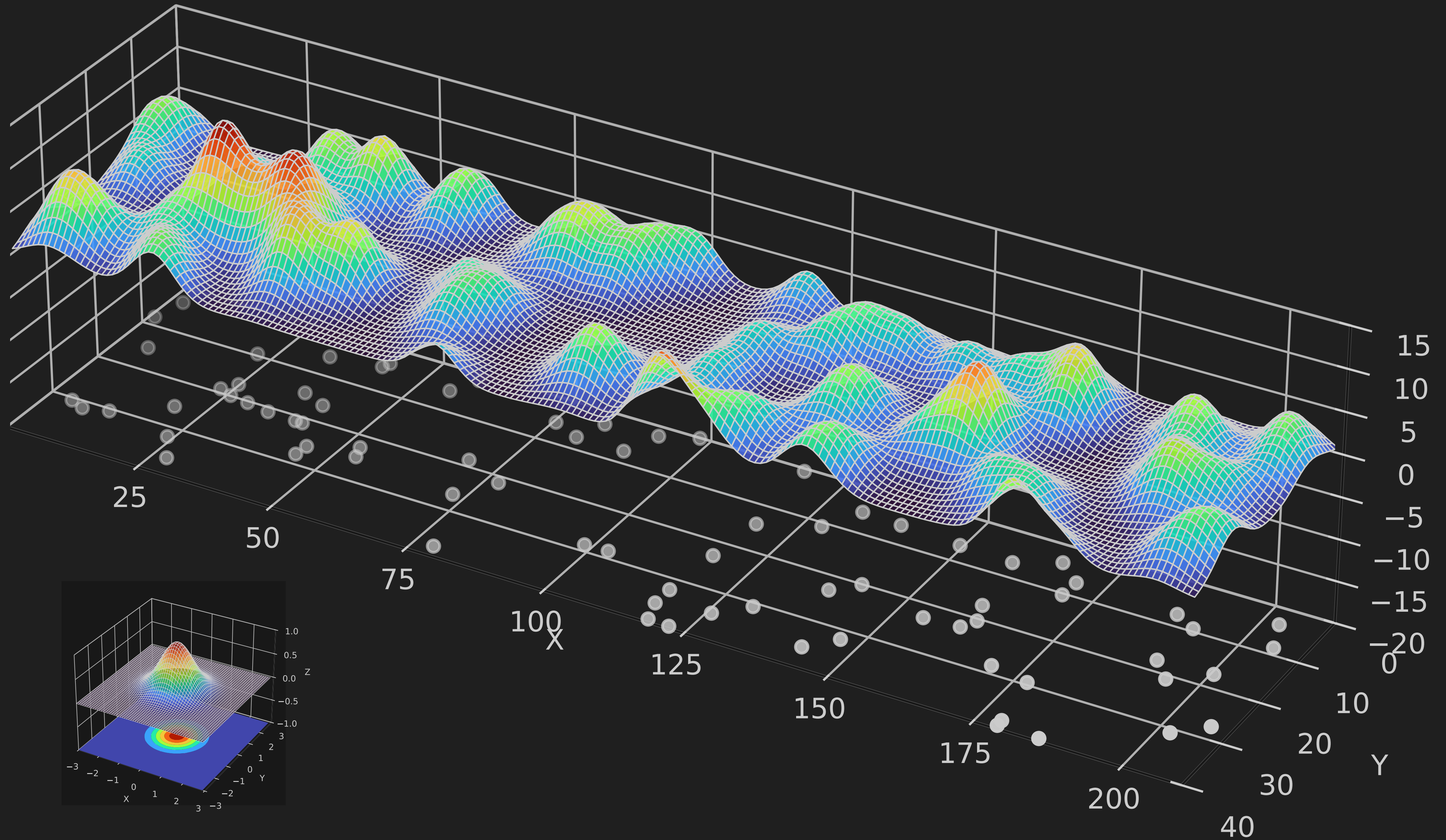
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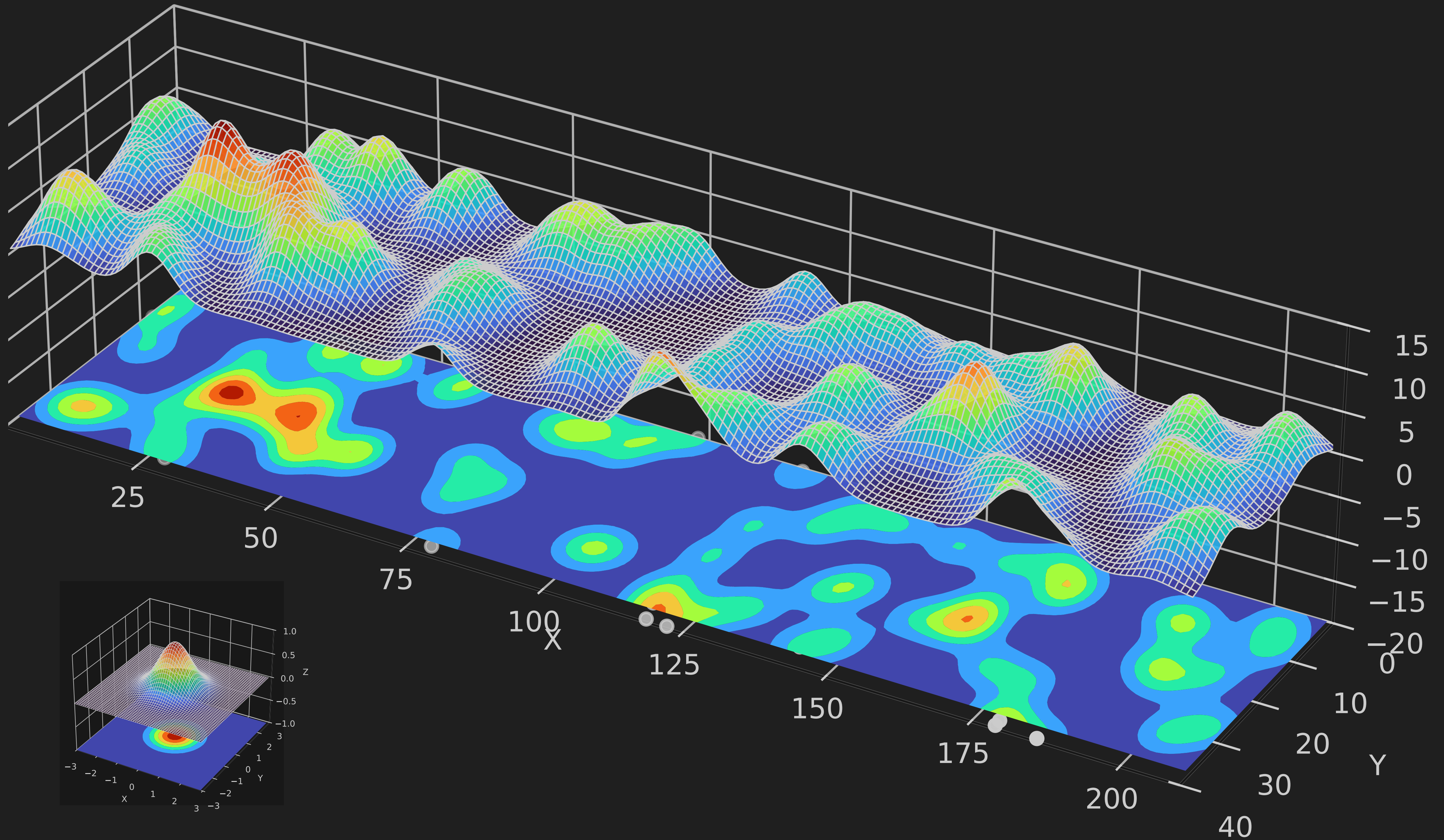
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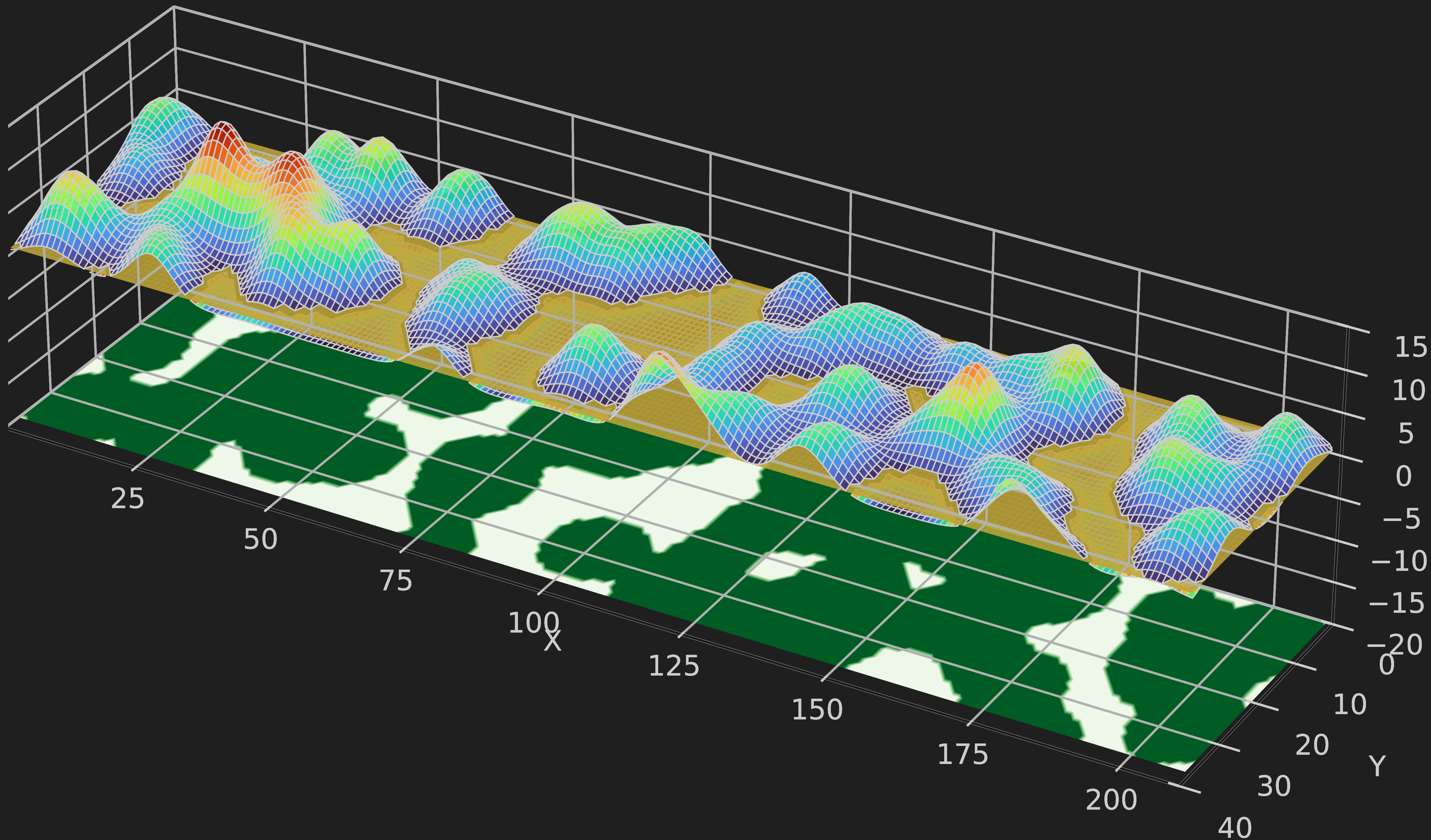
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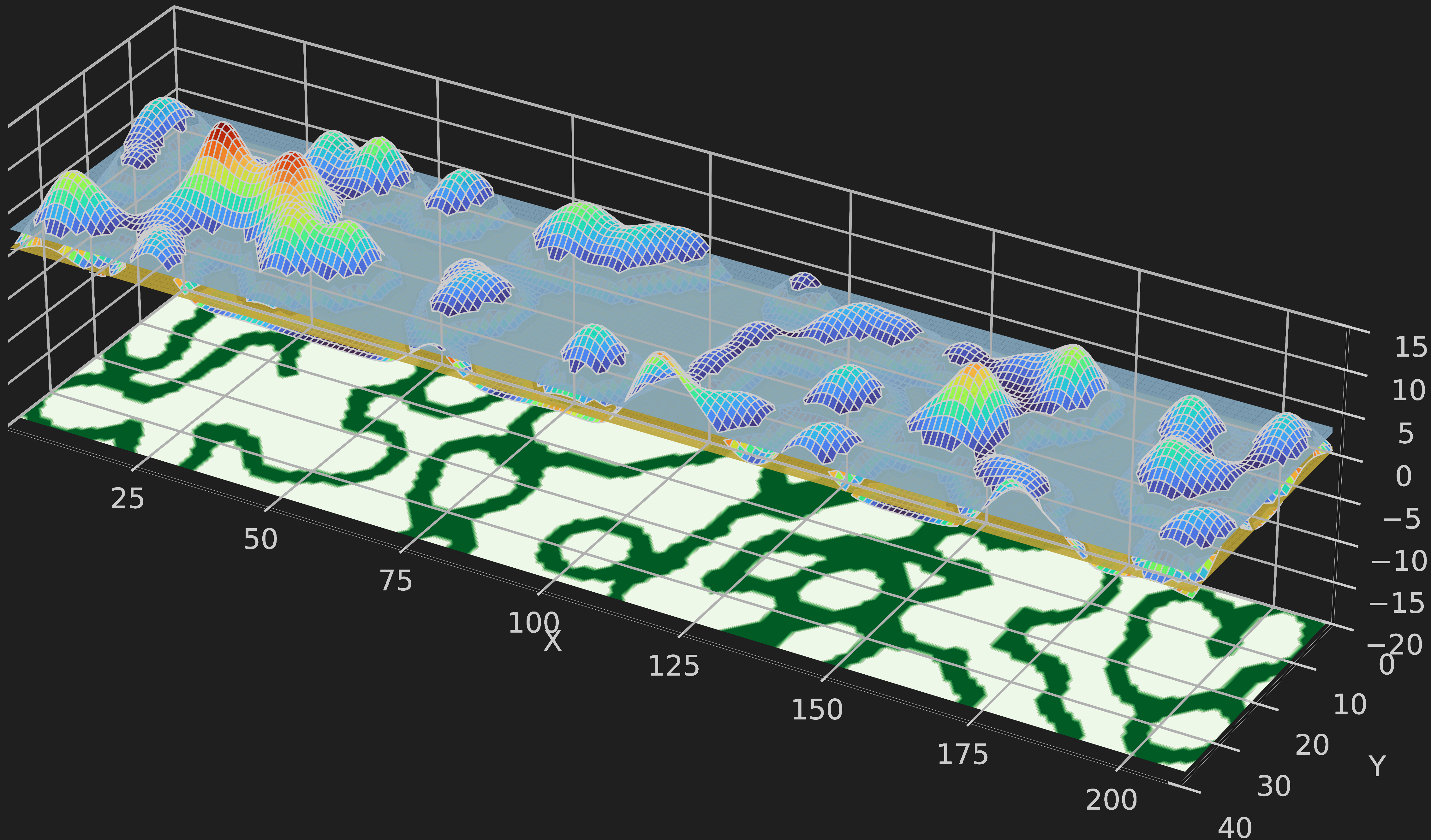


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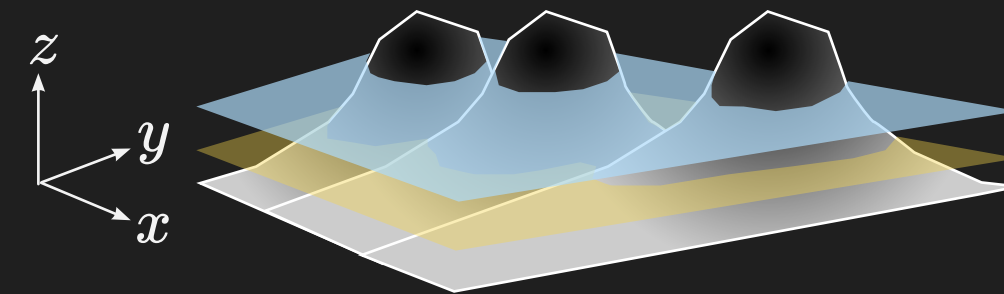
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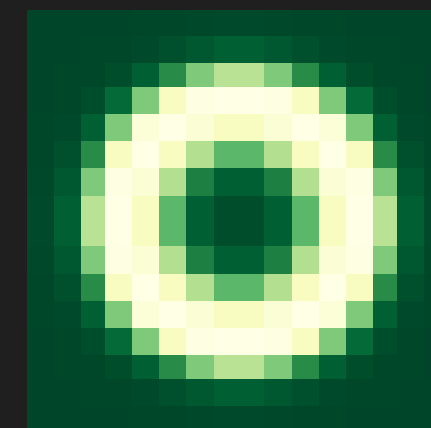
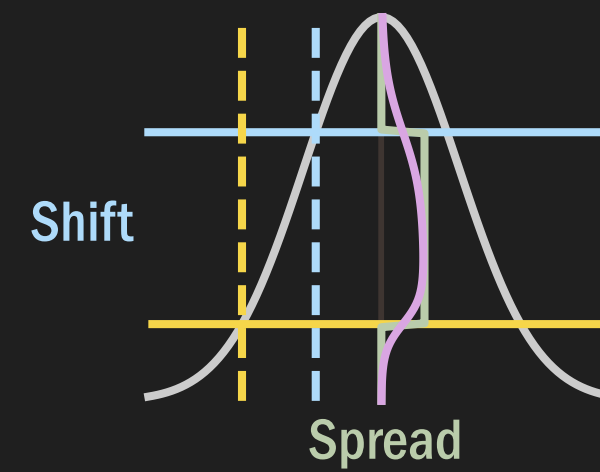
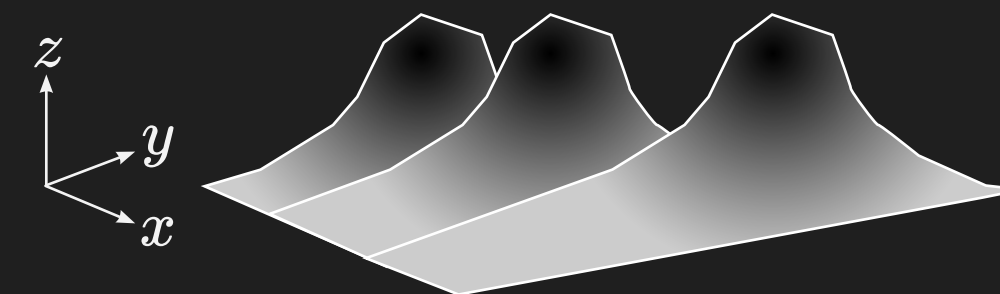
TOPOLOGY
DEFINITION



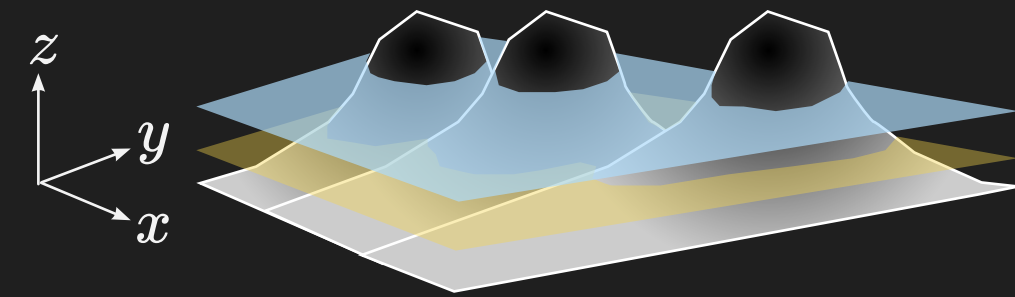
Shift



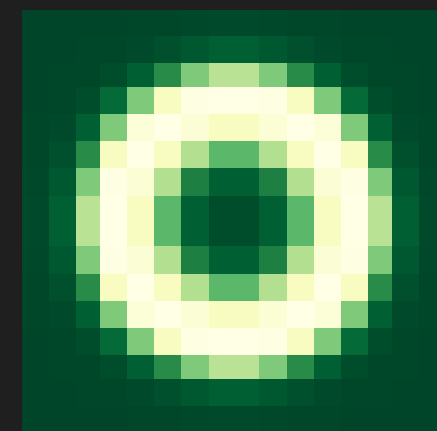
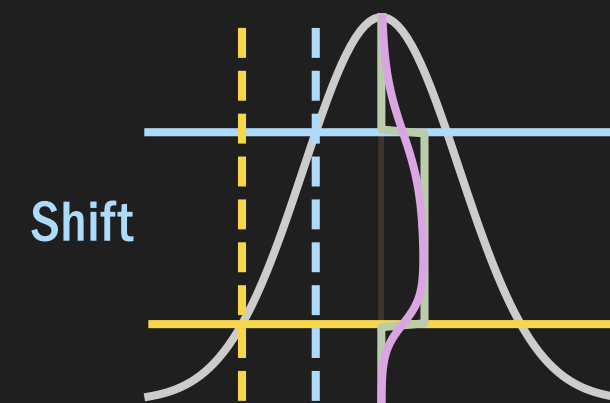
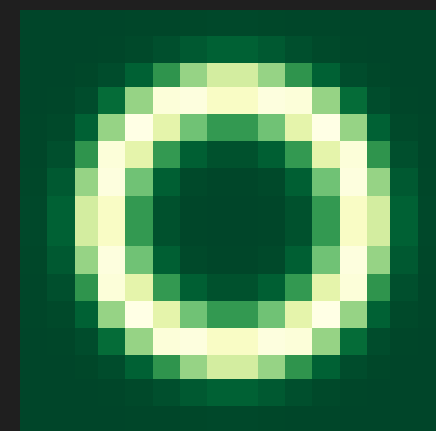
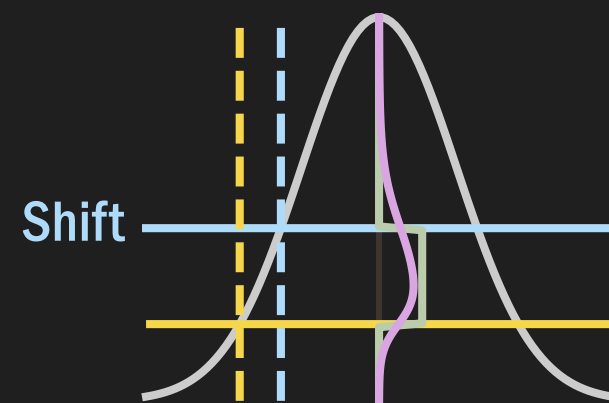
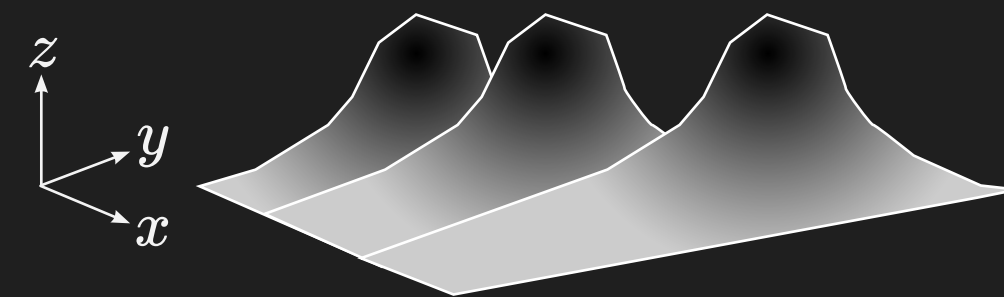
Spread



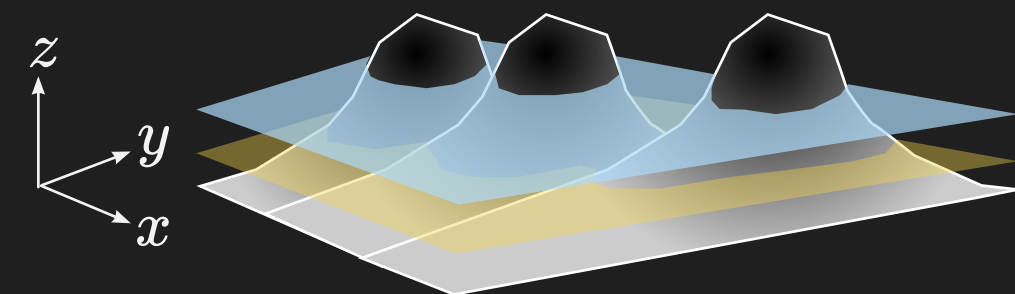
Shift



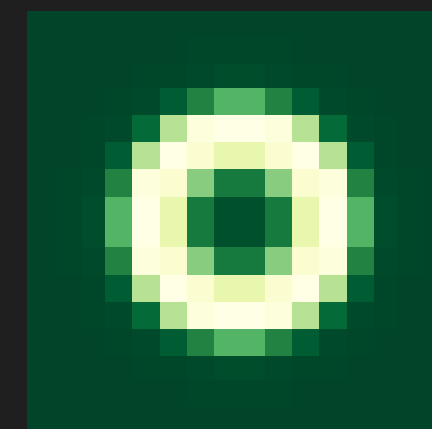
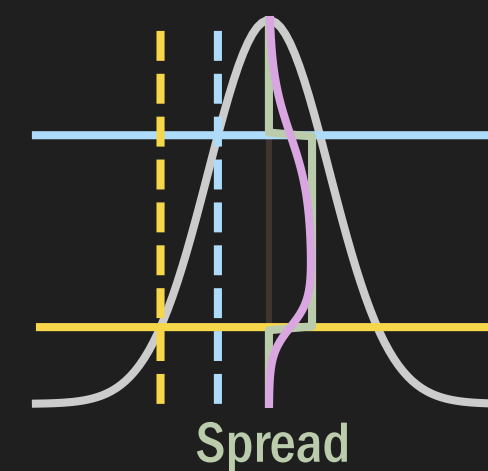
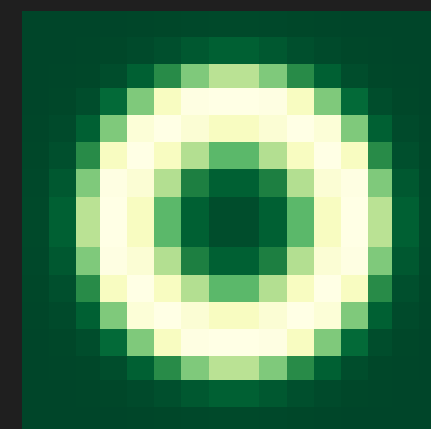
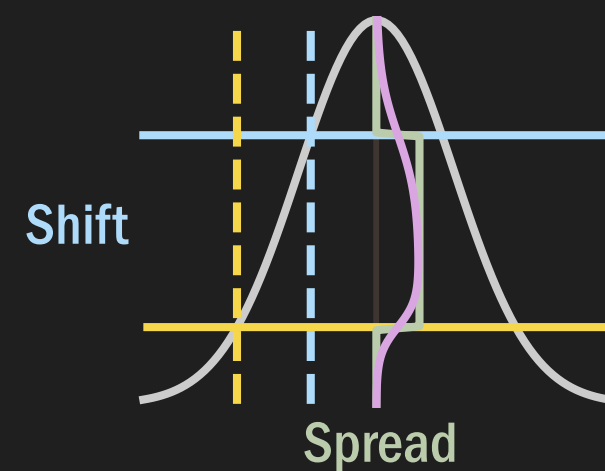
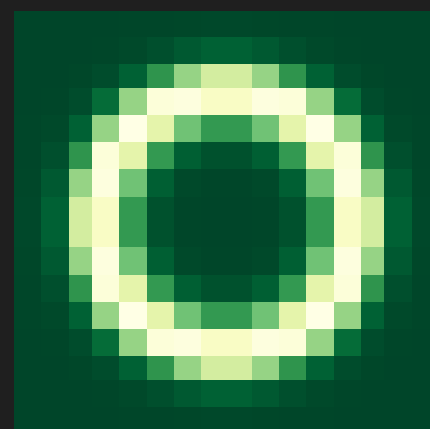
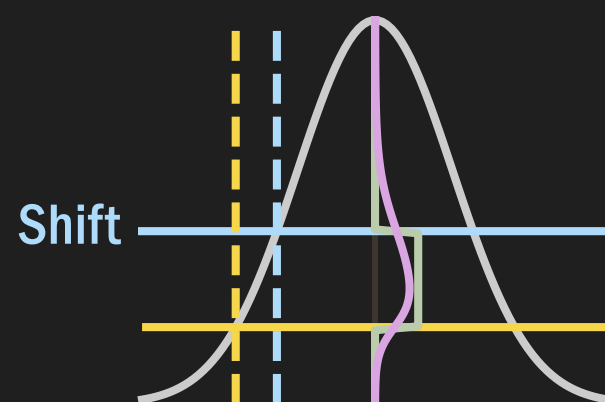
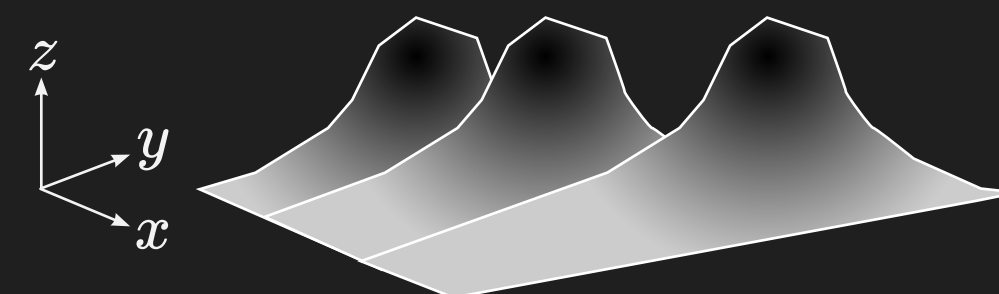
Spread



Shift

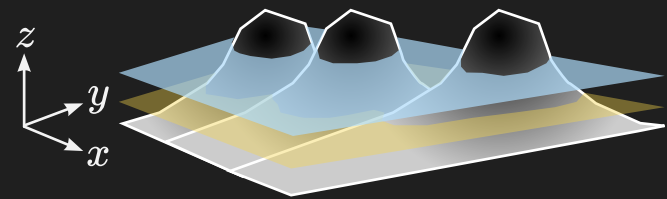


Spread



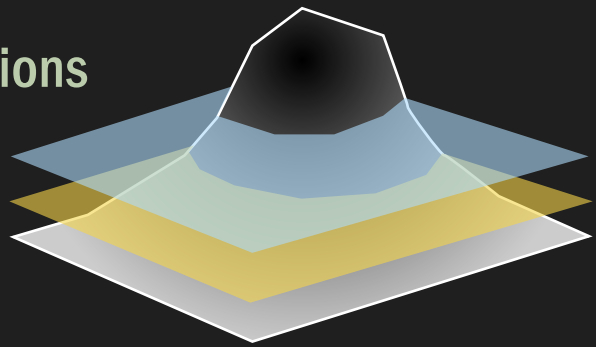
$$z = \sum_{n=1}^N A e^{-\left(\frac{(x-x_n)^2+(y-y_n)^2}{s^2}\right)}$$

Gaussian Field

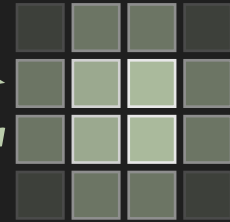
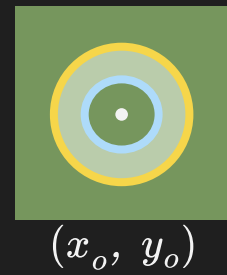


Two slicing functions

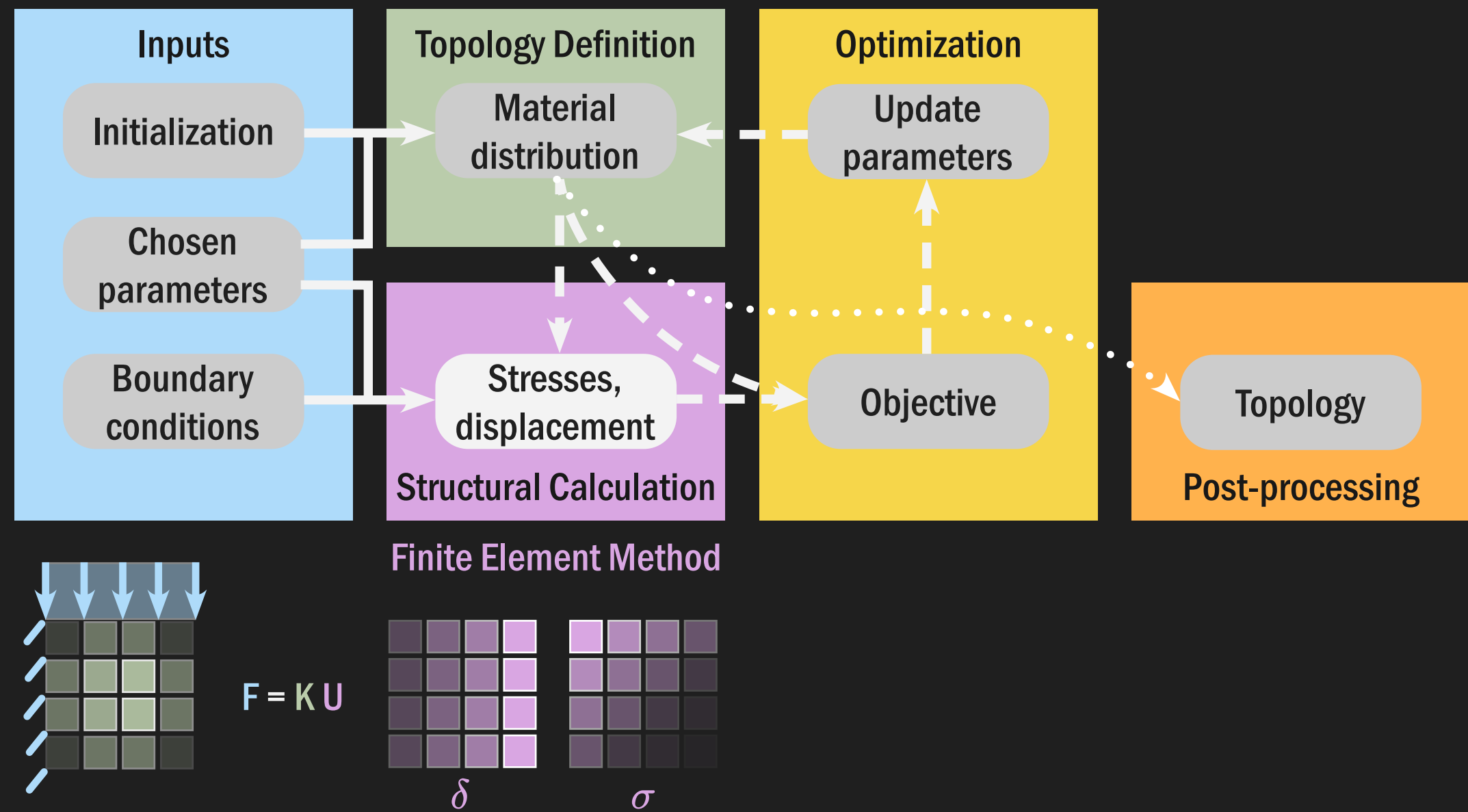
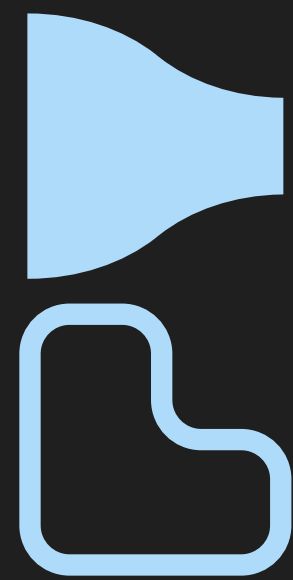
Level Set + Shift
Level Set



Pseudo-density



1st goal:
Material distribution definition,
specifically tailored to cast glass.

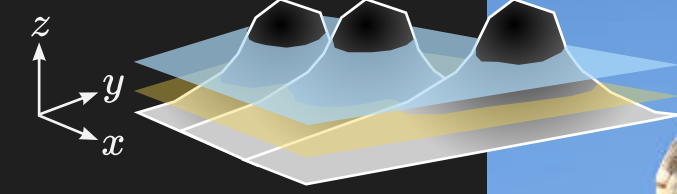


FINITE ELEMENT METHOD

$$z = \sum_{n=1}^N A e^{-\left(\frac{(x-x_n)^2 + (y-y_n)^2}{s^2}\right)}$$

Gaussian Field

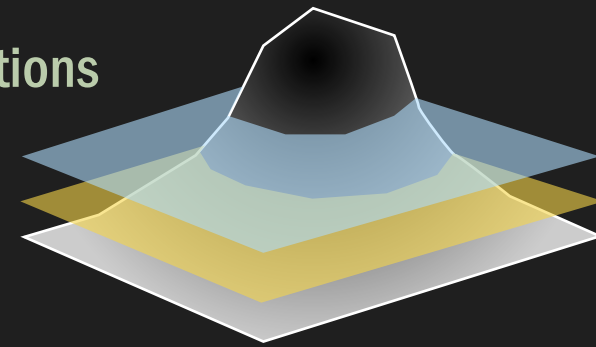
Gaussian Field



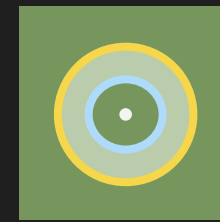
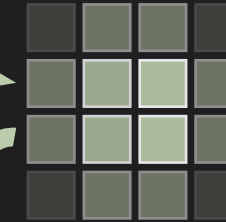
Two slicing functions

Level Set + Shift

Level Set

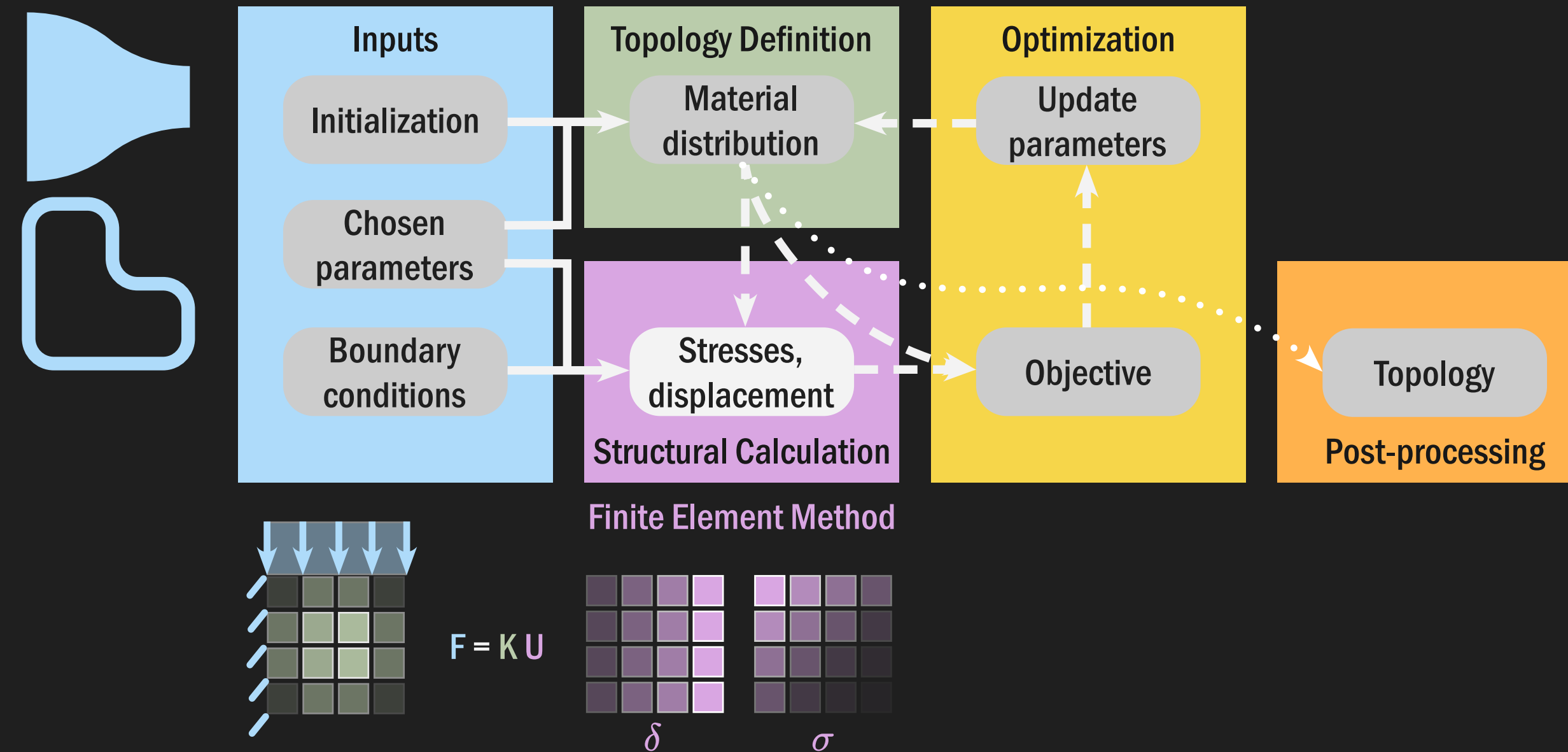


Pseudo-density


$$(x_o, y_o)$$


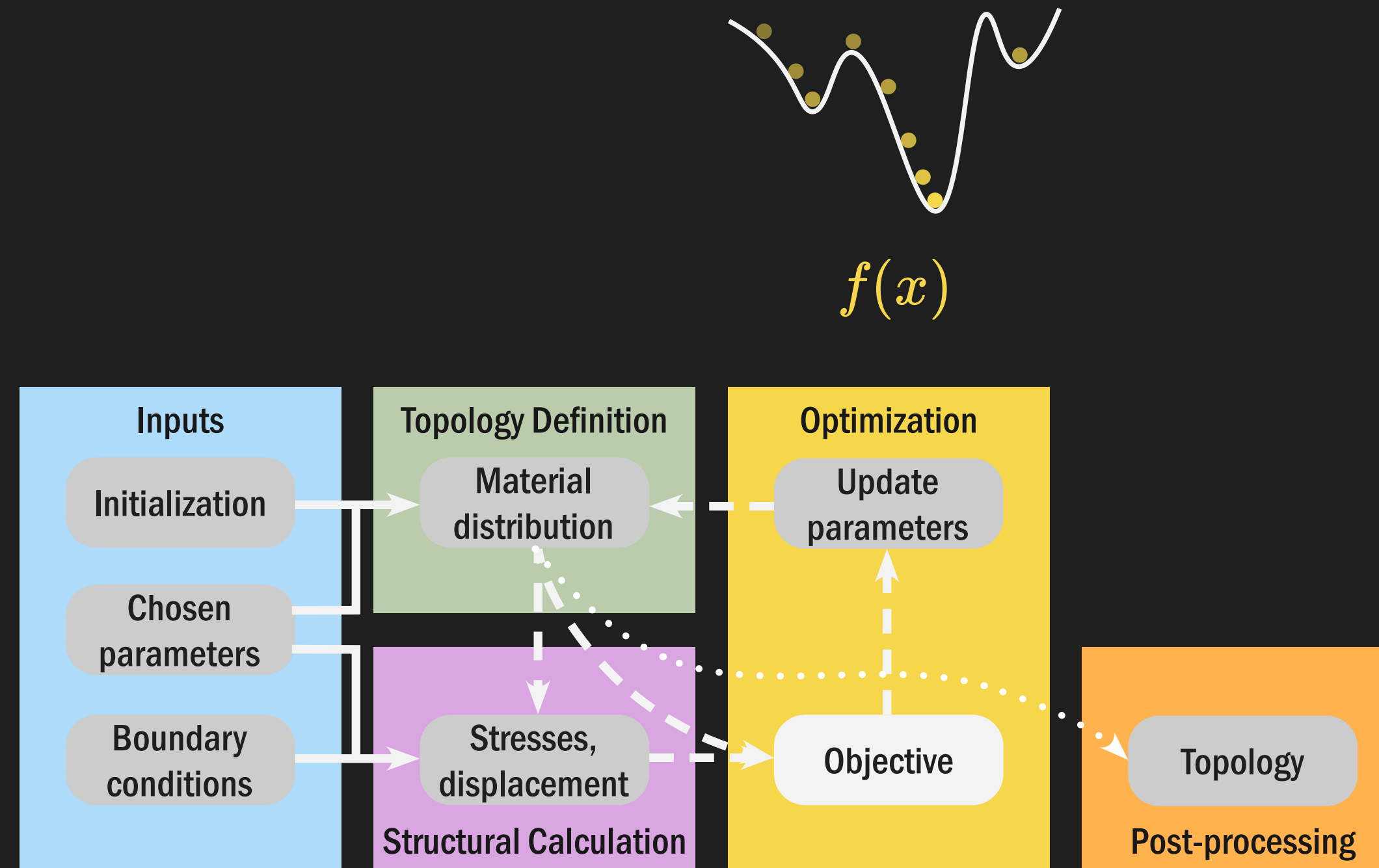
1st goal:

**Material distribution definition,
specifically tailored to cast glass.**



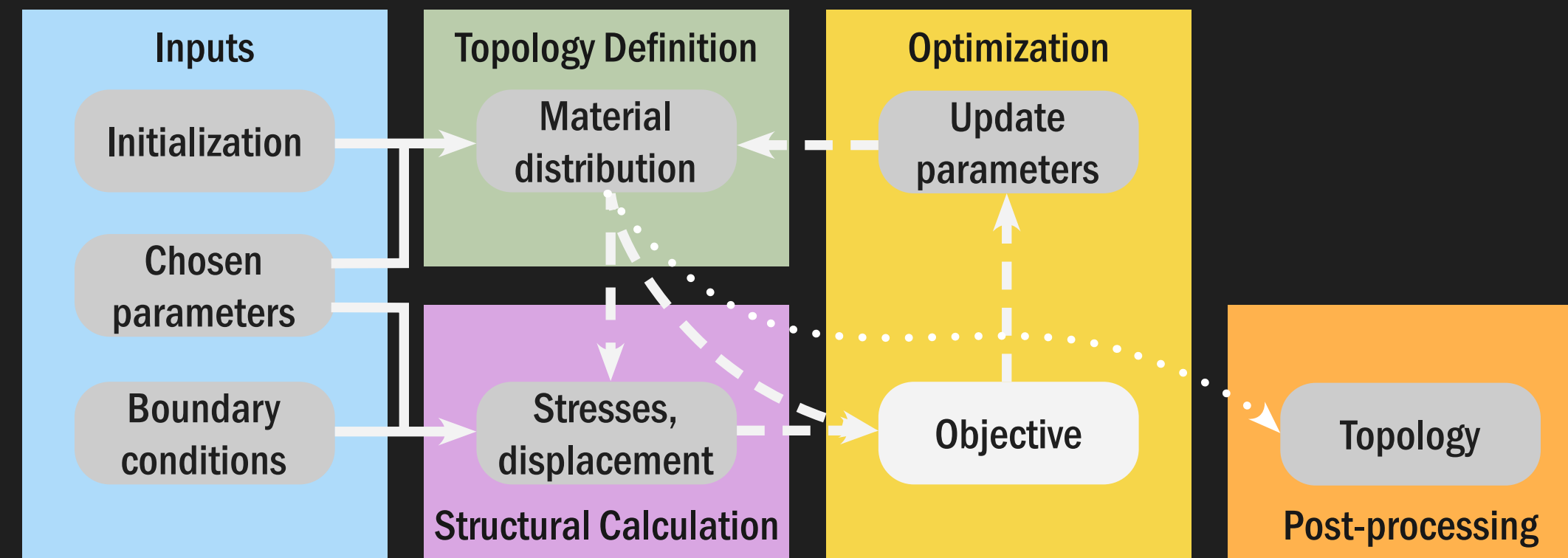
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2nd goal:
Optimization algorithm,
specifically tailored to brittle materials.



$$f(x) = \alpha \times \sigma + \beta \times A + \gamma \times \delta$$

2nd goal:
Optimization algorithm,
specifically tailored to brittle materials.

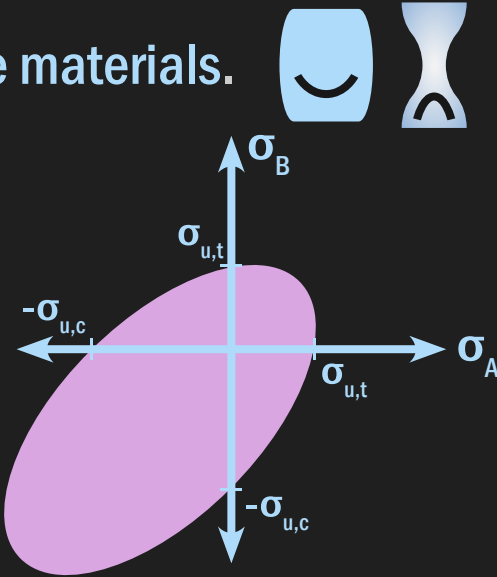


Brittleness

Local

$$f(x) = \alpha \times \sigma + \beta \times A + \gamma \times \delta$$

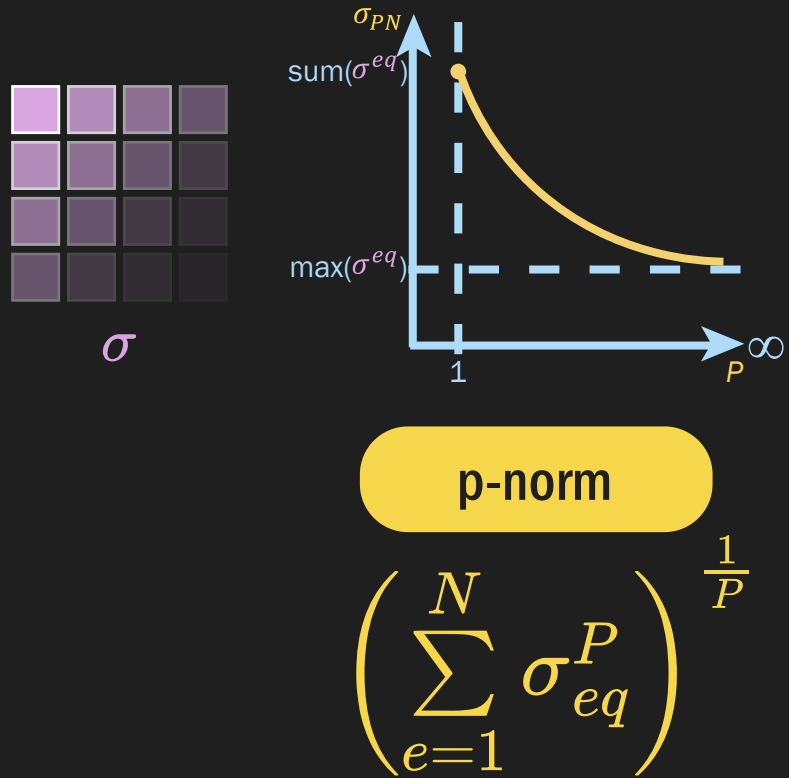
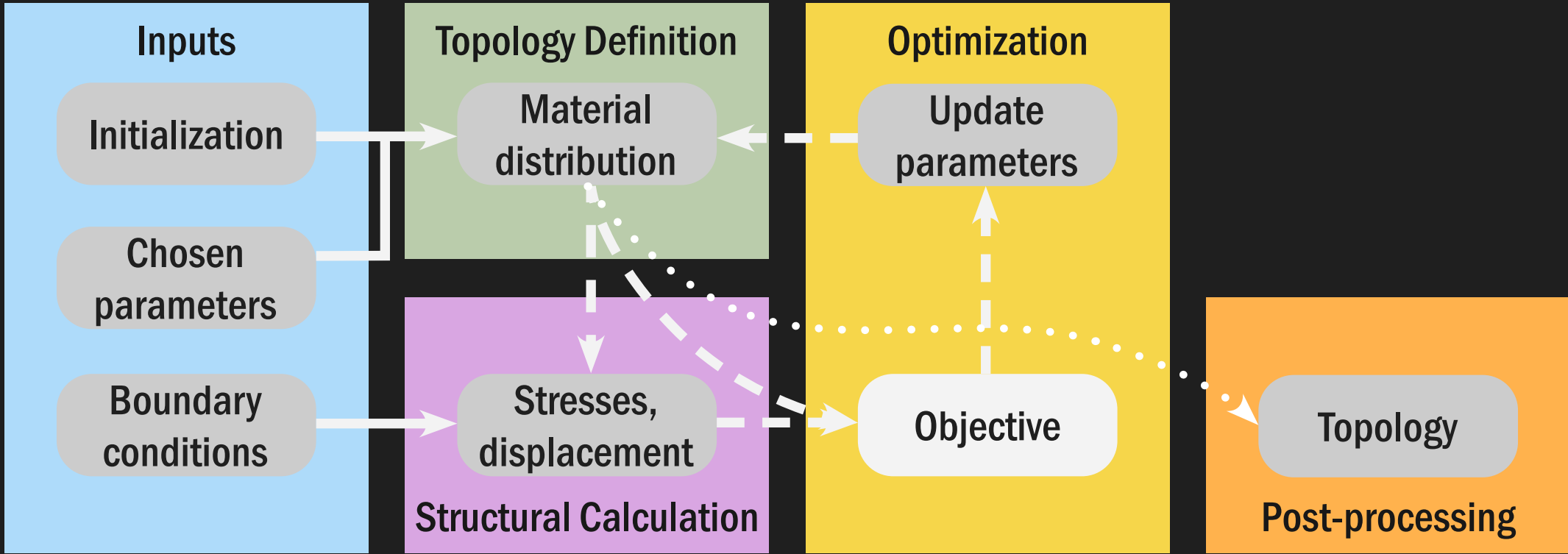
2nd goal:
Optimization algorithm,
specifically tailored to brittle materials.



using principal stresses
 $s = \frac{\sigma_{comp,lim}}{\sigma_{tens,lim}}$

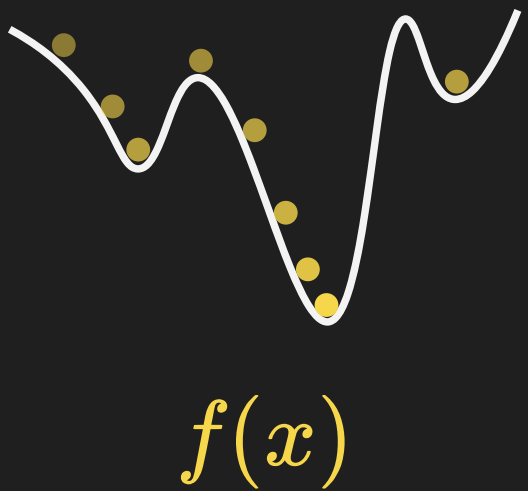
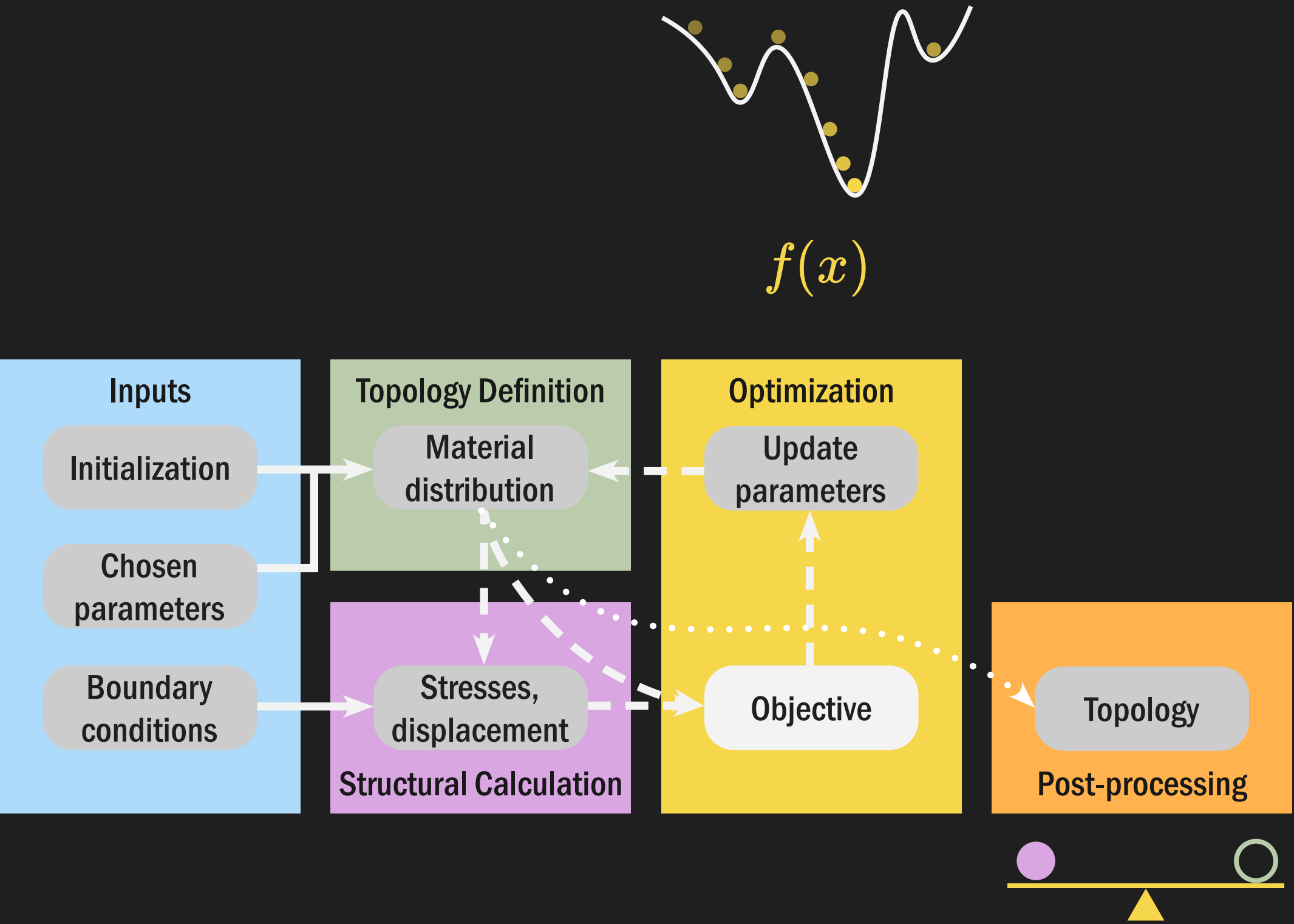
Drucker-Prager Criteria

$$\sigma_{eq} = \frac{s+1}{2s} \sqrt{\sigma_{11}^2 + \sigma_{22}^2 - \sigma_{11}\sigma_{22}} + \frac{s-1}{2s} (\sigma_{11} + \sigma_{22})$$



$$f(x) = \alpha \times \sigma + \beta \times A + \gamma \times \delta$$

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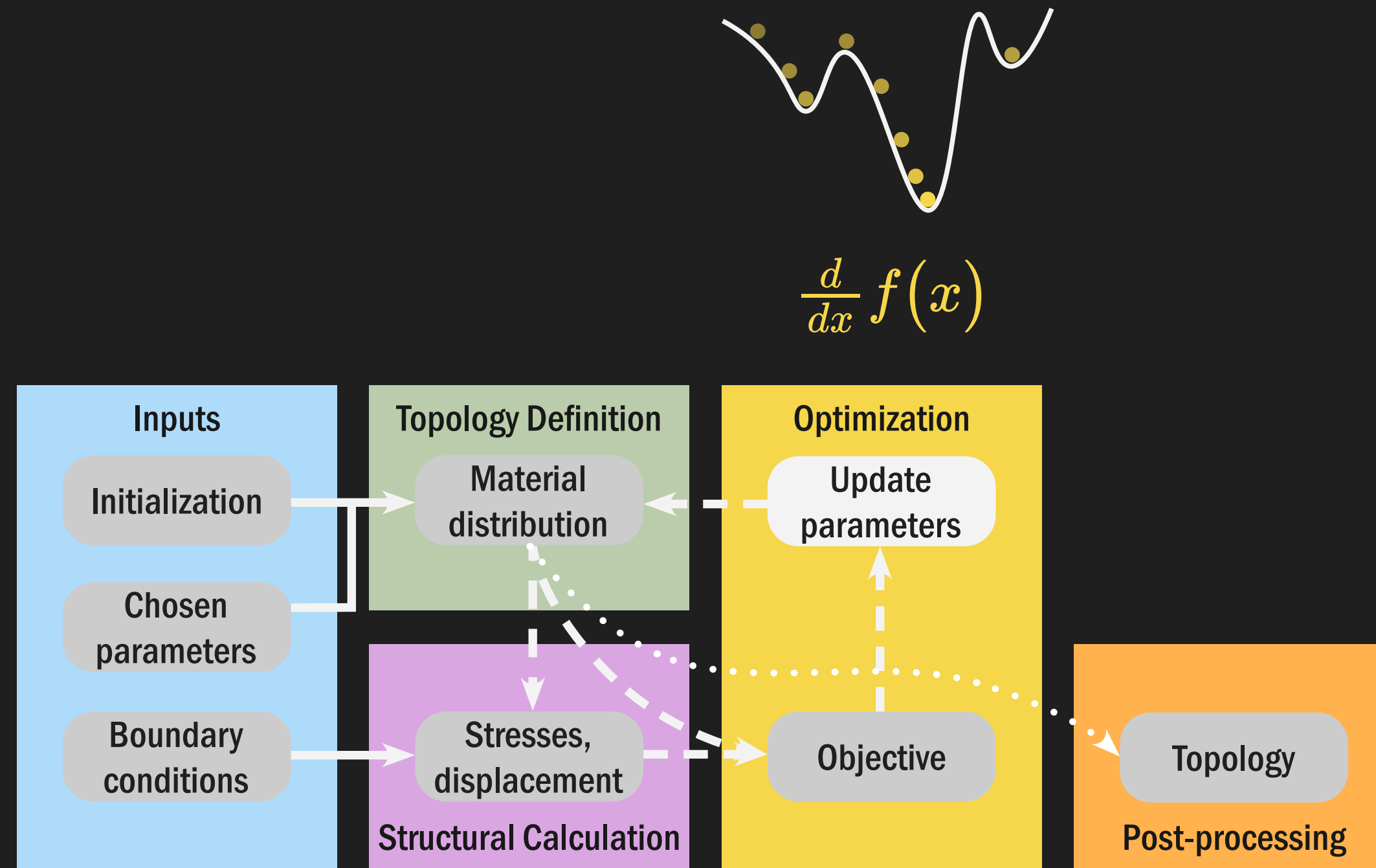


$$f(x) = \alpha \times \sigma + \beta \times A + \gamma \times \delta$$

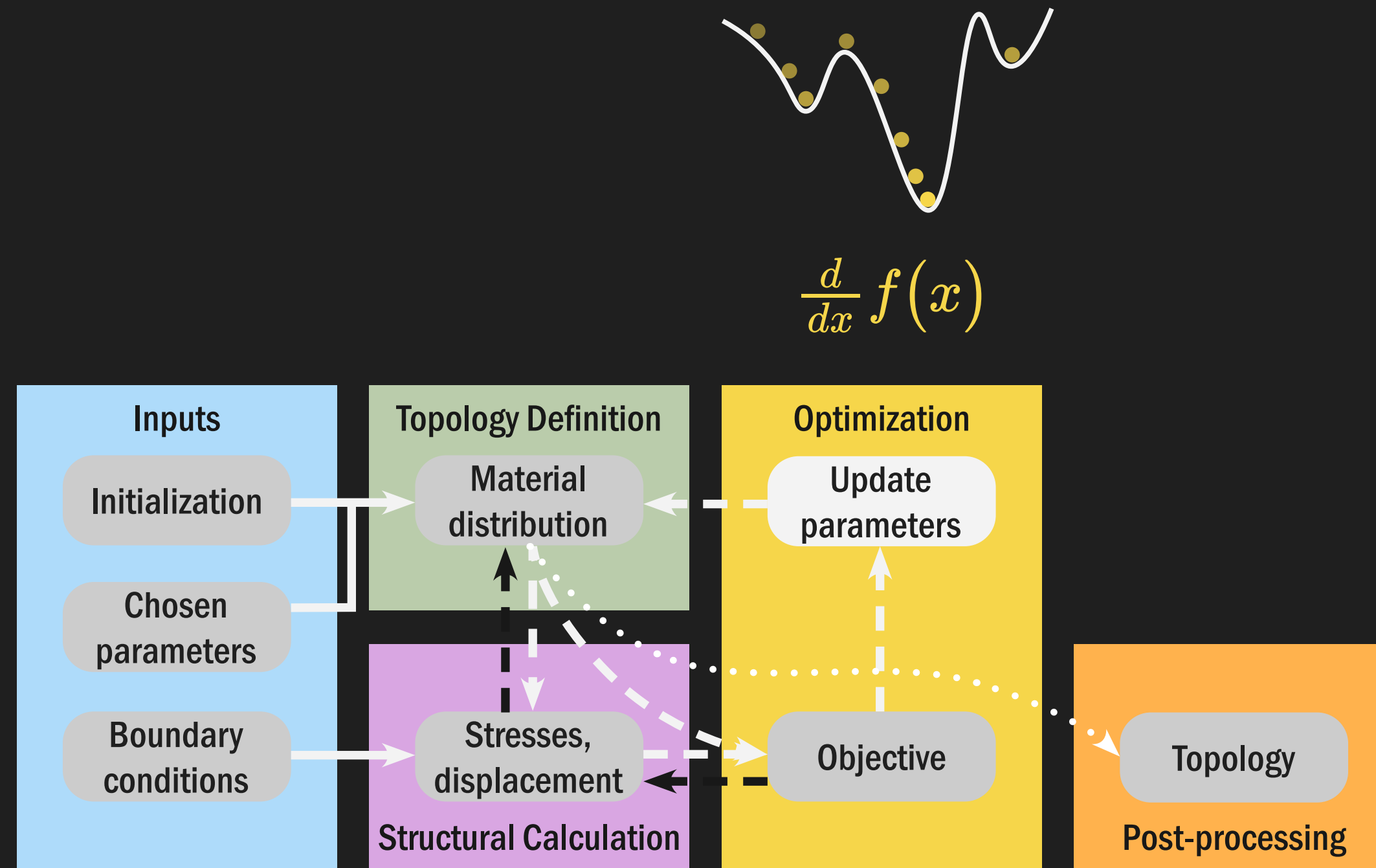
$$\min: \alpha \left(\sum_{e=1}^N \sigma_{eq}^P \right)^{\frac{1}{P}} + \beta \frac{\sum_{e=1}^N \rho_e}{N} + \gamma \left(\sum_{n=1}^N \delta_e^P \right)^{\frac{1}{P}}$$

where $\alpha = 70$, $\beta = 0.5$, and $\gamma = 1$

GRADIENTS



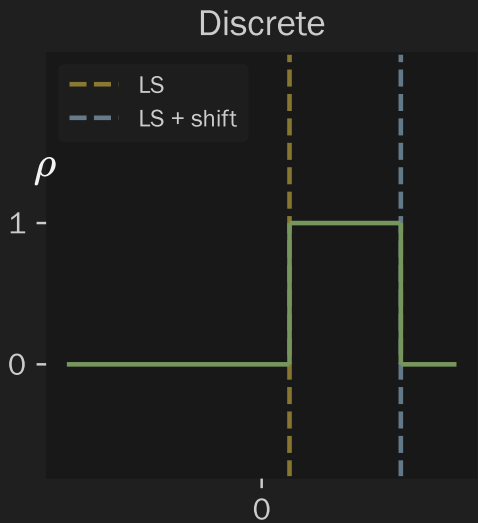
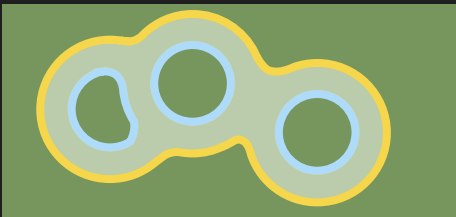
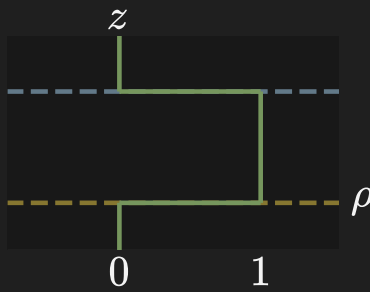
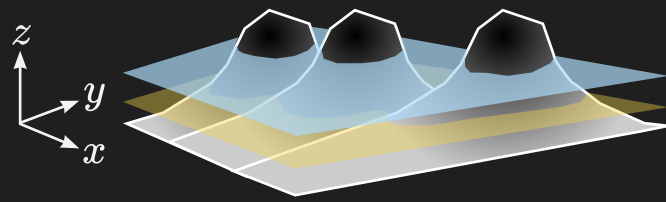
GRADIENTS



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$$z = \sum_{n=1}^N A e^{-\left(\frac{(x-x_n)^2+(y-y_n)^2}{s^2}\right)}$$

Gaussian Field

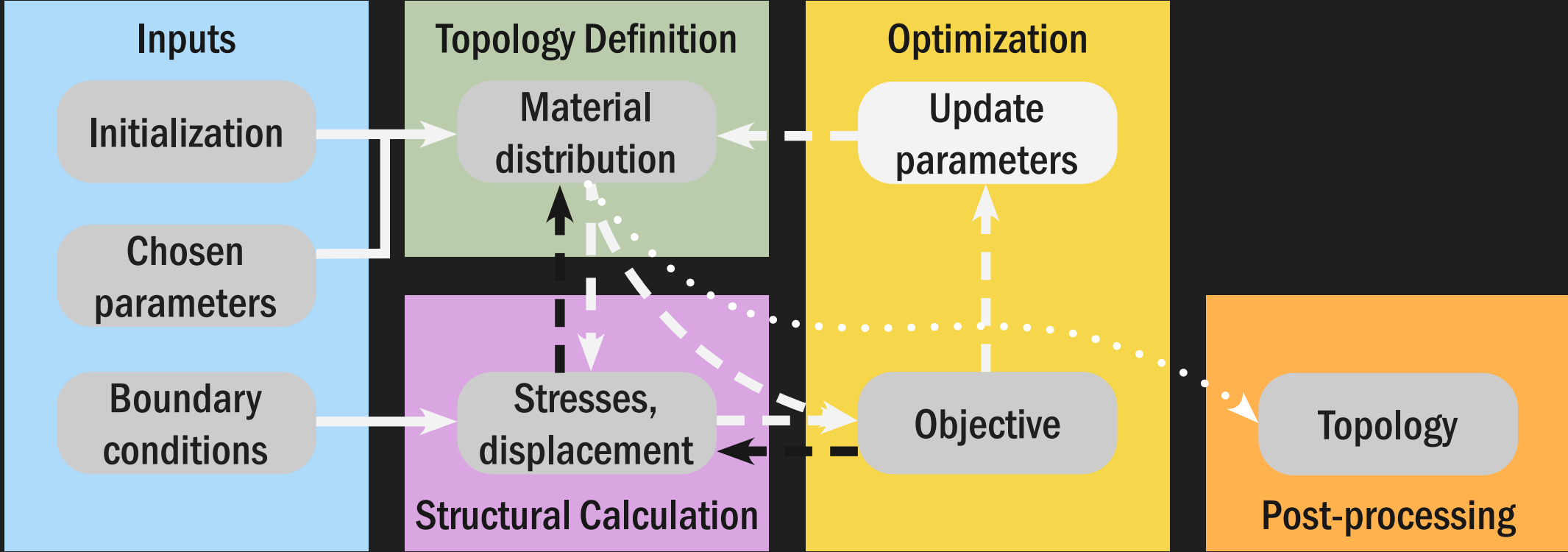


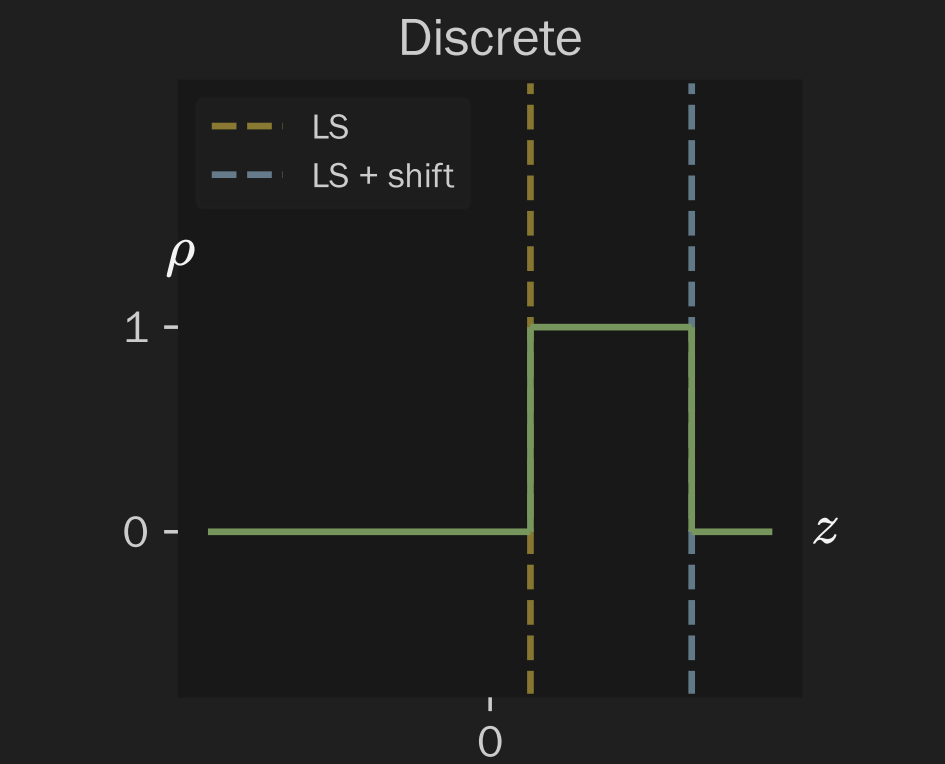
$\phi(x) > LS \wedge \phi(x) < (LS + shift), \quad x \in \Omega \text{ (material)}$

$\phi(x) = LS \vee \phi(x) = (LS + shift), \quad x \in \Gamma \text{ (boundary)}$

$\phi(x) < LS \vee \phi(x) > (LS + shift), \quad x \notin \Omega \text{ (void)}$

⊃ *differentiable*

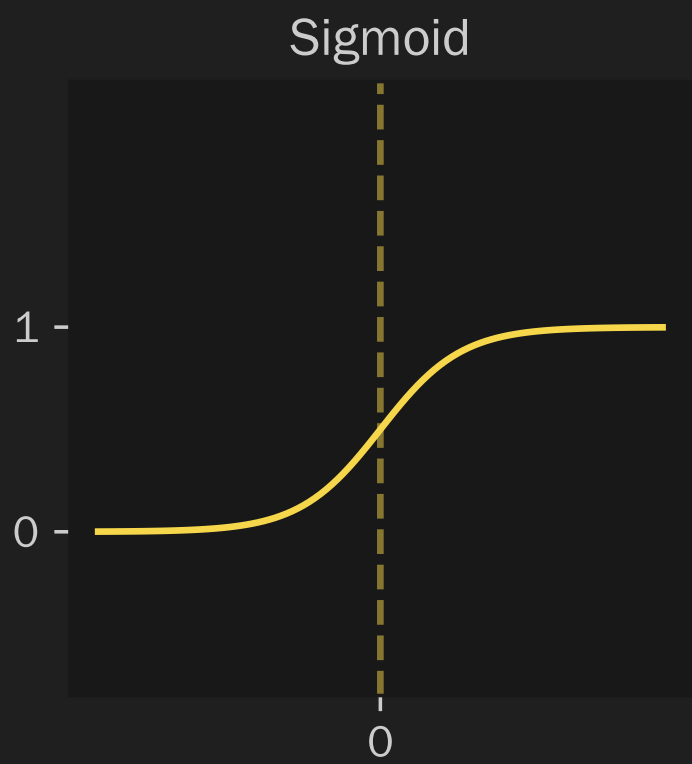




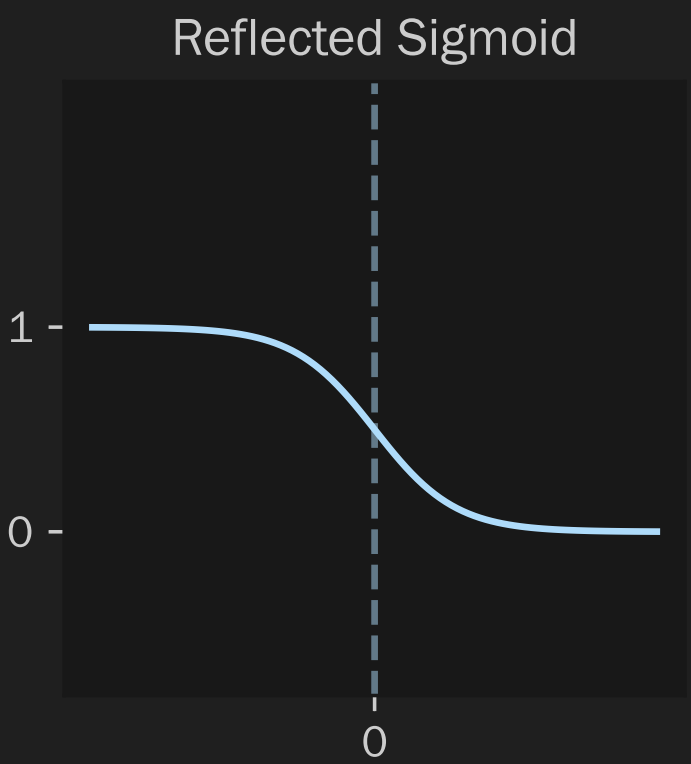
$$\phi(x) > LS \wedge \phi(x) < (LS + shift), \quad x \in \Omega \text{ (material)}$$

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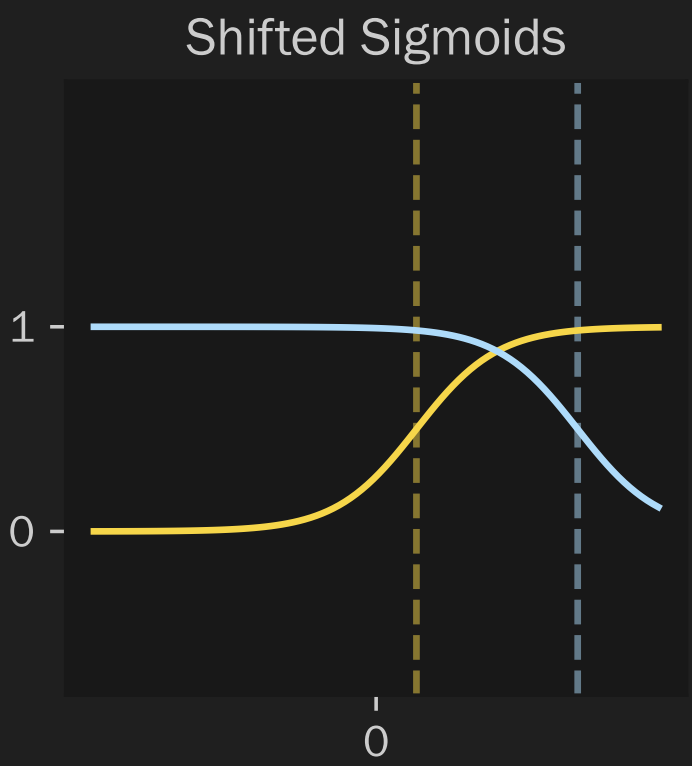
$$\phi(x) < LS \vee \phi(x) > (LS + shift), \quad x \notin \Omega \text{ (void)}$$



$$S(x) = \frac{1}{1 + e^{-x}}$$



$$S(x) = \frac{1}{1 + e^x}$$



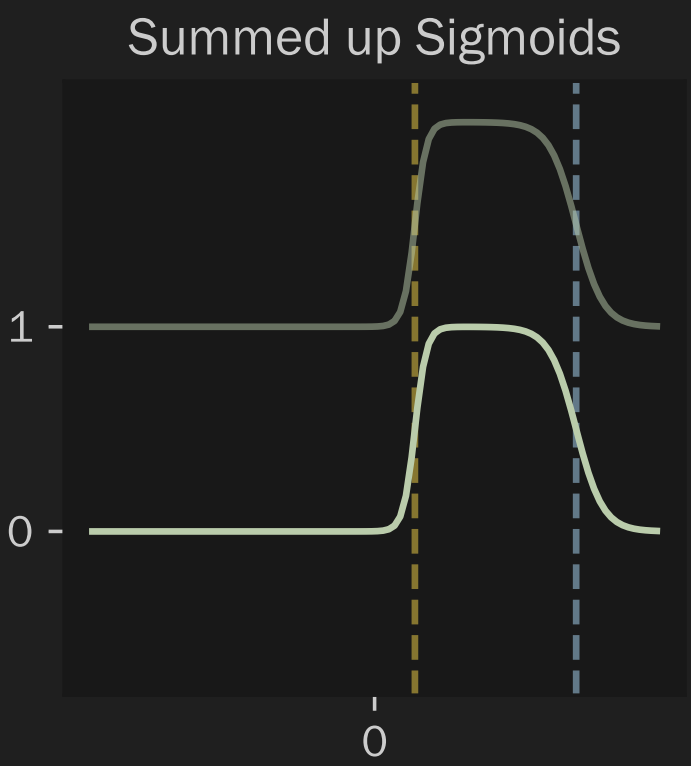
$$S_{LS}(x) = \frac{1}{1 + e^{-x + LS}}$$

$$S_{LS + shift}(x) = \frac{1}{1 + e^{x + LS + shift}}$$



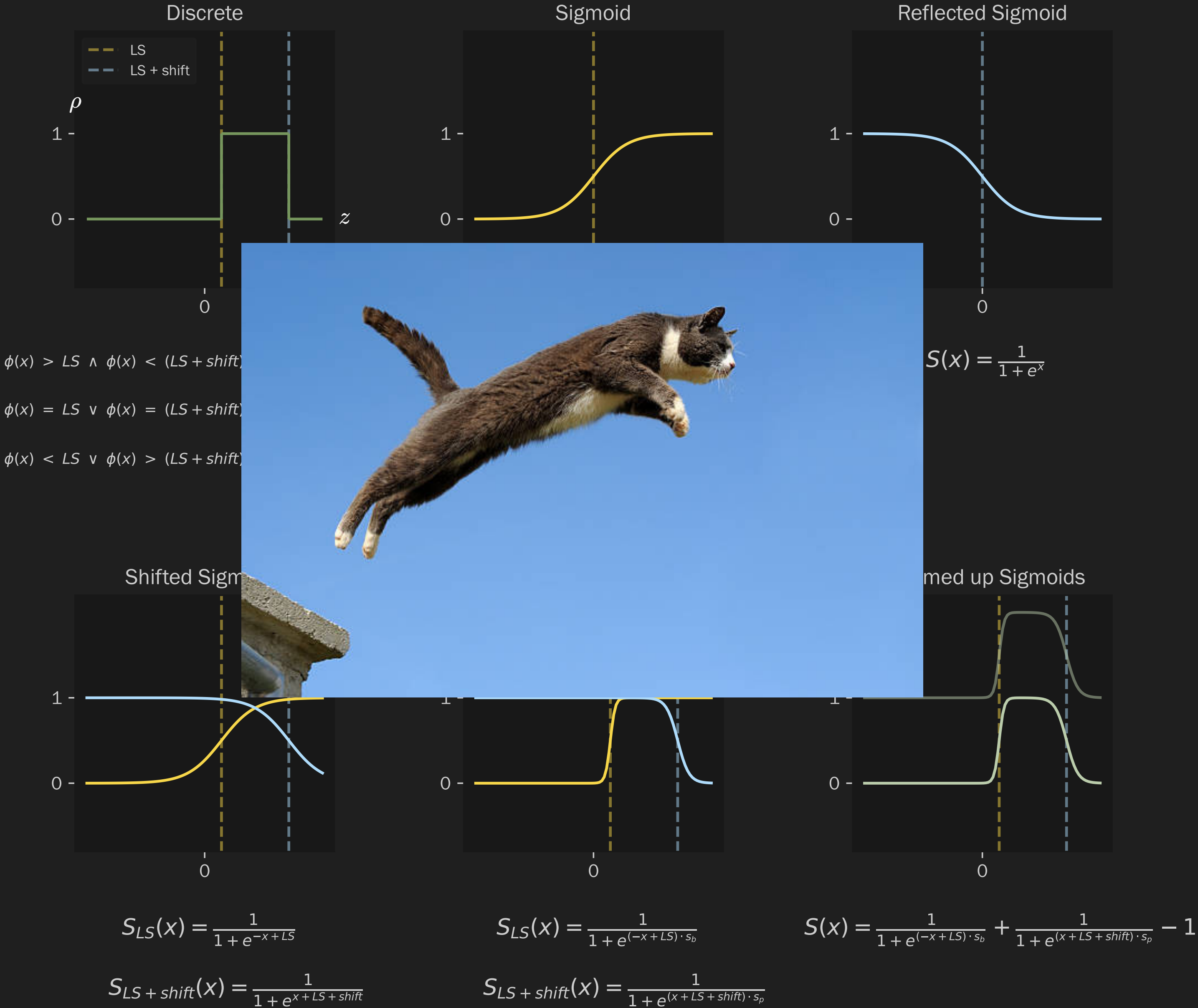
$$S_{LS}(x) = \frac{1}{1 + e^{(-x + LS) \cdot s_b}}$$

$$S_{LS + shift}(x) = \frac{1}{1 + e^{(x + LS + shift) \cdot s_p}}$$



$$S(x) = \frac{1}{1 + e^{(-x + LS) \cdot s_b}} + \frac{1}{1 + e^{(x + LS + shift) \cdot s_p}} - 1$$

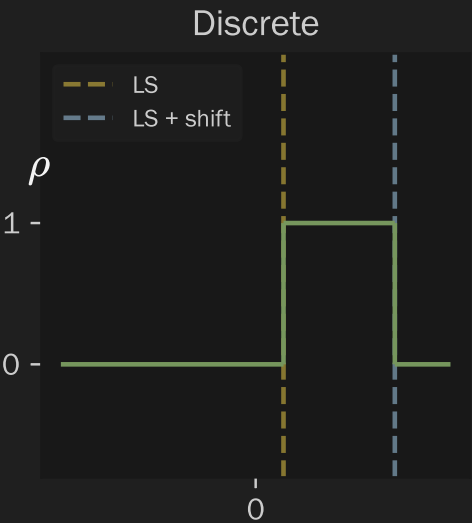
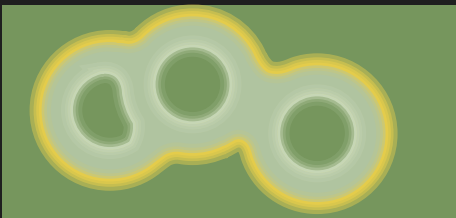
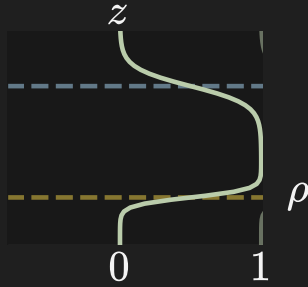
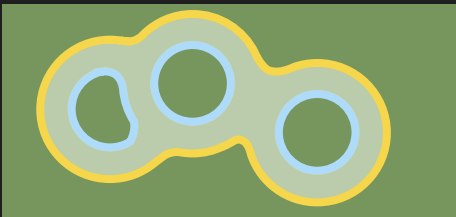
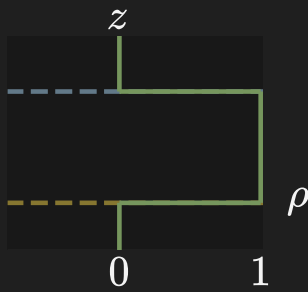
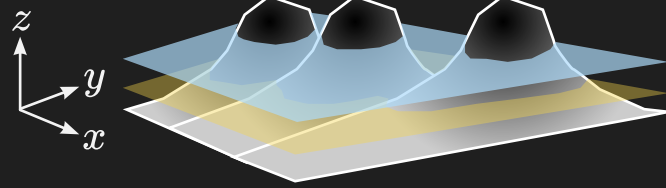
TOPOLOGY DEFINITION



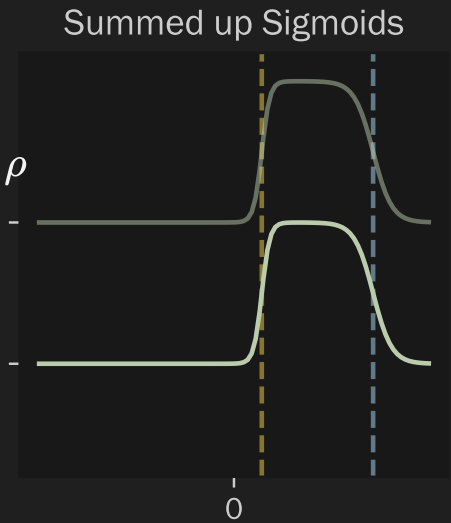
TOPOLOGY DEFINITION

$$z = \sum_{n=1}^N A e^{-\left(\frac{(x-x_n)^2+(y-y_n)^2}{s^2}\right)}$$

Gaussian Field



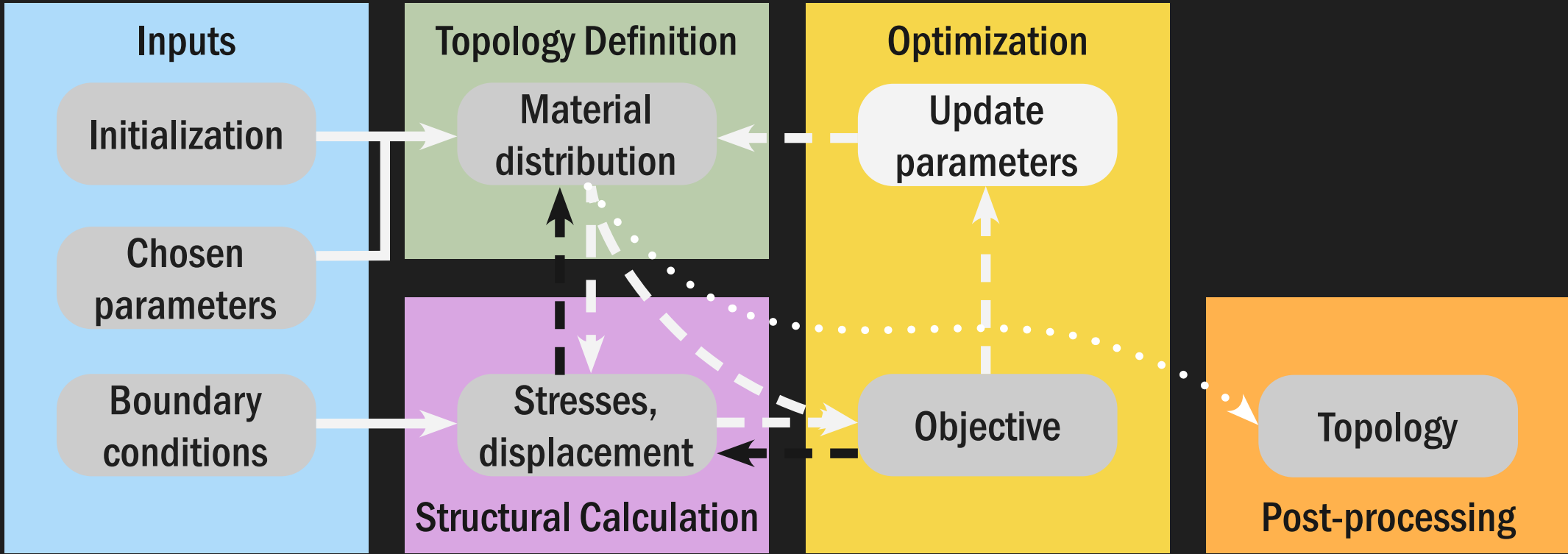
$\phi(x) > LS \wedge \phi(x) < (LS + shift), \quad x \in \Omega \text{ (material)}$
 $\phi(x) = LS \vee \phi(x) = (LS + shift), \quad x \in \Gamma \text{ (boundary)}$
 $\phi(x) < LS \vee \phi(x) > (LS + shift), \quad x \notin \Omega \text{ (void)}$



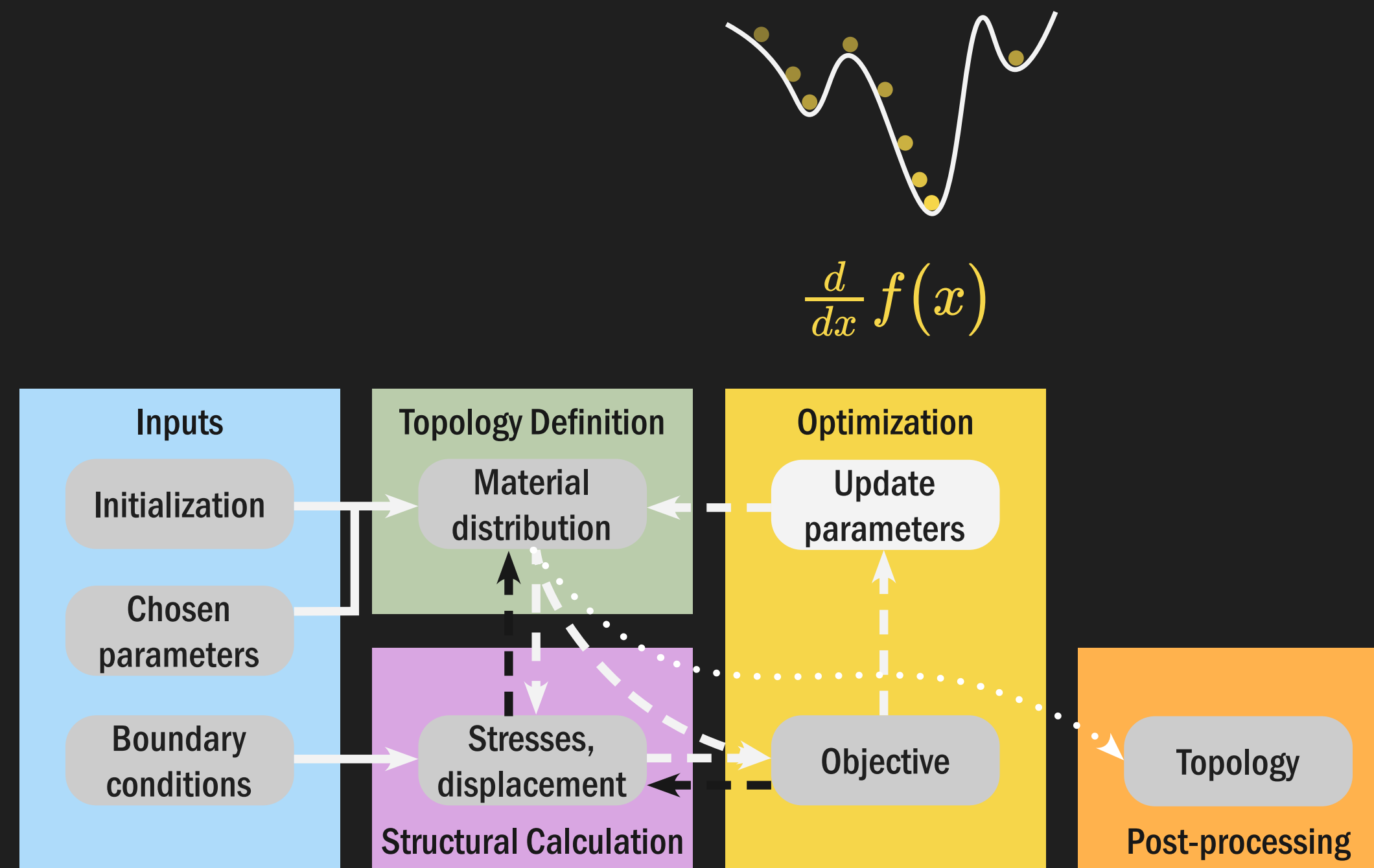
$$S(x) = \frac{1}{1 + e^{(-x + LS) \cdot s_b}} + \frac{1}{1 + e^{(x + LS + shift) \cdot s_p}} - 1$$

⊈ differentiable

$$\frac{d}{dx} f(x)$$

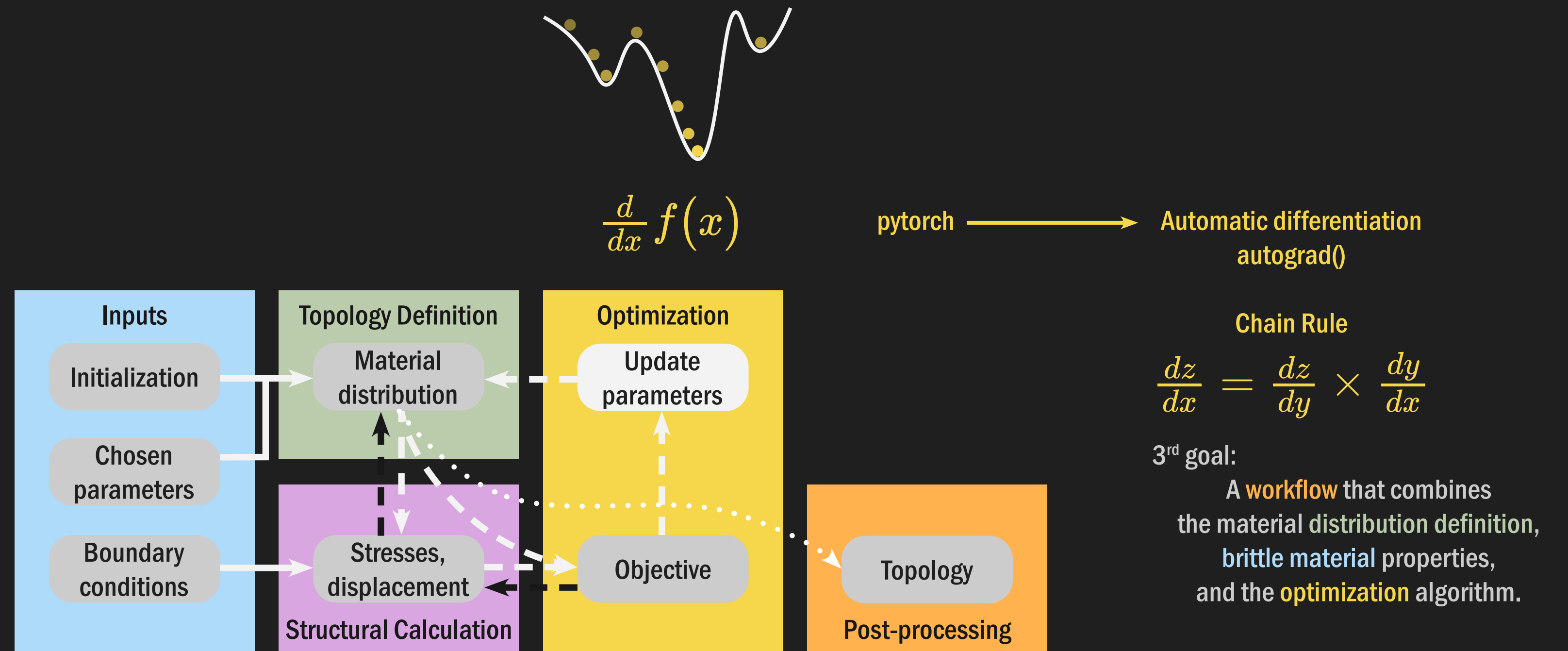


M L T O O L S

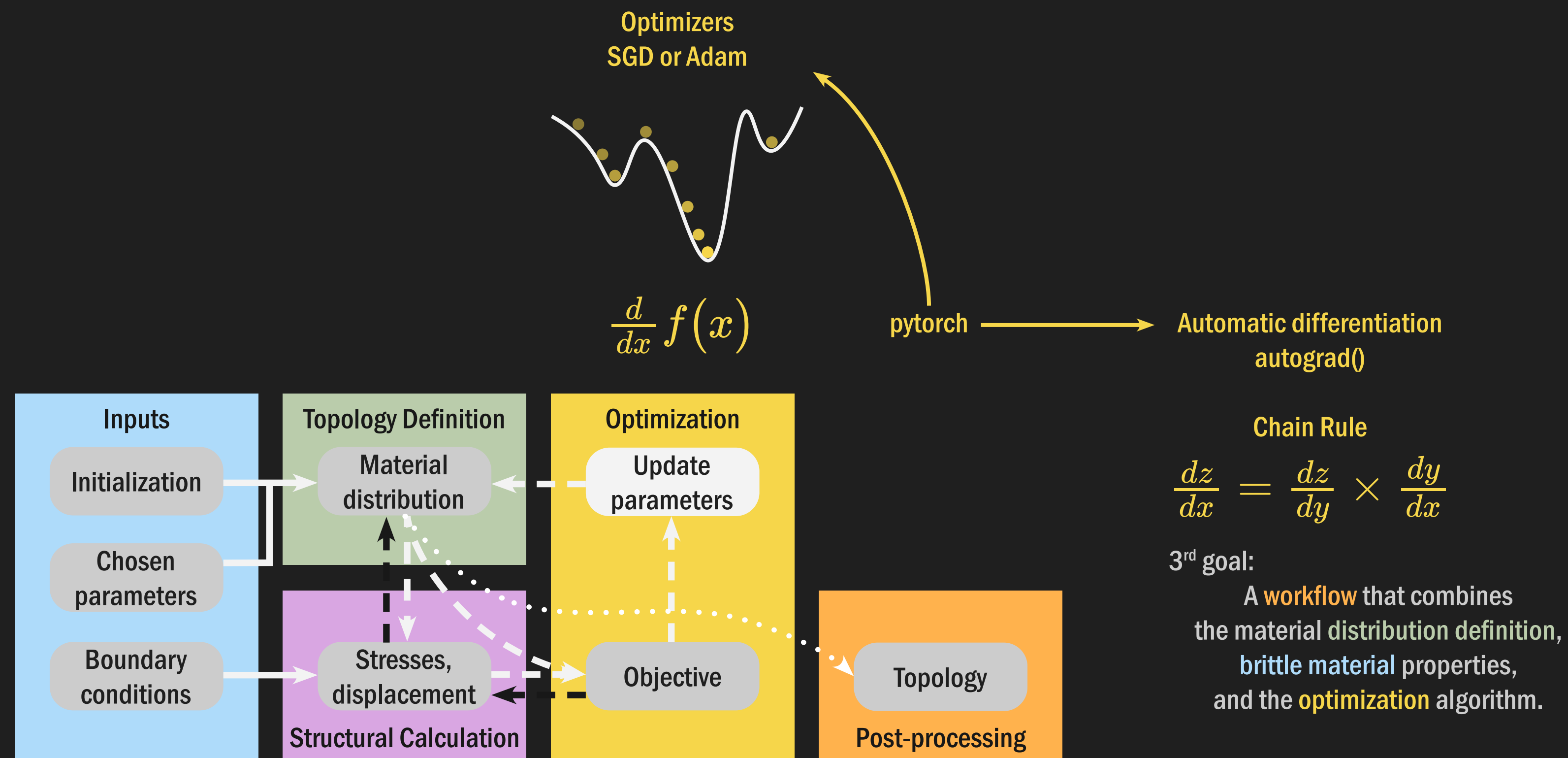


3rd goal:
A **workflow** that combines
the material distribution definition,
brittle material properties,
and the **optimization** algorithm.

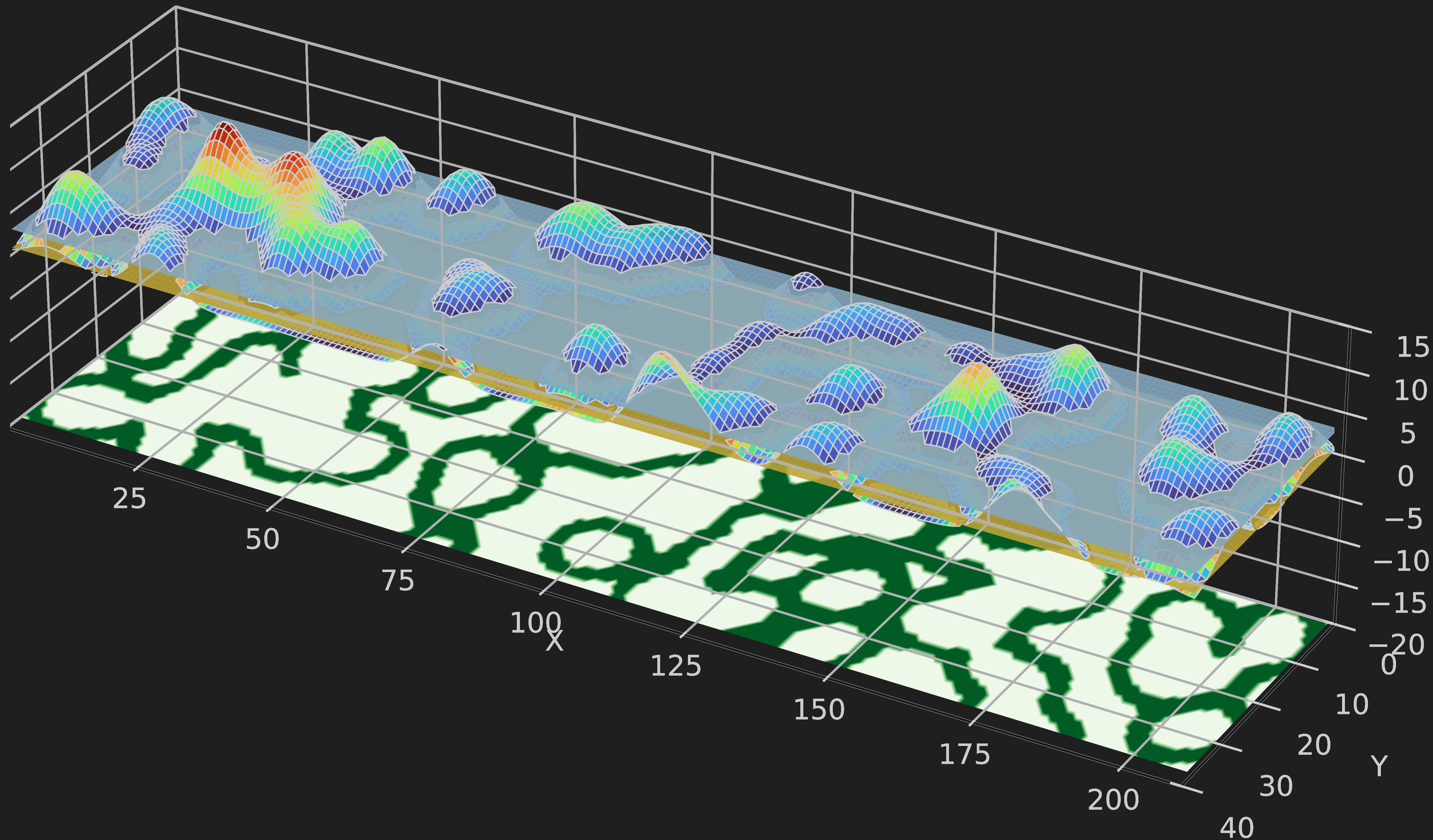
M L T O O L S



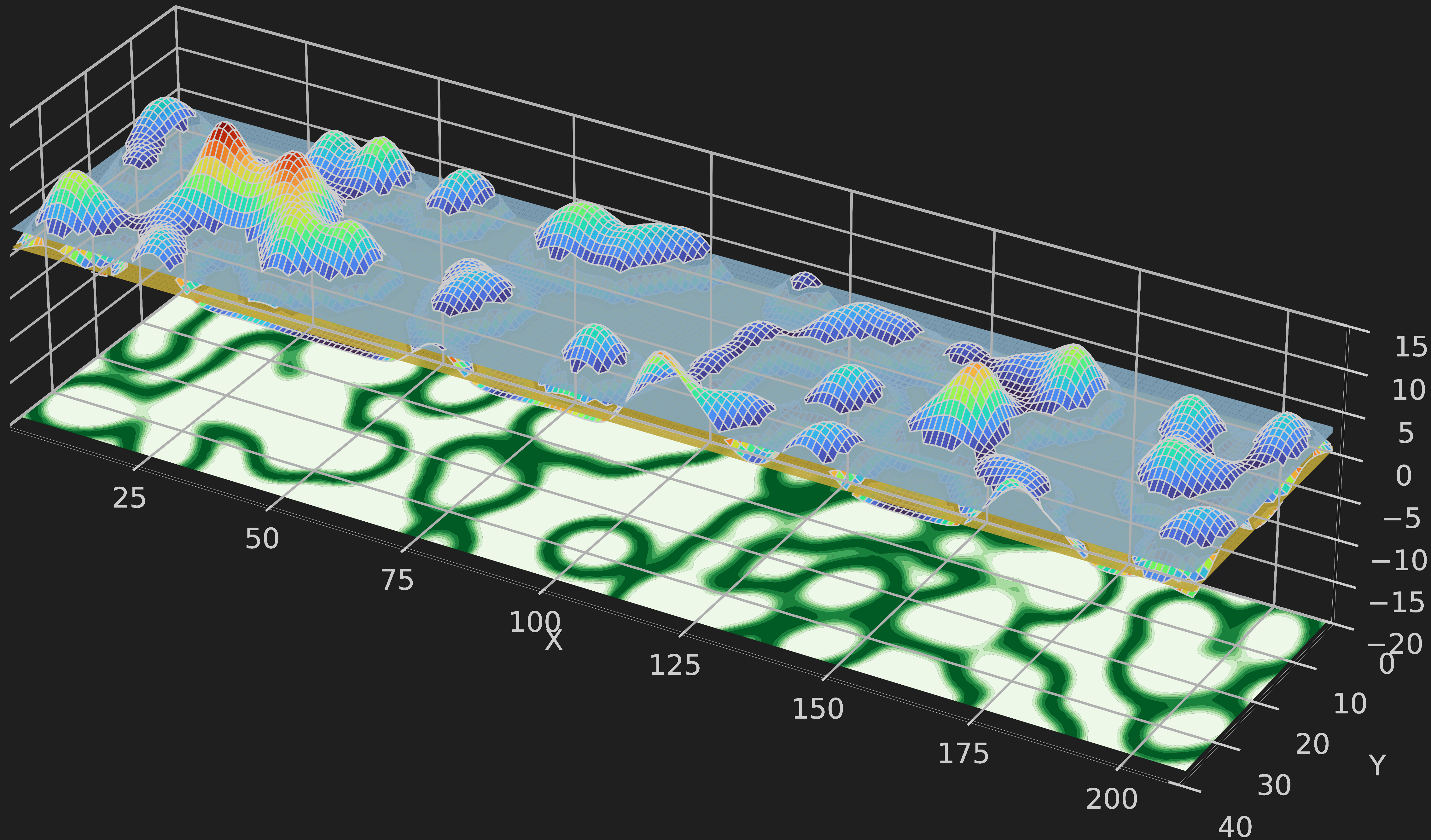
M L T O O L S



TOPOLOGY
DEFINITION



TOPOLOGY
DEFINITION

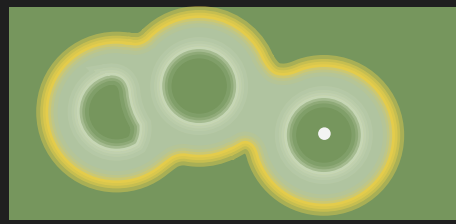
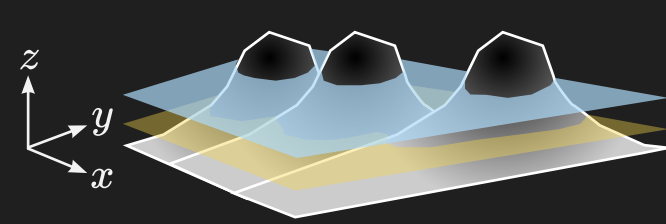


Z
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$$z = \sum_{n=1}^N A e^{-\left(\frac{(x-x_n)^2+(y-y_n)^2}{s^2}\right)}$$

Gaussian Field

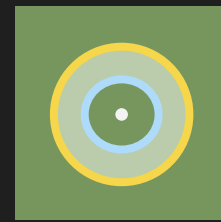
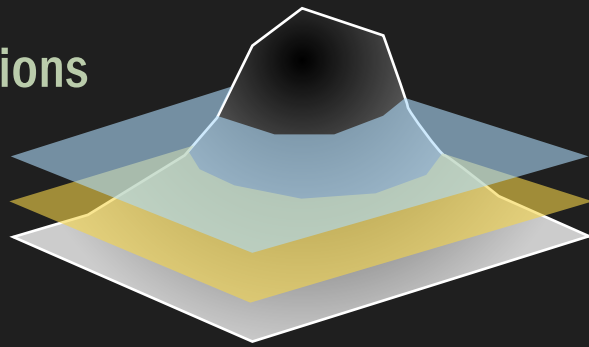


(x_n, y_n)

Two slicing functions

Level Set + Shift

Level Set



(x_o, y_o)

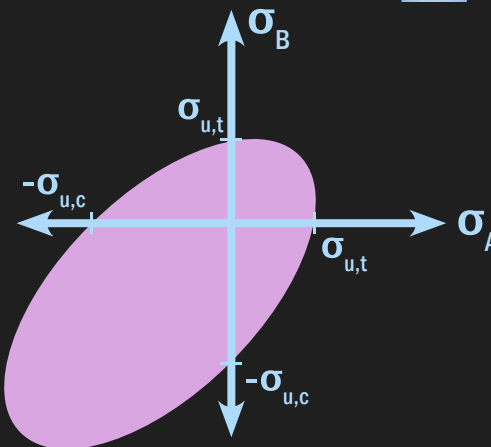
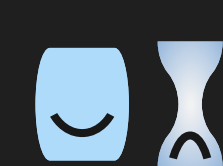
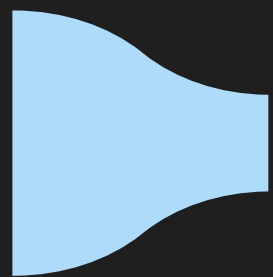
Cast Glass

1st goal:

Material distribution definition,
specifically tailored to cast glass.

2nd goal:

Optimization algorithm,
specifically tailored to brittle materials.

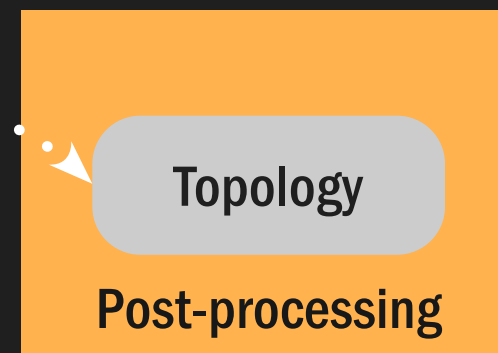
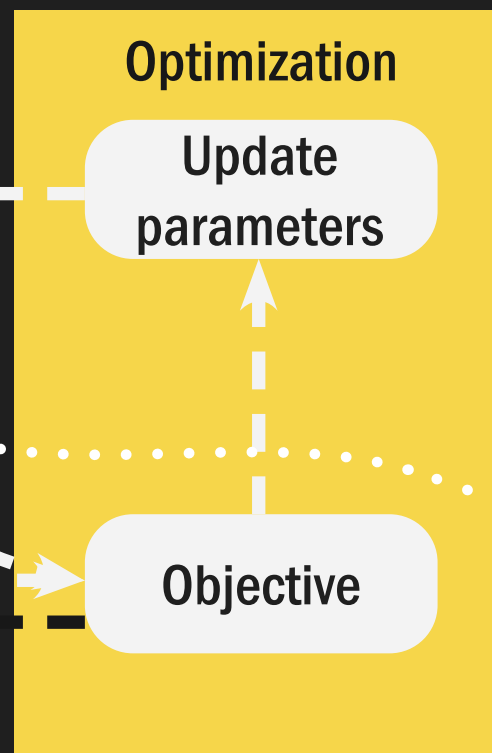
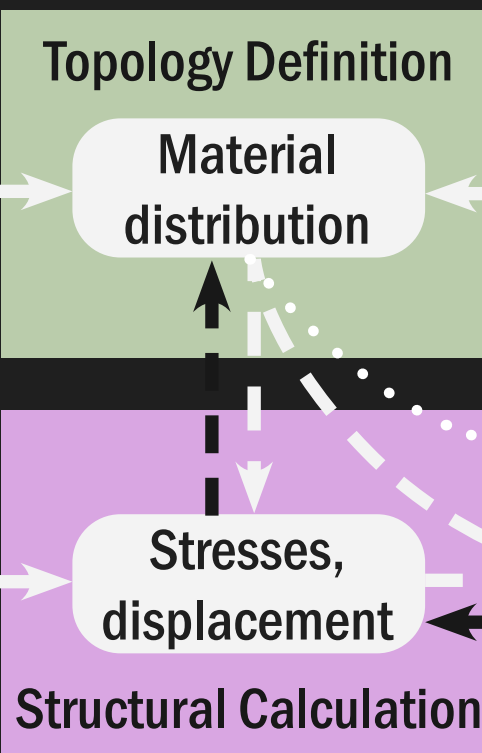
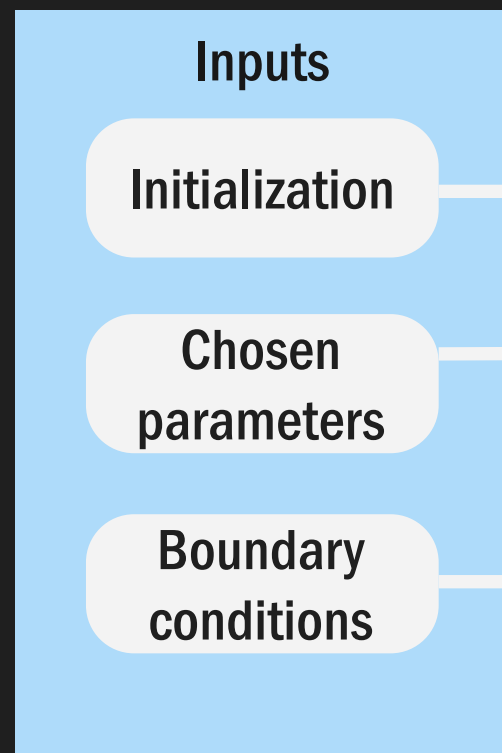


Drucker-Prager Criteria

using principal stresses

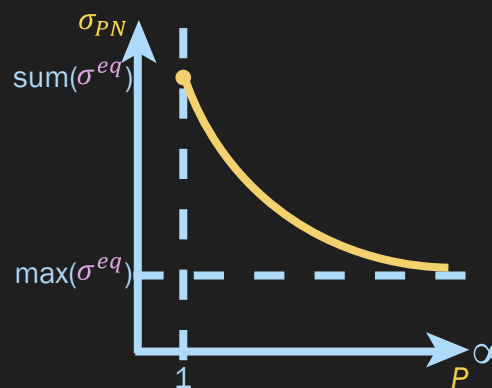
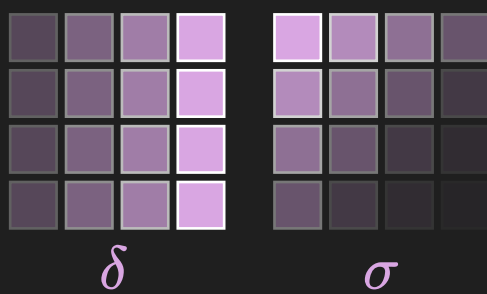
$$s = \frac{\sigma_{comp,lim}}{\sigma_{tens,lim}}$$

$$\sigma_{eq} = \frac{s+1}{2s} \sqrt{\sigma_{11}^2 + \sigma_{22}^2 - \sigma_{11}\sigma_{22}} + \frac{s-1}{2s} (\sigma_{11} + \sigma_{22})$$



Finite Element Method

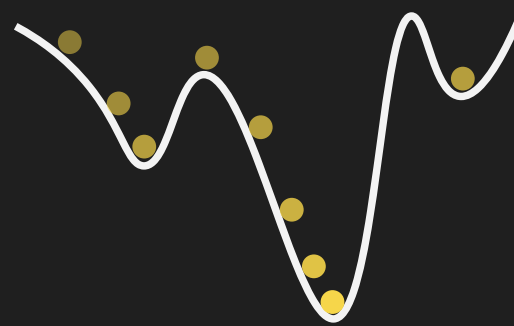
$$F = K U$$



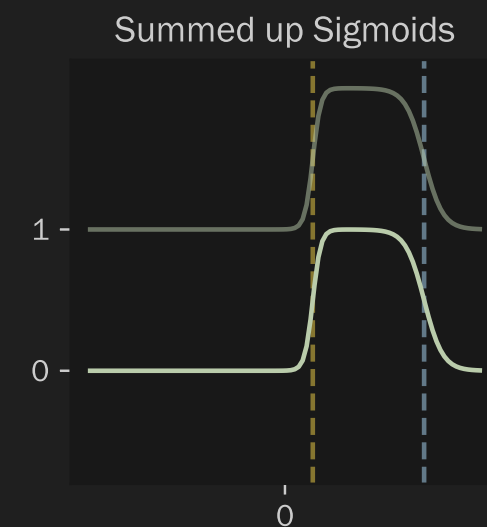
p-norm

$$\left(\sum_{e=1}^N \sigma_{eq}^P \right)^{\frac{1}{P}}$$

Optimizers
SGD or Adam



$$\frac{d}{dx} f(x)$$



$$S(x) = \frac{1}{1 + e^{(-x + LS) \cdot s_b}} + \frac{1}{1 + e^{(x + LS + shift) \cdot s_p}} - 1$$

pytorch

Automatic differentiation
autograd()

Chain Rule

$$\frac{dz}{dx} = \frac{dz}{dy} \times \frac{dy}{dx}$$

3rd goal:

A workflow that combines
the material distribution definition,
brittle material properties,
and the optimization algorithm.

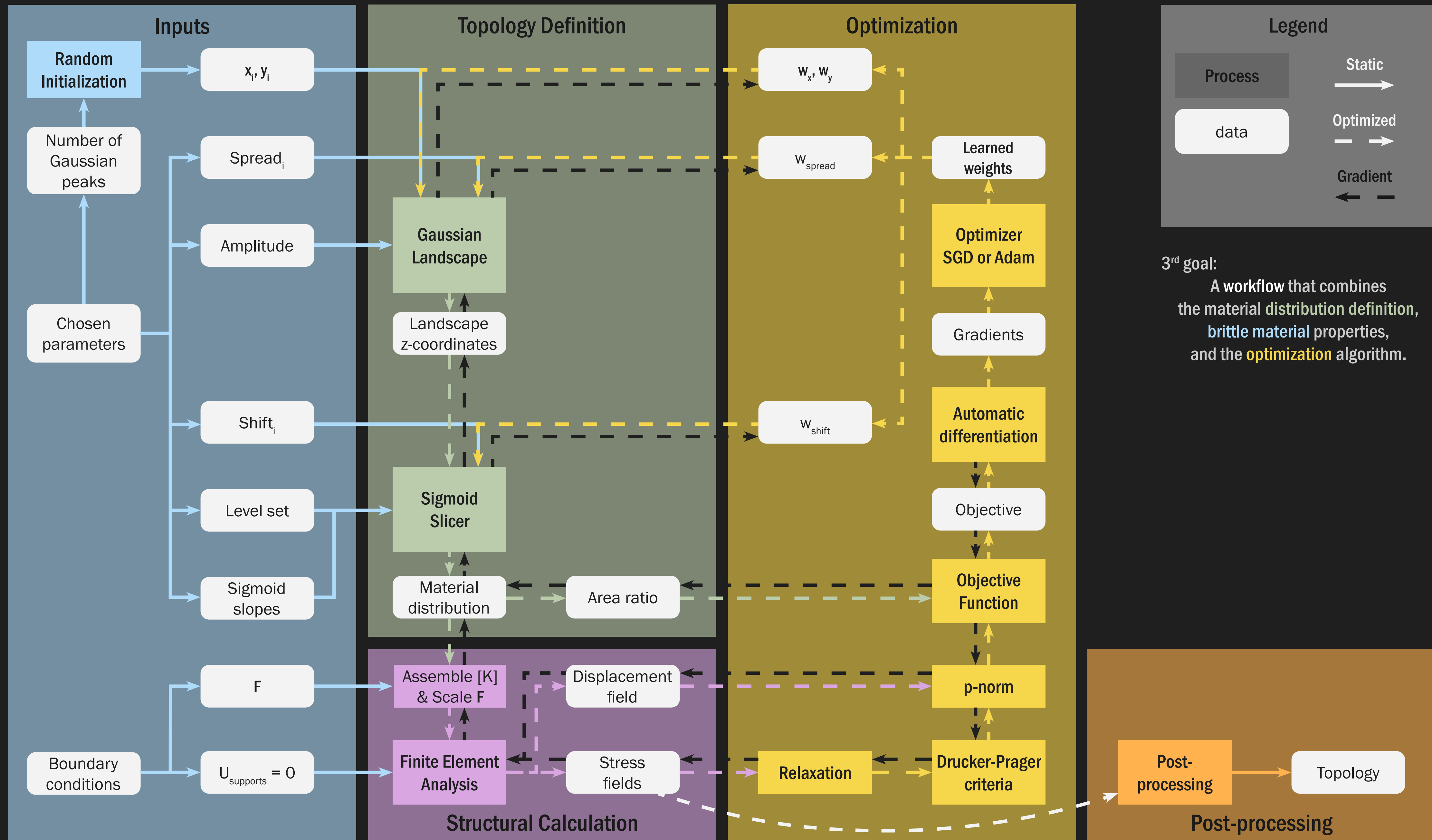


$$f(x) = \alpha \times \sigma + \beta \times A + \gamma \times \delta$$

$$\min: \alpha \left(\sum_{e=1}^N \sigma_{eq}^P \right)^{\frac{1}{P}} + \beta \frac{\sum_{e=1}^N \rho_e}{N} + \gamma \left(\sum_{n=1}^N \delta_e^P \right)^{\frac{1}{P}}$$

where $\alpha = 70$, $\beta = 0.5$, and $\gamma = 1$

WORKFLOW



C
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4th (& final) goal:
Use the above to inform the design of an
indoor, cast-glass, pedestrian bridge at
the British Museum, as a case study.

Current



Image Source: <https://www.flickr.com/photos/darellg/40769502223>

Koniari, 2022



Image Source: <https://www.restructgroup-tudelft.nl/>

Schoenmaker, 2023



Image Source: (Schoenmaker, 2023)

CASE STUDY

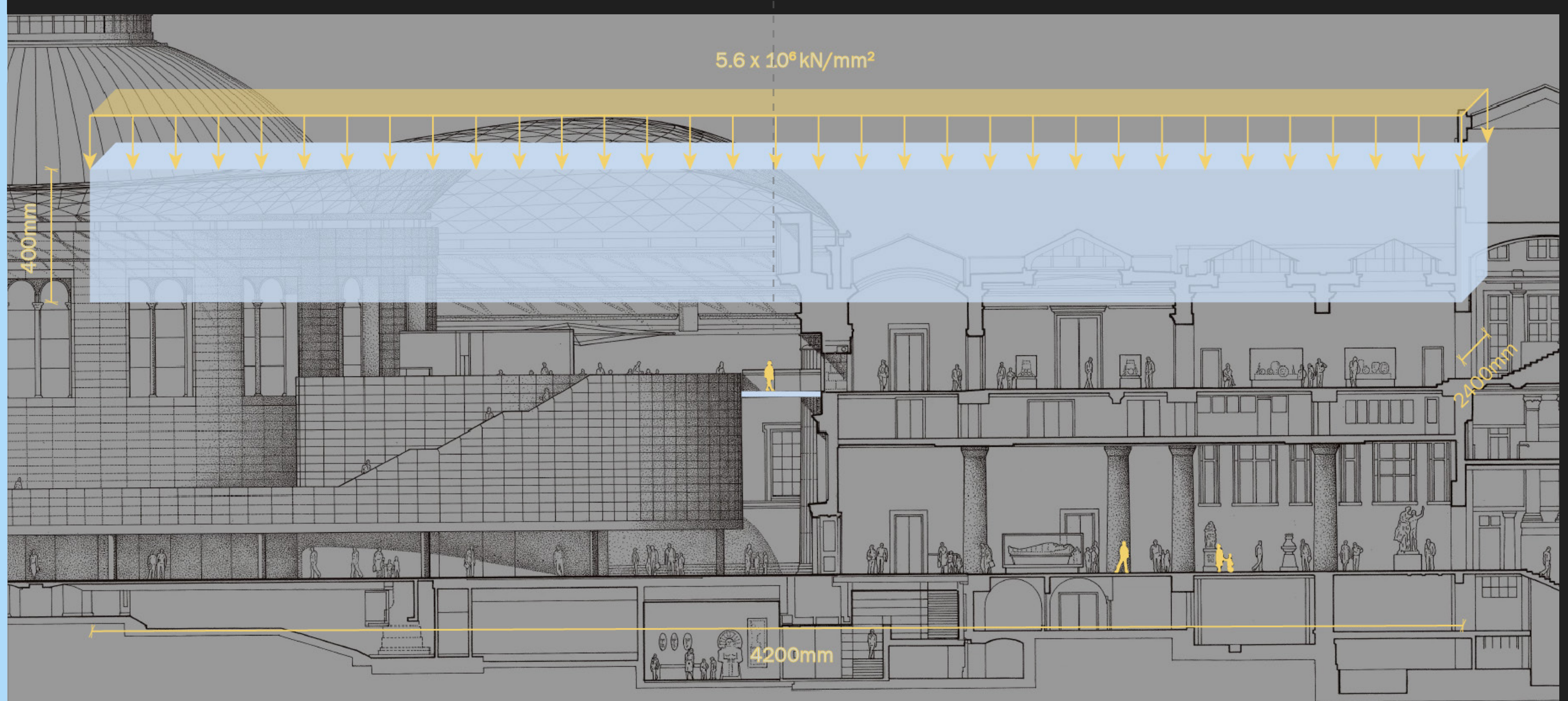
2D
plane stress

FE grid
40 x 210
= 8,400 elements,
8,651 nodes,
17,302 degrees of freedom

Fixed
supports
on both sides

Symmetry axis

4th (& final) goal:
Use the above to inform the design of an
indoor, cast-glass, pedestrian bridge at
the British Museum, as a case study.



CASE STUDY

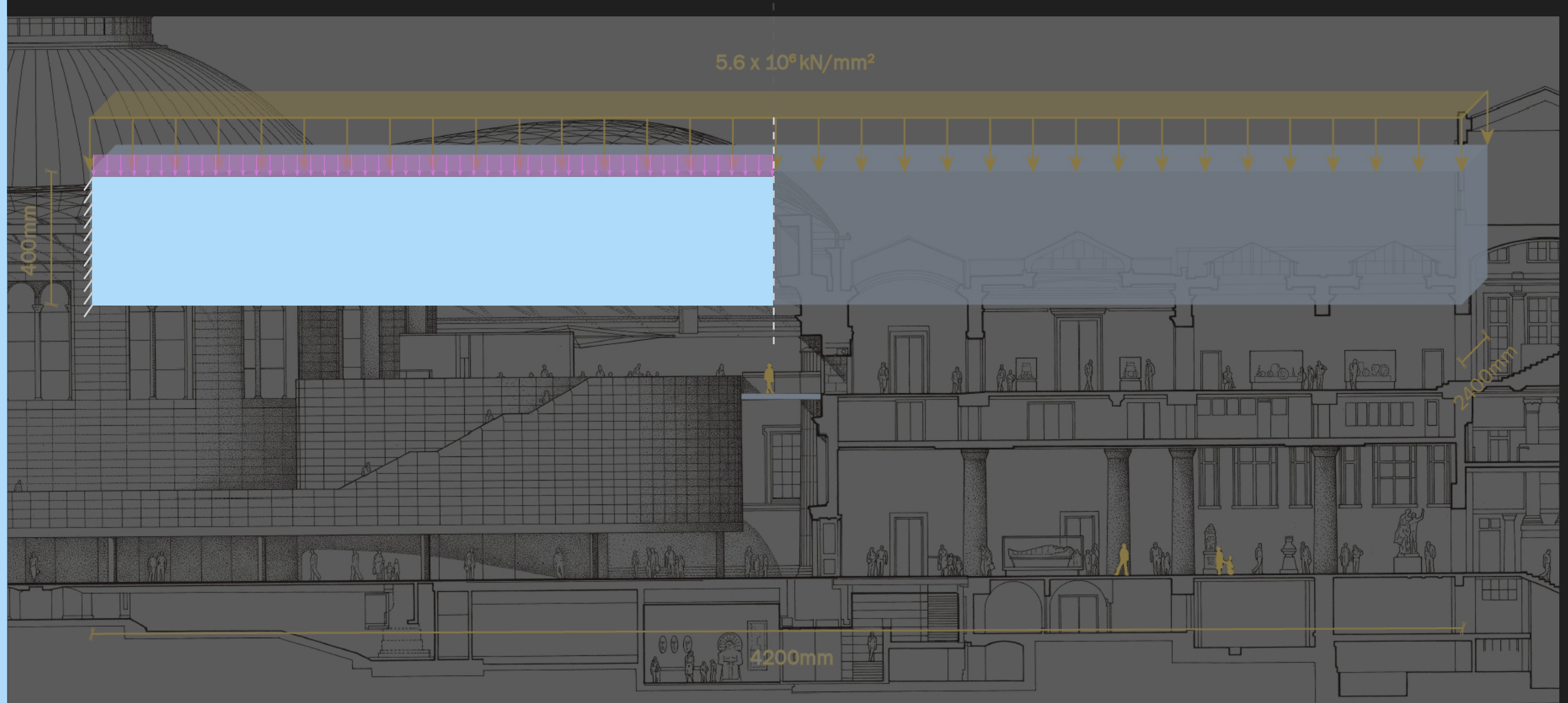
2D
plane stress

FE grid
40 x 210
= 8,400 elements,
8,651 nodes,
17,302 degrees of freedom

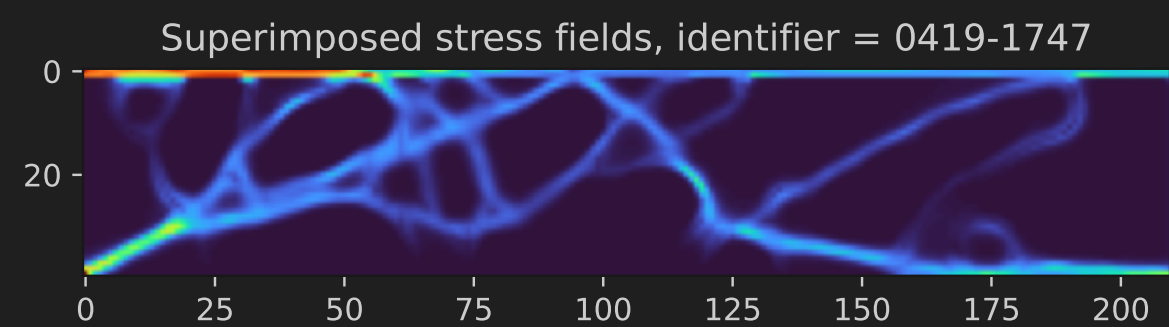
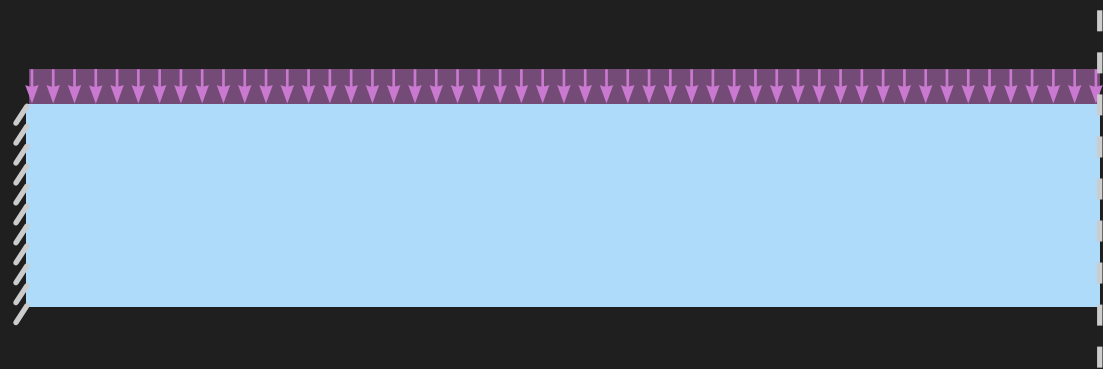
Fixed
supports
on both sides

Symmetry axis

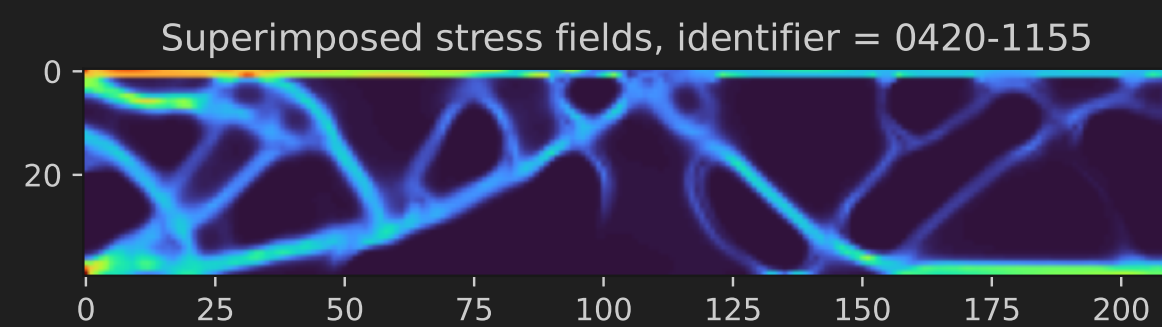
4th (& final) goal:
Use the above to inform the design of an
indoor, cast-glass, pedestrian bridge at
the British Museum, as a case study.



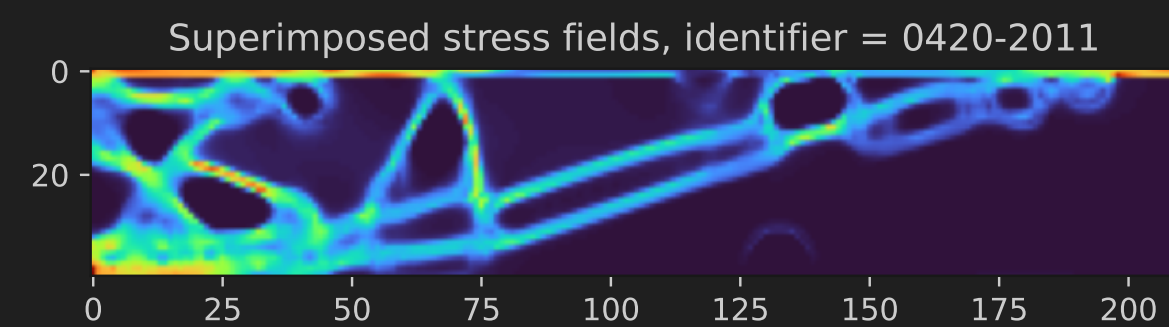
SGD RESULTS



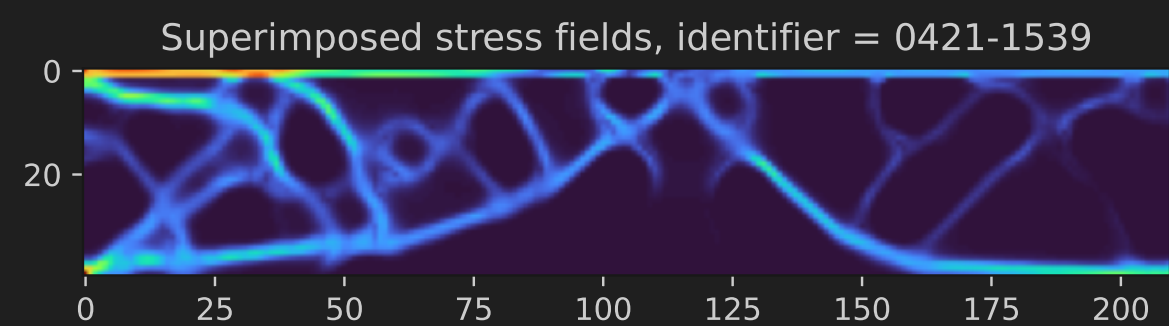
A



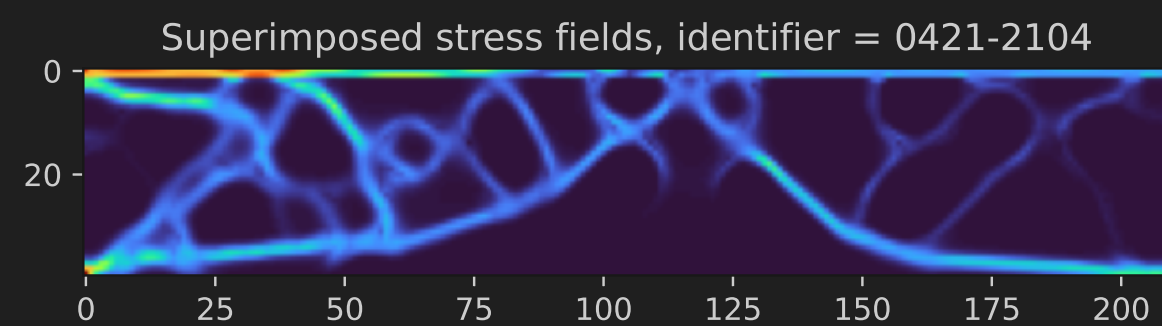
B



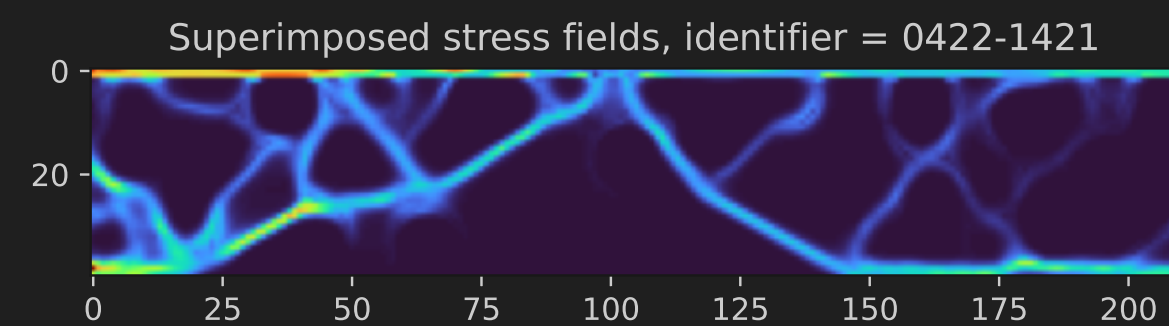
C



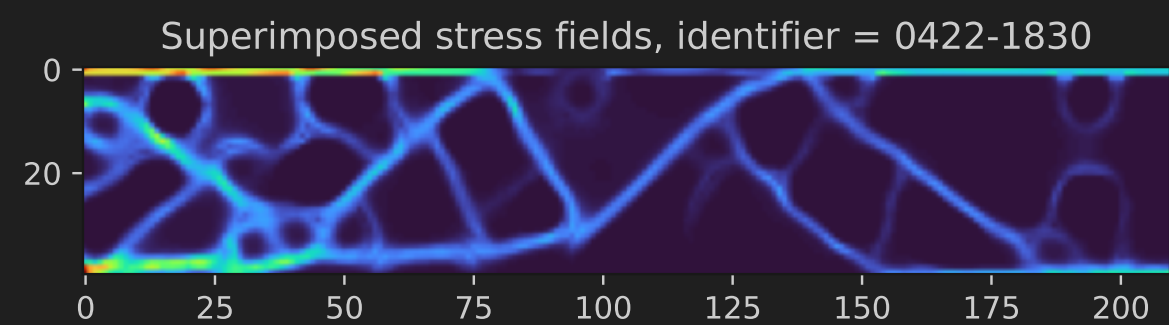
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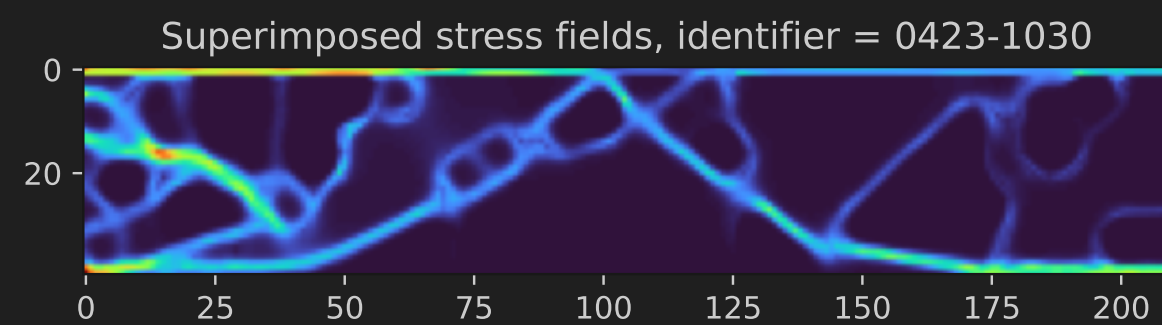
B



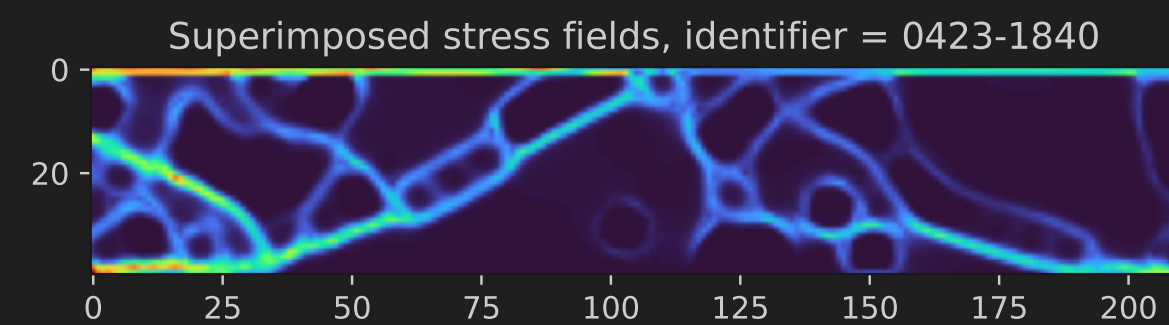
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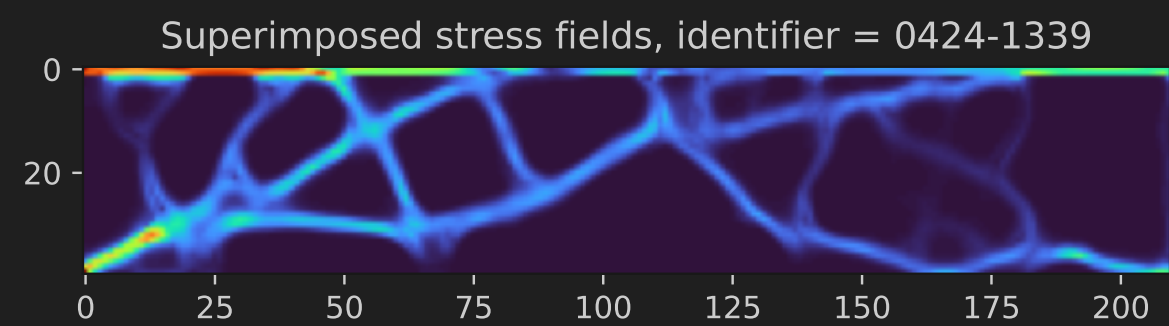
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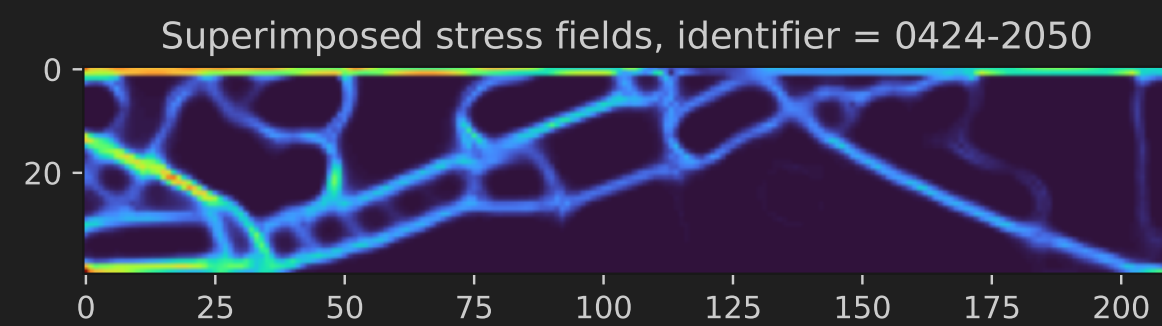
F



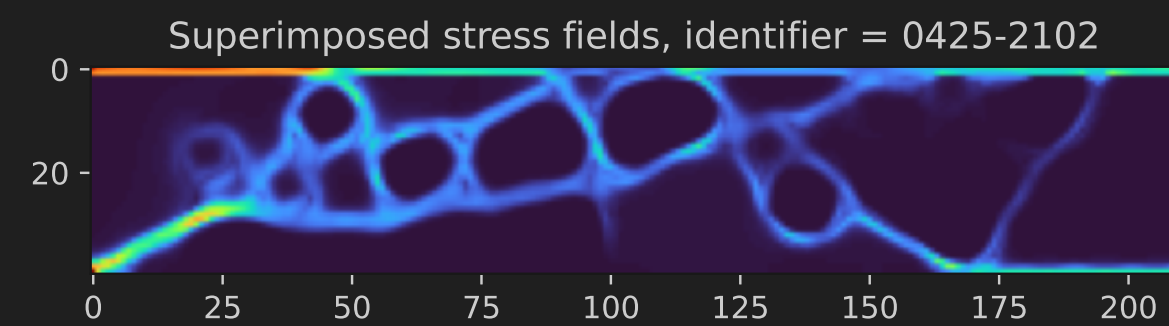
G



A

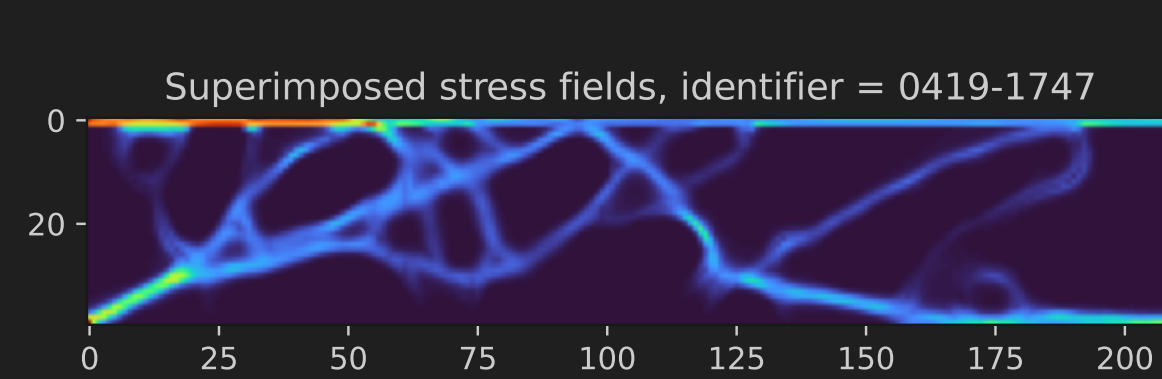
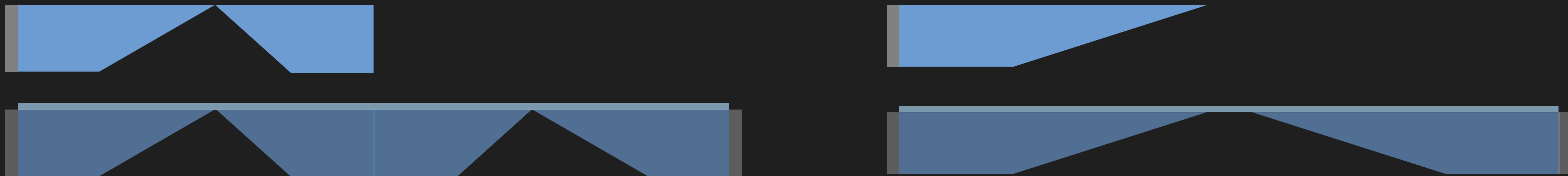


G

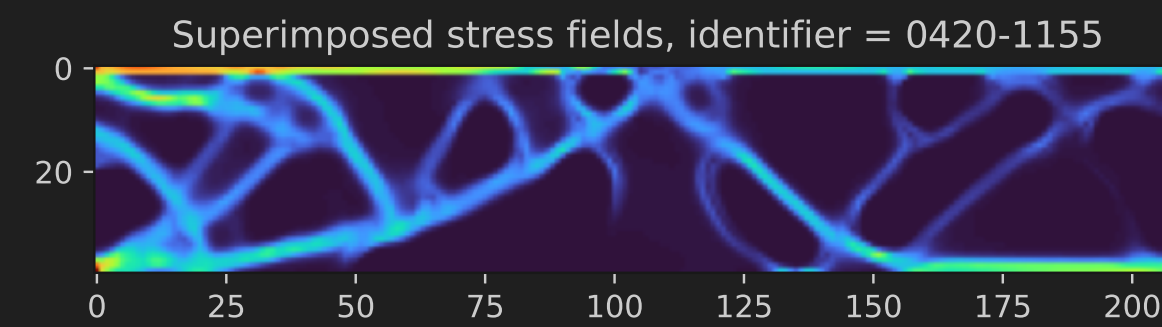


H

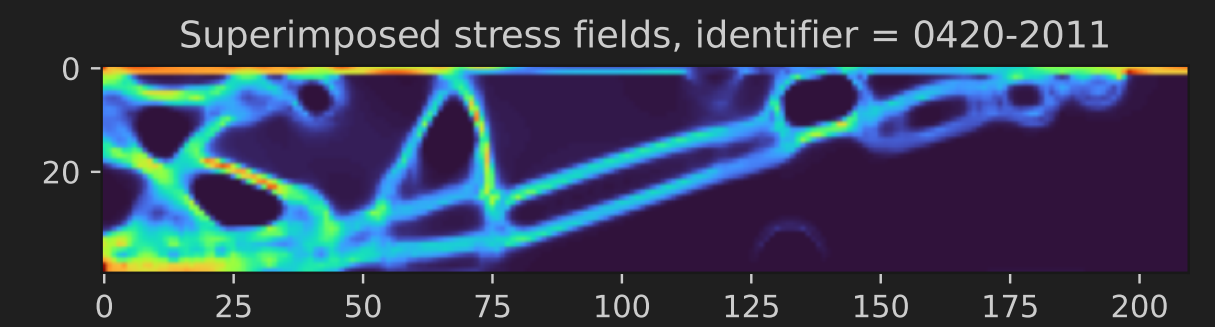
RESULTS



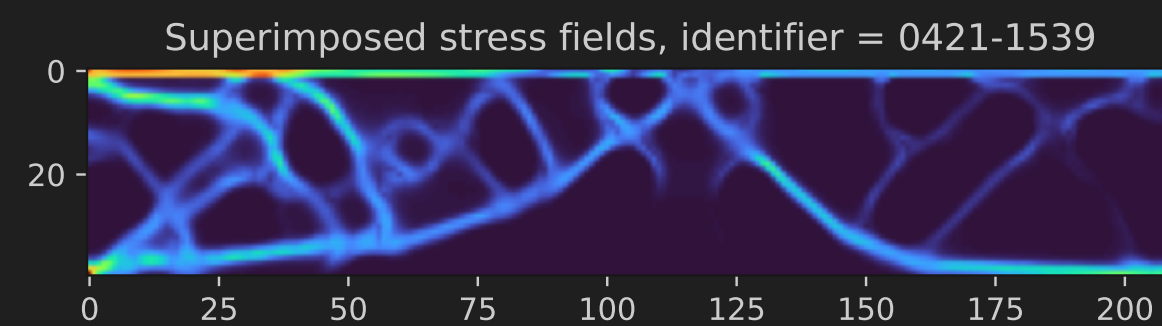
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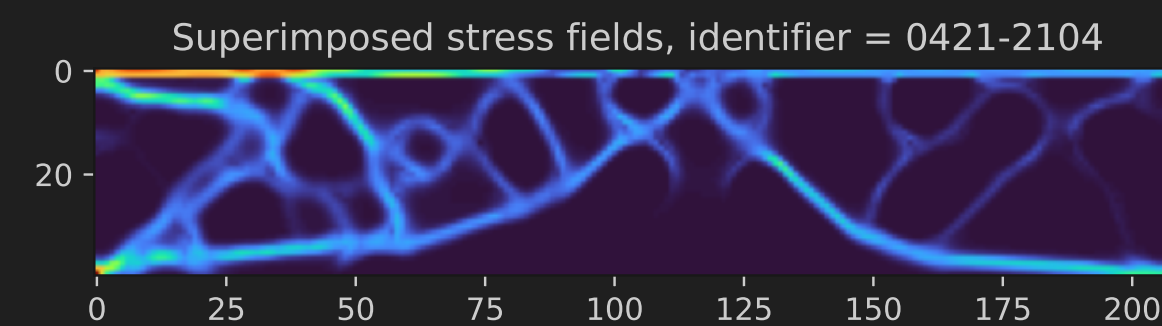
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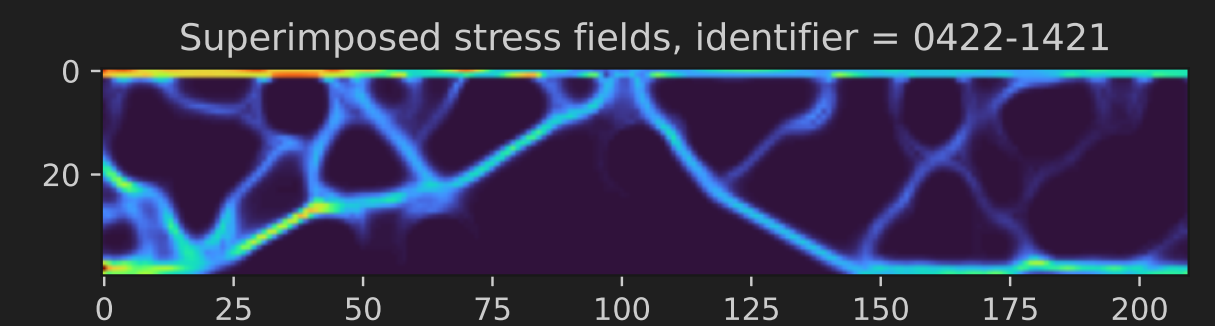
C



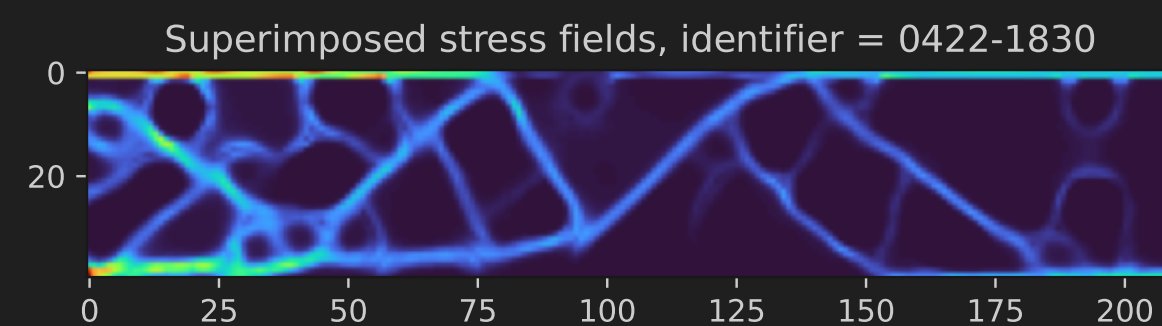
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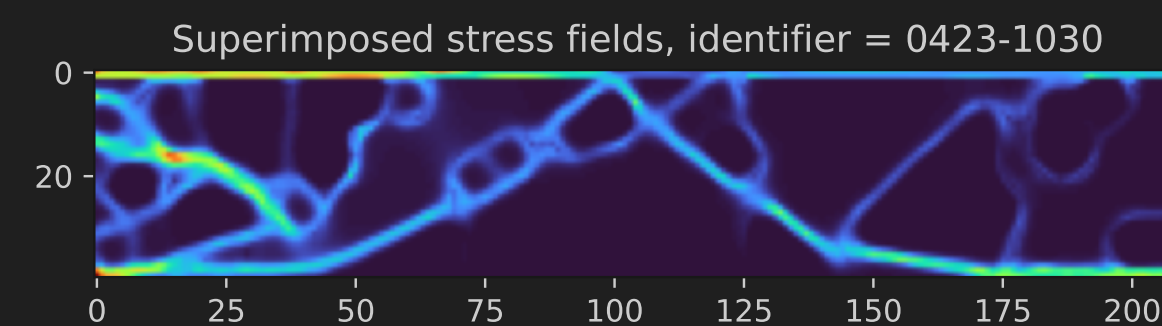
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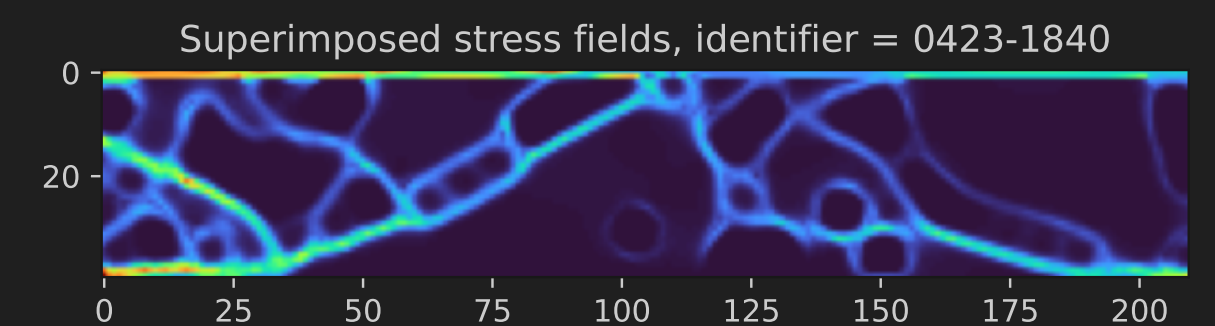
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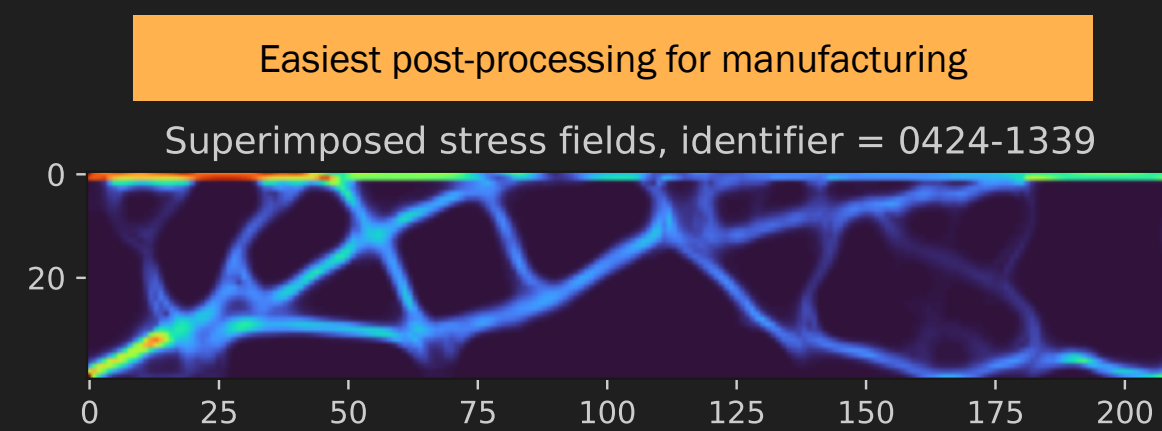
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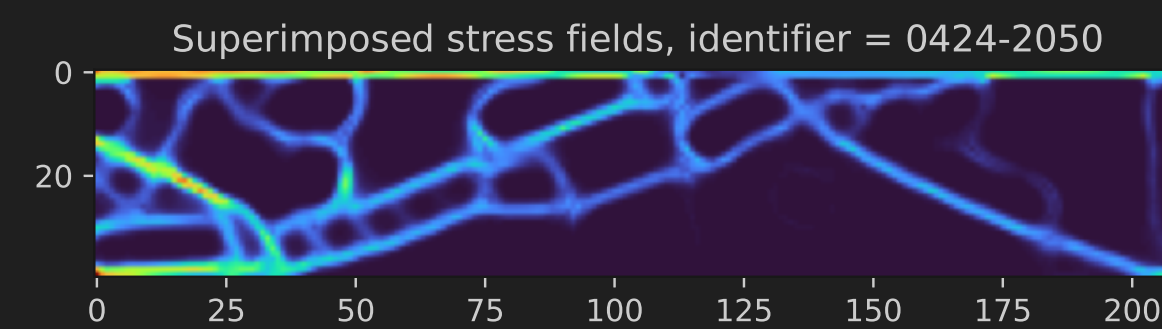
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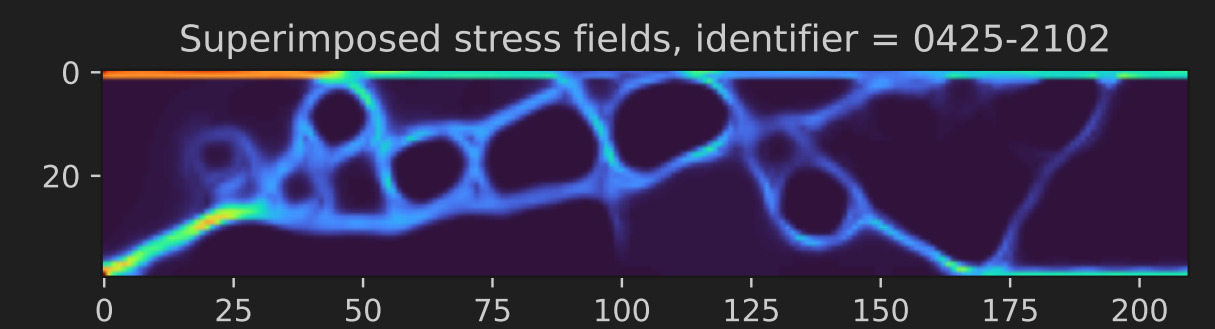
G



A



G



H

STRESS PATHS

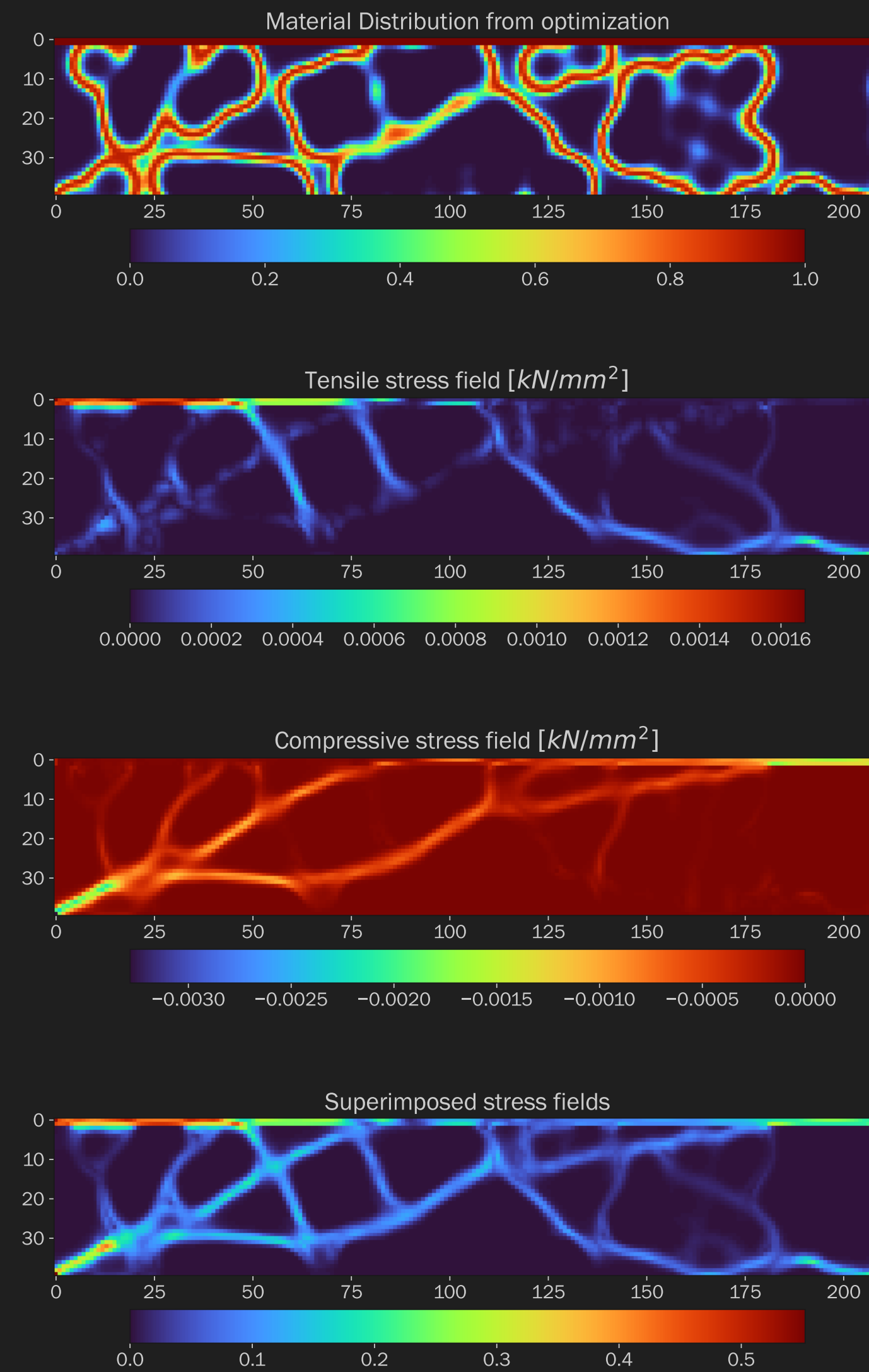
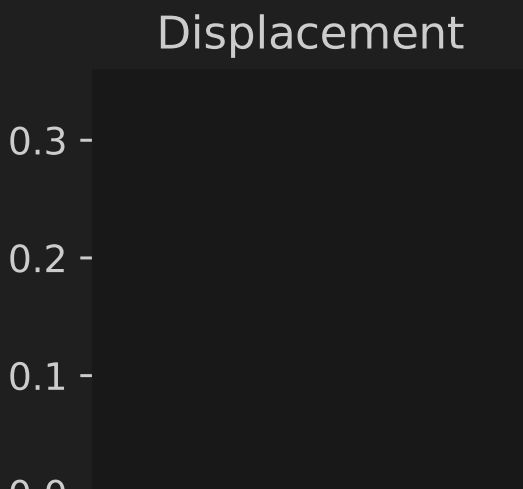
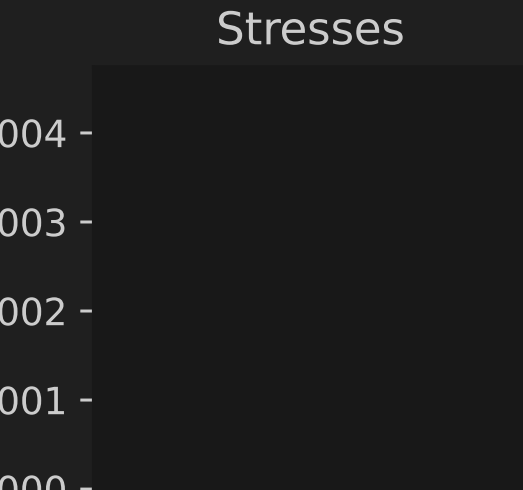
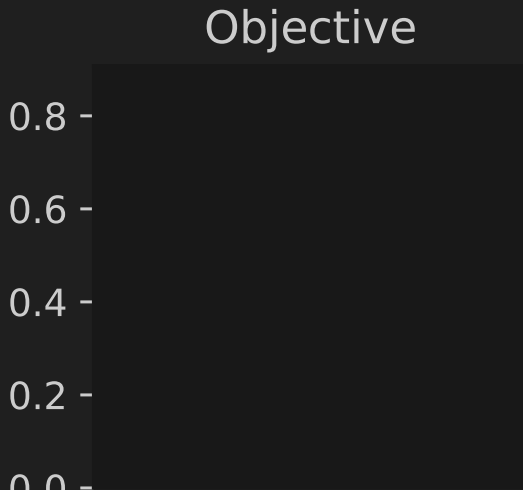
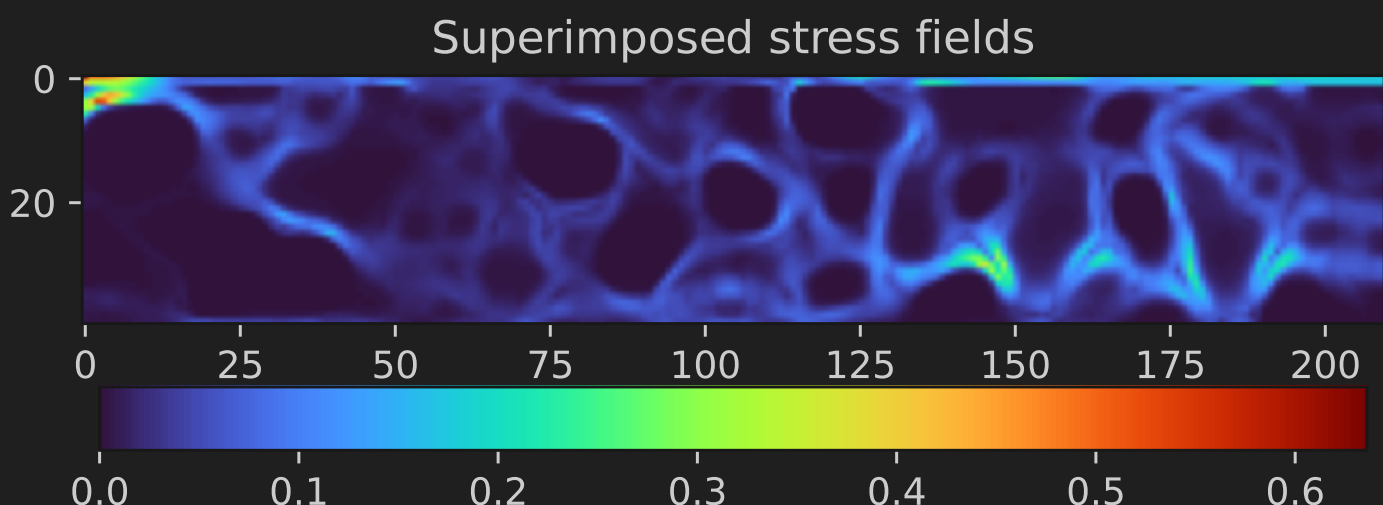
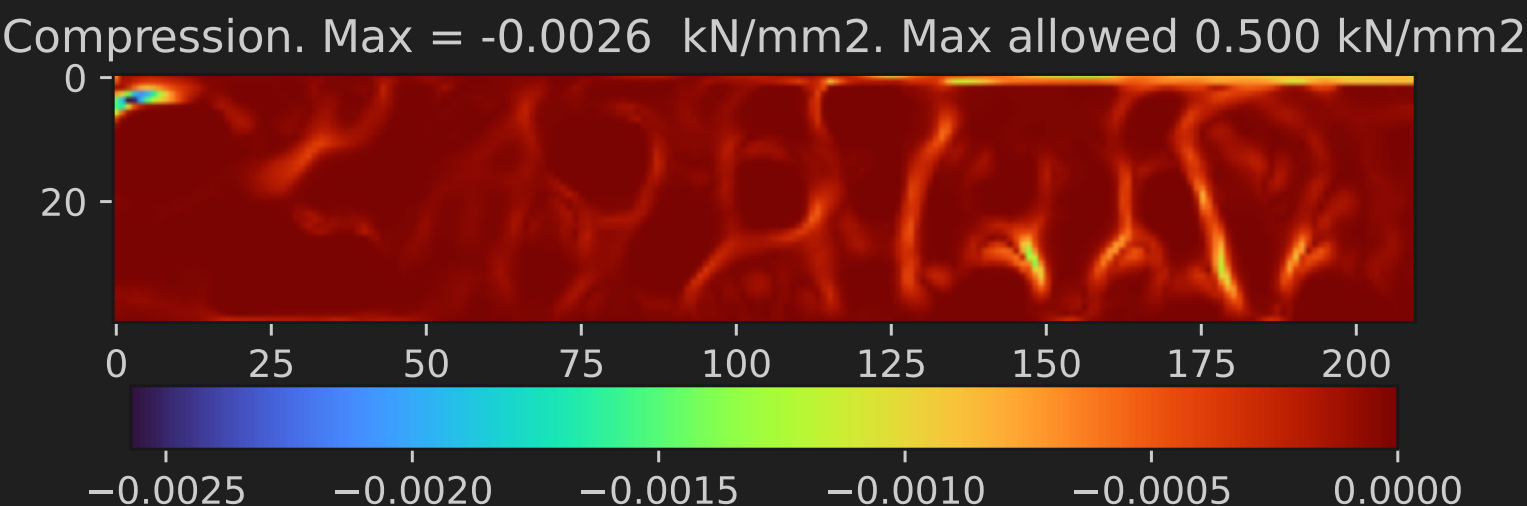
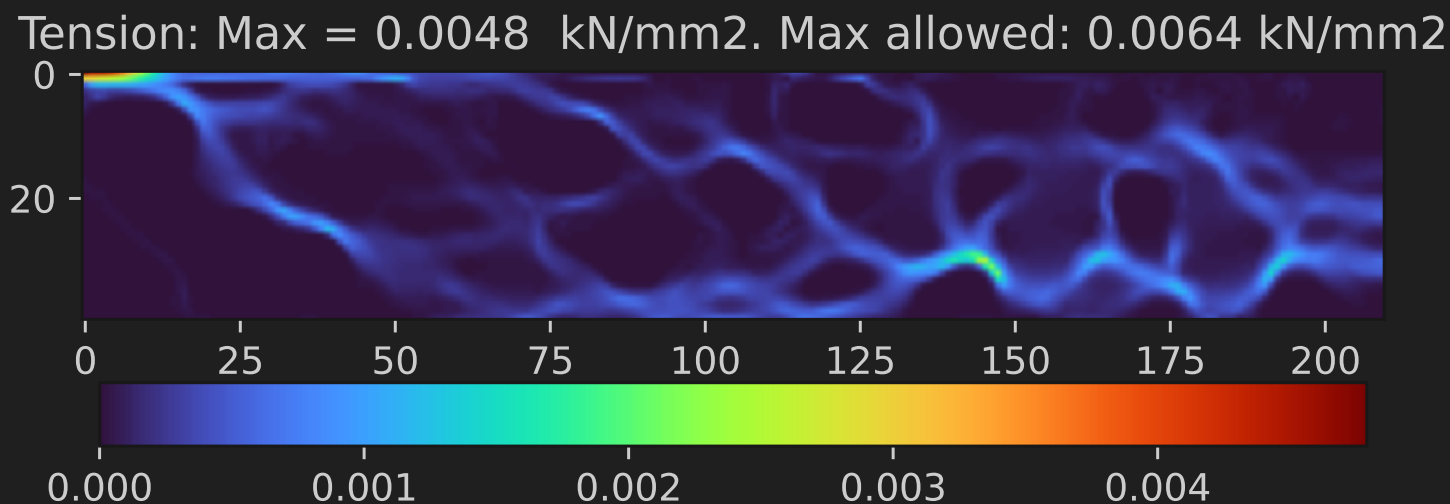
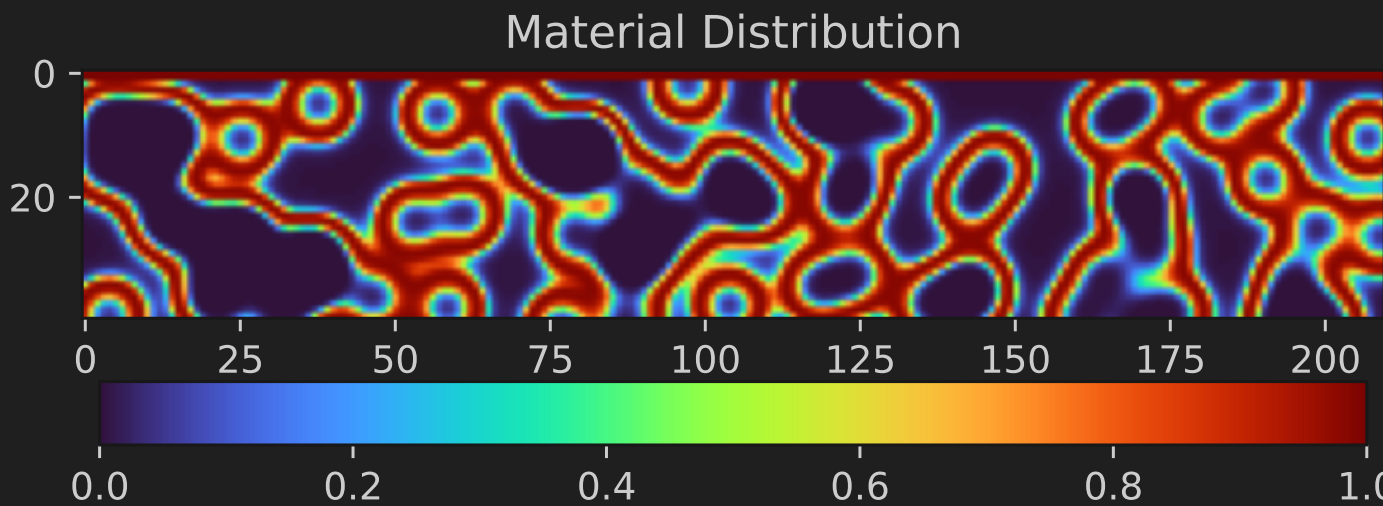
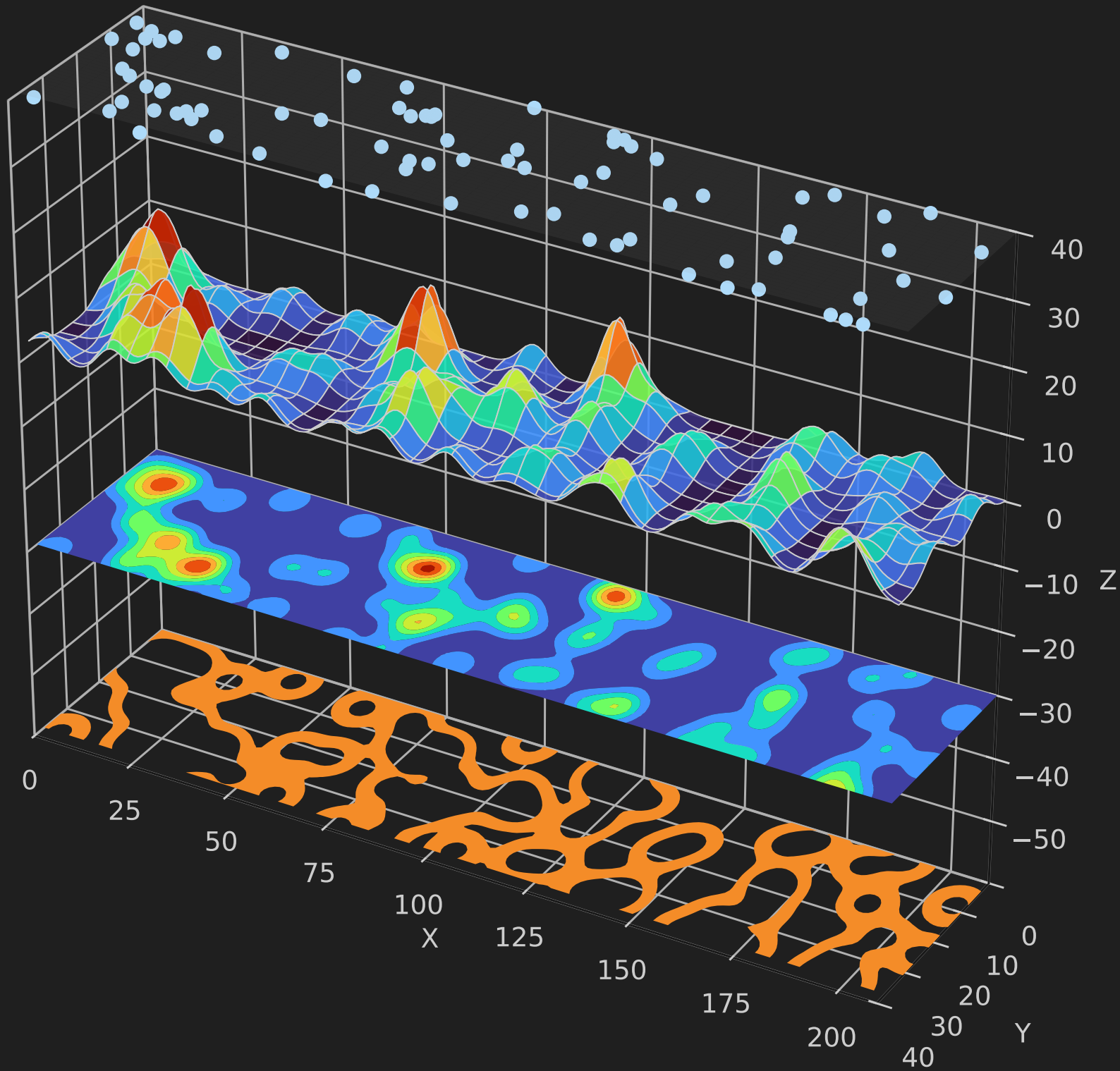


Image Source: https://grahamchastney.com/wp-content/uploads/2018/06/20180612_111442516_ios.jpg?w=2400

Objective = (Stress: 70 * 0.0046) + (Volume: 0.5 * 0.42) - (Displacement: 1 * -0.34) = 0.87

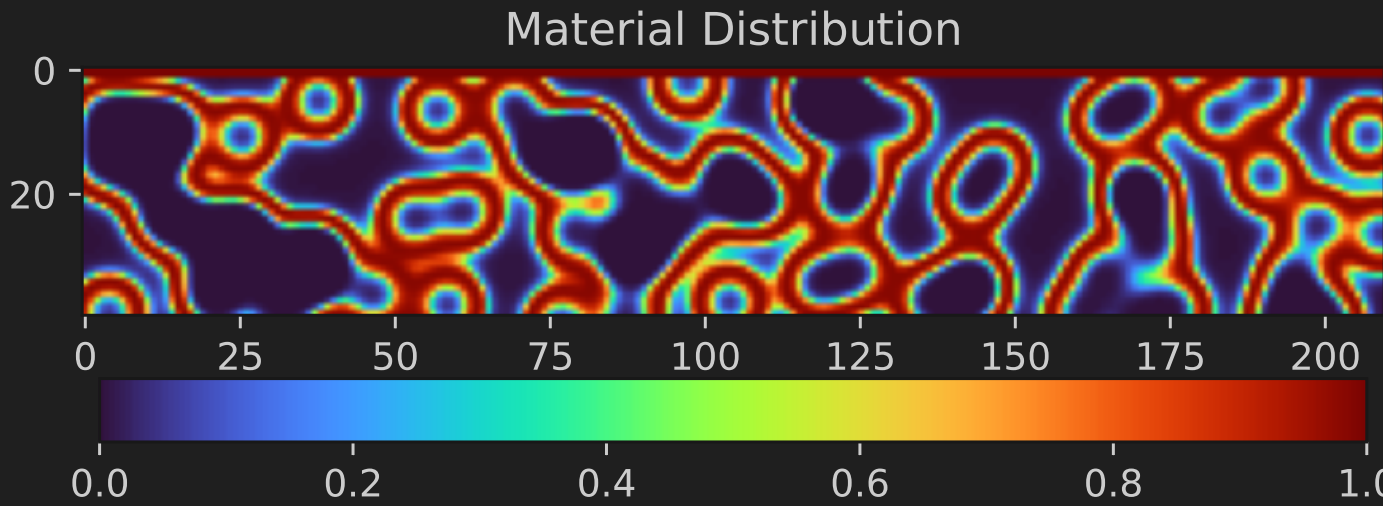
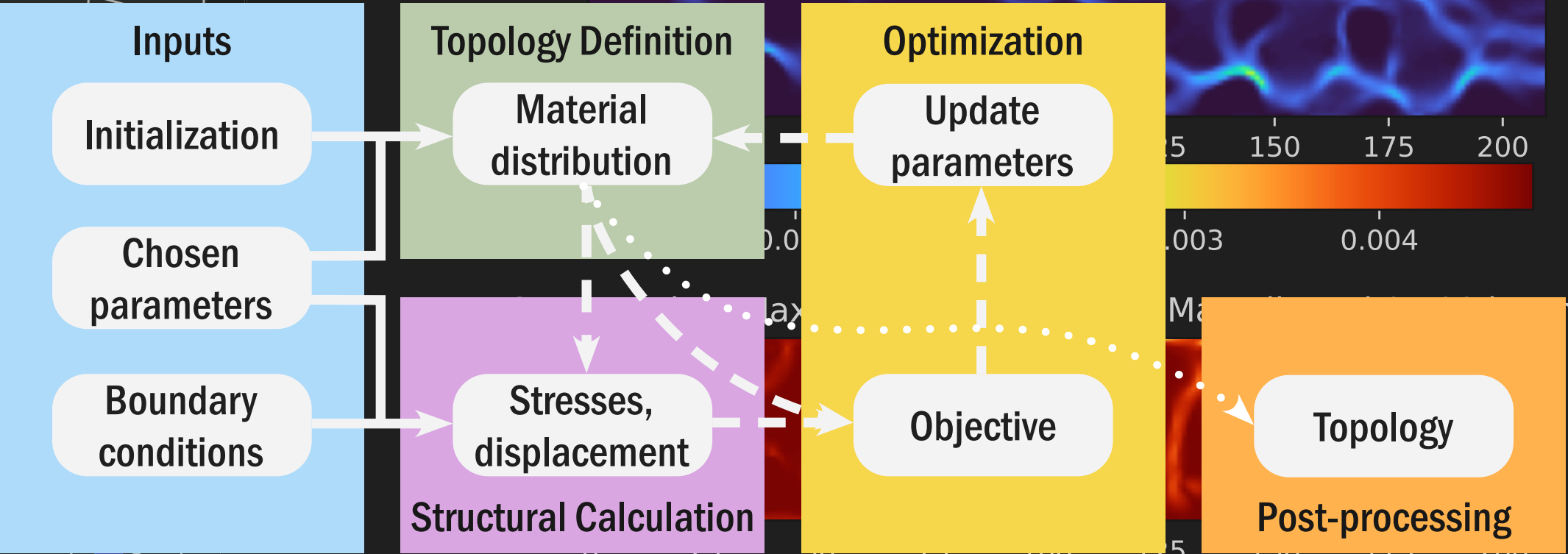
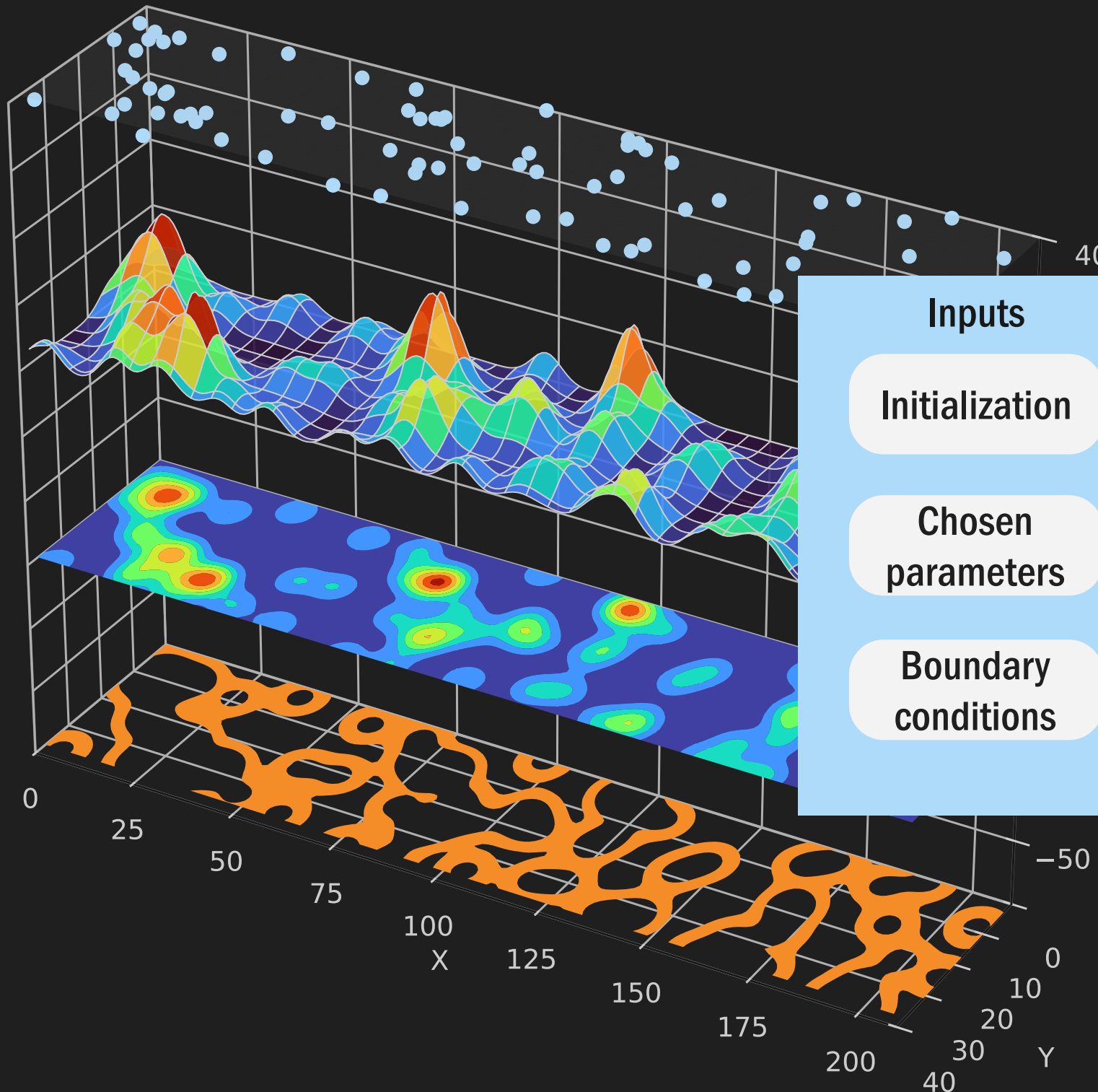
Spread Gaussian = 5.00 Shift = 2.20 Iteration = 000



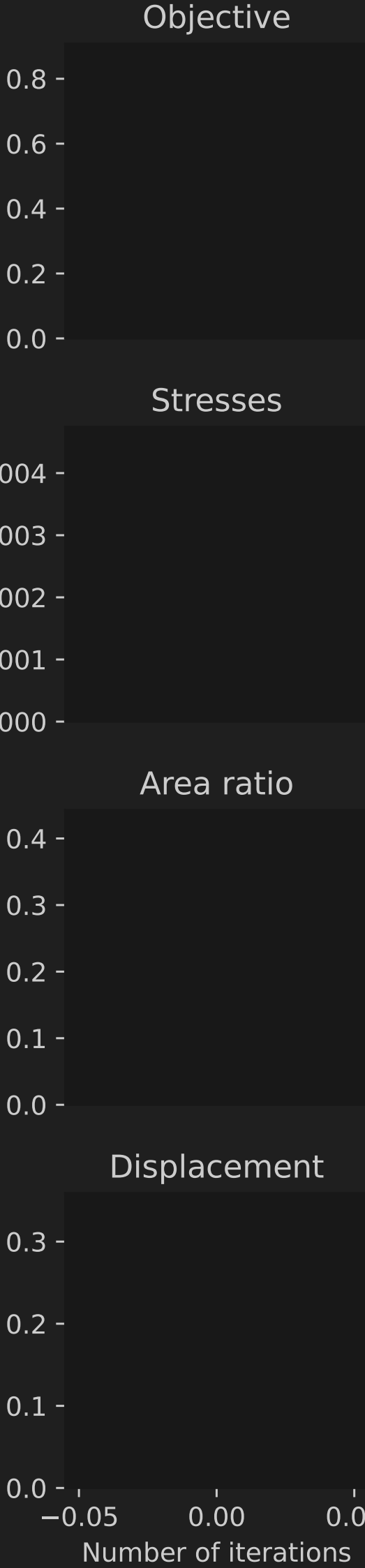
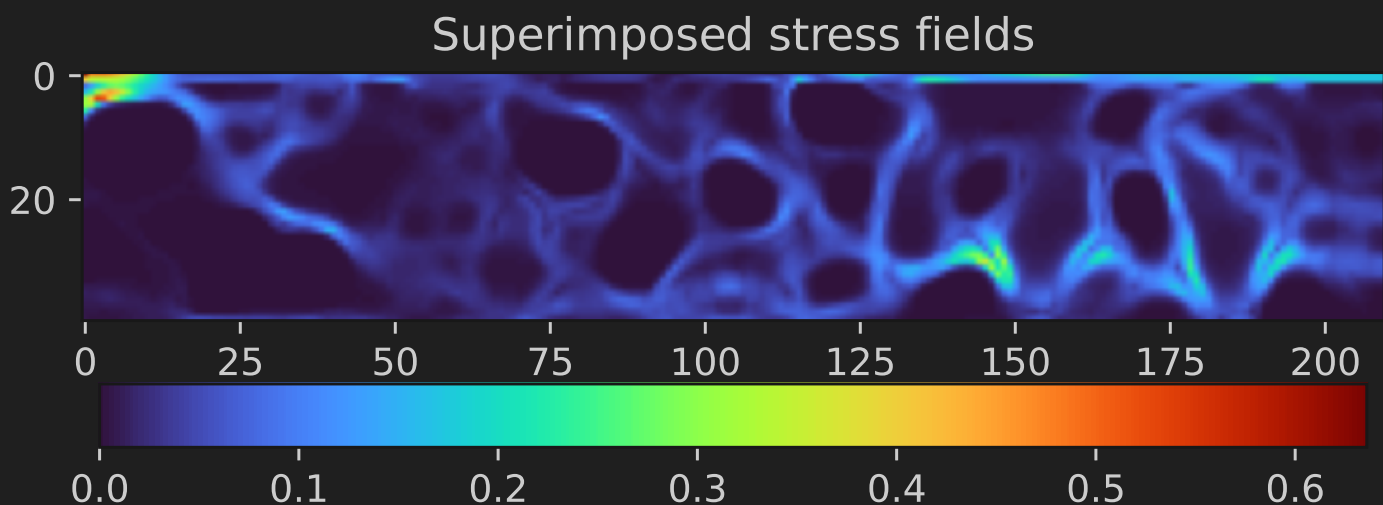
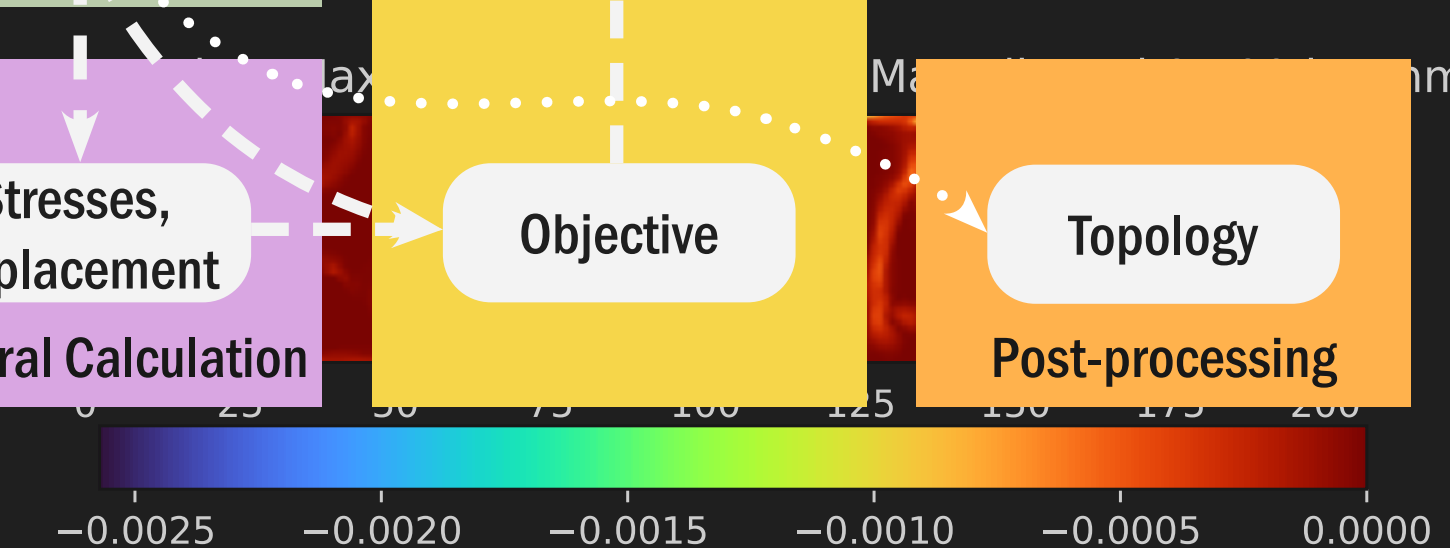
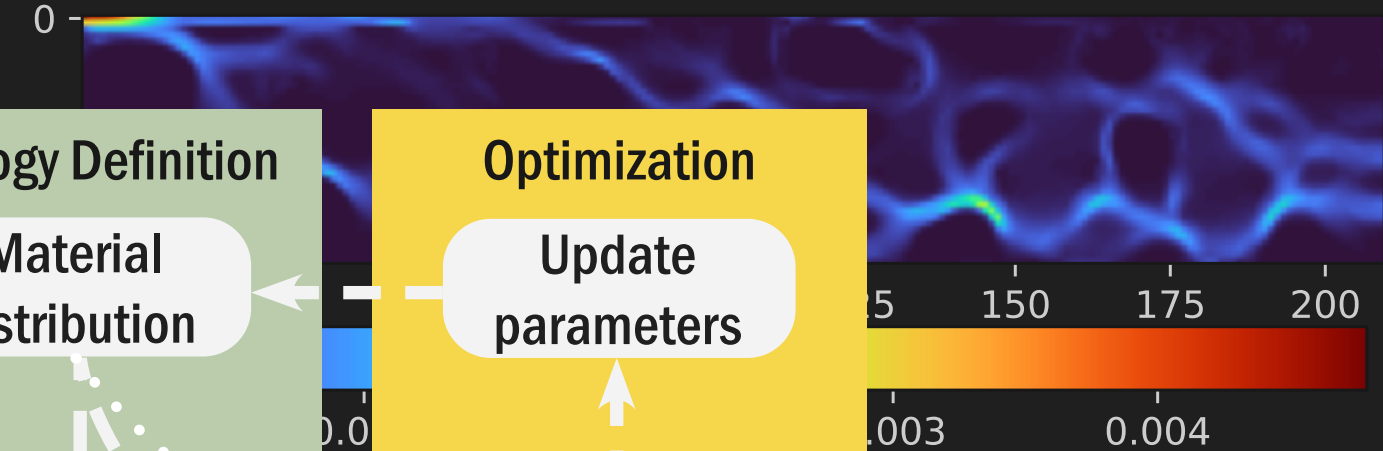
Number of iterations

Objective = (Stress: 70 * 0.0046) + (Volume: 0.5 * 0.42) - (Displacement: 1 * -0.34) = 0.87

Spread Gaussian = 5.00 Shift = 2.20 Iteration = 000

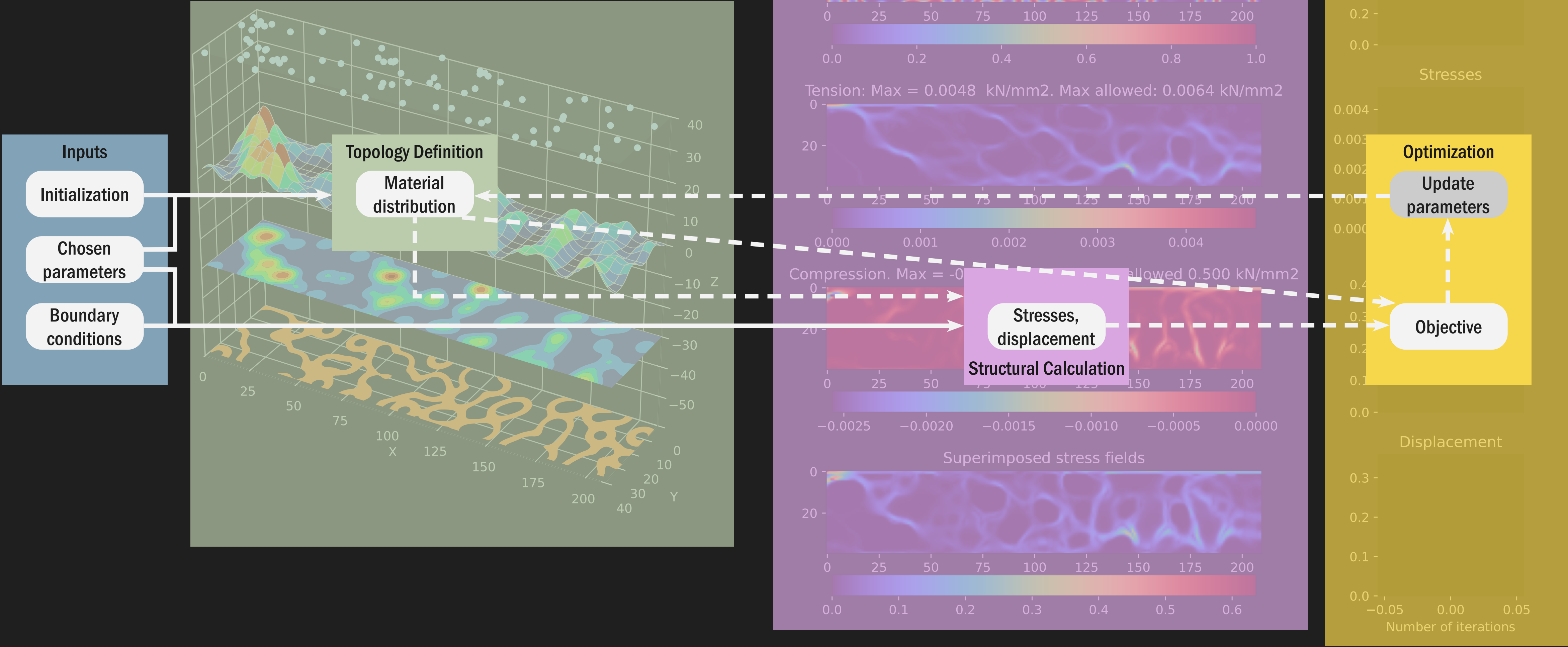


Tension: Max = 0.0048 kN/mm2. Max allowed: 0.0064 kN/mm2



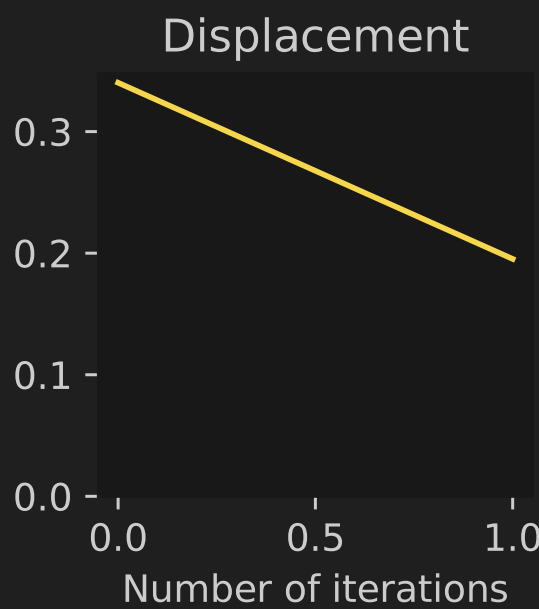
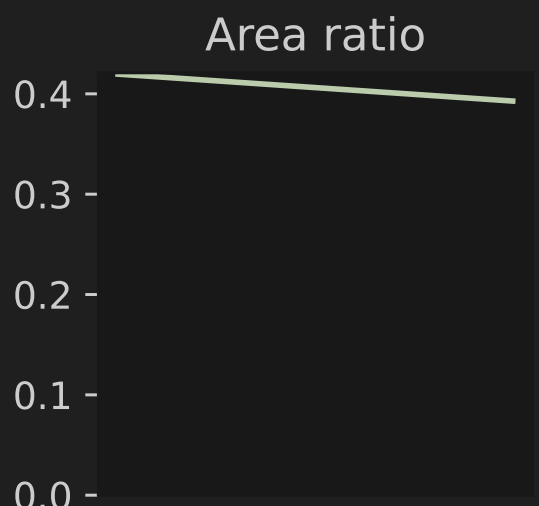
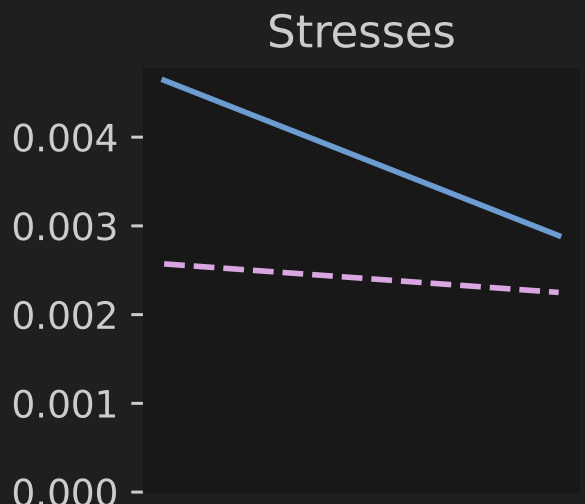
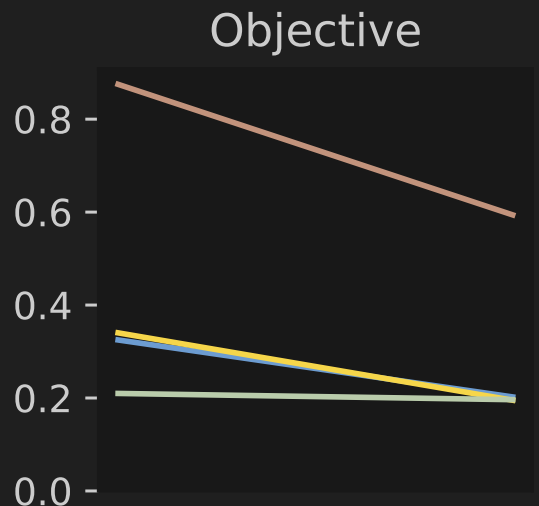
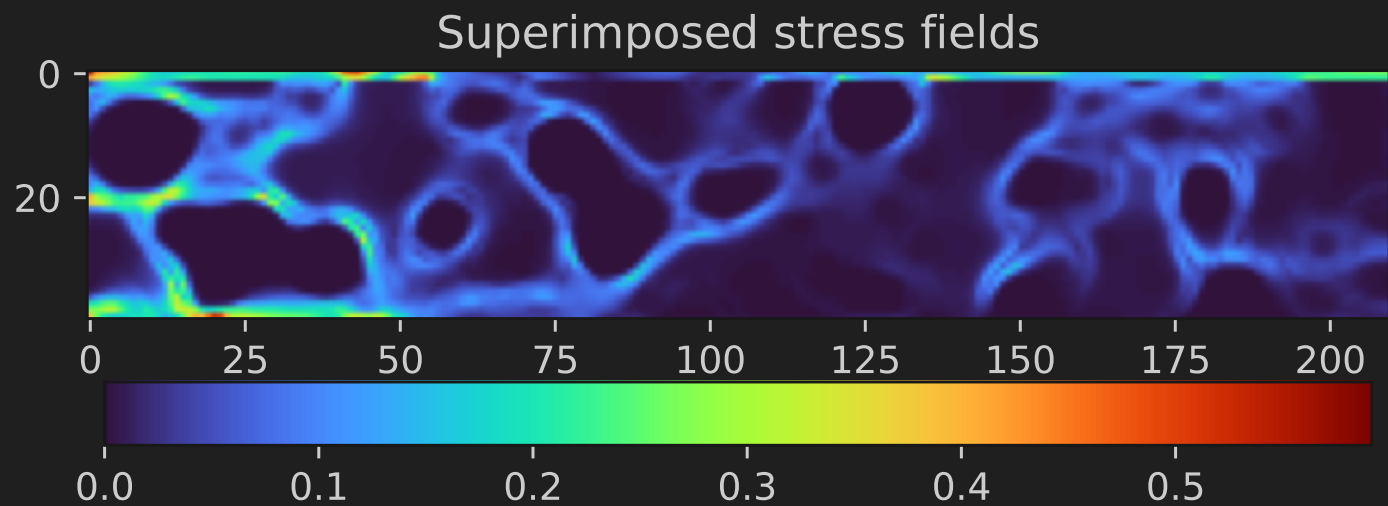
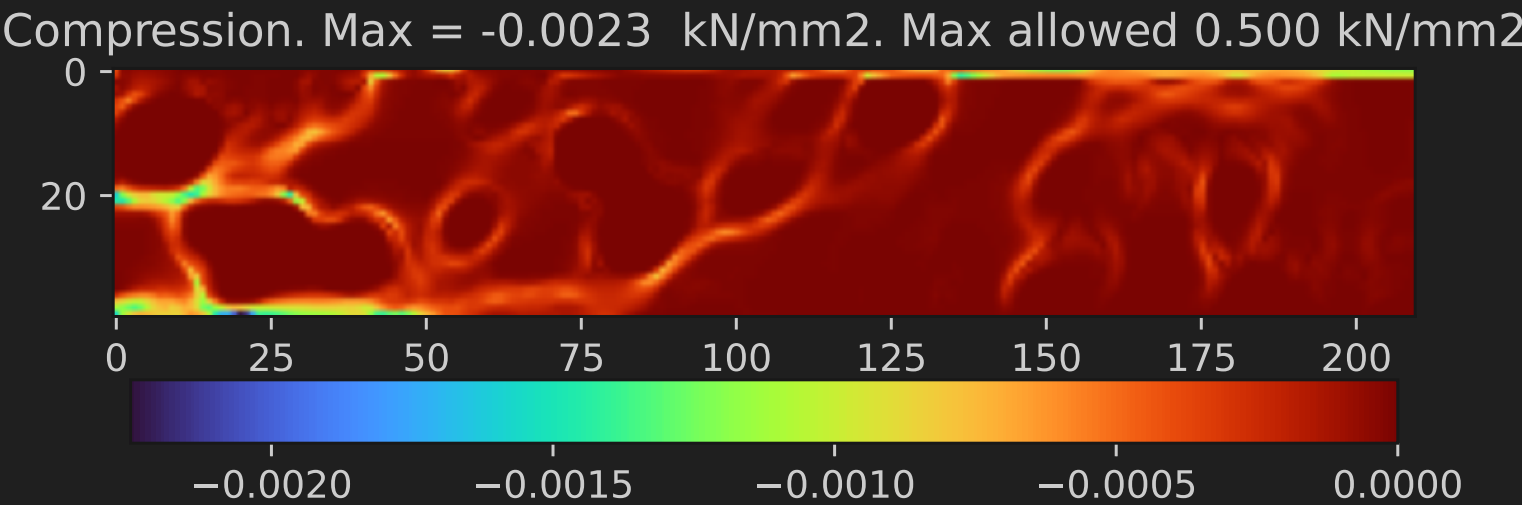
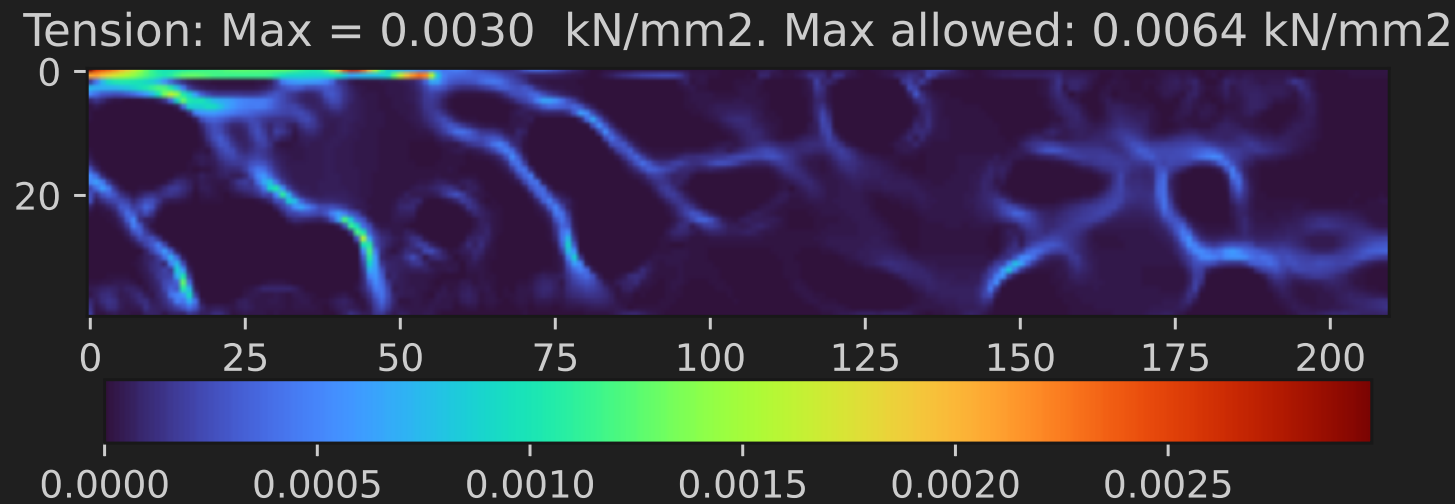
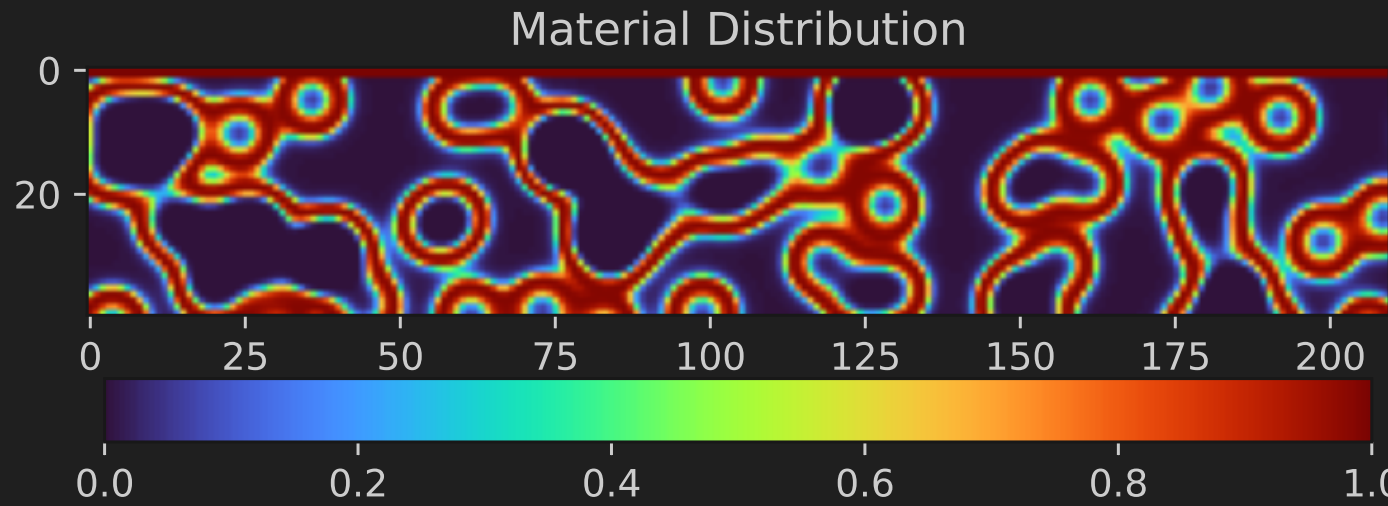
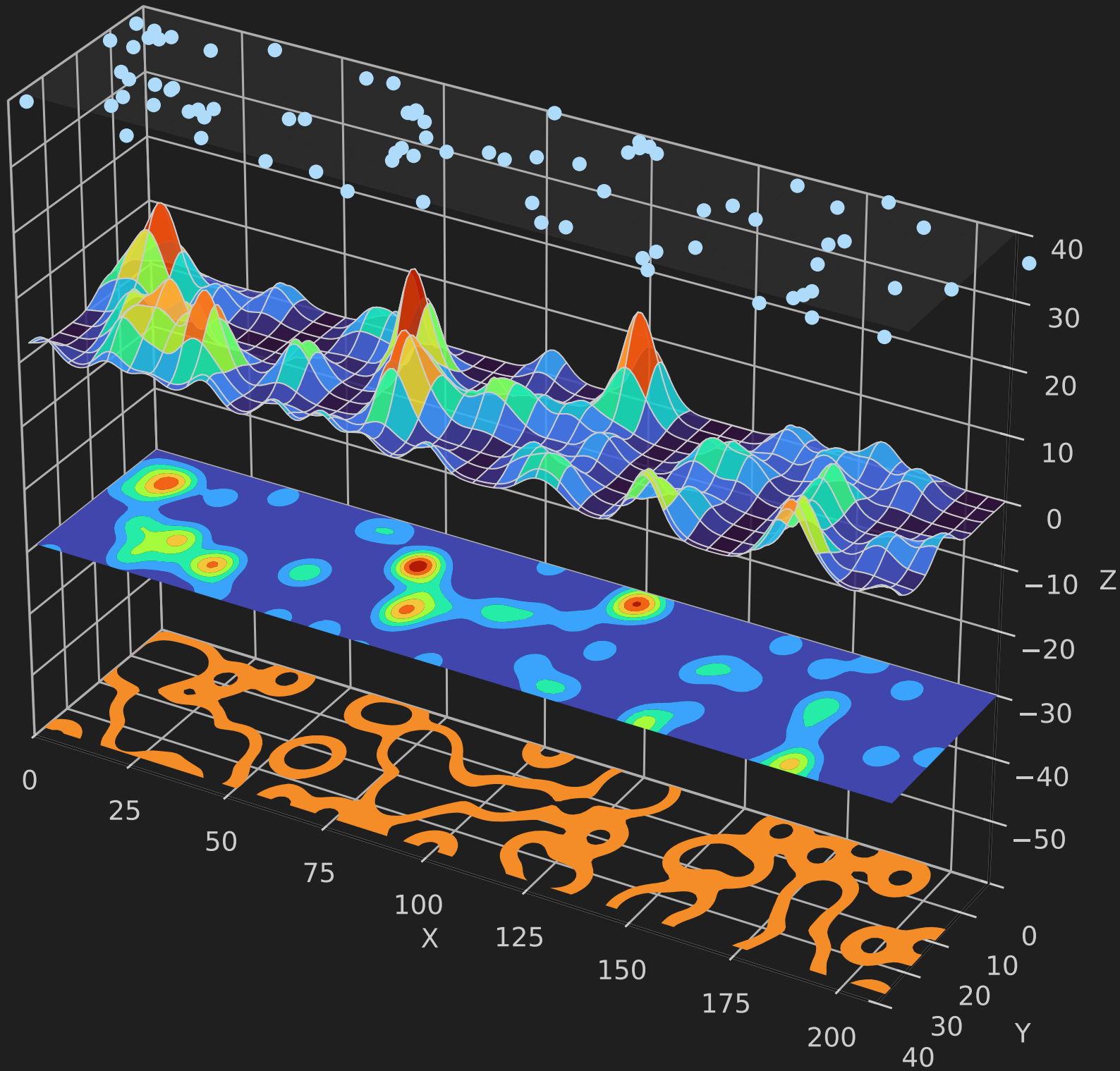
Objective = (Stress: 70 * 0.0046) + (Volume: 0.5 * 0.42) - (Displacement: 1 * -0.34) = 0.87

Spread Gaussian = 5.00 Shift = 2.20 Iteration = 000



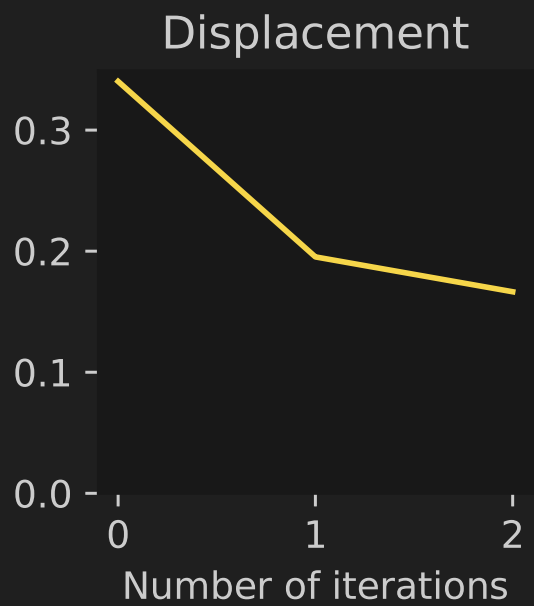
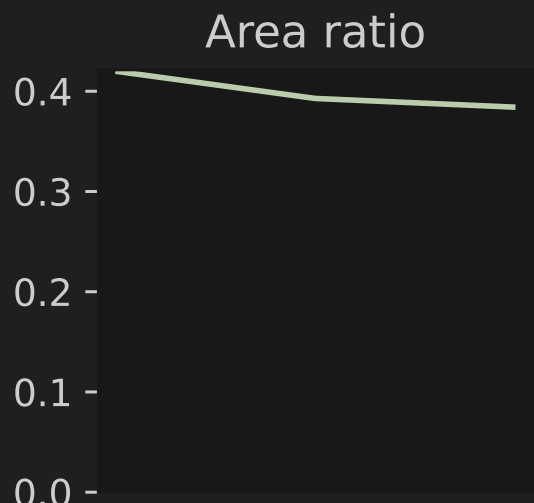
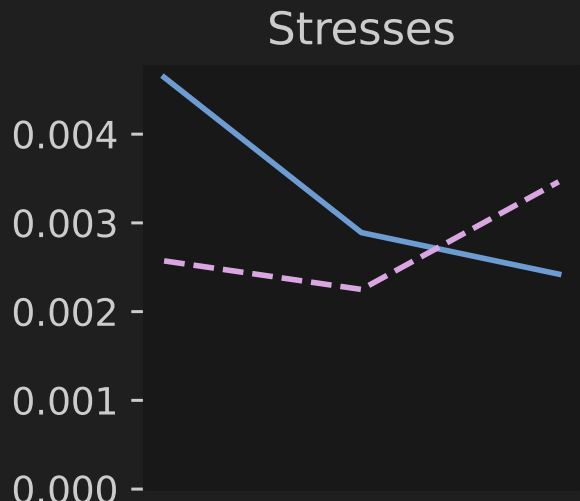
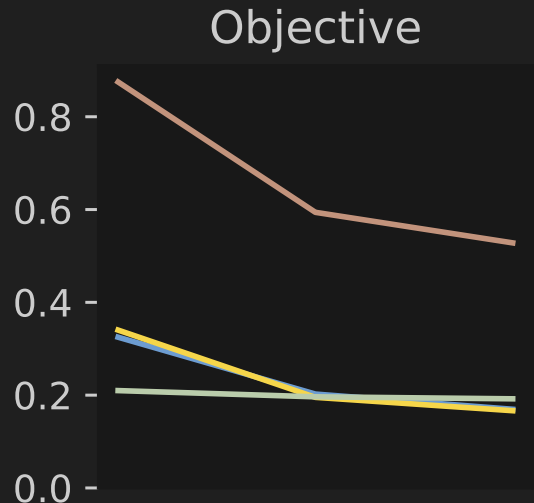
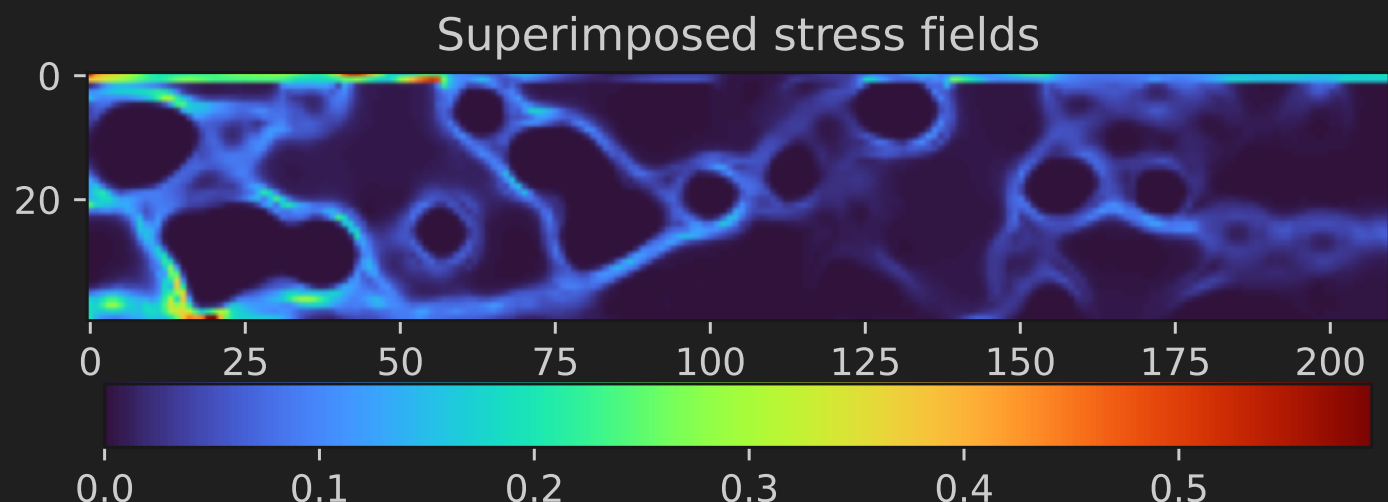
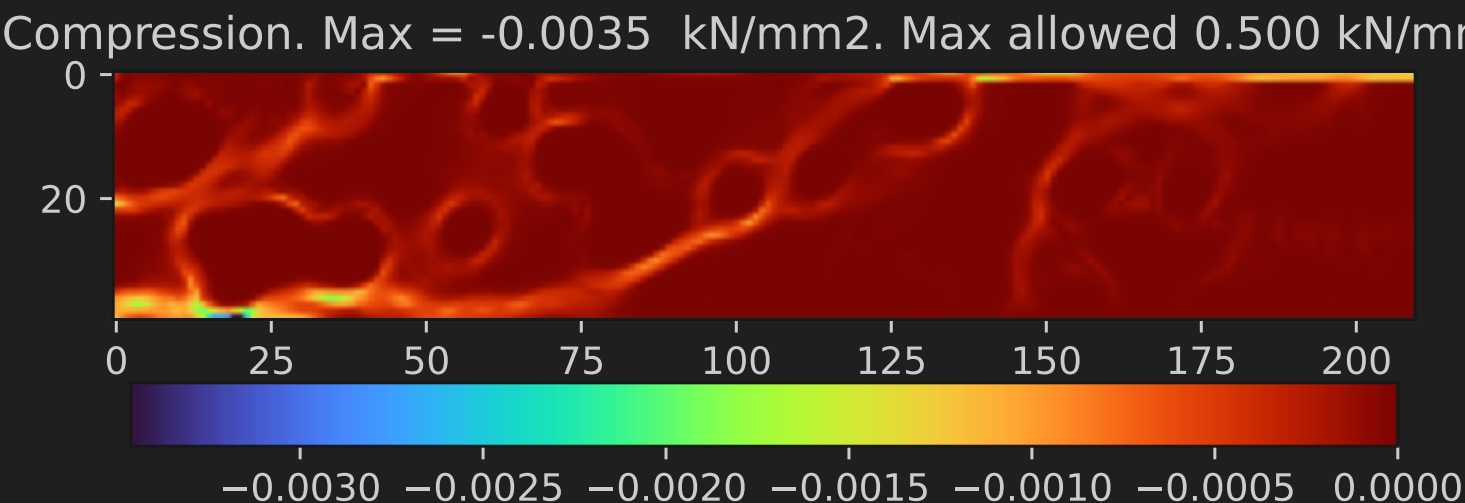
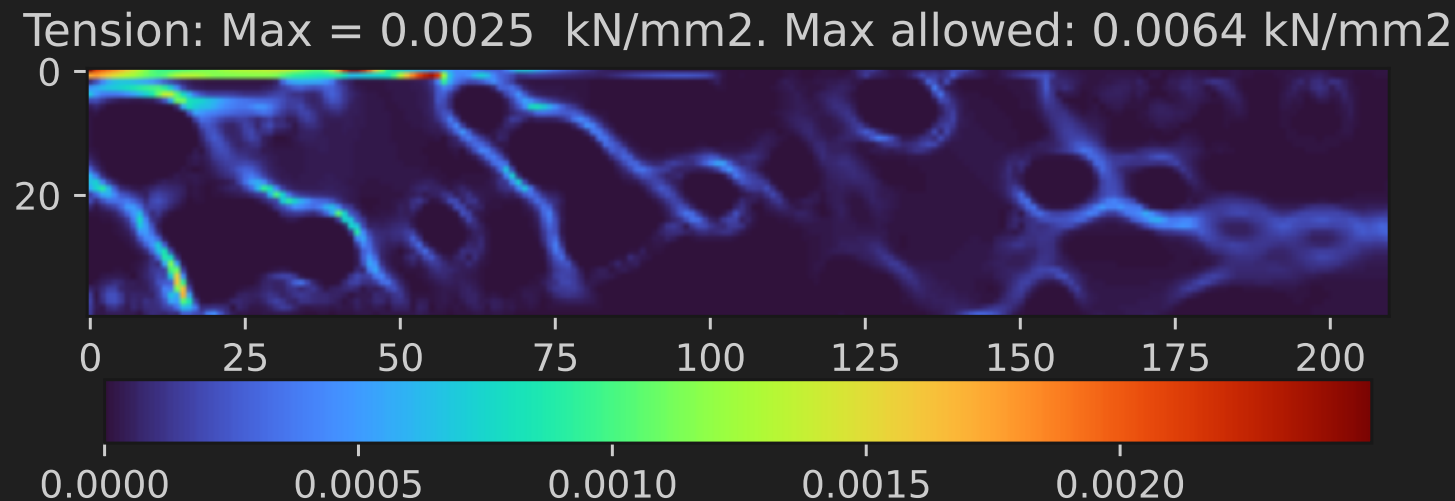
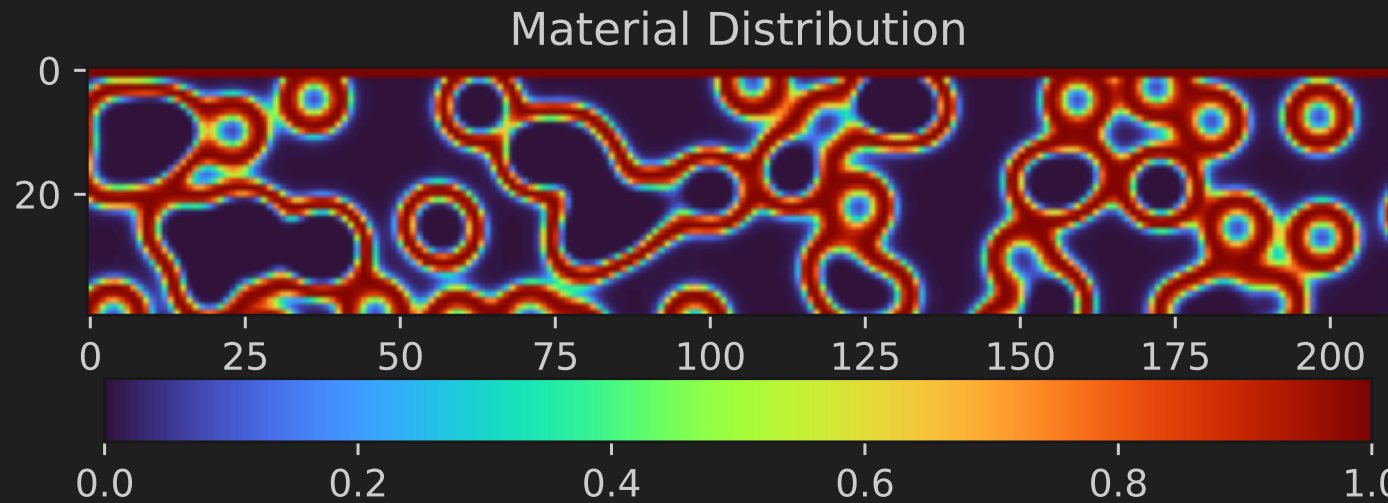
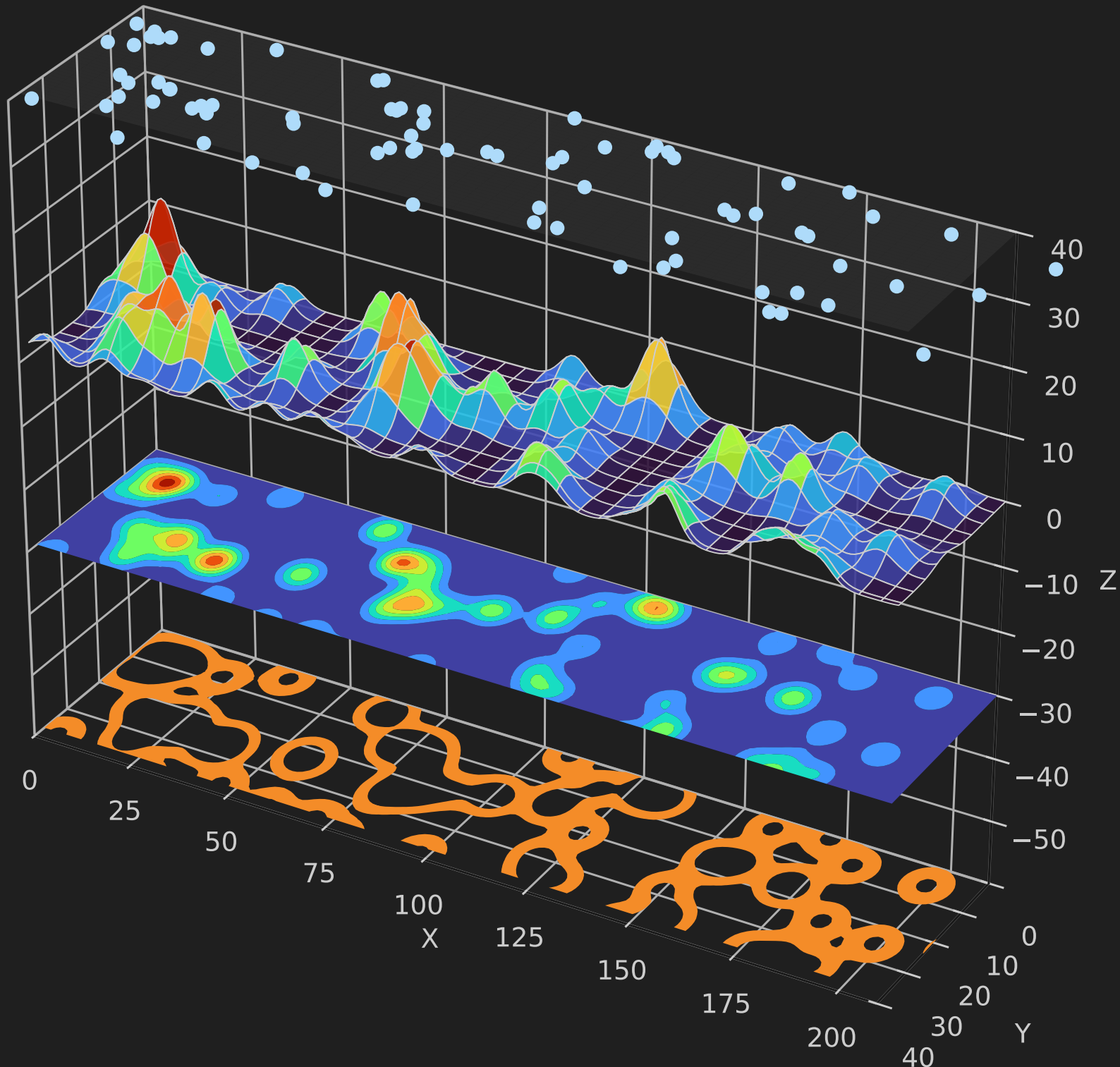
Objective = (Stress: 70 * 0.0029) + (Volume: 0.5 * 0.39) - (Displacement: 1 * -0.20) = 0.59

Spread Gaussian = 4.75 Shift = 2.31 Iteration = 001



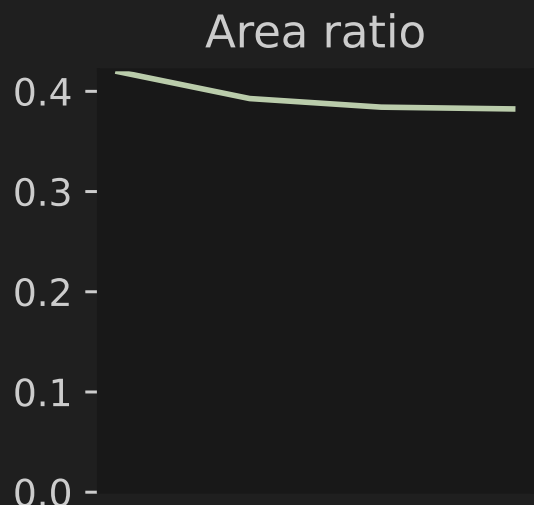
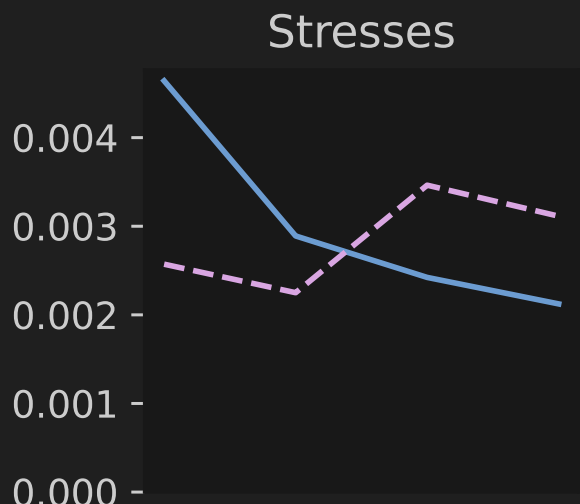
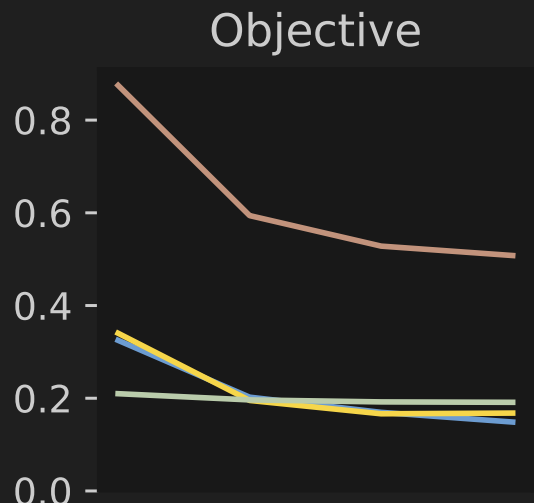
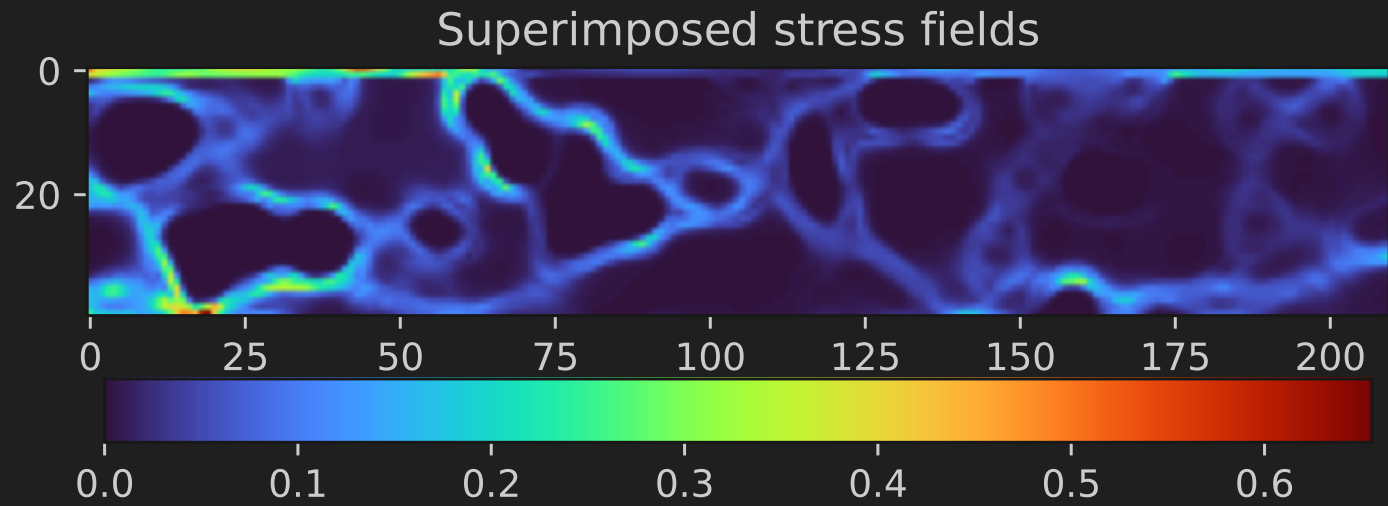
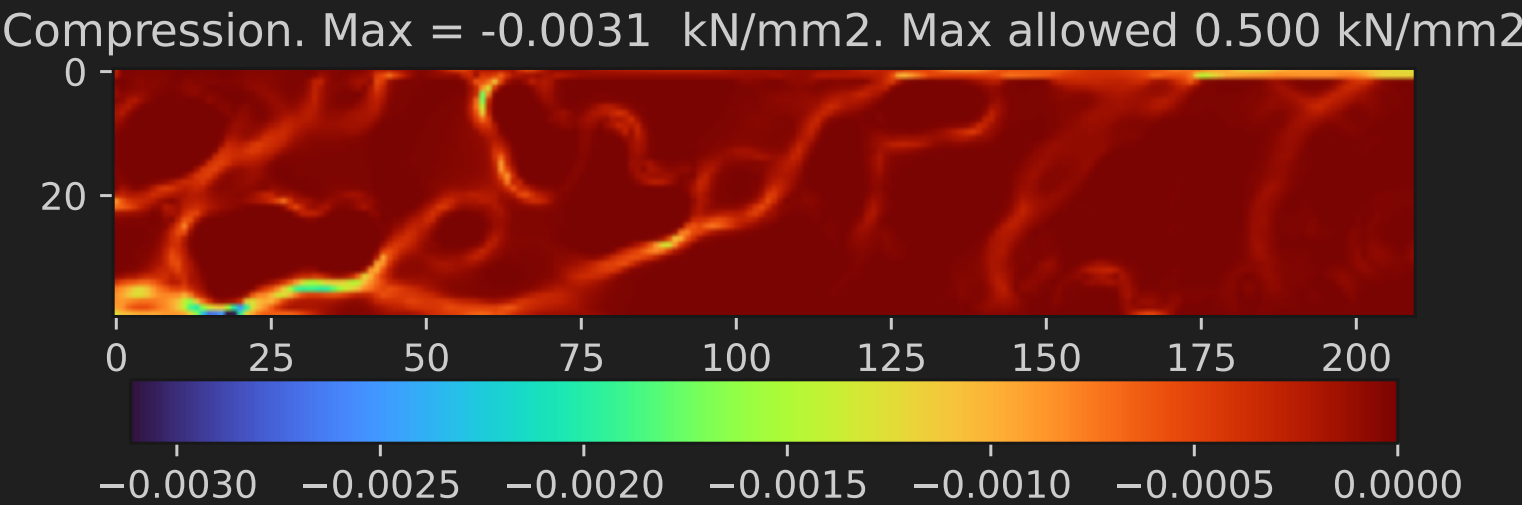
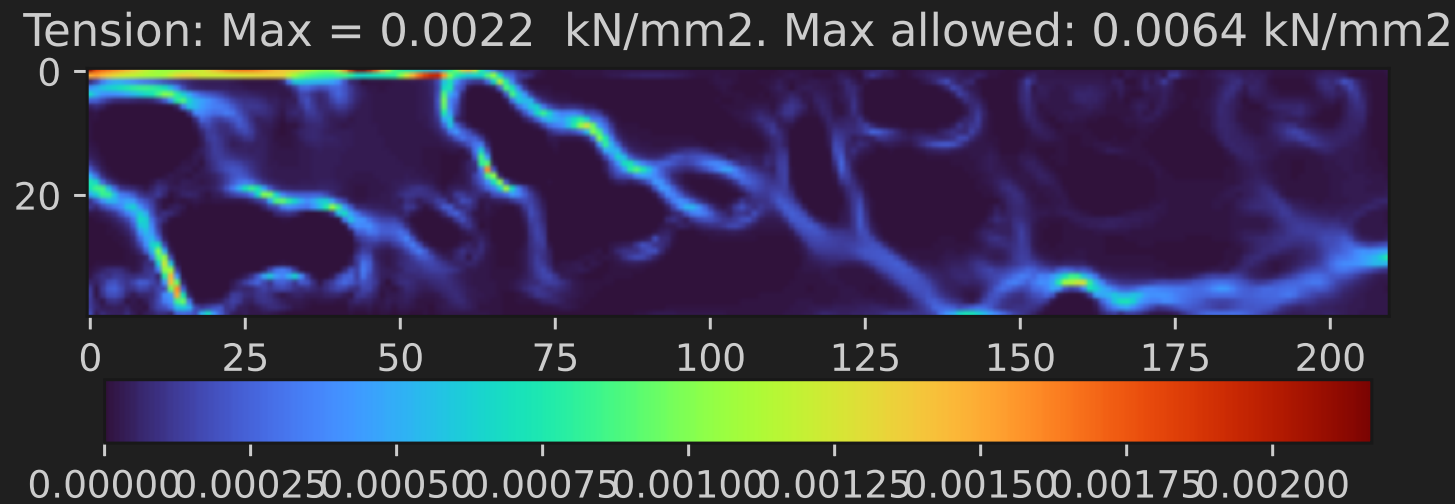
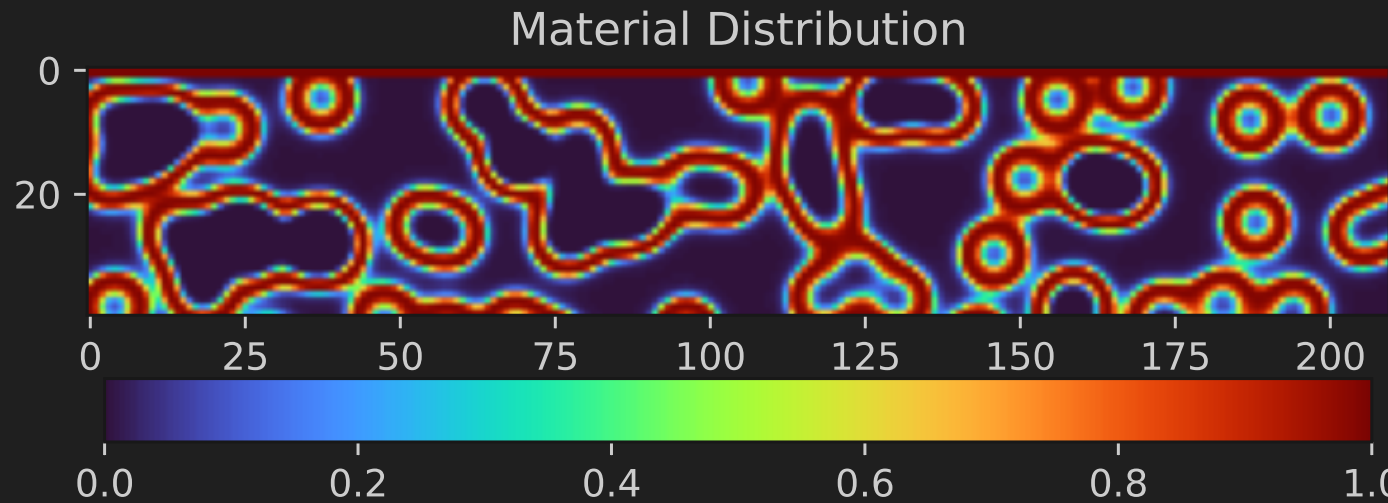
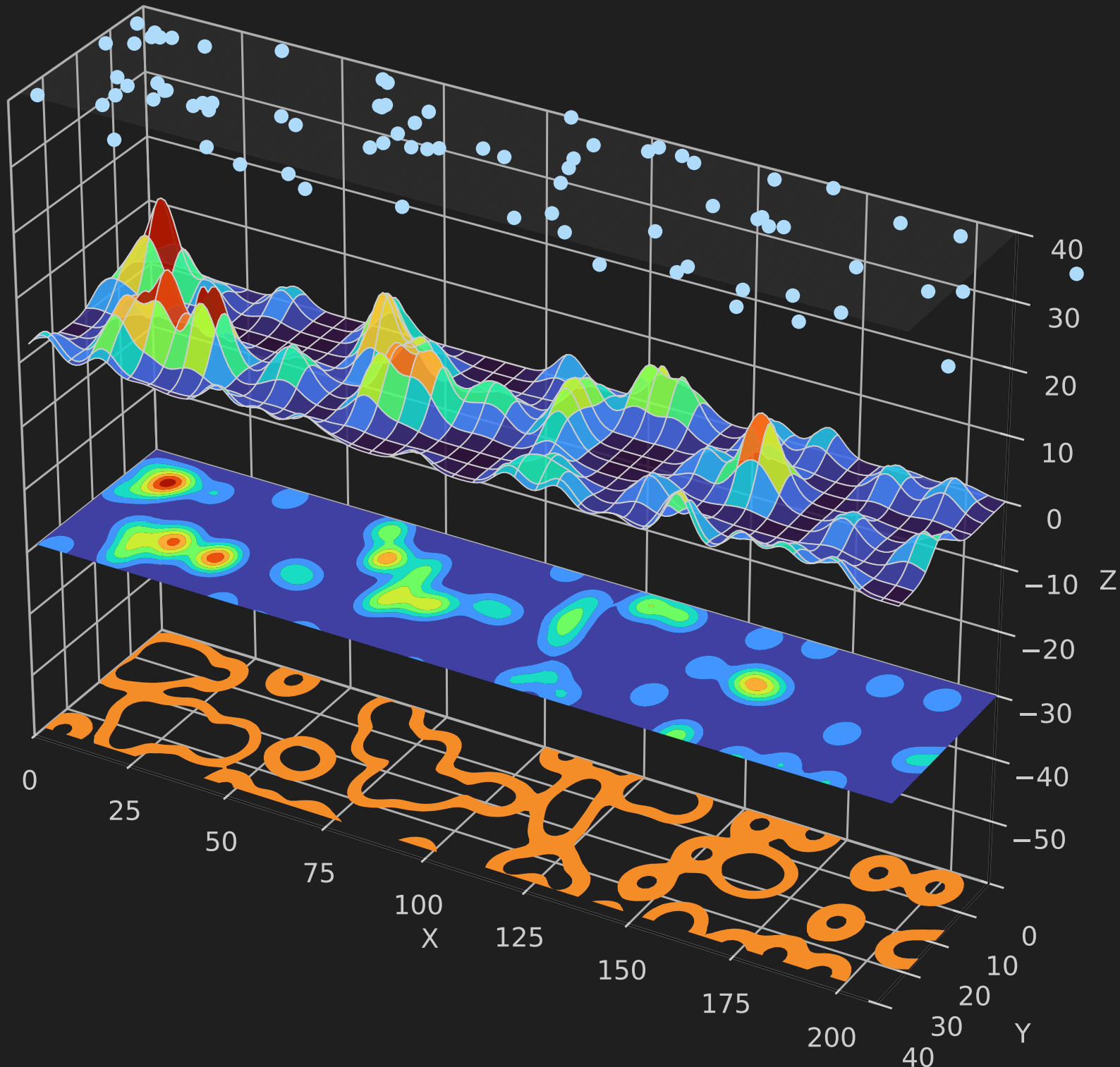
Objective = (Stress: 70 * 0.0024) + (Volume: 0.5 * 0.38) - (Displacement: 1 * -0.17) = 0.53

Spread Gaussian = 4.58 Shift = 2.42 Iteration = 002



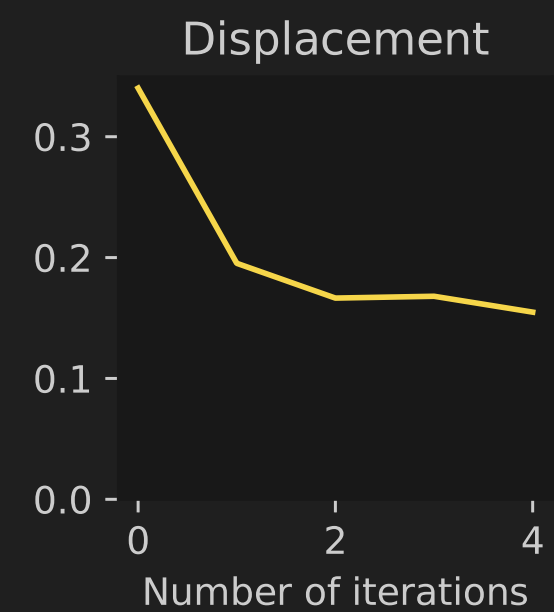
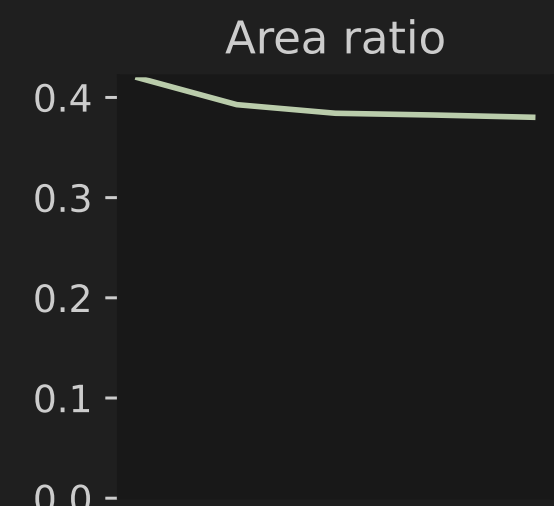
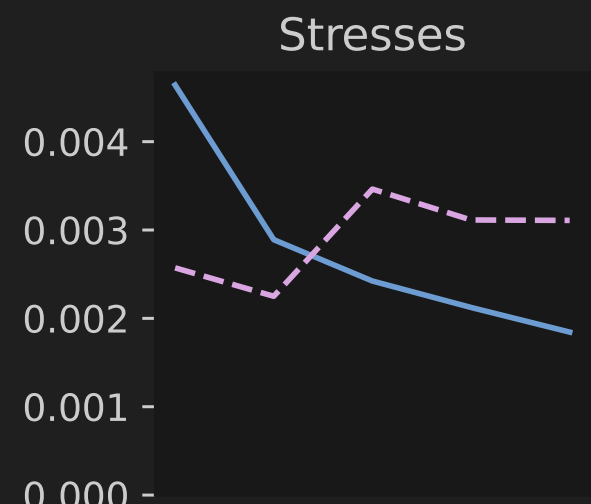
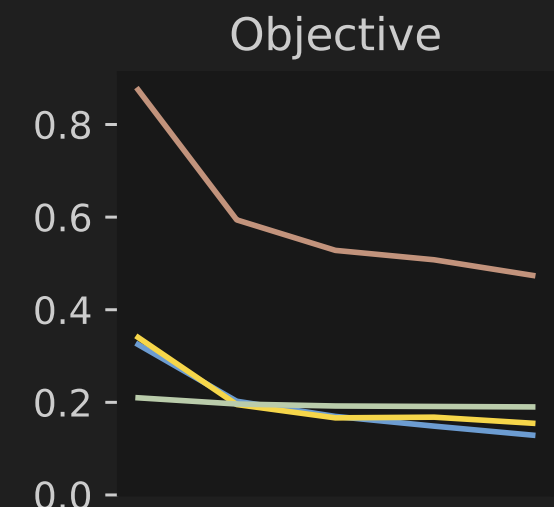
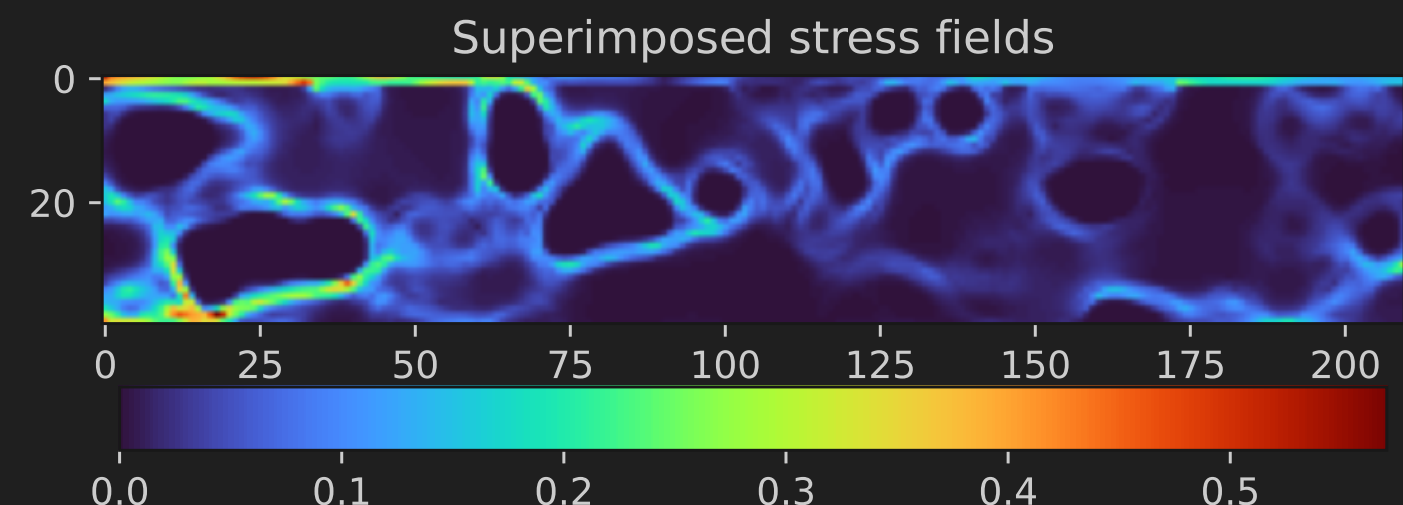
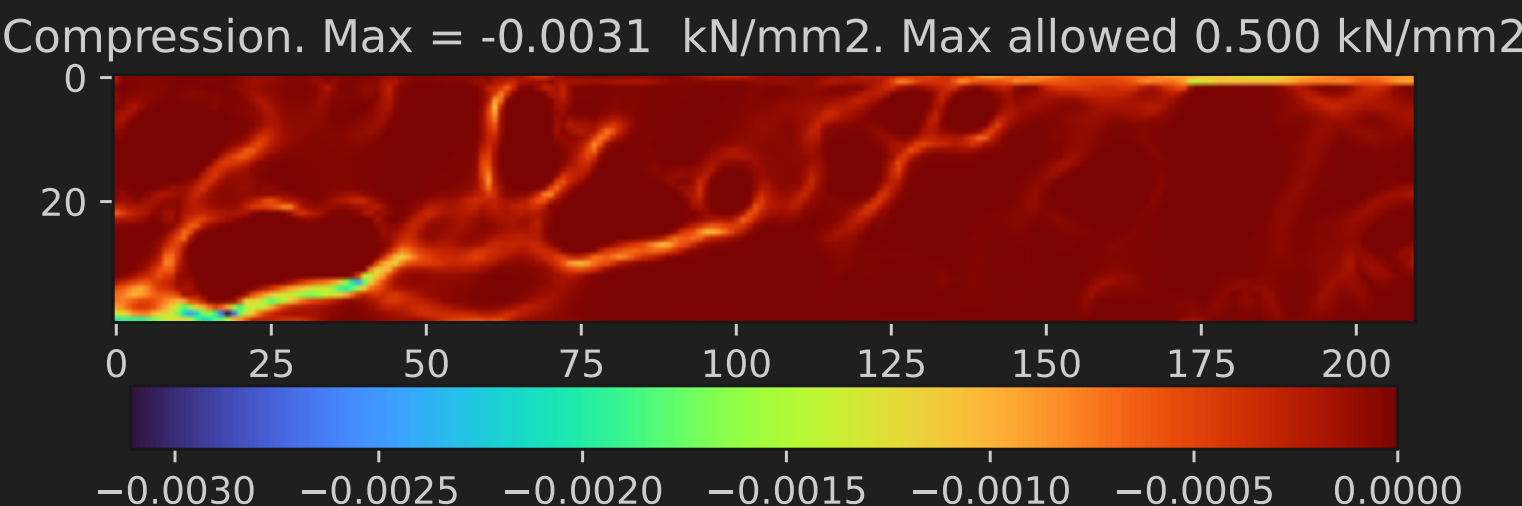
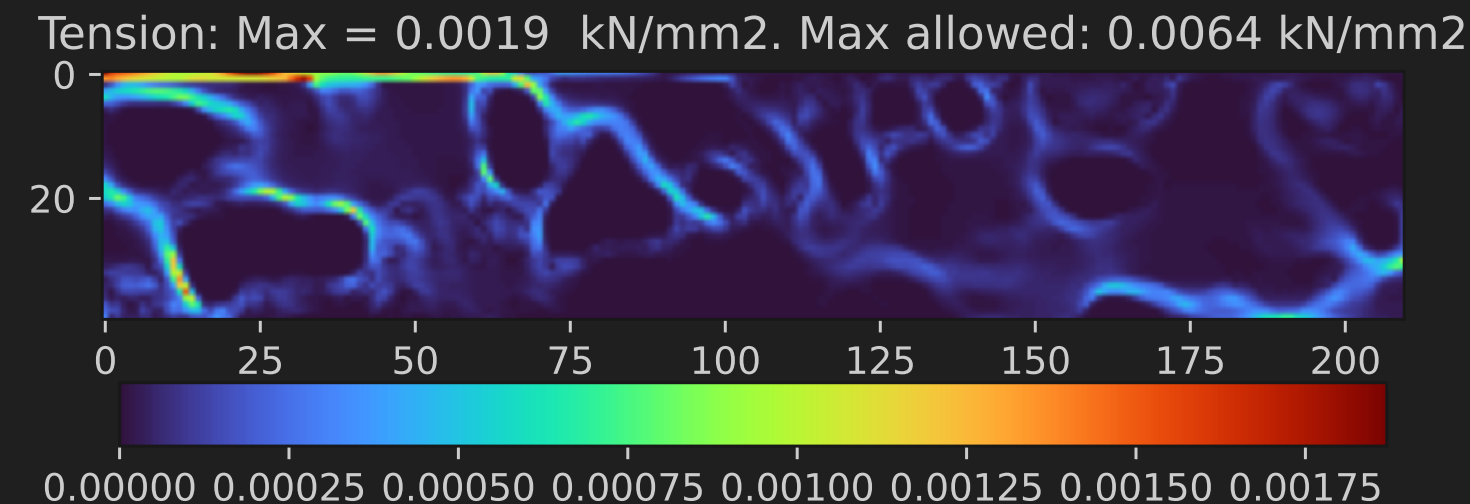
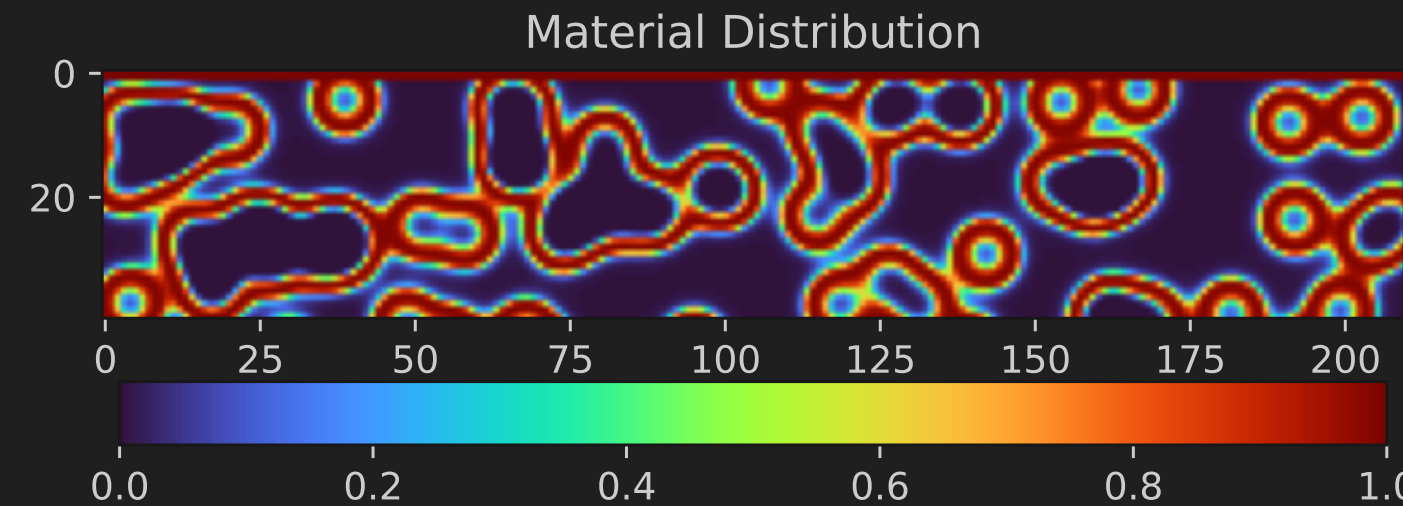
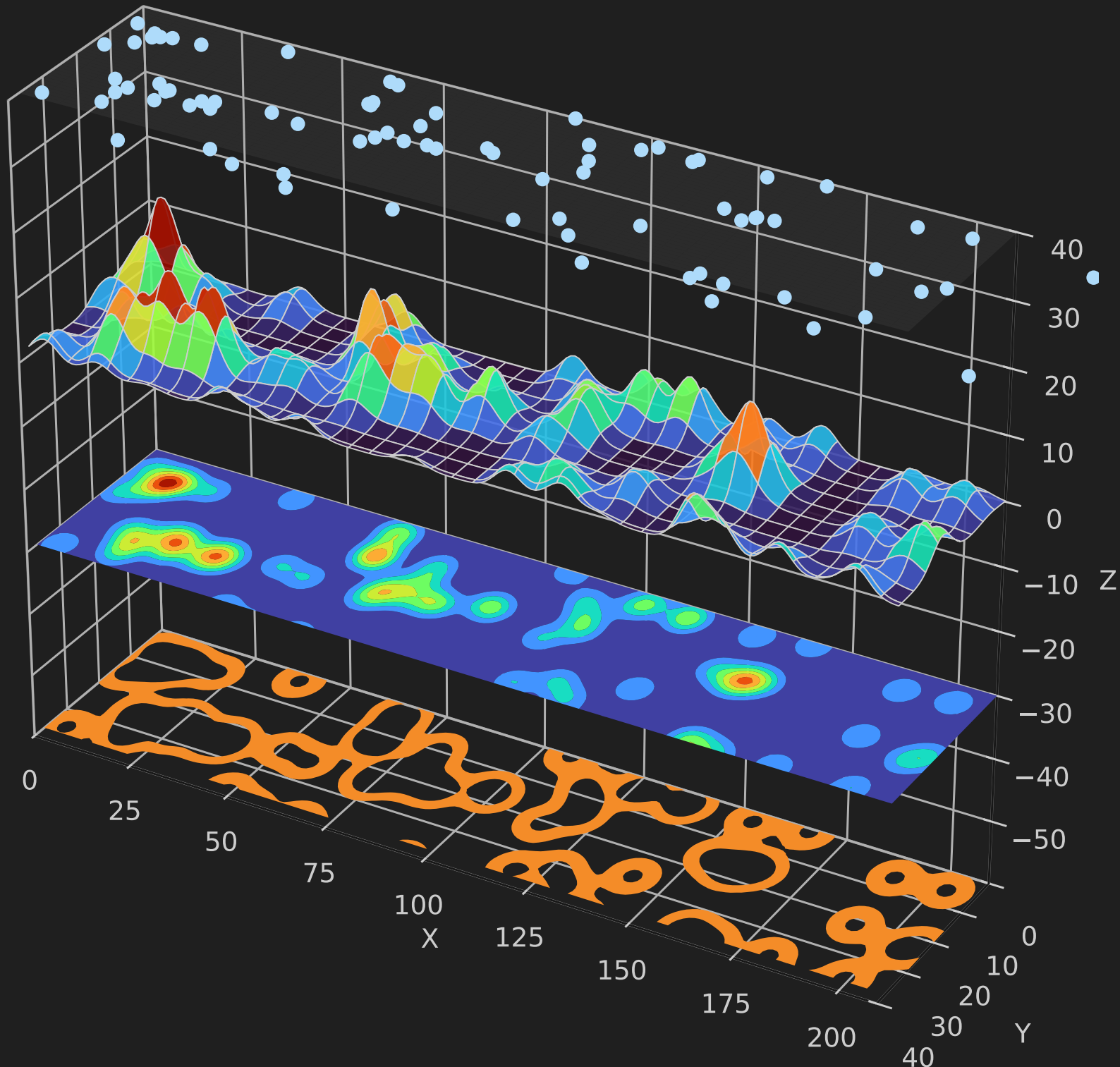
Objective = (Stress: 70 * 0.0021) + (Volume: 0.5 * 0.38) - (Displacement: 1 * -0.17) = 0.51

Spread Gaussian = 4.52 Shift = 2.46 Iteration = 003



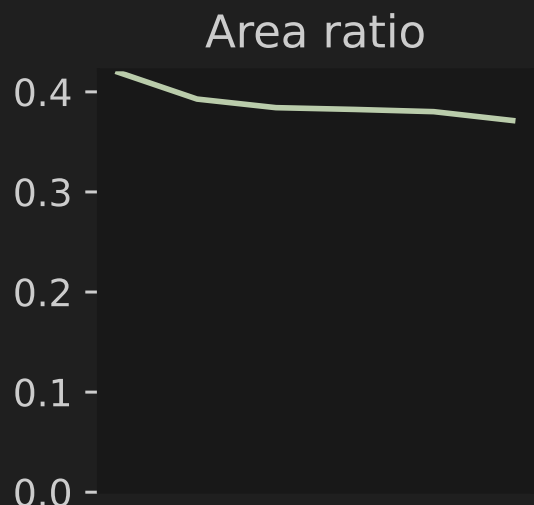
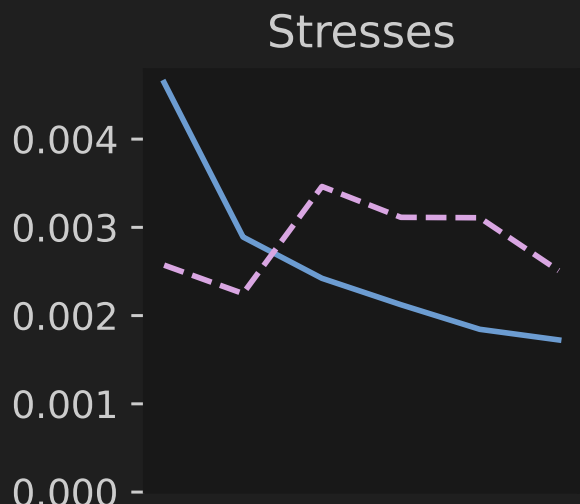
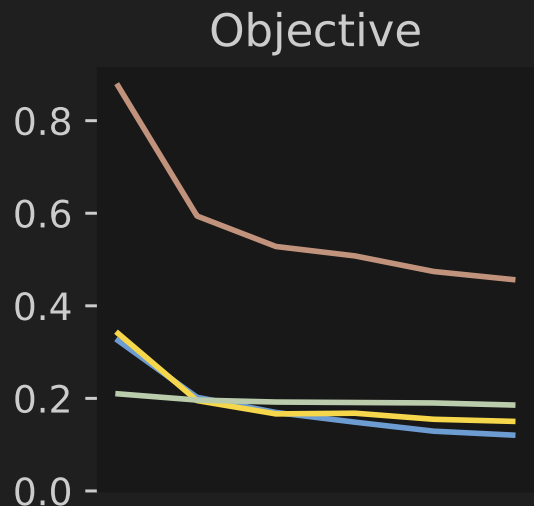
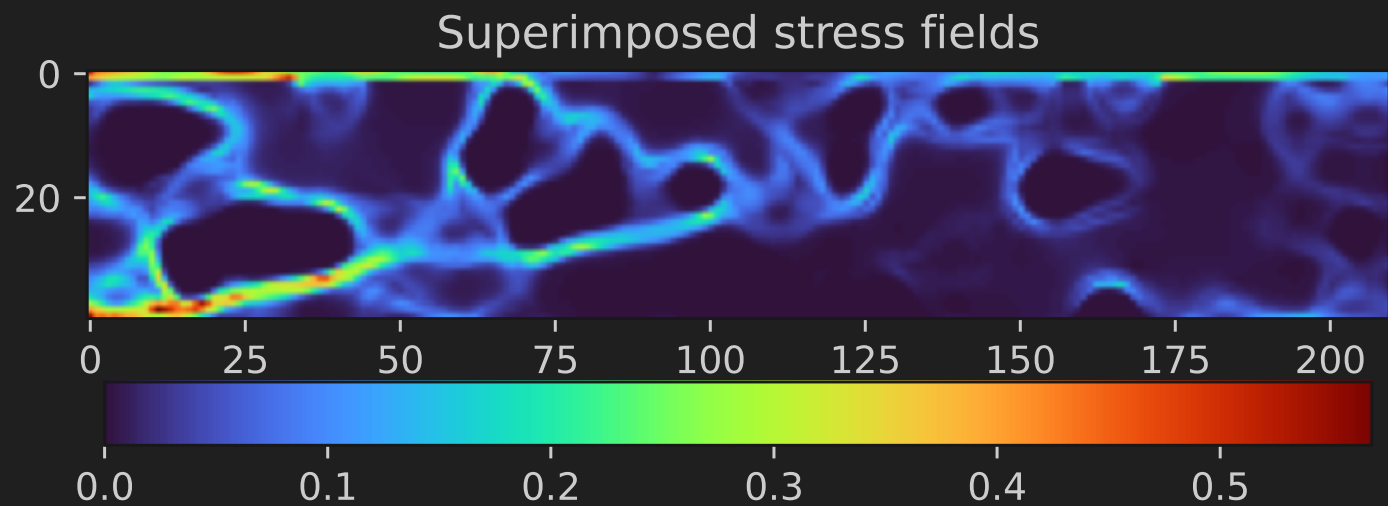
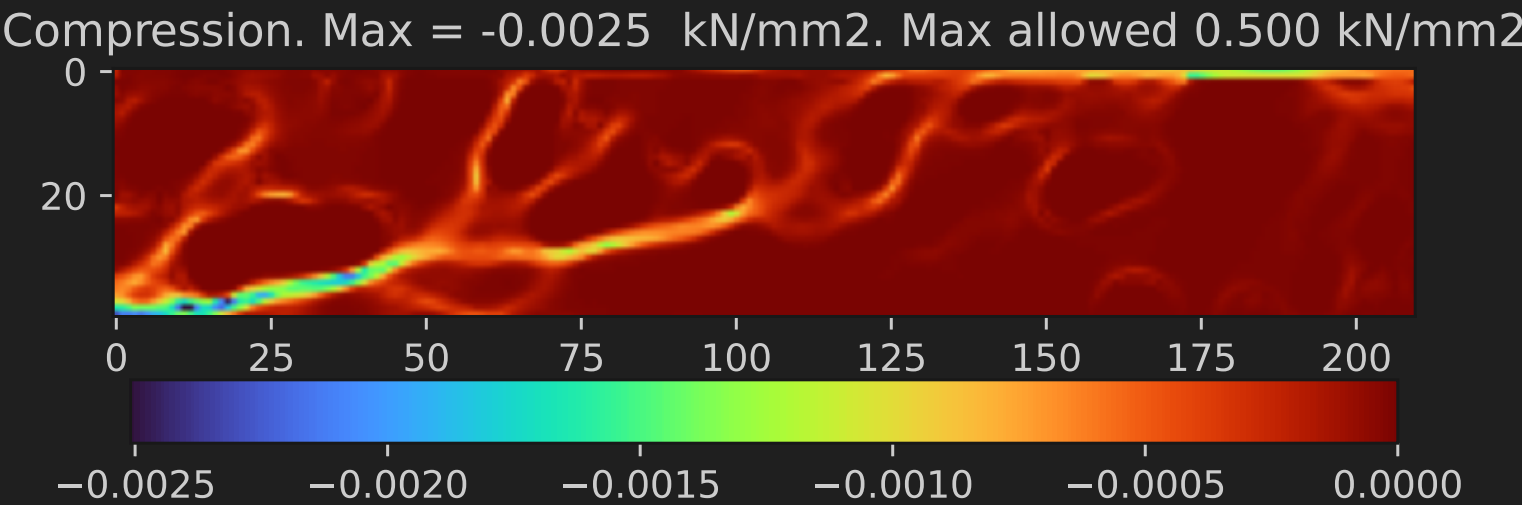
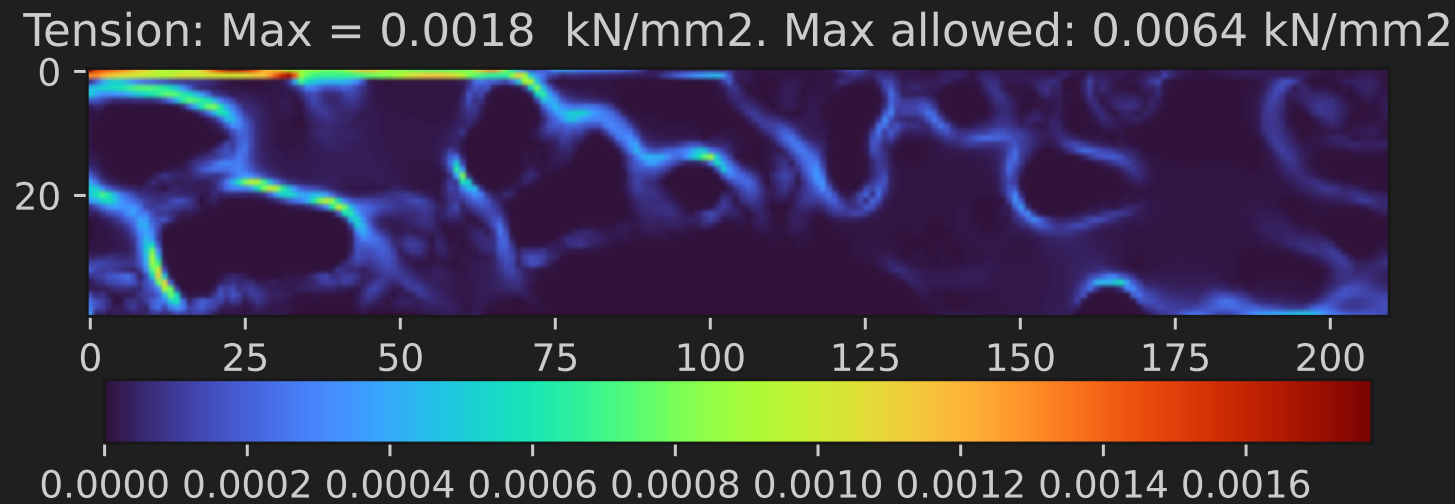
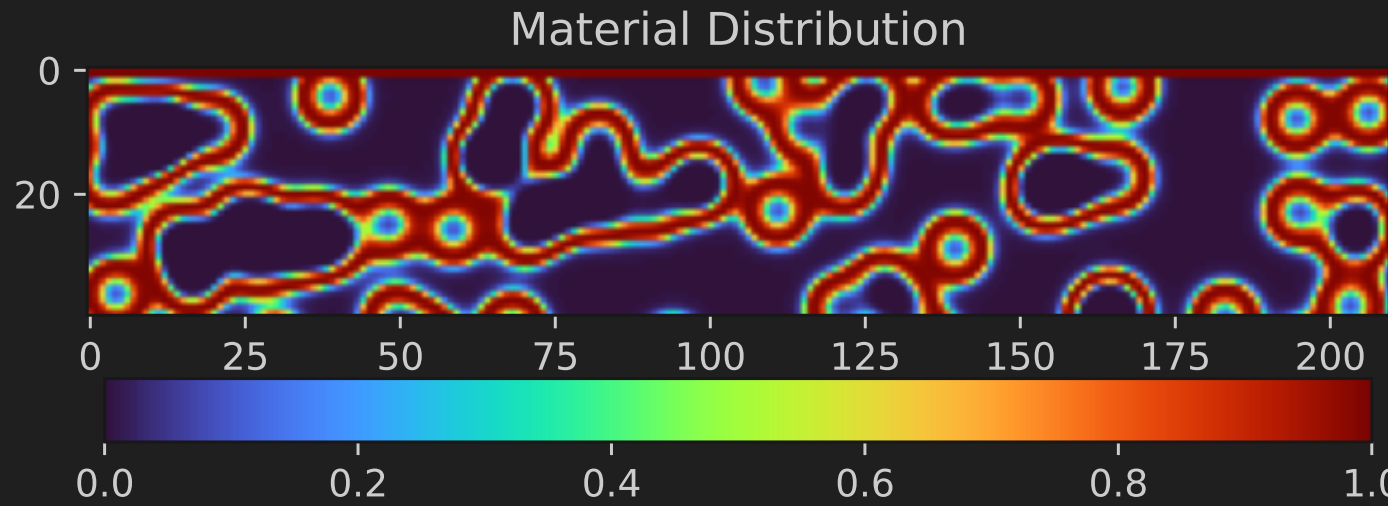
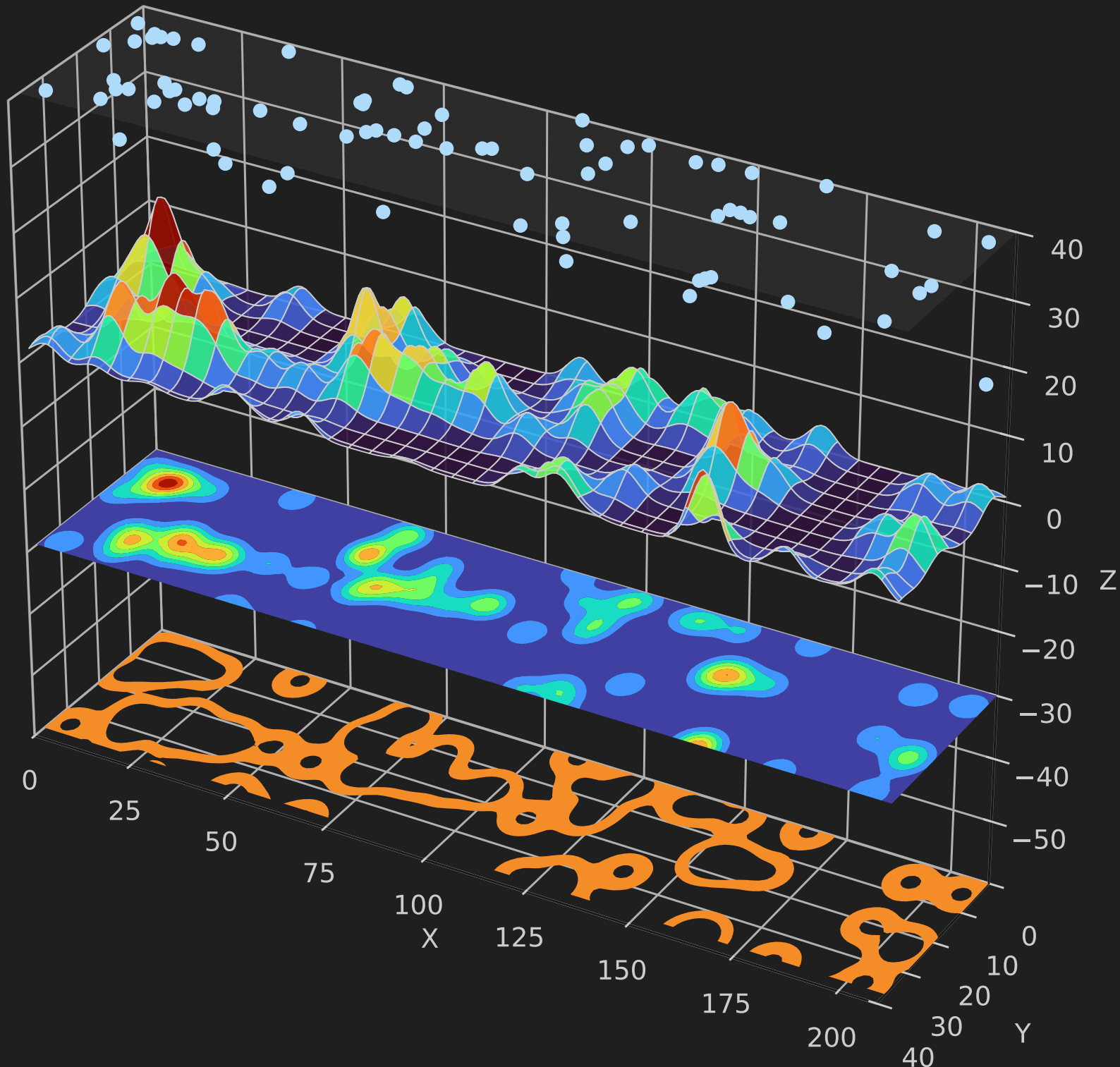
Objective = (Stress: 70 * 0.0018) + (Volume: 0.5 * 0.38) - (Displacement: 1 * -0.15) = 0.47

Spread Gaussian = 4.53 Shift = 2.48 Iteration = 004



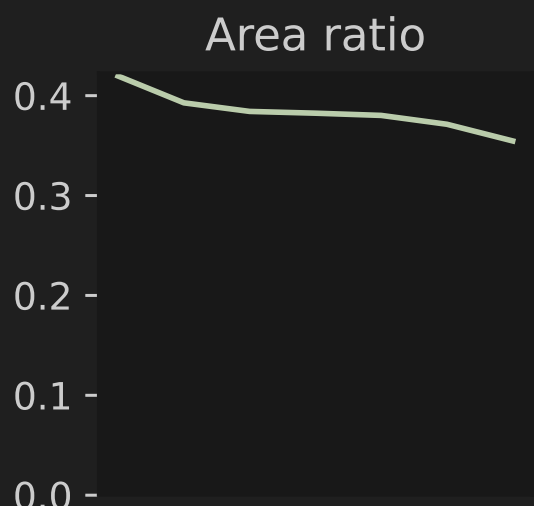
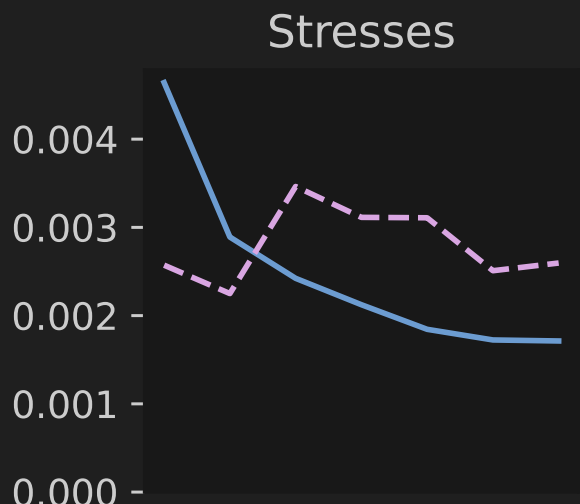
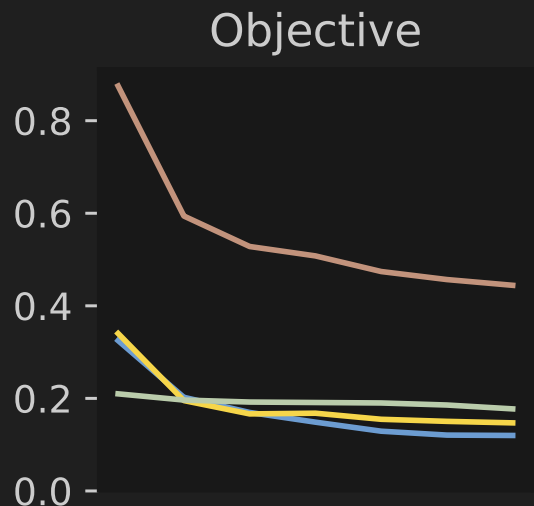
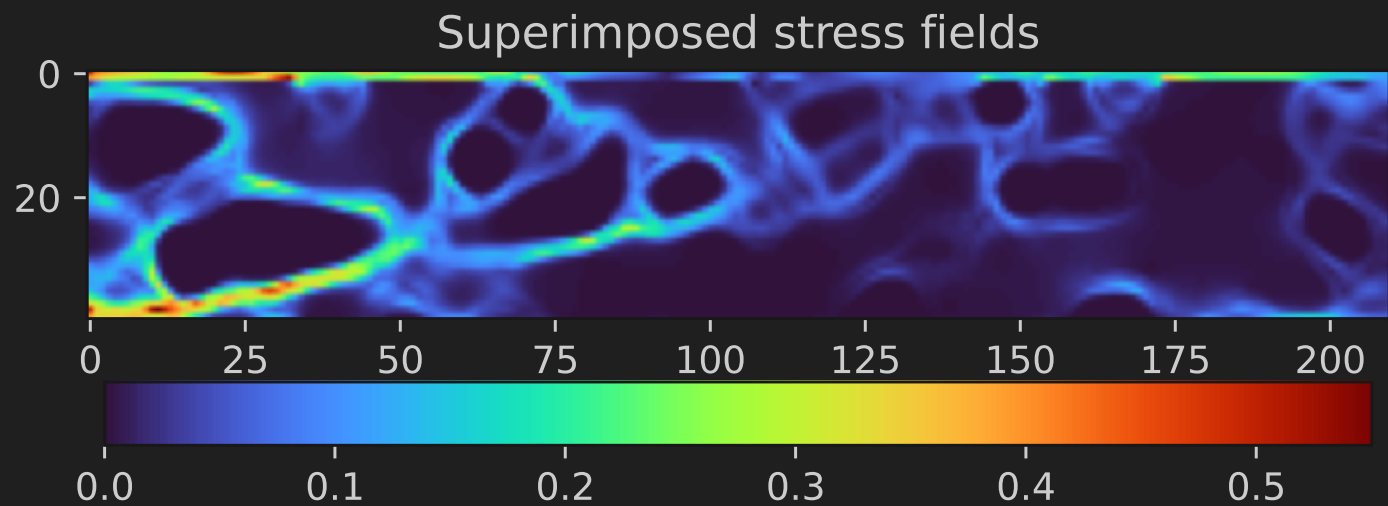
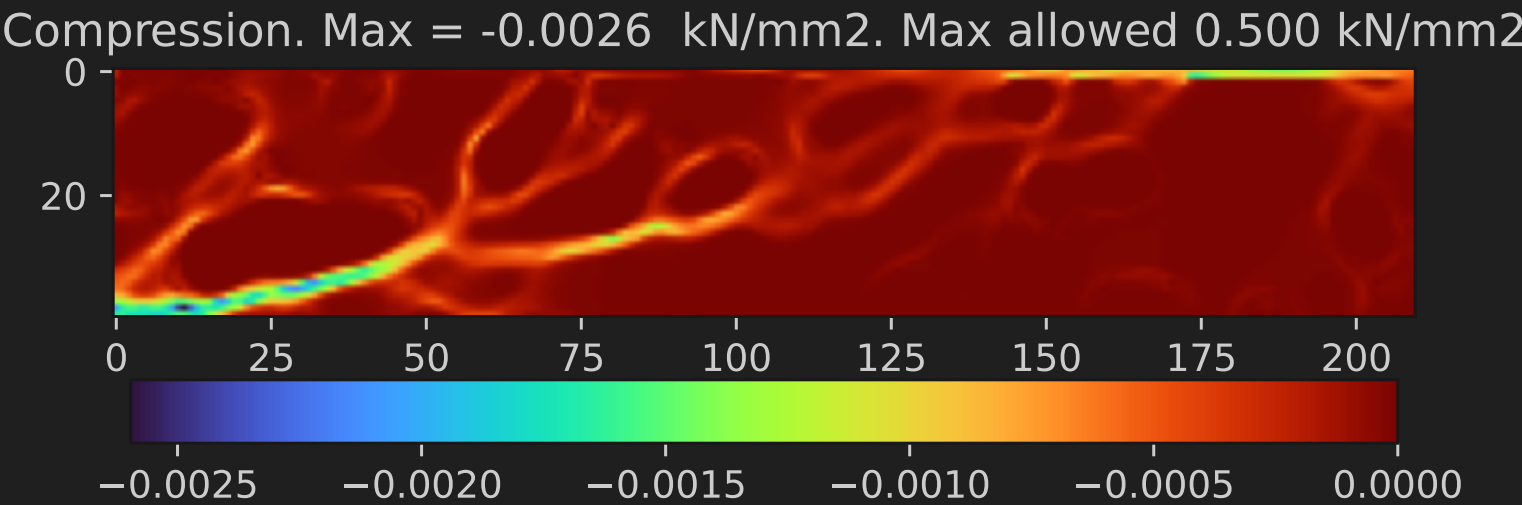
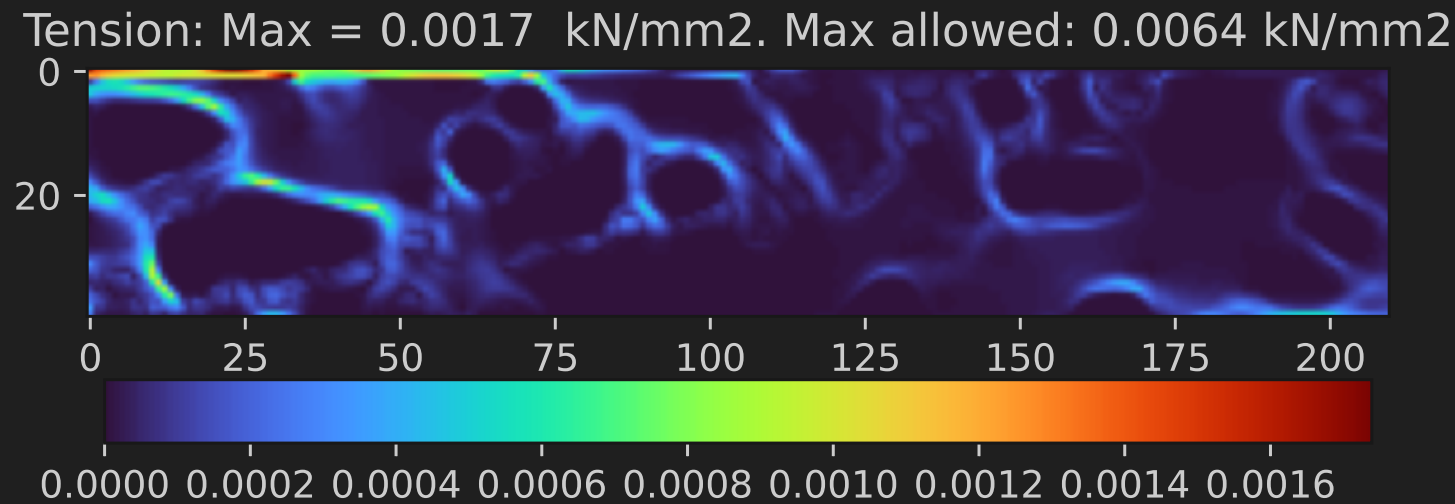
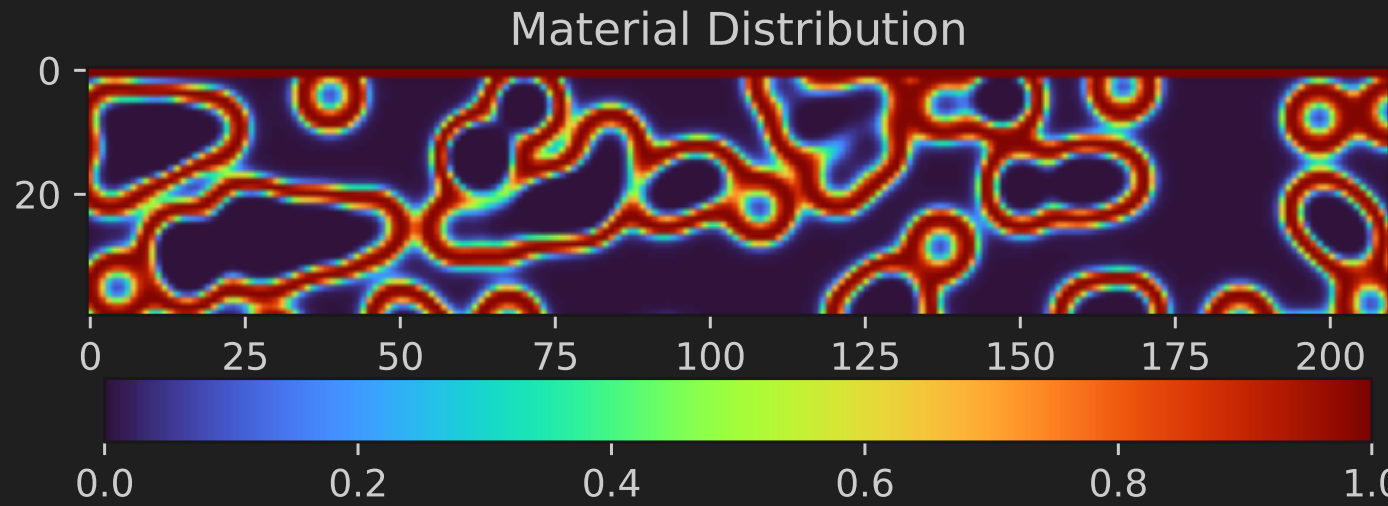
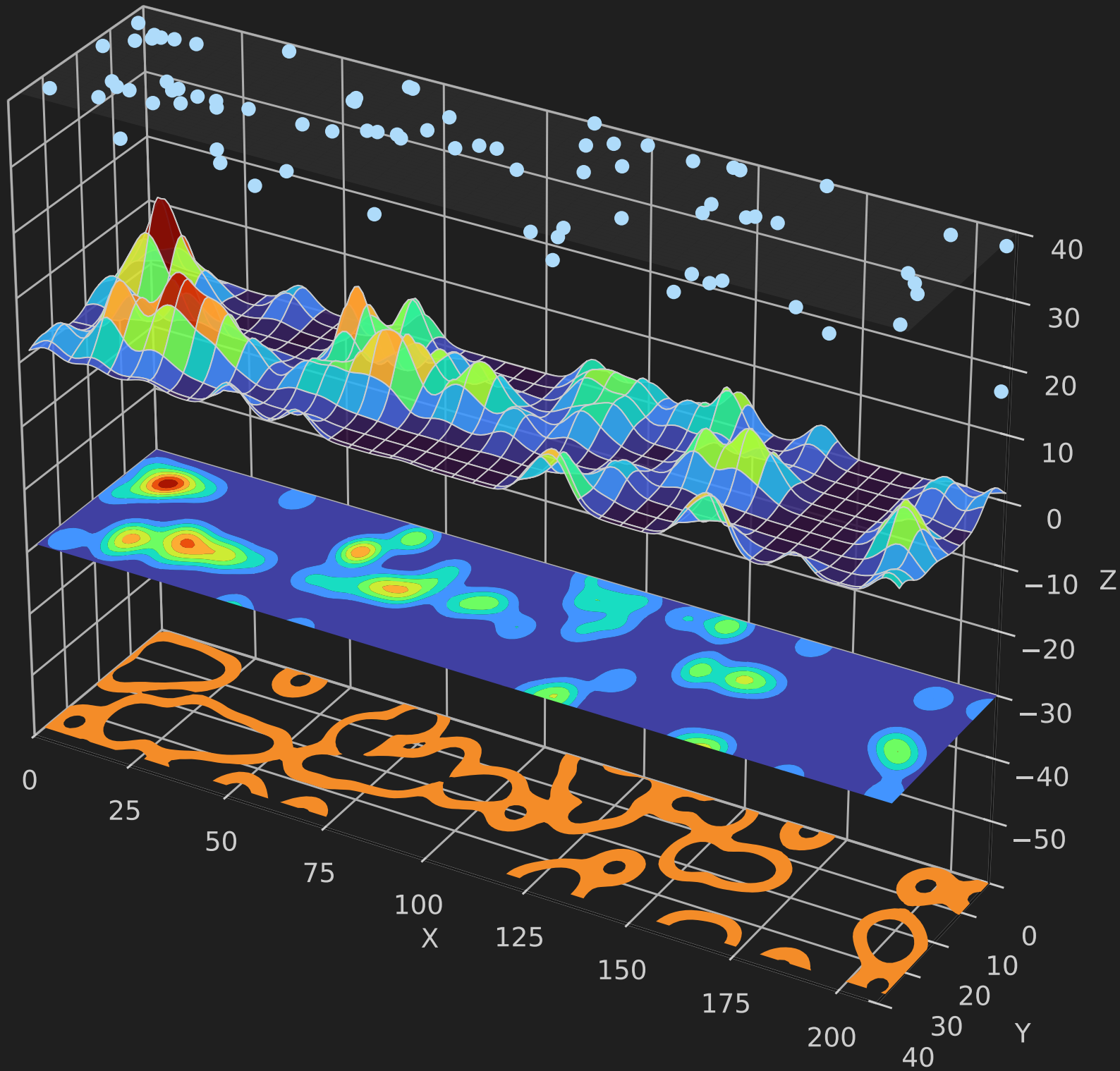
Objective = (Stress: 70 * 0.0017) + (Volume: 0.5 * 0.37) - (Displacement: 1 * -0.15) = 0.46

Spread Gaussian = 4.58 Shift = 2.46 Iteration = 005



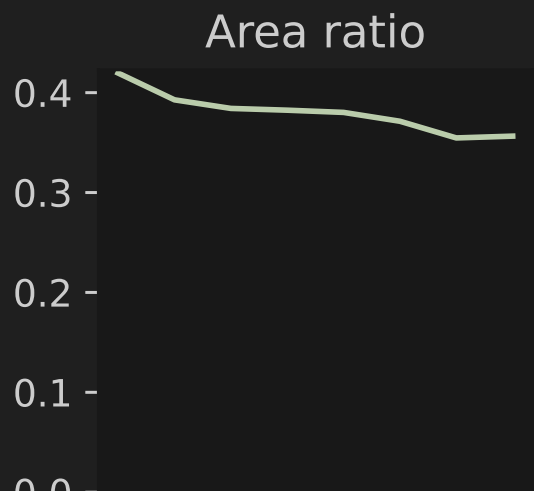
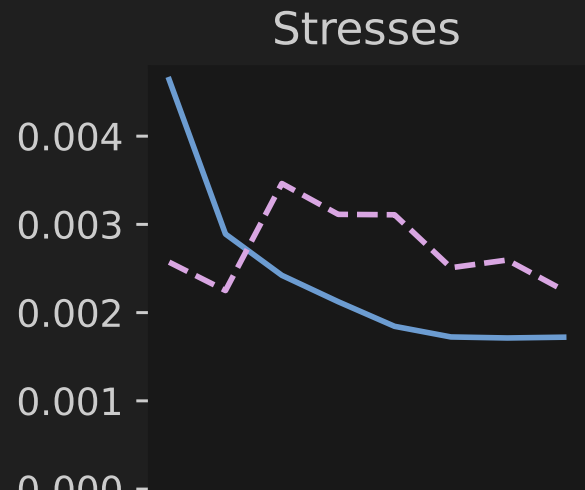
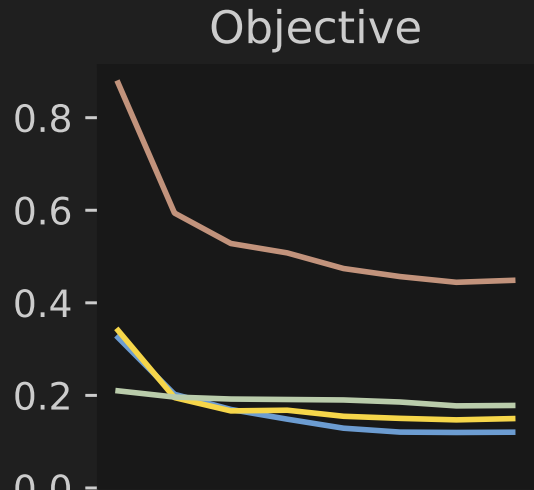
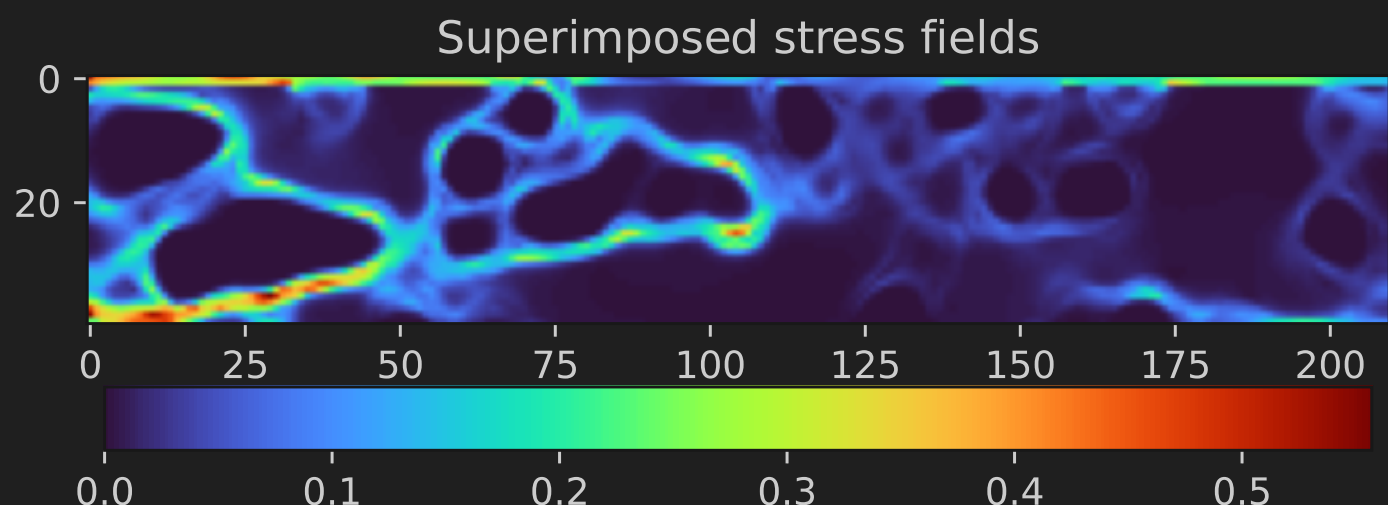
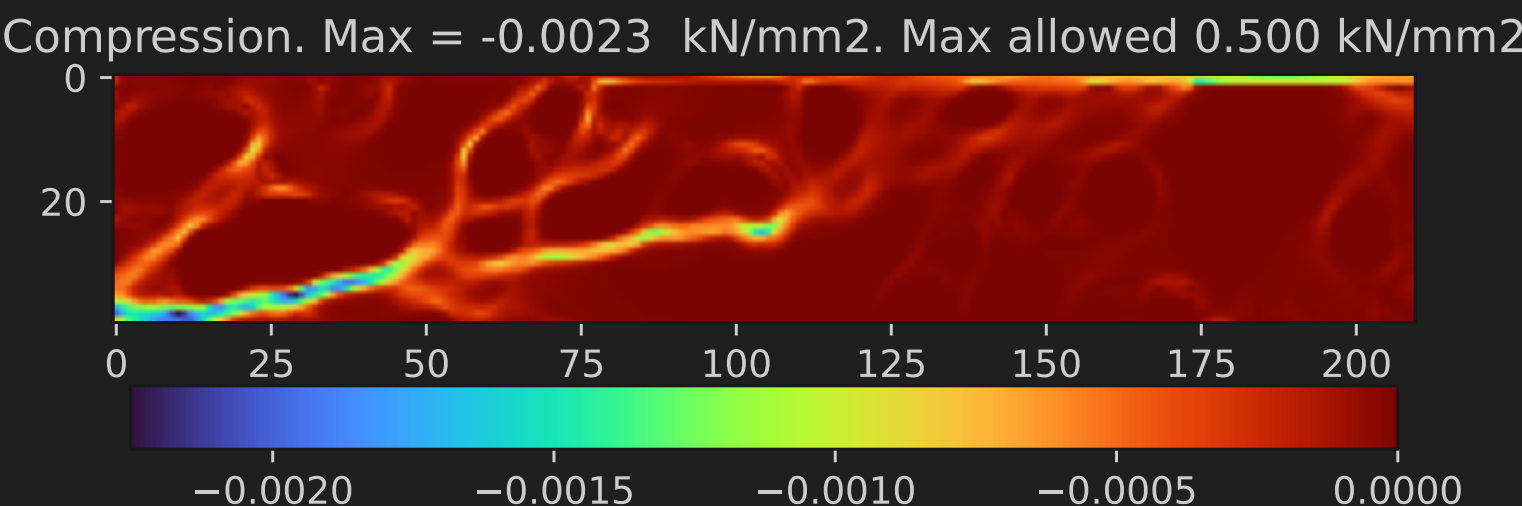
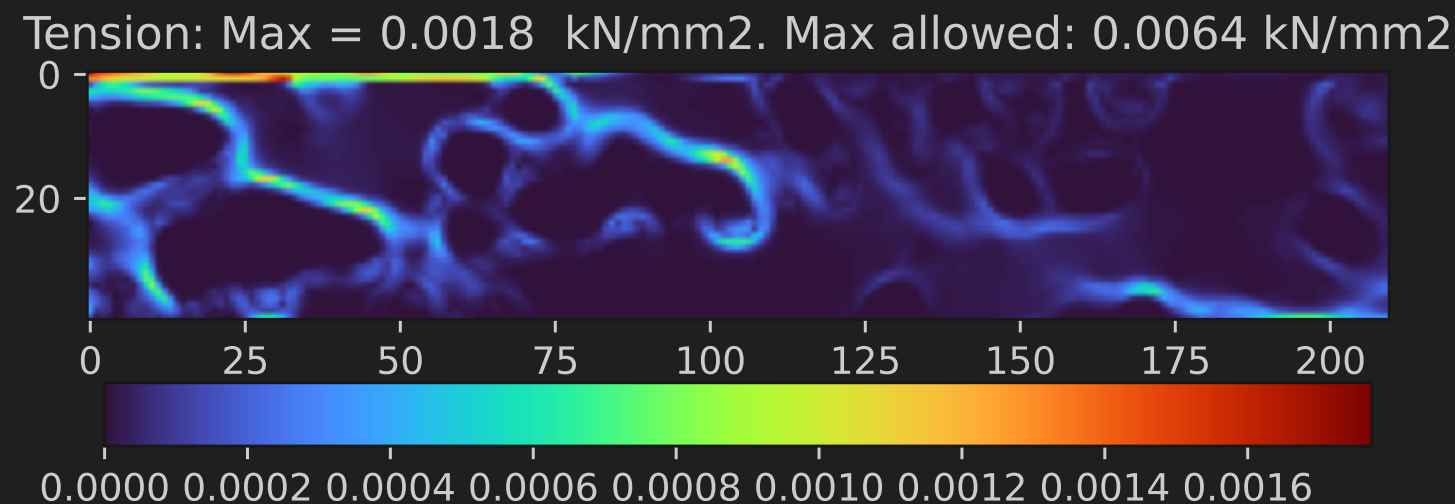
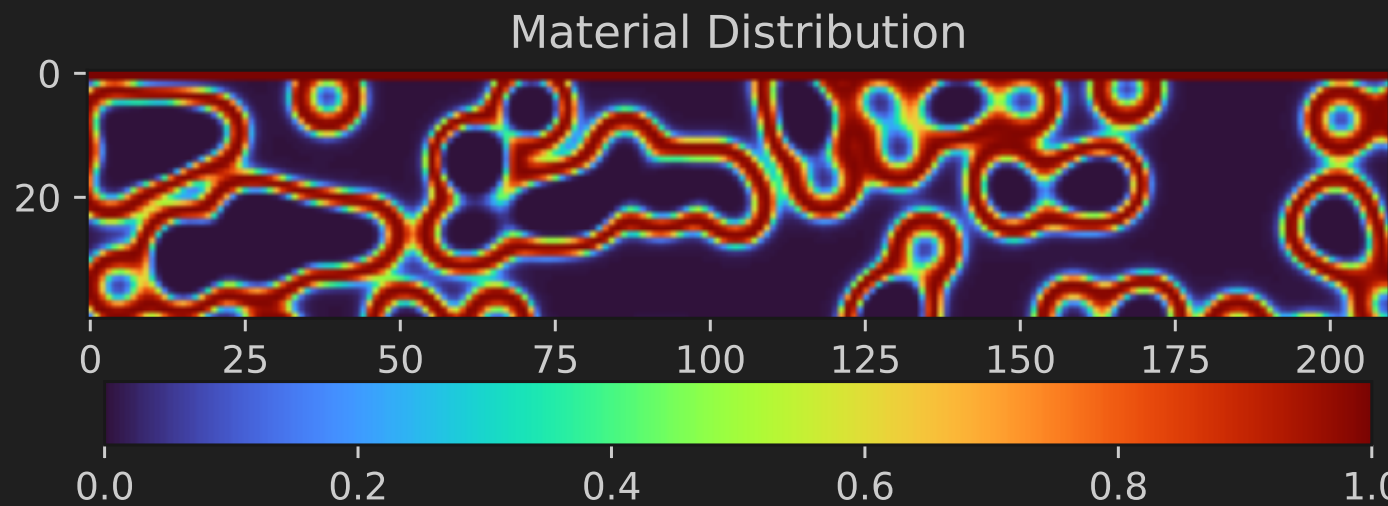
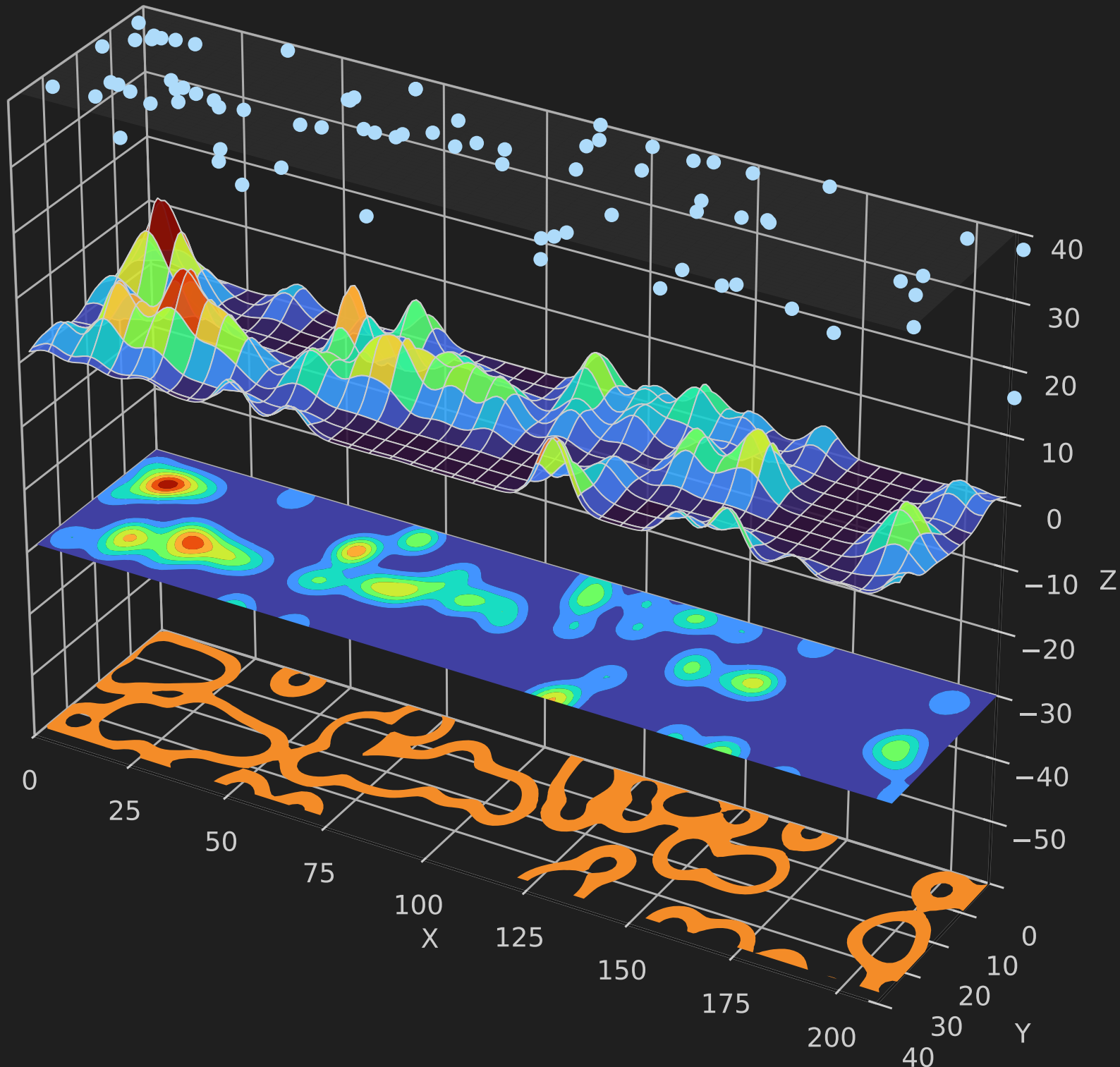
Objective = (Stress: 70 * 0.0017) + (Volume: 0.5 * 0.35) - (Displacement: 1 * -0.15) = 0.44

Spread Gaussian = 4.64 Shift = 2.43 Iteration = 006



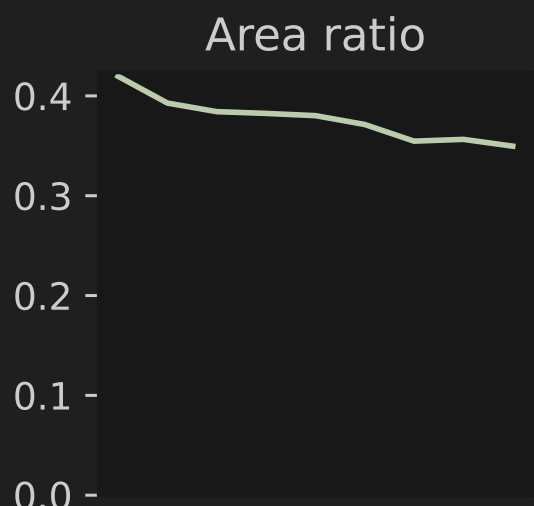
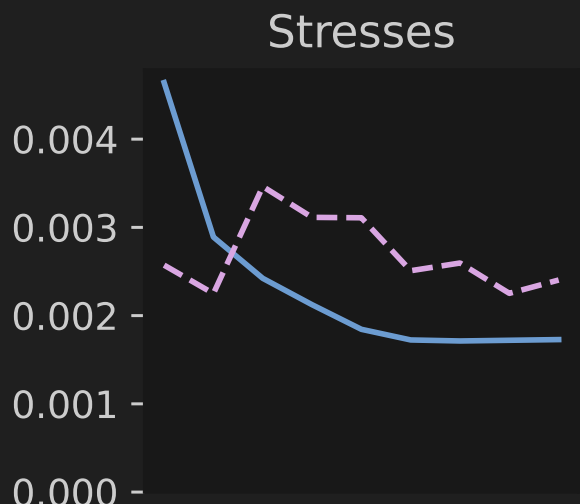
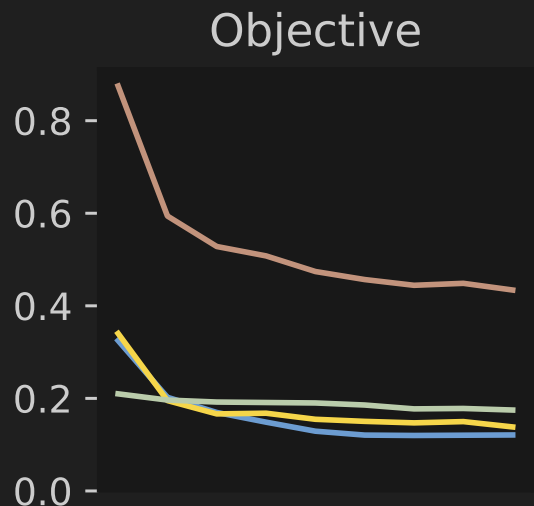
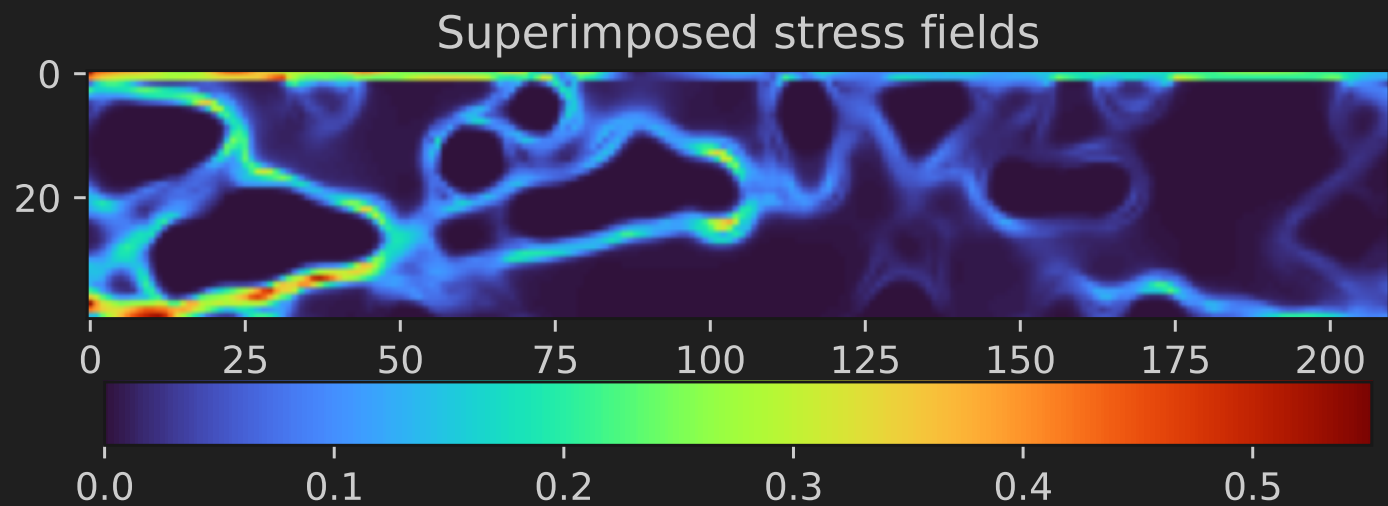
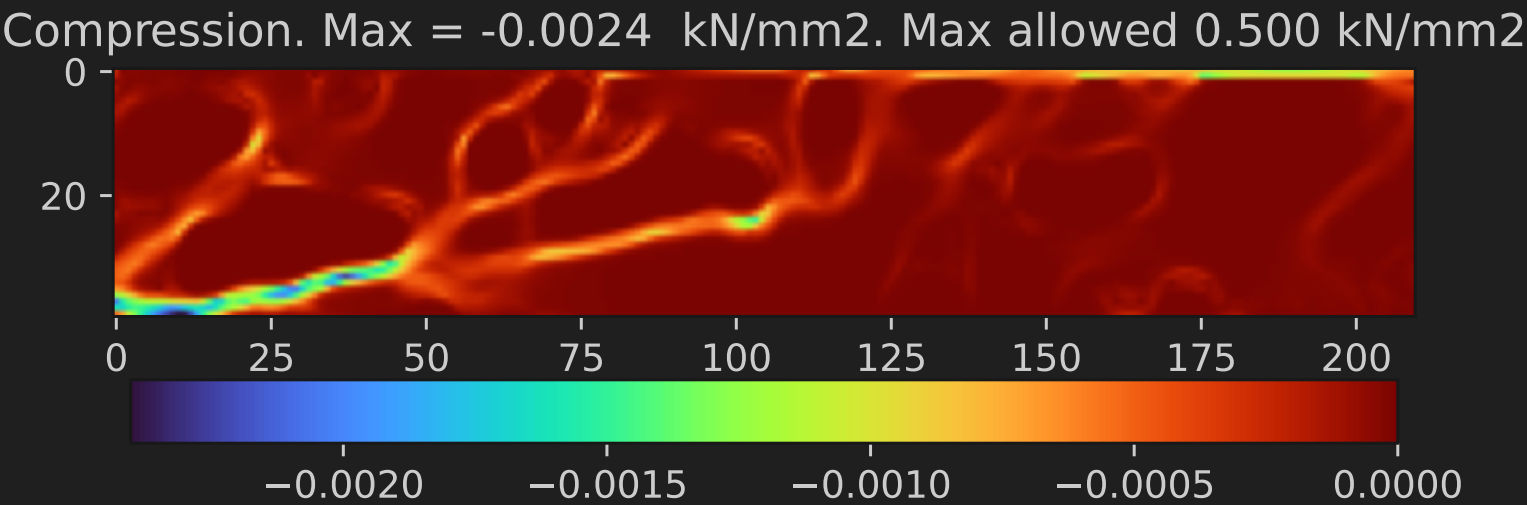
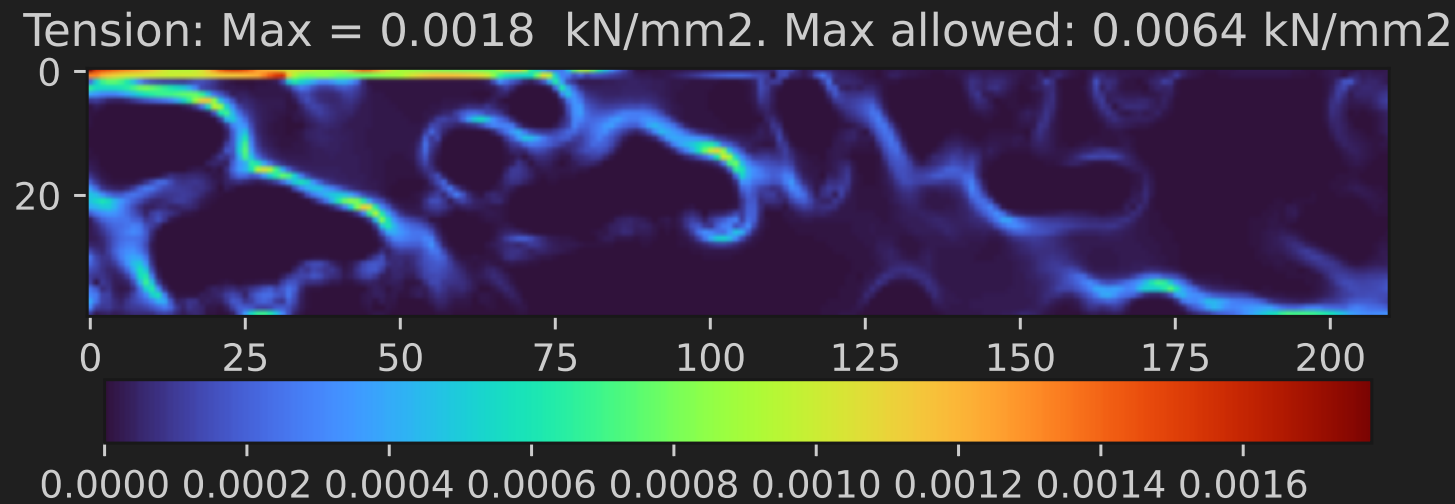
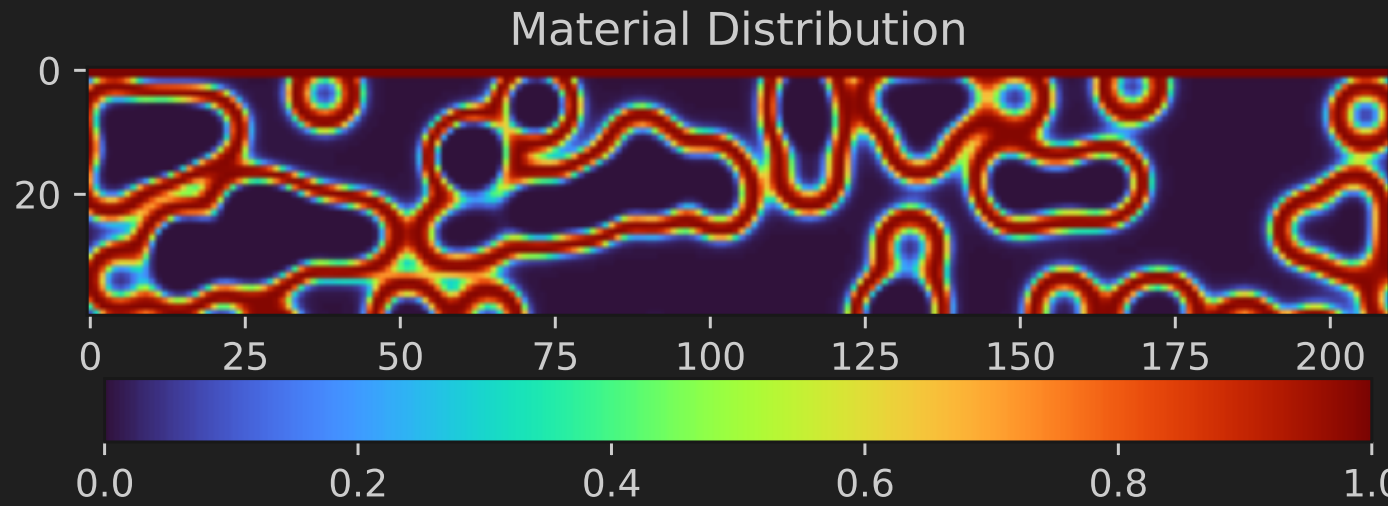
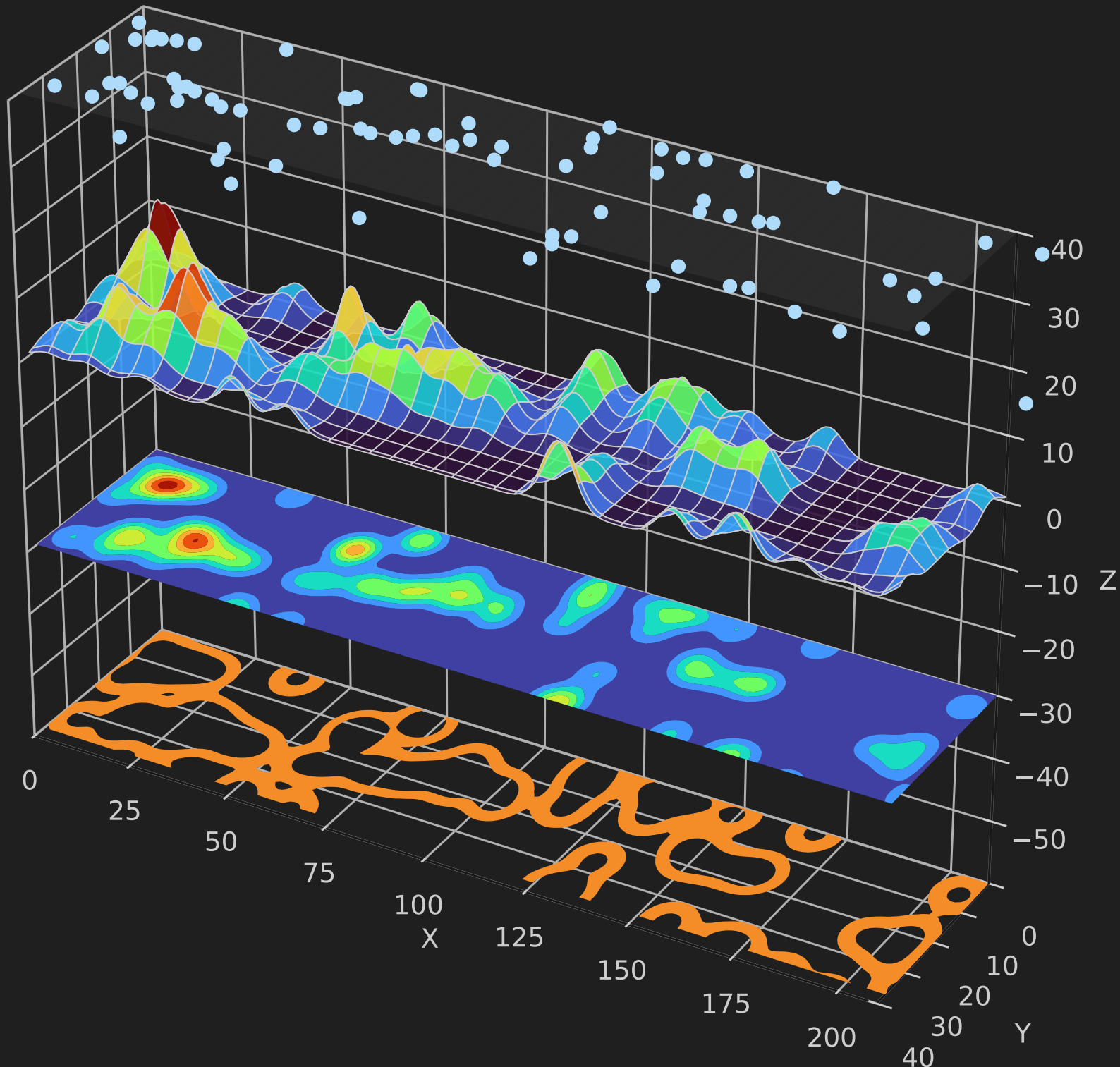
Objective = (Stress: 70 * 0.0017) + (Volume: 0.5 * 0.36) - (Displacement: 1 * -0.15) = 0.45

Spread Gaussian = 4.71 Shift = 2.37 Iteration = 007



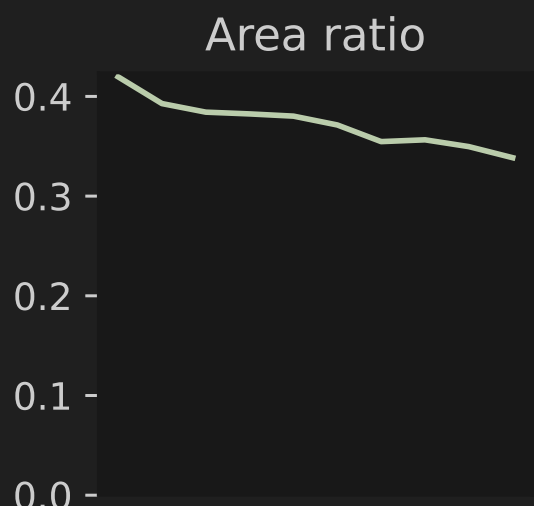
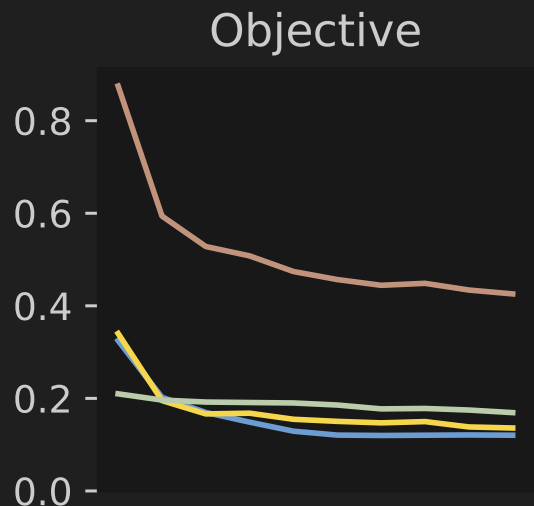
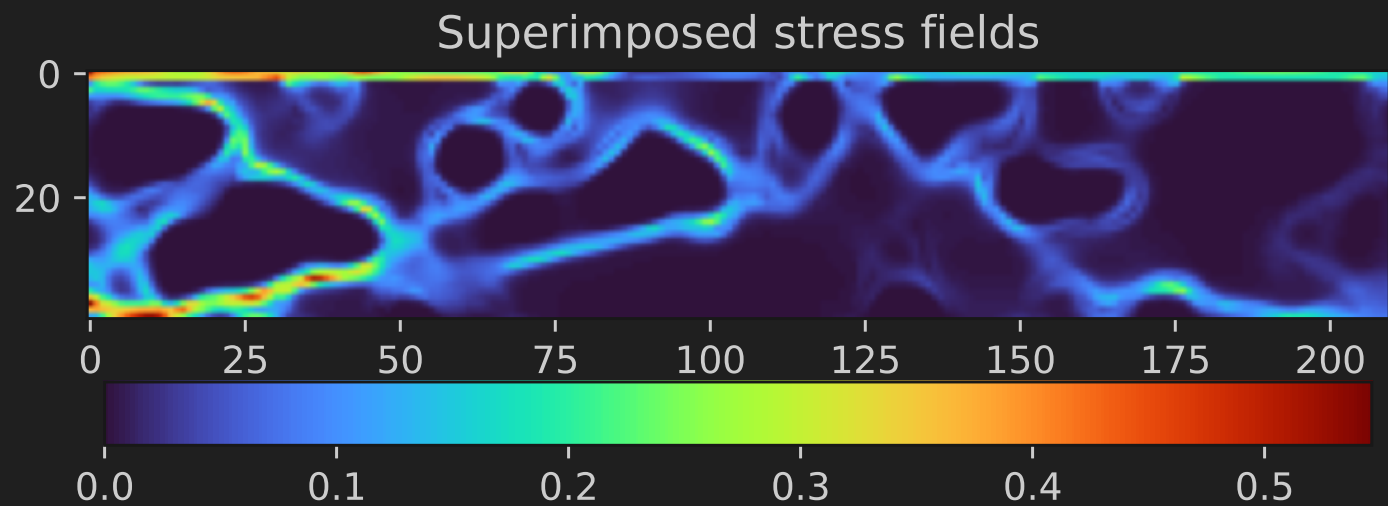
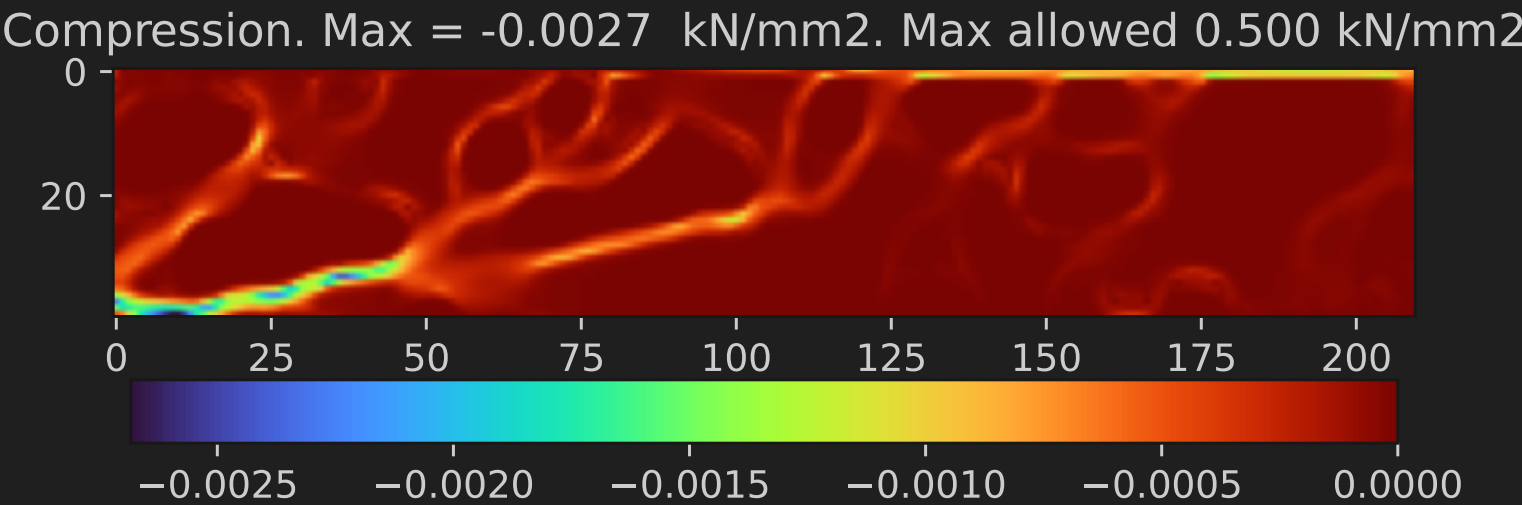
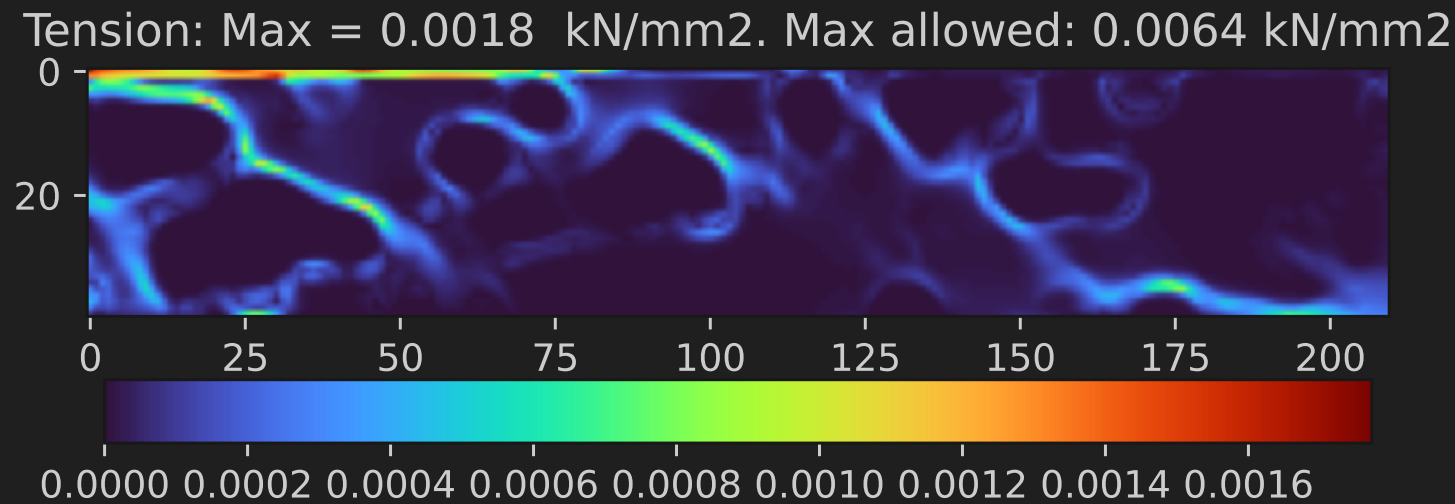
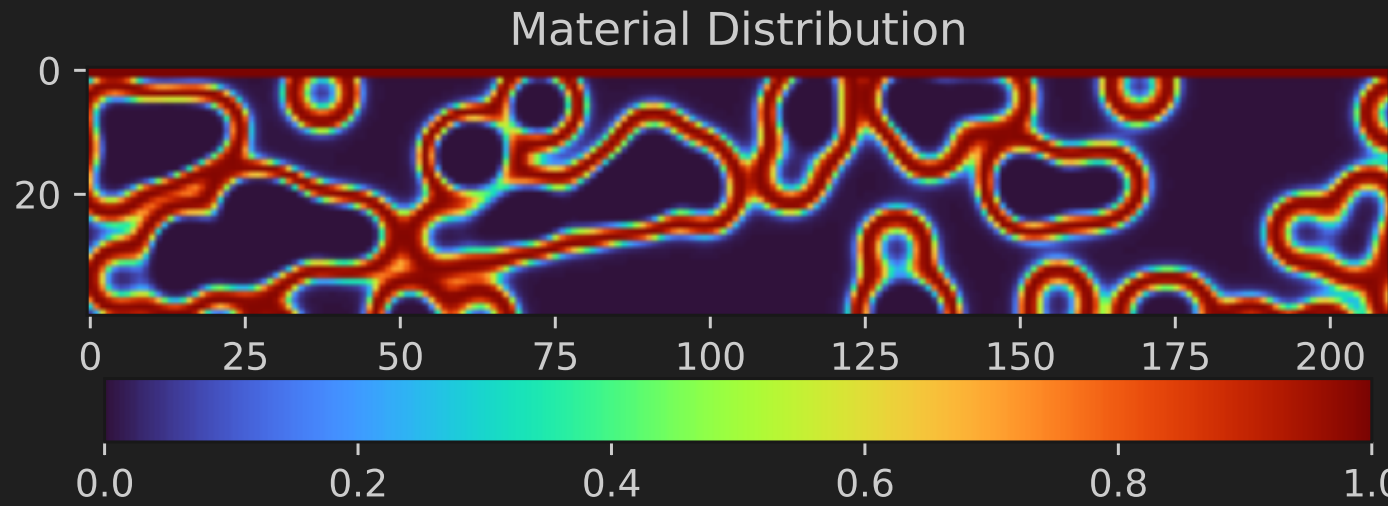
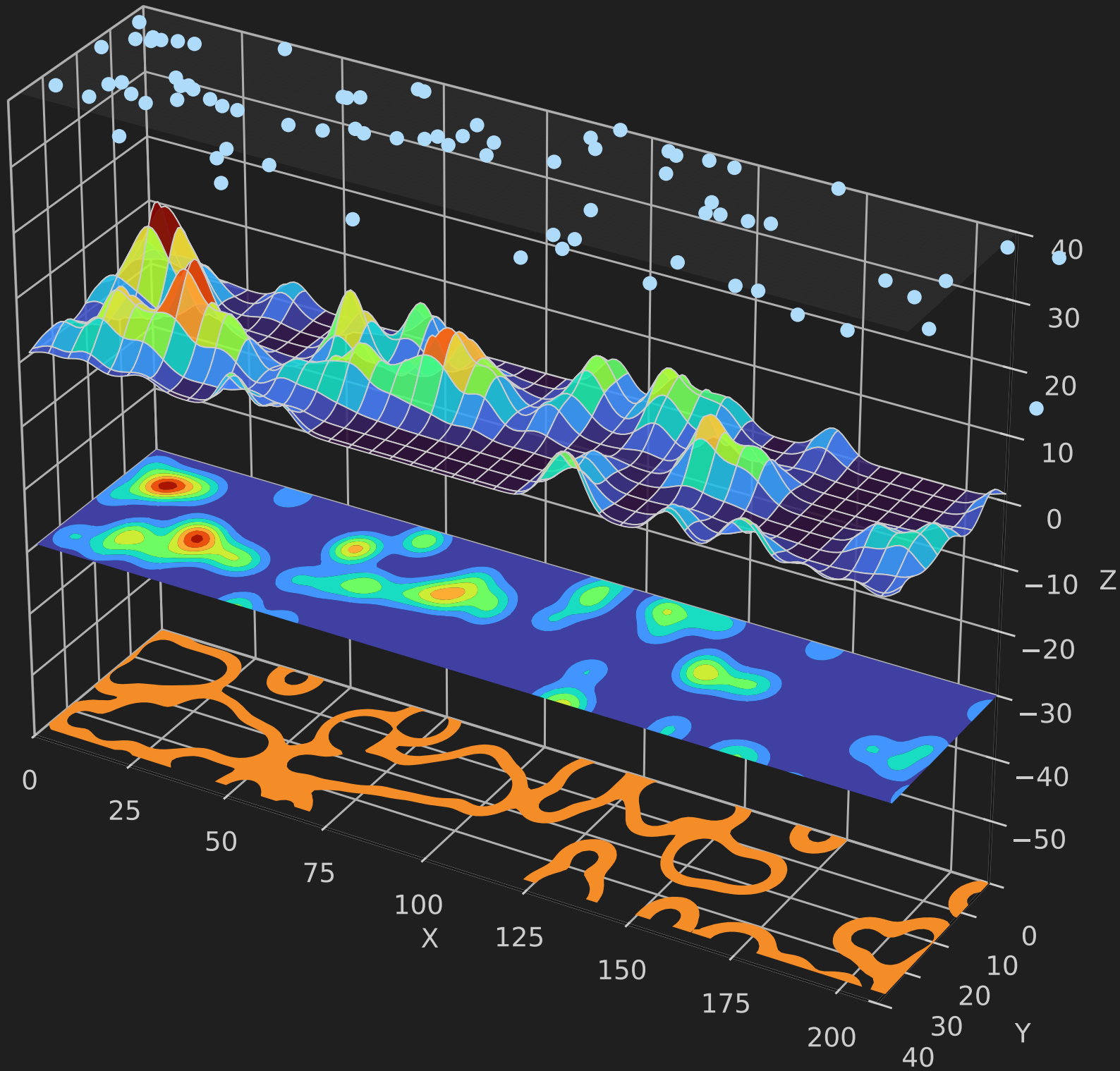
Objective = (Stress: 70 * 0.0017) + (Volume: 0.5 * 0.35) - (Displacement: 1 * -0.14) = 0.43

Spread Gaussian = 4.77 Shift = 2.31 Iteration = 008



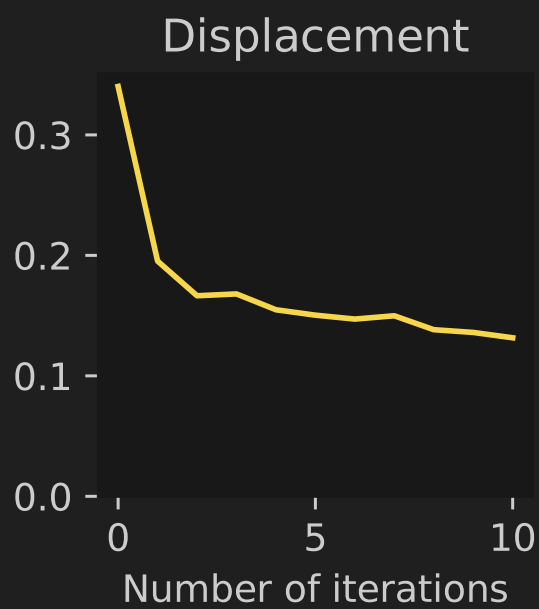
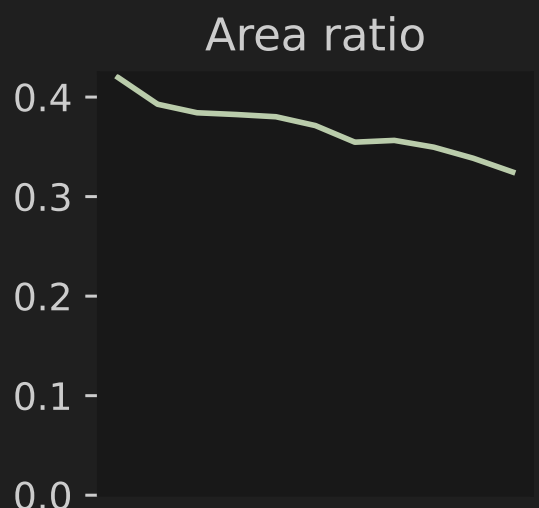
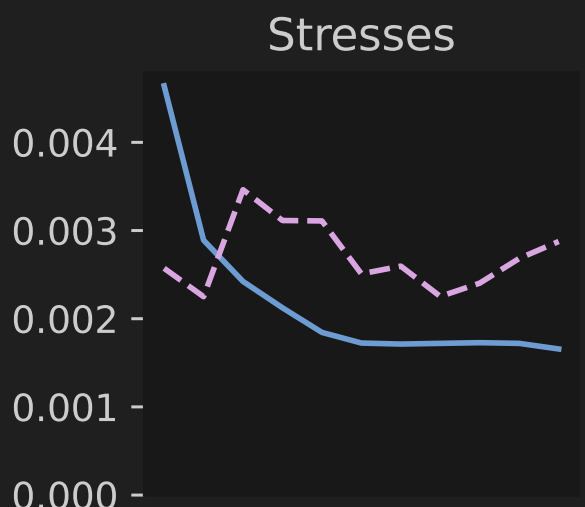
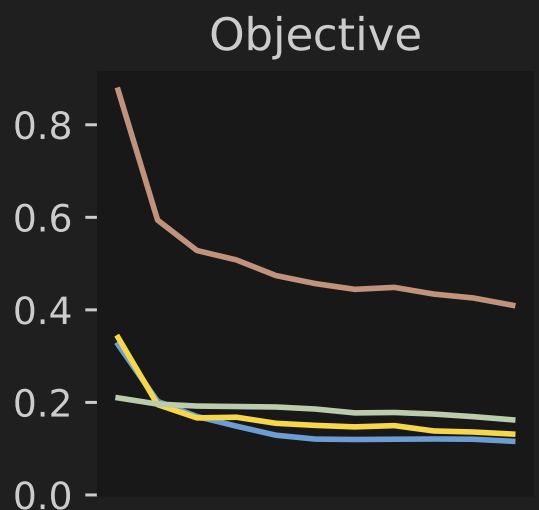
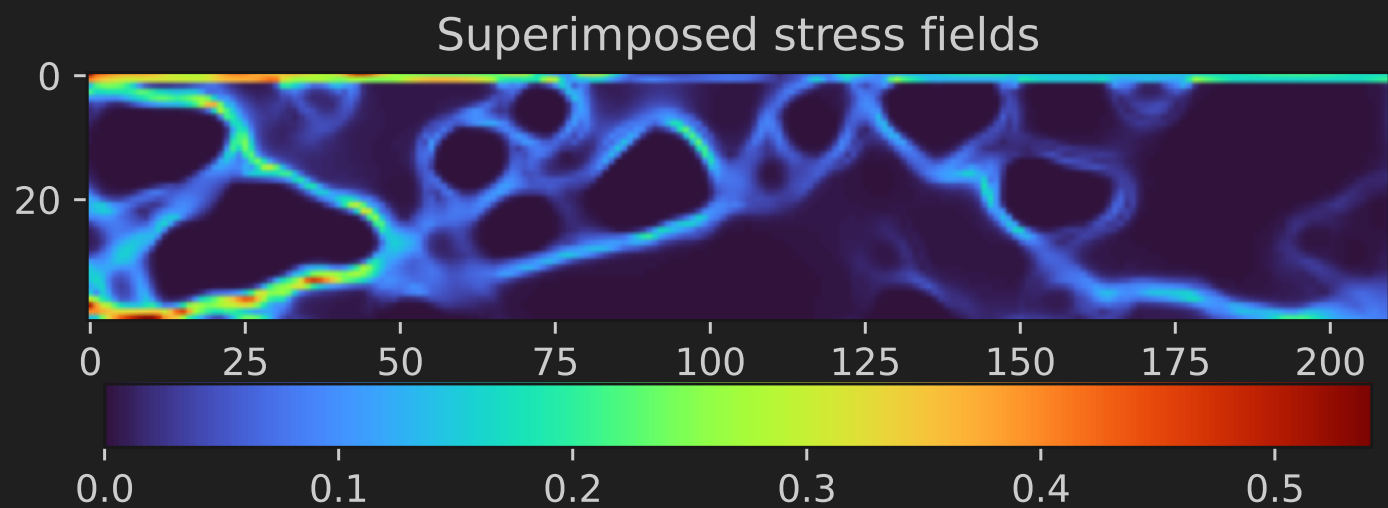
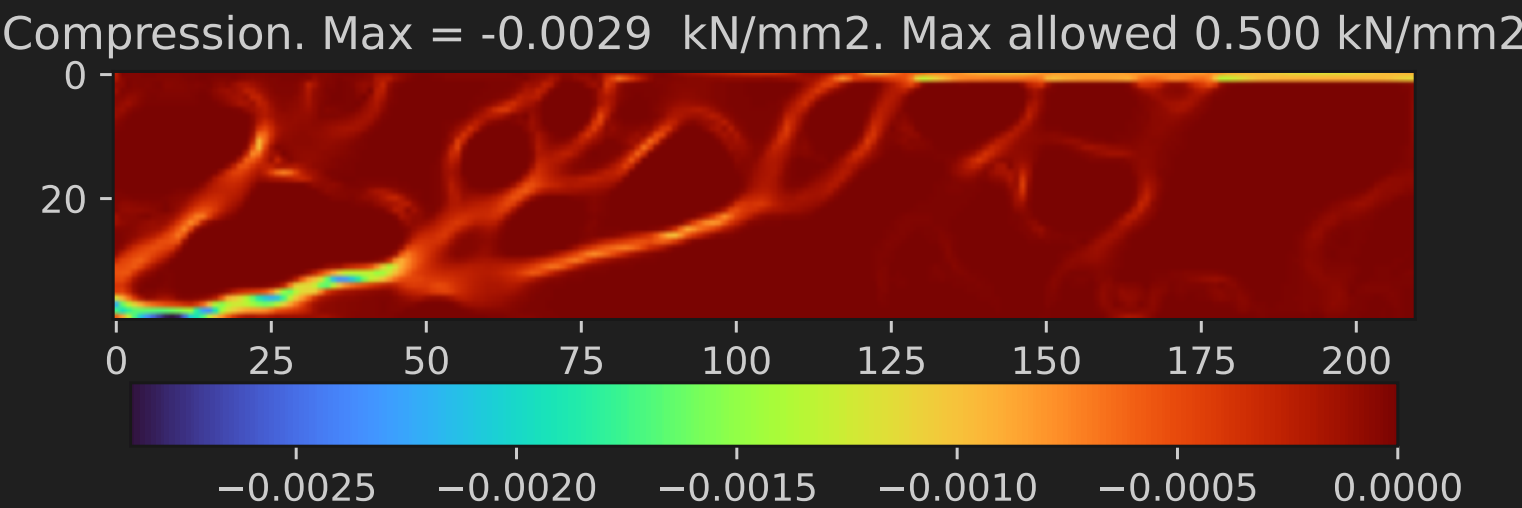
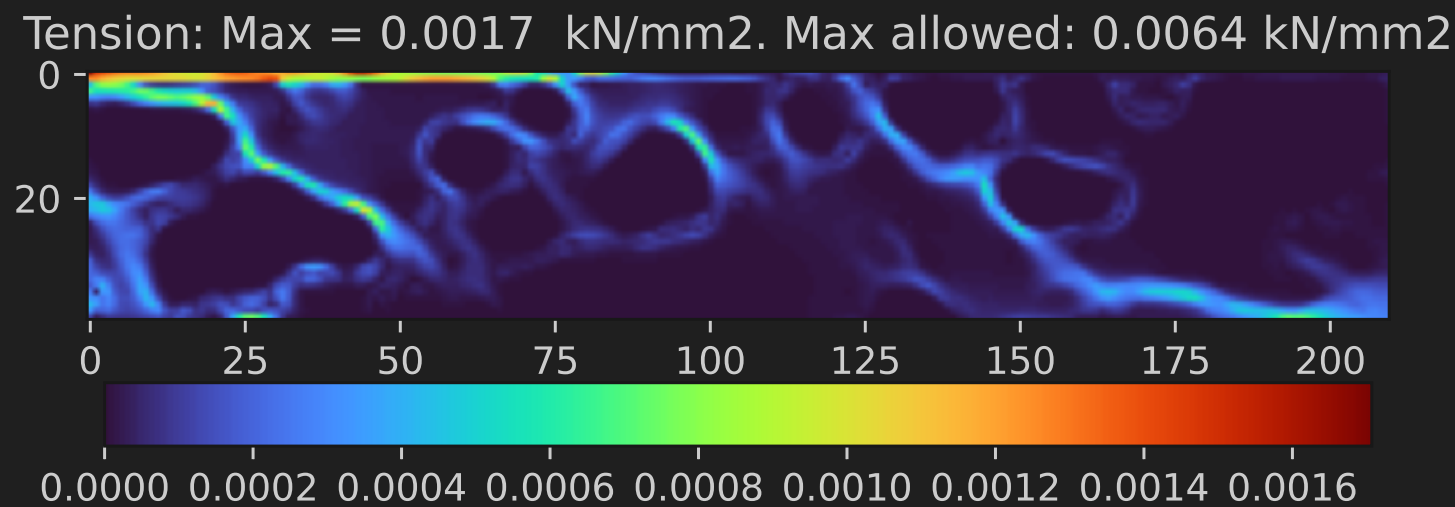
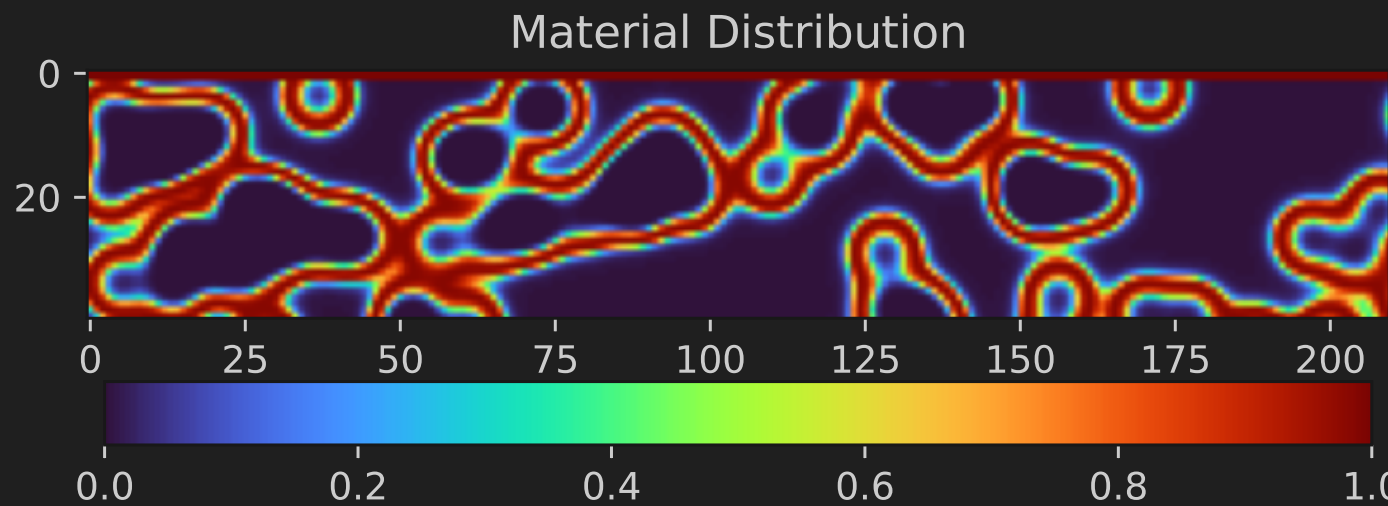
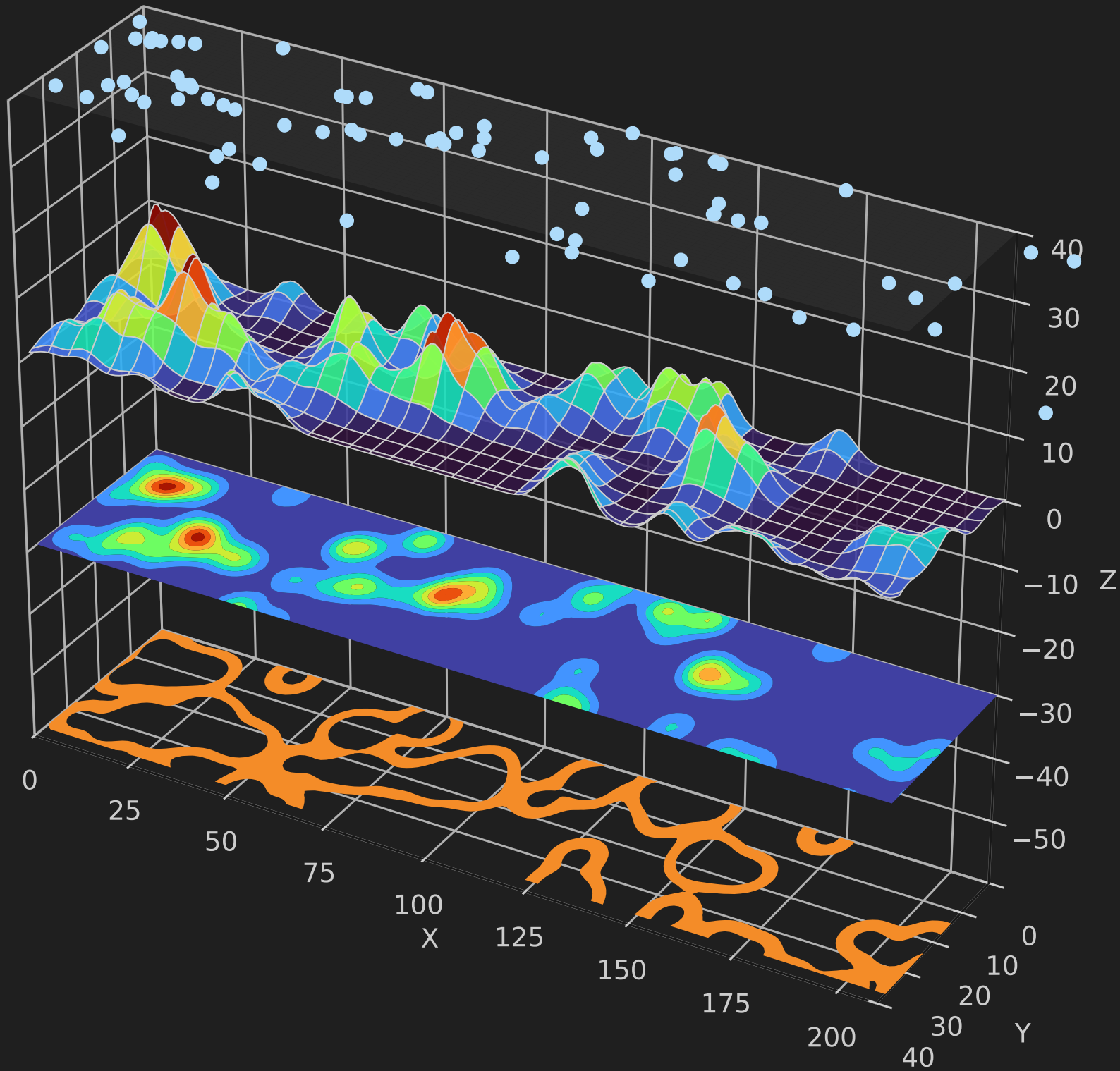
Objective = (Stress: 70 * 0.0017) + (Volume: 0.5 * 0.34) - (Displacement: 1 * -0.14) = 0.43

Spread Gaussian = 4.82 Shift = 2.26 Iteration = 009



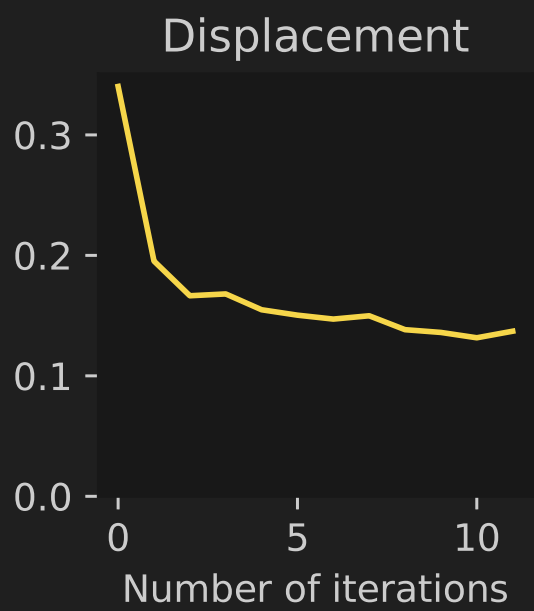
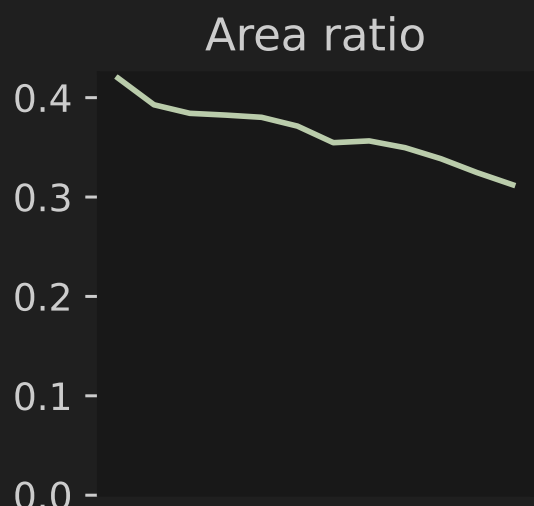
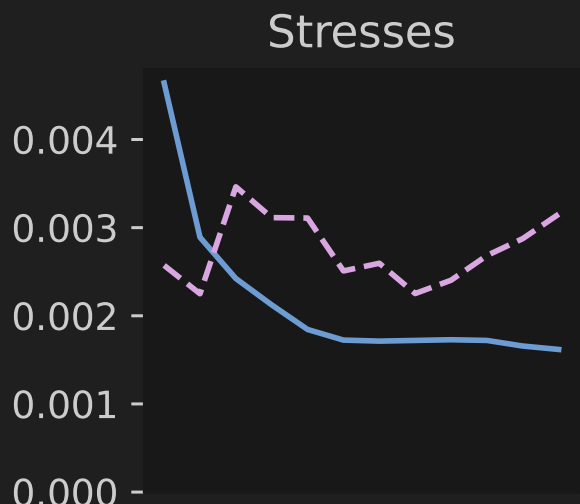
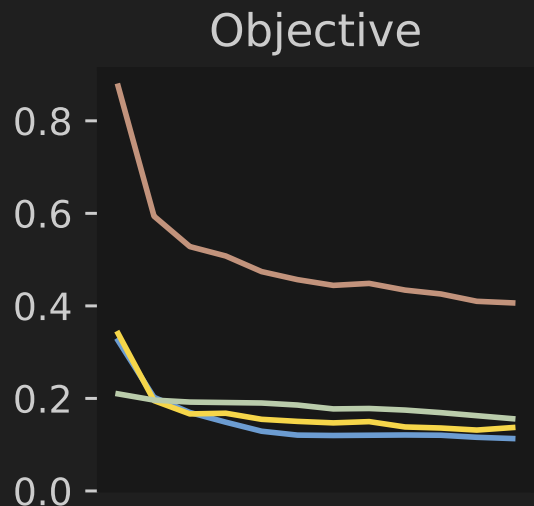
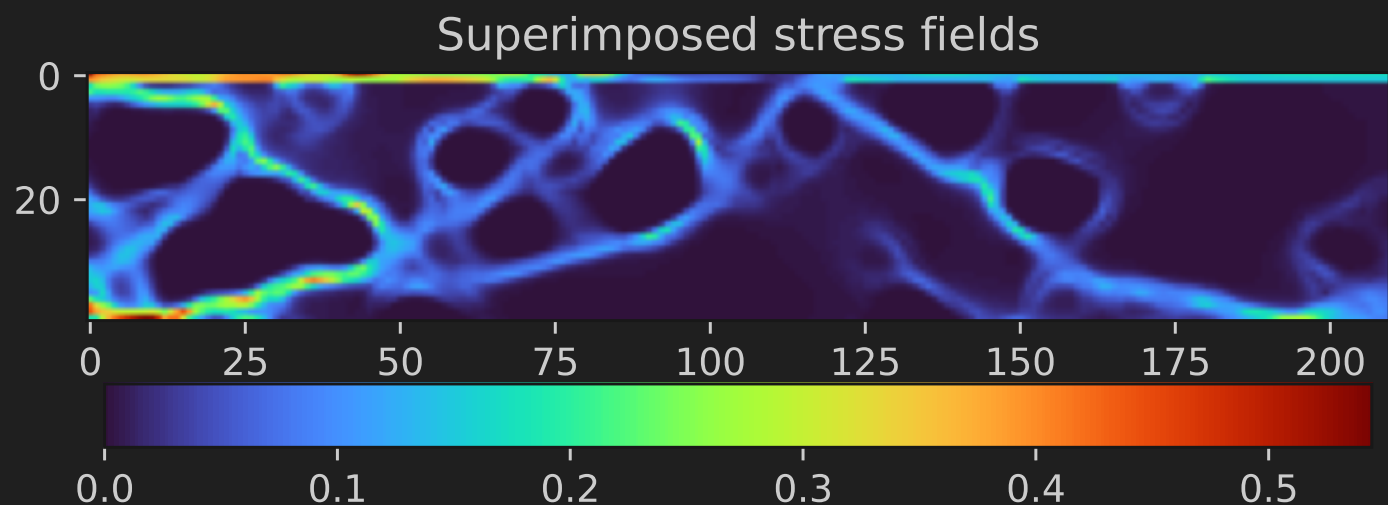
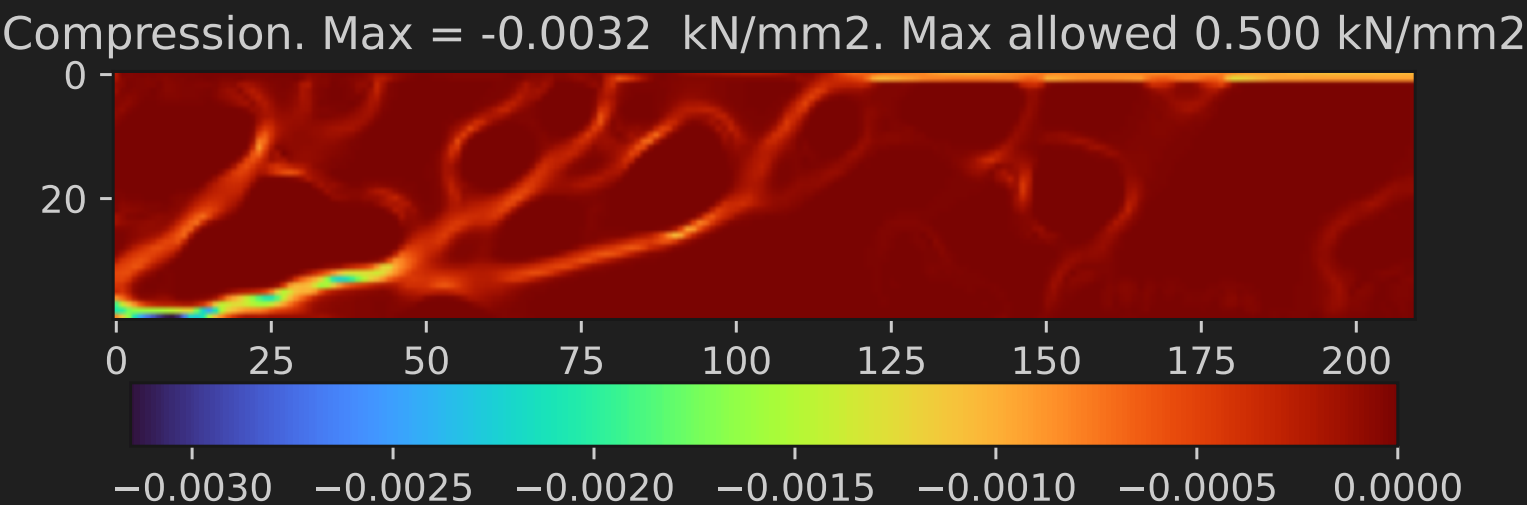
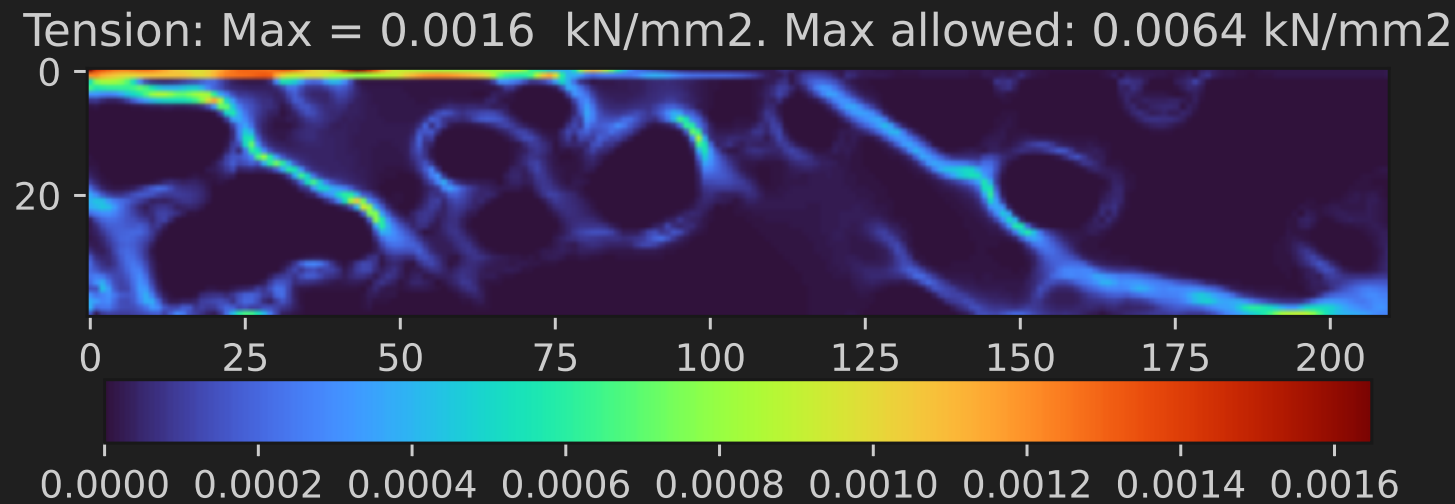
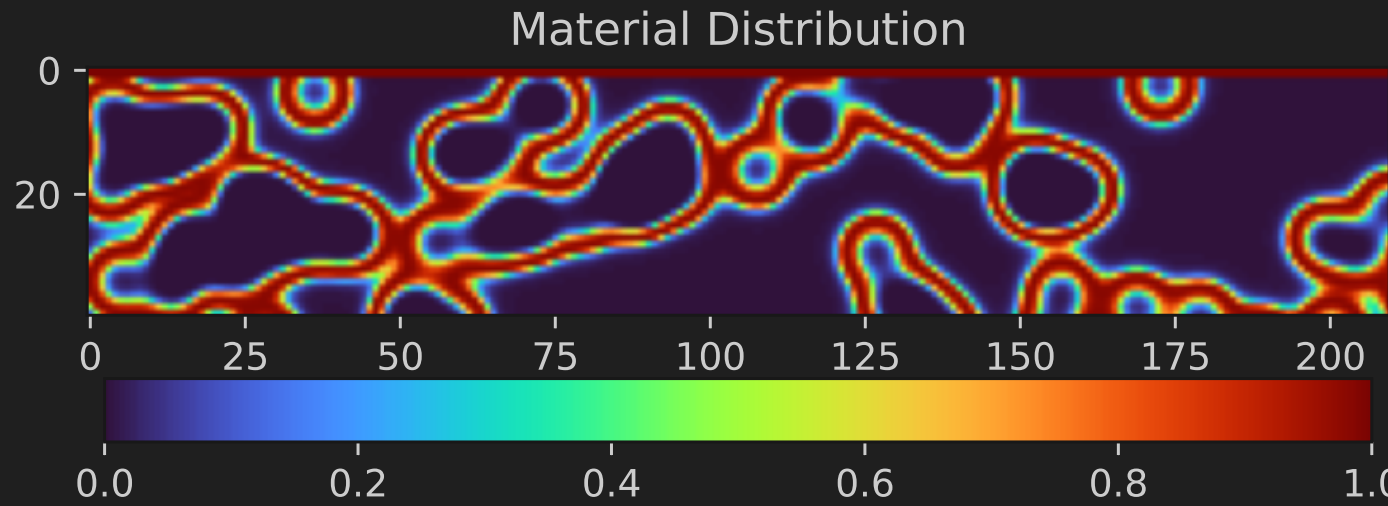
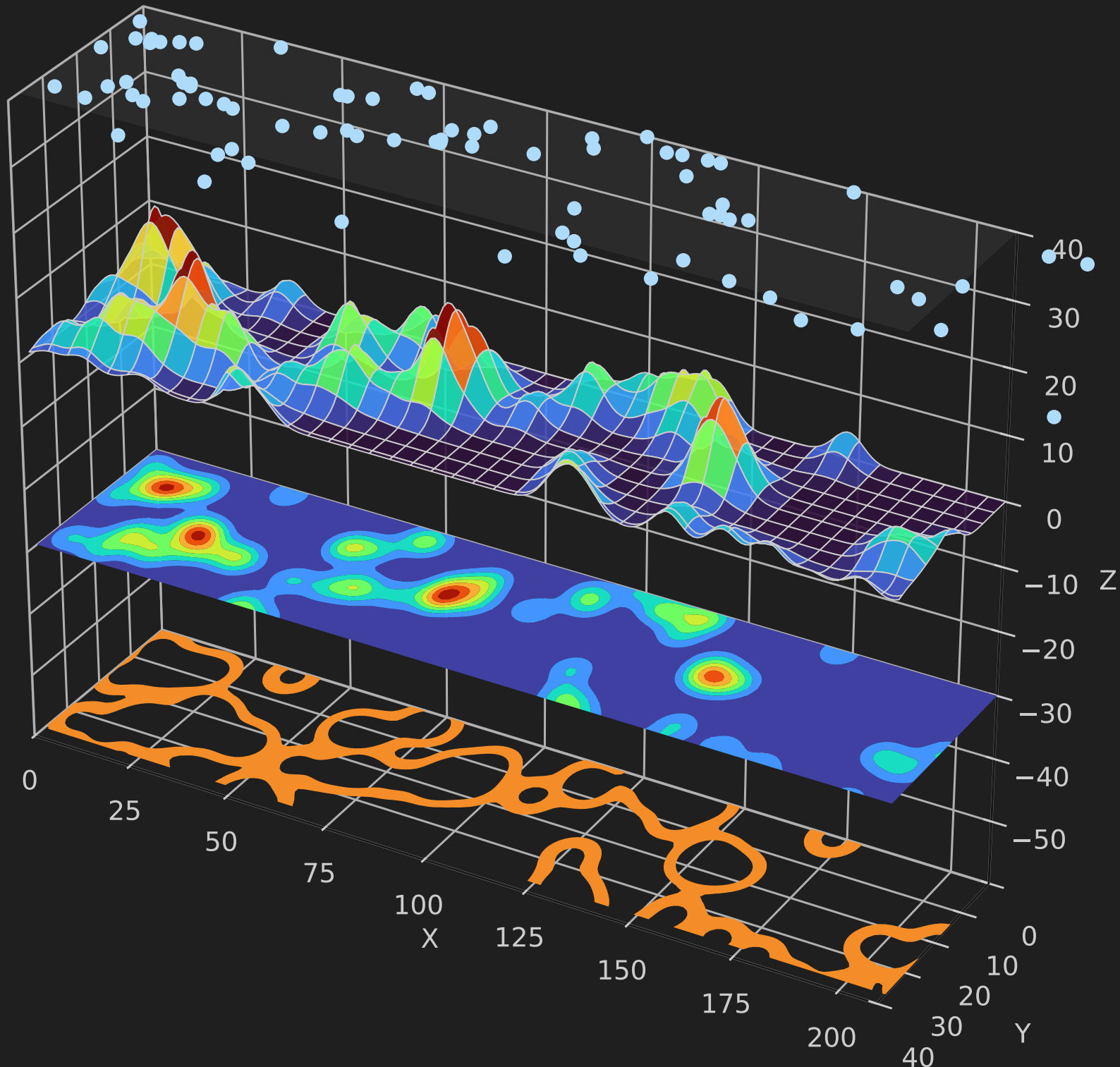
Objective = (Stress: 70 * 0.0017) + (Volume: 0.5 * 0.32) - (Displacement: 1 * -0.13) = 0.41

Spread Gaussian = 4.85 Shift = 2.21 Iteration = 010



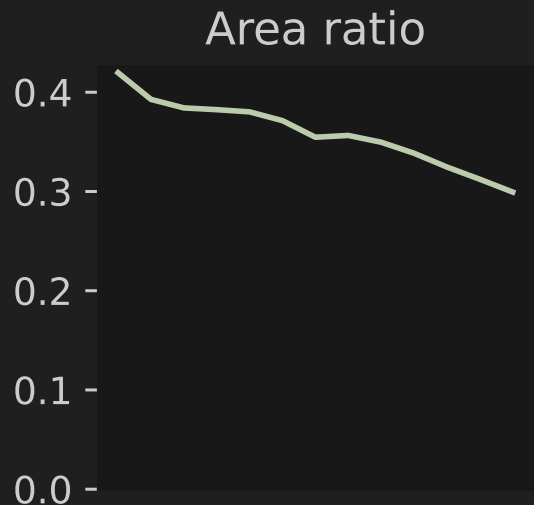
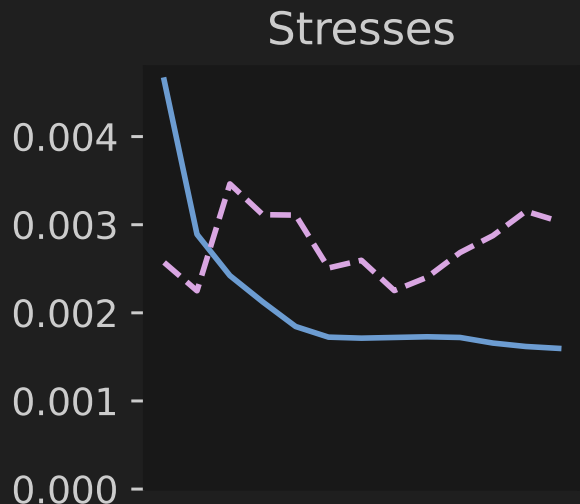
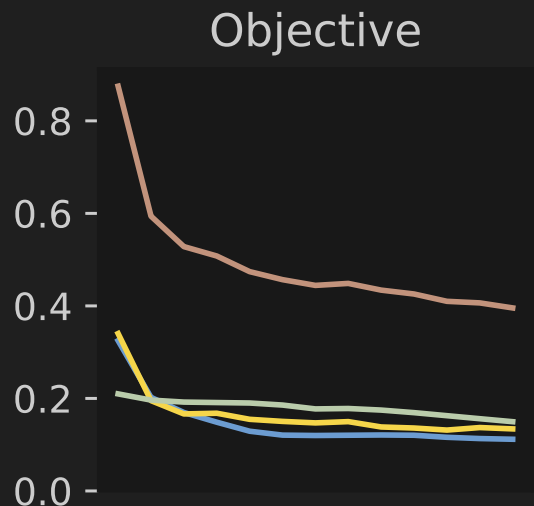
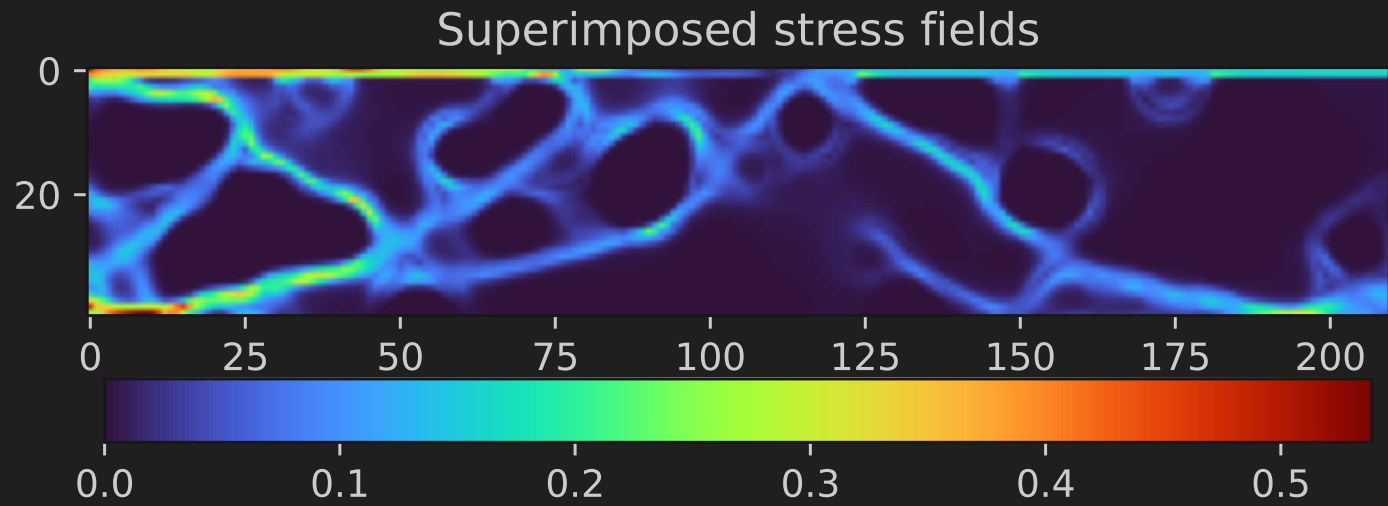
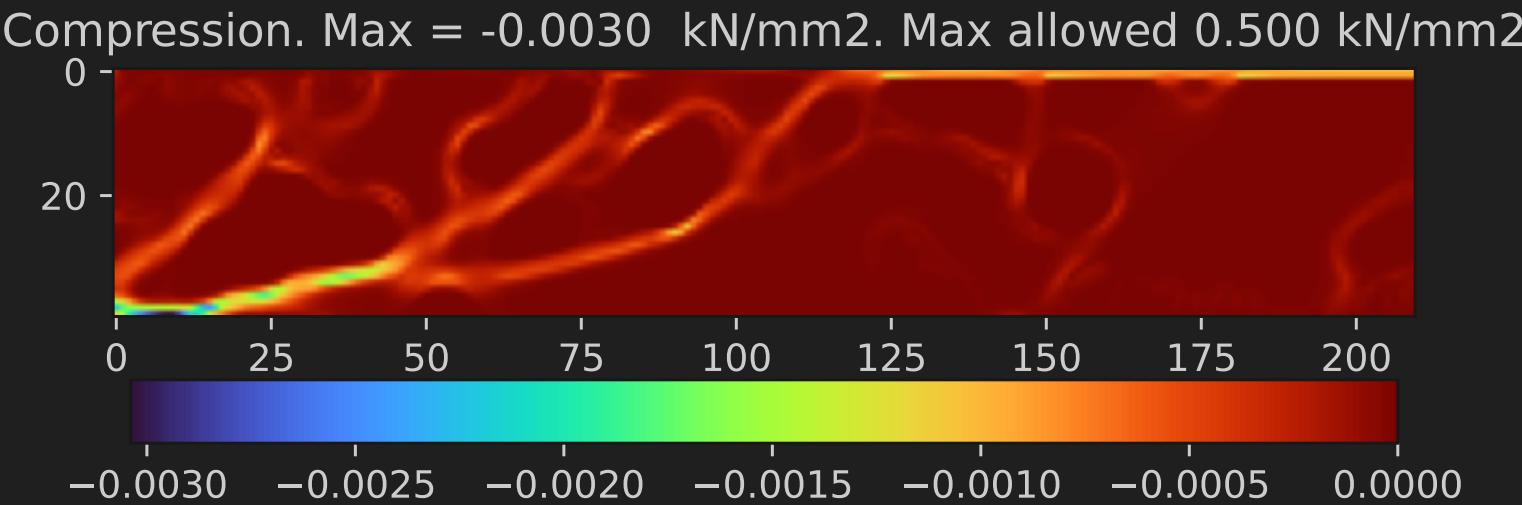
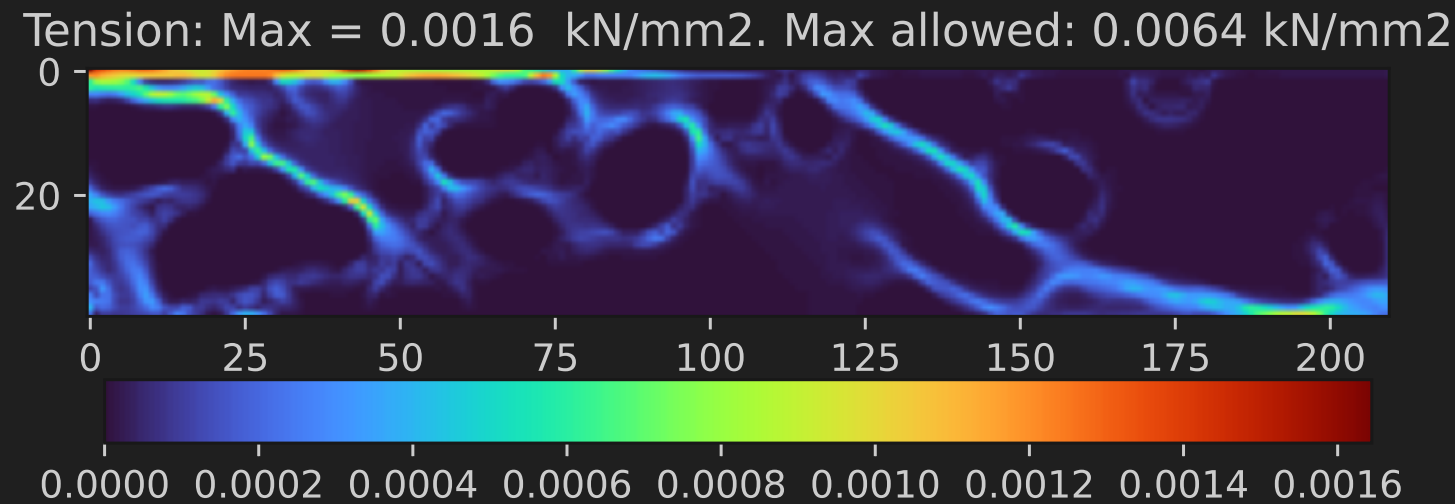
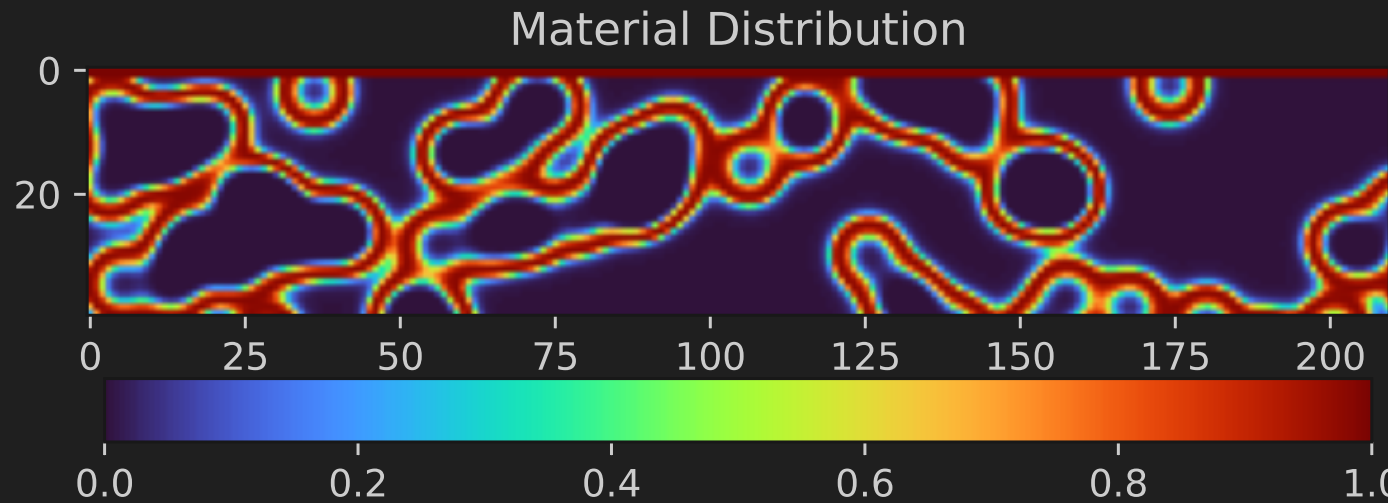
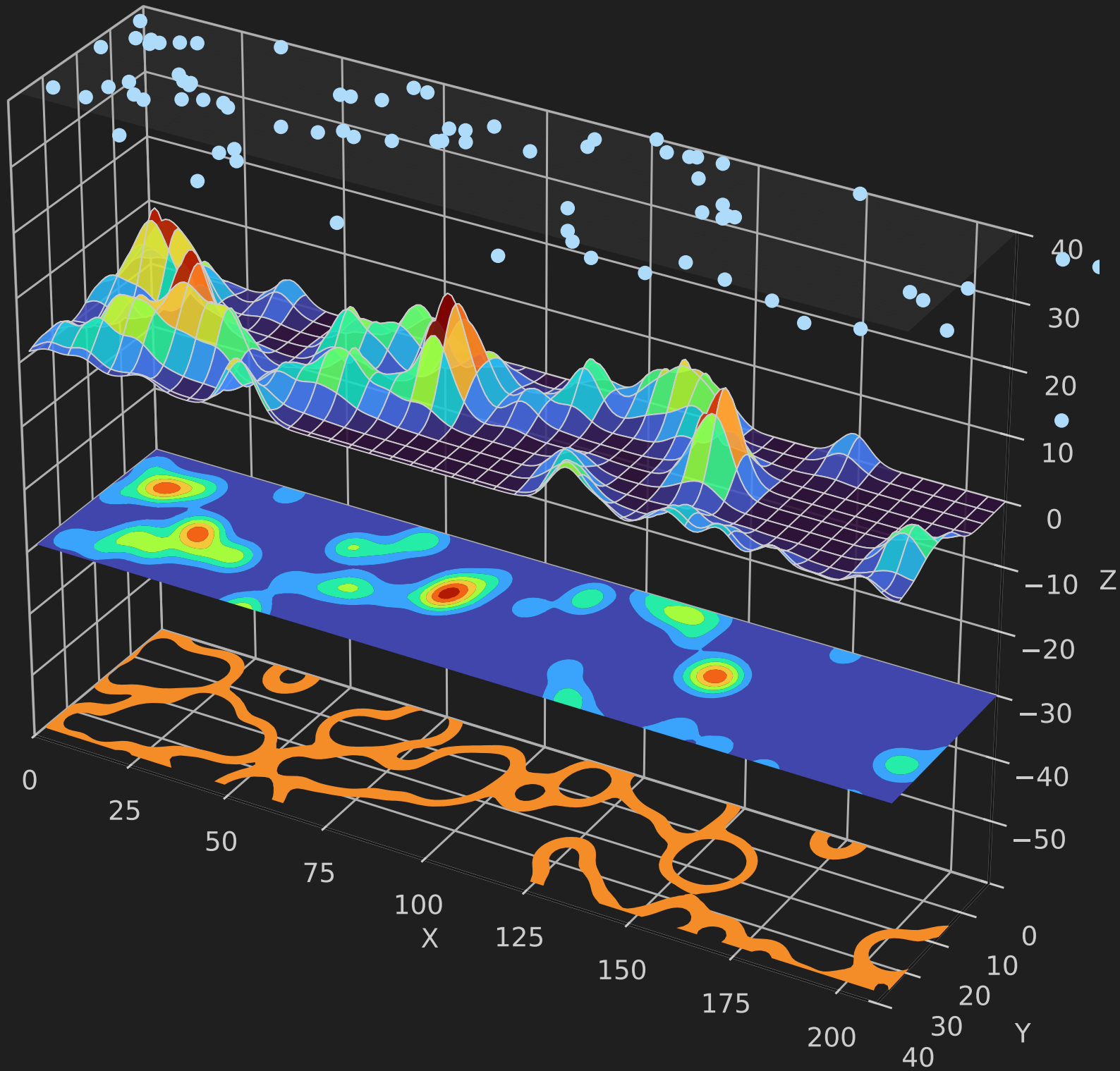
Objective = (Stress: 70 * 0.0016) + (Volume: 0.5 * 0.31) - (Displacement: 1 * -0.14) = 0.41

Spread Gaussian = 4.86 Shift = 2.16 Iteration = 011



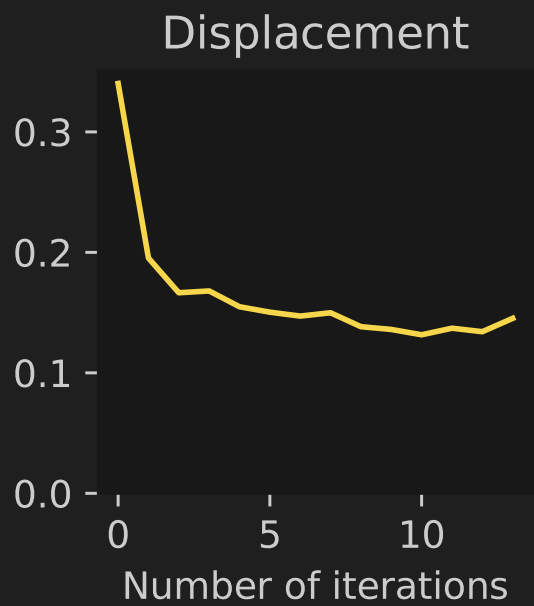
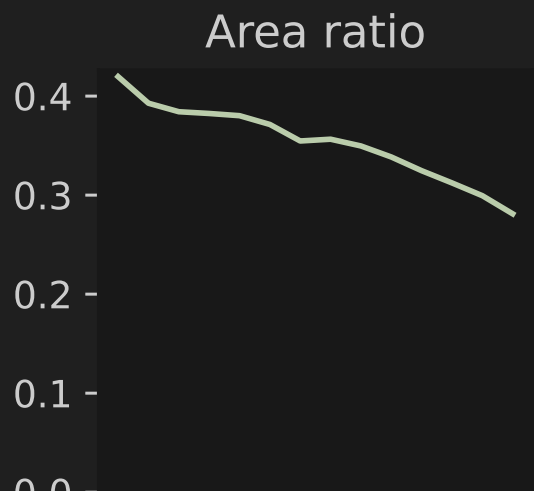
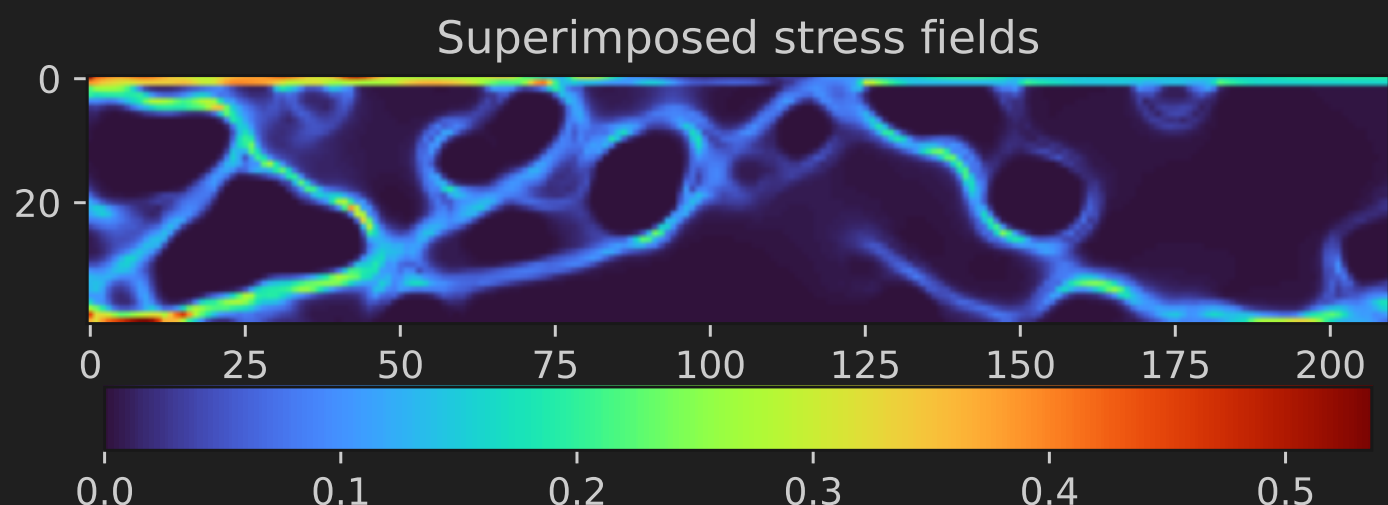
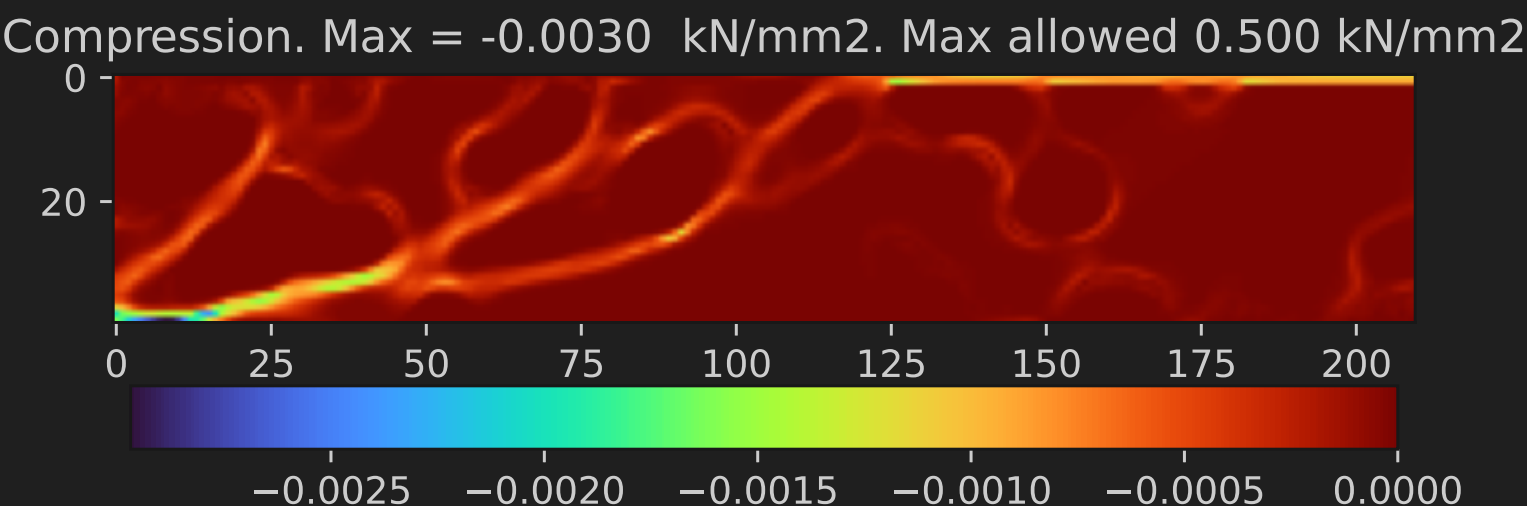
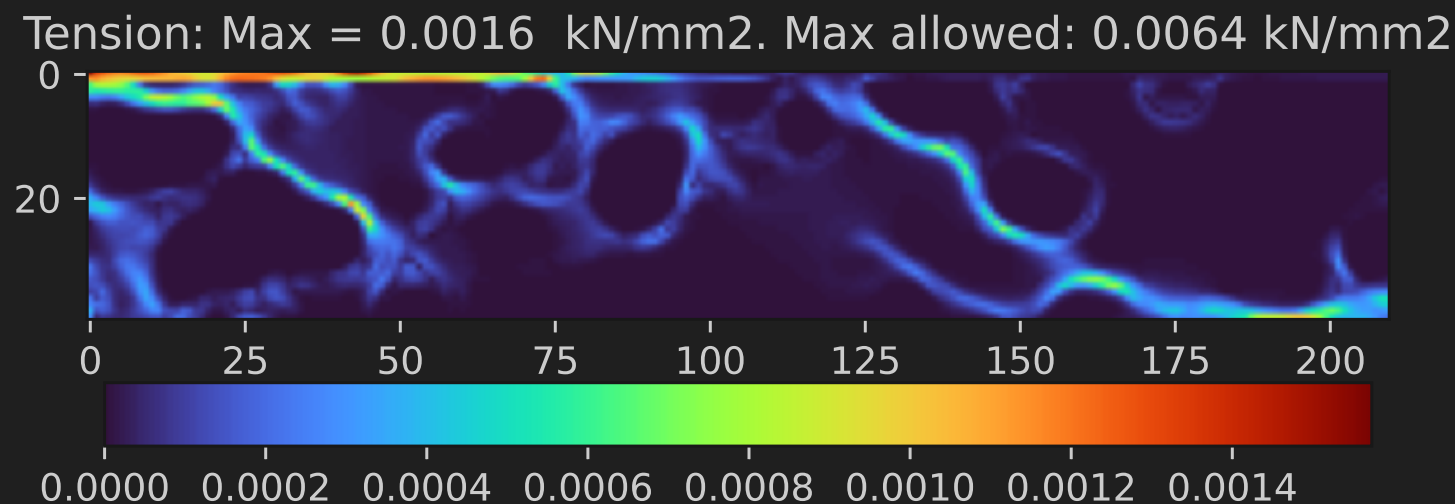
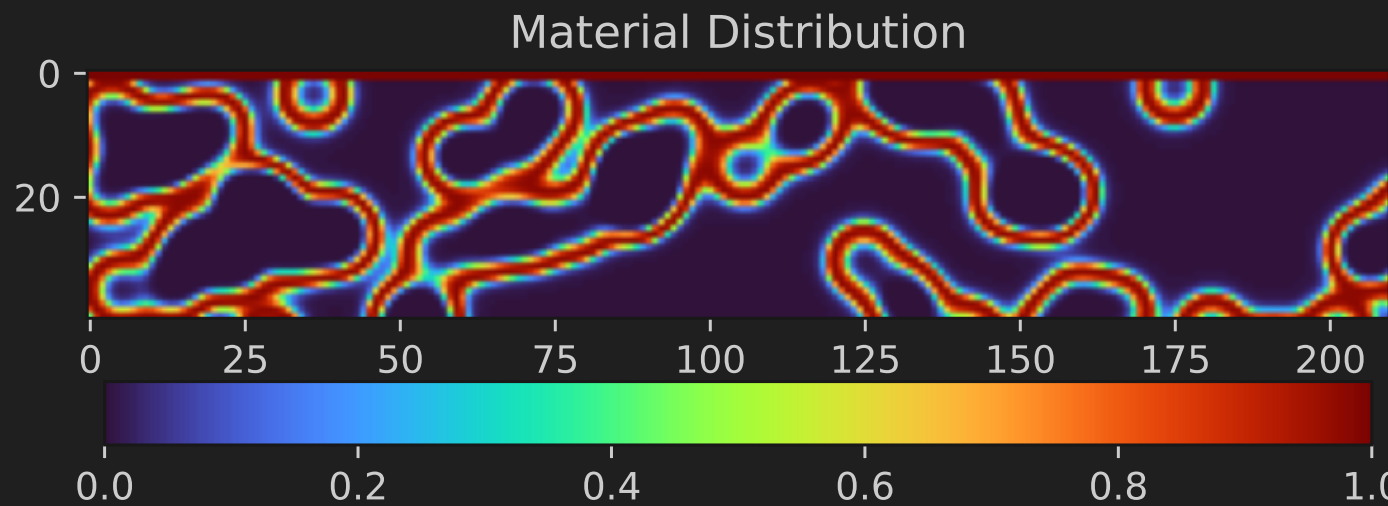
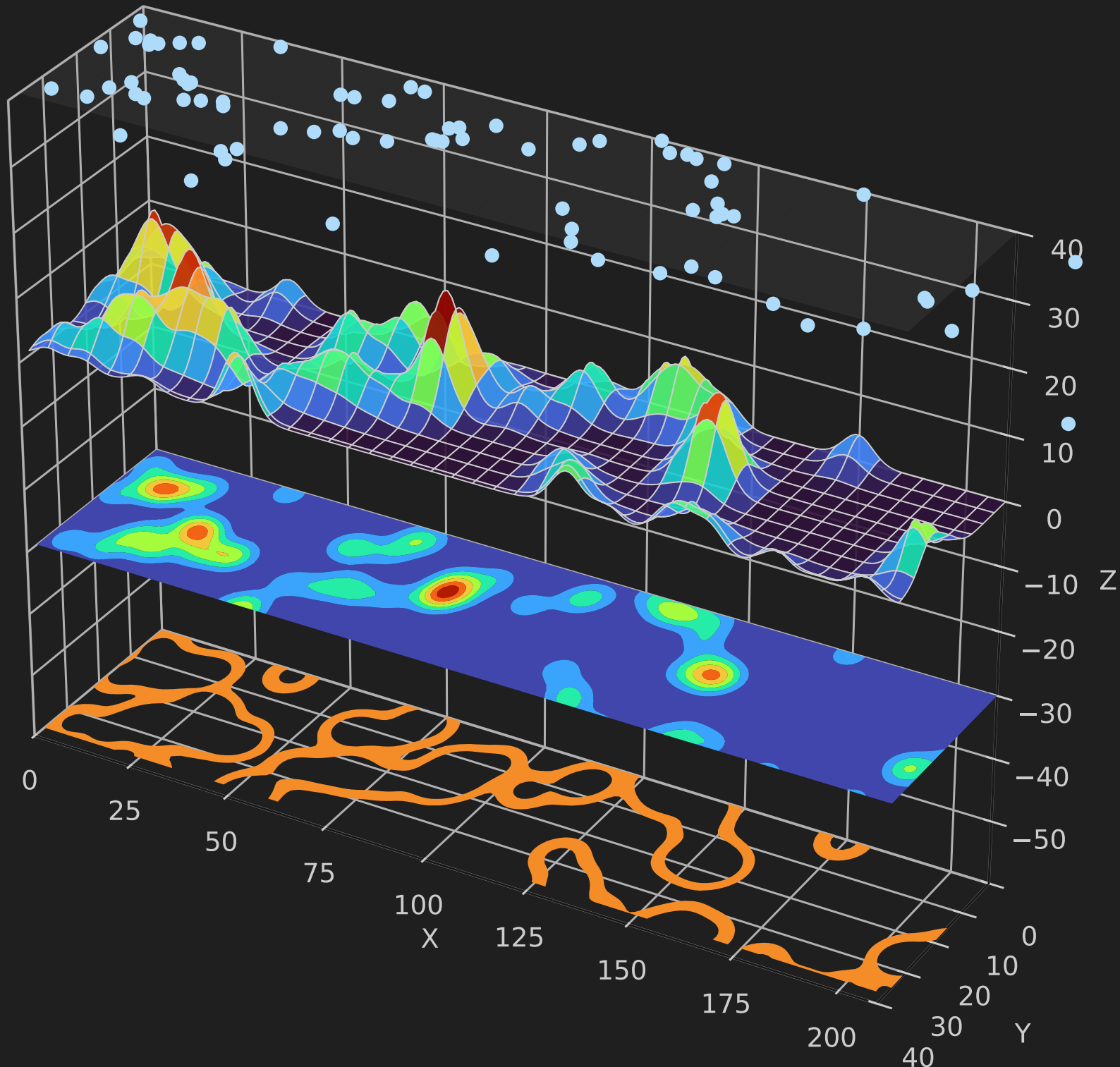
Objective = (Stress: 70 * 0.0016) + (Volume: 0.5 * 0.30) - (Displacement: 1 * -0.13) = 0.40

Spread Gaussian = 4.86 Shift = 2.12 Iteration = 012



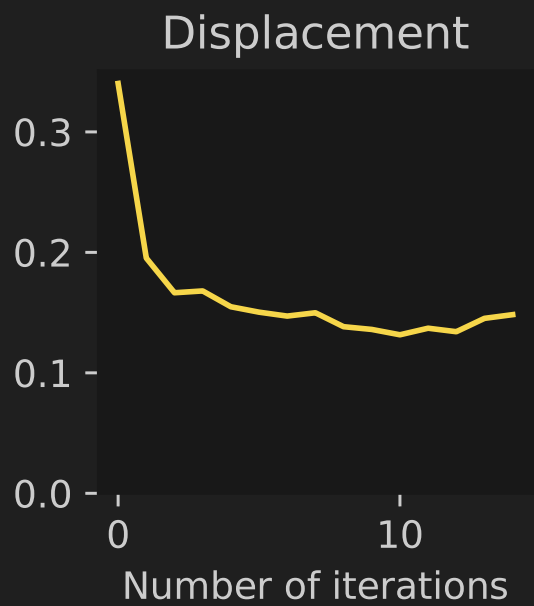
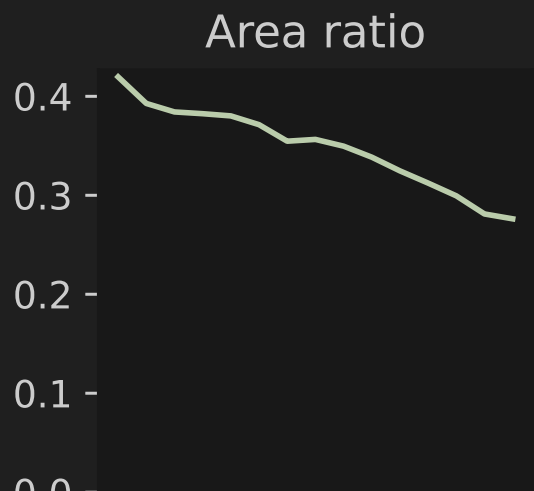
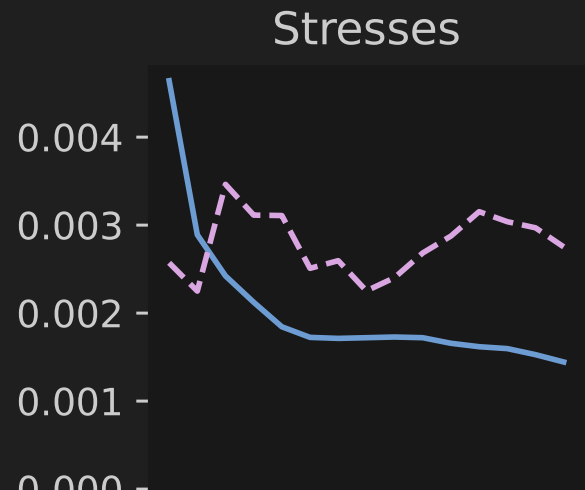
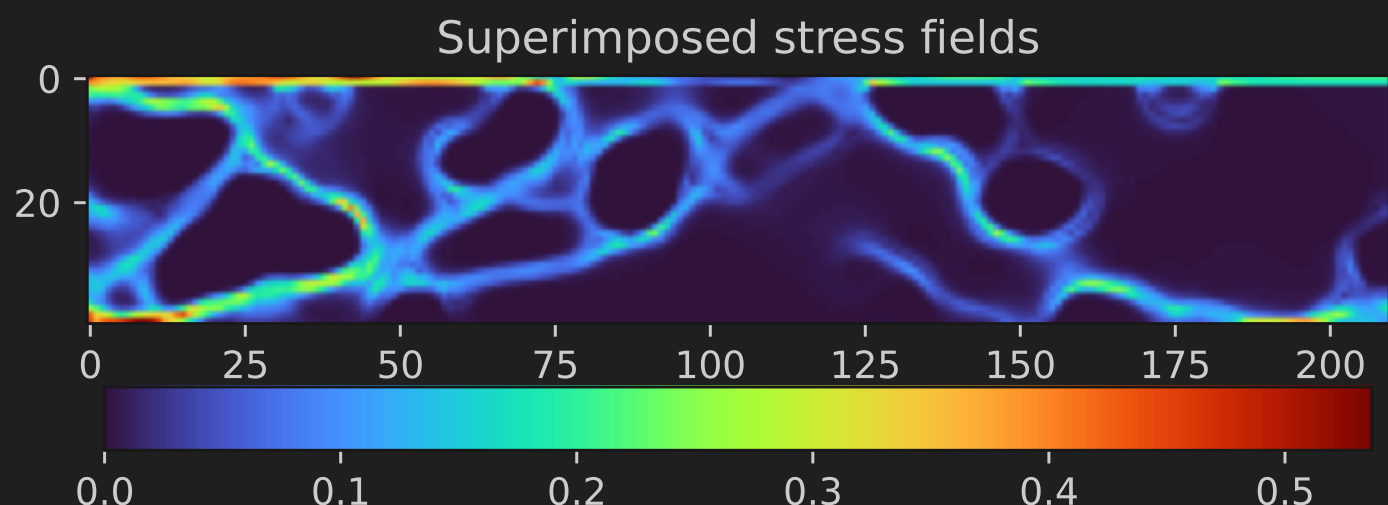
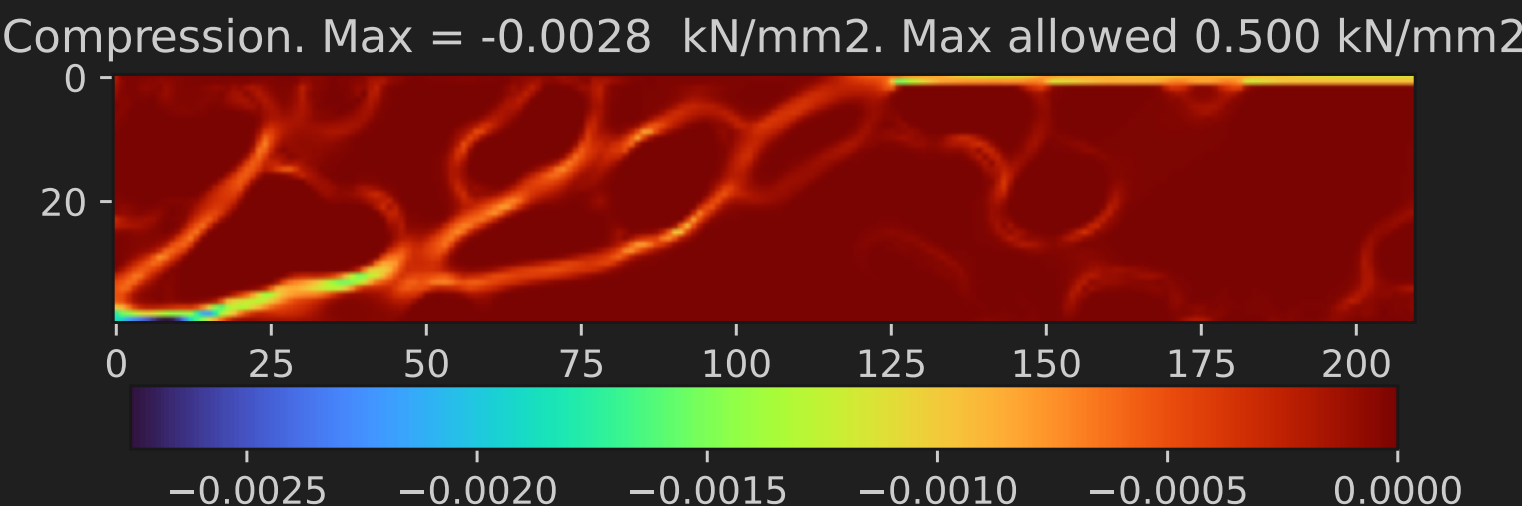
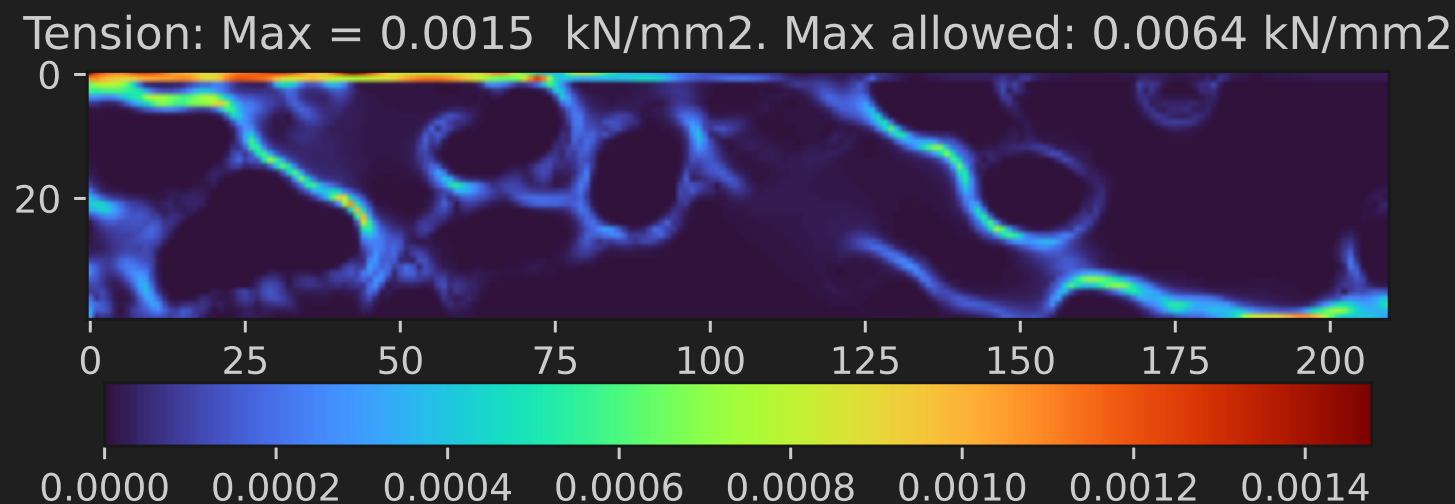
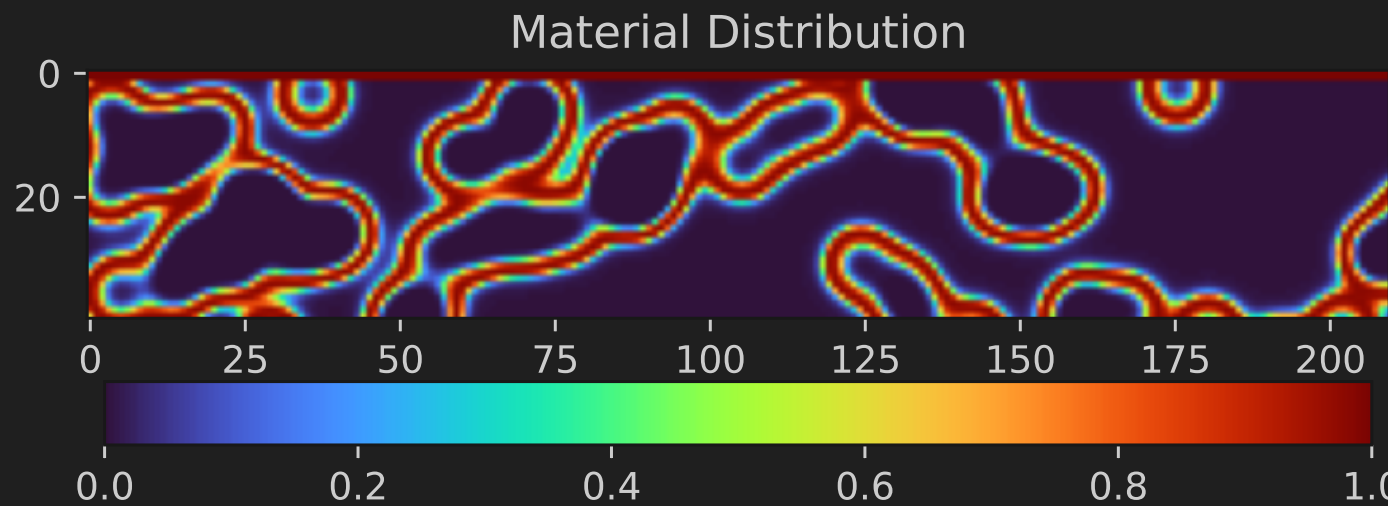
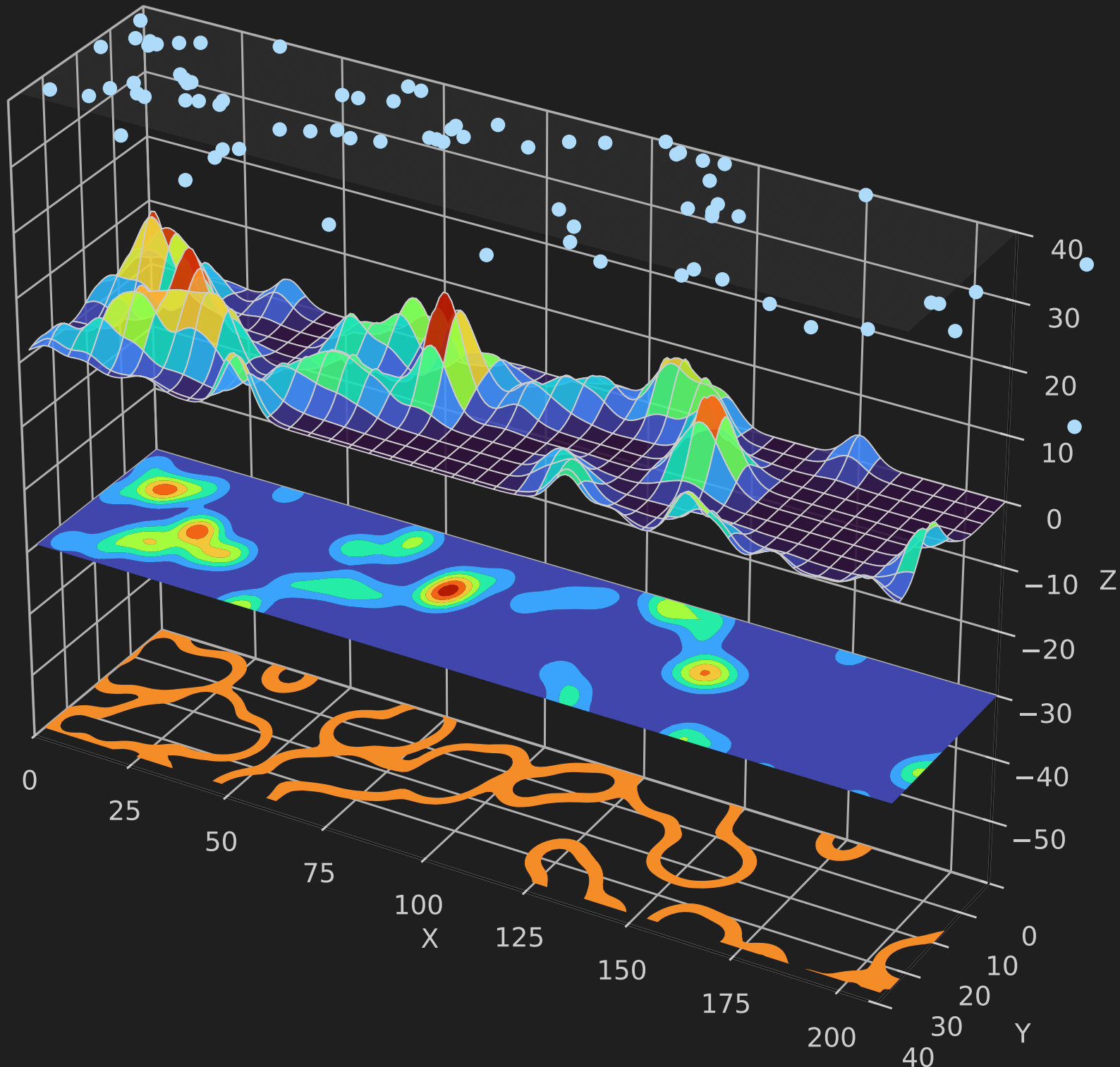
Objective = (Stress: 70 * 0.0015) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.15) = 0.39

Spread Gaussian = 4.84 Shift = 2.09 Iteration = 013



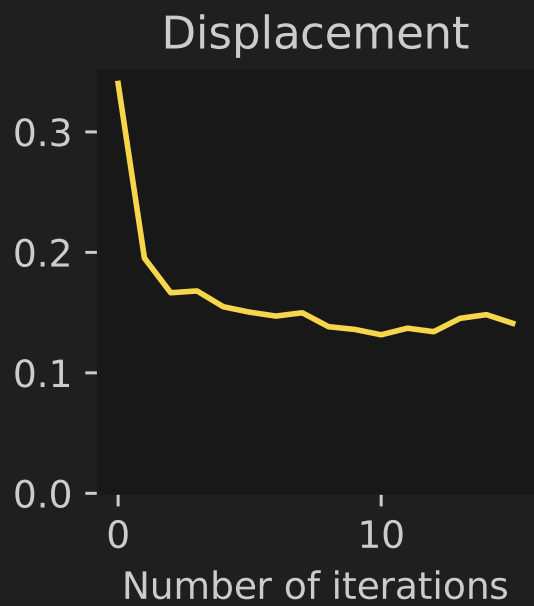
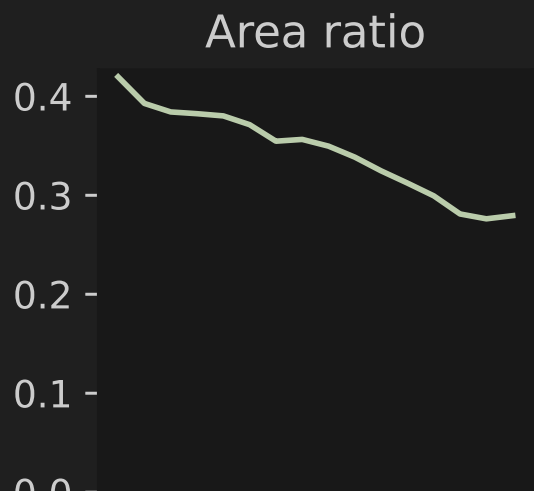
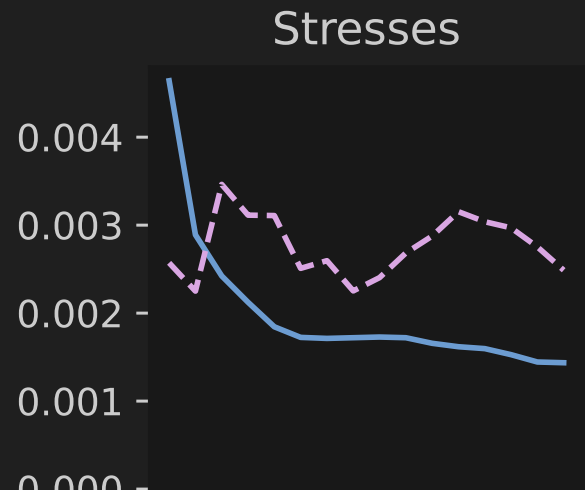
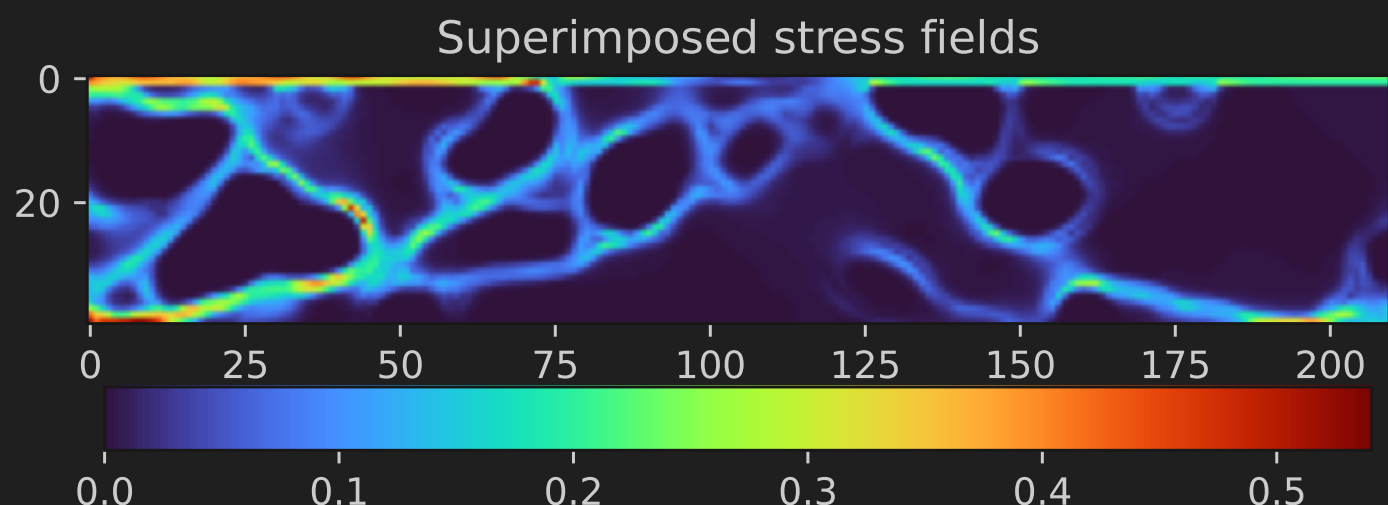
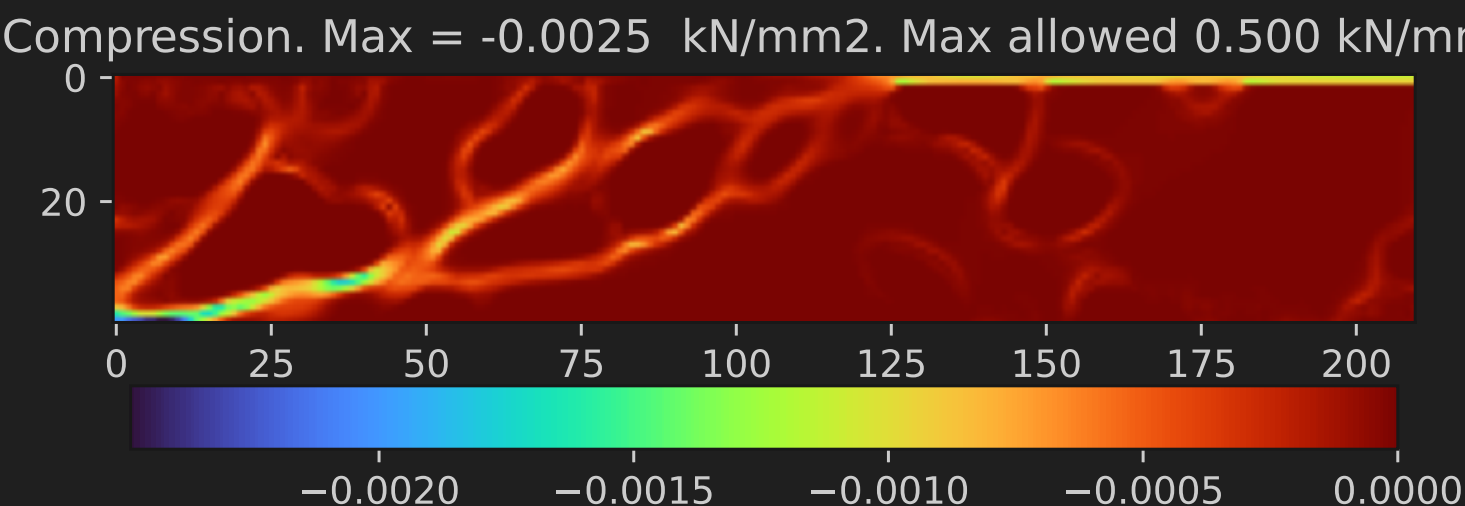
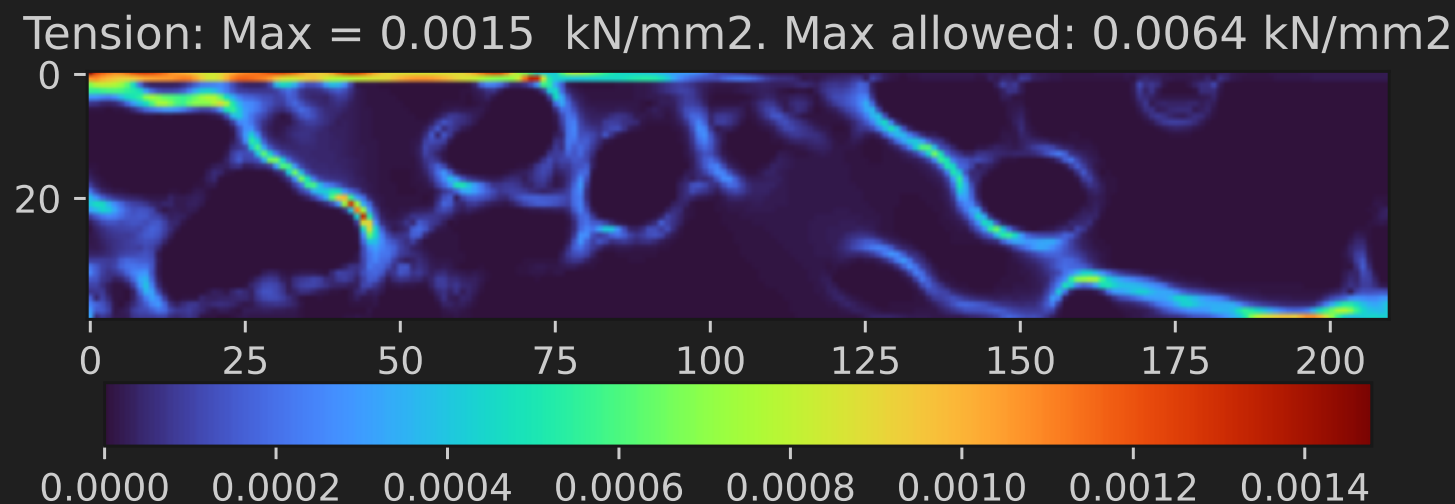
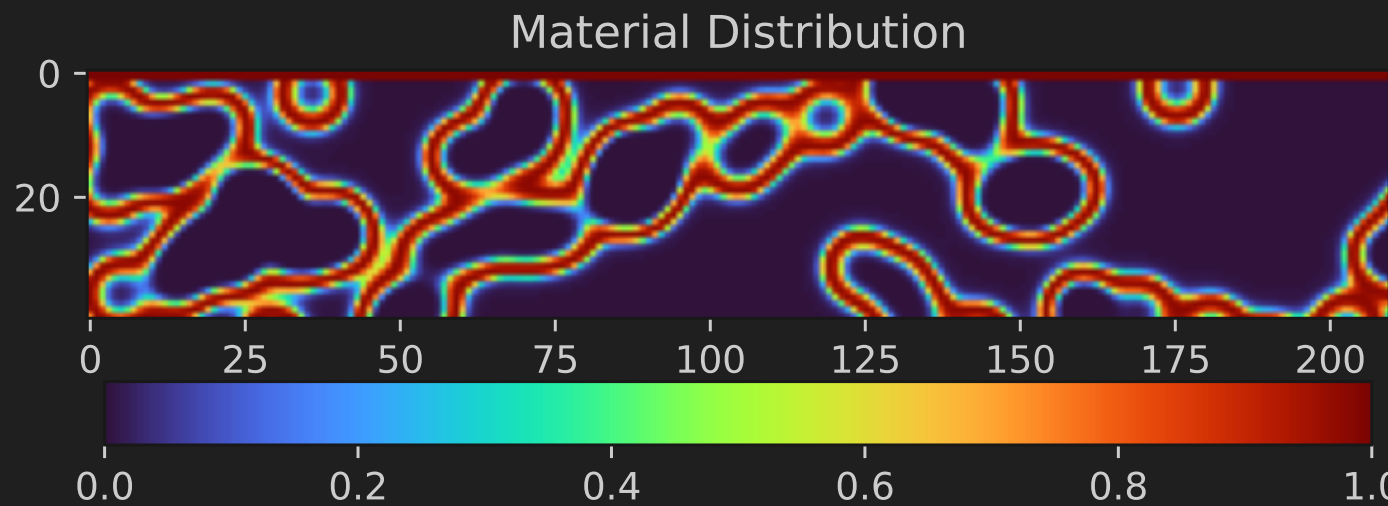
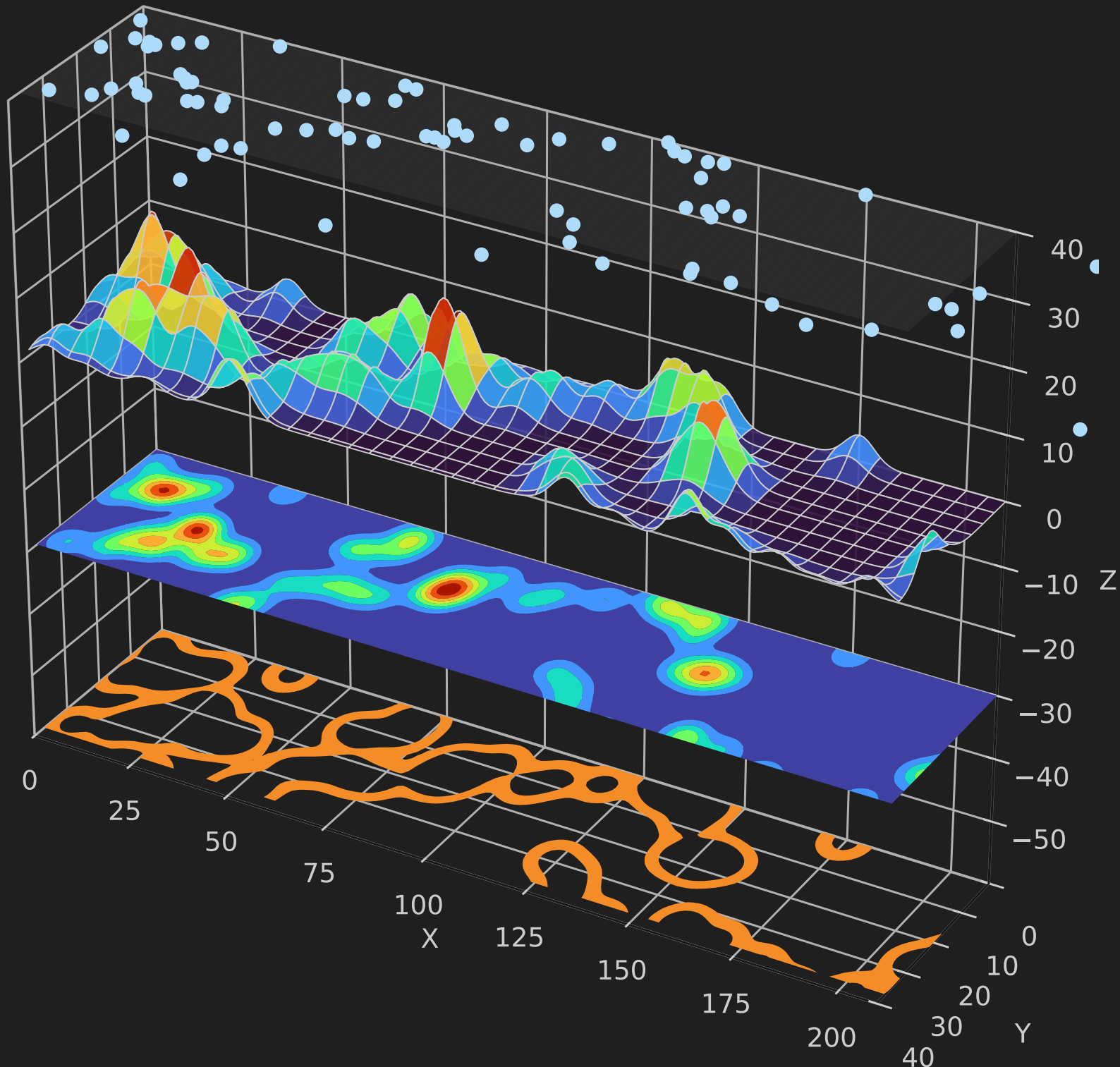
Objective = (Stress: 70 * 0.0014) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.15) = 0.39

Spread Gaussian = 4.82 Shift = 2.09 Iteration = 014



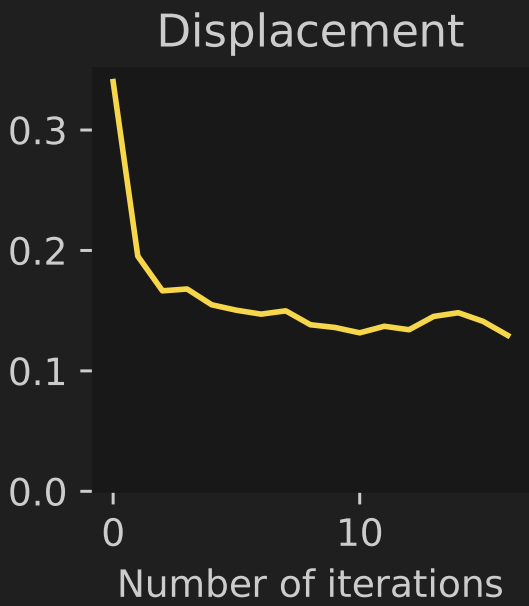
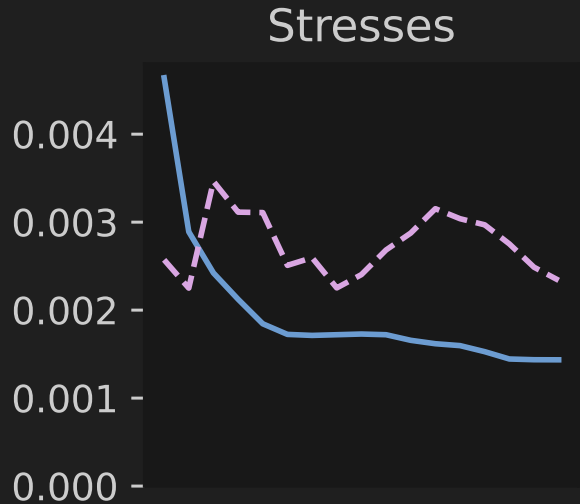
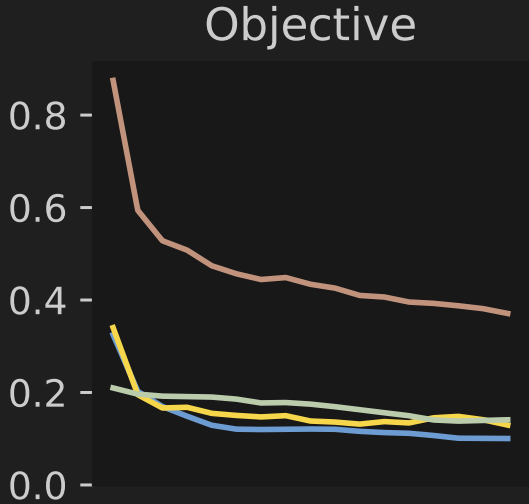
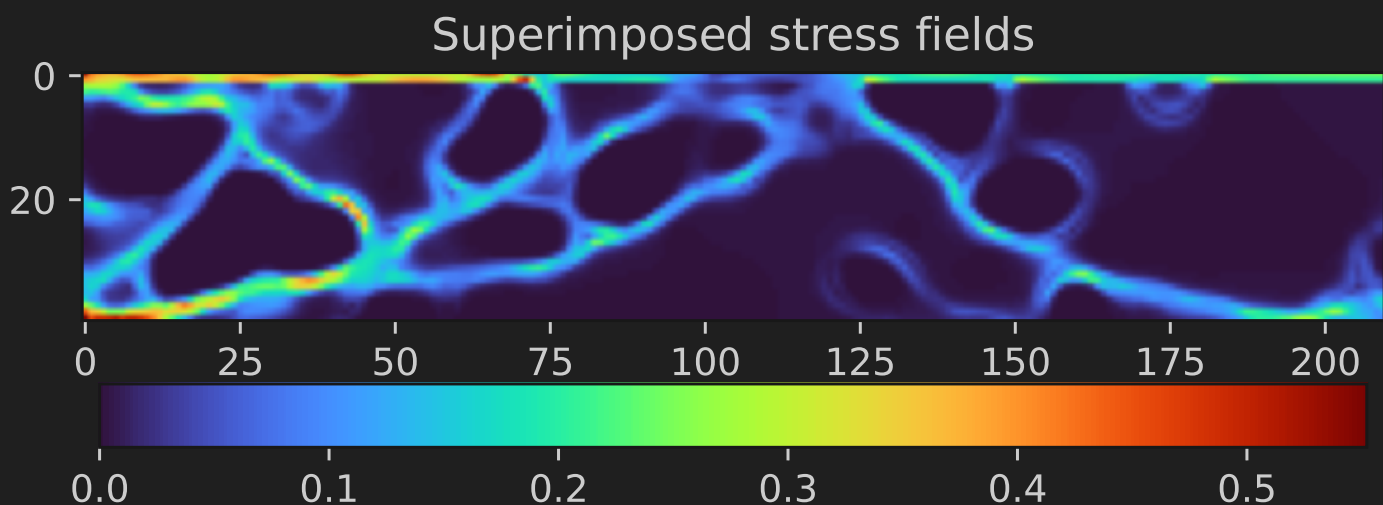
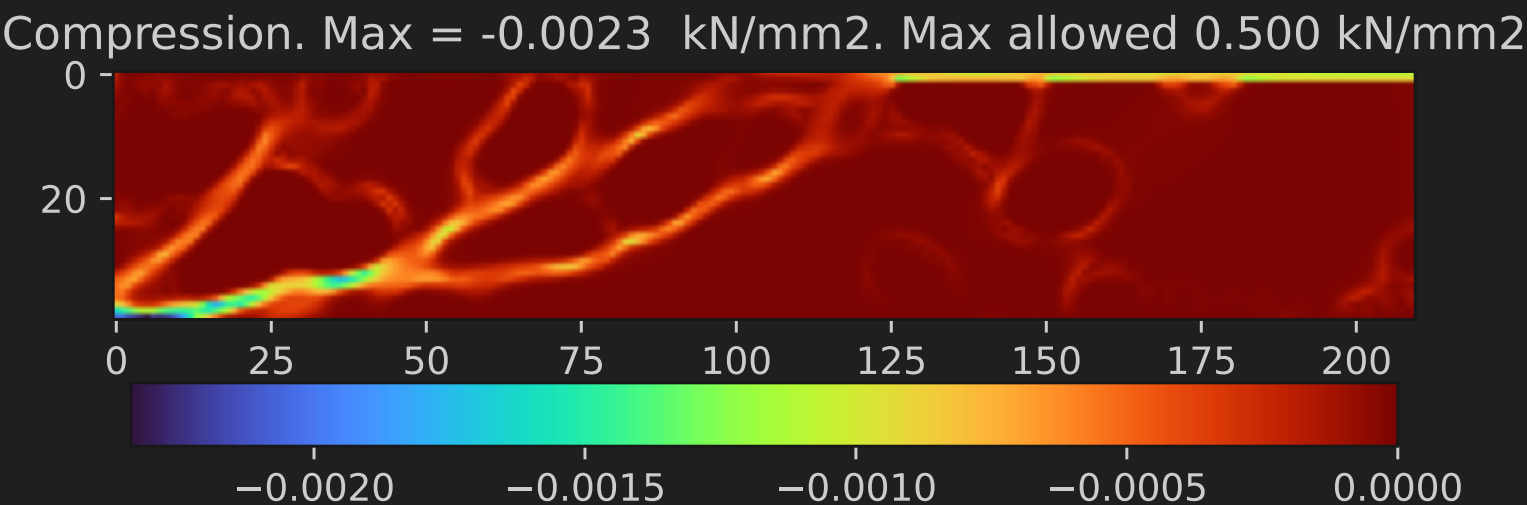
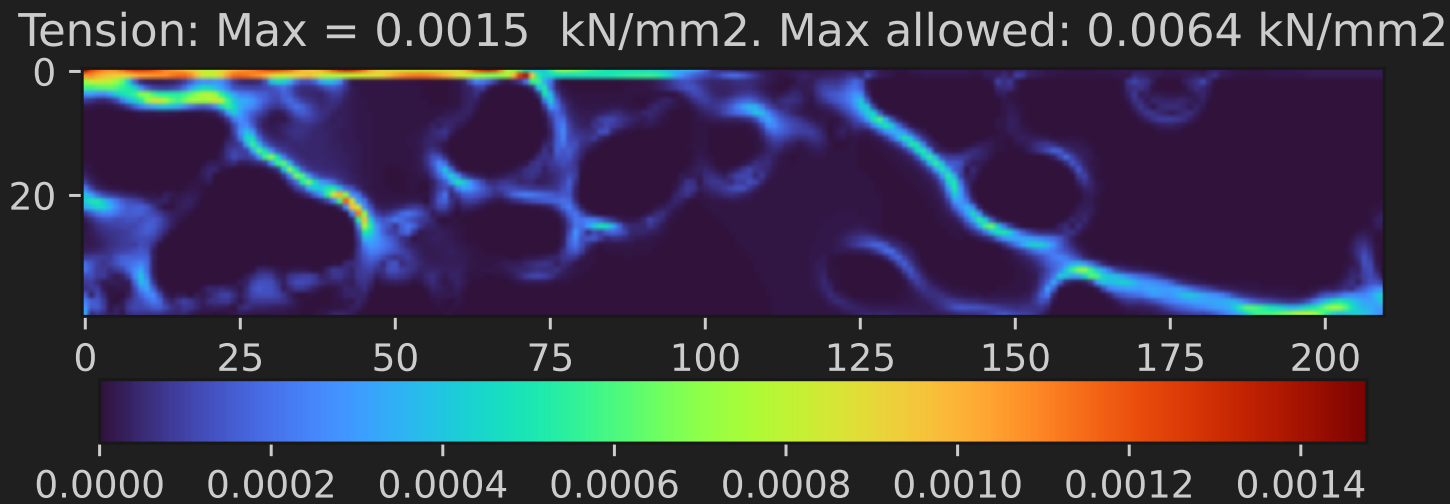
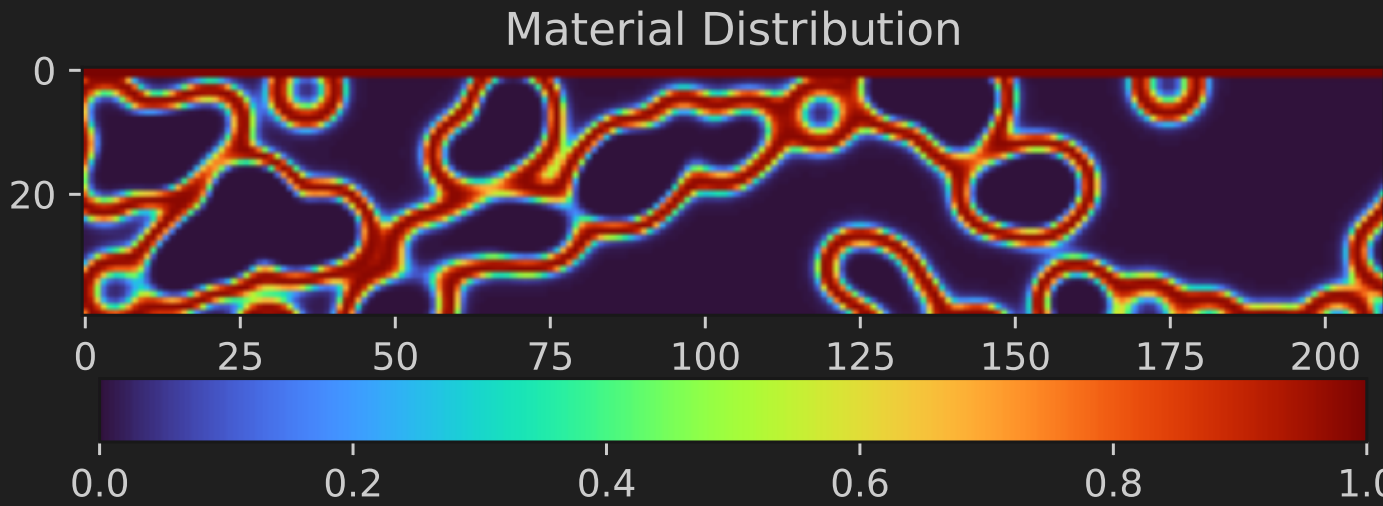
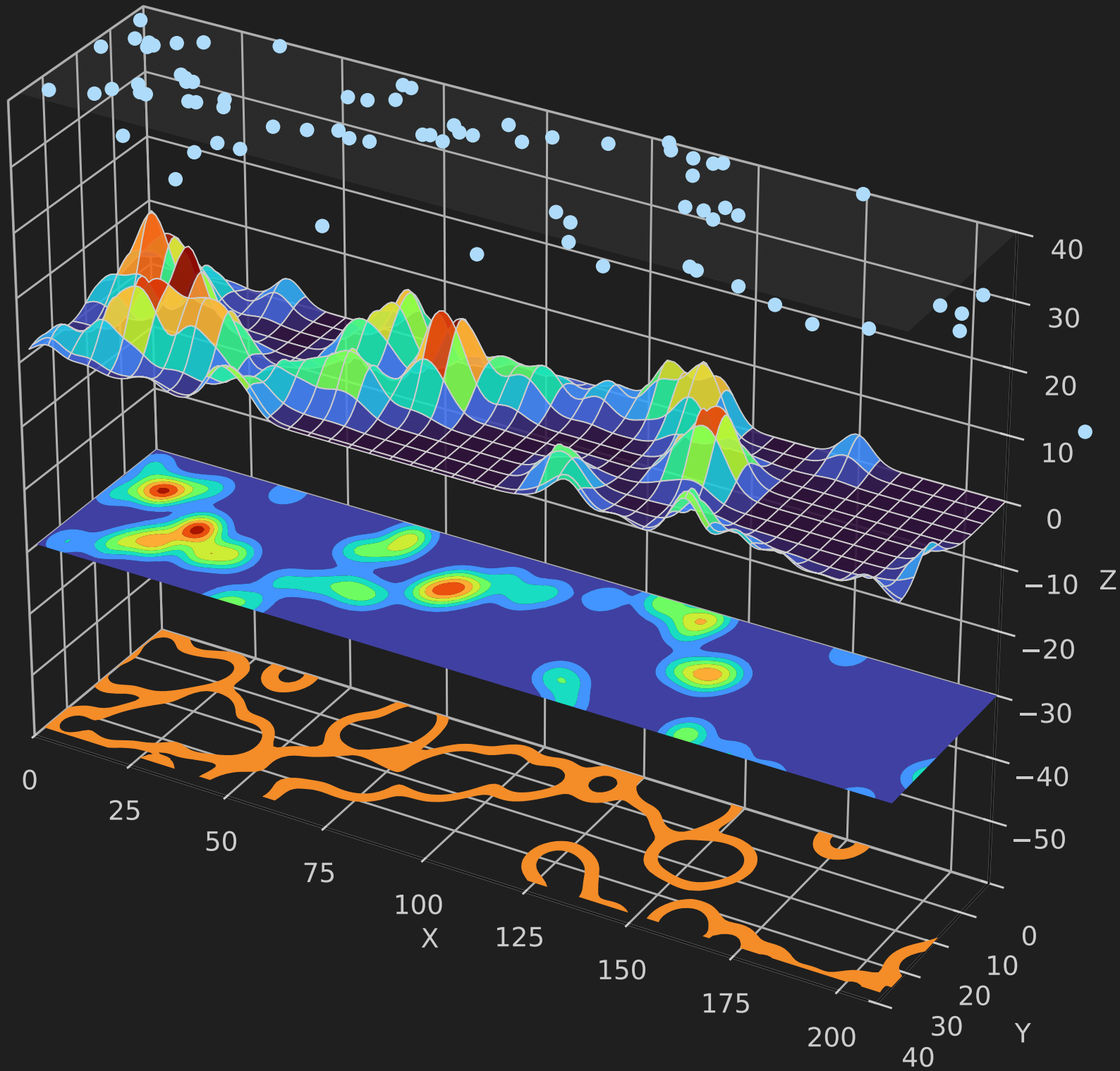
Objective = (Stress: 70 * 0.0014) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.14) = 0.38

Spread Gaussian = 4.83 Shift = 2.08 Iteration = 015



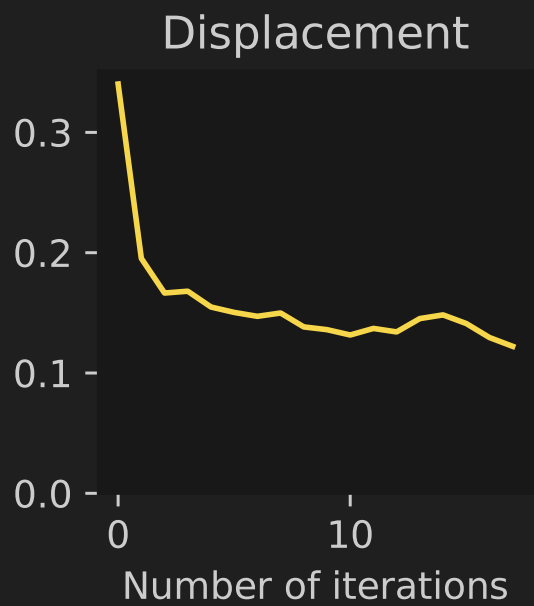
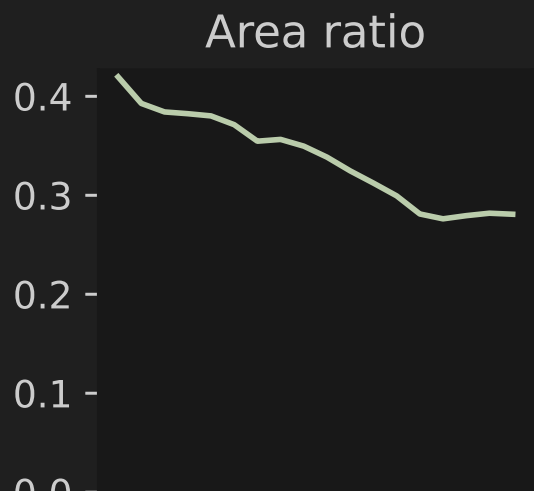
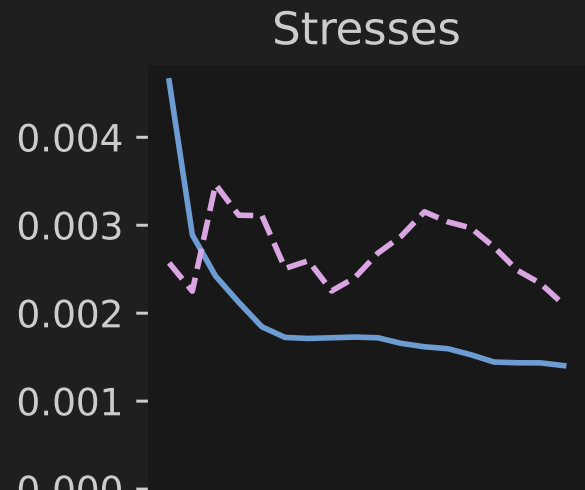
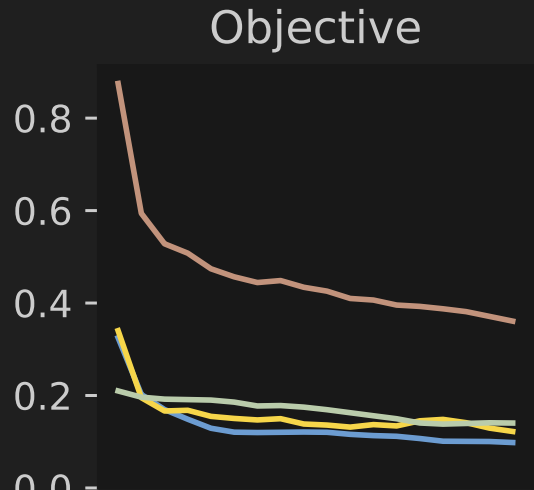
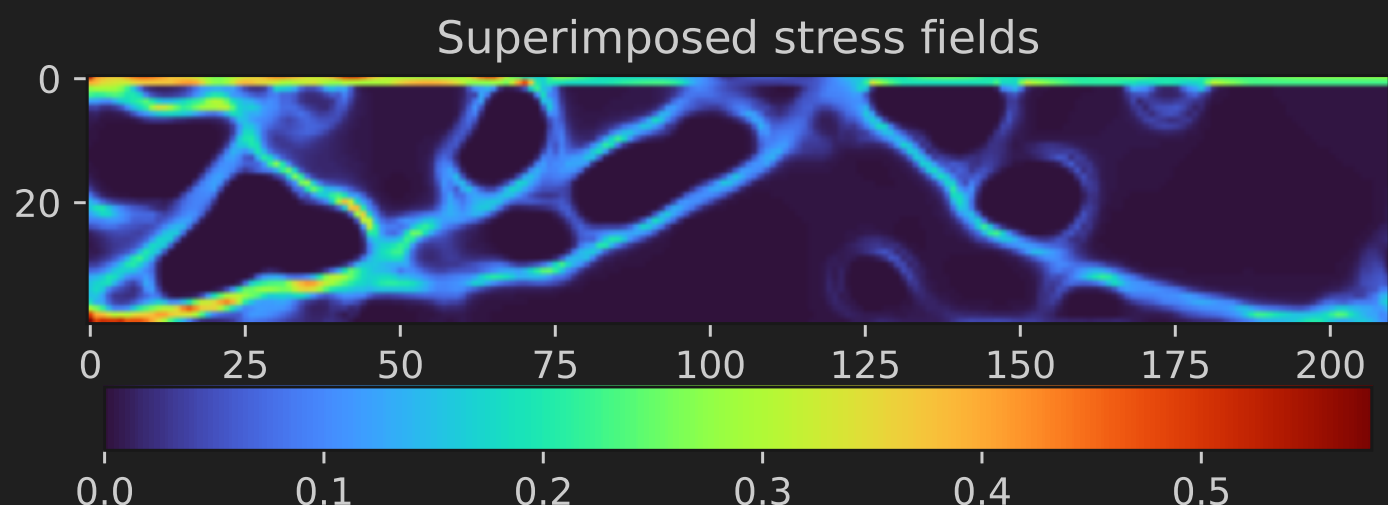
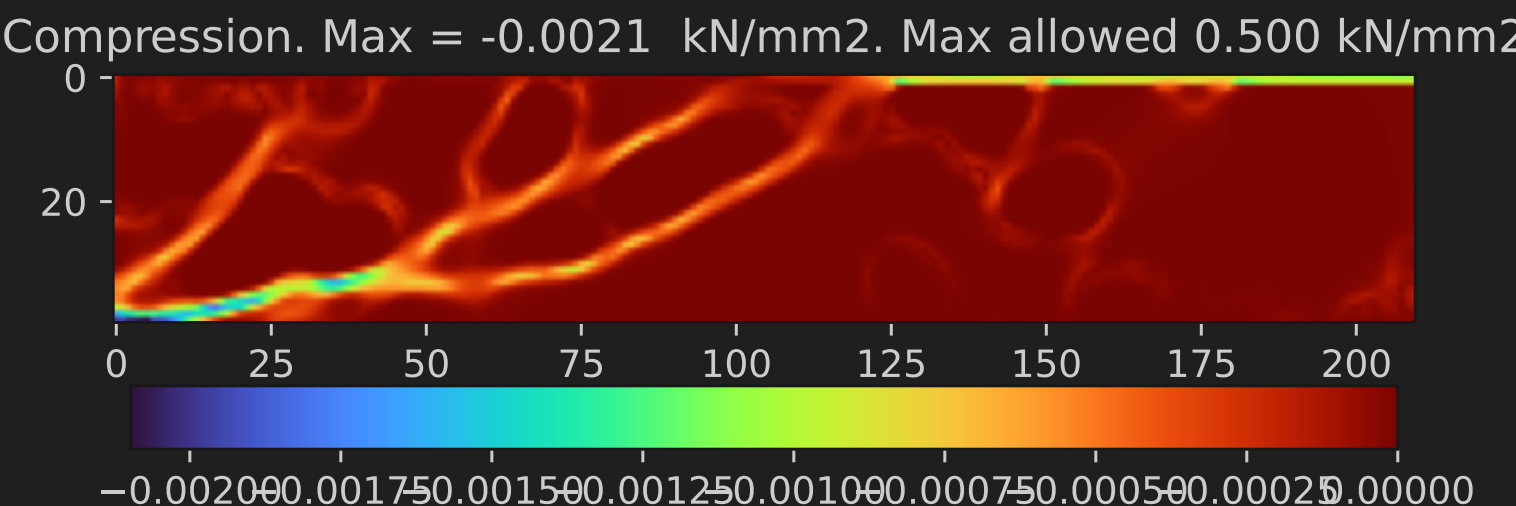
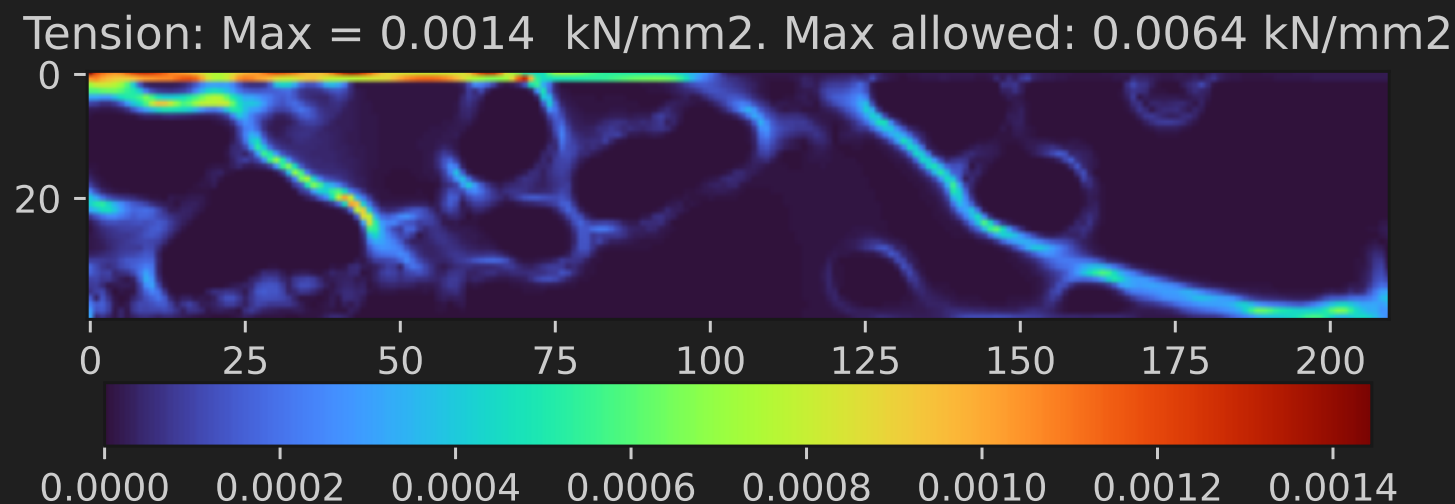
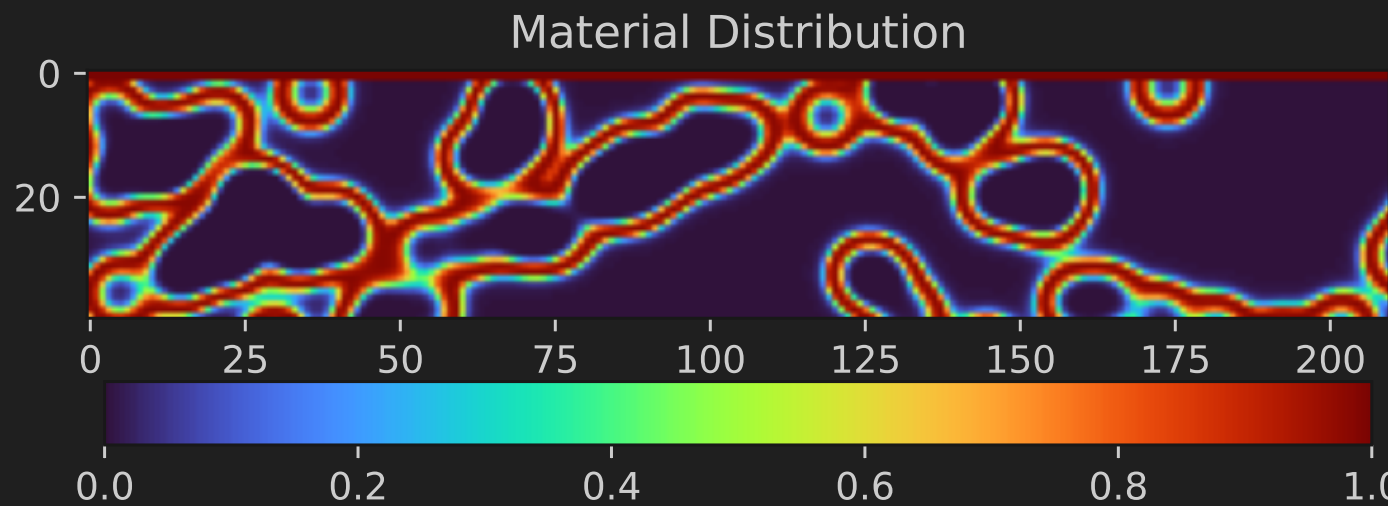
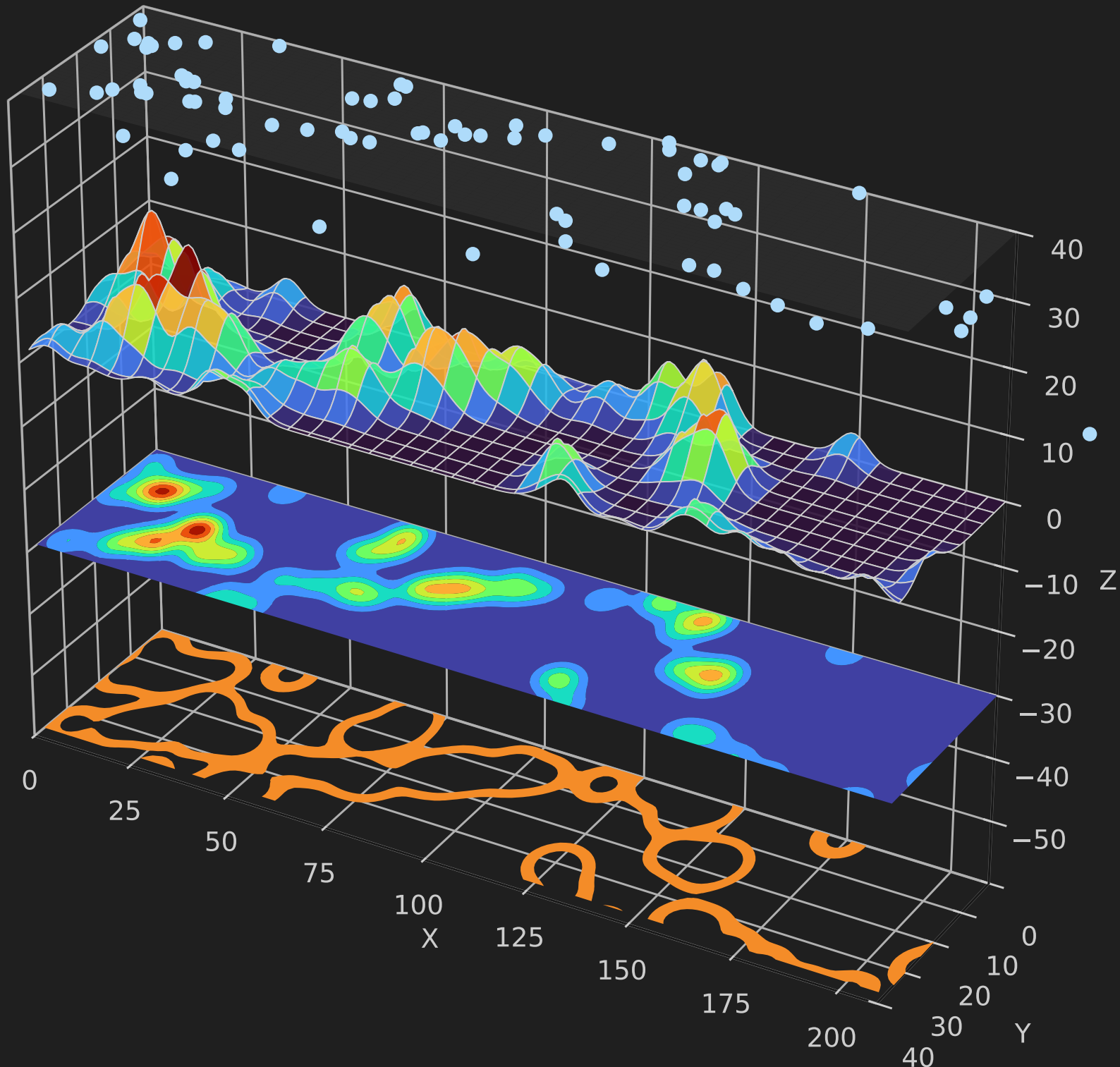
Objective = (Stress: 70 * 0.0014) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.13) = 0.37

Spread Gaussian = 4.83 Shift = 2.10 Iteration = 016



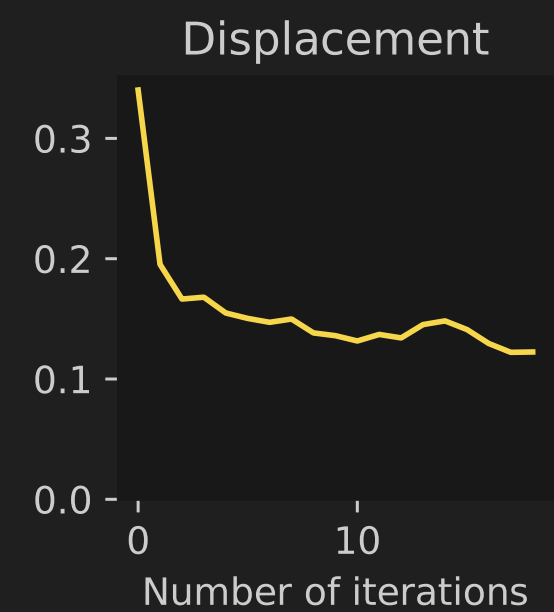
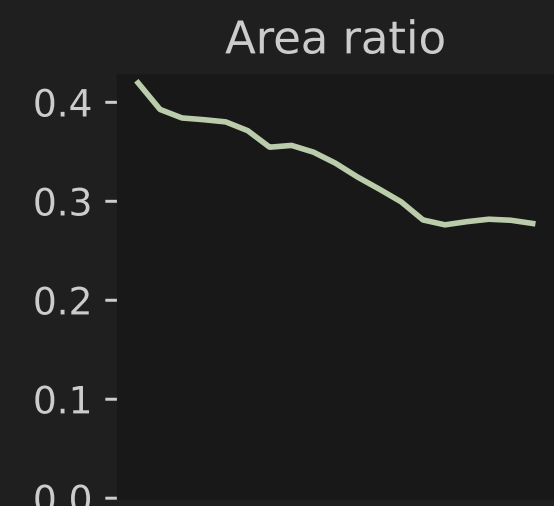
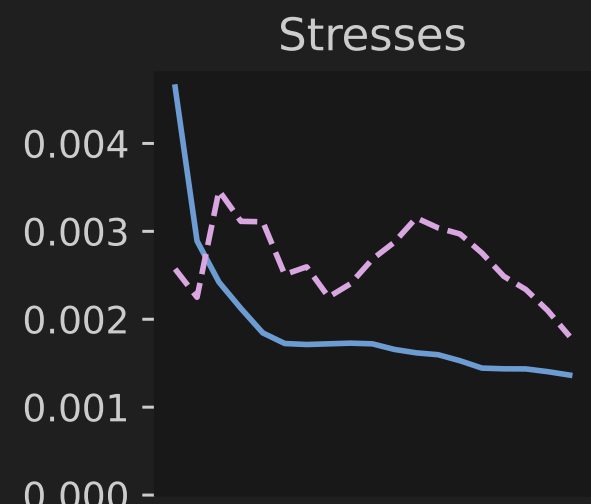
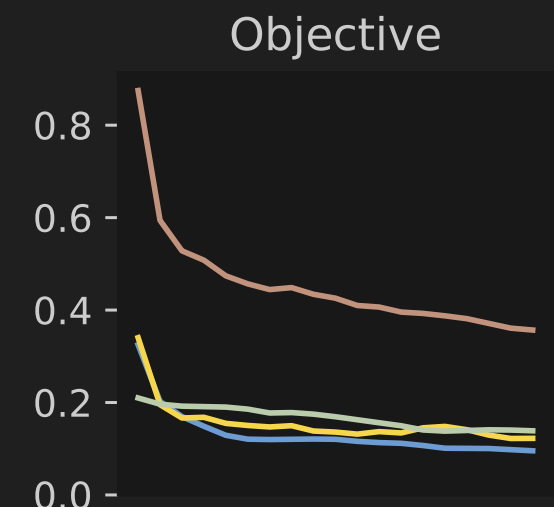
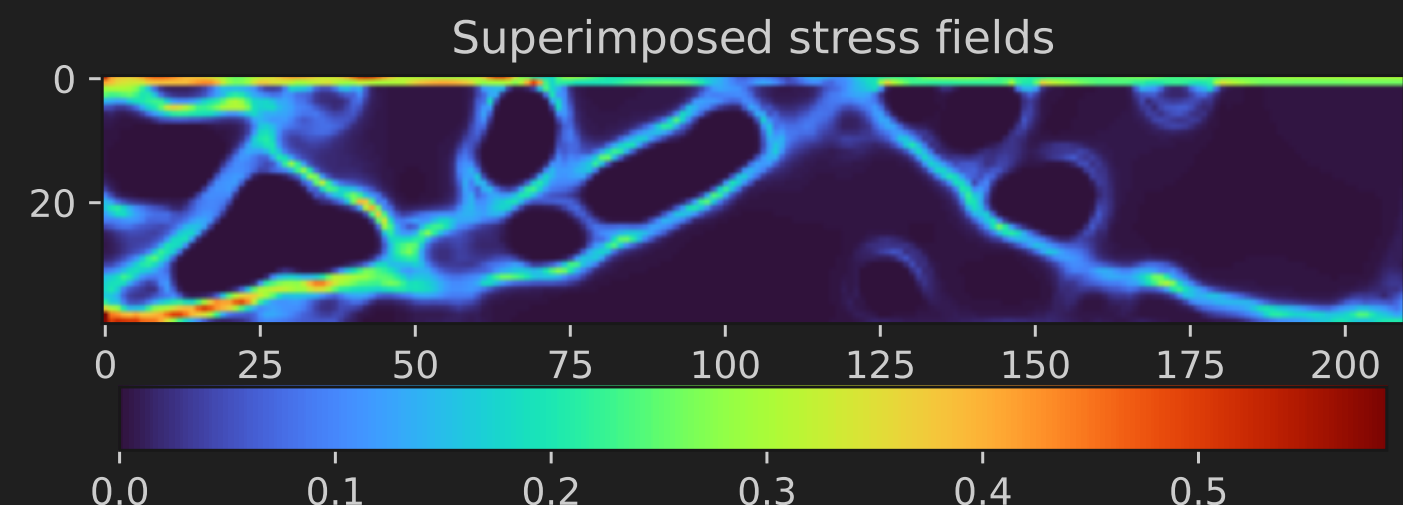
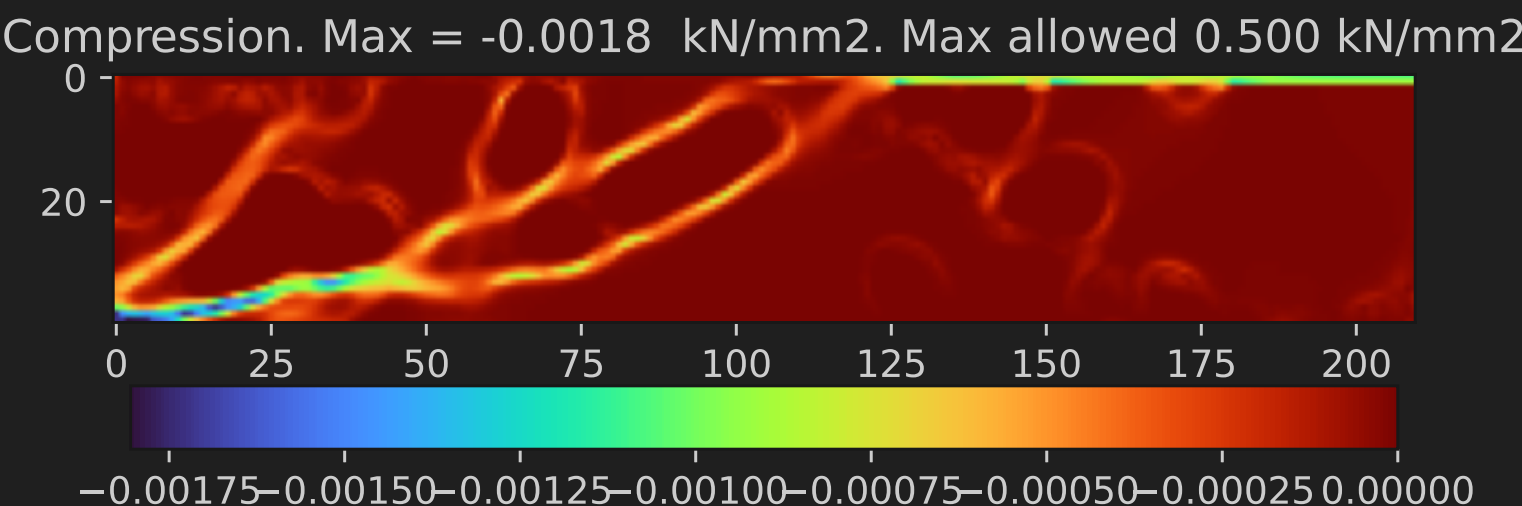
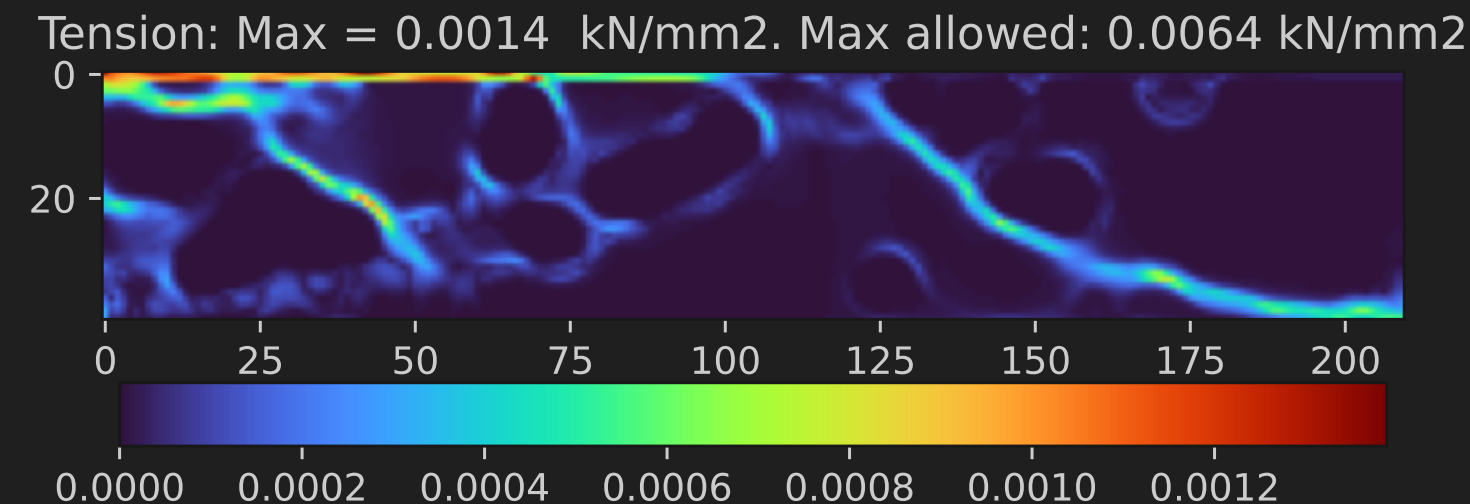
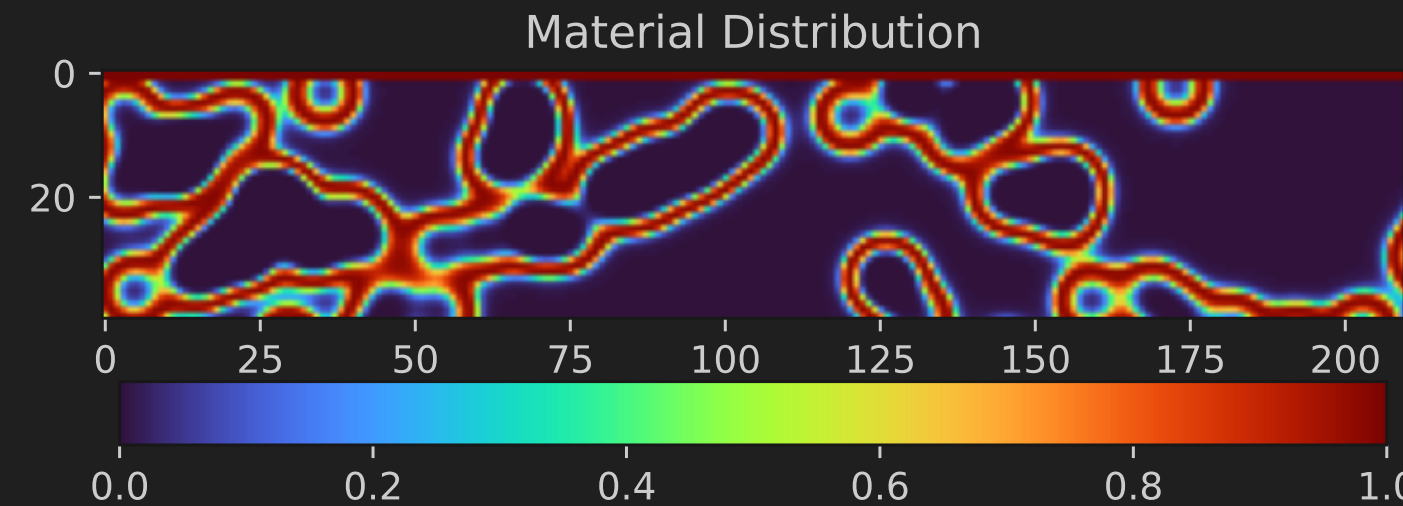
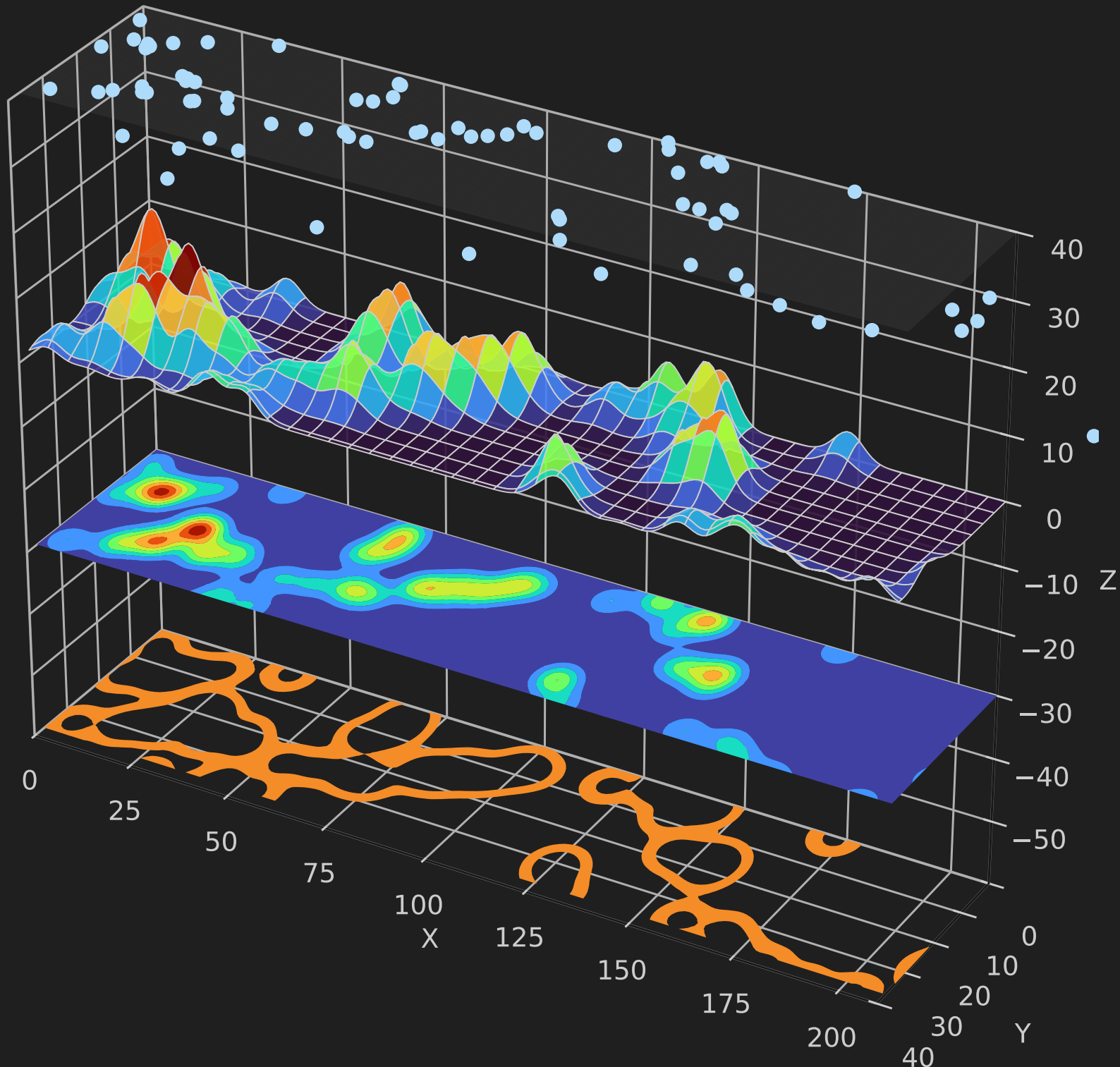
Objective = (Stress: 70 * 0.0014) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.12) = 0.36

Spread Gaussian = 4.81 Shift = 2.13 Iteration = 017



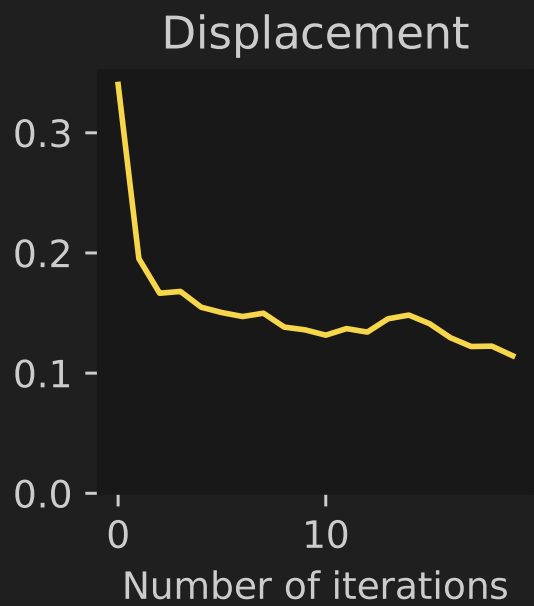
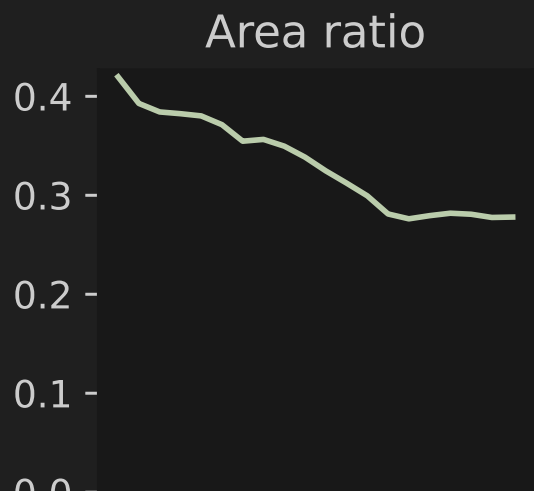
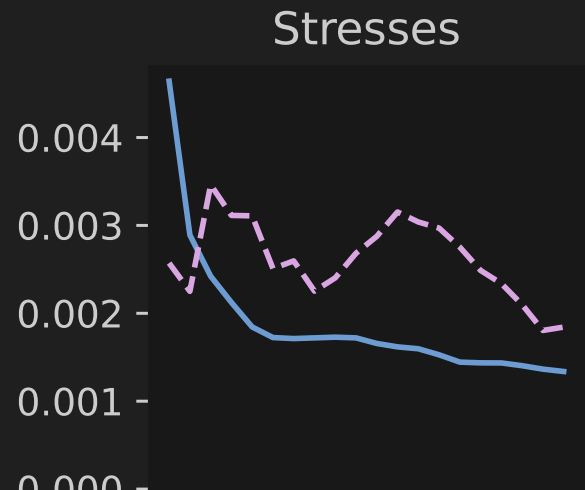
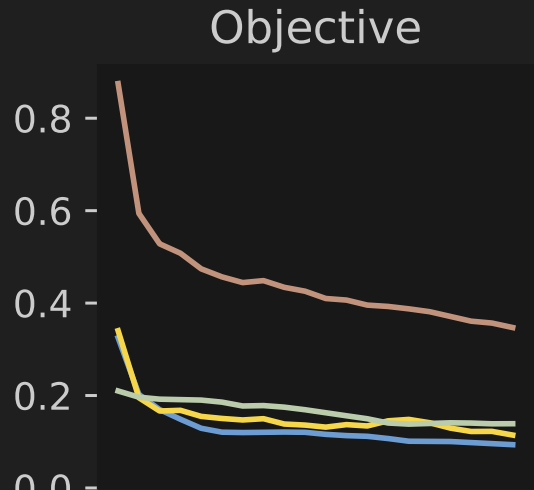
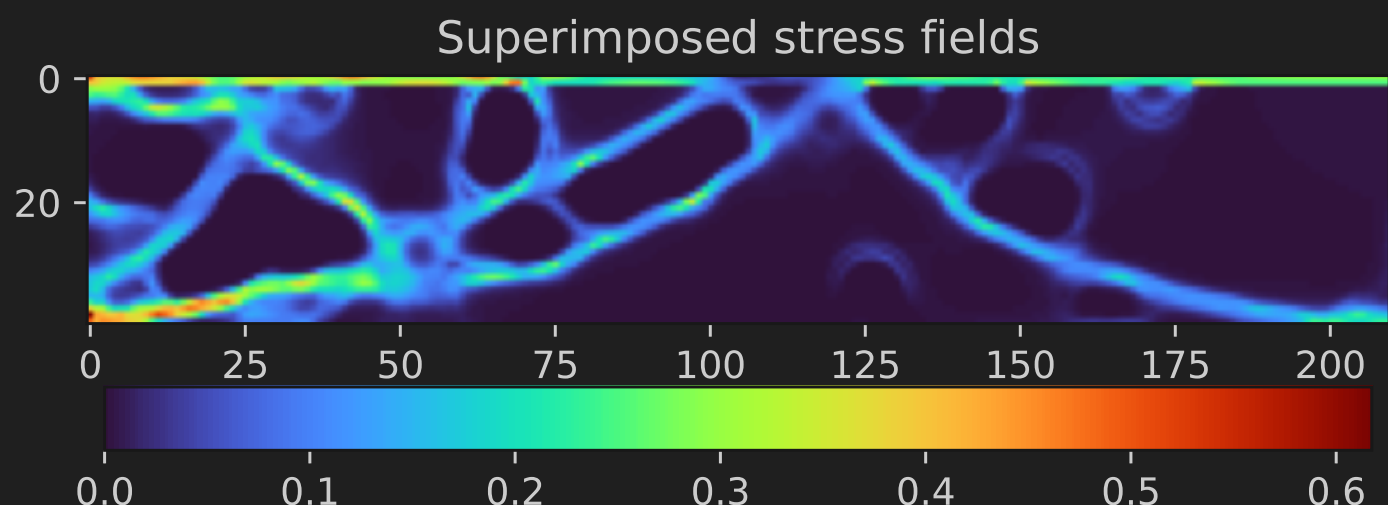
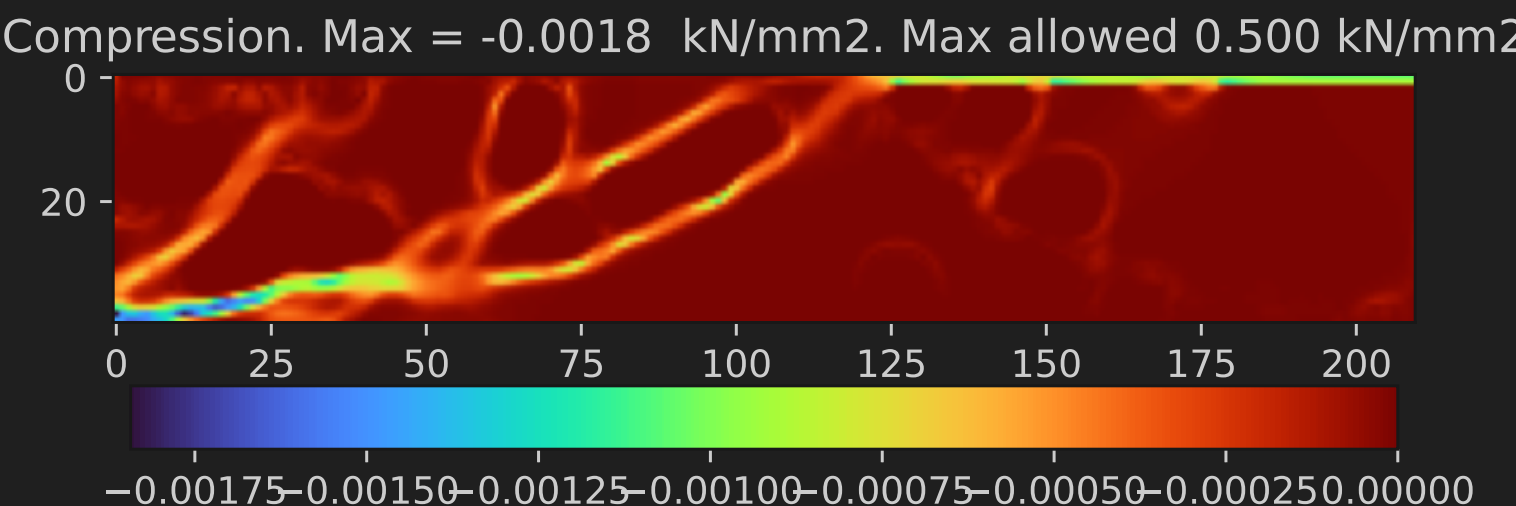
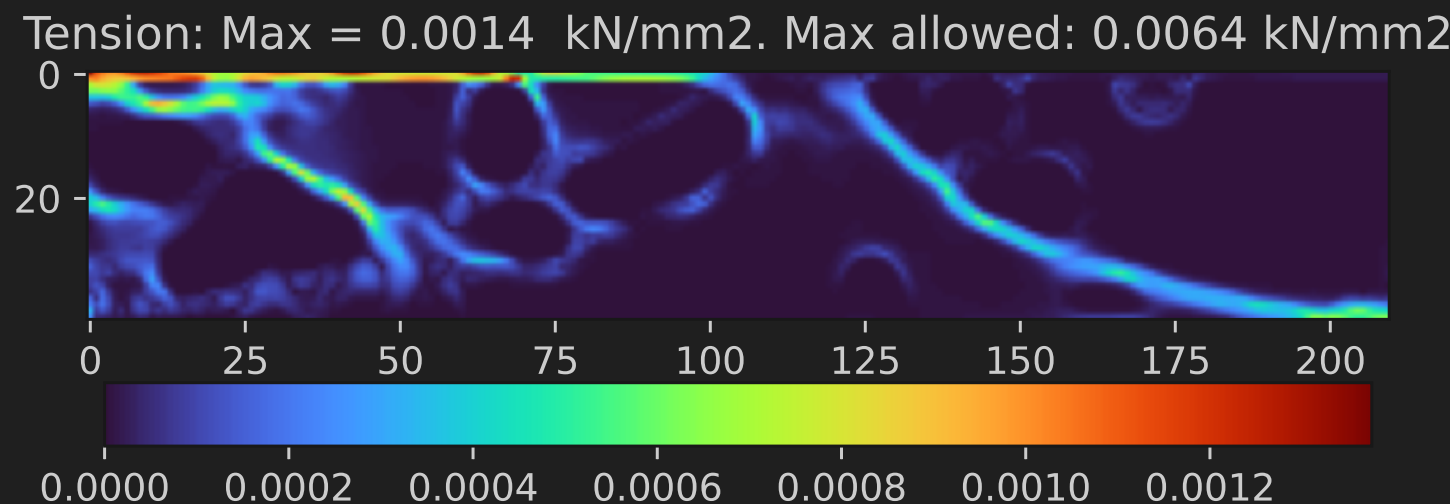
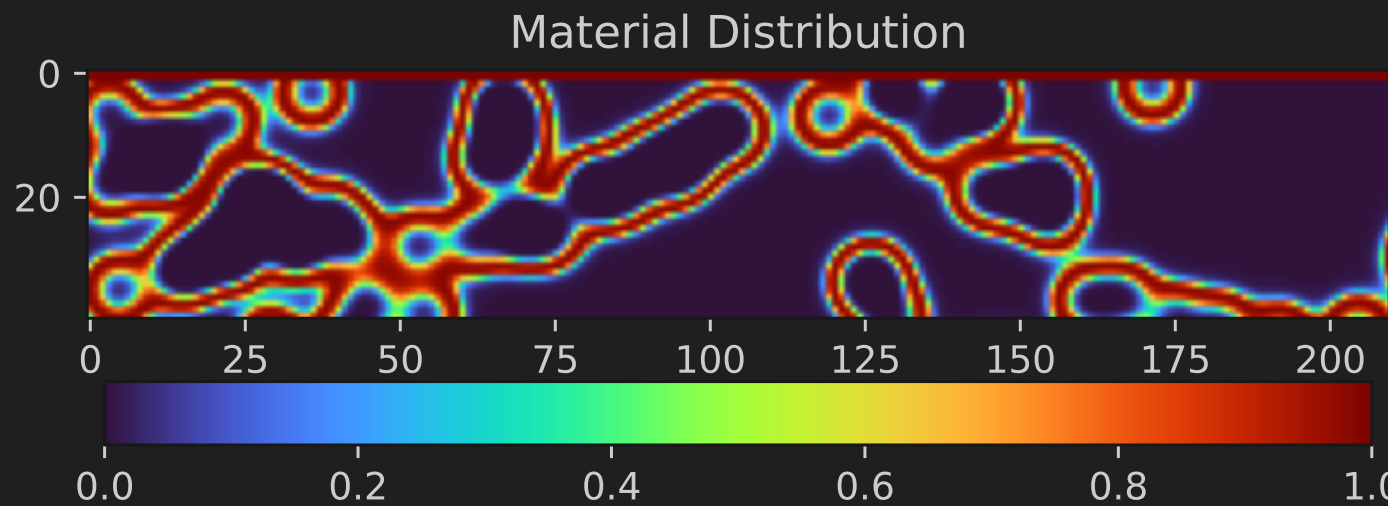
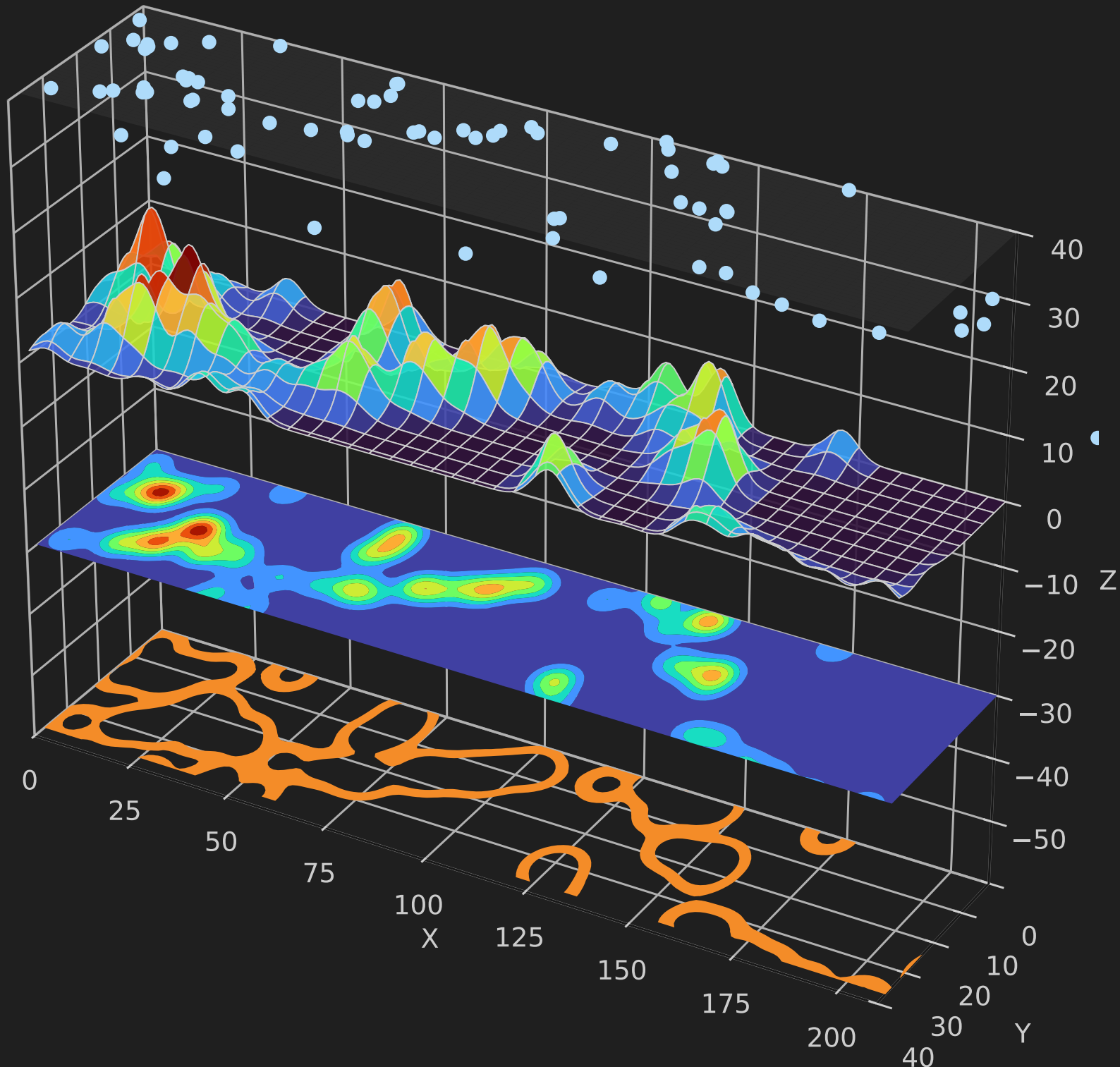
Objective = (Stress: 70 * 0.0014) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.12) = 0.36

Spread Gaussian = 4.78 Shift = 2.16 Iteration = 018



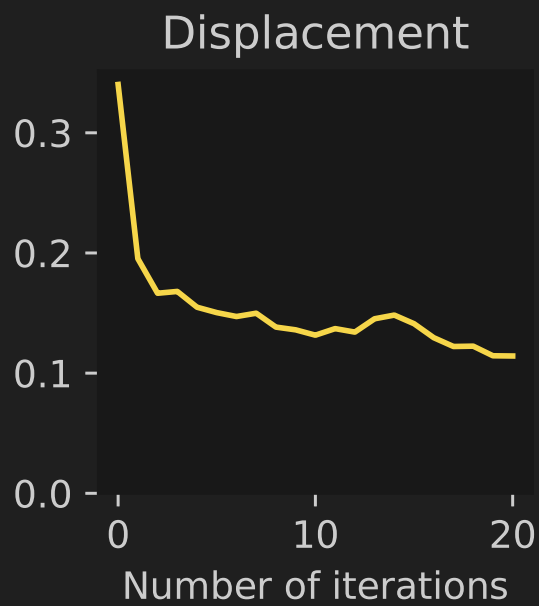
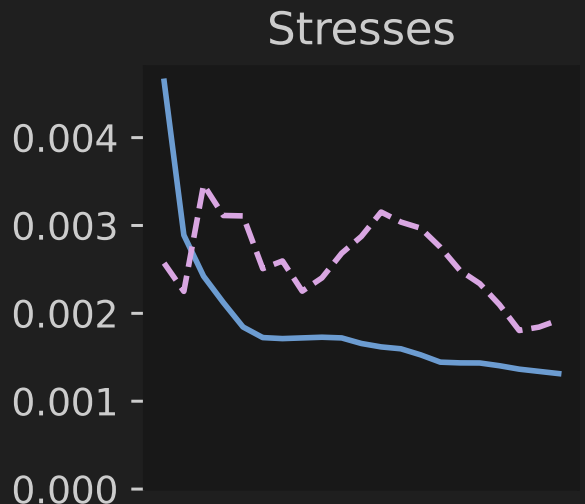
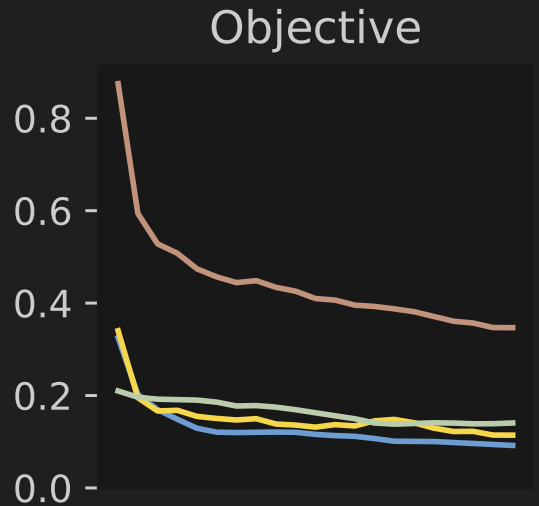
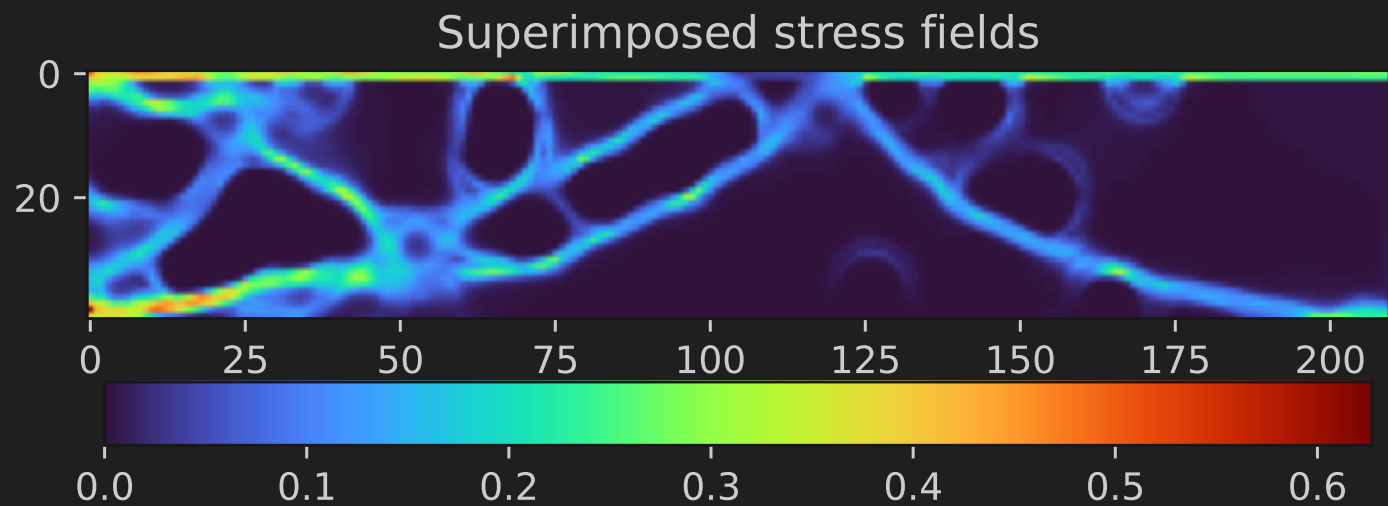
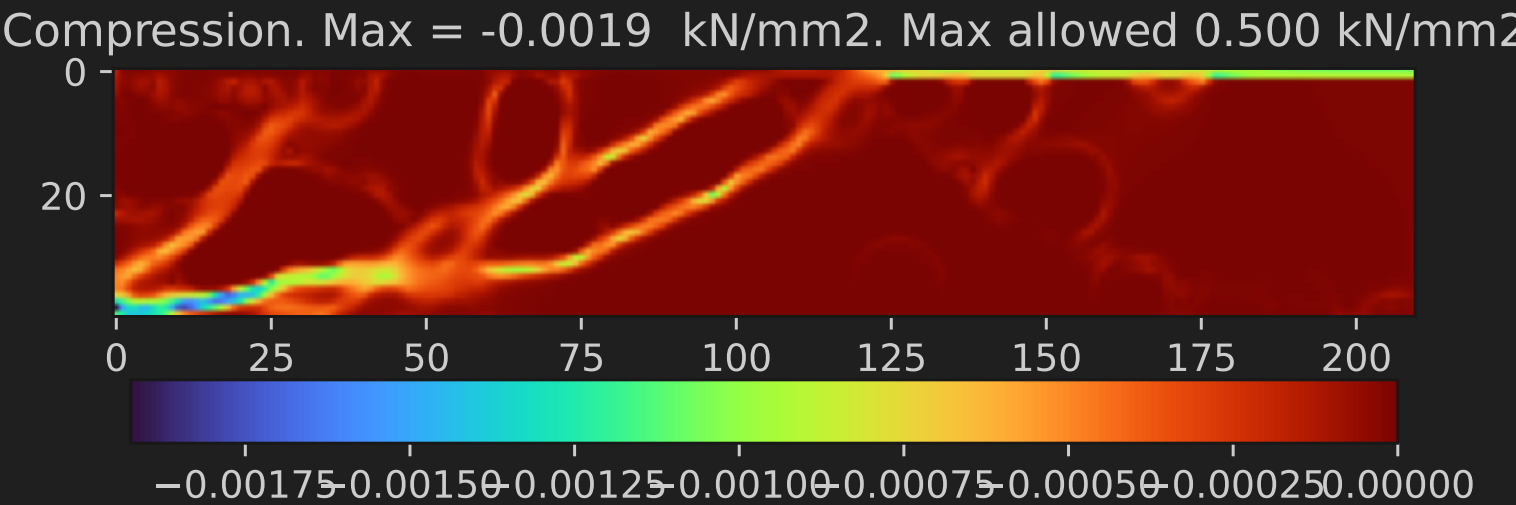
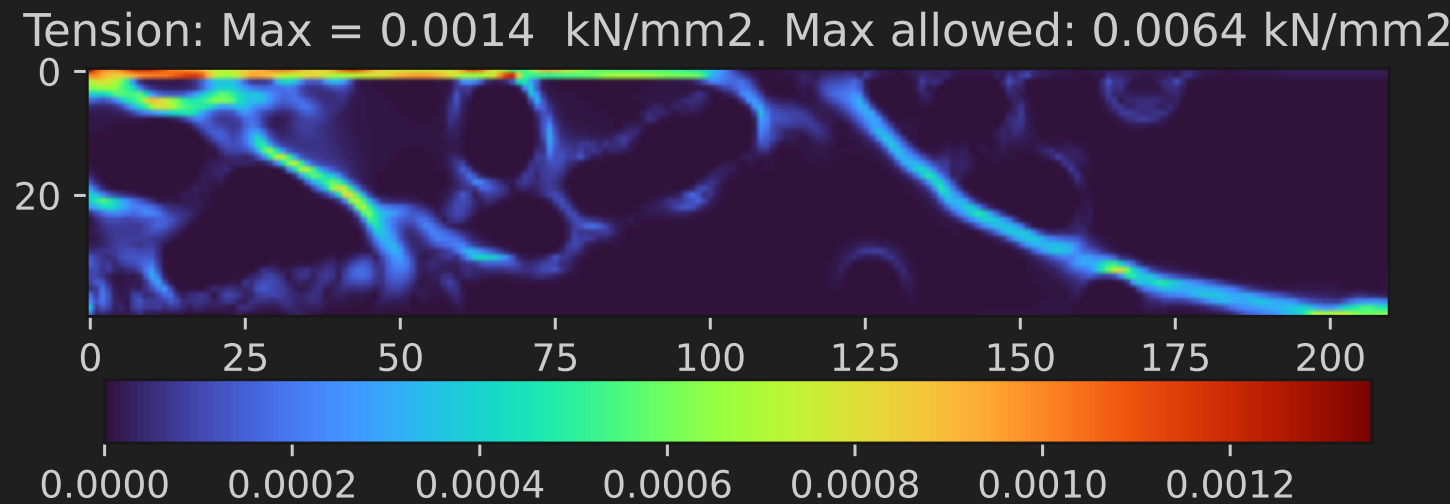
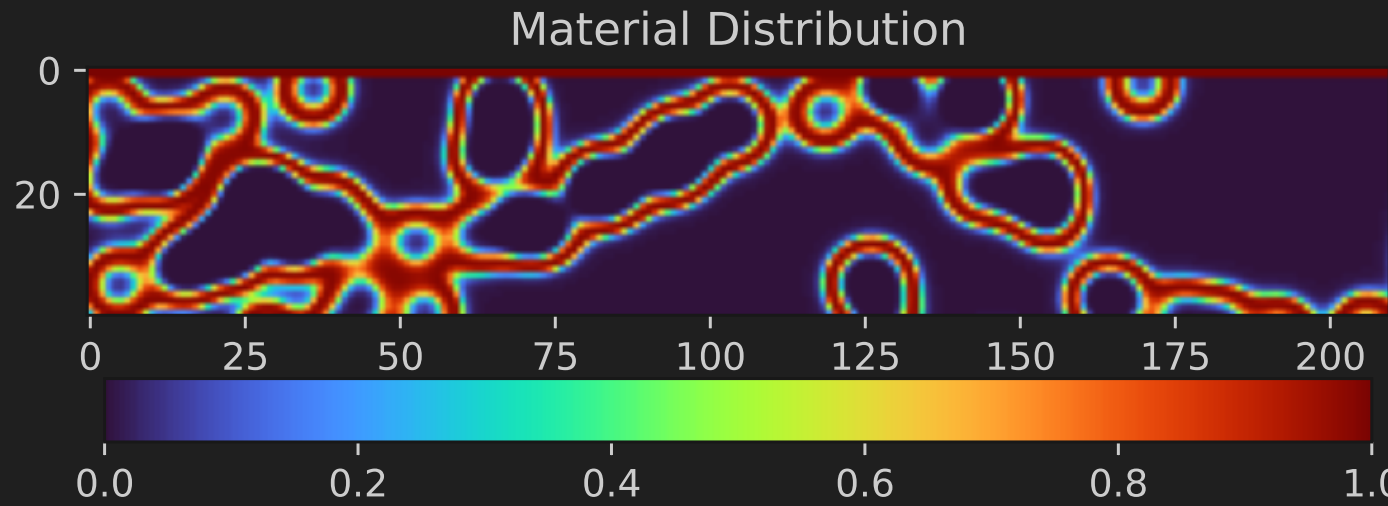
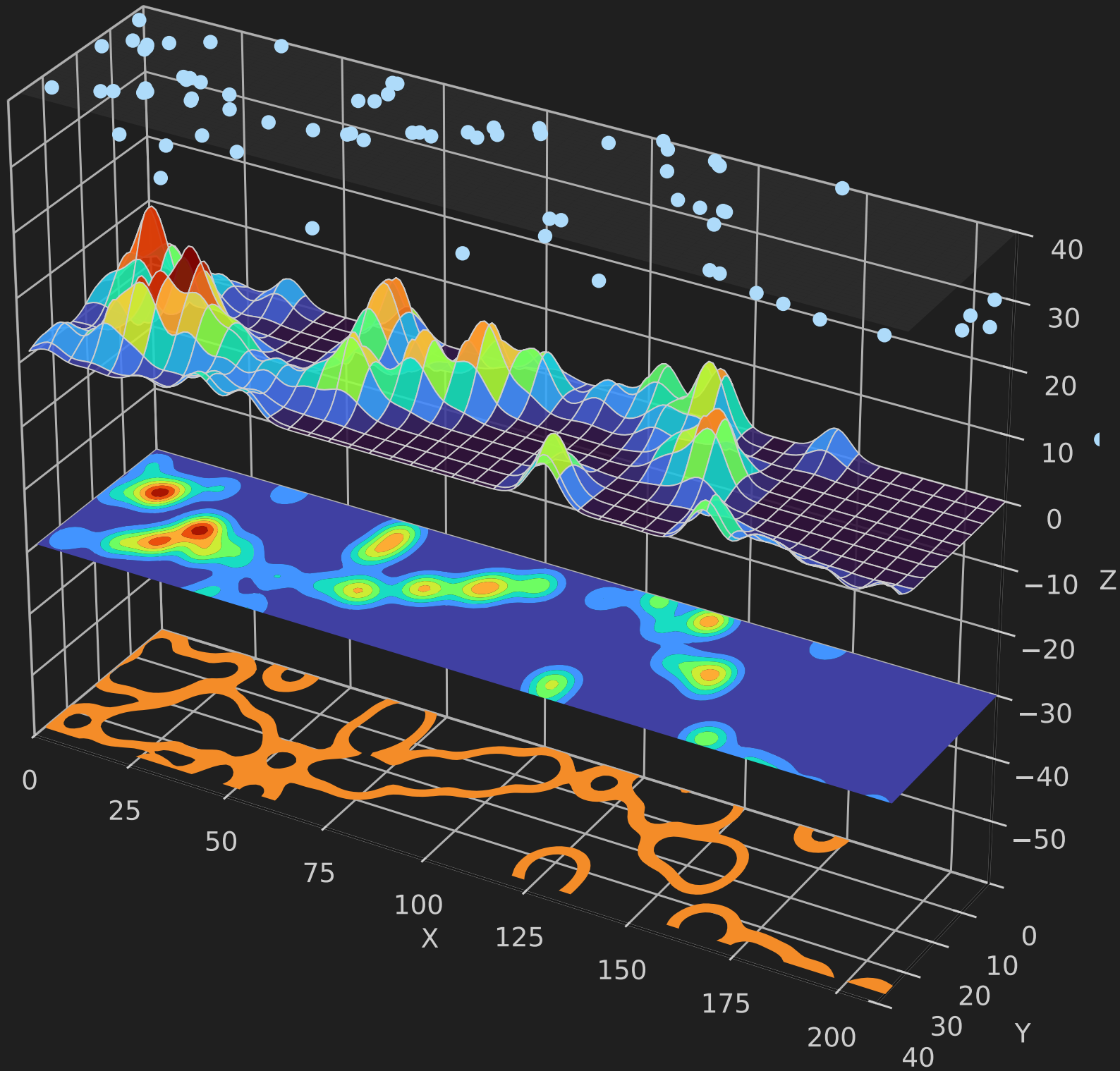
Objective = (Stress: 70 * 0.0013) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.11) = 0.35

Spread Gaussian = 4.77 Shift = 2.19 Iteration = 019



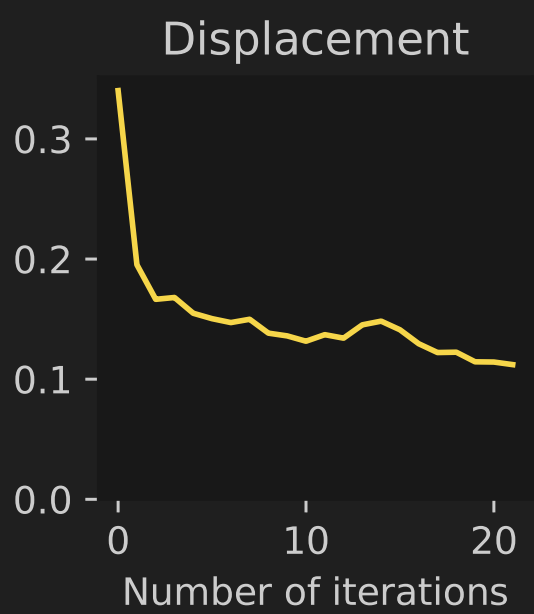
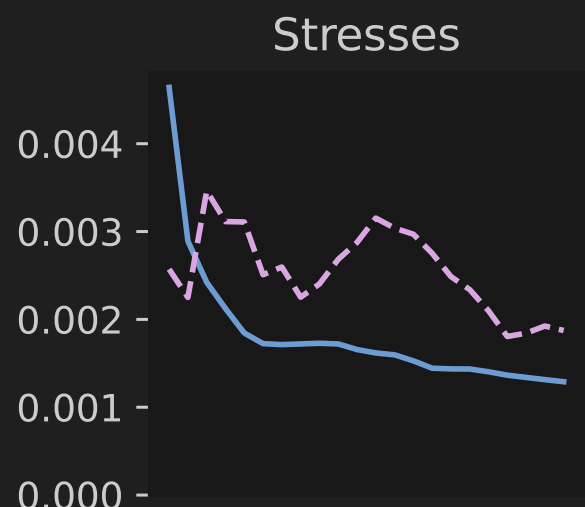
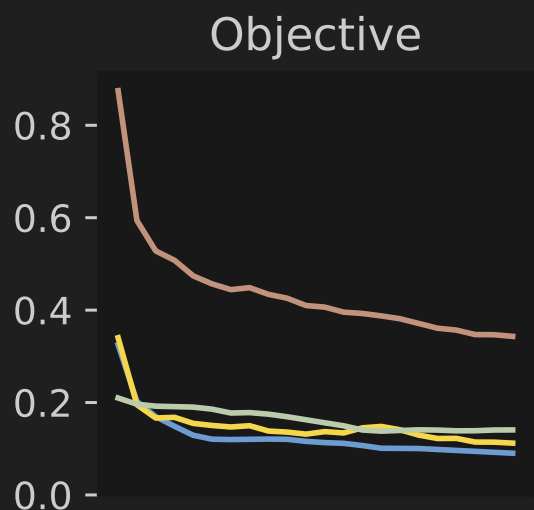
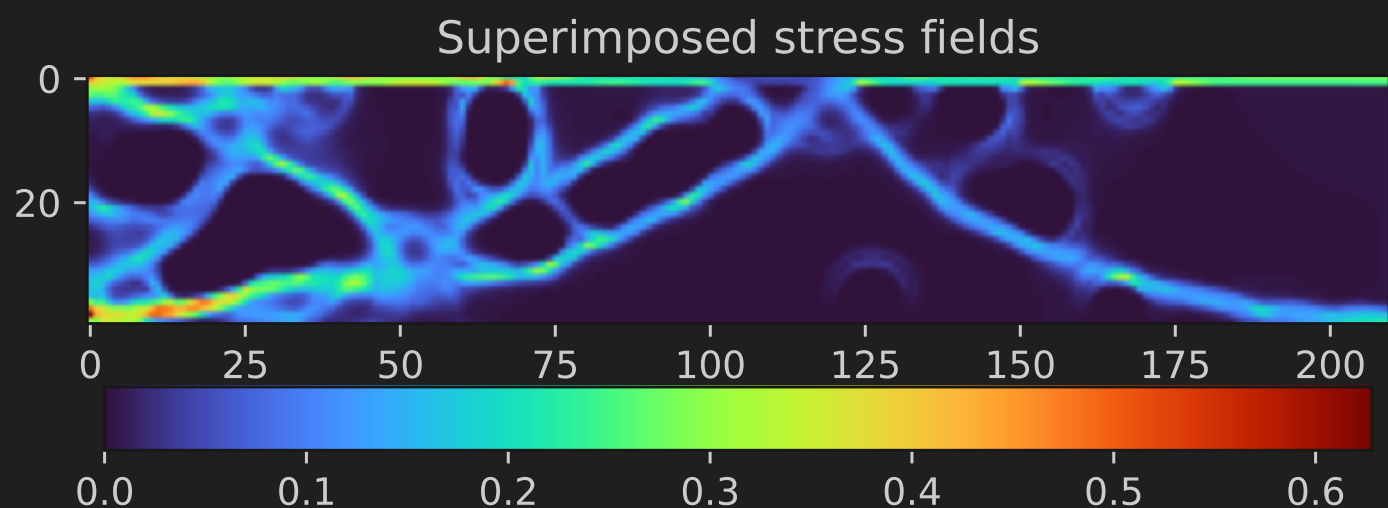
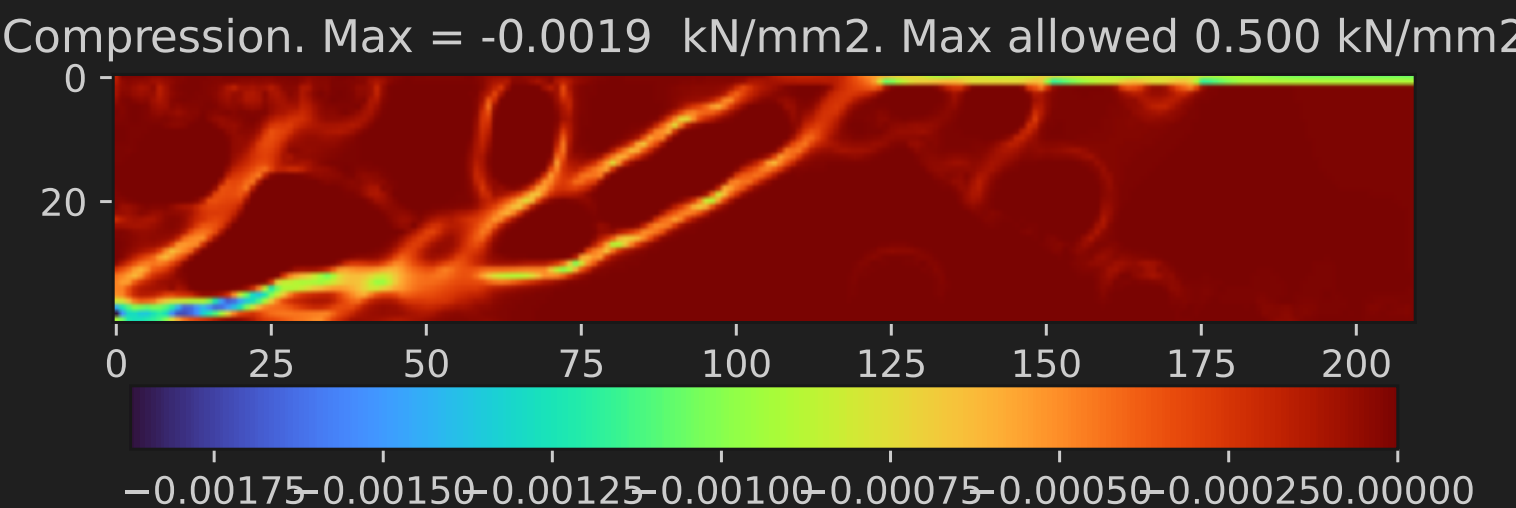
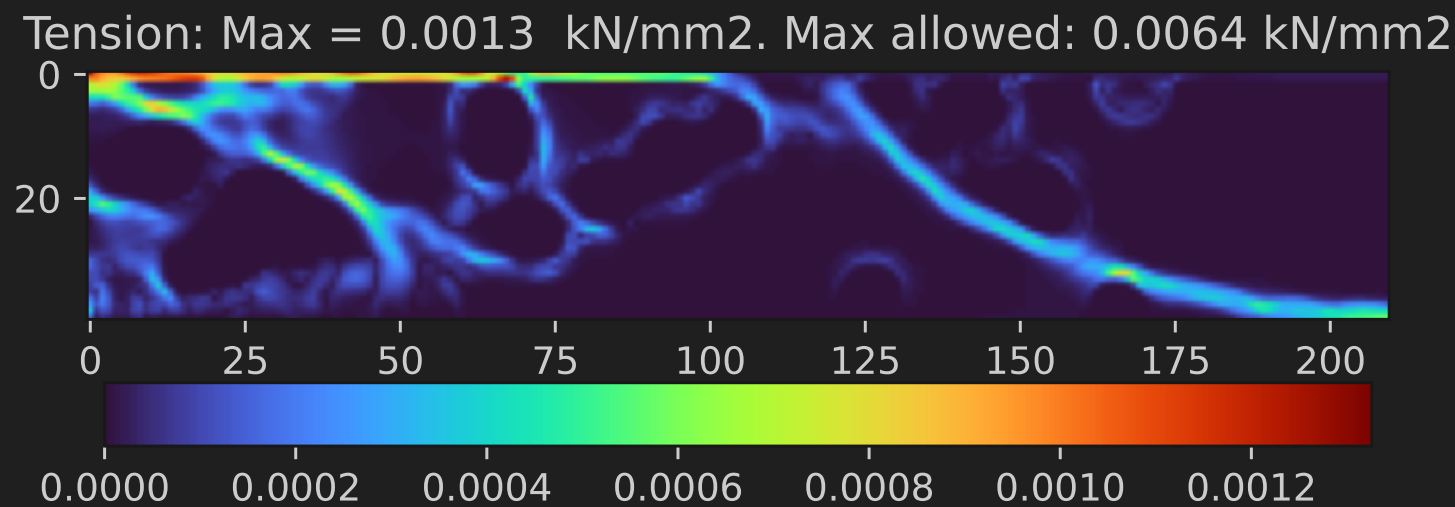
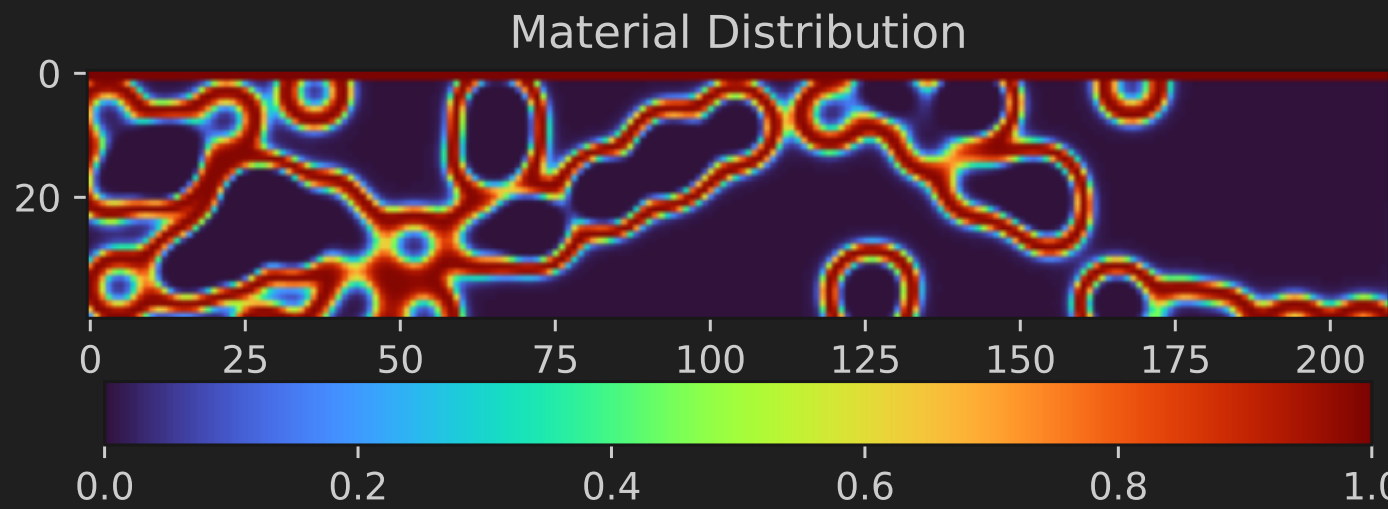
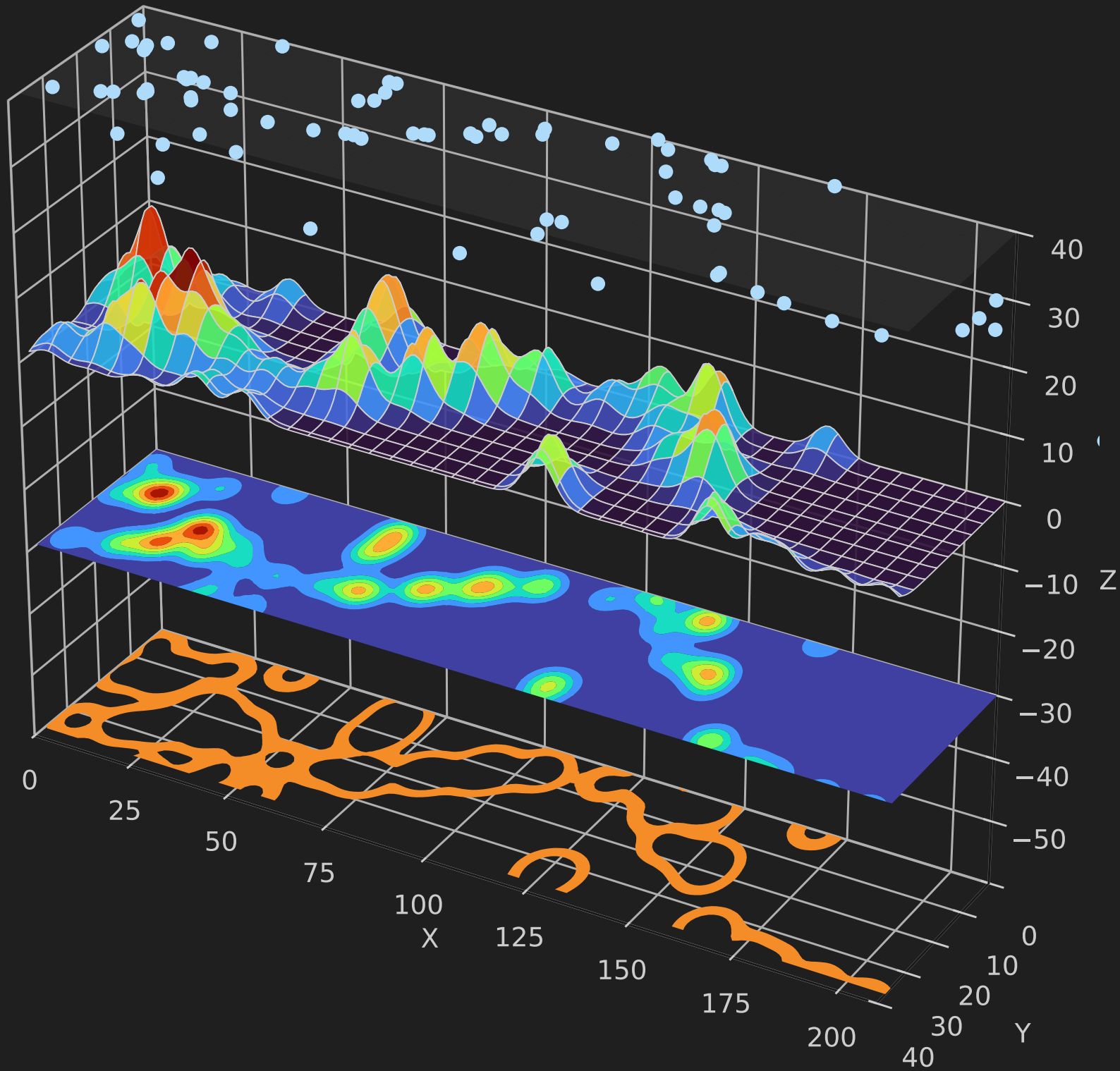
Objective = (Stress: 70 * 0.0013) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.11) = 0.35

Spread Gaussian = 4.74 Shift = 2.22 Iteration = 020



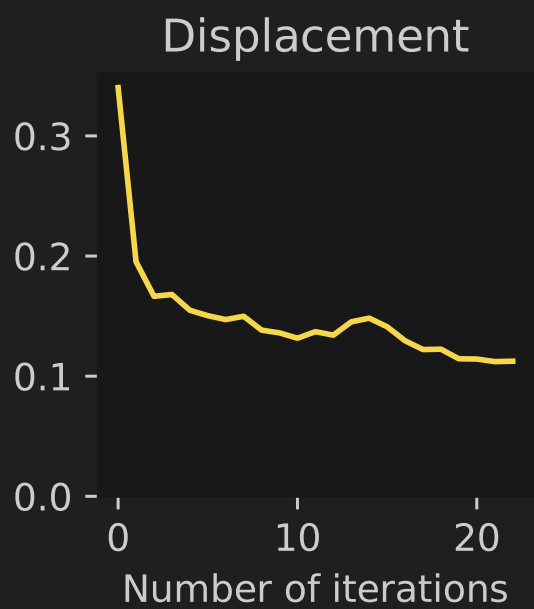
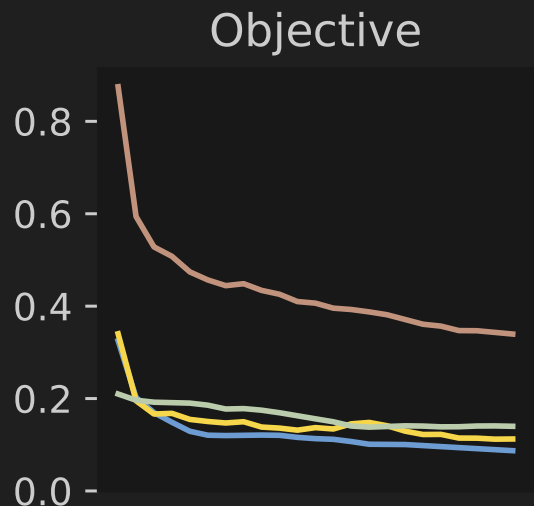
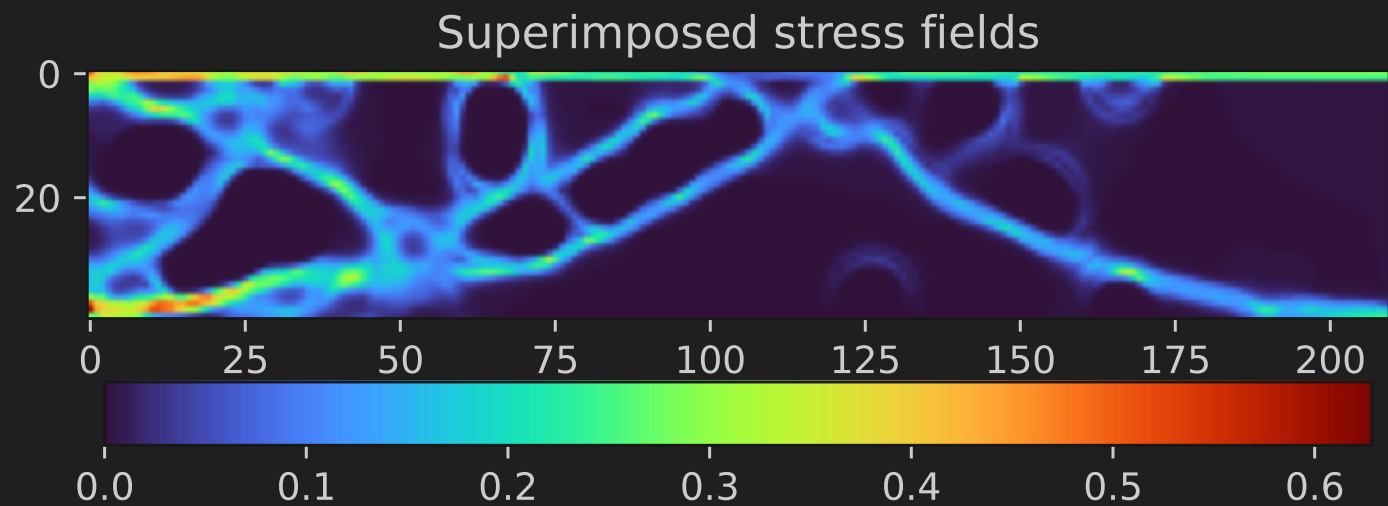
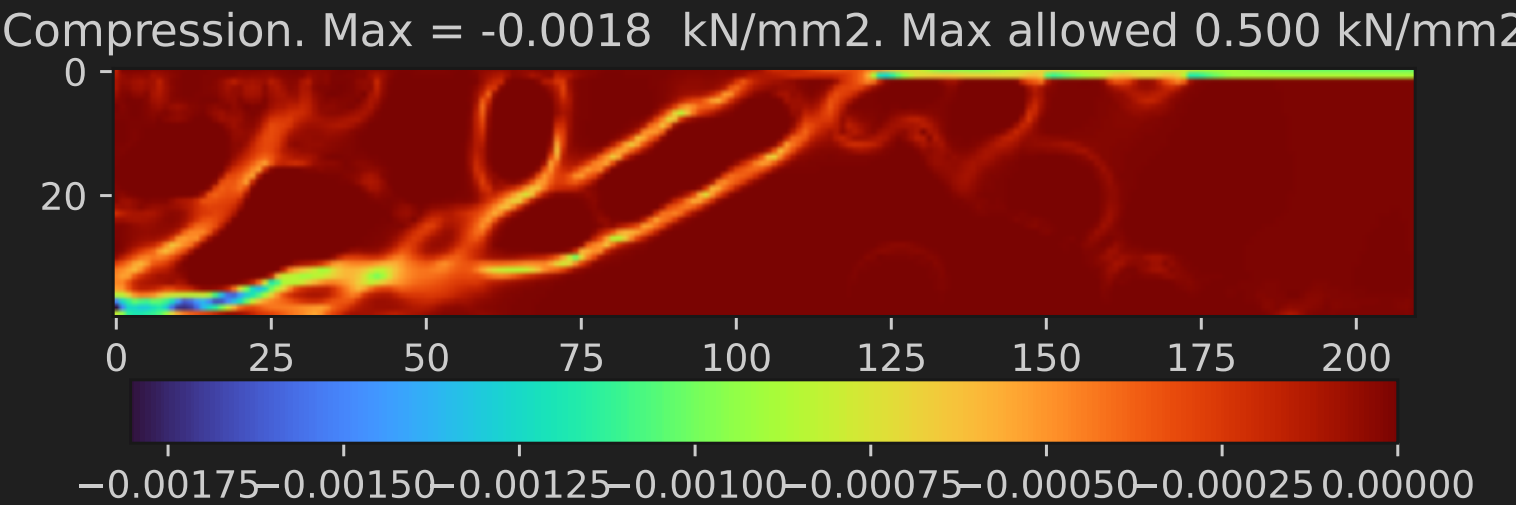
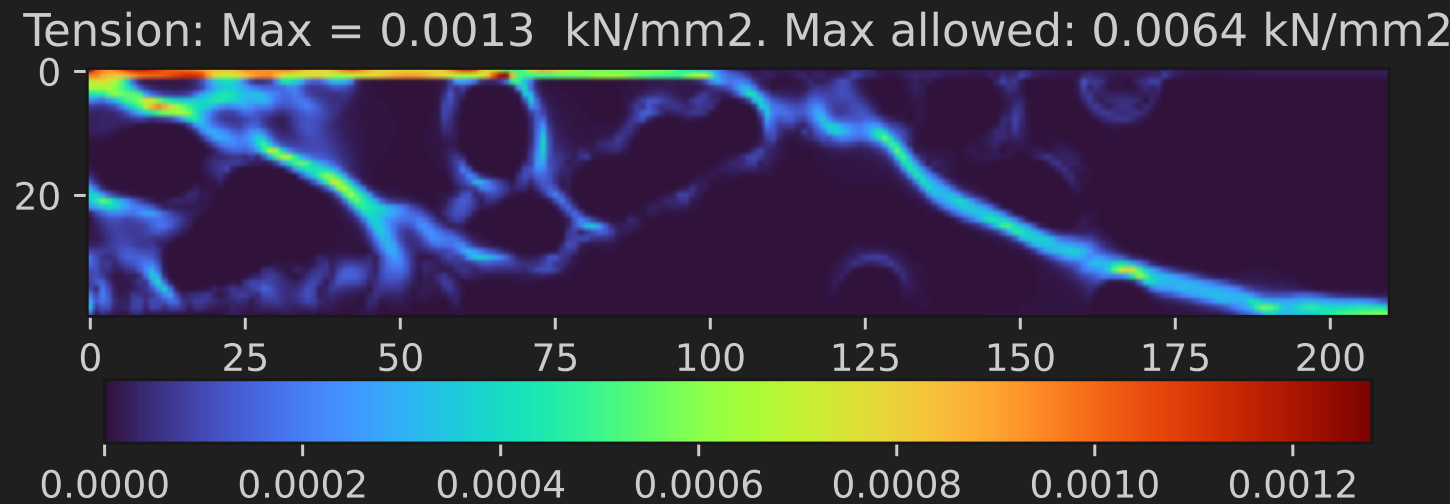
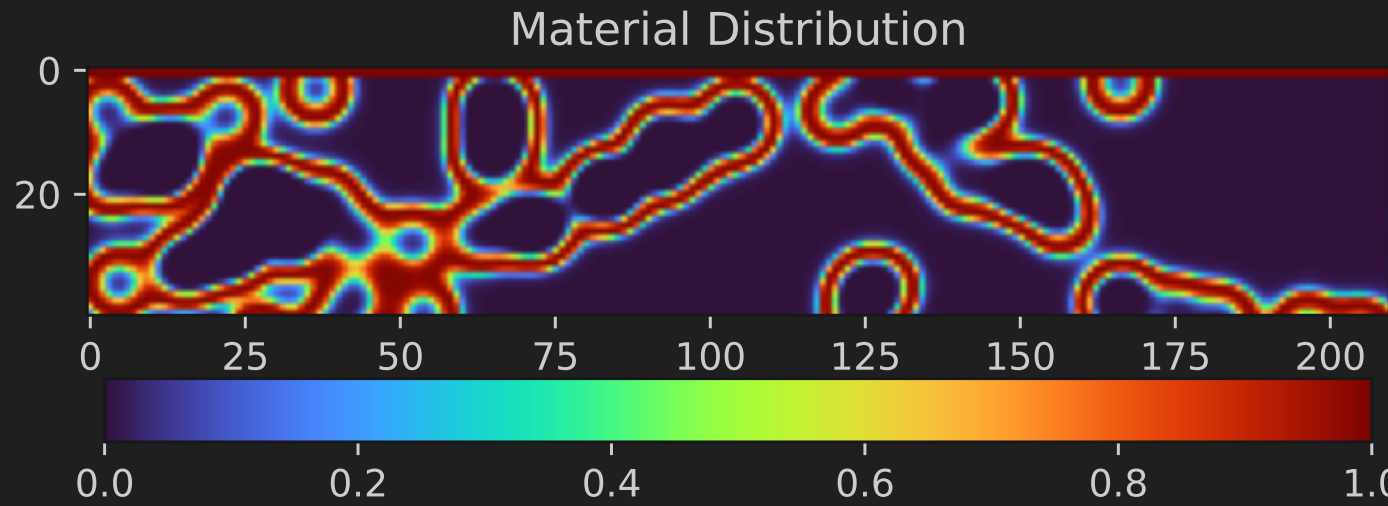
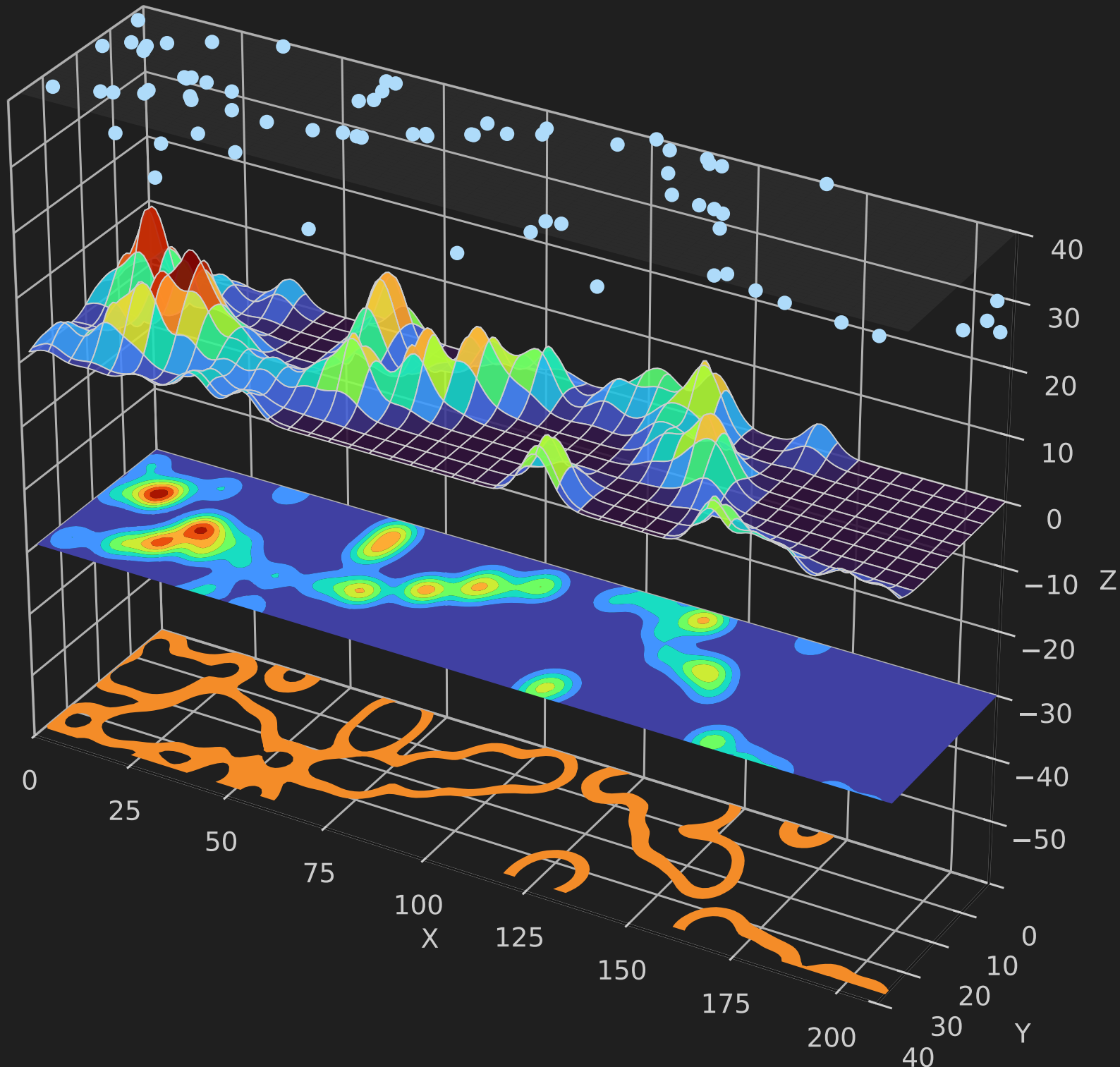
Objective = (Stress: 70 * 0.0013) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.11) = 0.34

Spread Gaussian = 4.73 Shift = 2.25 Iteration = 021



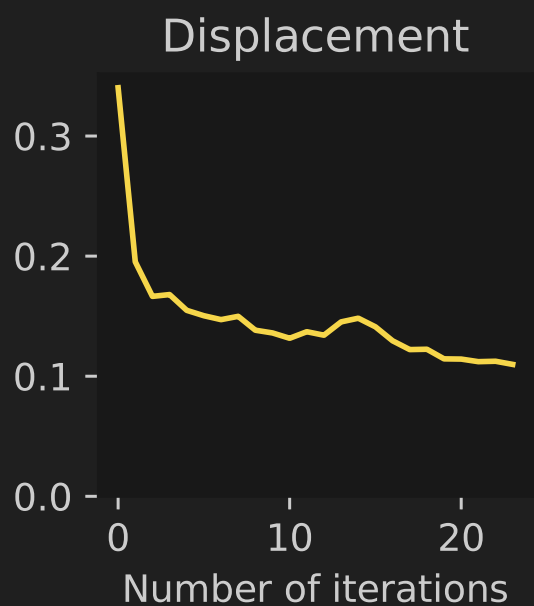
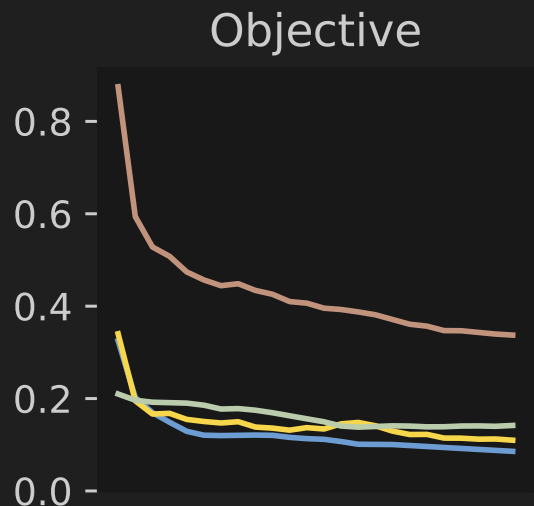
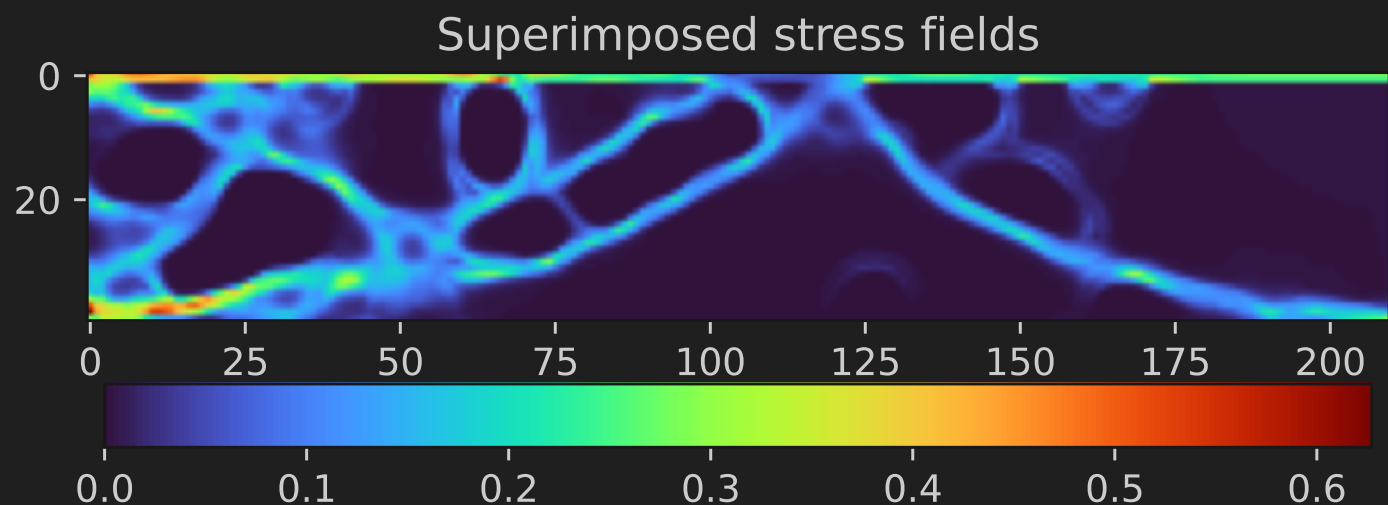
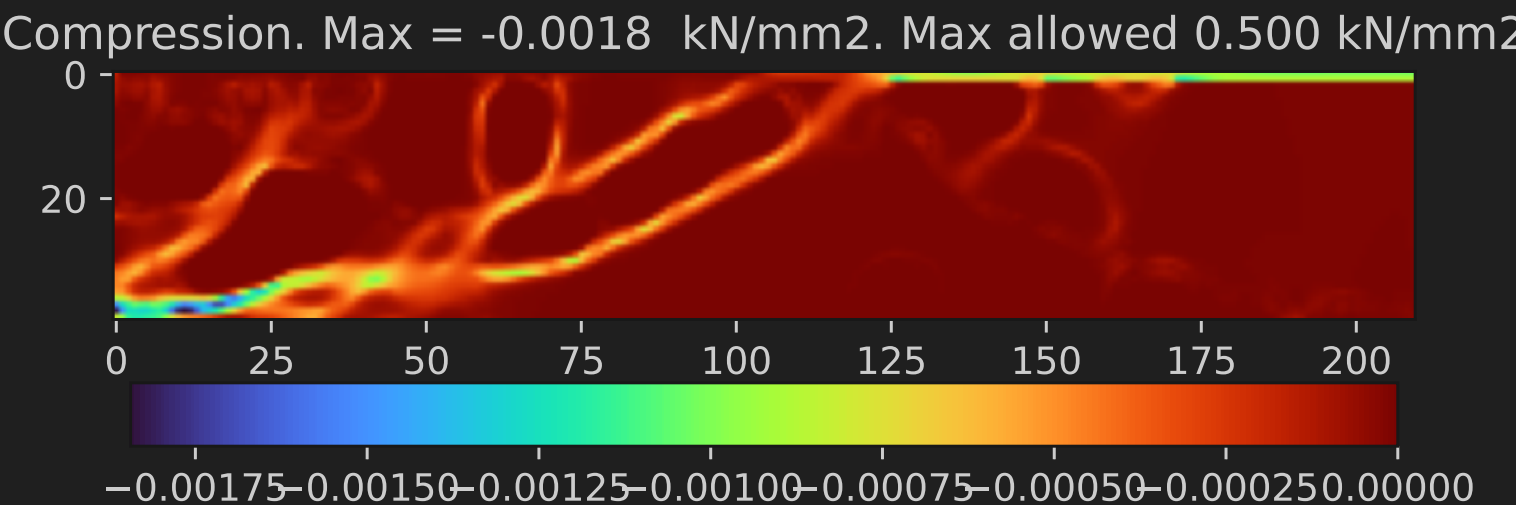
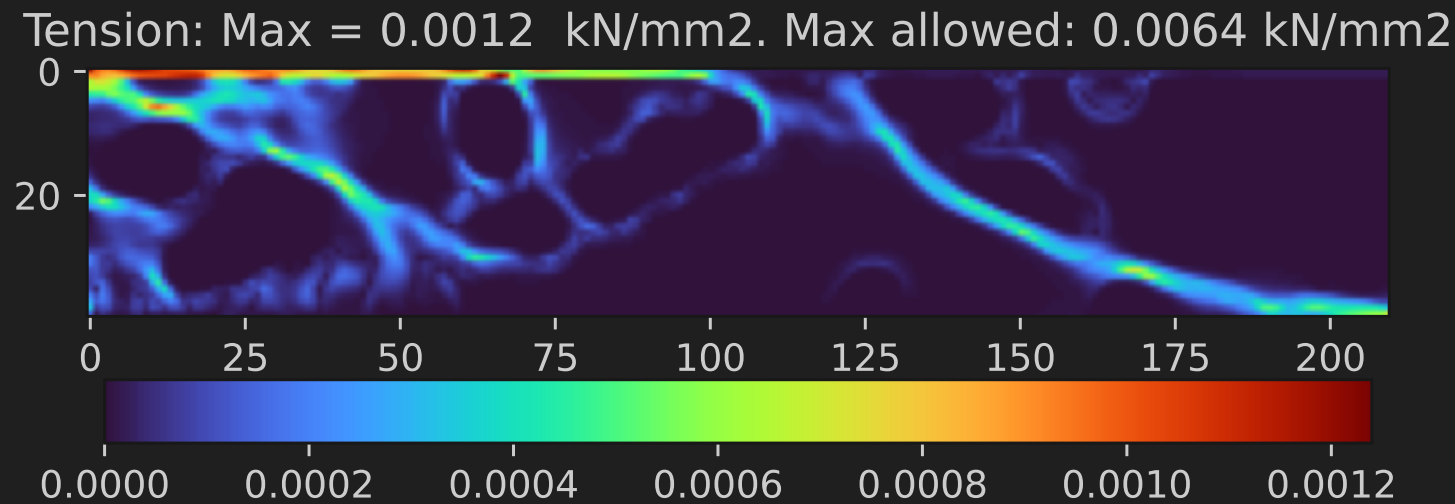
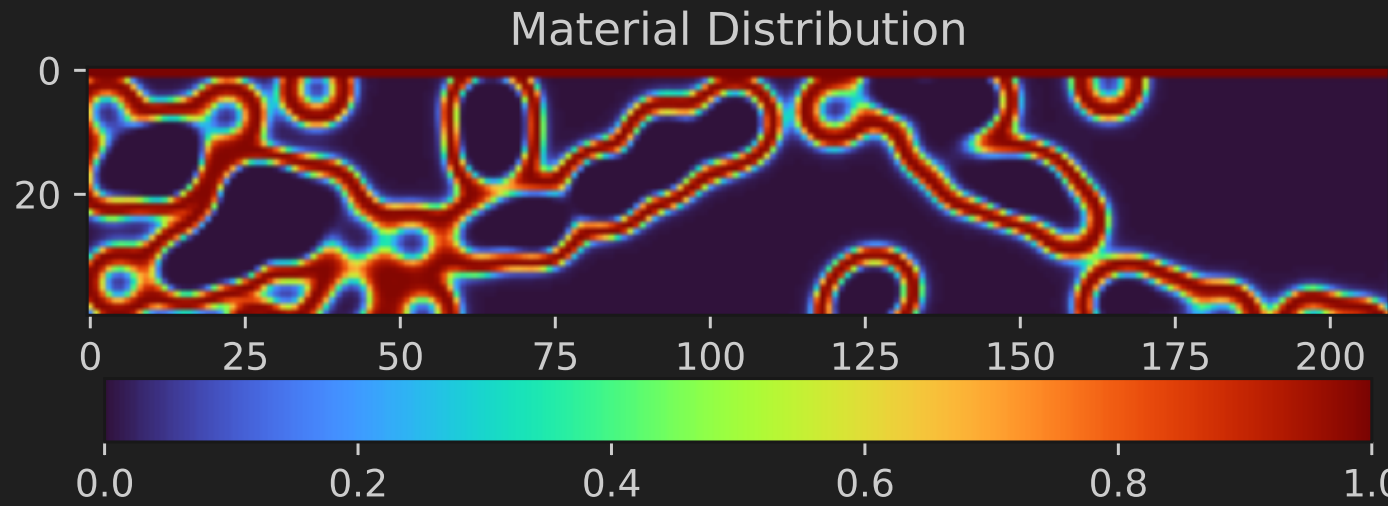
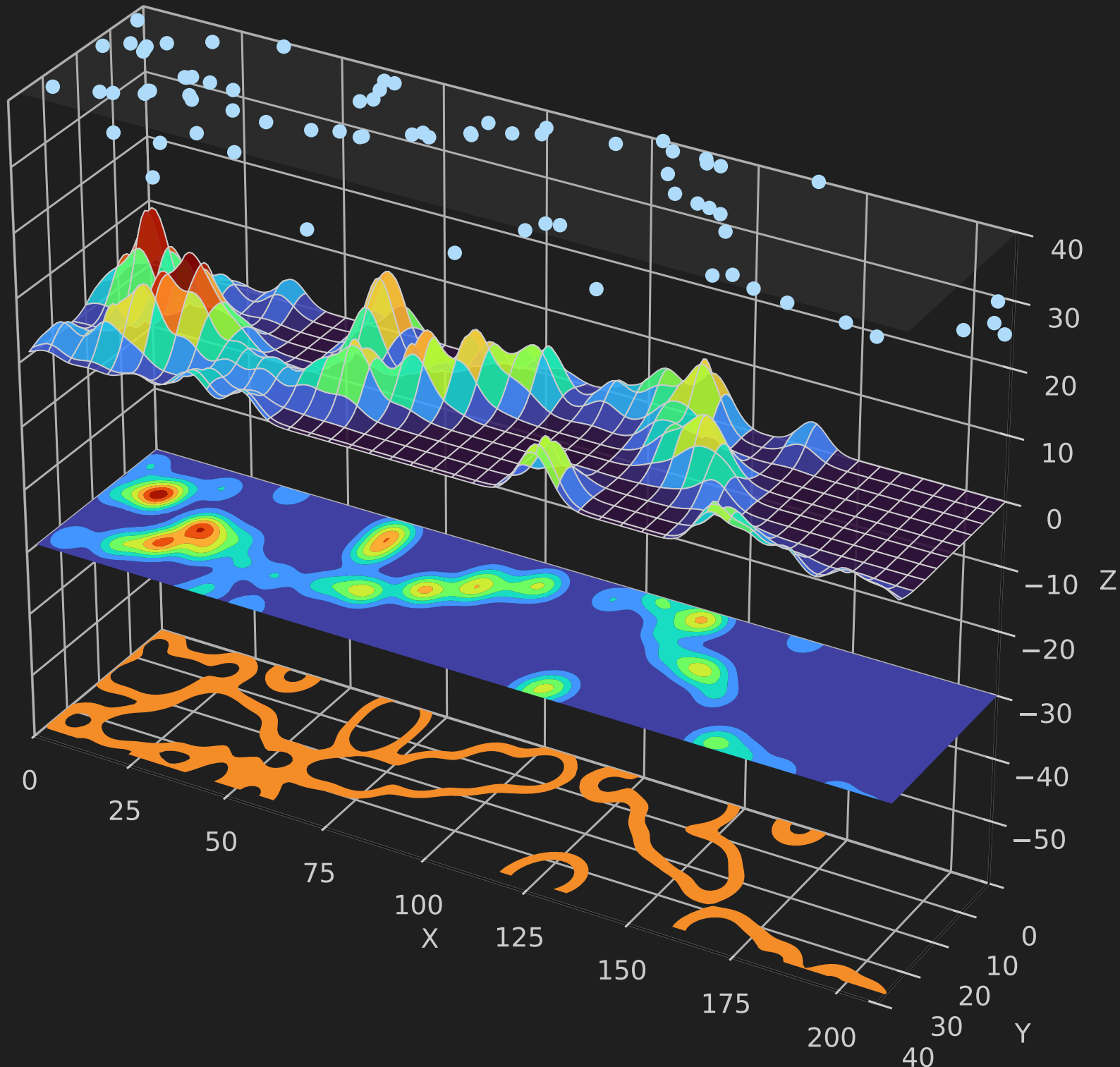
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.11) = 0.34

Spread Gaussian = 4.72 Shift = 2.27 Iteration = 022



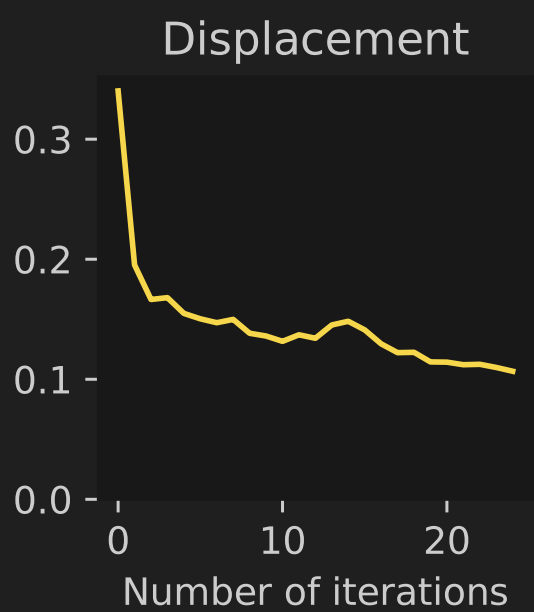
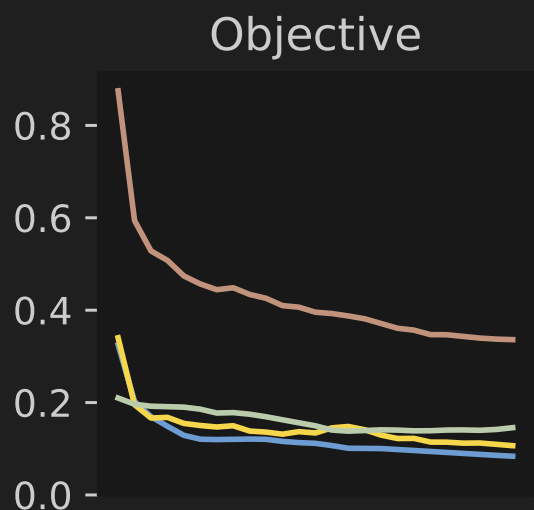
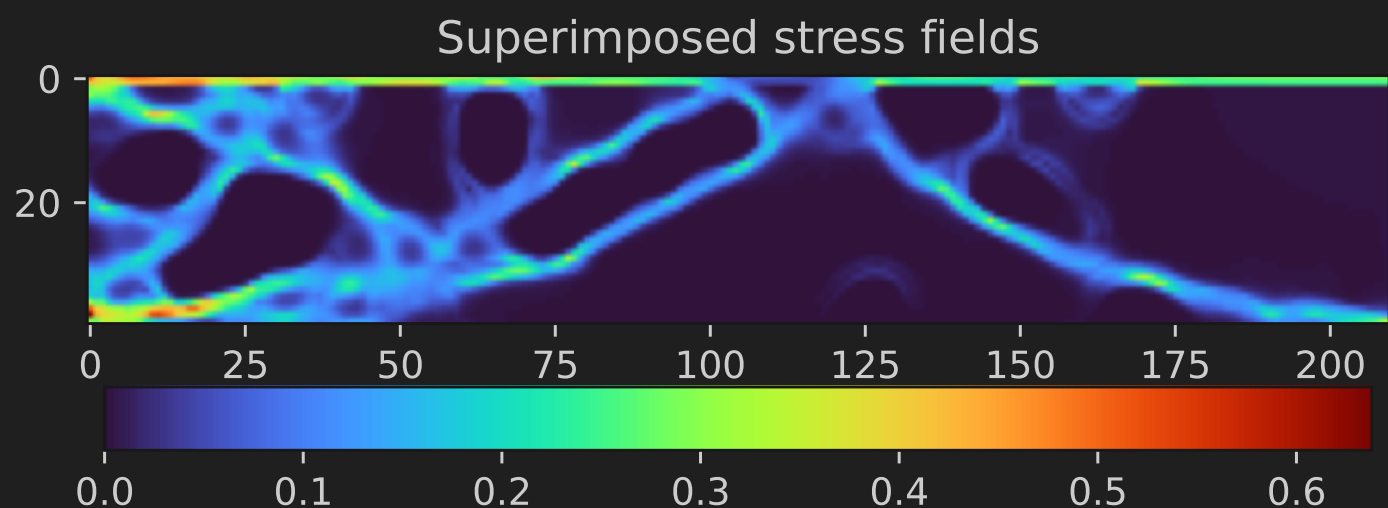
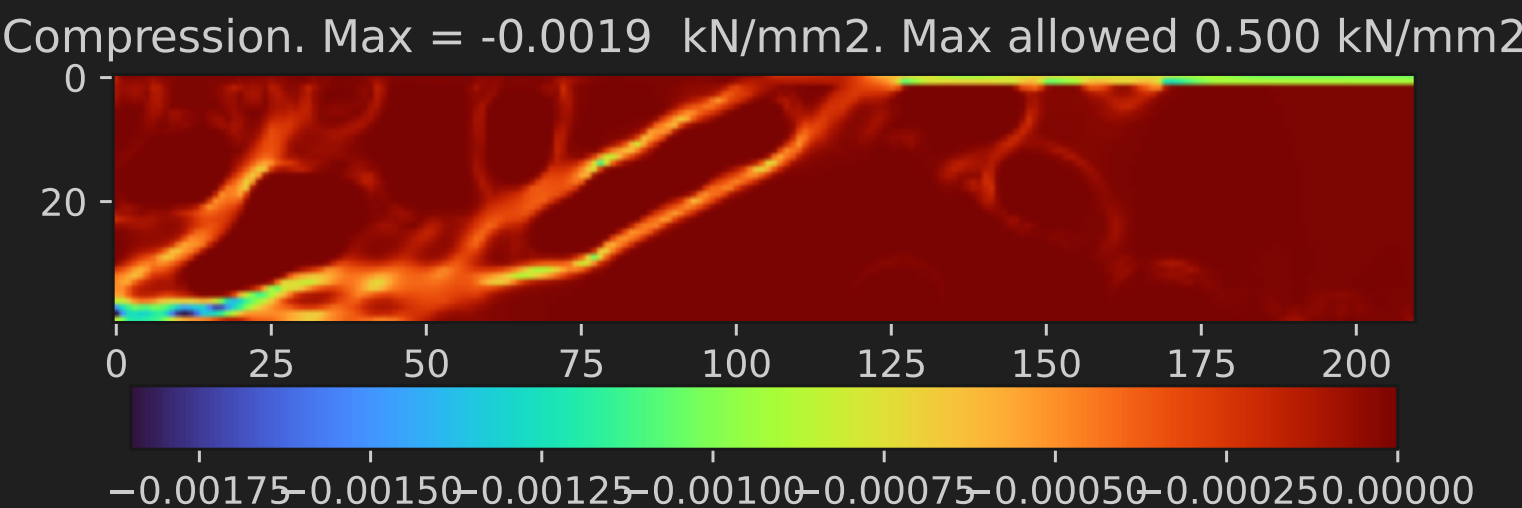
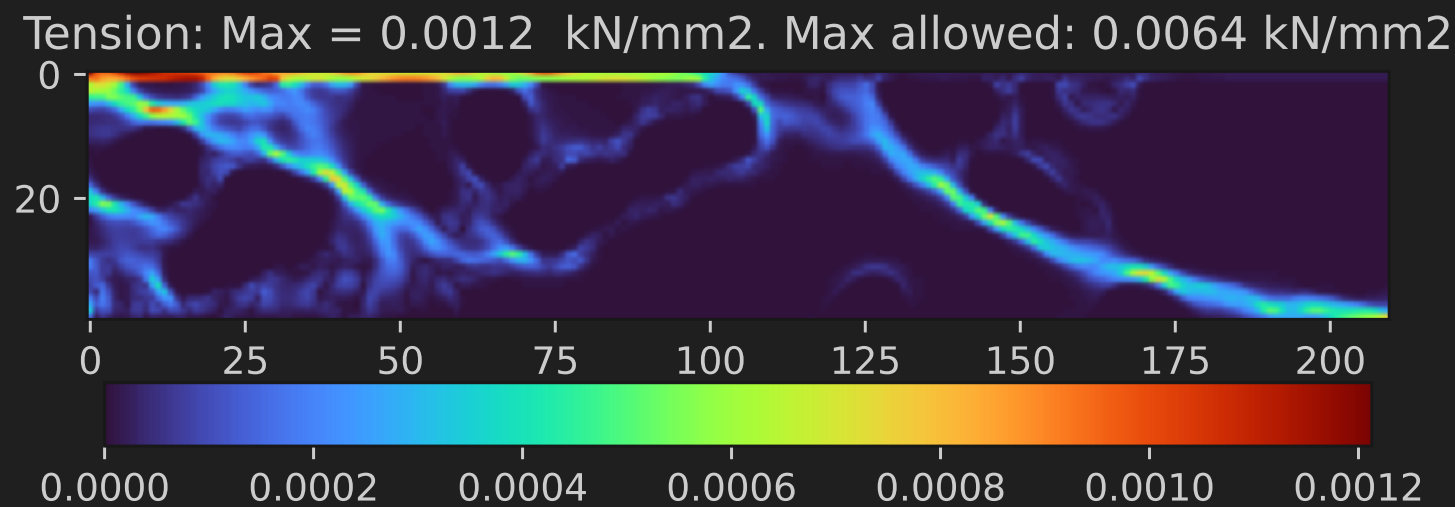
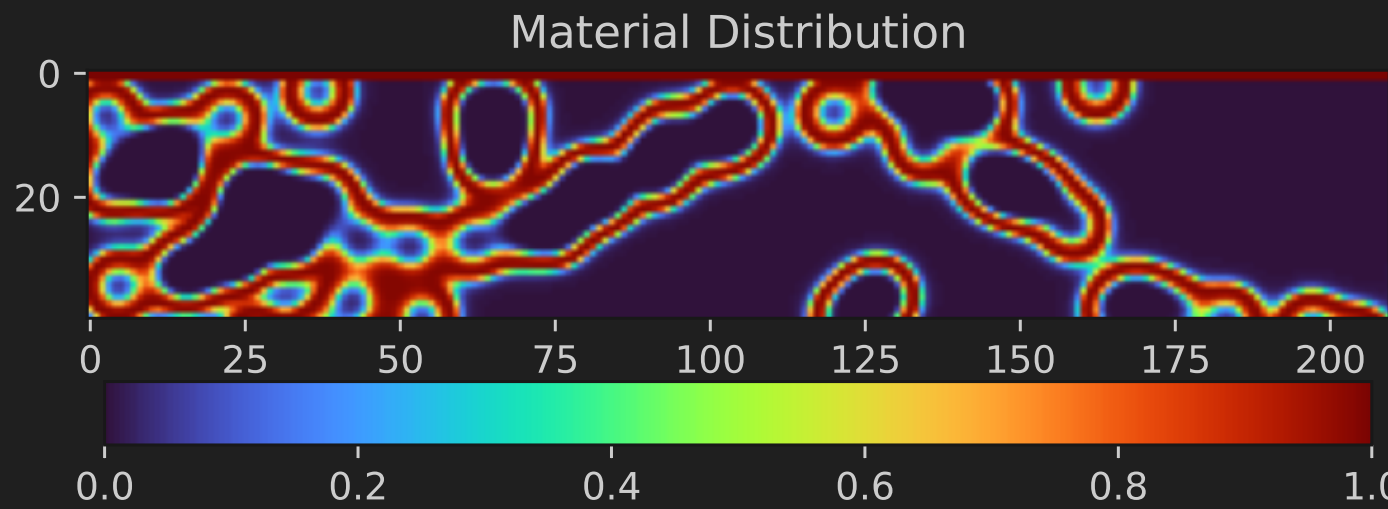
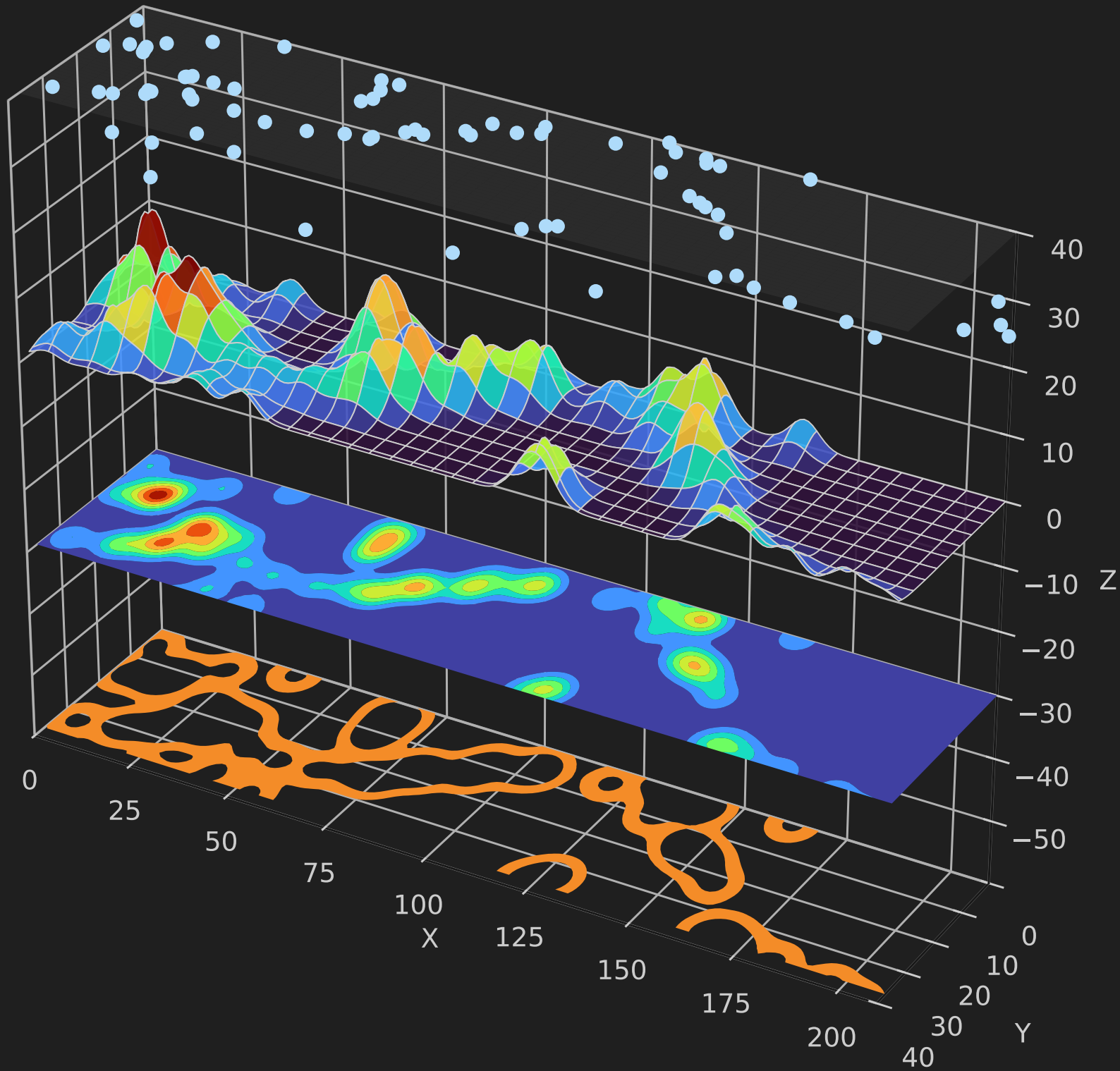
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.11) = 0.34

Spread Gaussian = 4.72 Shift = 2.30 Iteration = 023



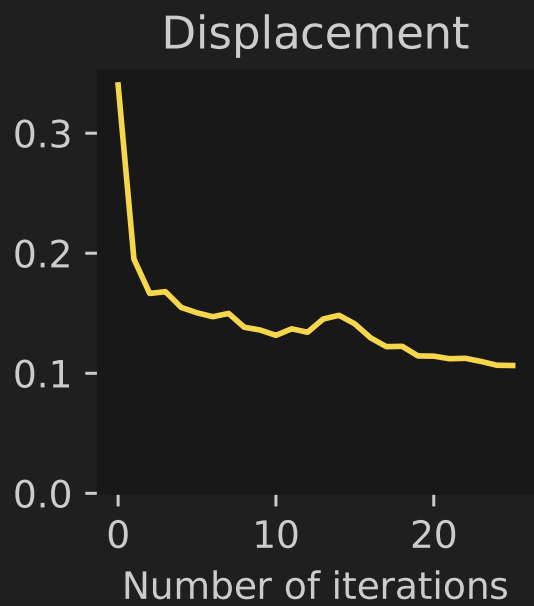
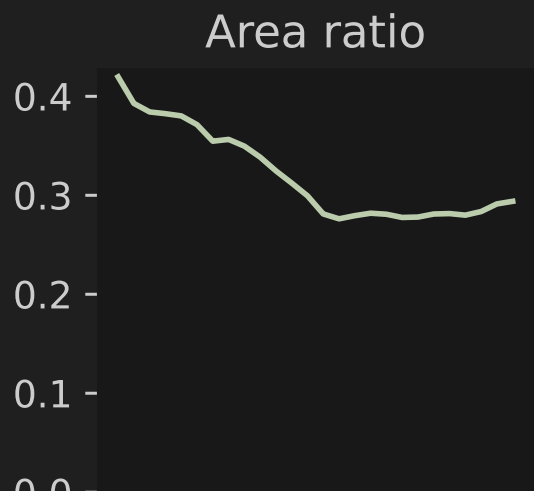
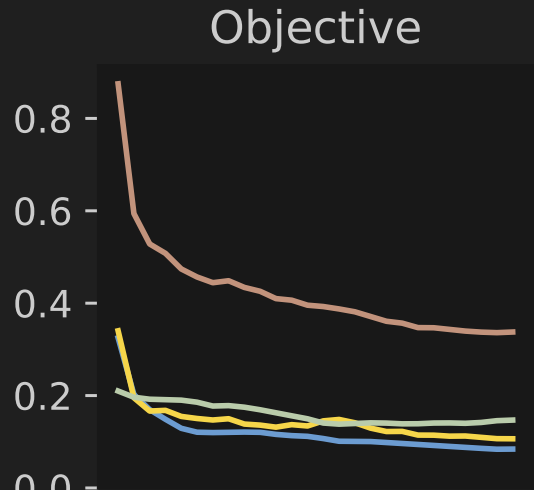
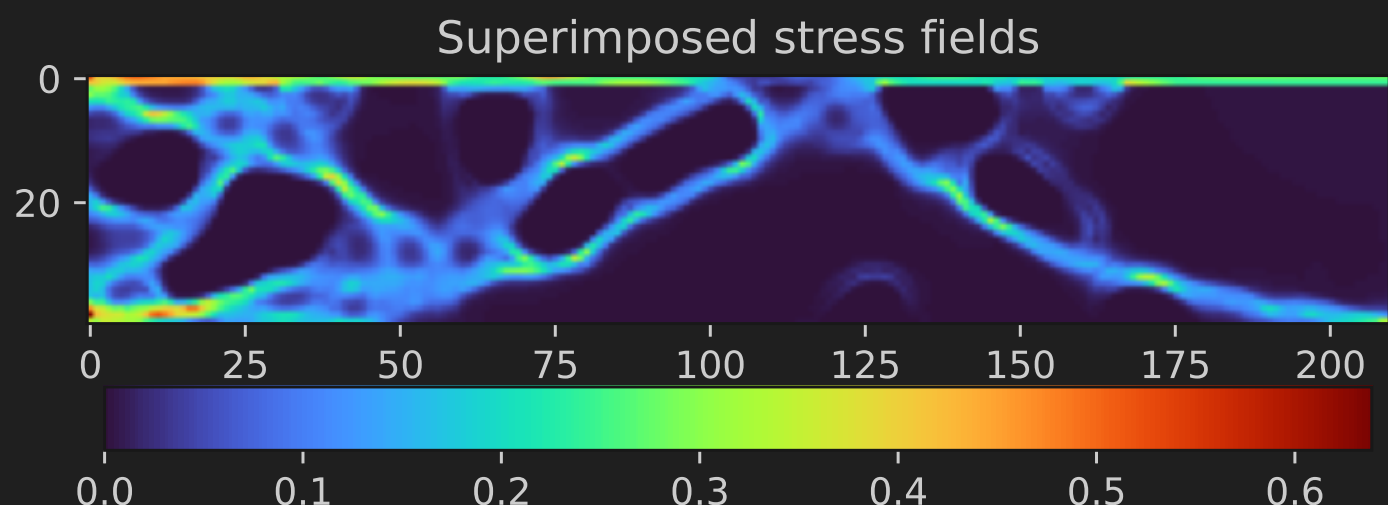
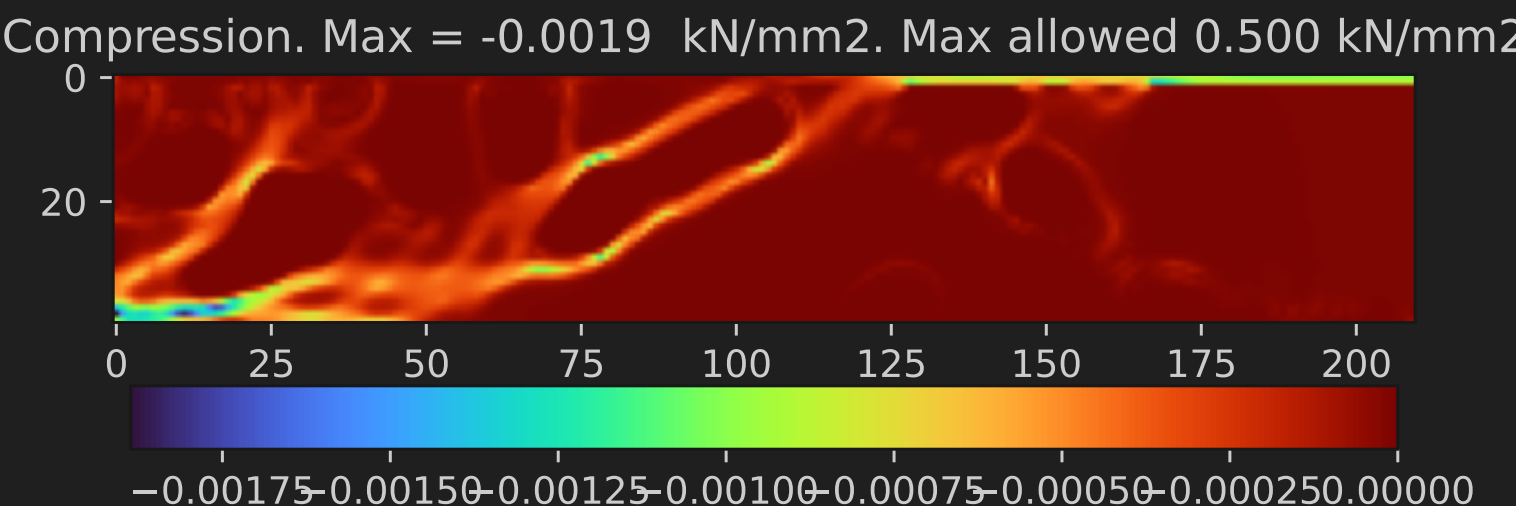
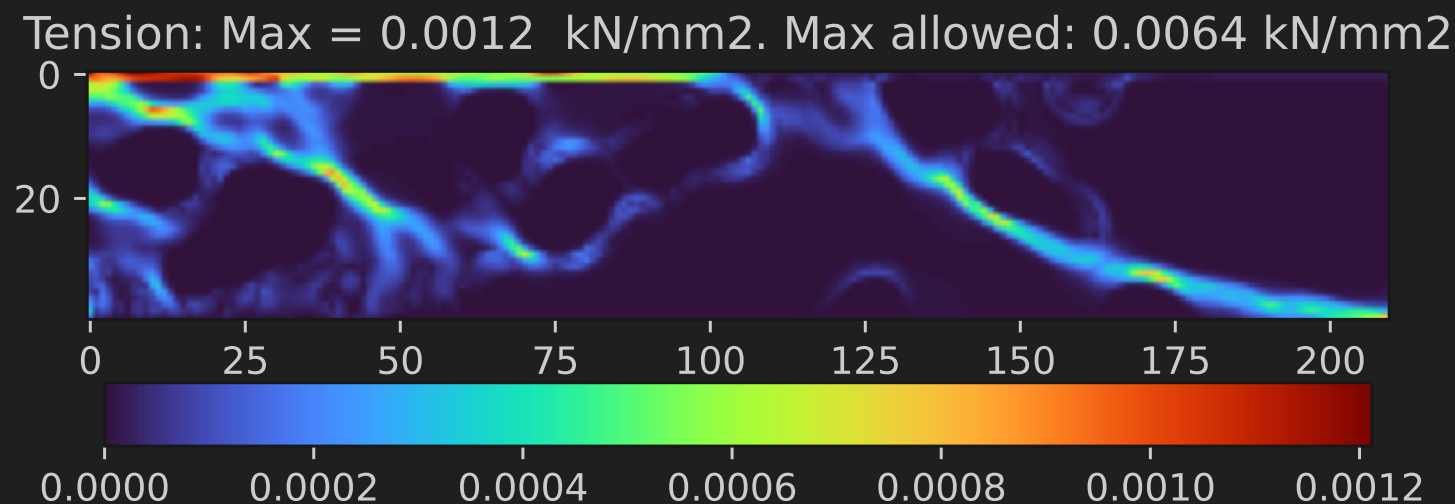
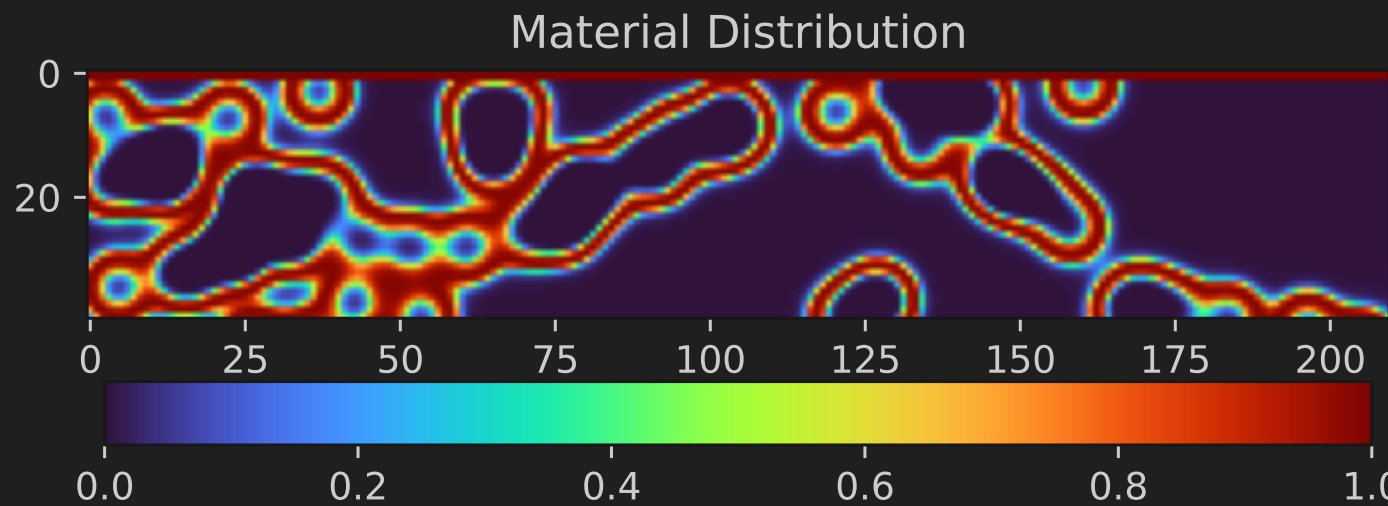
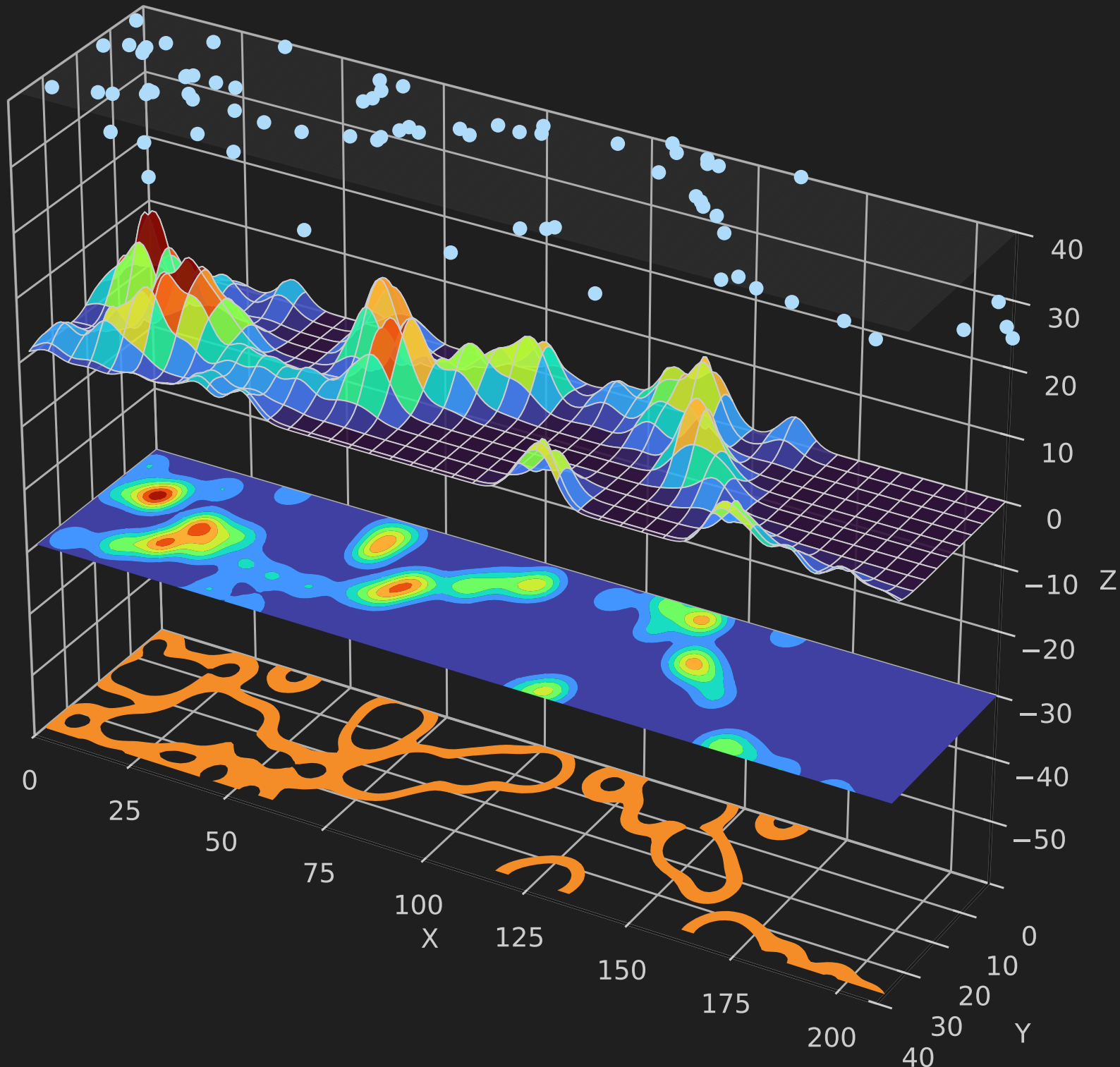
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.29) - (Displacement: 1 * -0.11) = 0.34

Spread Gaussian = 4.71 Shift = 2.32 Iteration = 024



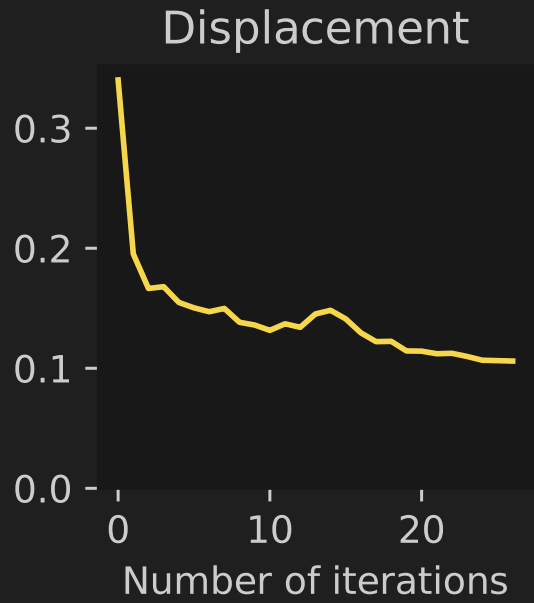
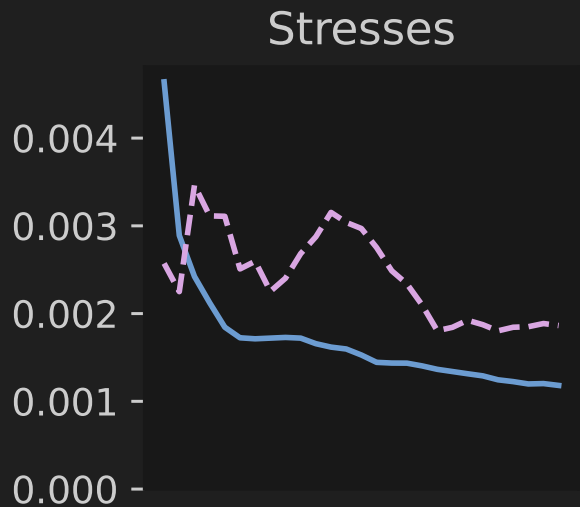
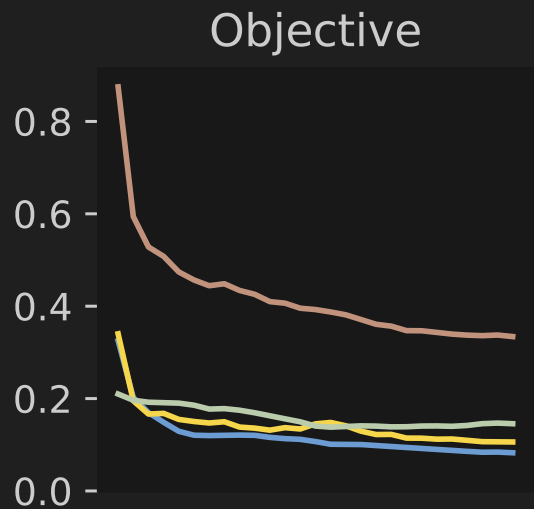
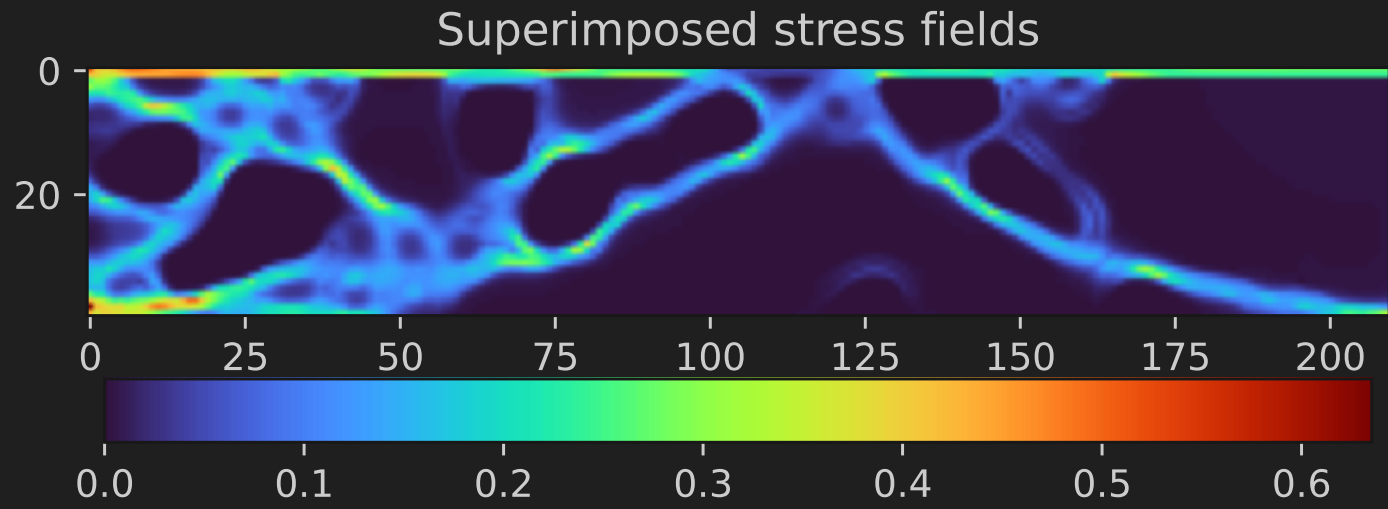
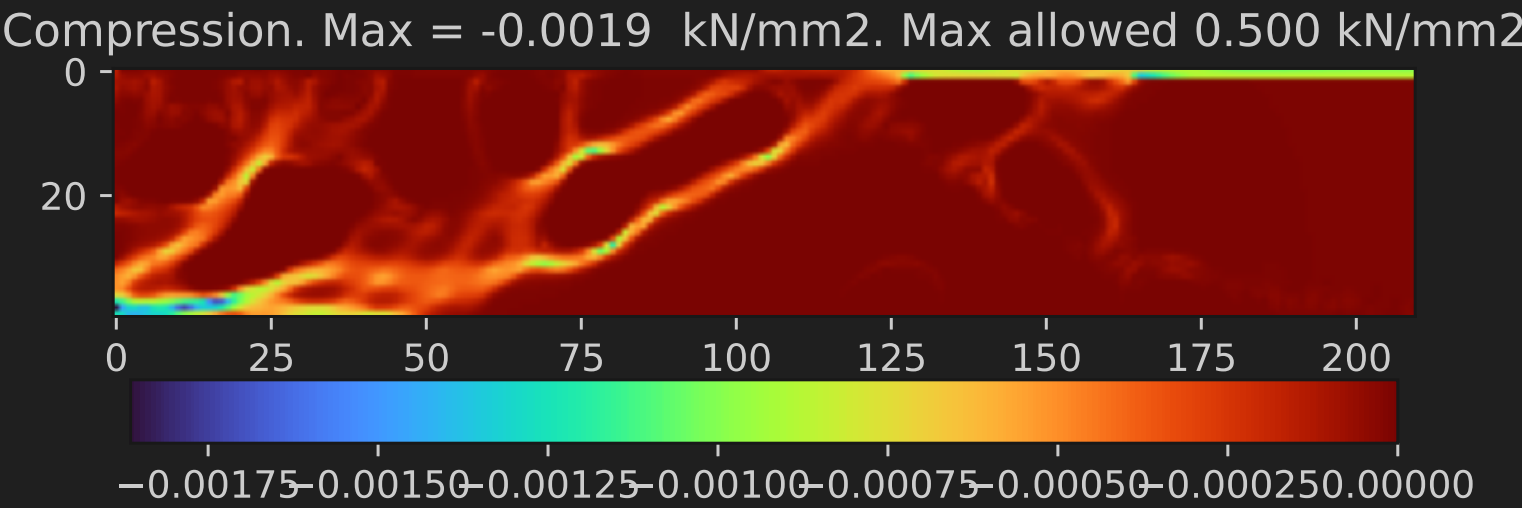
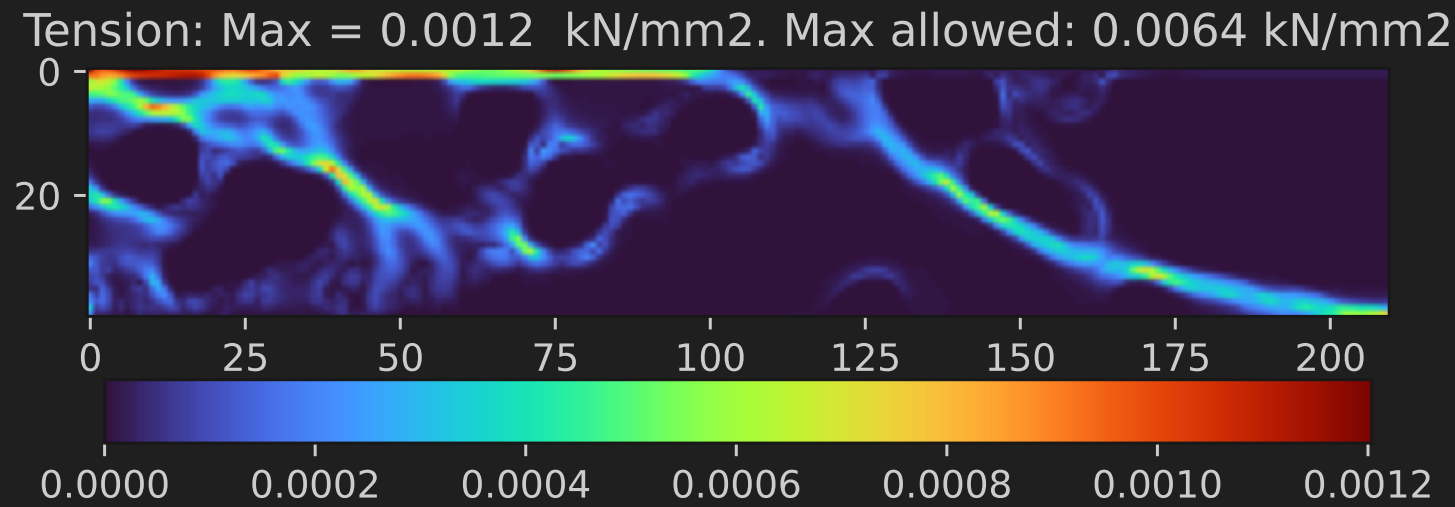
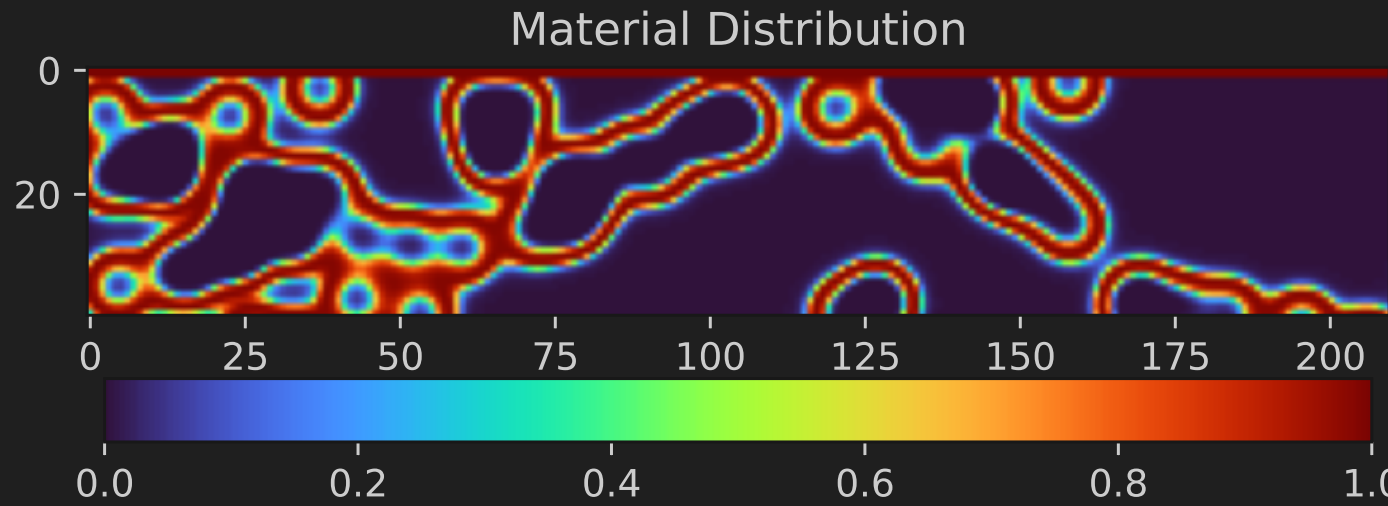
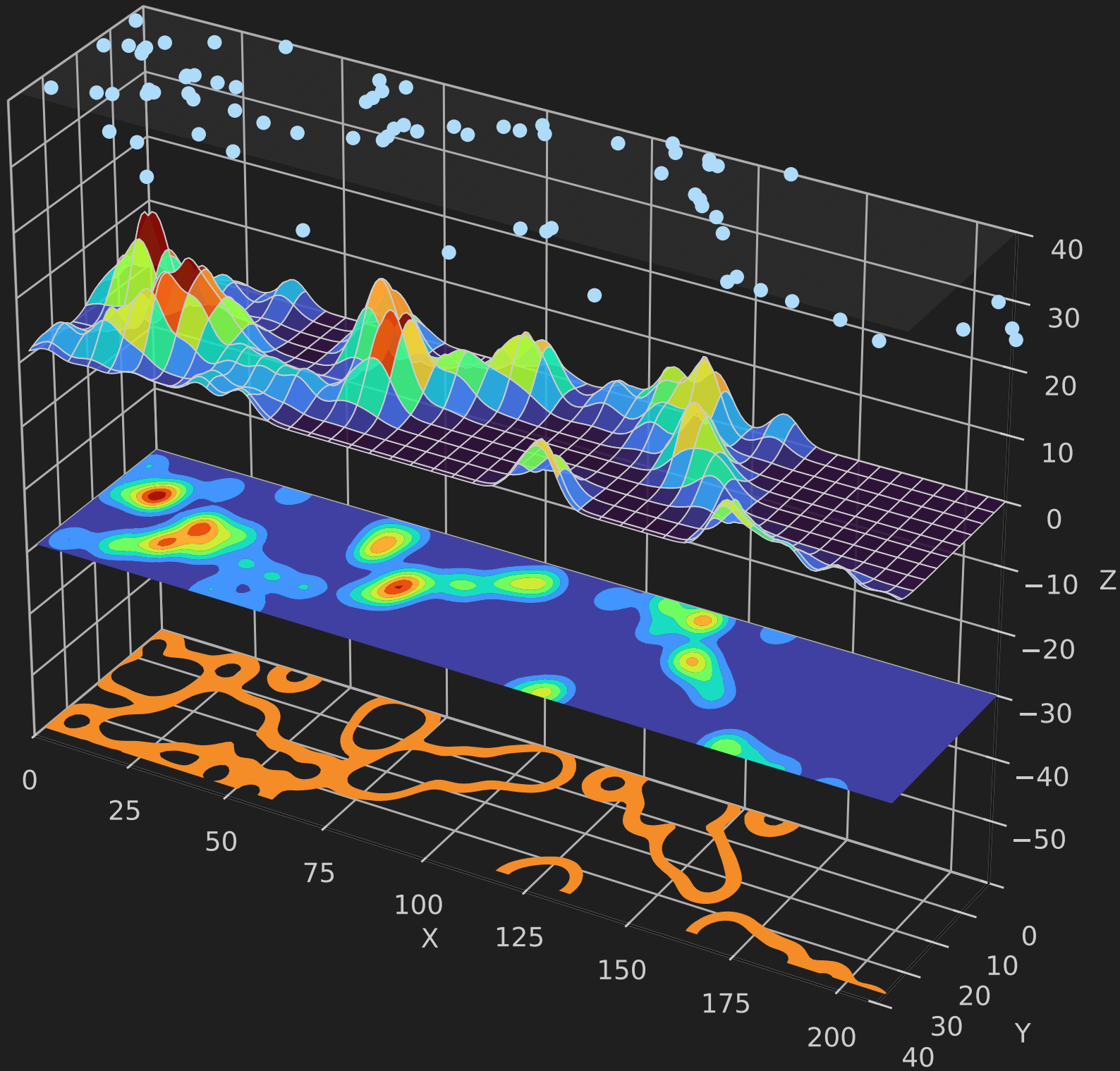
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.29) - (Displacement: 1 * -0.11) = 0.34

Spread Gaussian = 4.71 Shift = 2.33 Iteration = 025



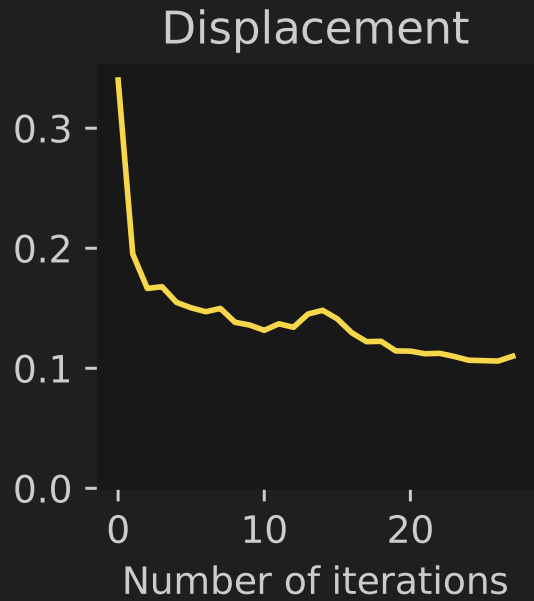
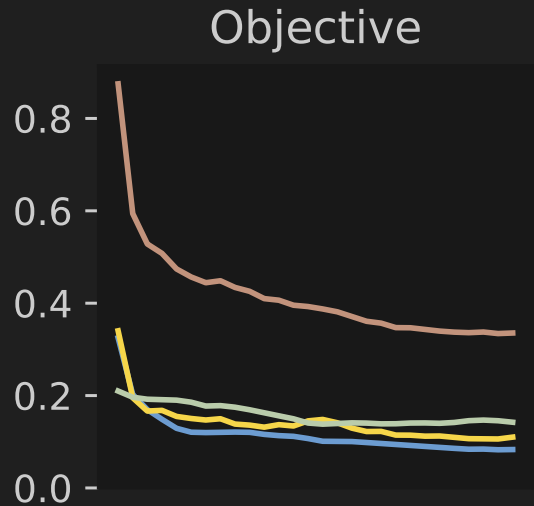
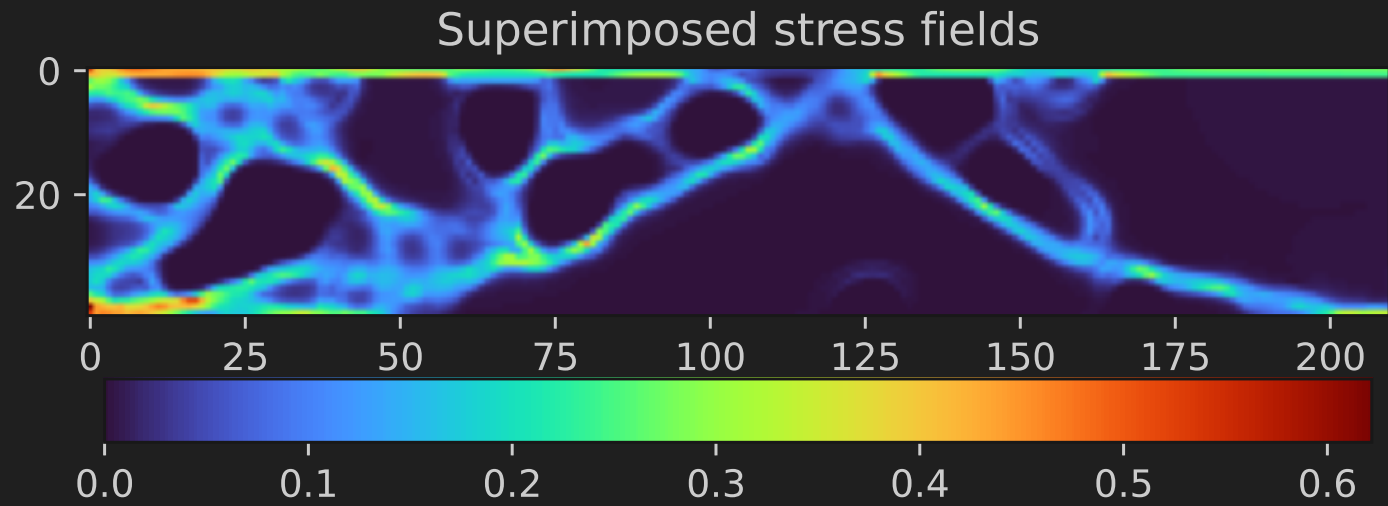
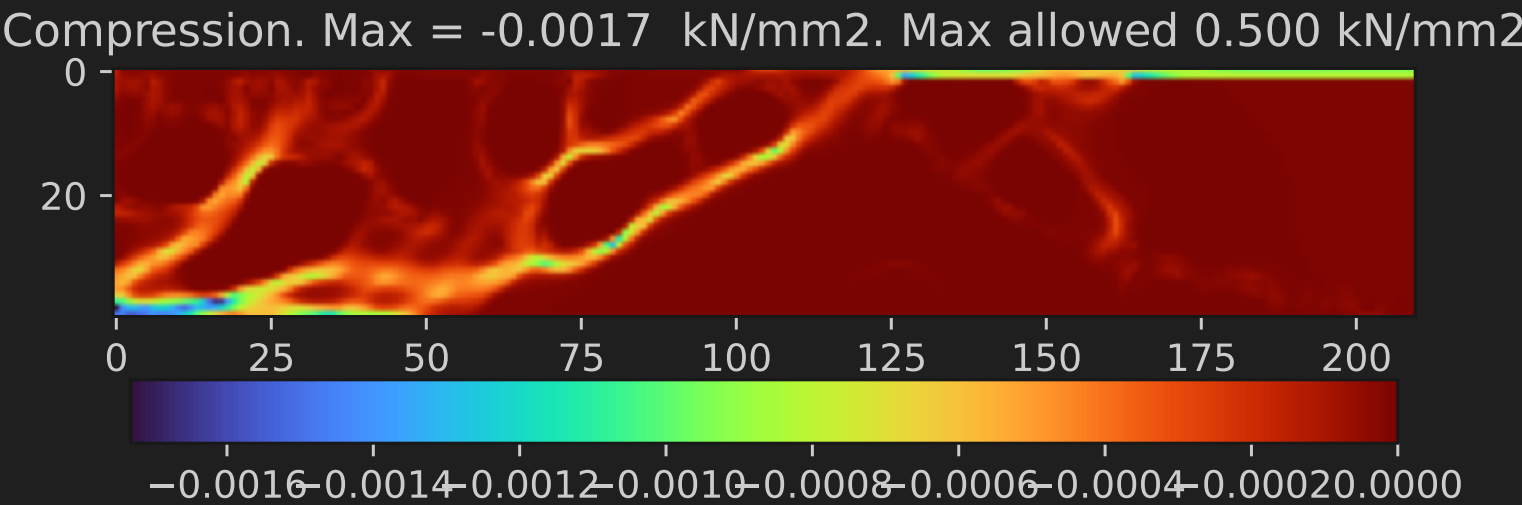
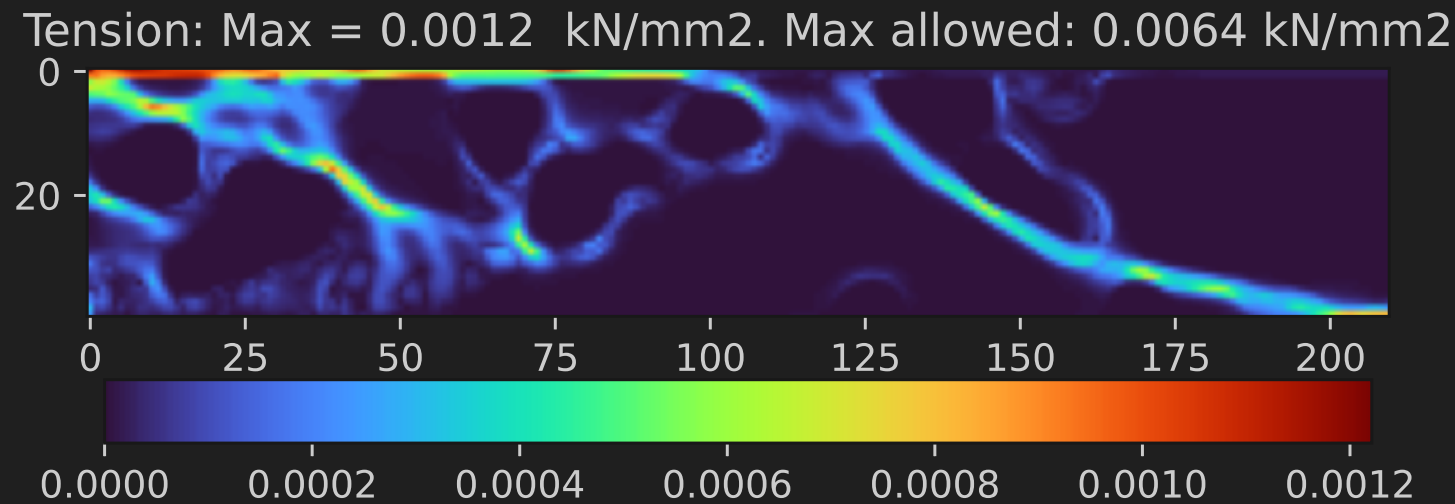
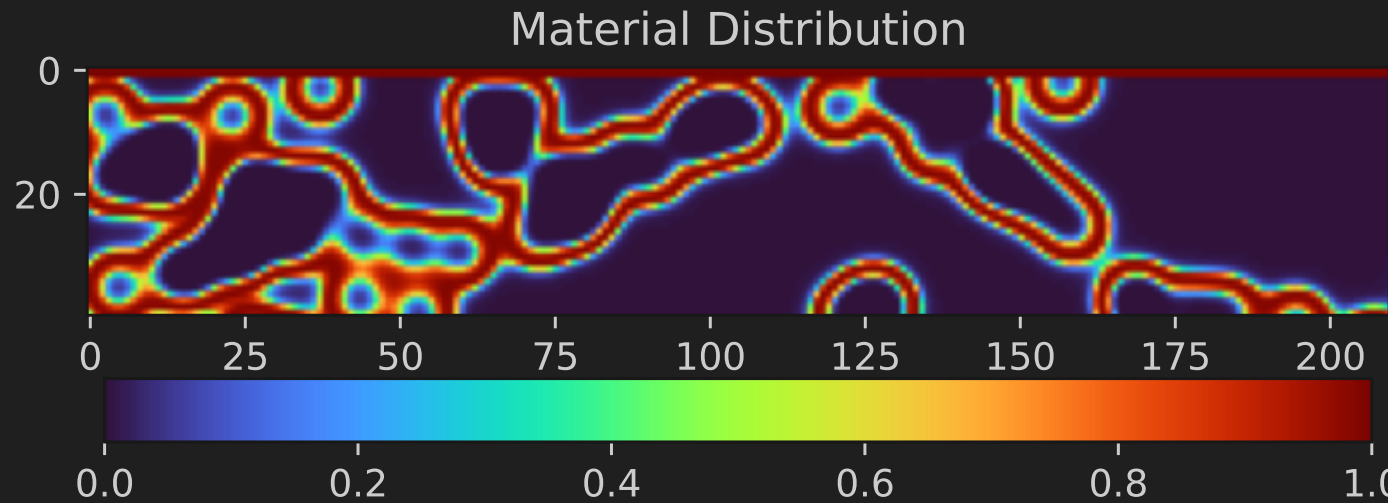
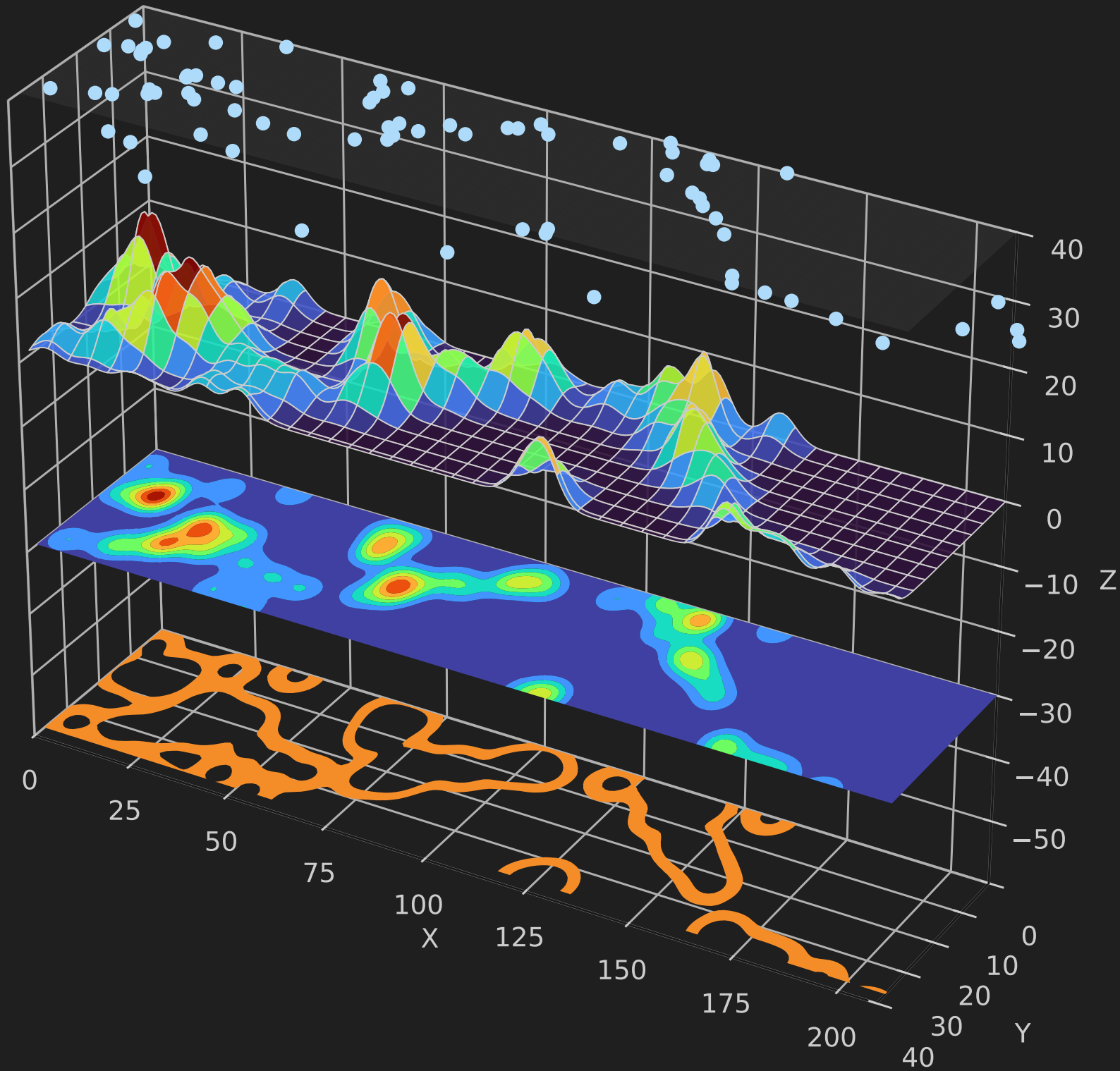
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.29) - (Displacement: 1 * -0.11) = 0.33

Spread Gaussian = 4.72 Shift = 2.33 Iteration = 026



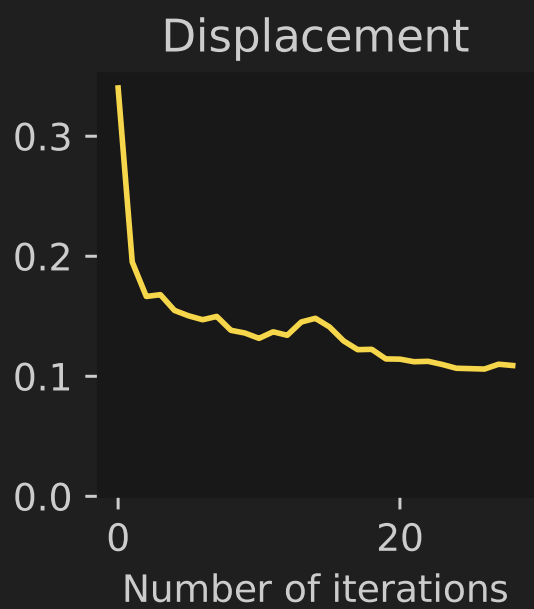
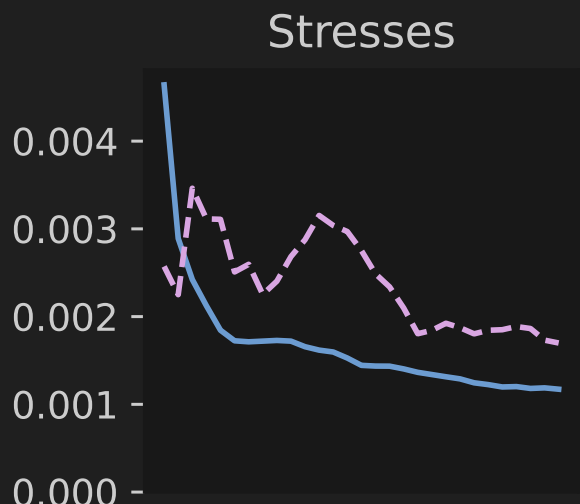
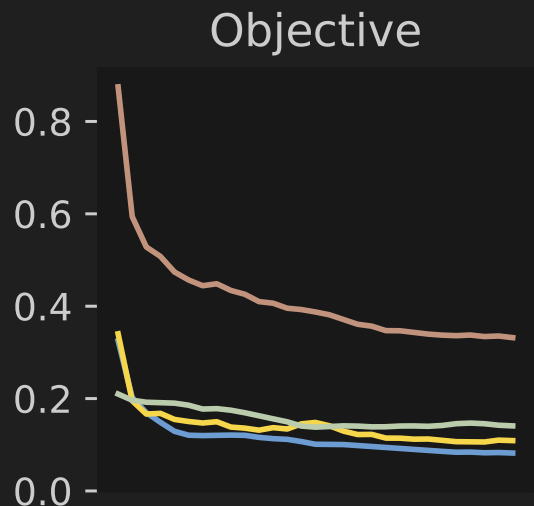
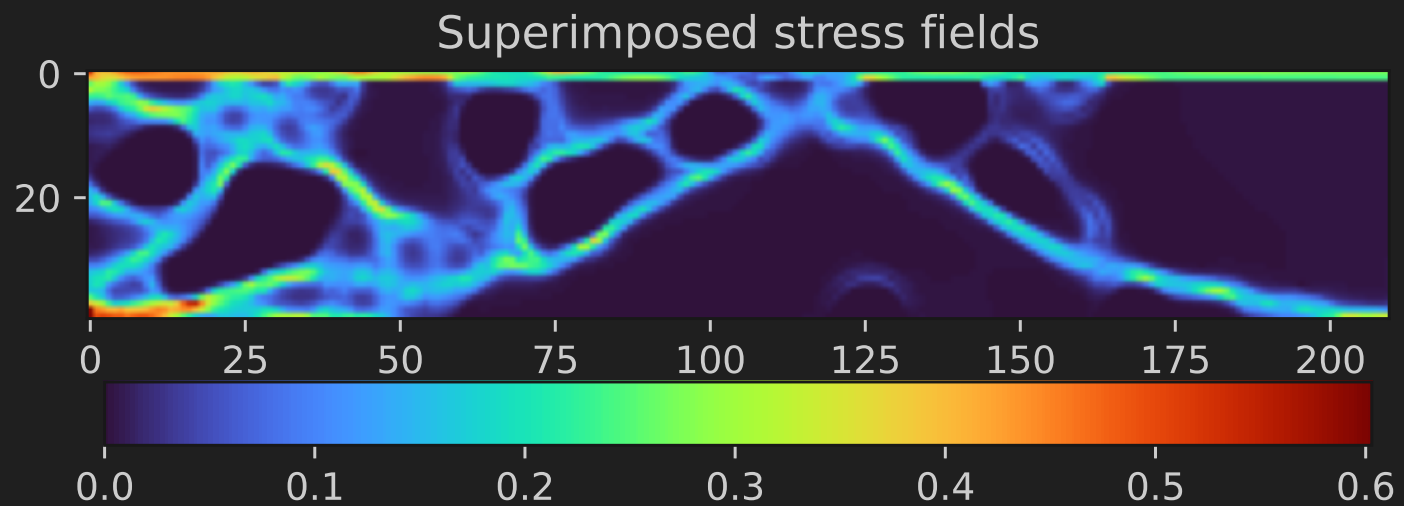
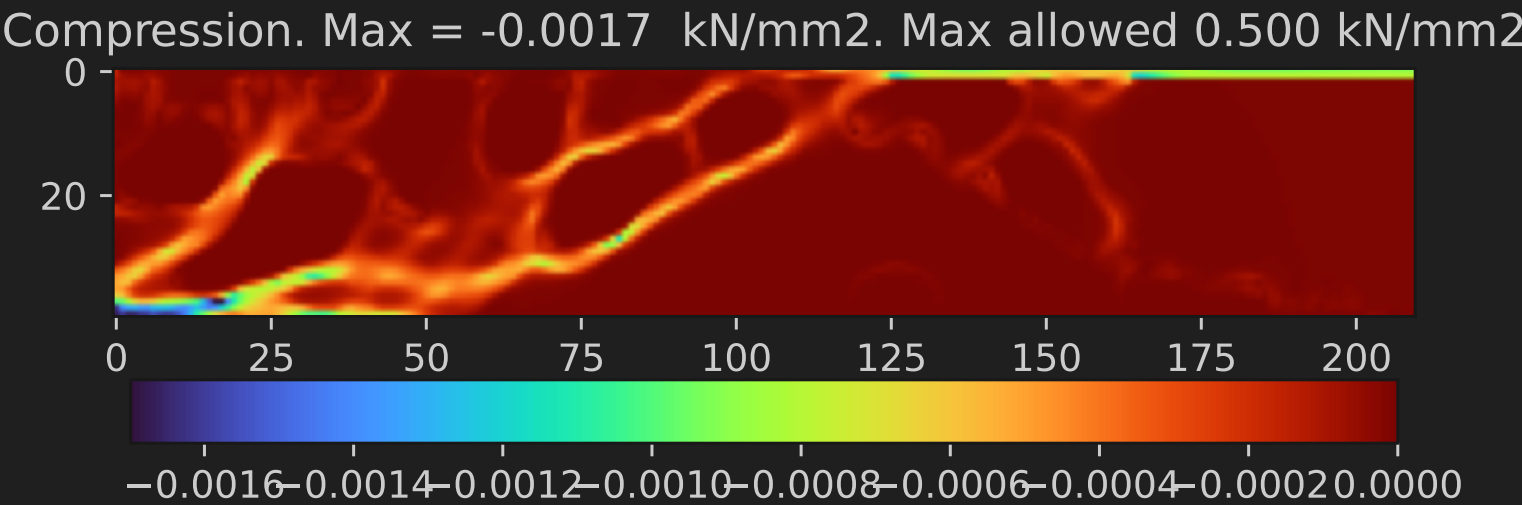
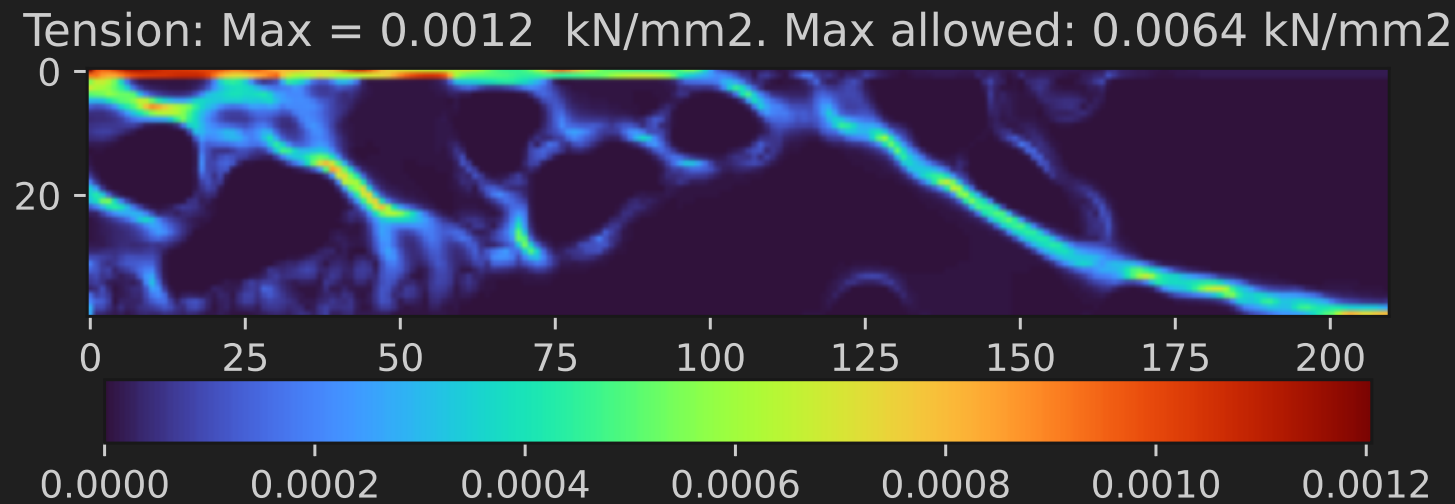
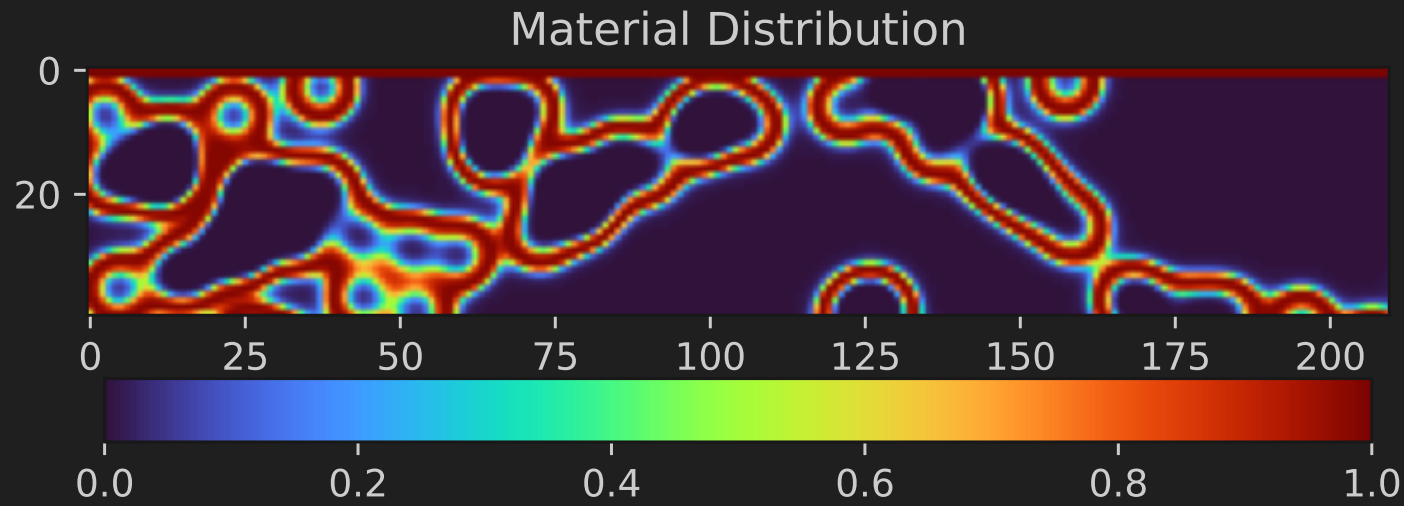
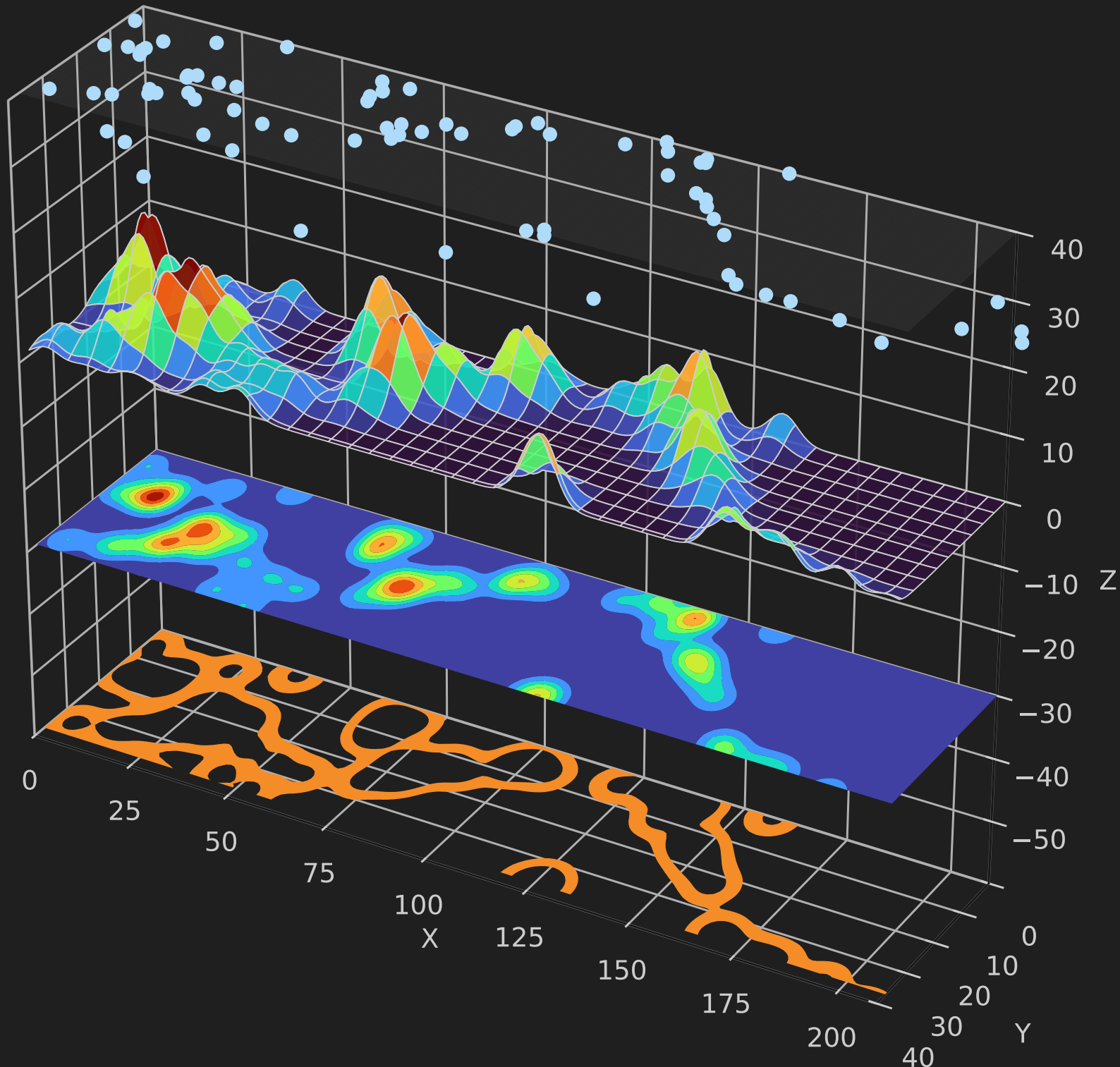
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.11) = 0.34

Spread Gaussian = 4.73 Shift = 2.33 Iteration = 027



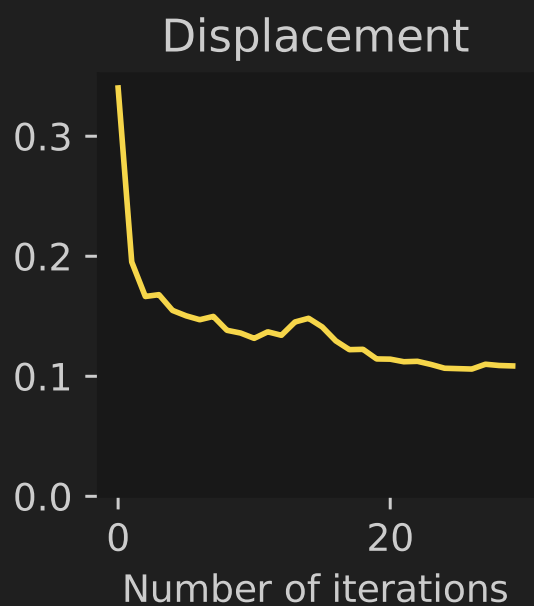
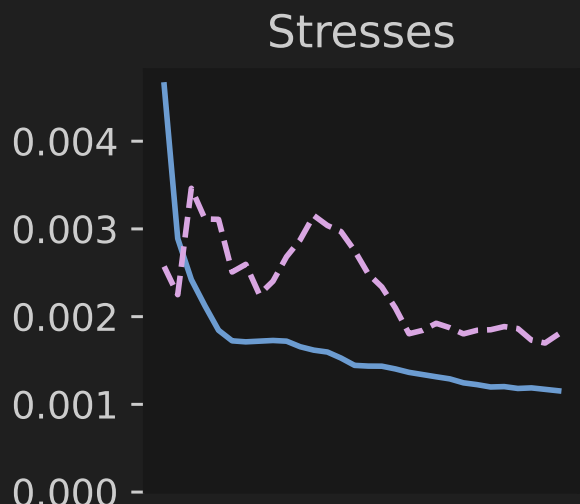
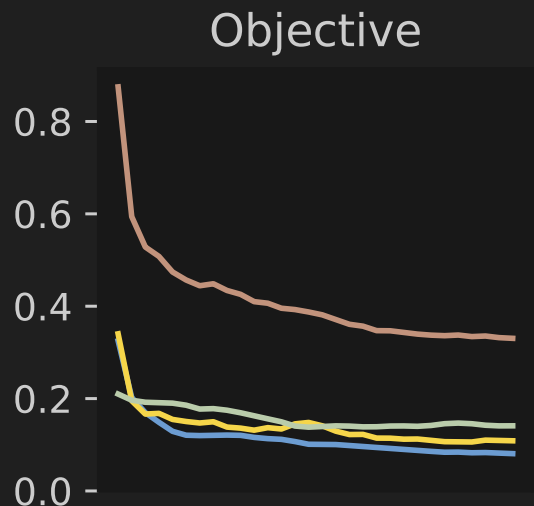
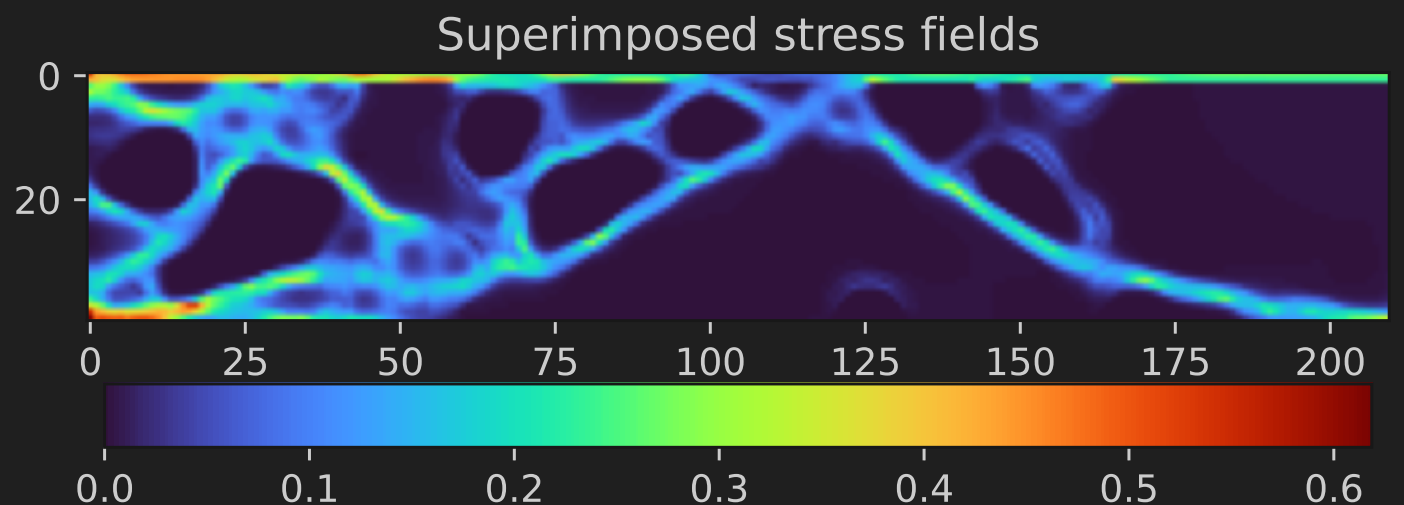
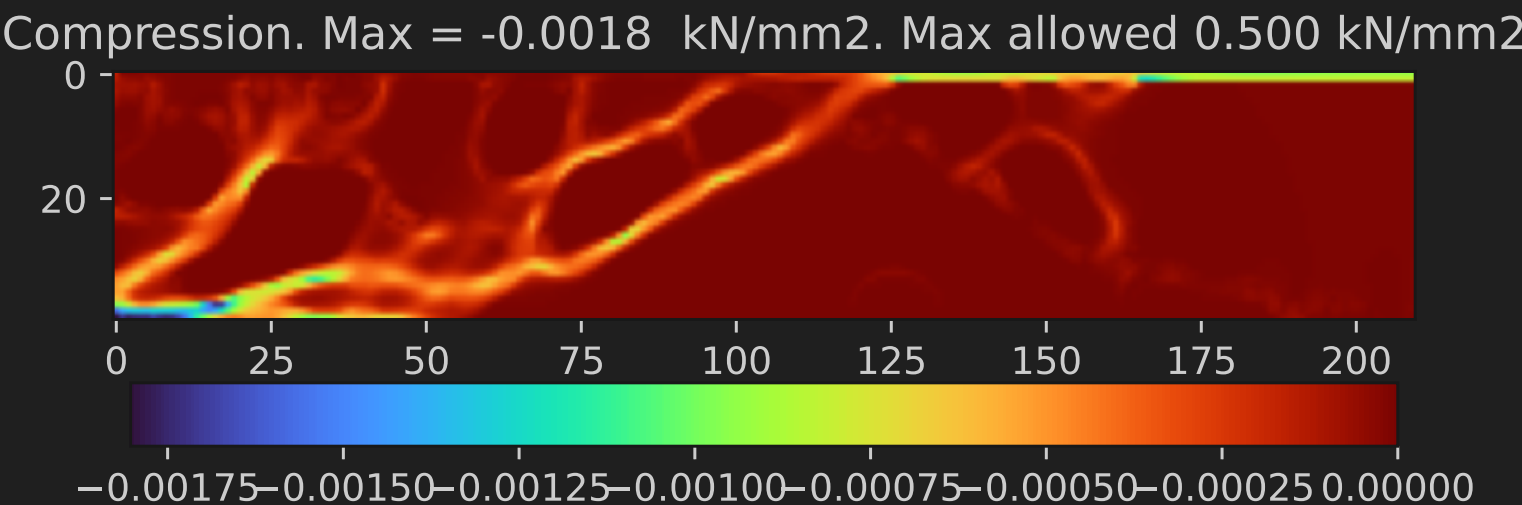
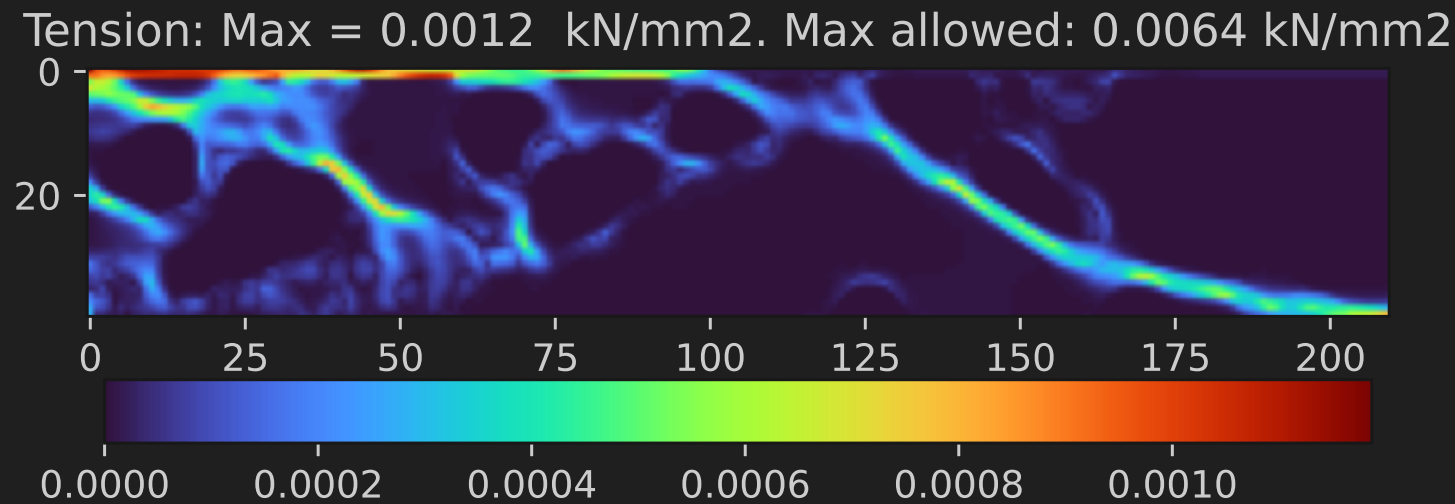
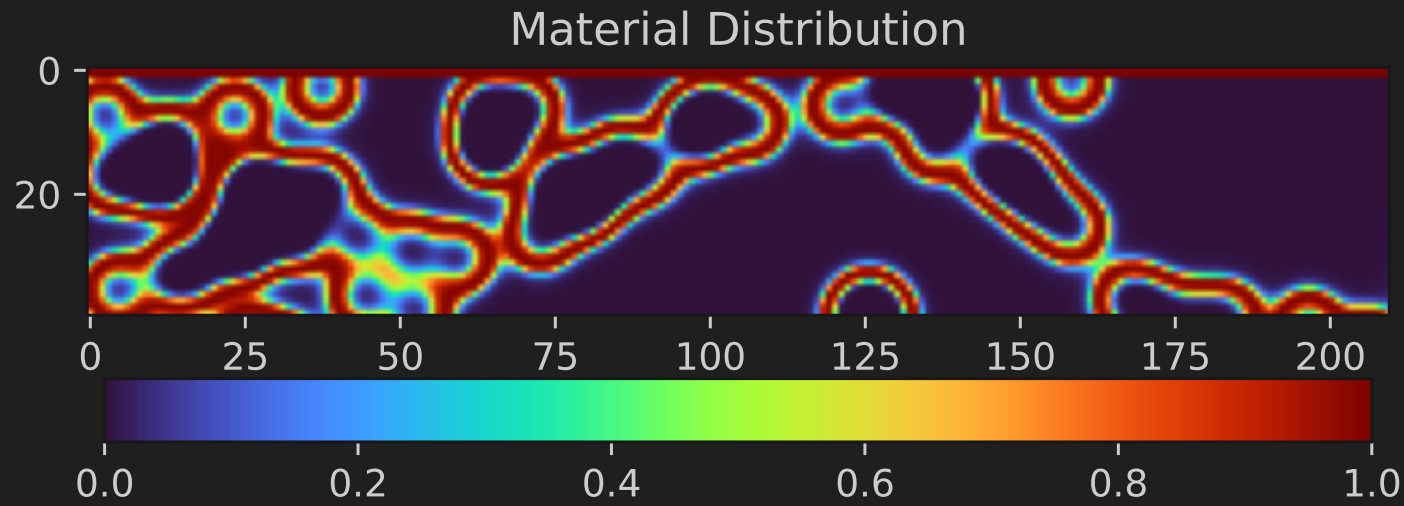
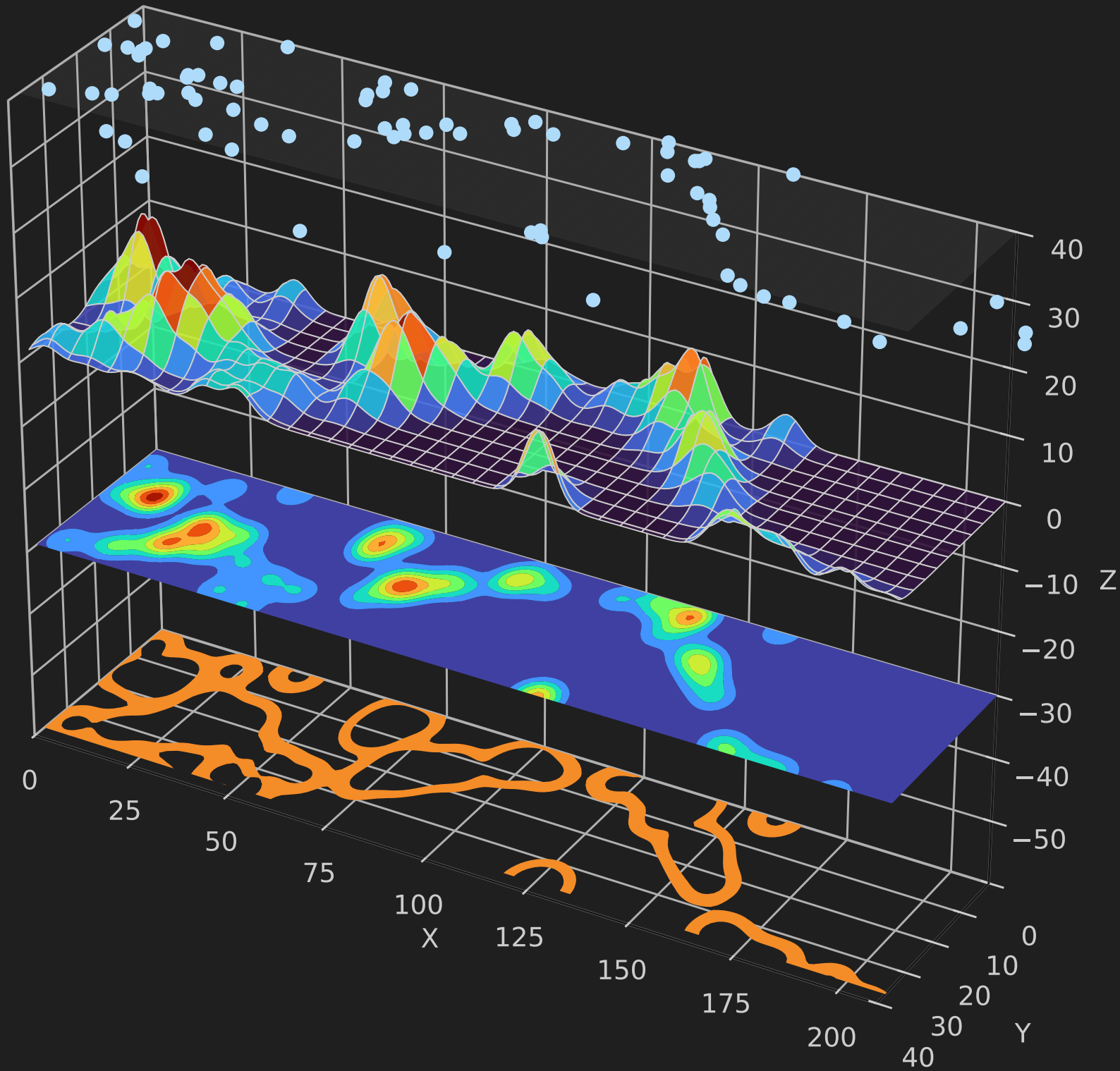
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.11) = 0.33

Spread Gaussian = 4.73 Shift = 2.34 Iteration = 028



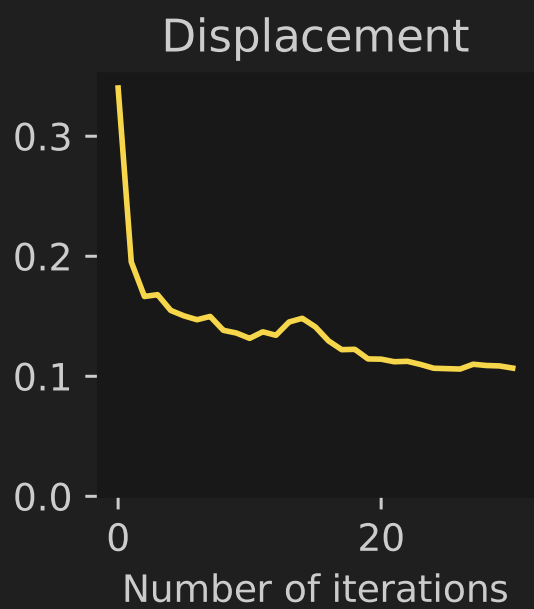
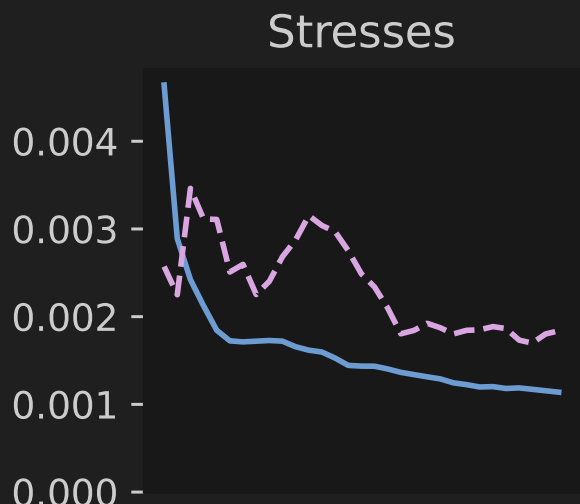
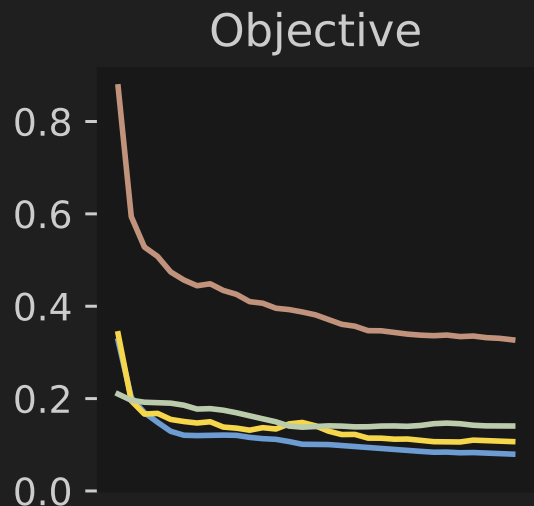
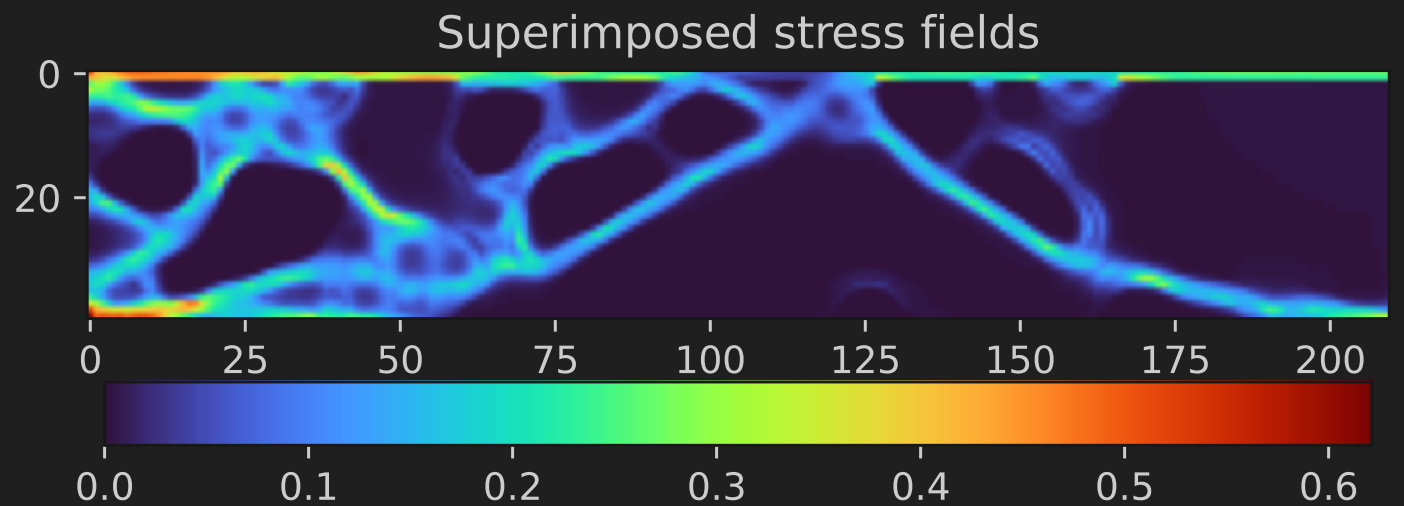
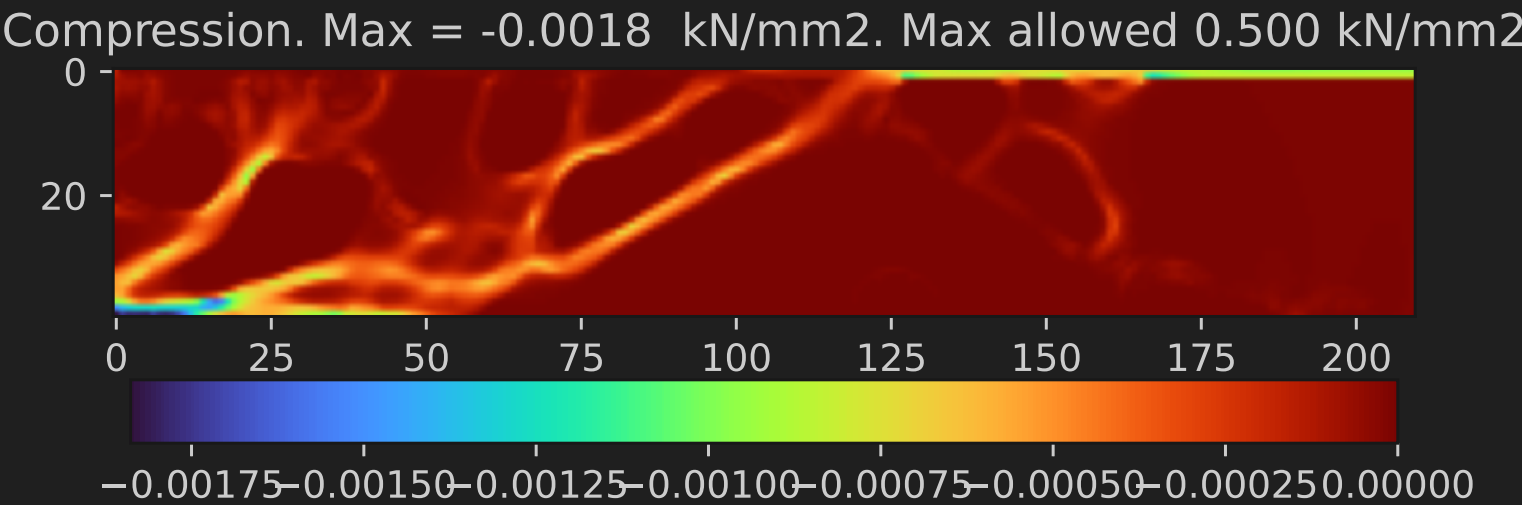
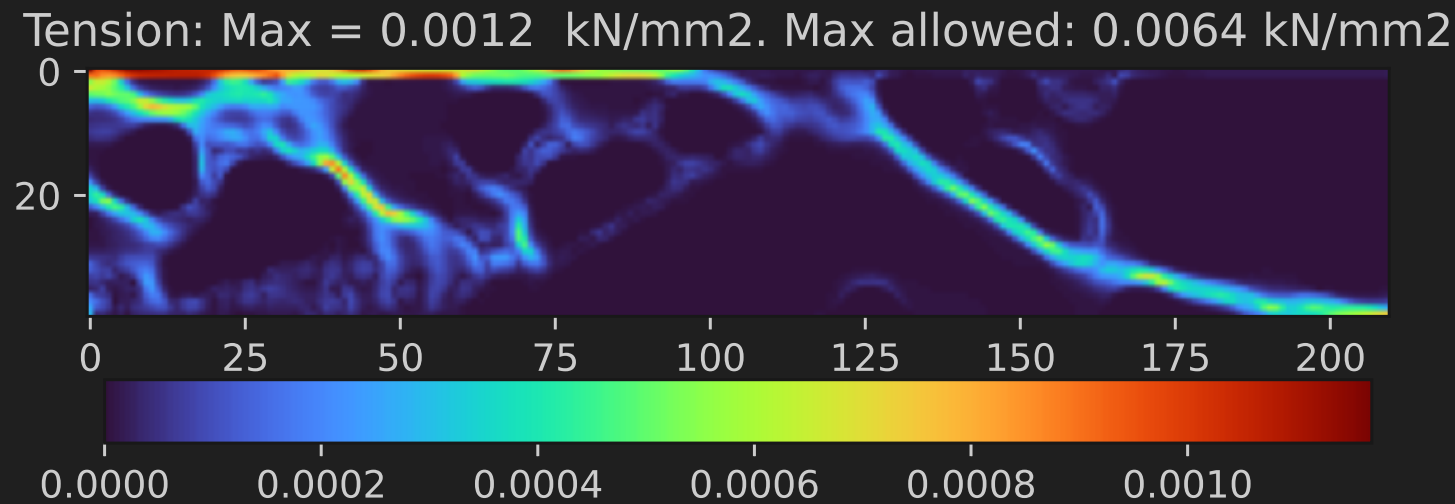
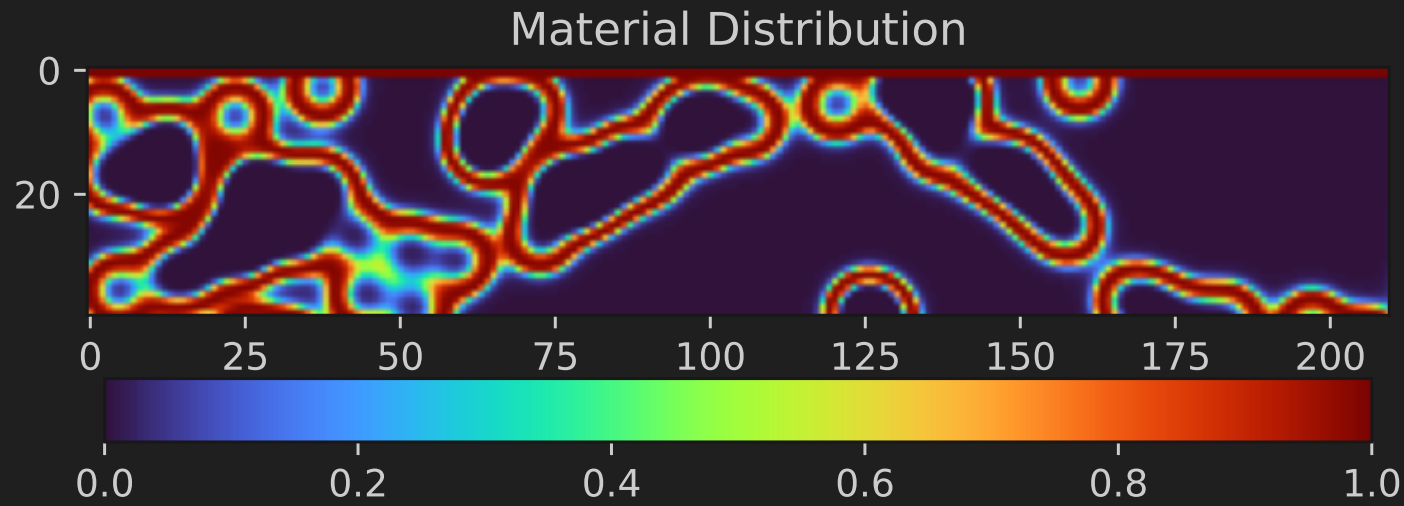
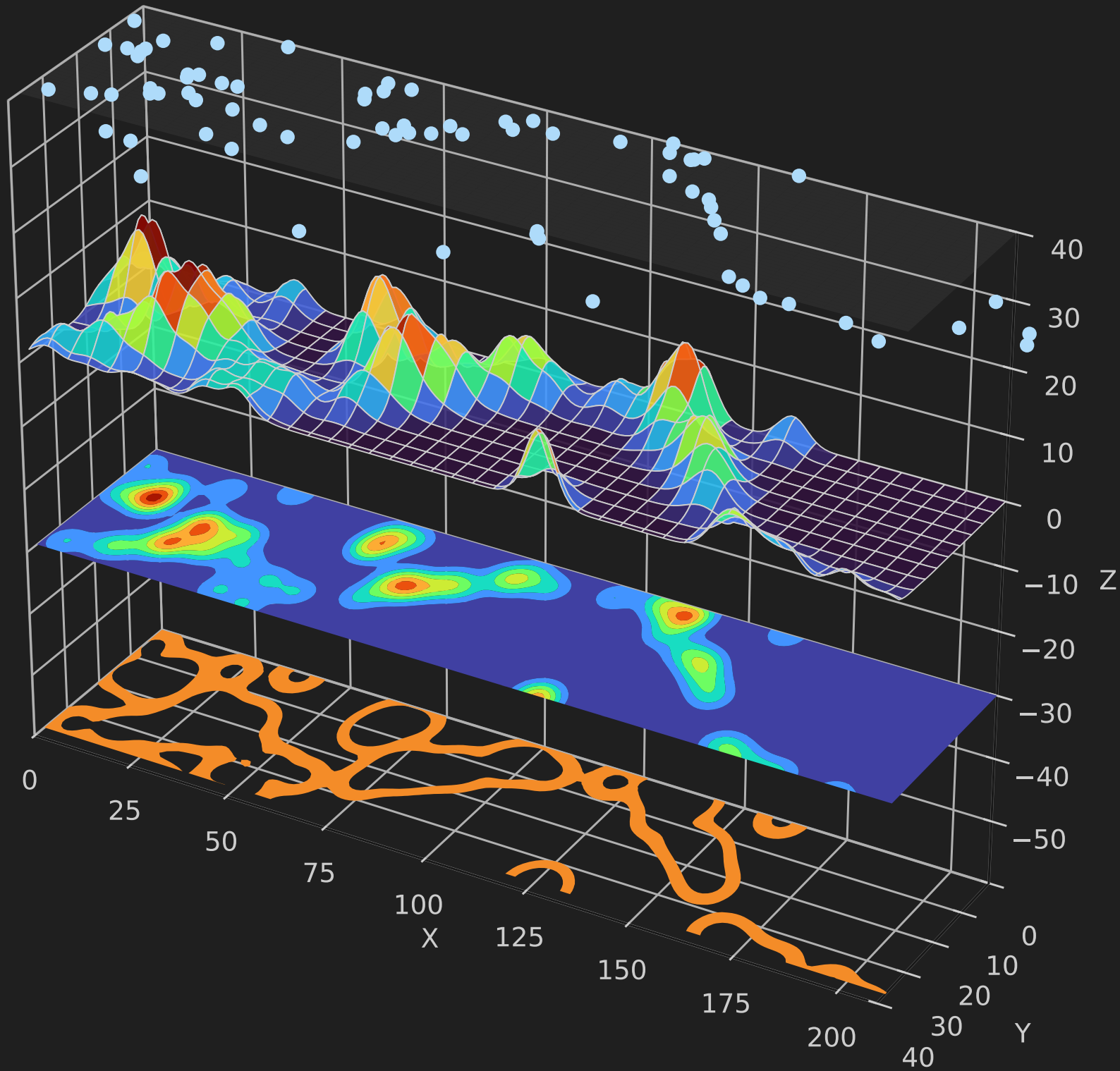
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.11) = 0.33

Spread Gaussian = 4.73 Shift = 2.35 Iteration = 029



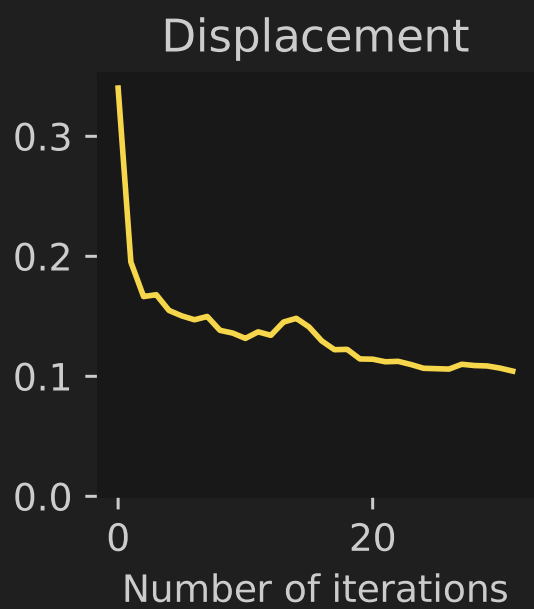
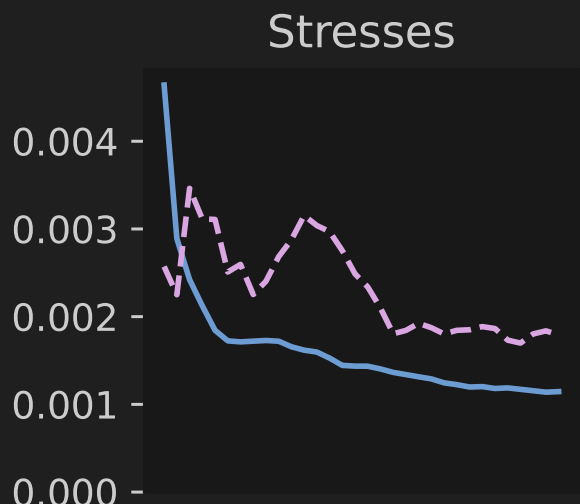
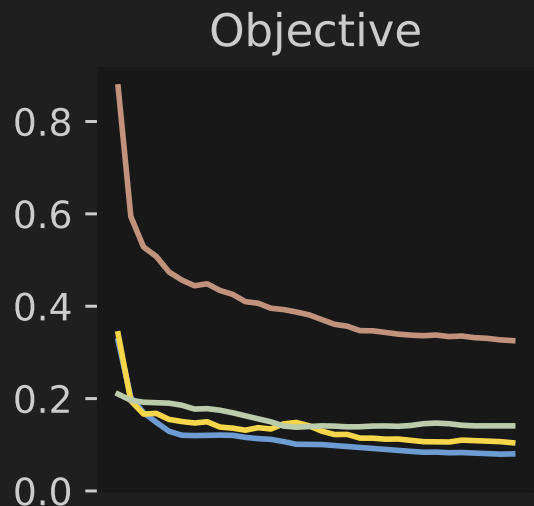
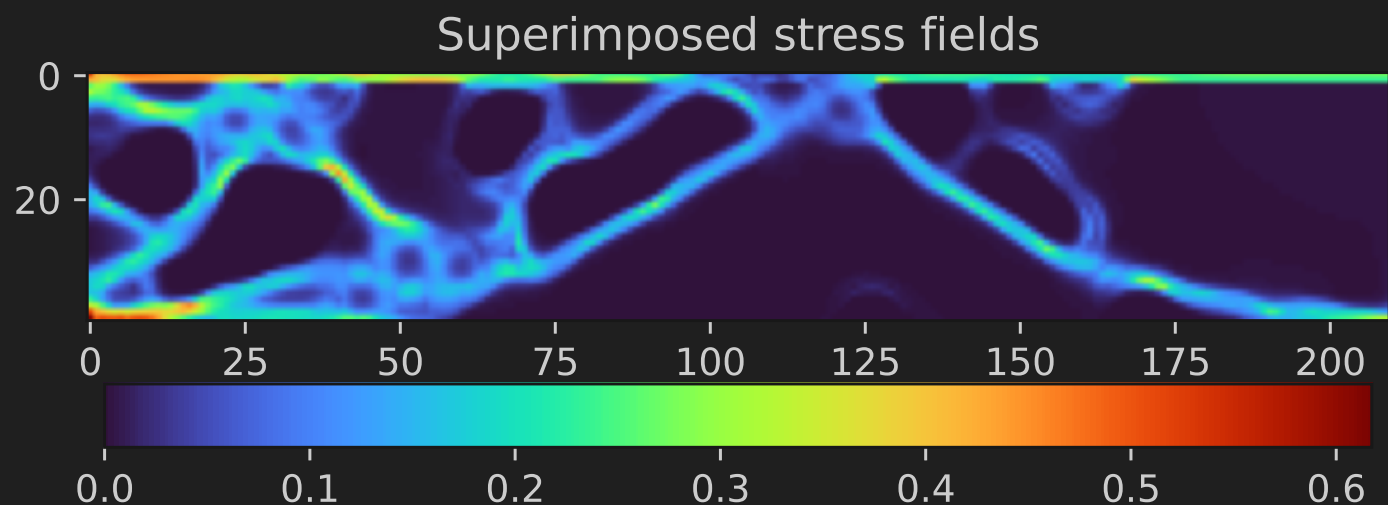
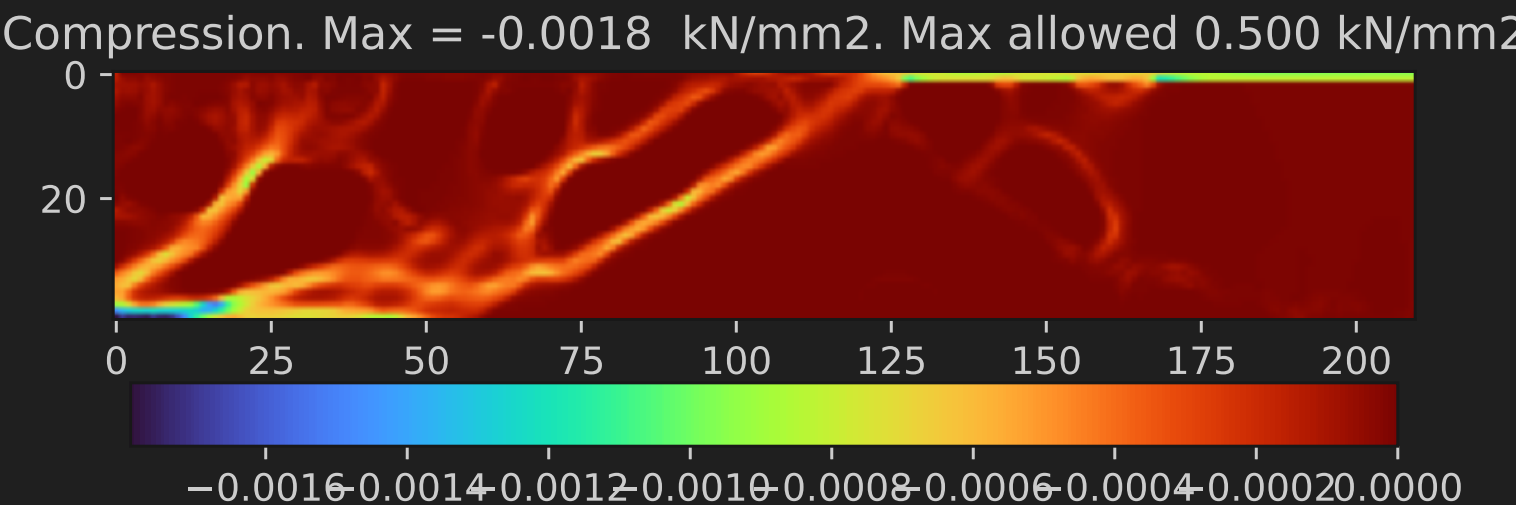
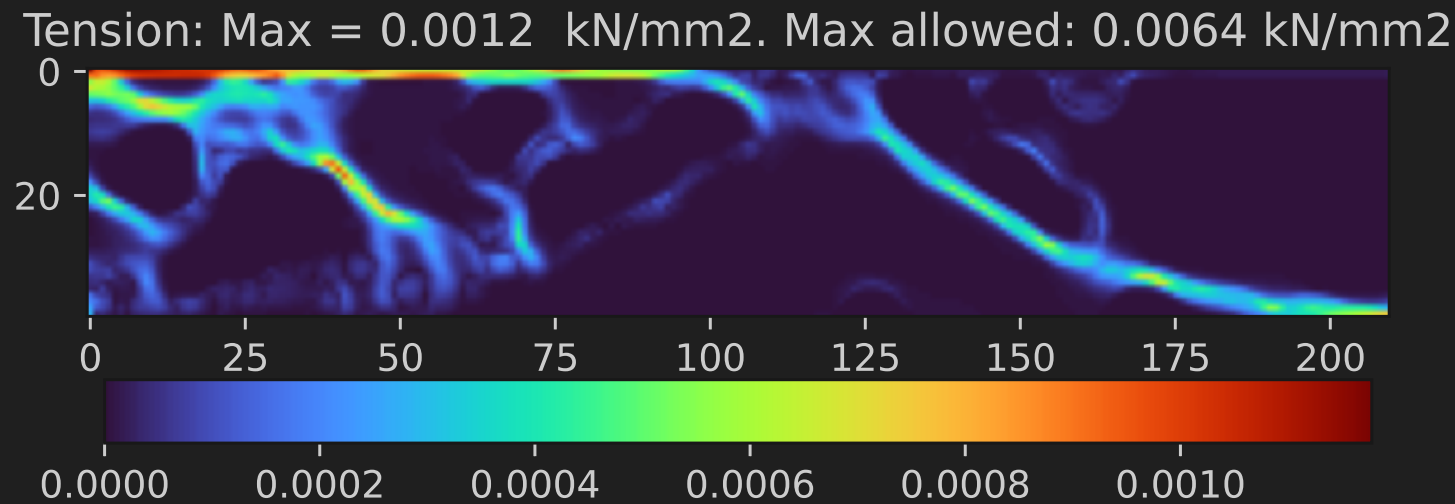
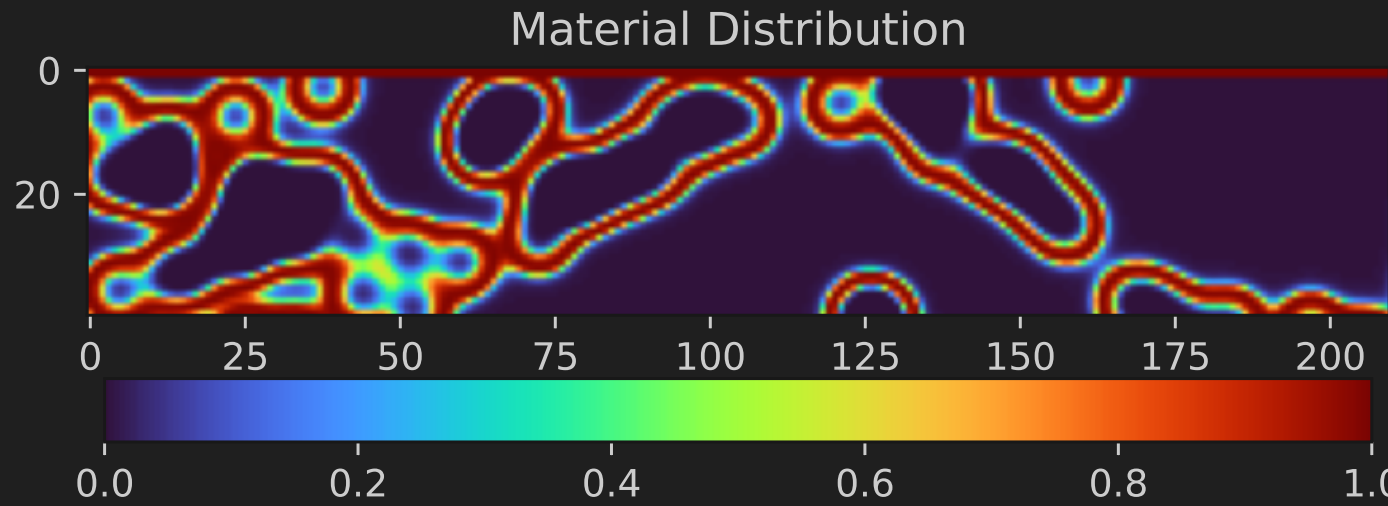
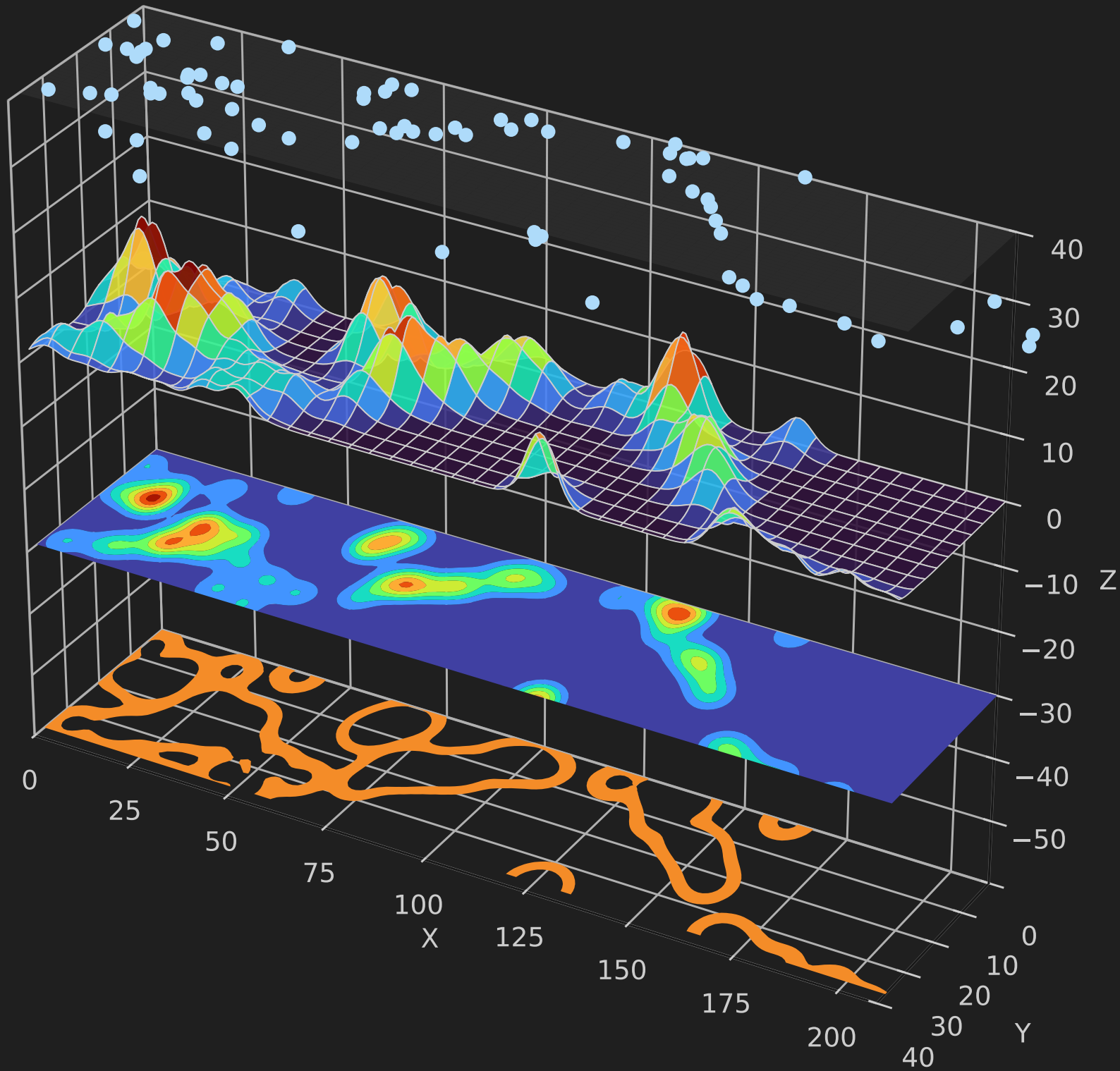
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.11) = 0.33

Spread Gaussian = 4.75 Shift = 2.36 Iteration = 030



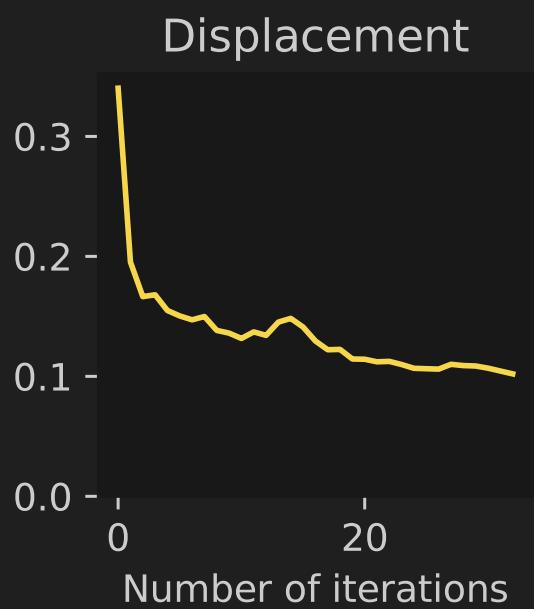
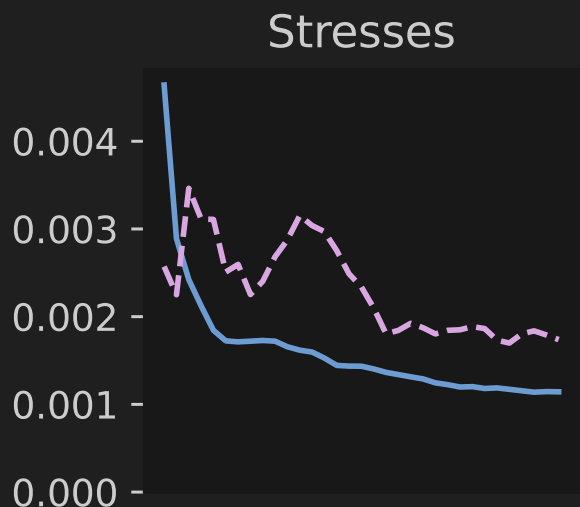
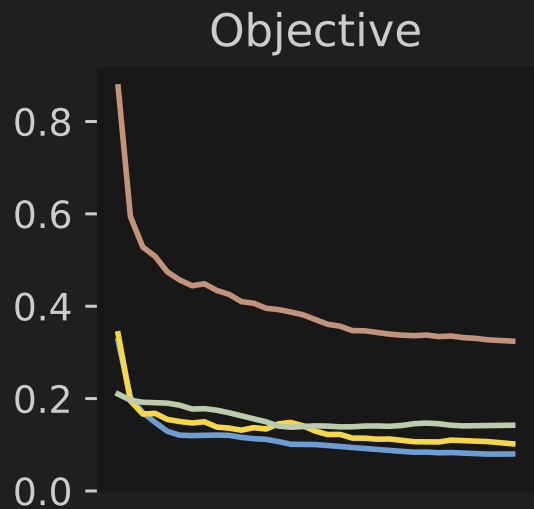
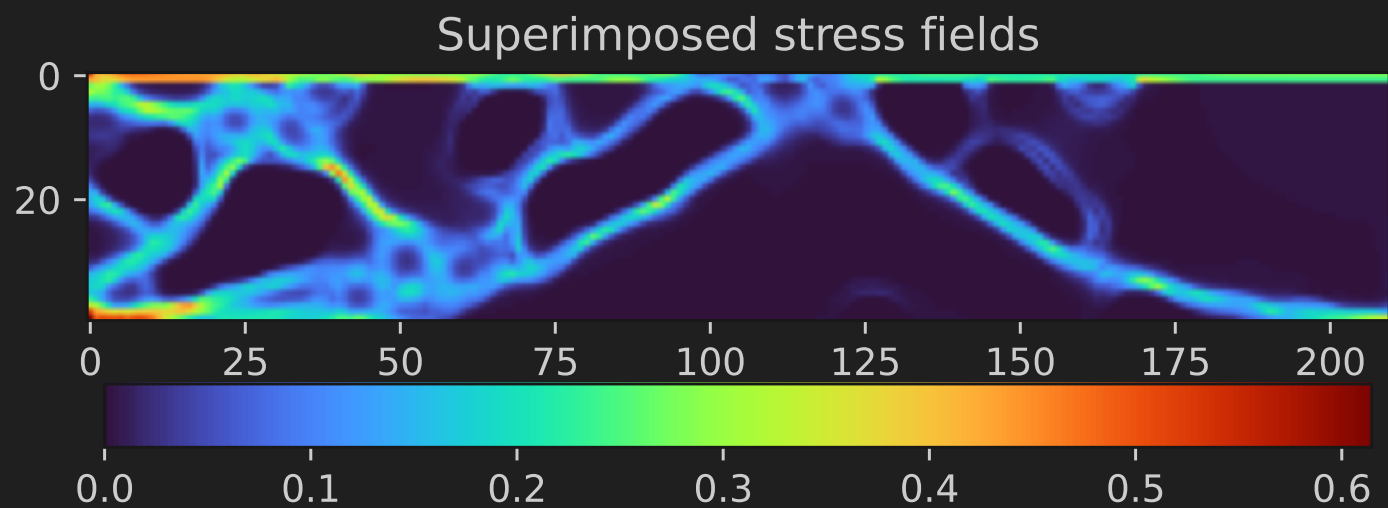
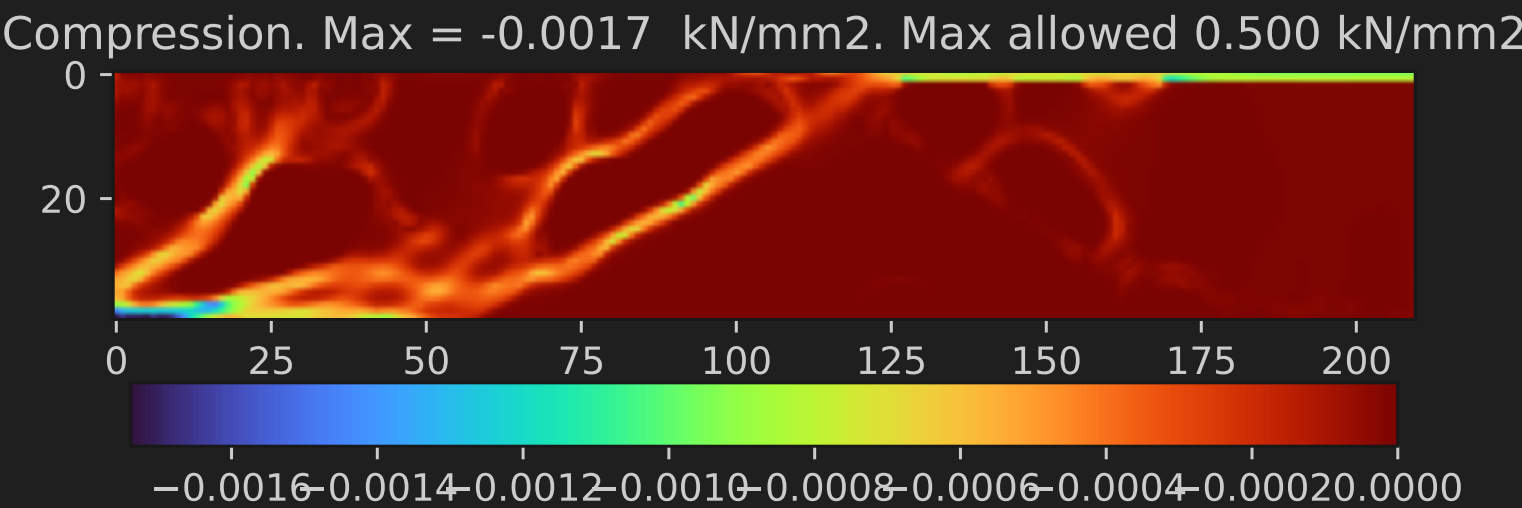
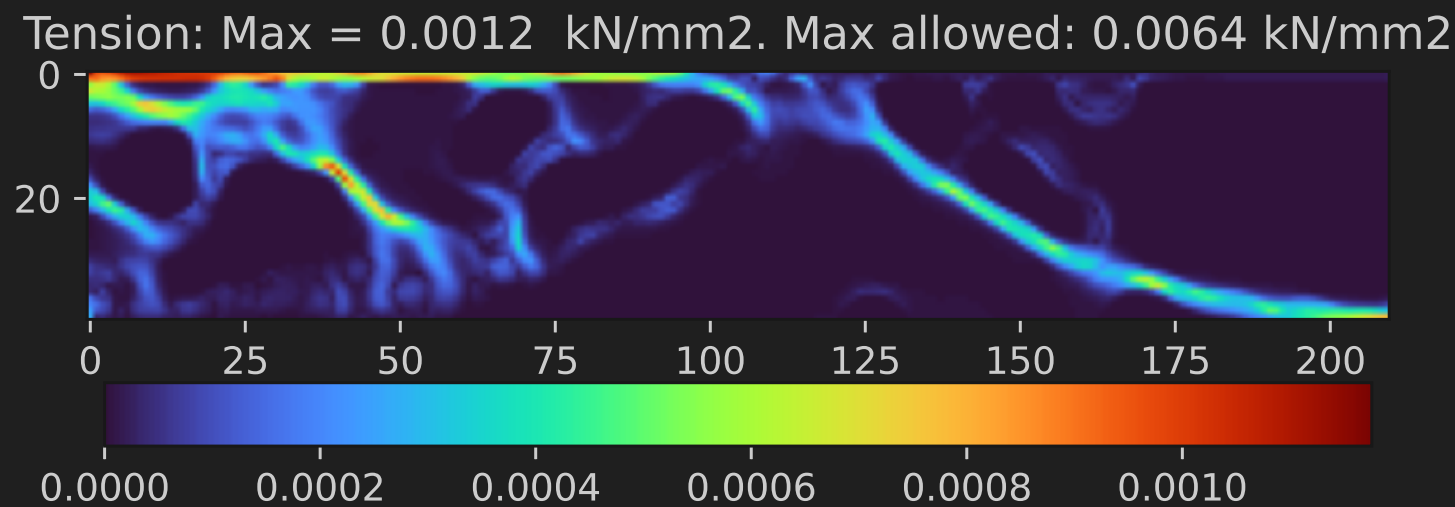
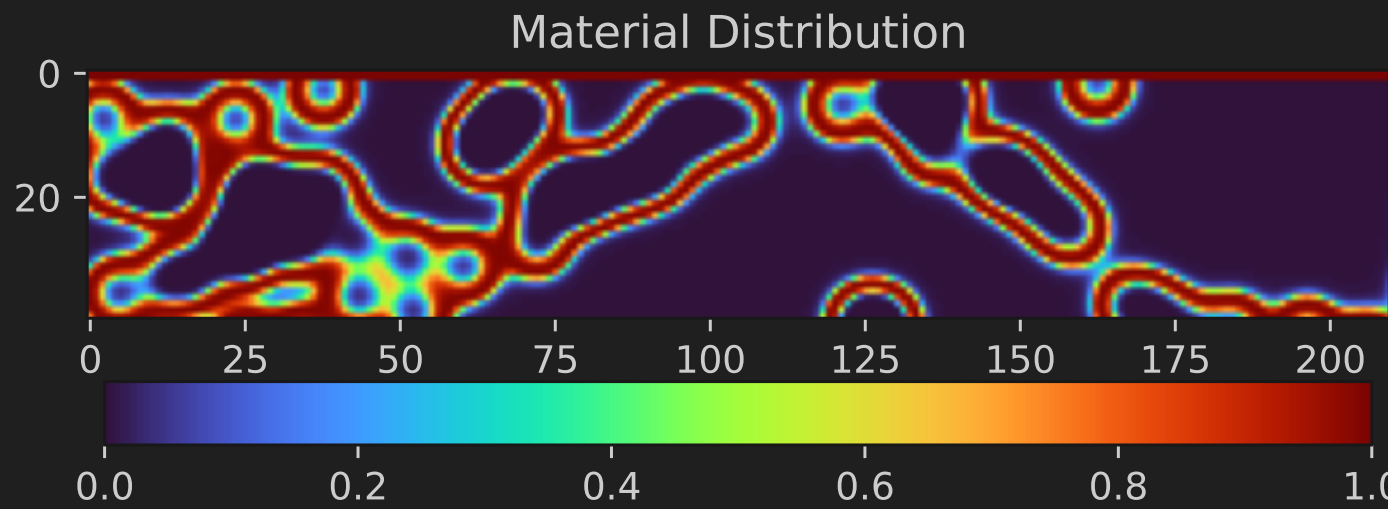
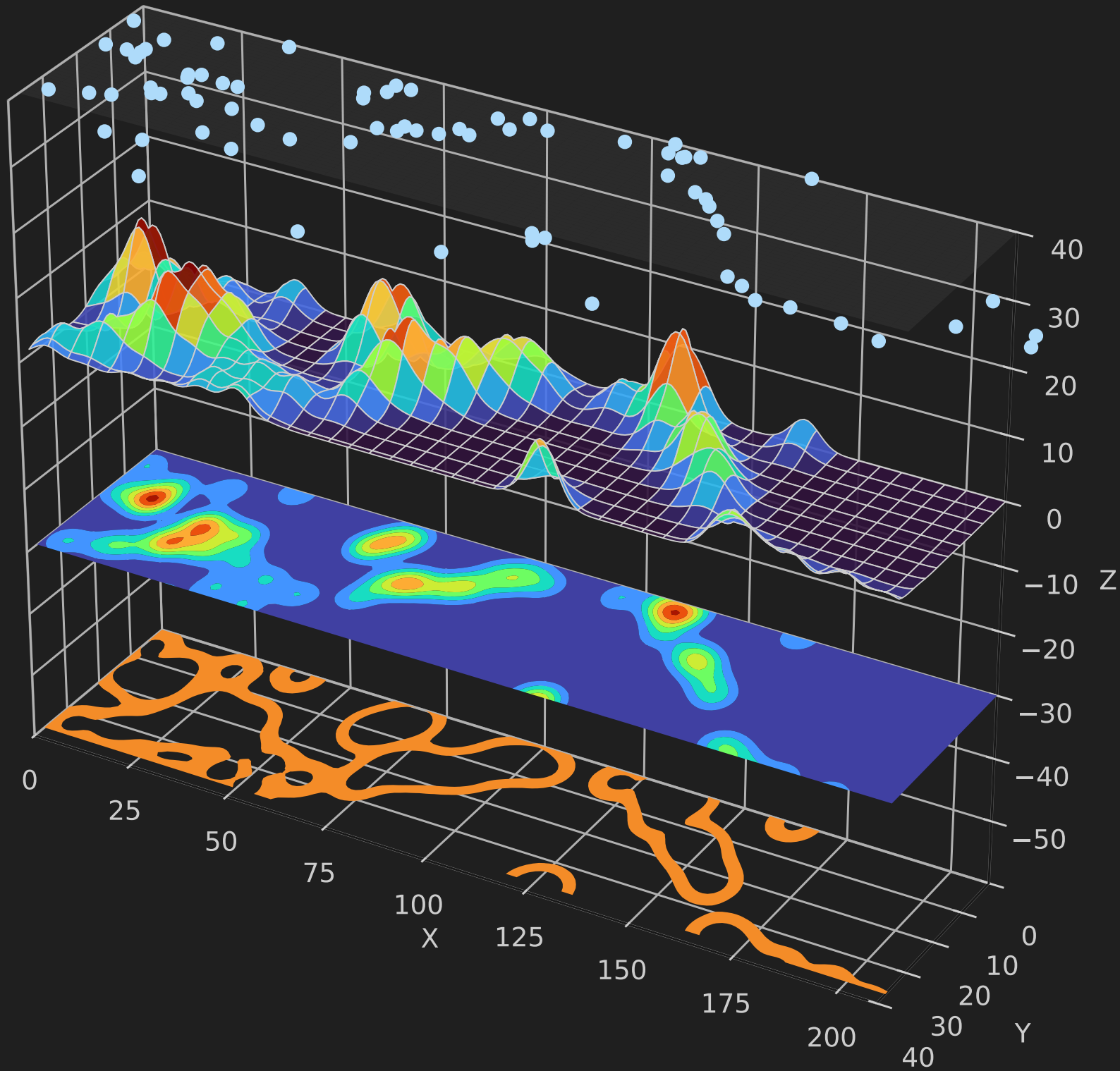
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.10) = 0.33

Spread Gaussian = 4.75 Shift = 2.38 Iteration = 031



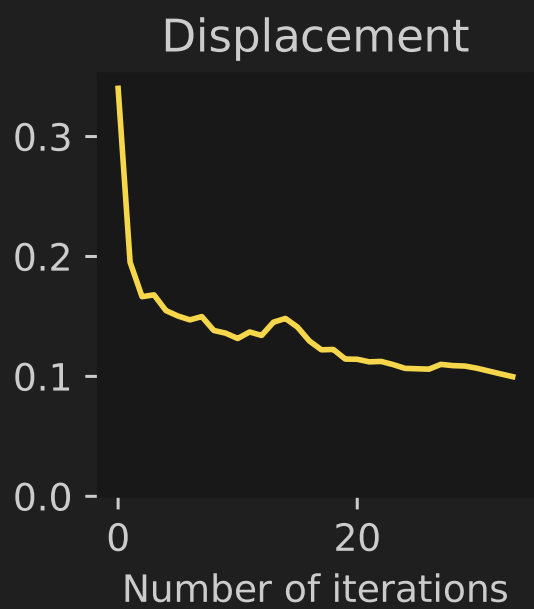
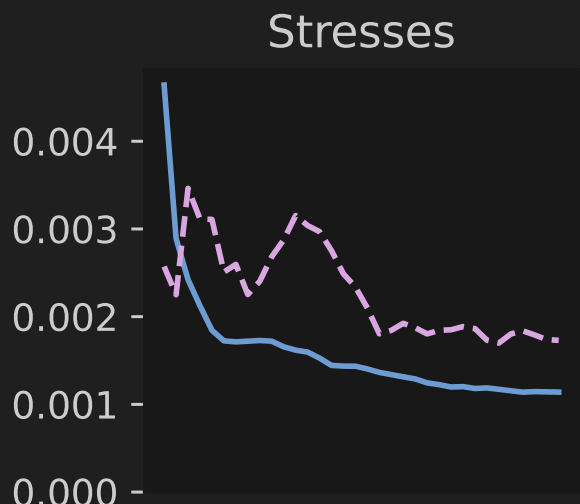
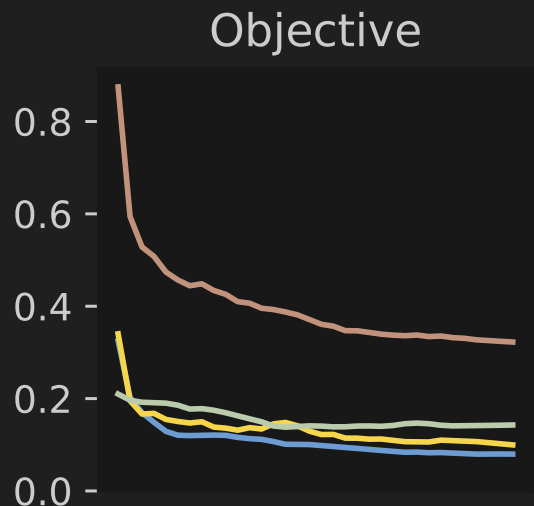
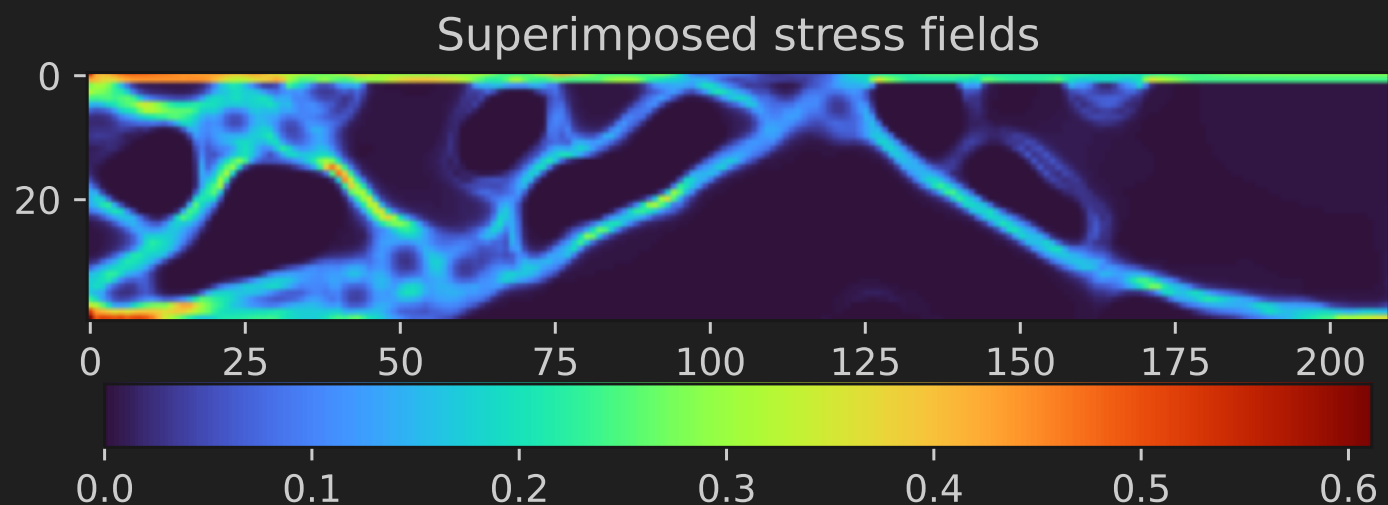
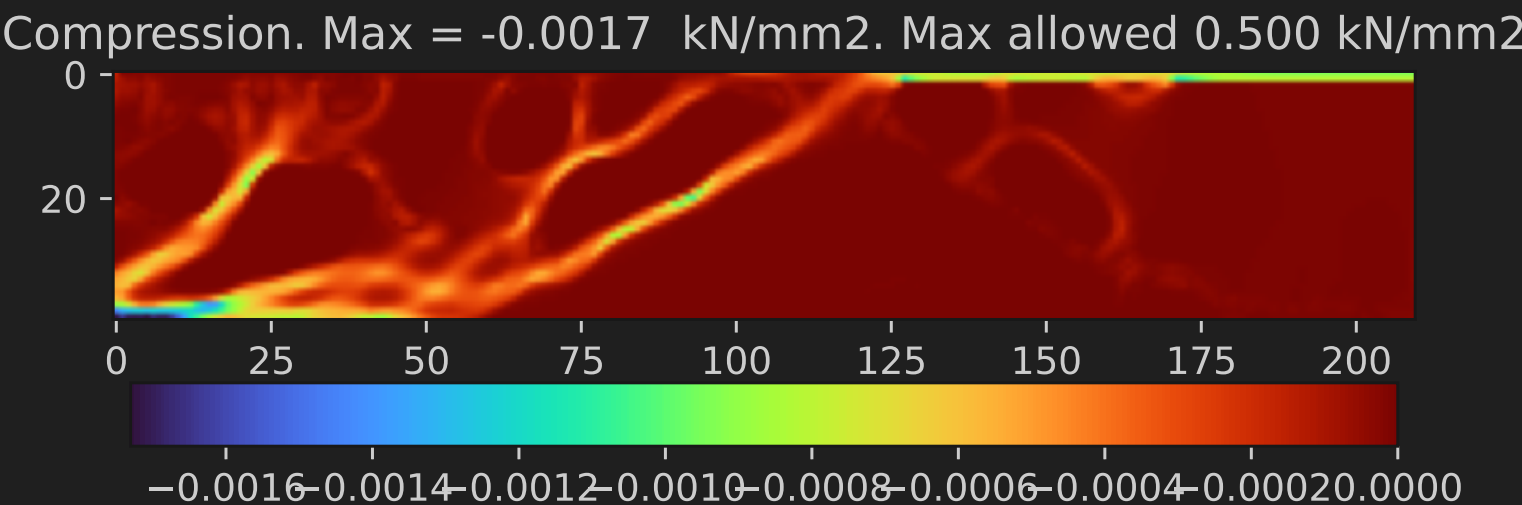
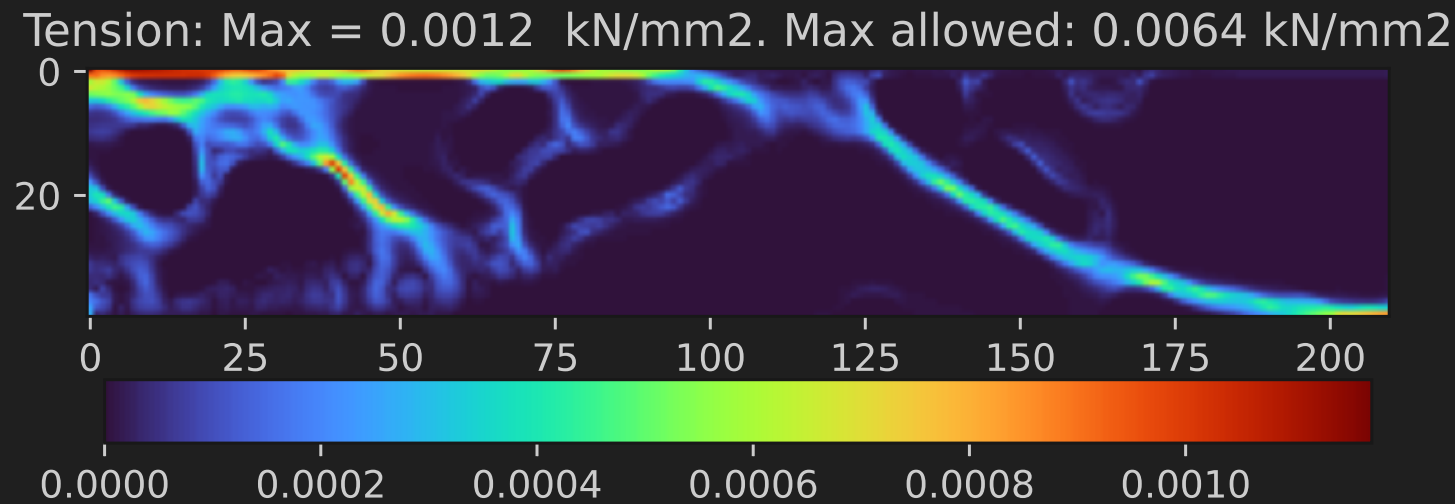
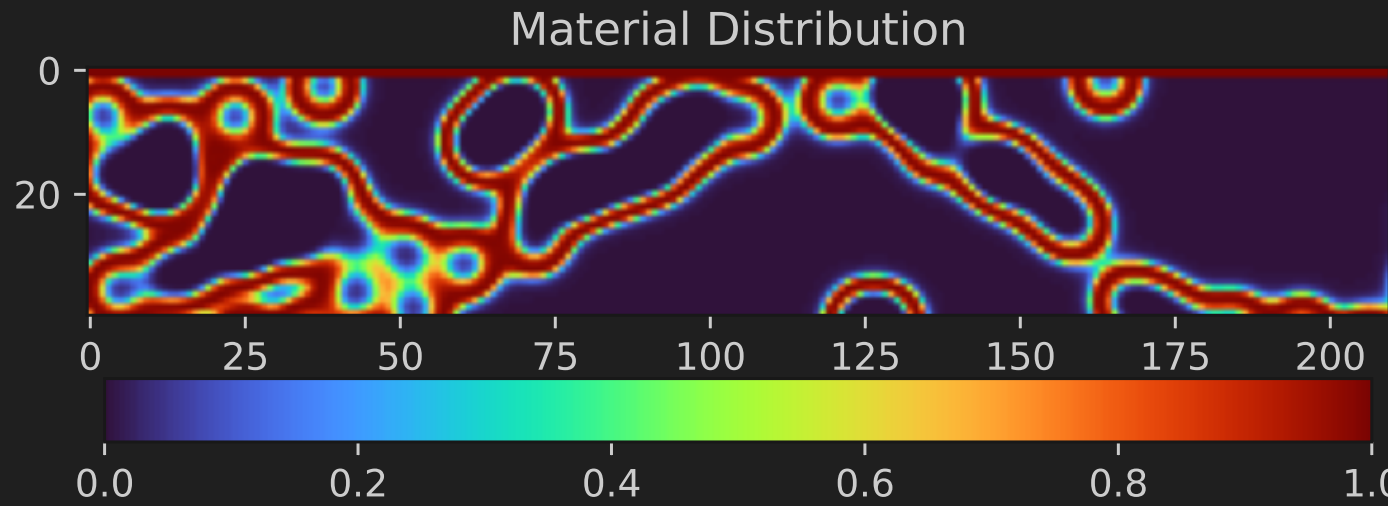
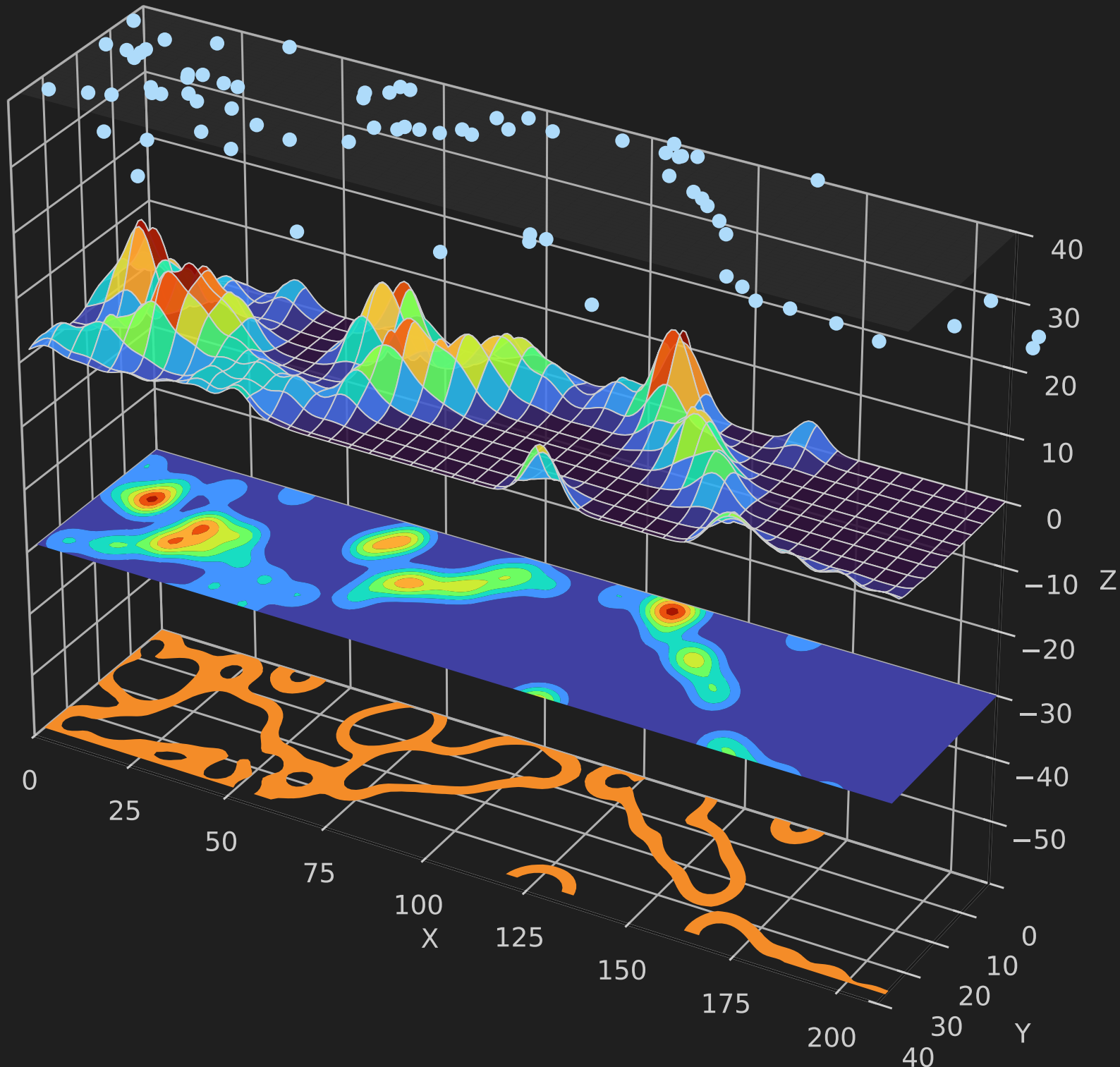
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.10) = 0.32

Spread Gaussian = 4.76 Shift = 2.39 Iteration = 032



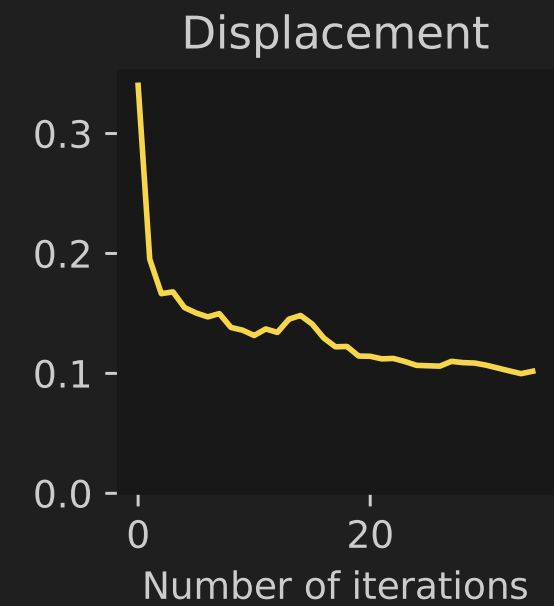
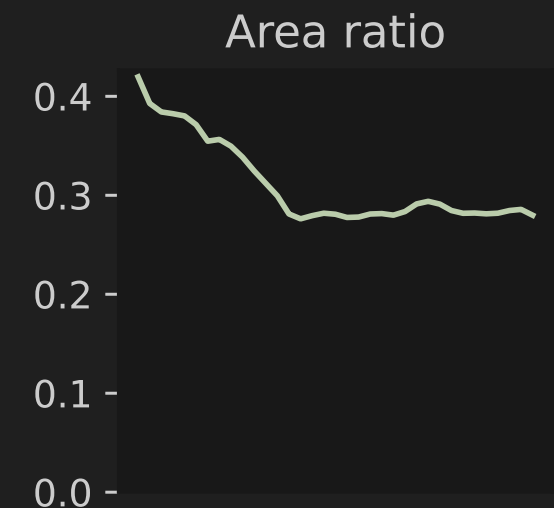
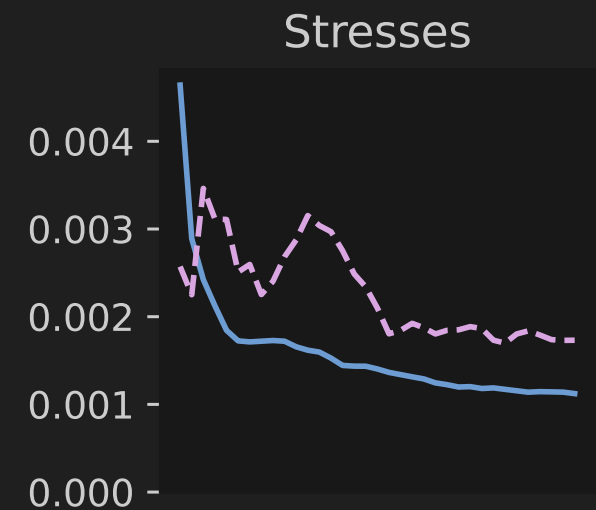
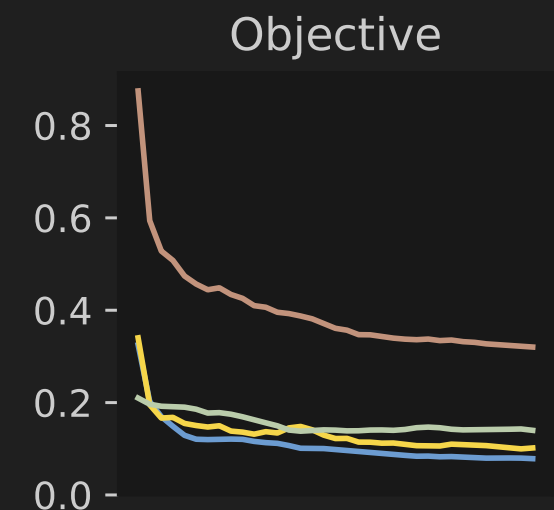
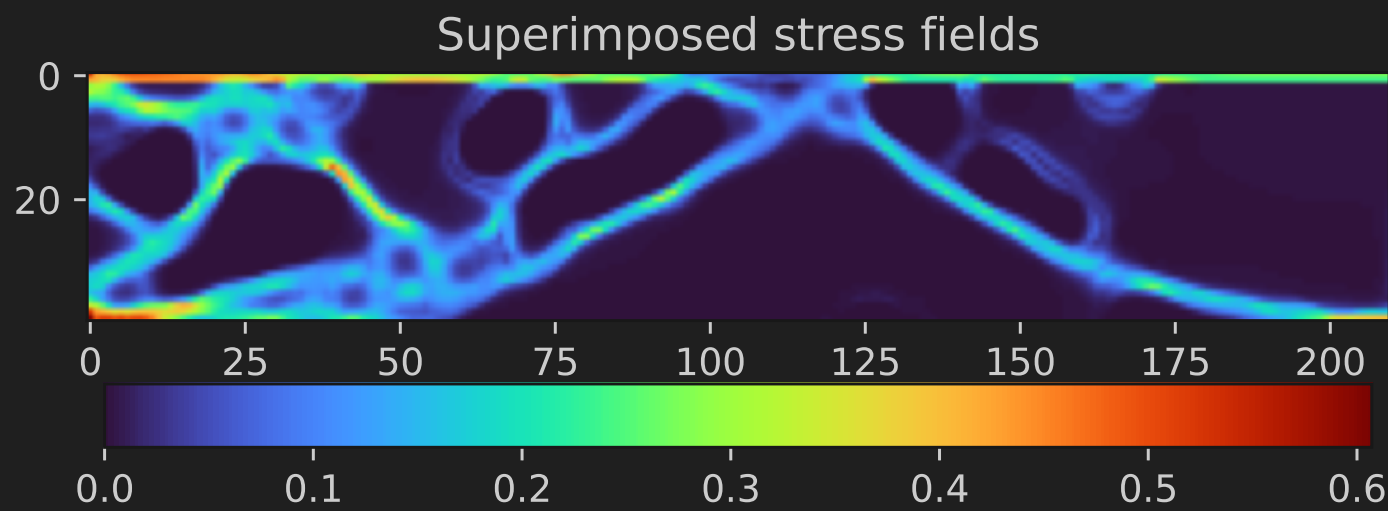
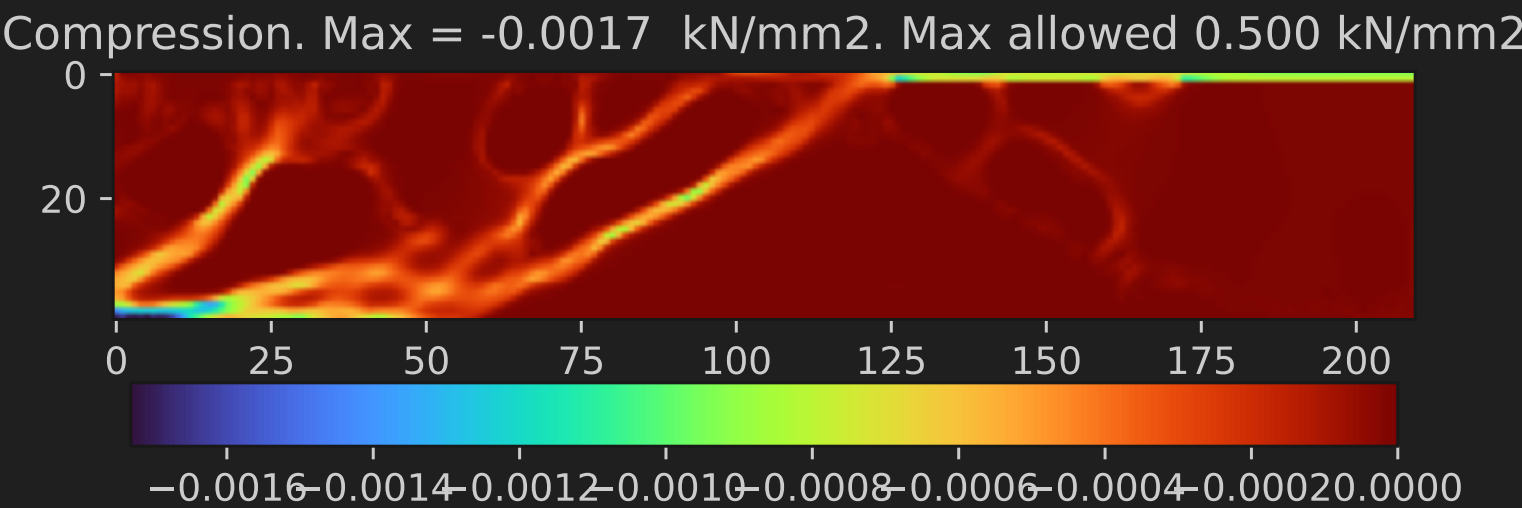
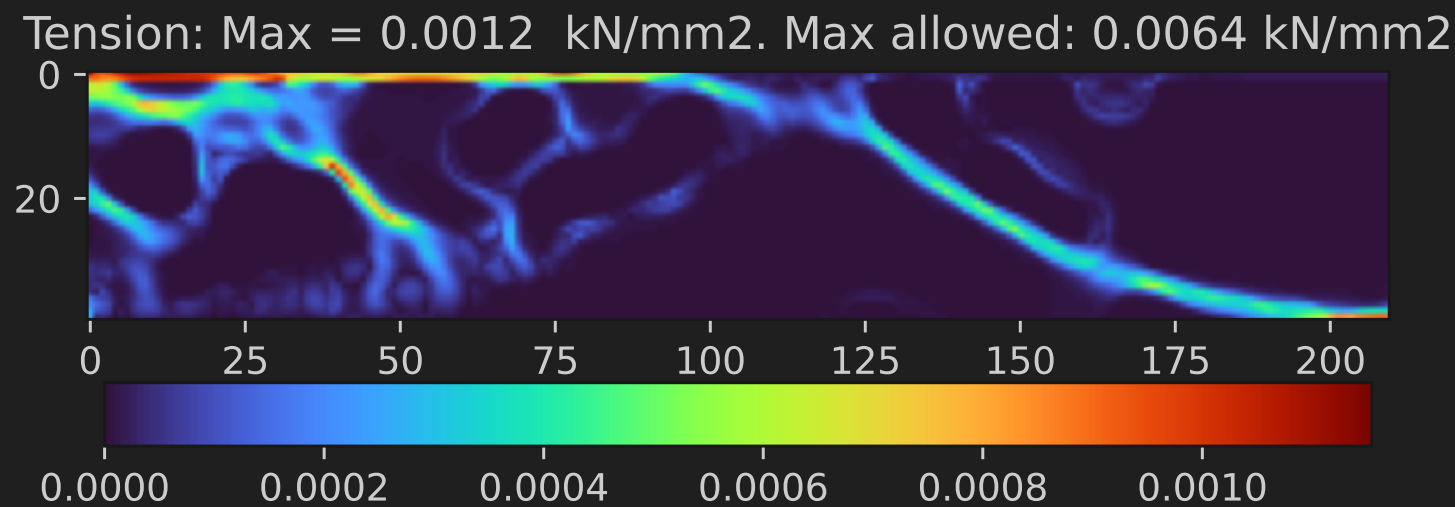
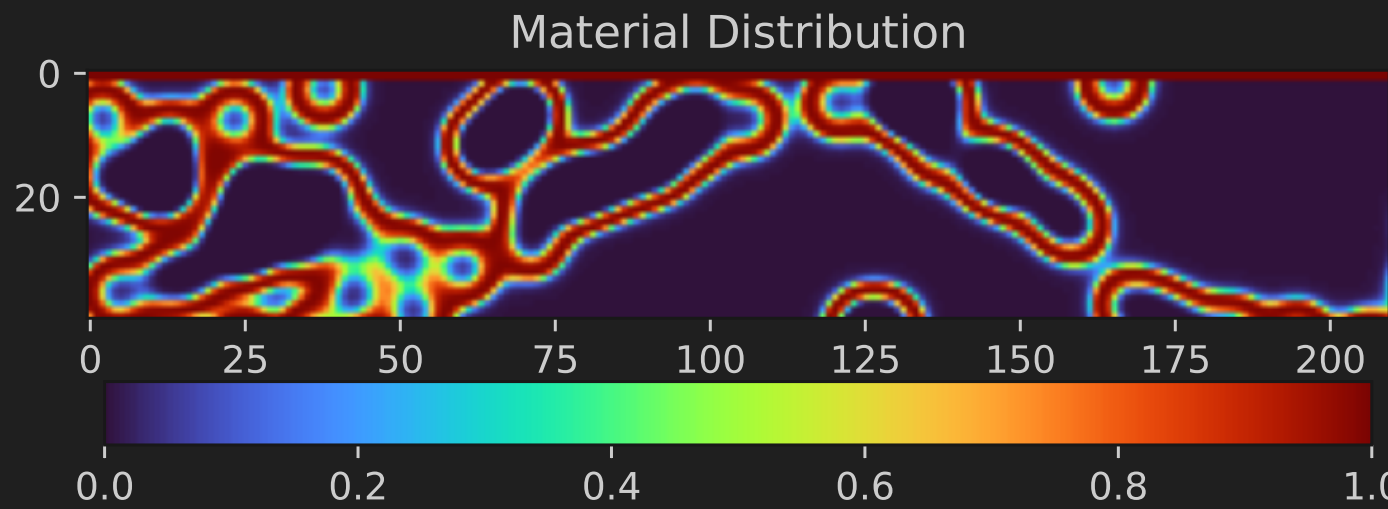
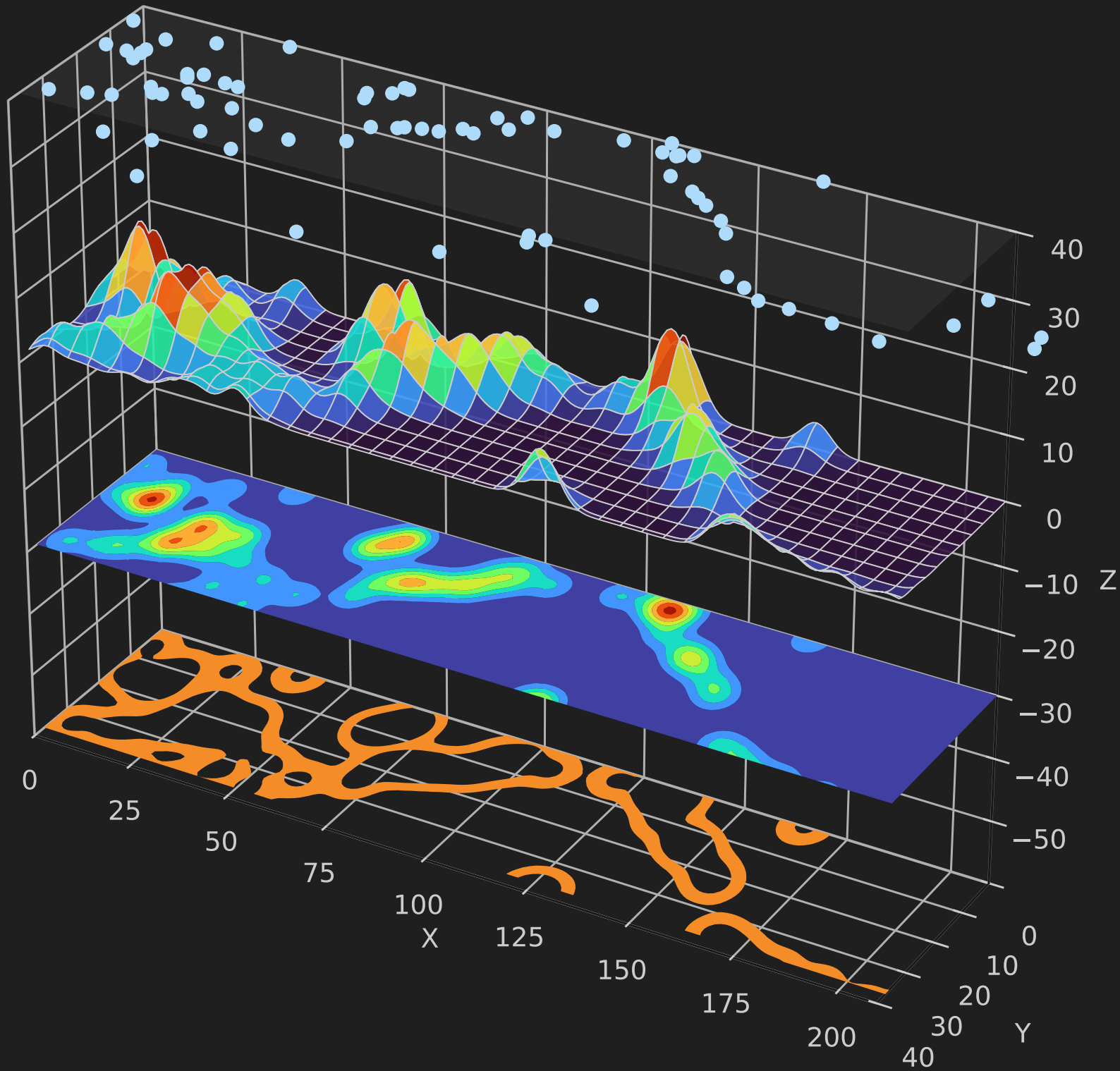
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.29) - (Displacement: 1 * -0.10) = 0.32

Spread Gaussian = 4.77 Shift = 2.40 Iteration = 033



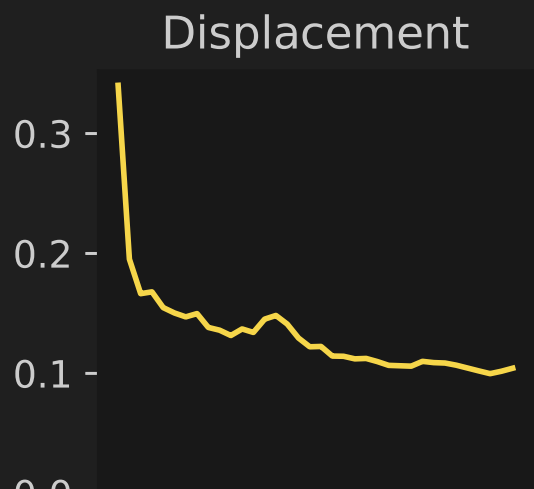
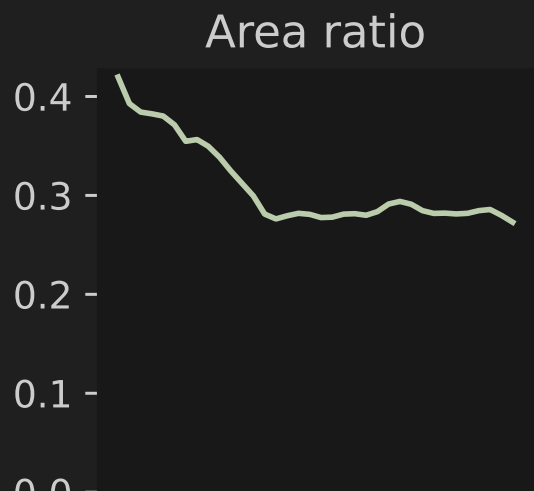
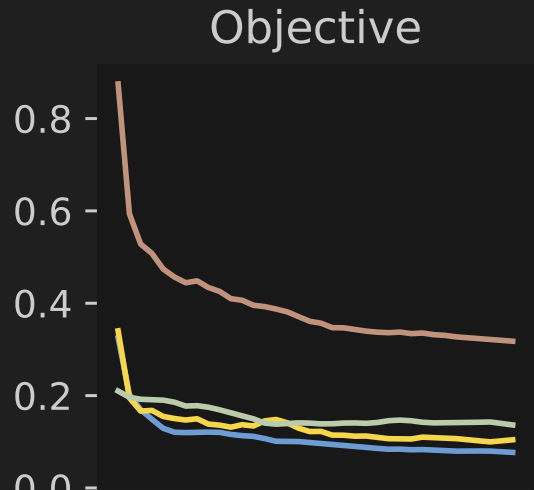
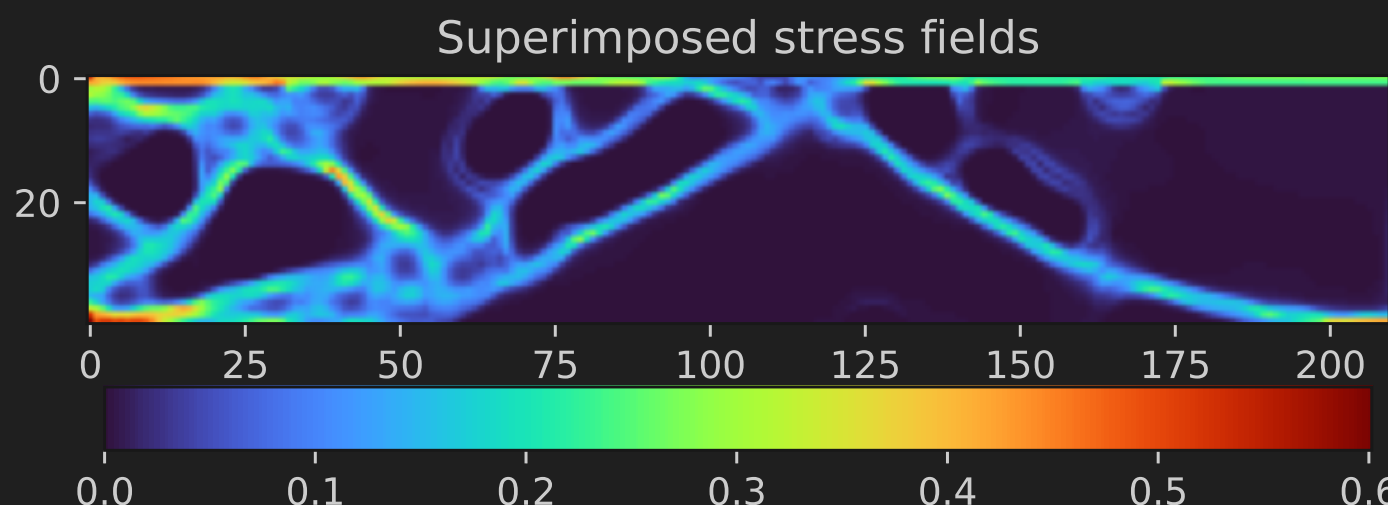
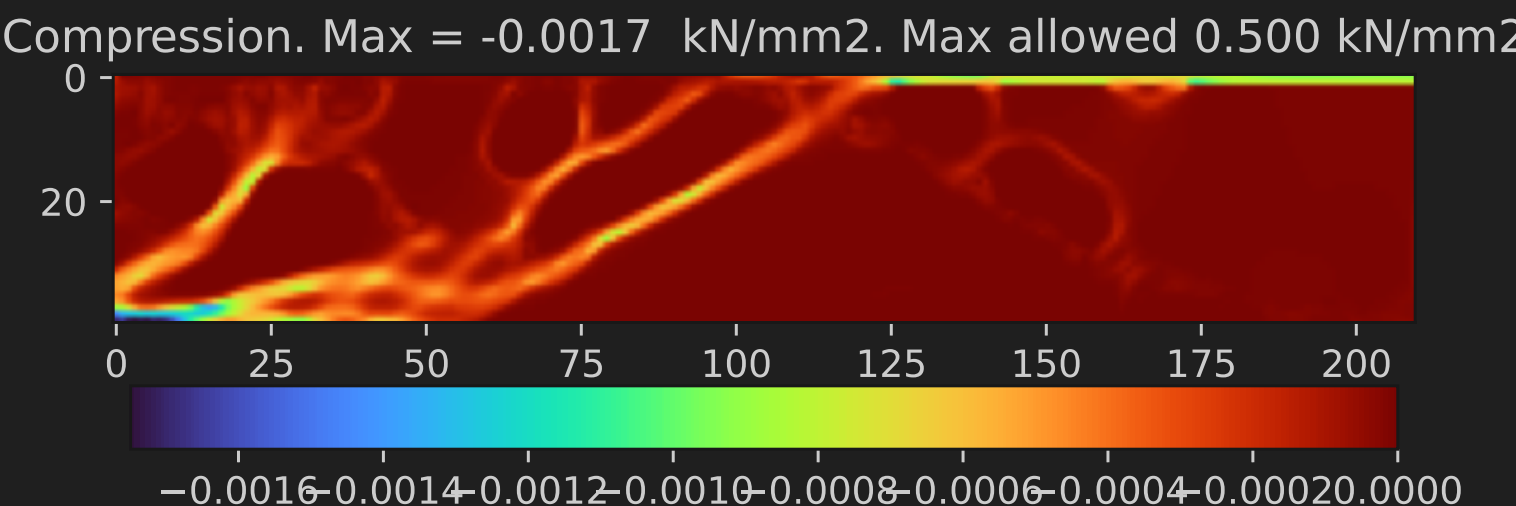
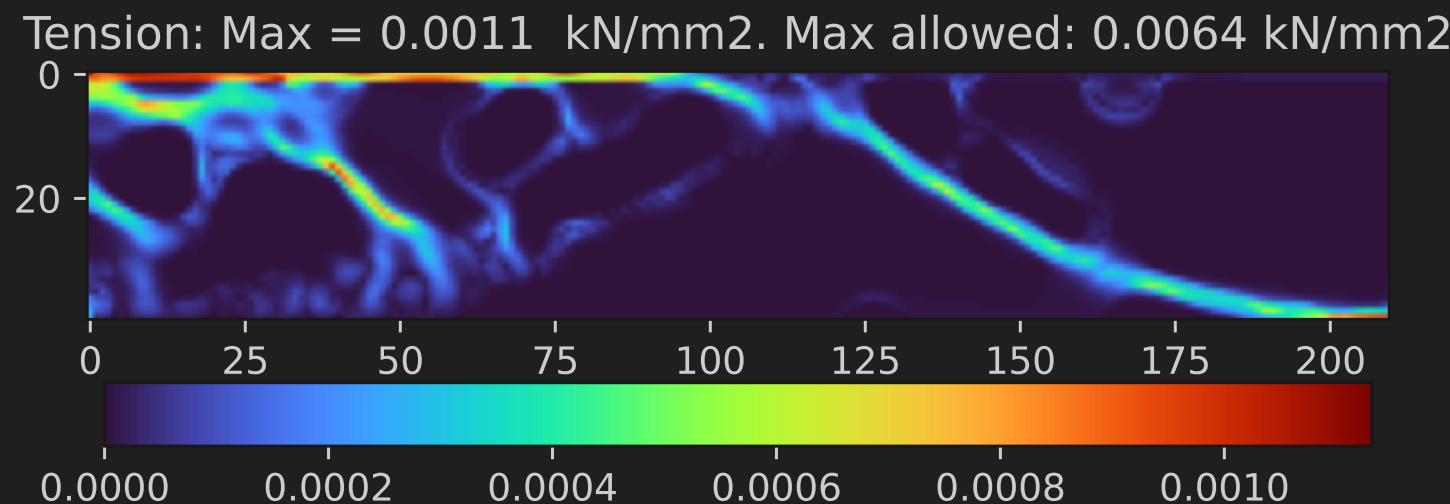
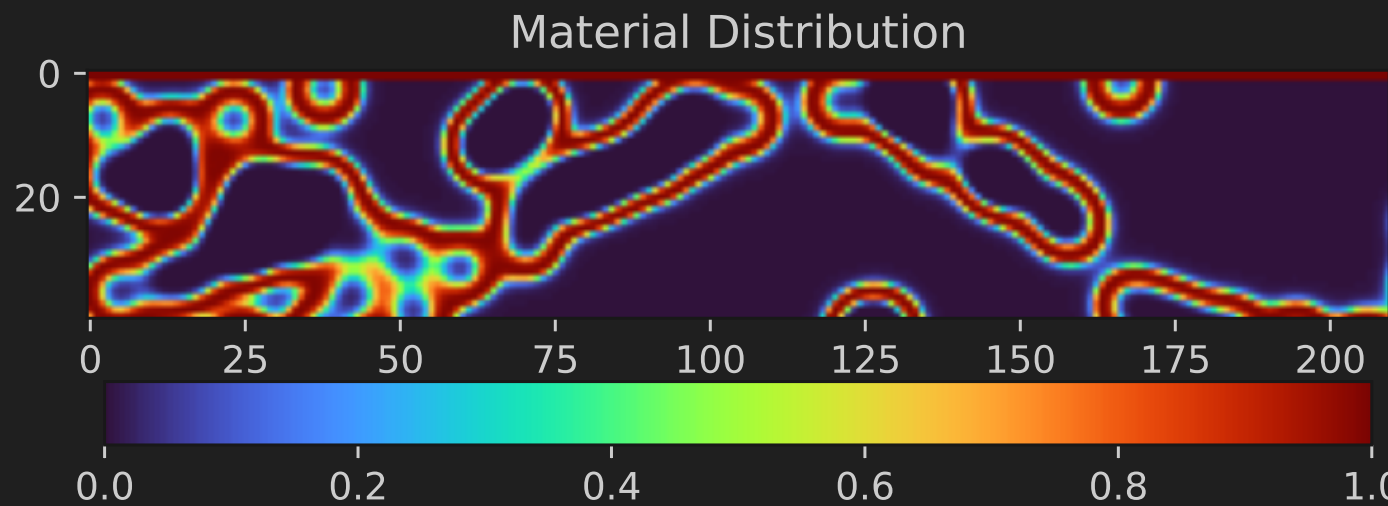
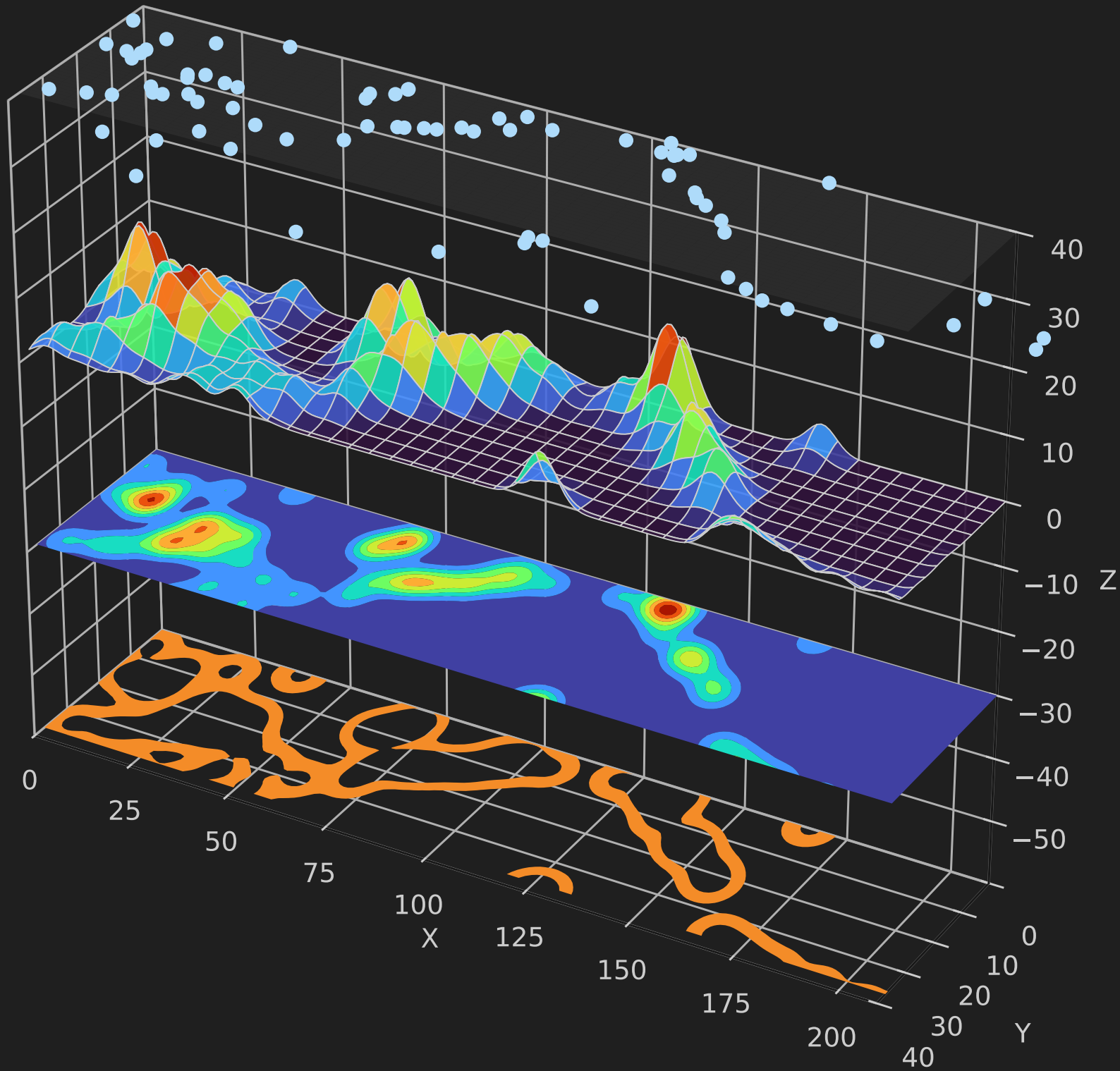
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.28) - (Displacement: 1 * -0.10) = 0.32

Spread Gaussian = 4.78 Shift = 2.41 Iteration = 034



Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.10) = 0.32

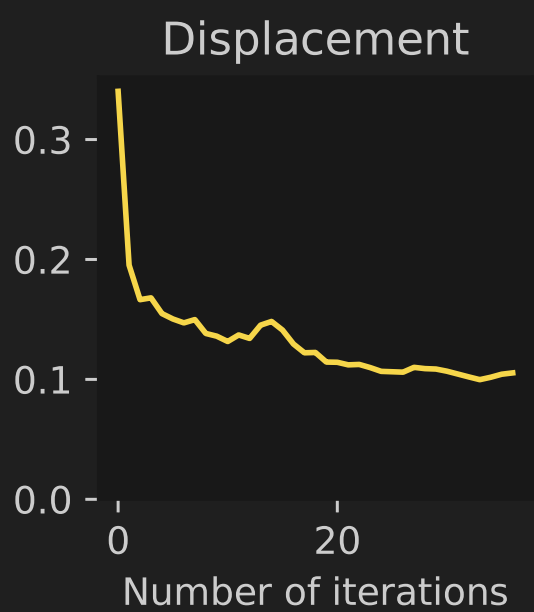
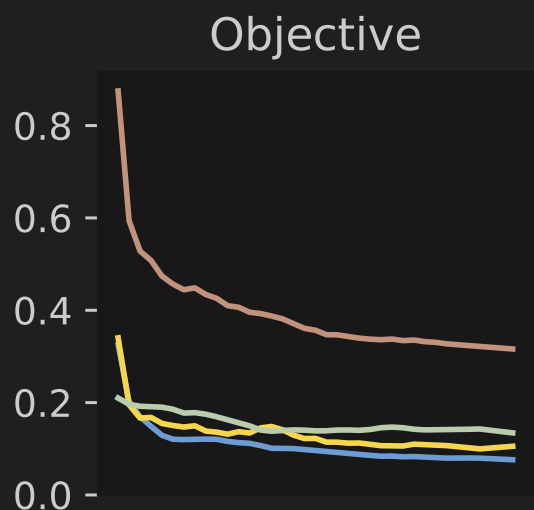
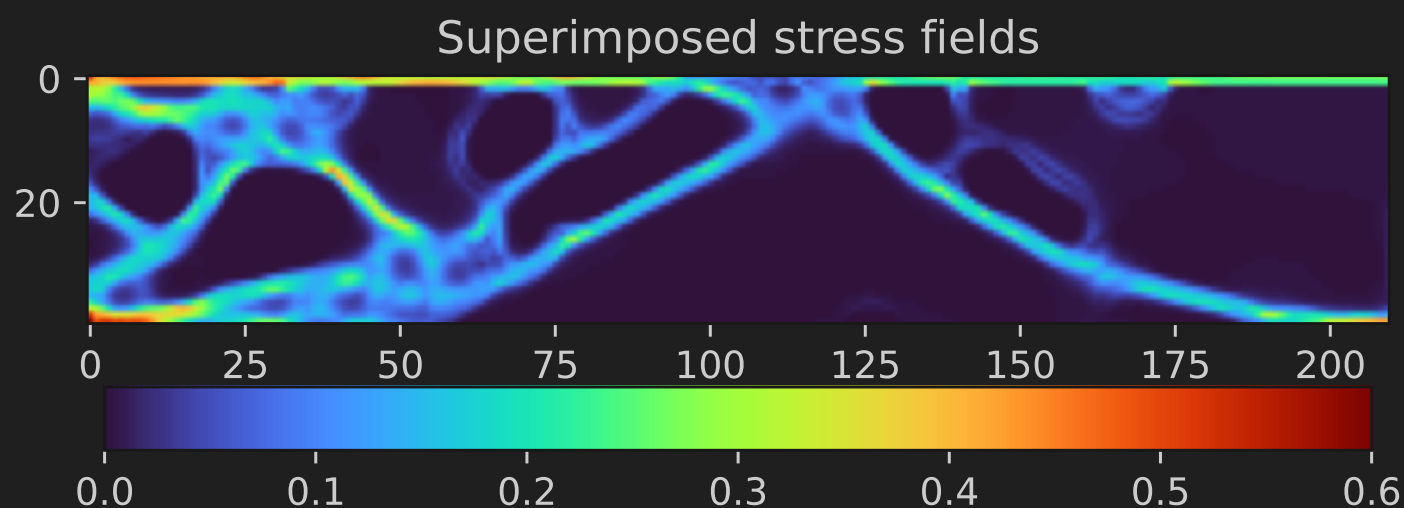
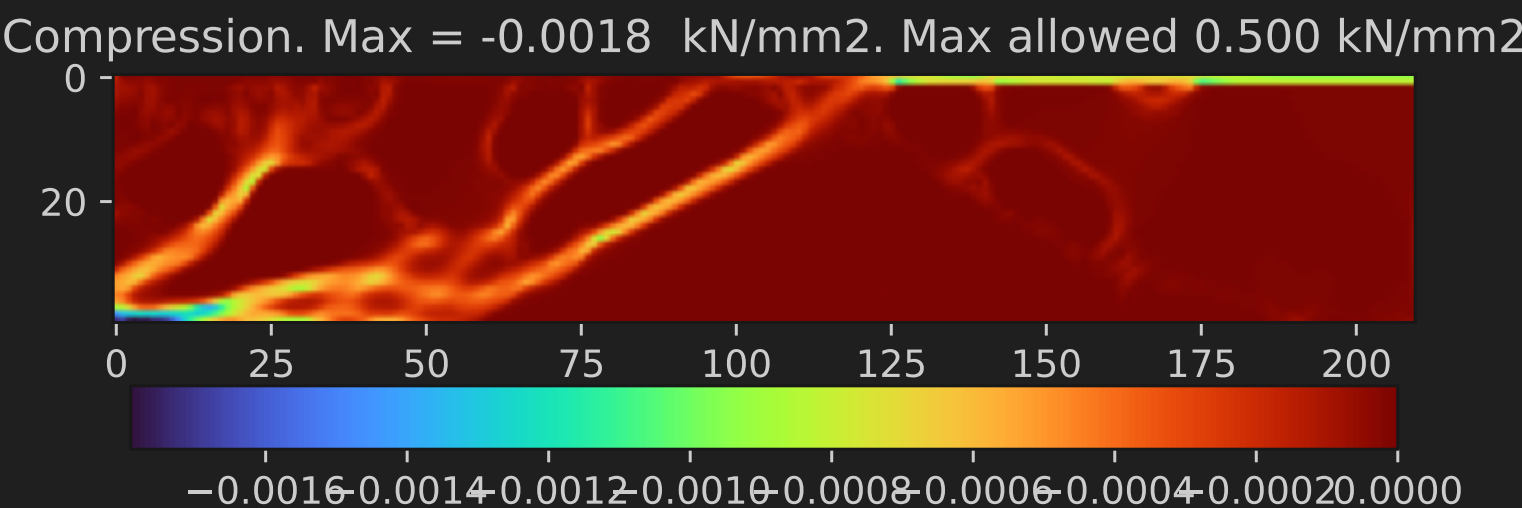
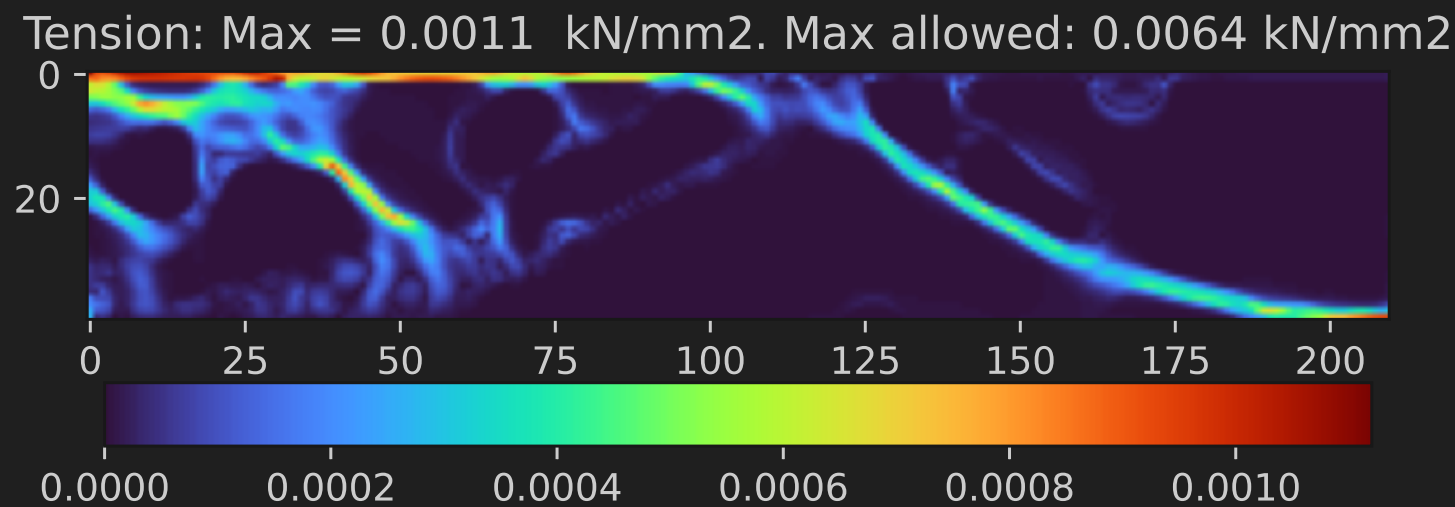
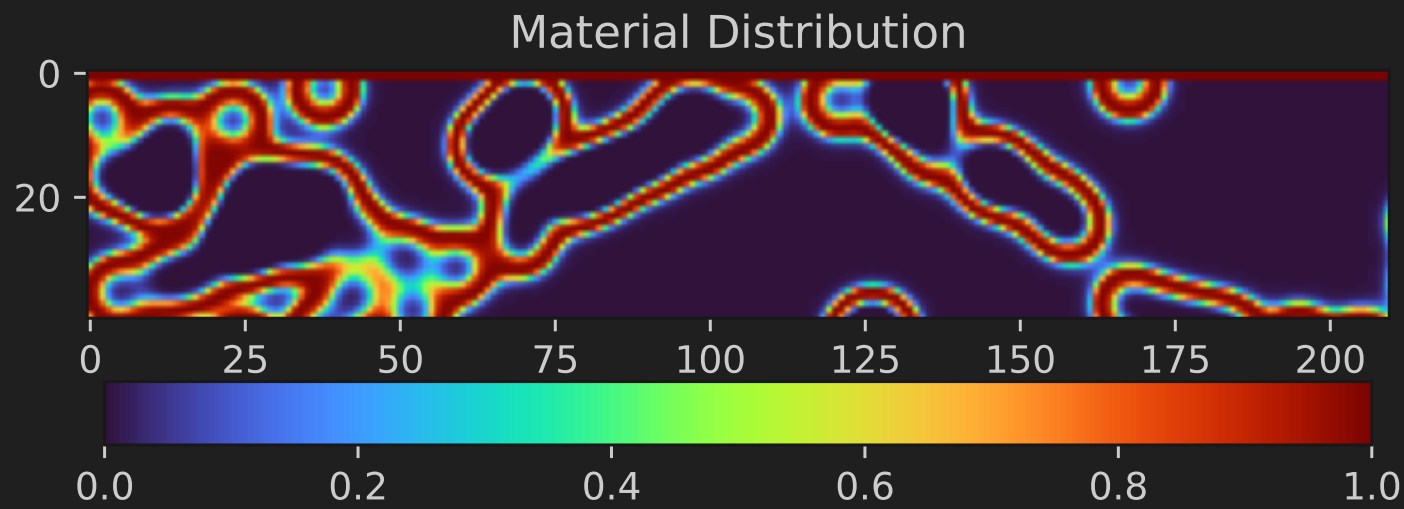
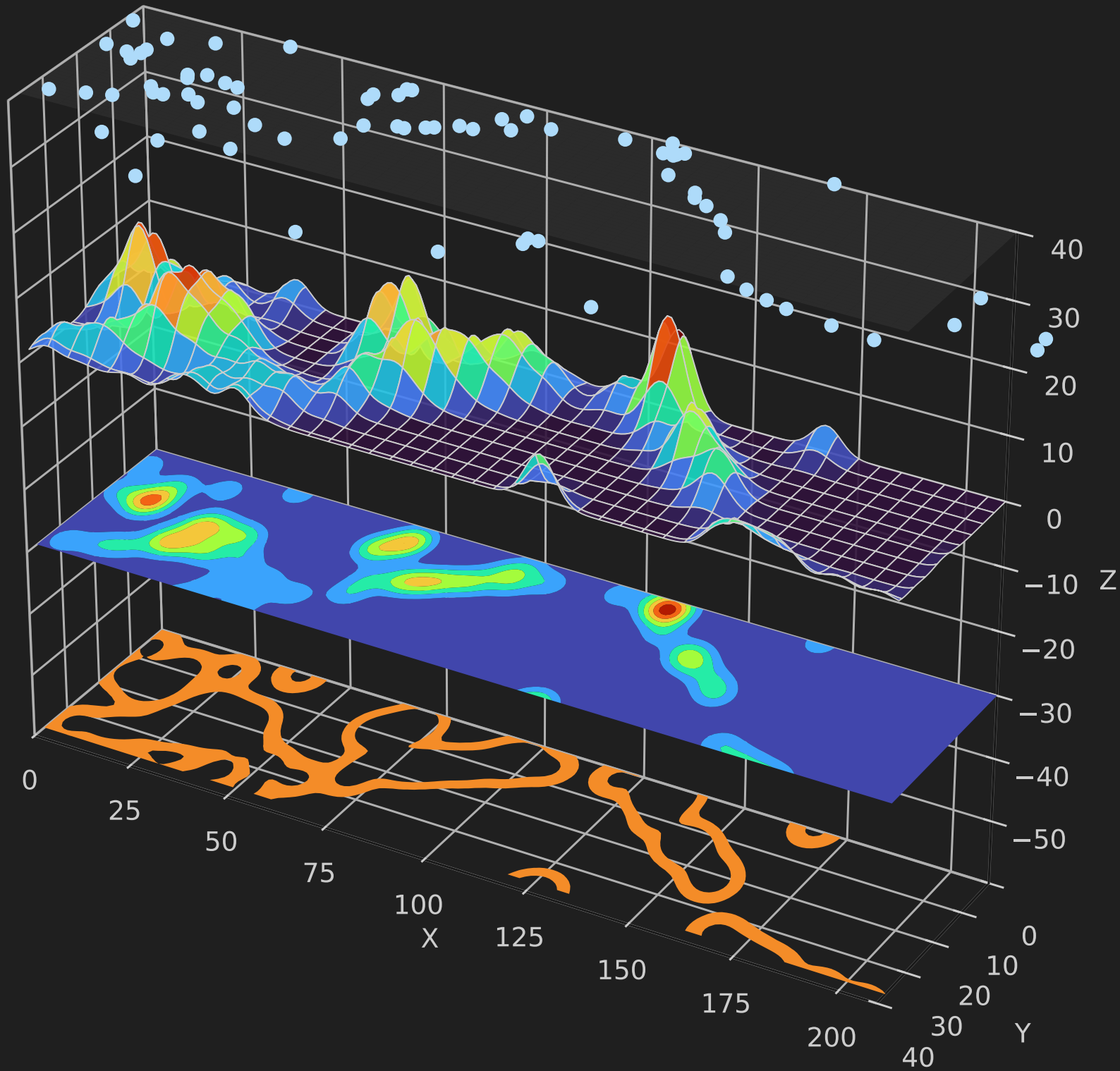
Spread Gaussian = 4.78 Shift = 2.41 Iteration = 035



Number of iterations

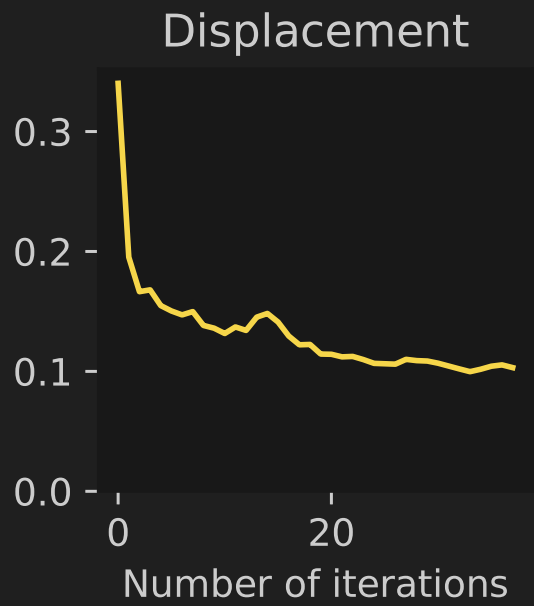
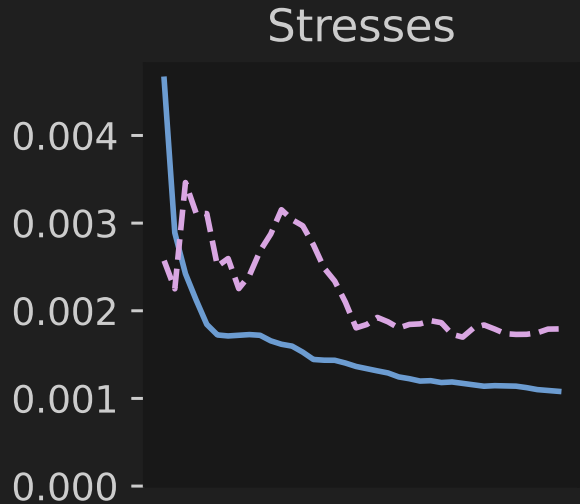
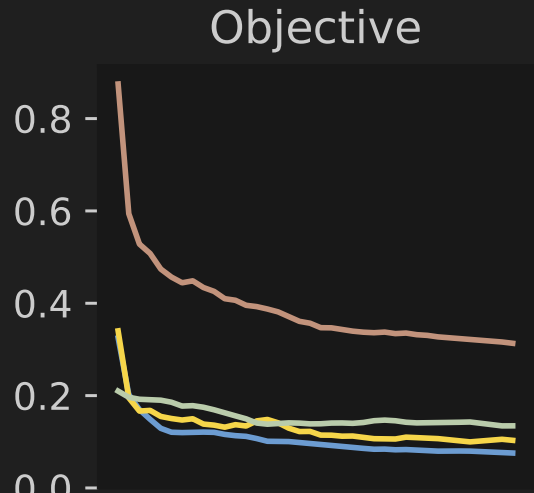
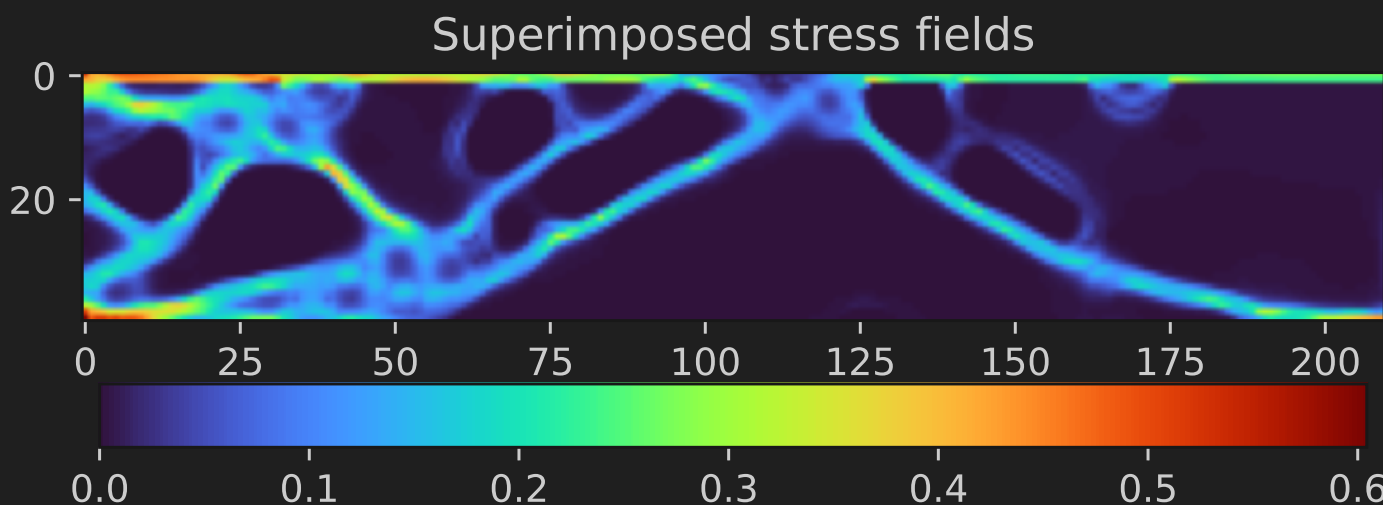
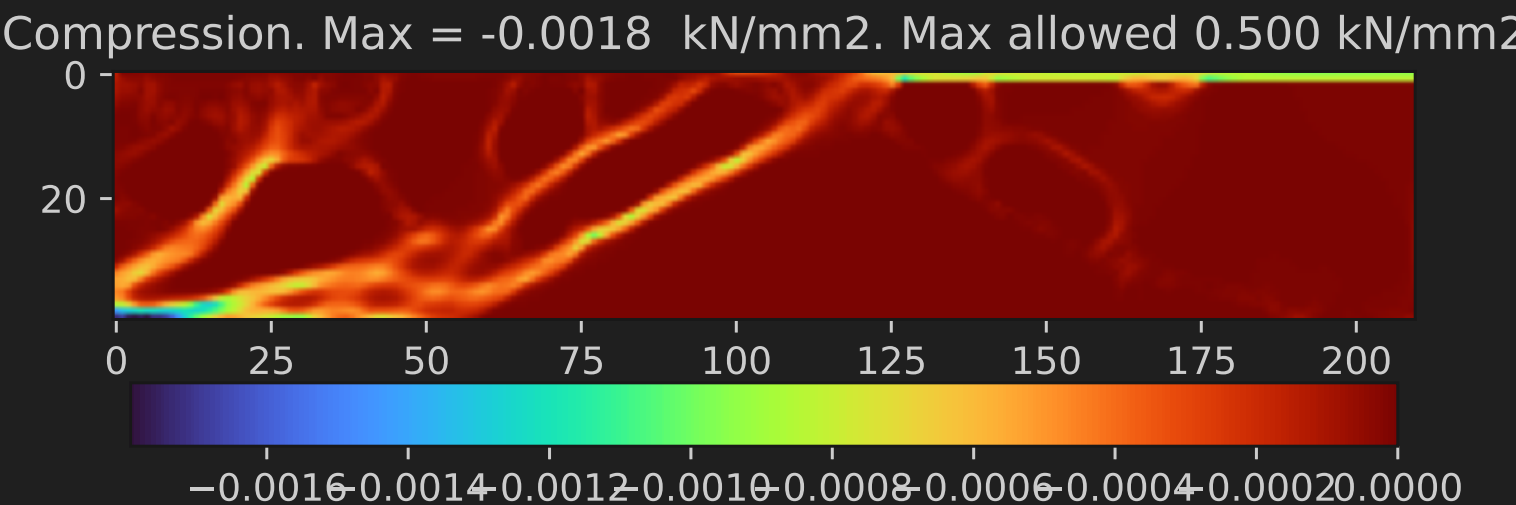
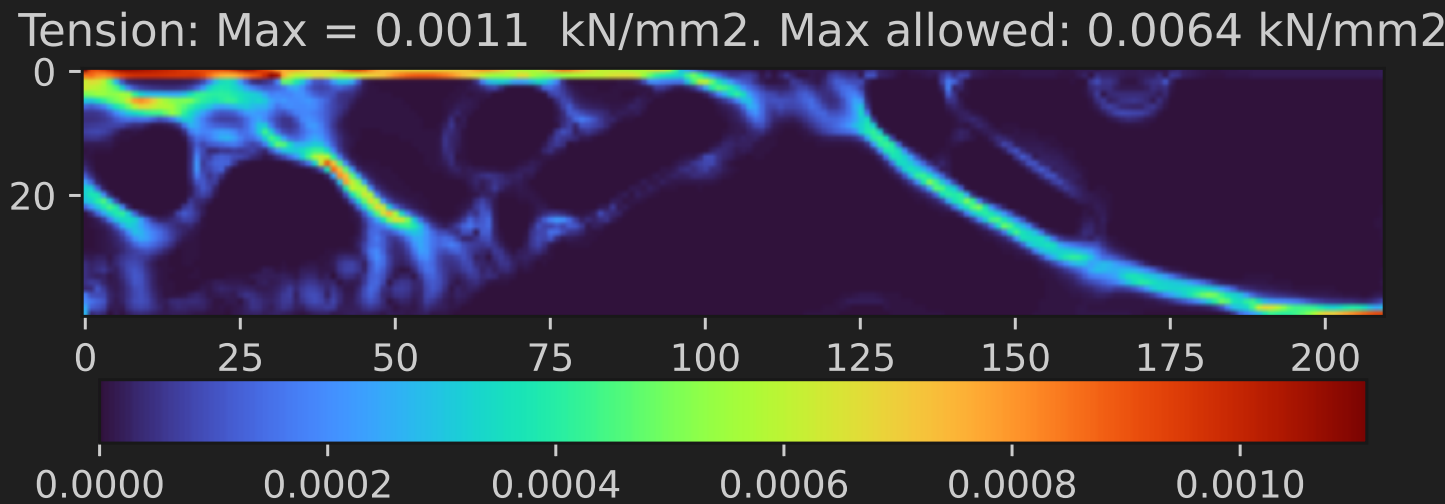
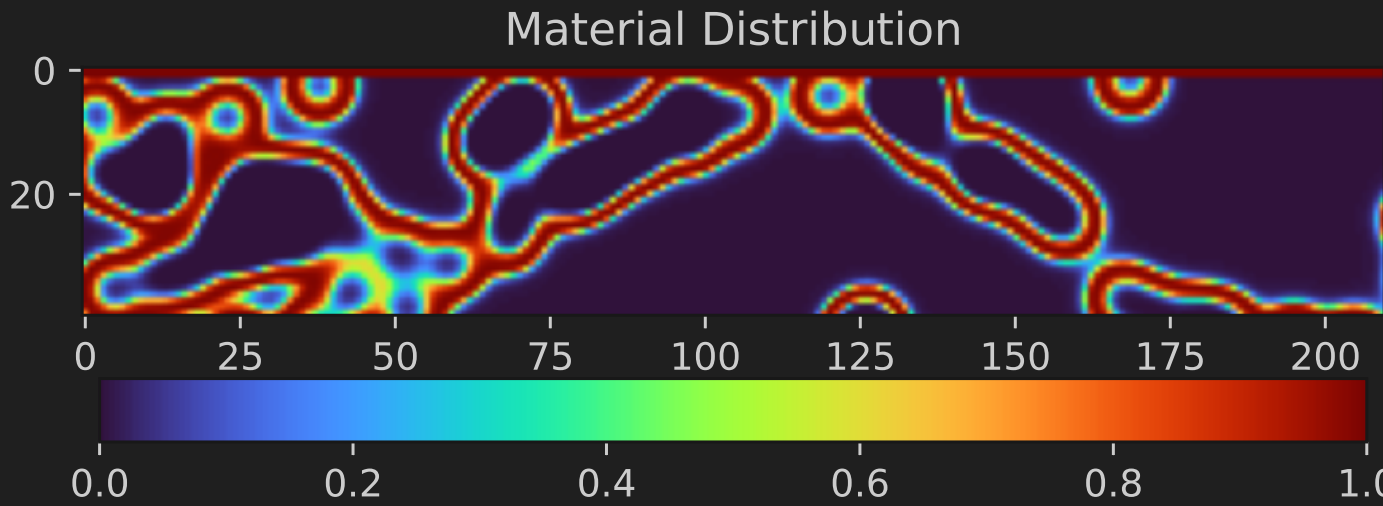
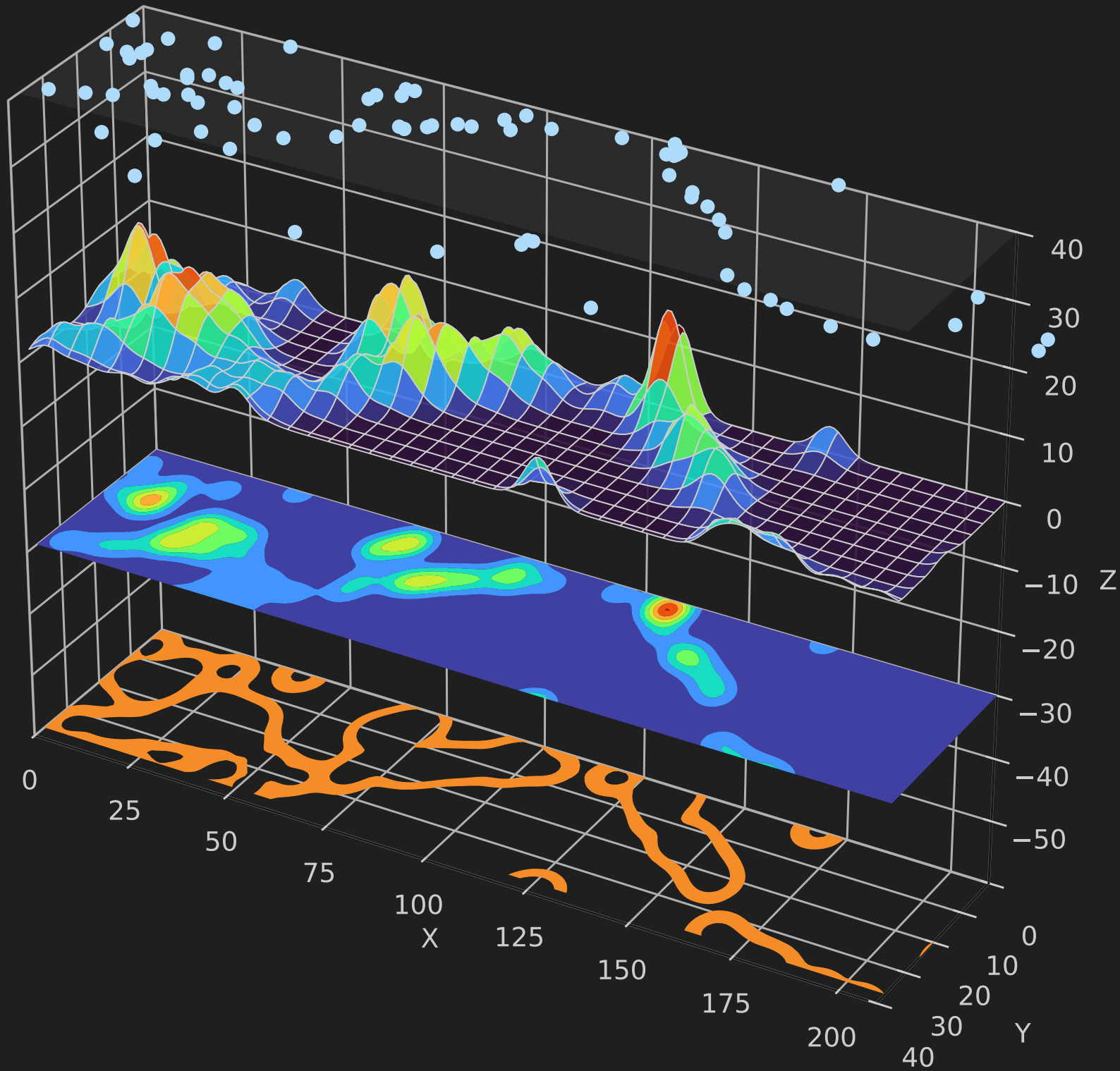
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.11) = 0.32

Spread Gaussian = 4.78 Shift = 2.41 Iteration = 036



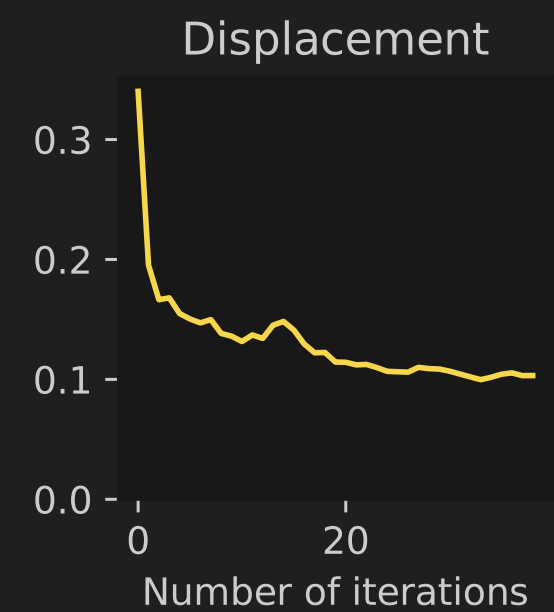
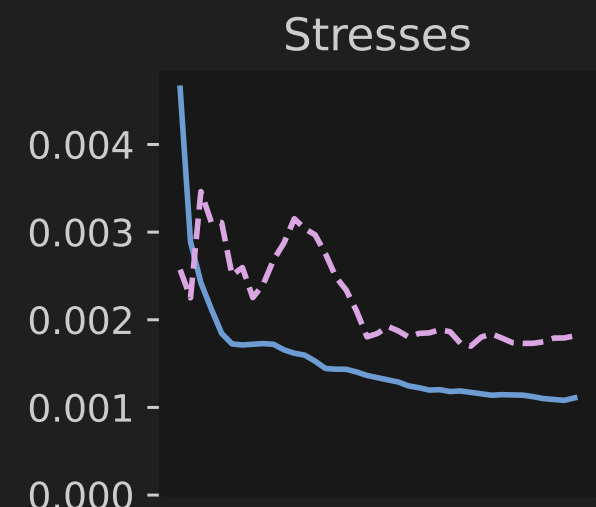
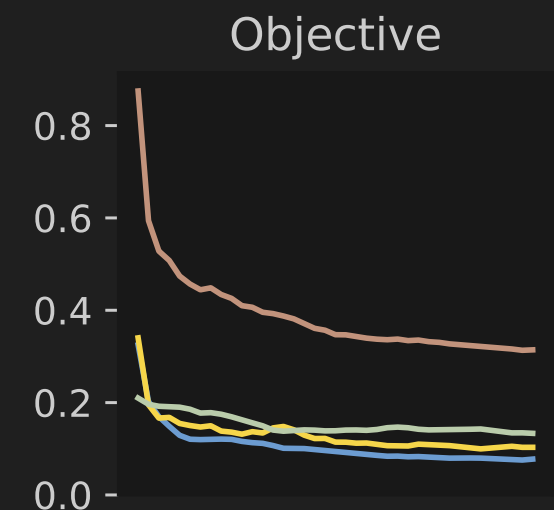
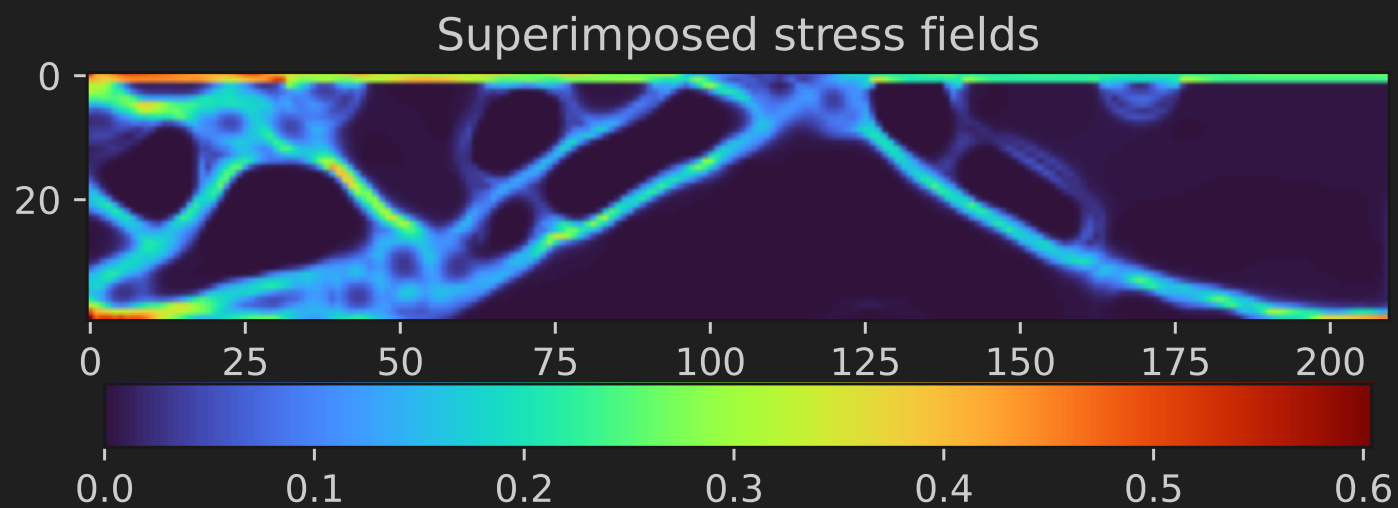
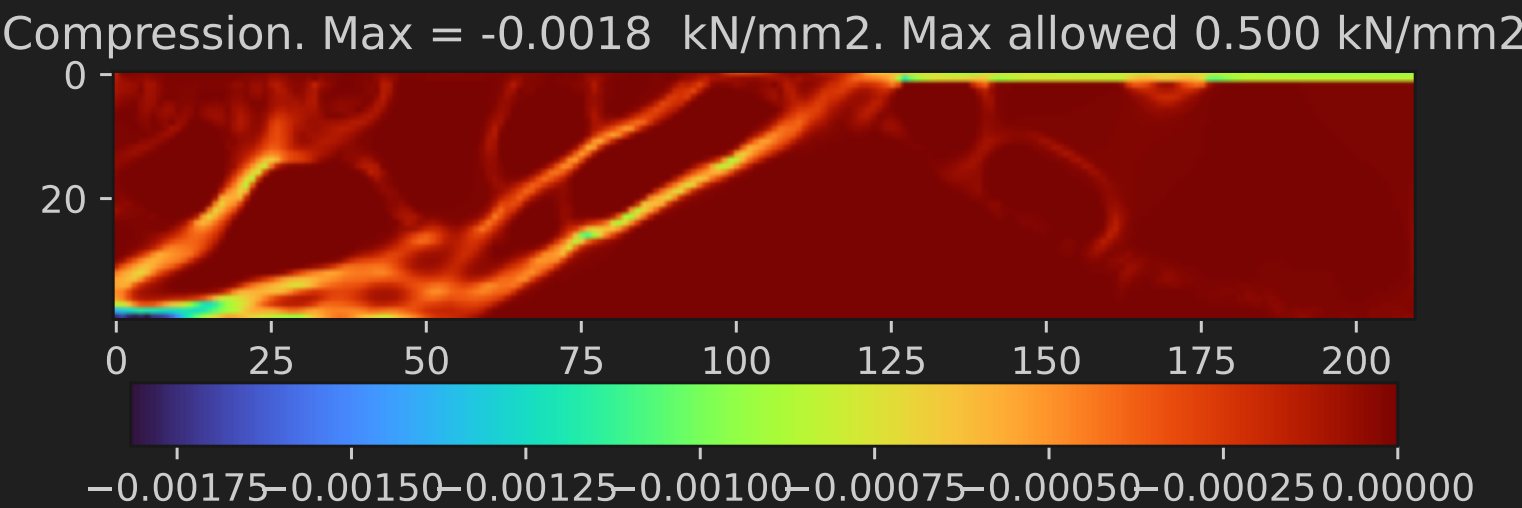
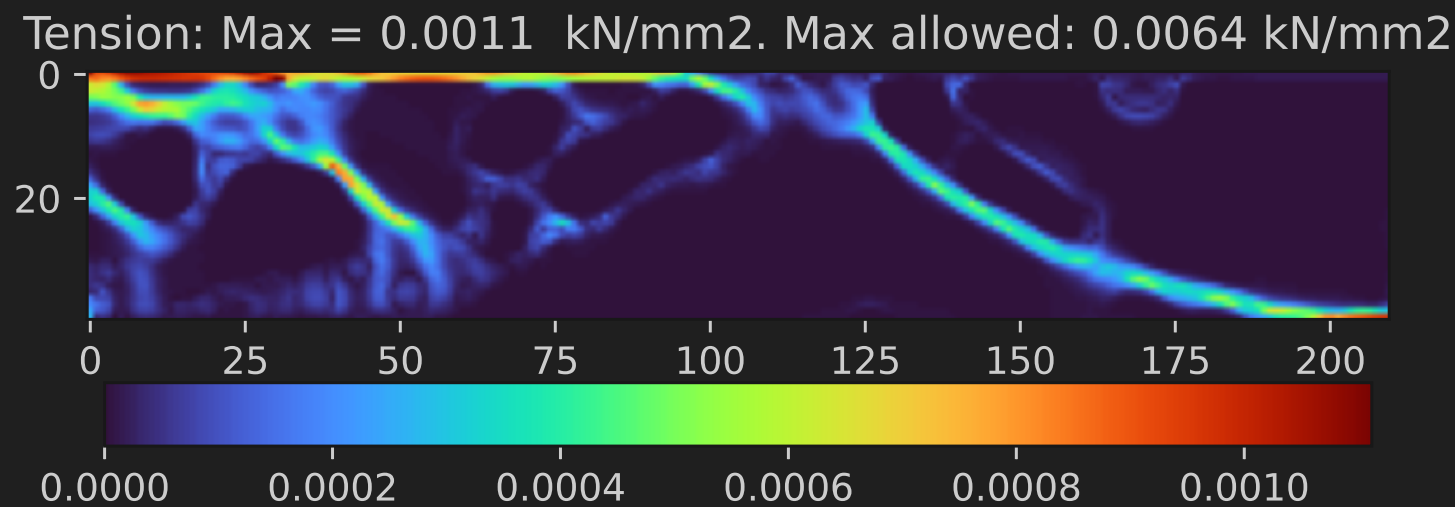
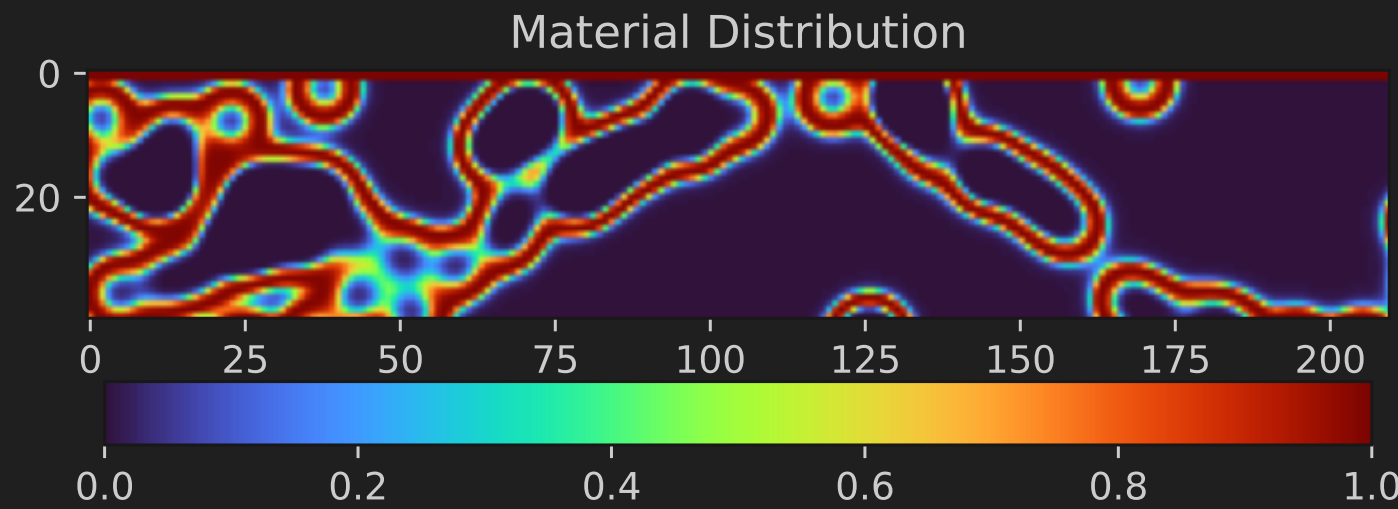
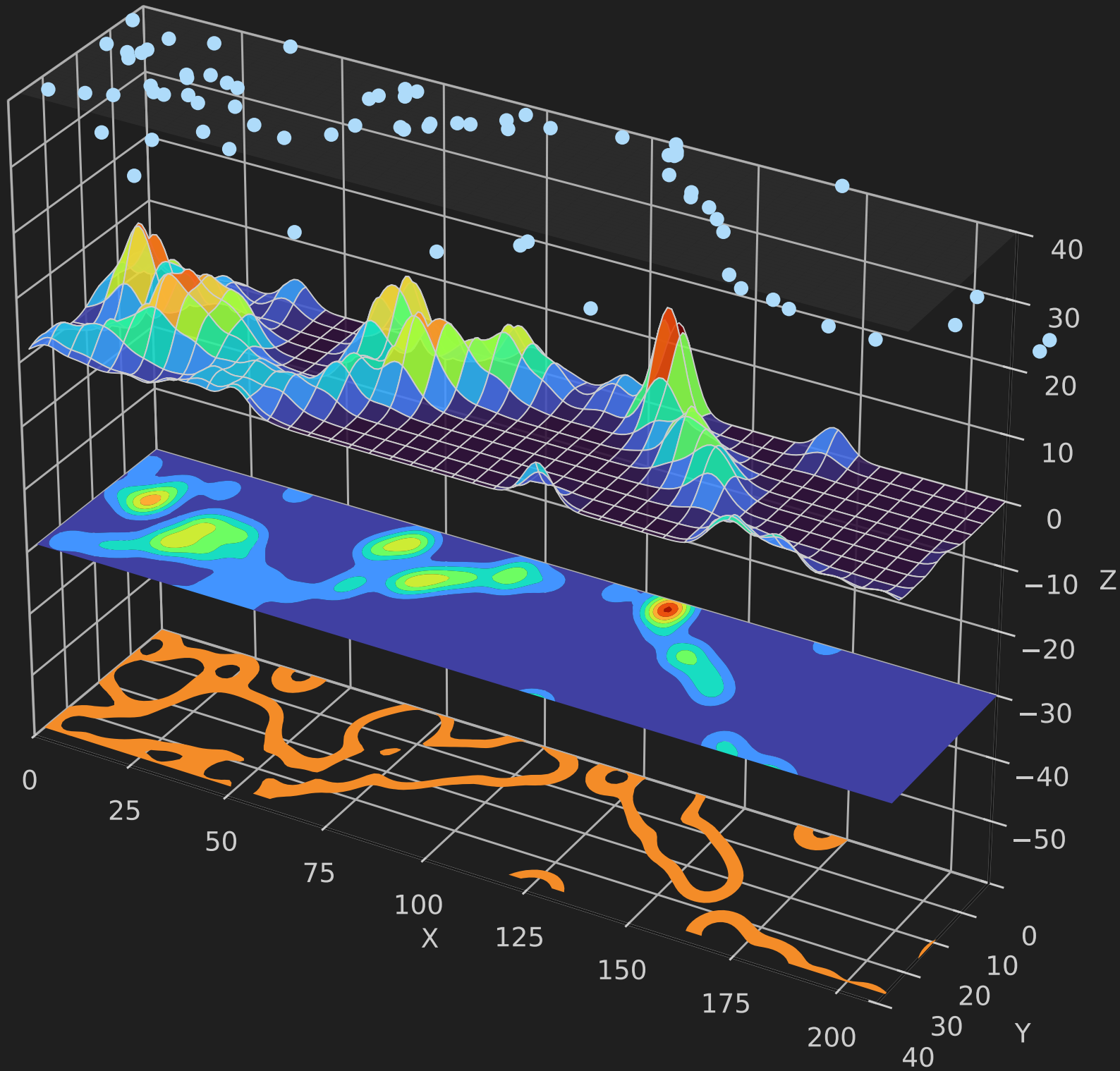
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.77 Shift = 2.41 Iteration = 037



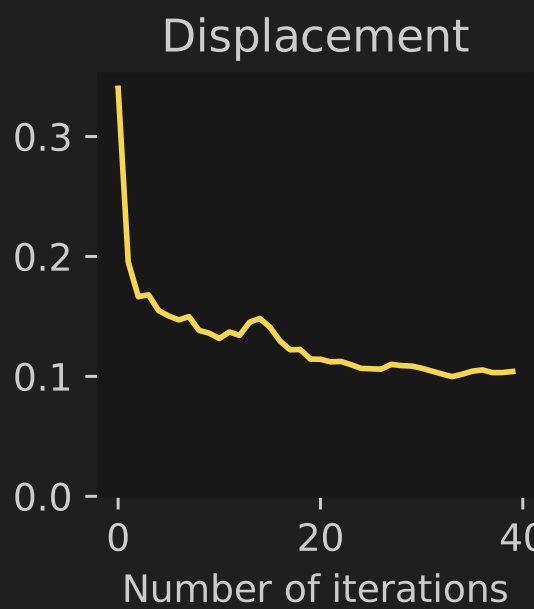
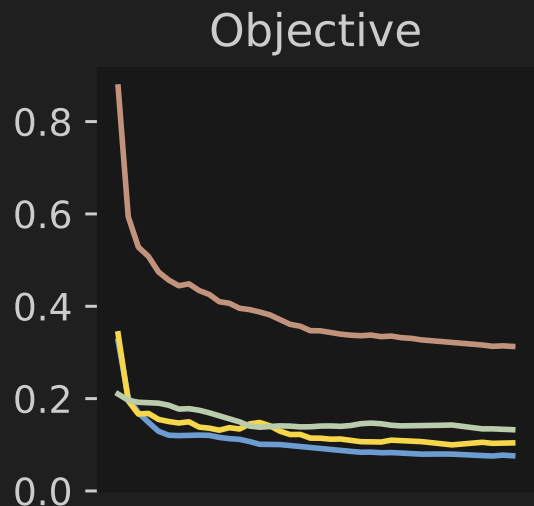
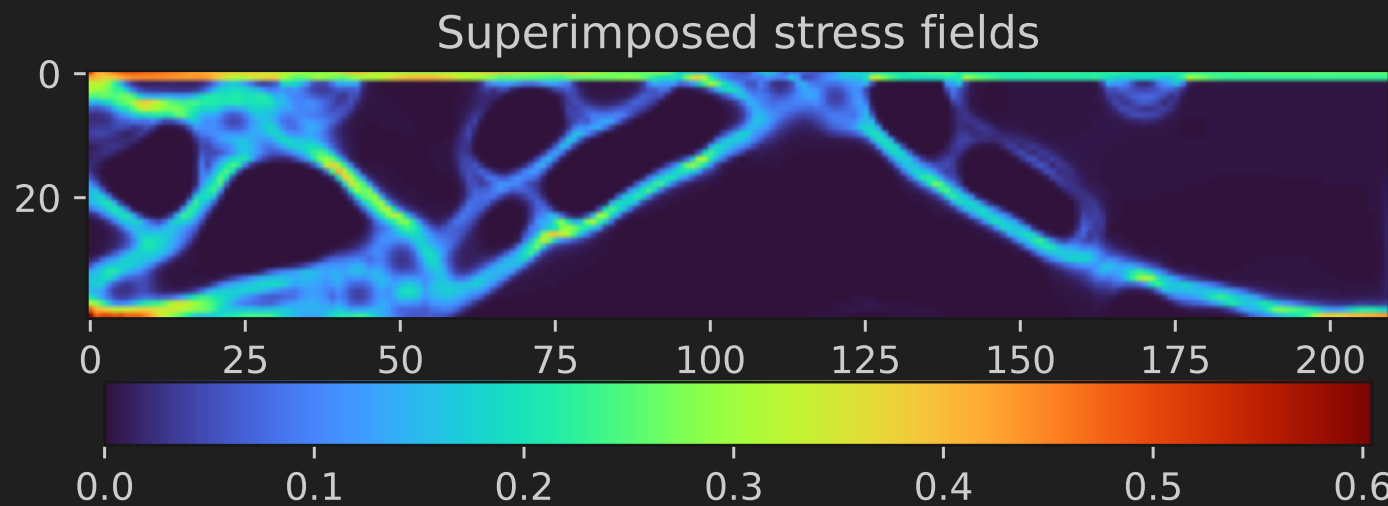
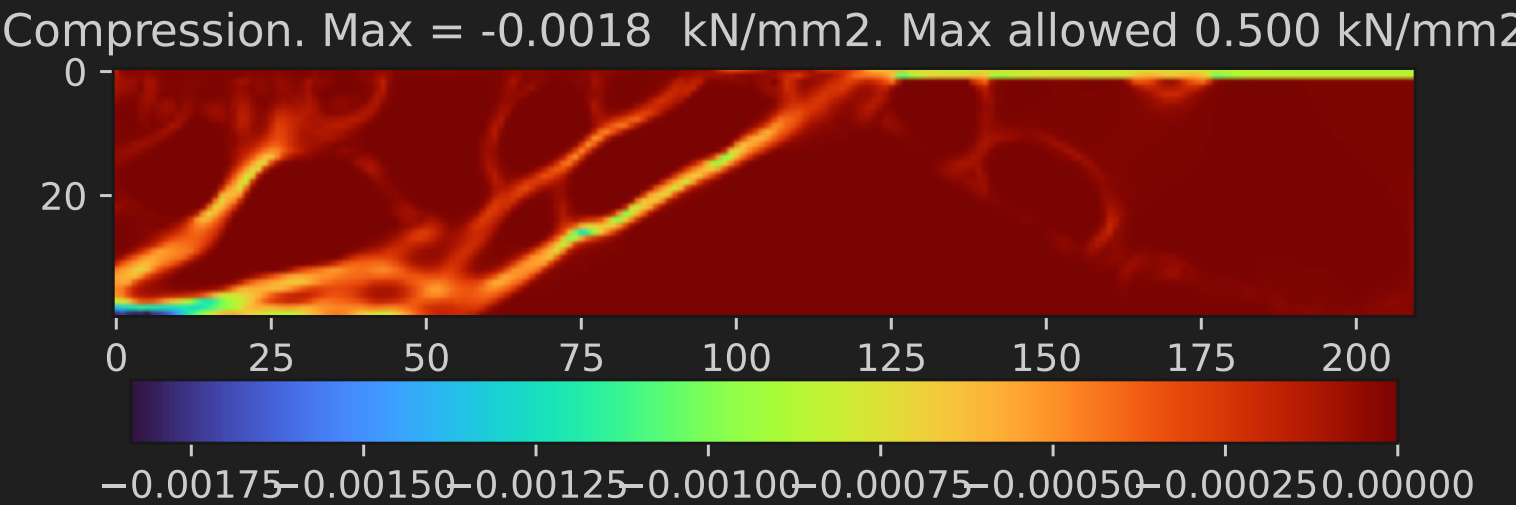
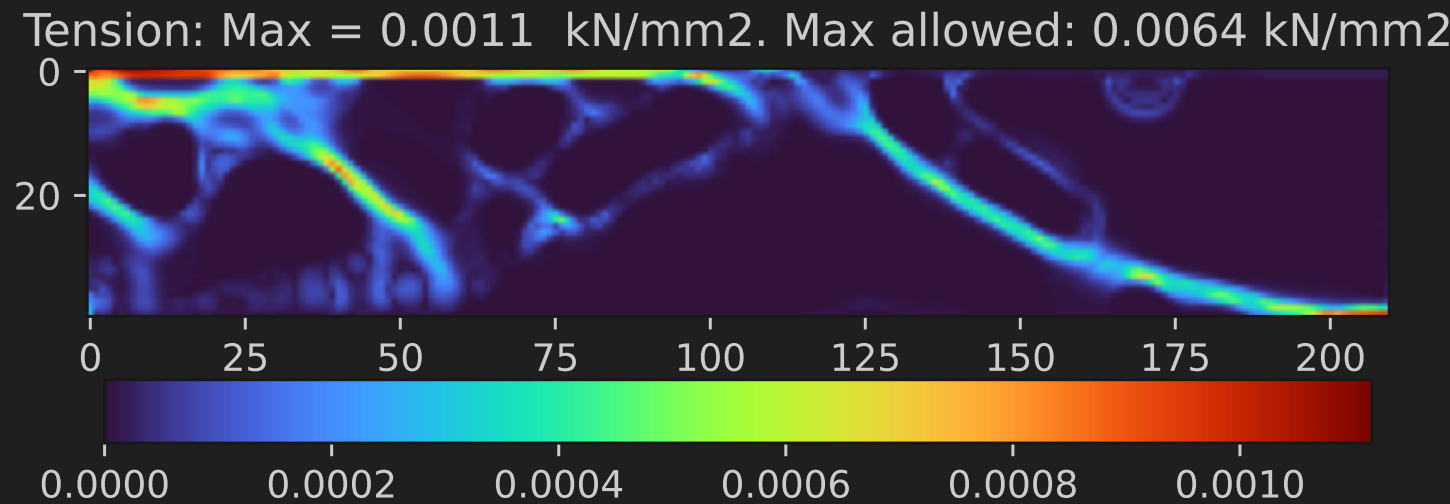
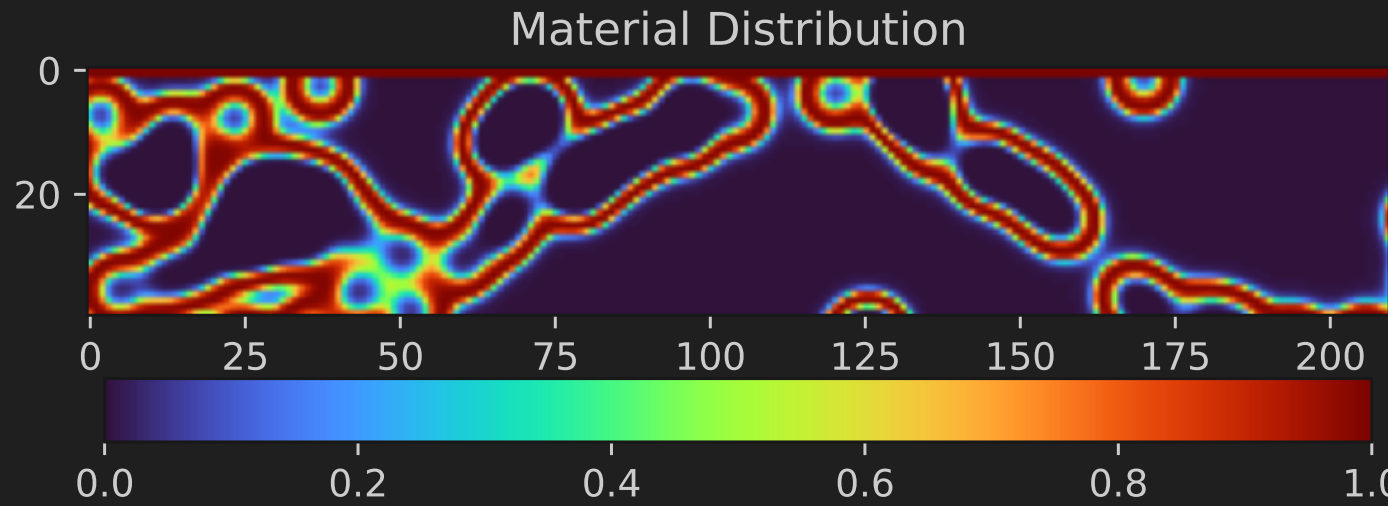
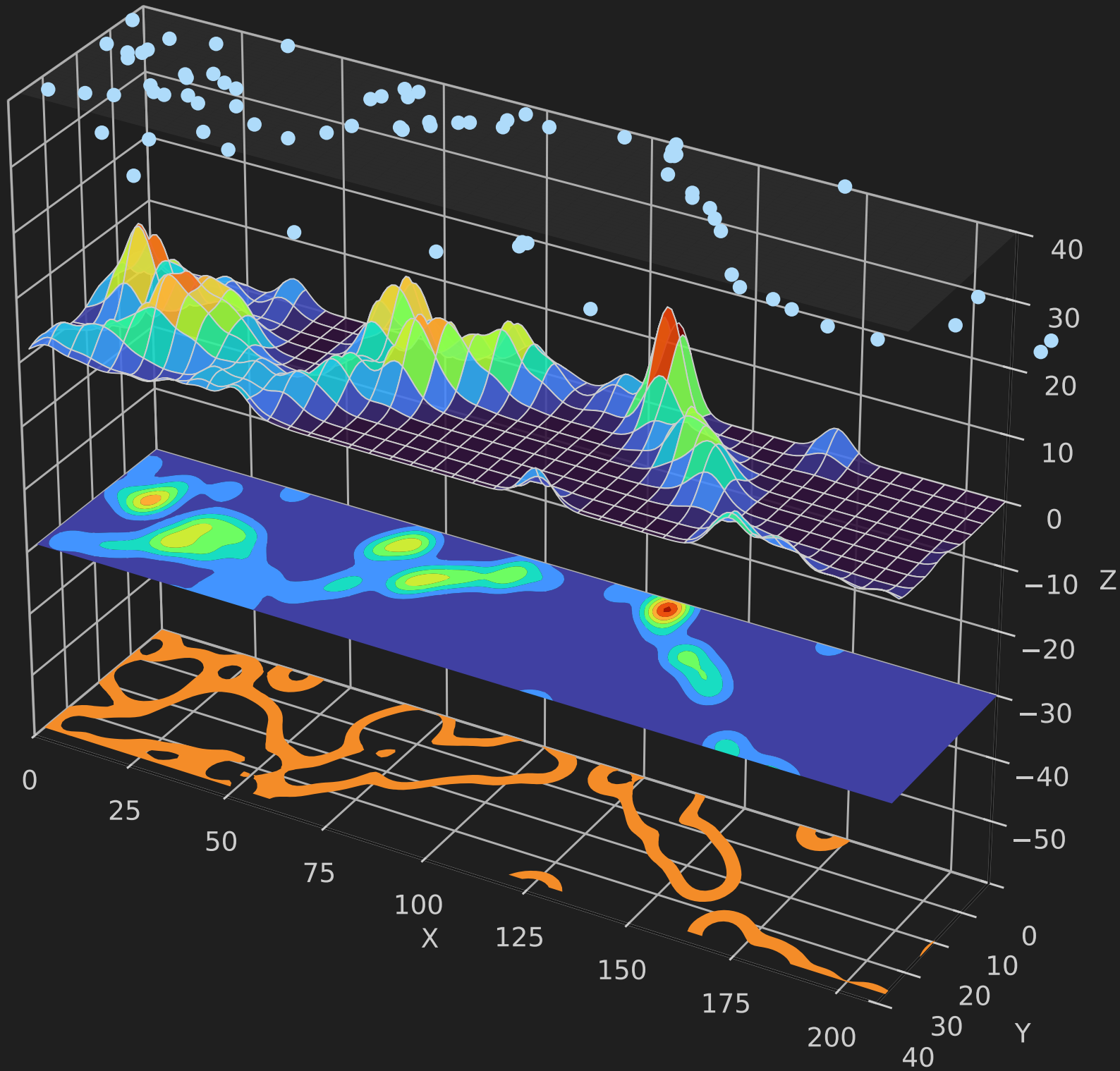
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.76 Shift = 2.42 Iteration = 038



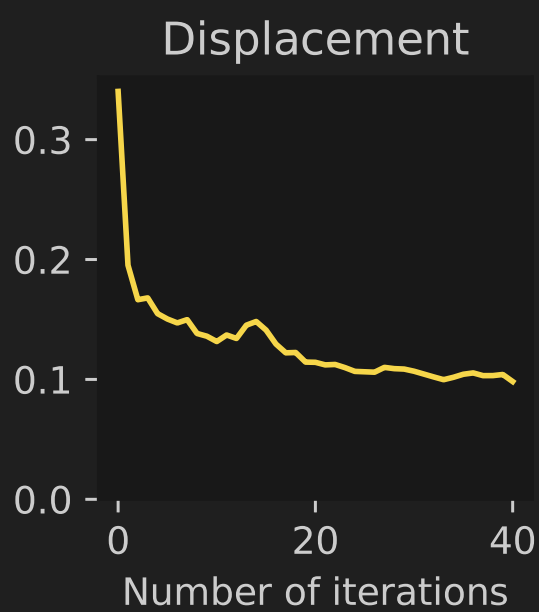
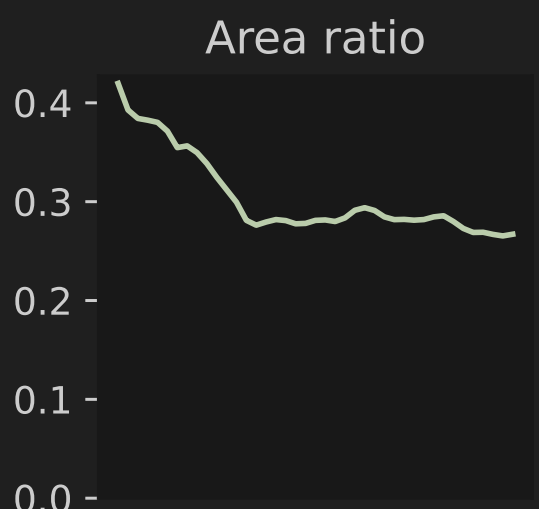
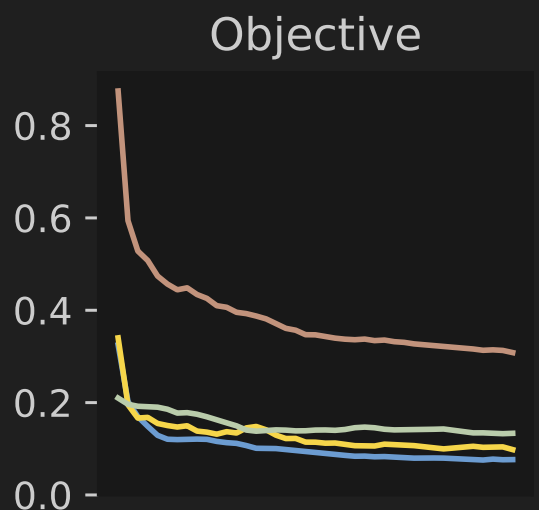
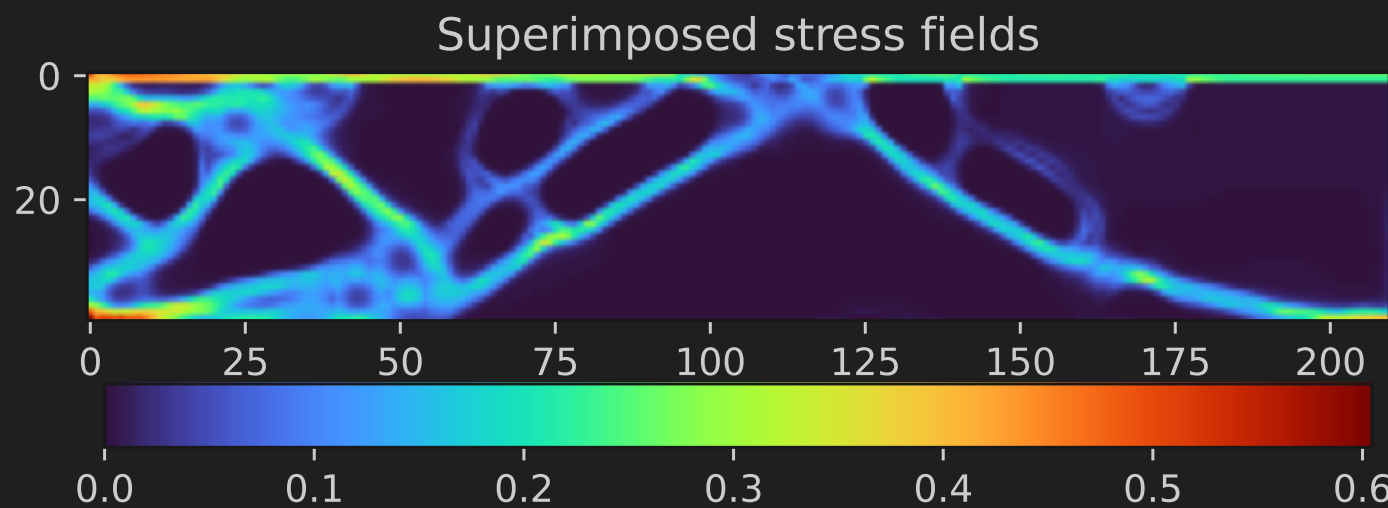
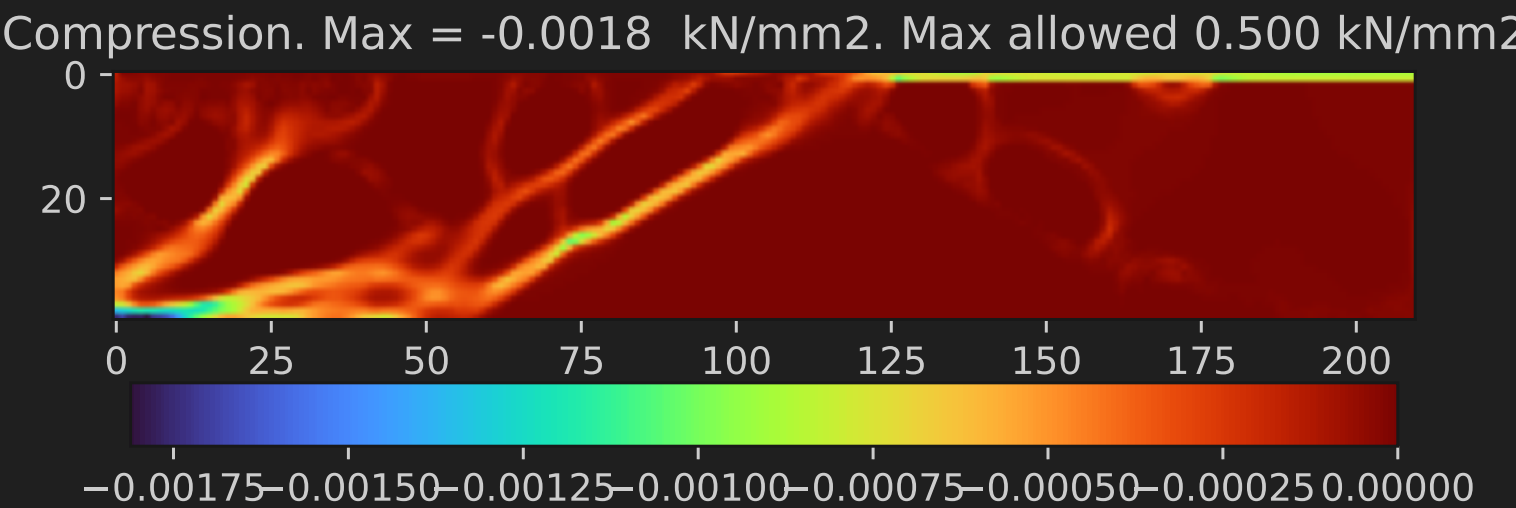
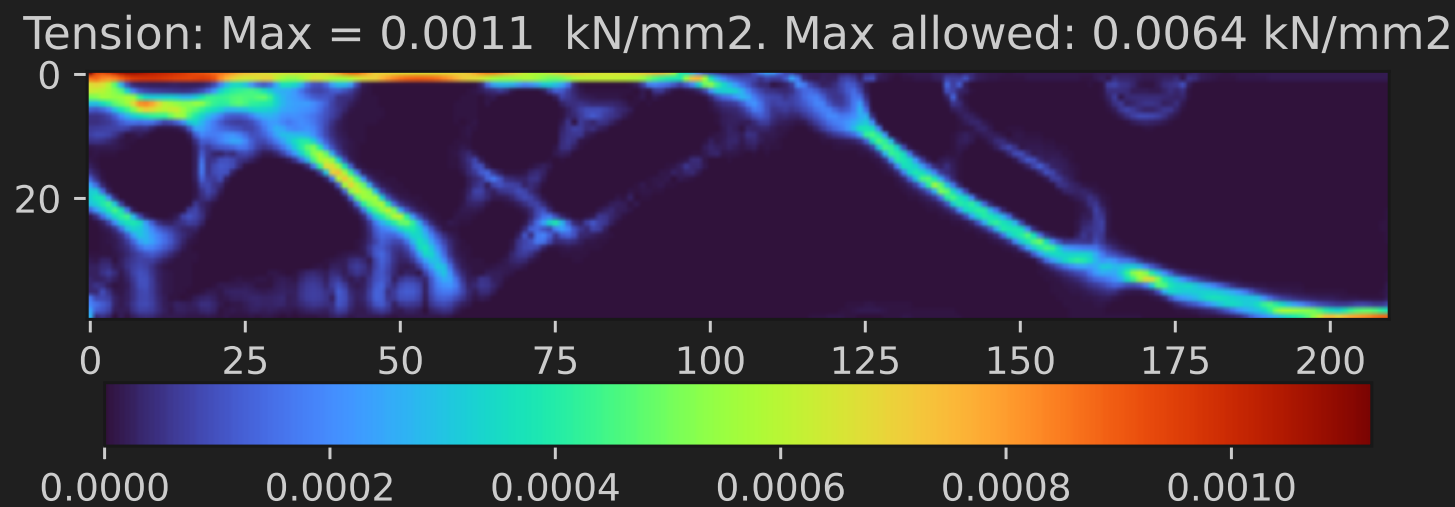
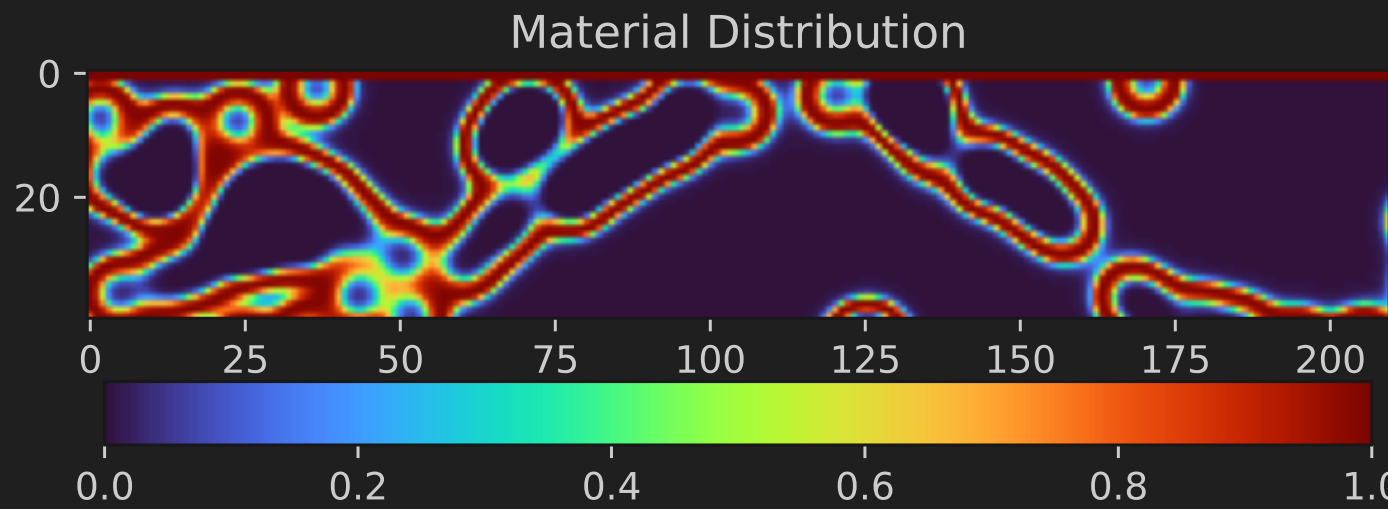
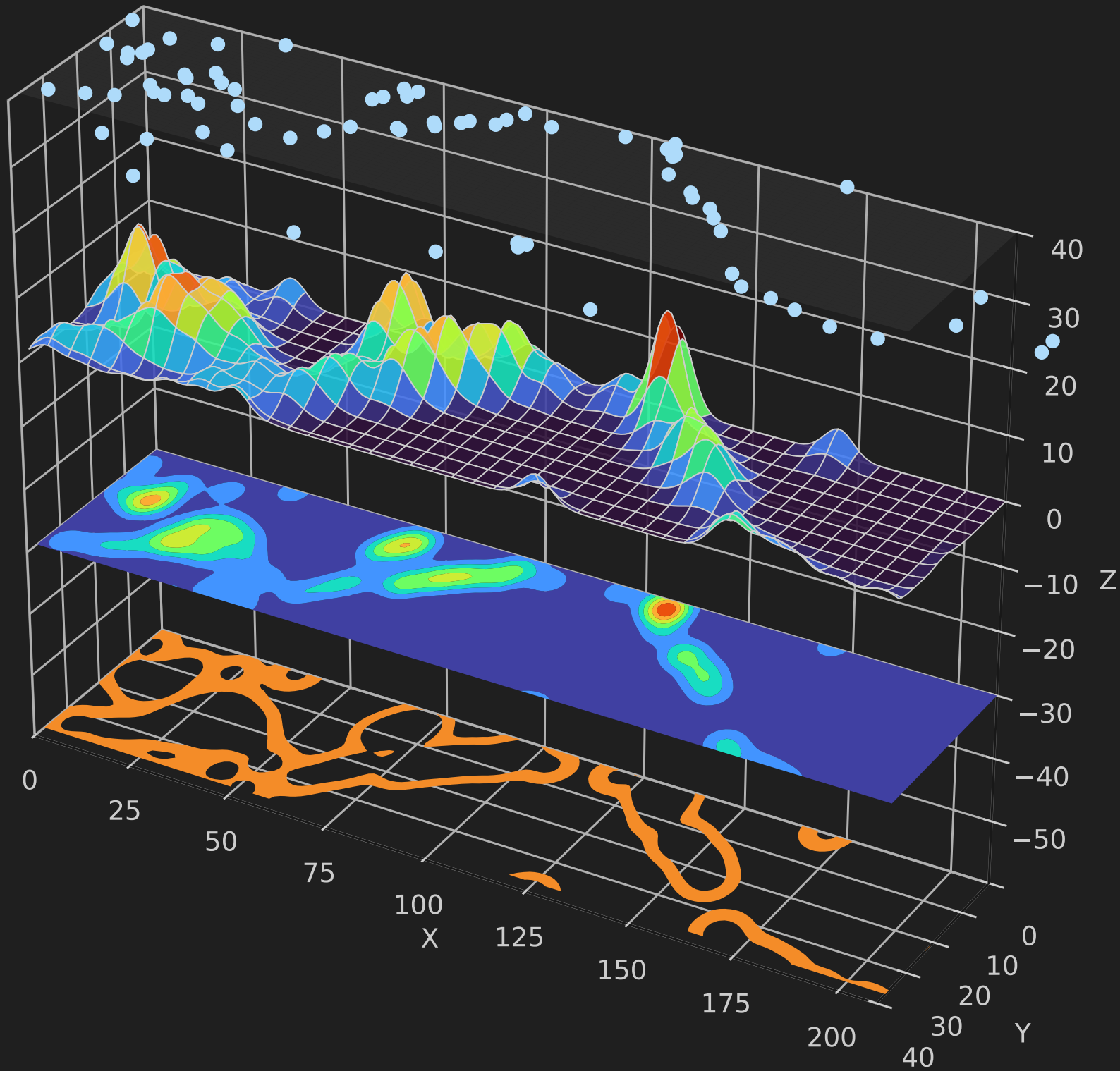
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.78 Shift = 2.41 Iteration = 039



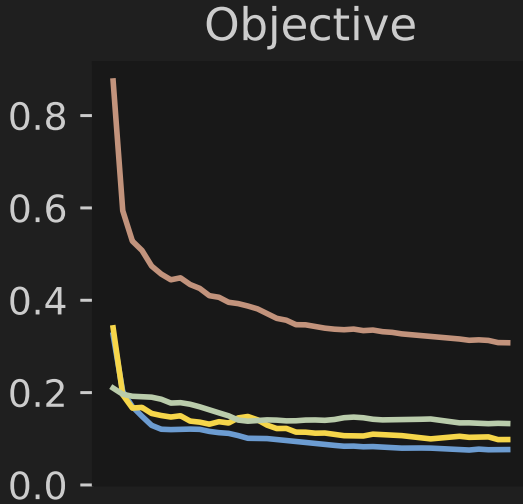
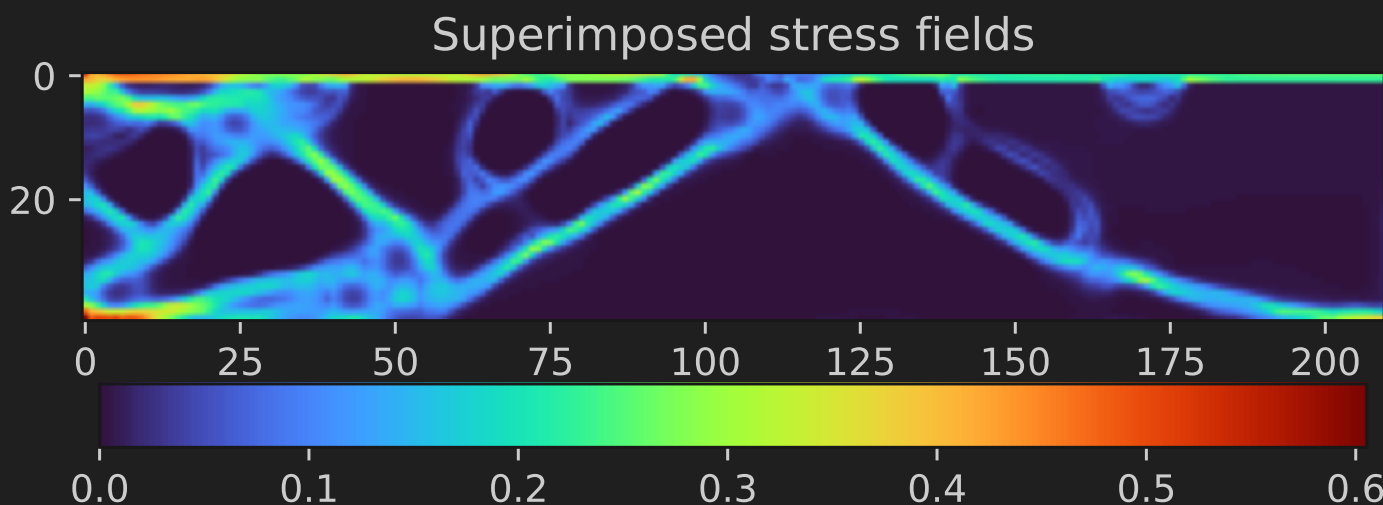
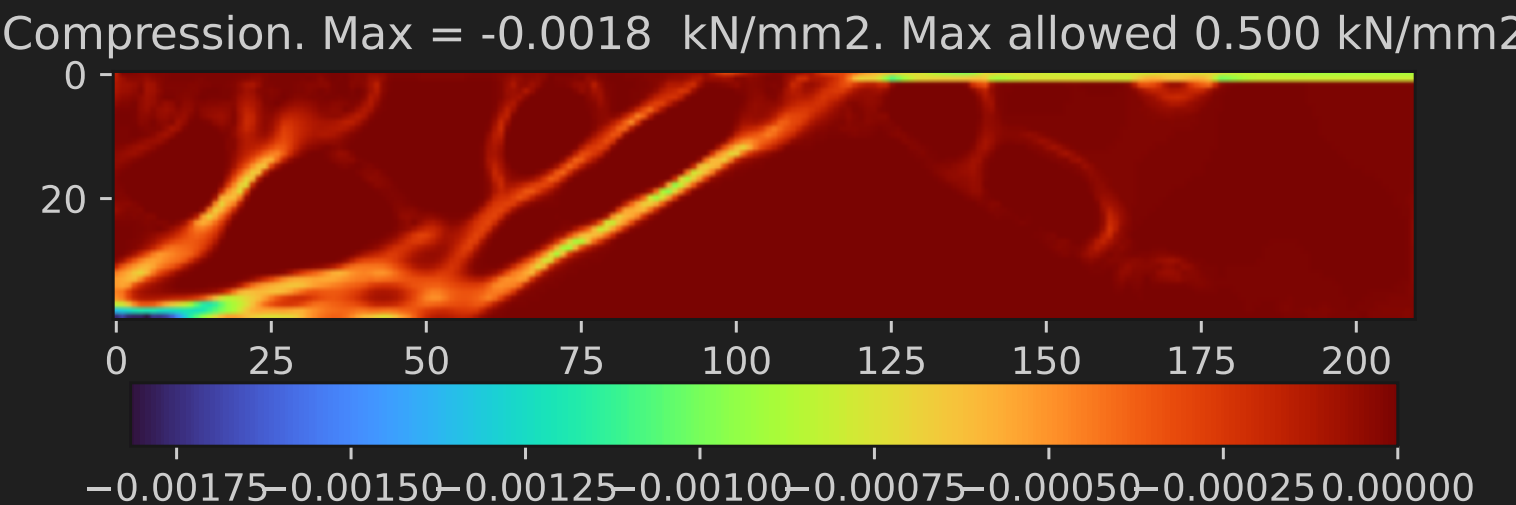
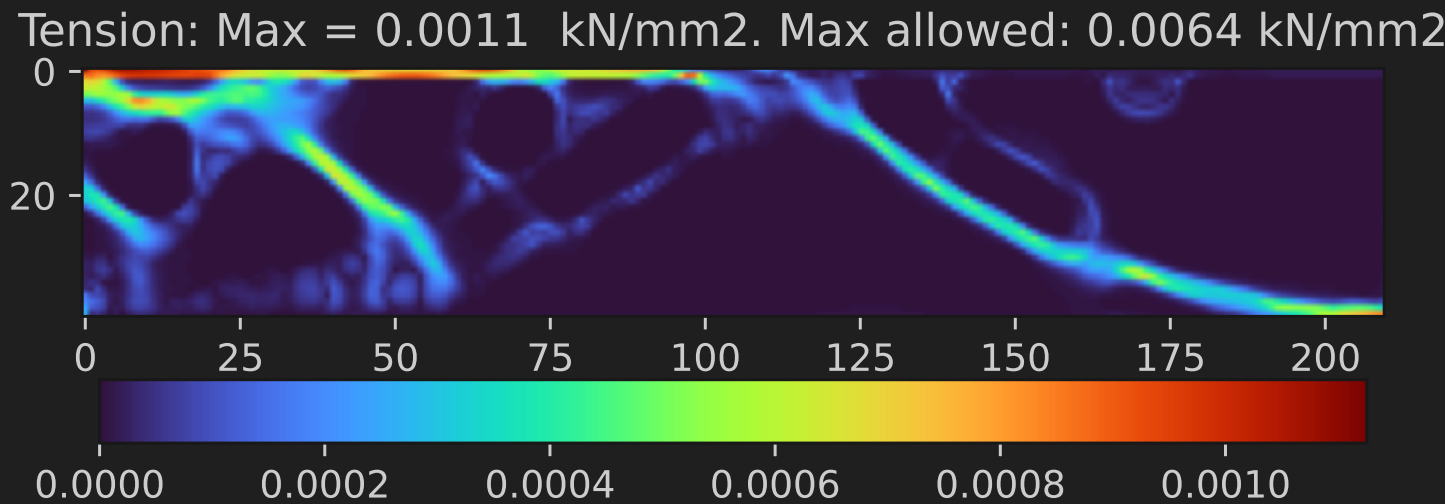
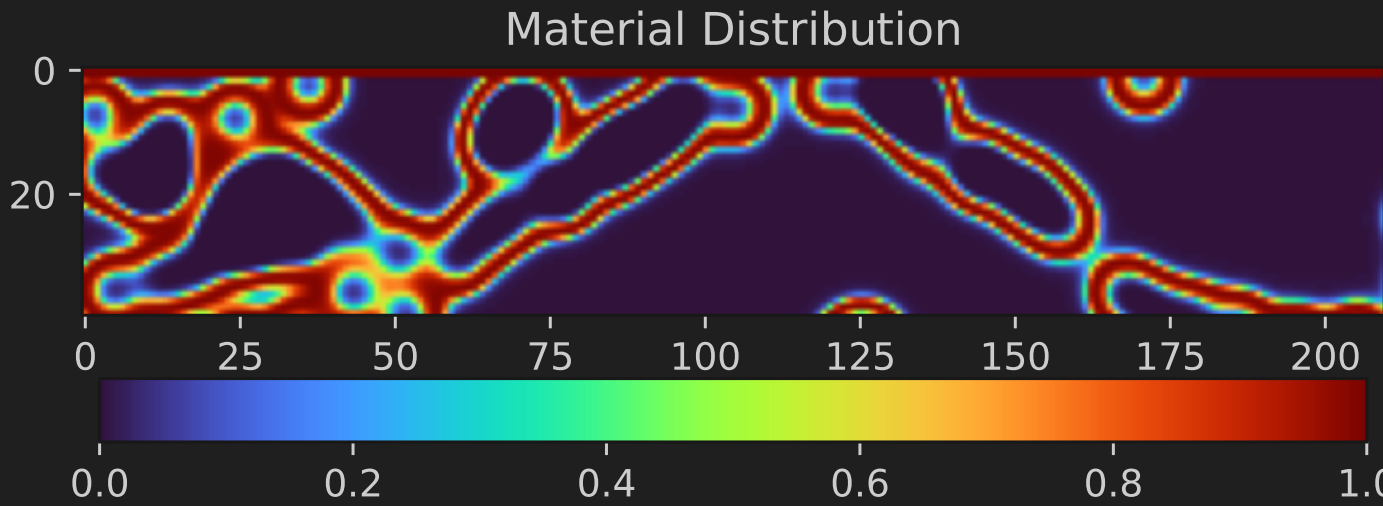
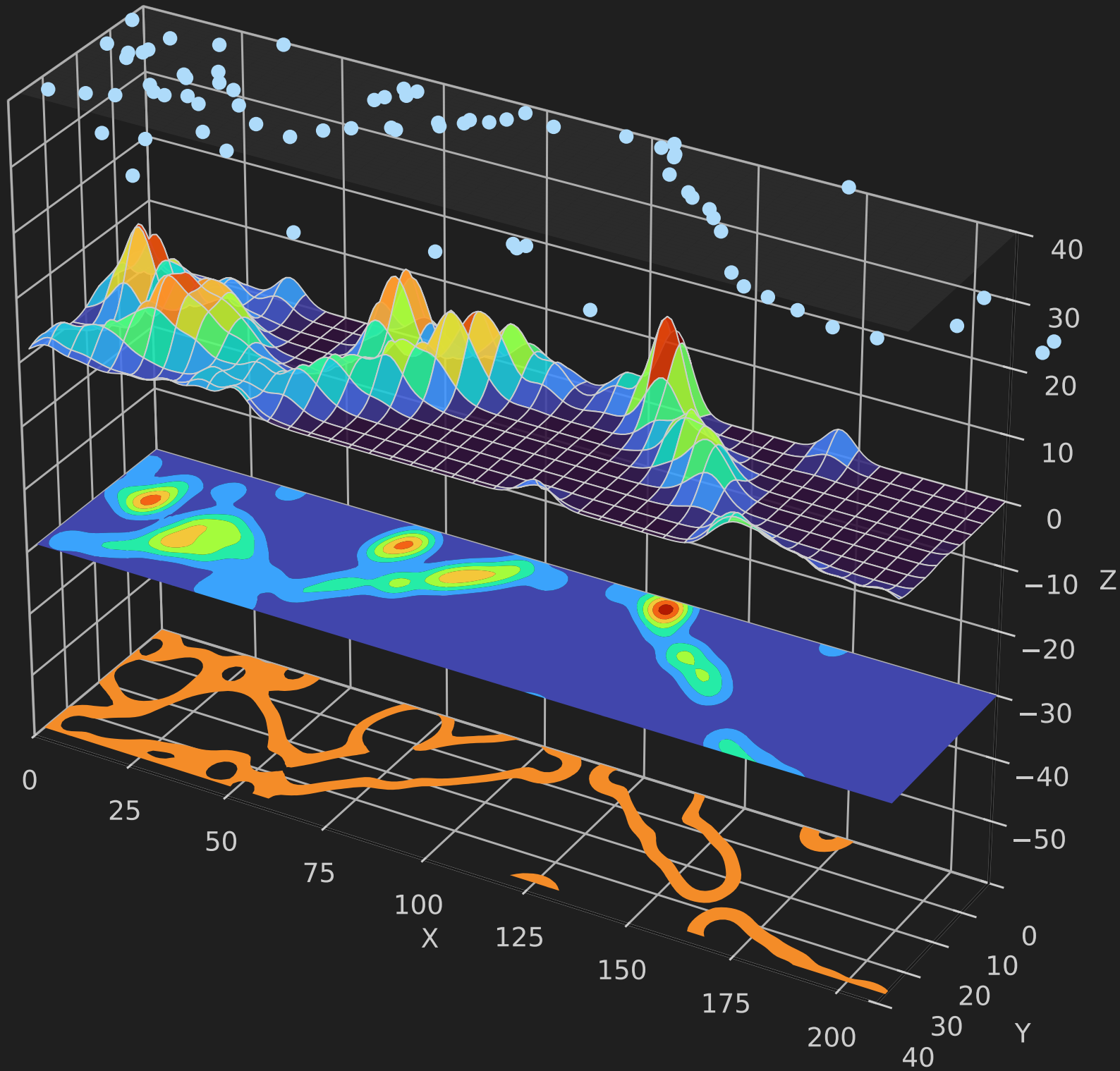
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.79 Shift = 2.41 Iteration = 040



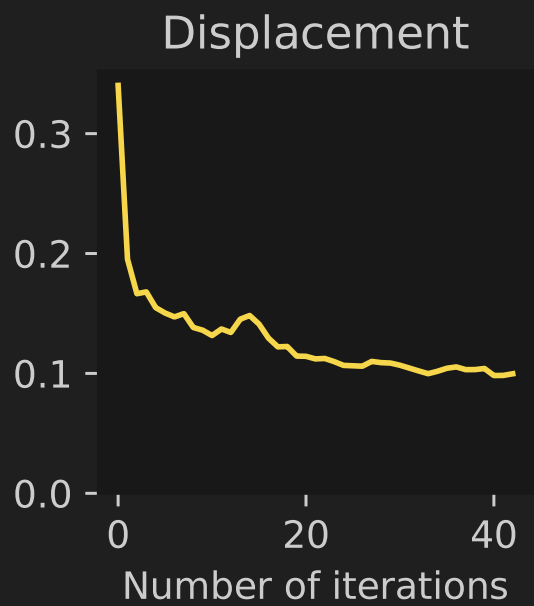
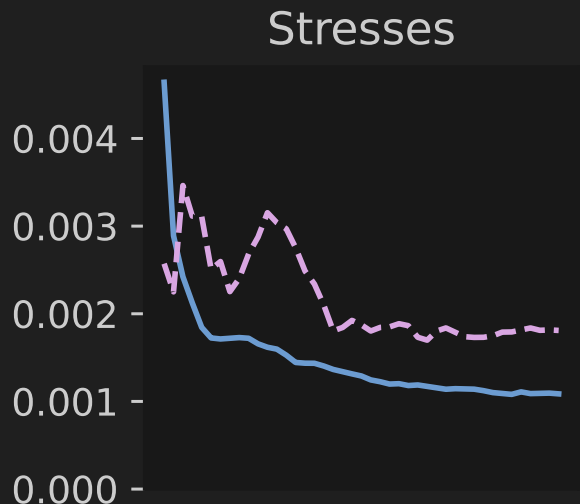
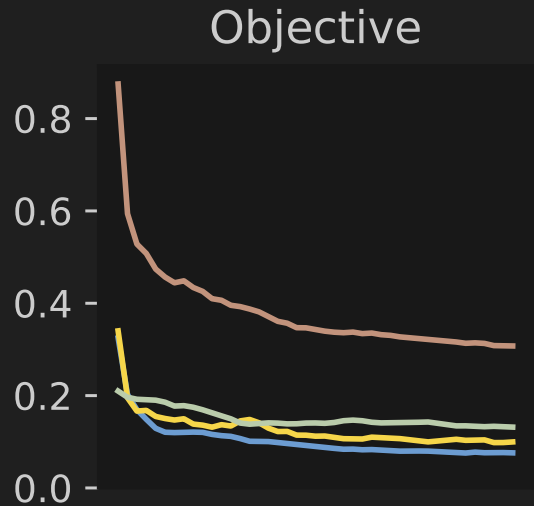
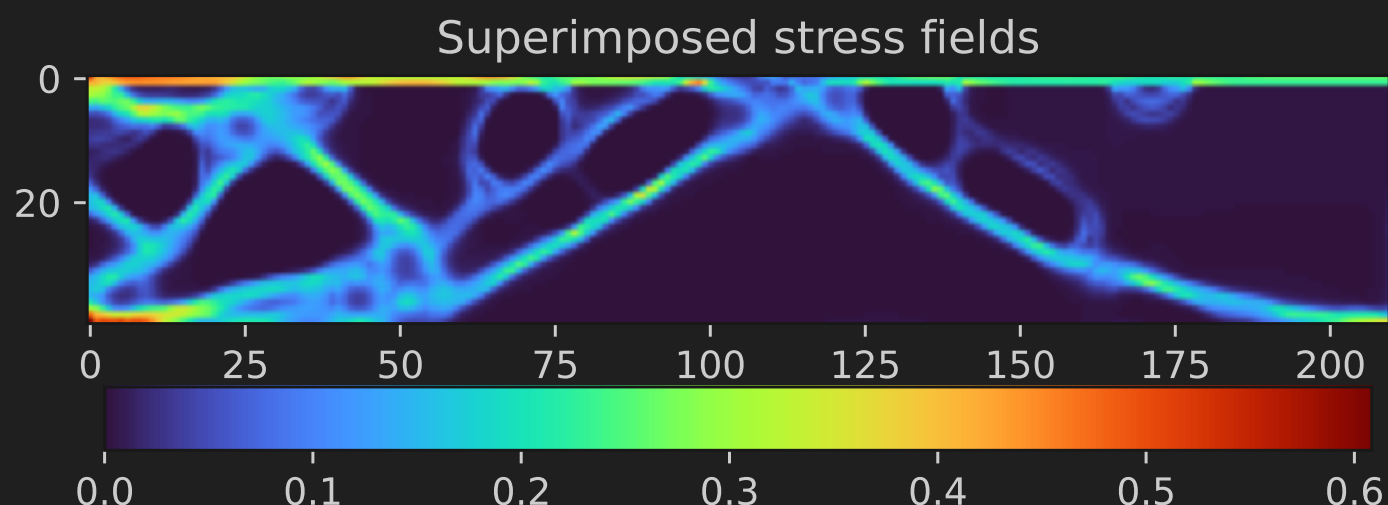
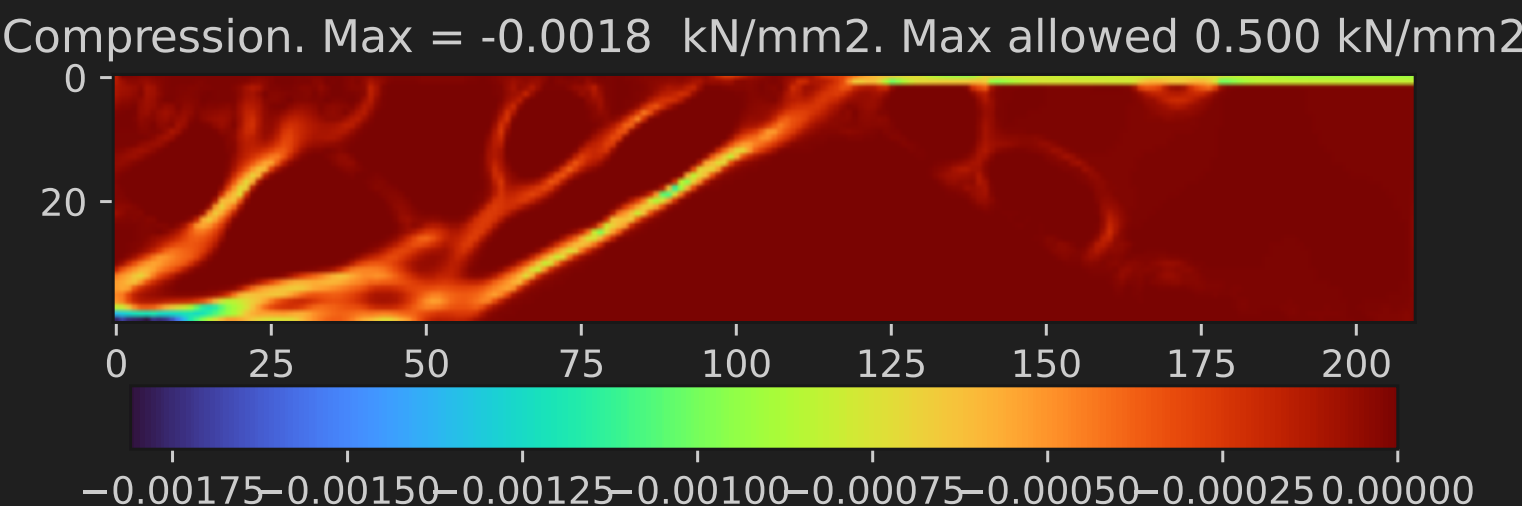
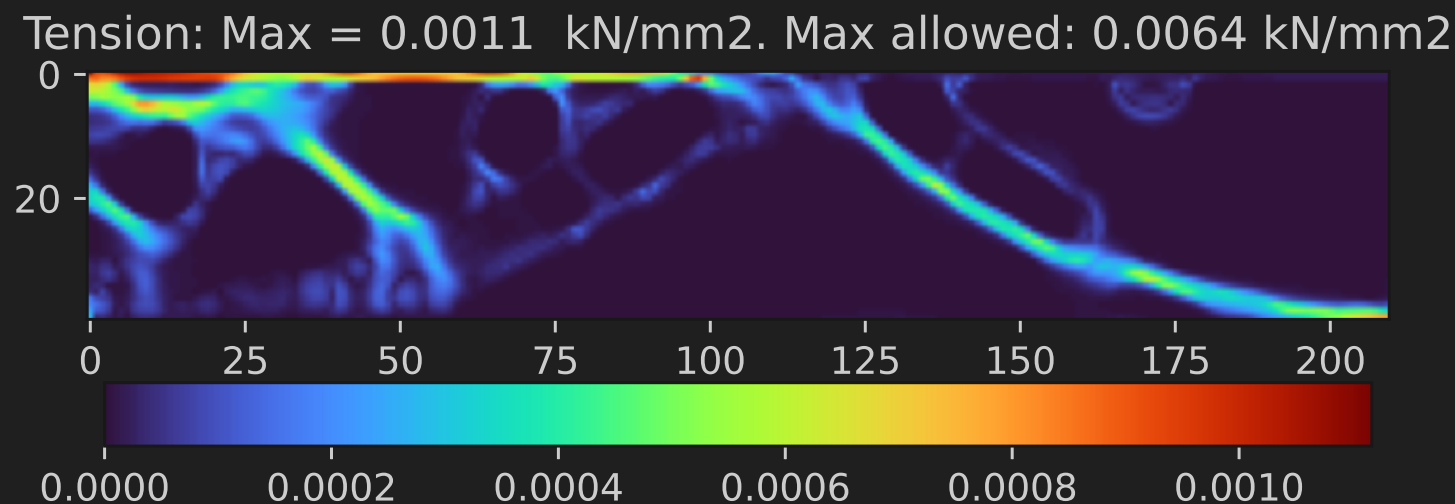
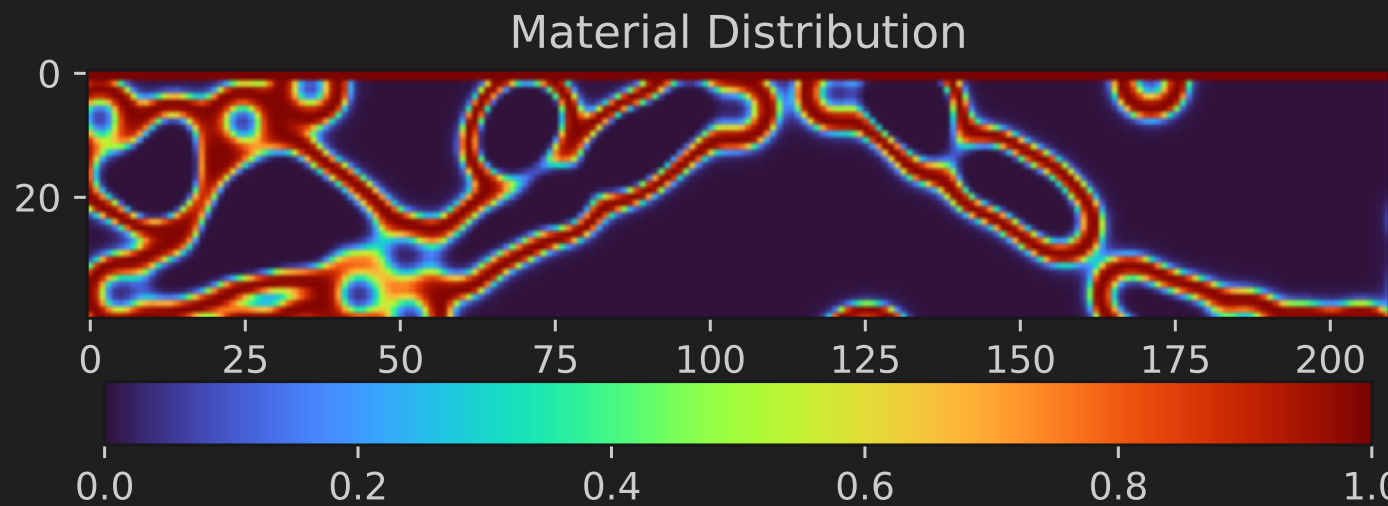
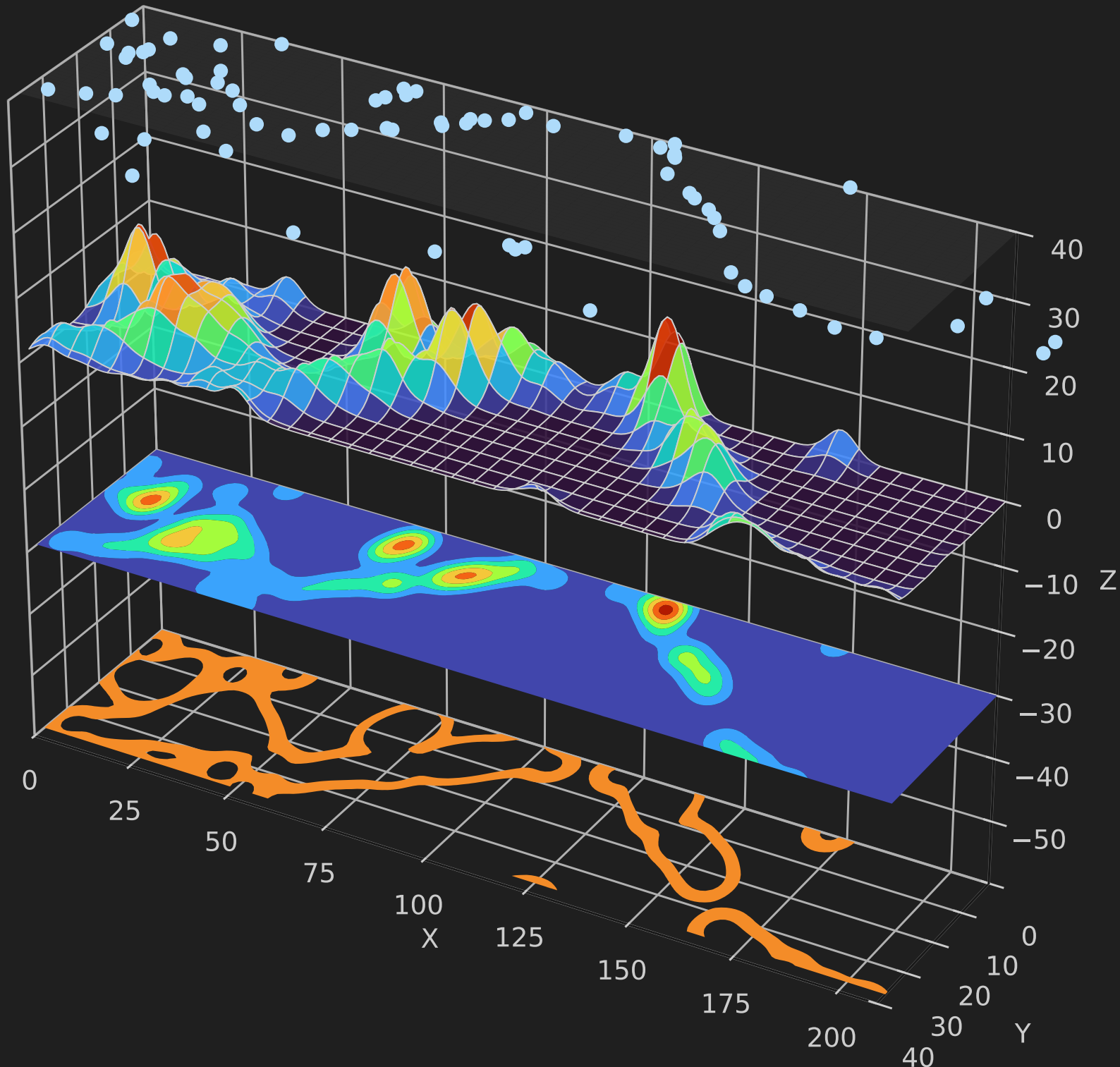
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.79 Shift = 2.40 Iteration = 041



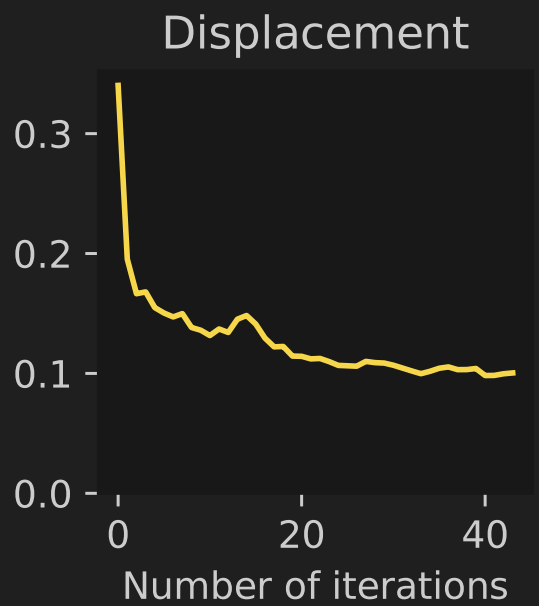
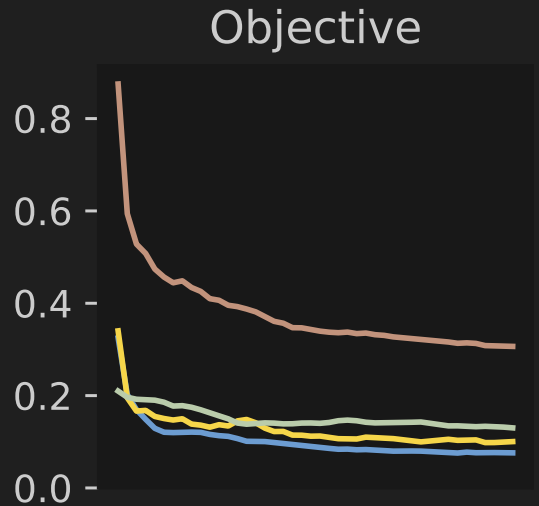
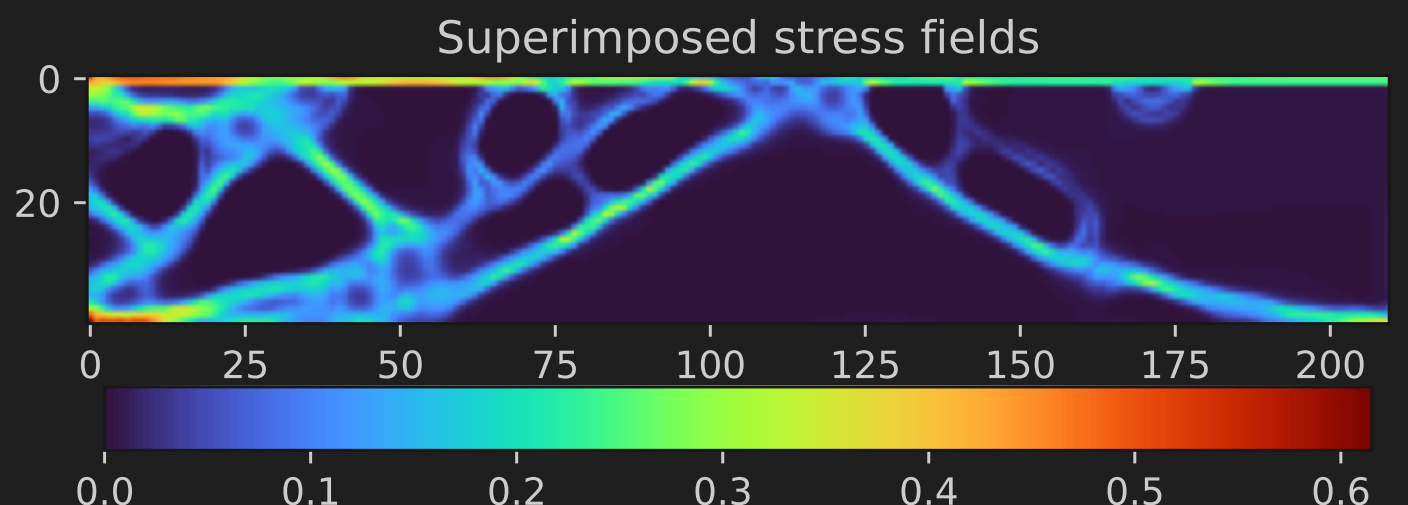
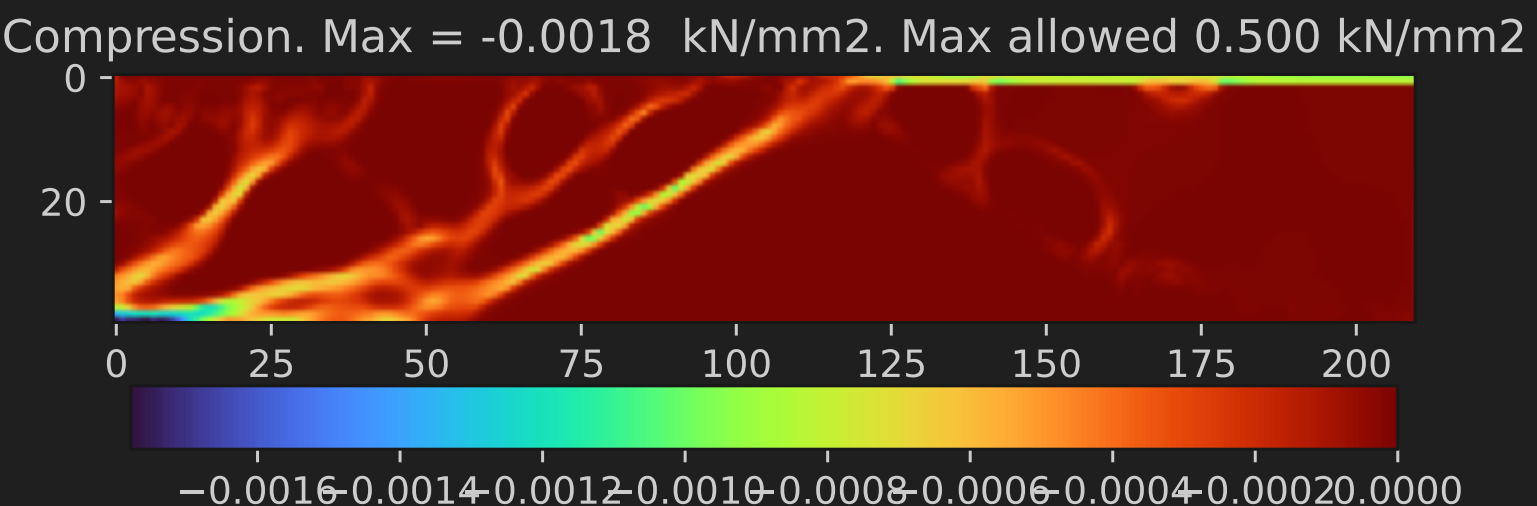
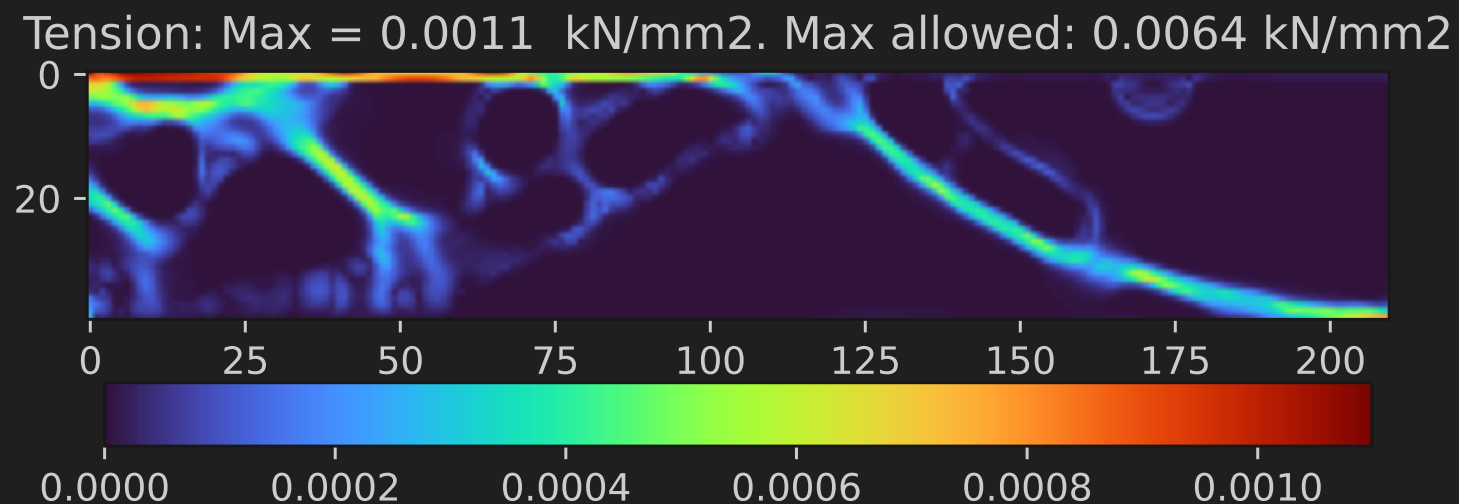
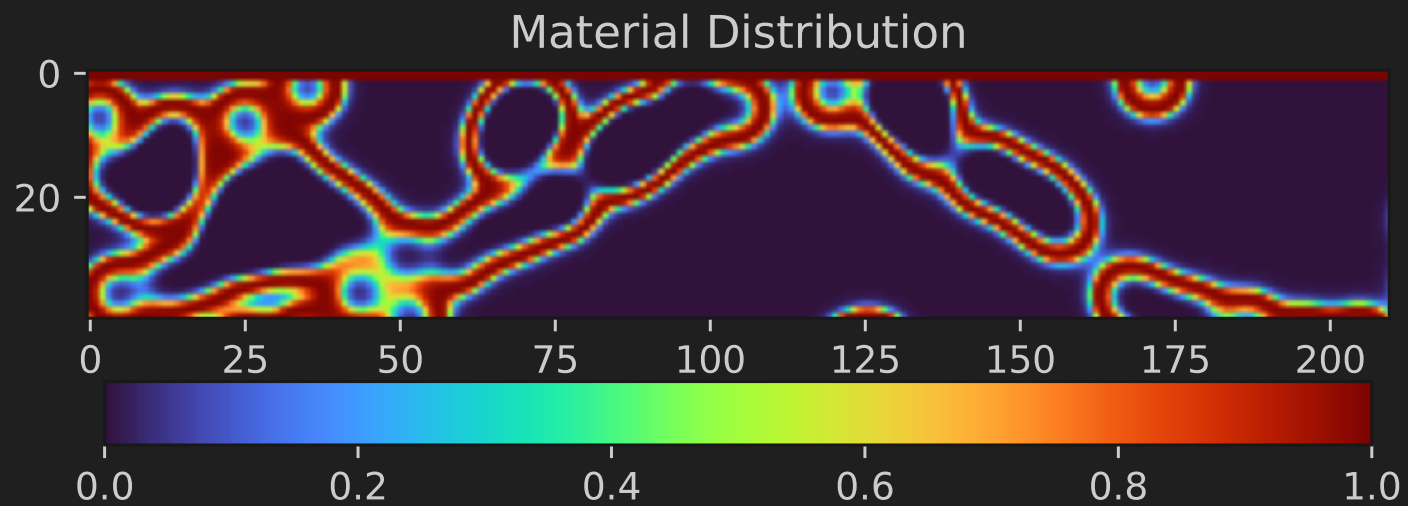
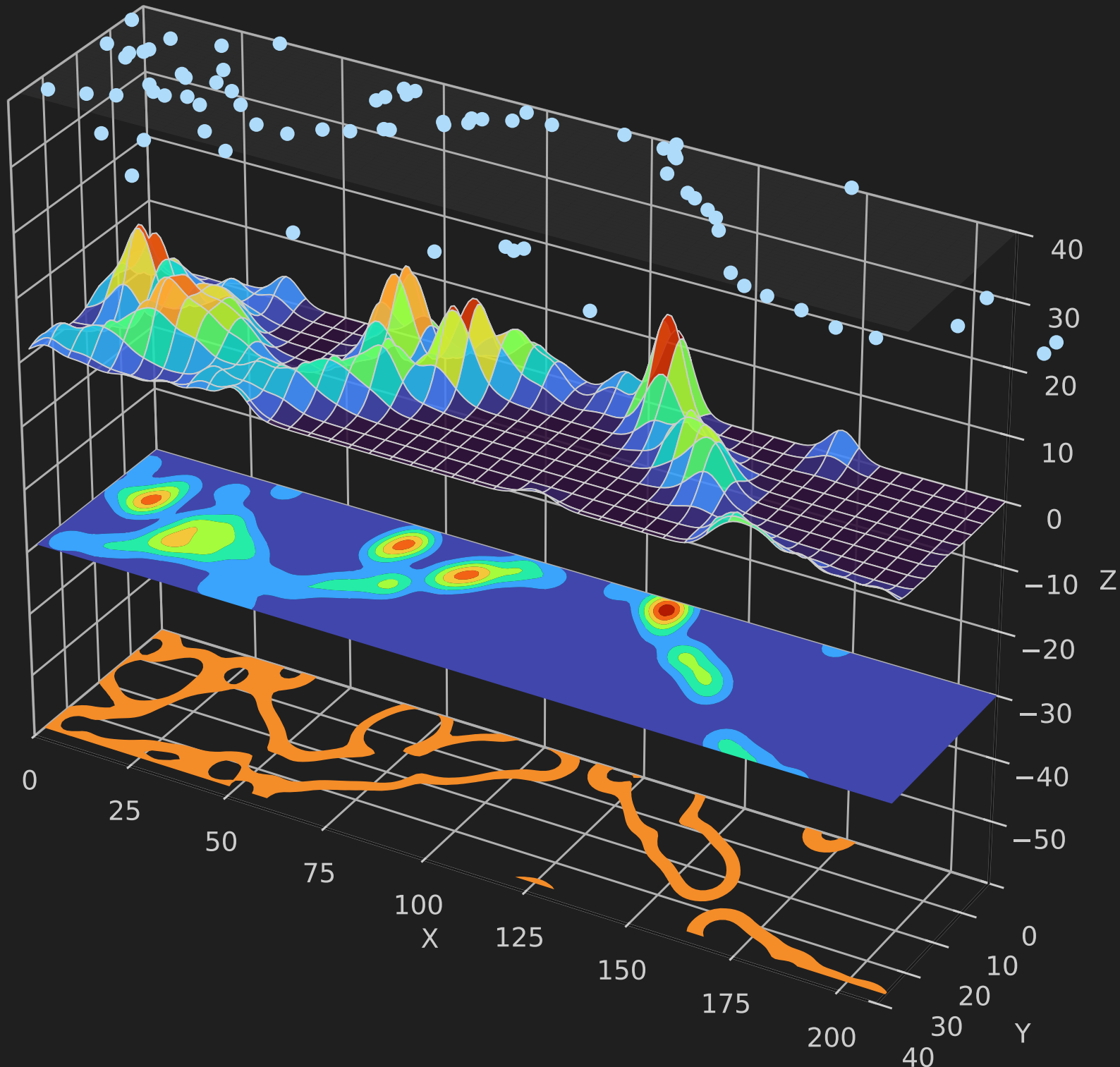
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.26) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.79 Shift = 2.39 Iteration = 042



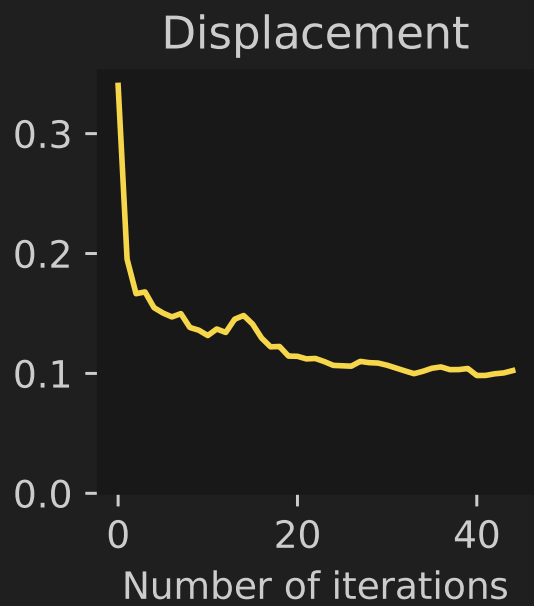
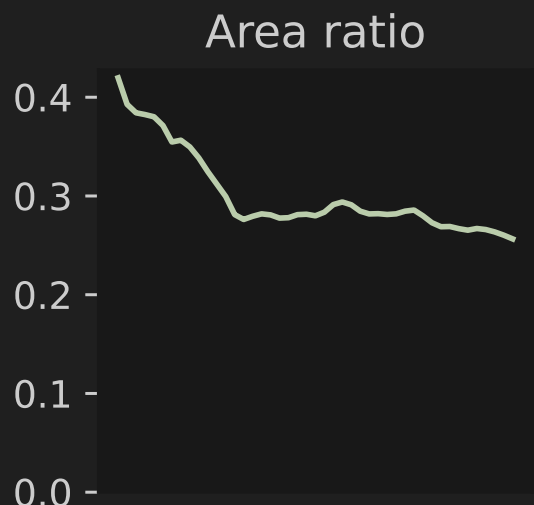
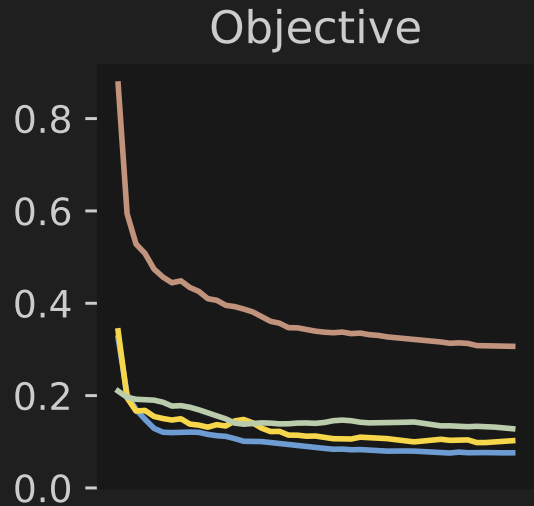
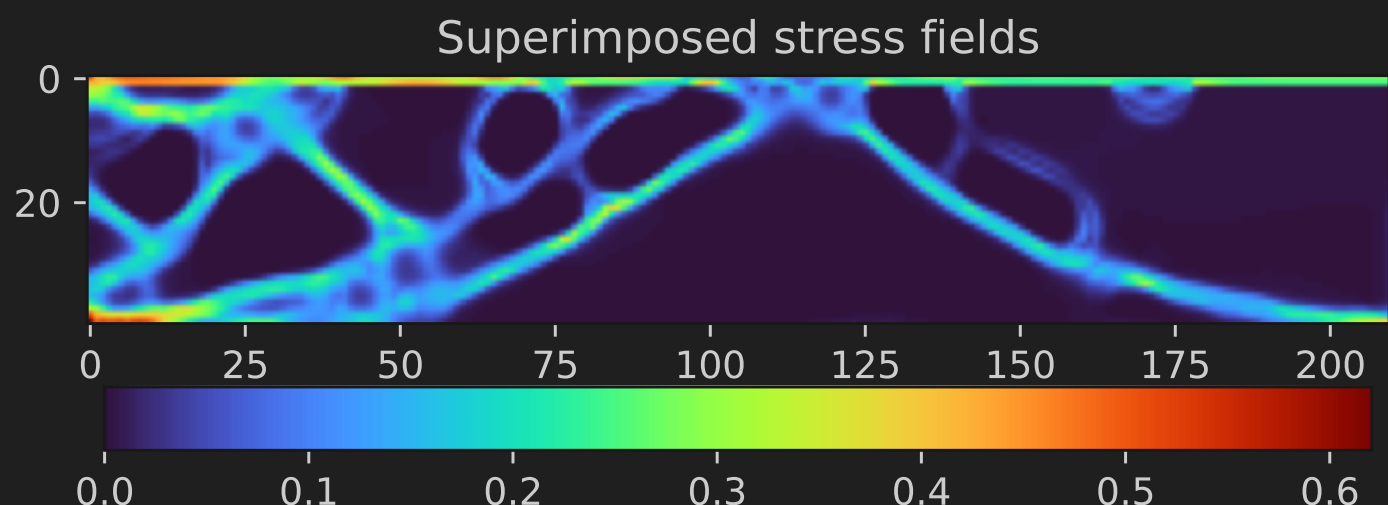
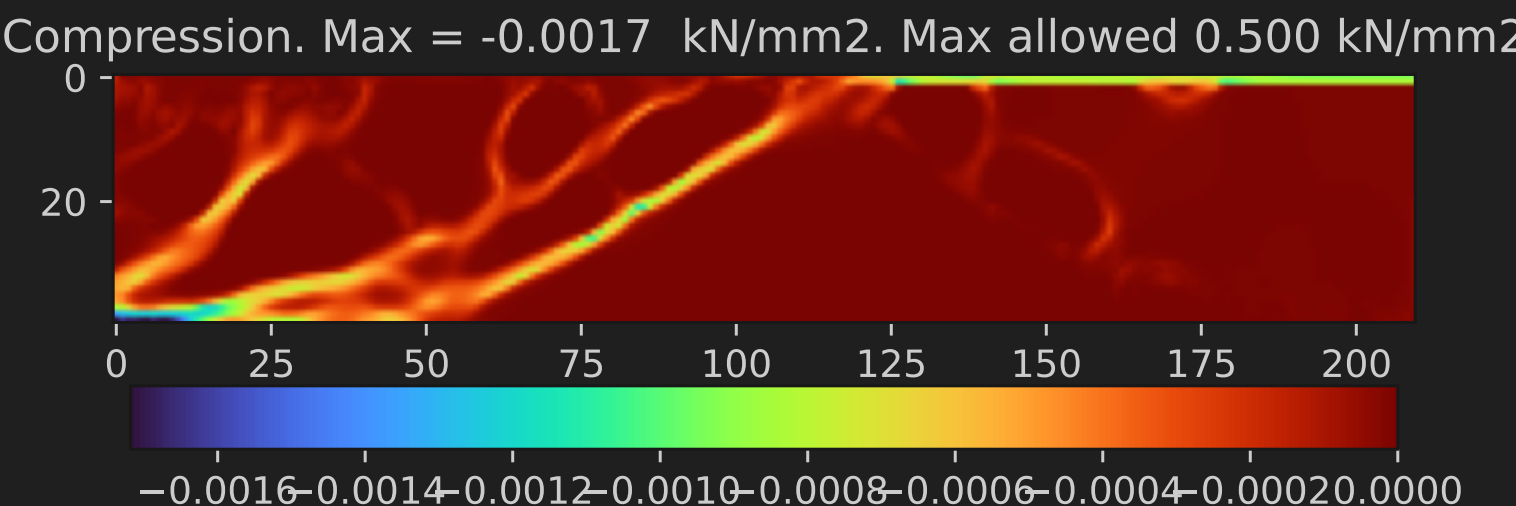
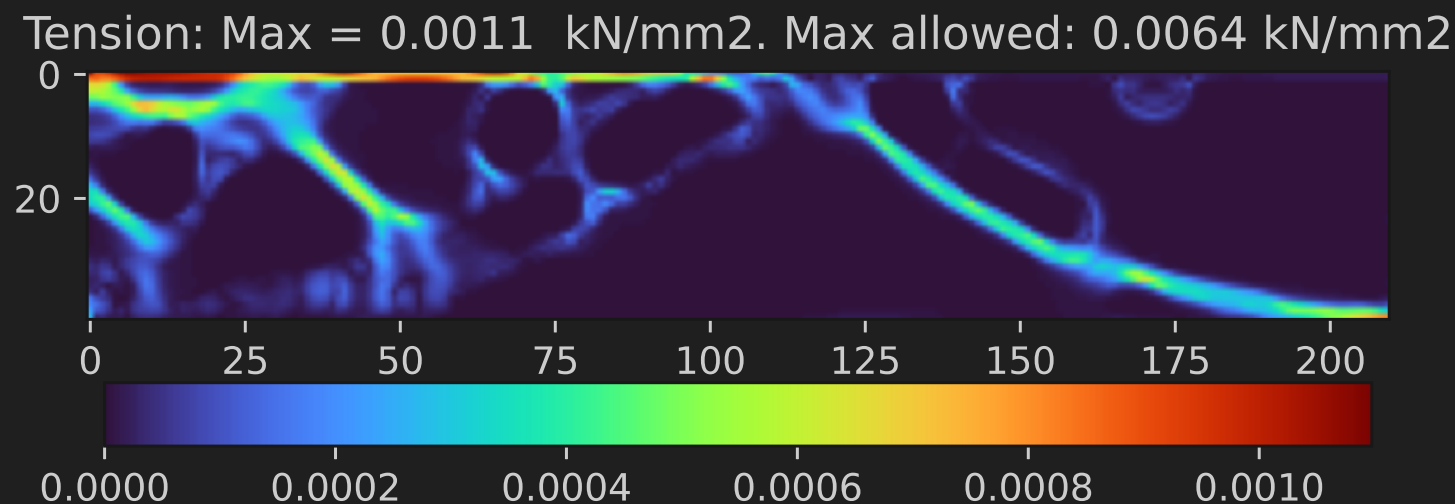
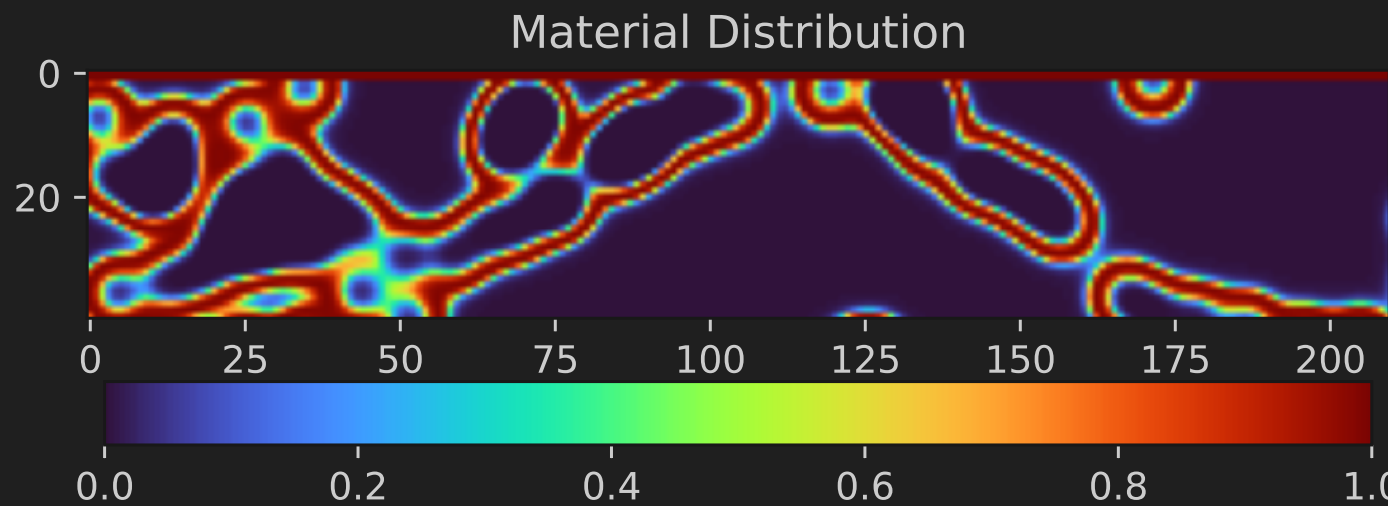
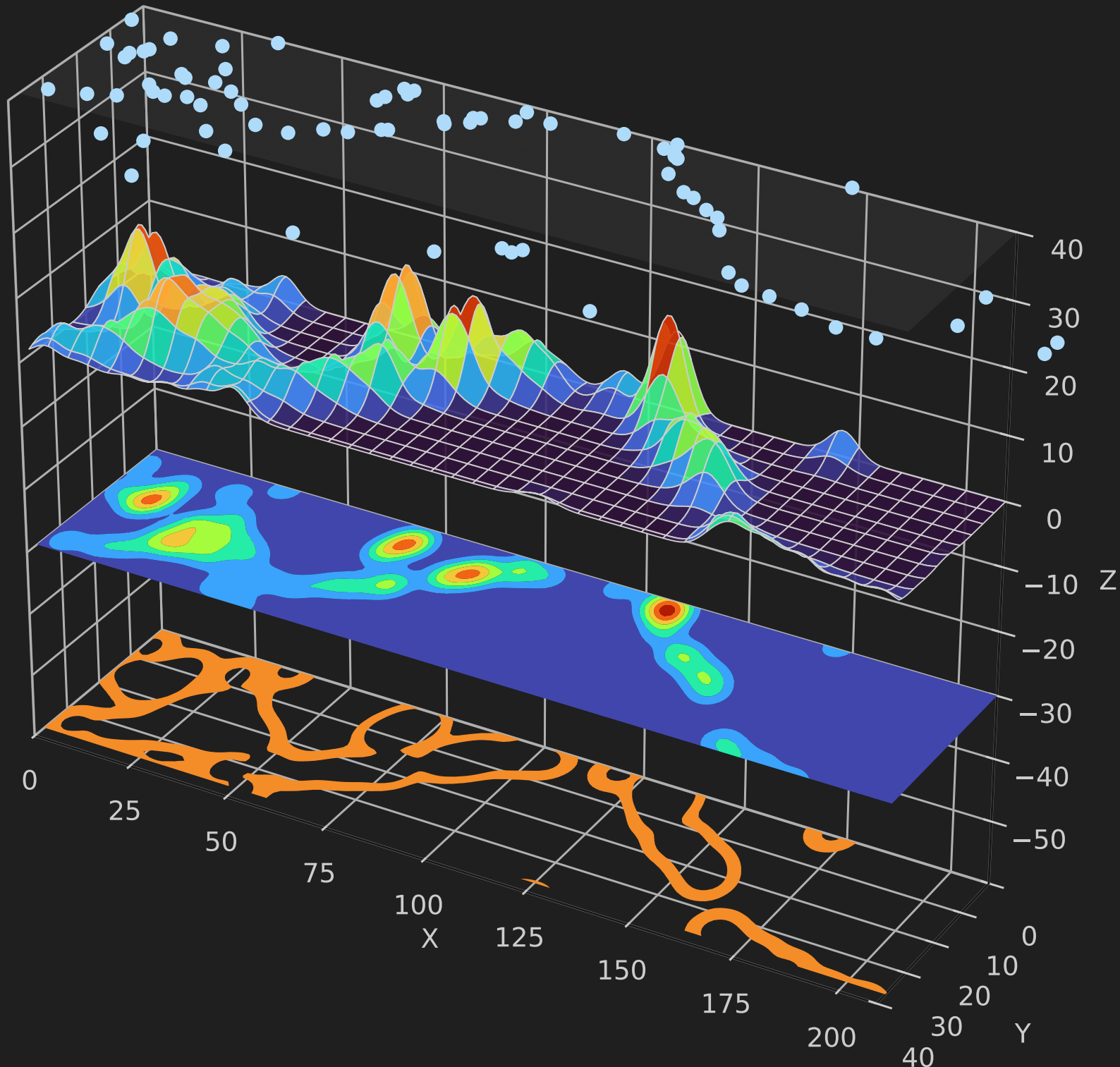
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.26) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.77 Shift = 2.38 Iteration = 043



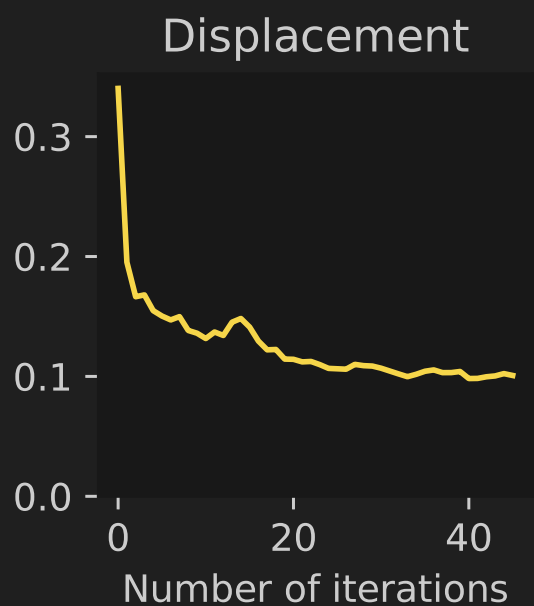
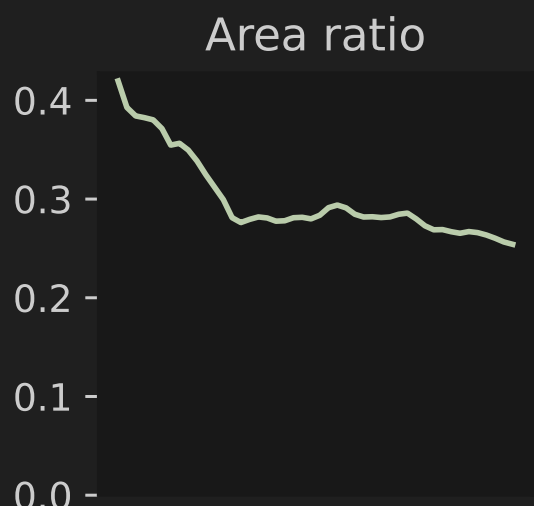
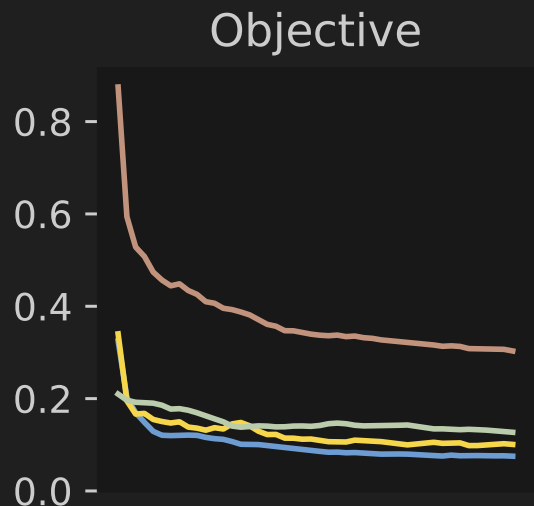
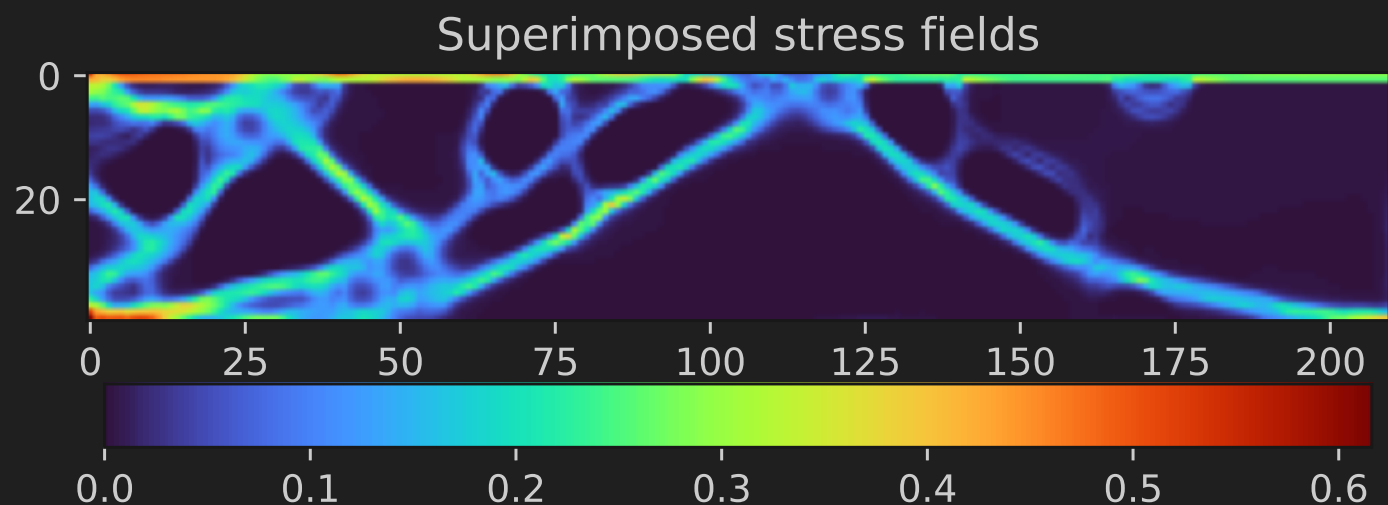
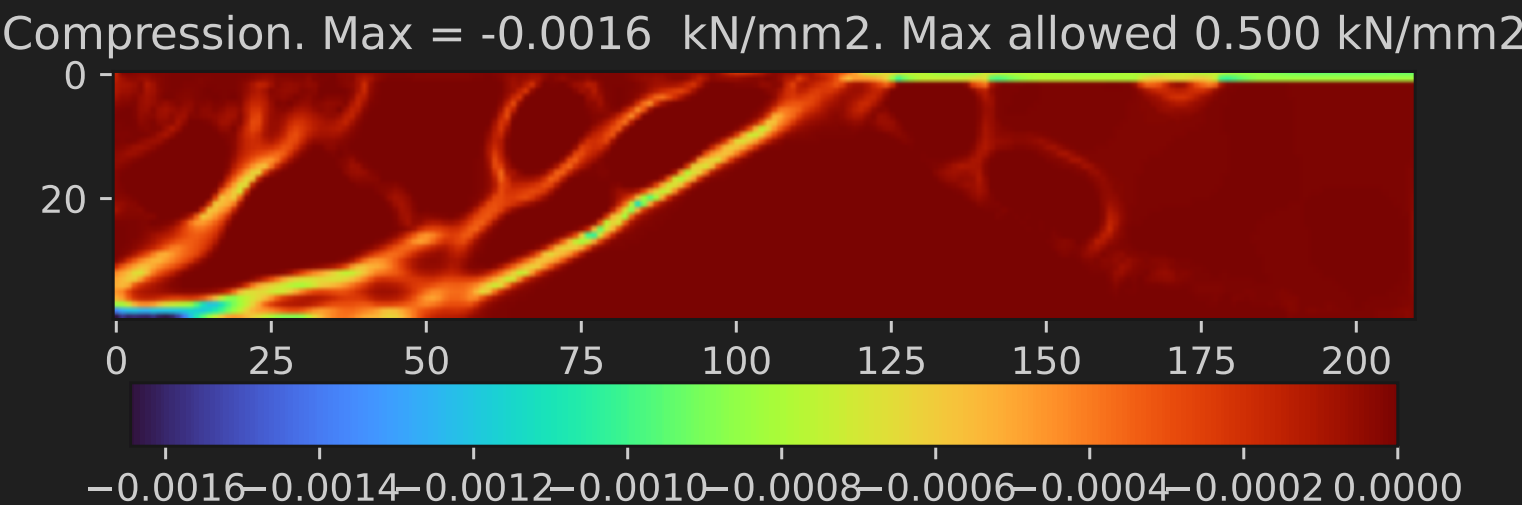
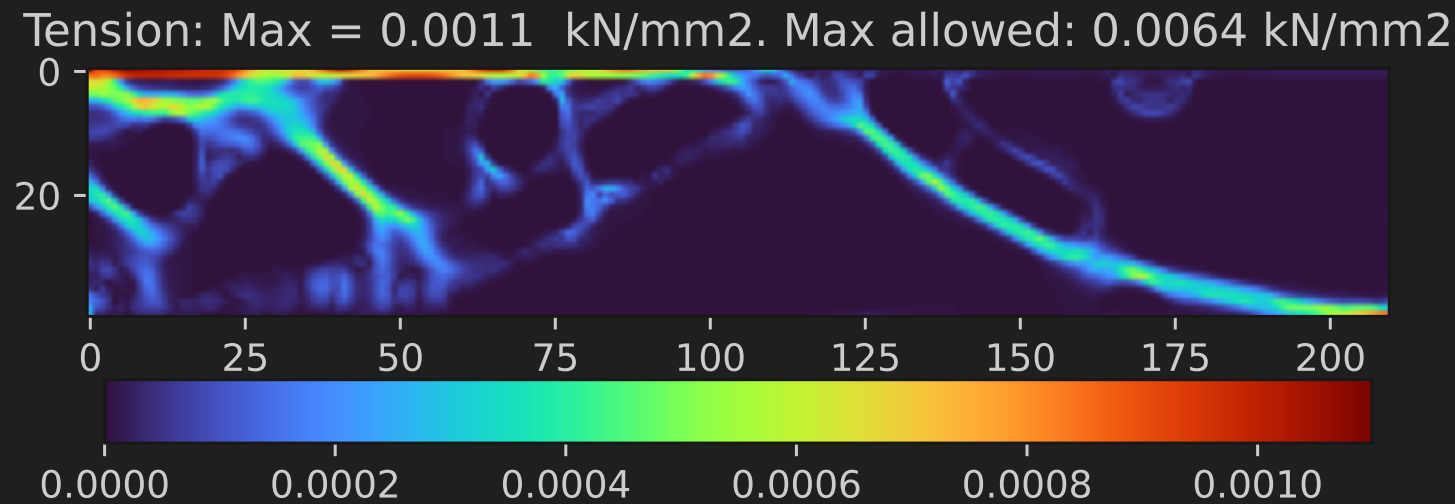
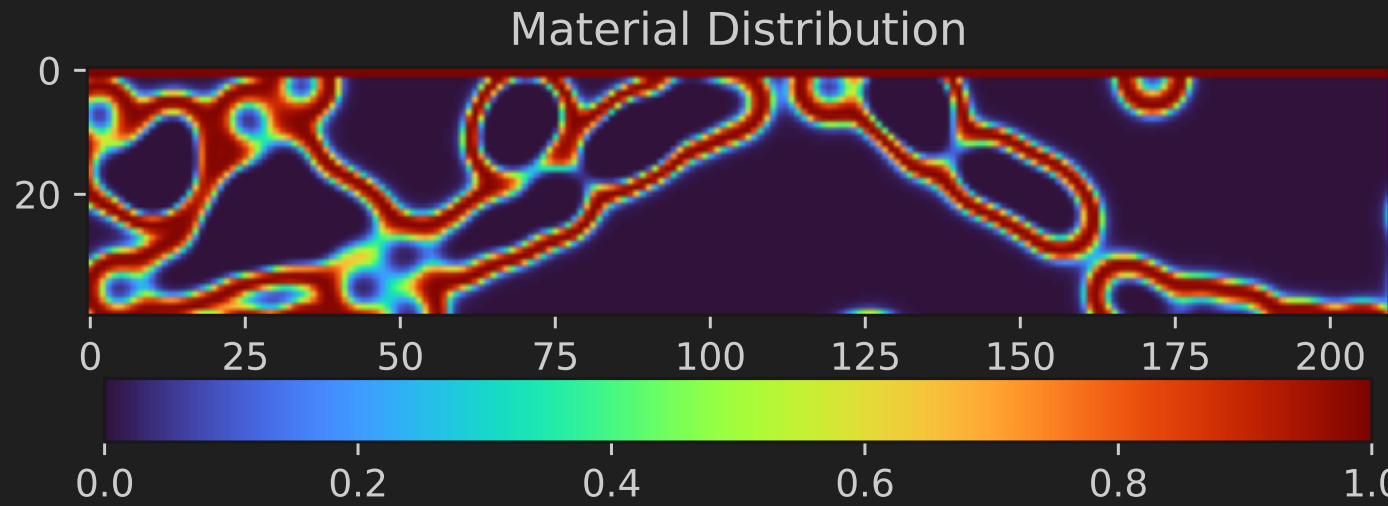
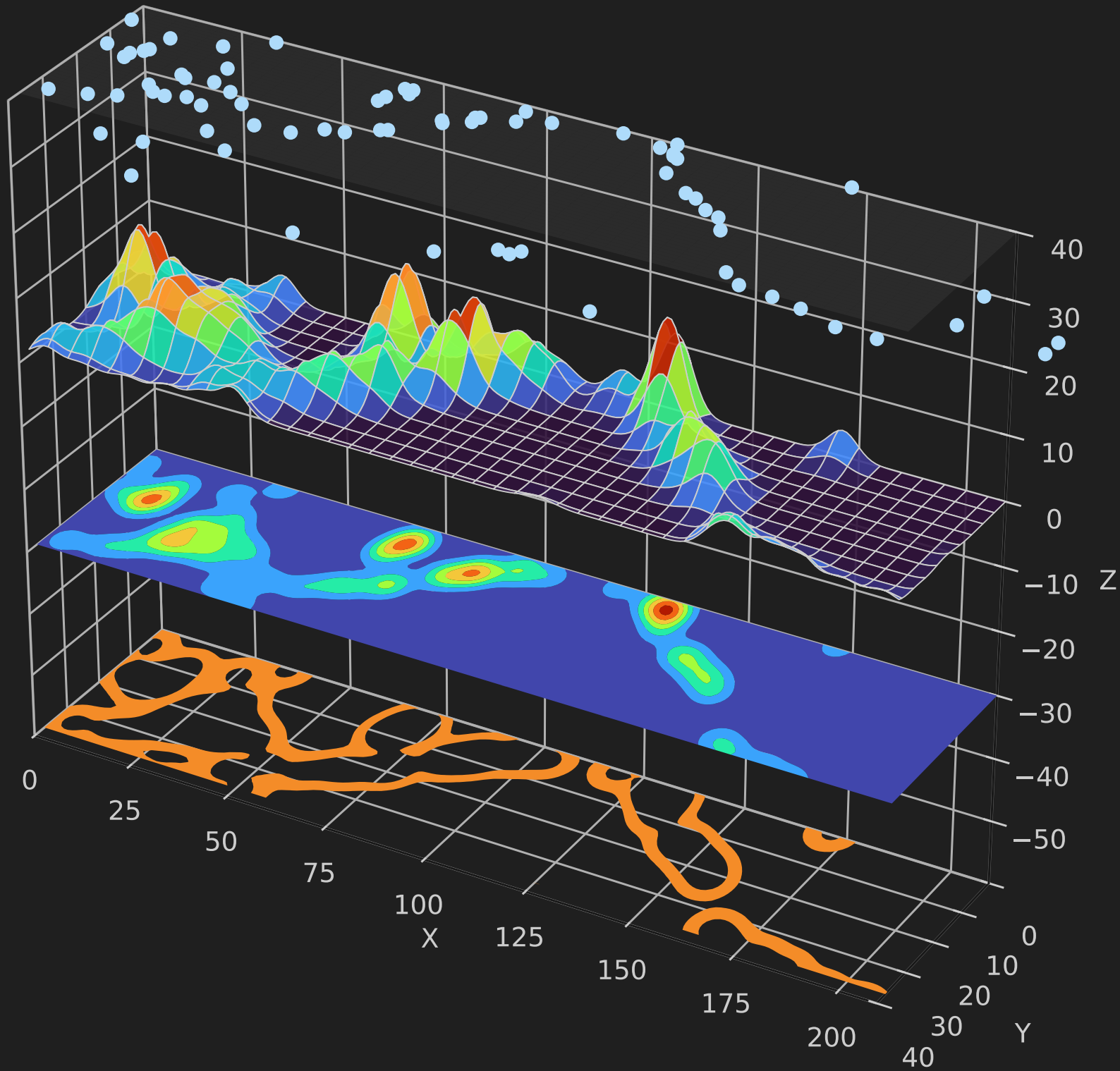
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.26) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.76 Shift = 2.37 Iteration = 044



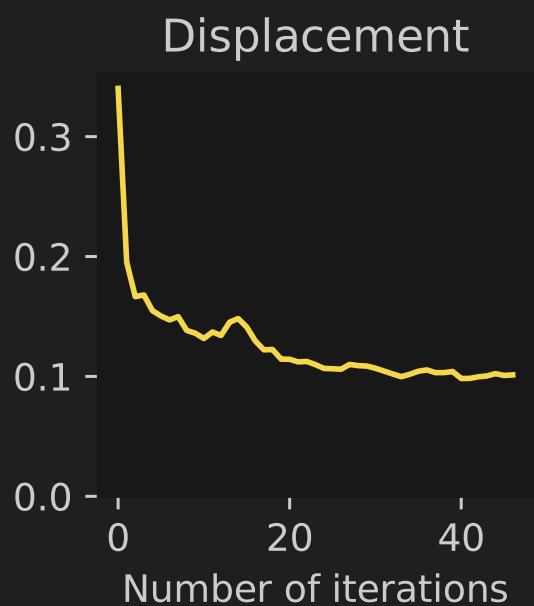
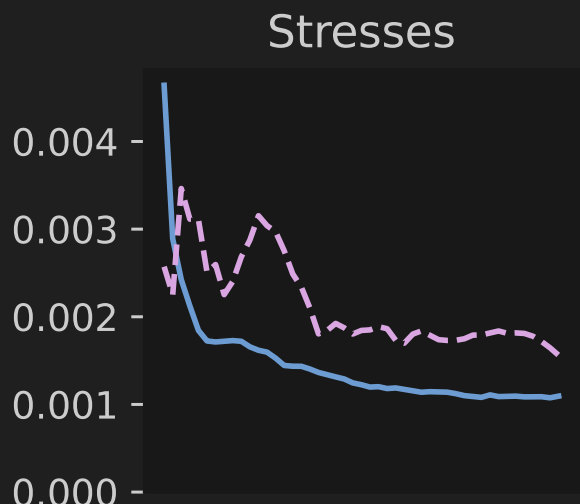
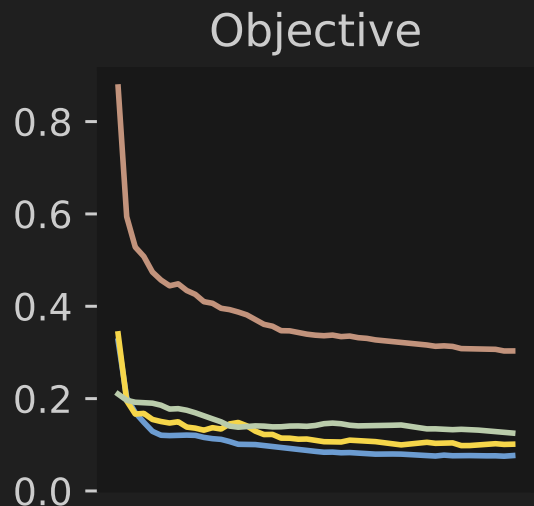
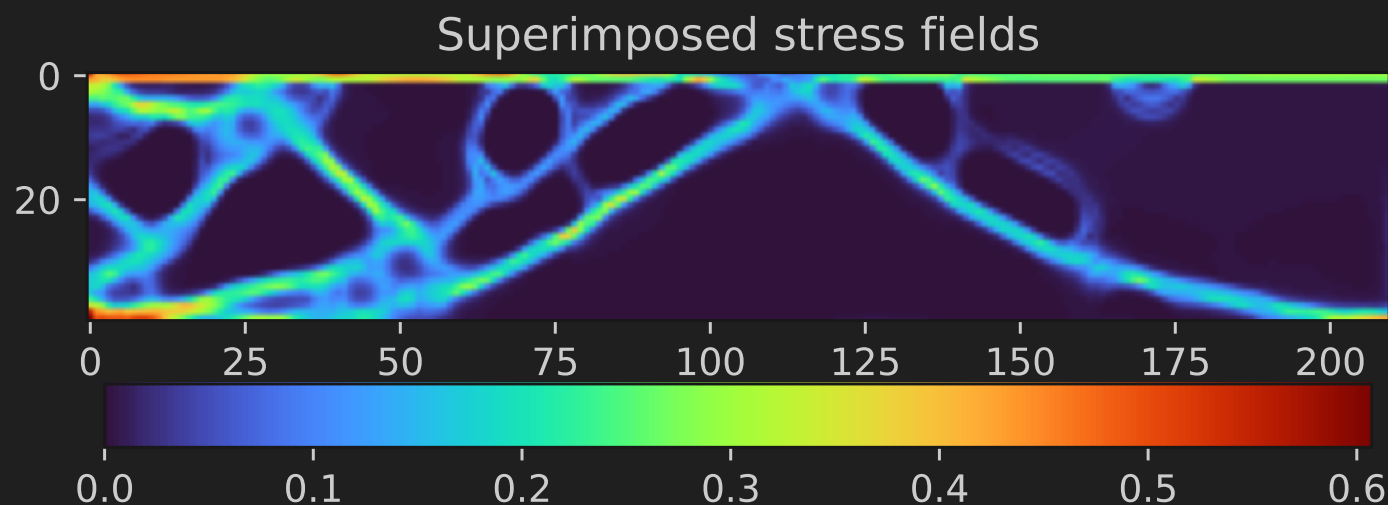
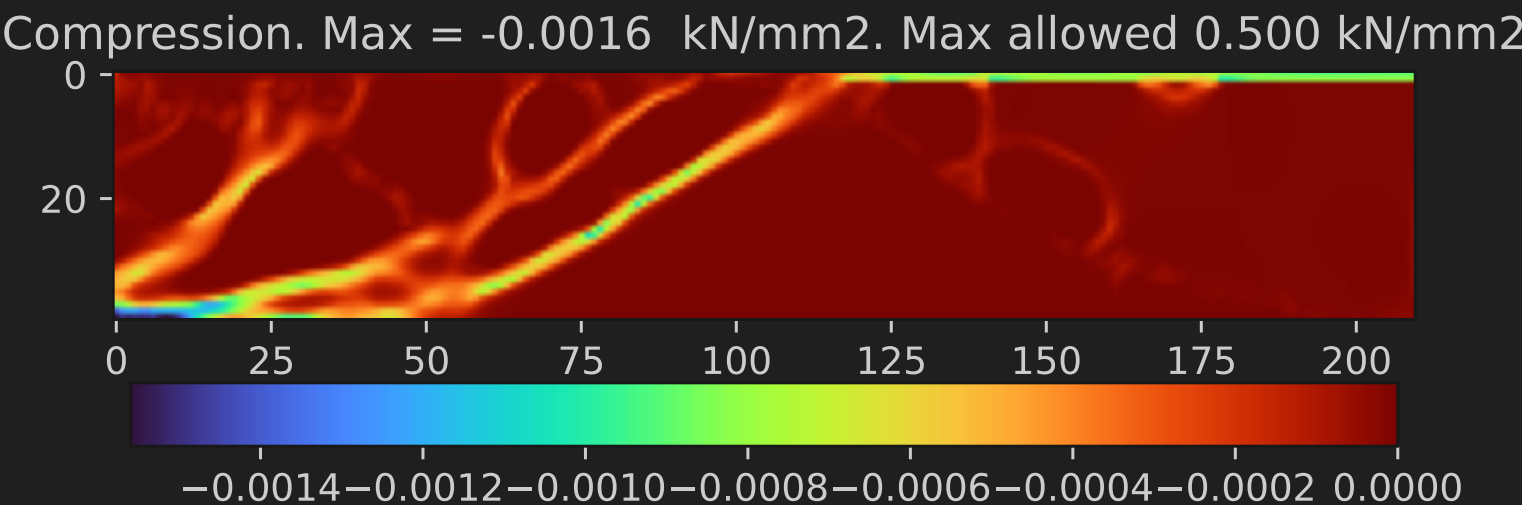
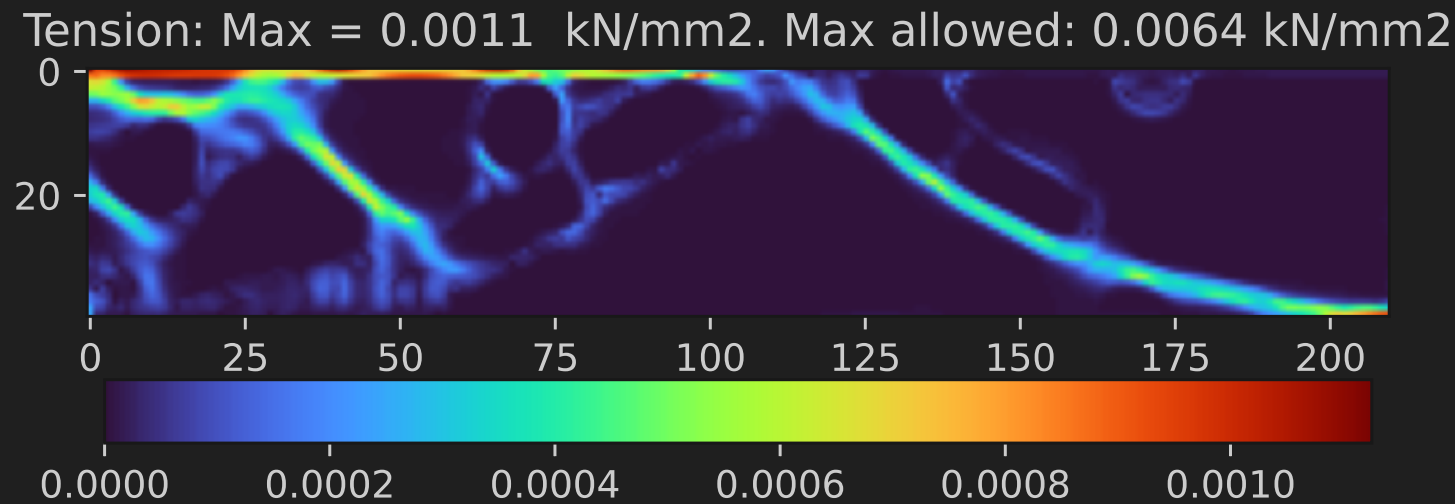
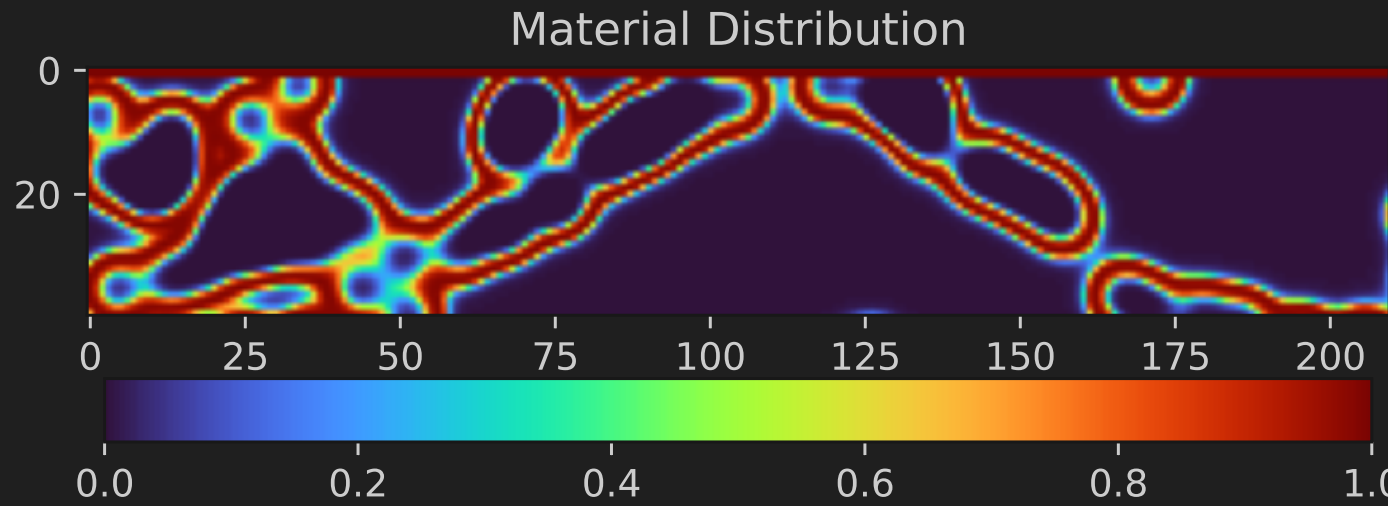
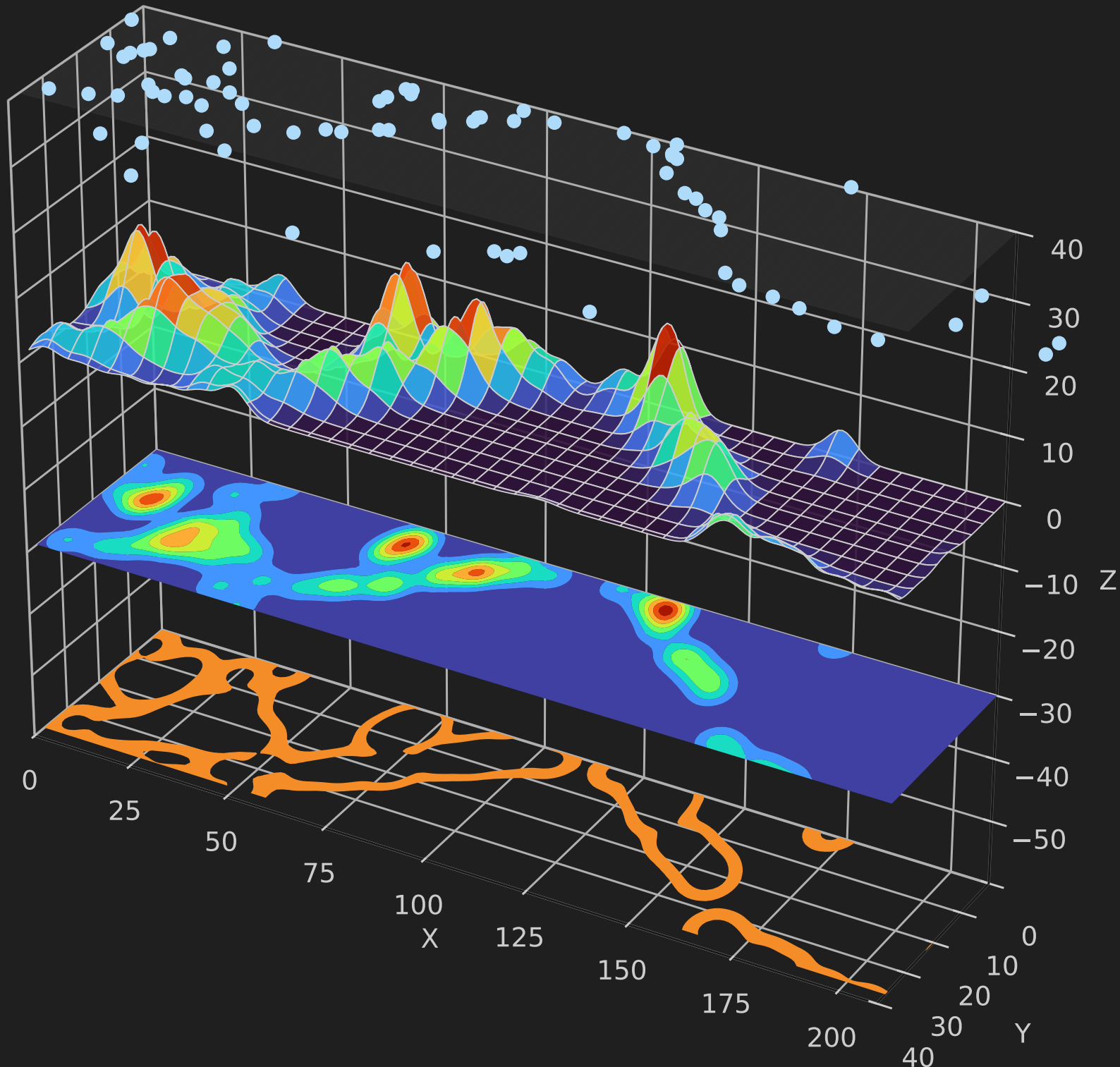
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 4.75 Shift = 2.36 Iteration = 045



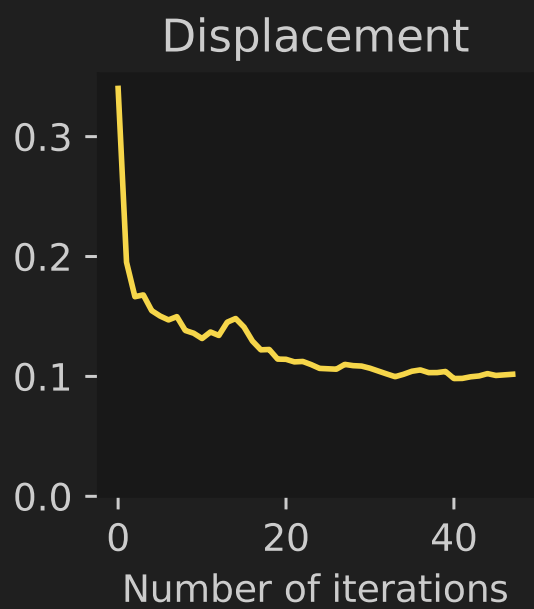
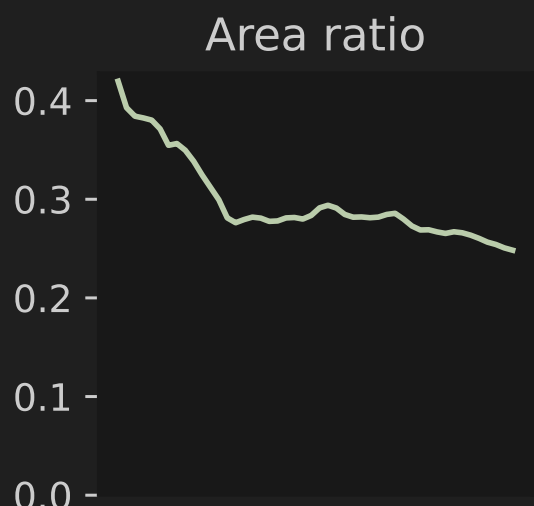
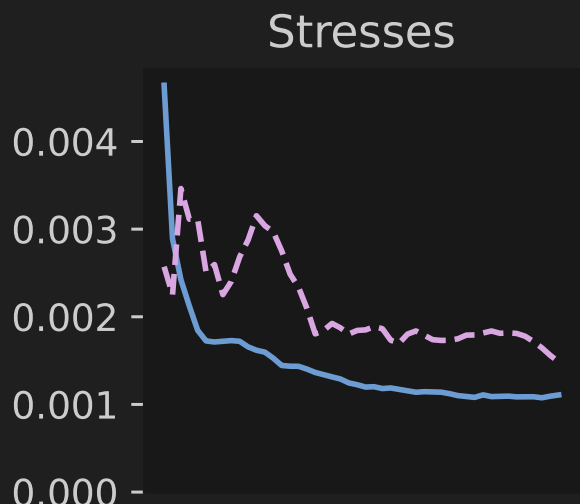
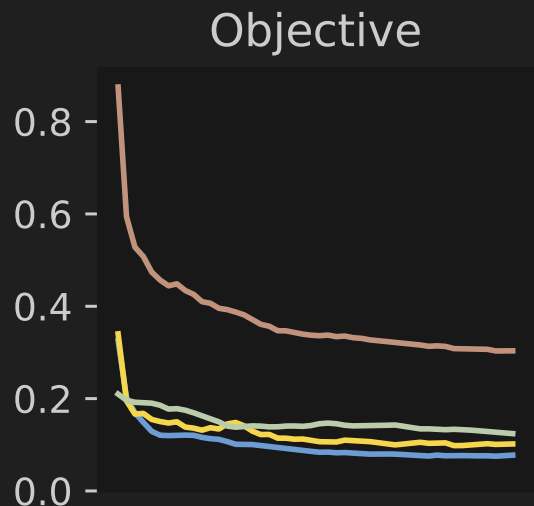
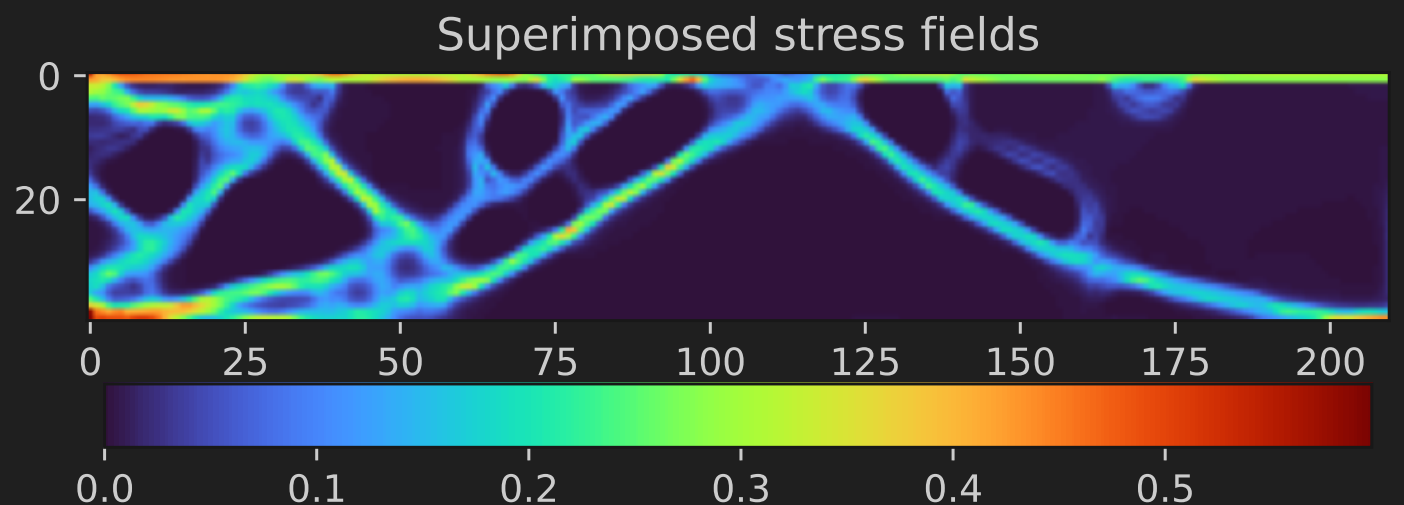
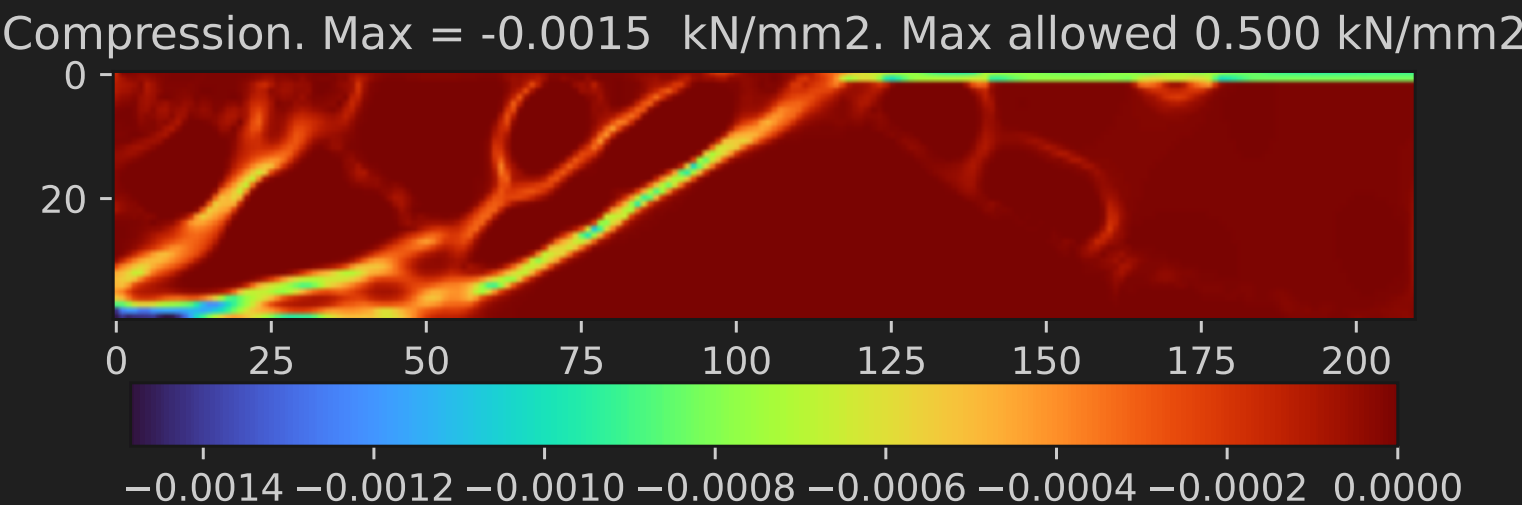
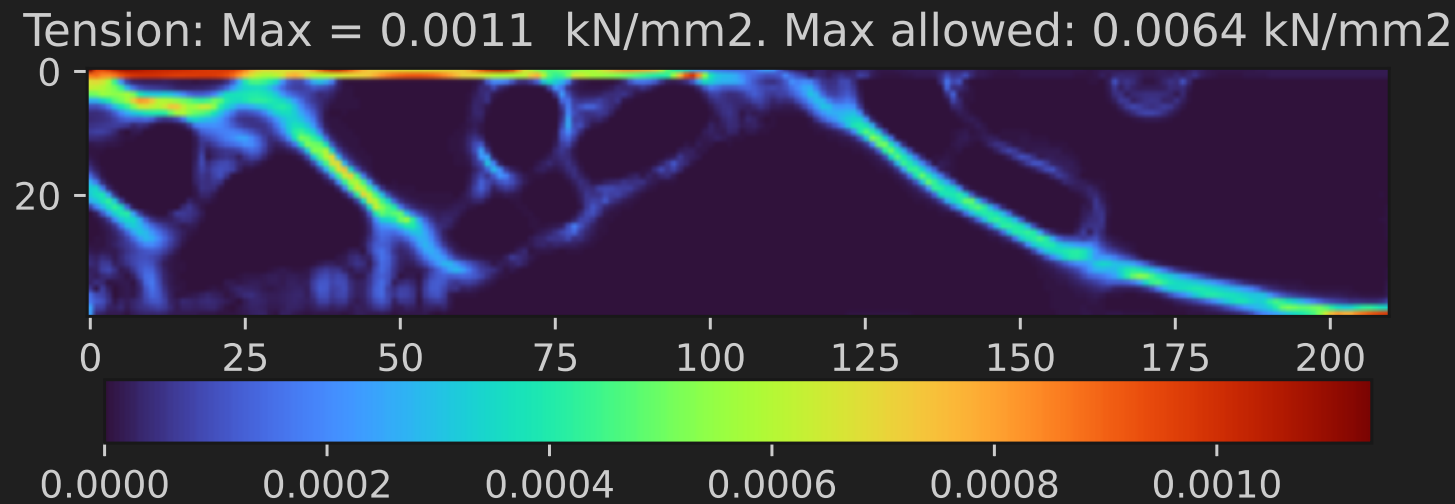
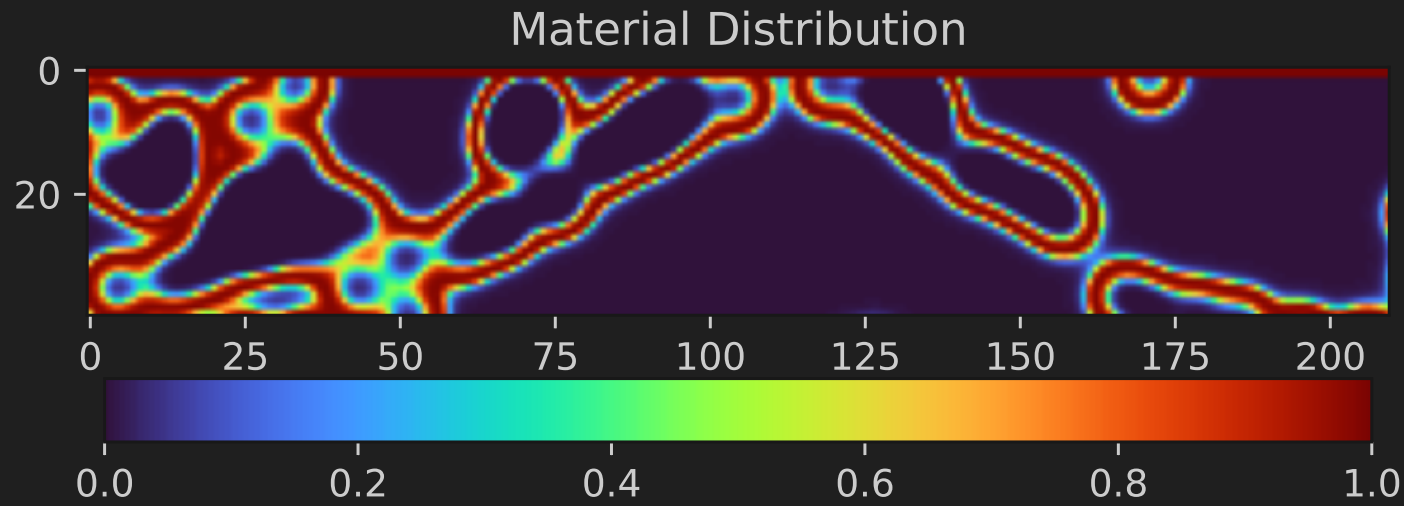
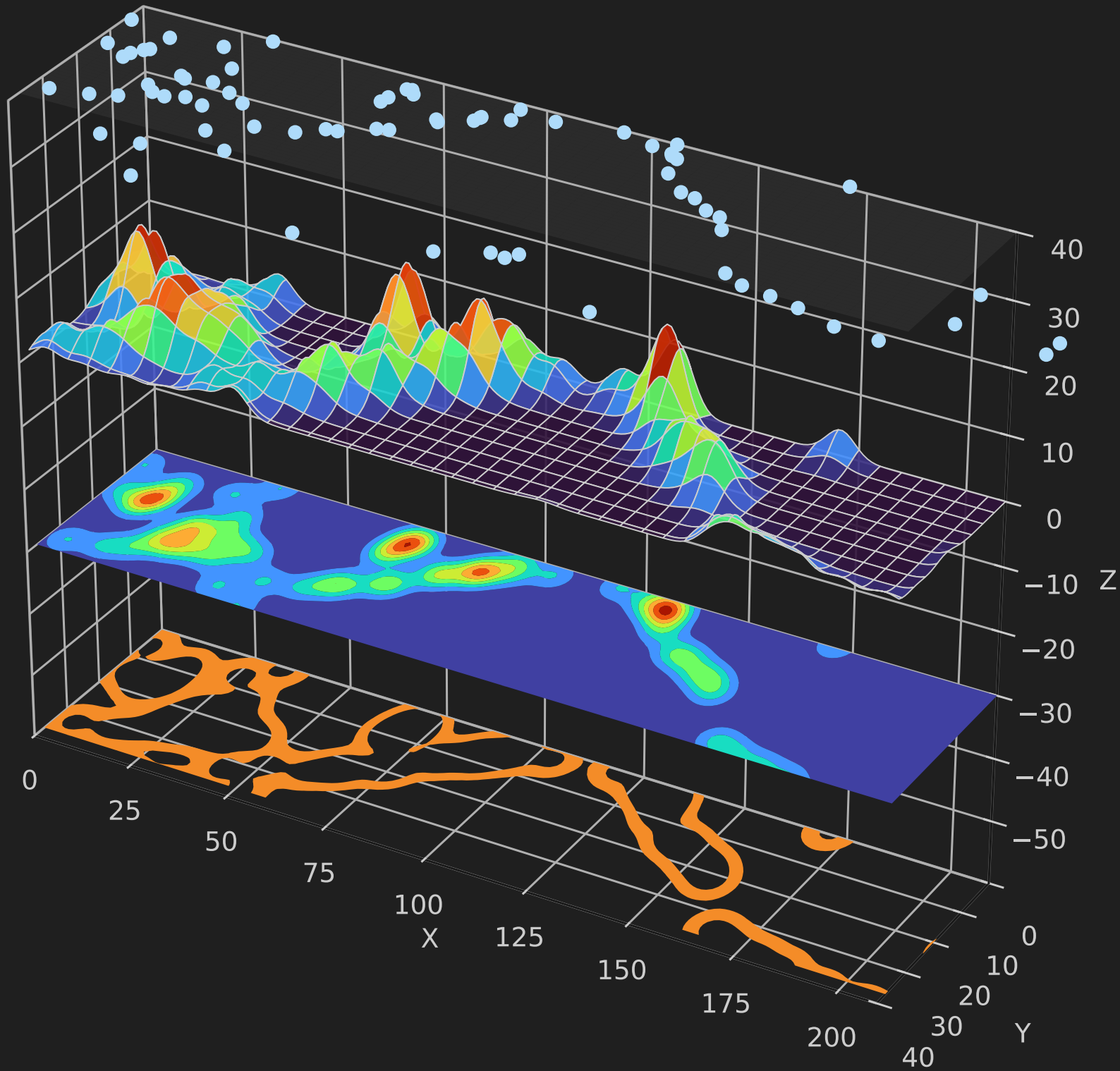
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 4.74 Shift = 2.35 Iteration = 046



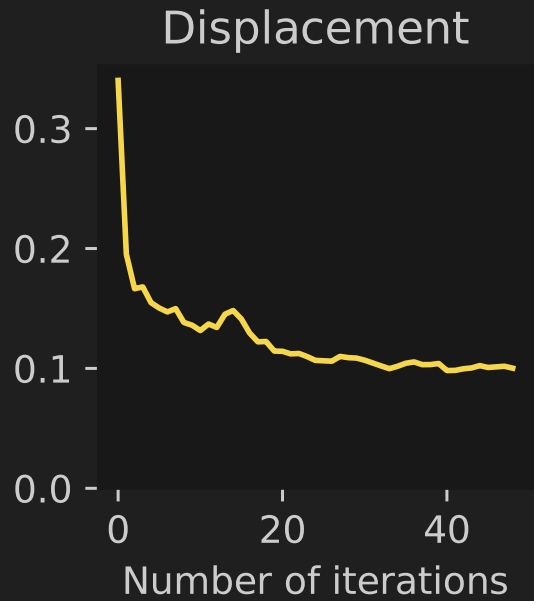
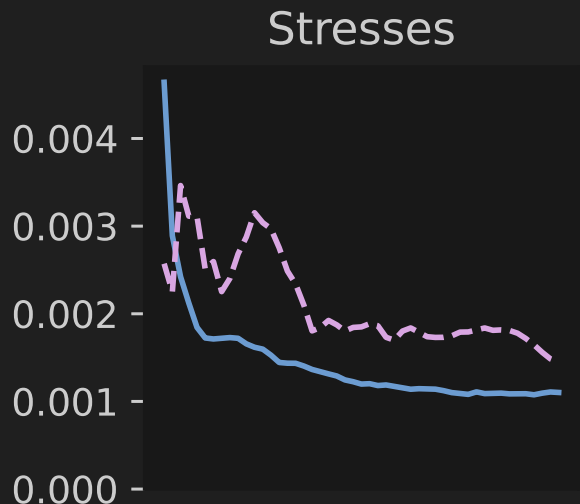
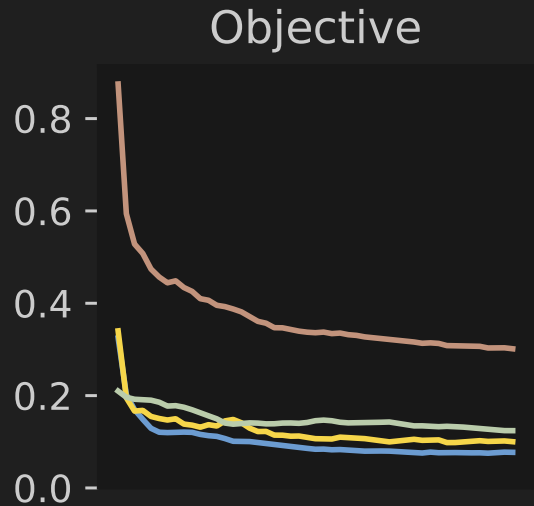
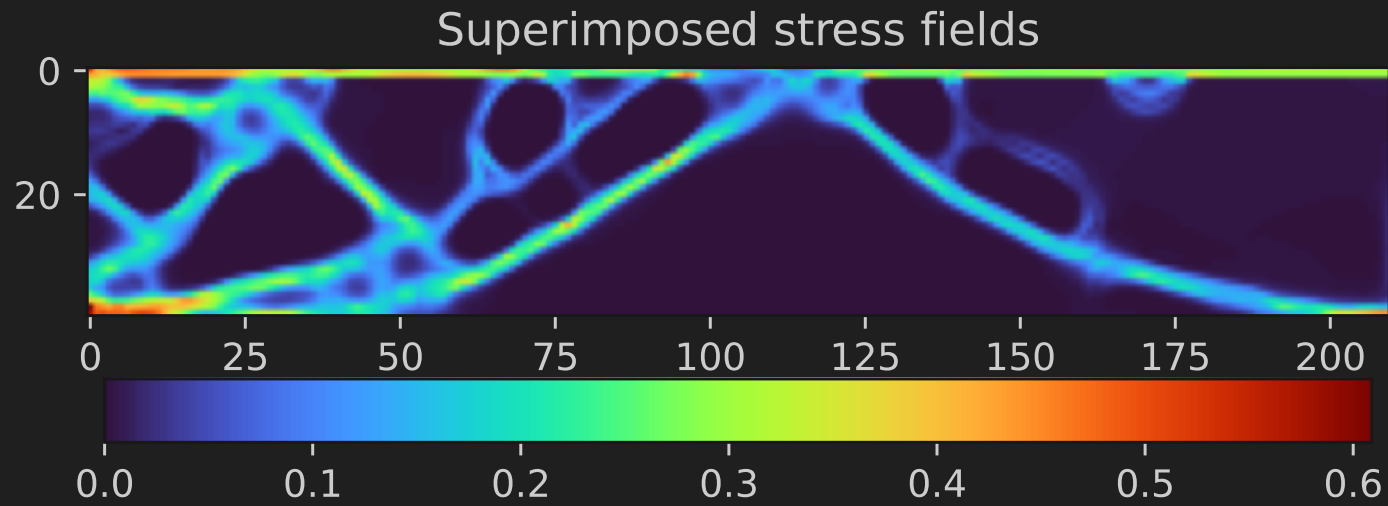
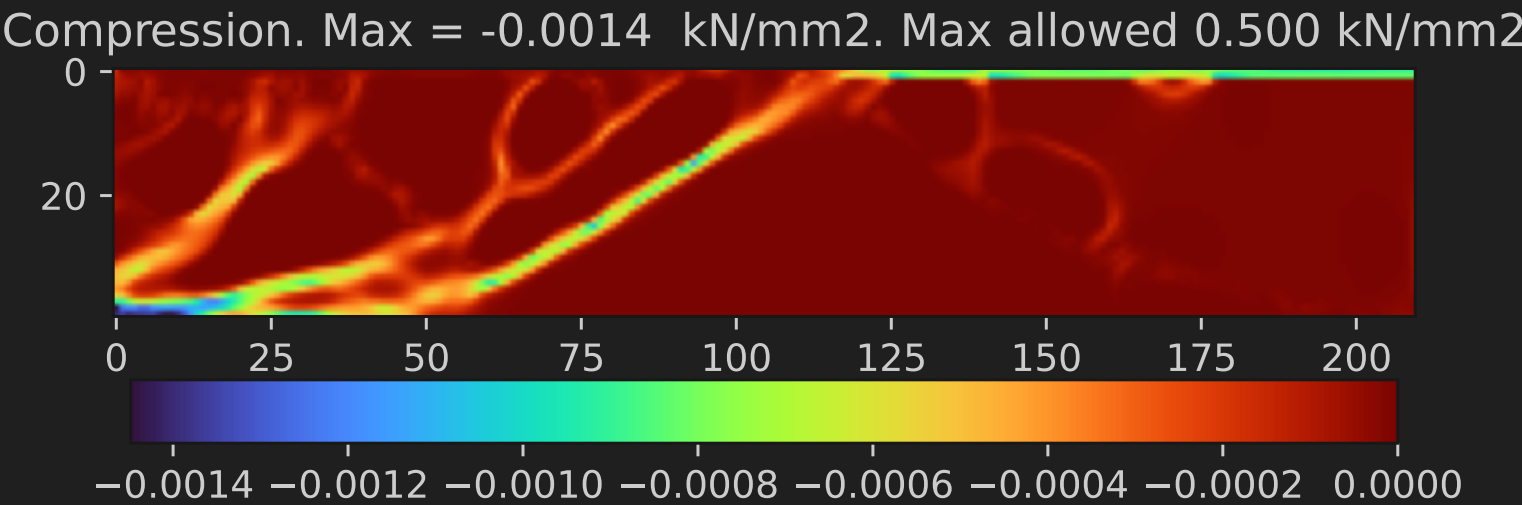
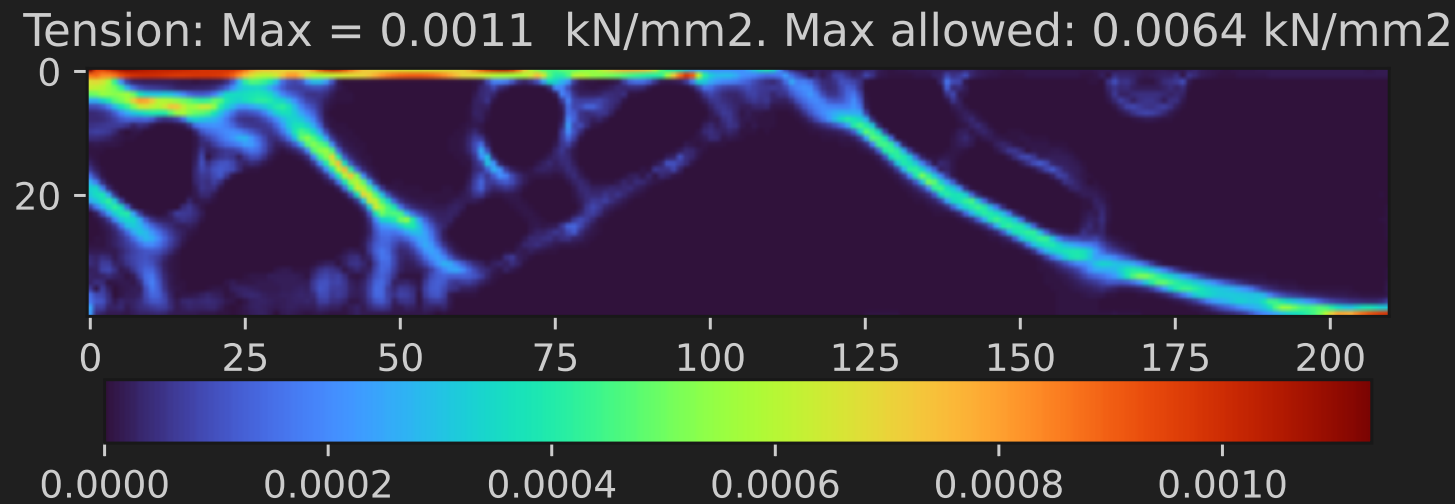
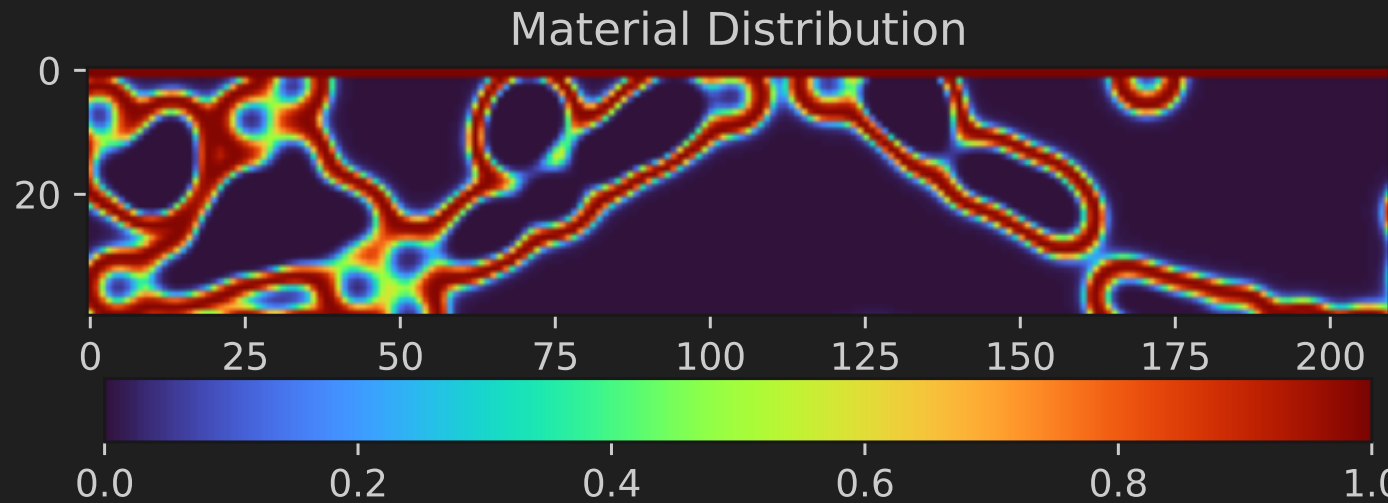
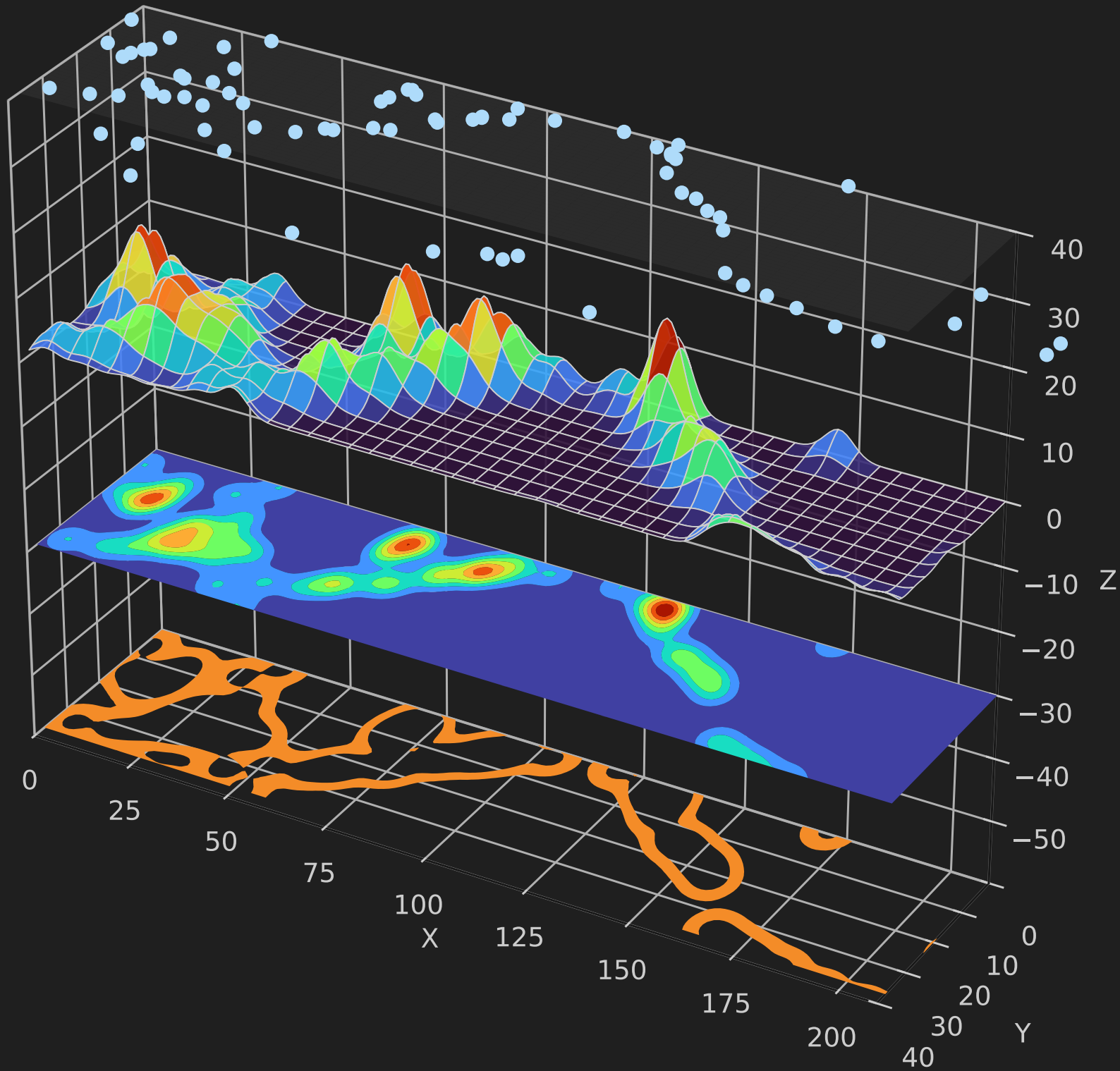
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 4.74 Shift = 2.34 Iteration = 047



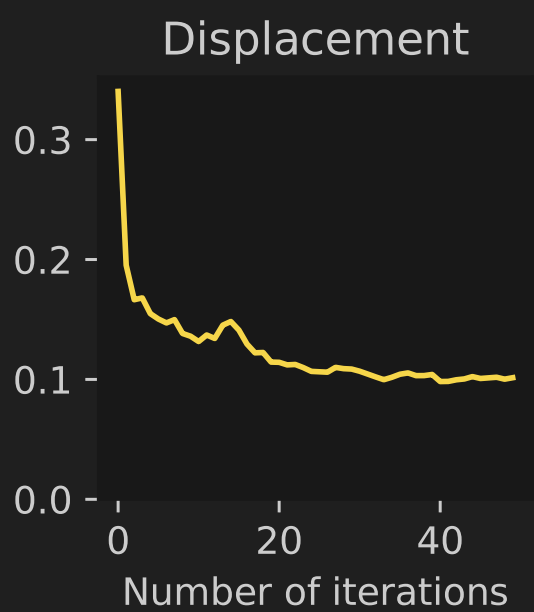
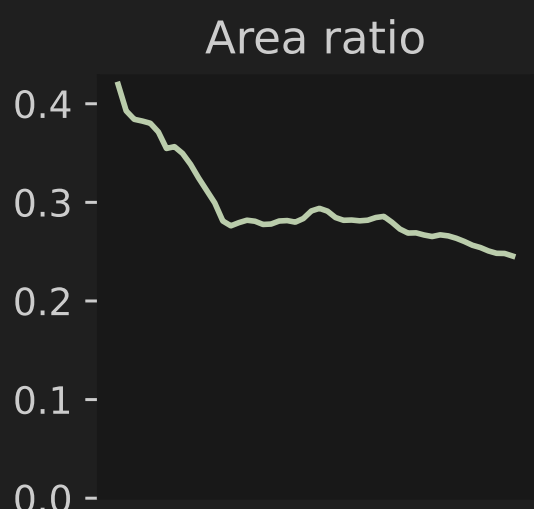
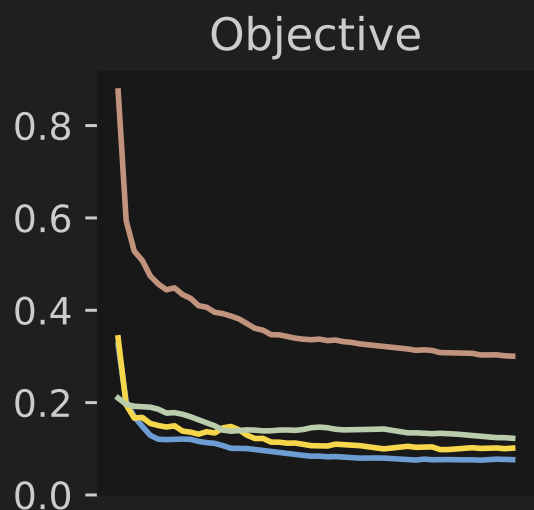
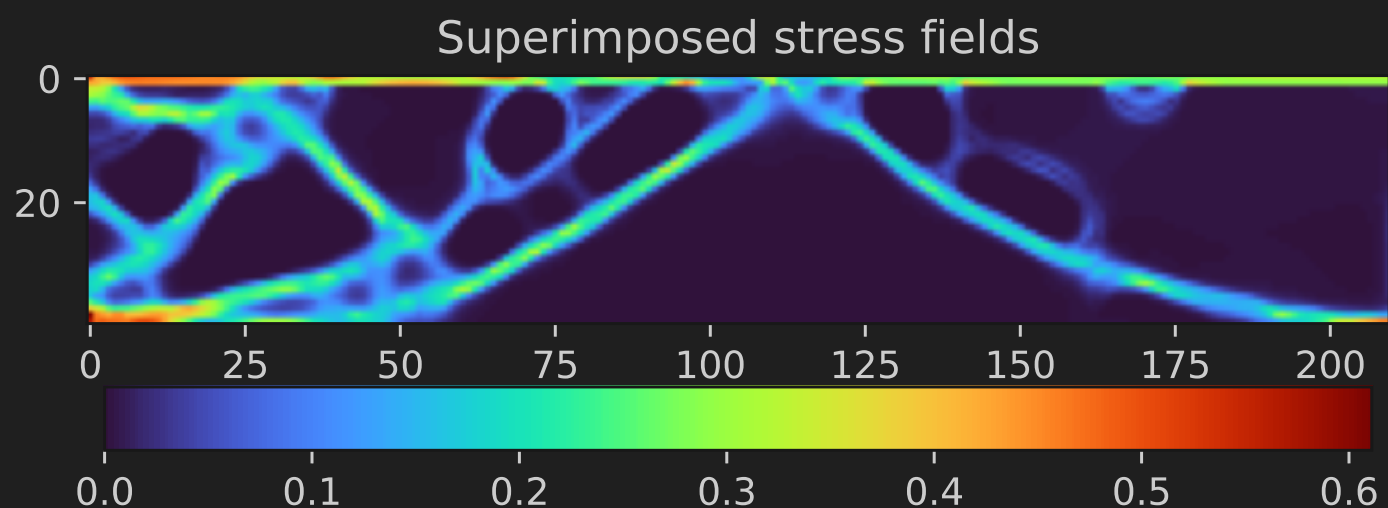
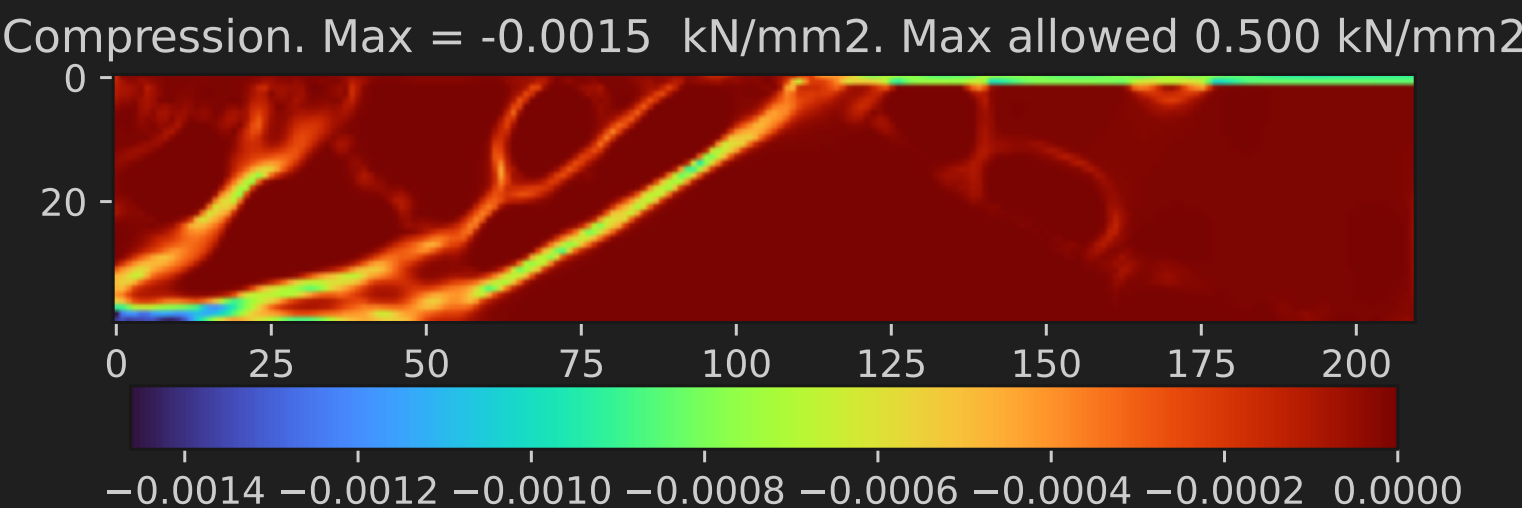
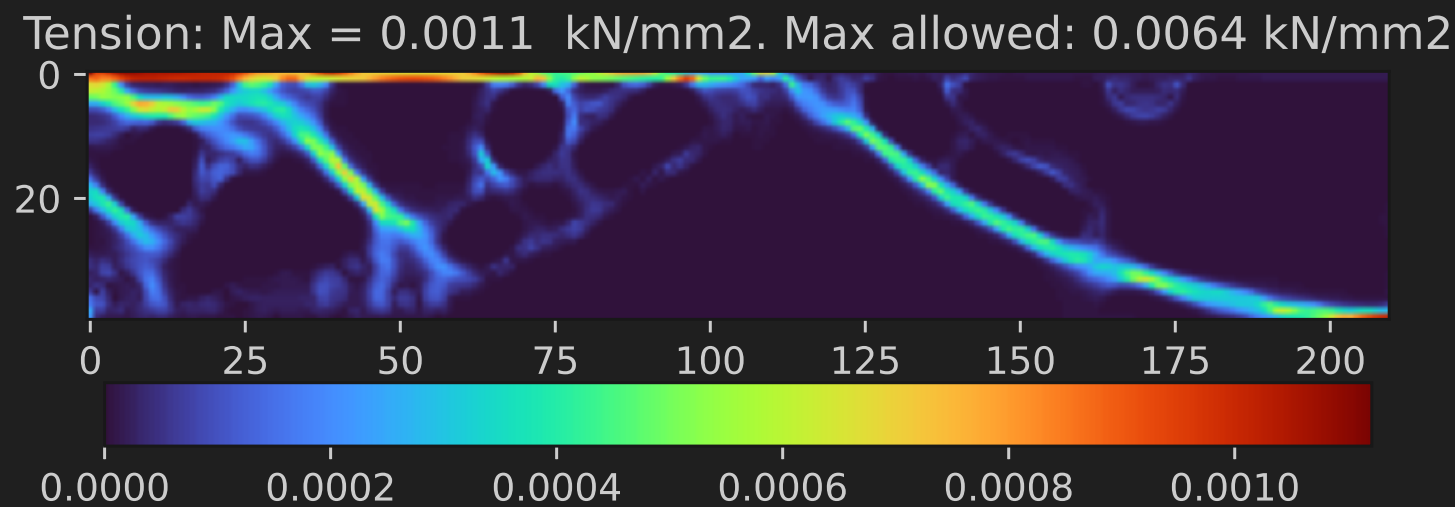
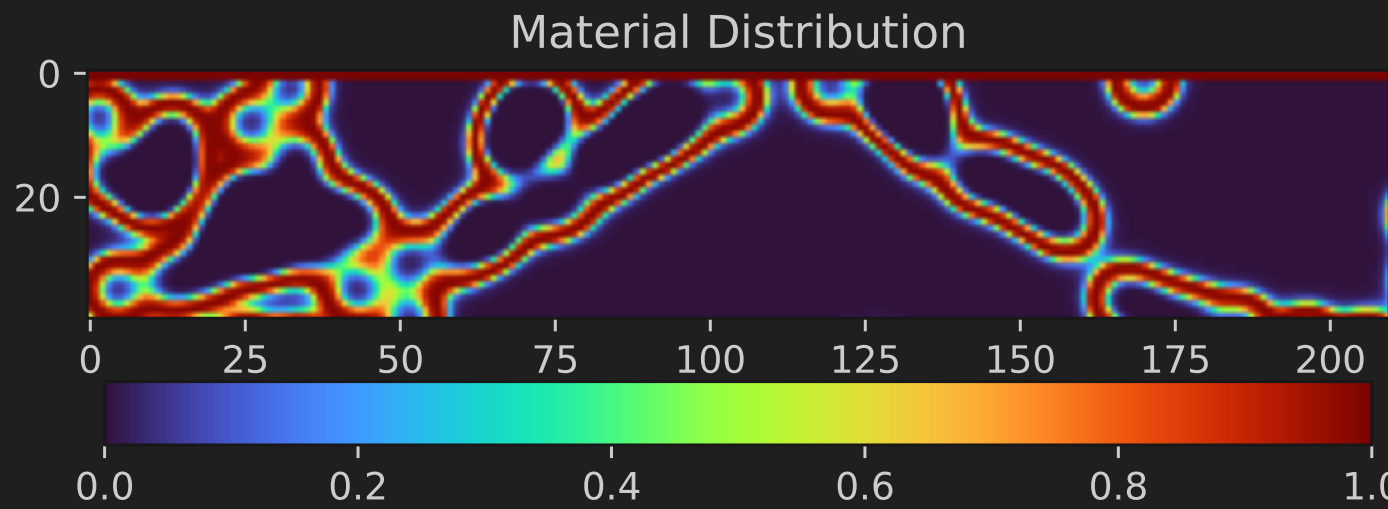
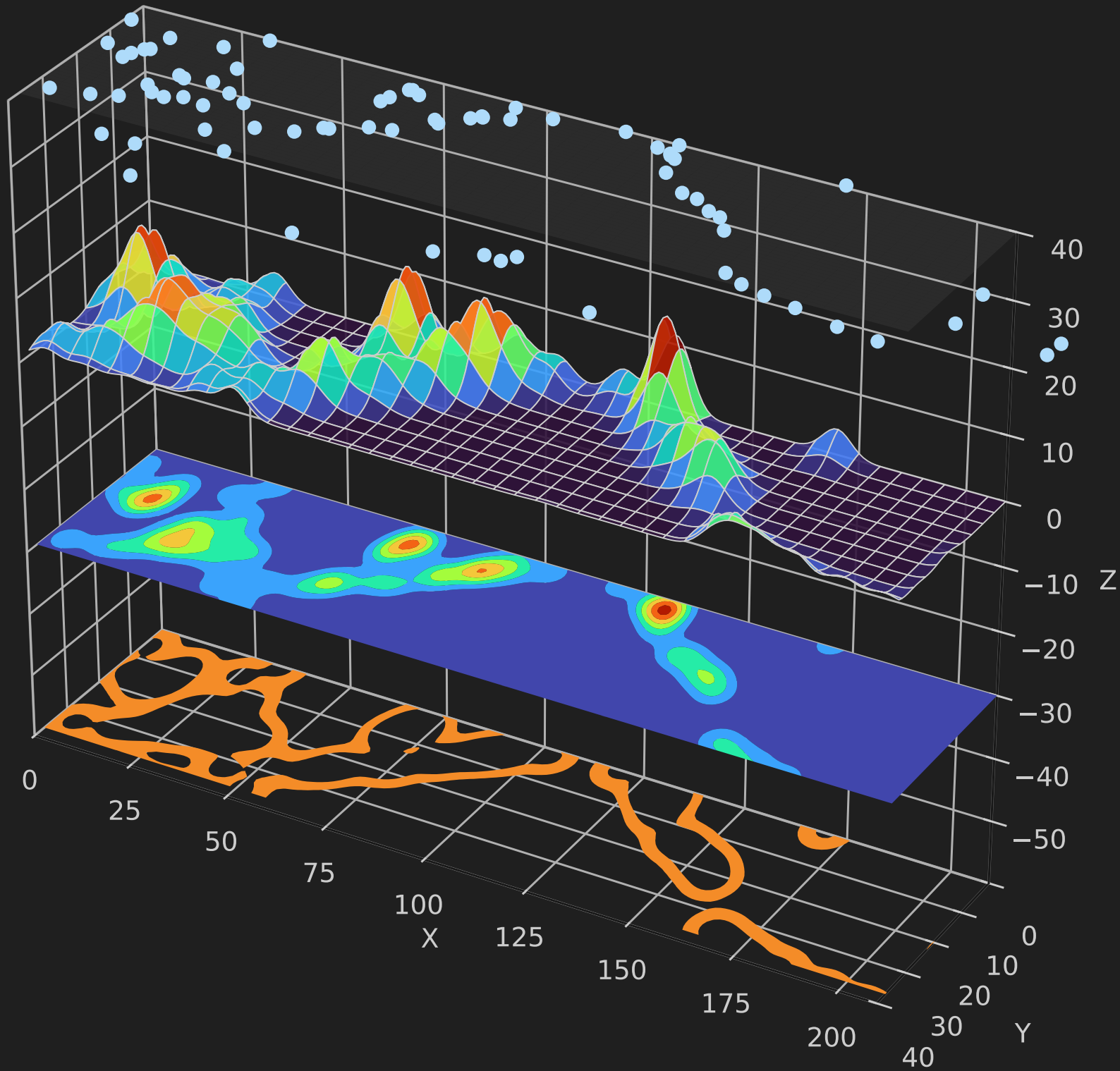
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 4.73 Shift = 2.34 Iteration = 048



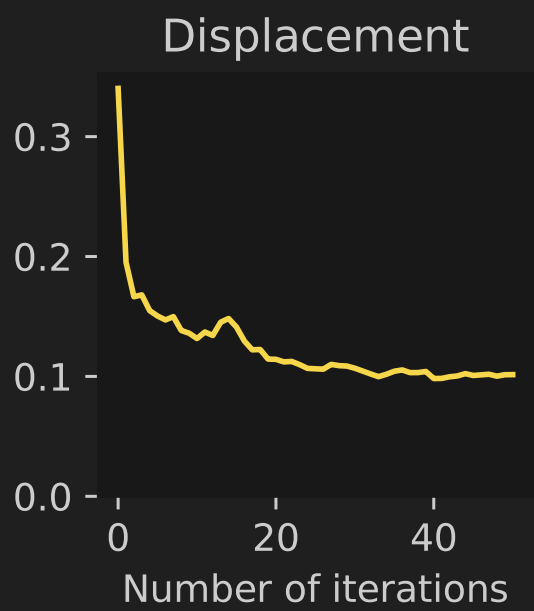
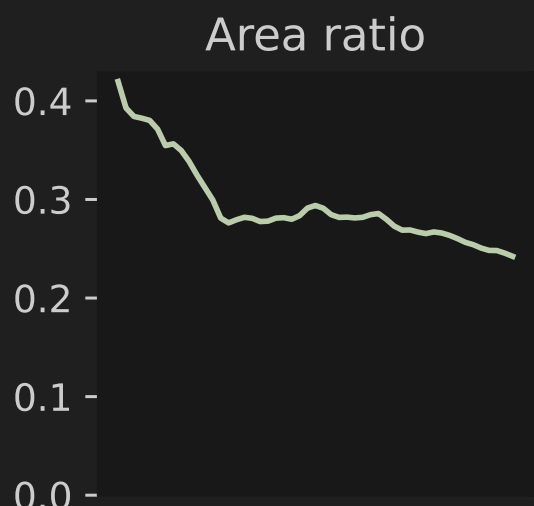
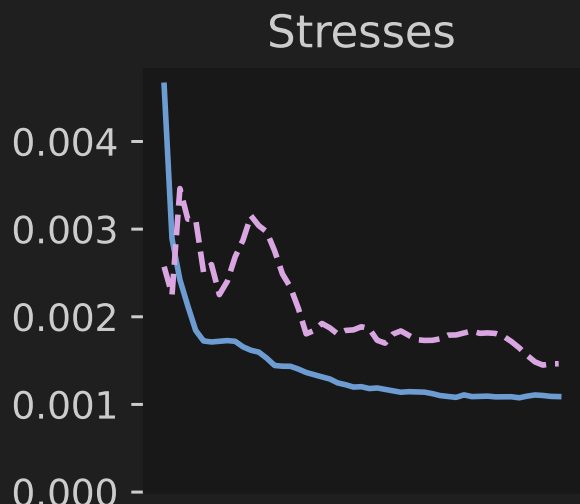
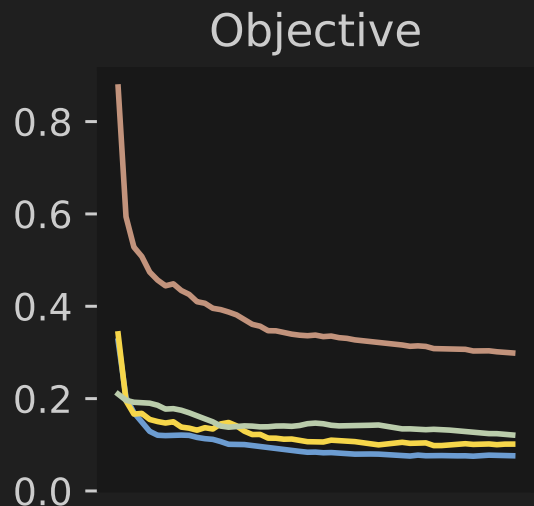
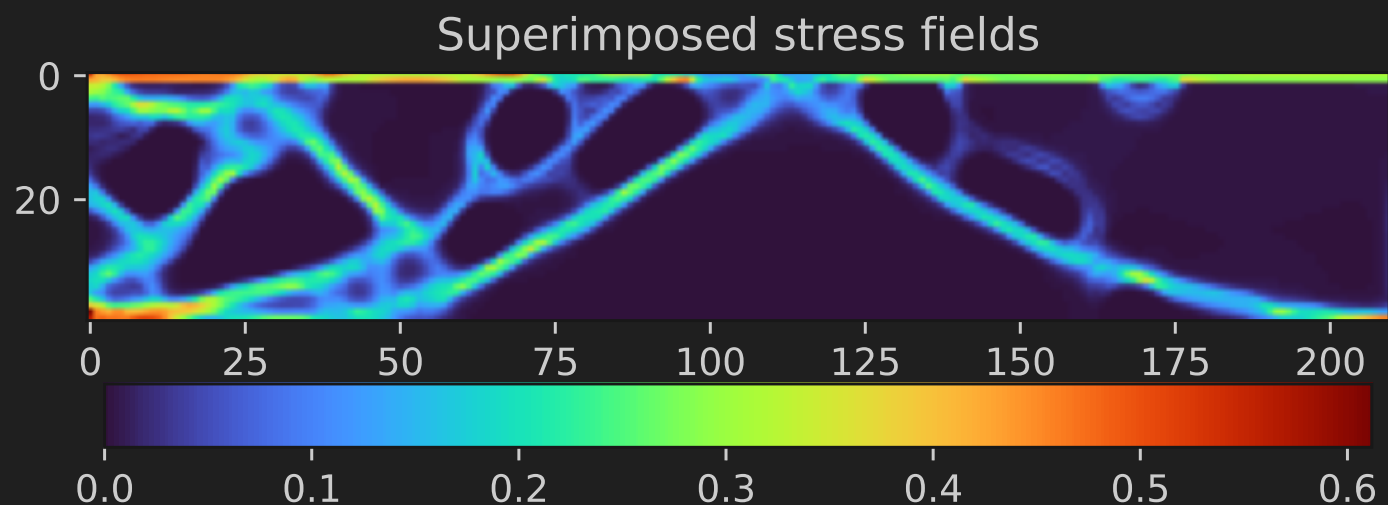
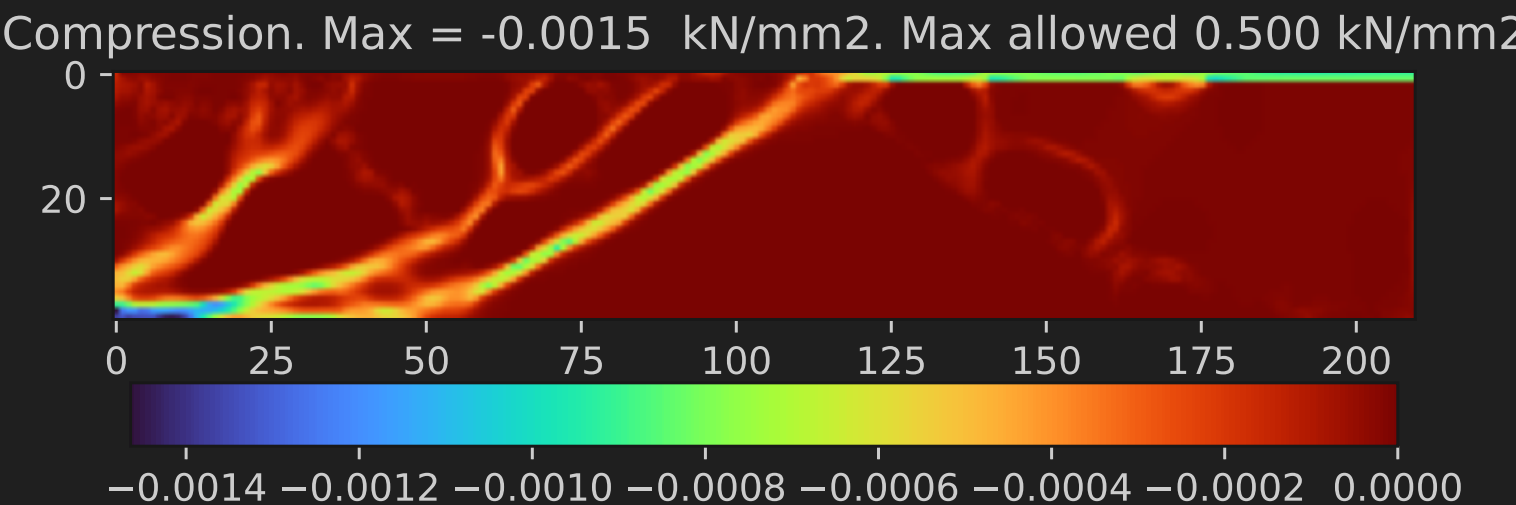
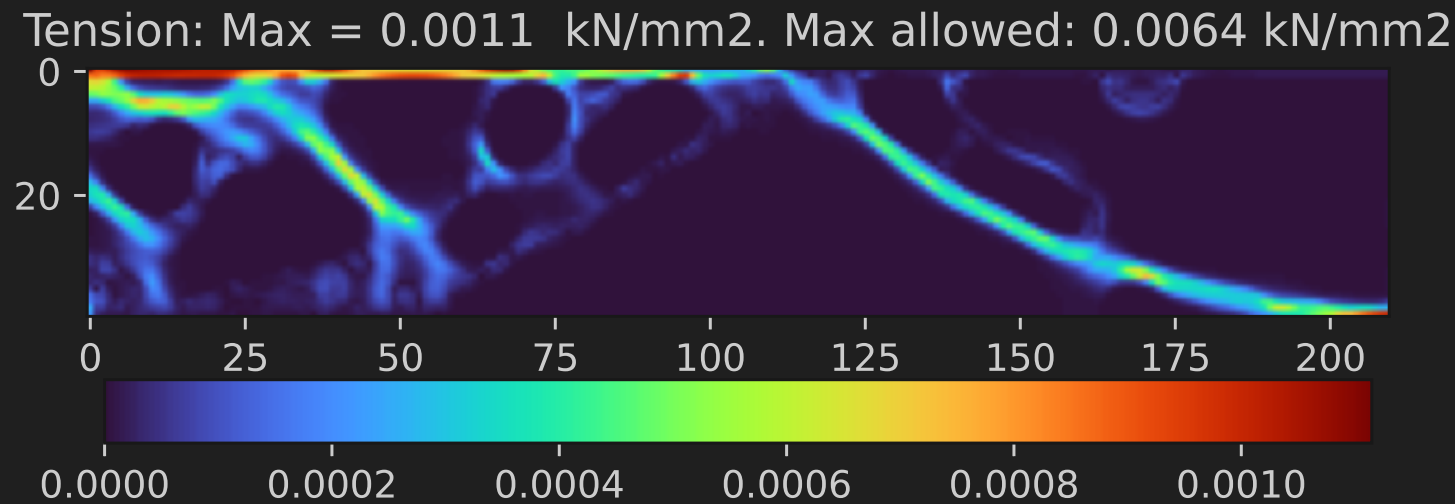
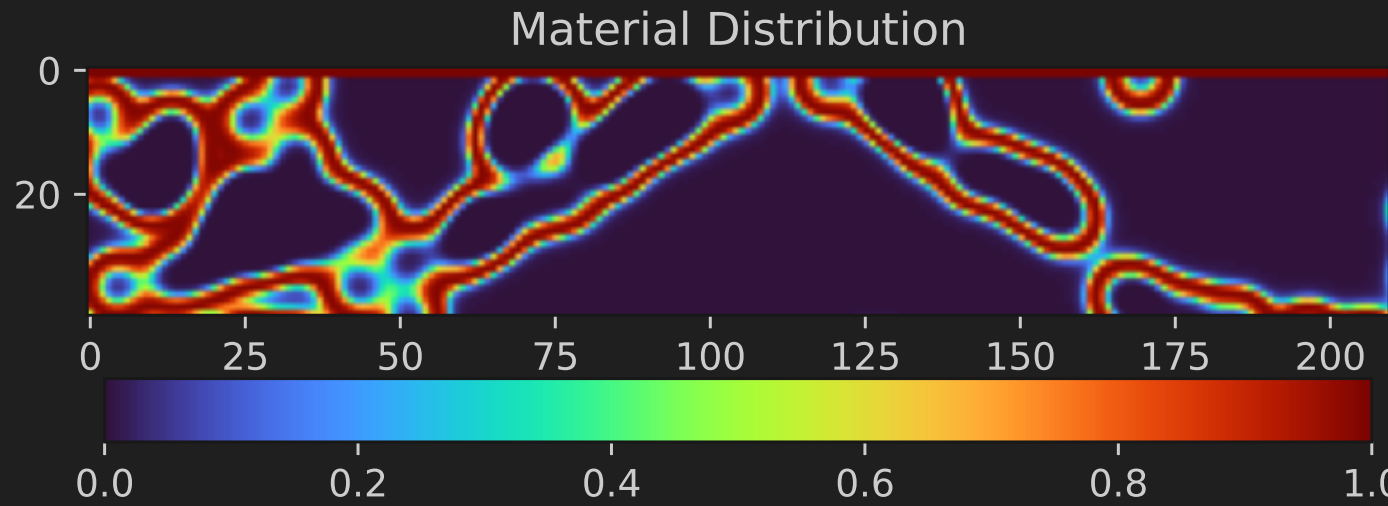
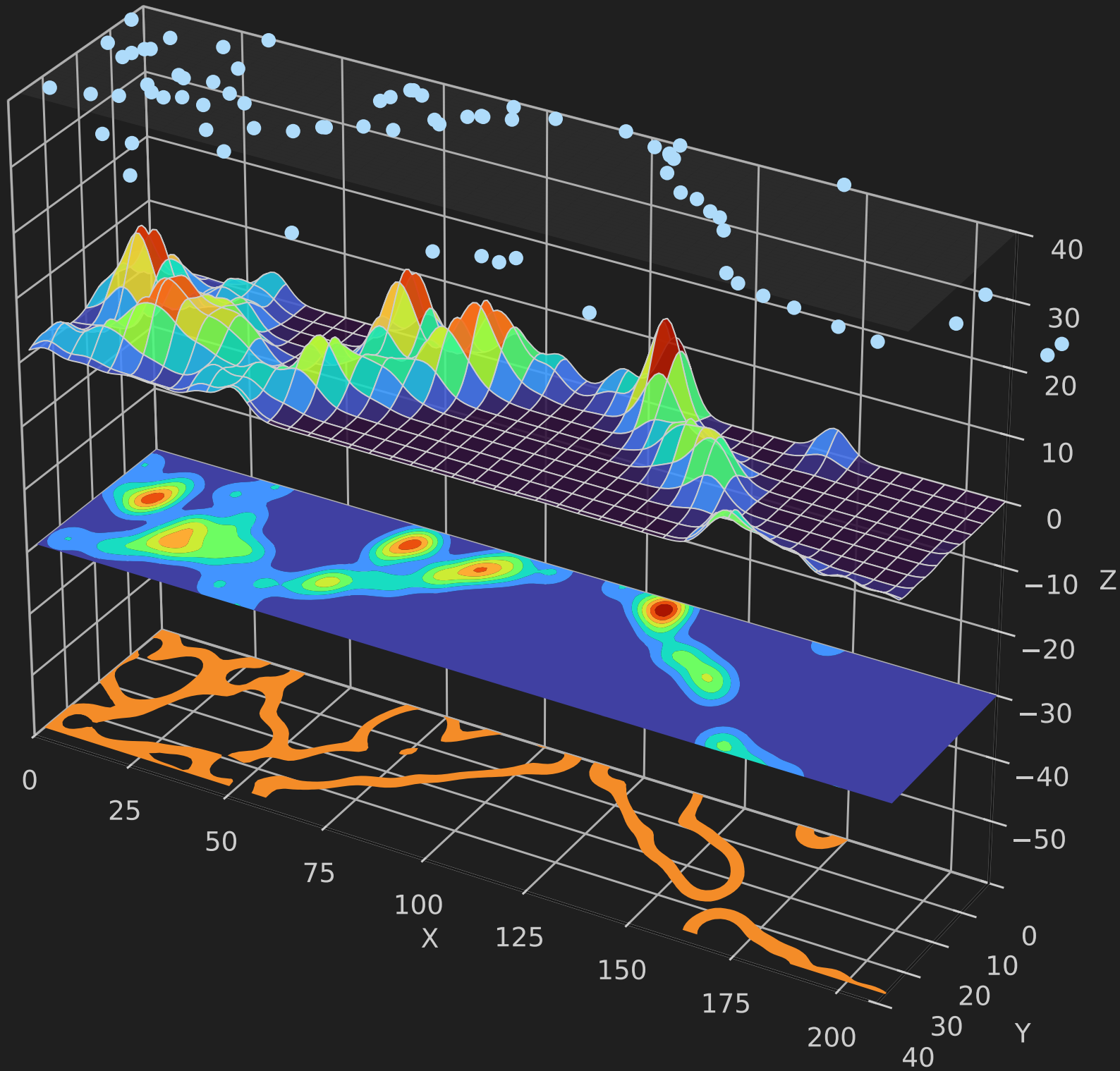
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 4.73 Shift = 2.33 Iteration = 049



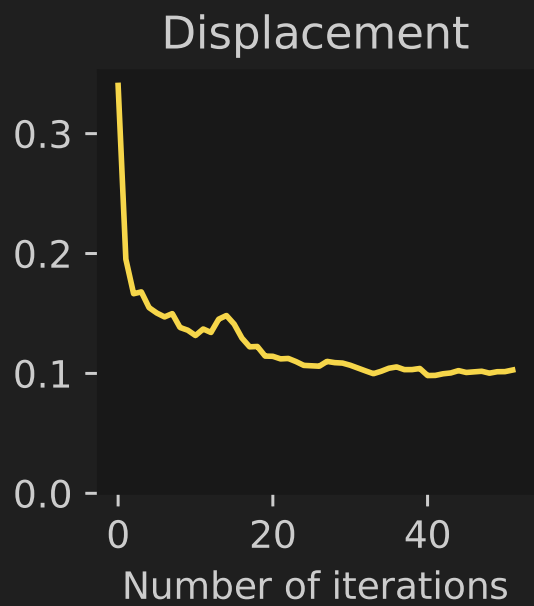
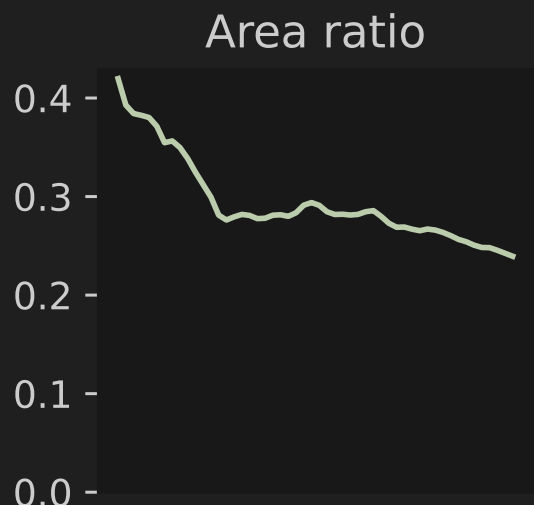
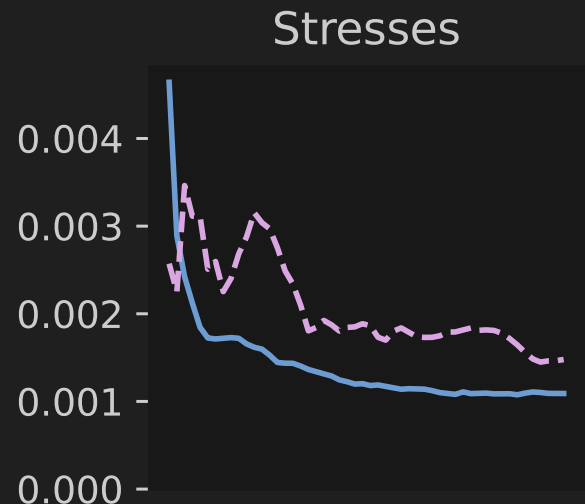
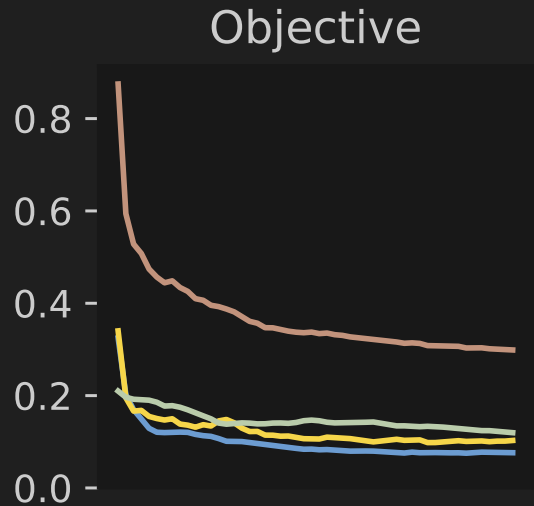
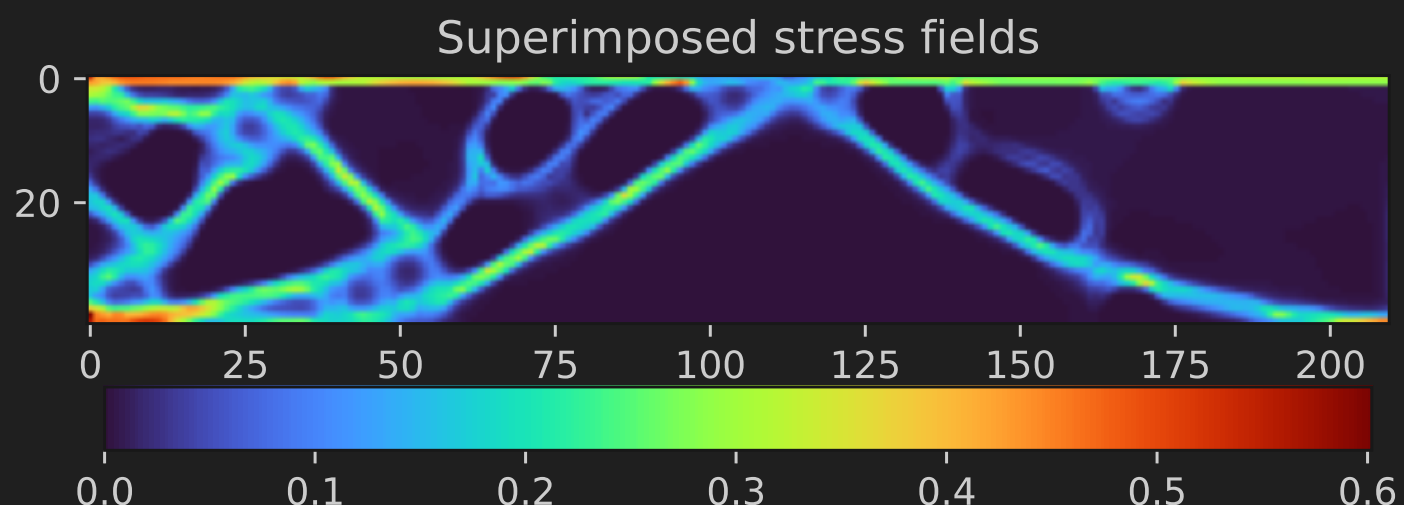
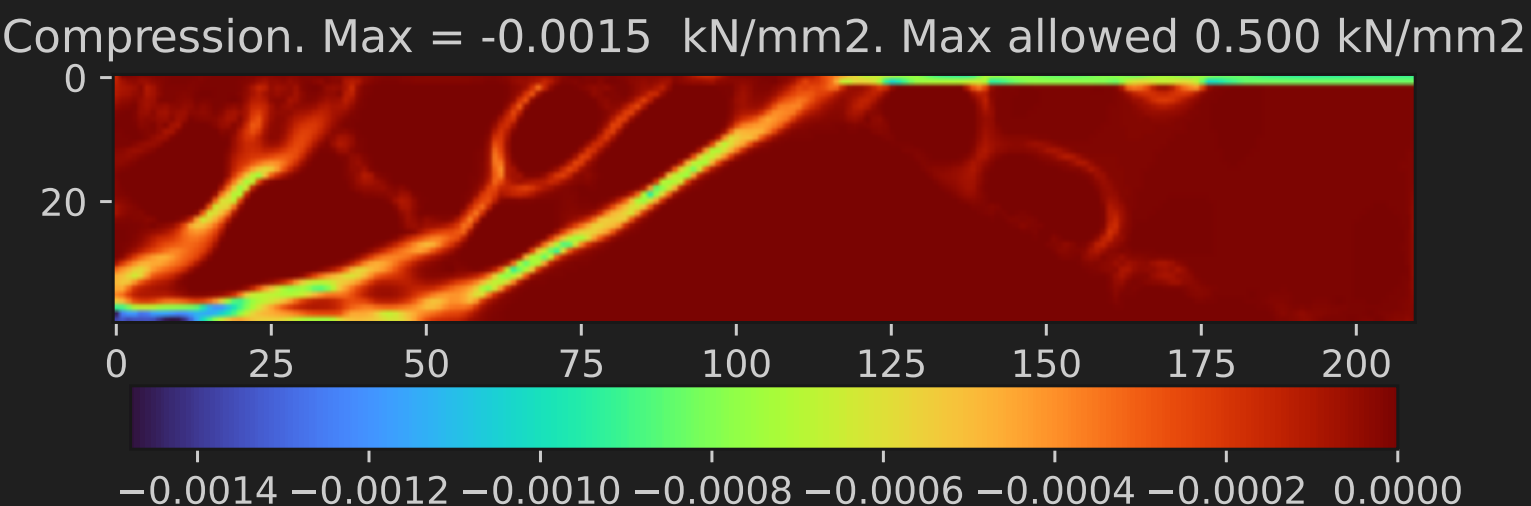
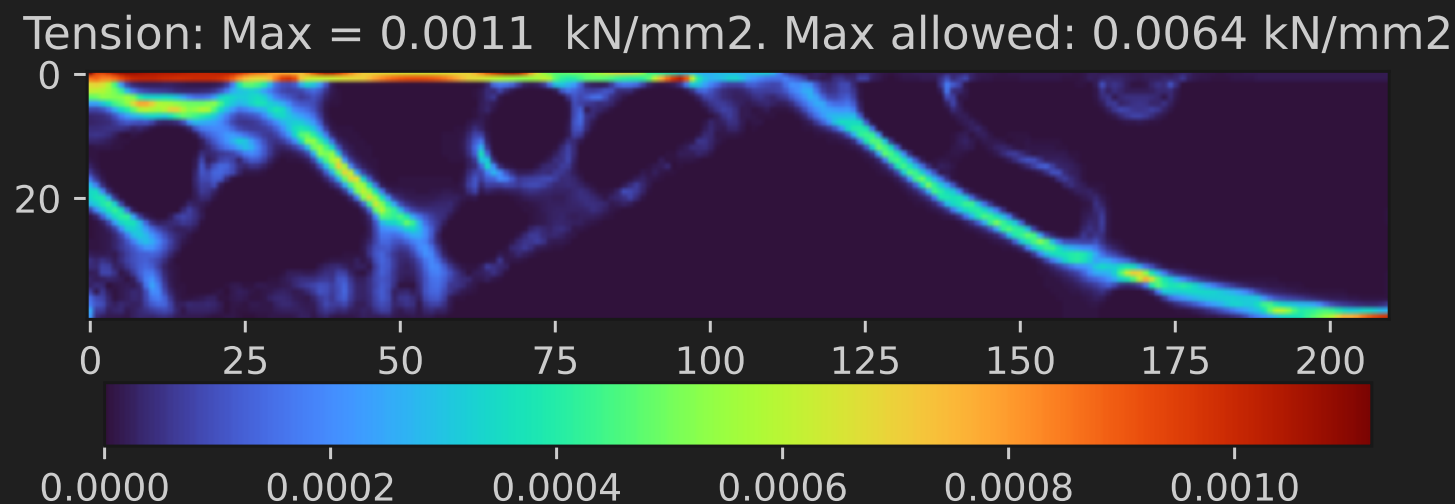
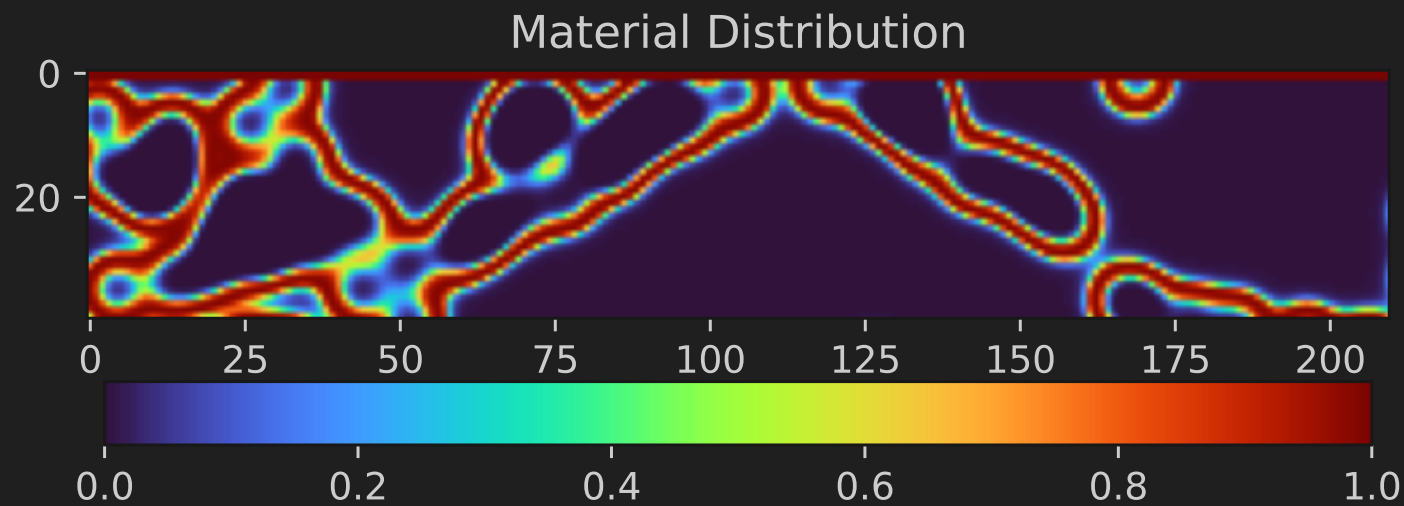
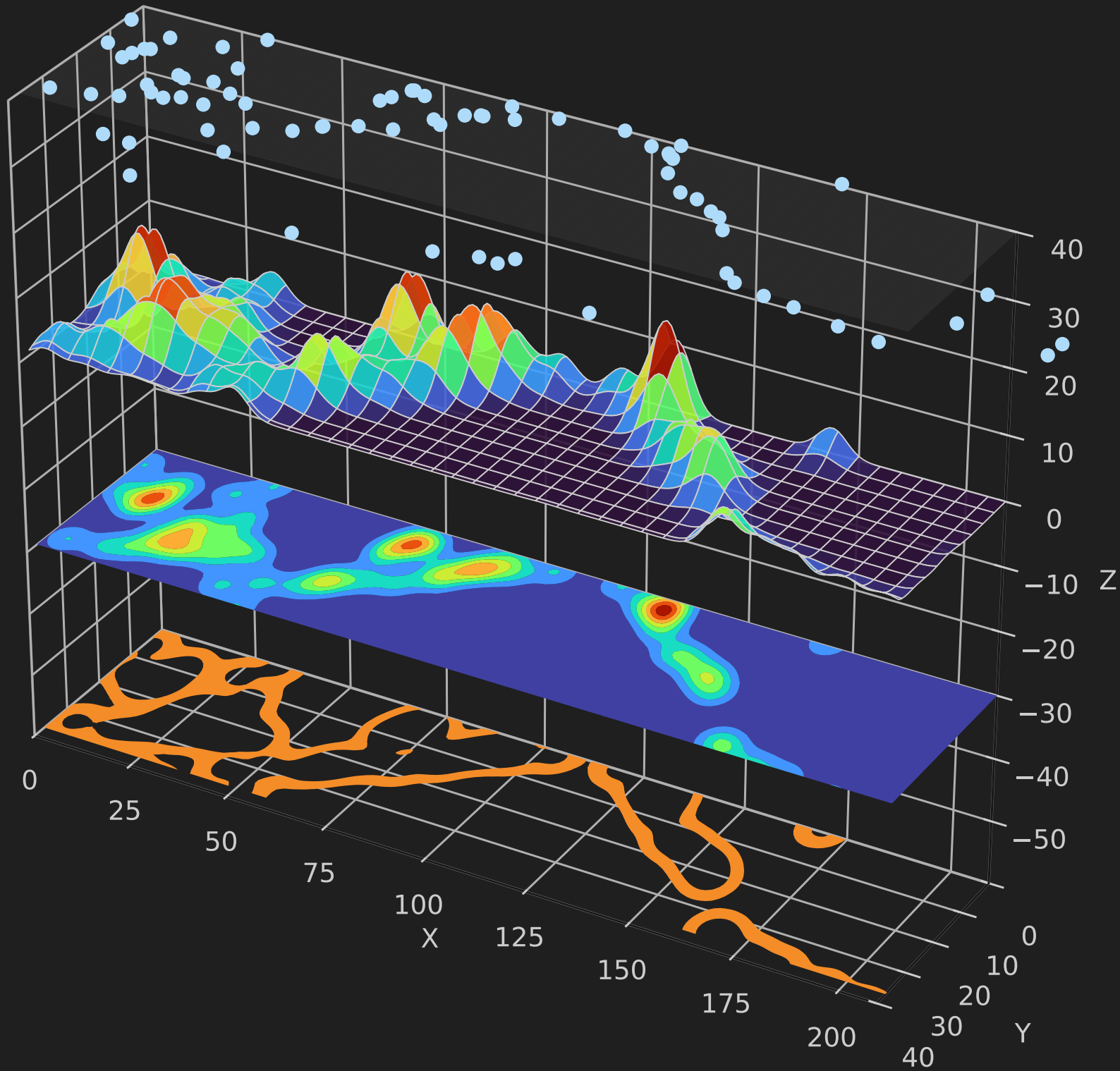
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 4.75 Shift = 2.32 Iteration = 050



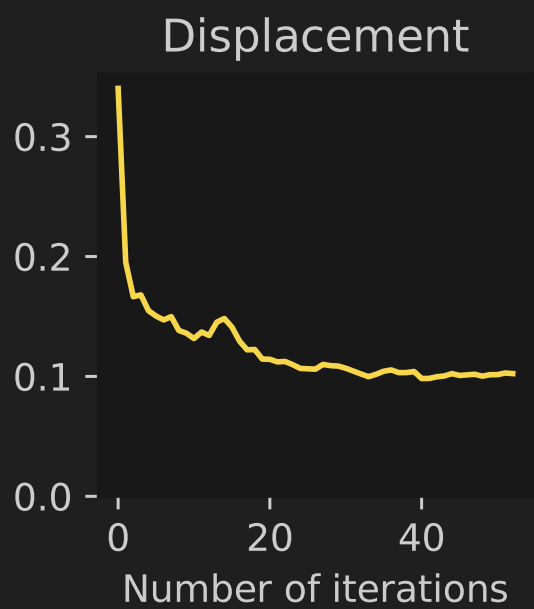
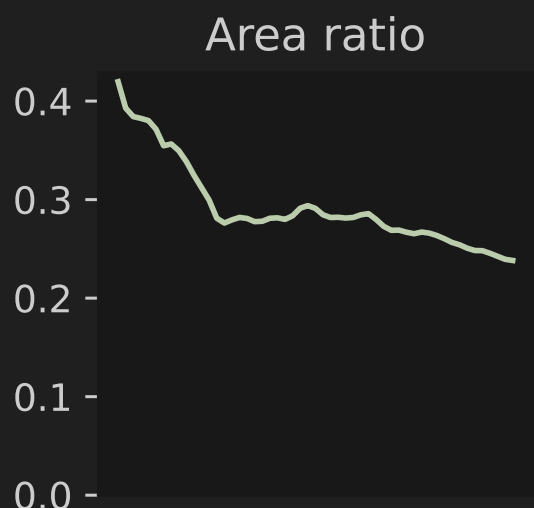
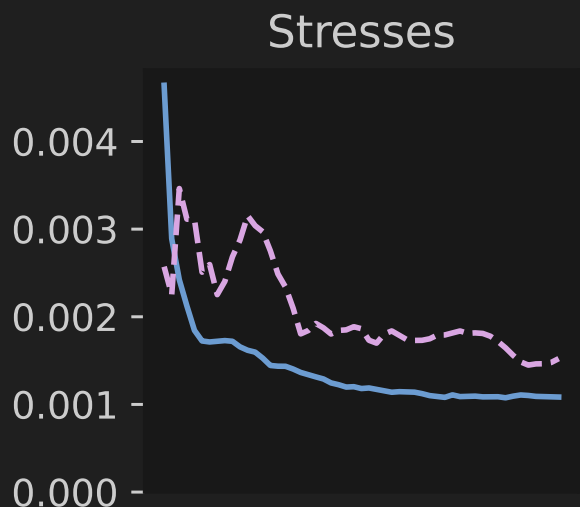
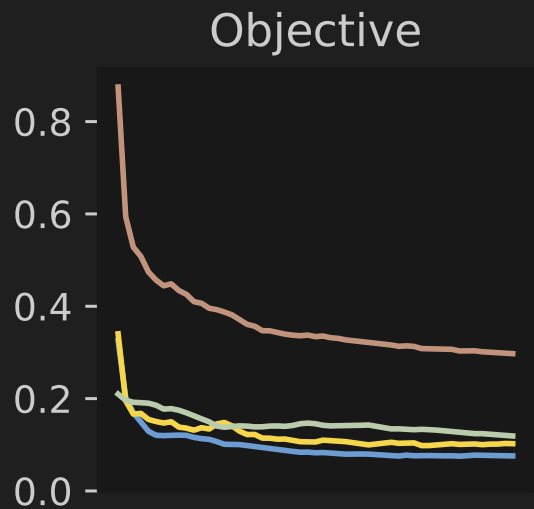
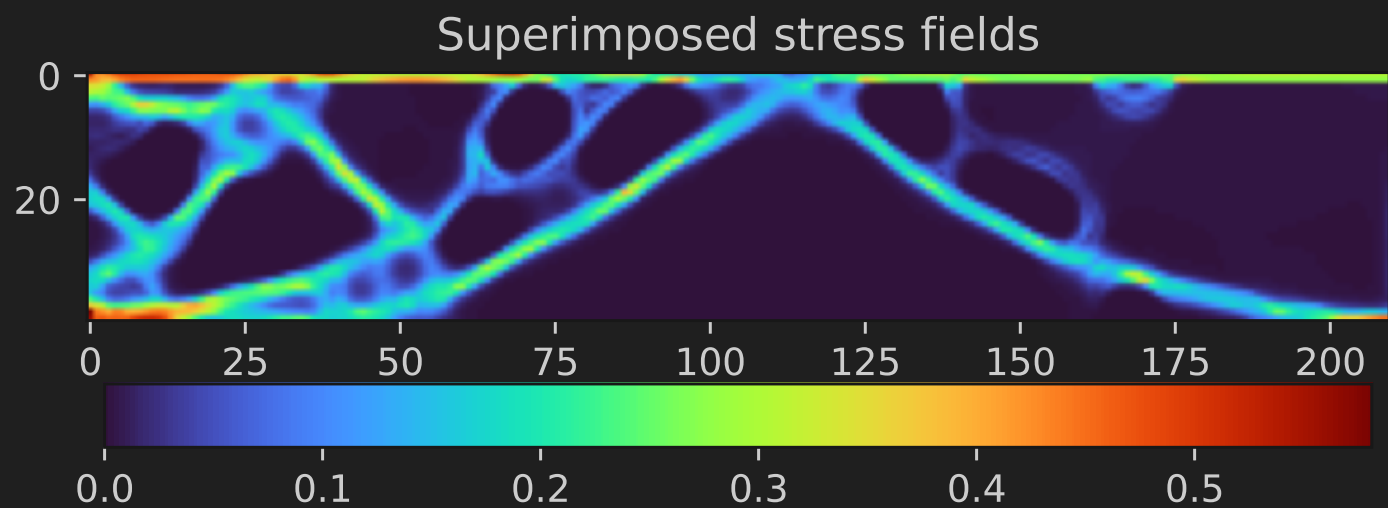
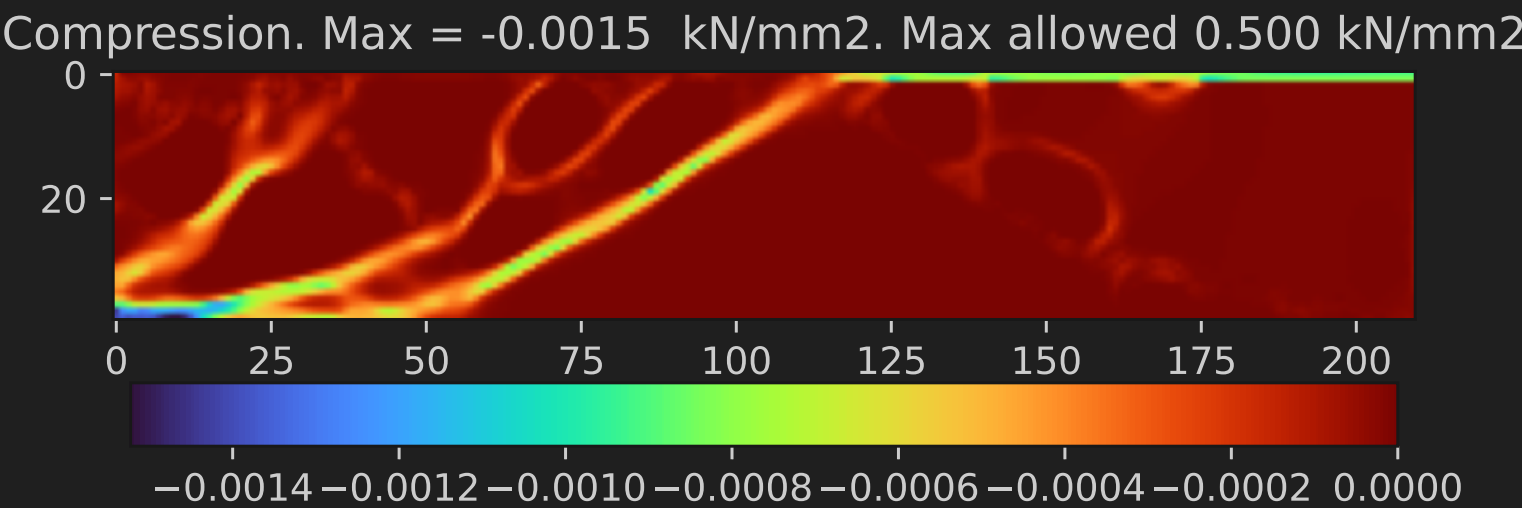
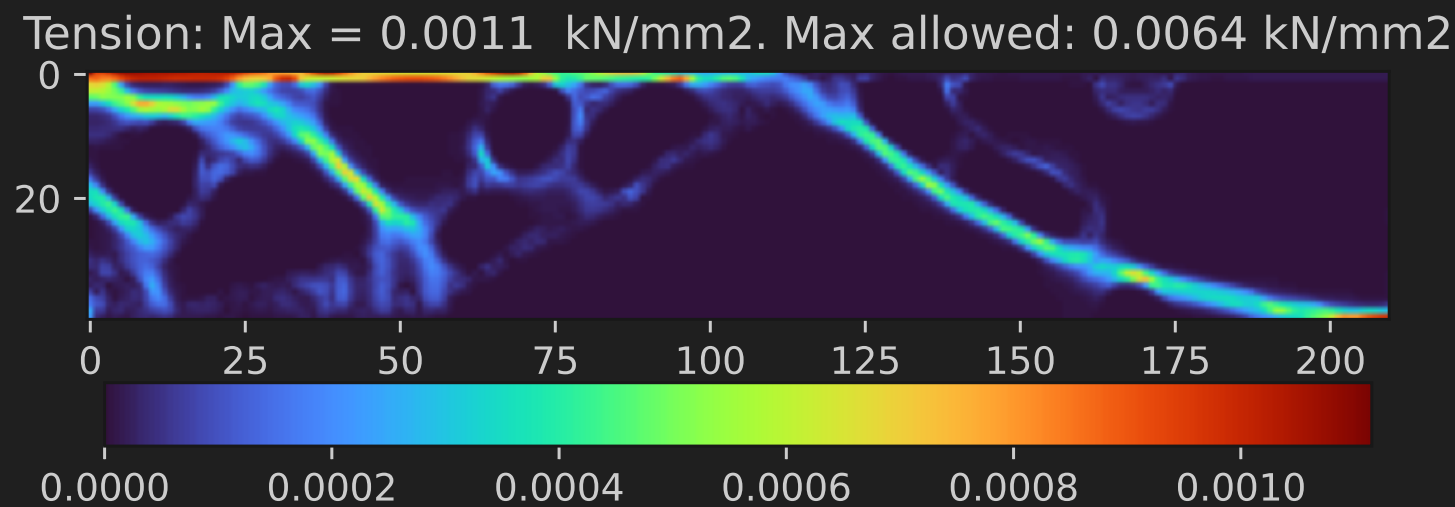
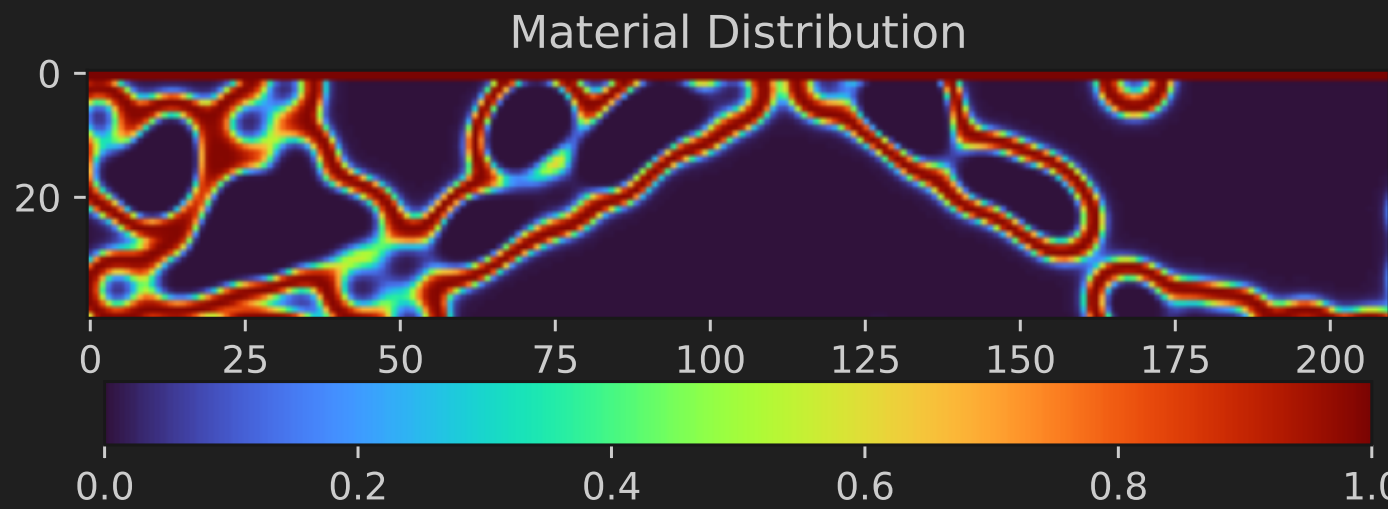
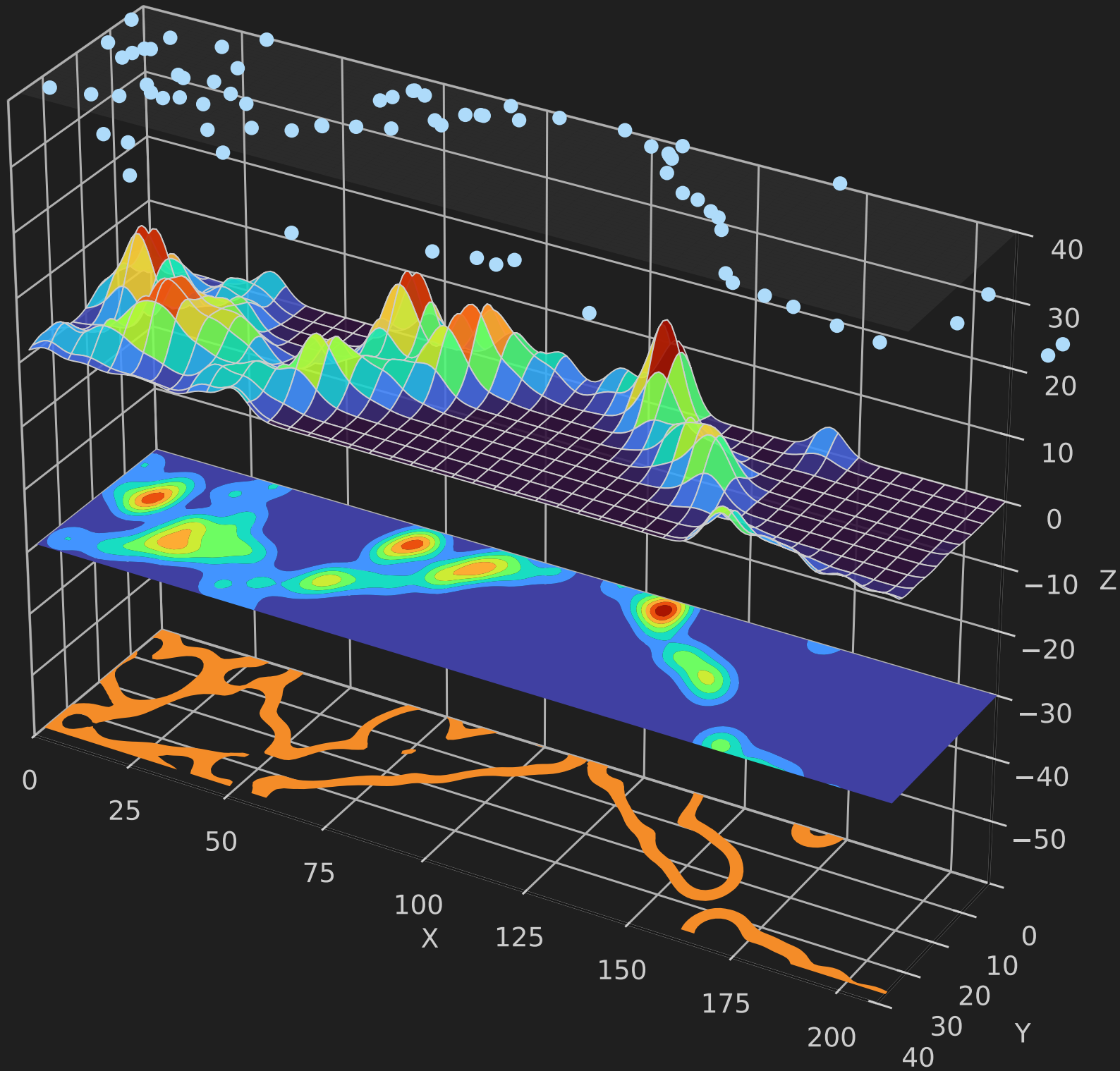
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 4.77 Shift = 2.30 Iteration = 051



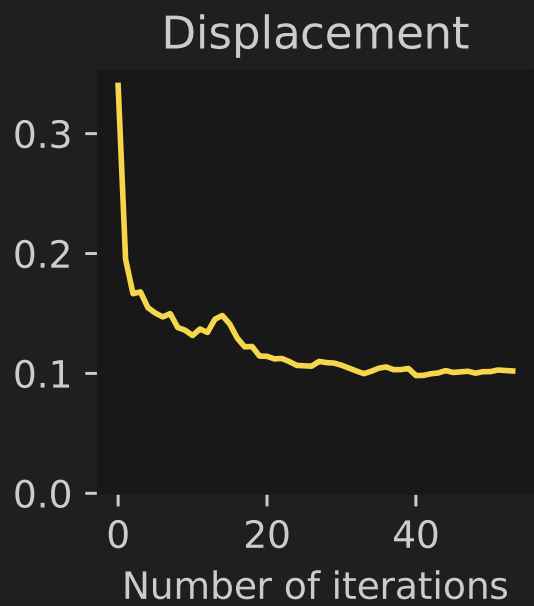
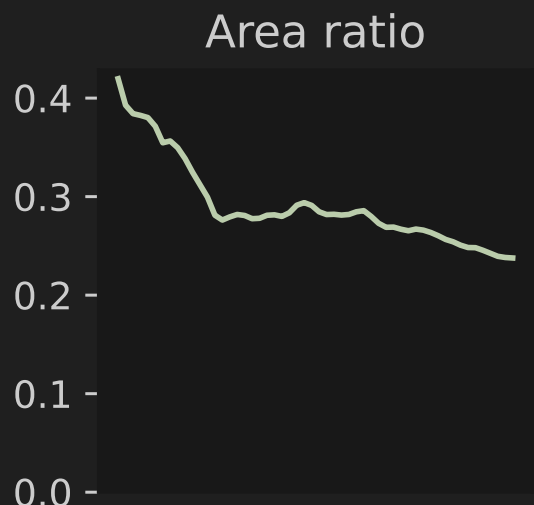
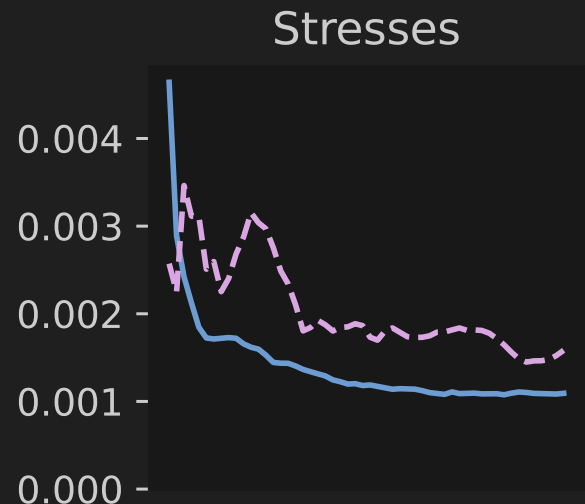
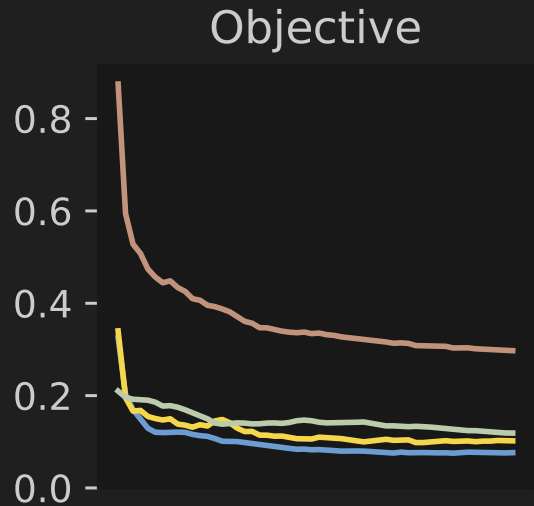
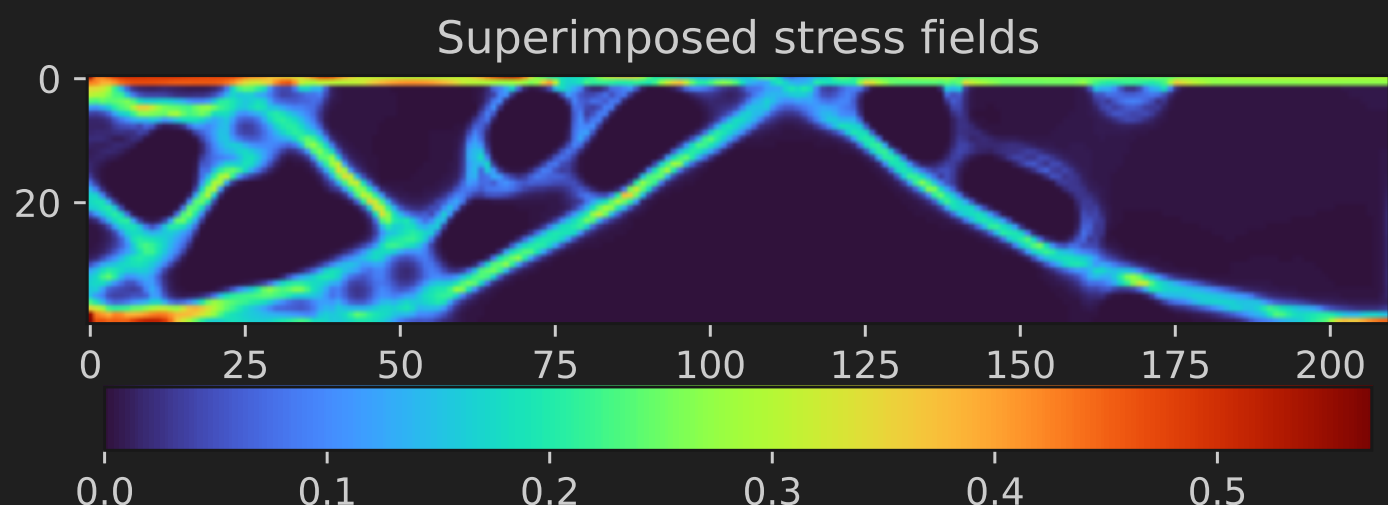
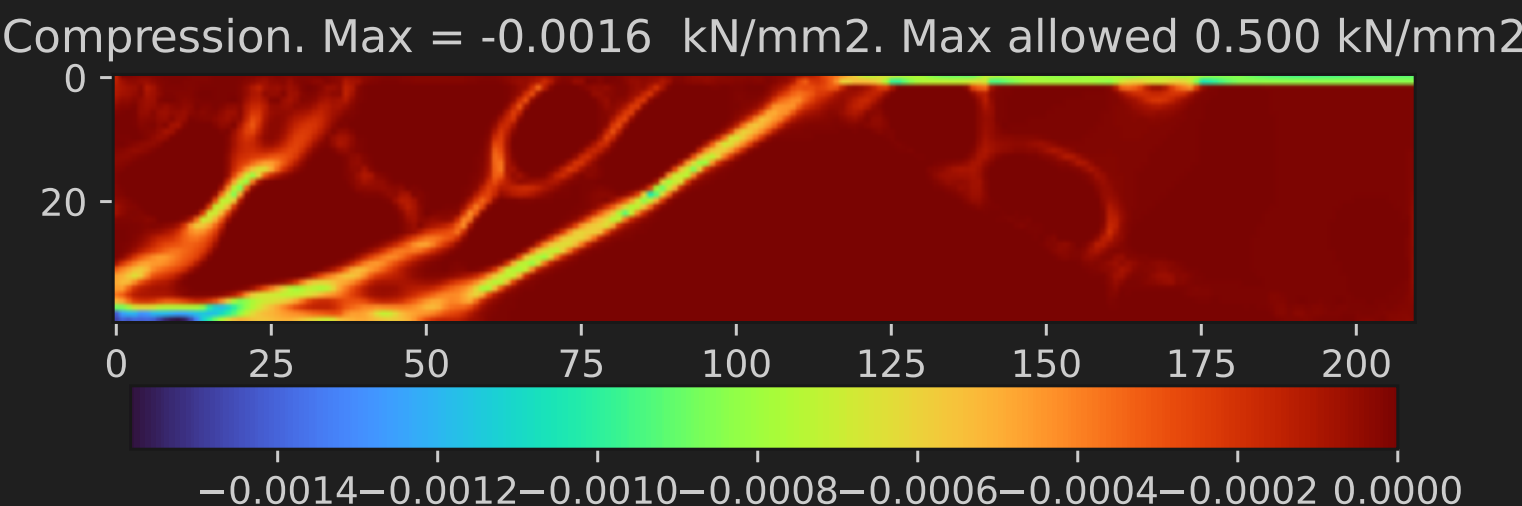
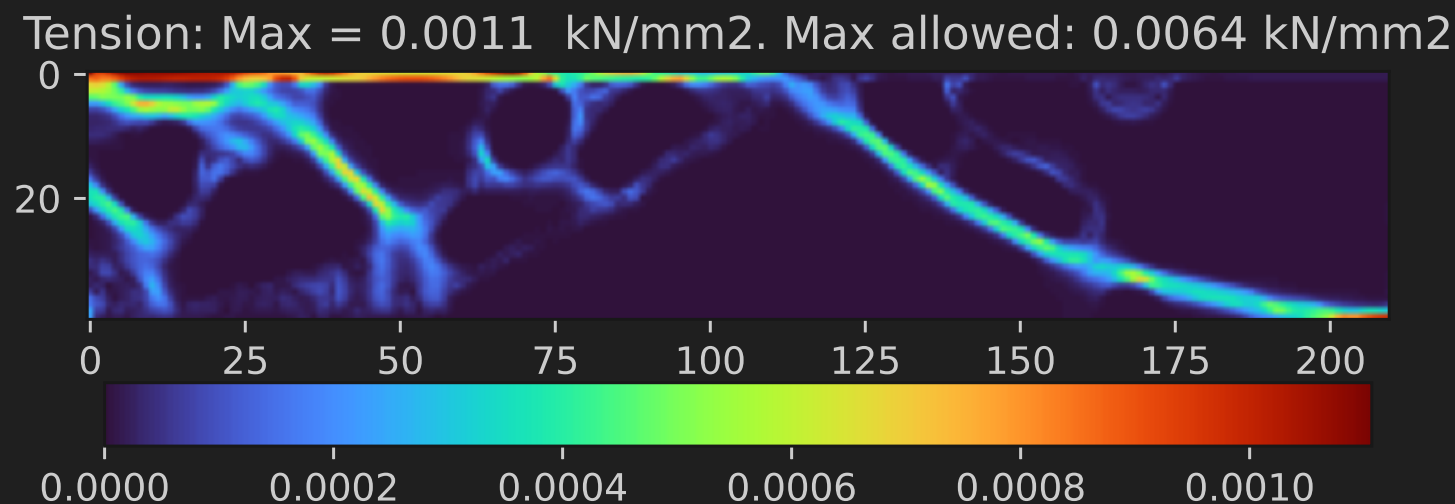
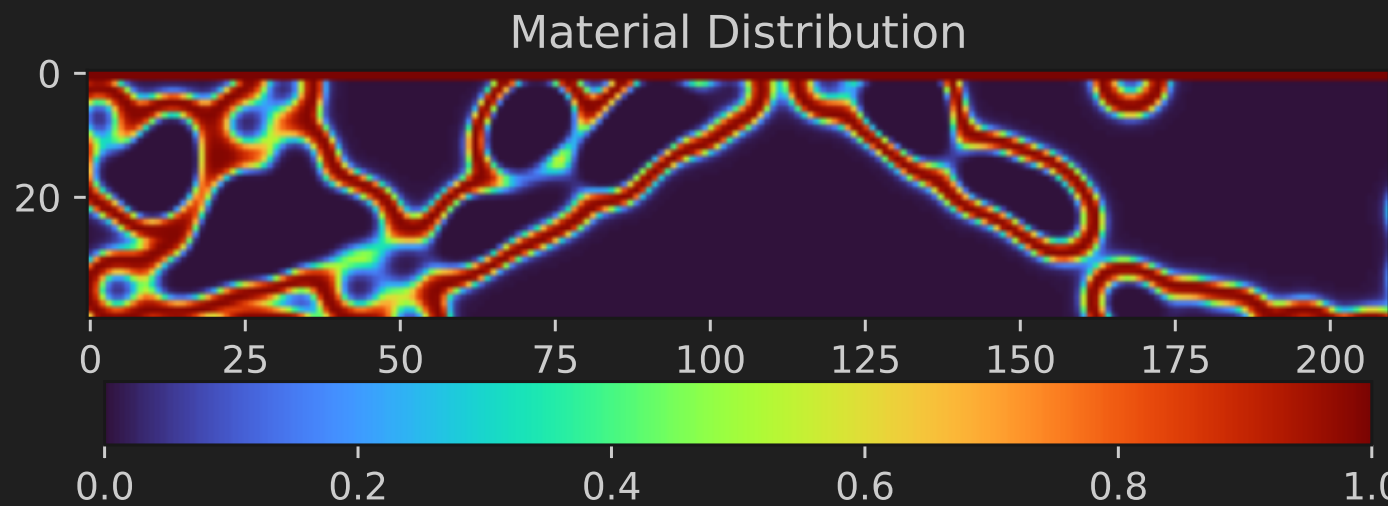
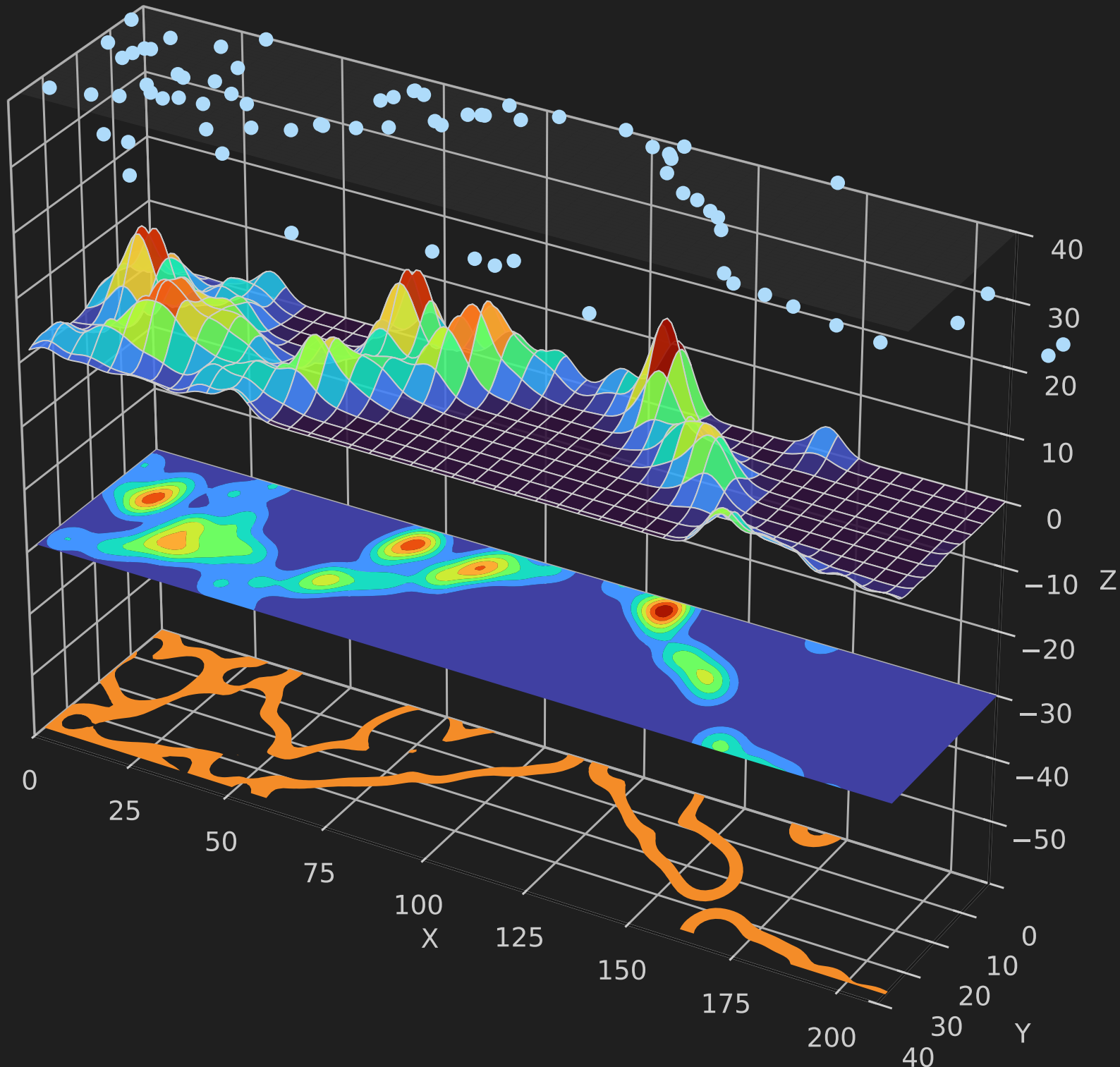
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 4.79 Shift = 2.30 Iteration = 052



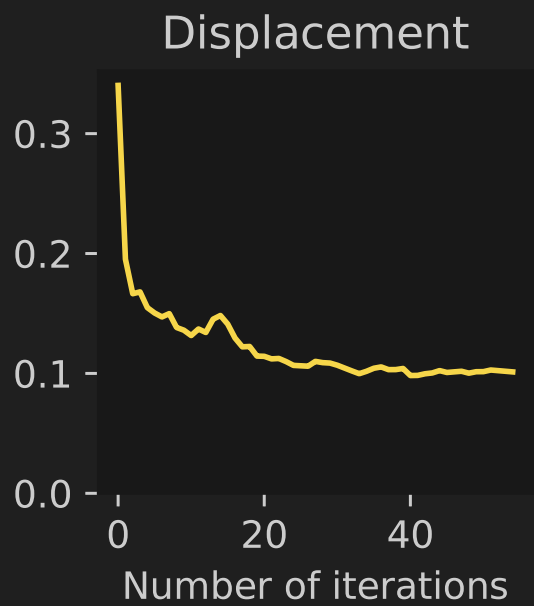
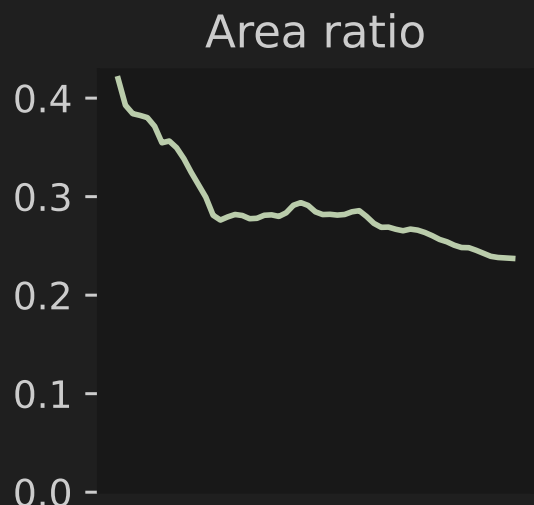
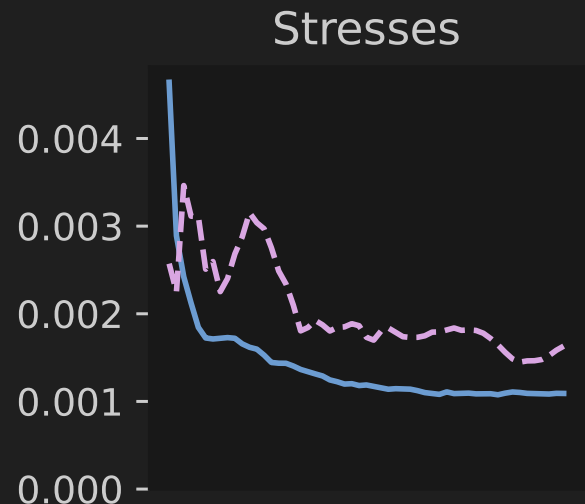
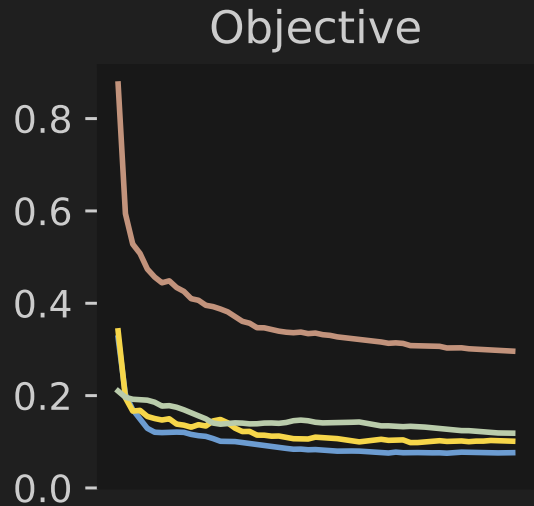
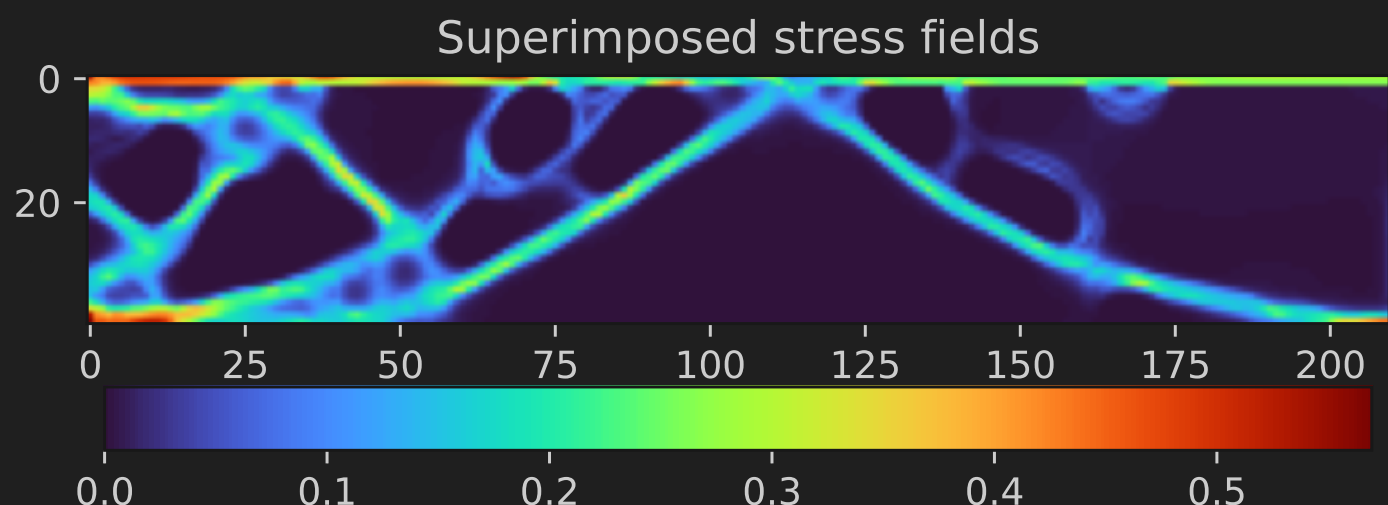
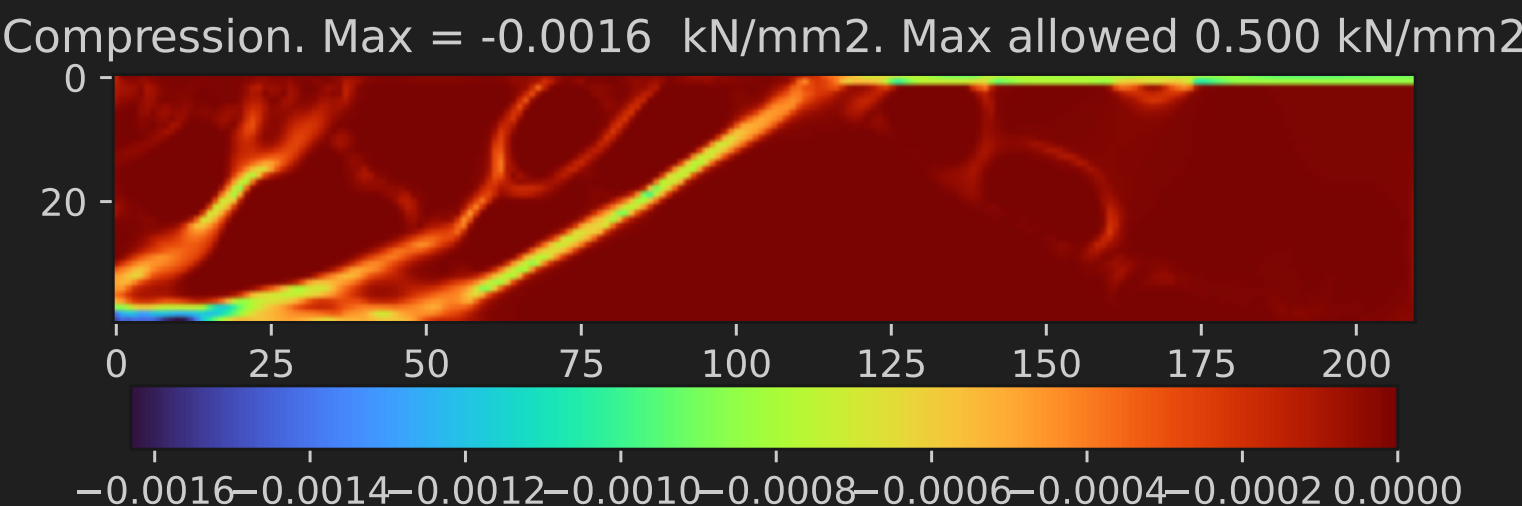
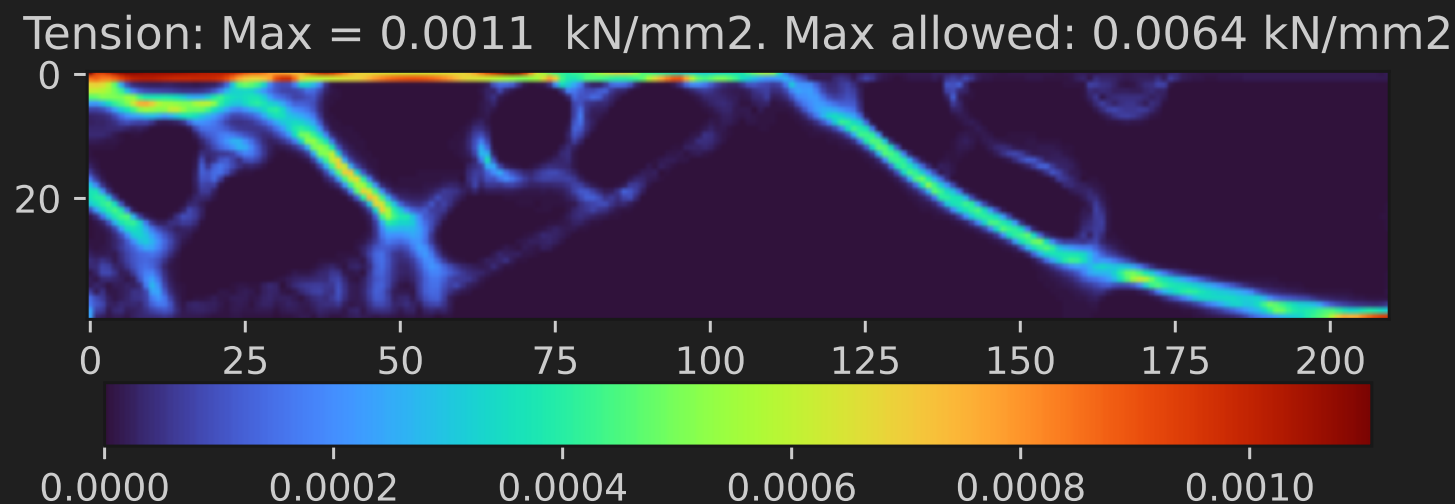
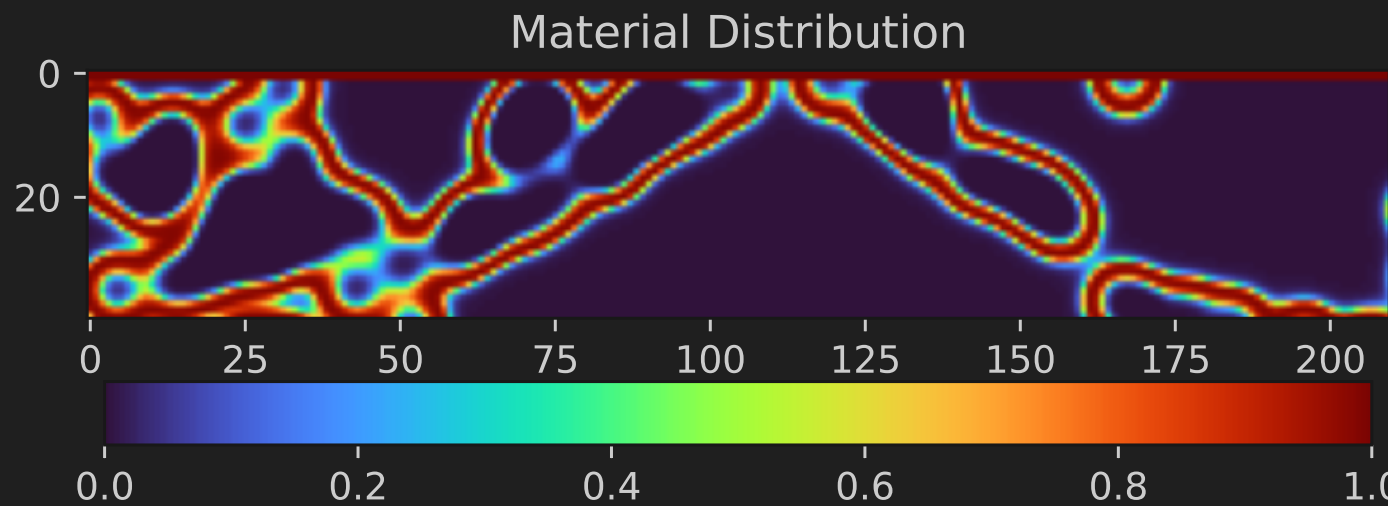
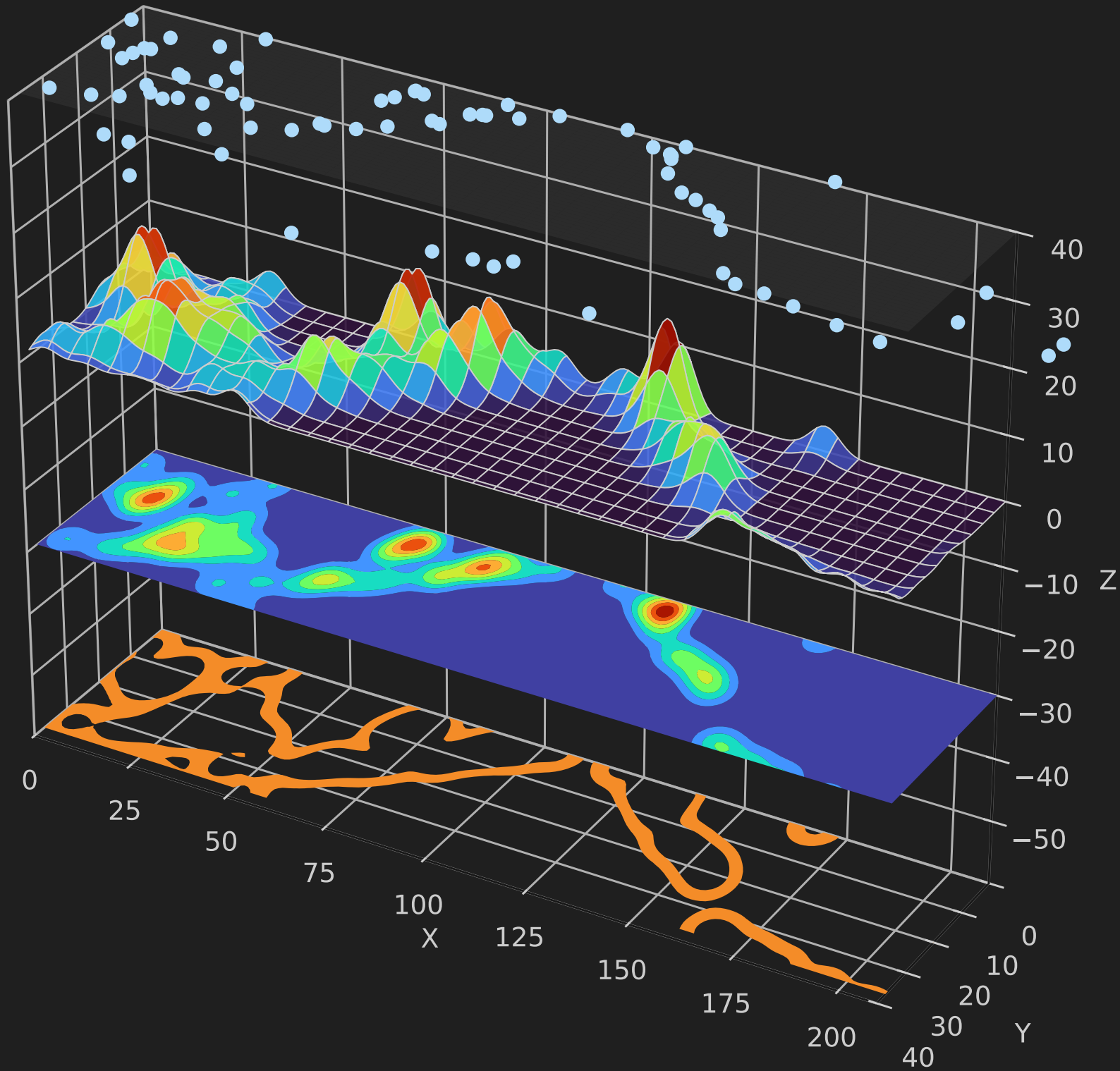
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 4.80 Shift = 2.29 Iteration = 053



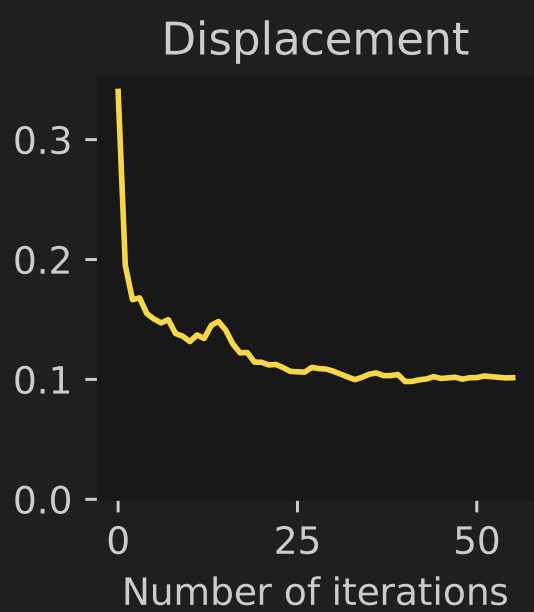
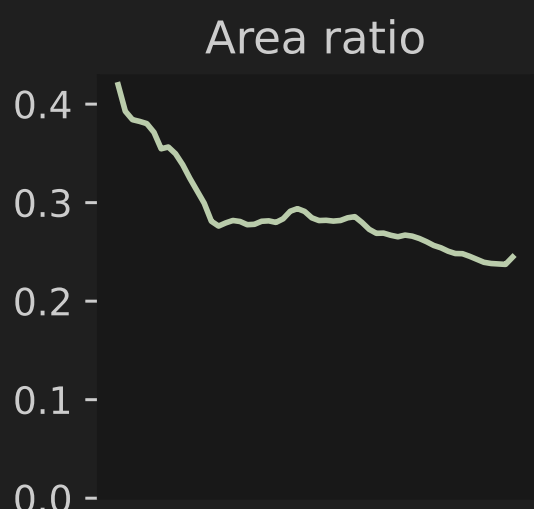
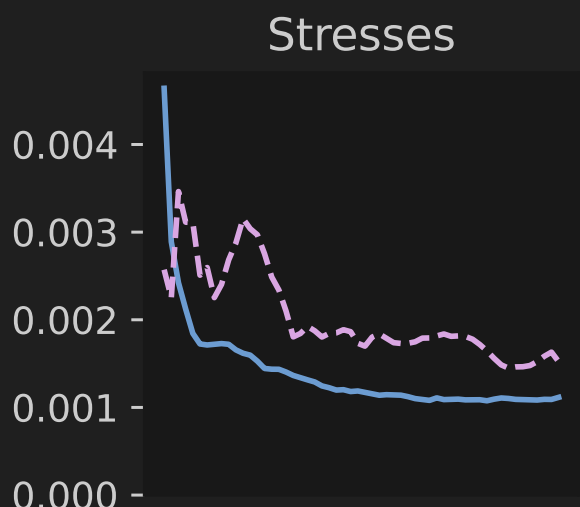
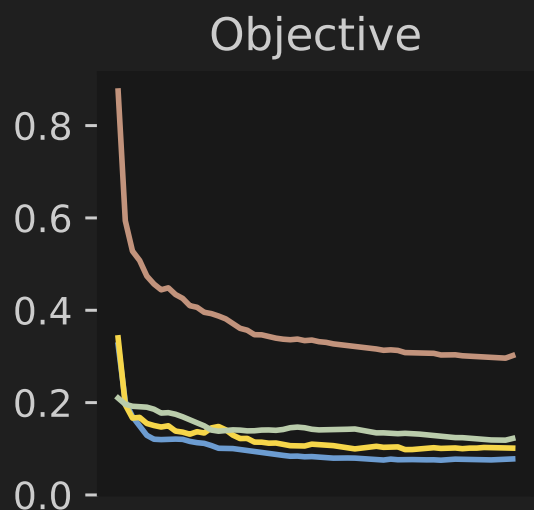
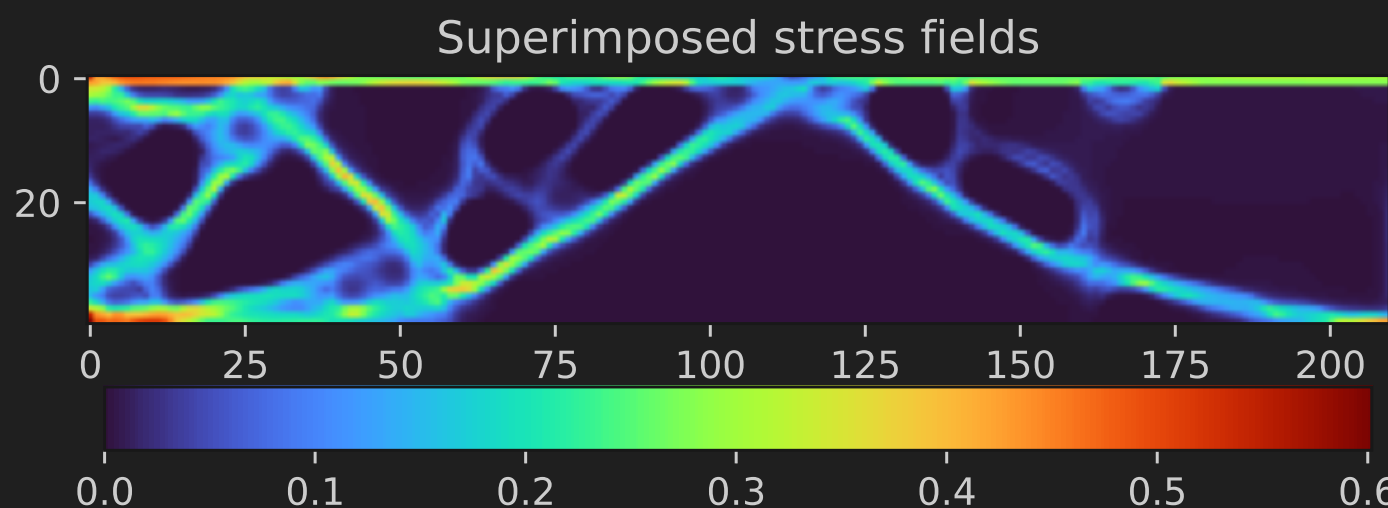
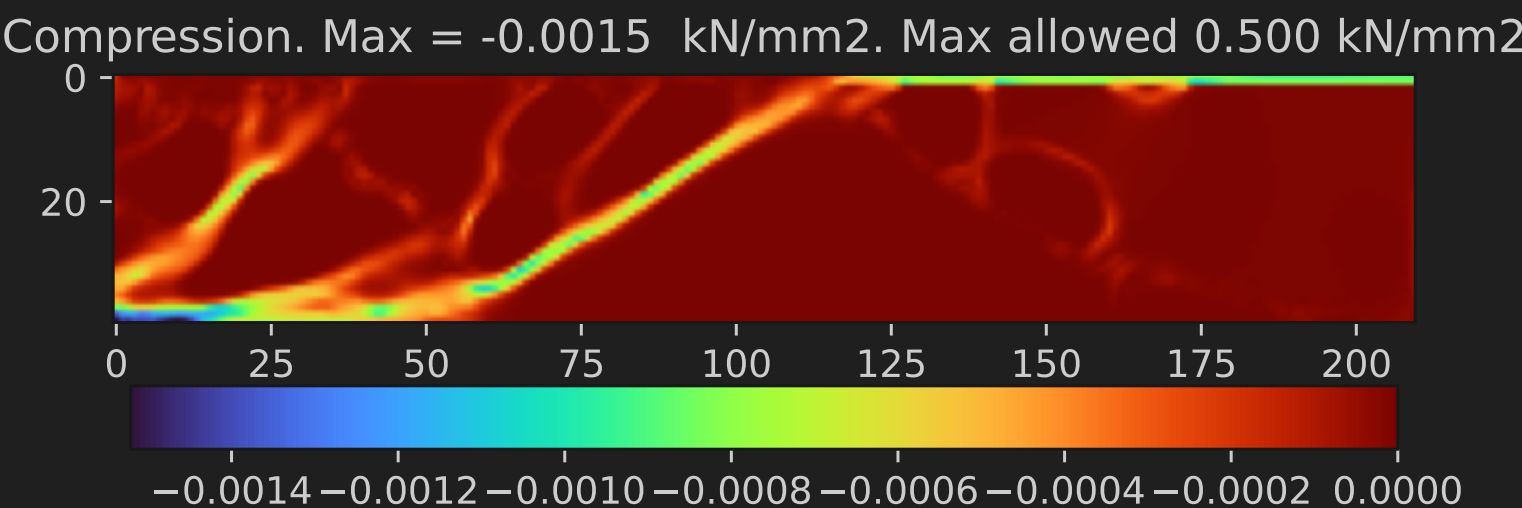
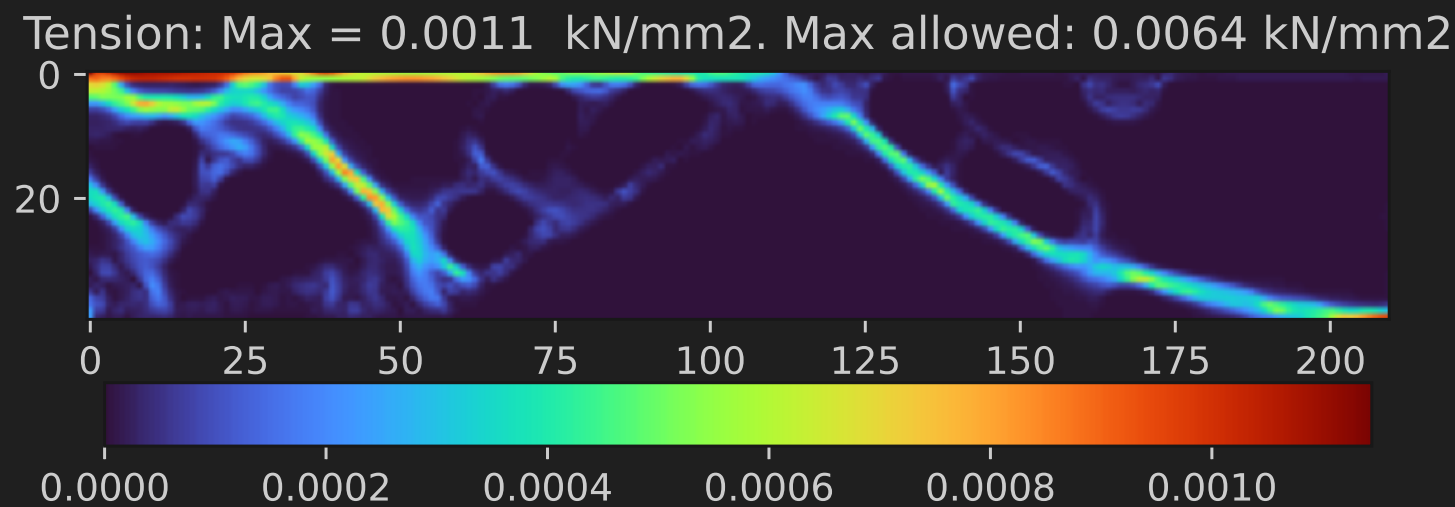
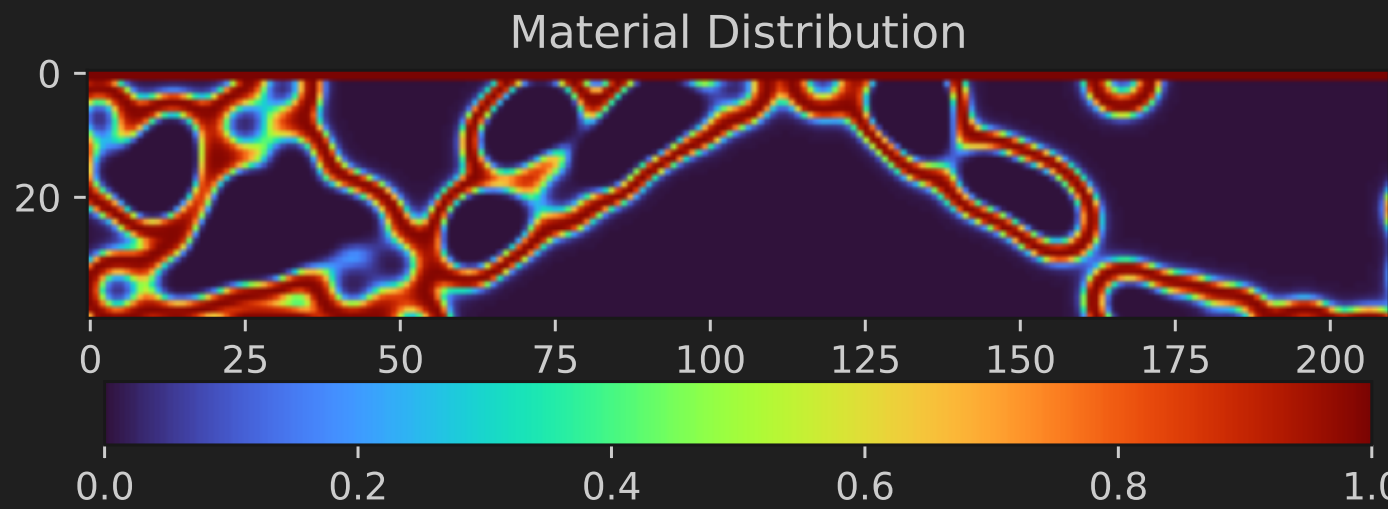
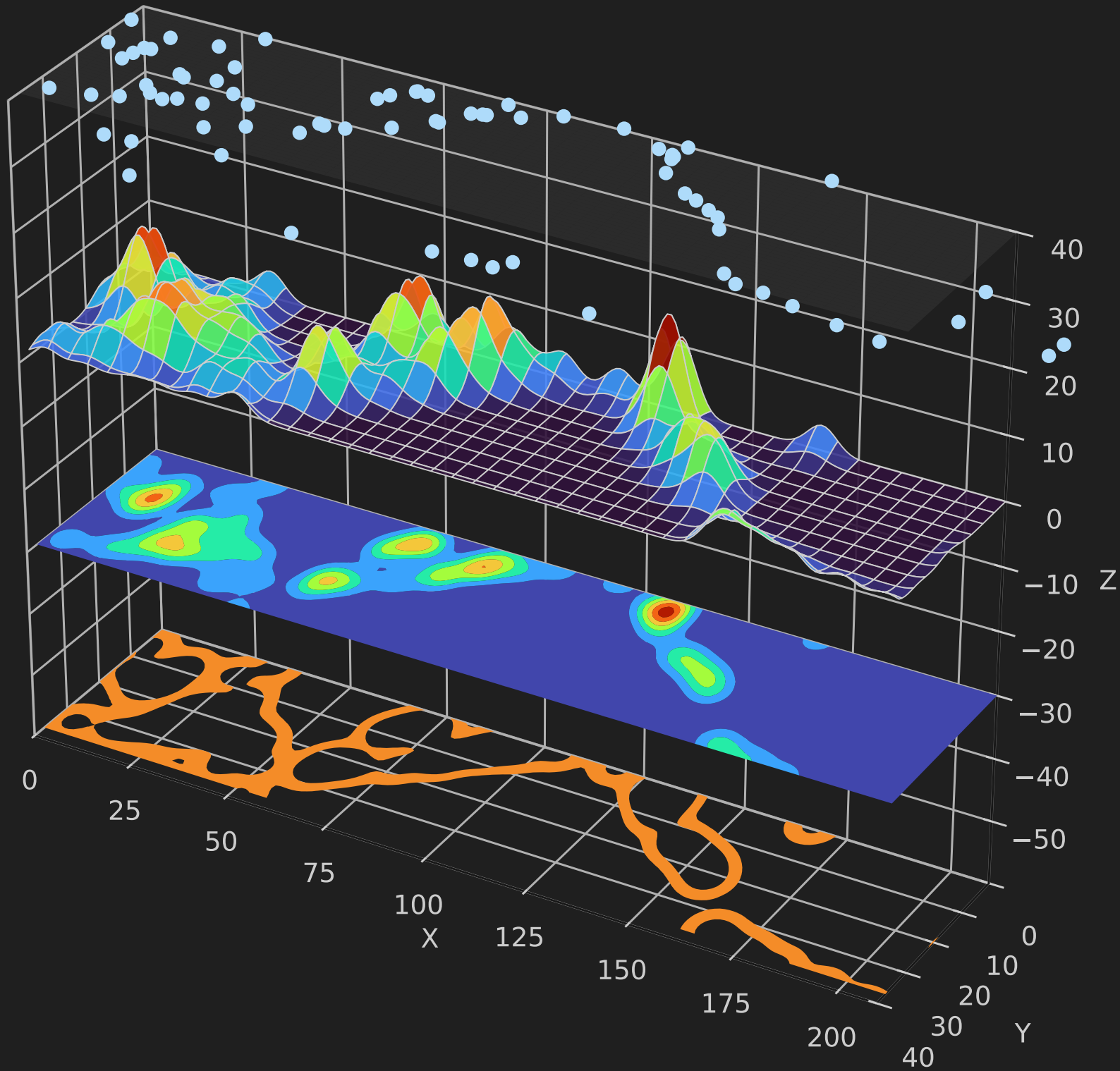
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 4.82 Shift = 2.29 Iteration = 054



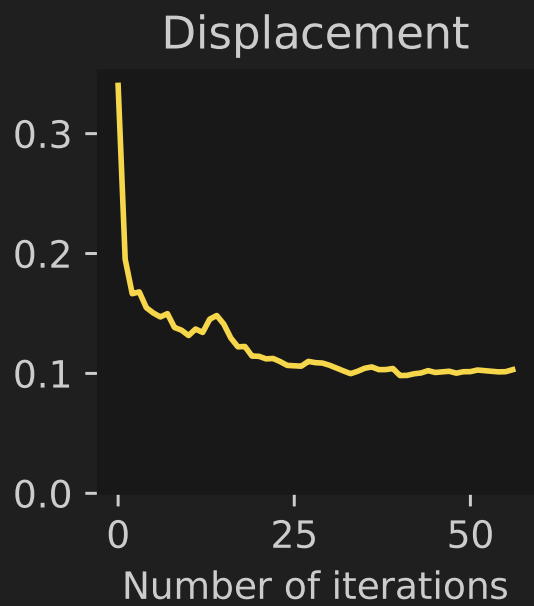
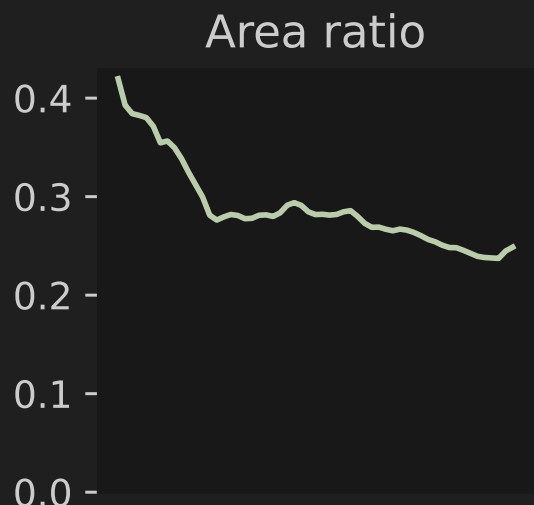
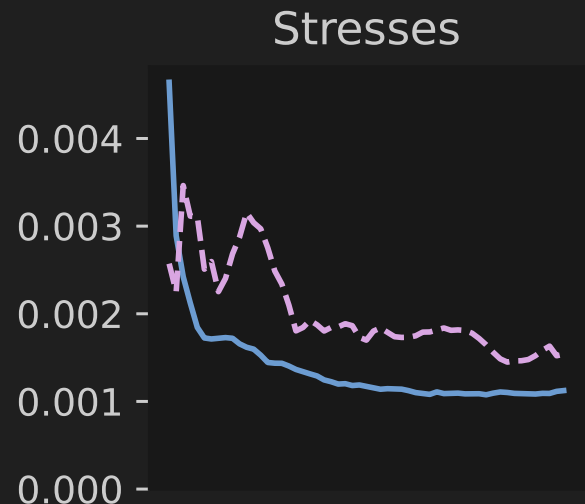
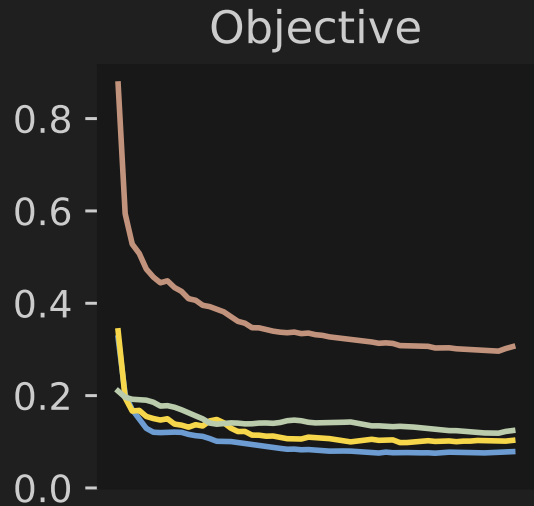
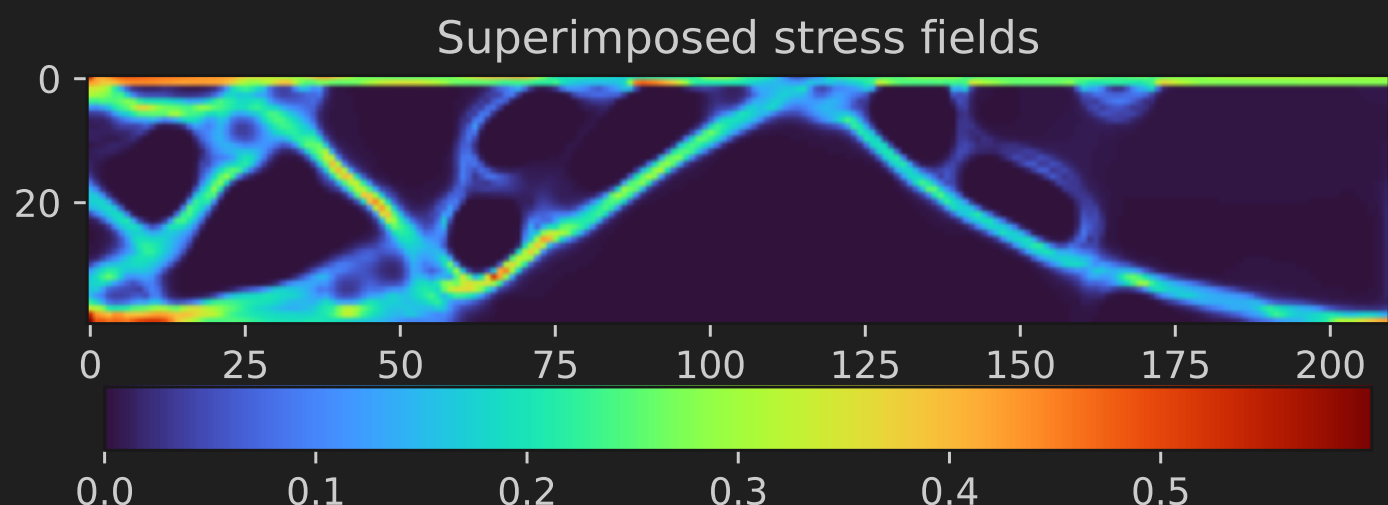
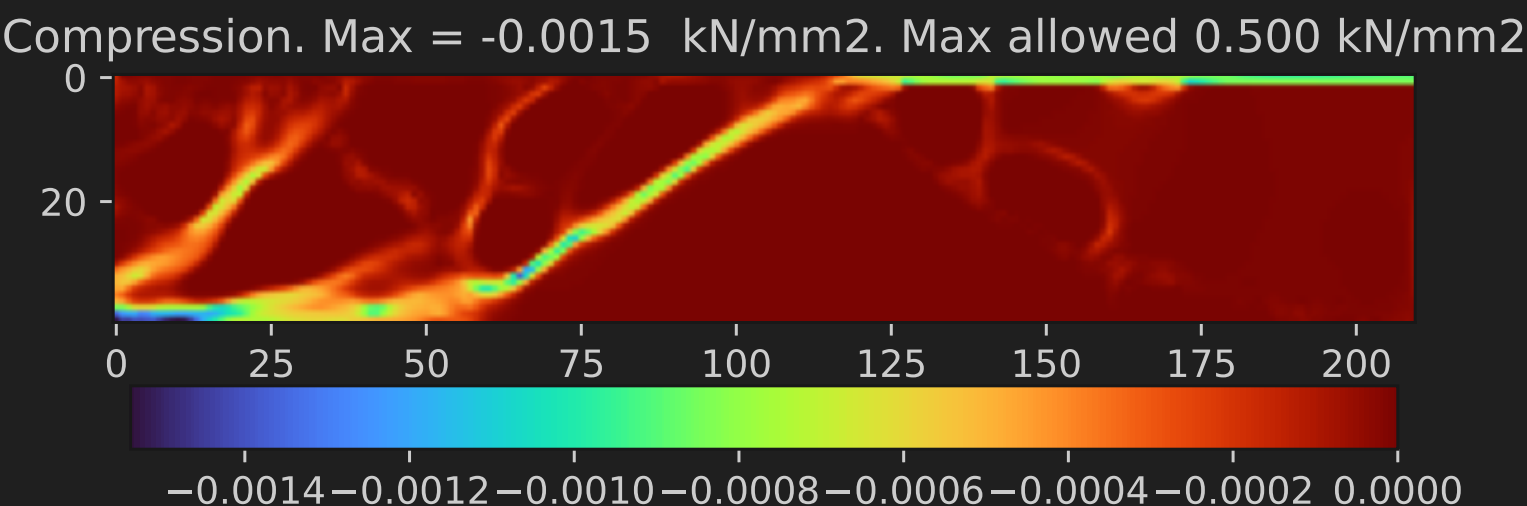
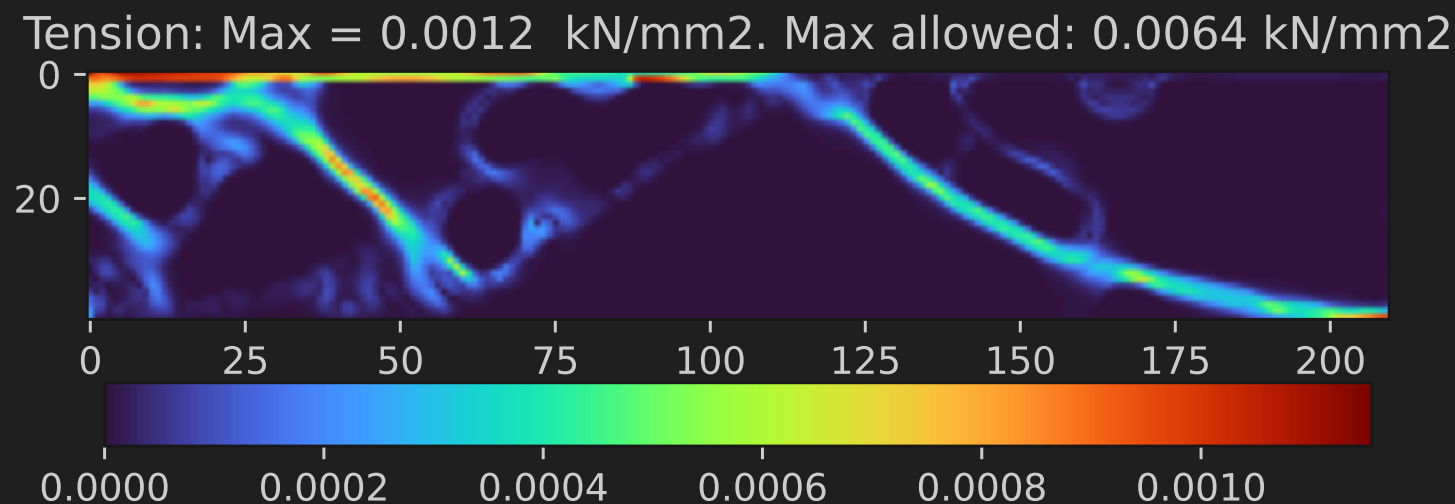
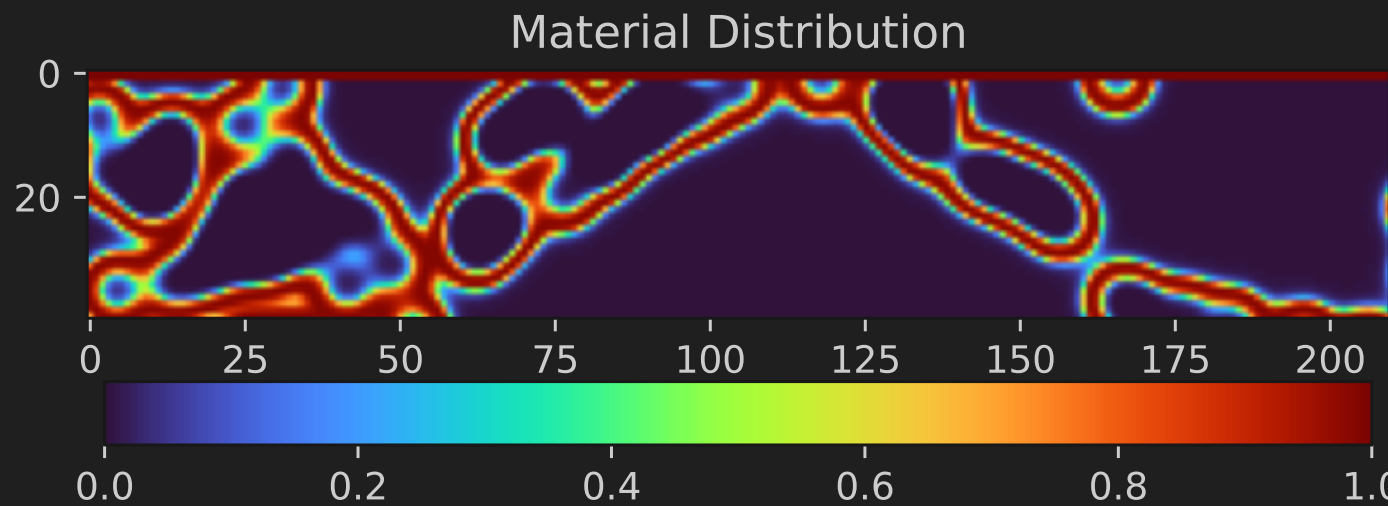
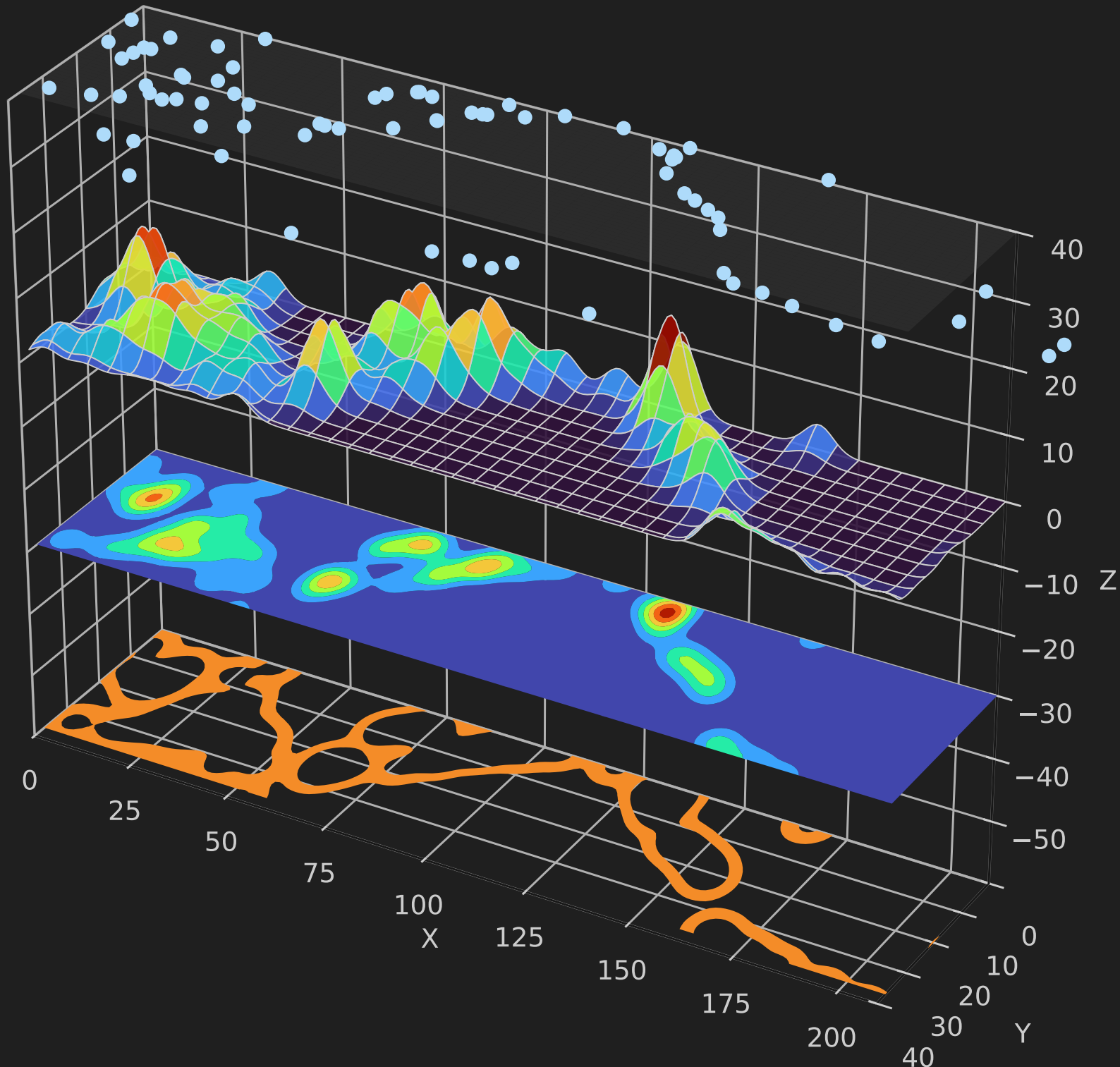
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 4.82 Shift = 2.29 Iteration = 055



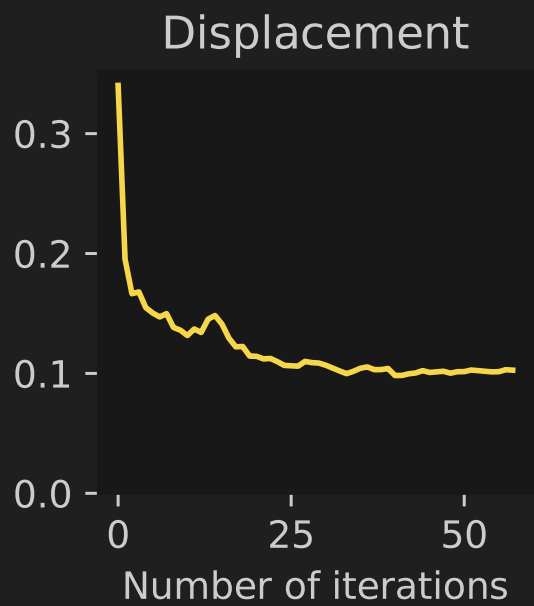
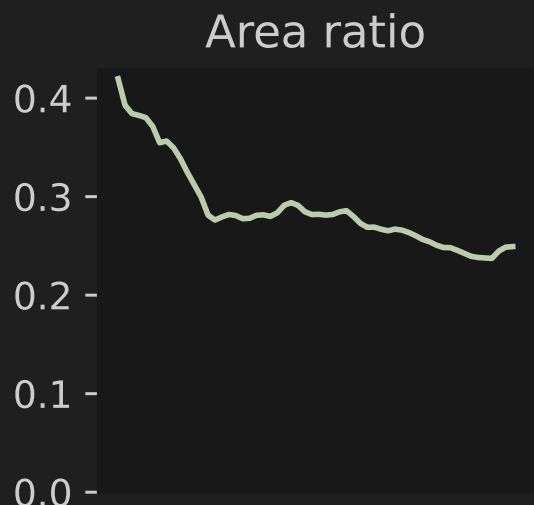
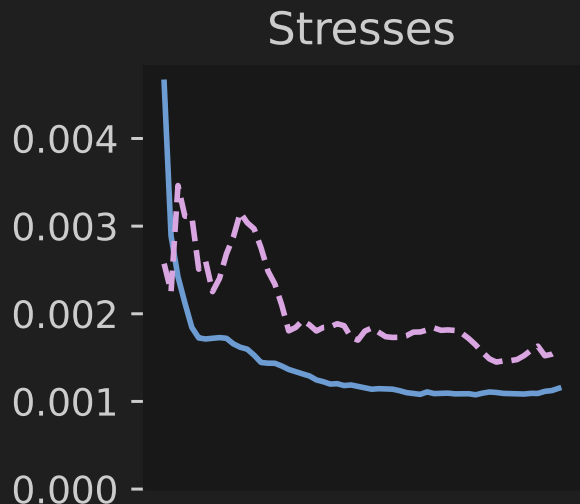
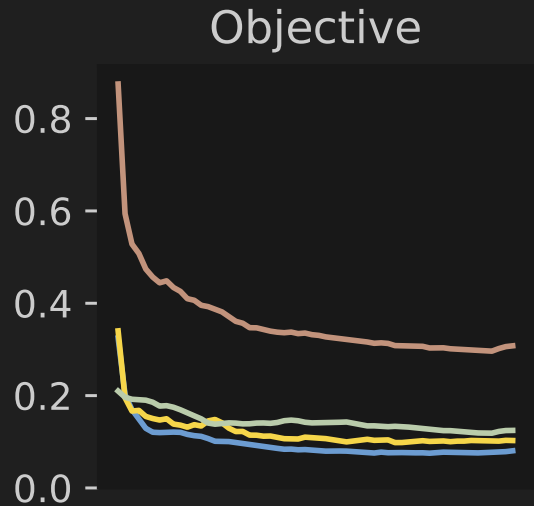
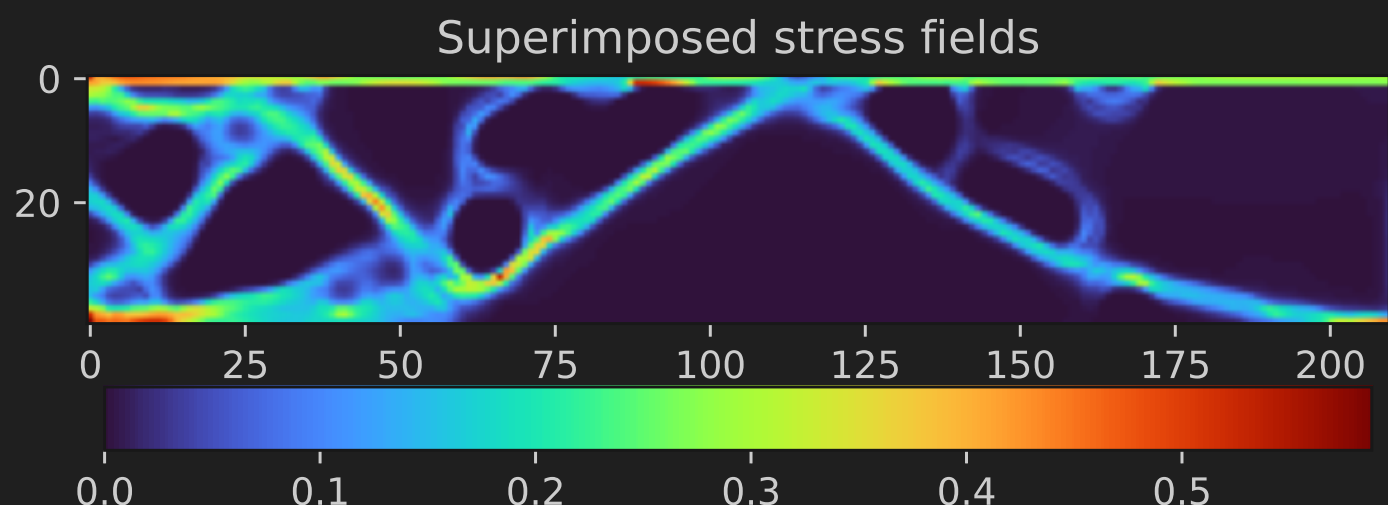
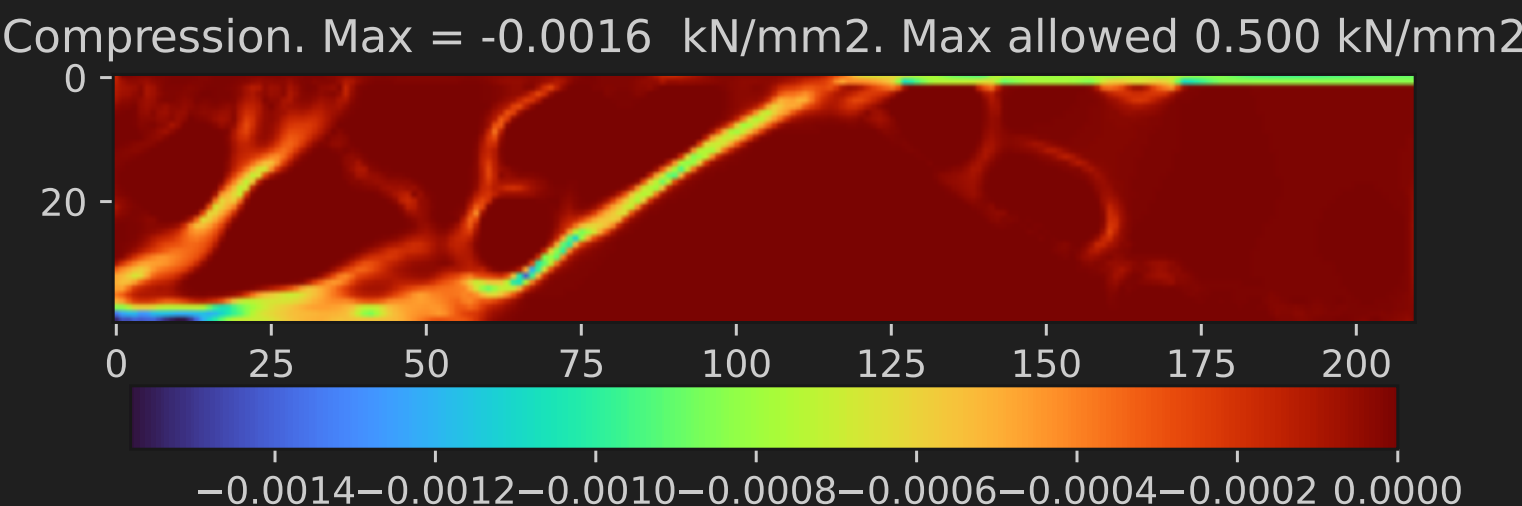
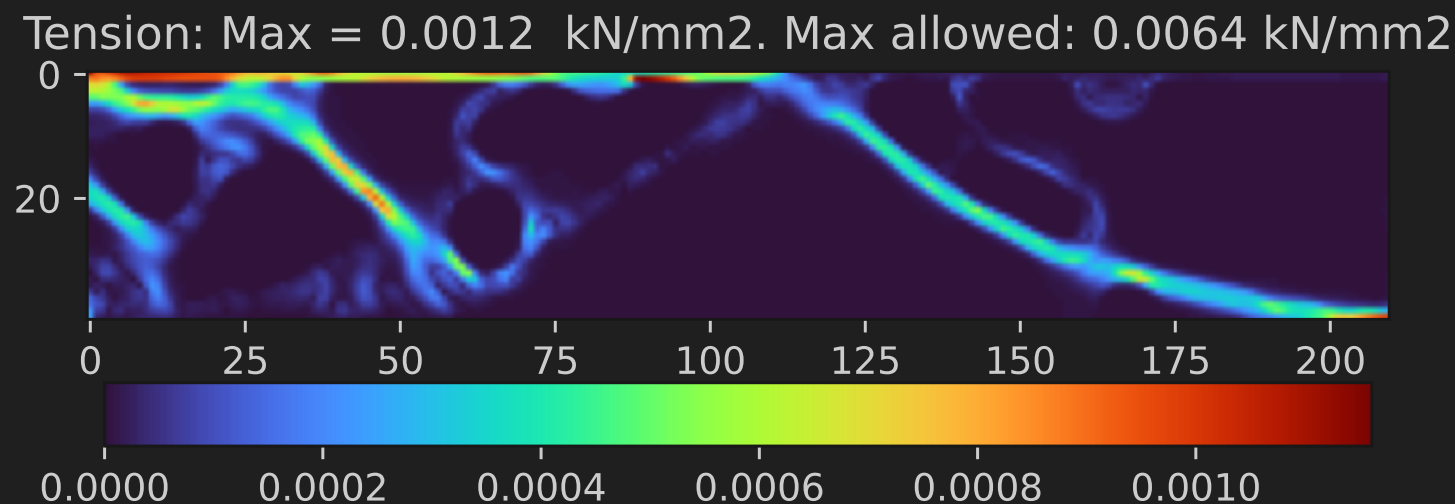
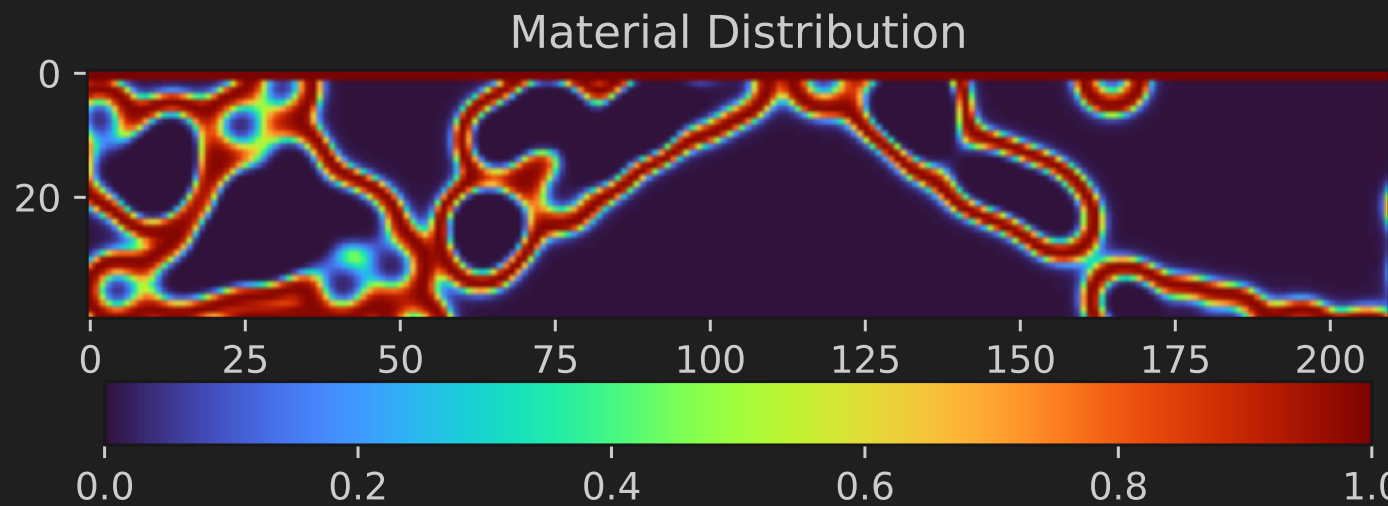
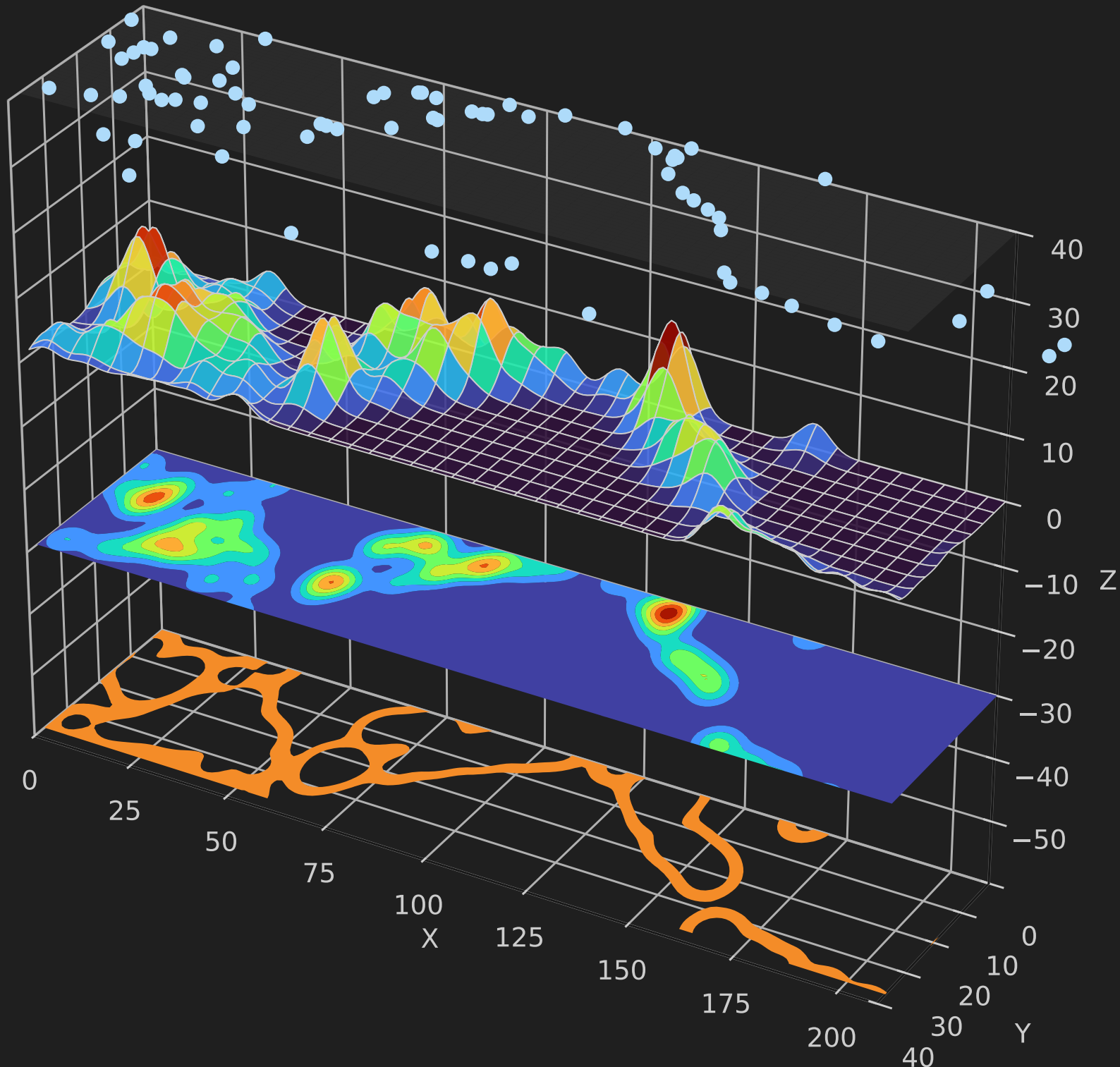
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.82 Shift = 2.30 Iteration = 056



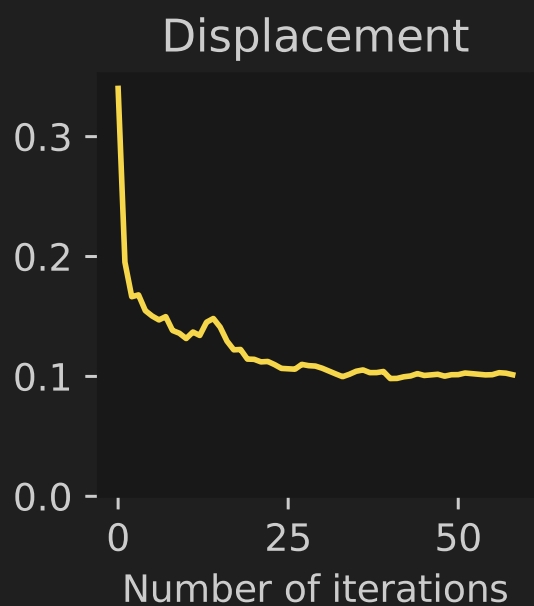
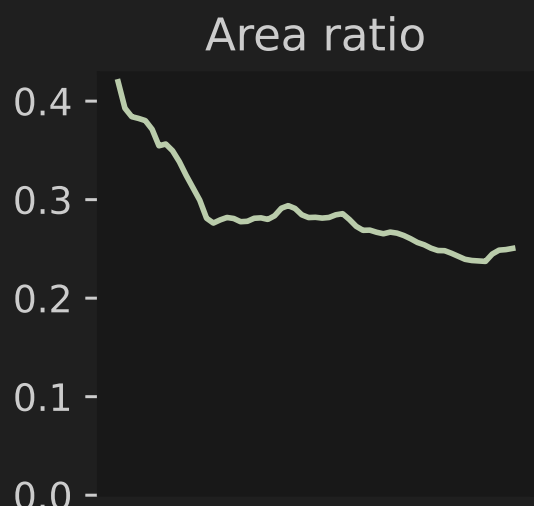
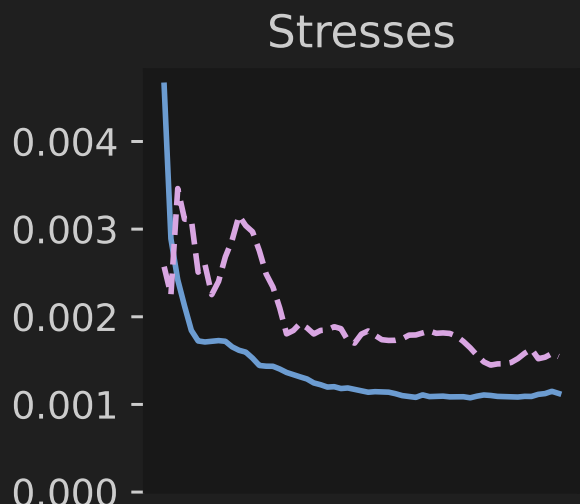
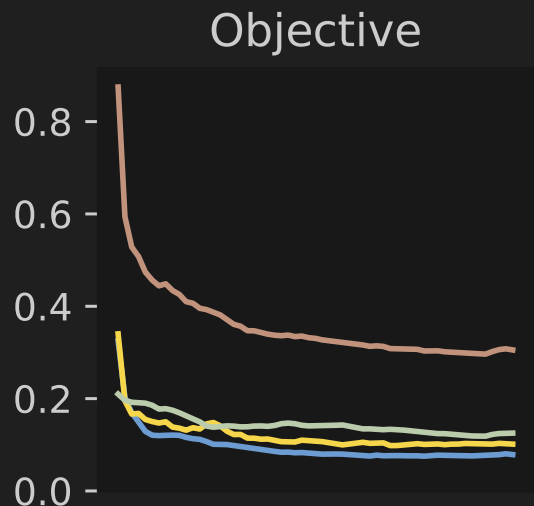
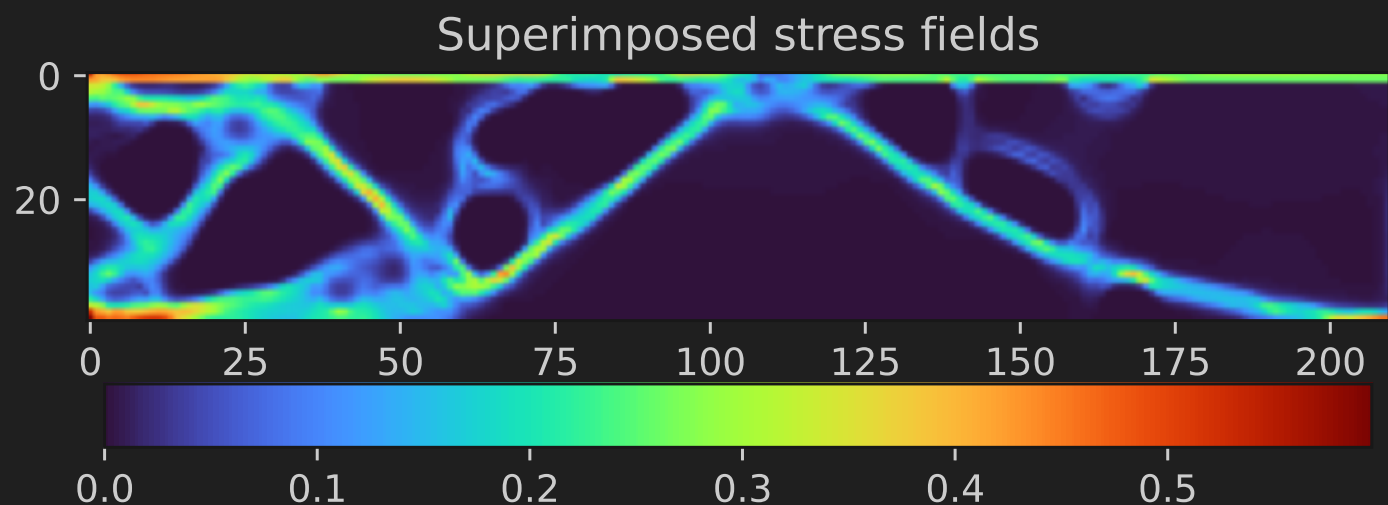
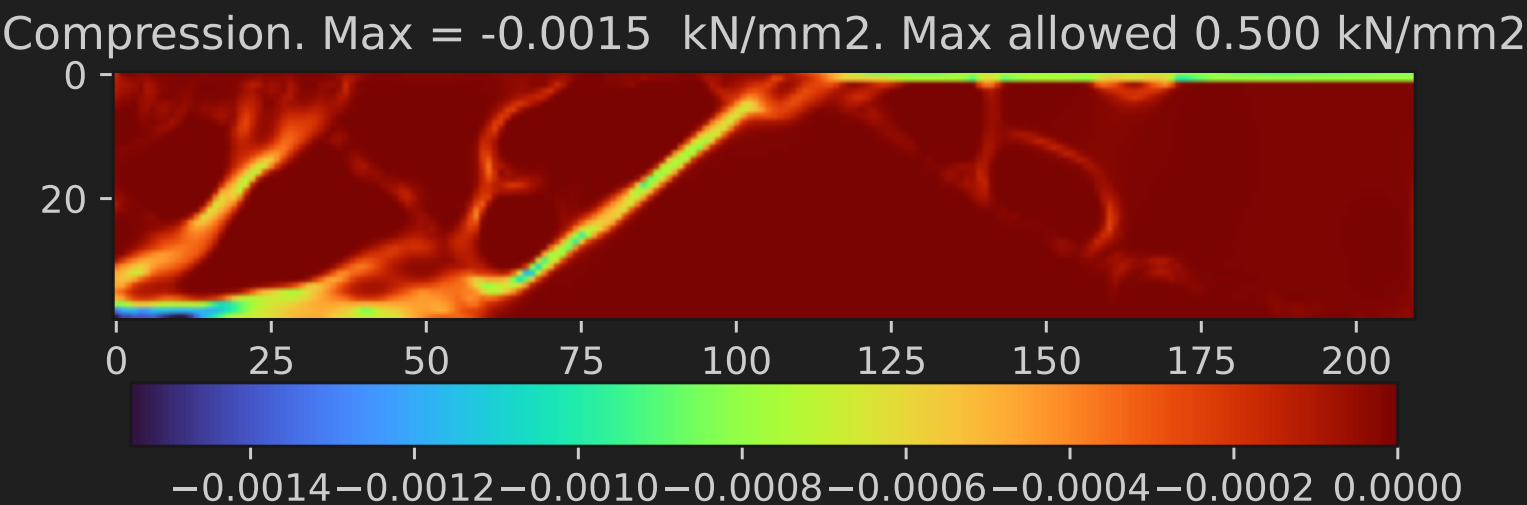
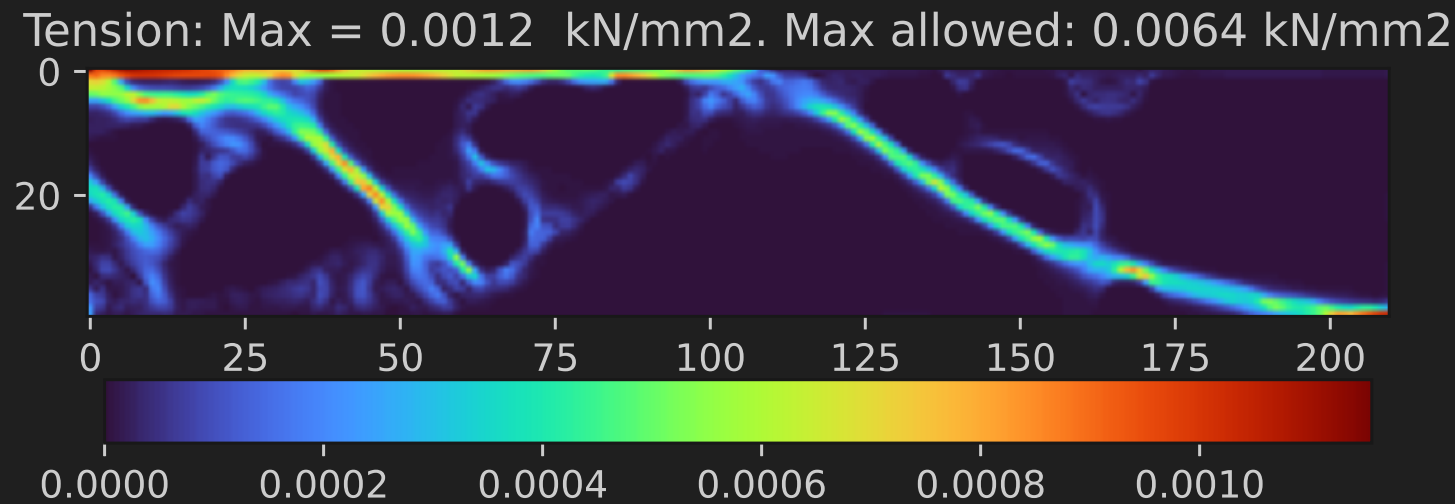
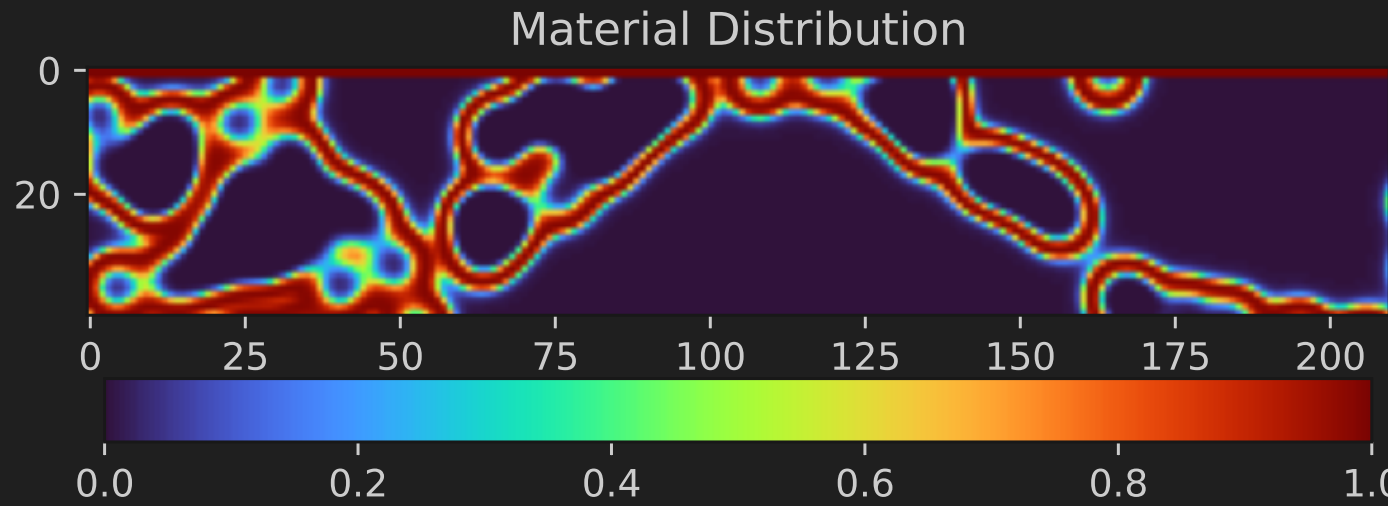
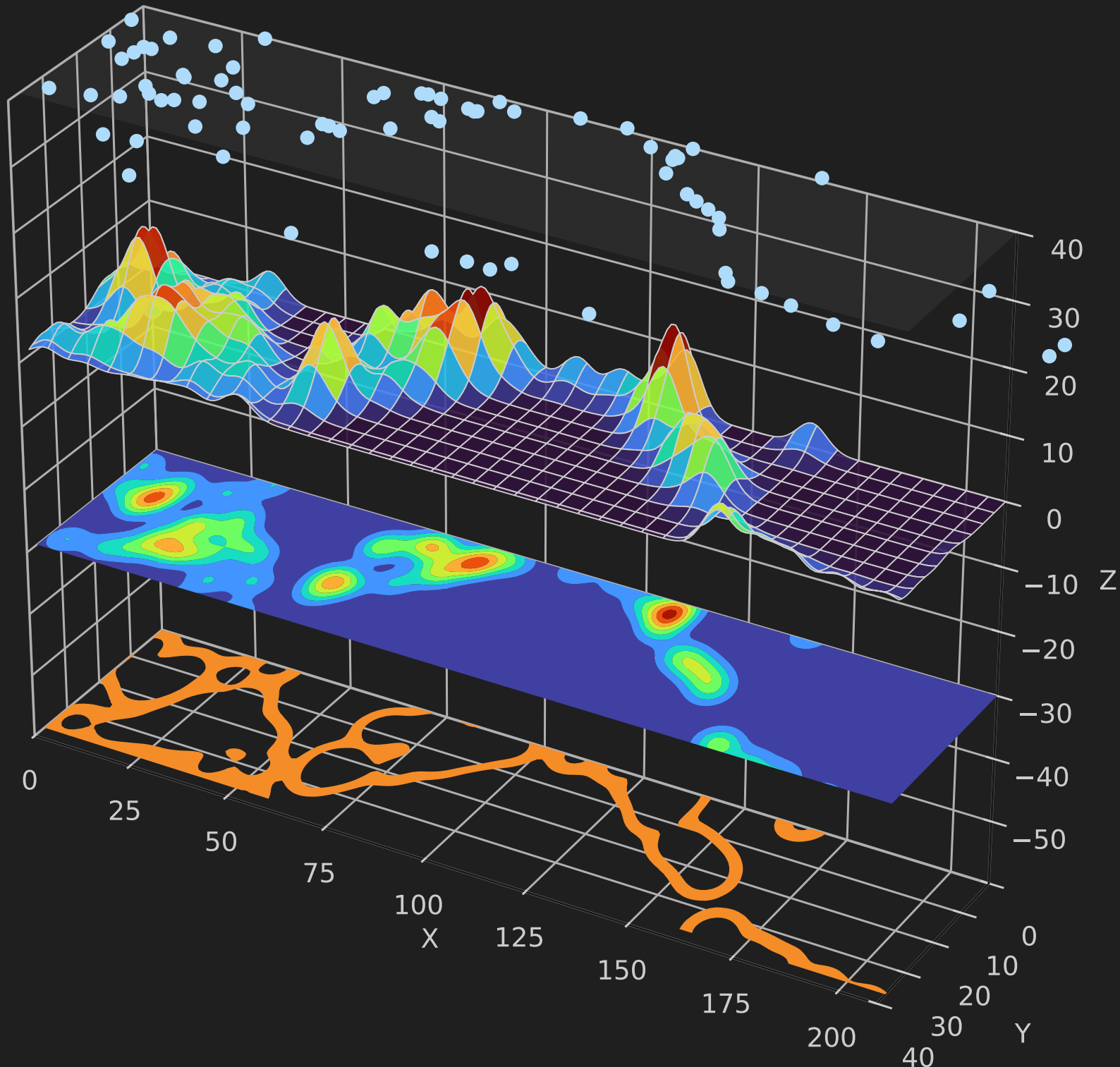
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.82 Shift = 2.30 Iteration = 057



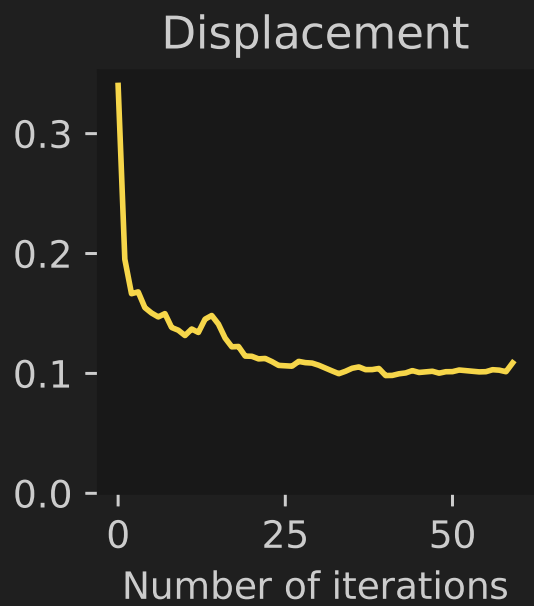
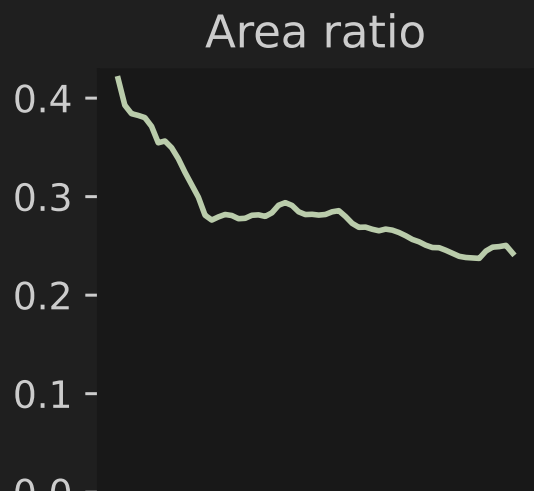
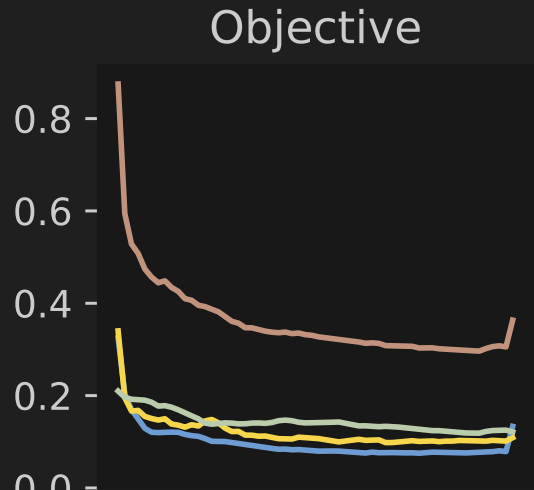
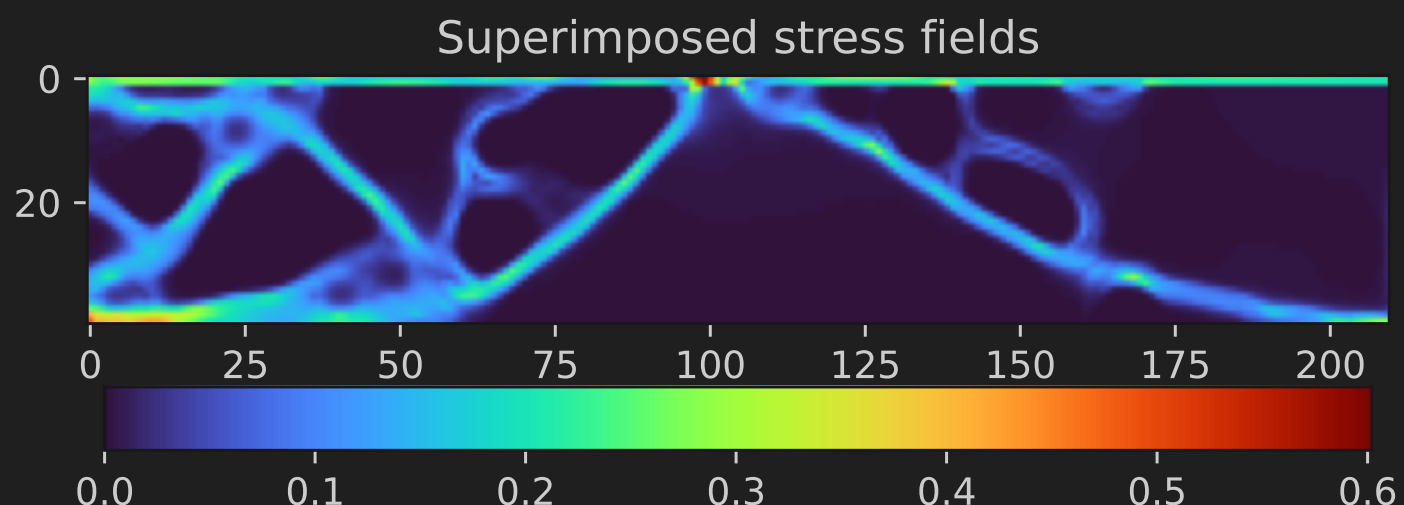
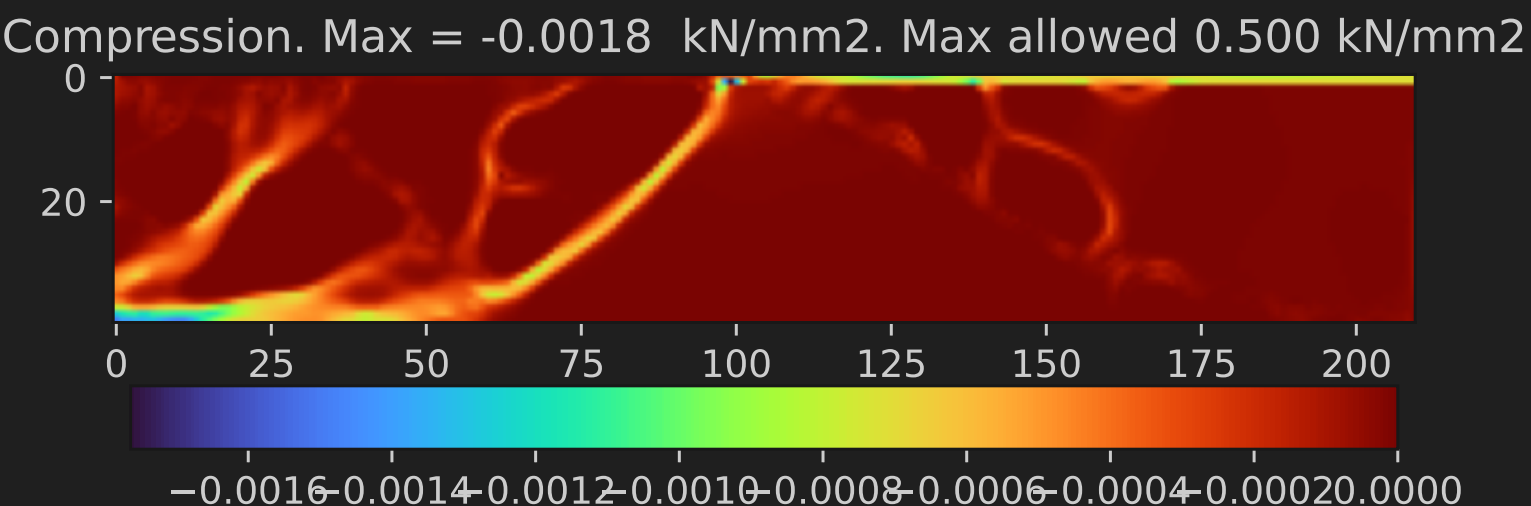
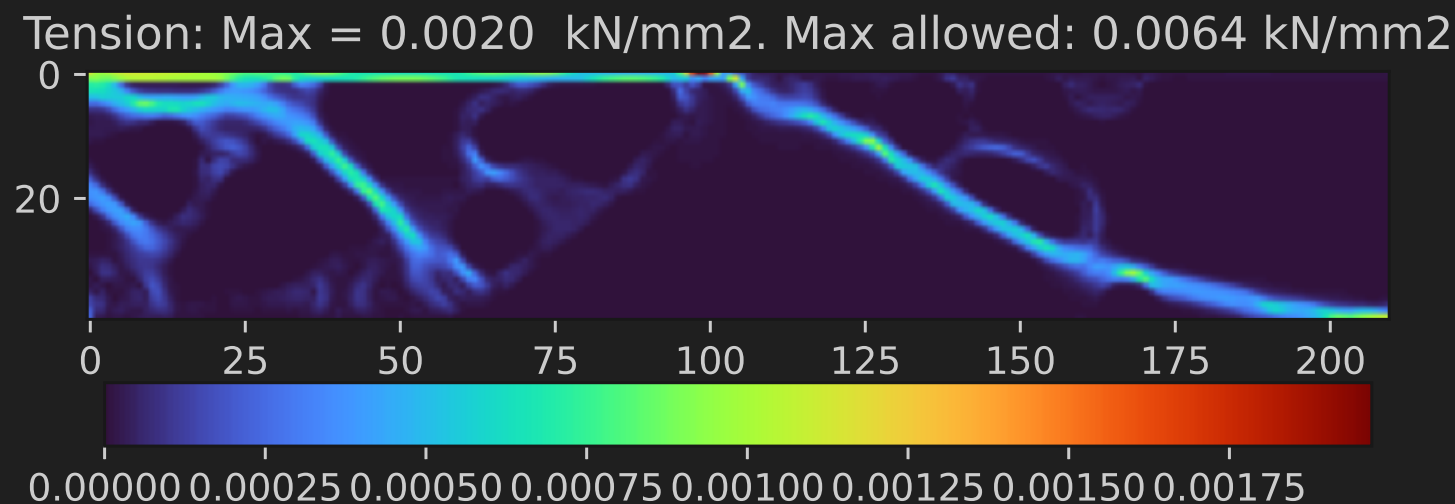
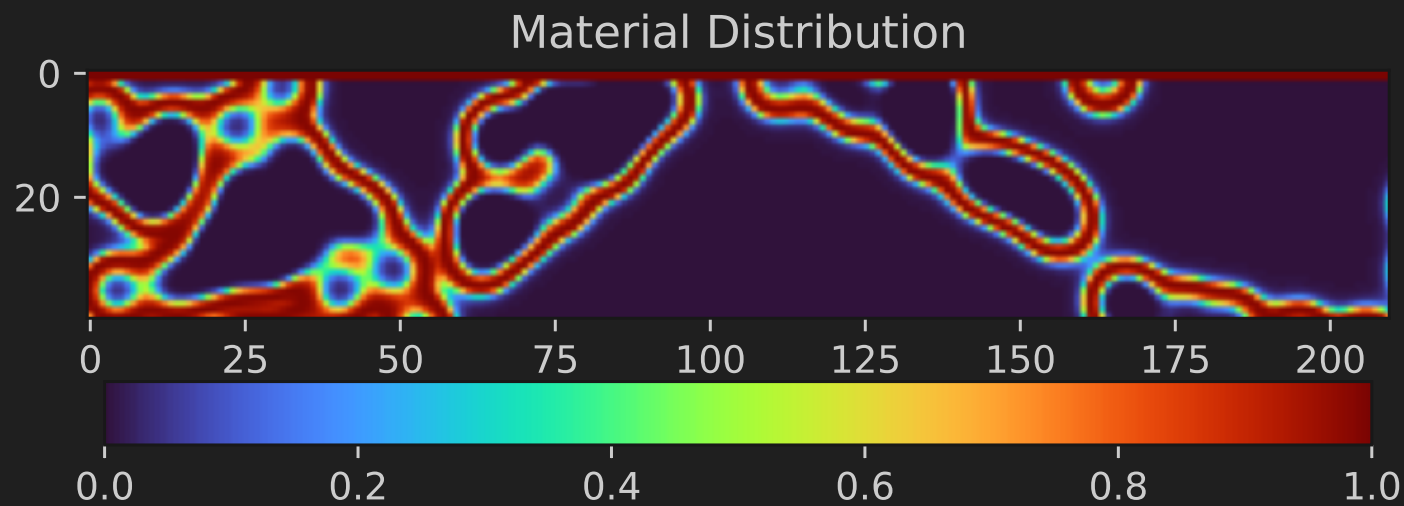
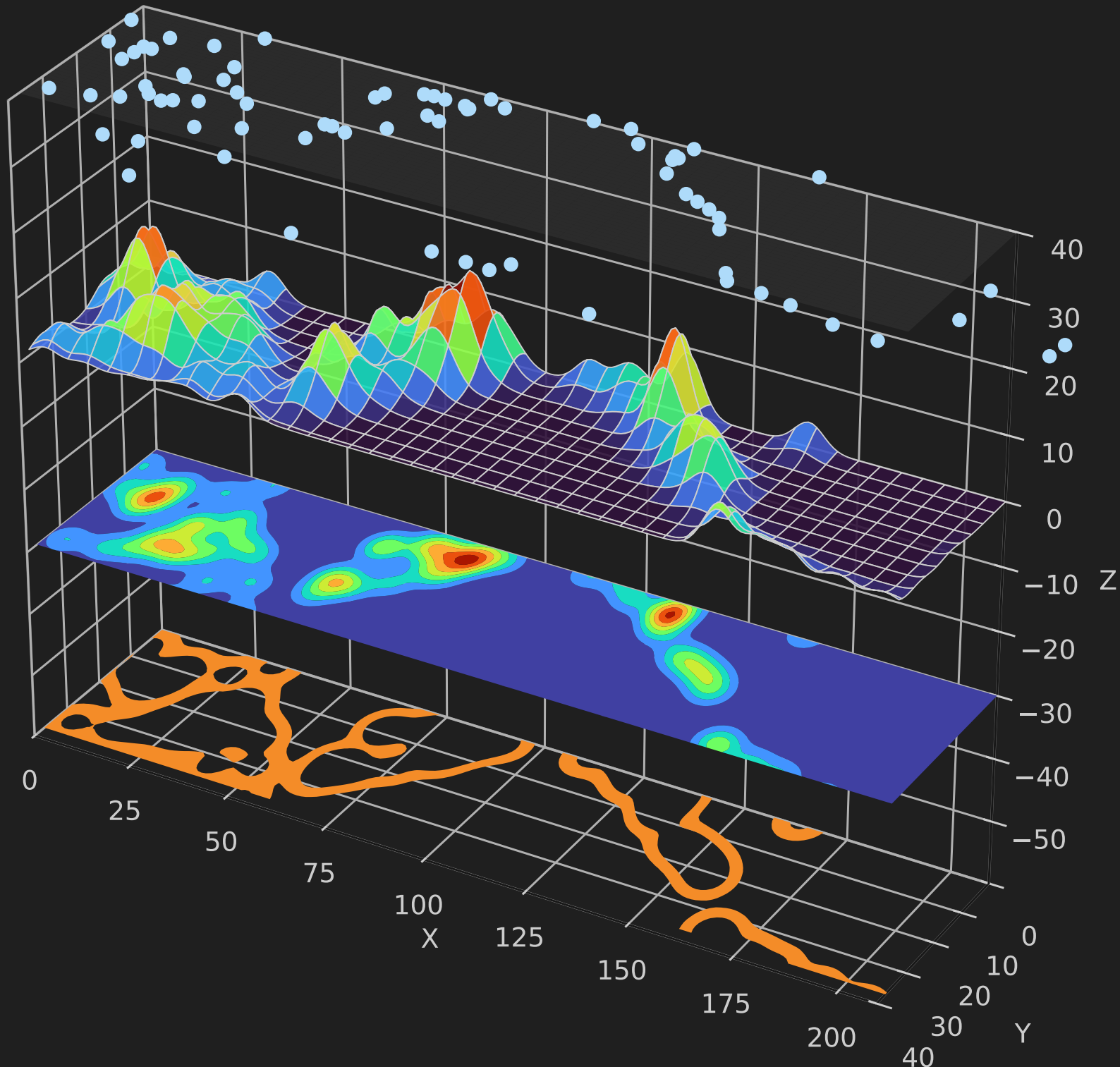
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.82 Shift = 2.30 Iteration = 058



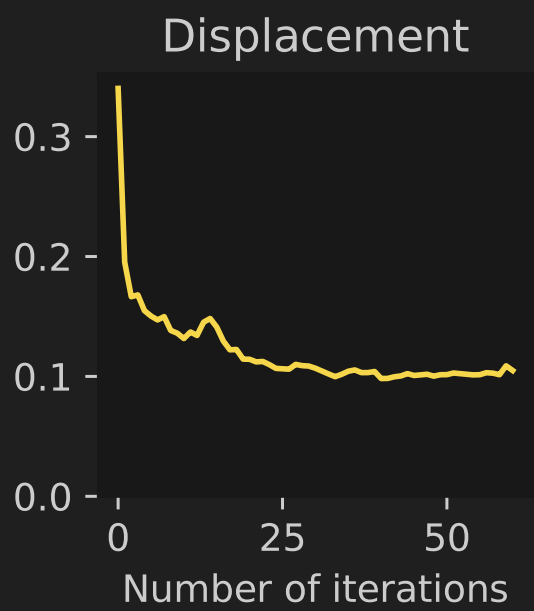
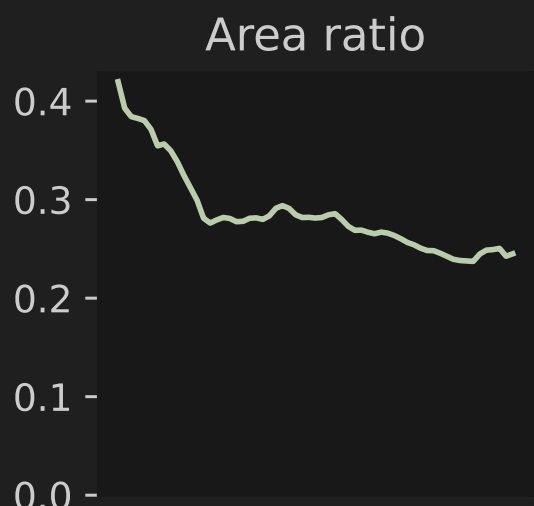
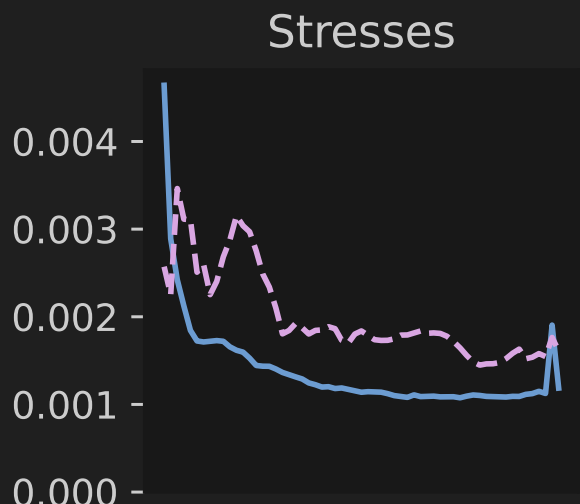
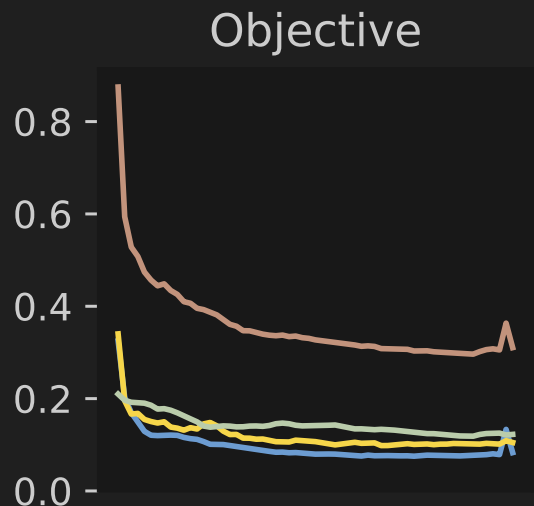
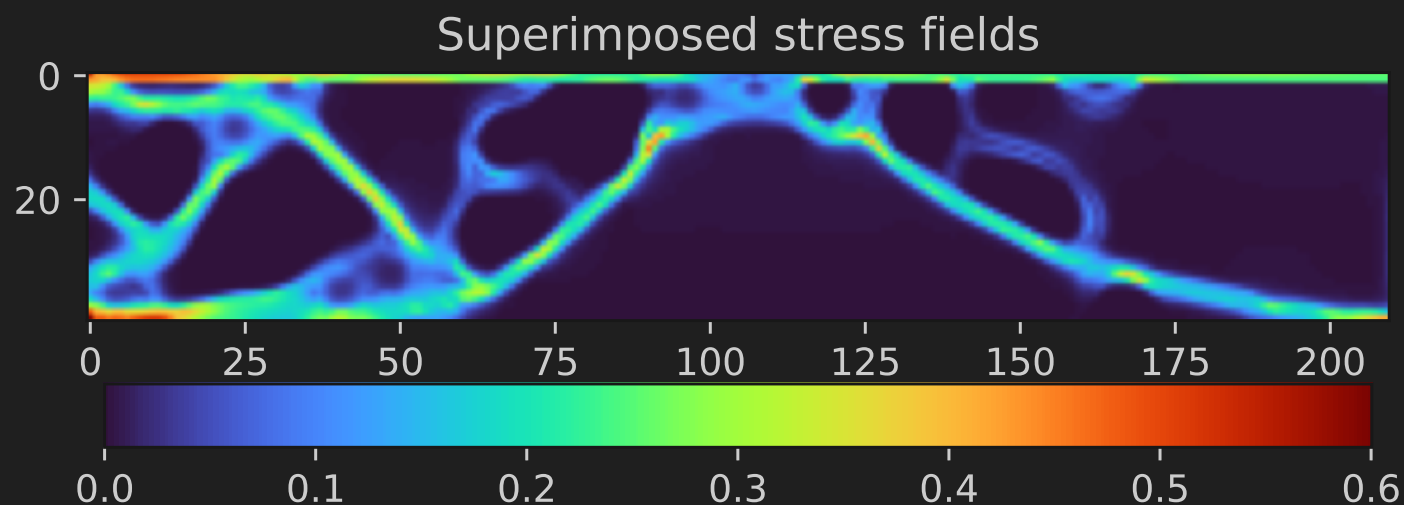
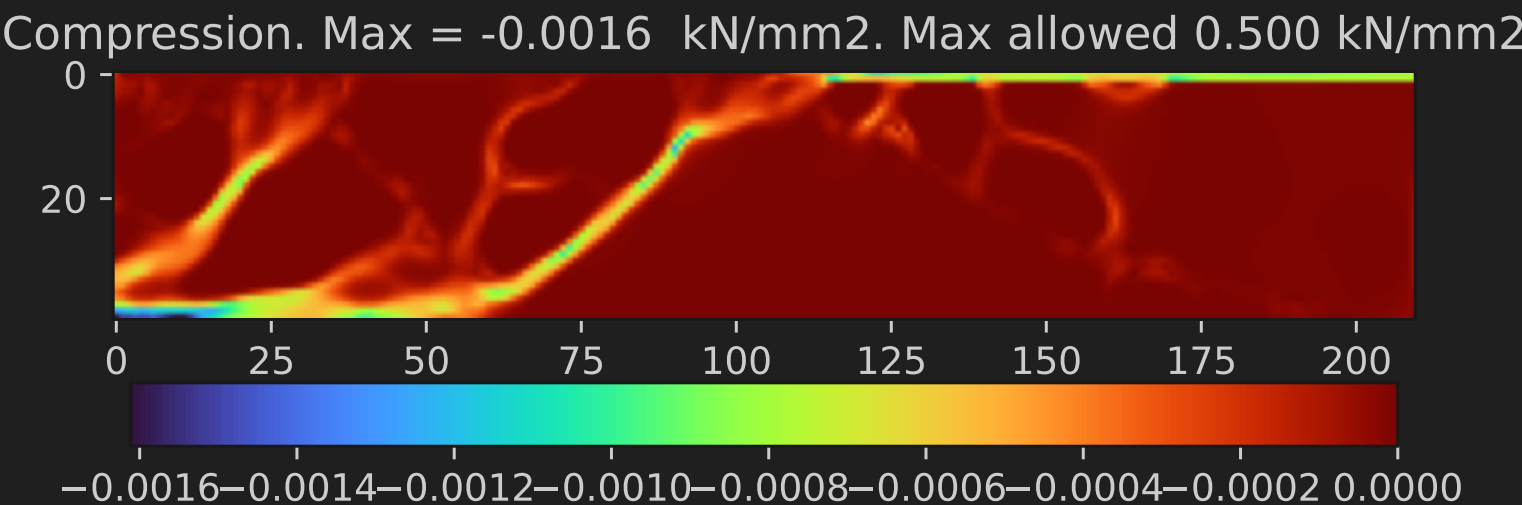
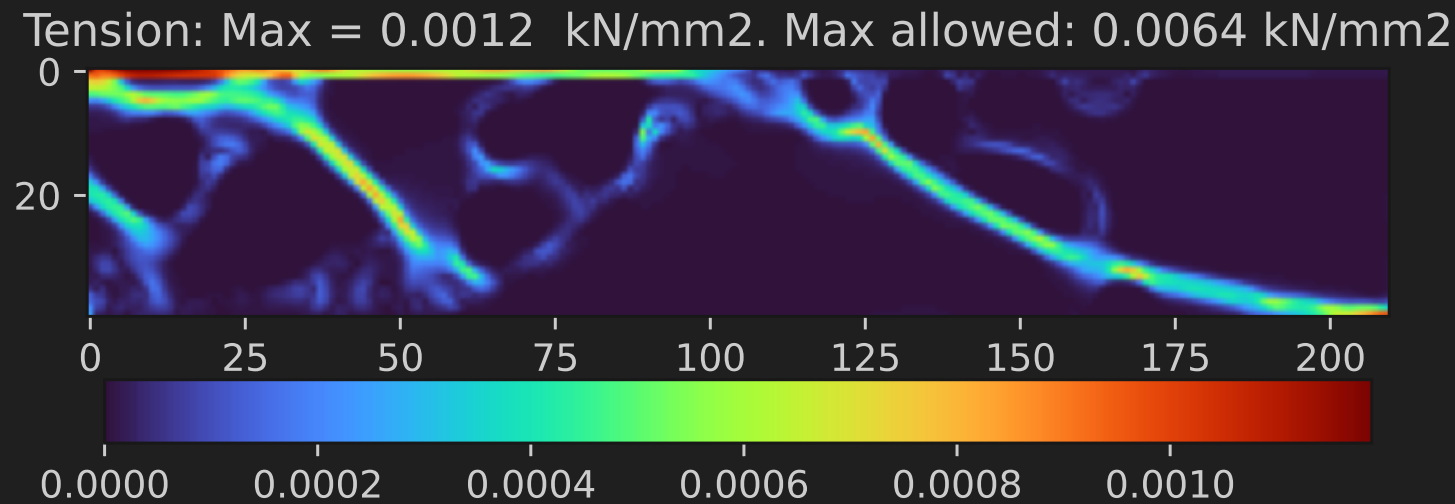
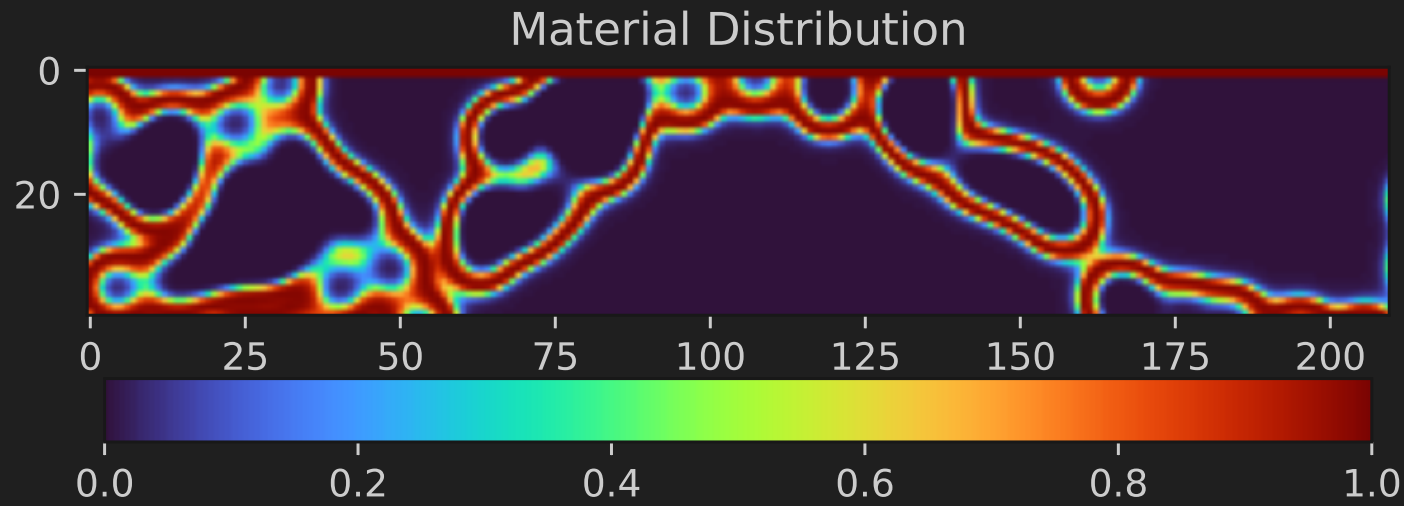
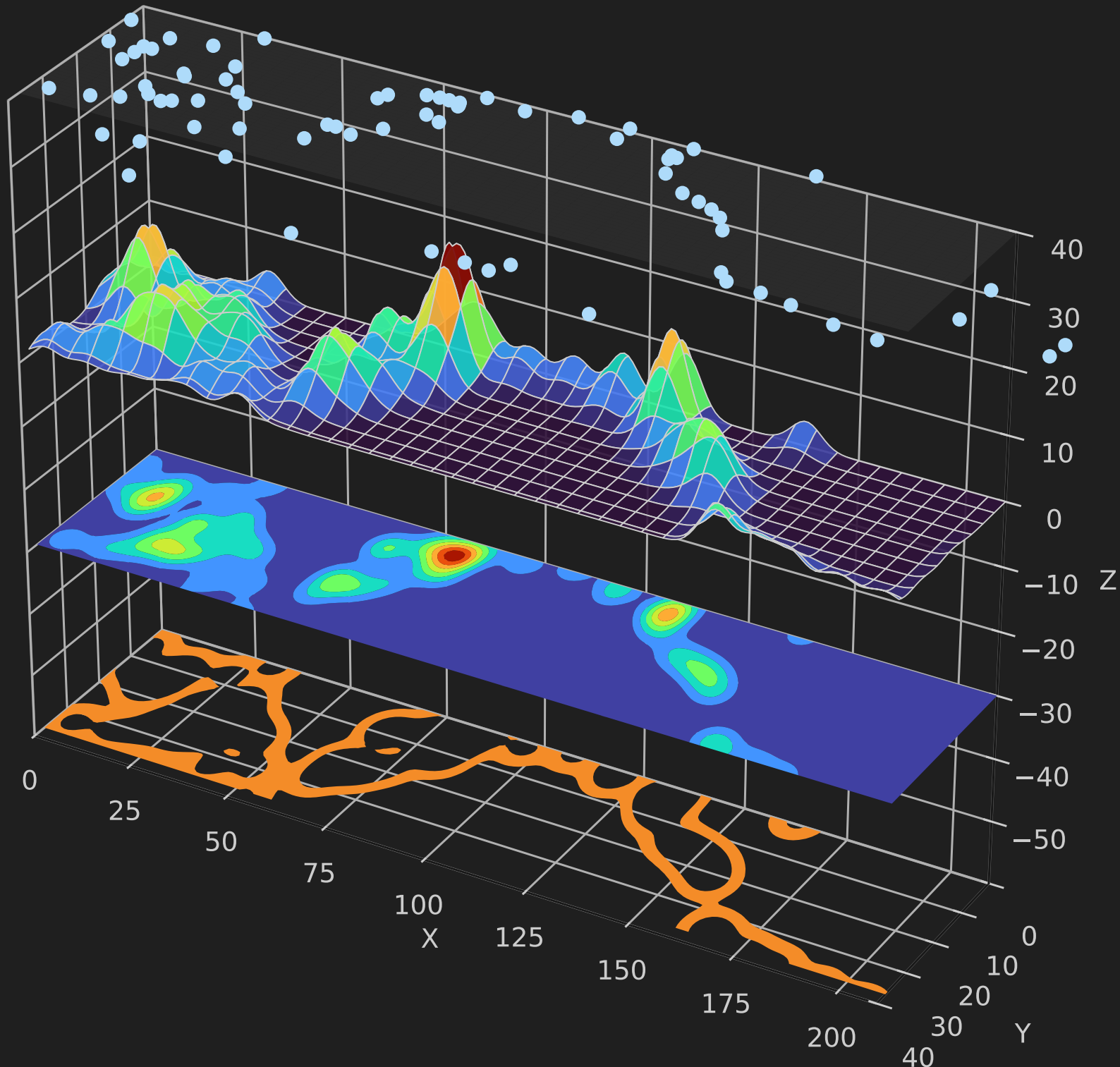
Objective = (Stress: 70 * 0.0019) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.11) = 0.36

Spread Gaussian = 4.83 Shift = 2.29 Iteration = 059



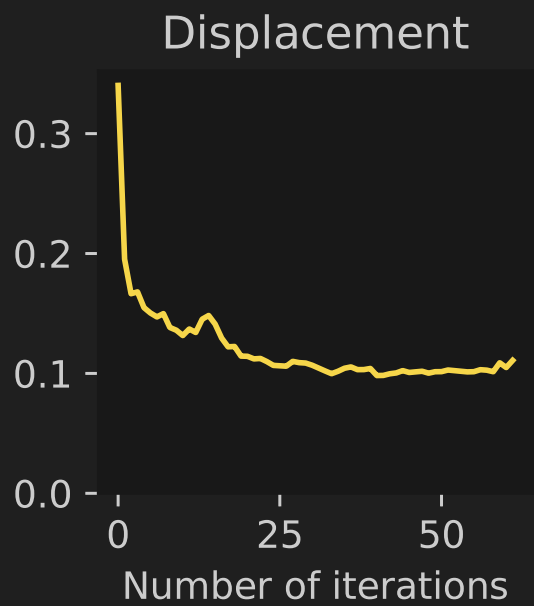
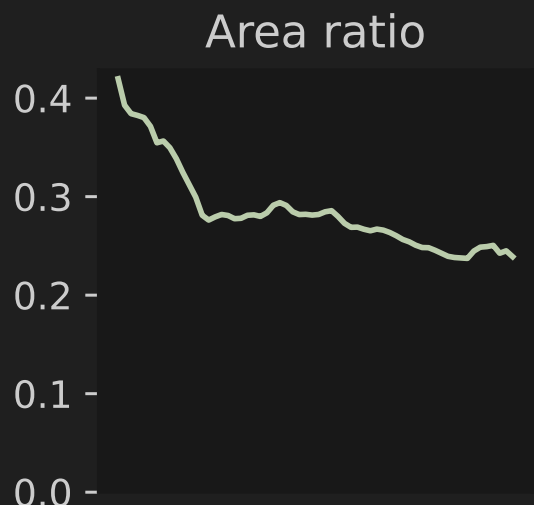
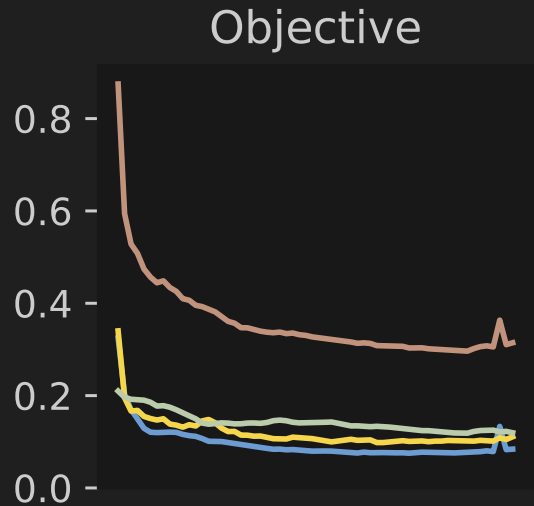
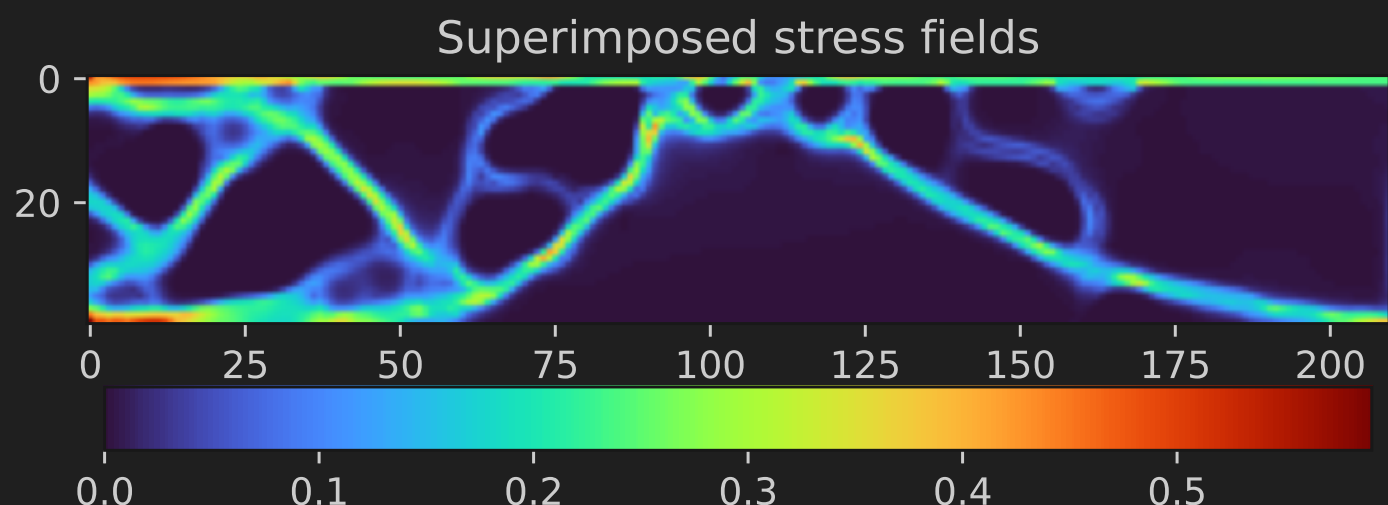
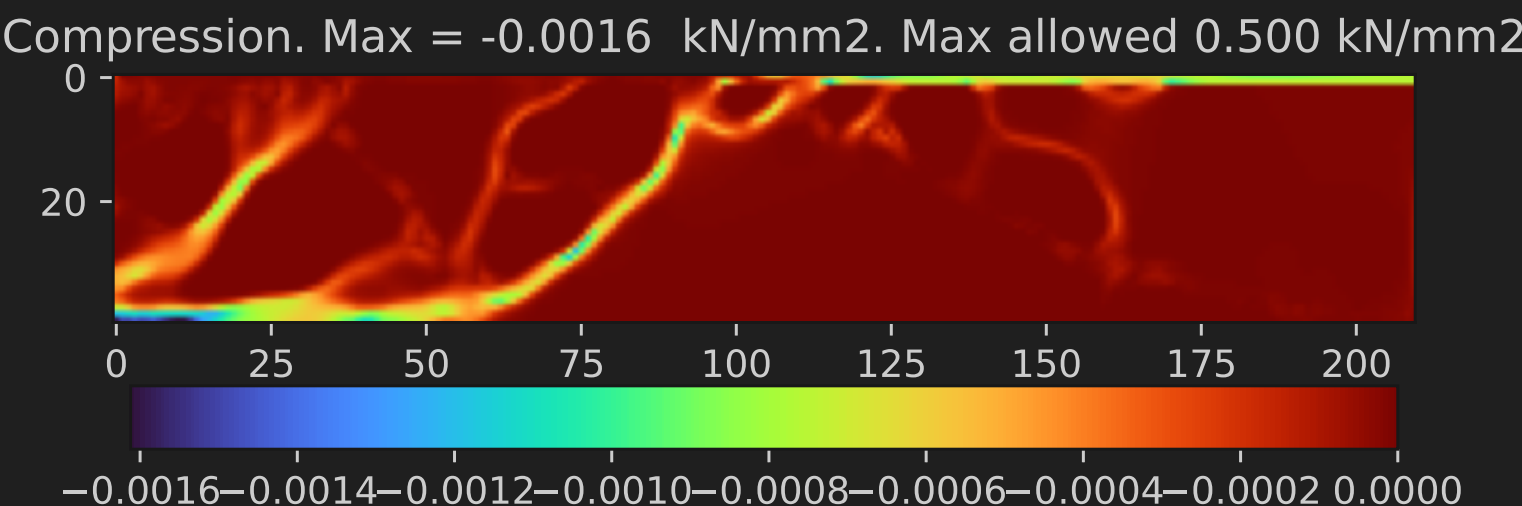
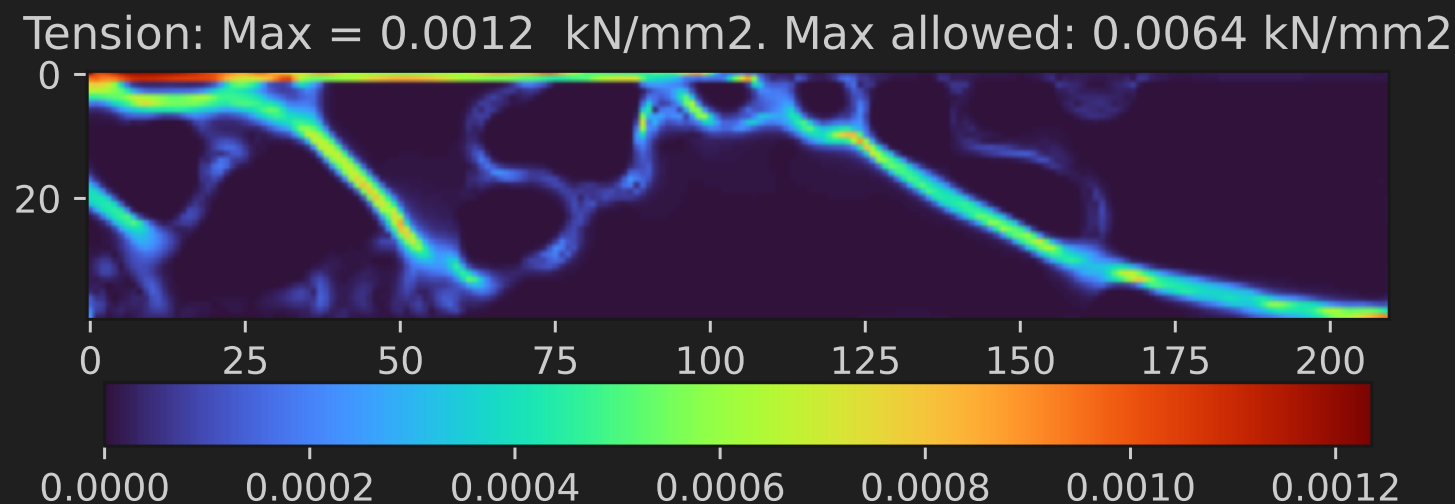
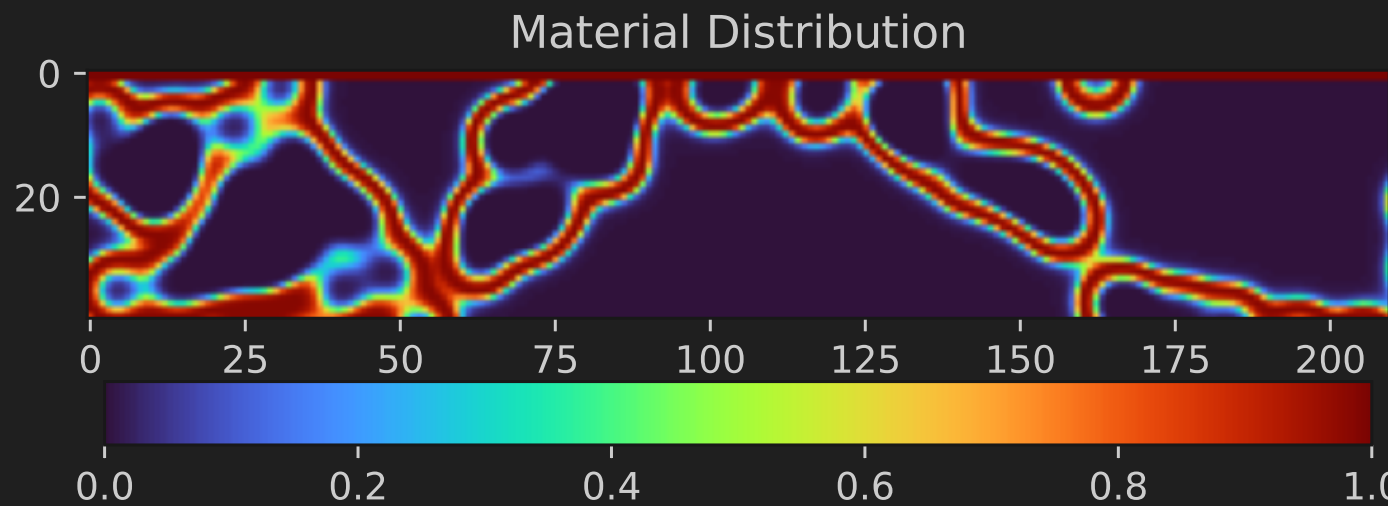
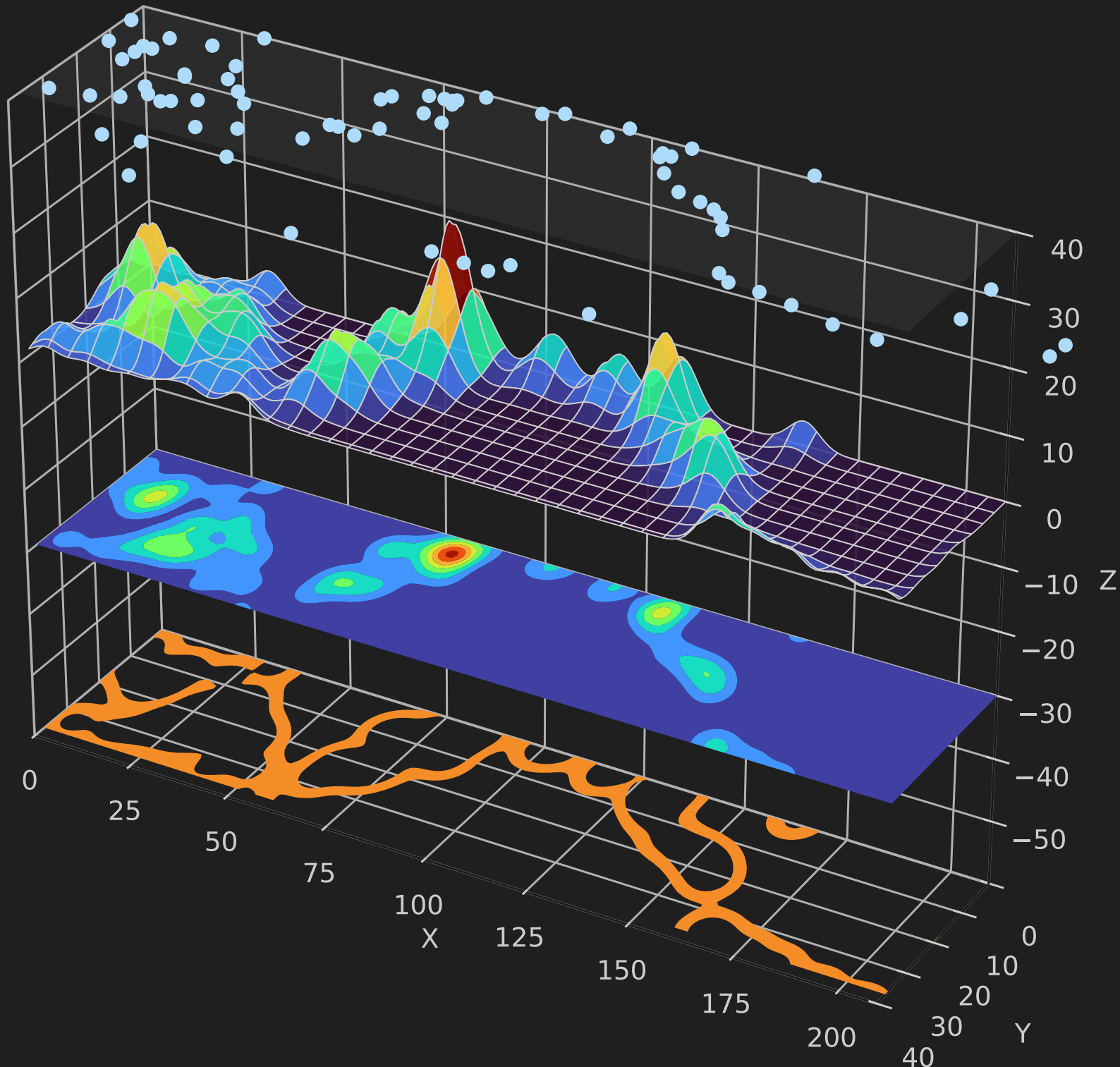
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 4.92 Shift = 2.25 Iteration = 060



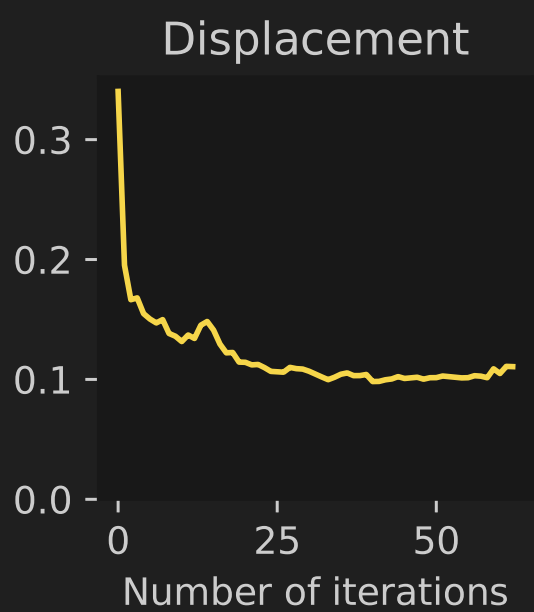
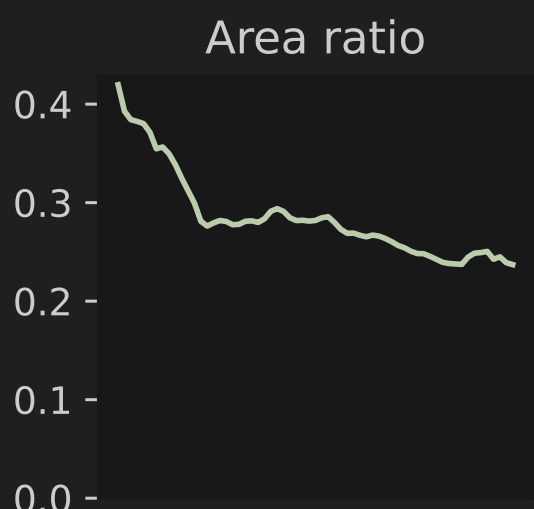
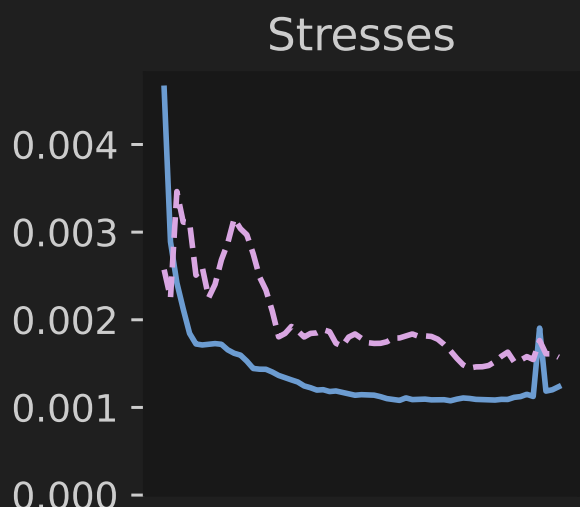
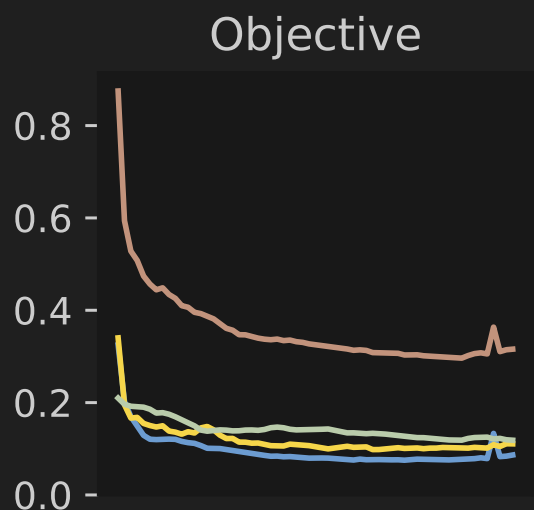
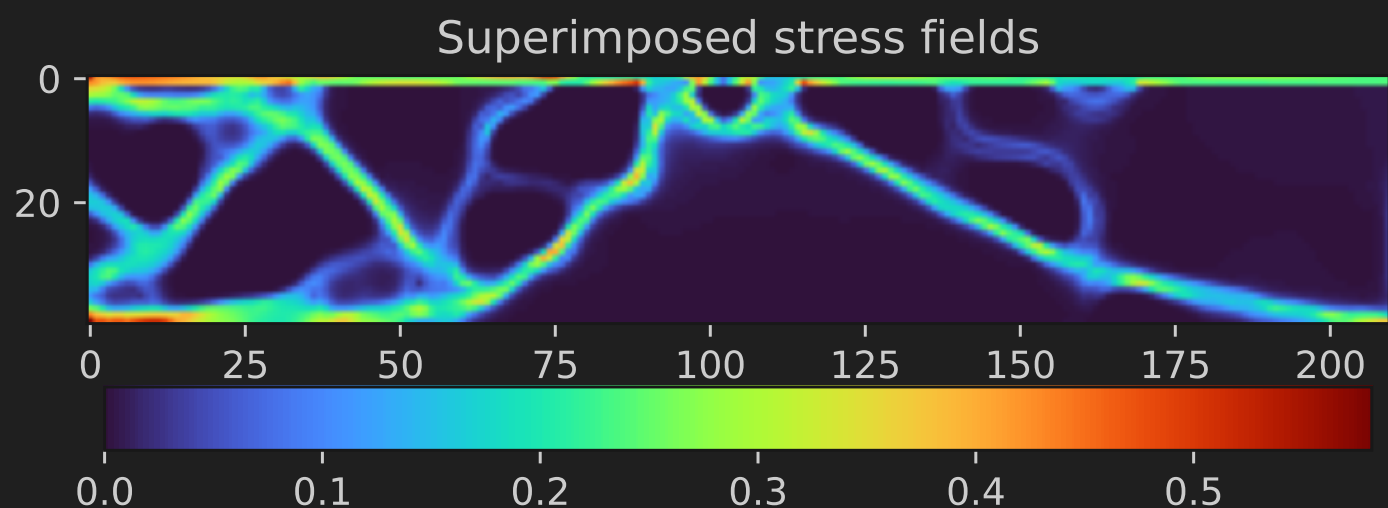
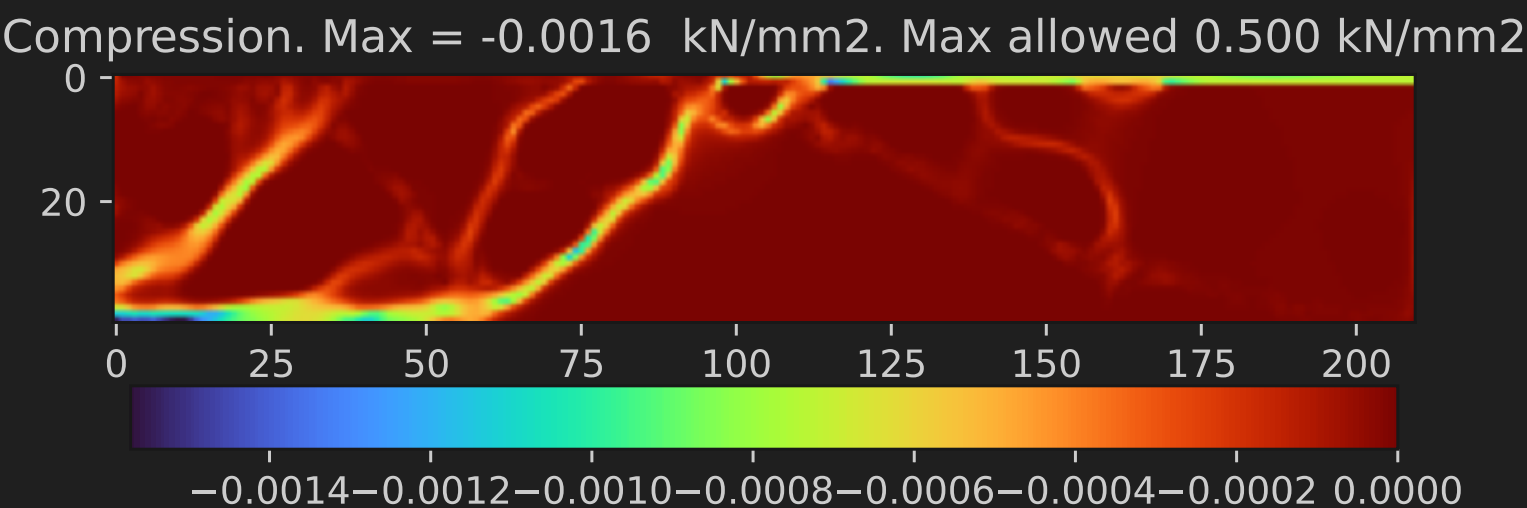
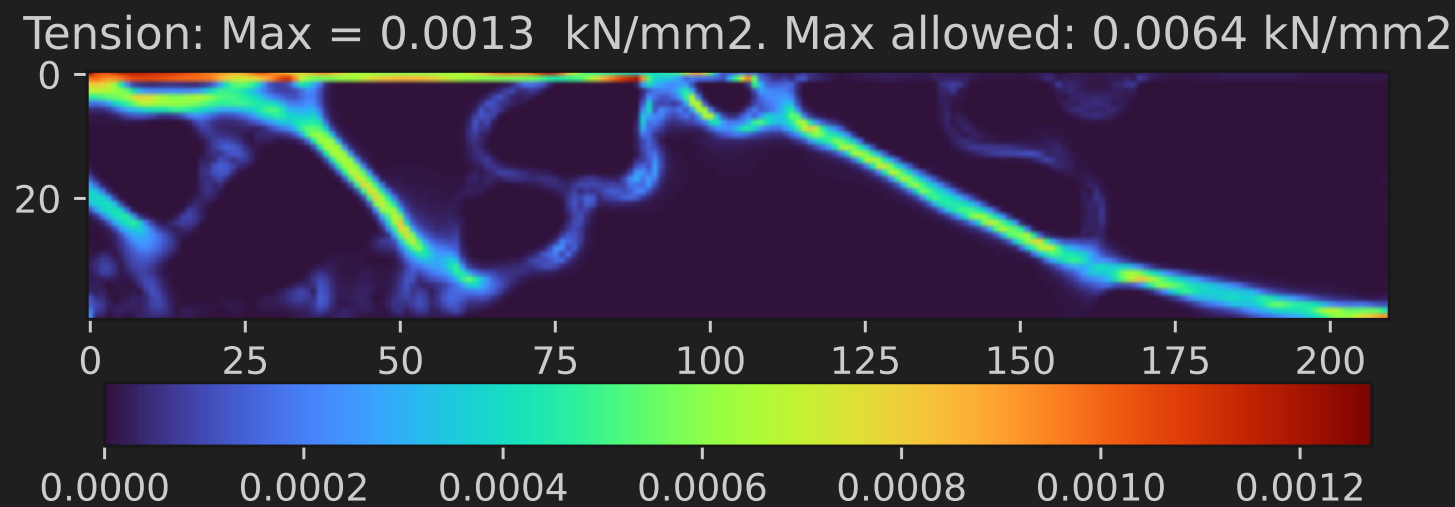
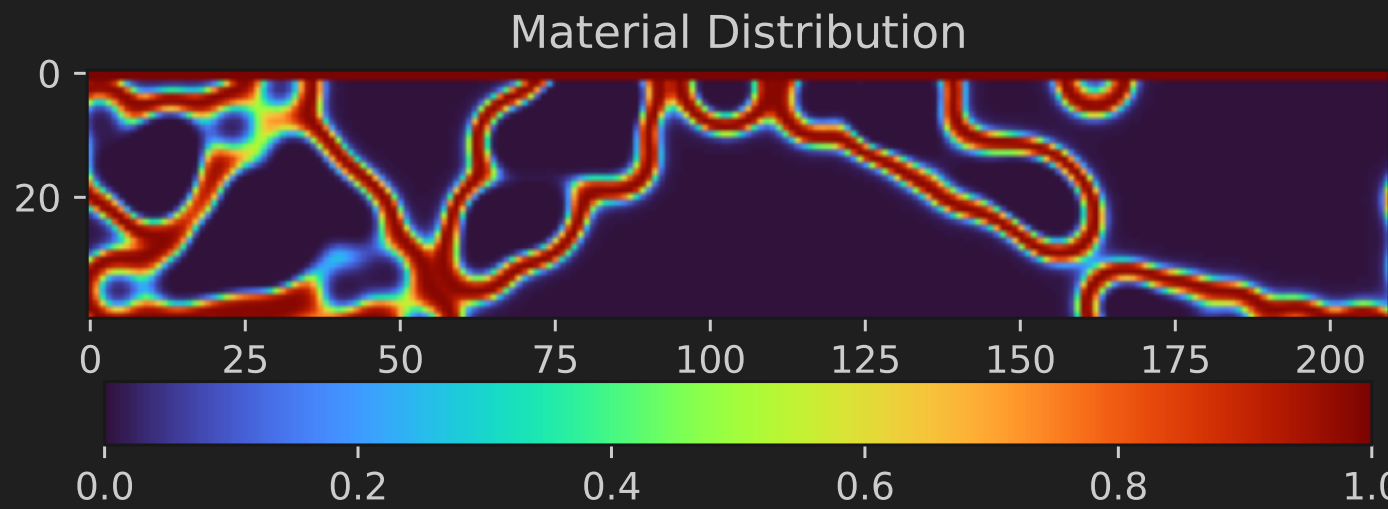
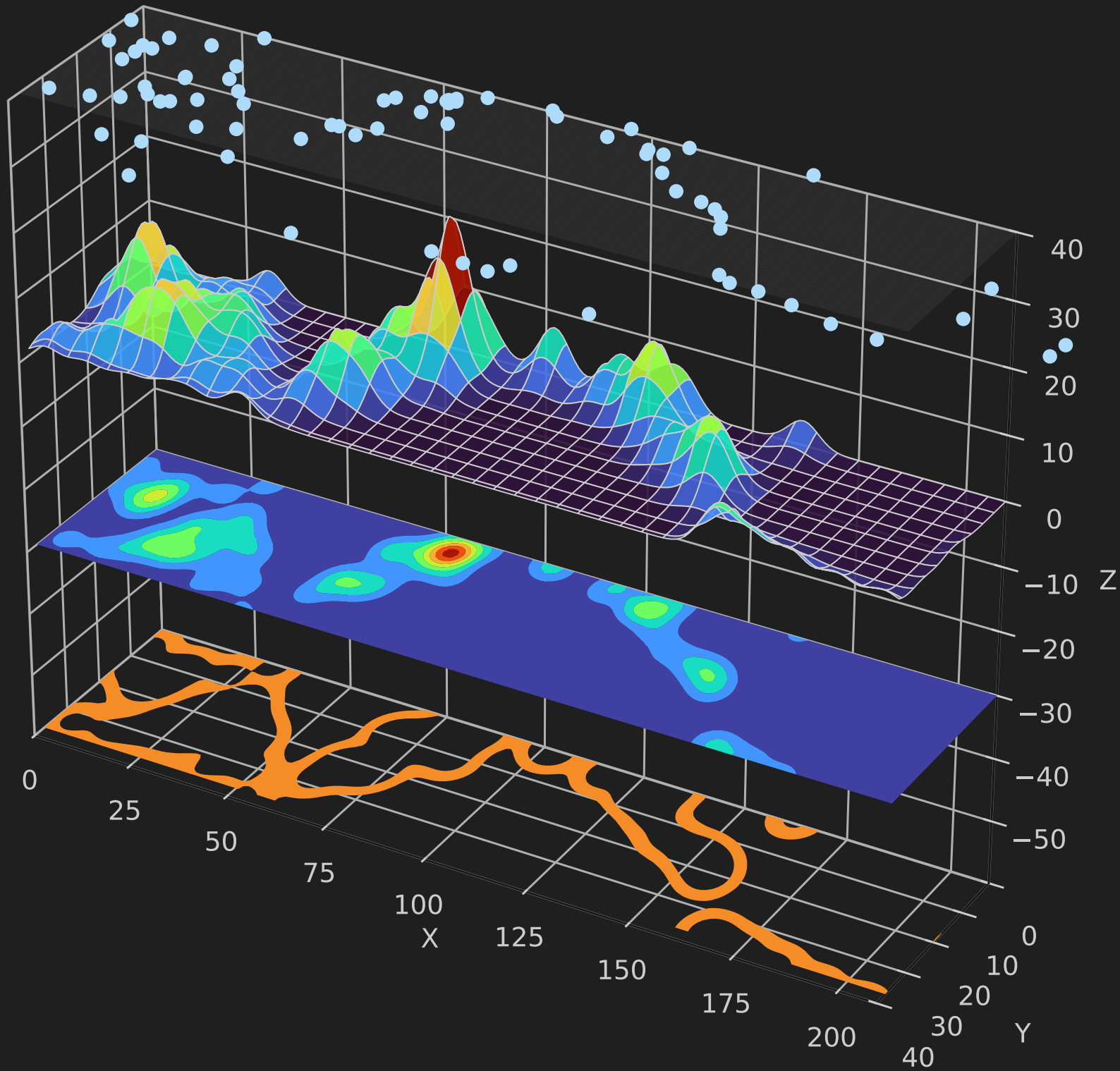
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.11) = 0.31

Spread Gaussian = 5.01 Shift = 2.22 Iteration = 061



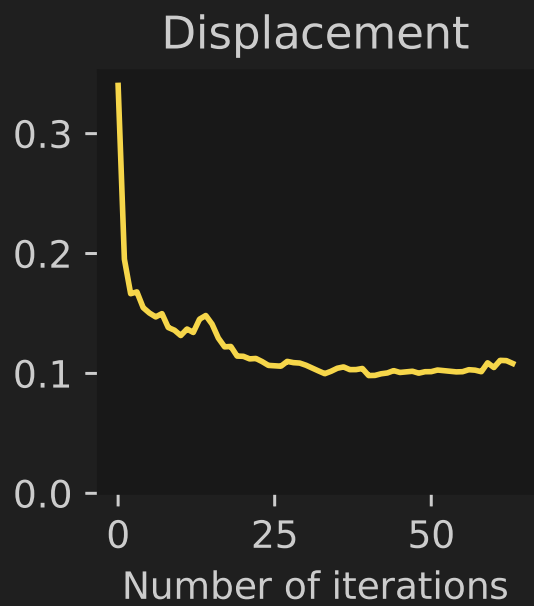
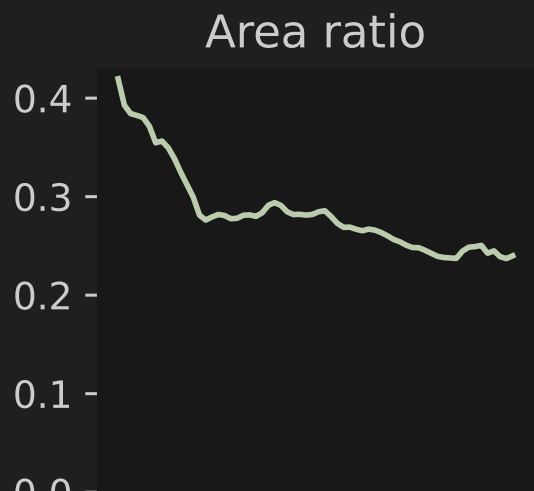
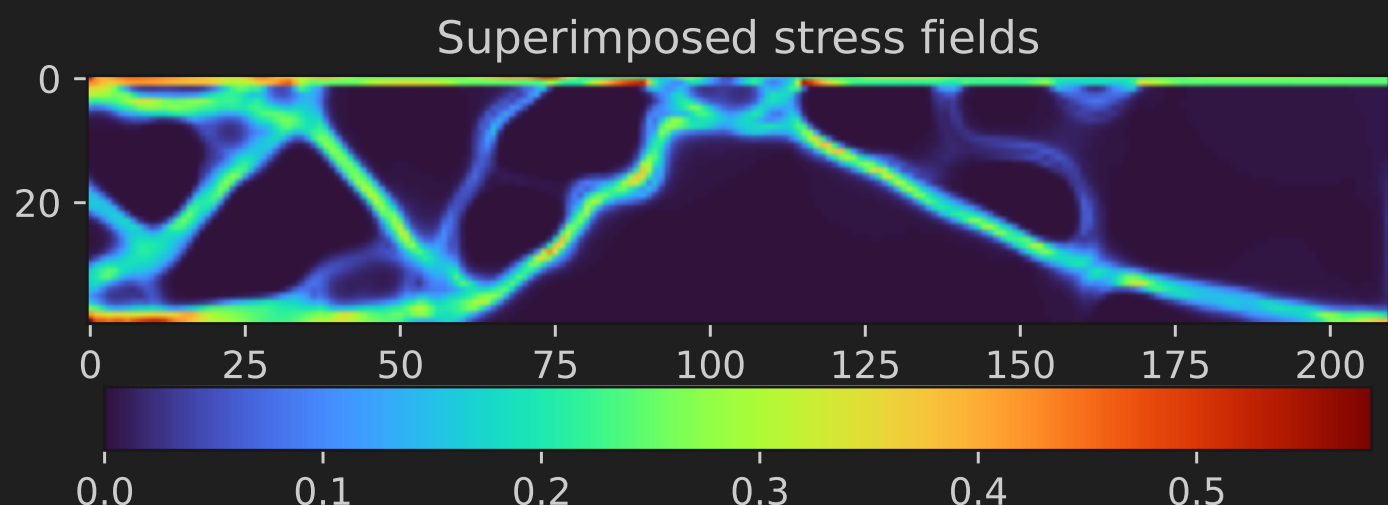
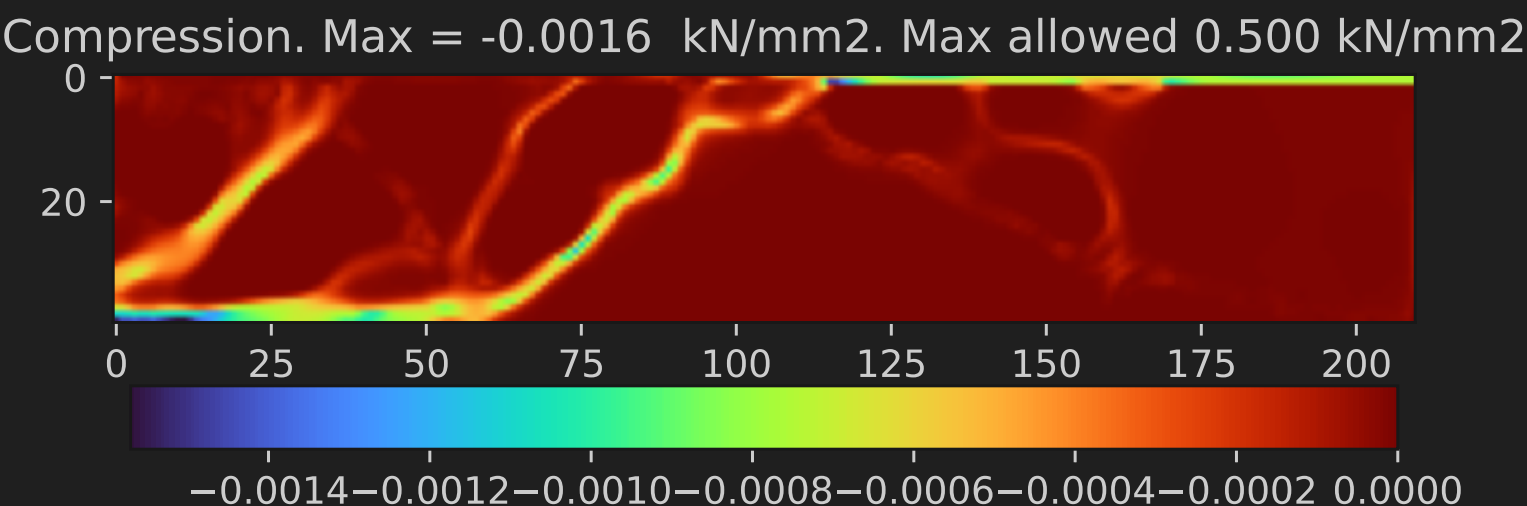
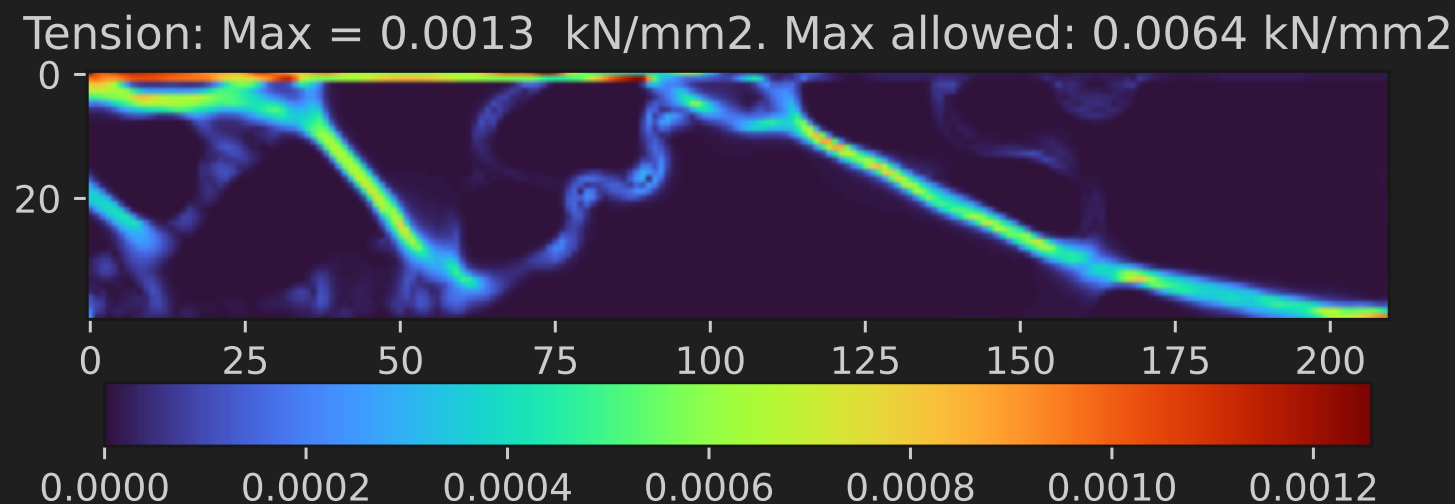
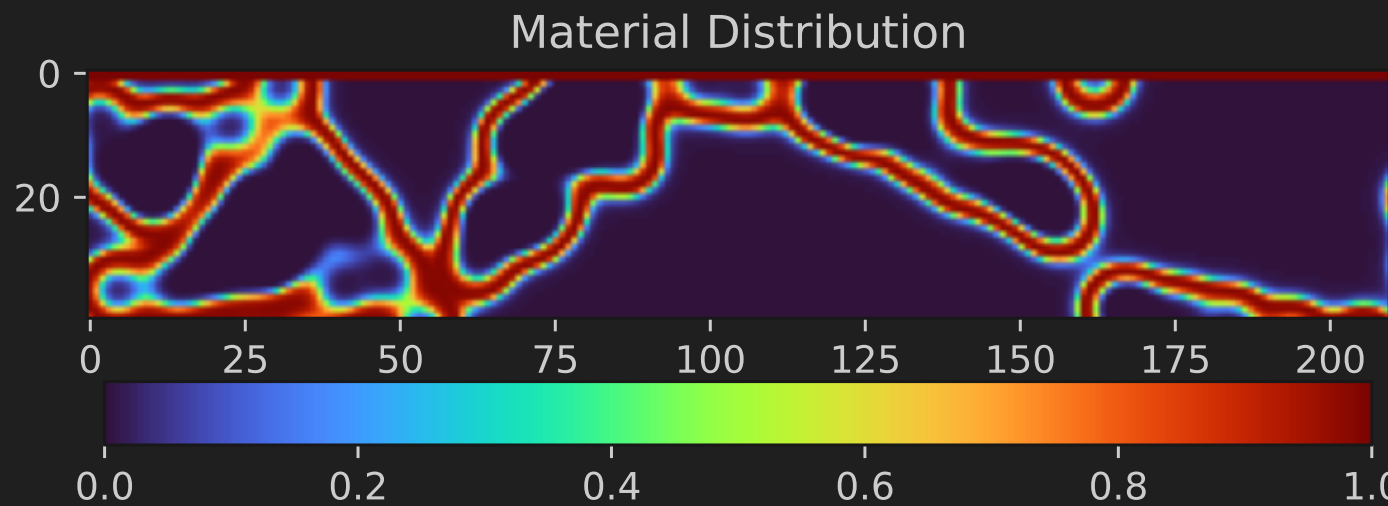
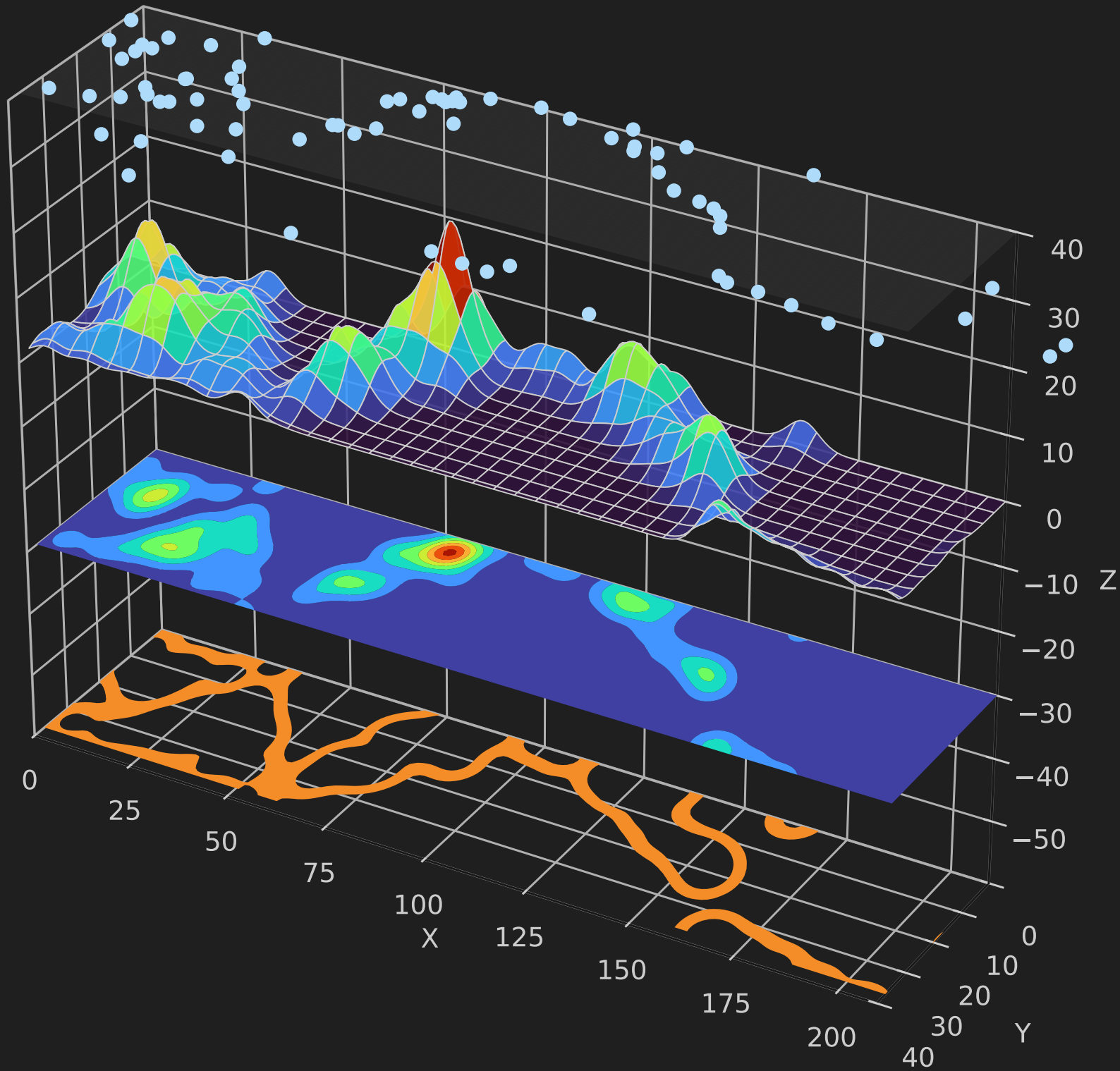
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.11) = 0.32

Spread Gaussian = 5.08 Shift = 2.21 Iteration = 062



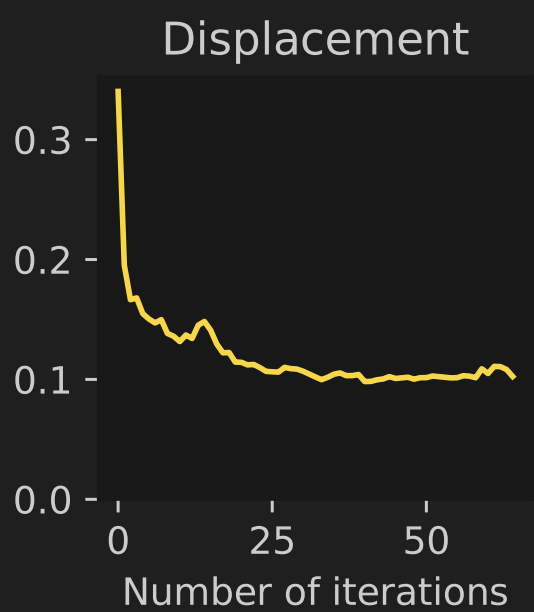
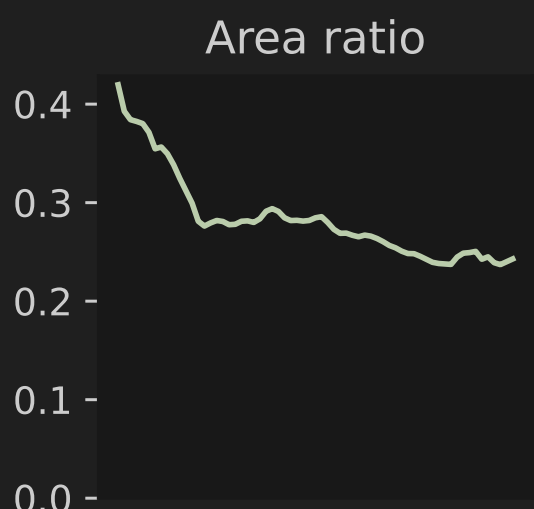
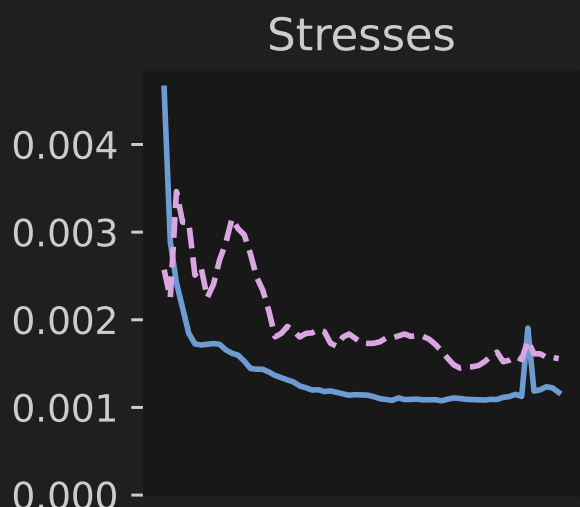
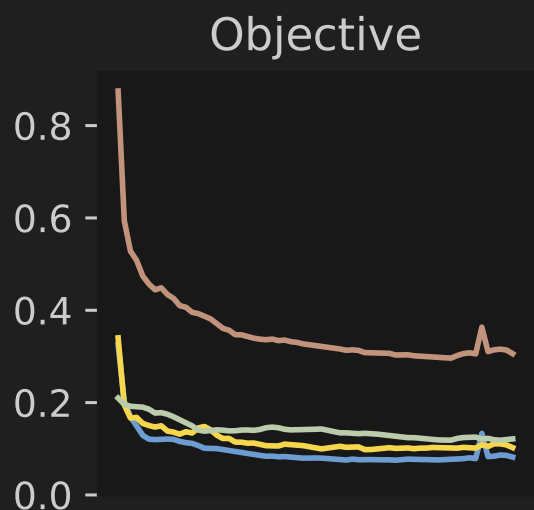
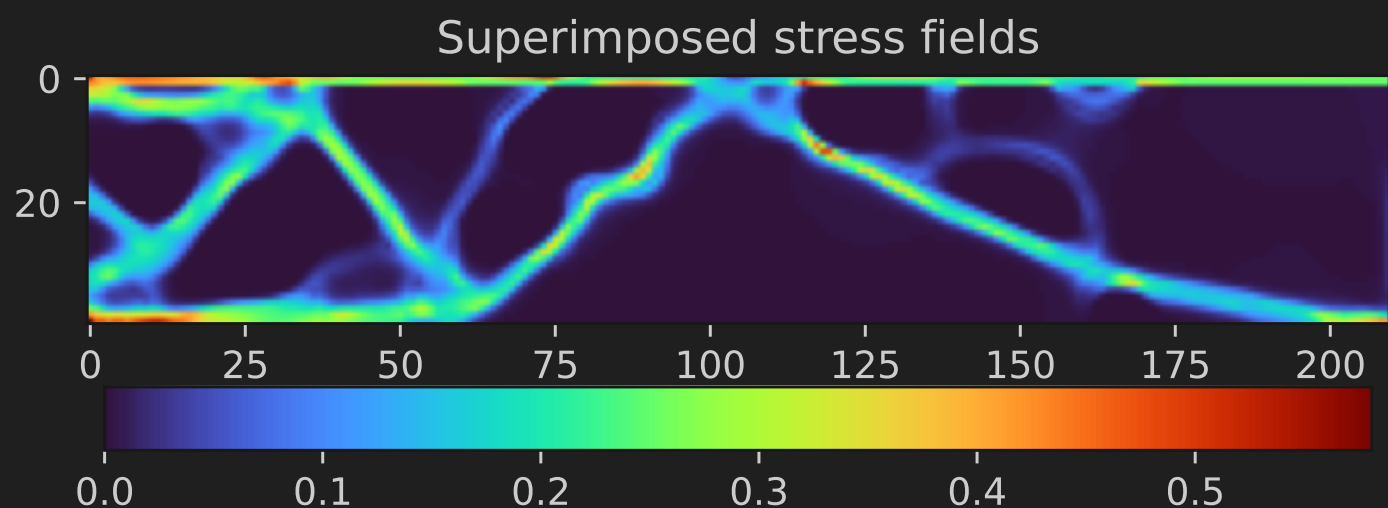
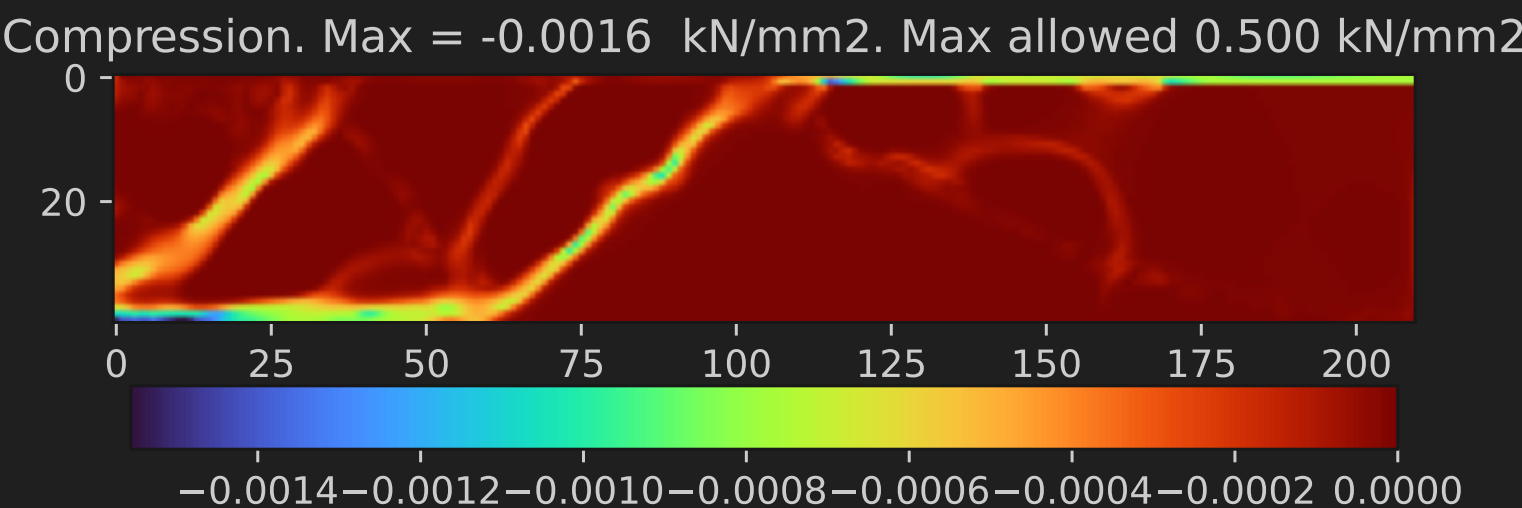
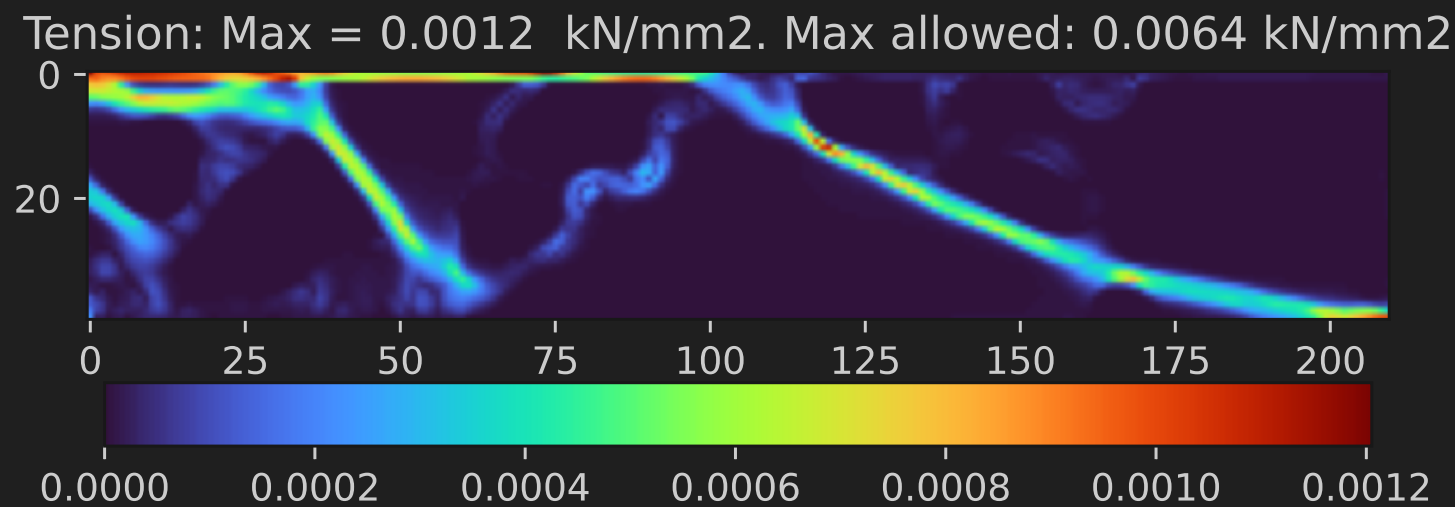
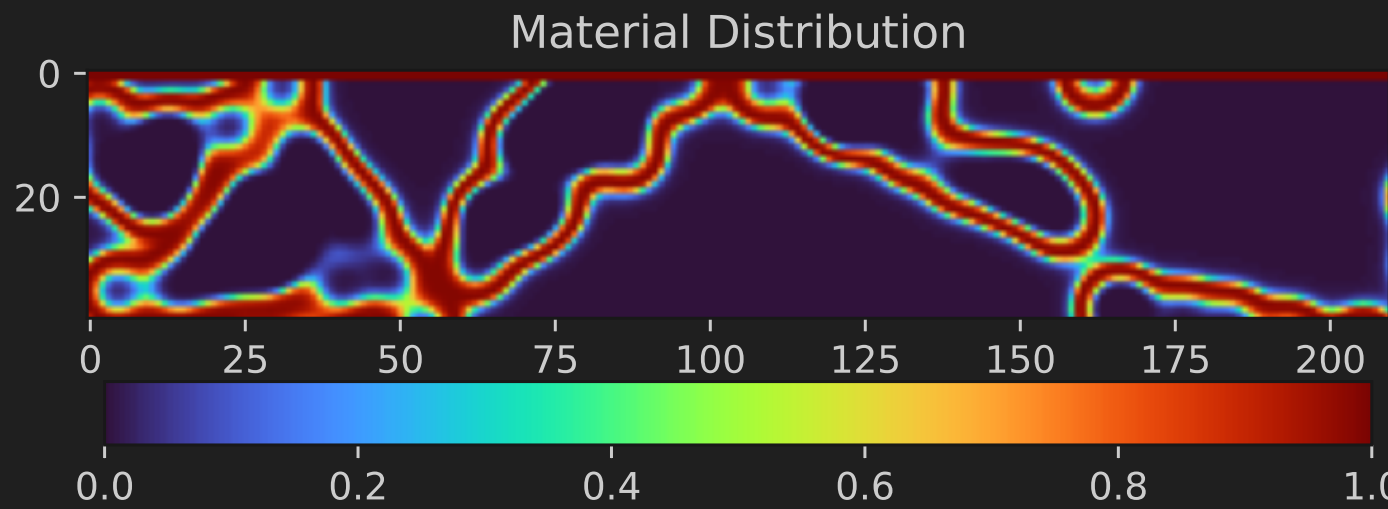
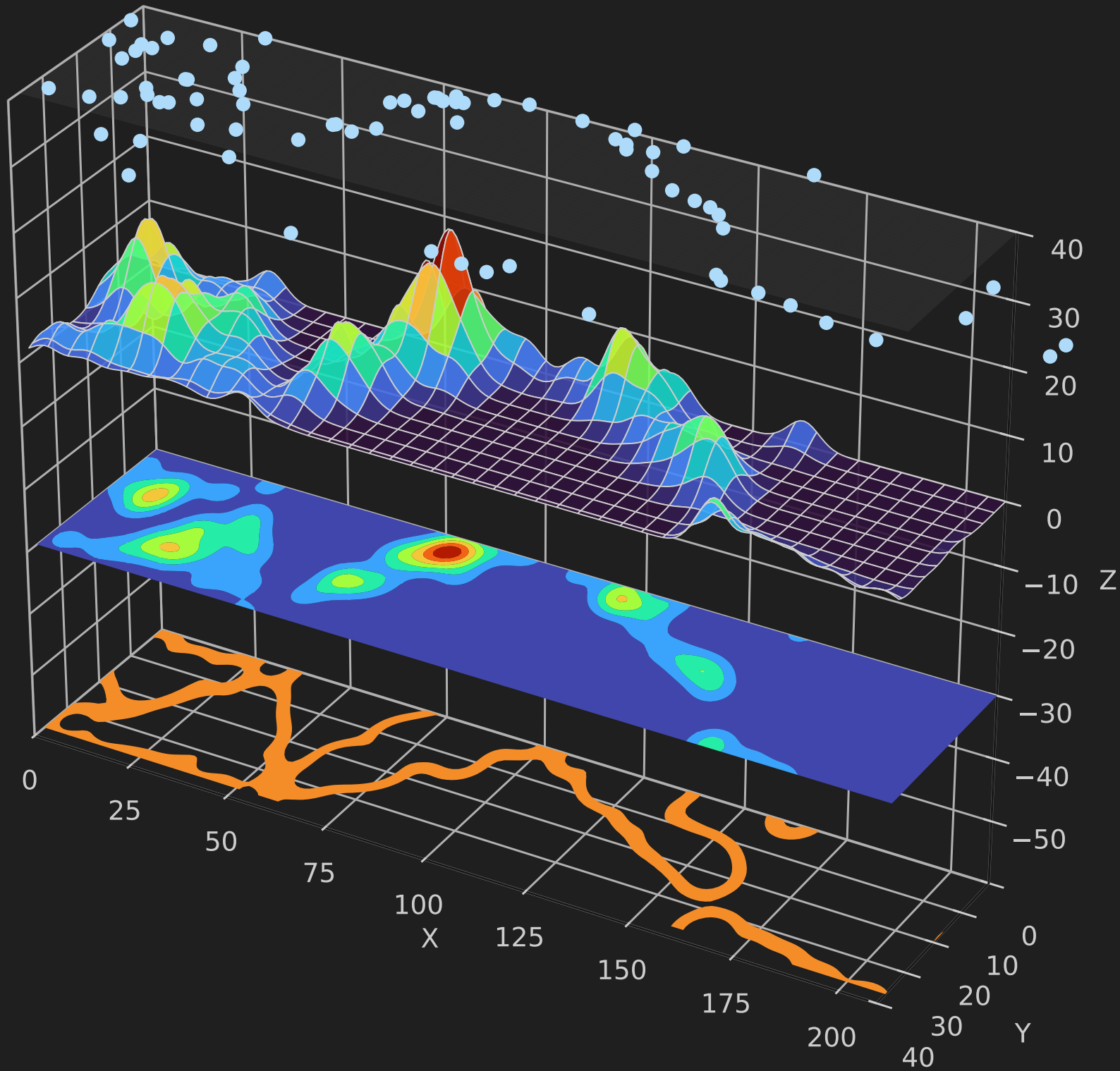
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.11) = 0.31

Spread Gaussian = 5.11 Shift = 2.23 Iteration = 063



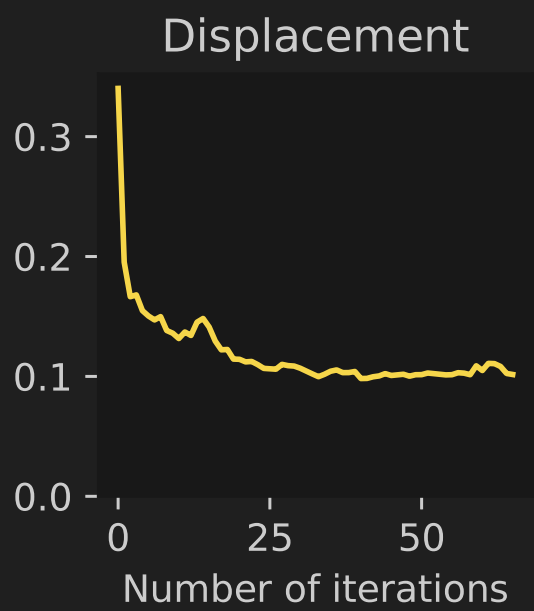
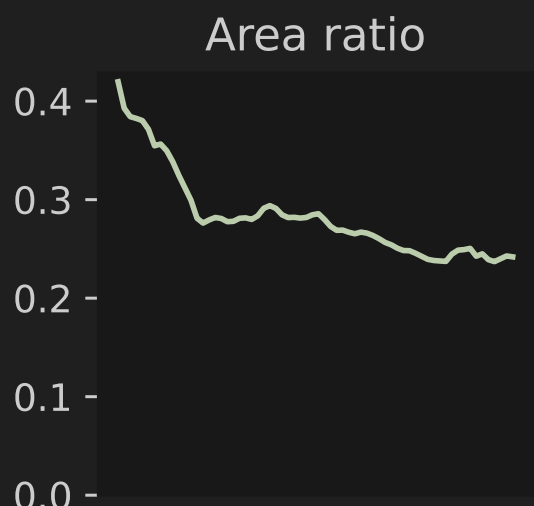
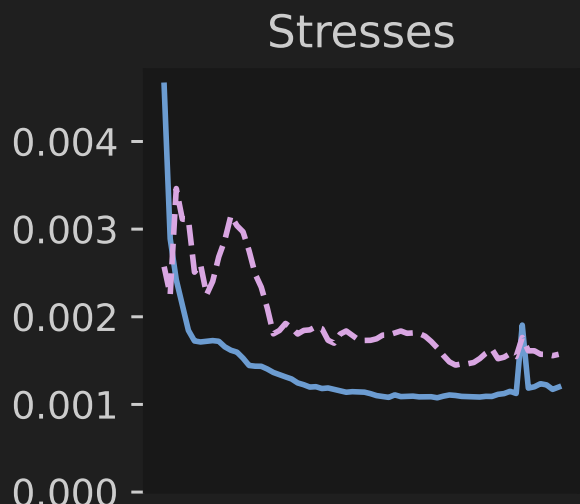
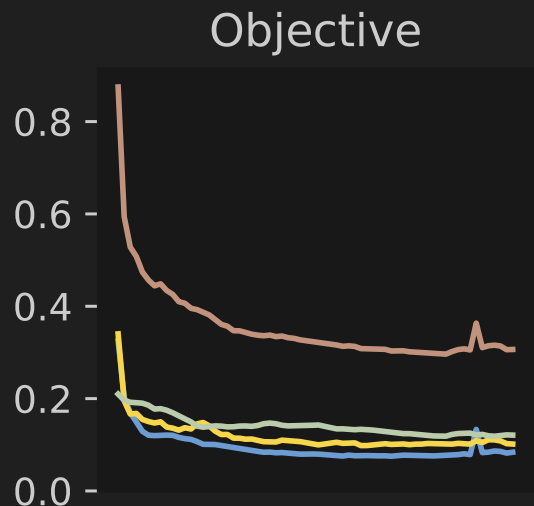
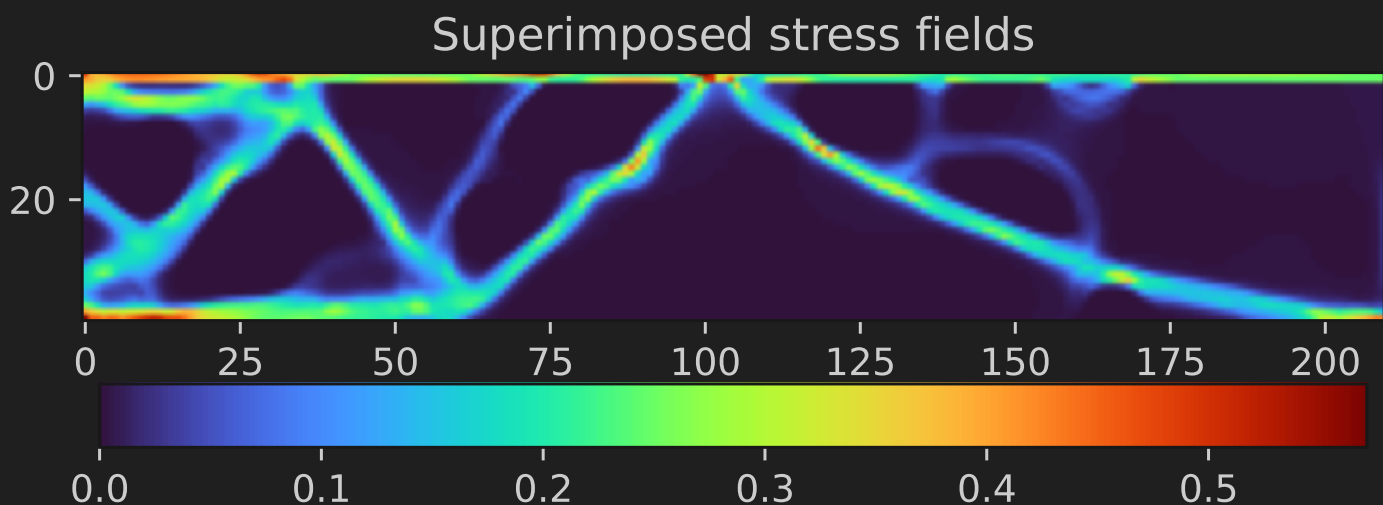
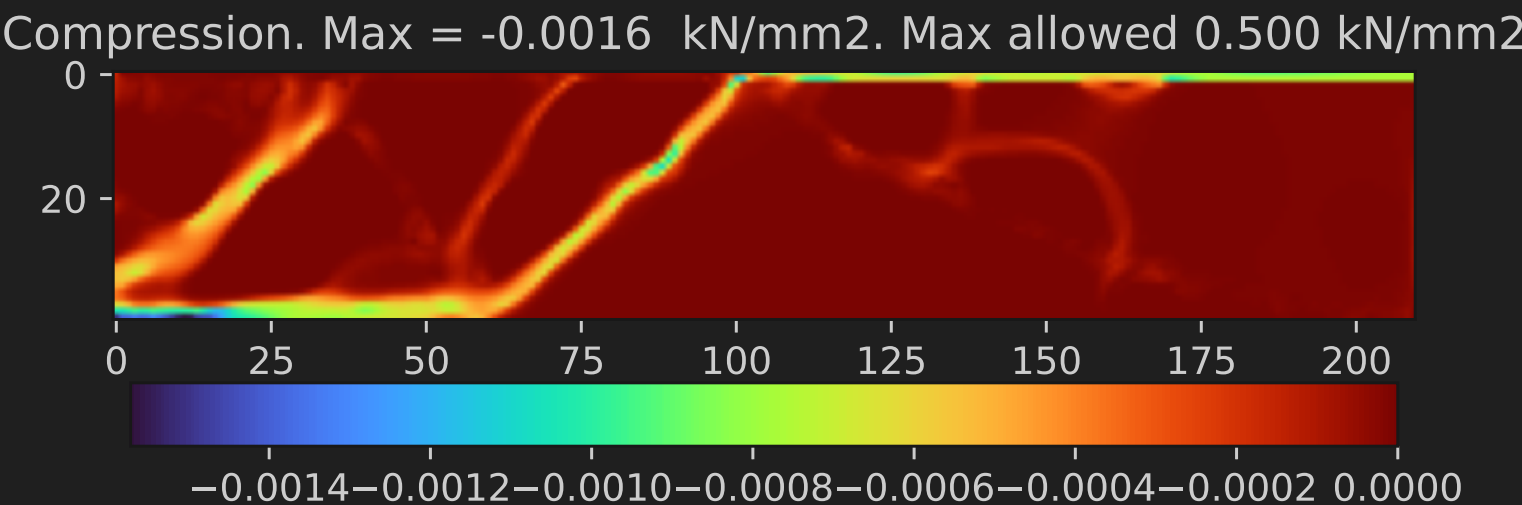
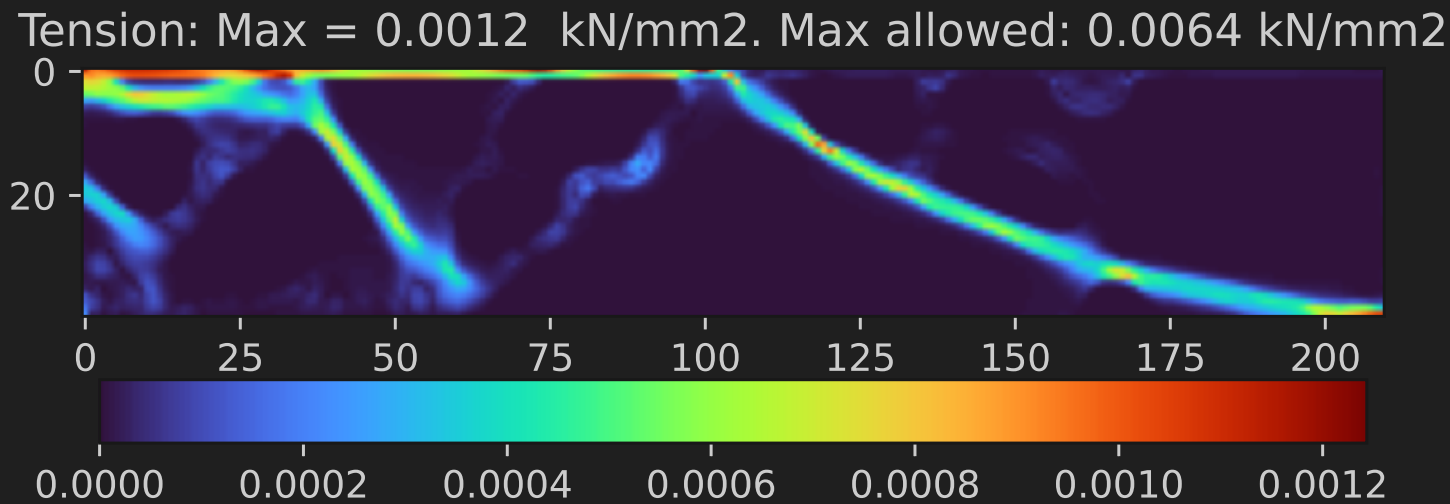
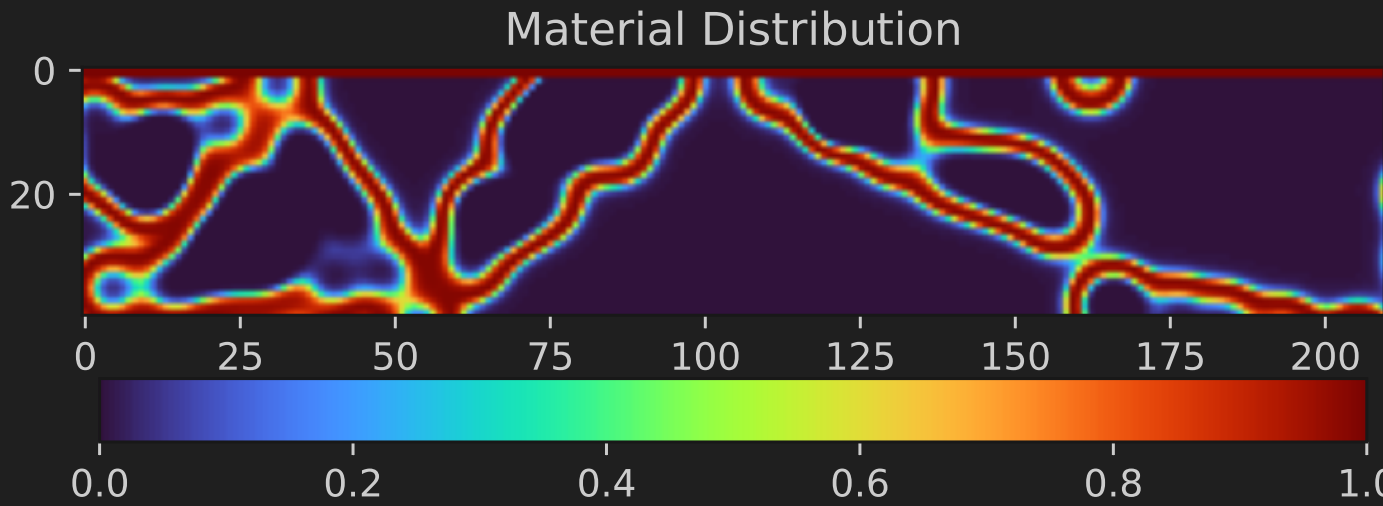
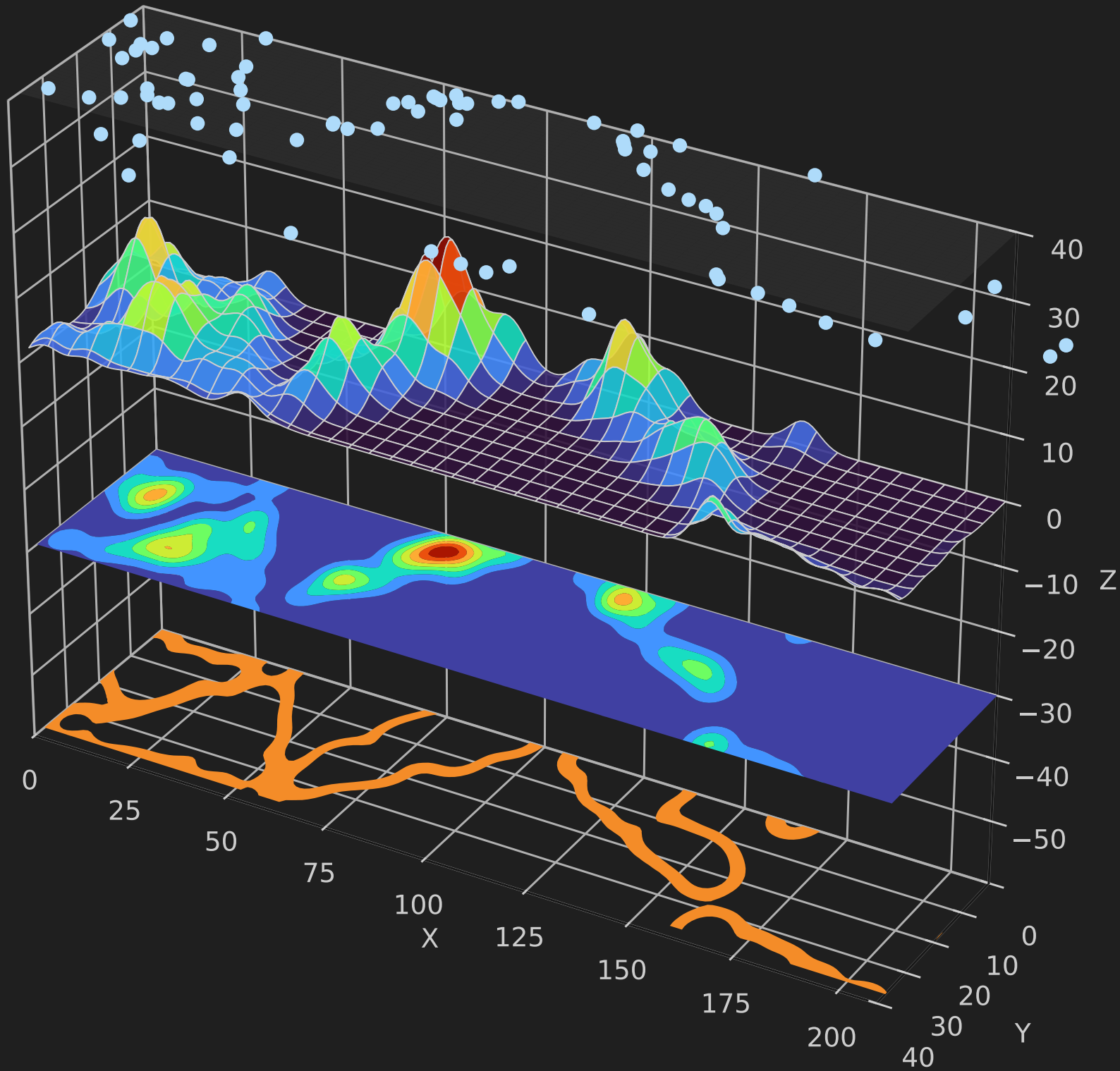
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 5.13 Shift = 2.26 Iteration = 064



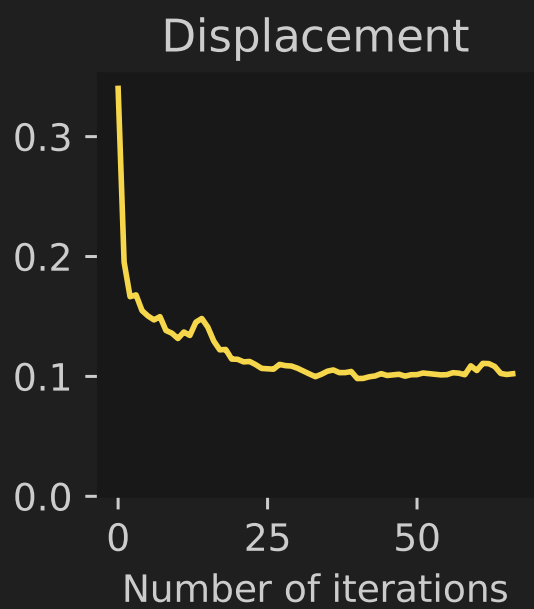
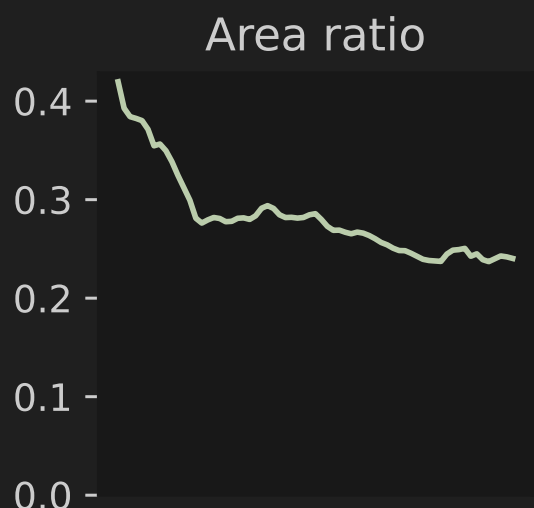
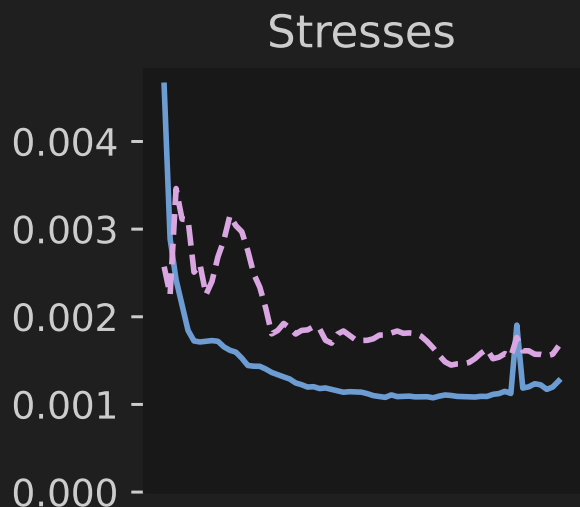
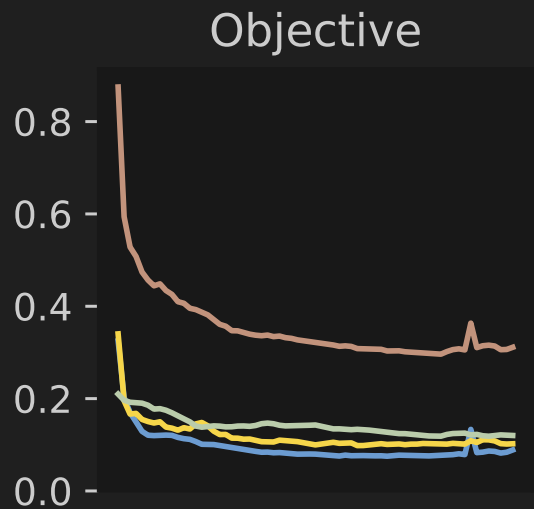
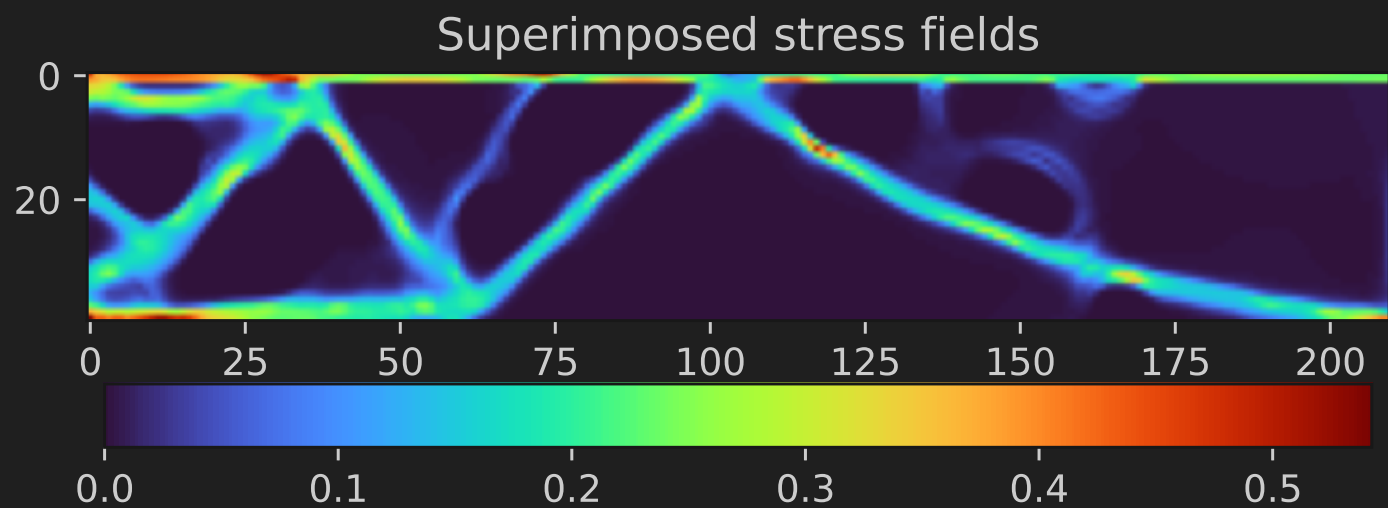
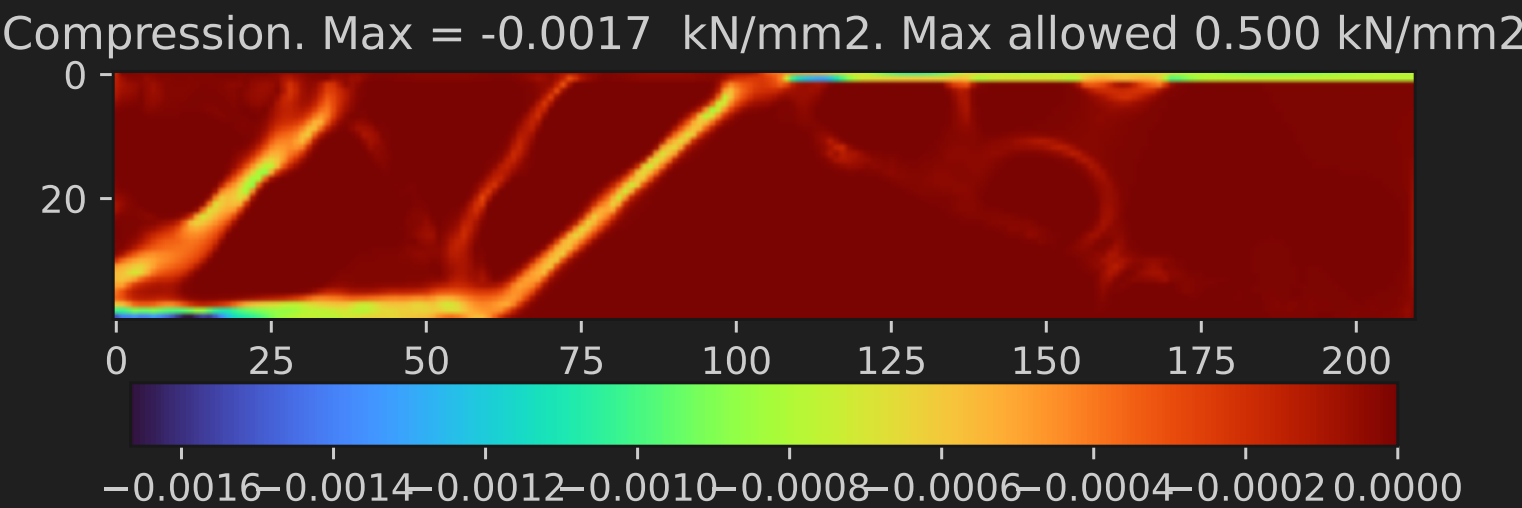
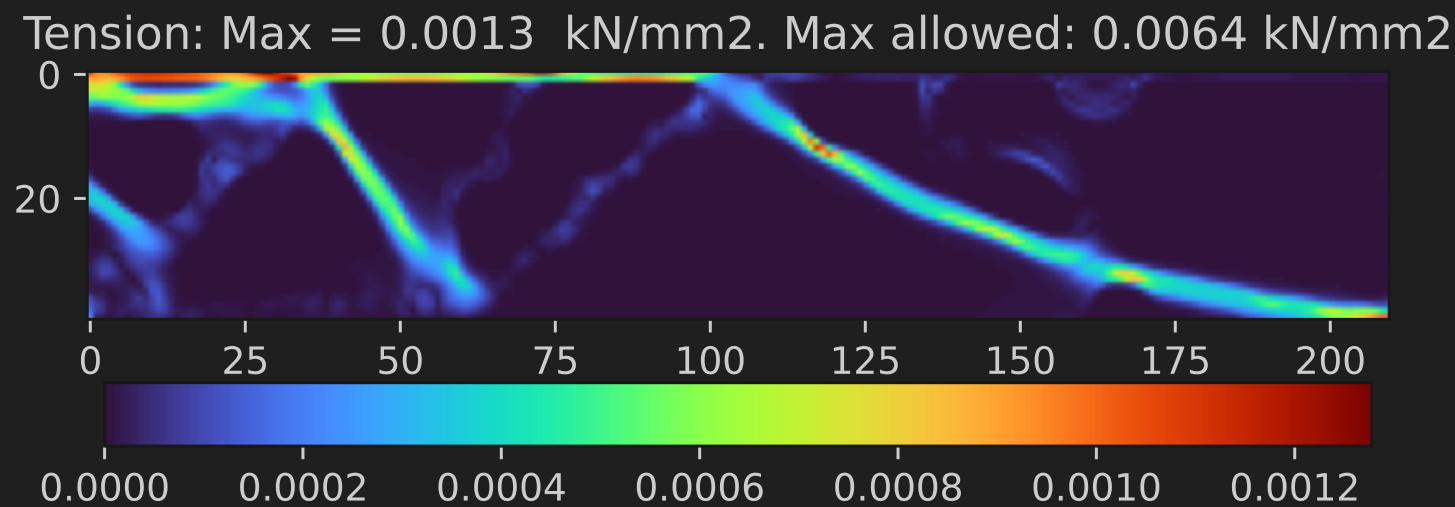
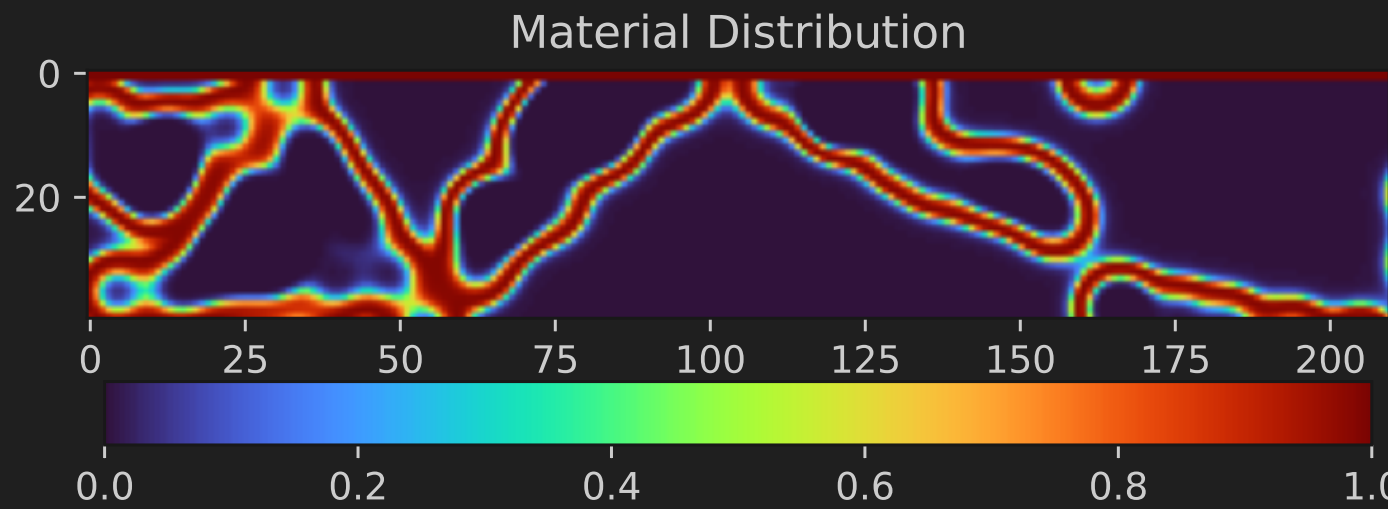
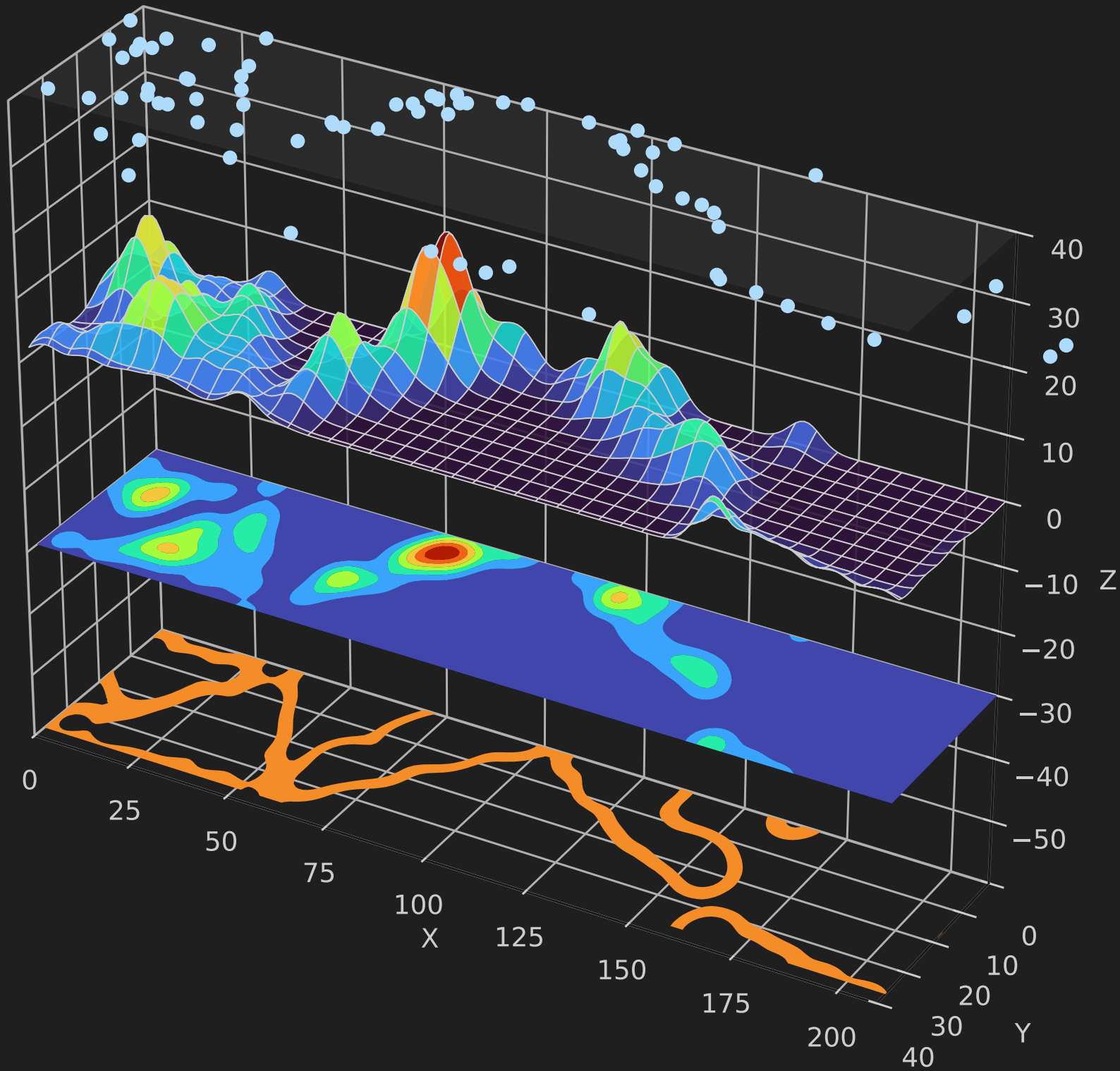
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 5.14 Shift = 2.30 Iteration = 065



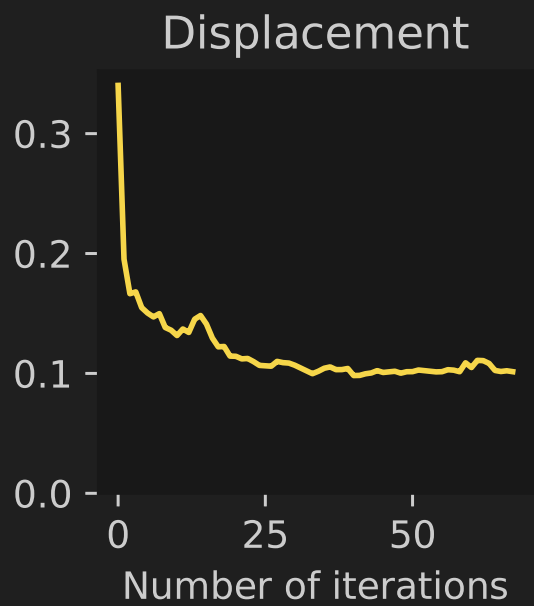
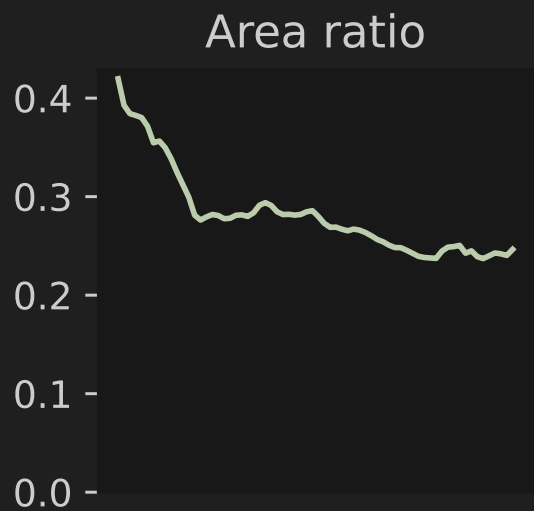
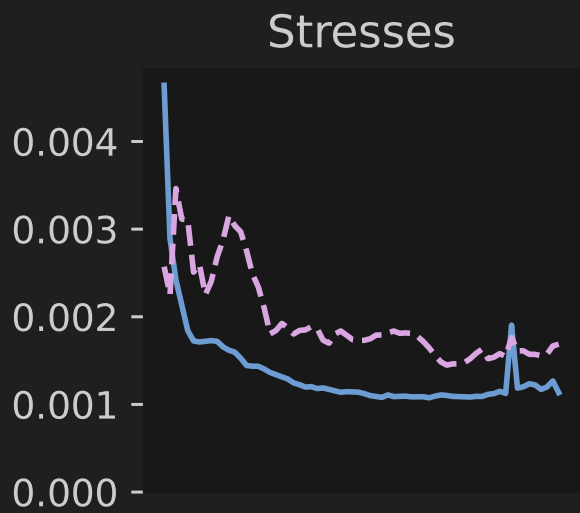
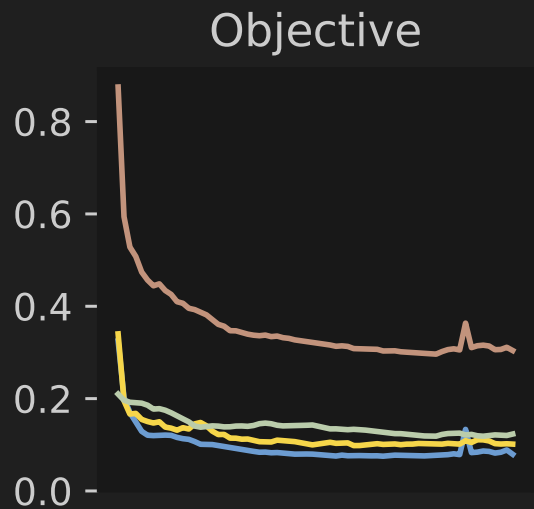
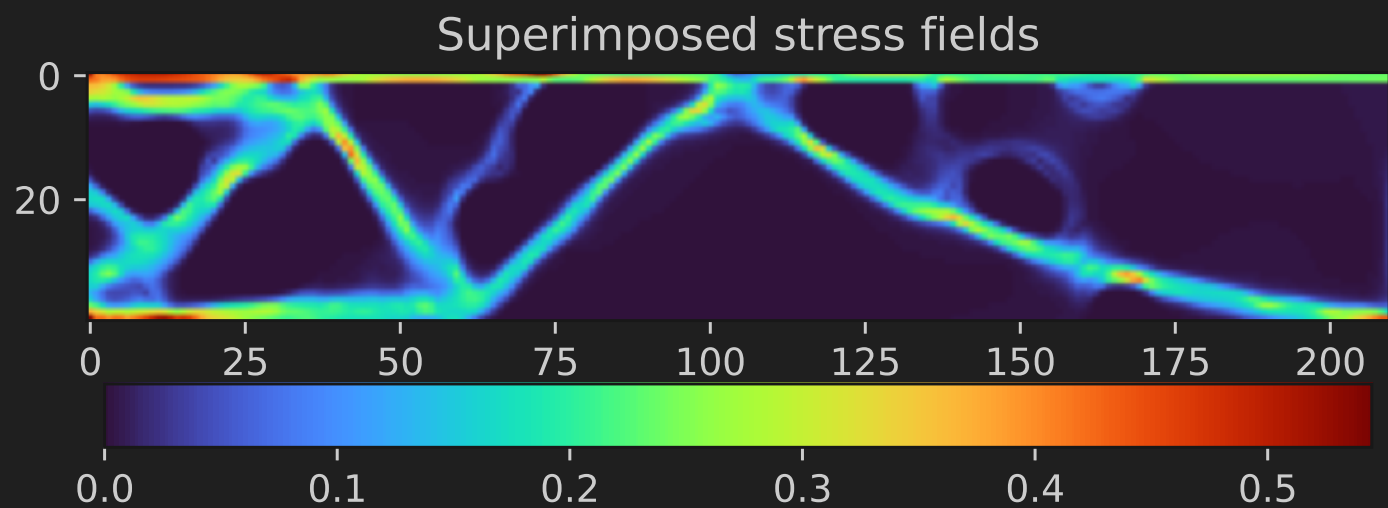
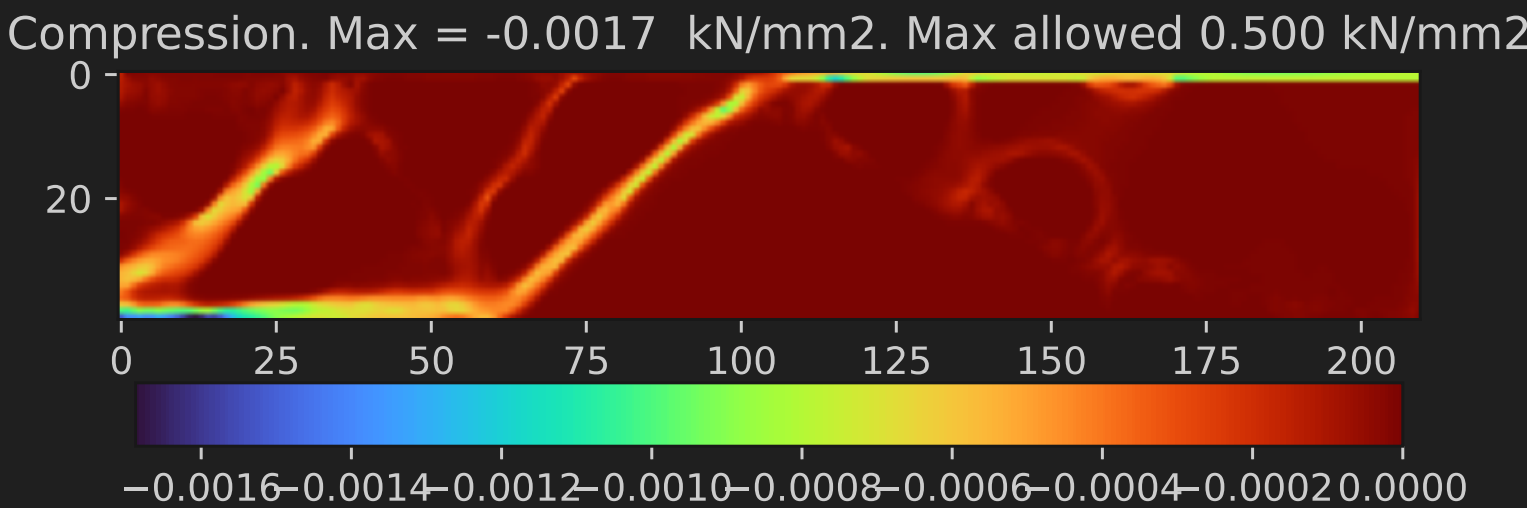
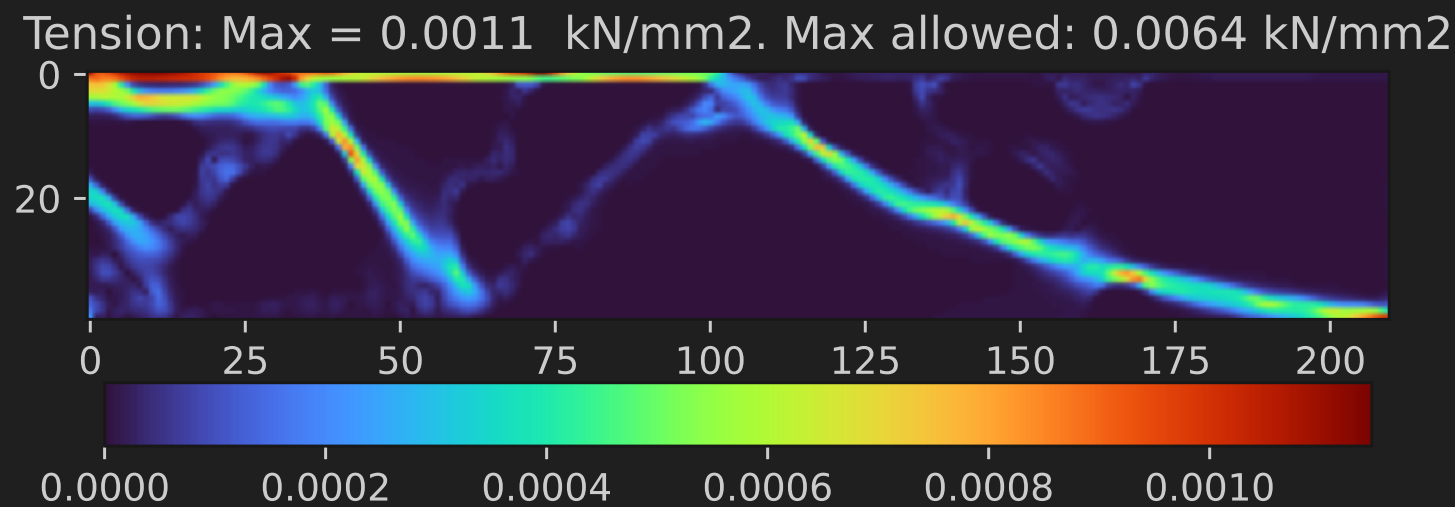
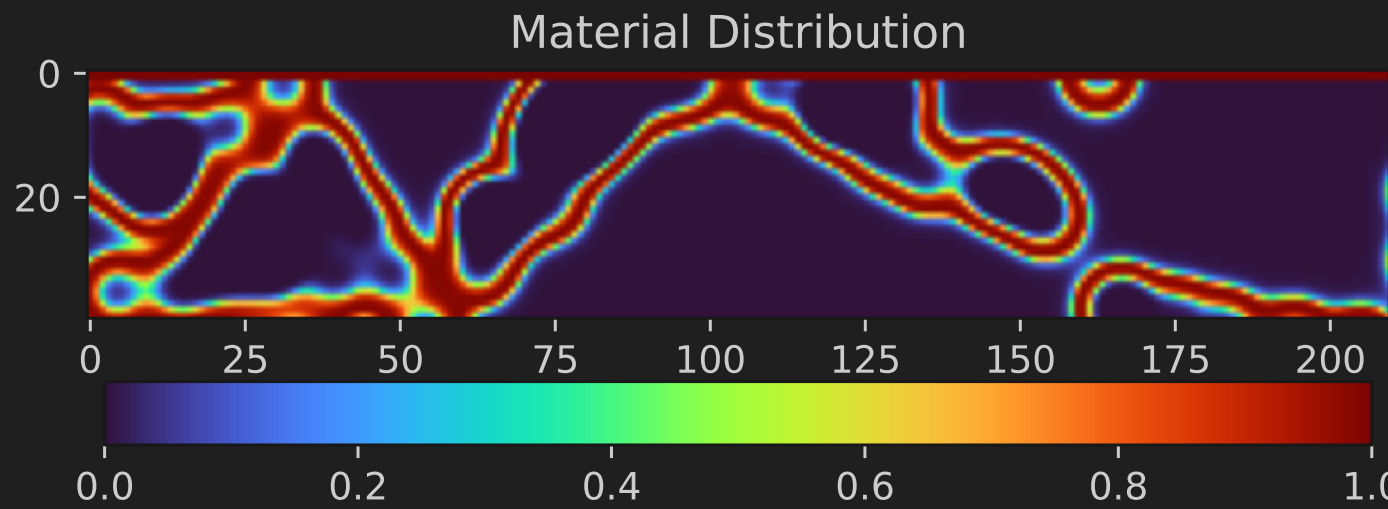
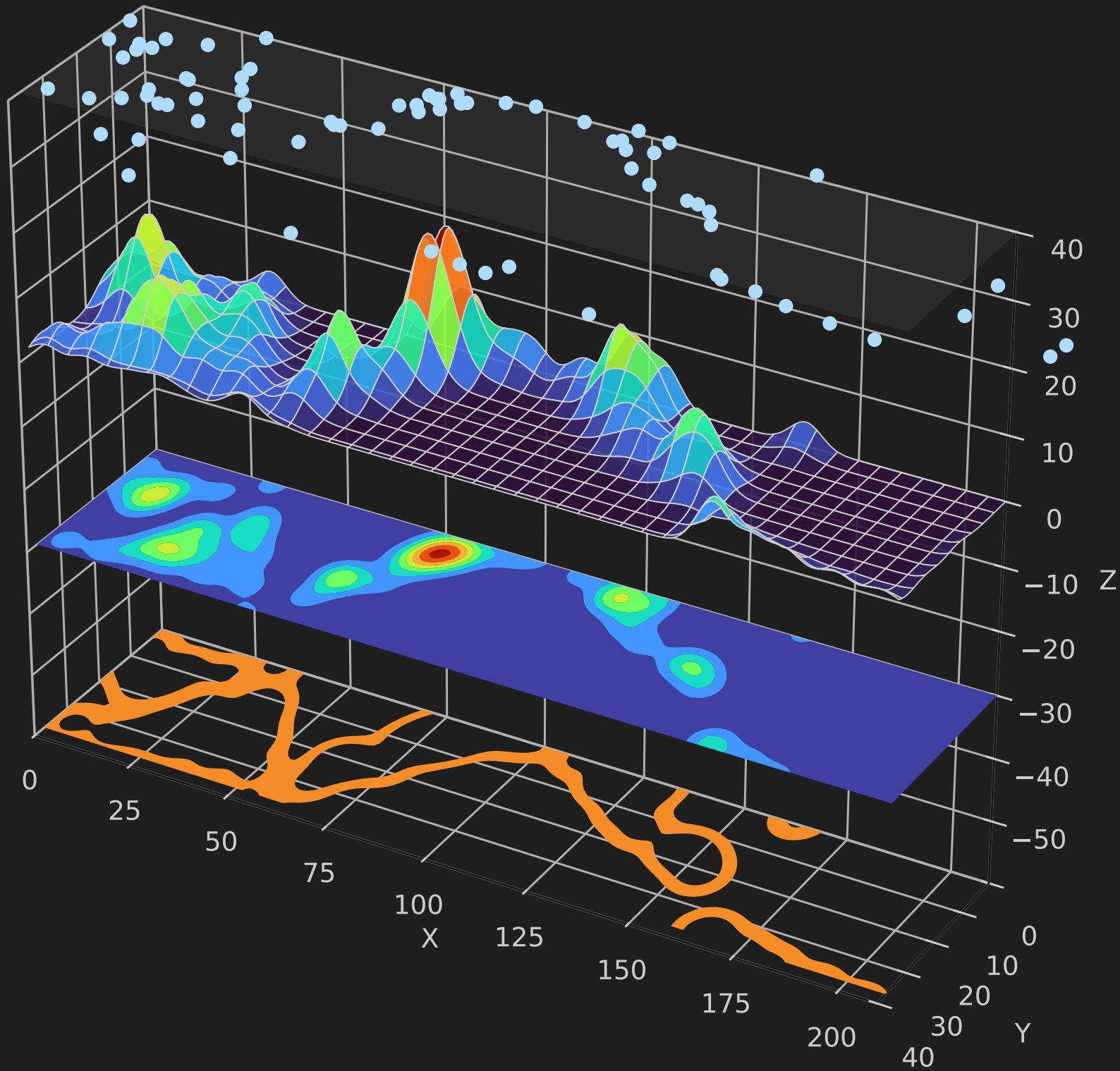
Objective = (Stress: 70 * 0.0013) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 5.20 Shift = 2.30 Iteration = 066



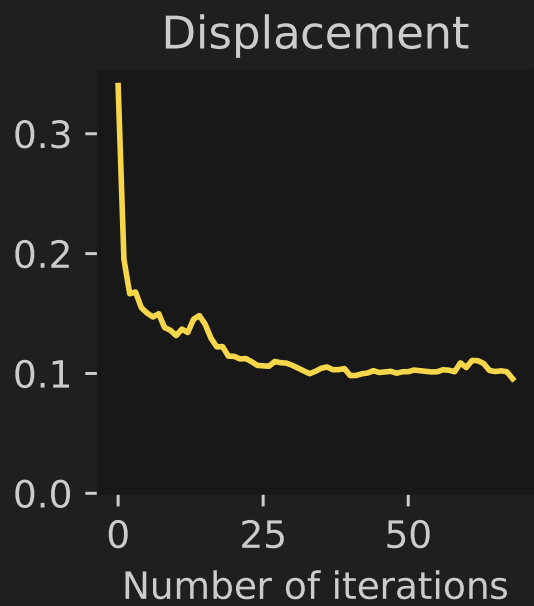
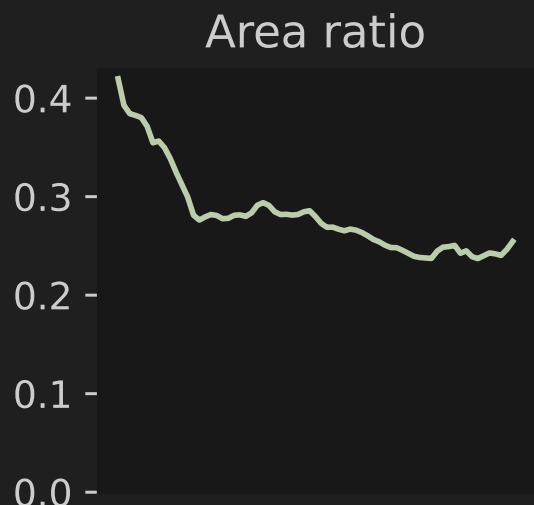
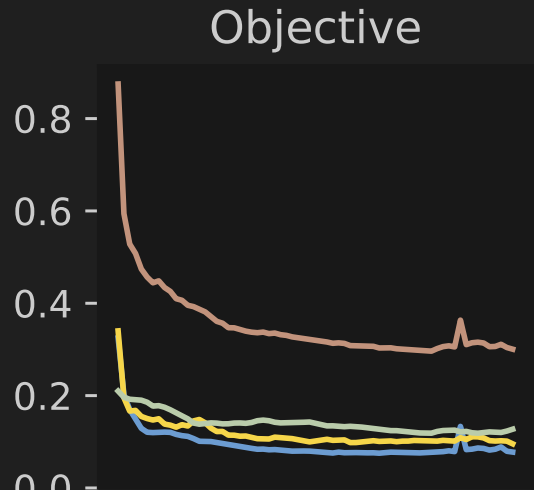
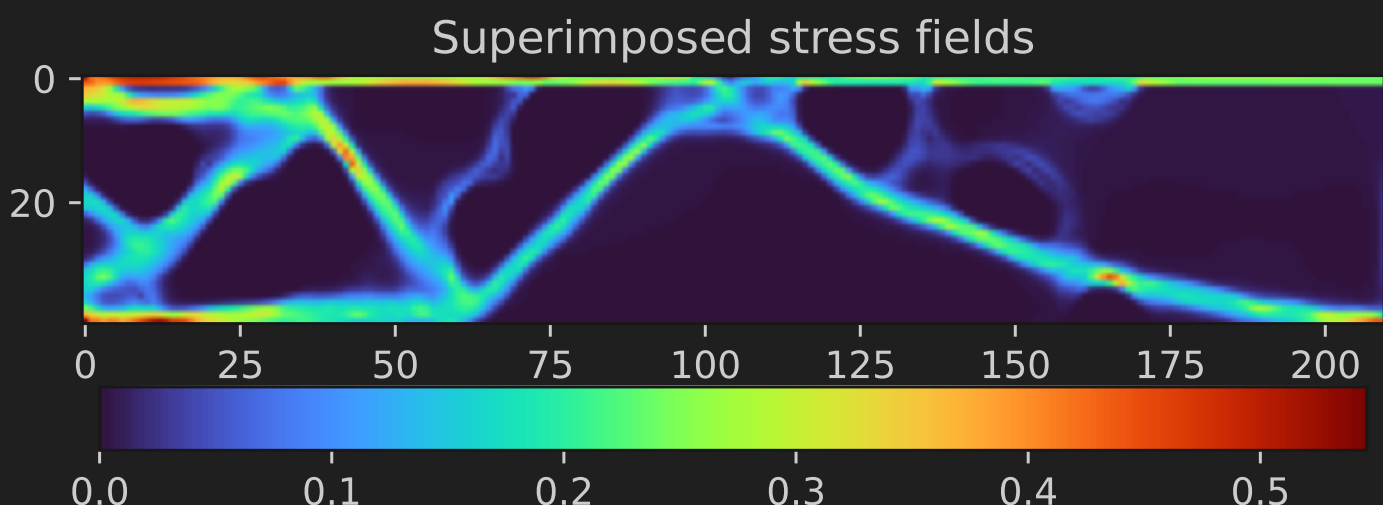
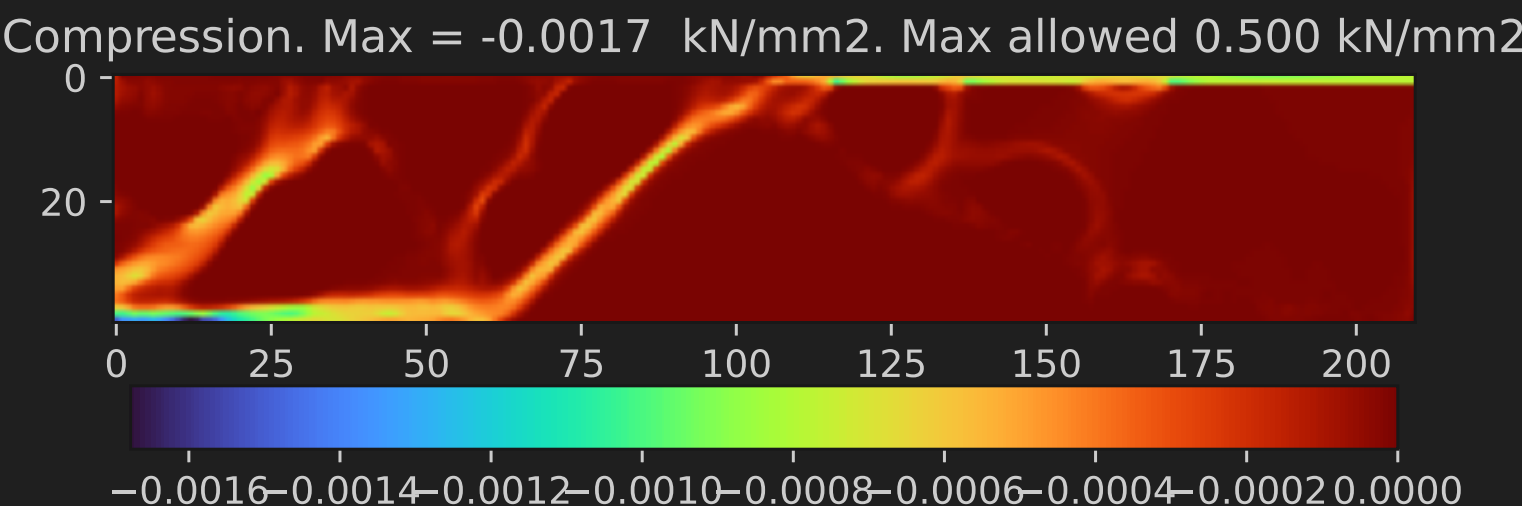
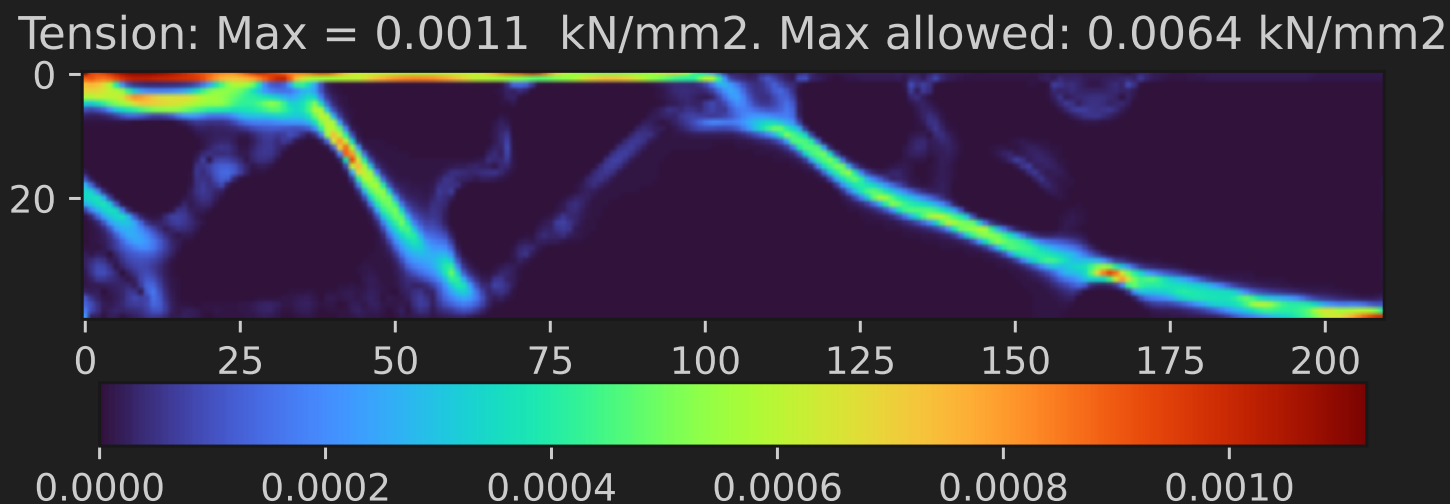
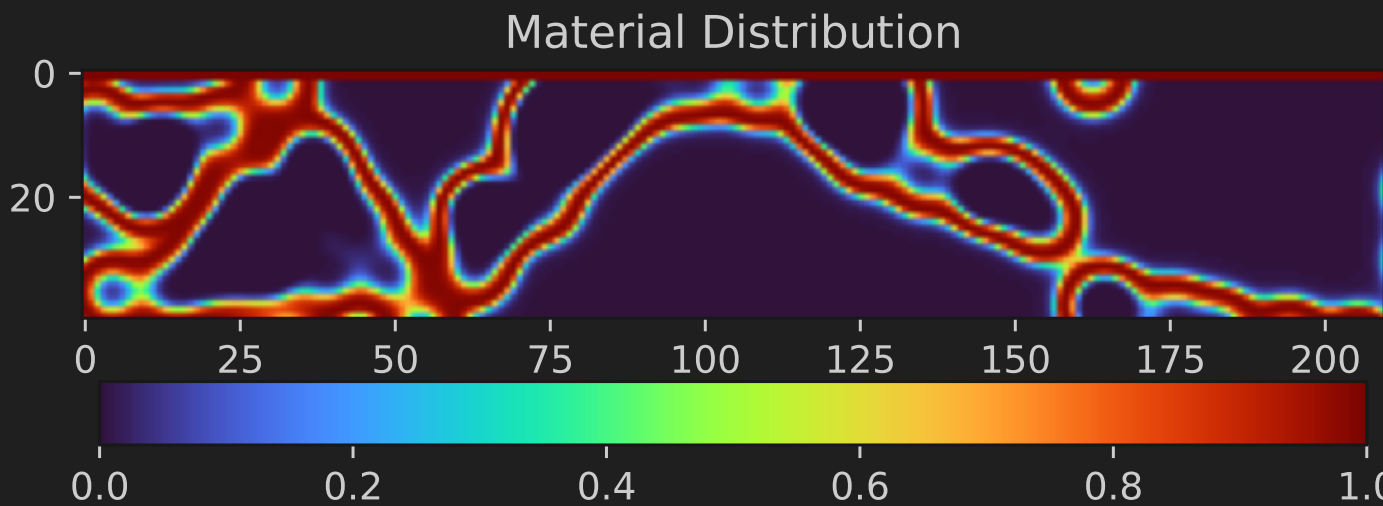
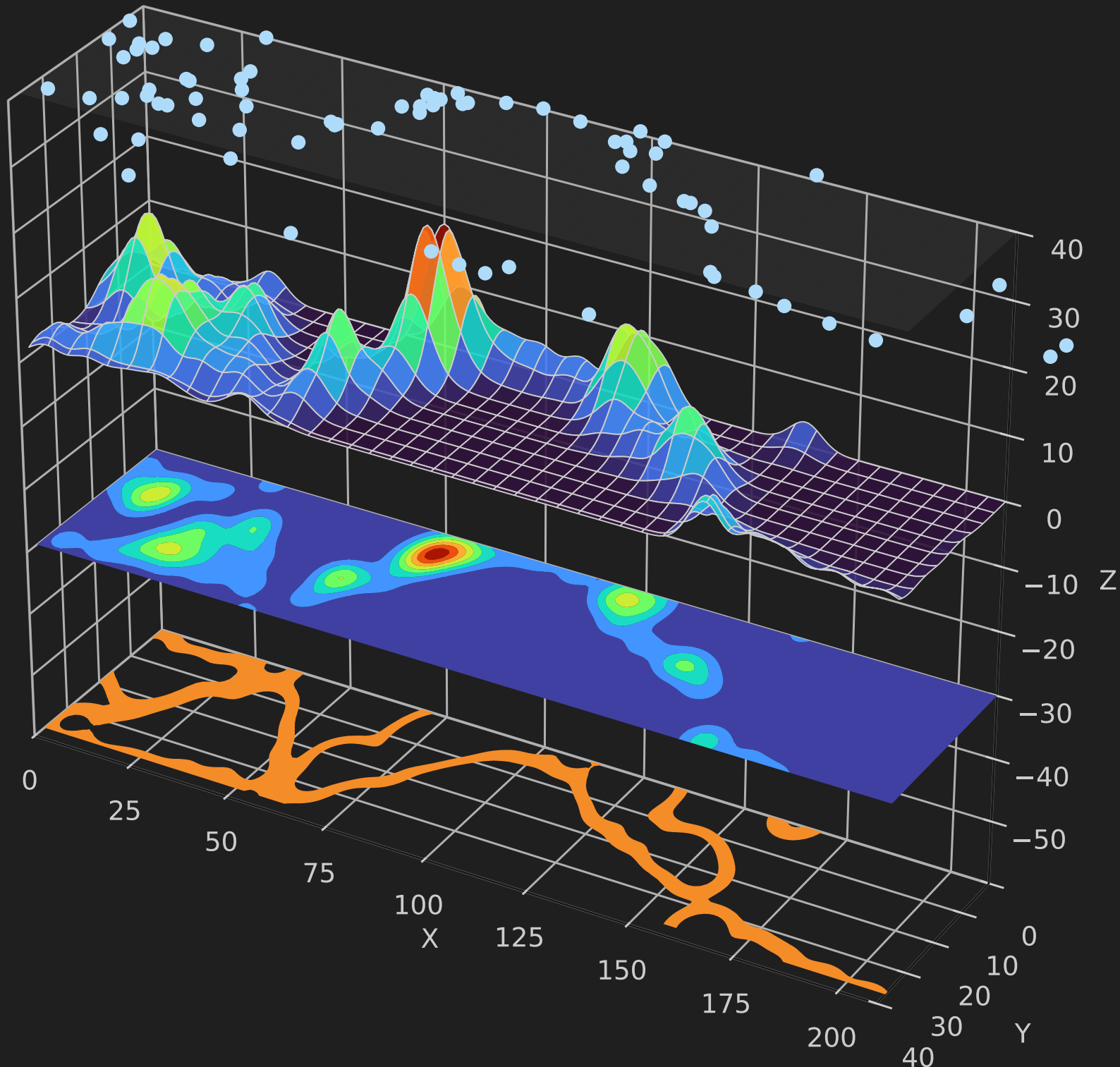
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 5.22 Shift = 2.34 Iteration = 067



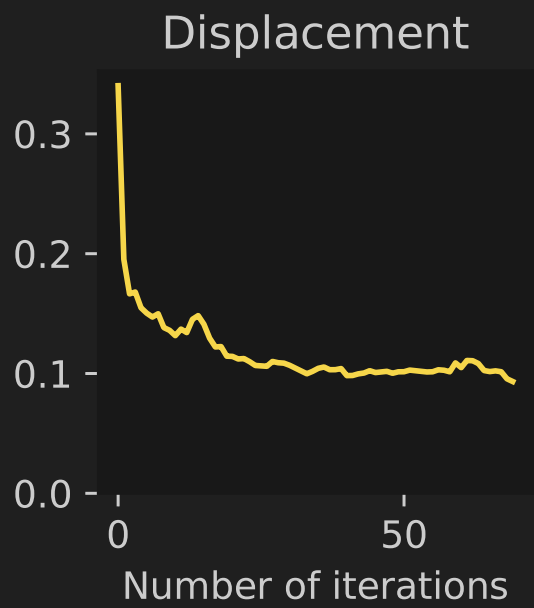
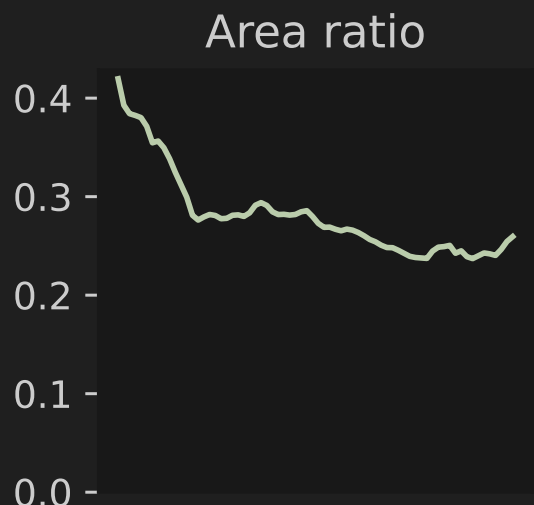
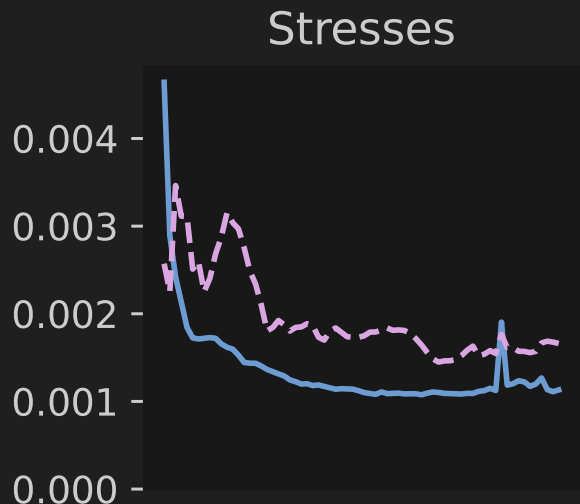
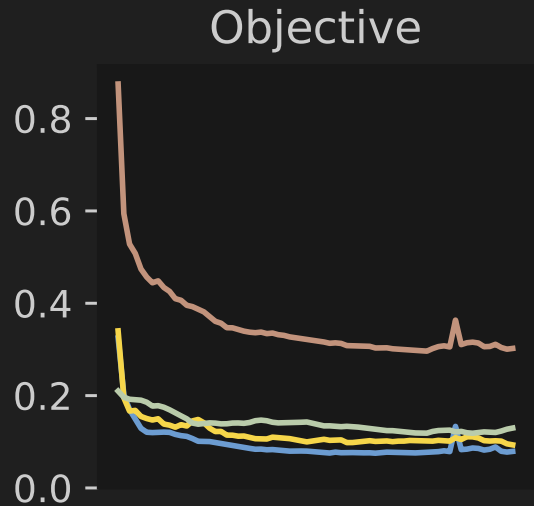
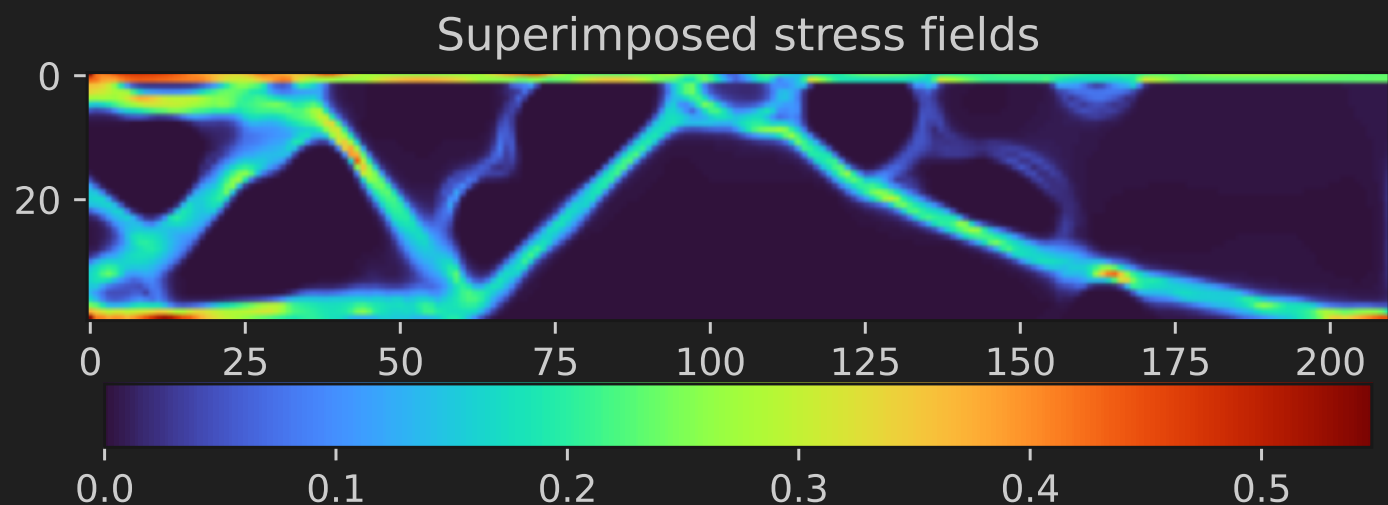
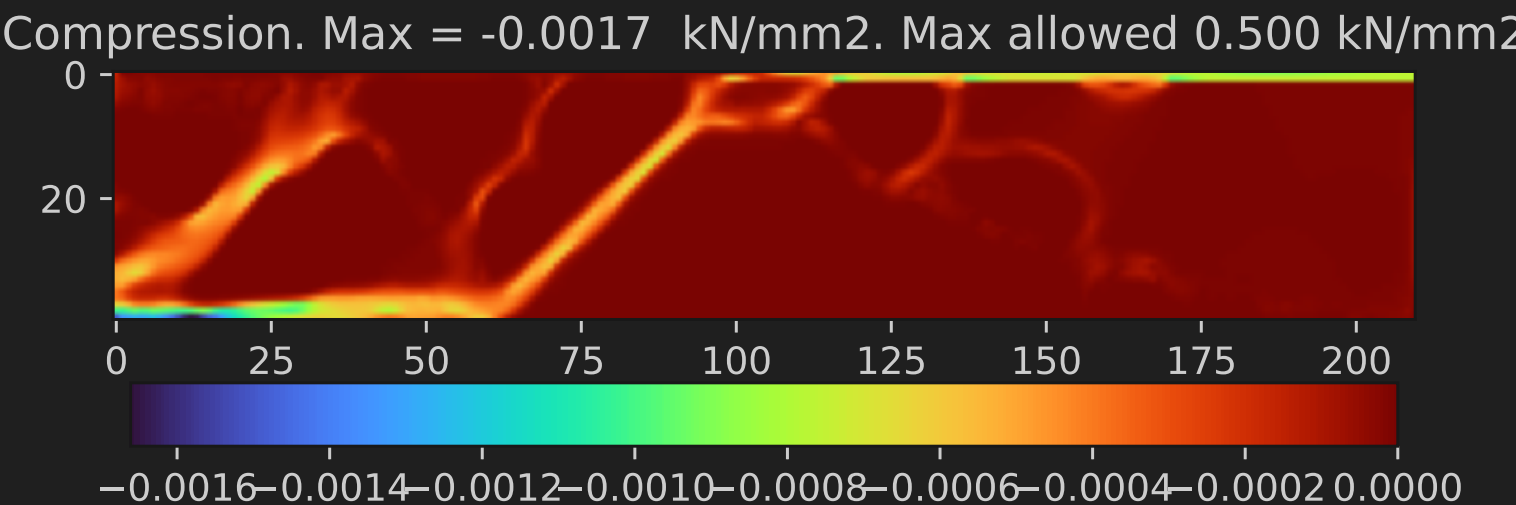
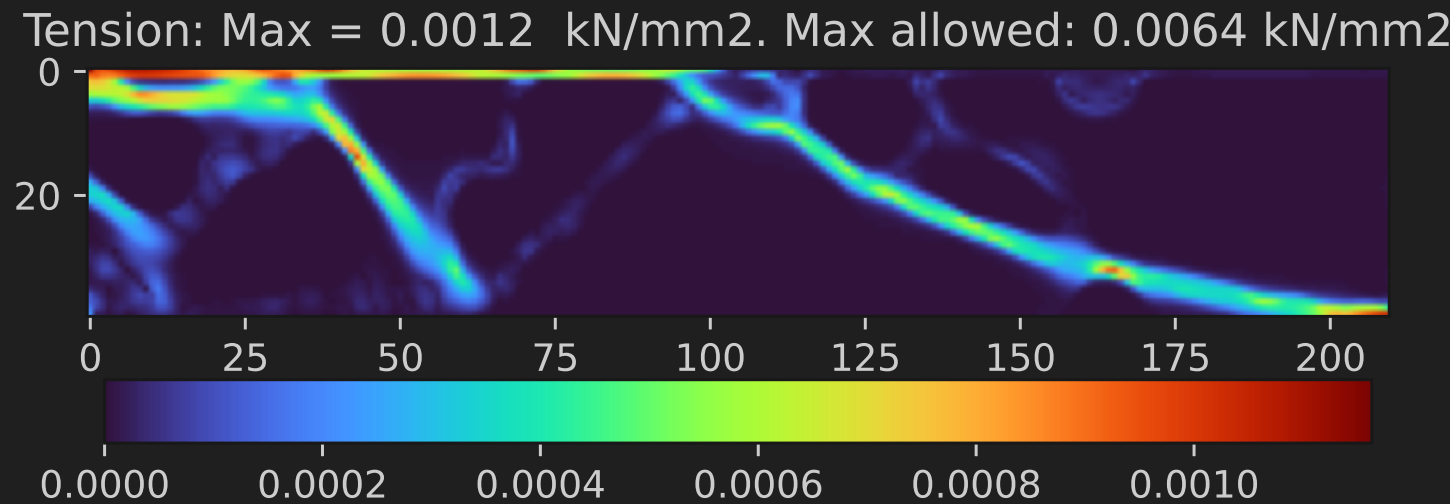
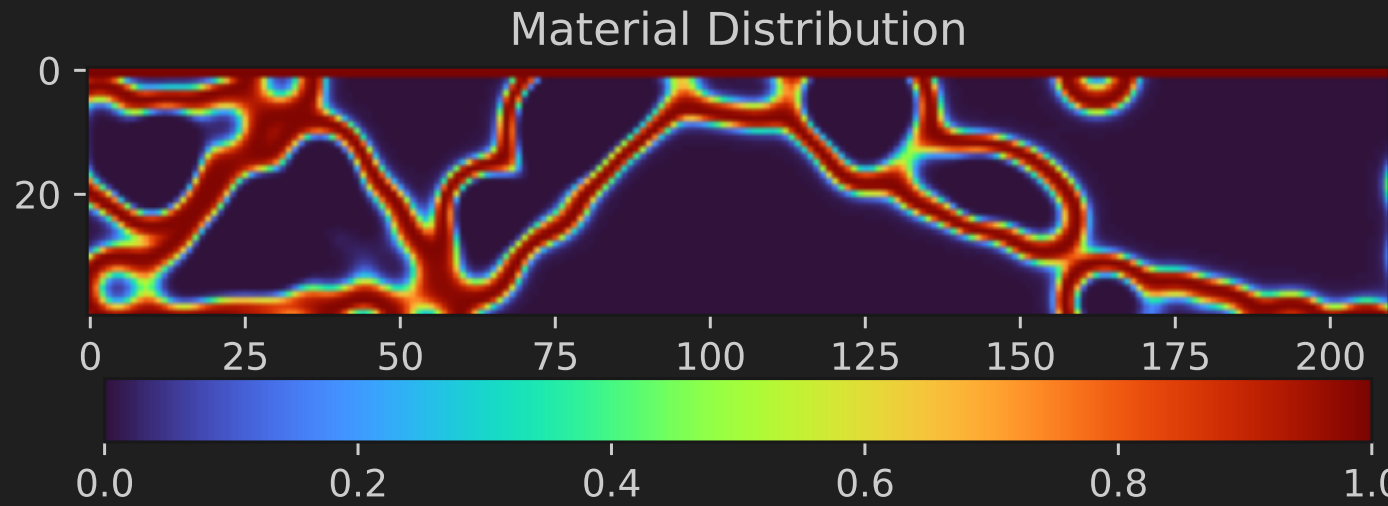
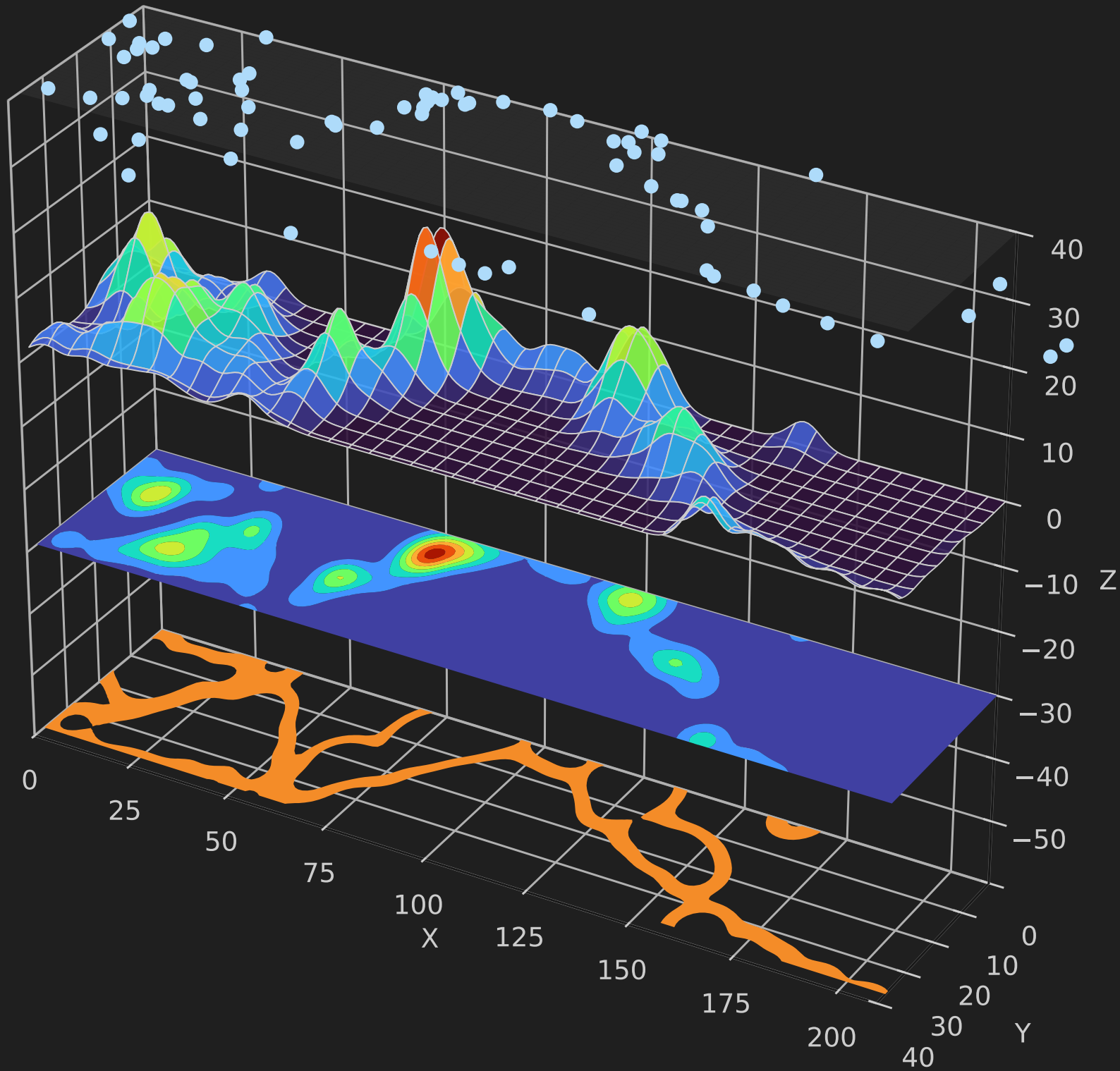
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 5.24 Shift = 2.37 Iteration = 068



Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.26) - (Displacement: 1 * -0.09) = 0.30

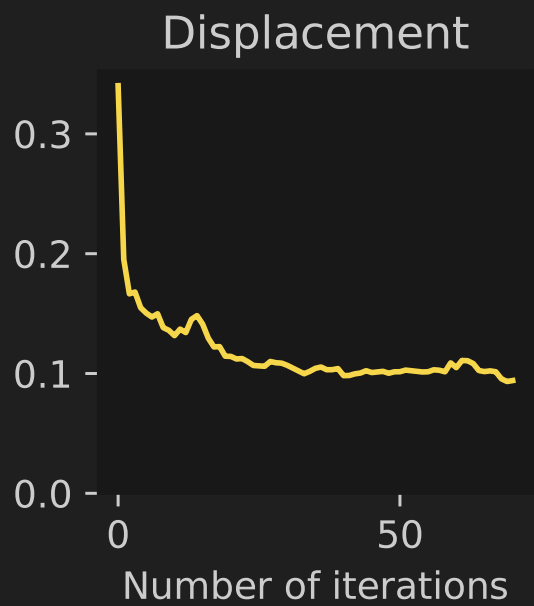
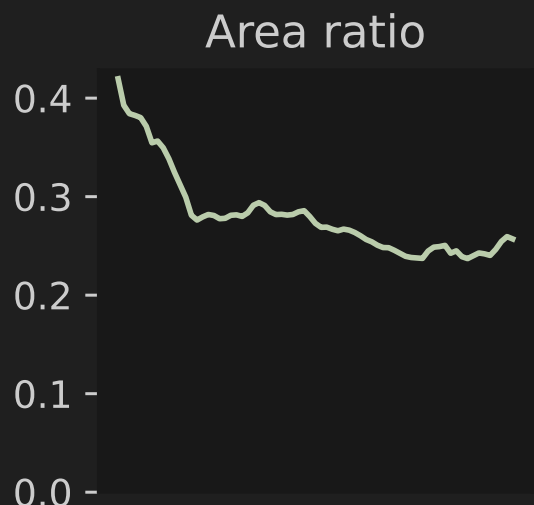
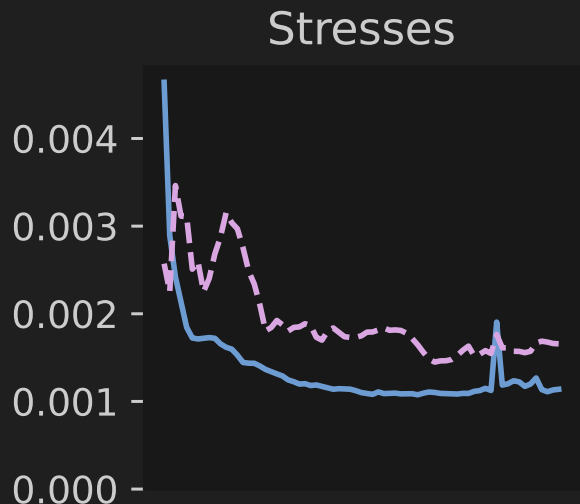
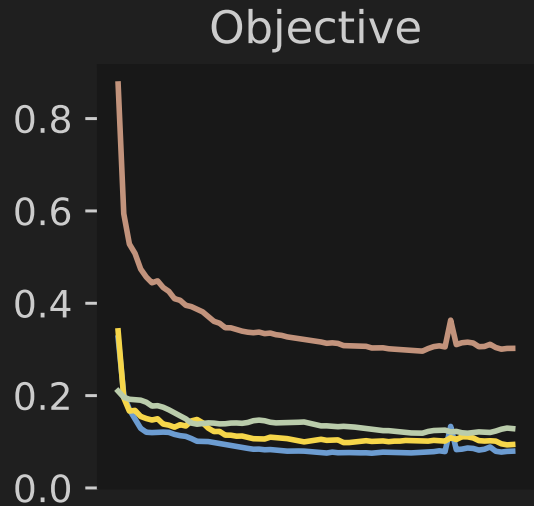
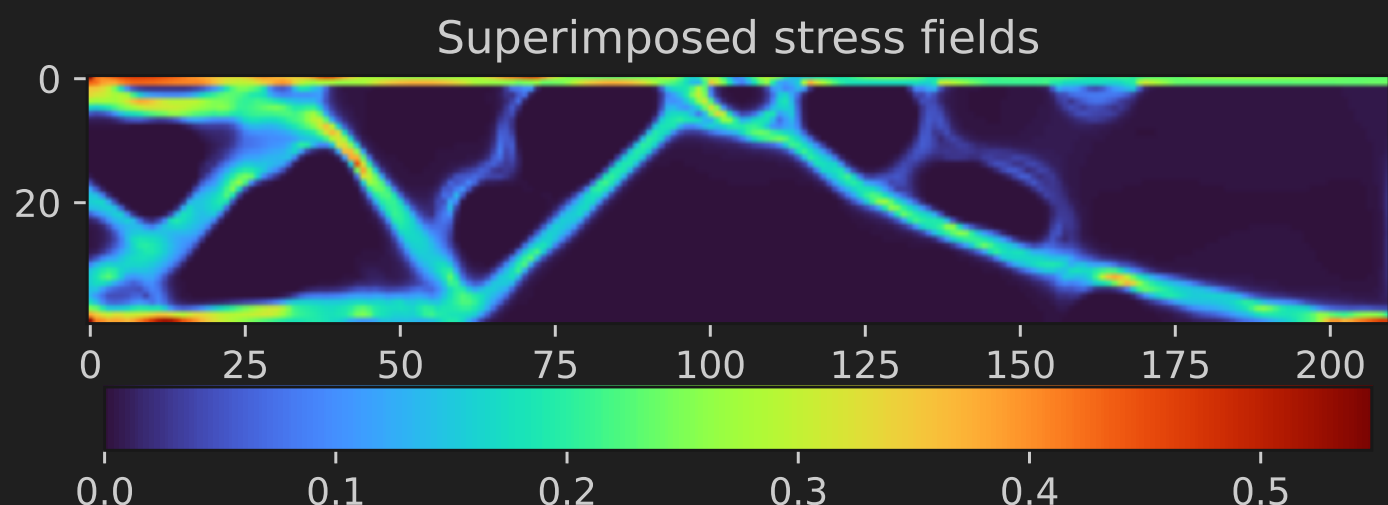
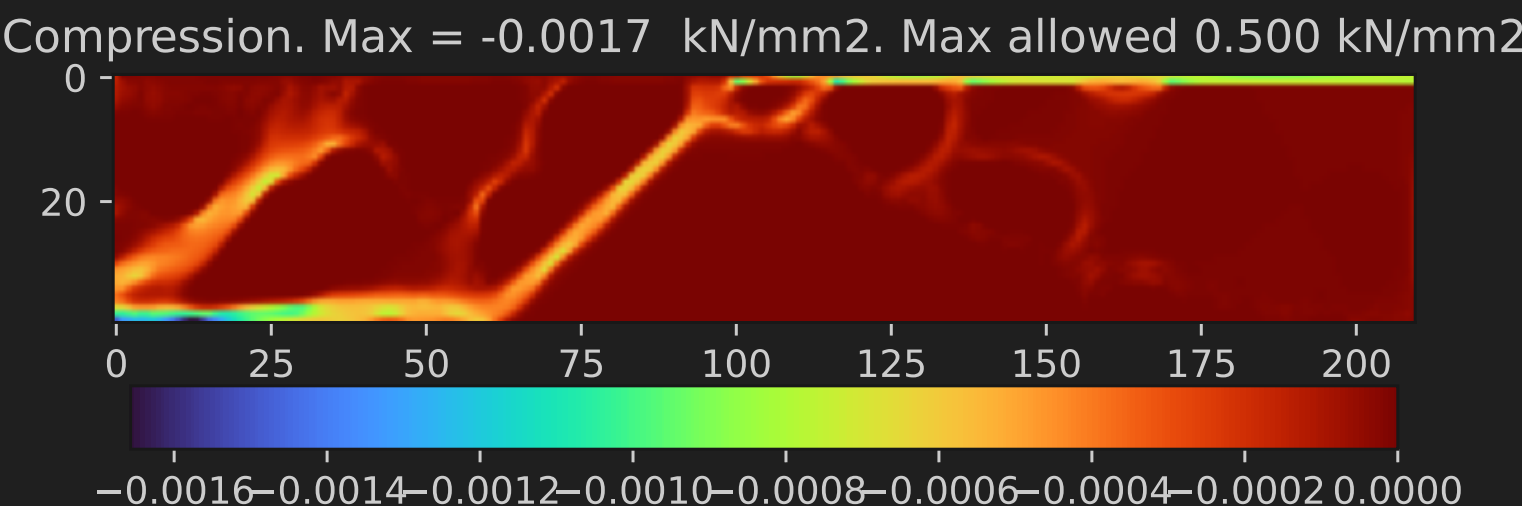
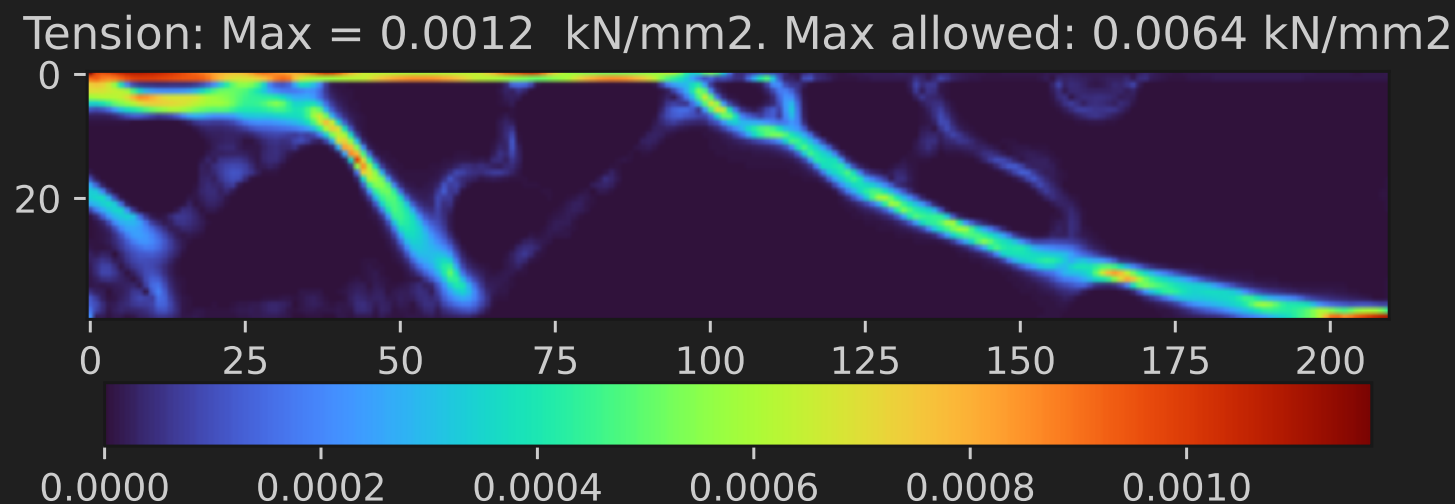
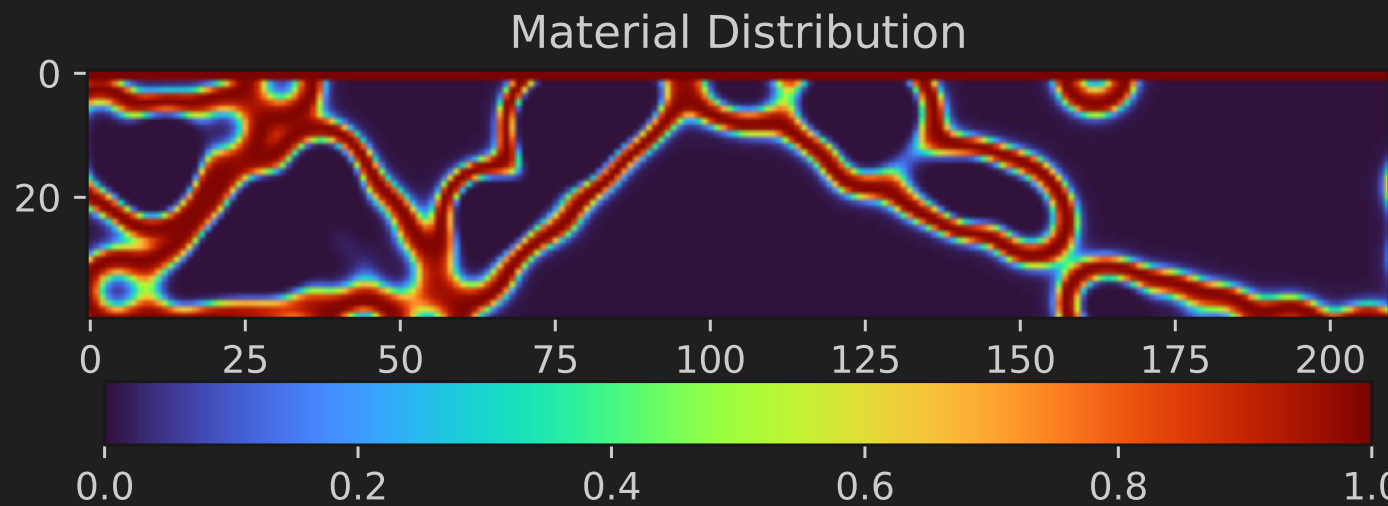
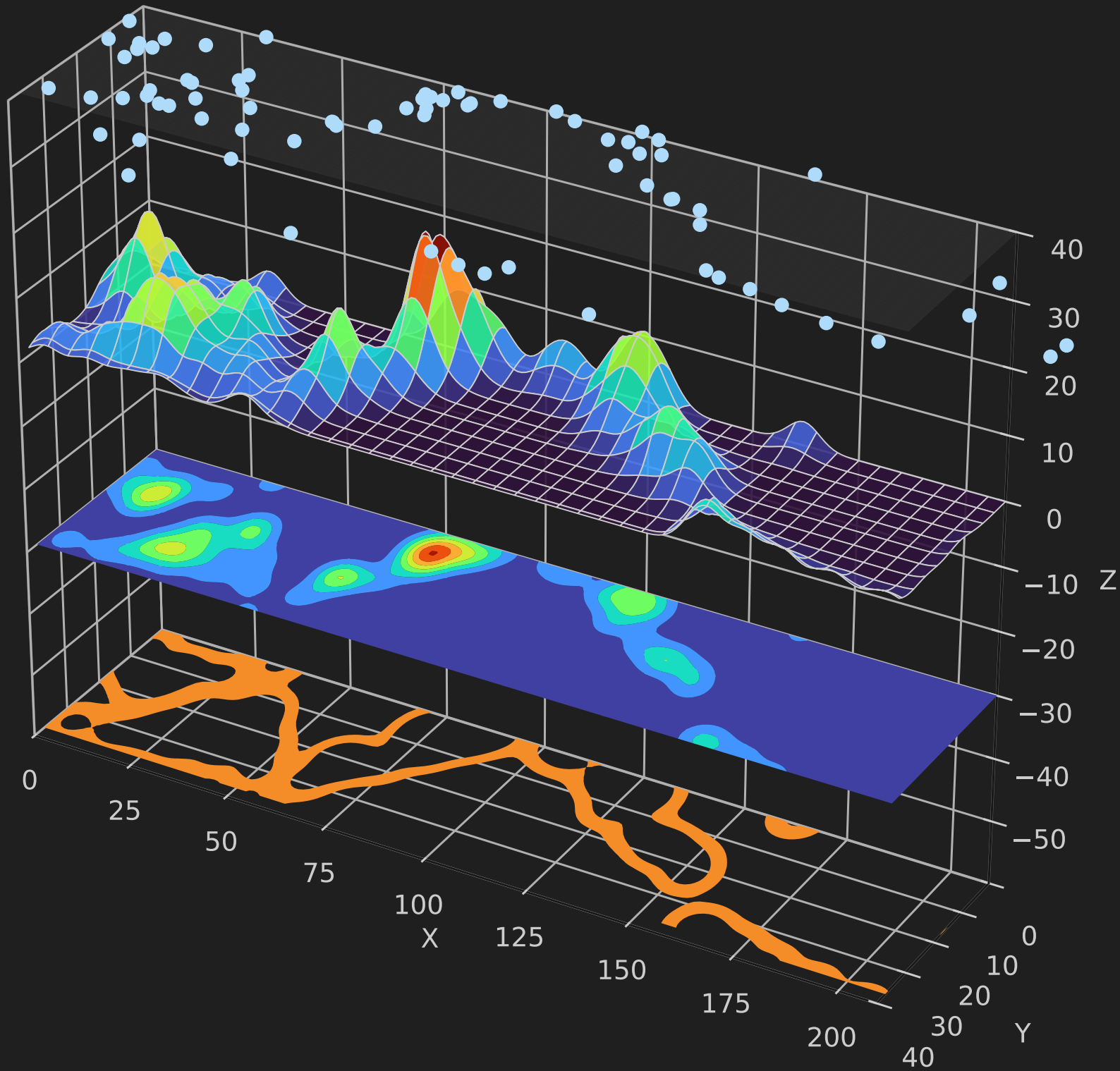
Spread Gaussian = 5.26 Shift = 2.41 Iteration = 069



Number of iterations

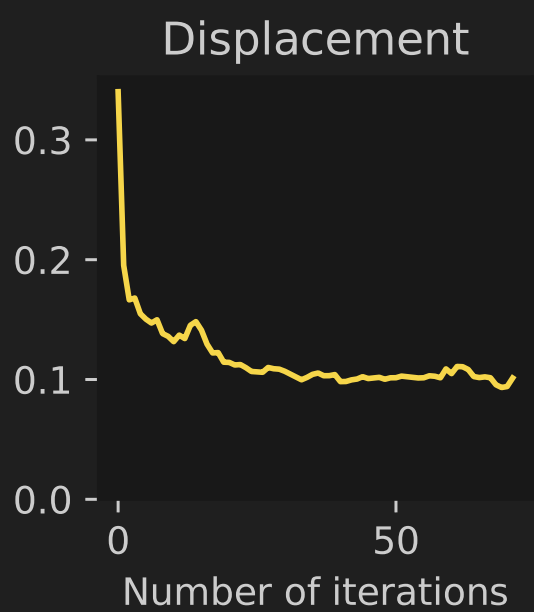
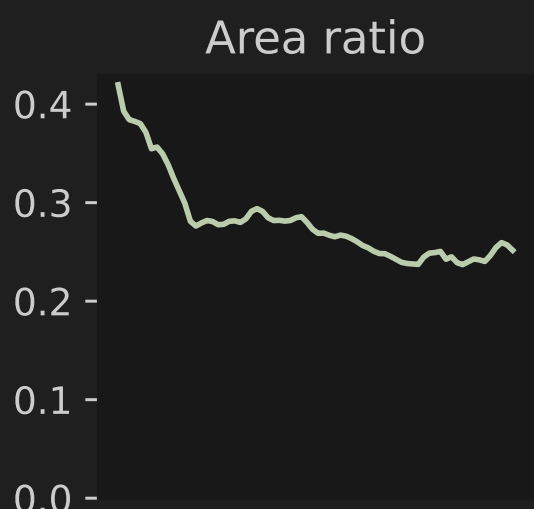
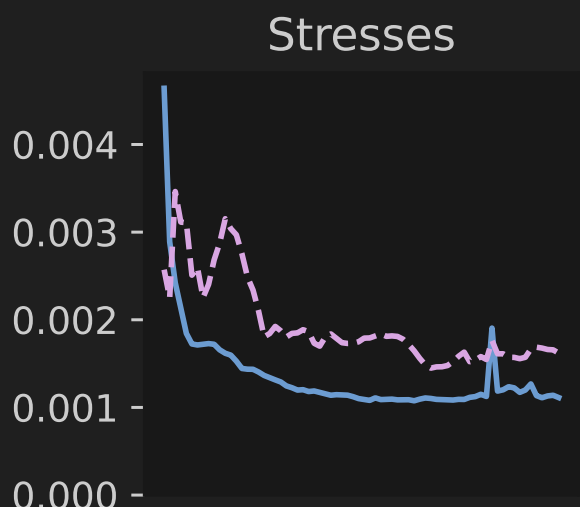
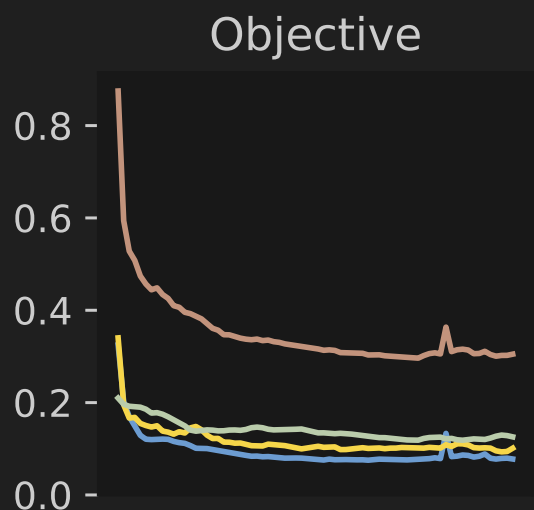
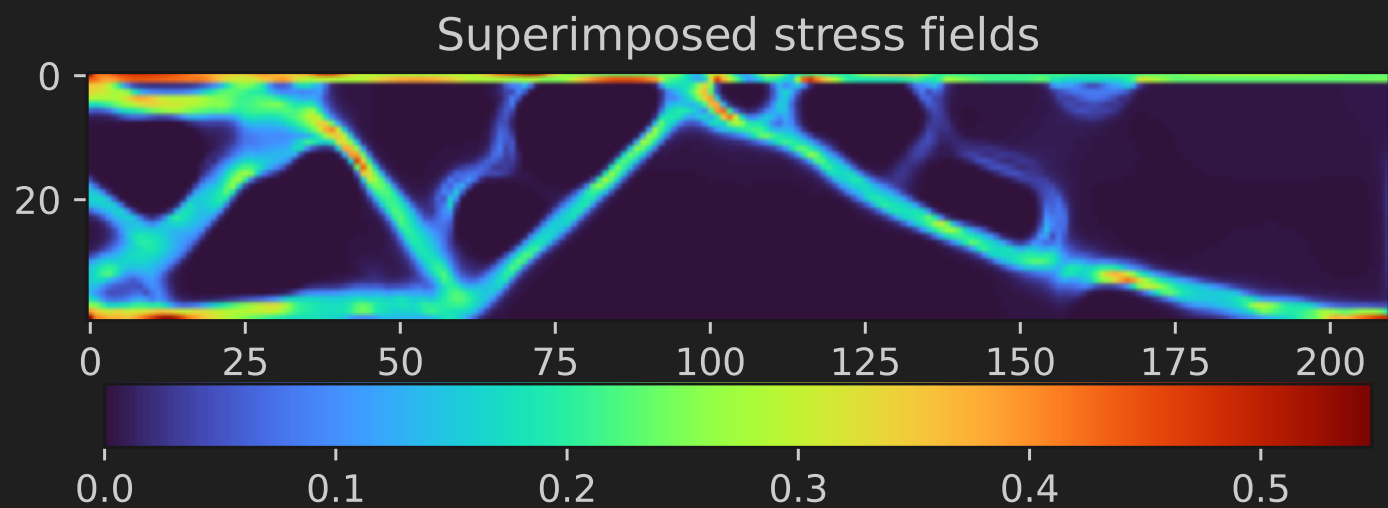
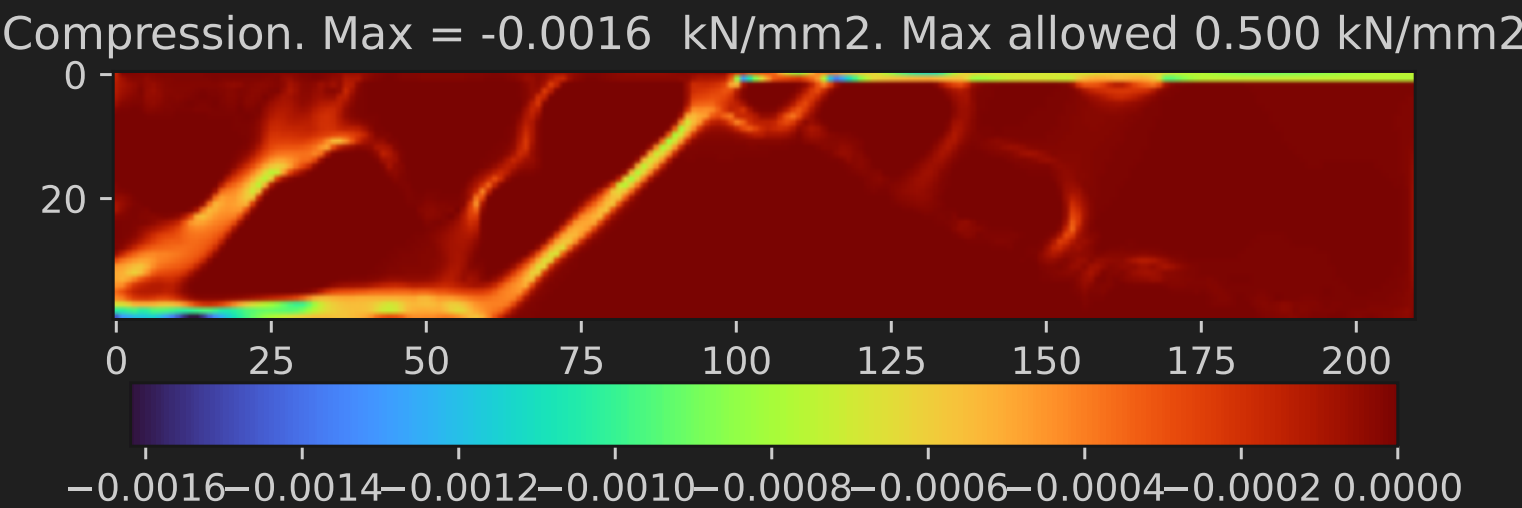
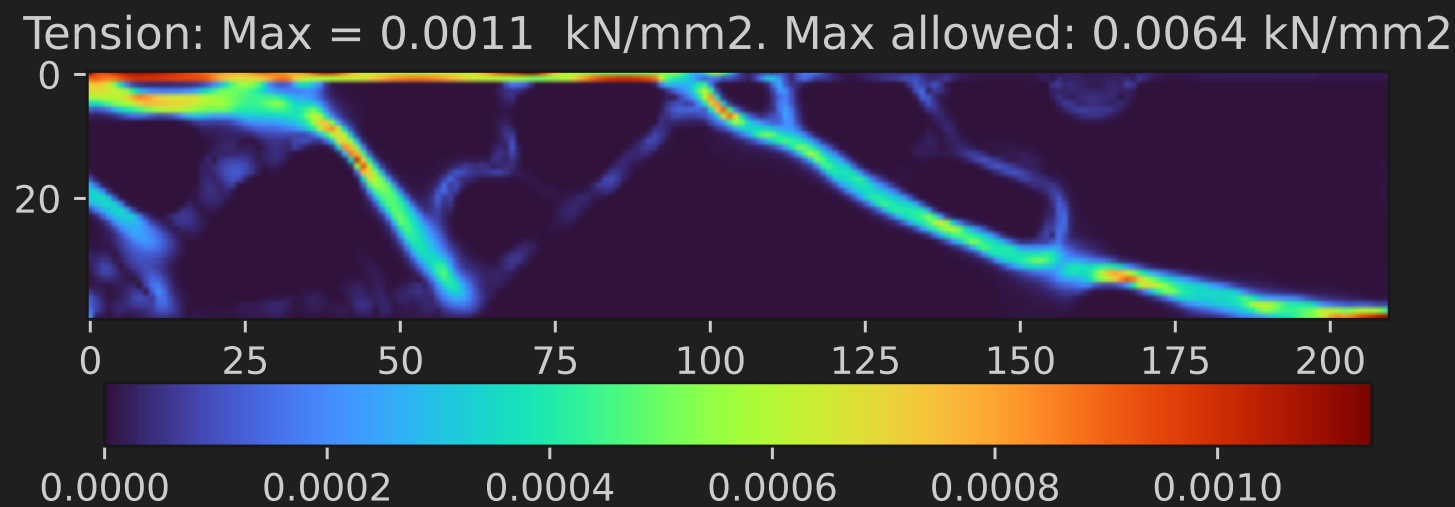
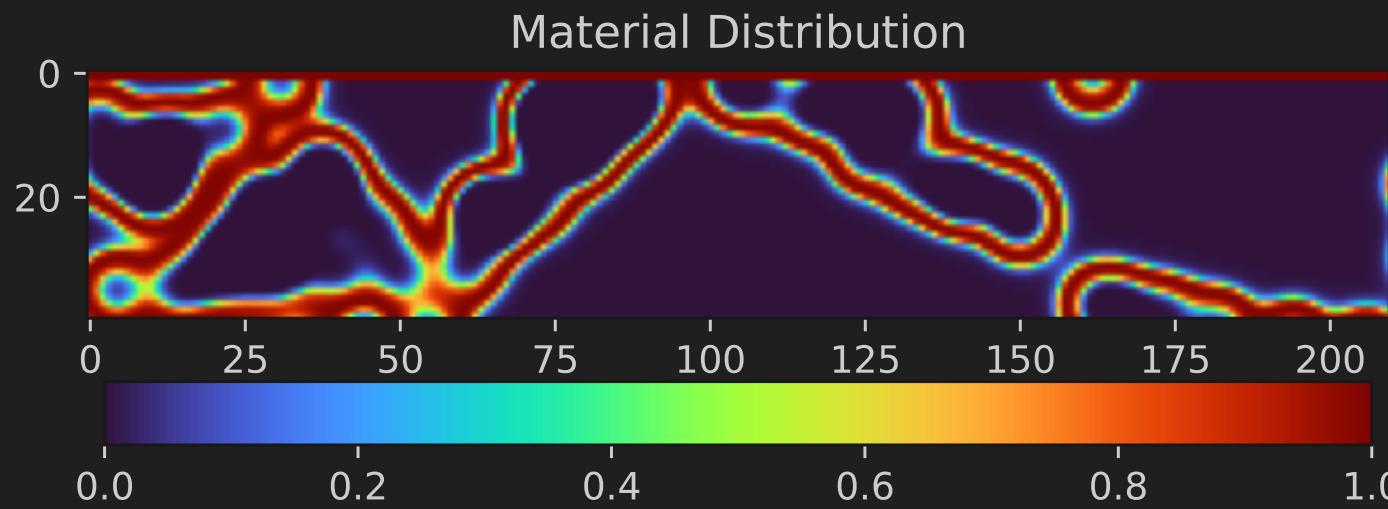
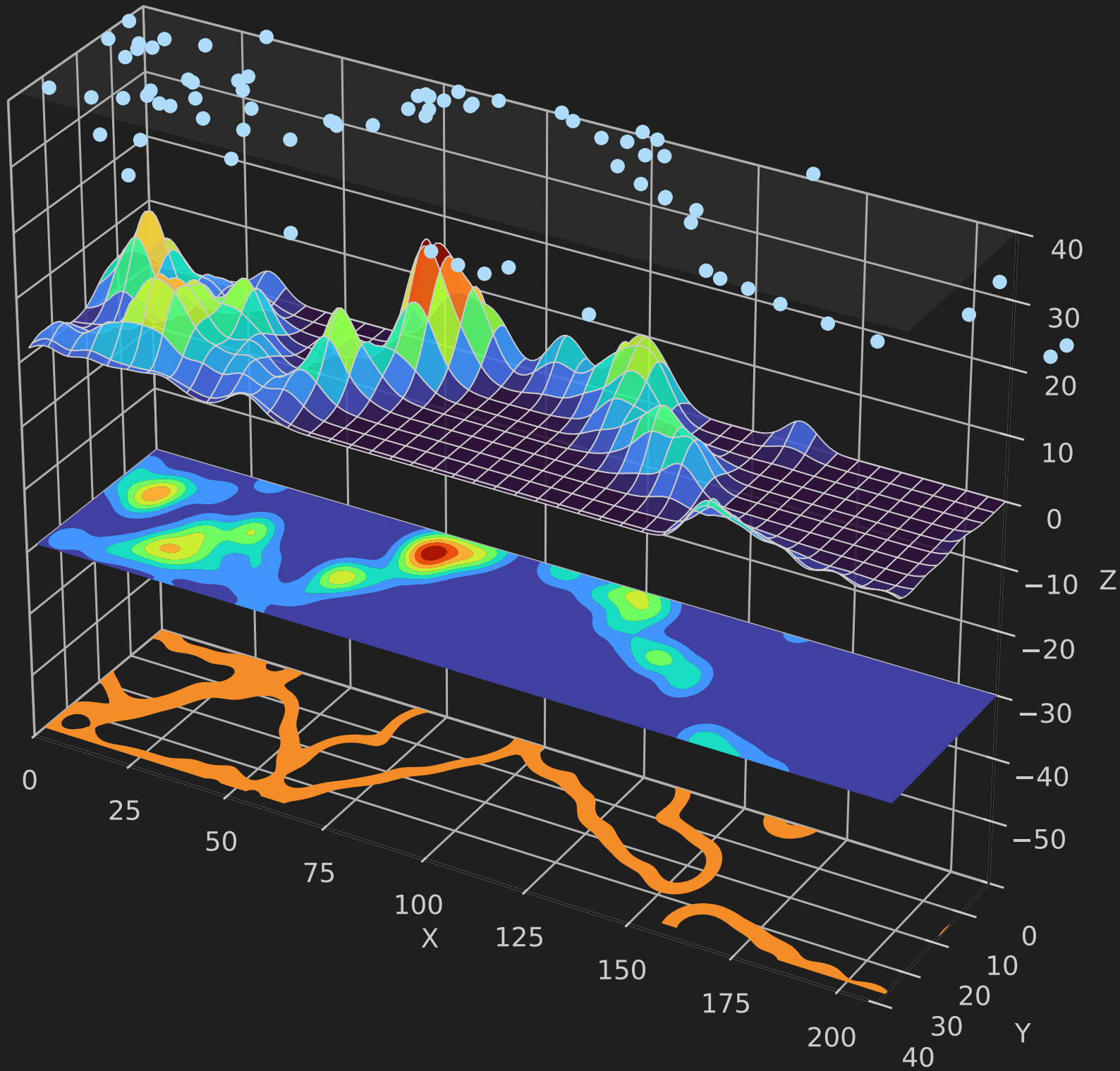
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.26) - (Displacement: 1 * -0.09) = 0.30

Spread Gaussian = 5.26 Shift = 2.43 Iteration = 070



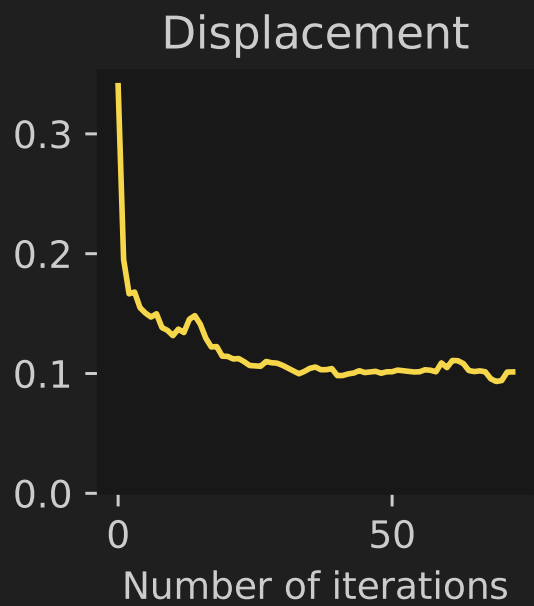
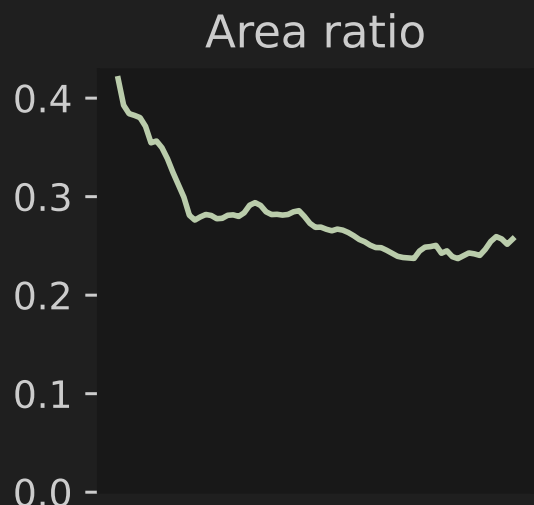
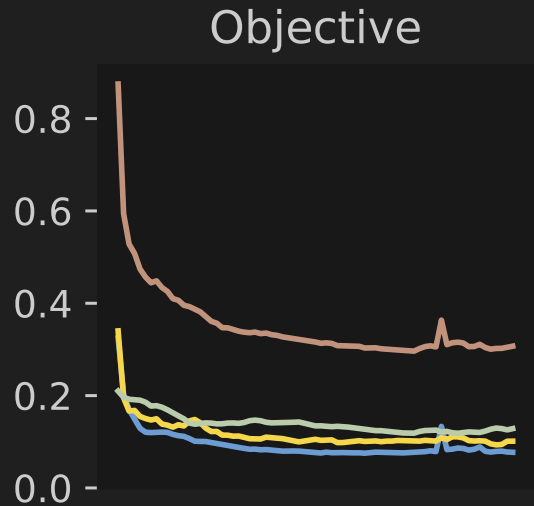
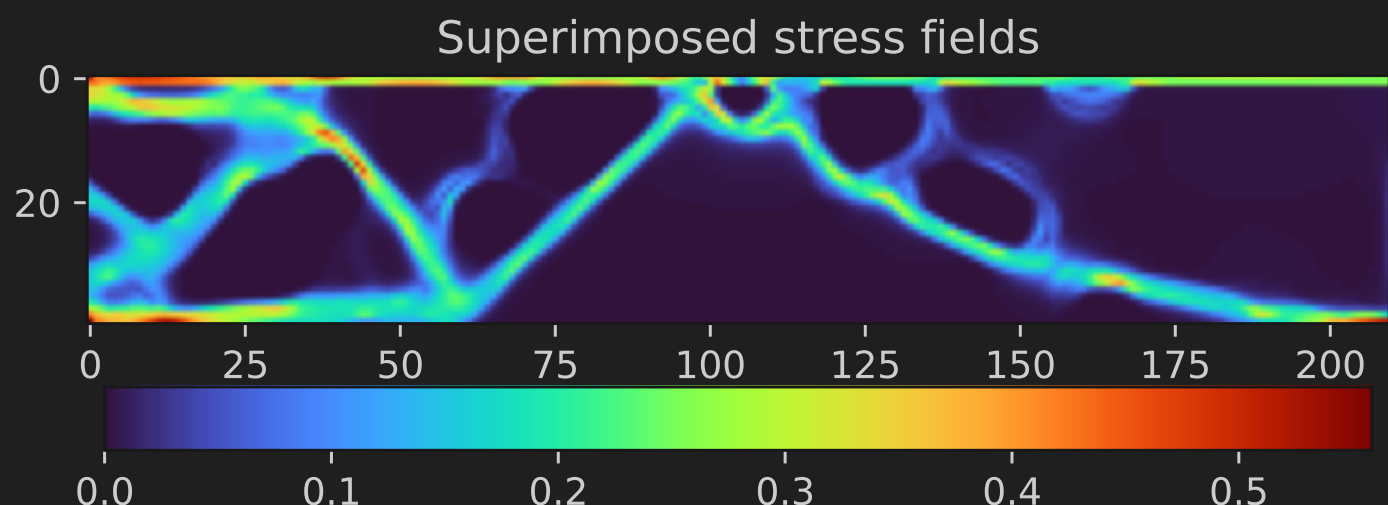
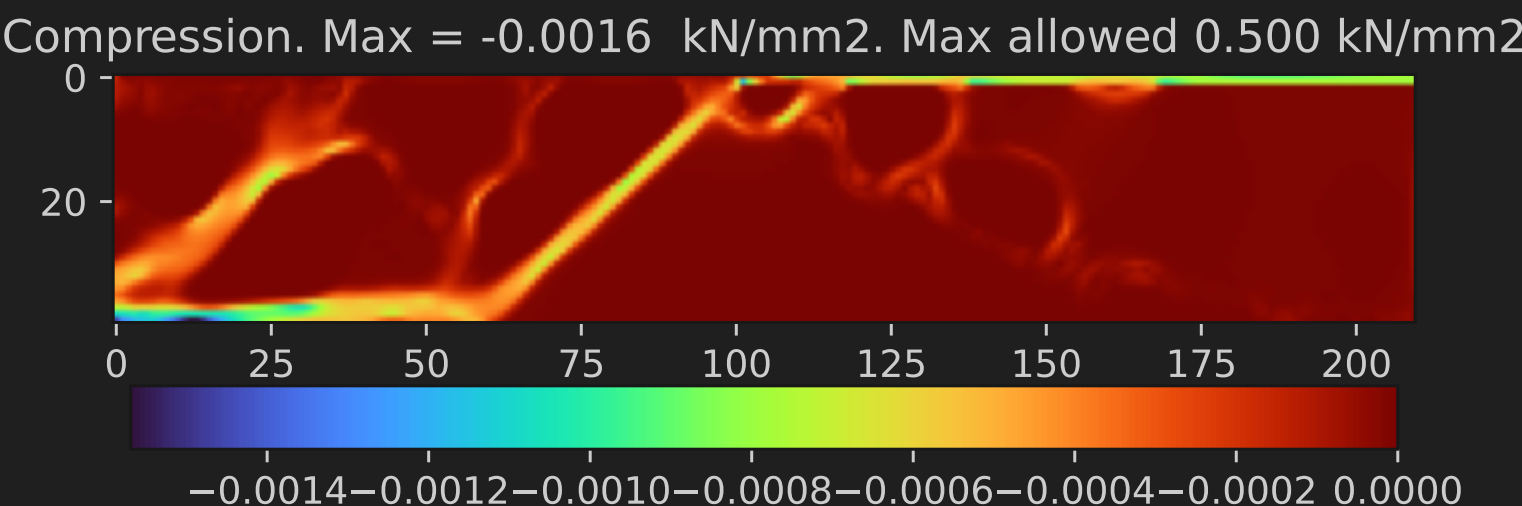
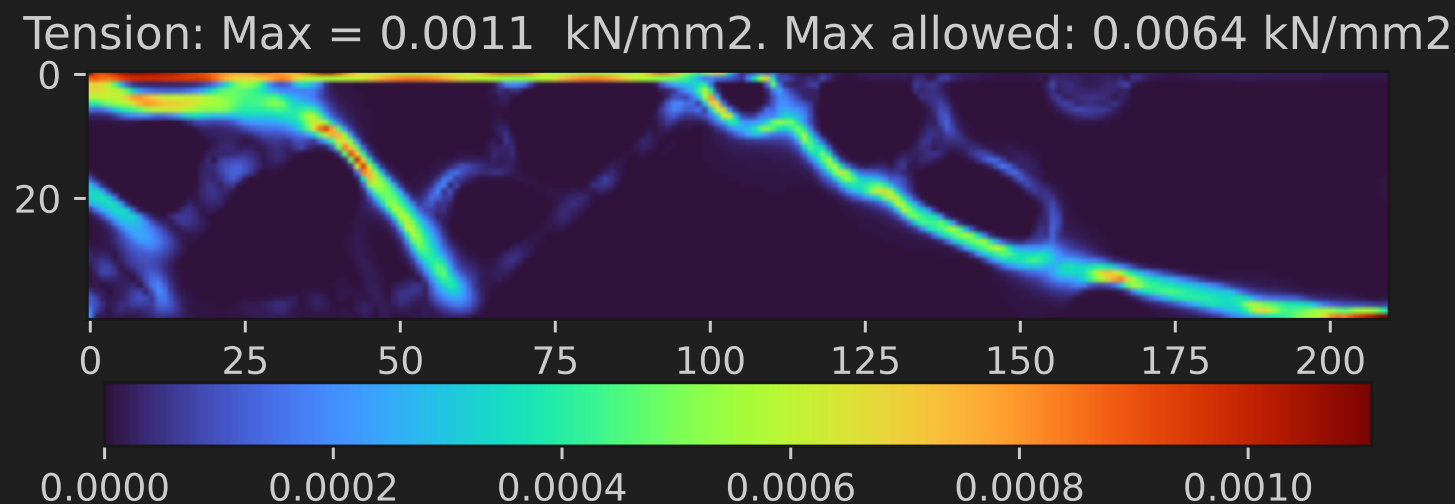
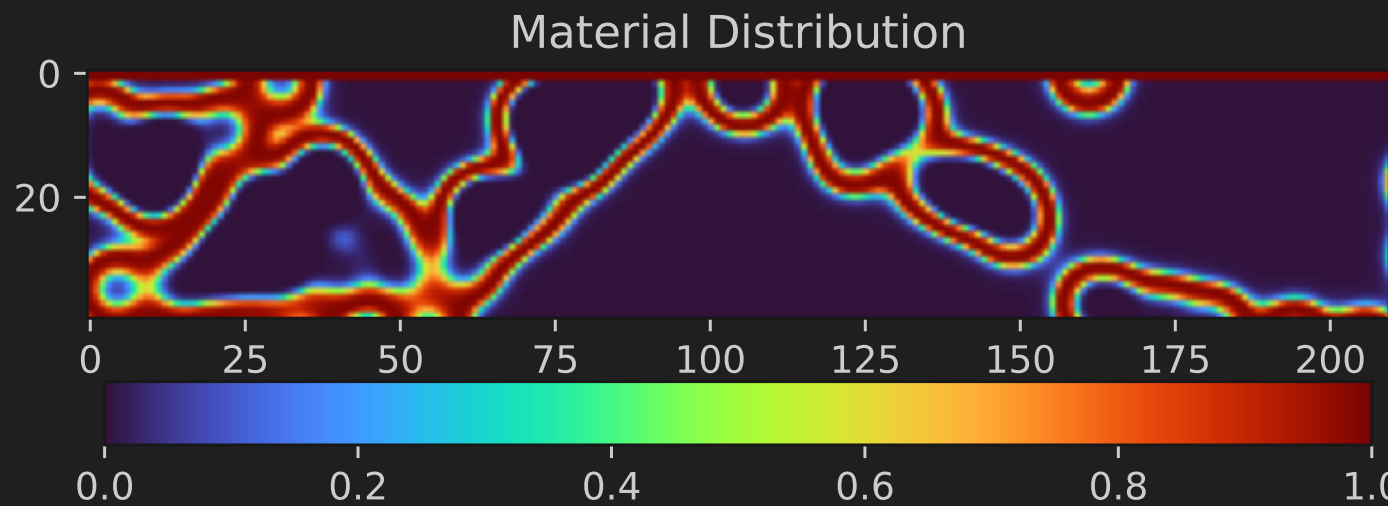
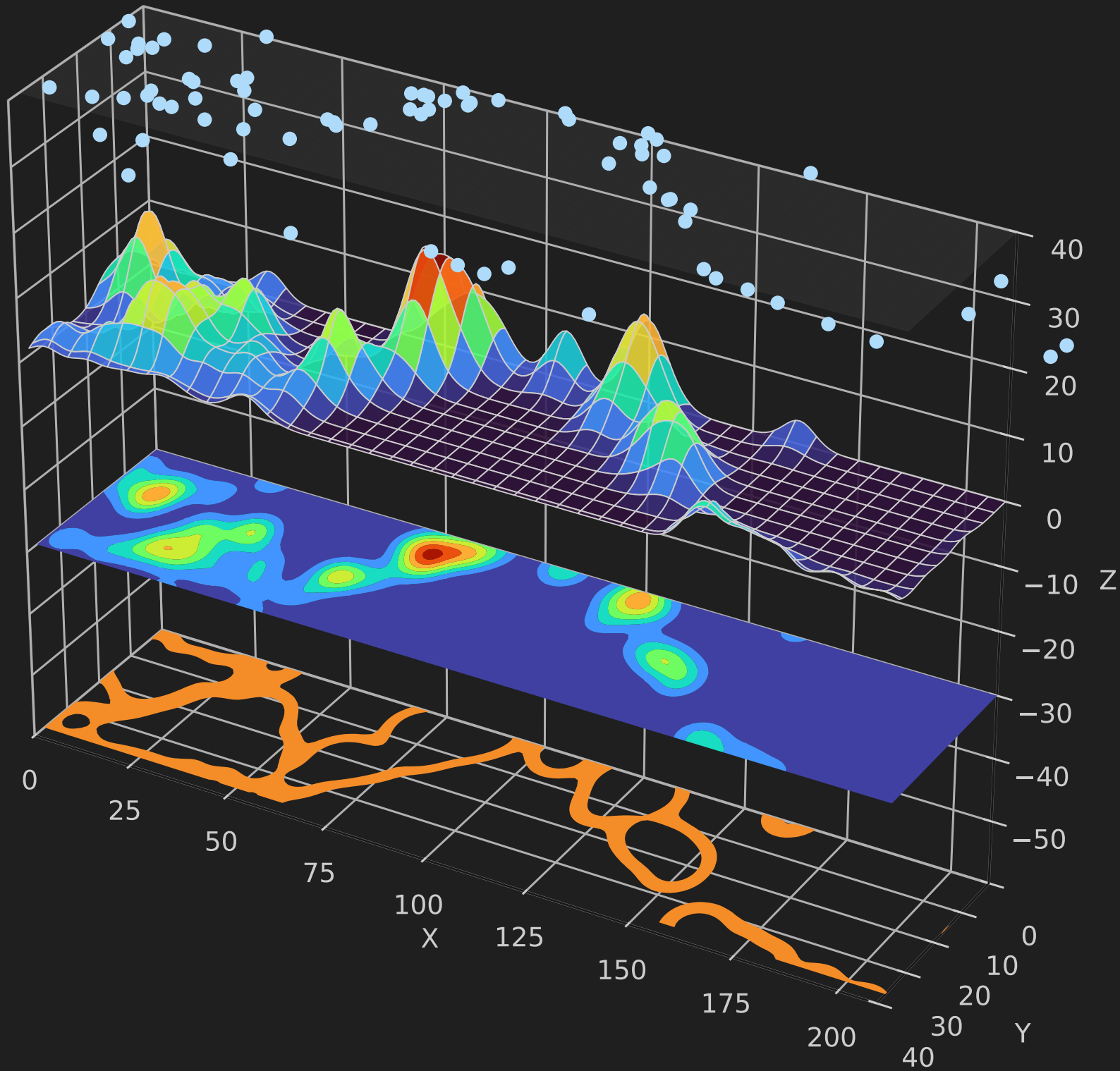
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 5.26 Shift = 2.44 Iteration = 071



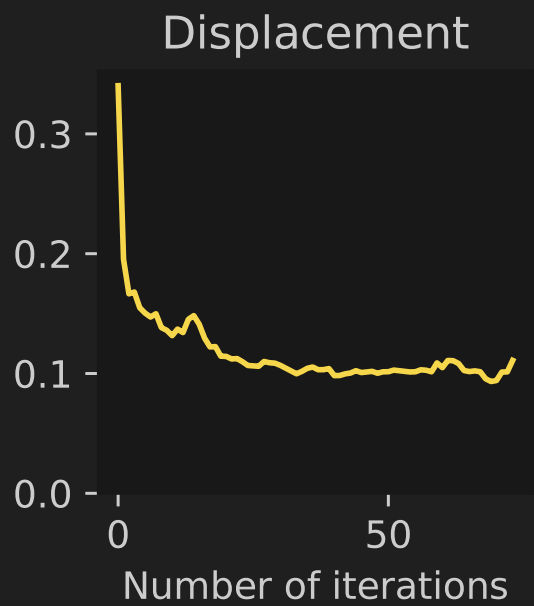
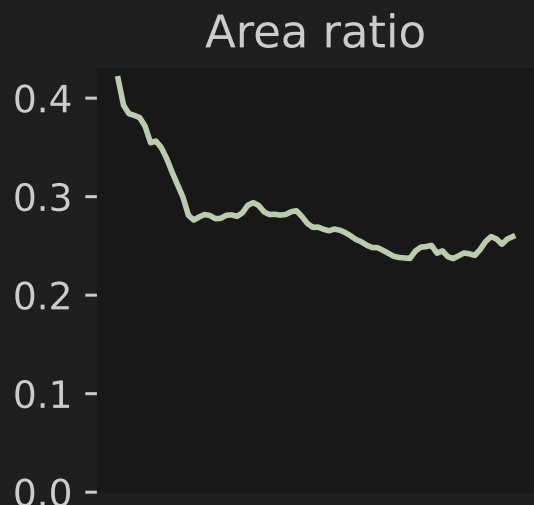
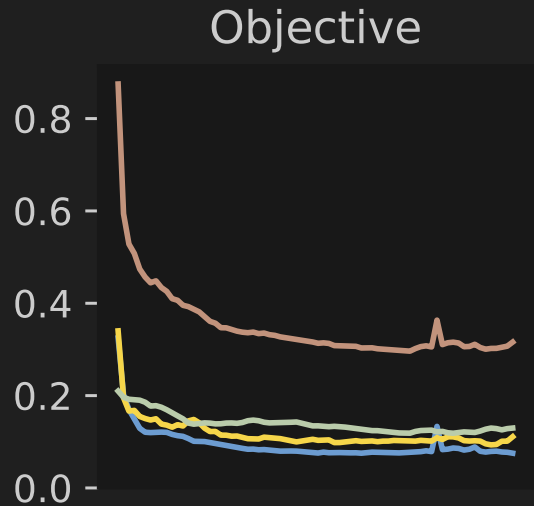
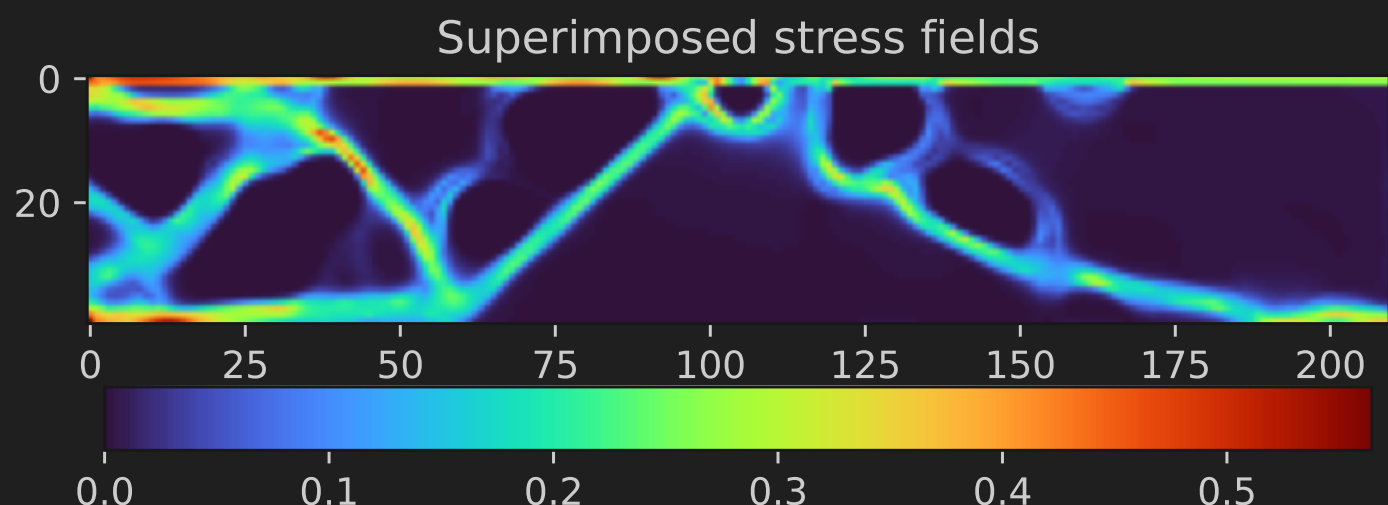
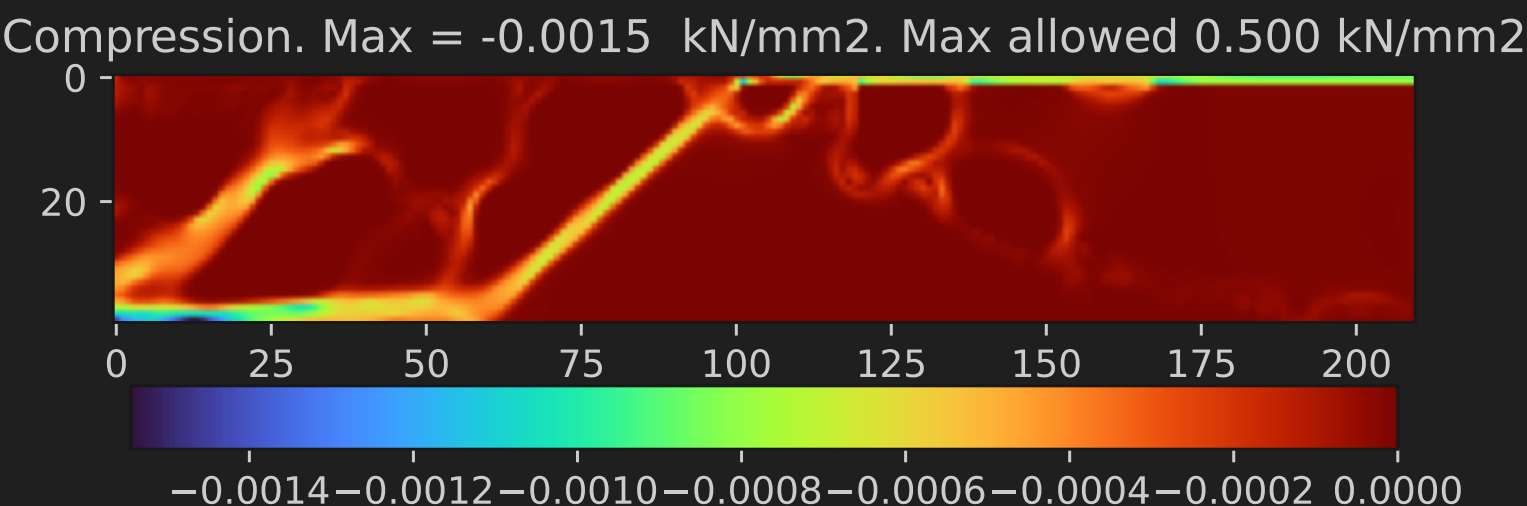
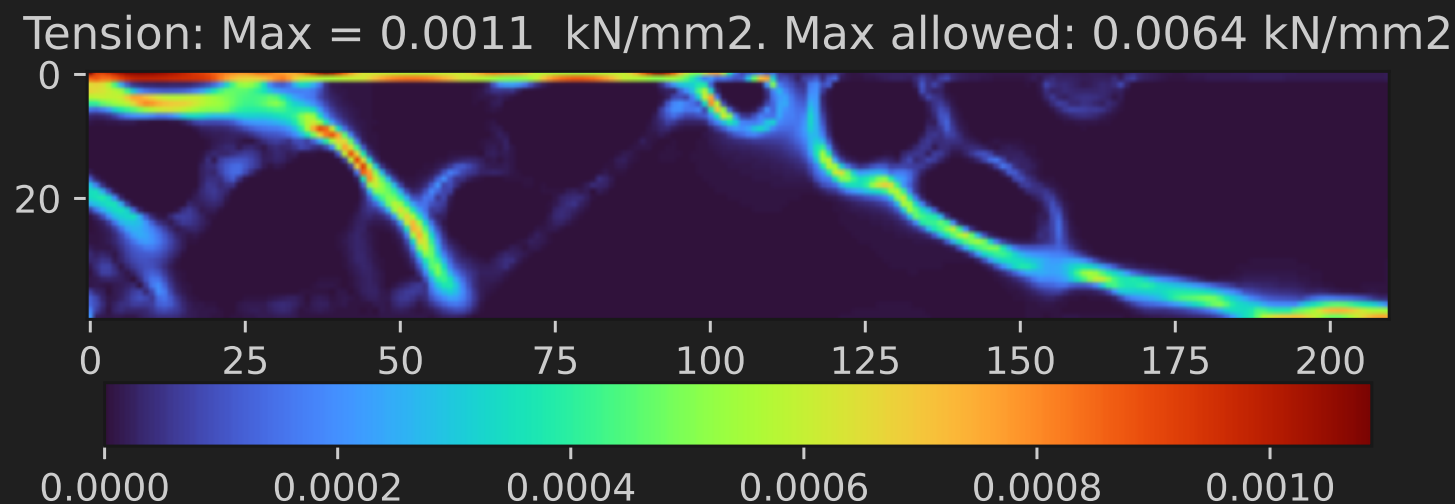
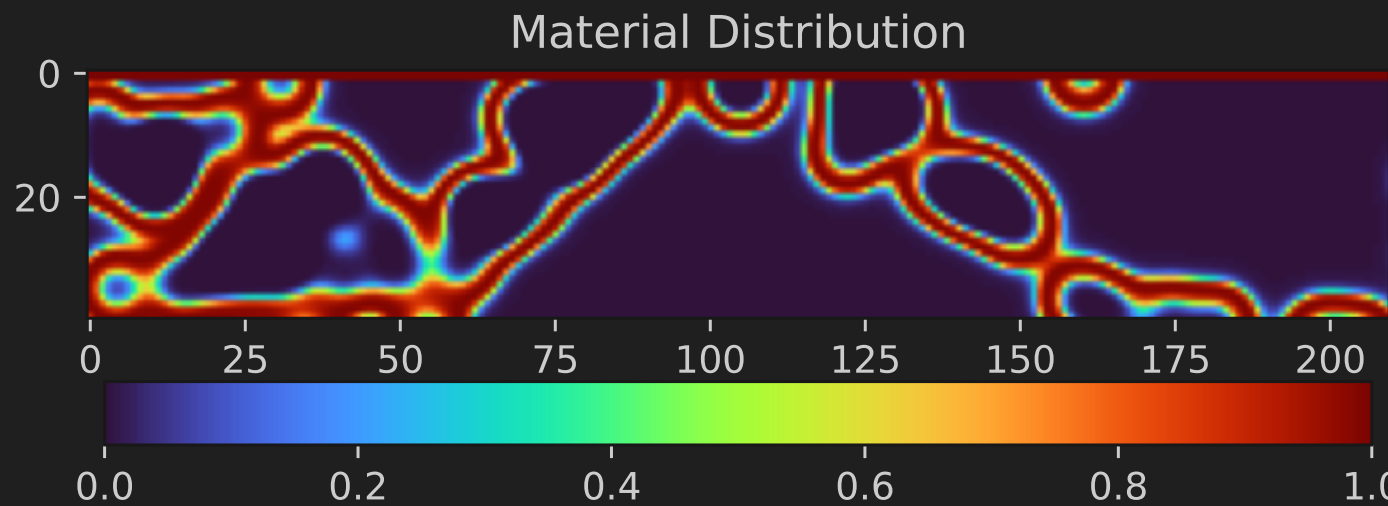
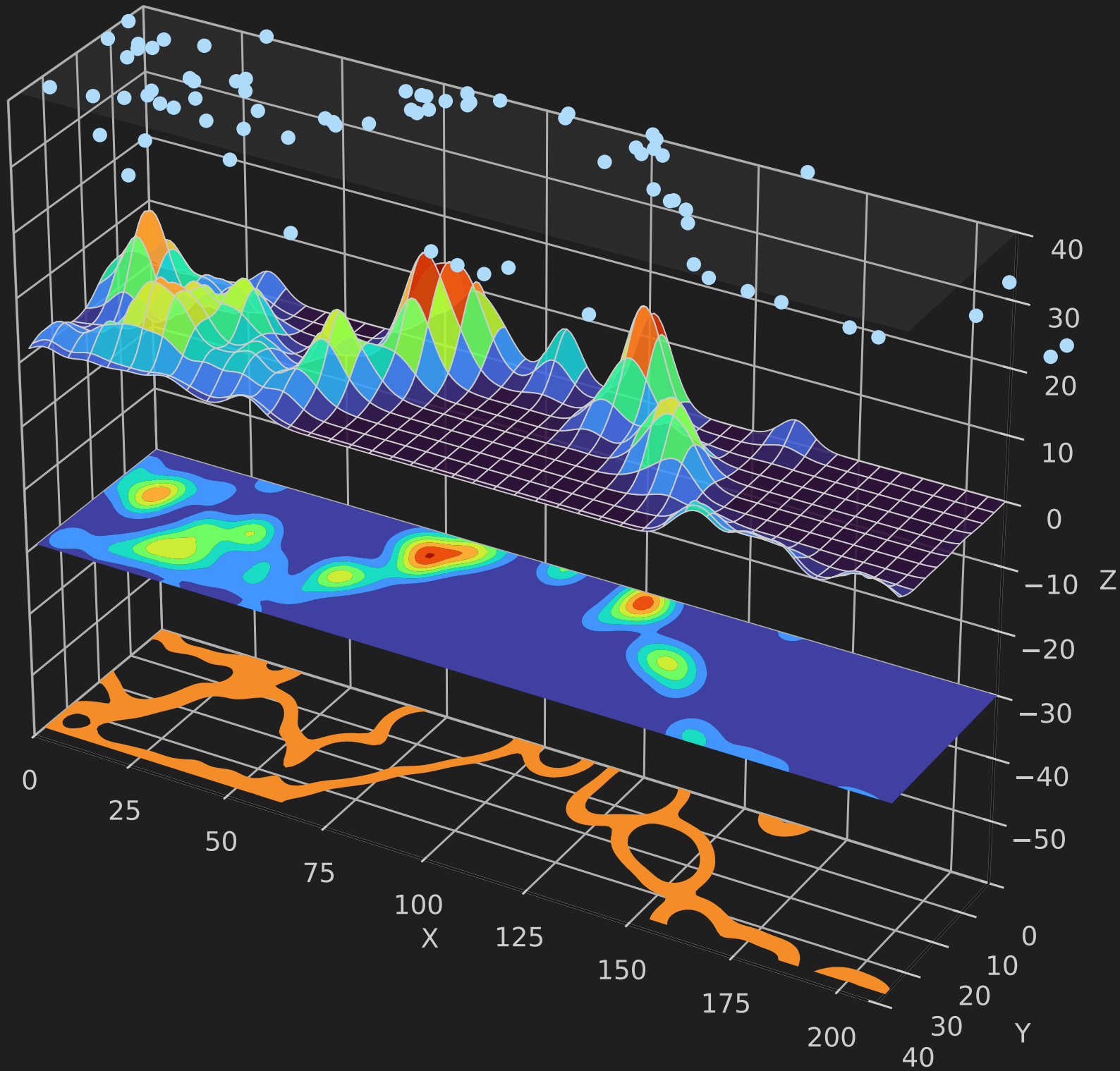
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.26) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 5.23 Shift = 2.46 Iteration = 072



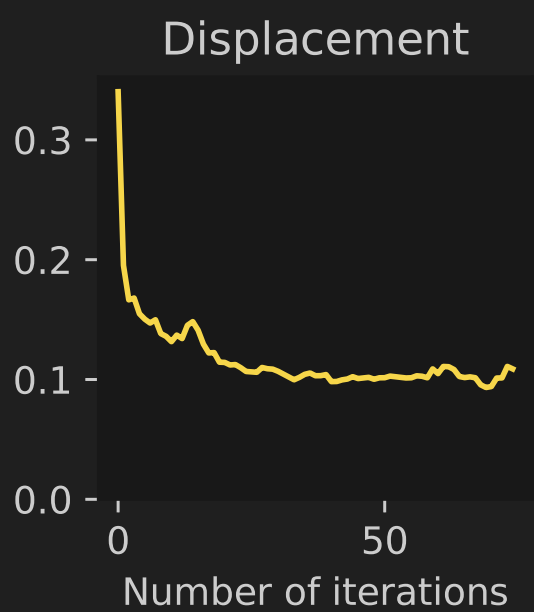
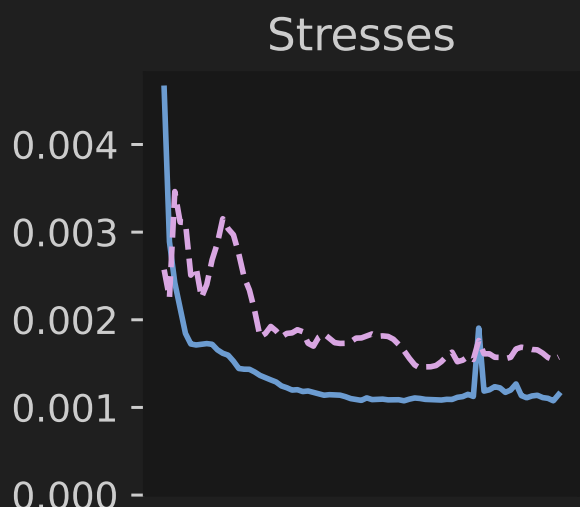
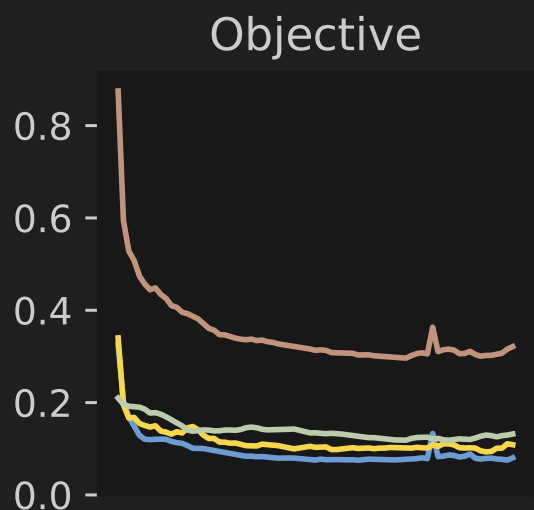
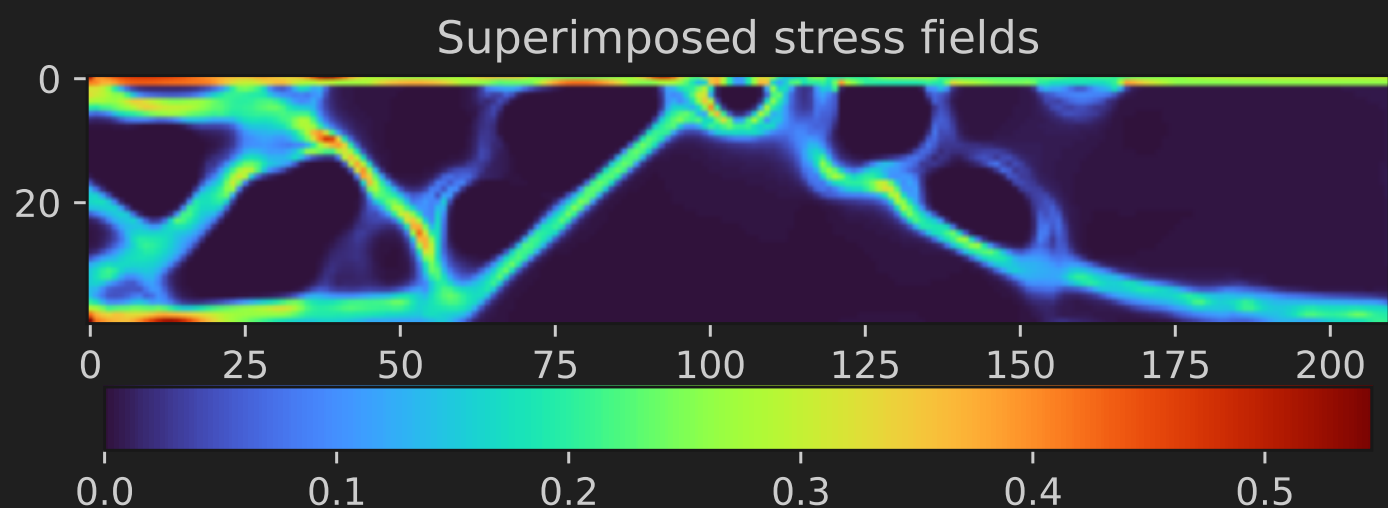
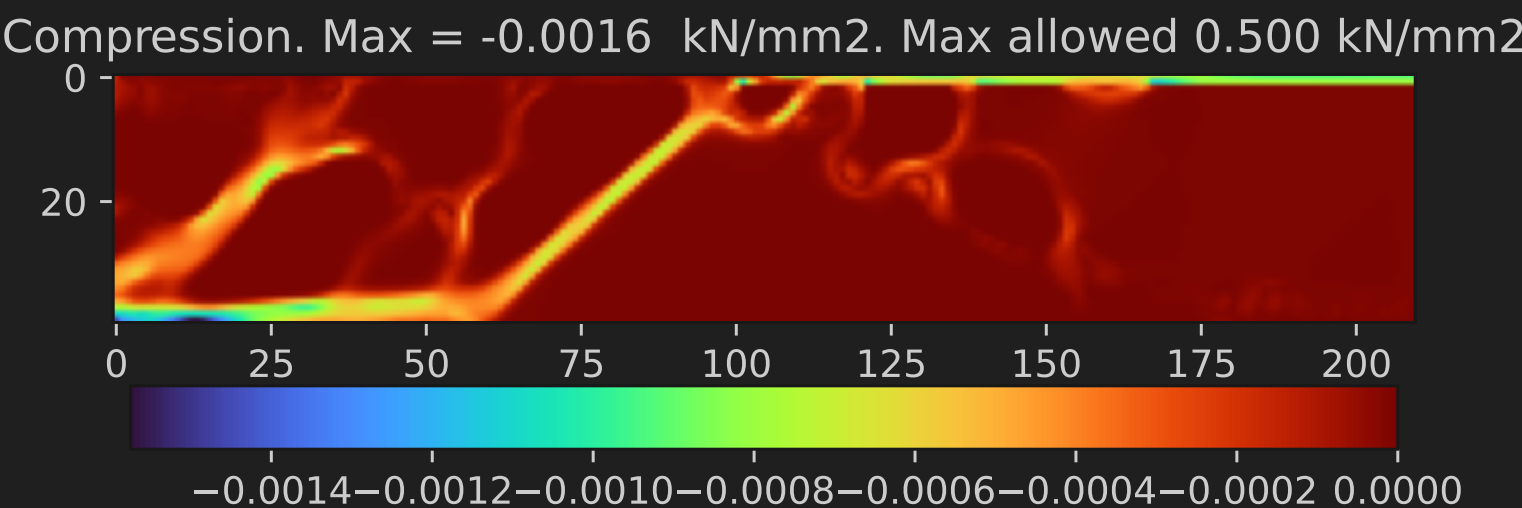
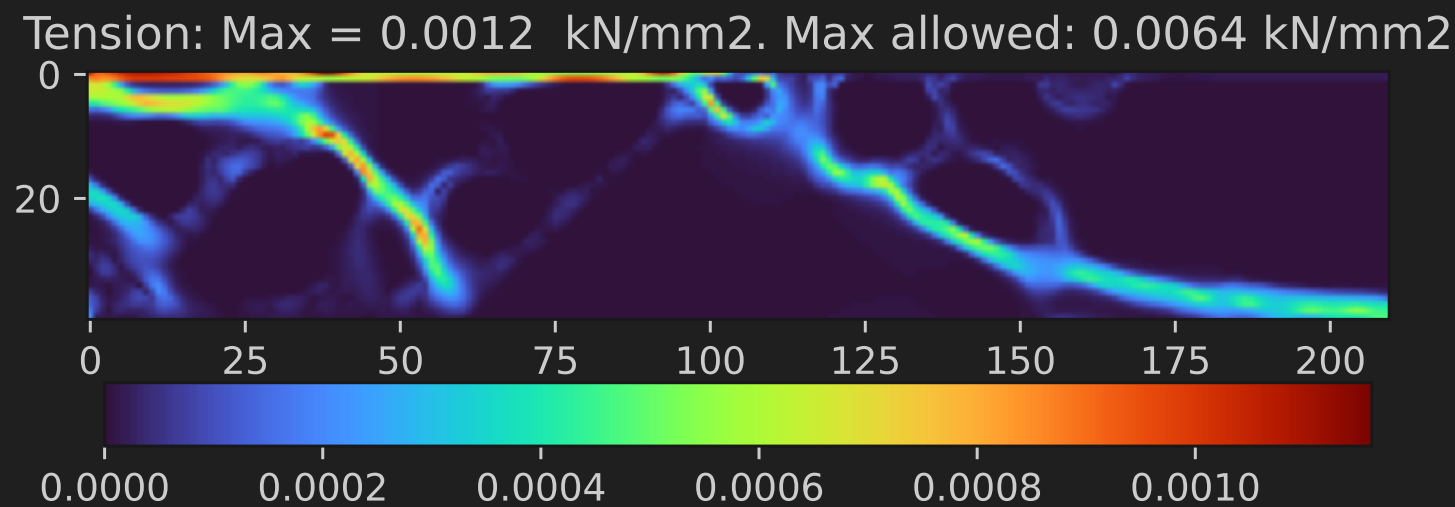
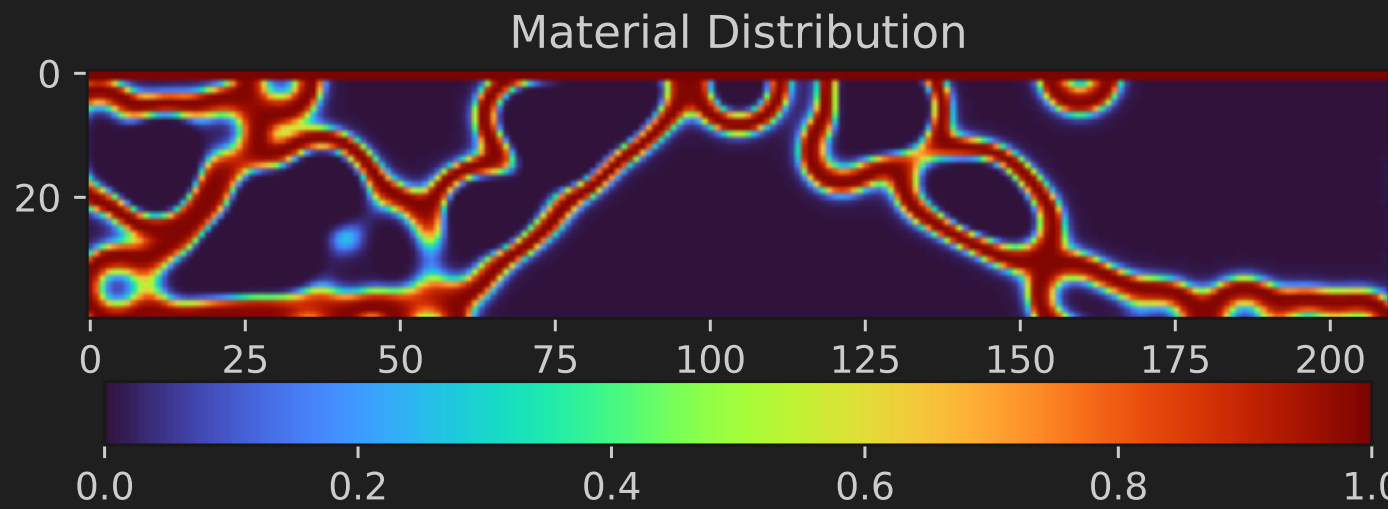
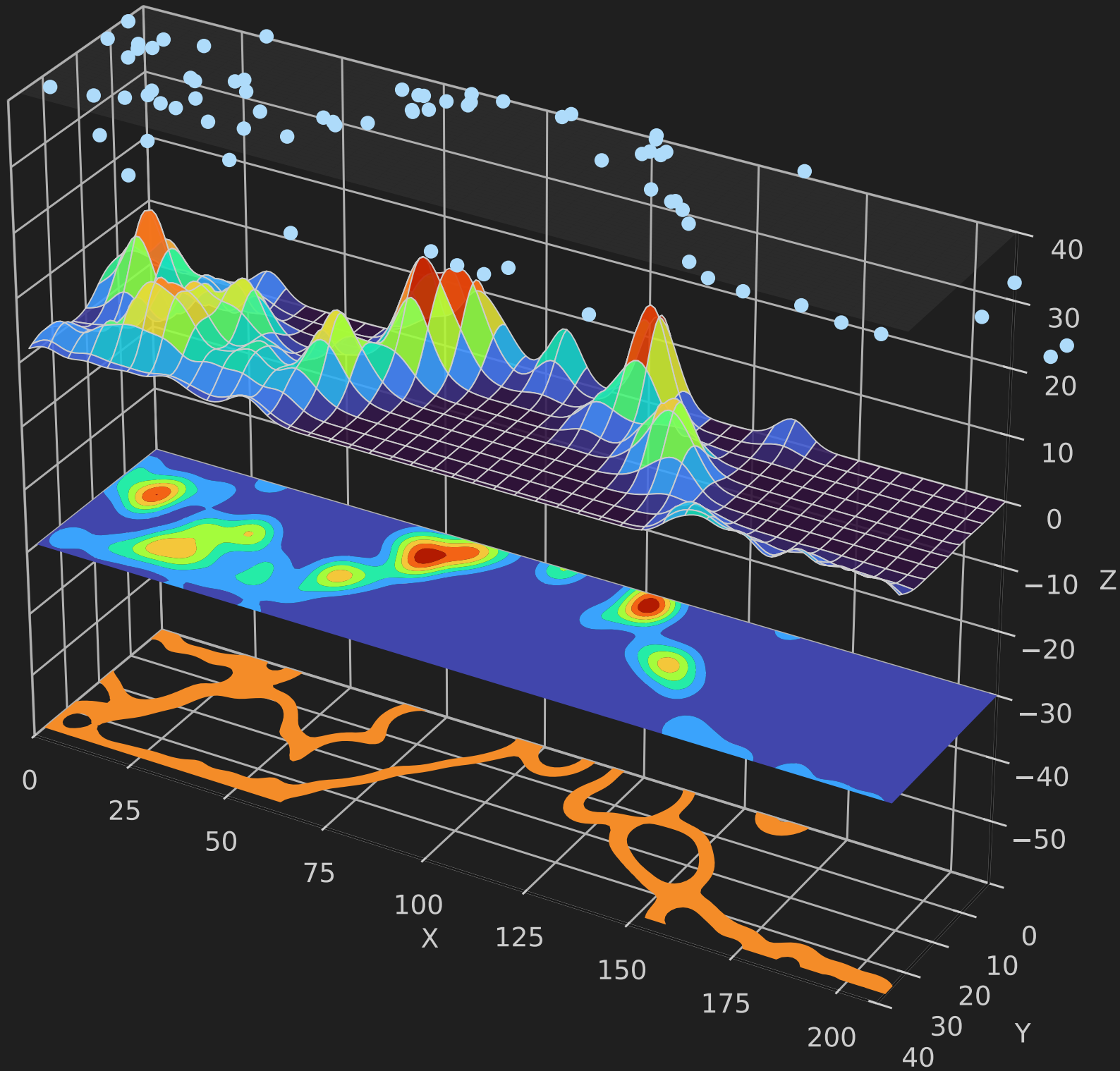
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.26) - (Displacement: 1 * -0.11) = 0.32

Spread Gaussian = 5.23 Shift = 2.47 Iteration = 073



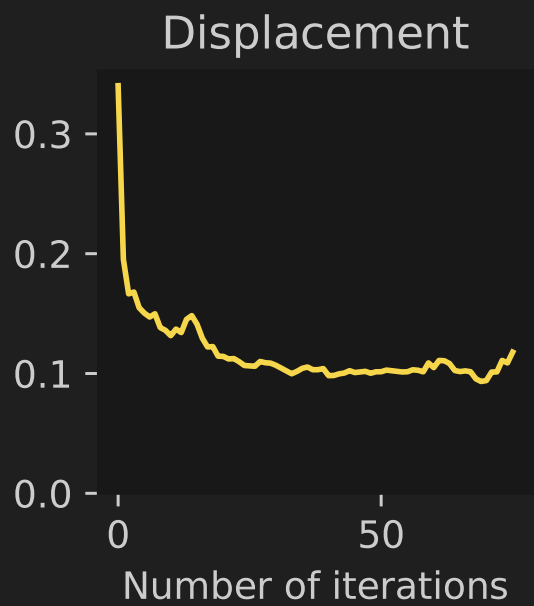
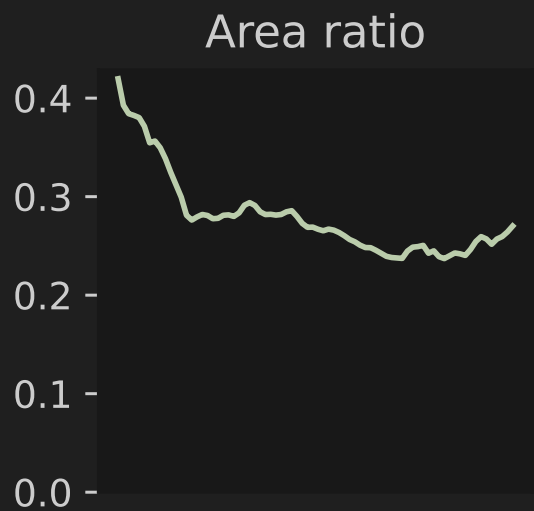
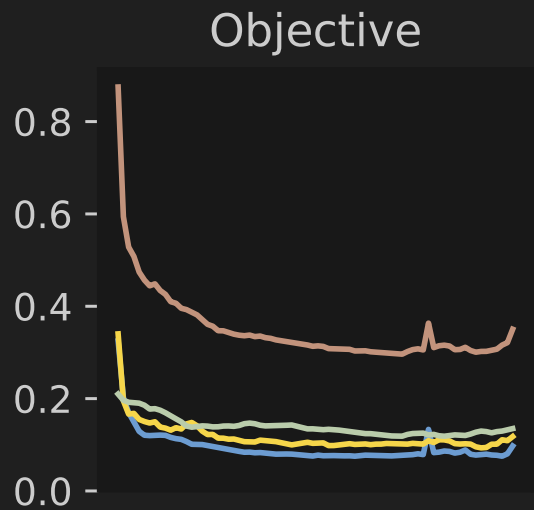
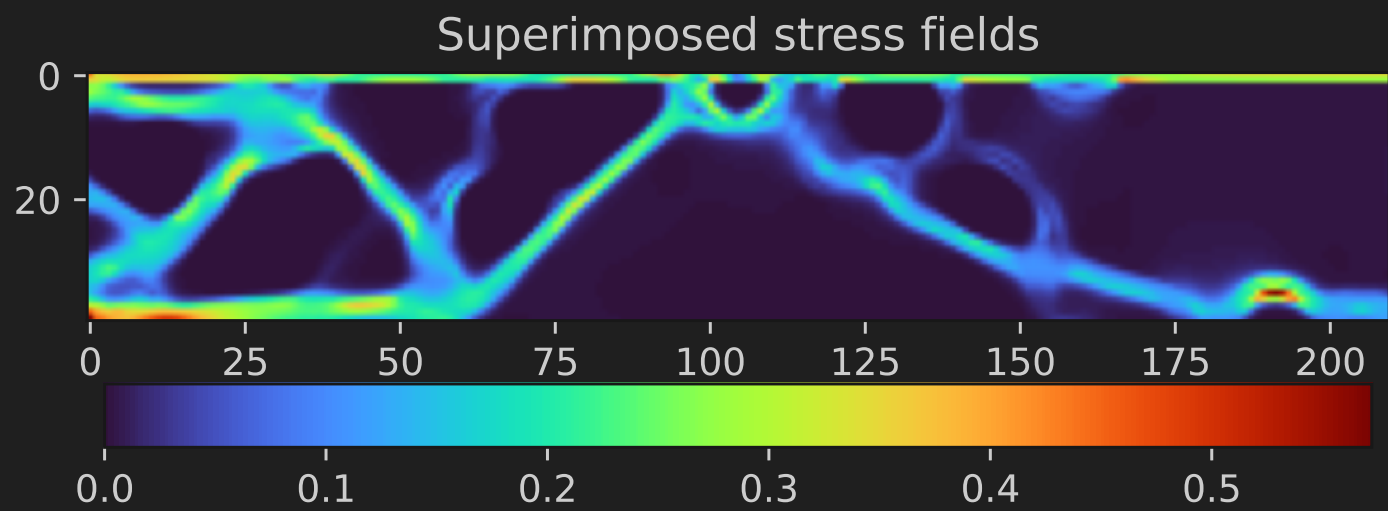
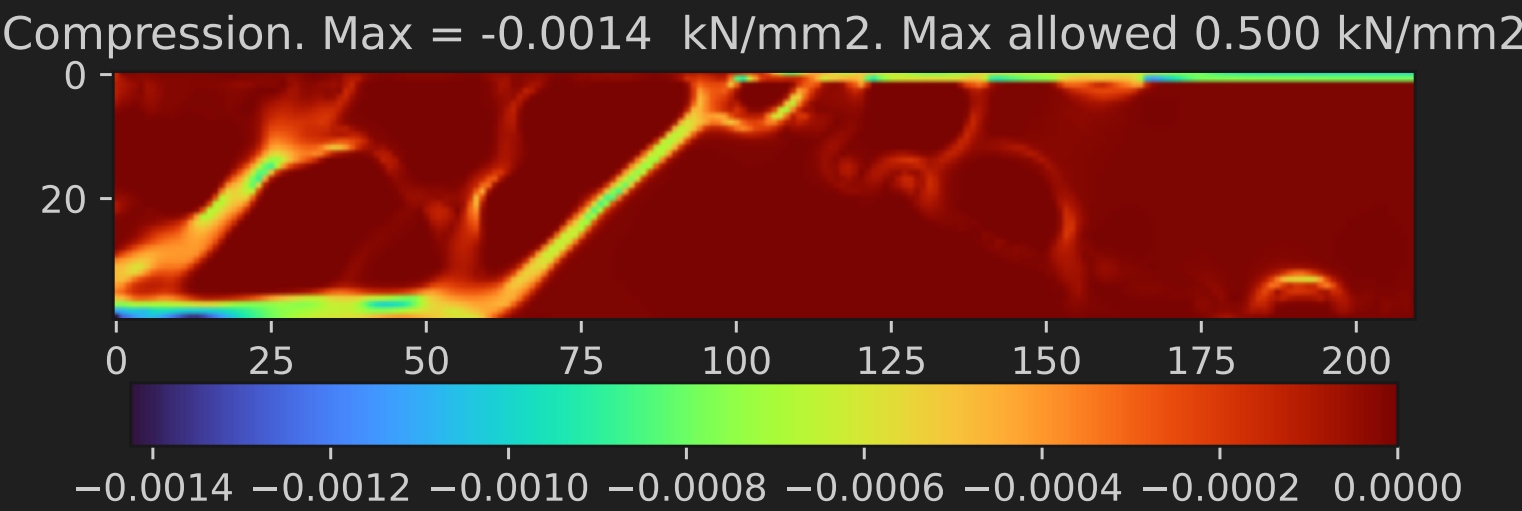
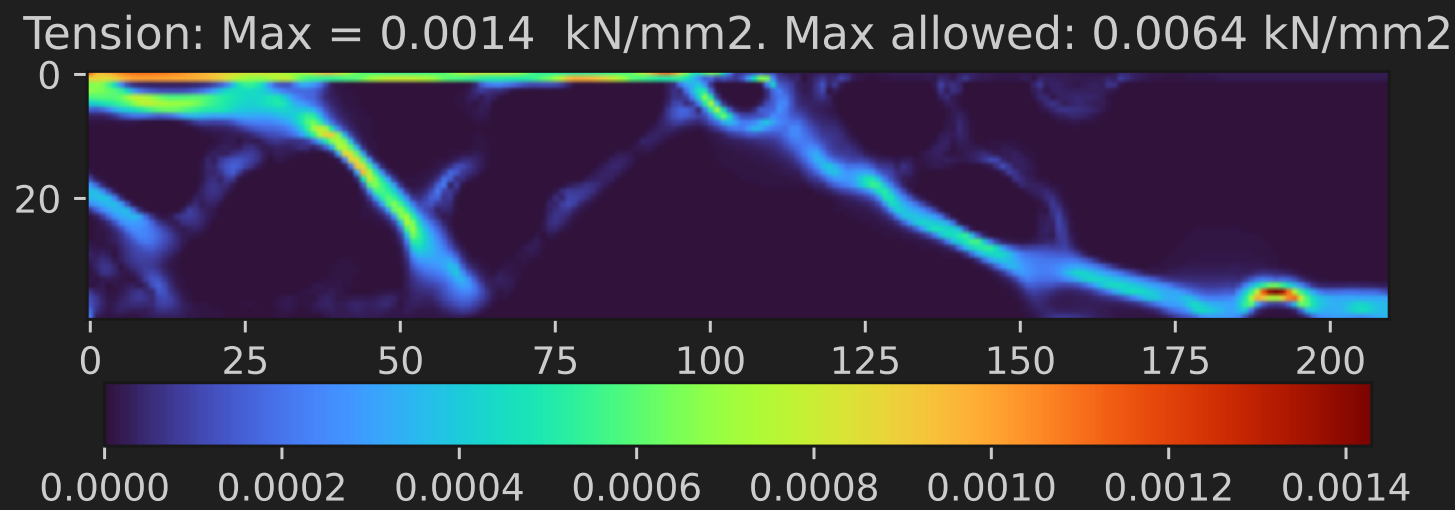
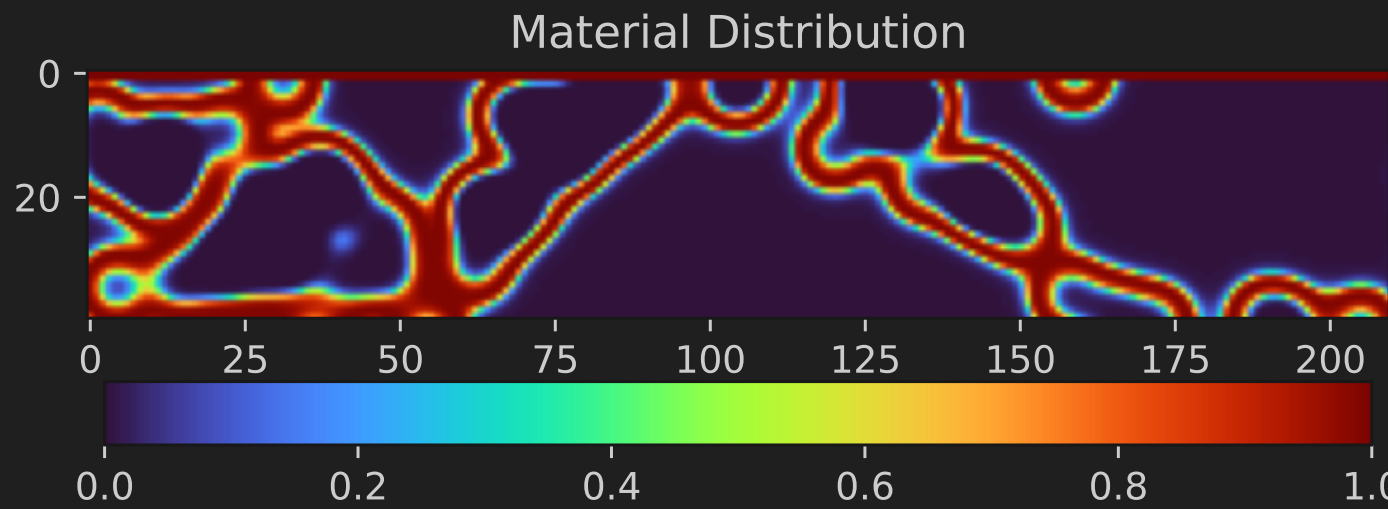
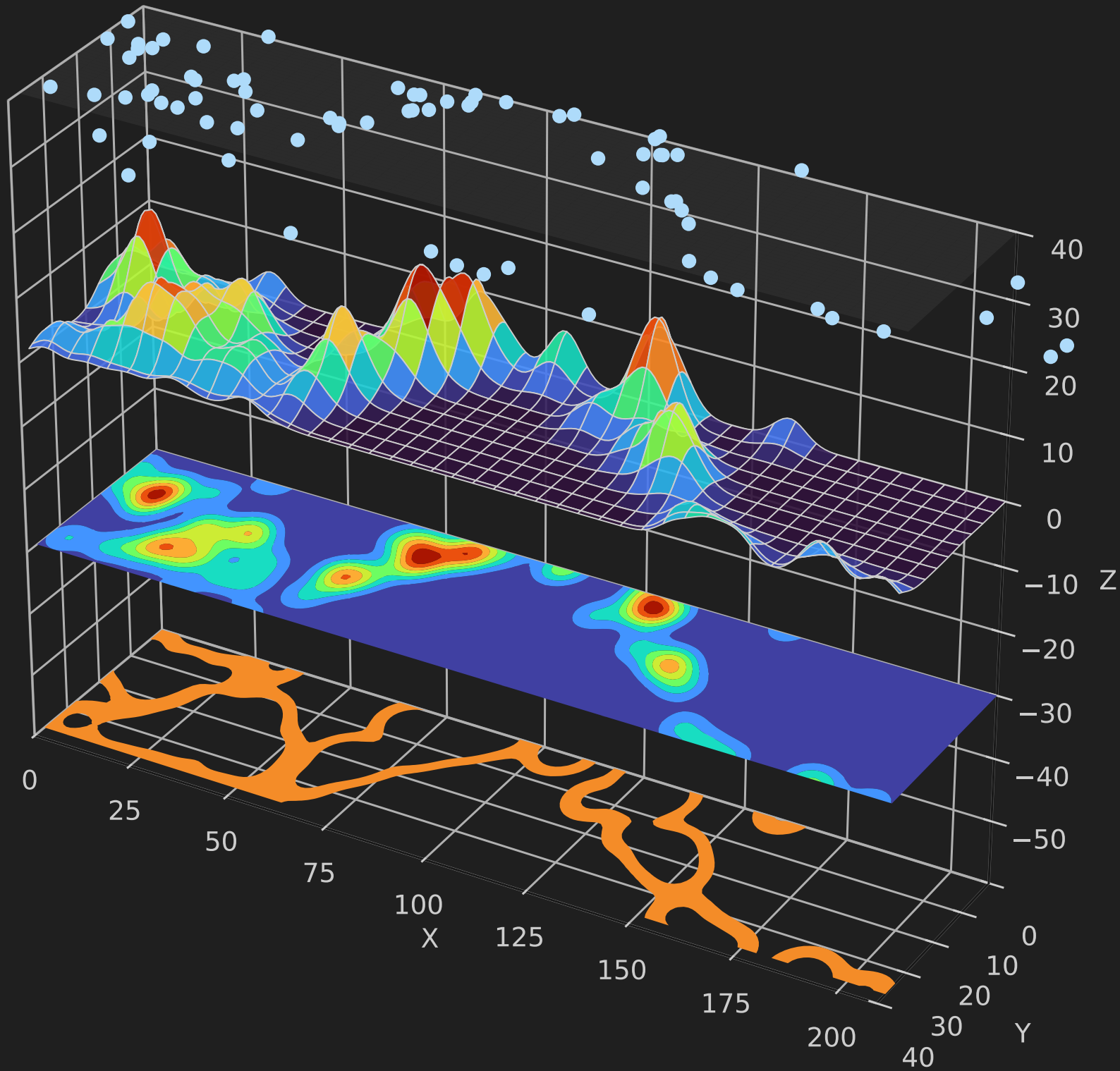
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.26) - (Displacement: 1 * -0.11) = 0.32

Spread Gaussian = 5.26 Shift = 2.47 Iteration = 074



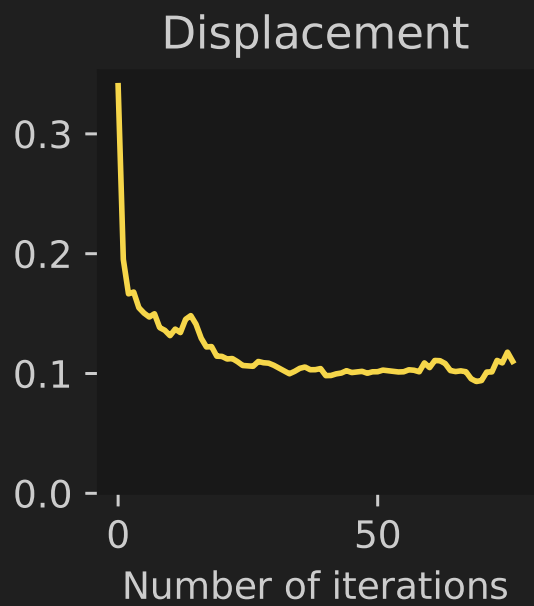
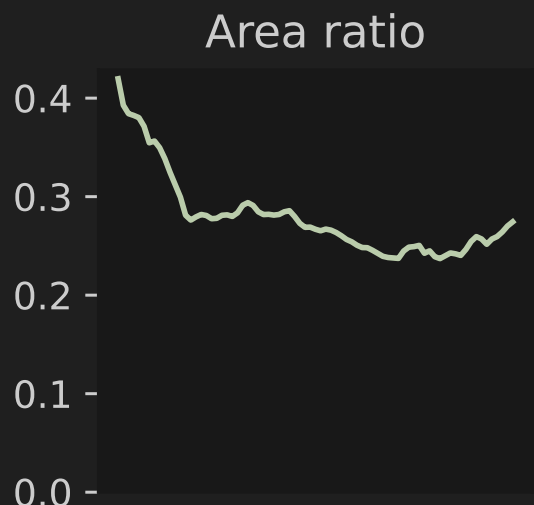
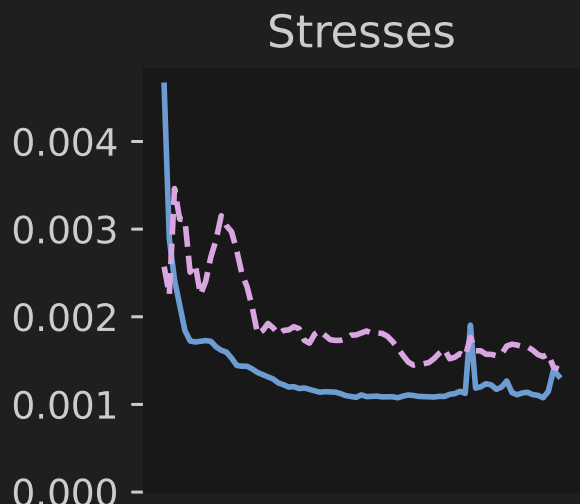
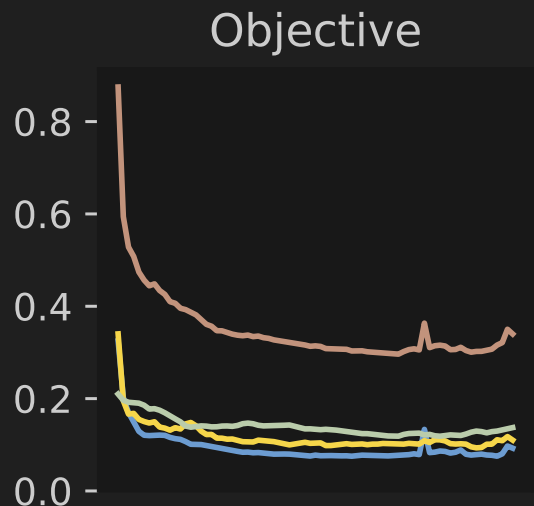
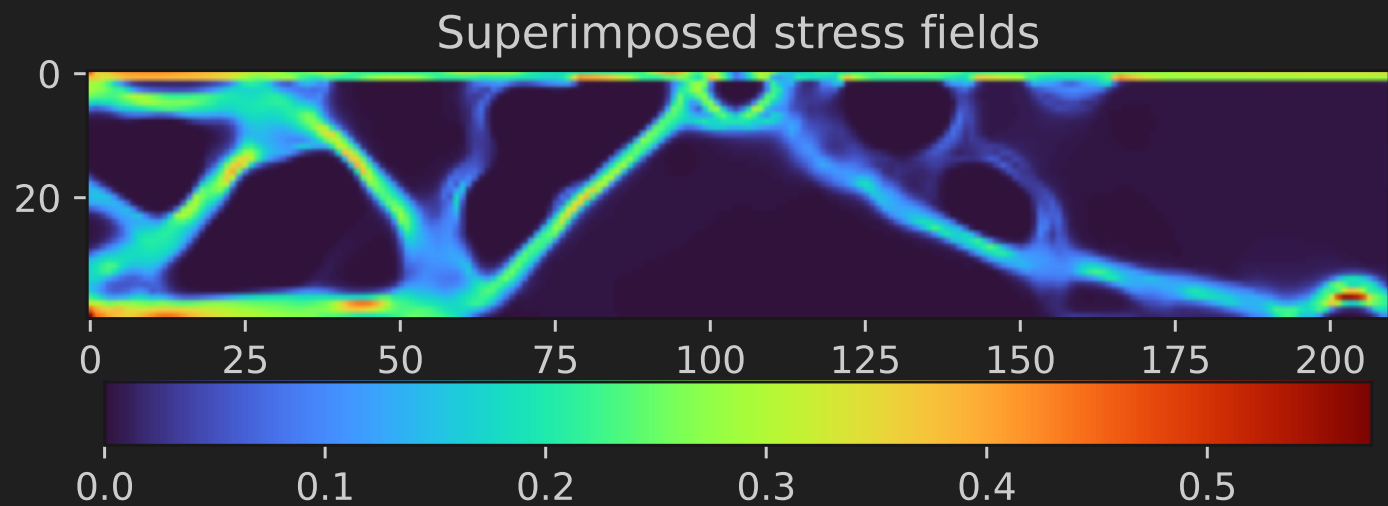
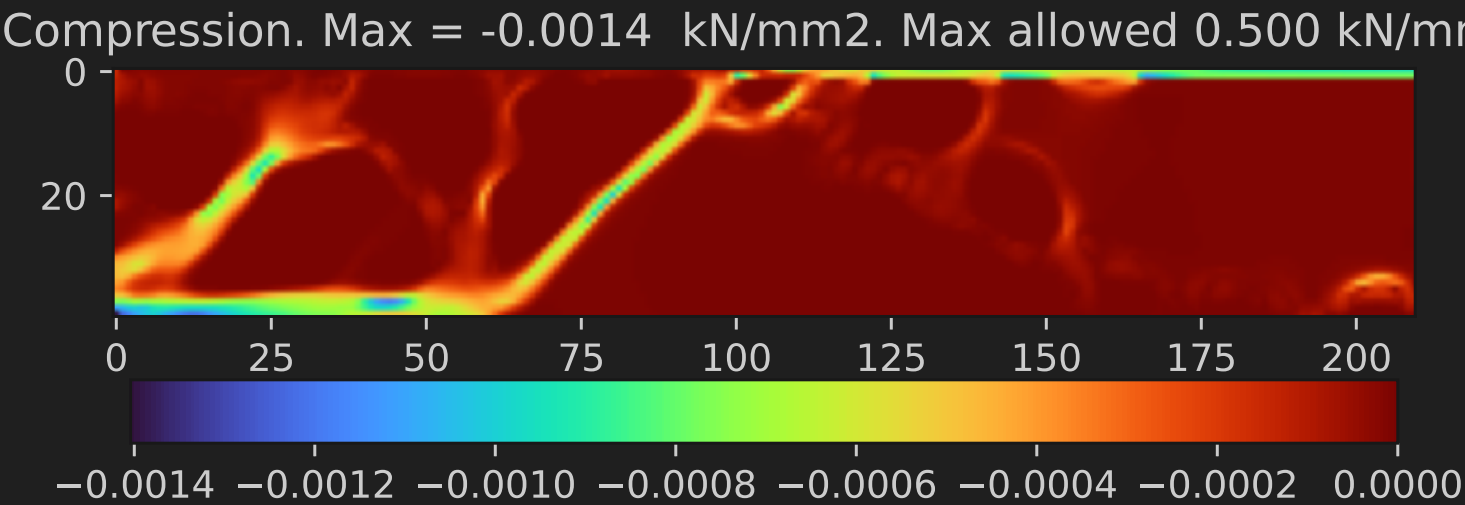
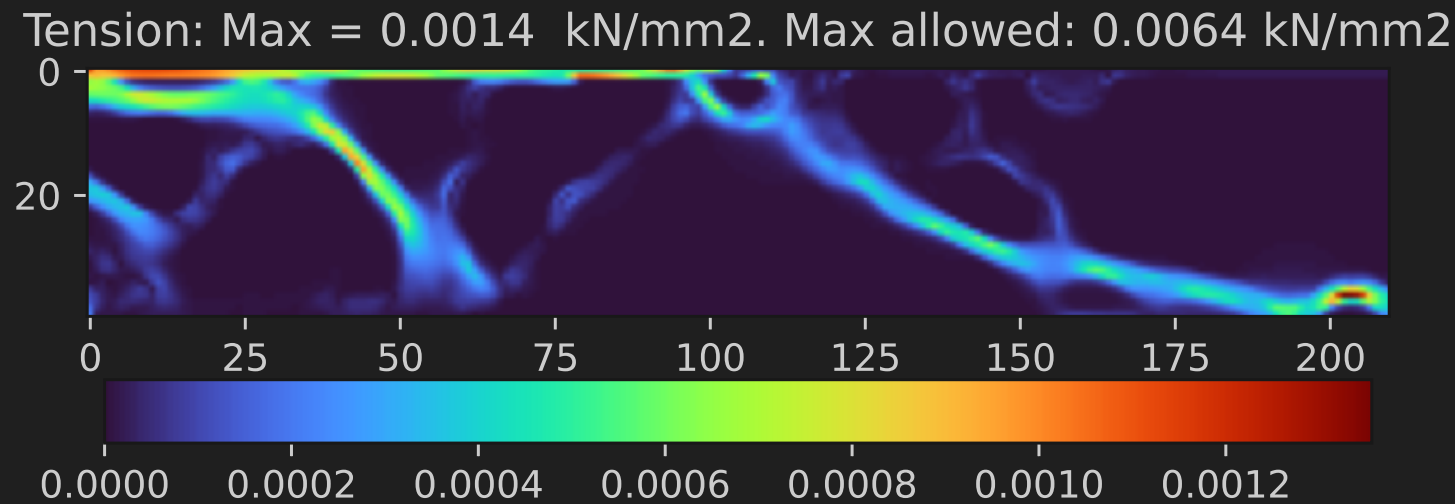
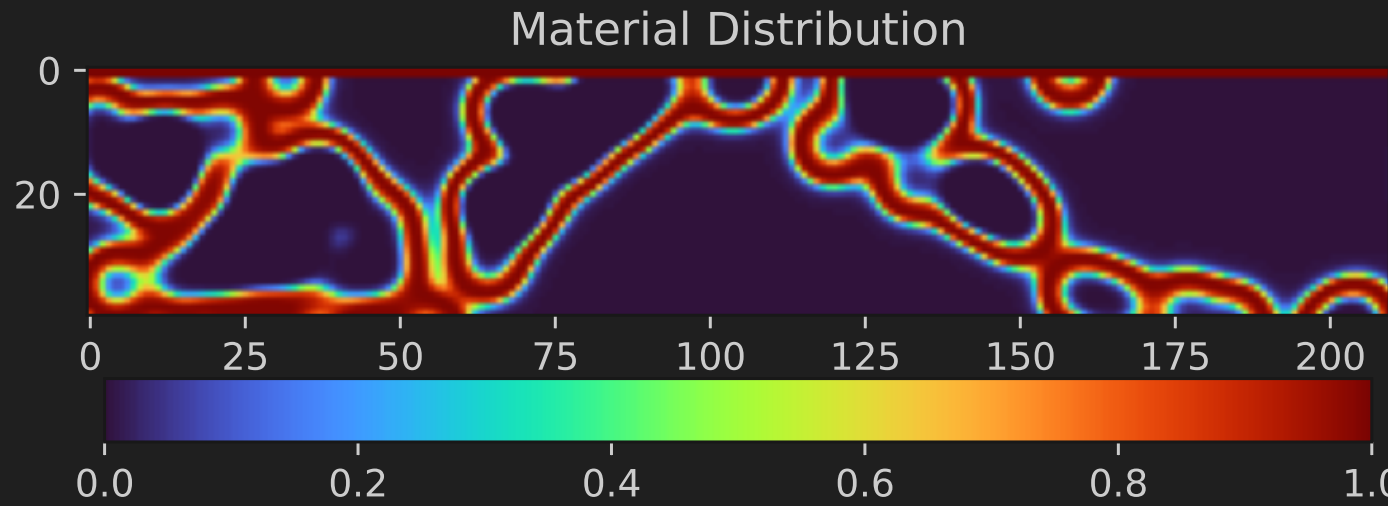
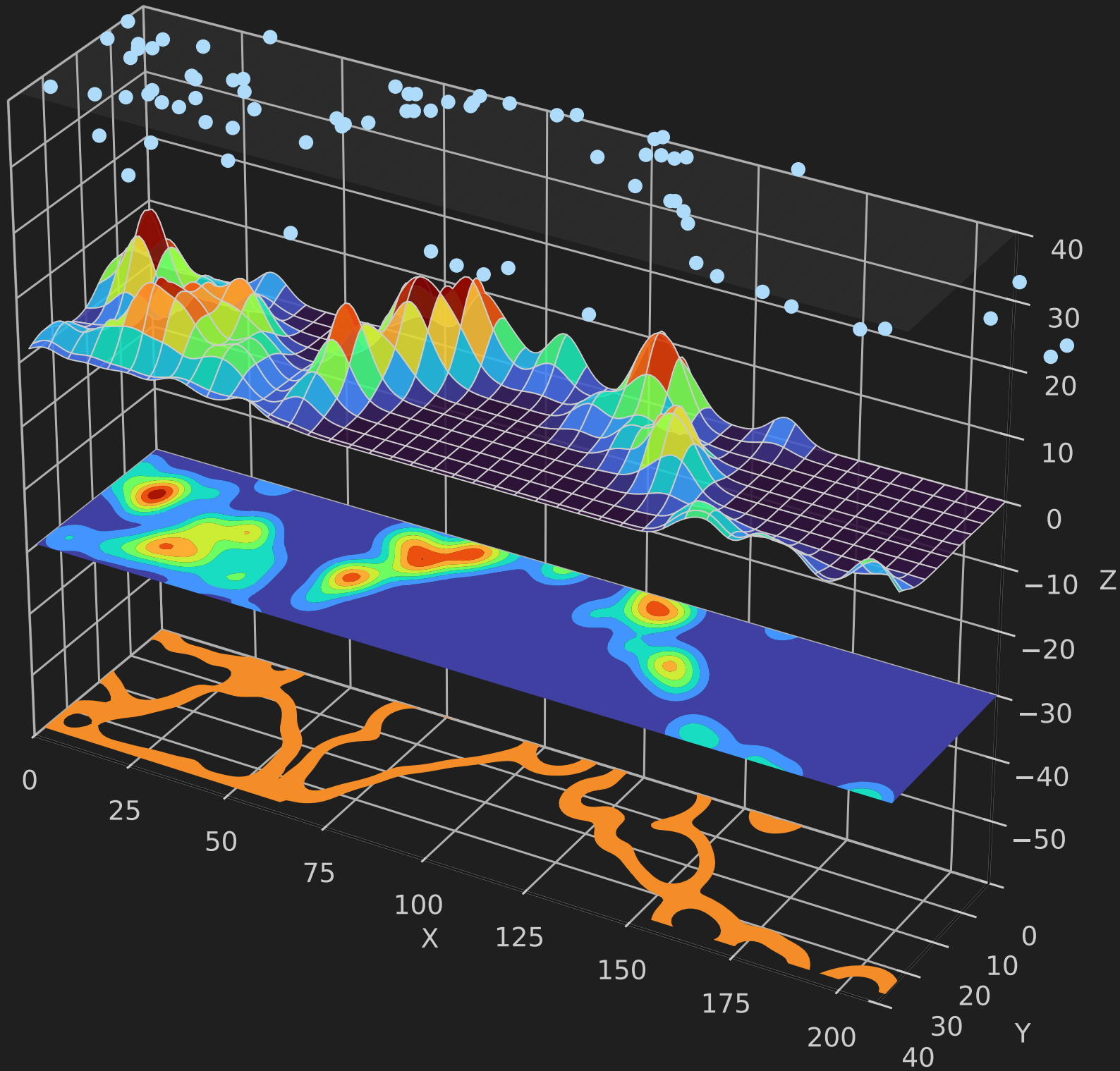
Objective = (Stress: 70 * 0.0014) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.12) = 0.35

Spread Gaussian = 5.27 Shift = 2.49 Iteration = 075



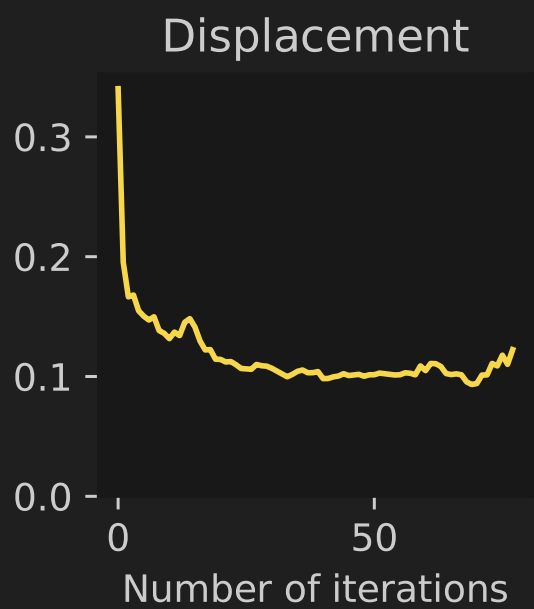
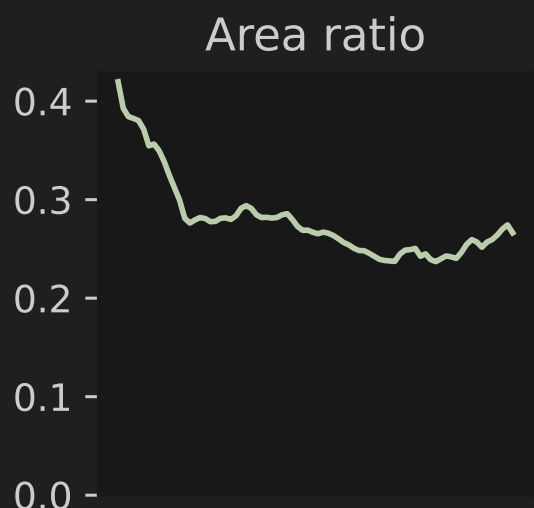
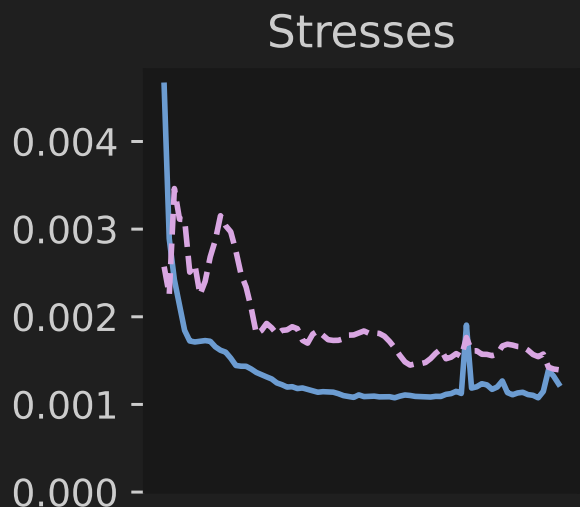
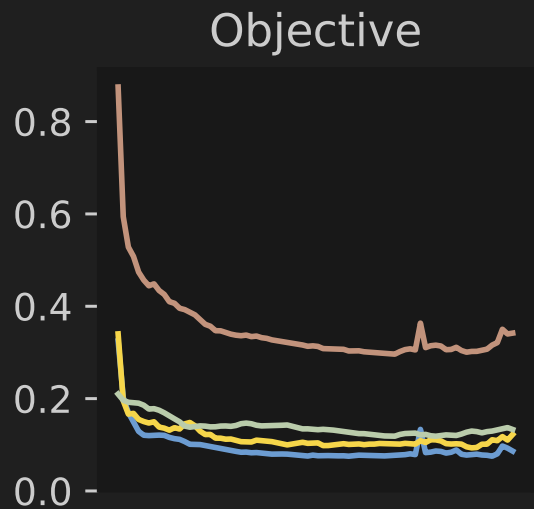
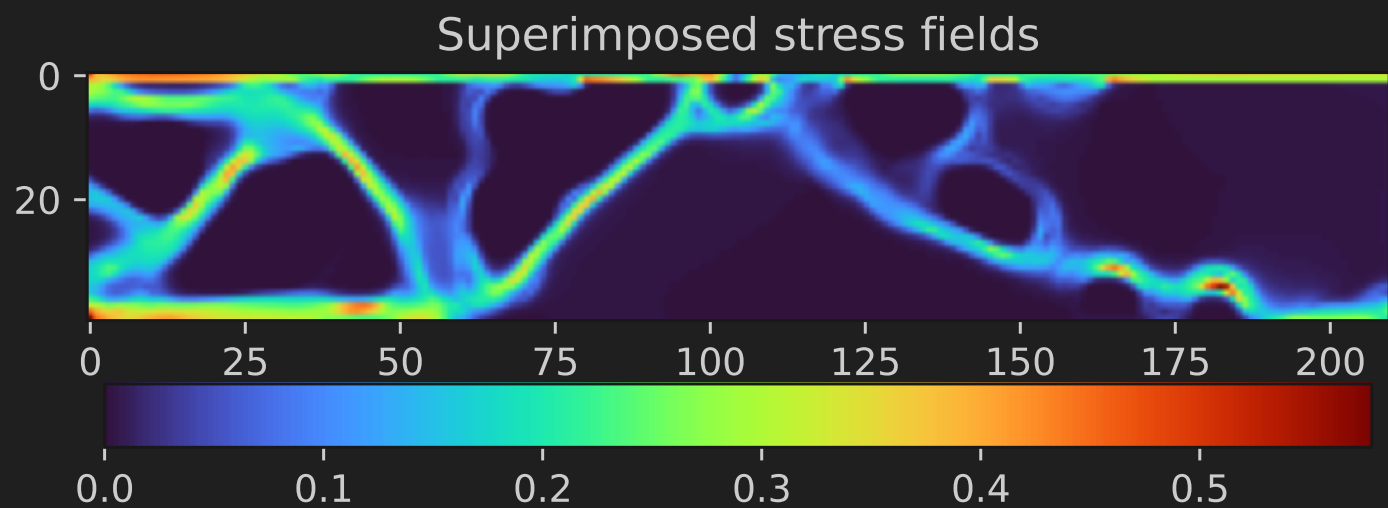
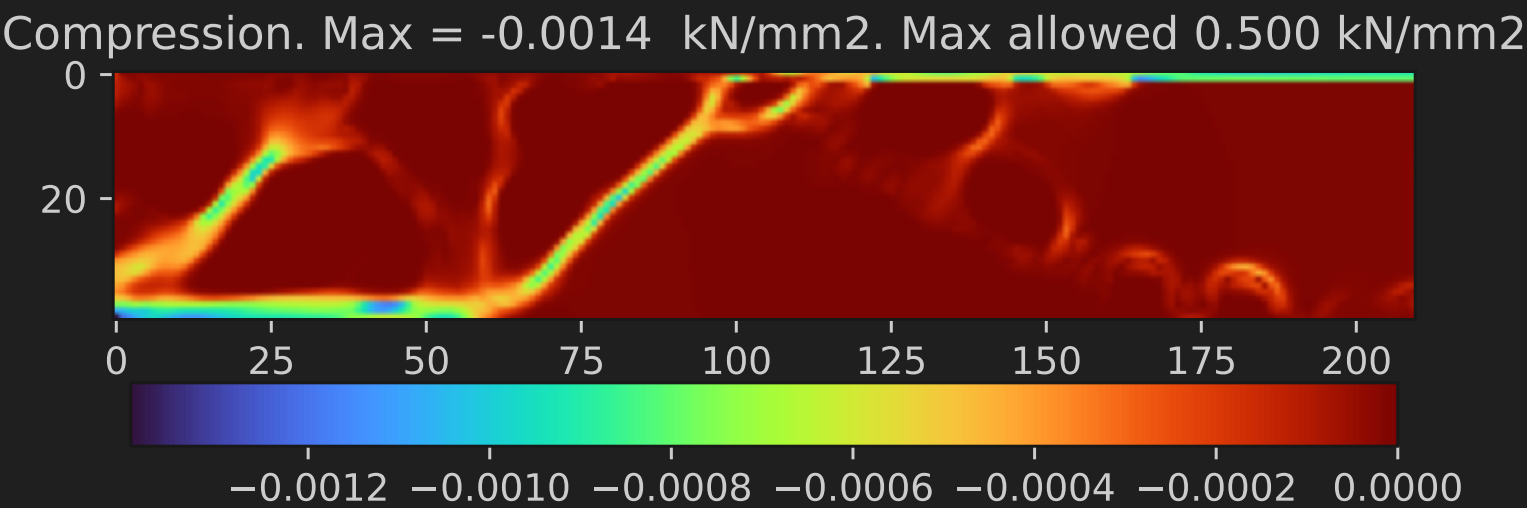
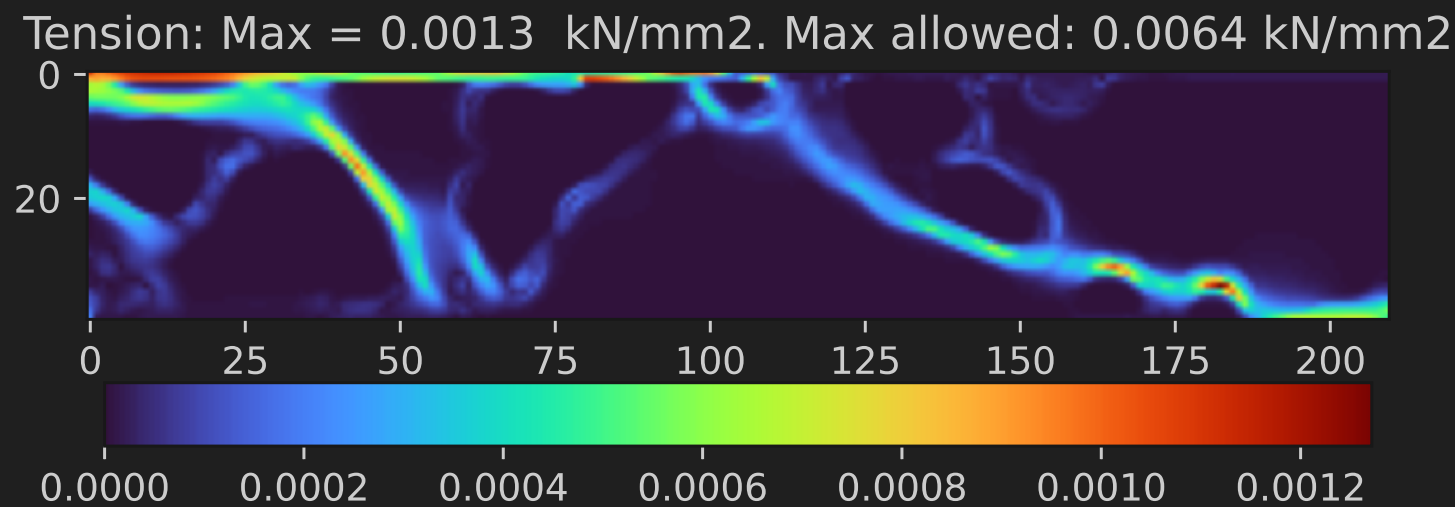
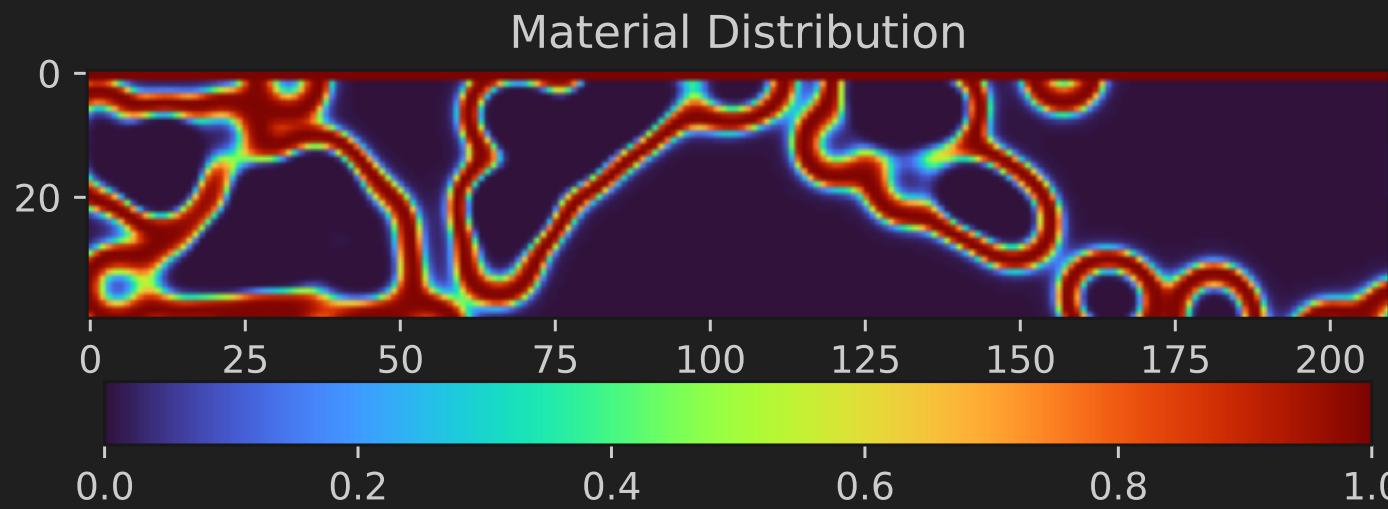
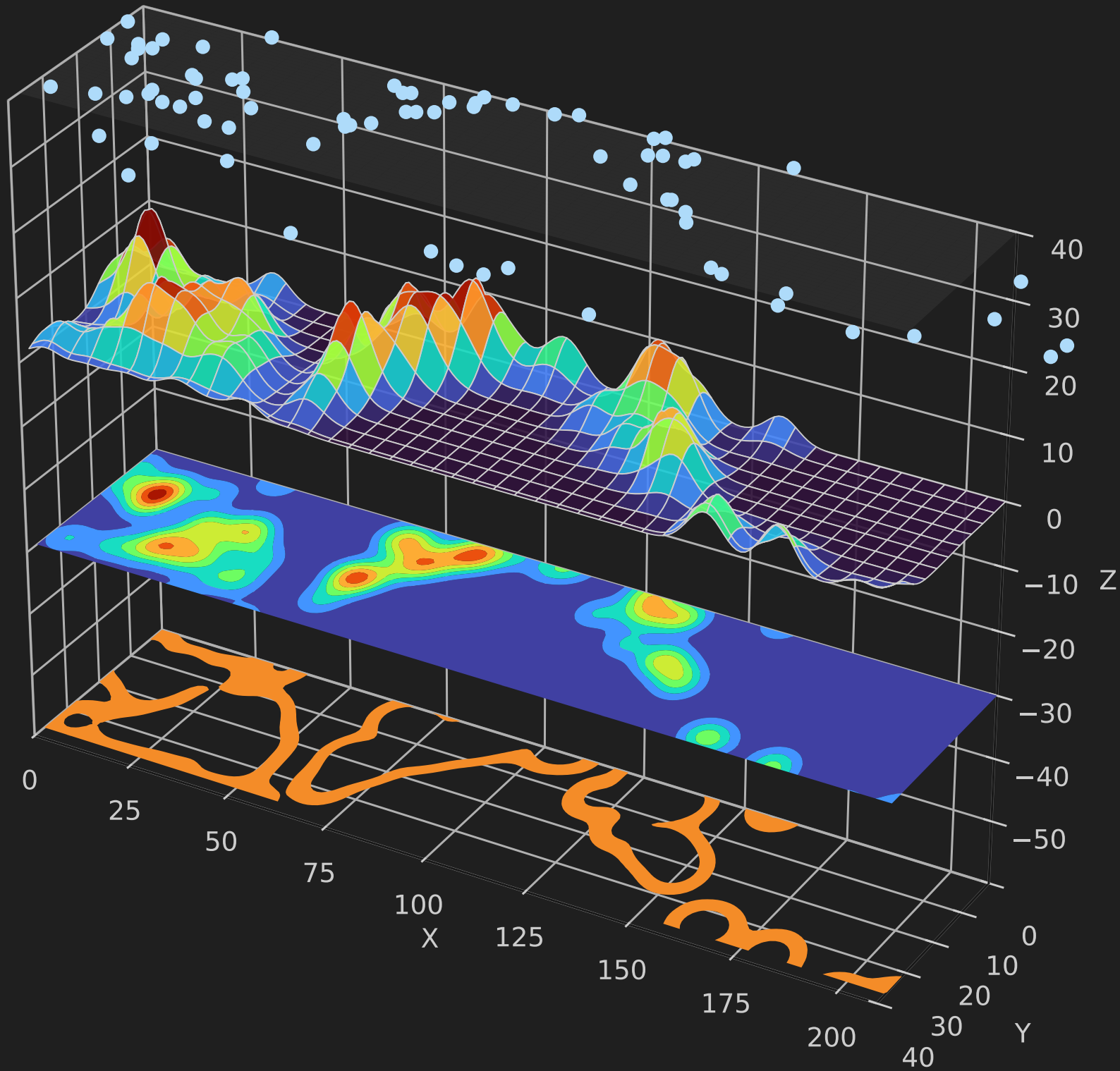
Objective = (Stress: 70 * 0.0013) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.11) = 0.34

Spread Gaussian = 5.28 Shift = 2.54 Iteration = 076



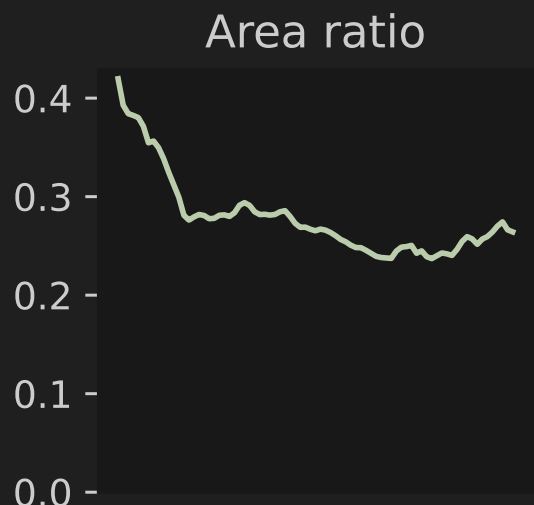
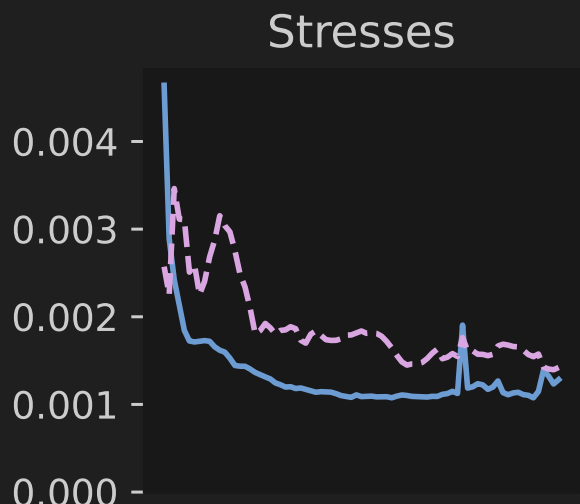
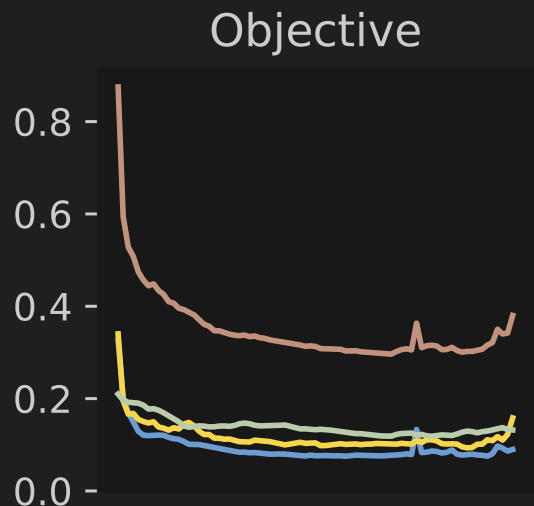
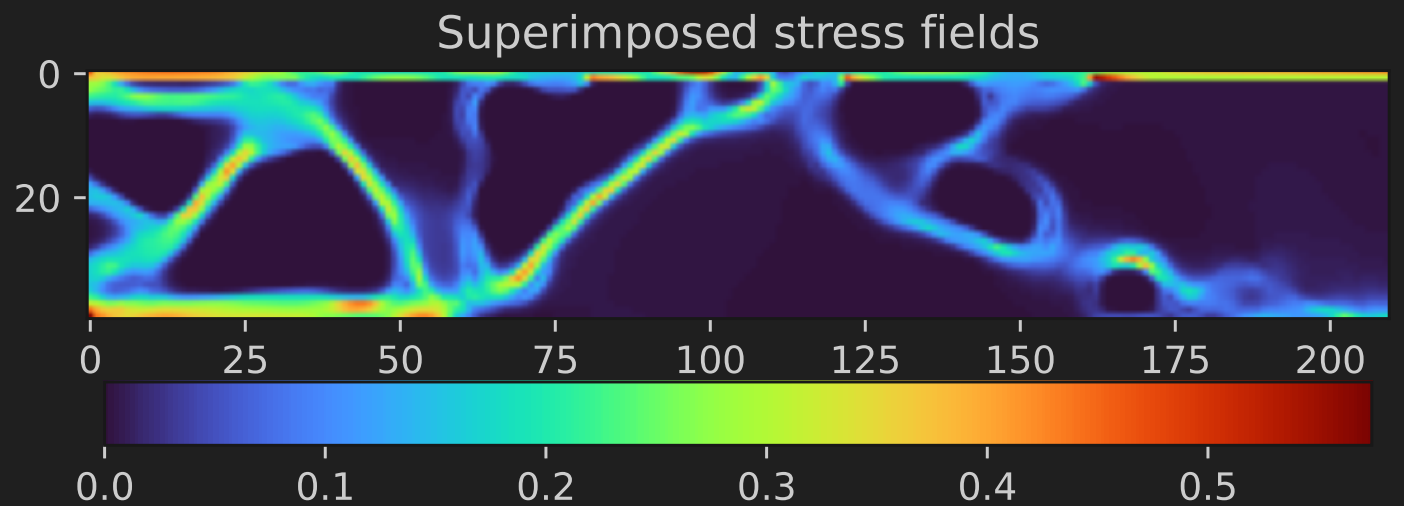
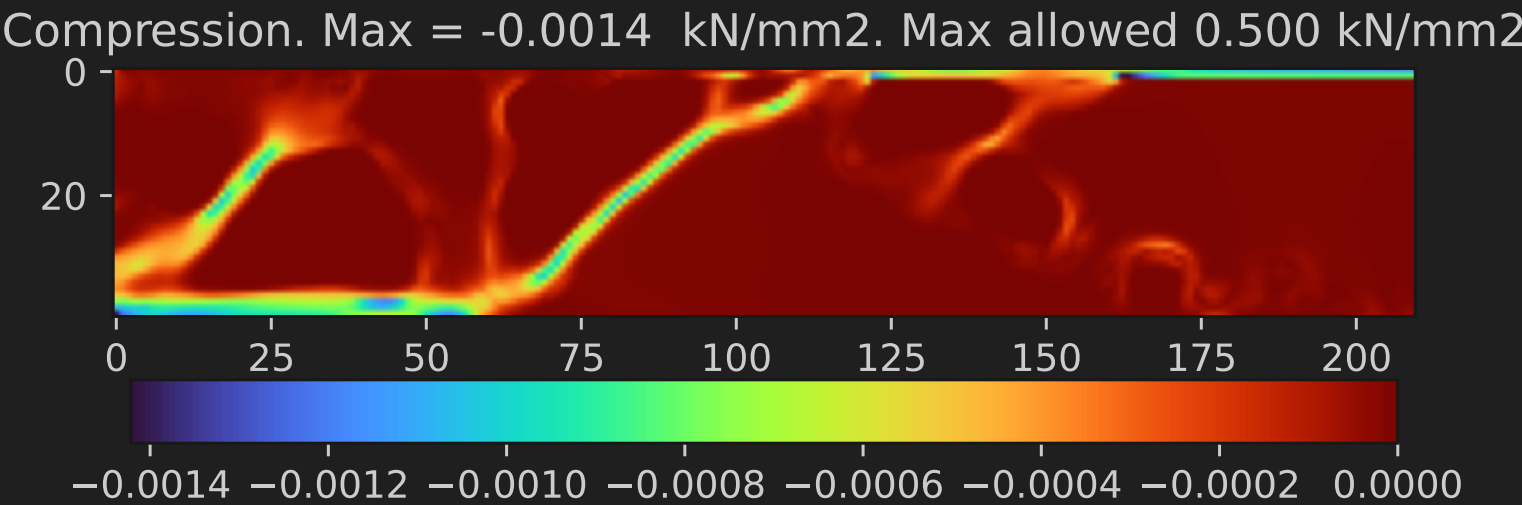
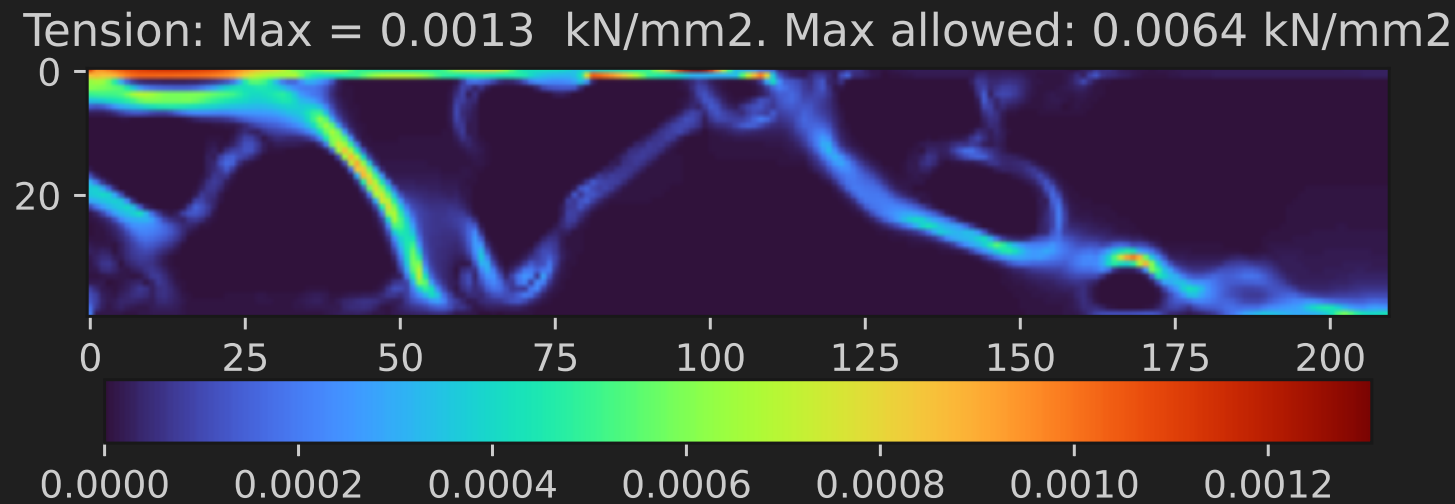
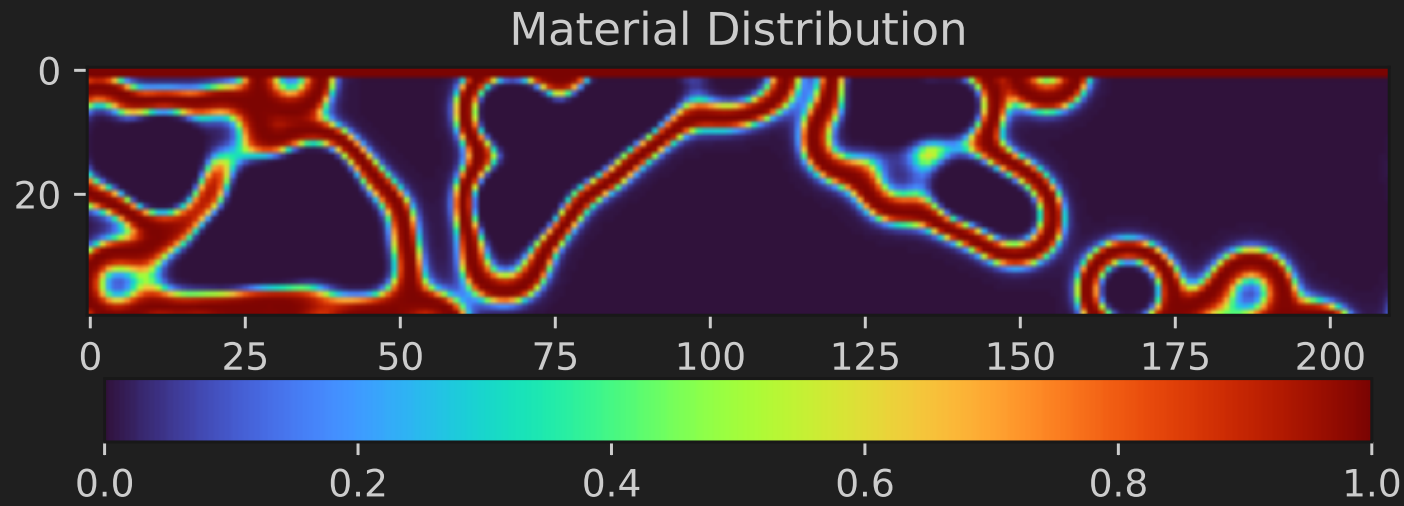
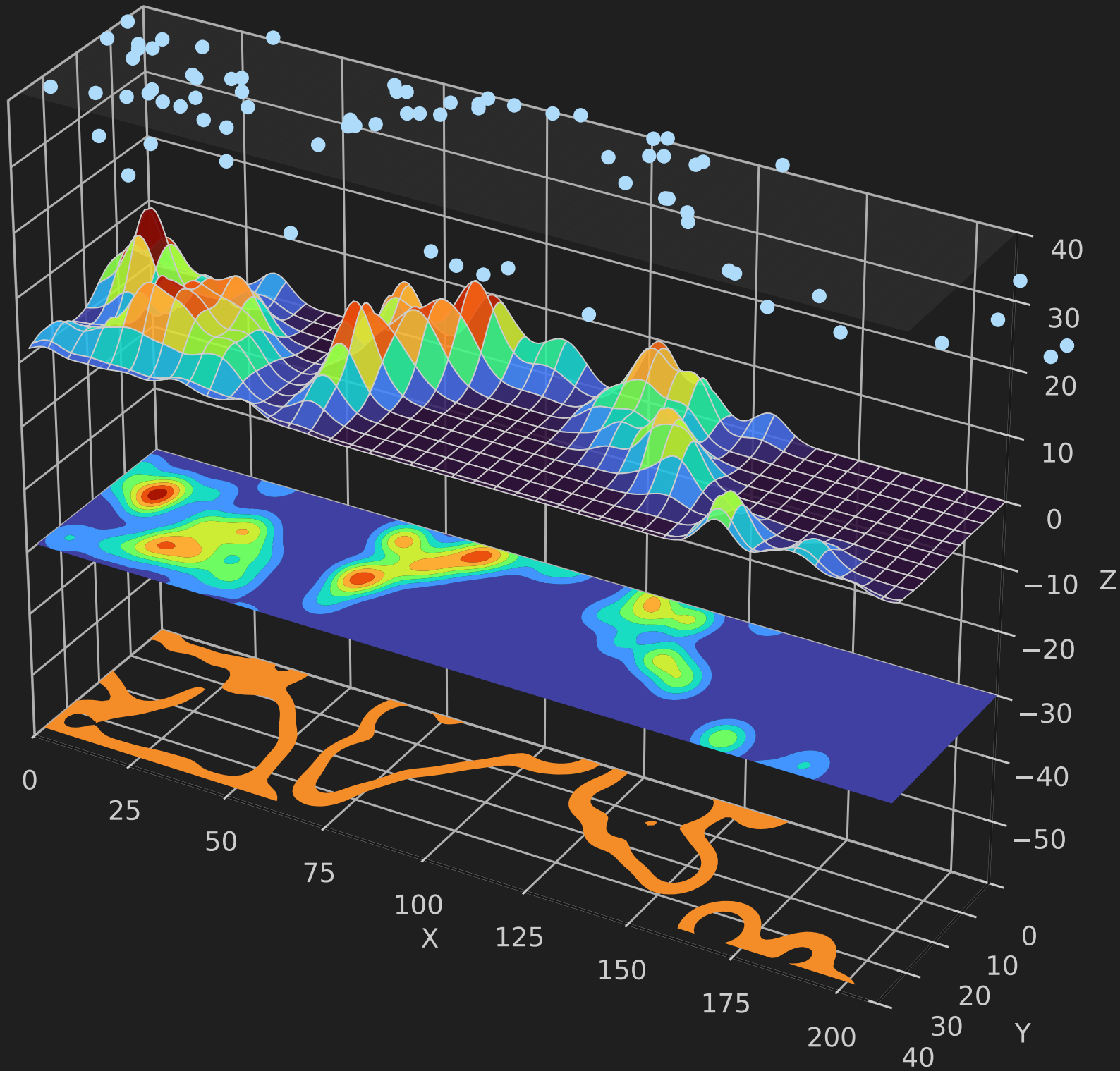
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.12) = 0.34

Spread Gaussian = 5.32 Shift = 2.58 Iteration = 077



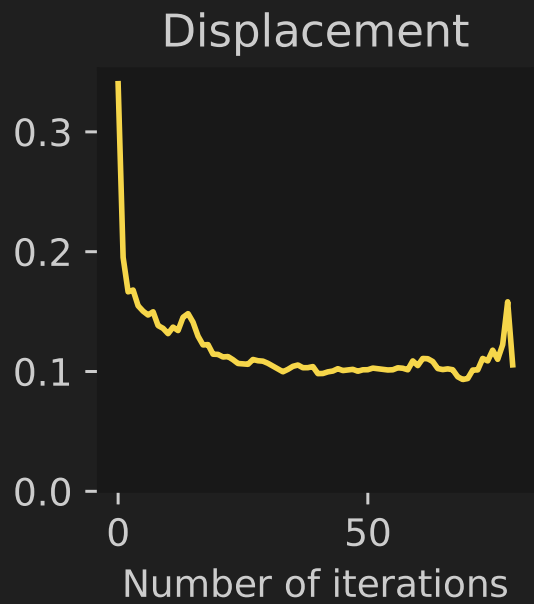
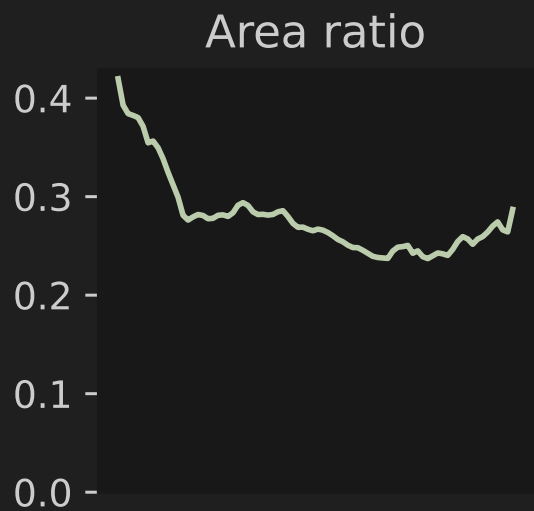
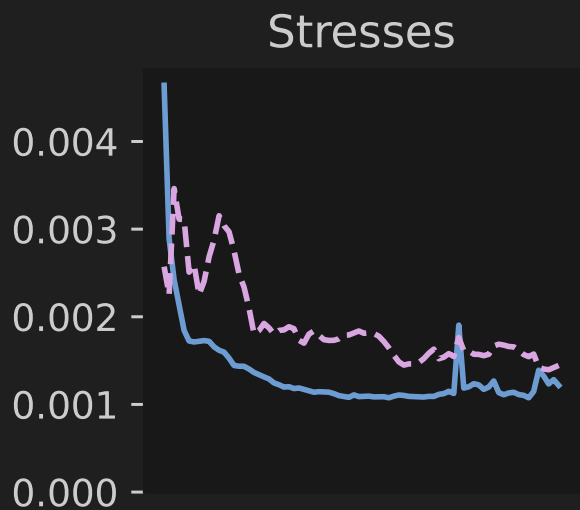
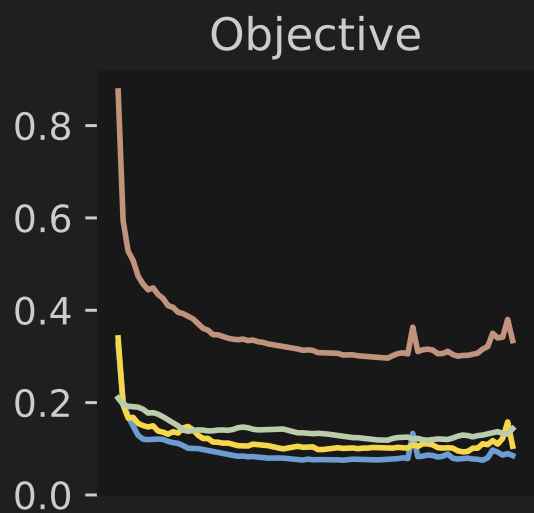
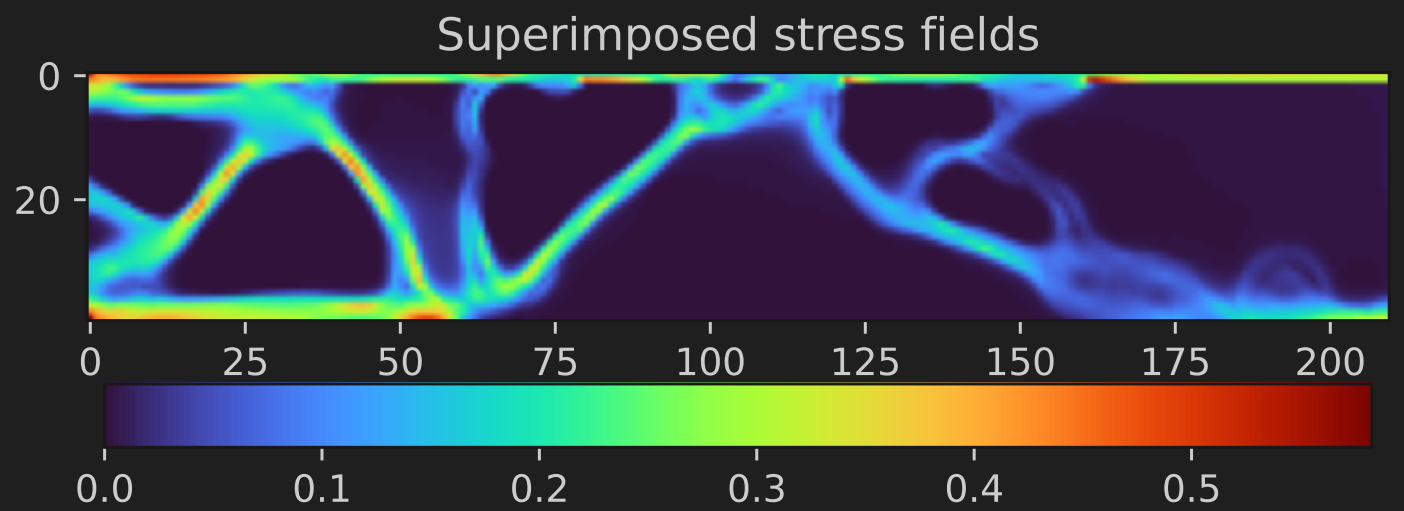
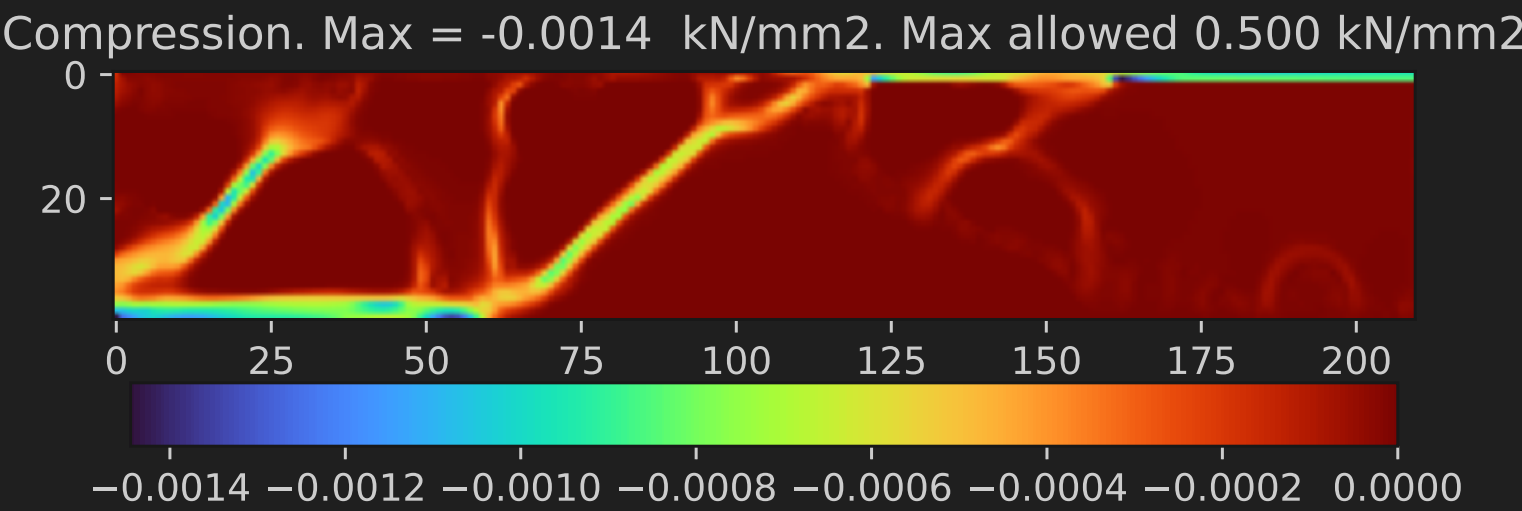
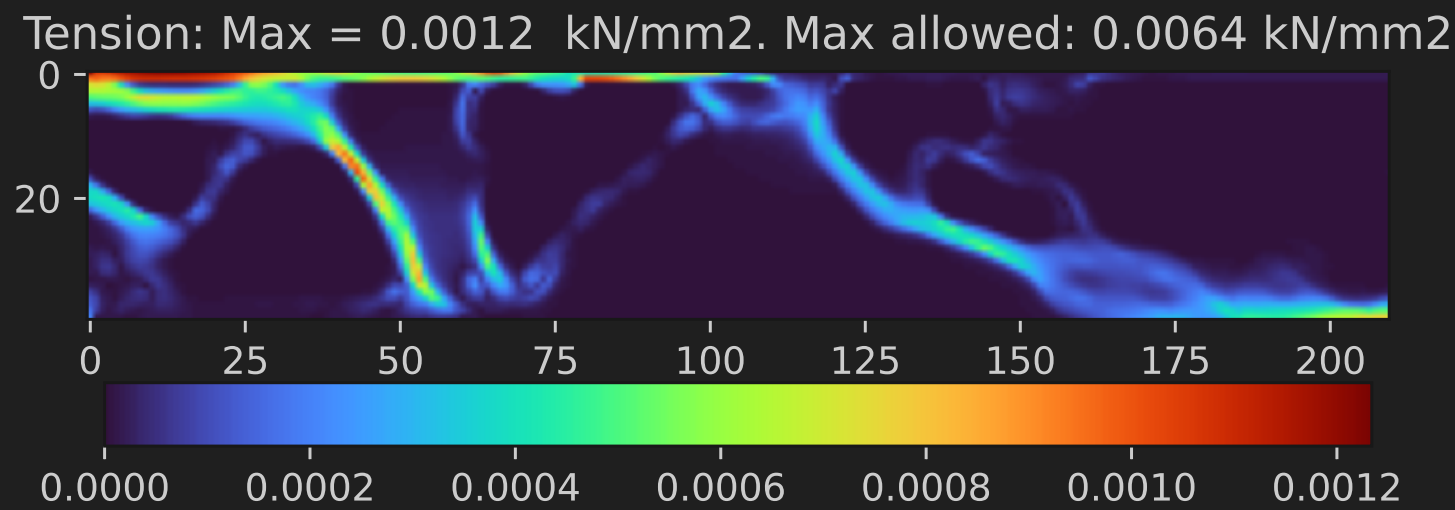
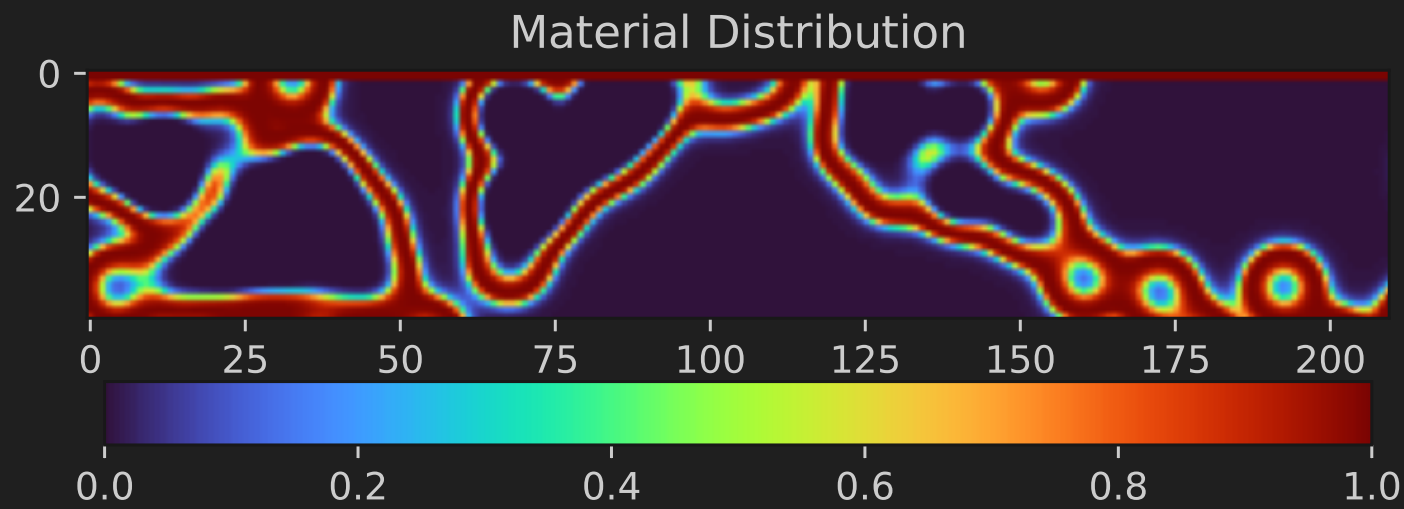
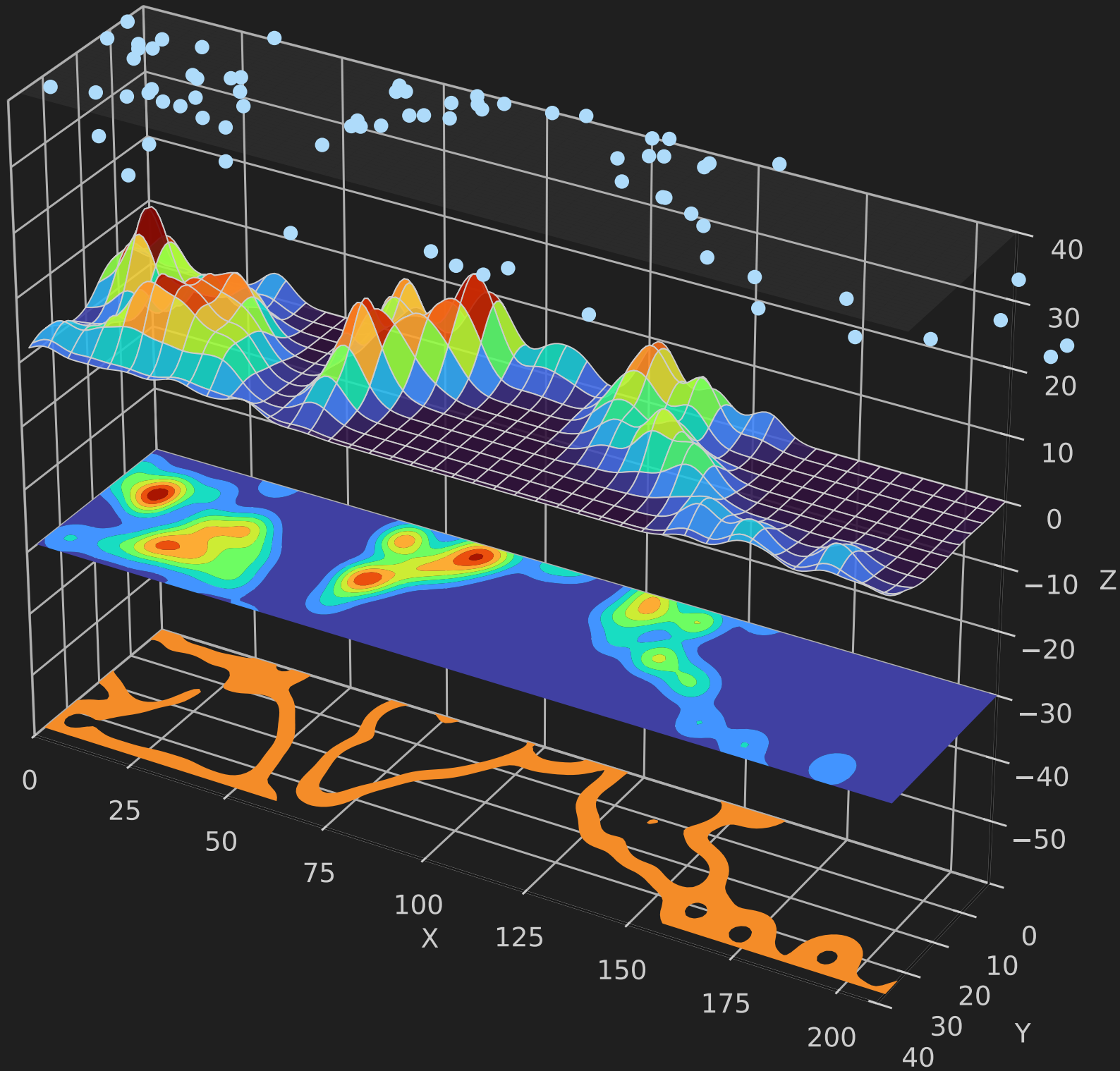
Objective = (Stress: 70 * 0.0013) + (Volume: 0.5 * 0.26) - (Displacement: 1 * -0.16) = 0.38

Spread Gaussian = 5.39 Shift = 2.63 Iteration = 078



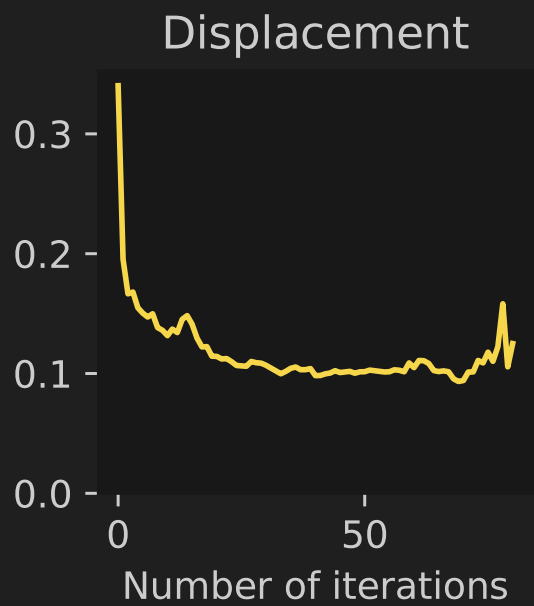
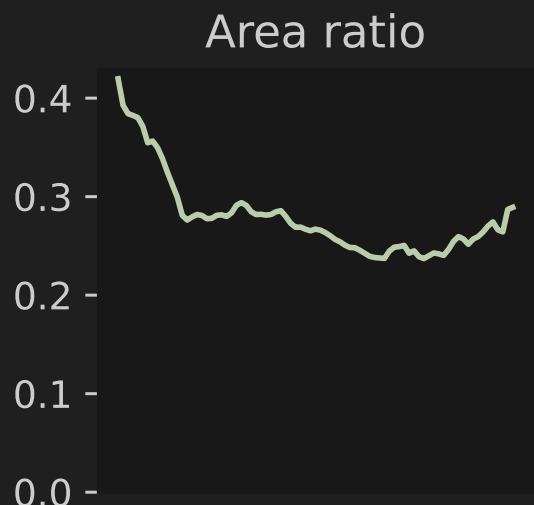
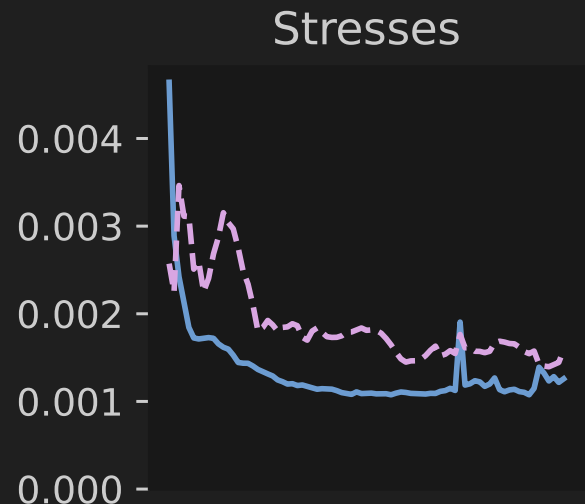
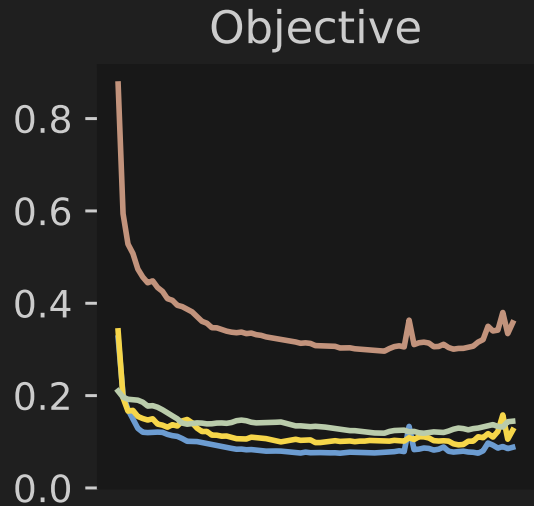
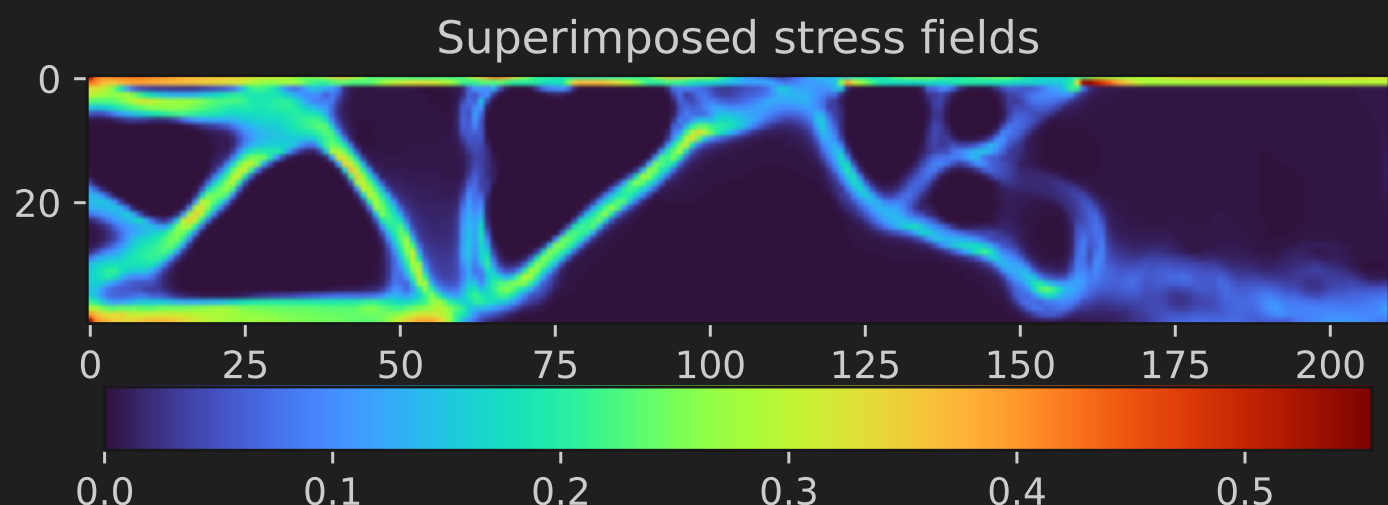
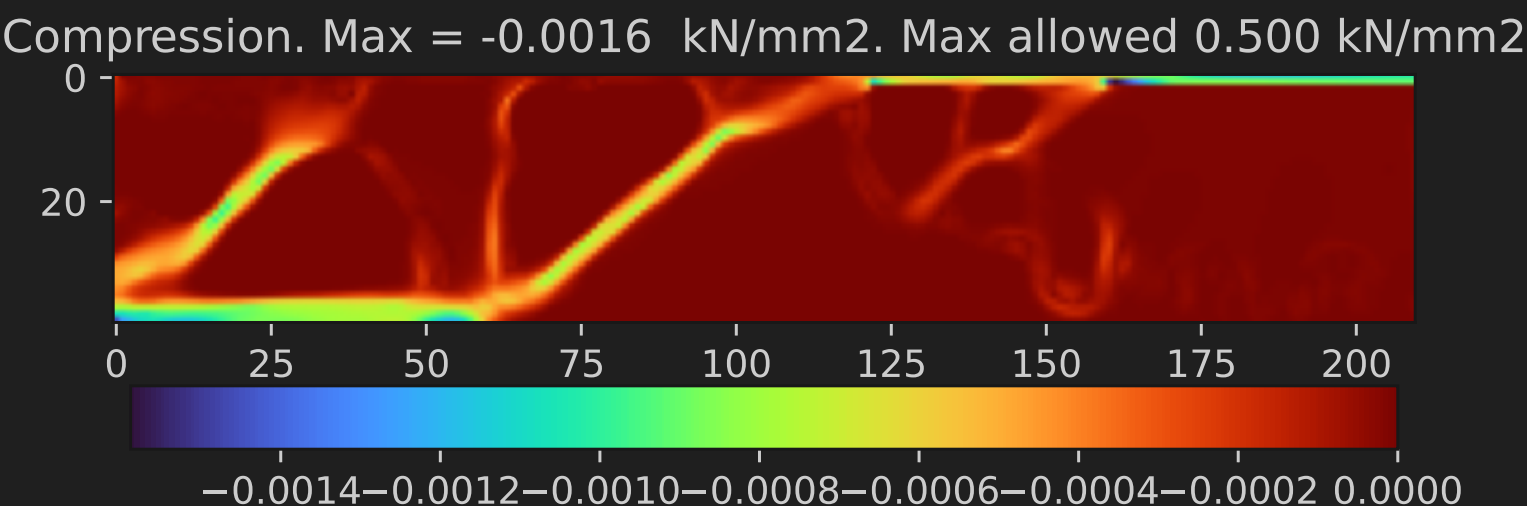
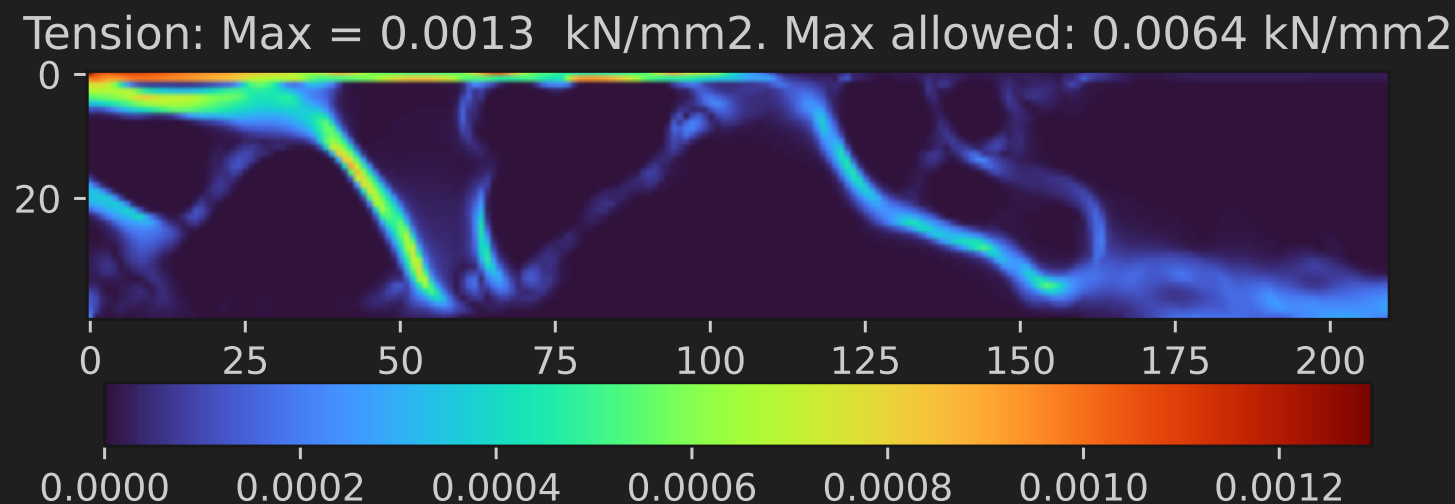
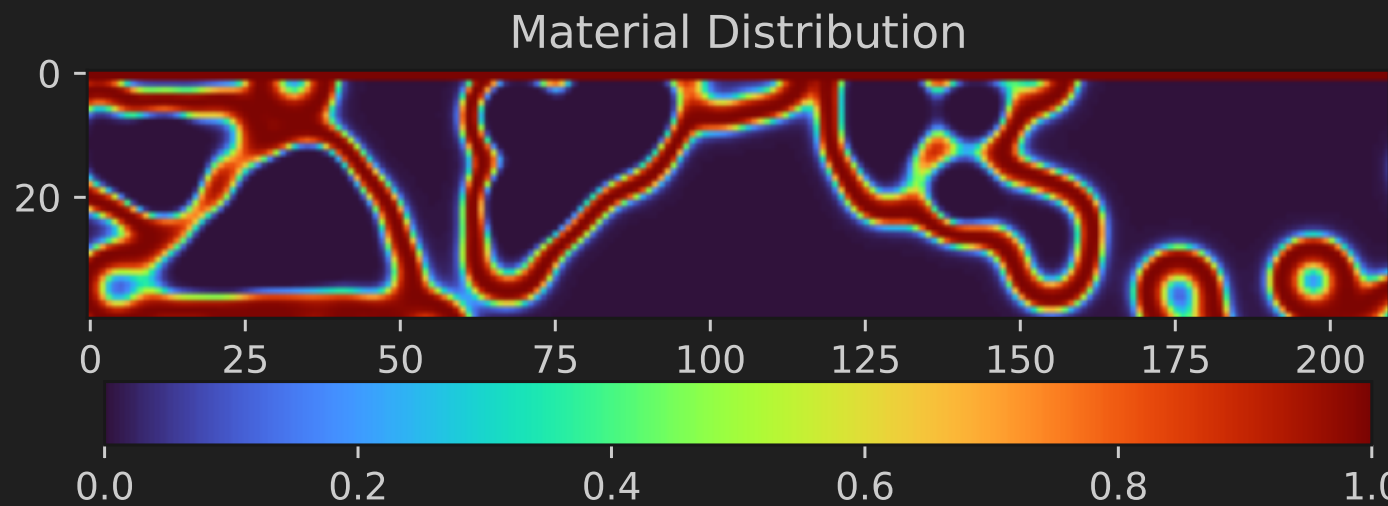
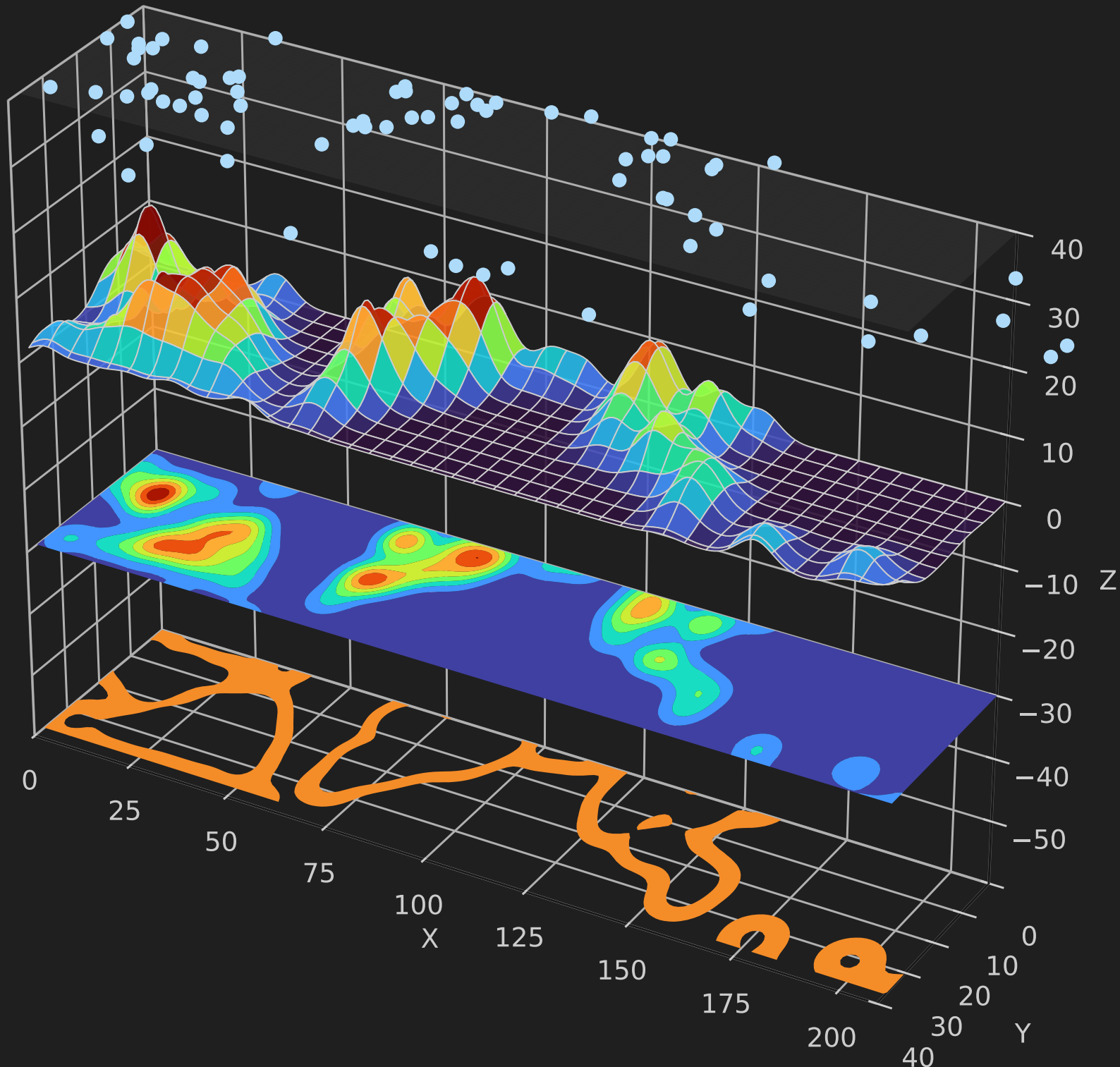
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.29) - (Displacement: 1 * -0.11) = 0.33

Spread Gaussian = 5.50 Shift = 2.68 Iteration = 079



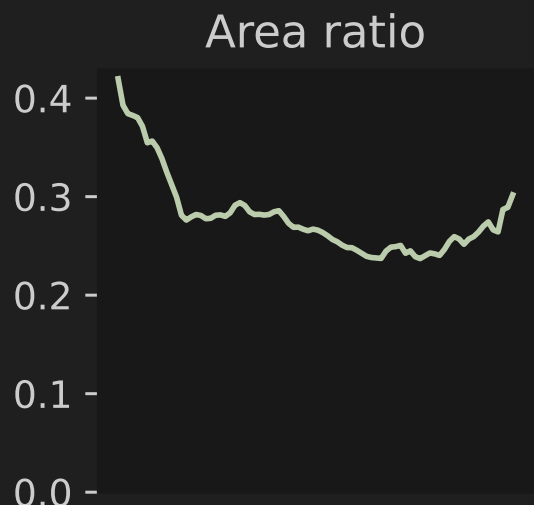
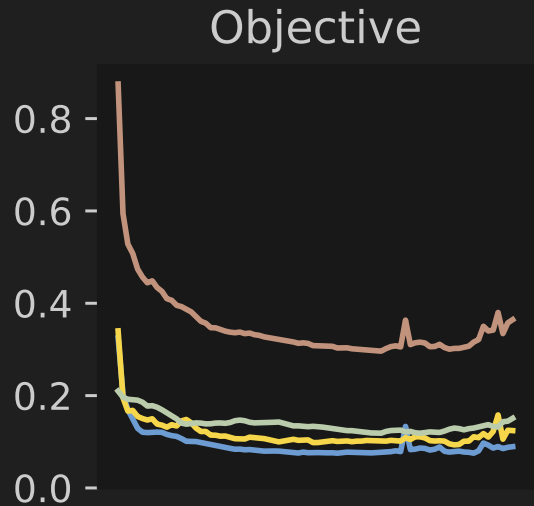
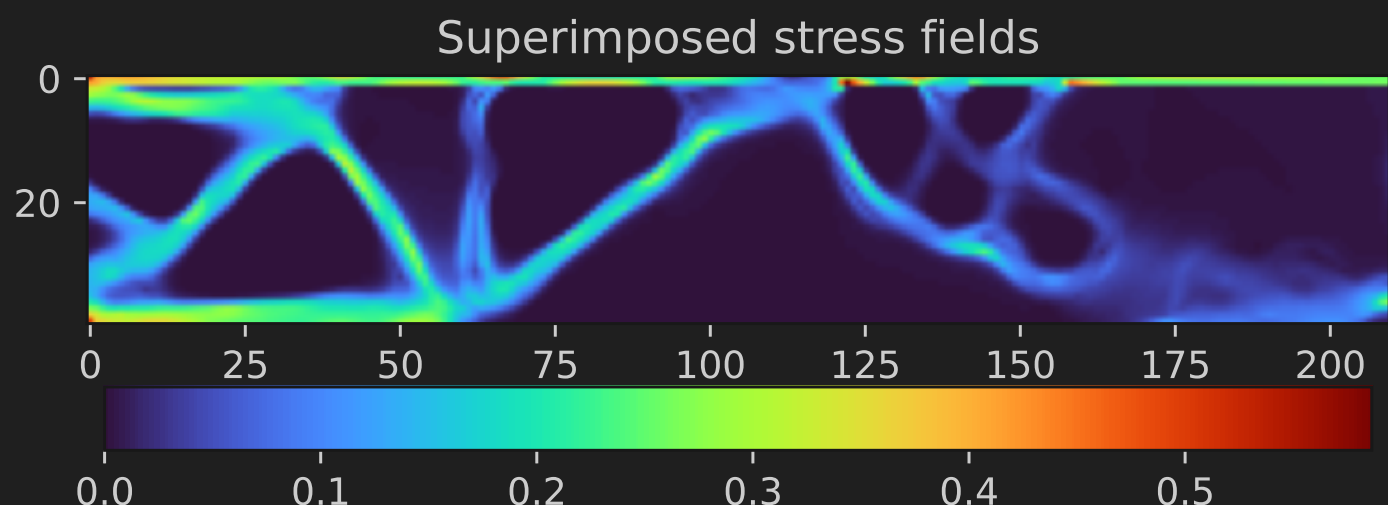
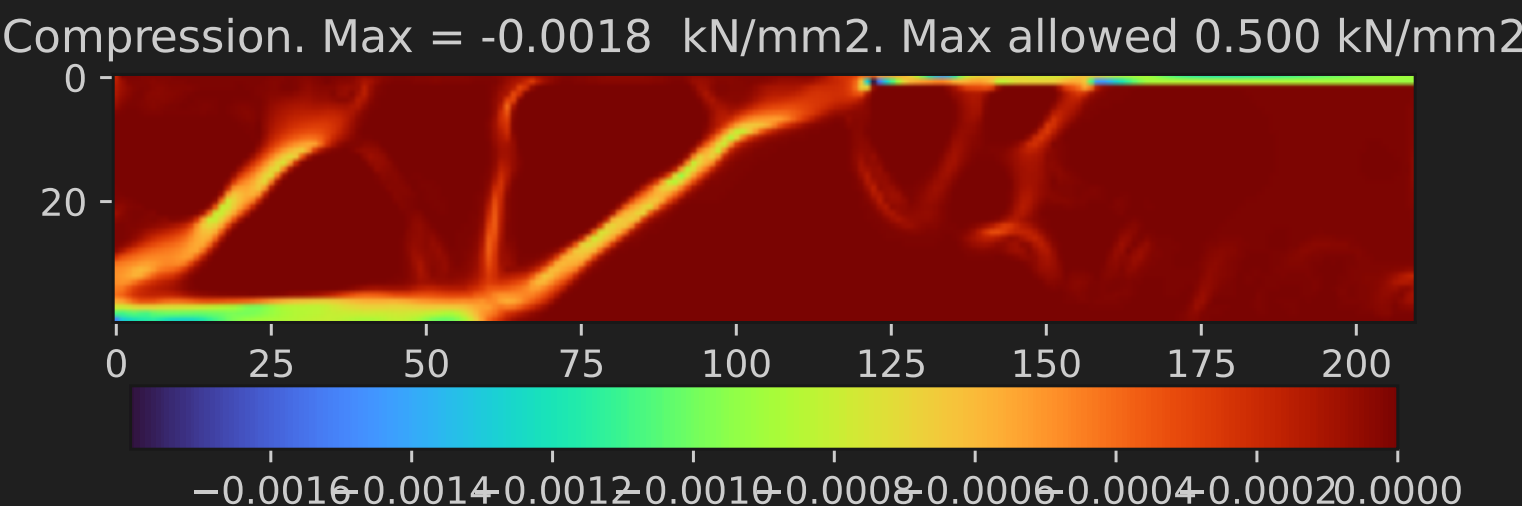
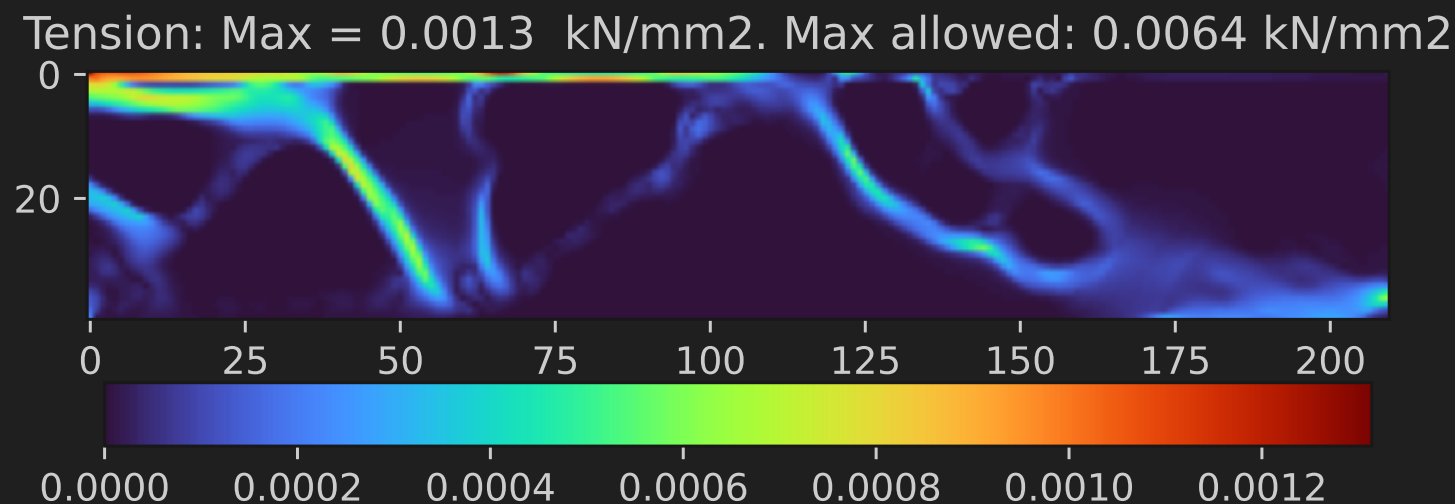
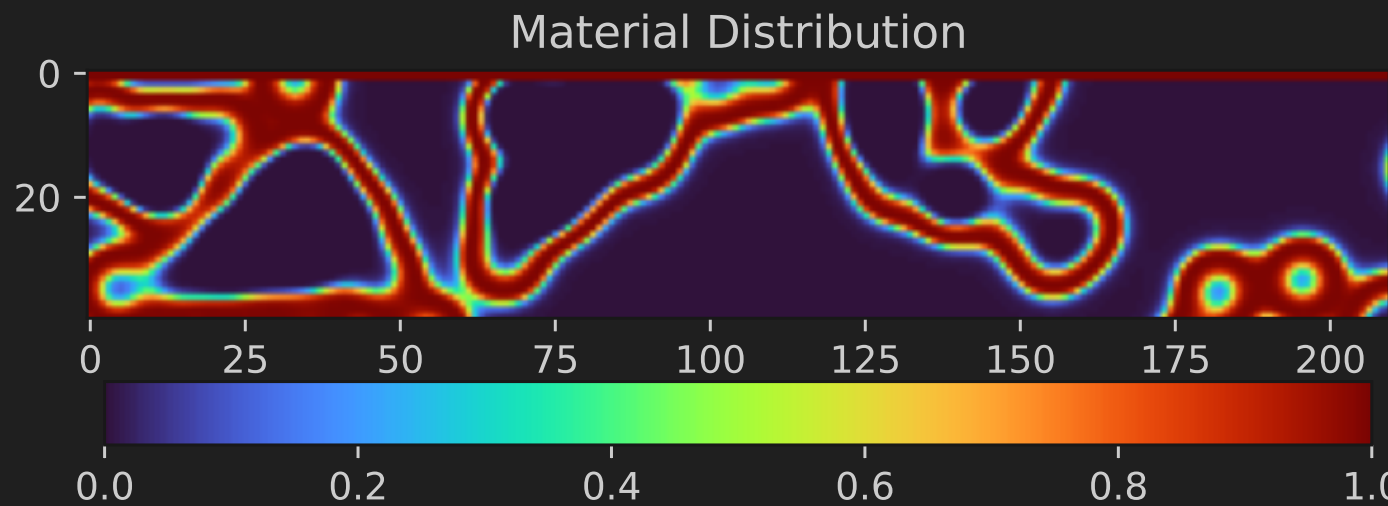
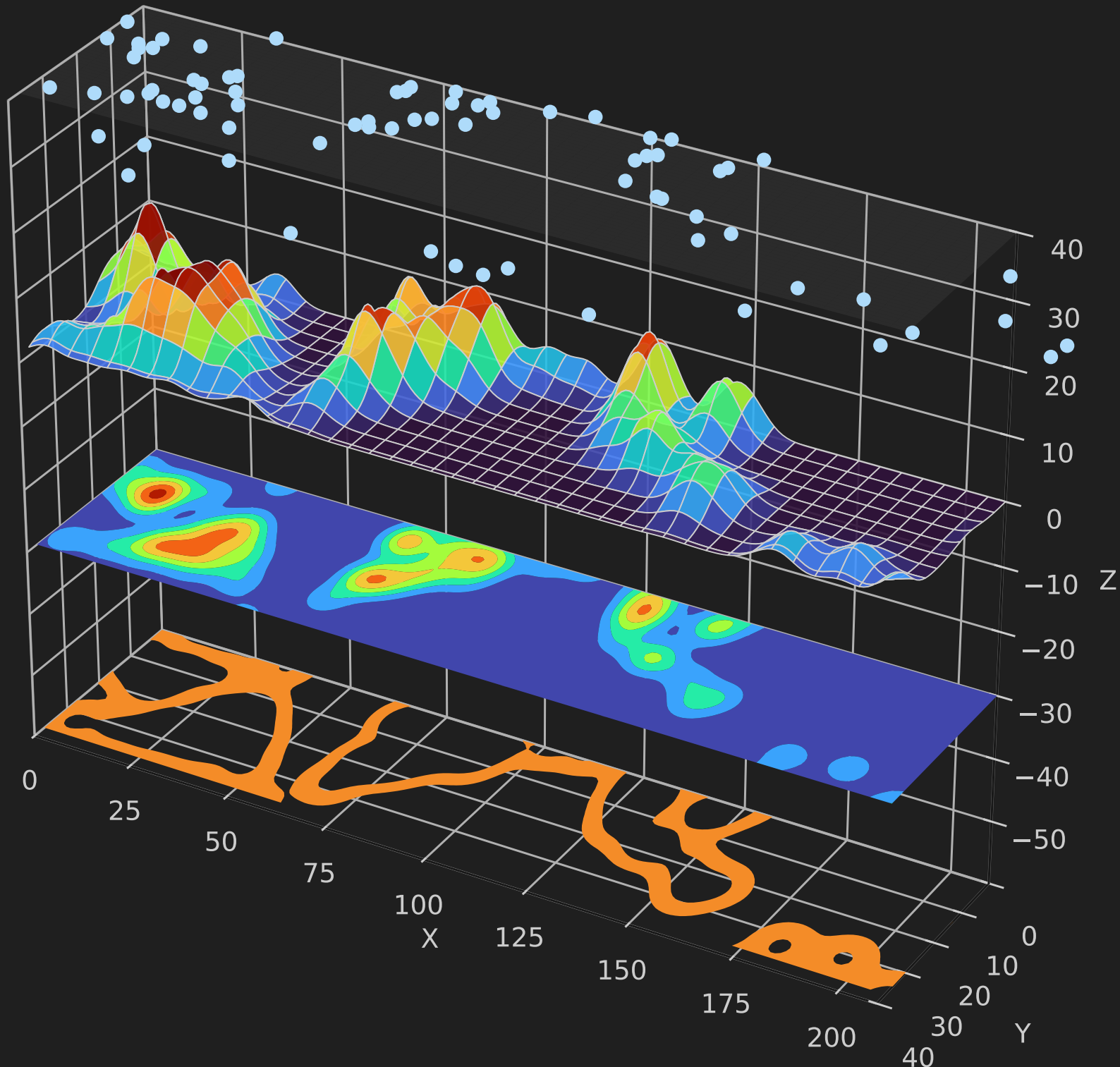
Objective = (Stress: 70 * 0.0013) + (Volume: 0.5 * 0.29) - (Displacement: 1 * -0.12) = 0.36

Spread Gaussian = 5.57 Shift = 2.73 Iteration = 080



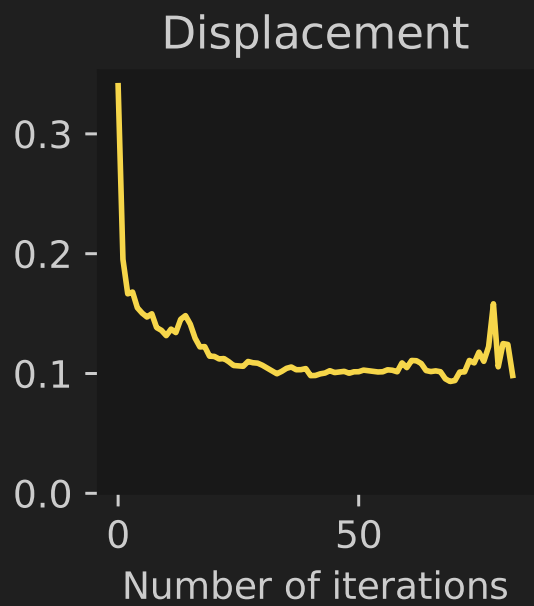
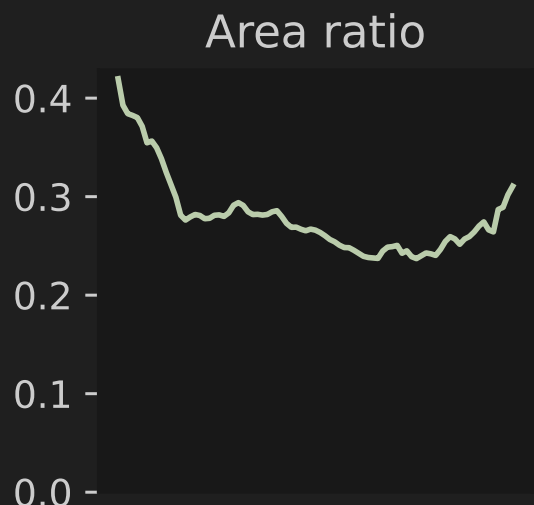
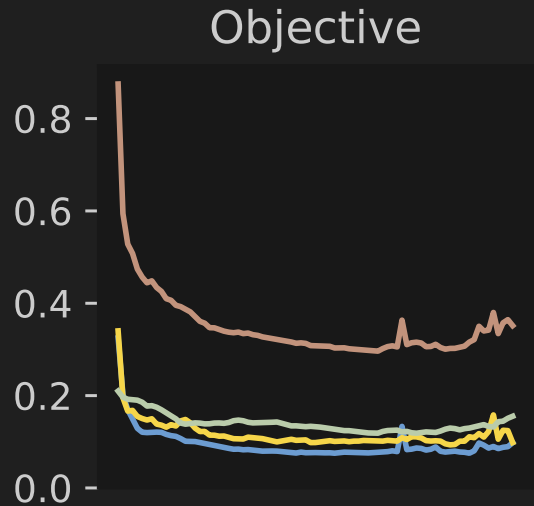
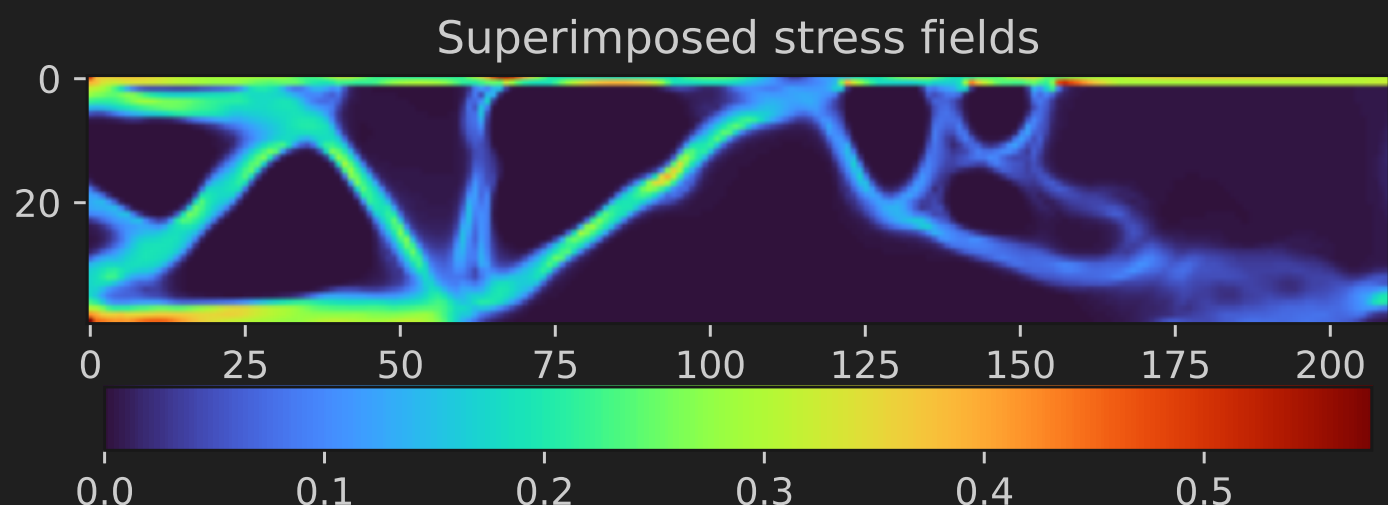
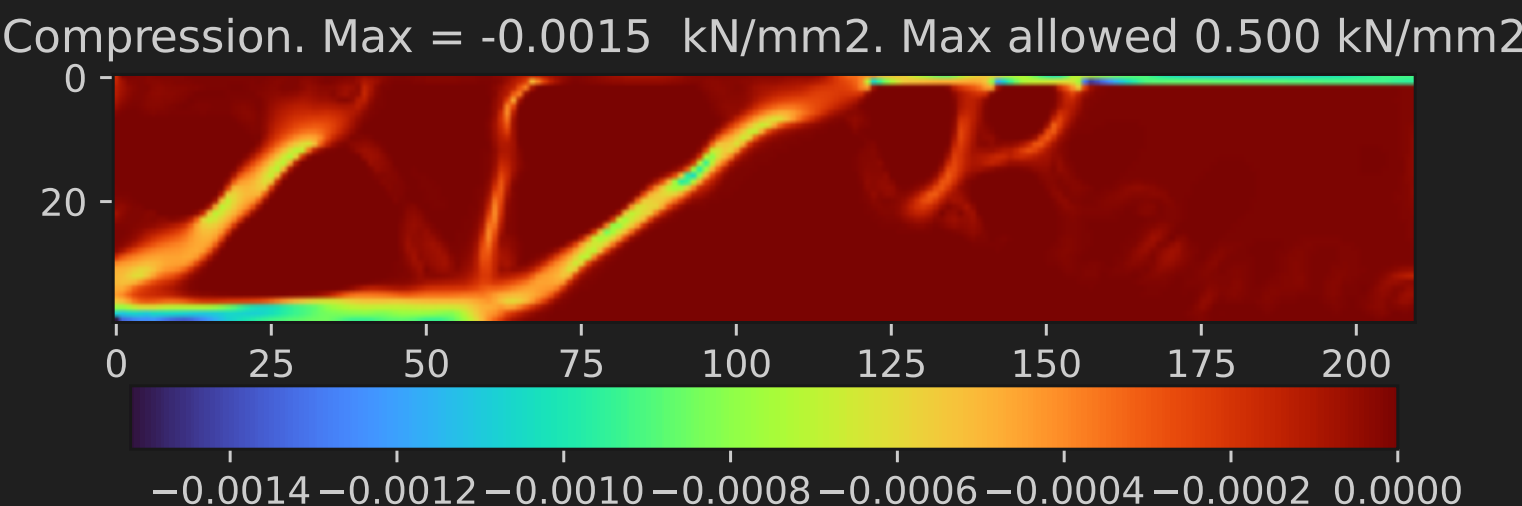
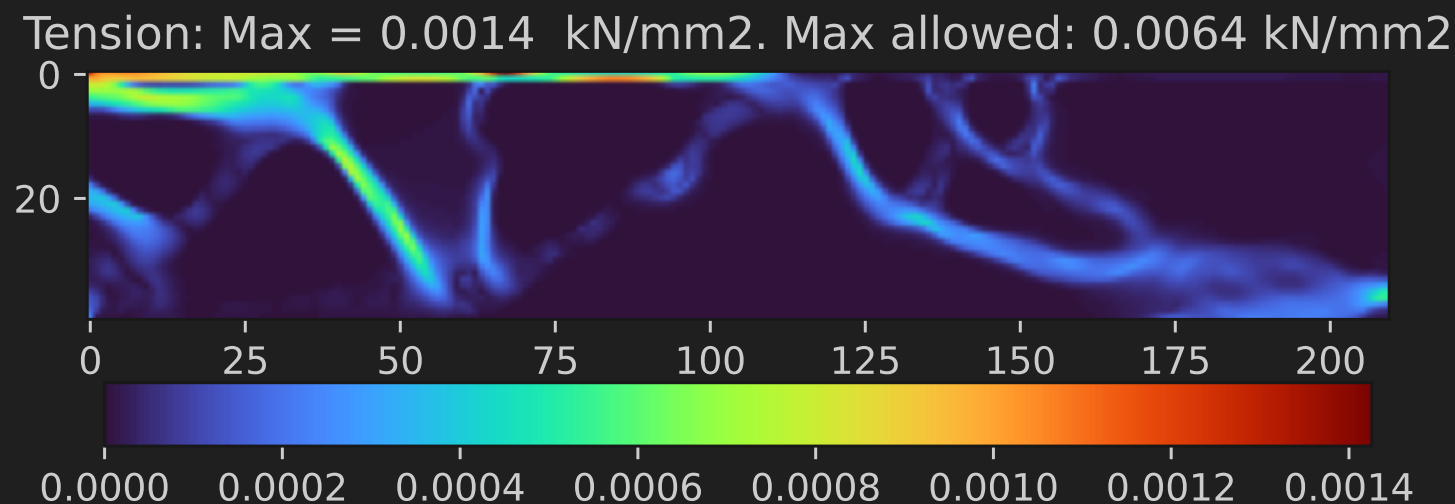
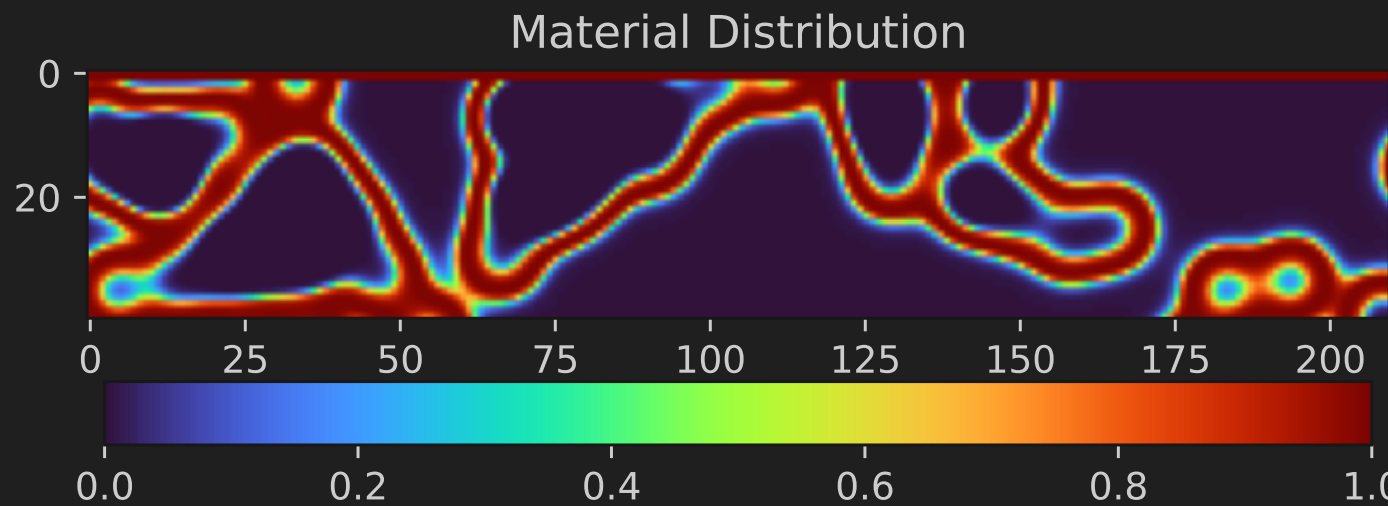
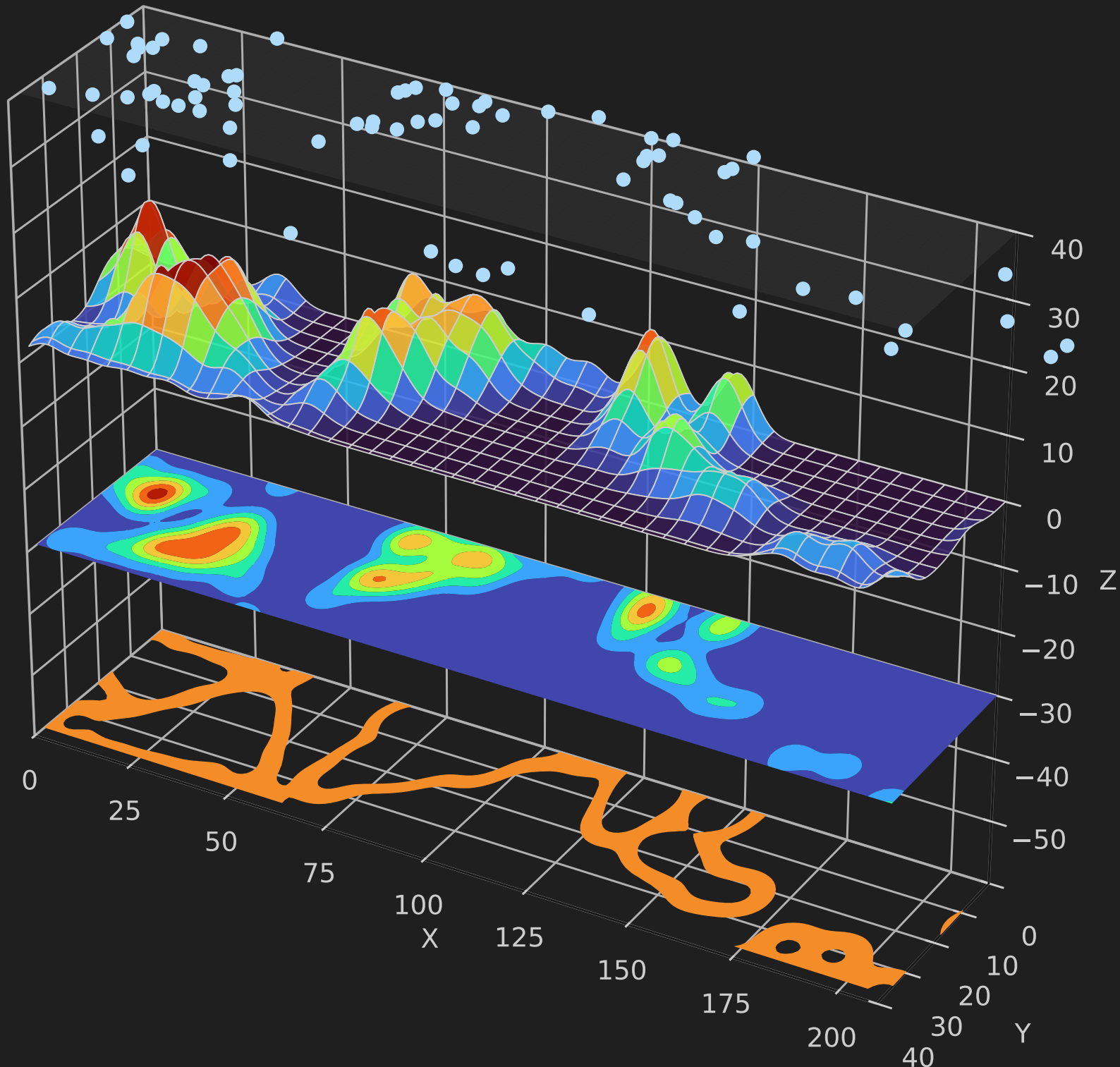
Objective = (Stress: 70 * 0.0013) + (Volume: 0.5 * 0.30) - (Displacement: 1 * -0.12) = 0.36

Spread Gaussian = 5.64 Shift = 2.77 Iteration = 081



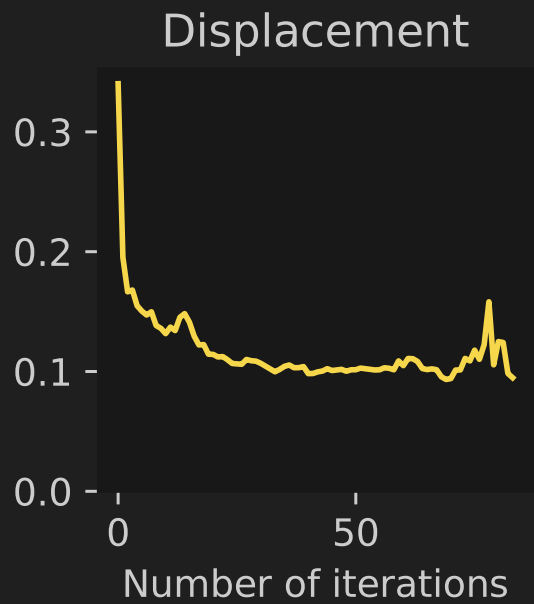
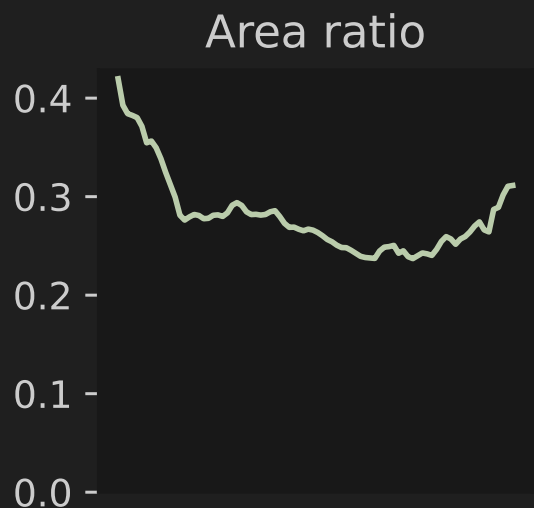
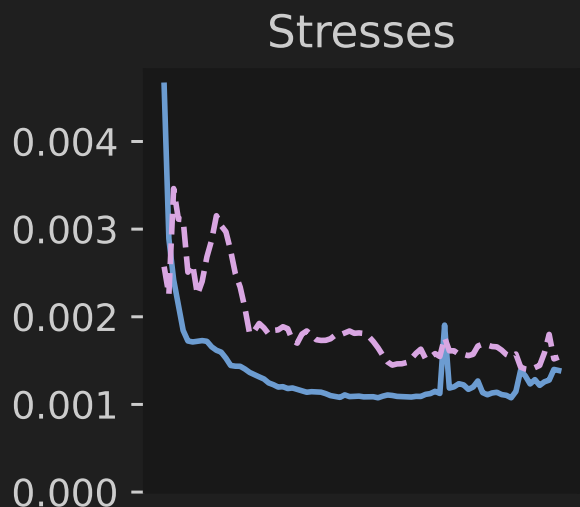
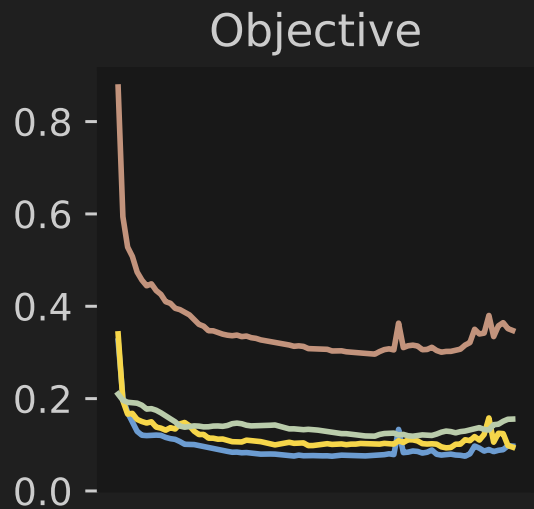
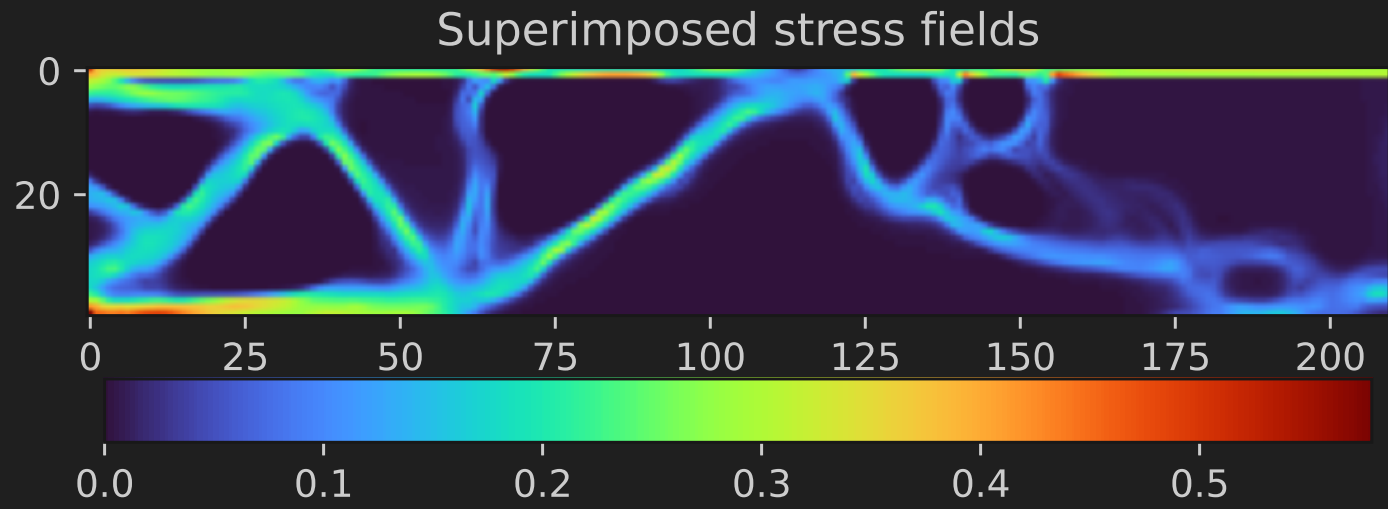
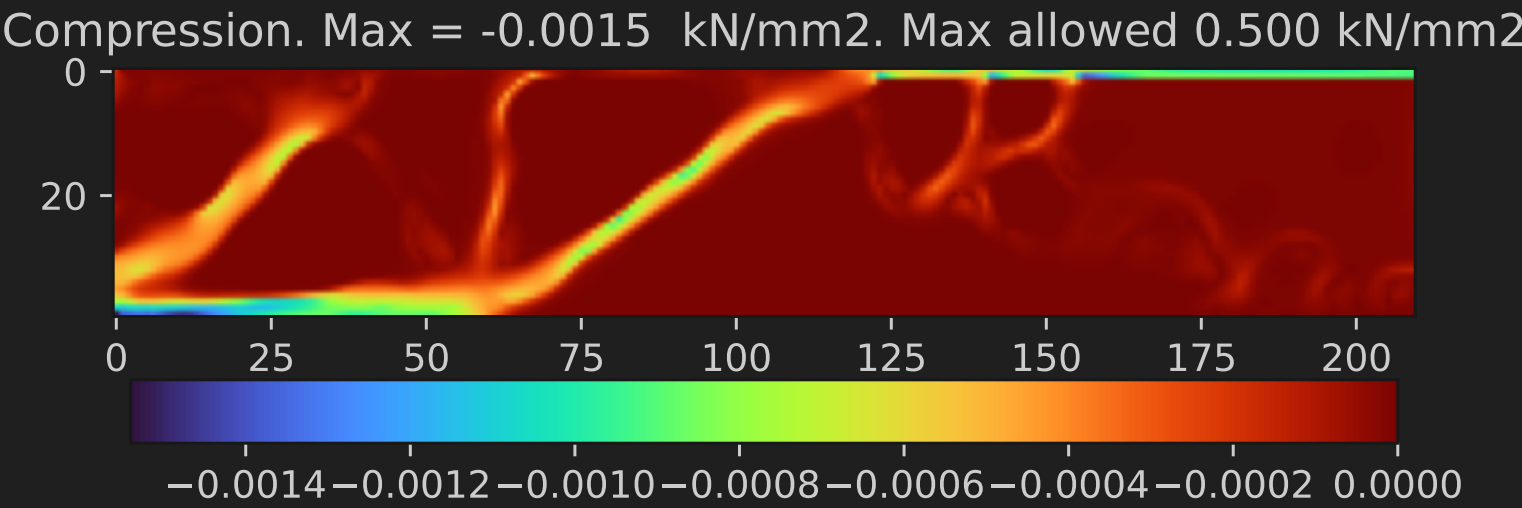
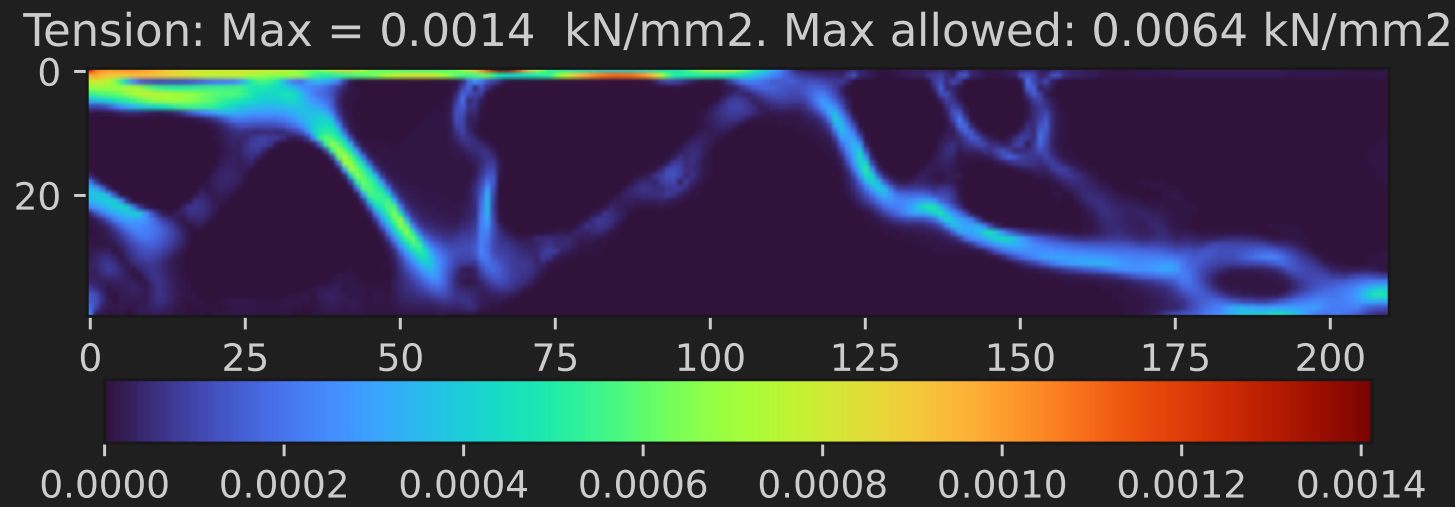
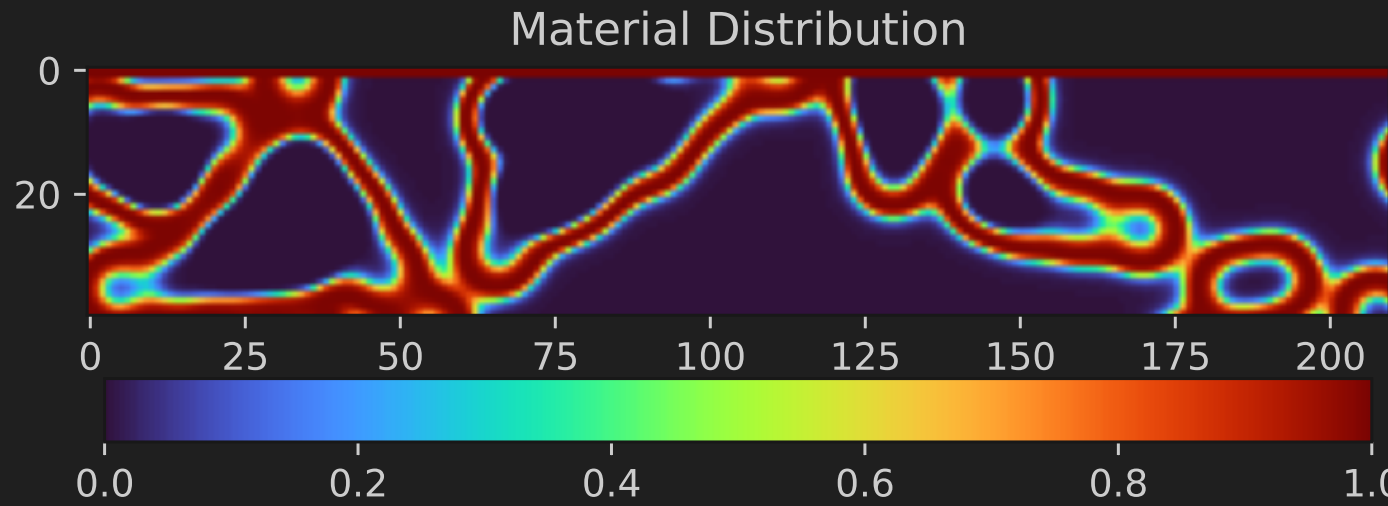
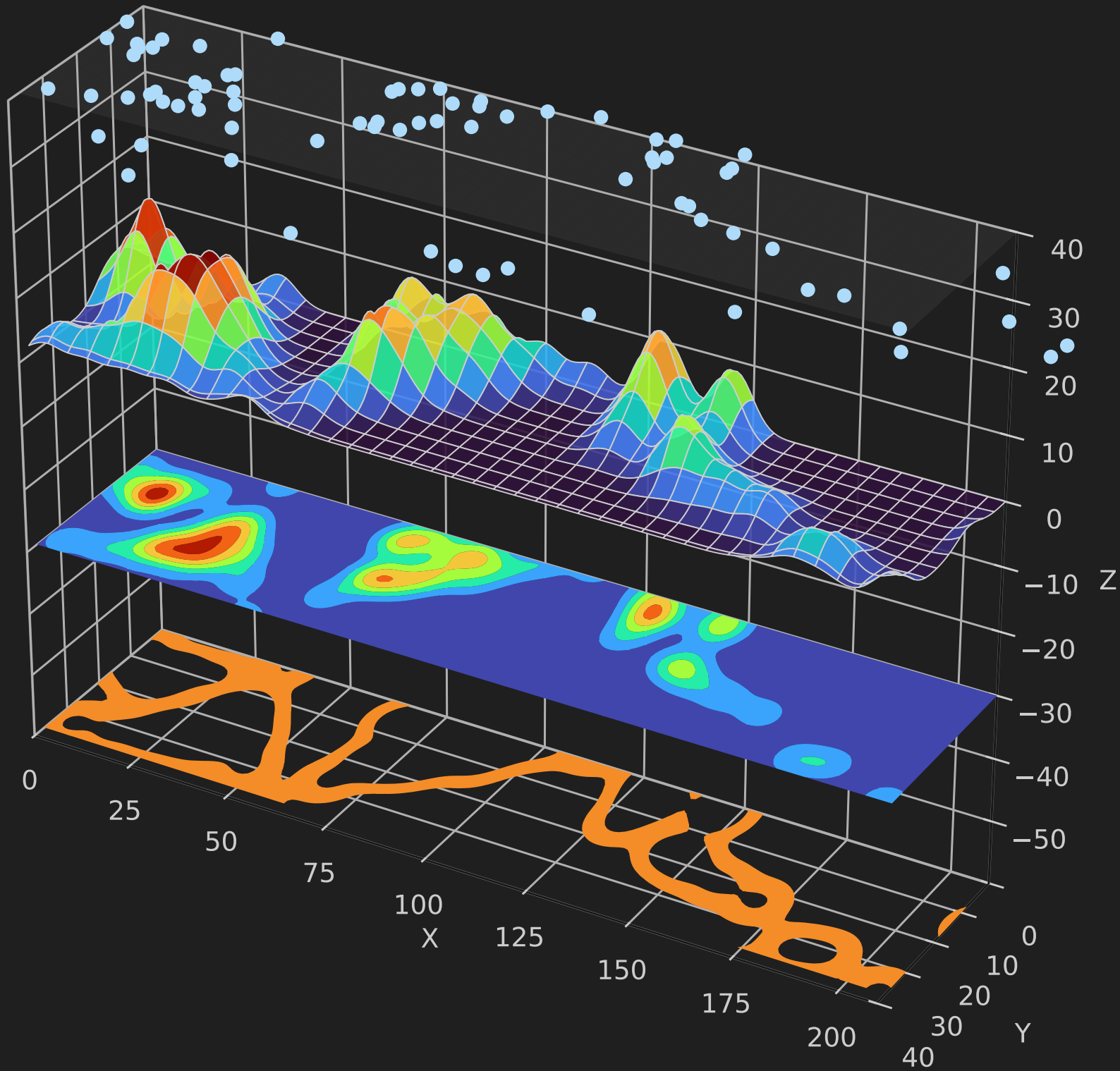
Objective = (Stress: 70 * 0.0014) + (Volume: 0.5 * 0.31) - (Displacement: 1 * -0.10) = 0.35

Spread Gaussian = 5.69 Shift = 2.81 Iteration = 082



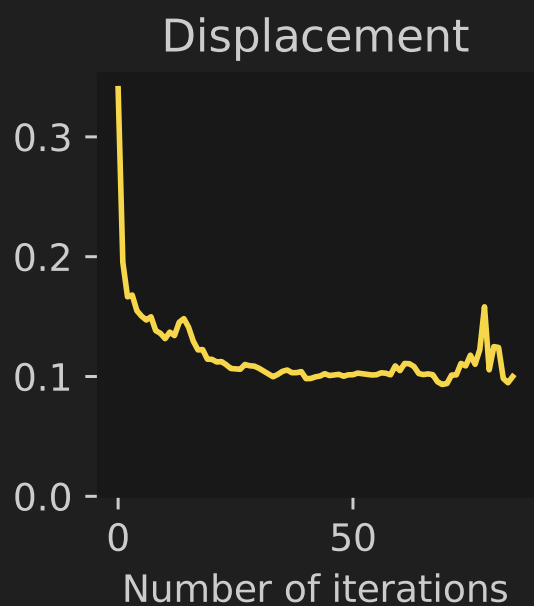
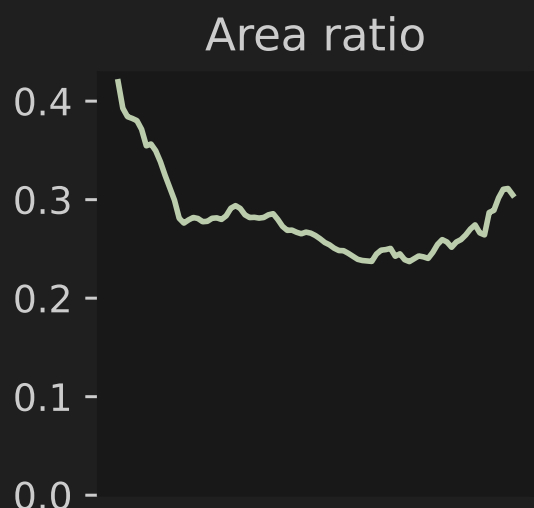
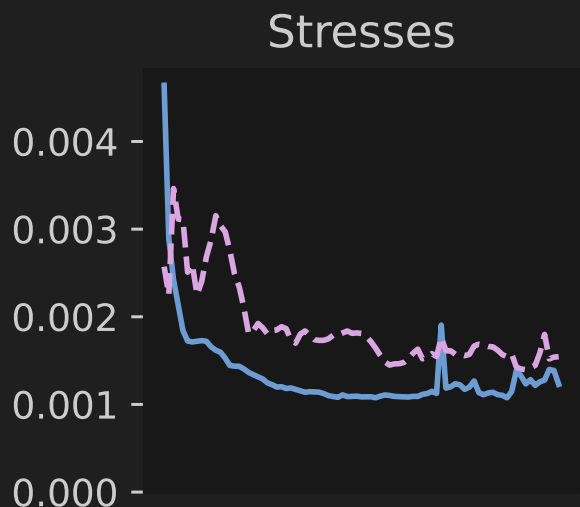
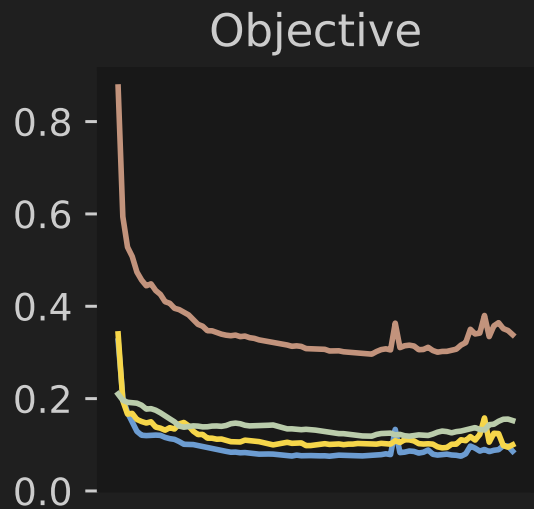
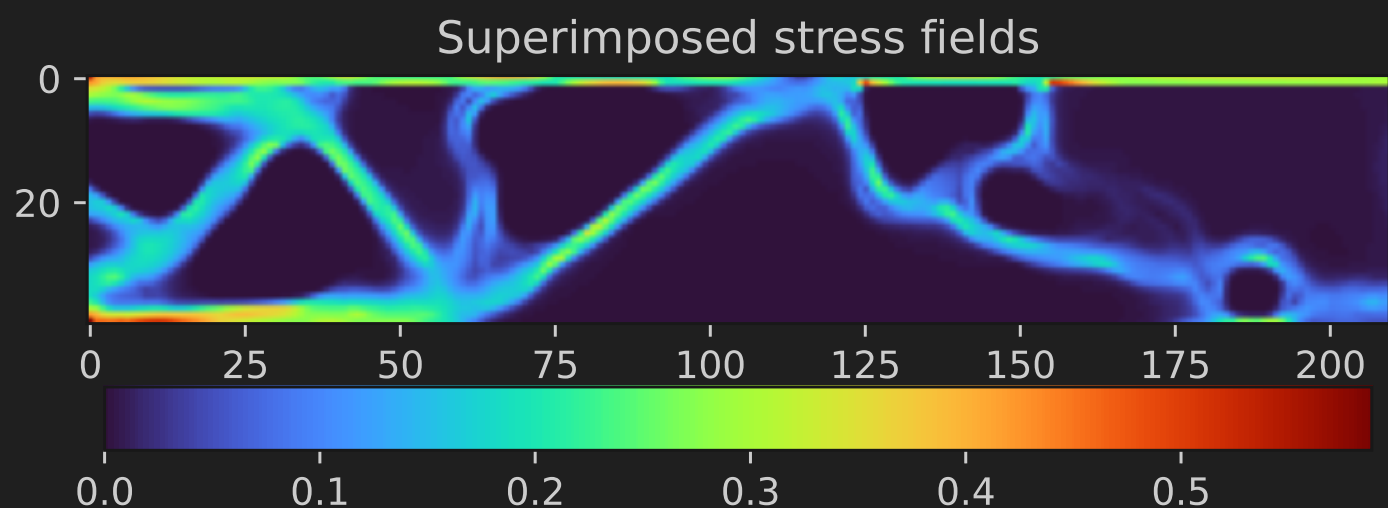
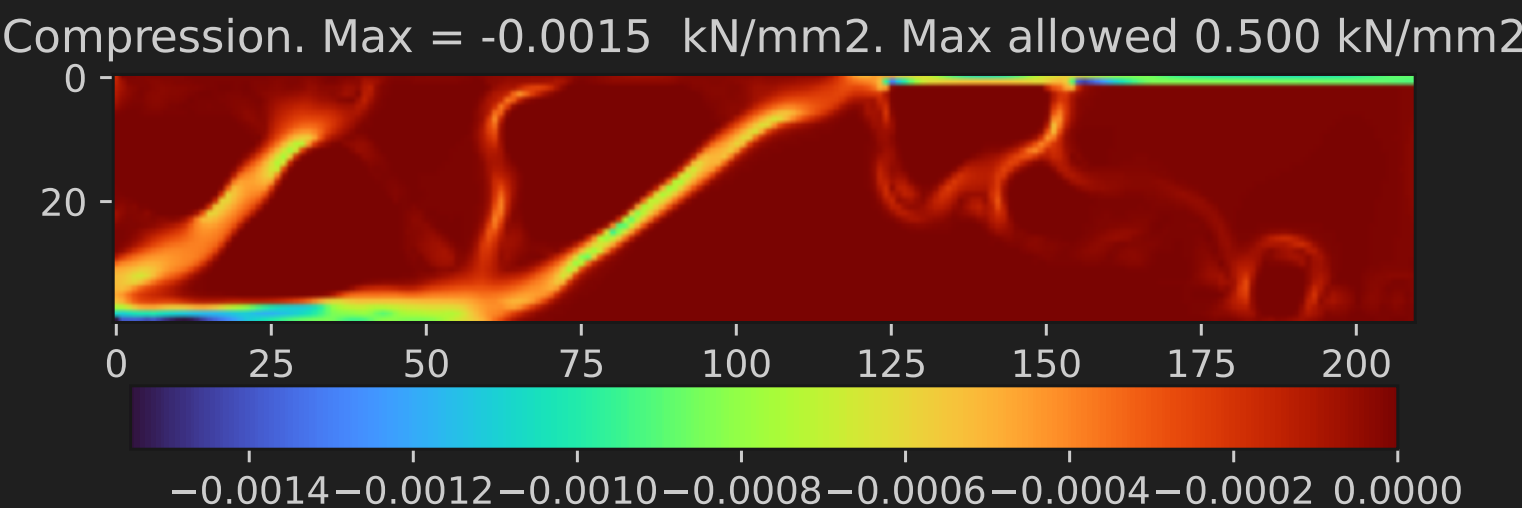
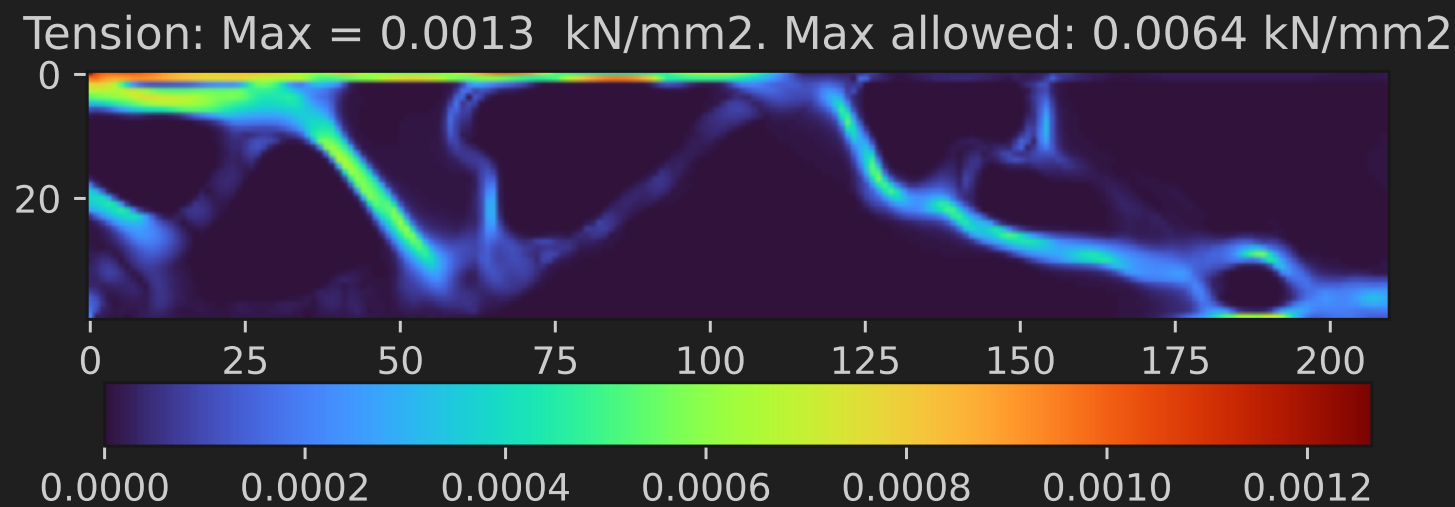
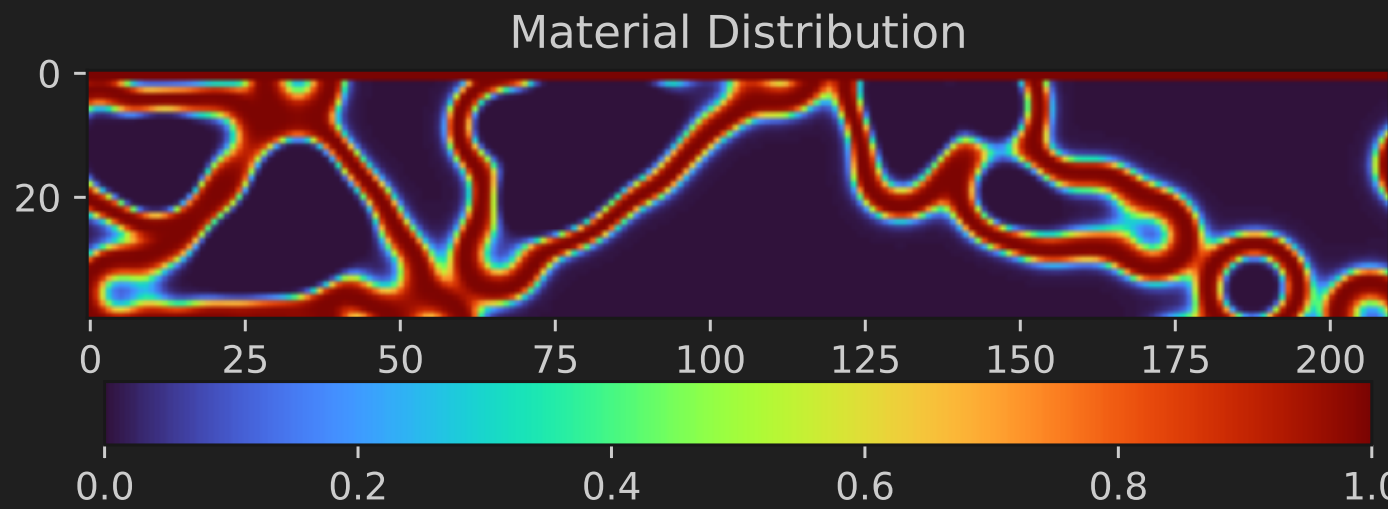
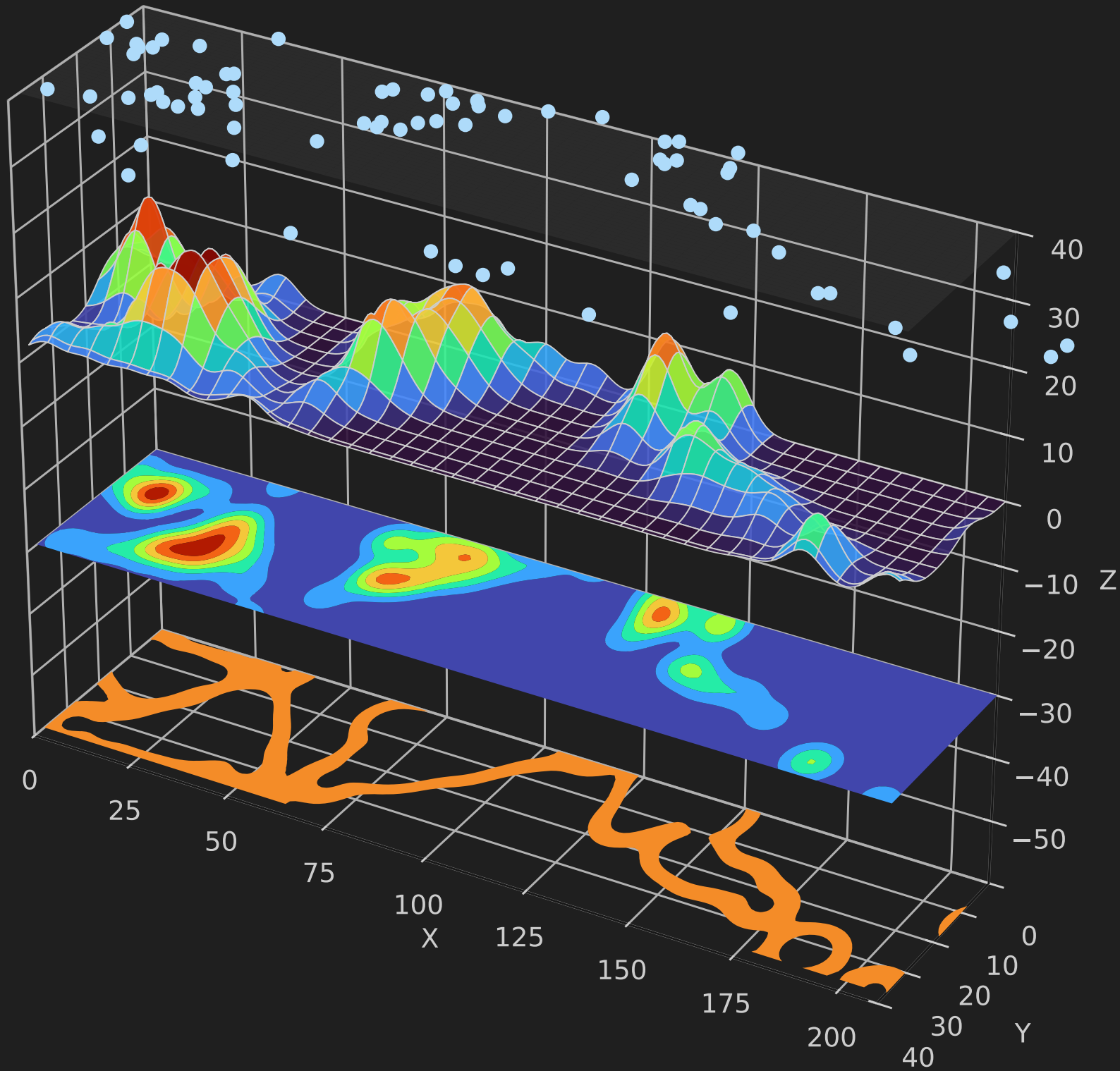
Objective = (Stress: 70 * 0.0014) + (Volume: 0.5 * 0.31) - (Displacement: 1 * -0.09) = 0.35

Spread Gaussian = 5.75 Shift = 2.81 Iteration = 083



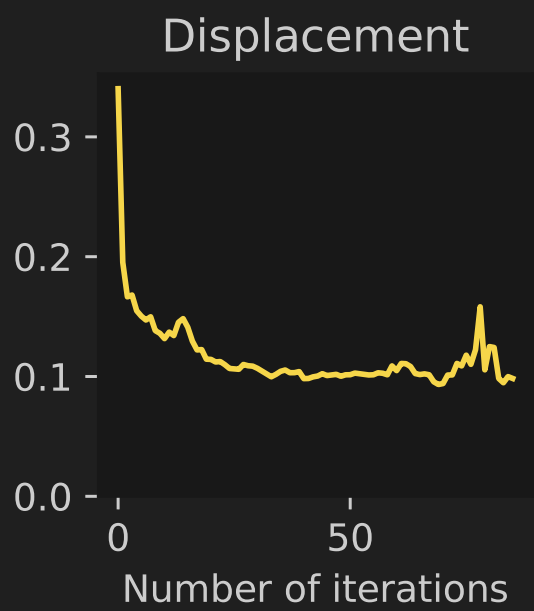
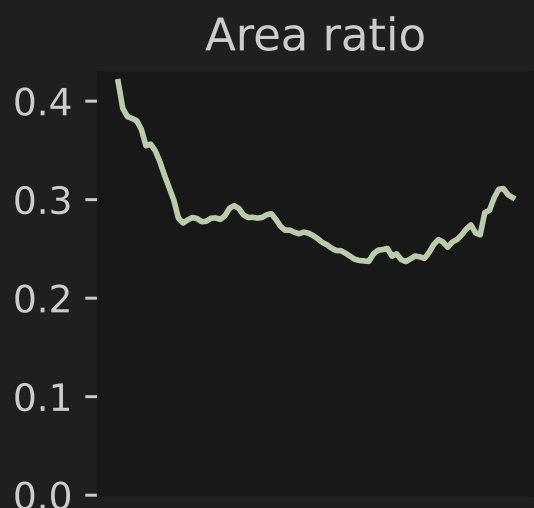
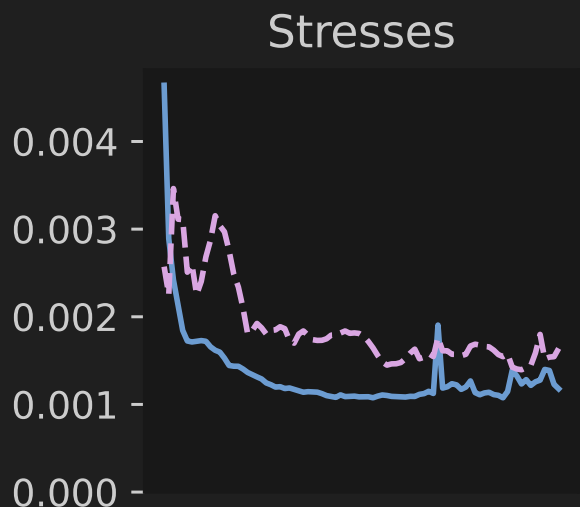
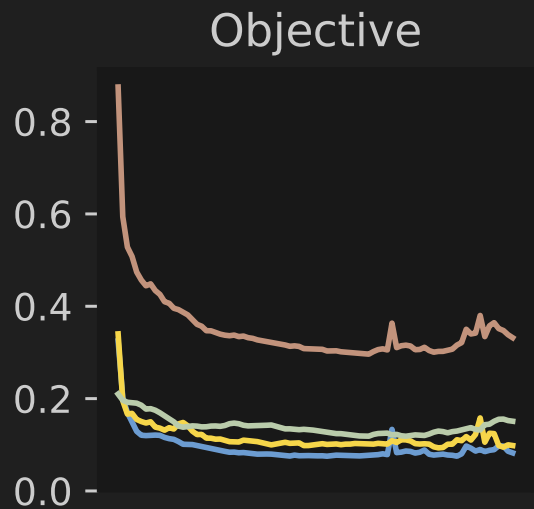
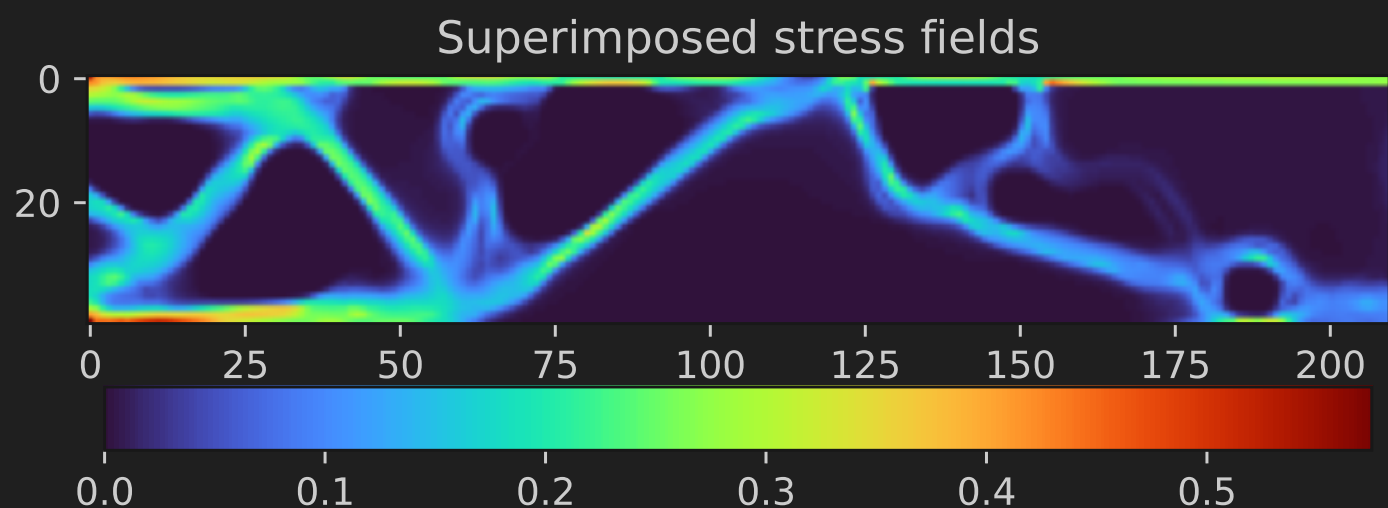
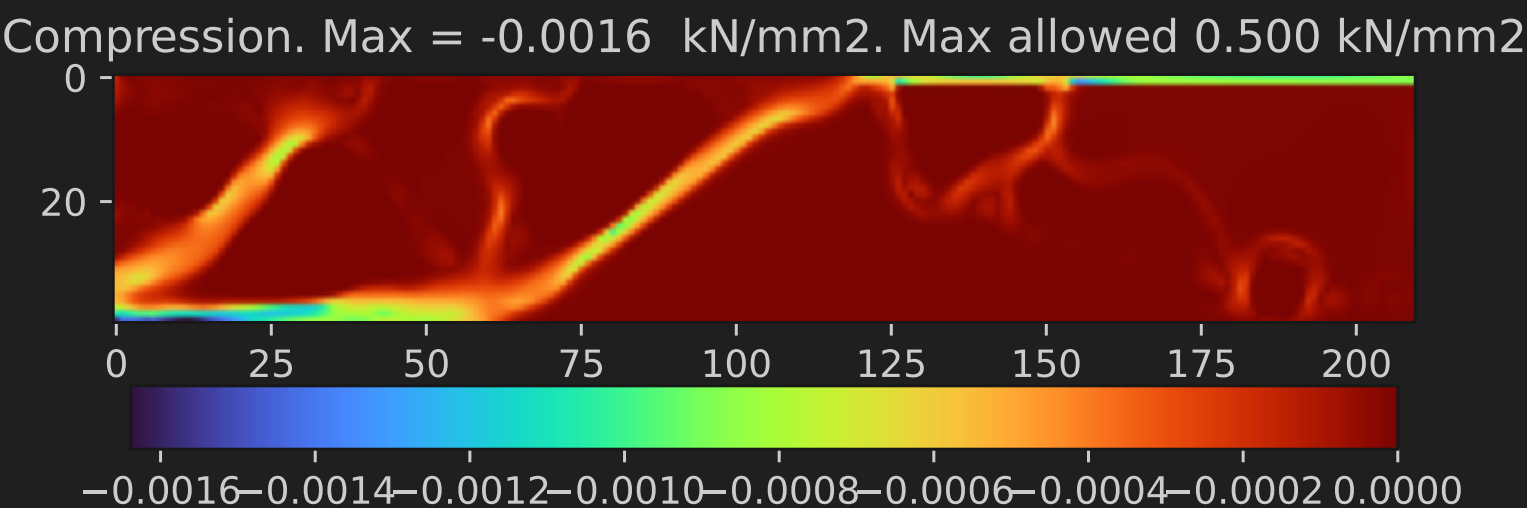
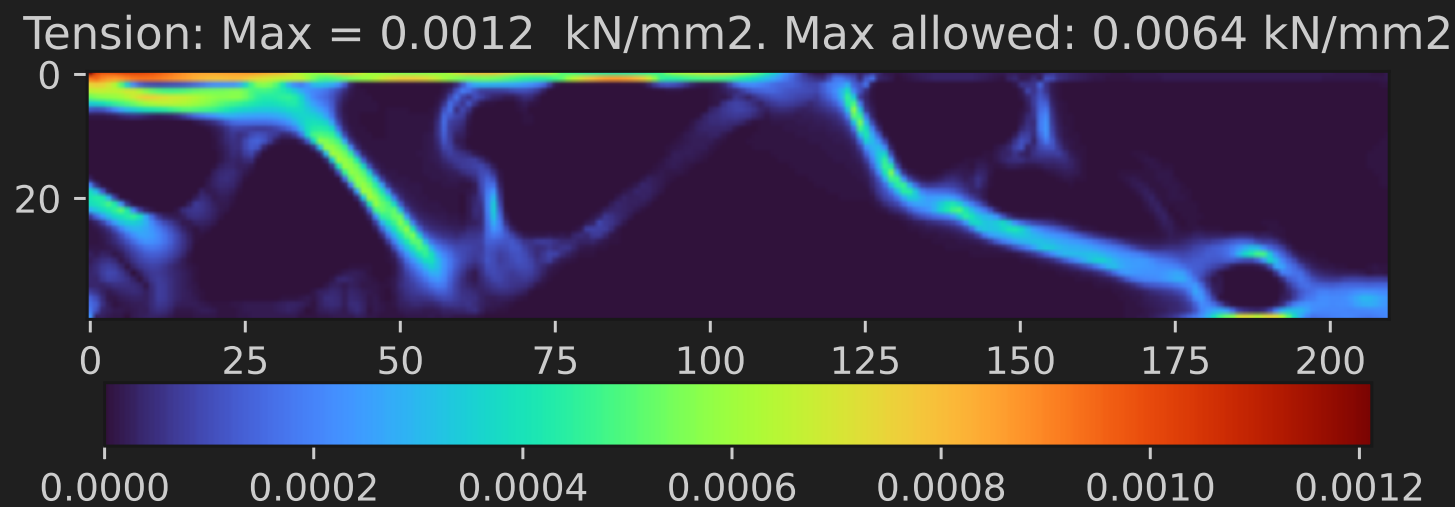
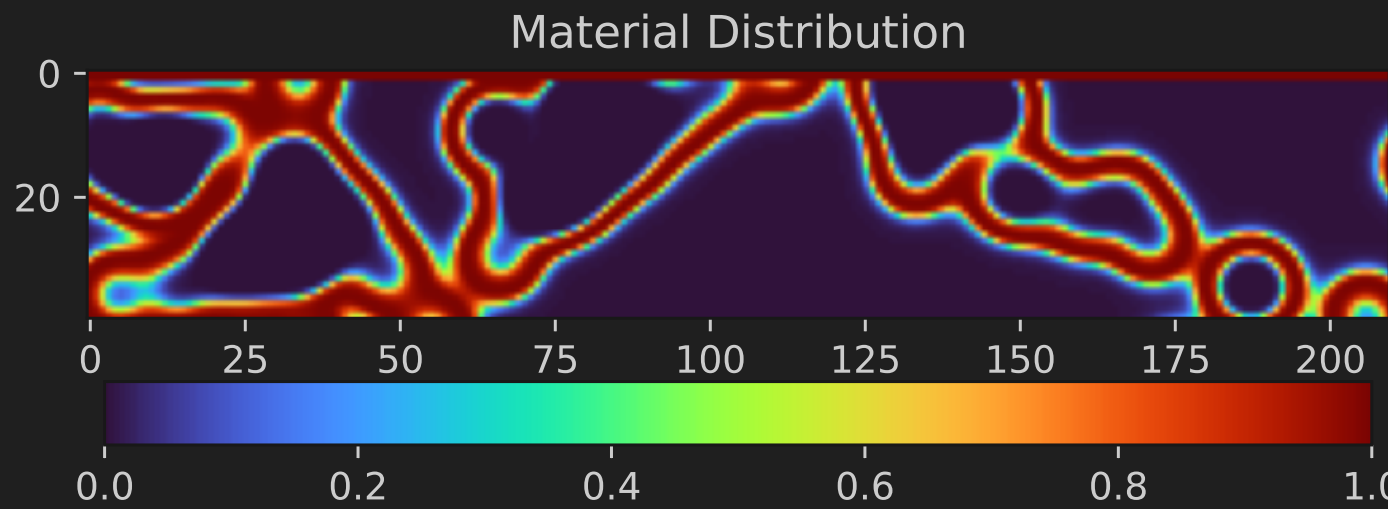
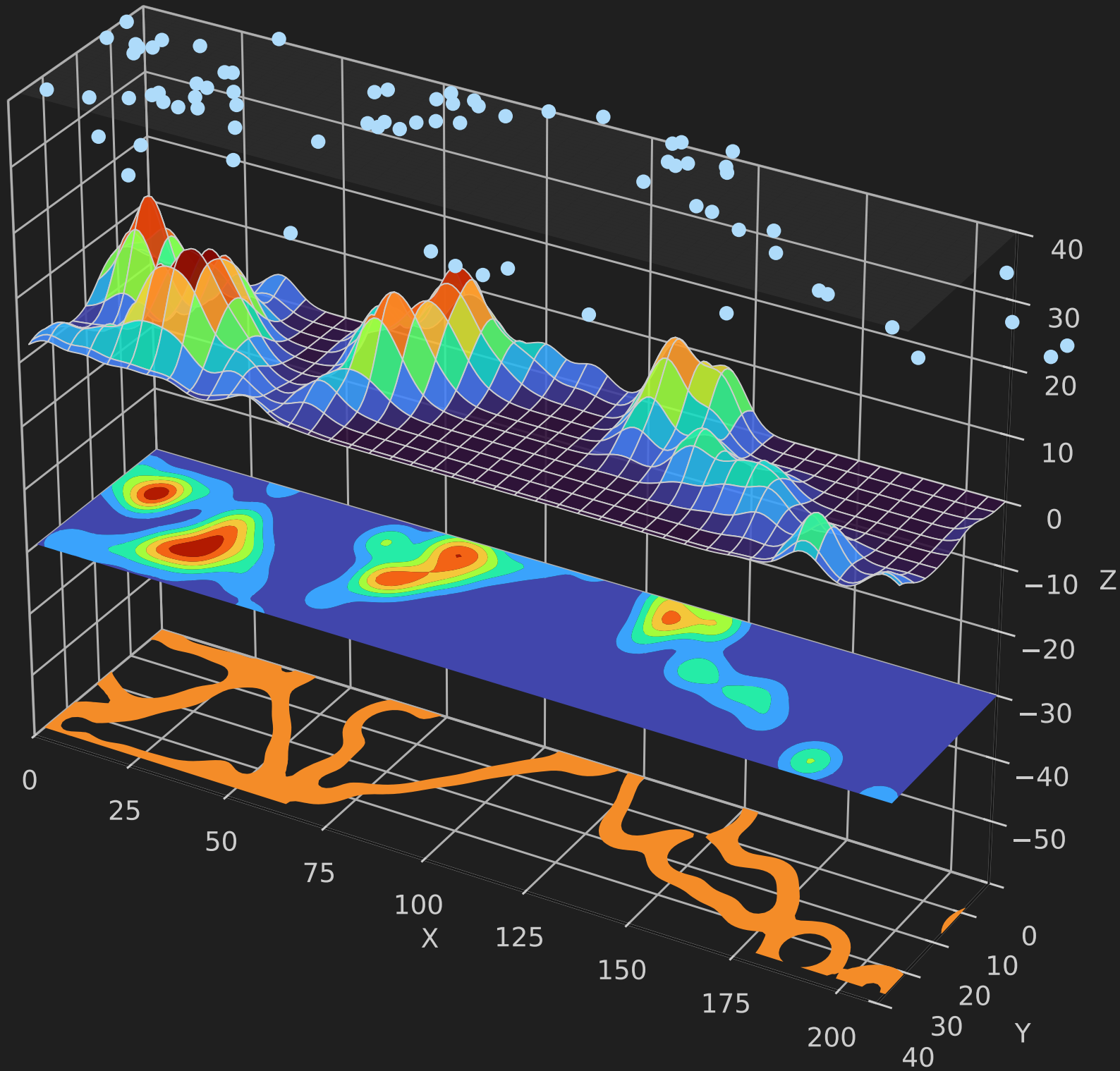
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.30) - (Displacement: 1 * -0.10) = 0.34

Spread Gaussian = 5.77 Shift = 2.81 Iteration = 084



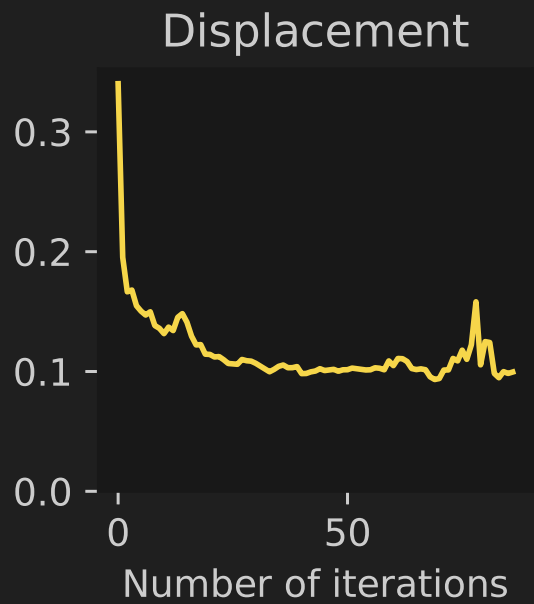
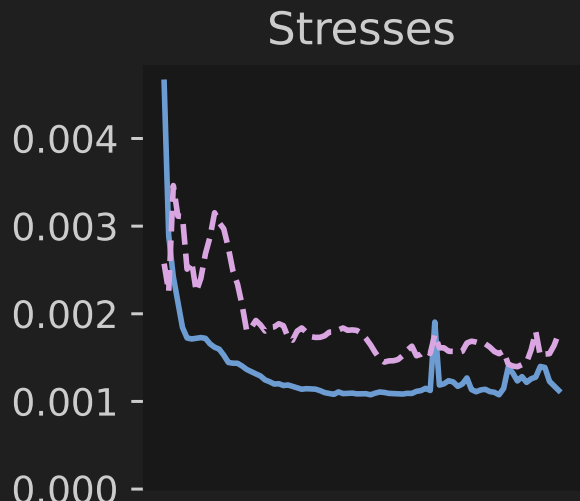
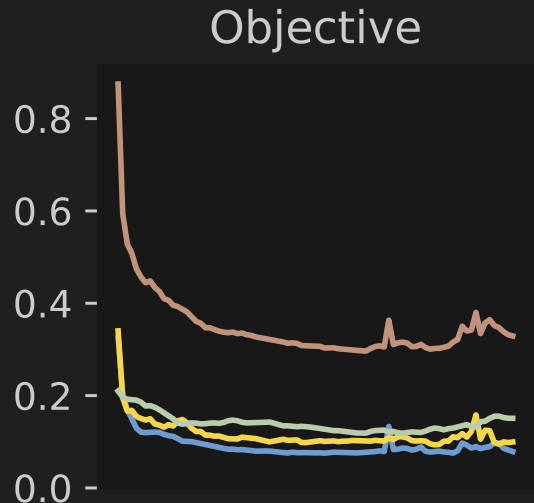
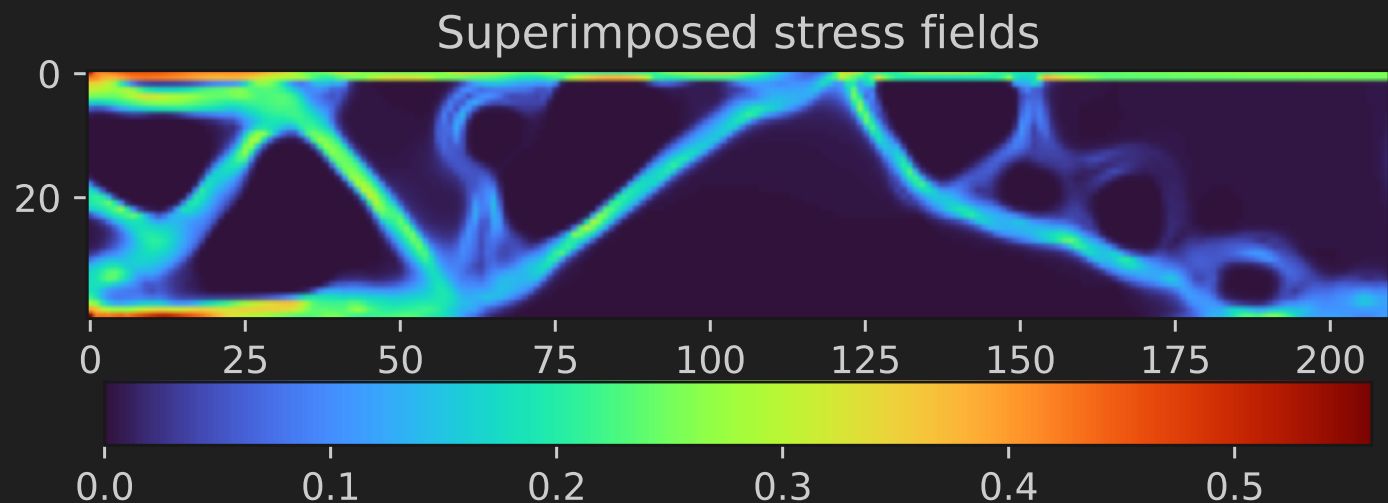
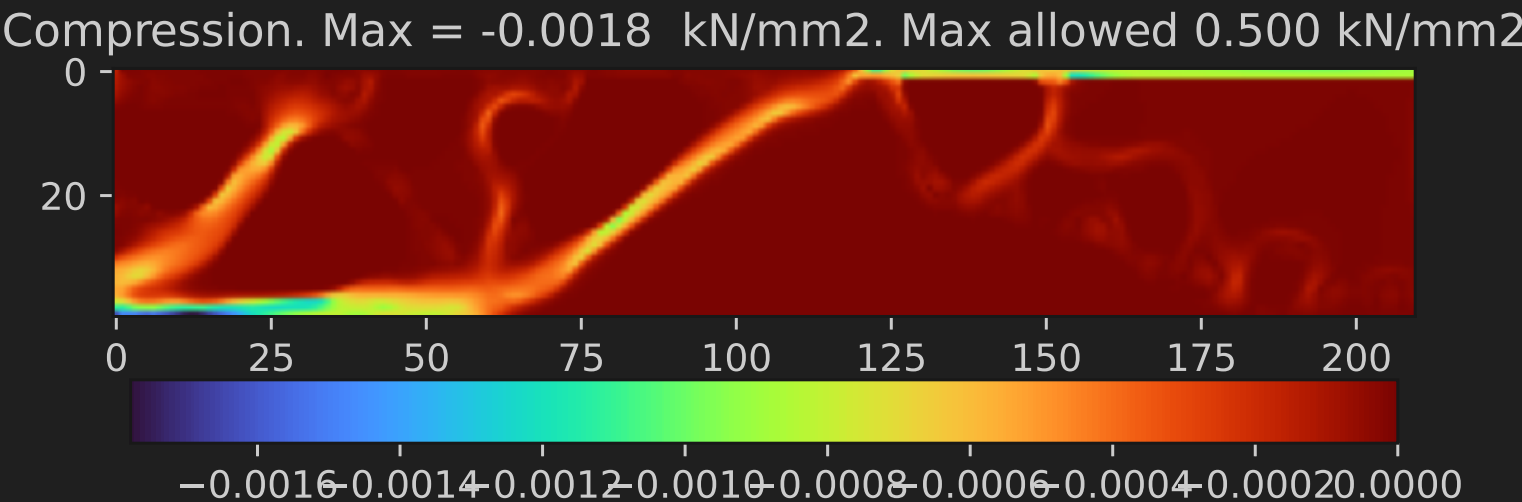
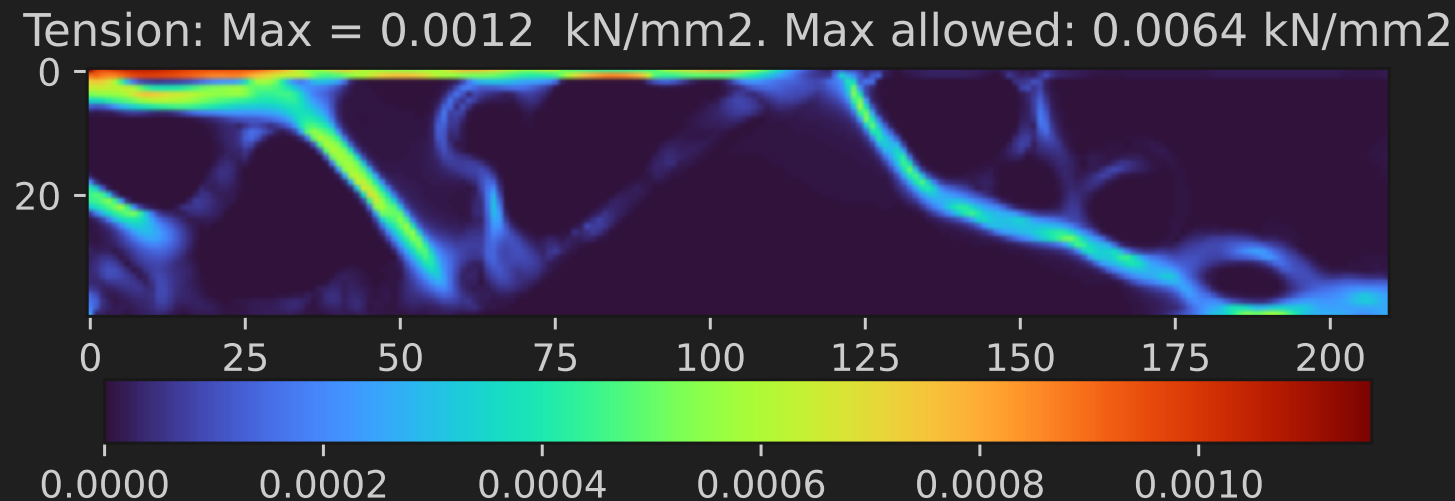
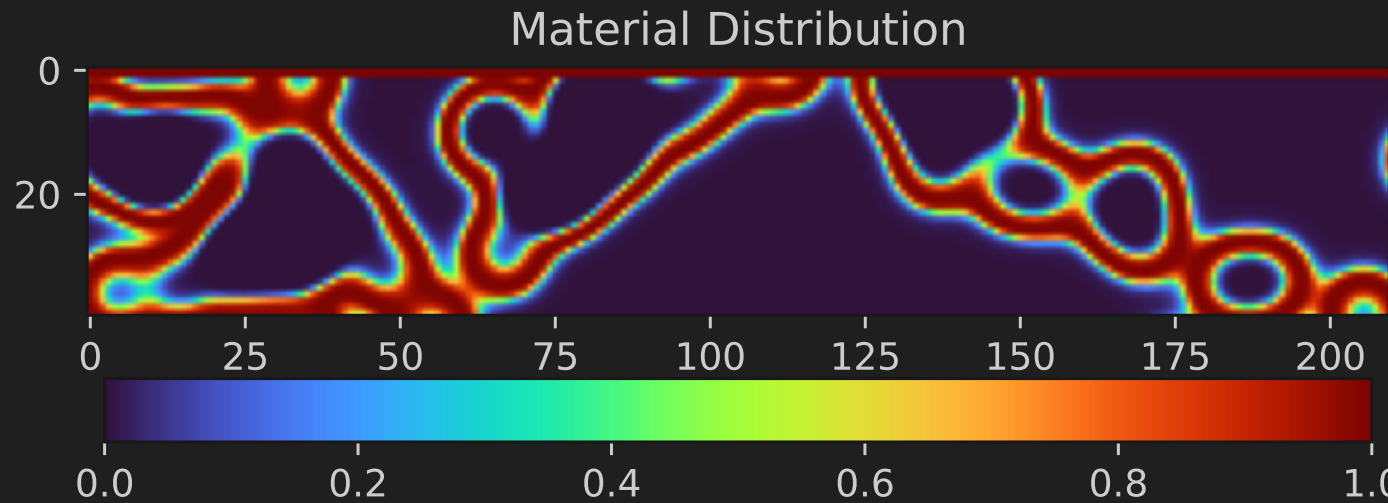
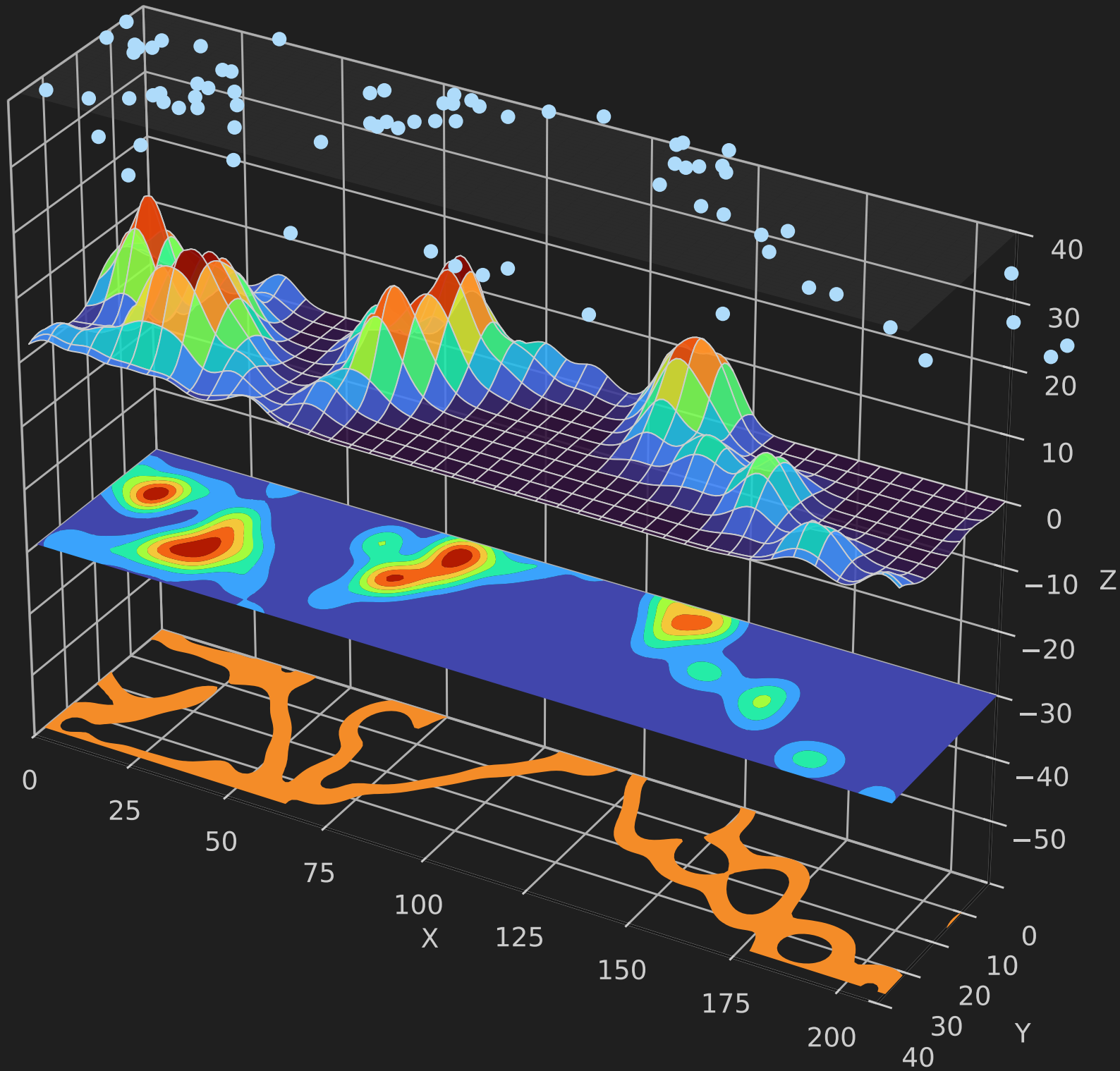
Objective = (Stress: 70 * 0.0012) + (Volume: 0.5 * 0.30) - (Displacement: 1 * -0.10) = 0.33

Spread Gaussian = 5.77 Shift = 2.80 Iteration = 085



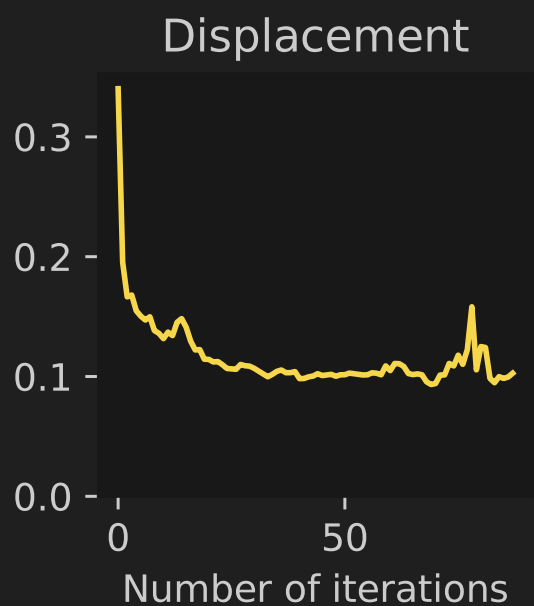
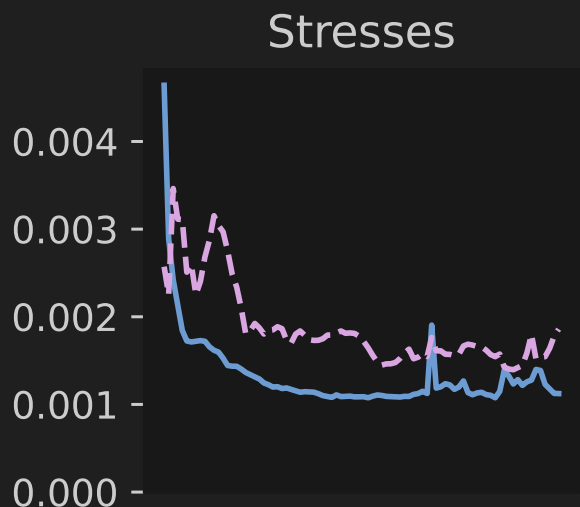
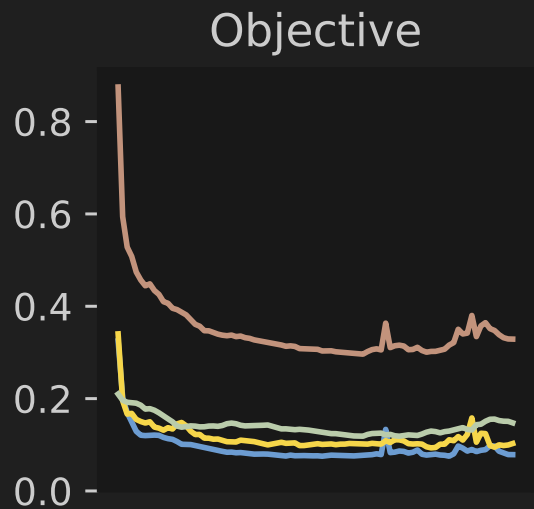
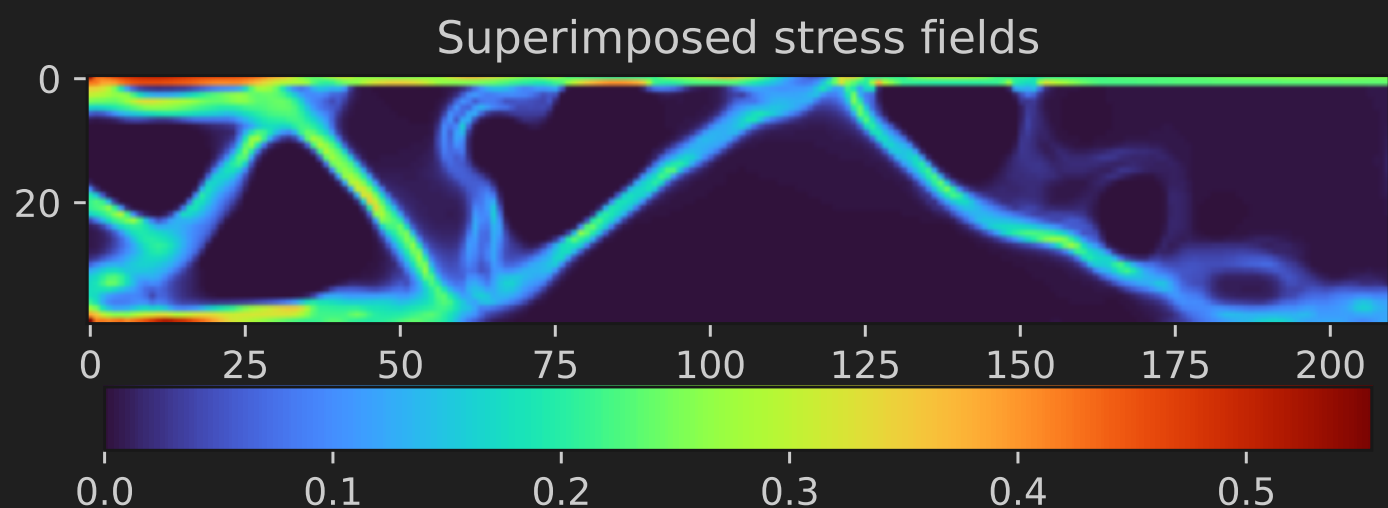
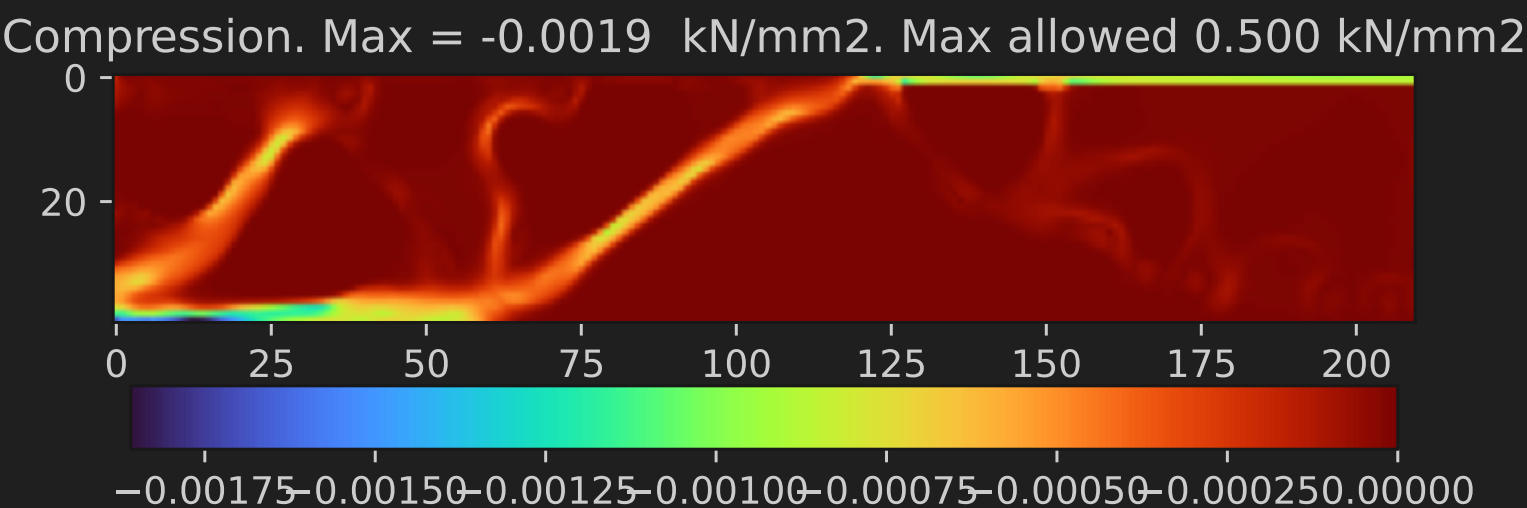
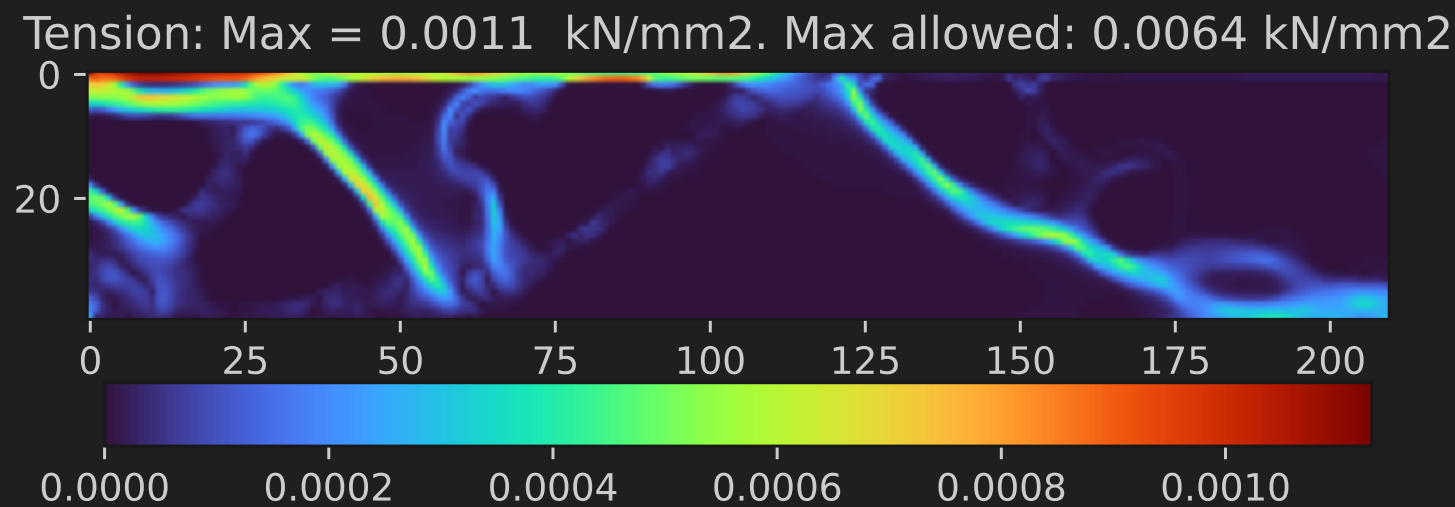
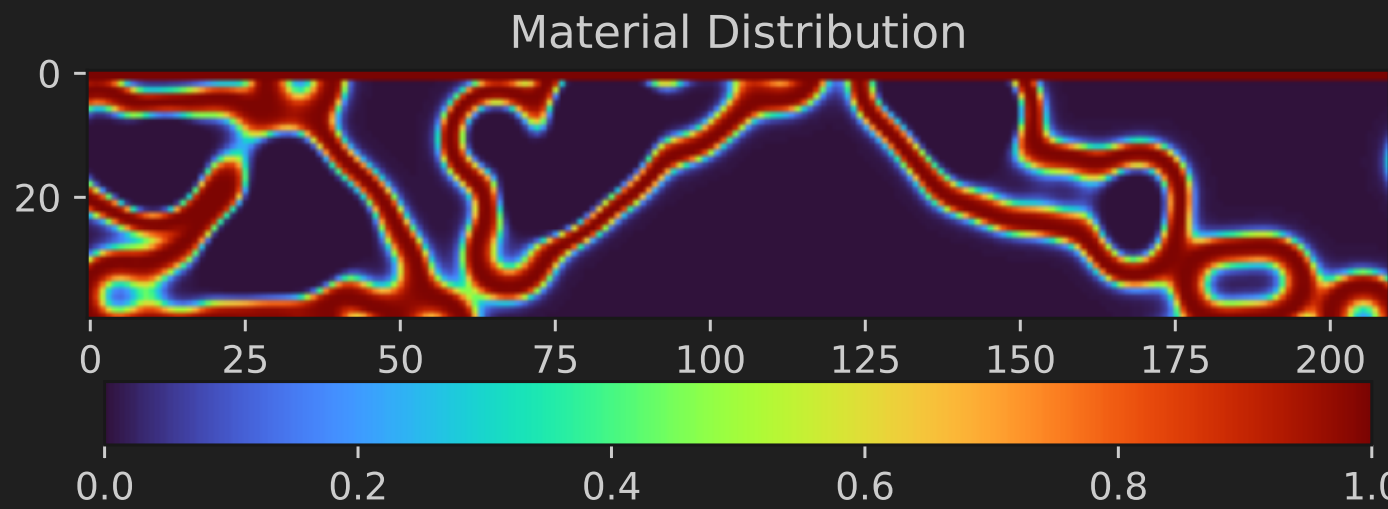
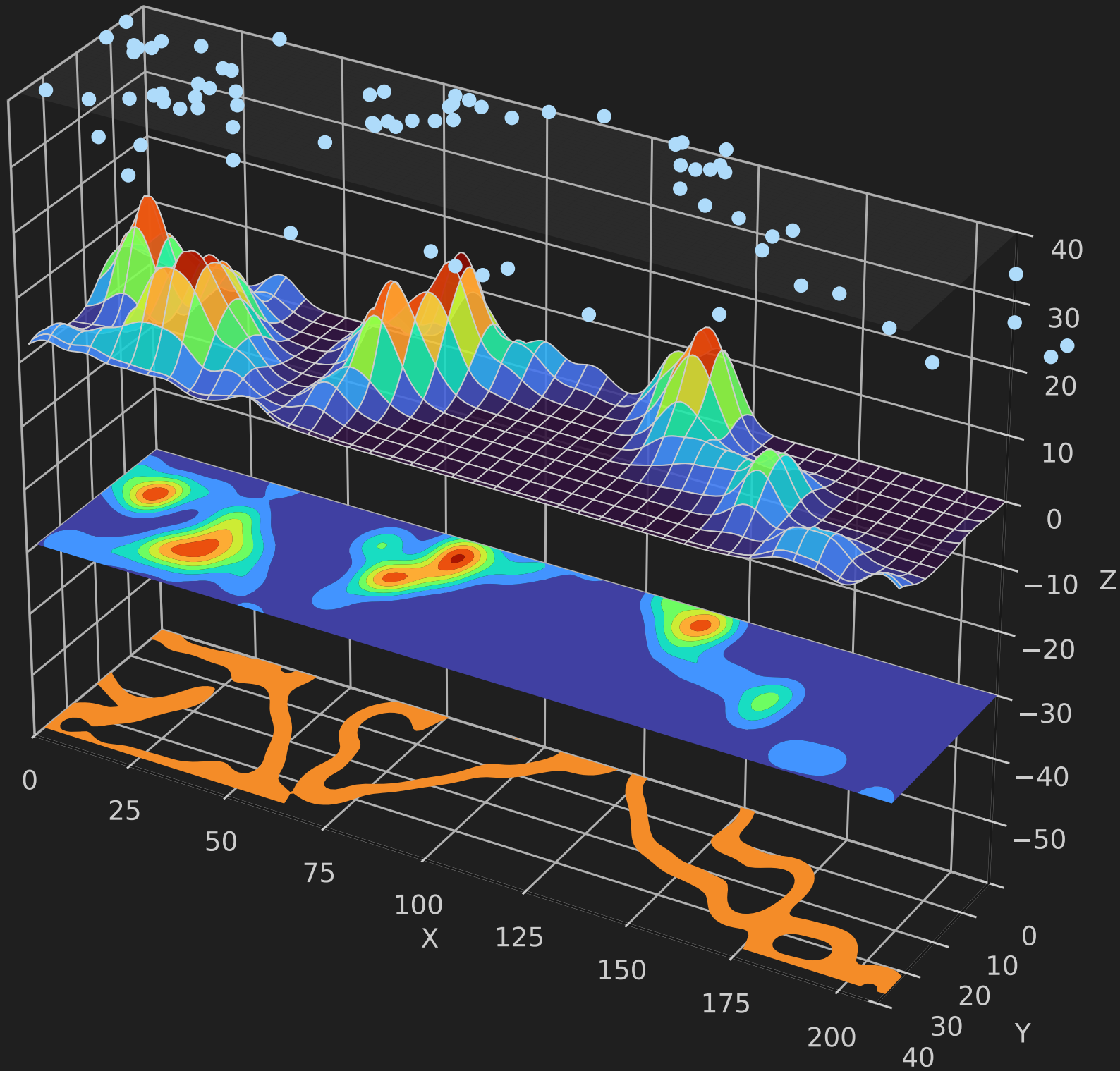
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.30) - (Displacement: 1 * -0.10) = 0.33

Spread Gaussian = 5.76 Shift = 2.78 Iteration = 086



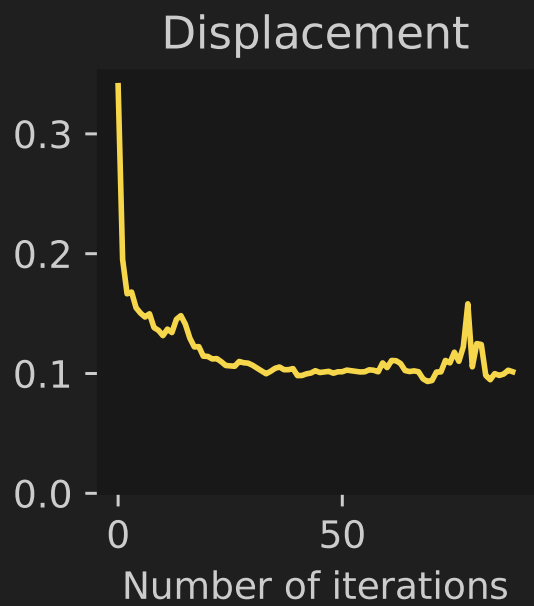
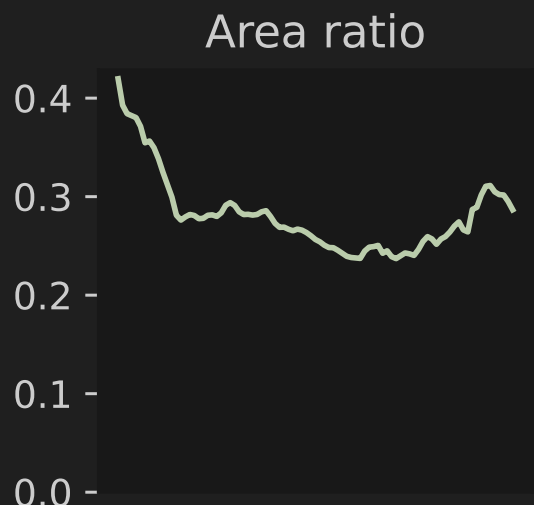
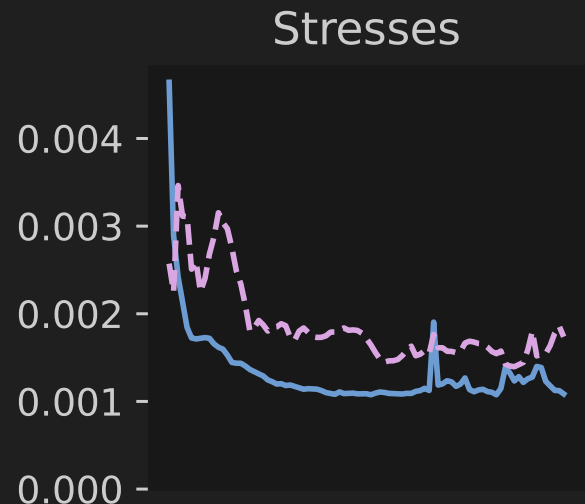
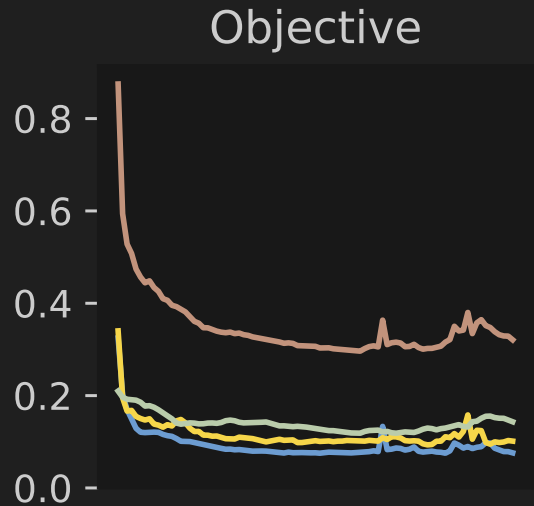
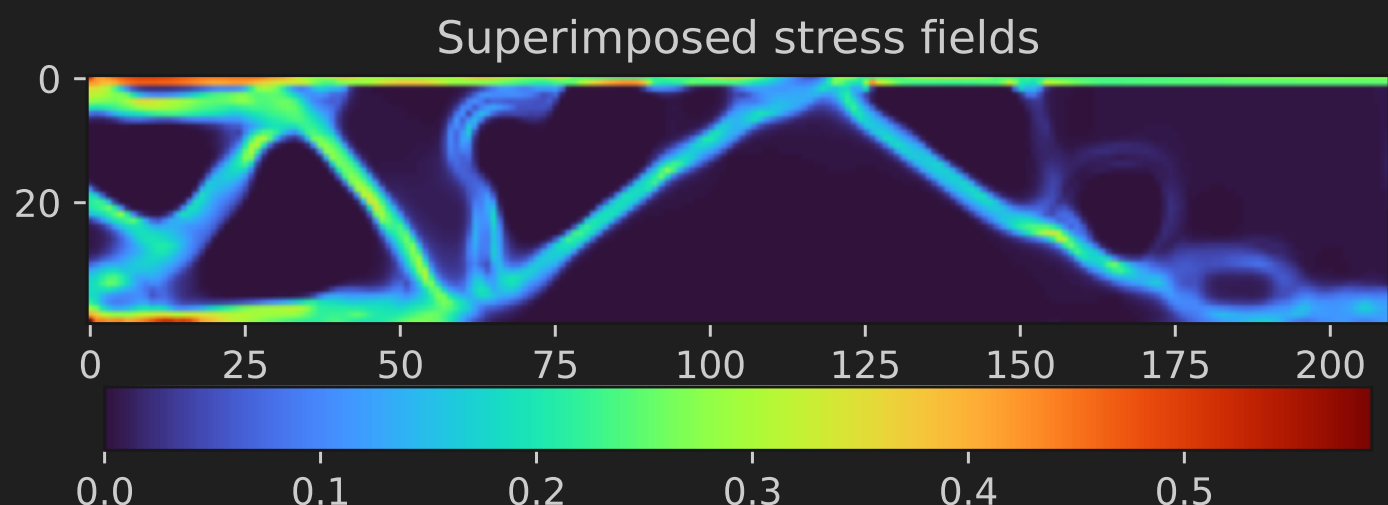
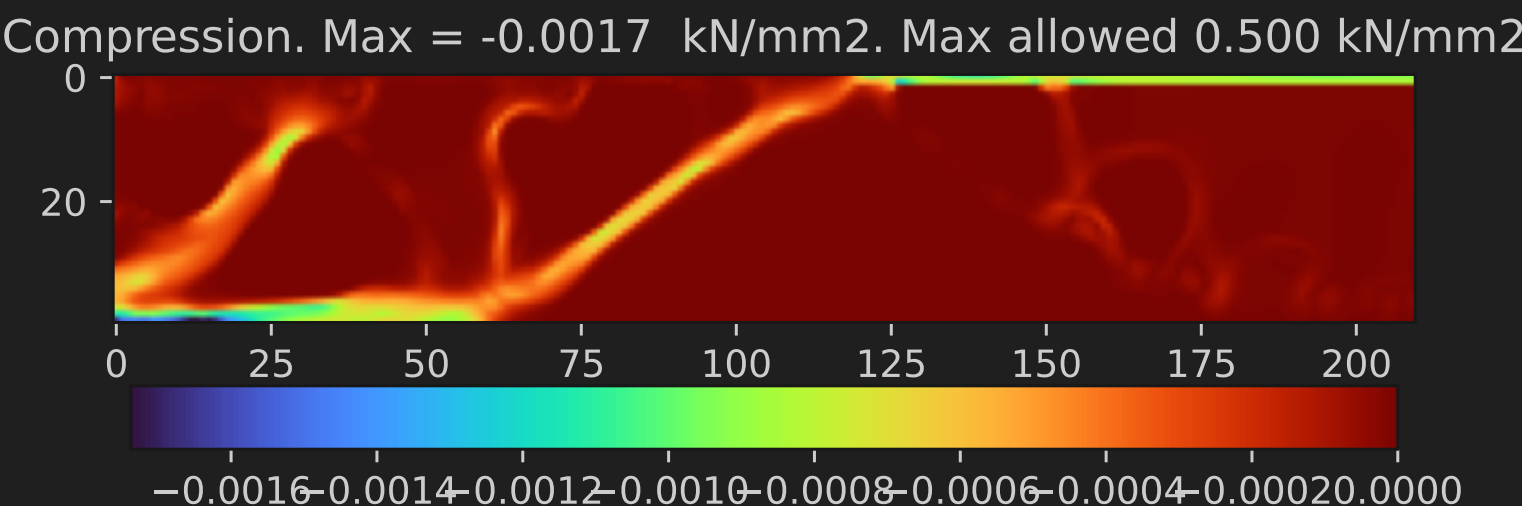
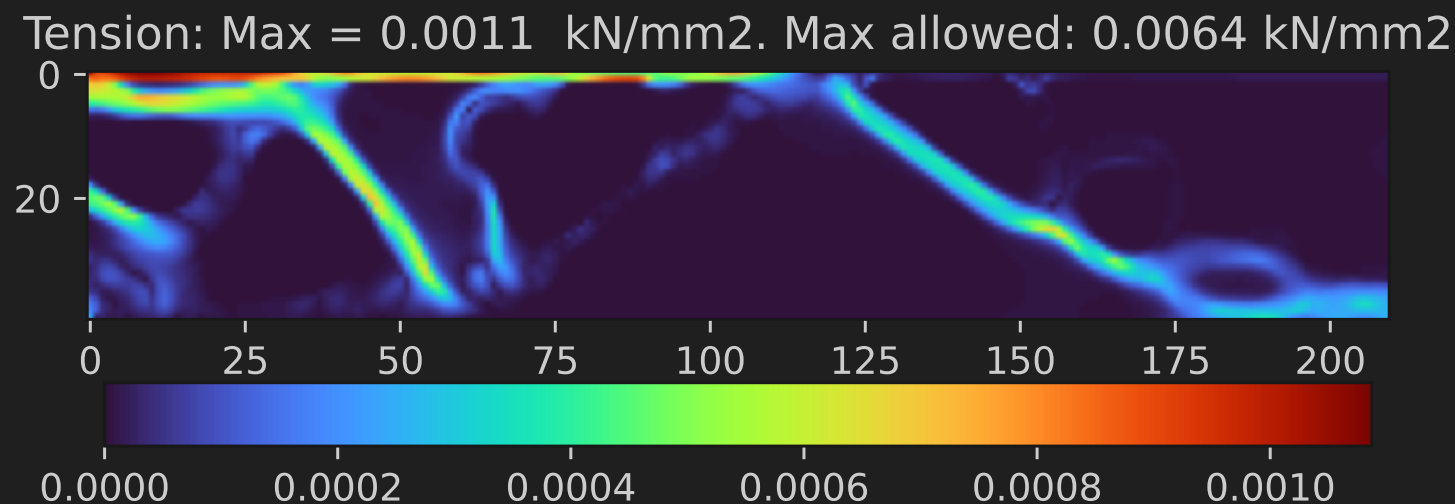
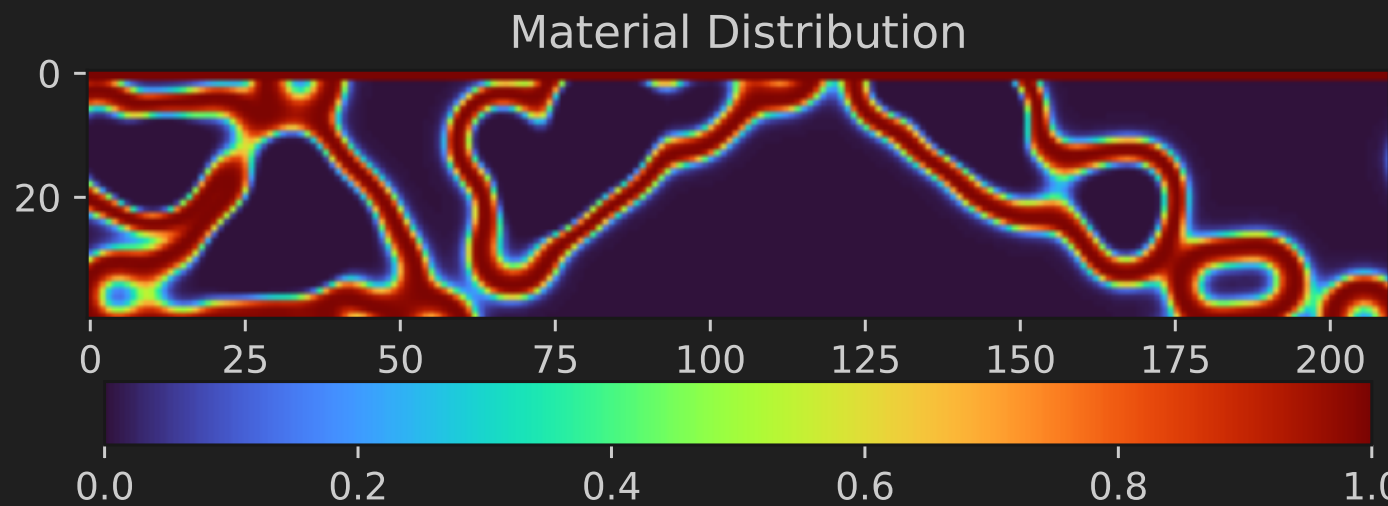
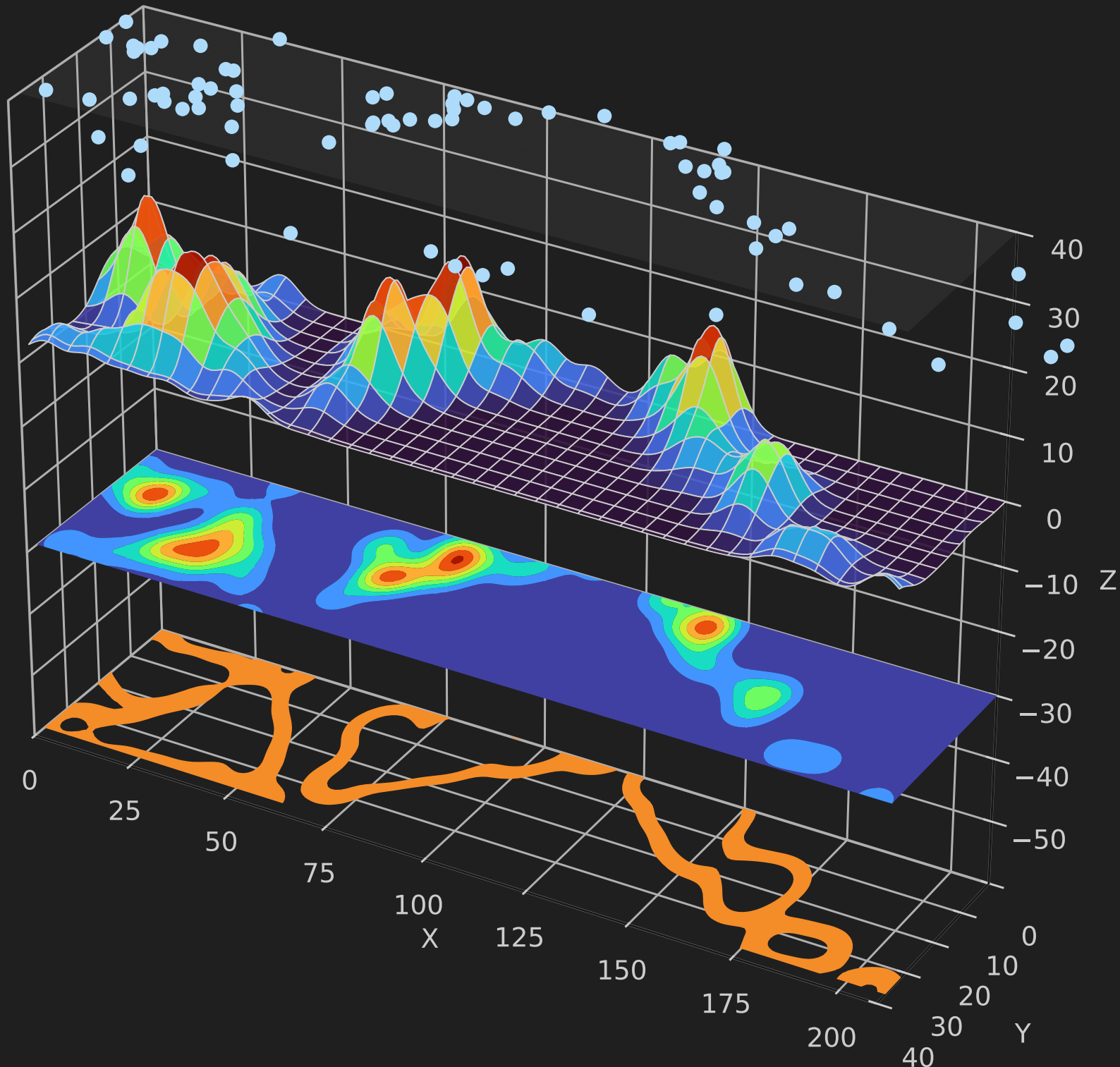
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.30) - (Displacement: 1 * -0.10) = 0.33

Spread Gaussian = 5.72 Shift = 2.75 Iteration = 087



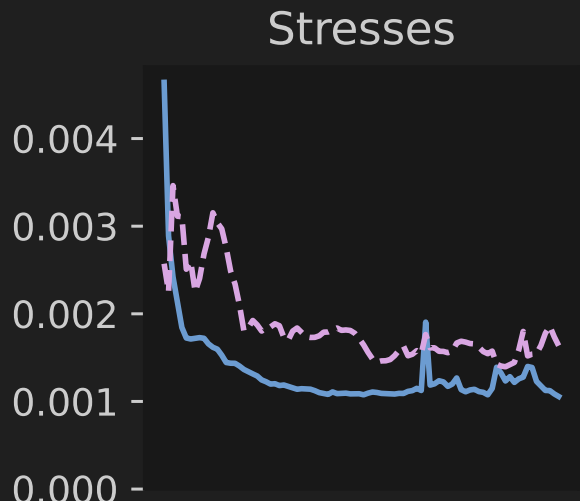
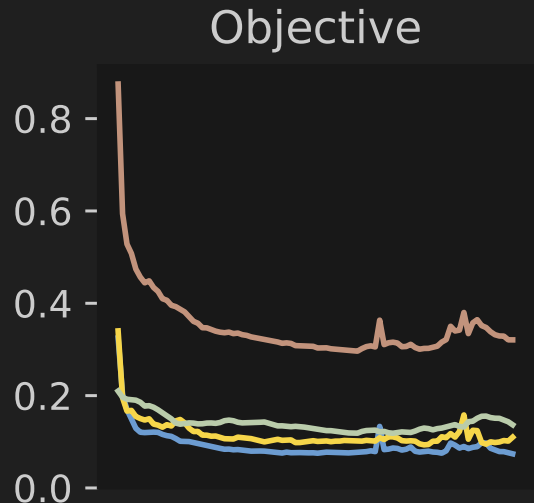
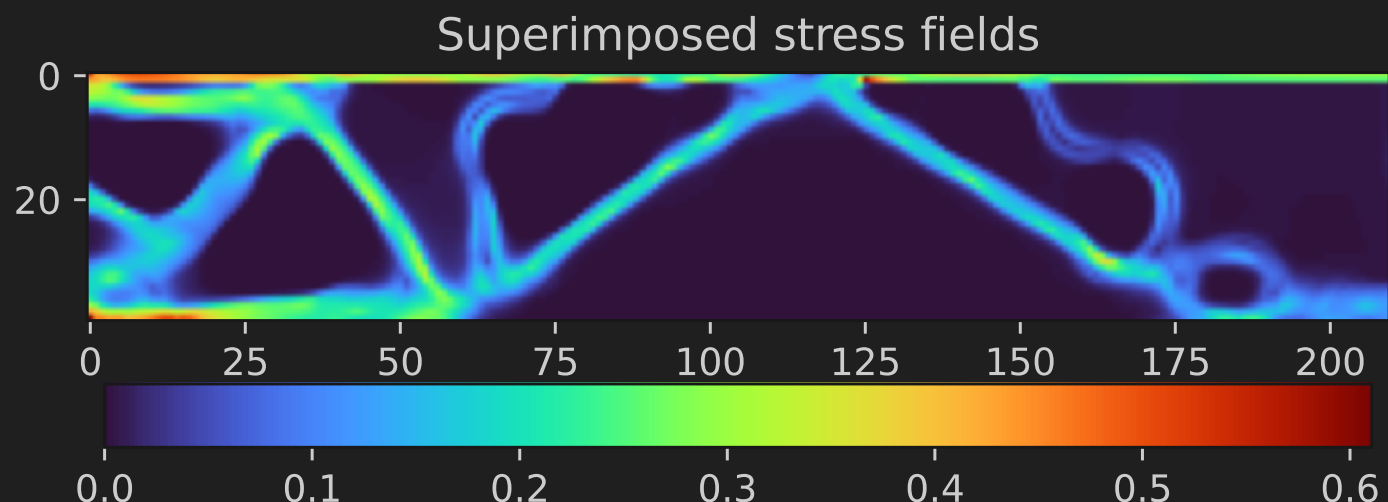
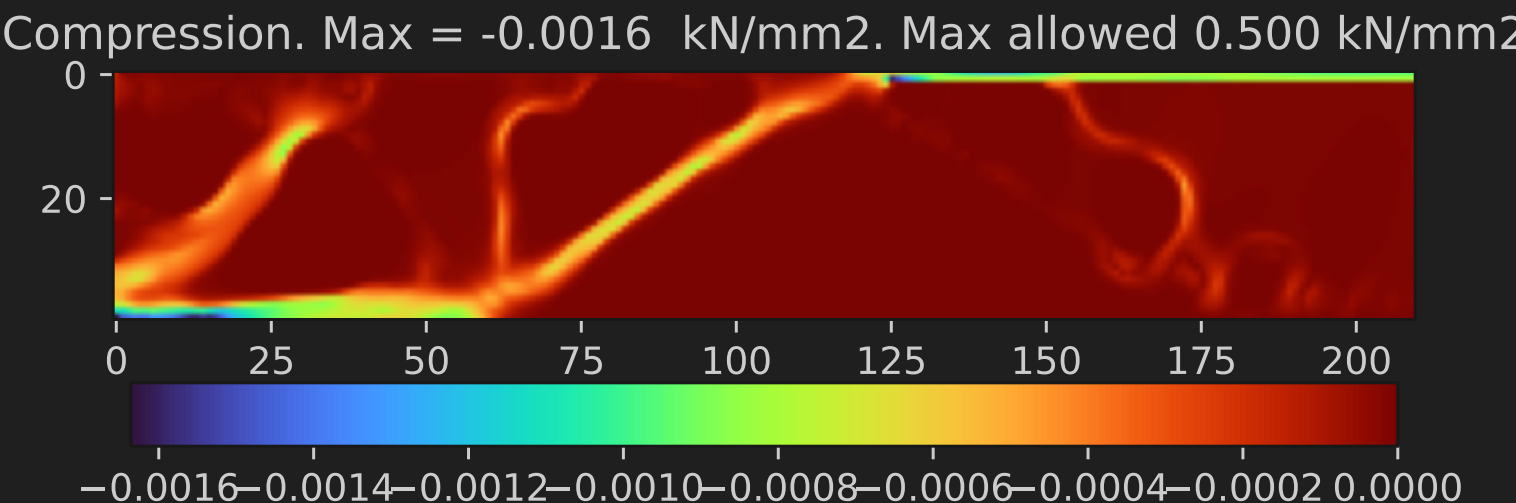
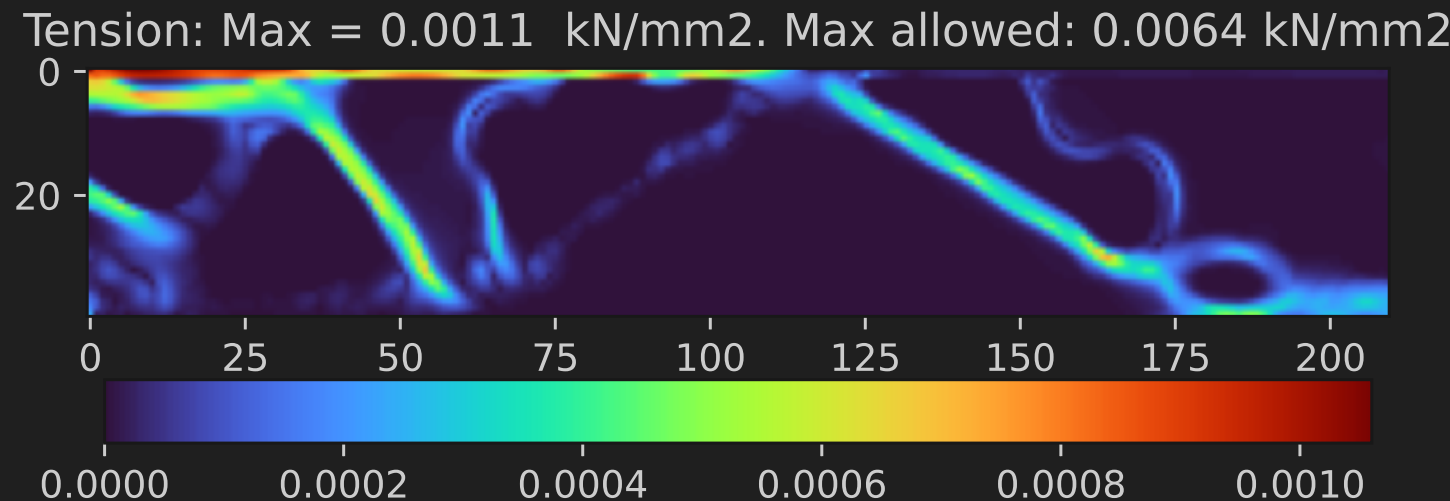
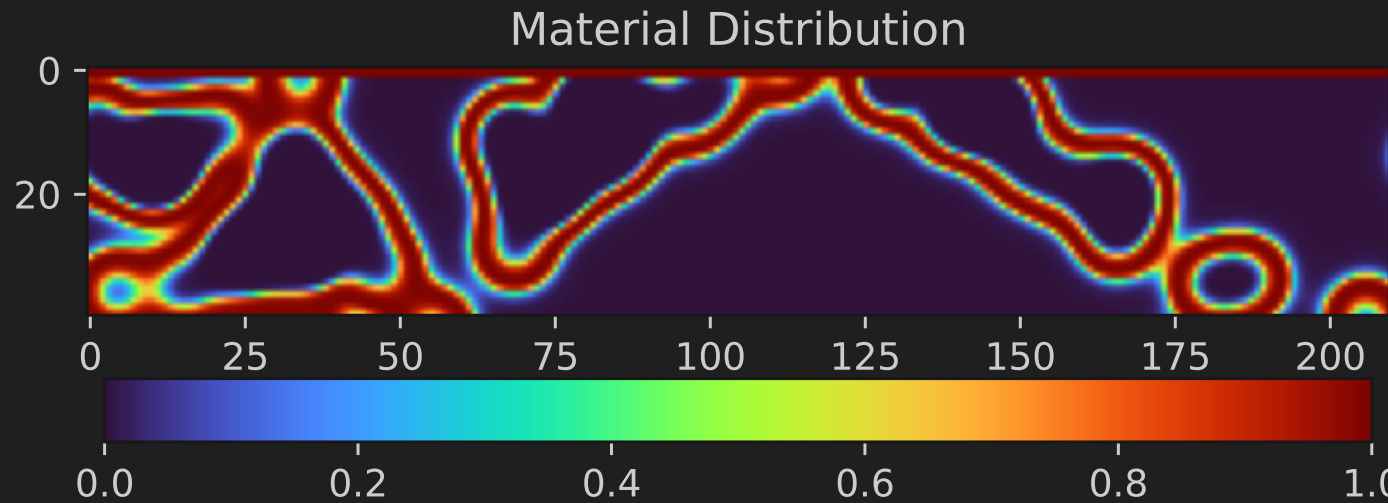
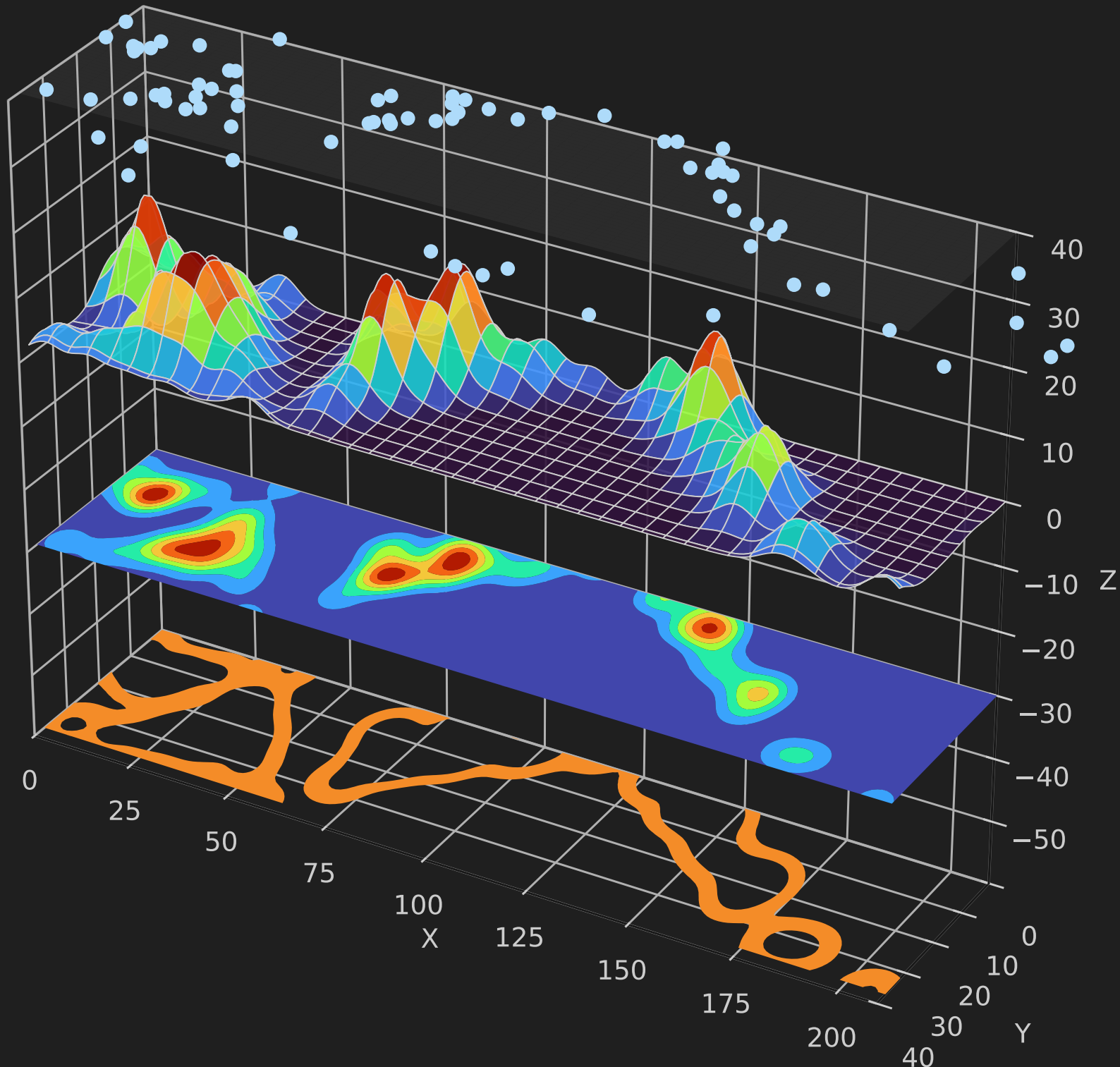
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.29) - (Displacement: 1 * -0.10) = 0.32

Spread Gaussian = 5.67 Shift = 2.73 Iteration = 088



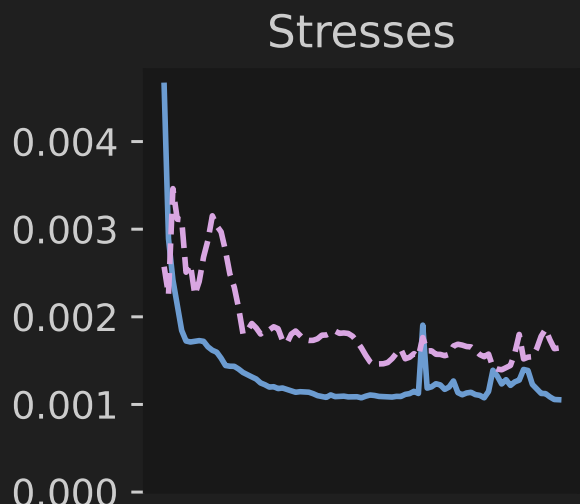
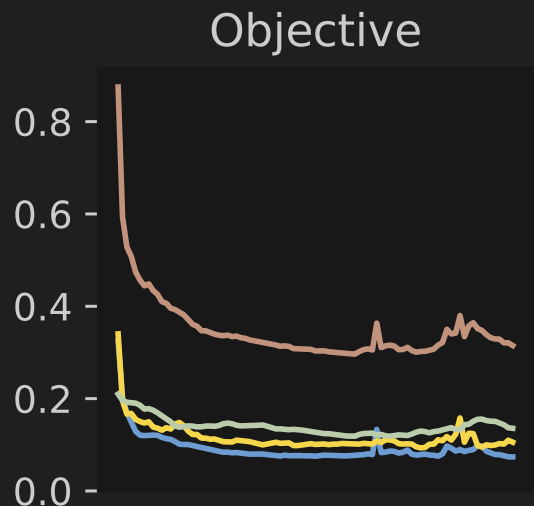
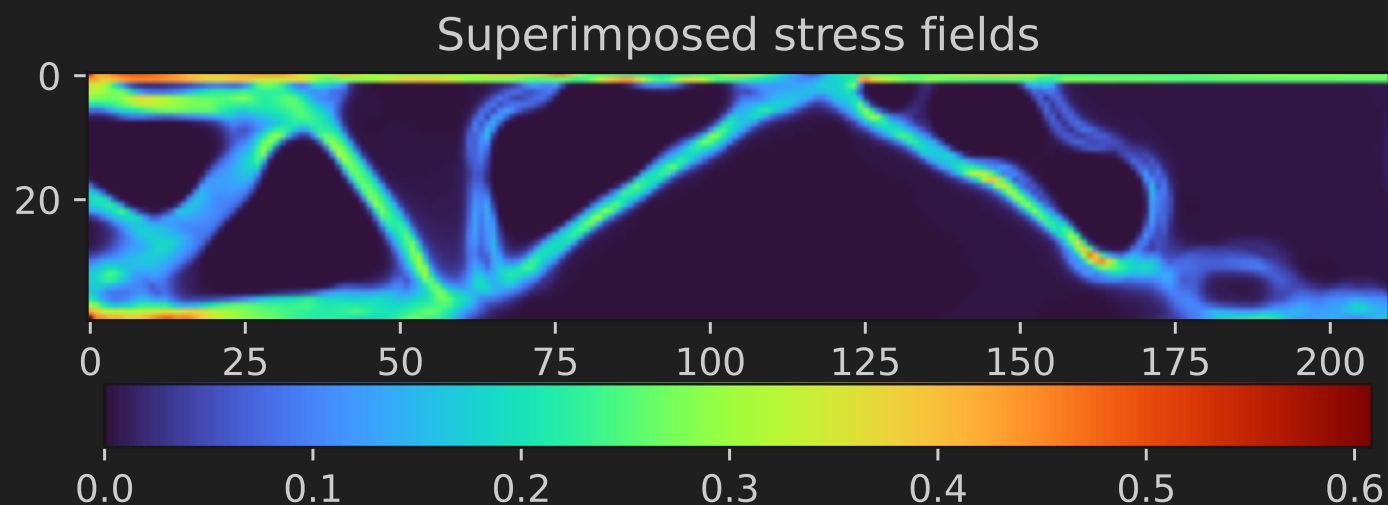
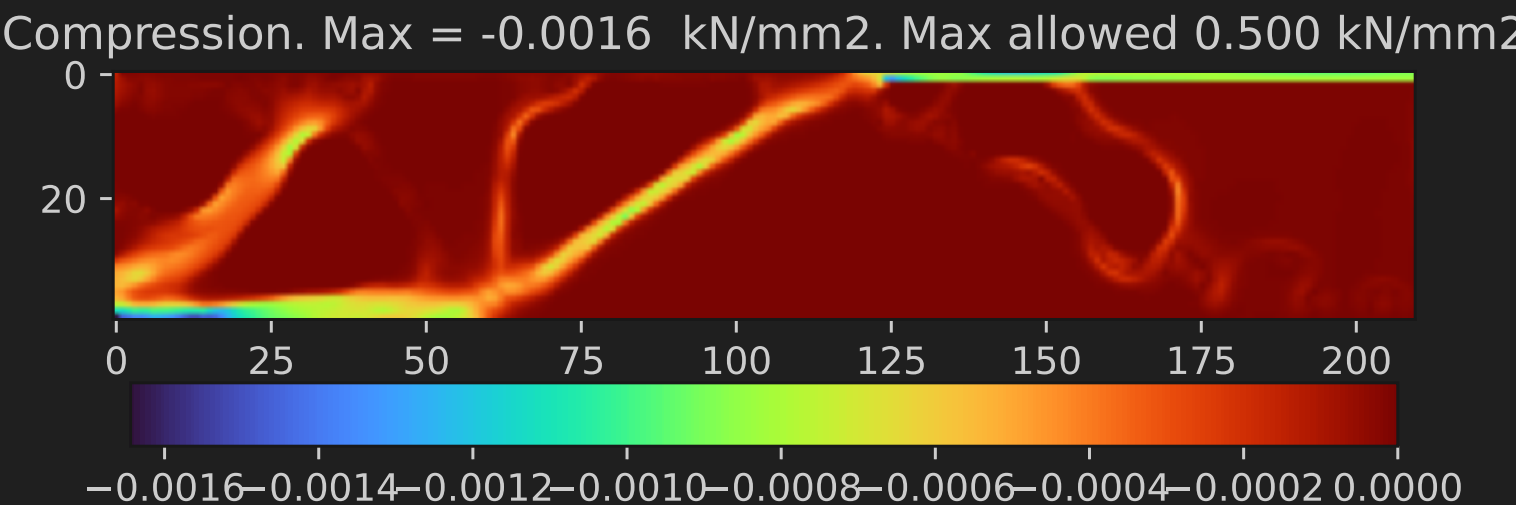
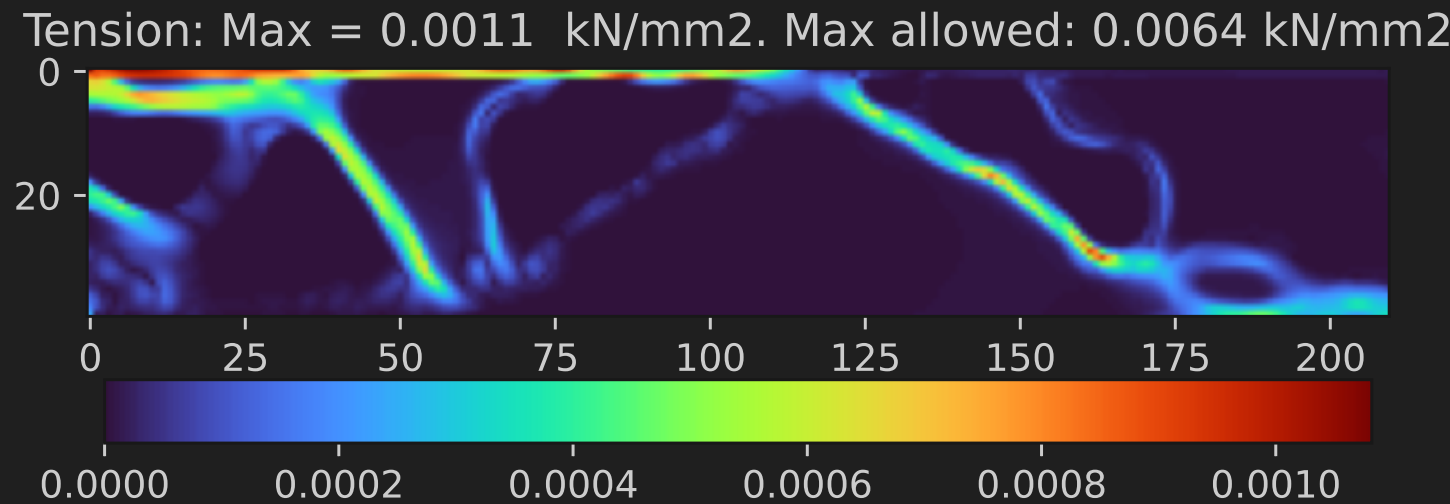
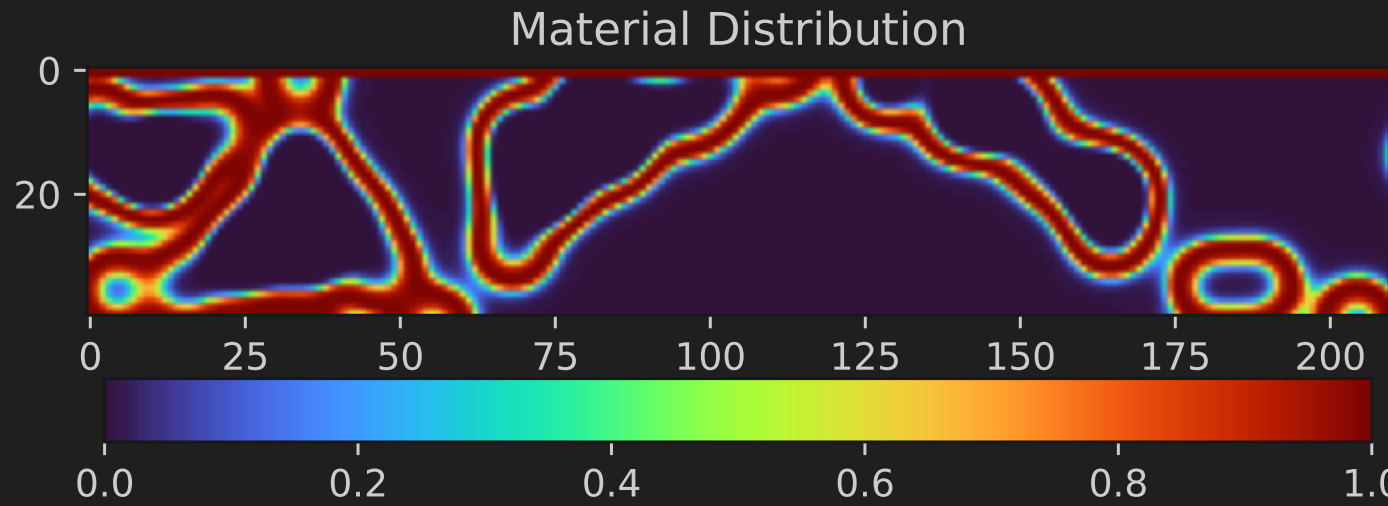
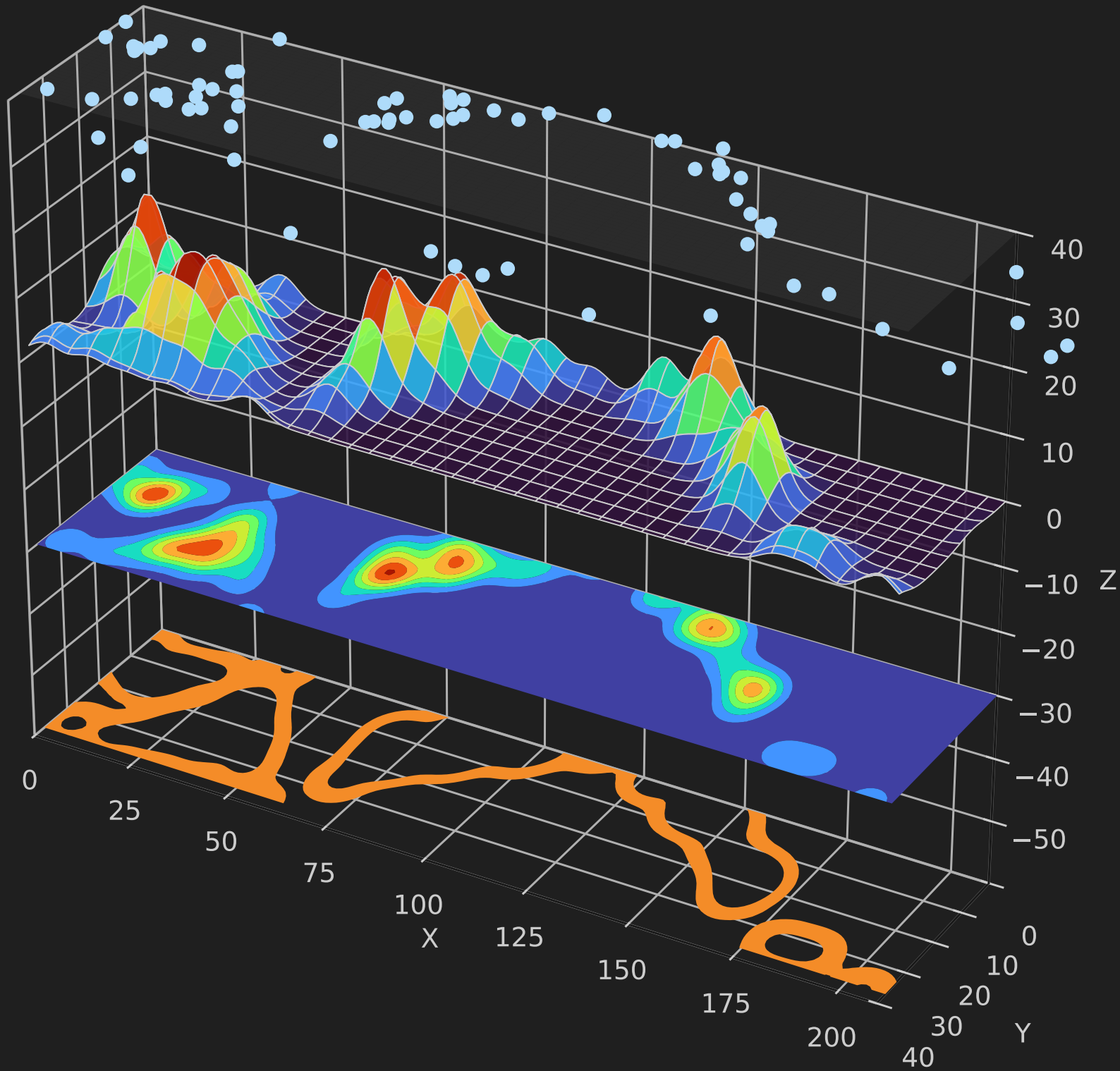
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.11) = 0.32

Spread Gaussian = 5.63 Shift = 2.70 Iteration = 089



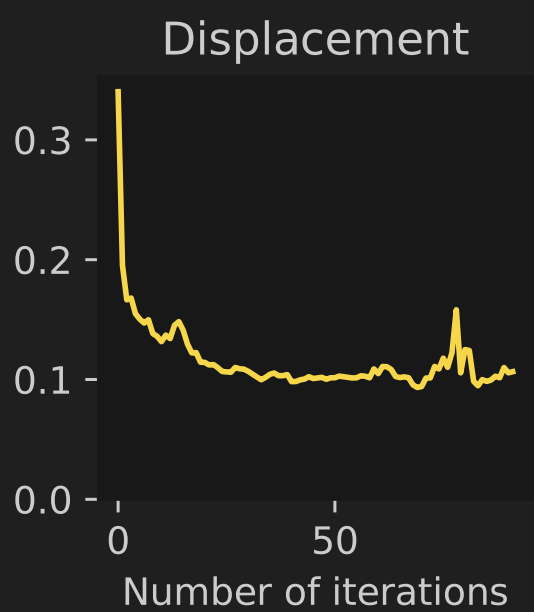
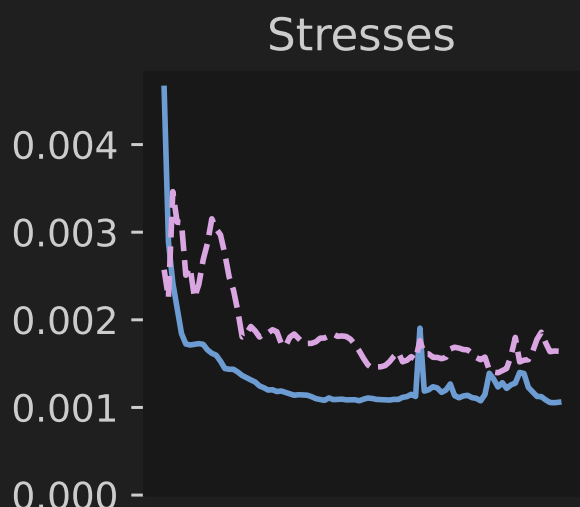
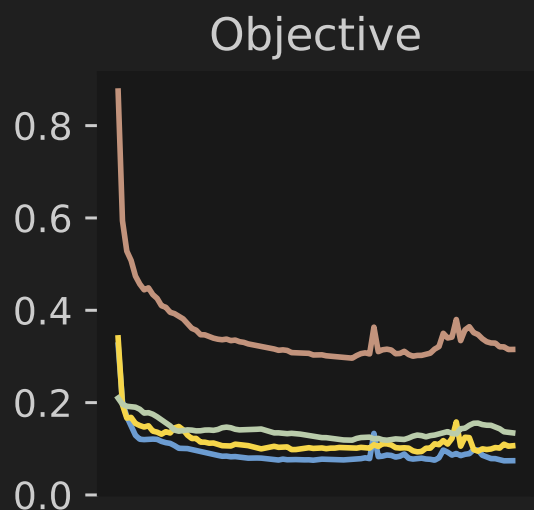
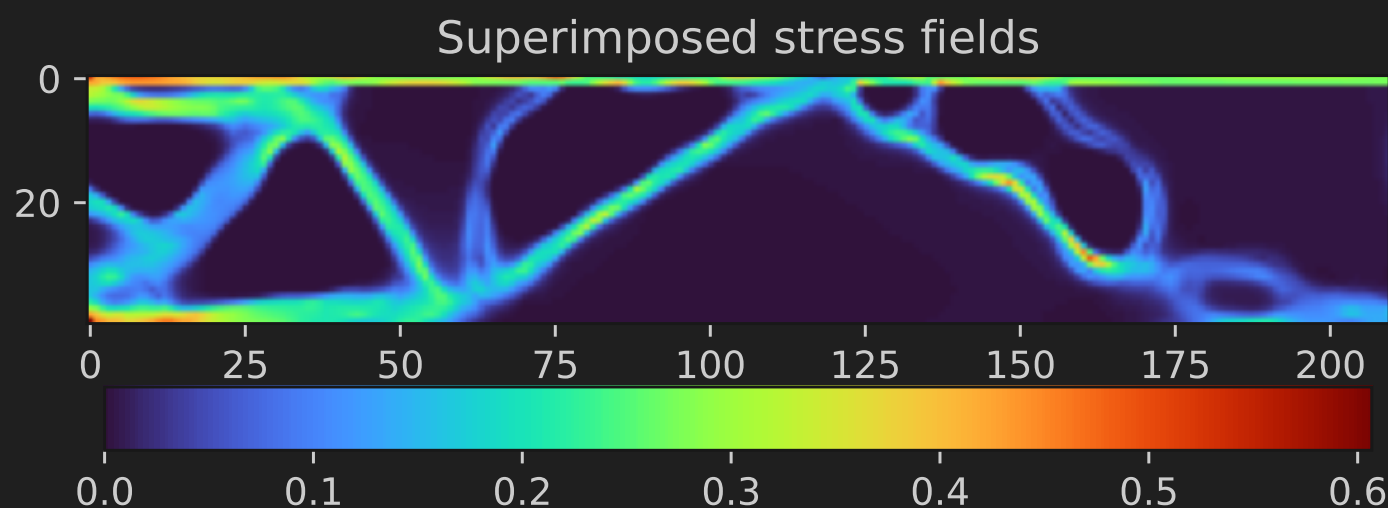
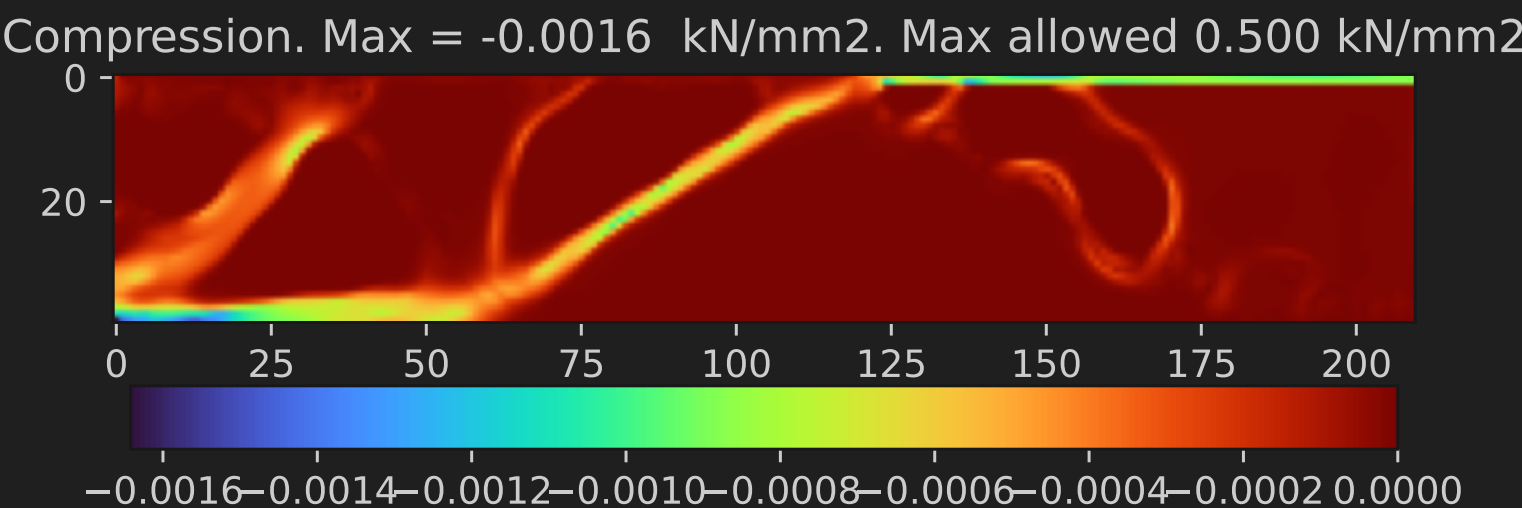
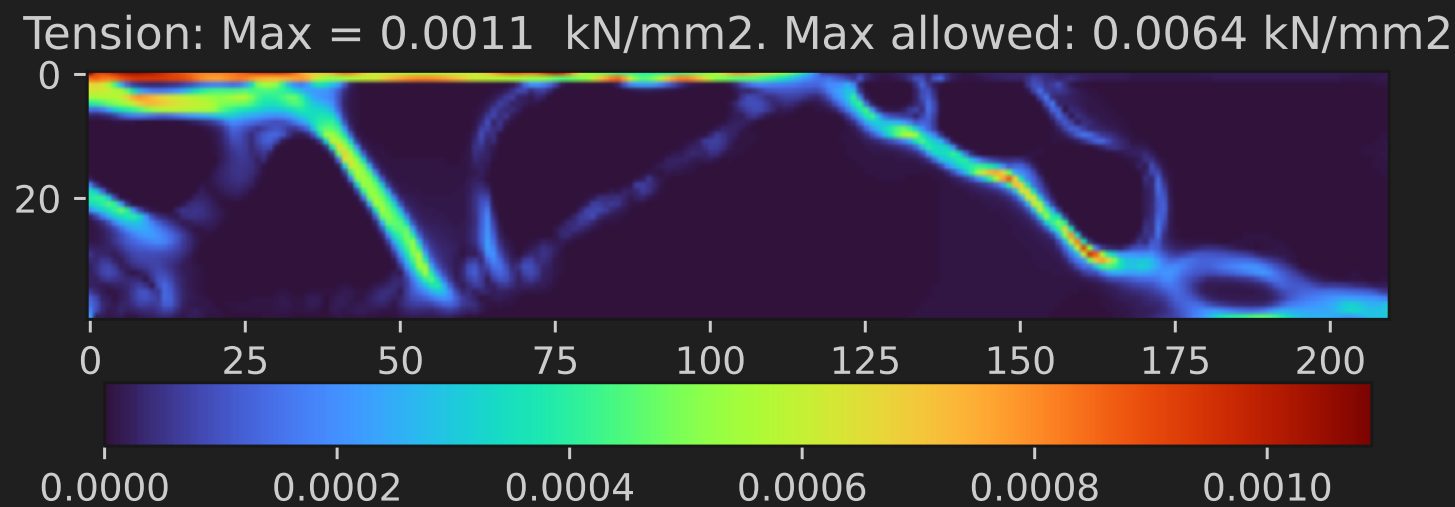
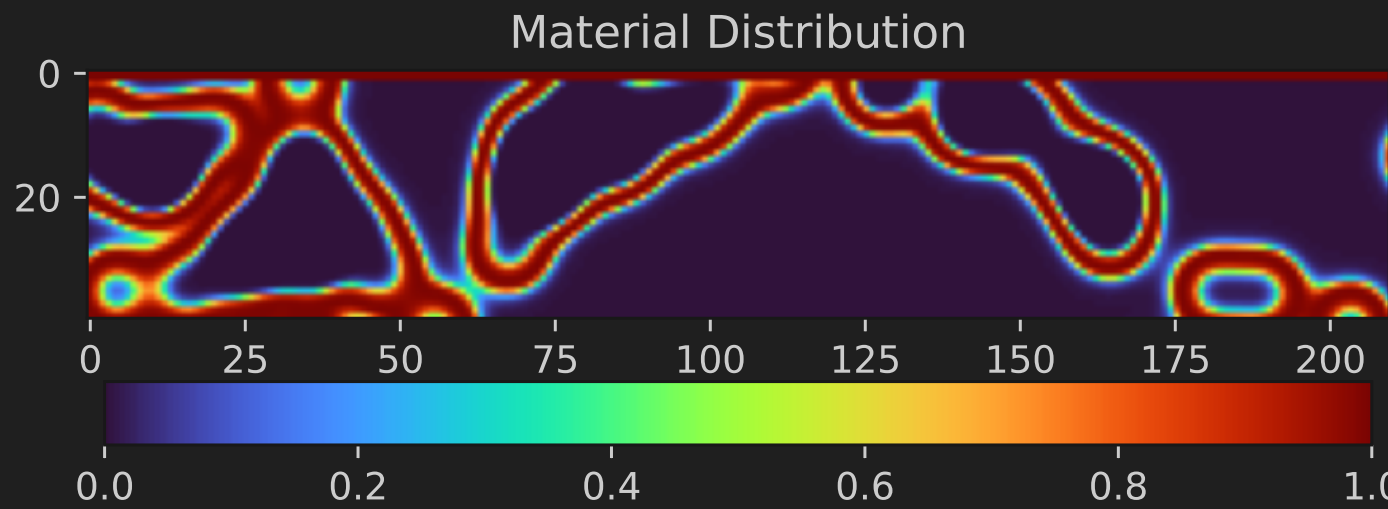
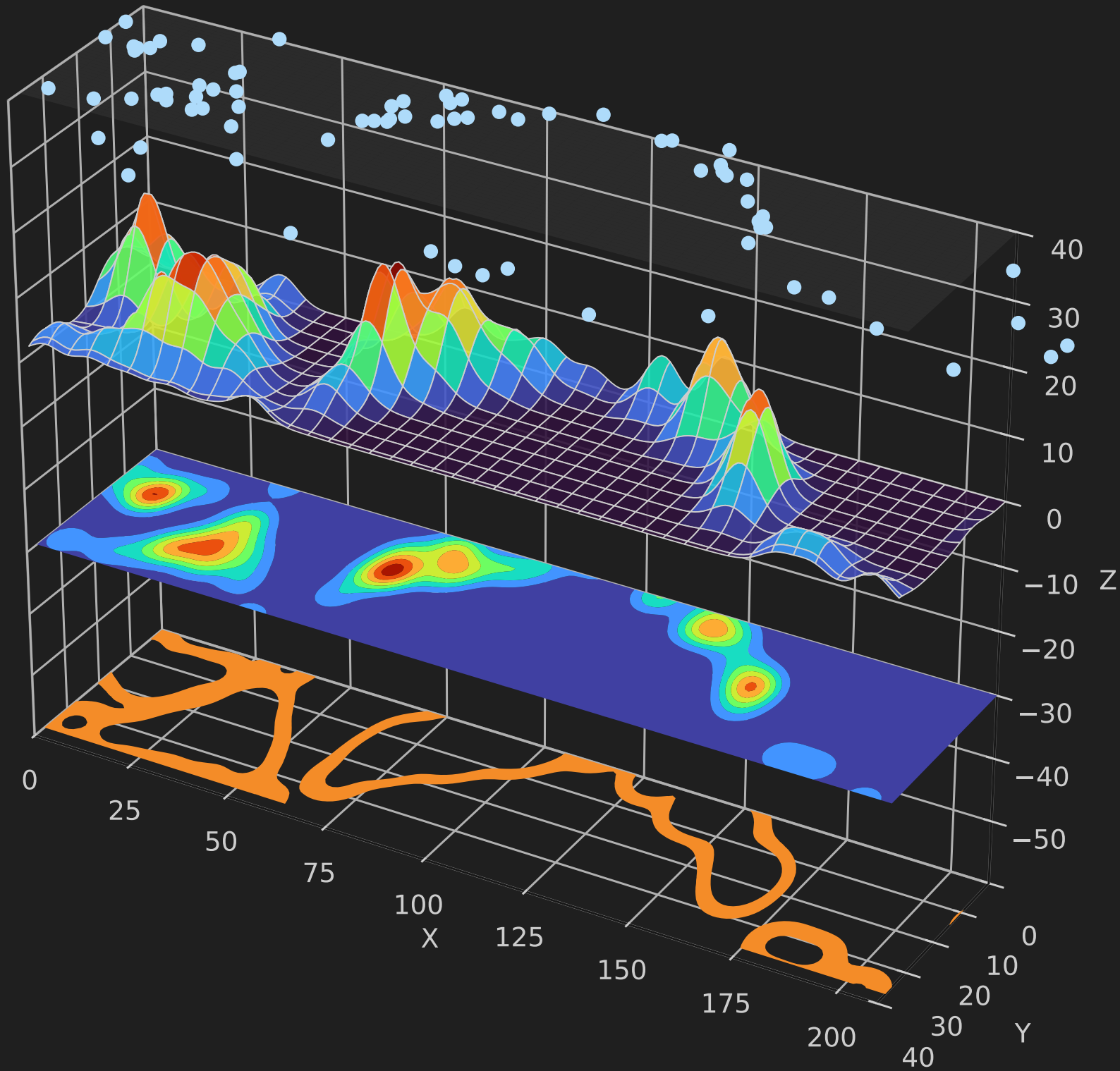
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.11) = 0.32

Spread Gaussian = 5.61 Shift = 2.68 Iteration = 090



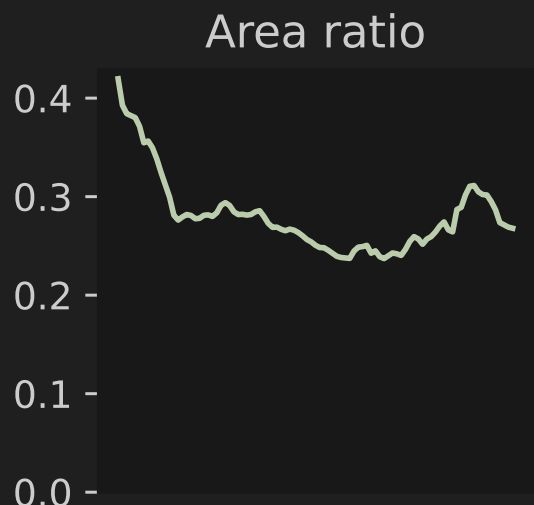
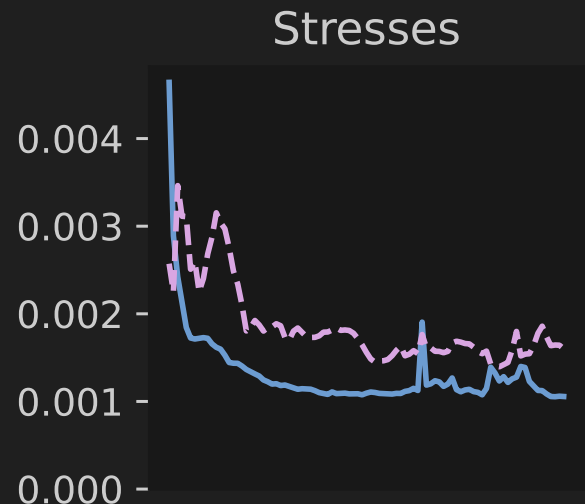
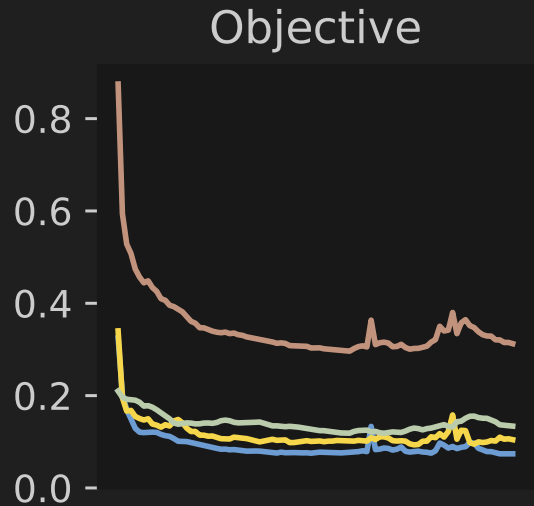
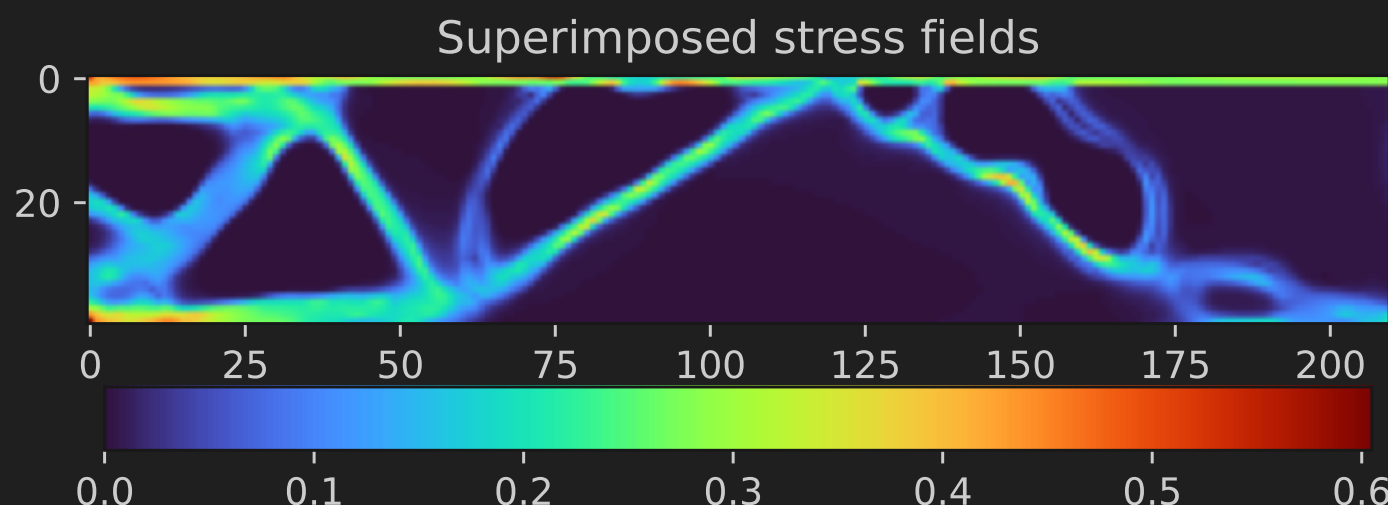
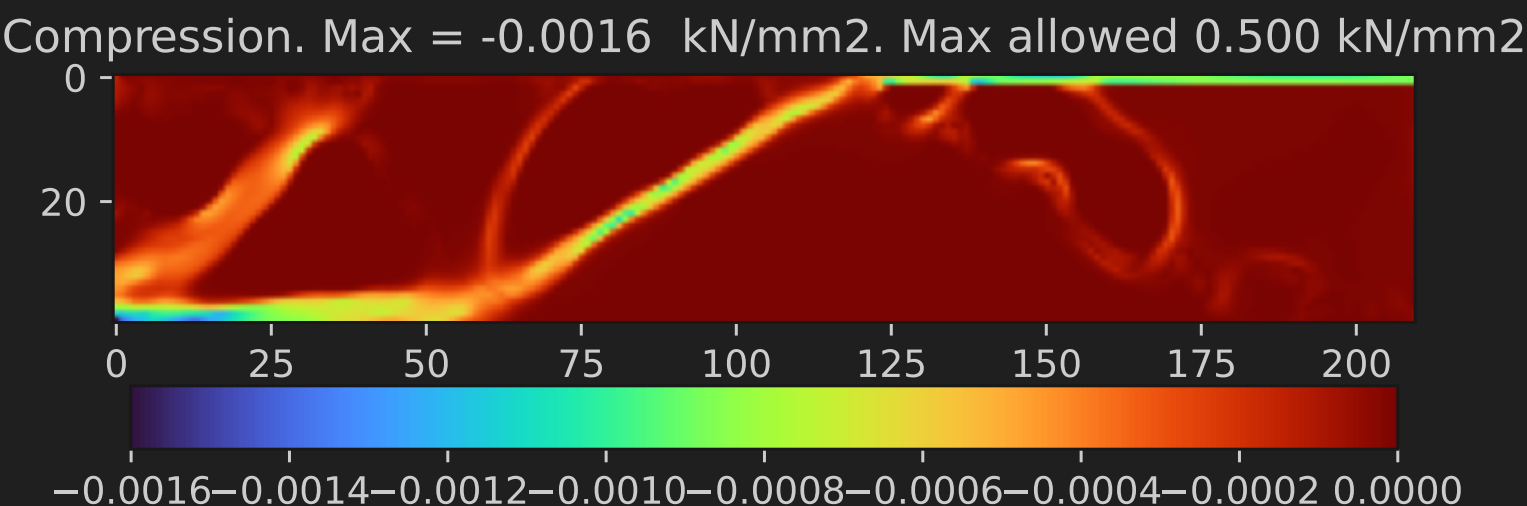
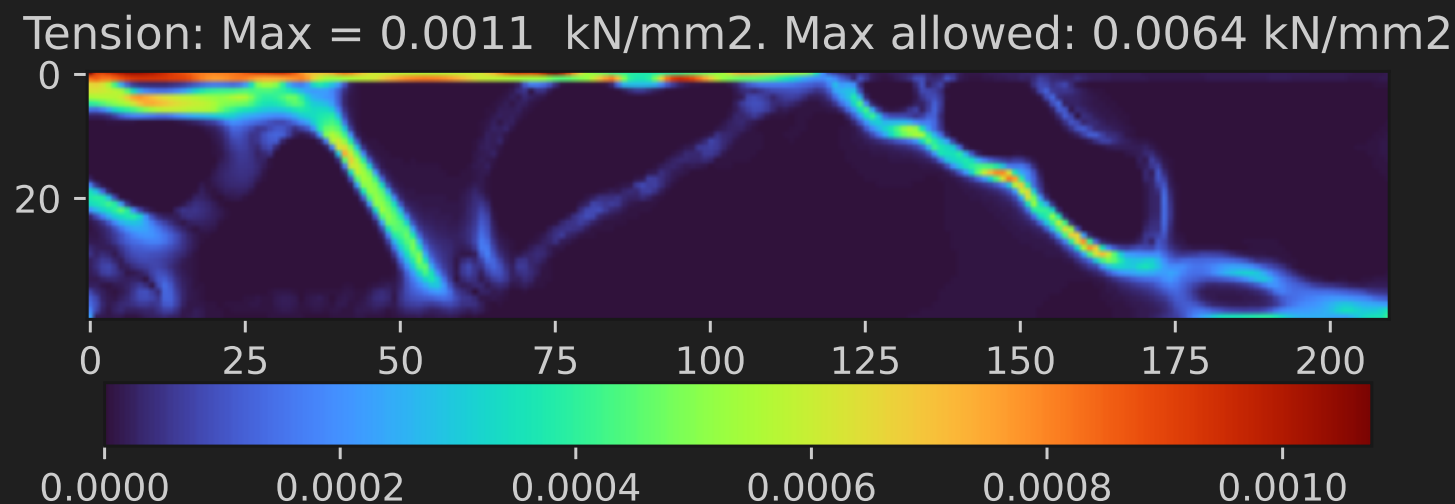
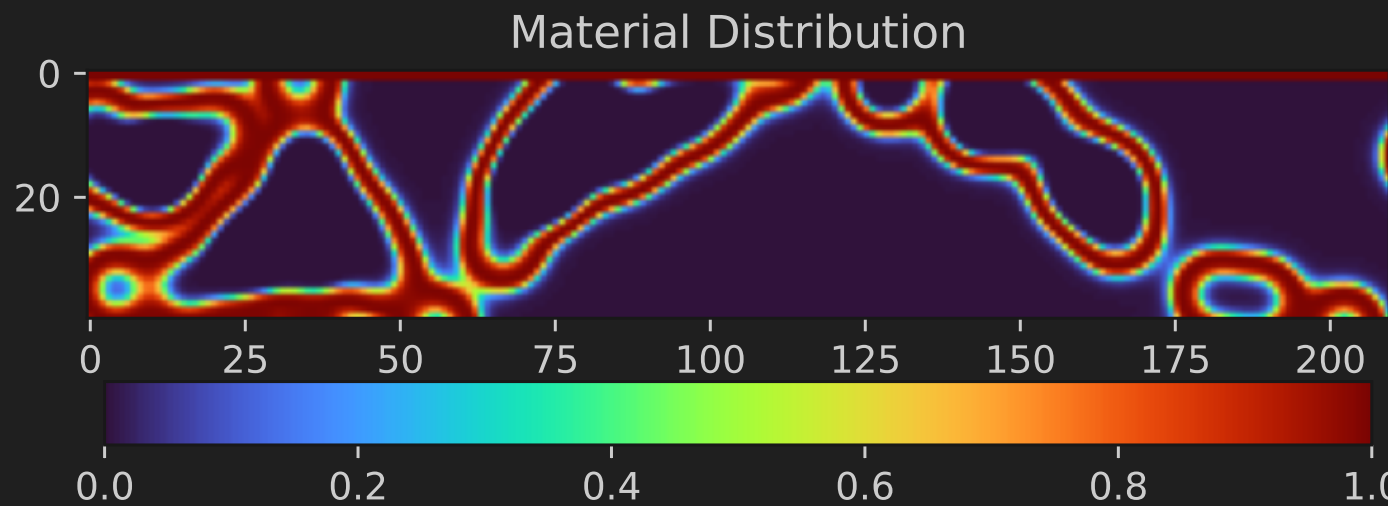
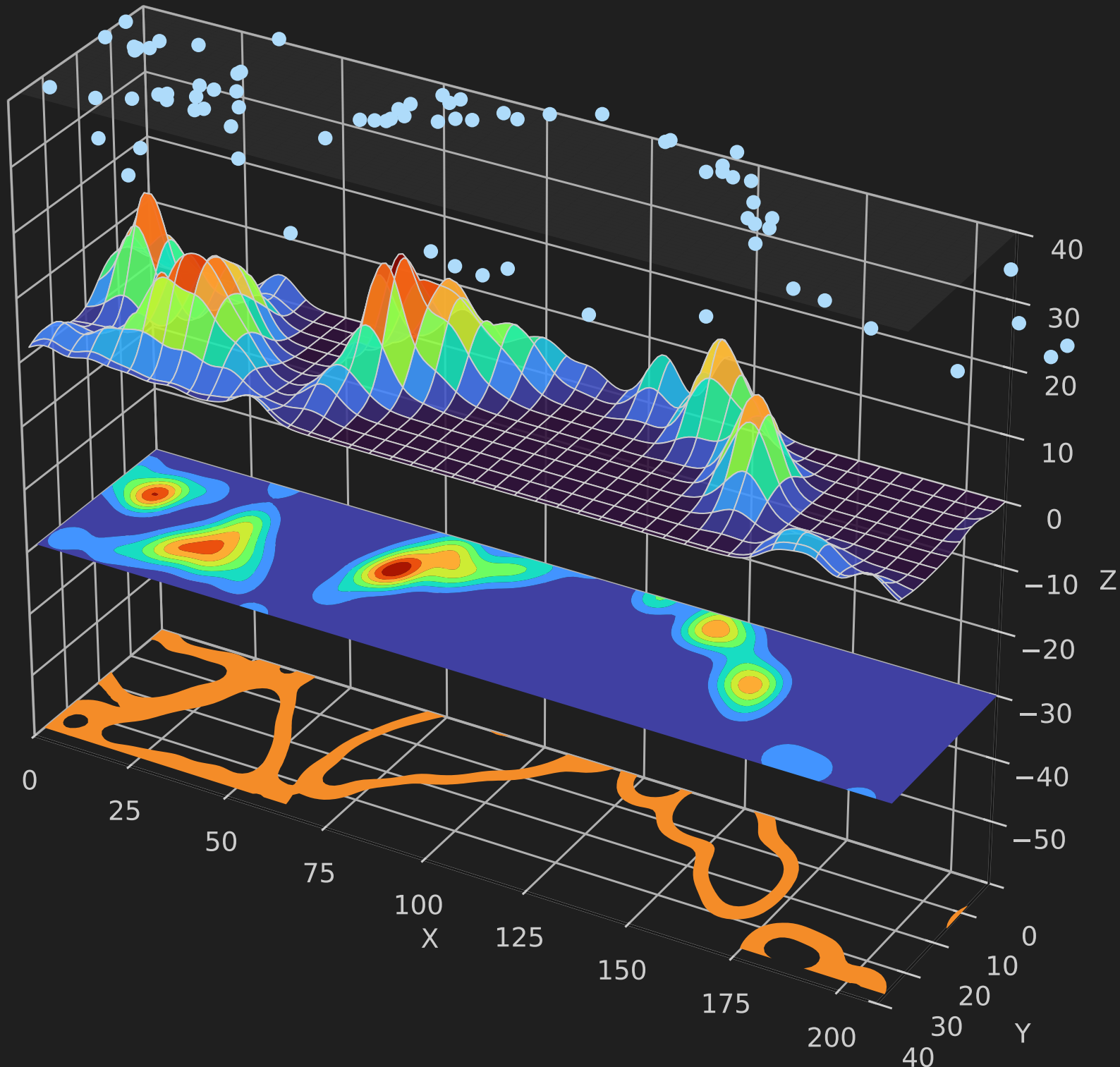
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.11) = 0.32

Spread Gaussian = 5.60 Shift = 2.65 Iteration = 091



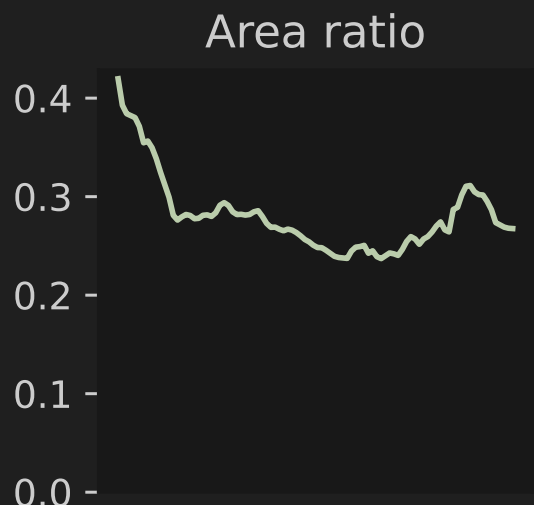
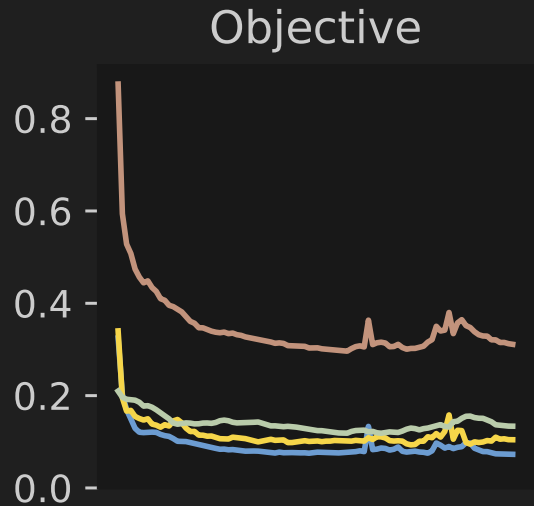
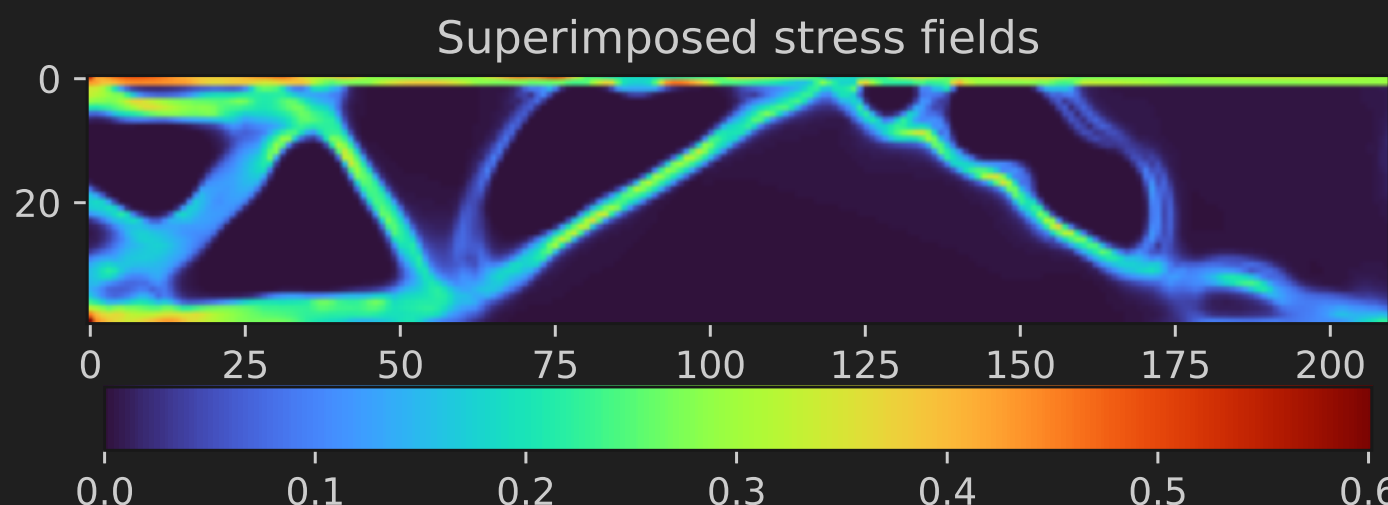
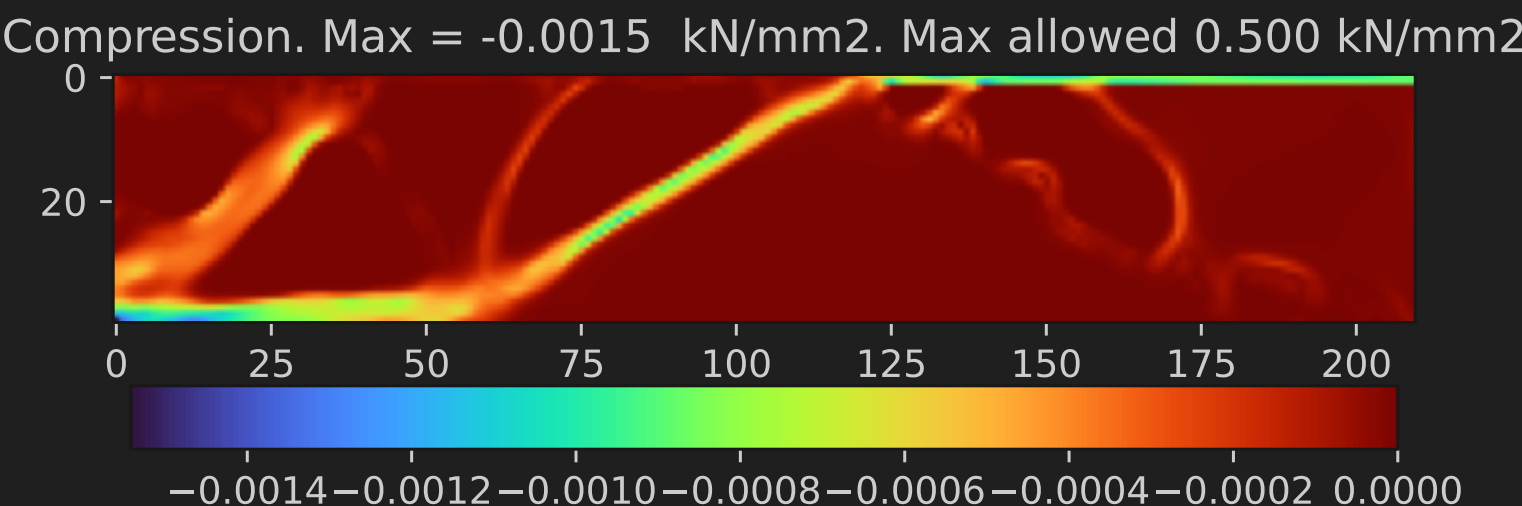
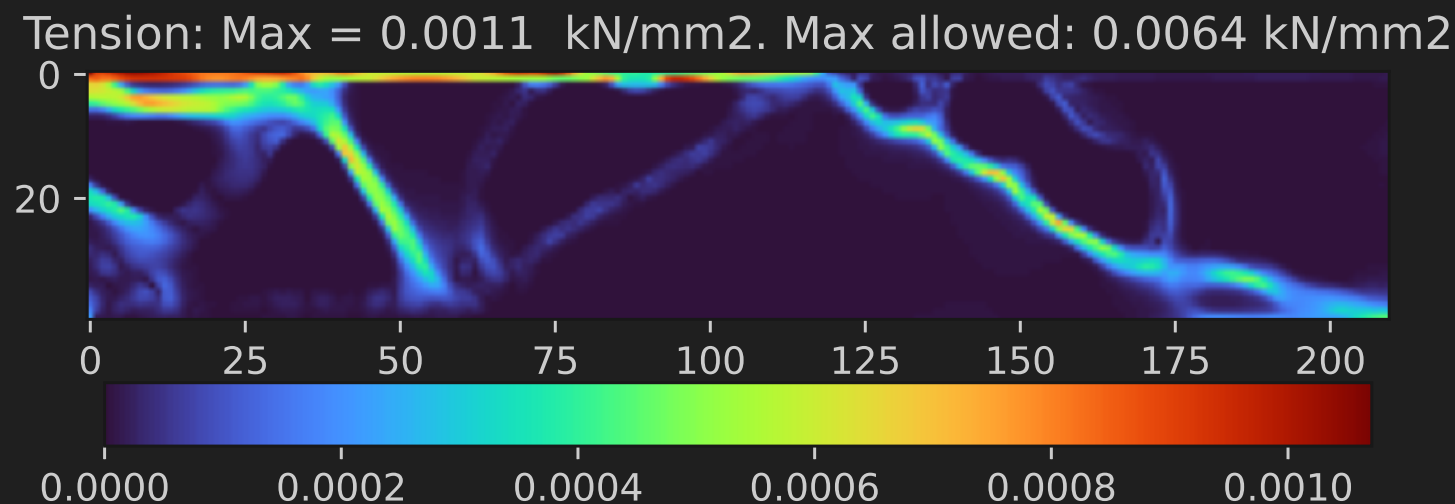
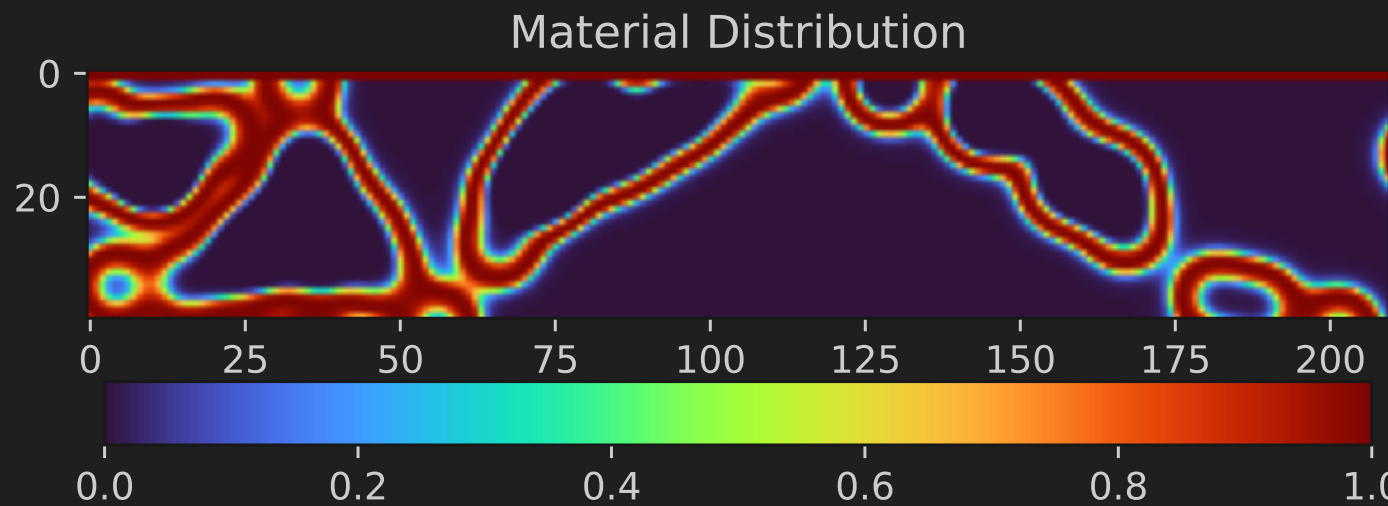
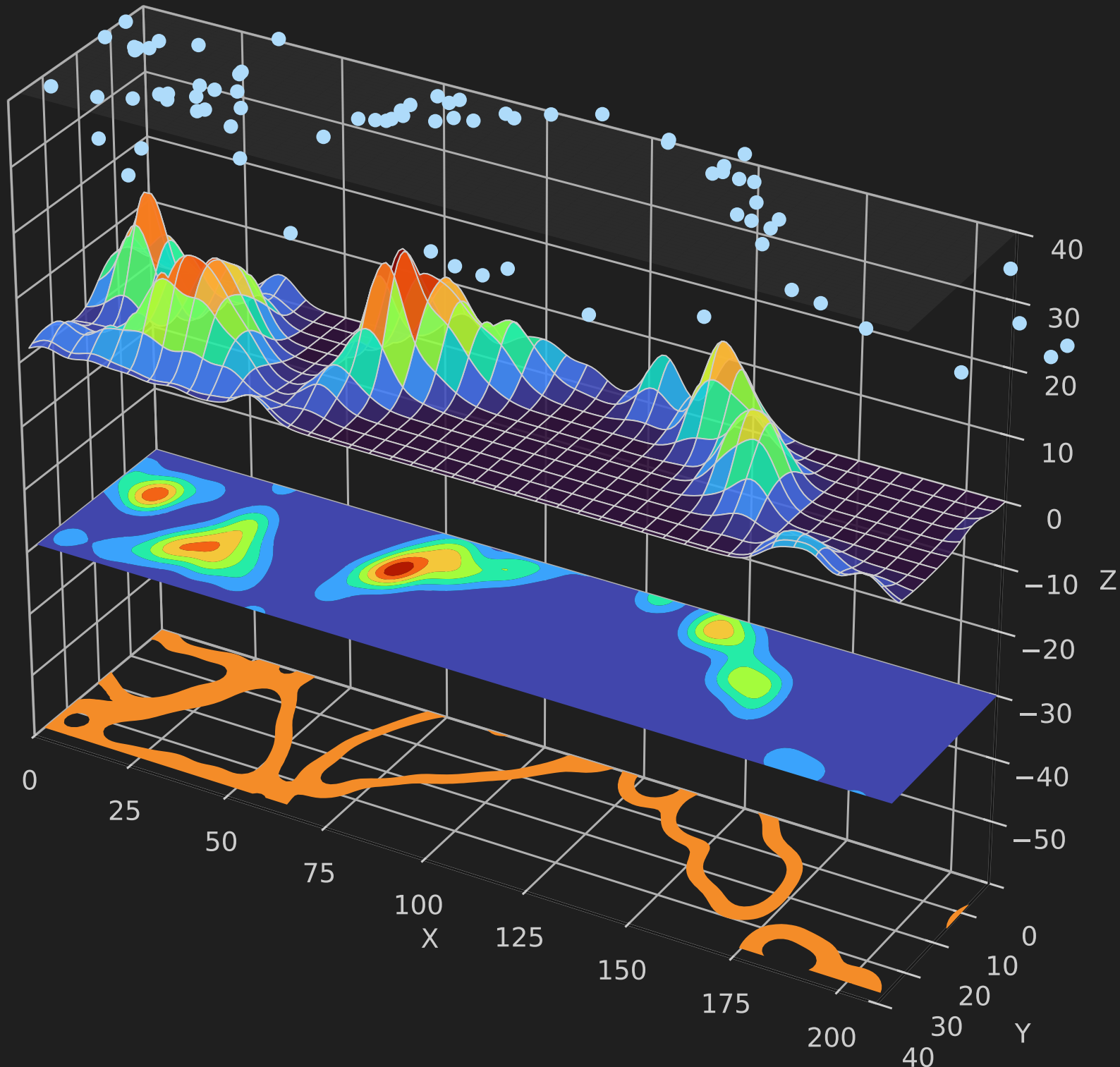
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 5.58 Shift = 2.62 Iteration = 092



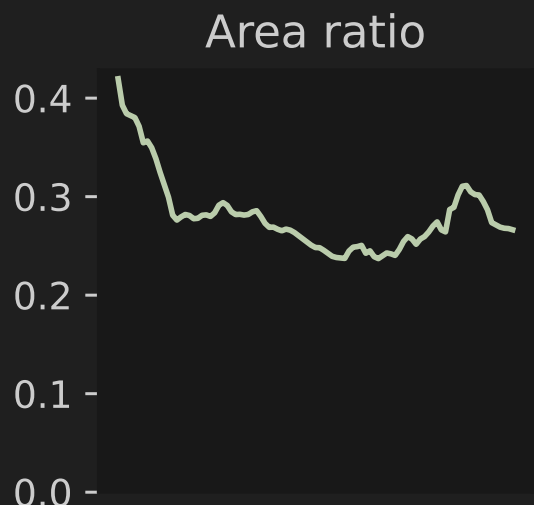
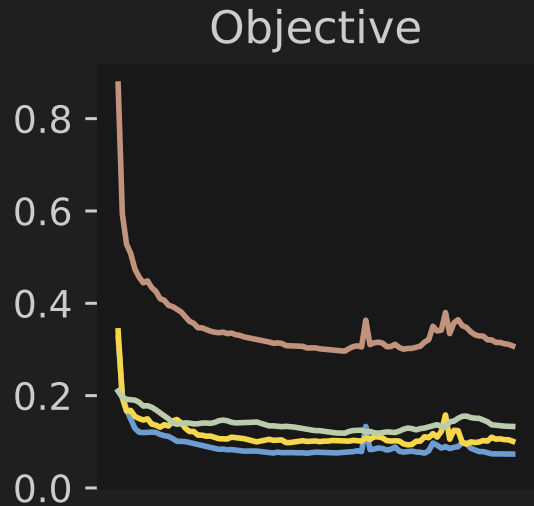
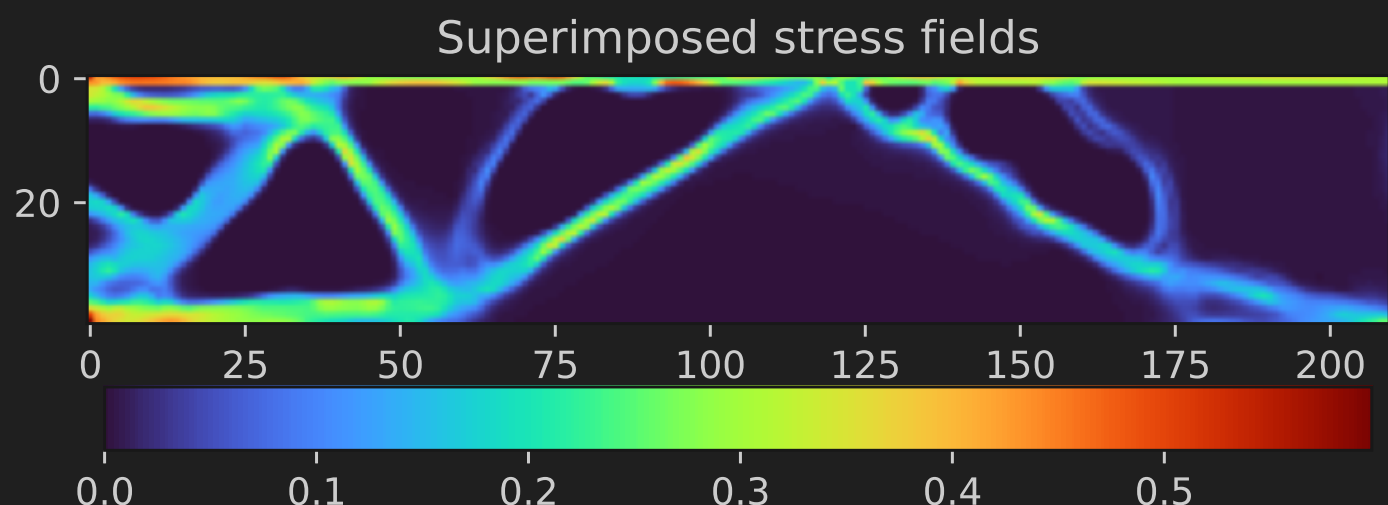
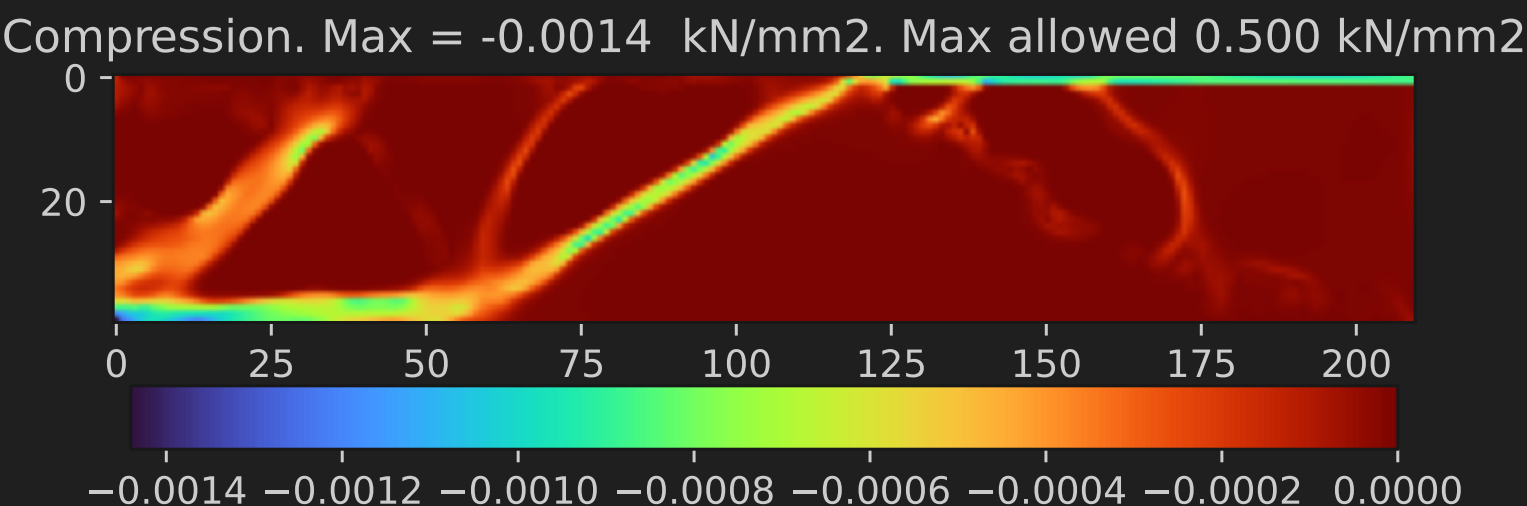
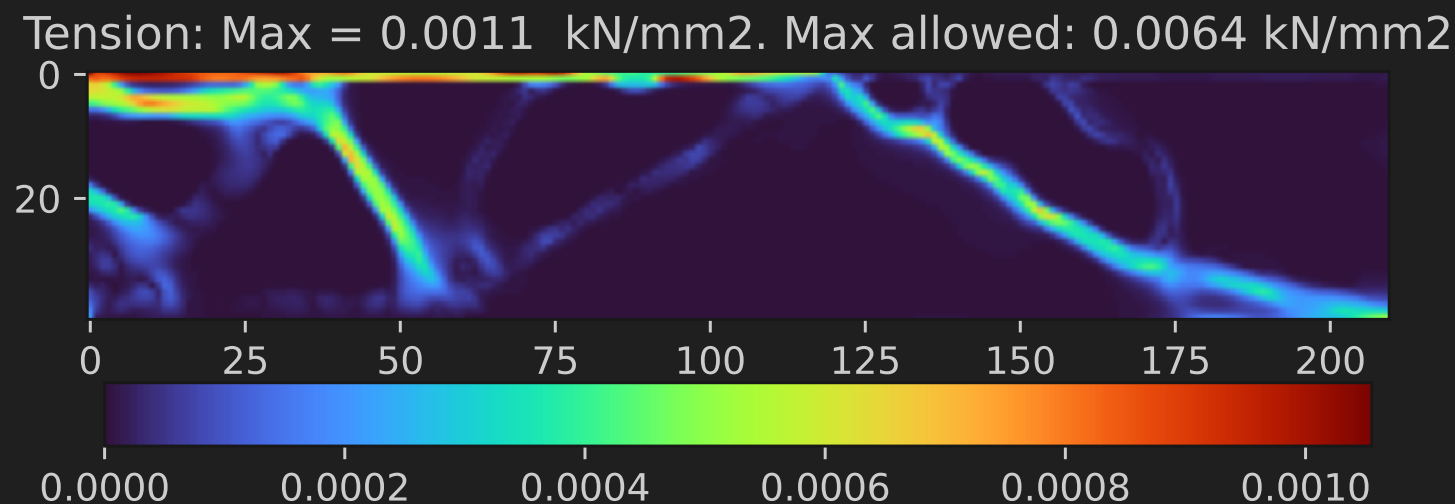
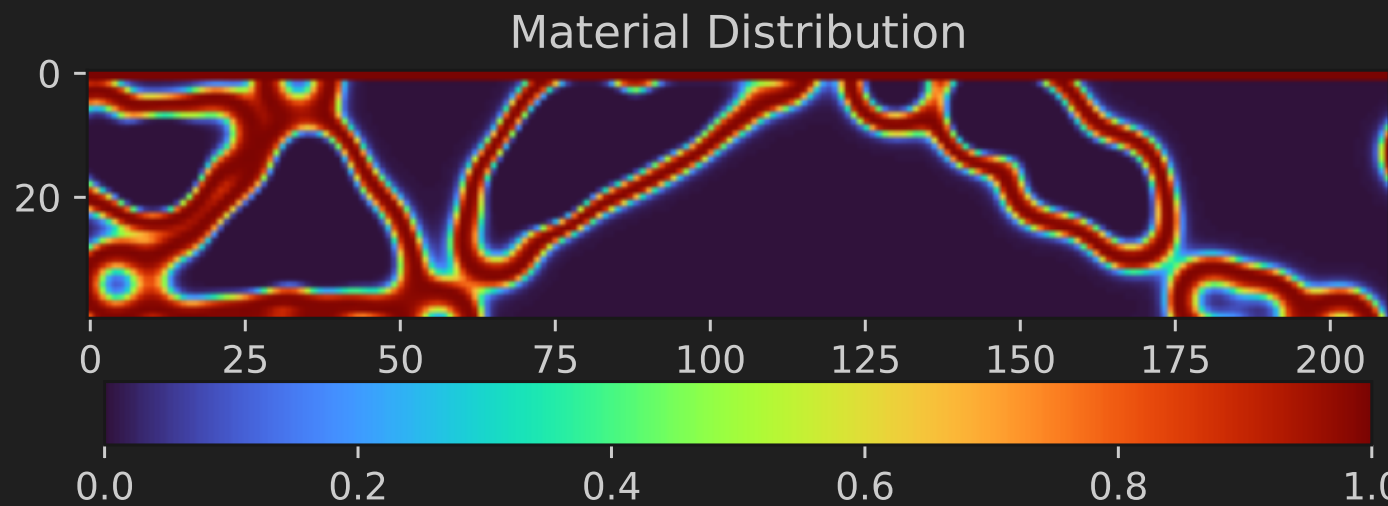
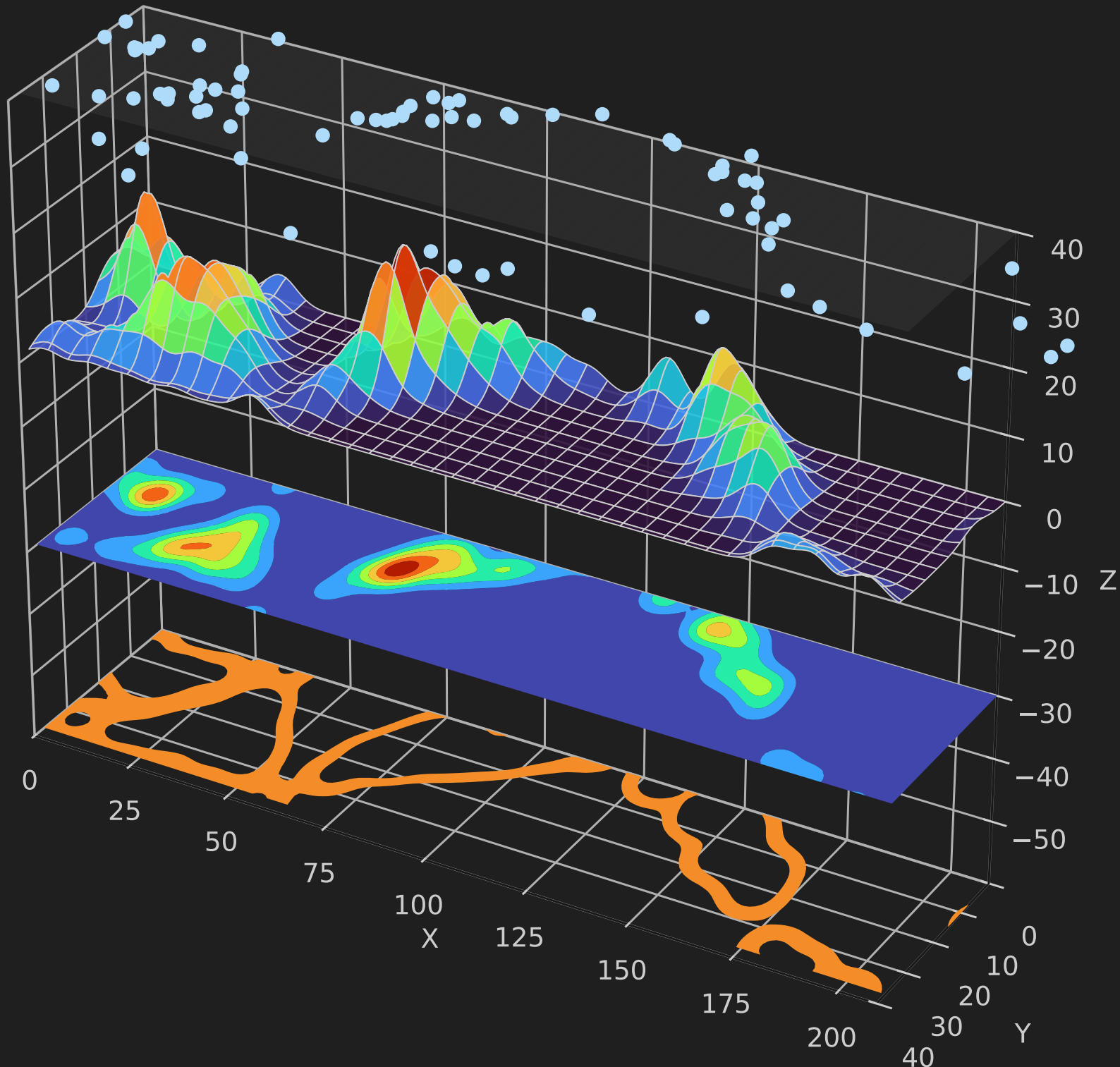
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 5.56 Shift = 2.59 Iteration = 093



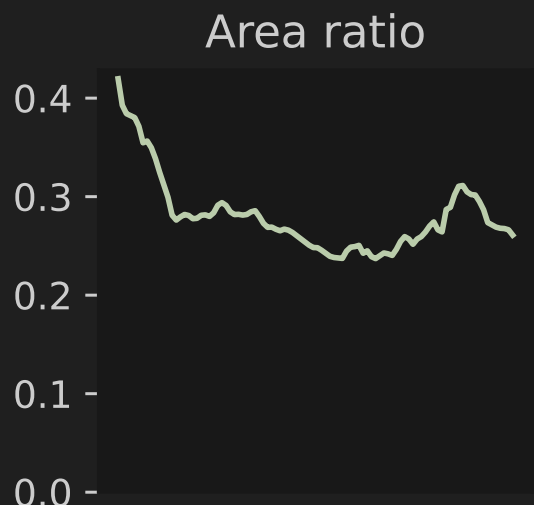
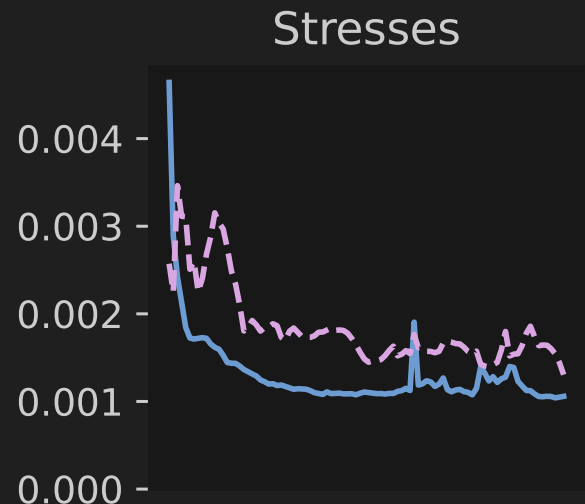
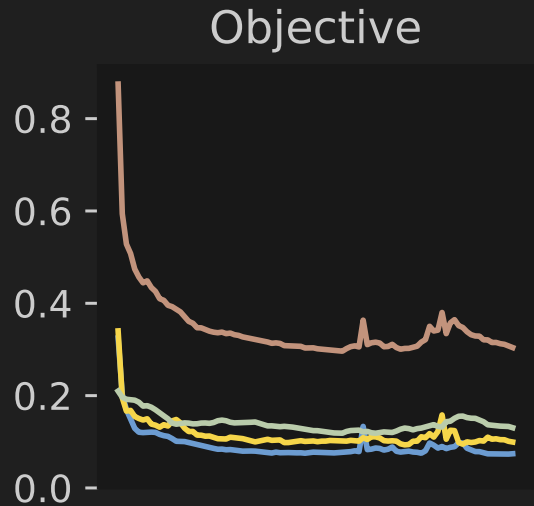
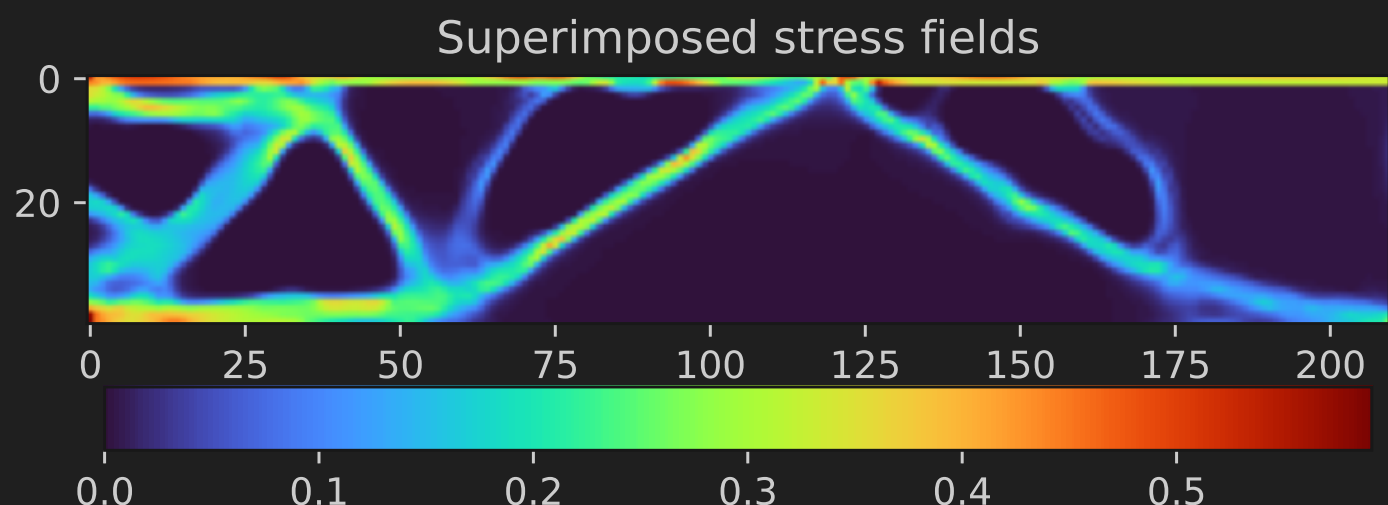
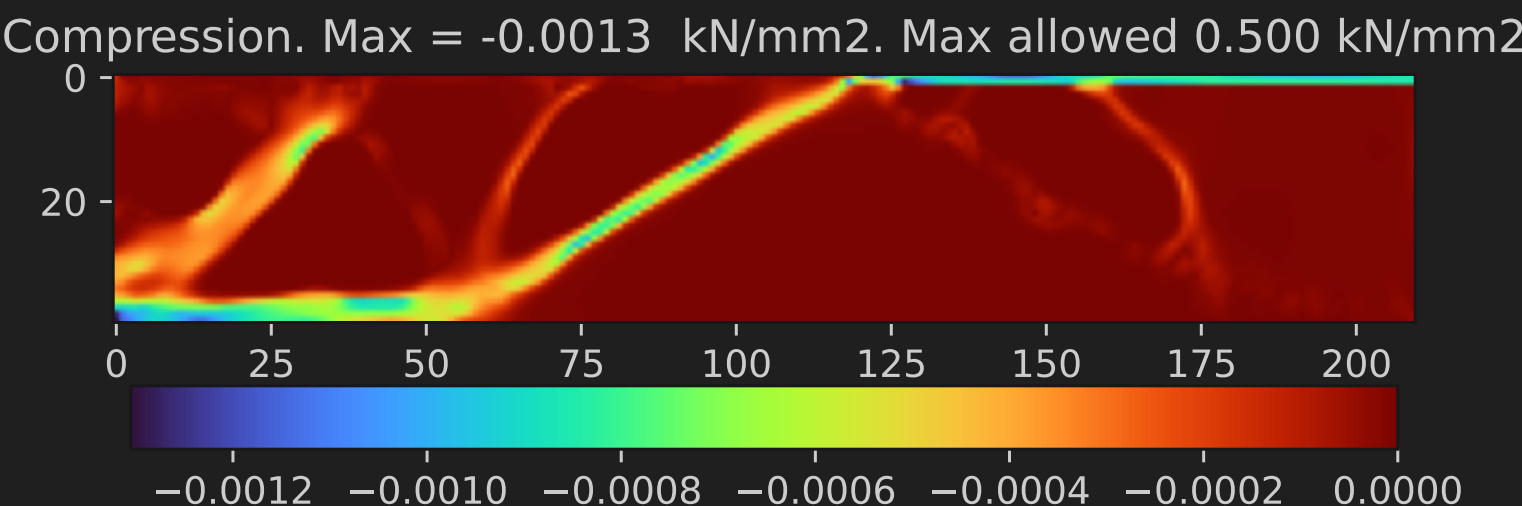
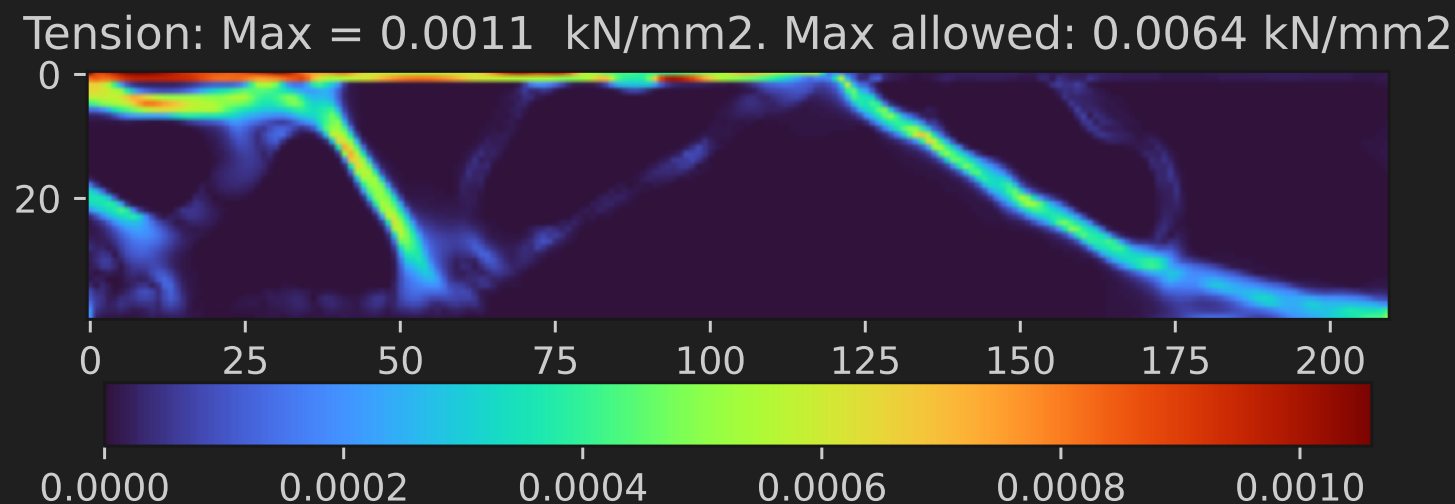
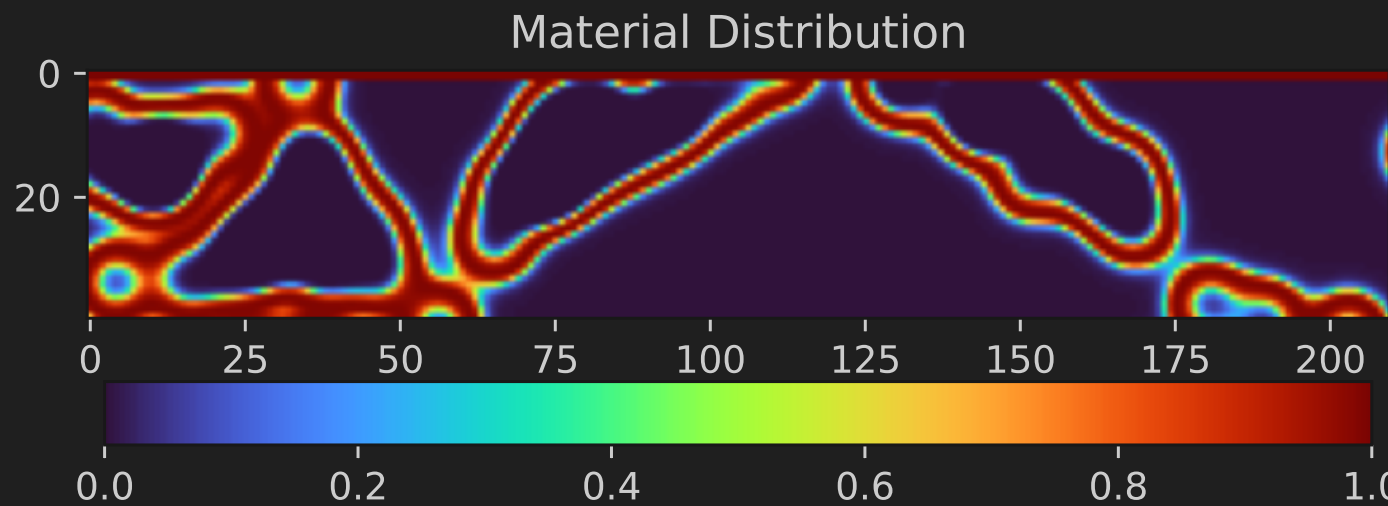
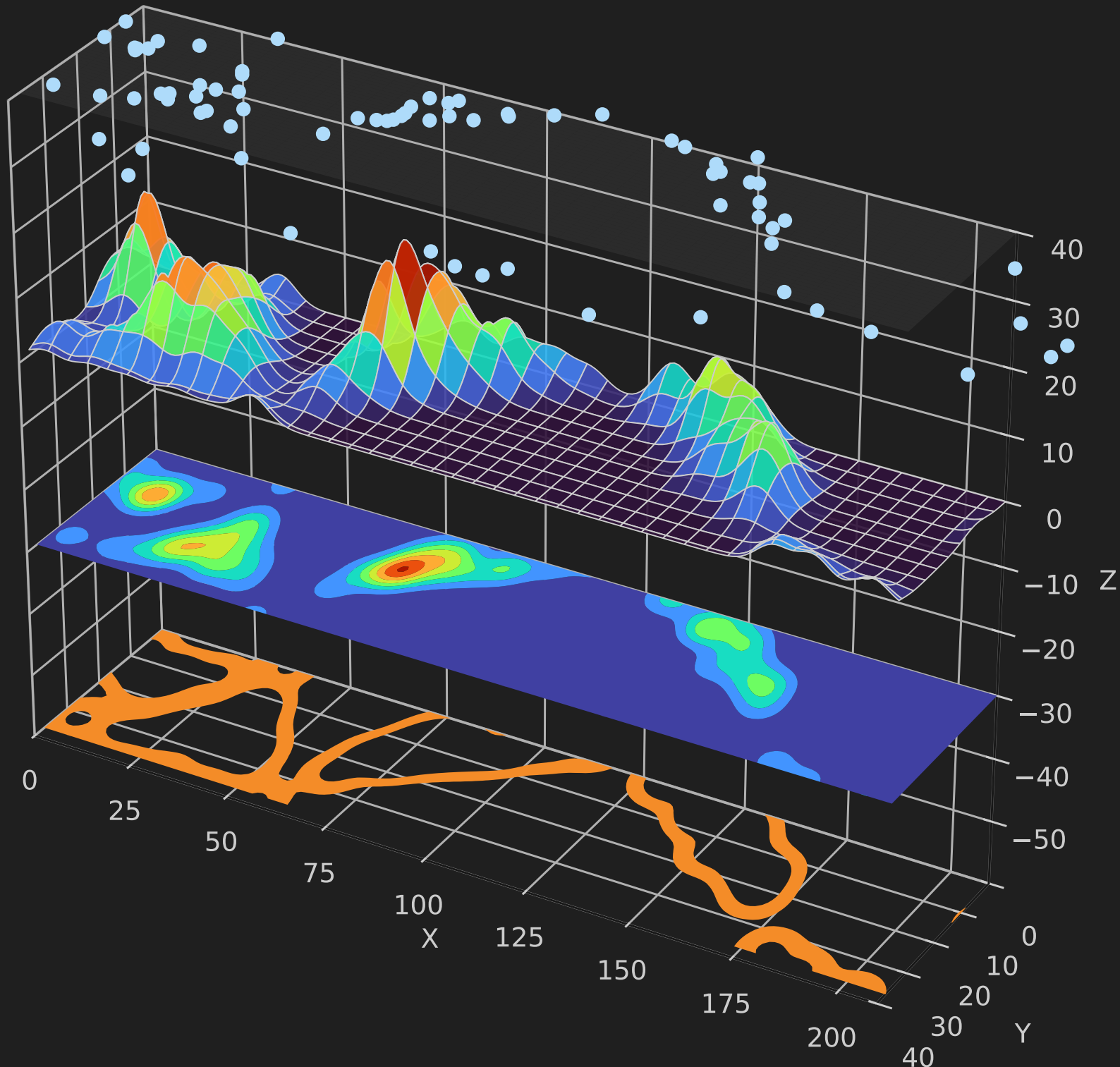
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.27) - (Displacement: 1 * -0.10) = 0.31

Spread Gaussian = 5.53 Shift = 2.55 Iteration = 094



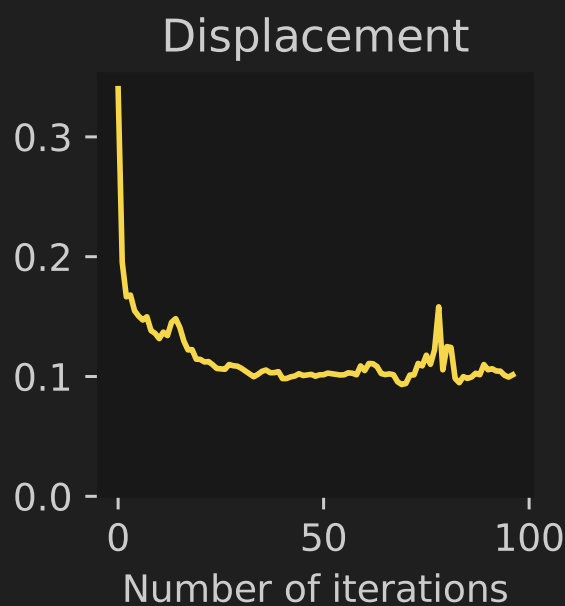
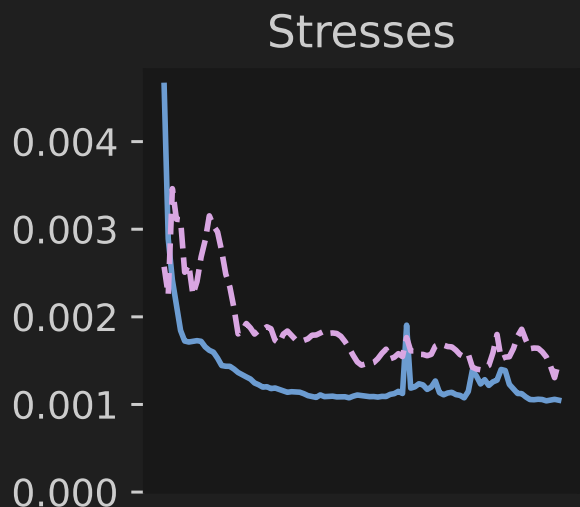
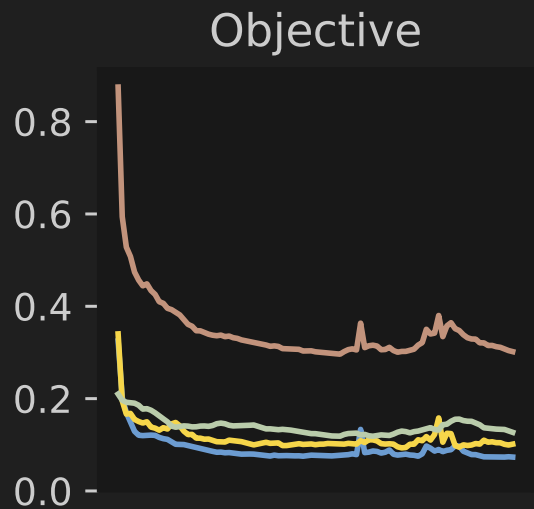
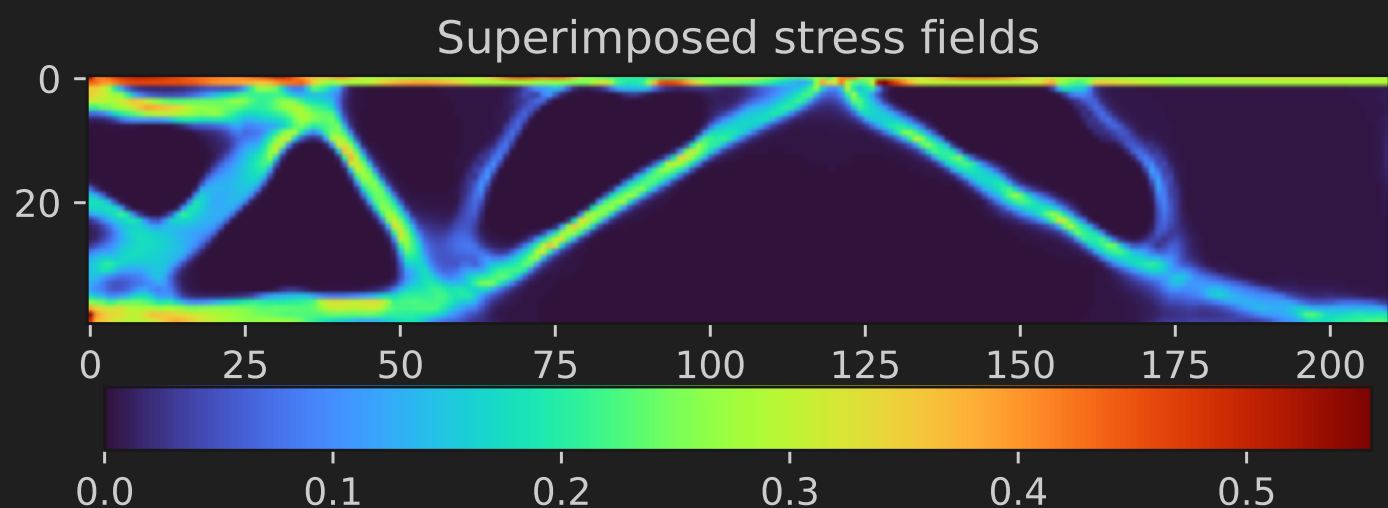
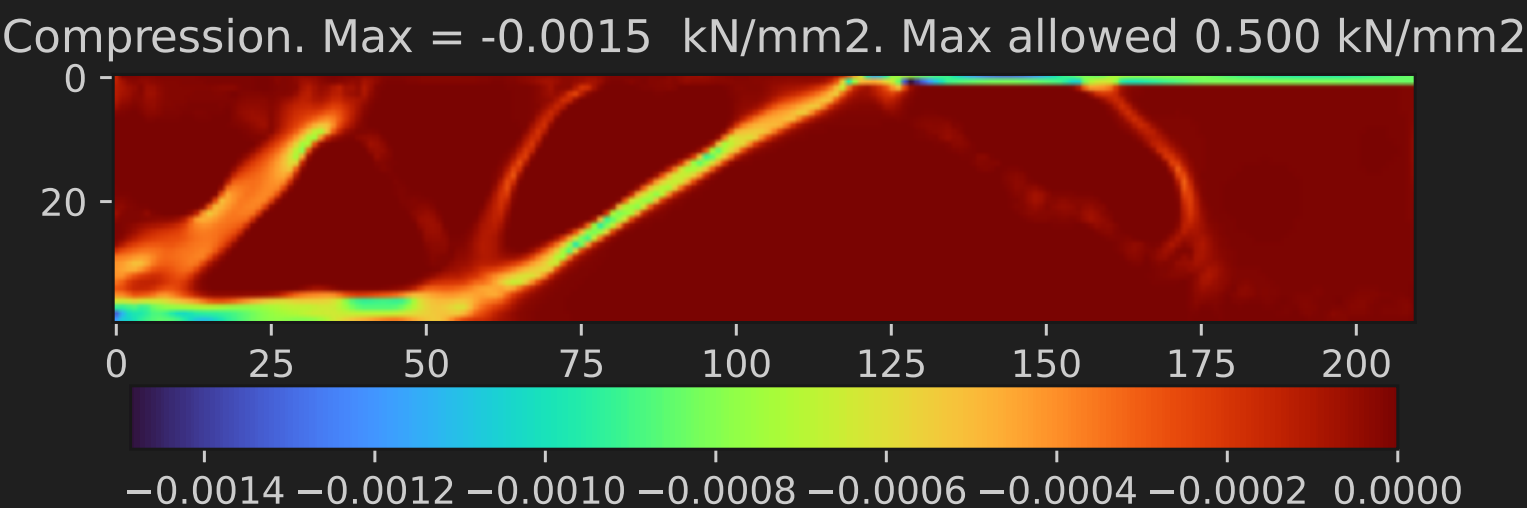
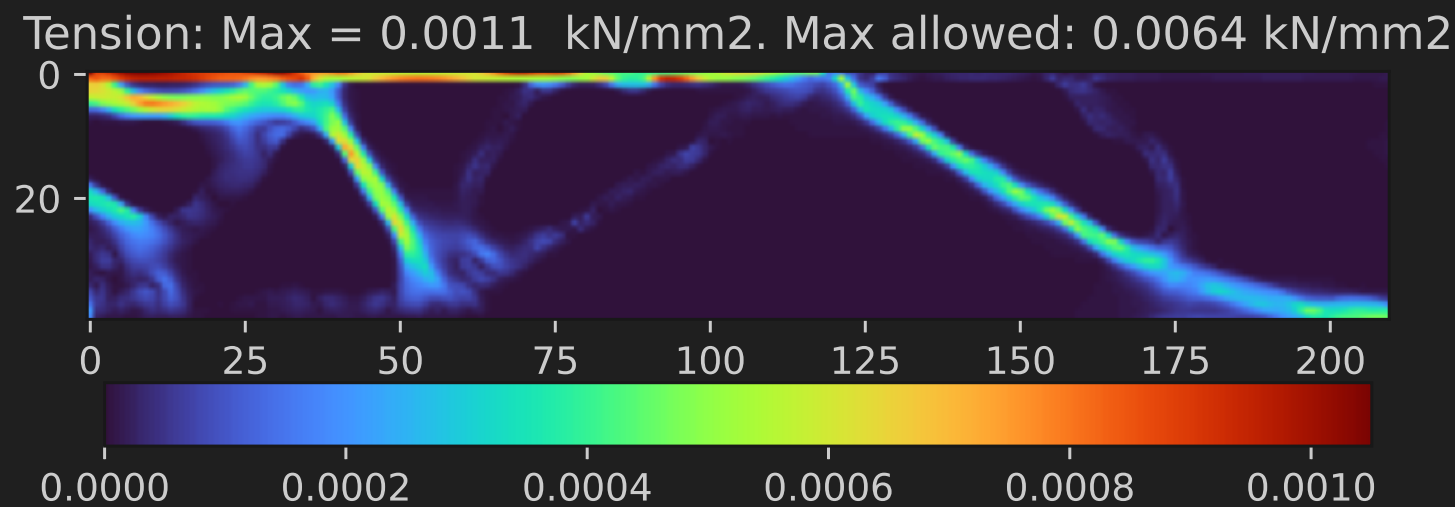
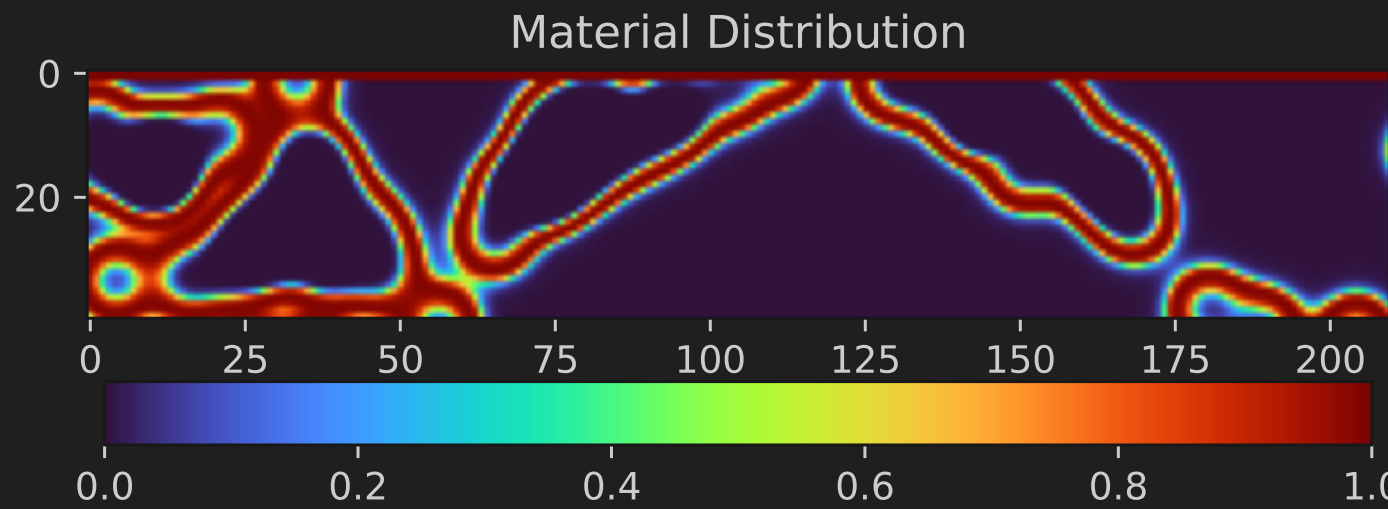
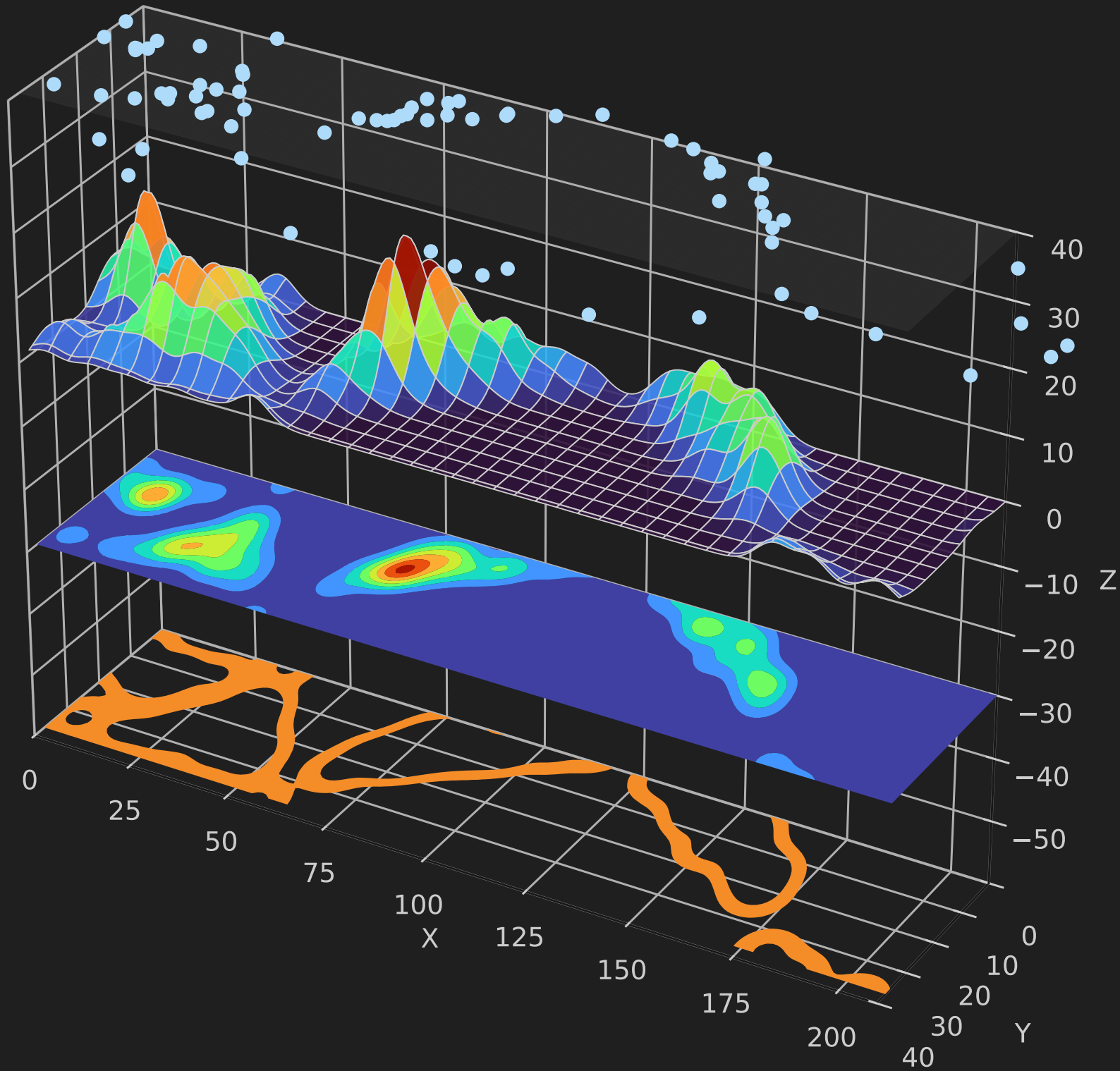
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.26) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 5.51 Shift = 2.51 Iteration = 095



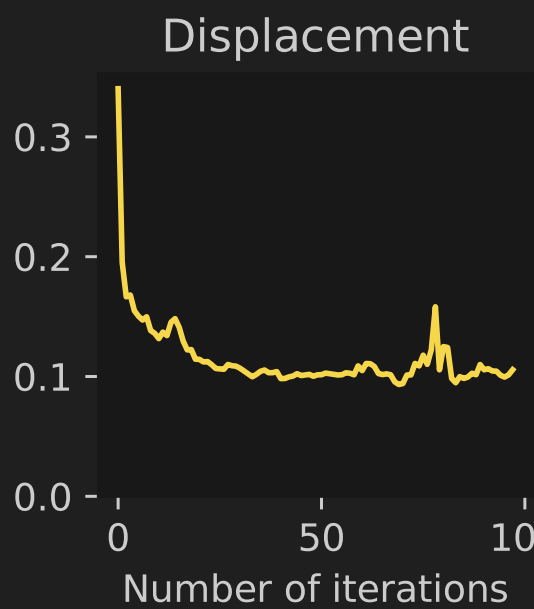
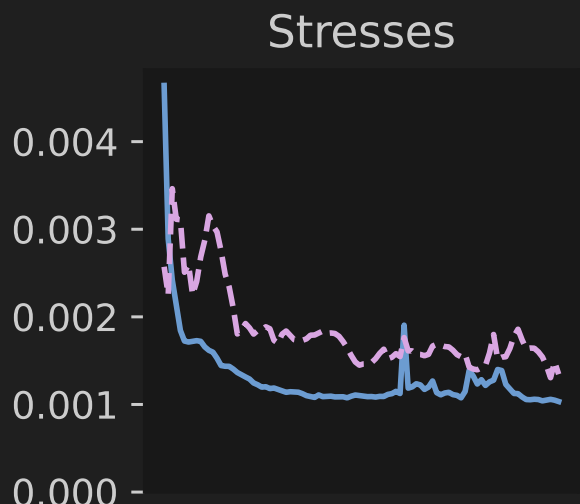
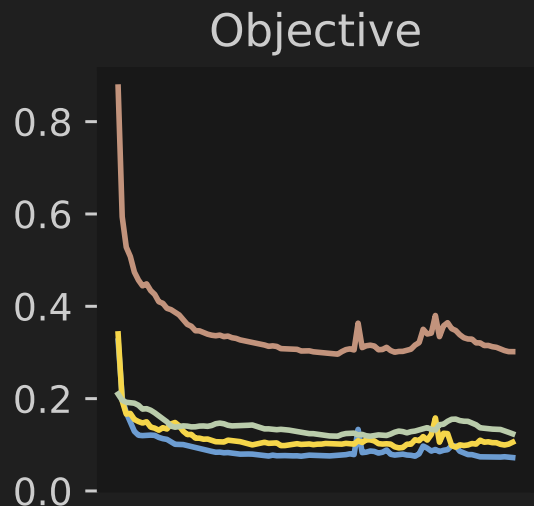
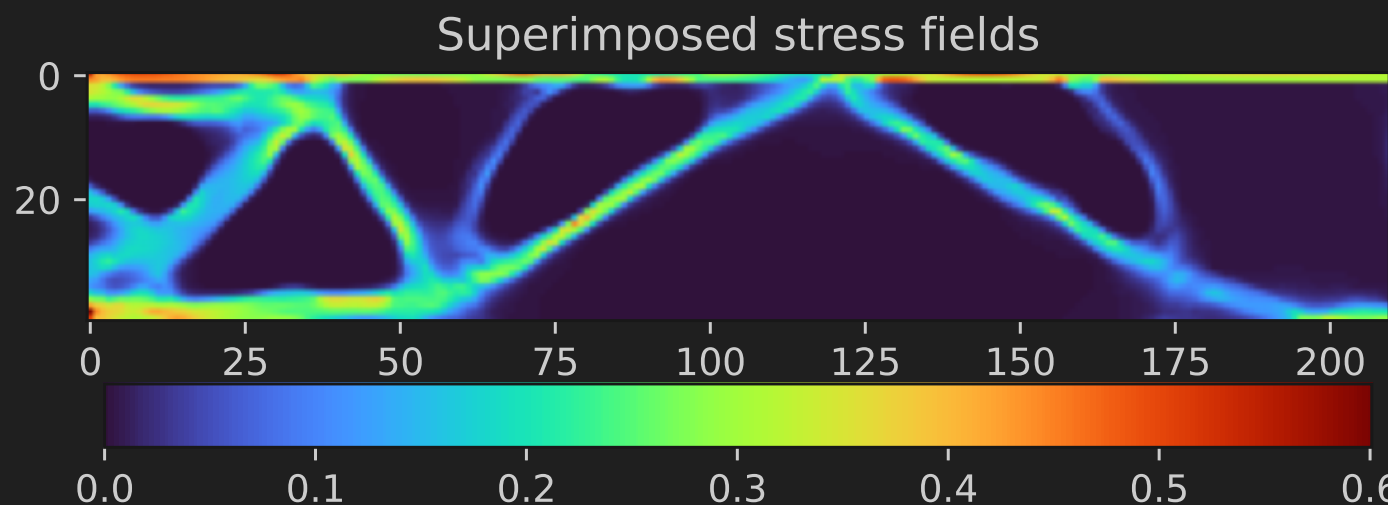
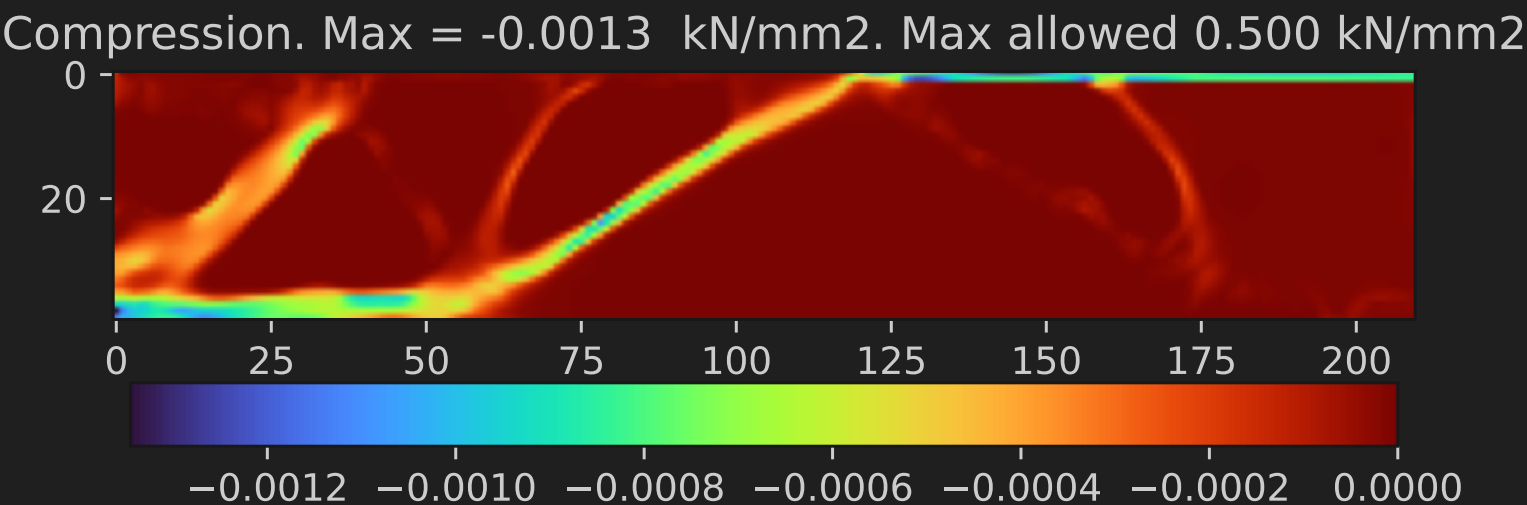
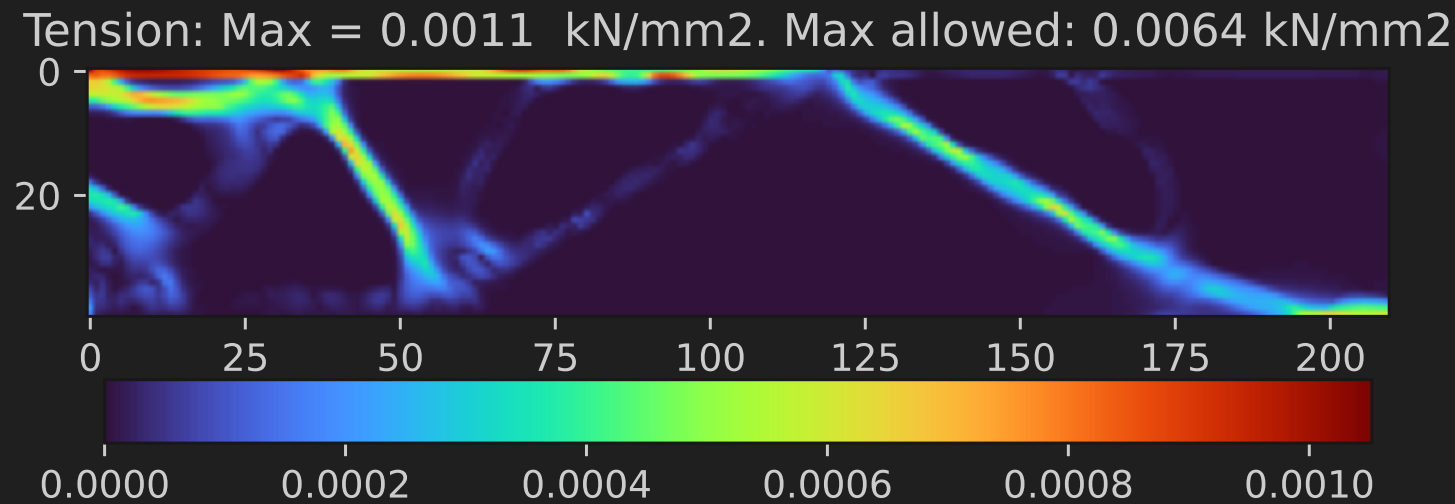
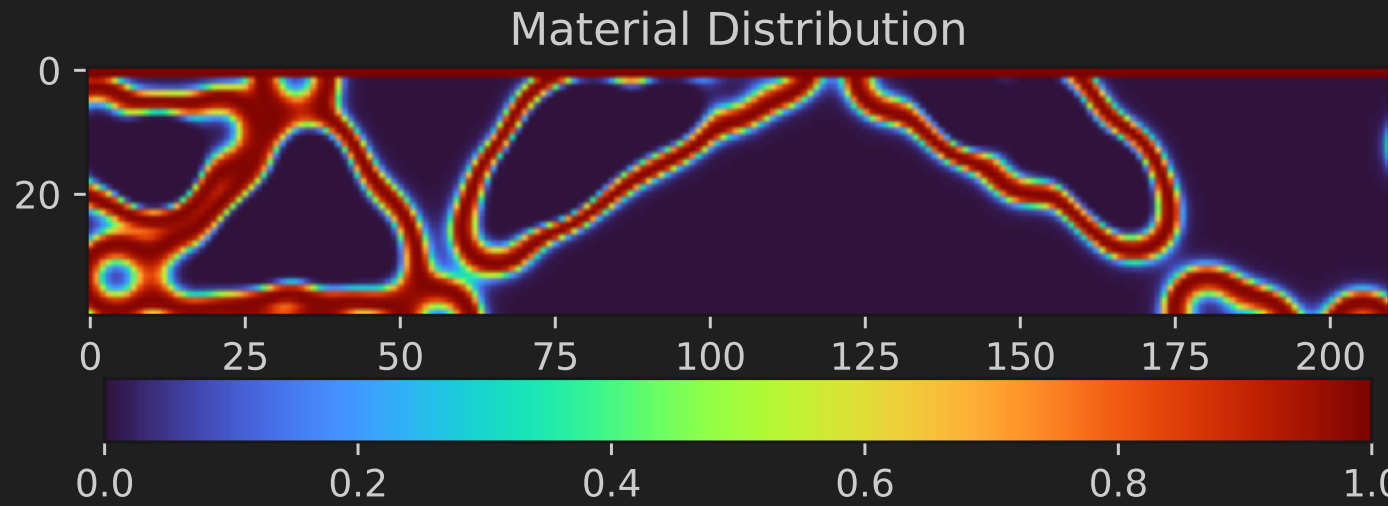
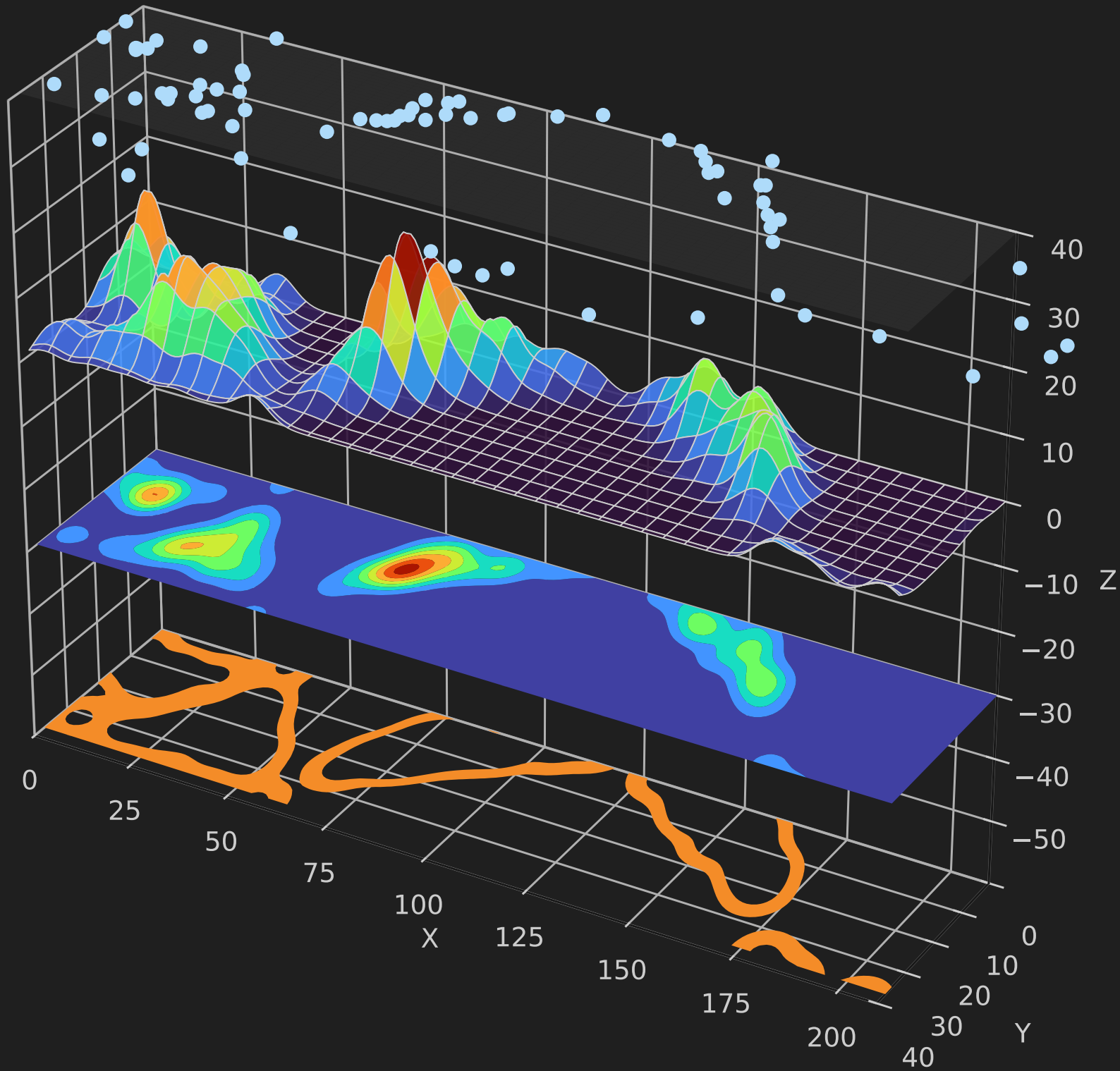
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 5.51 Shift = 2.47 Iteration = 096



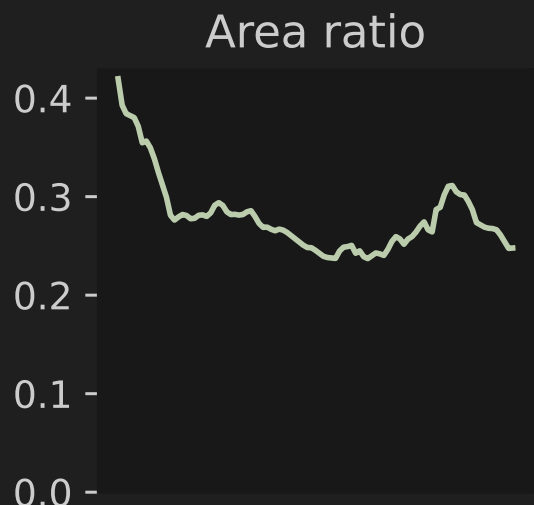
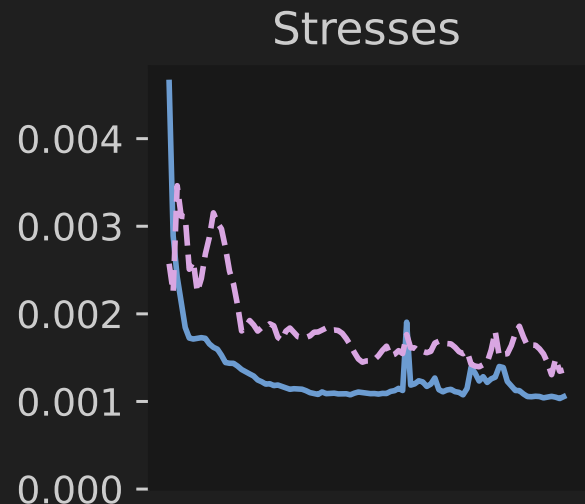
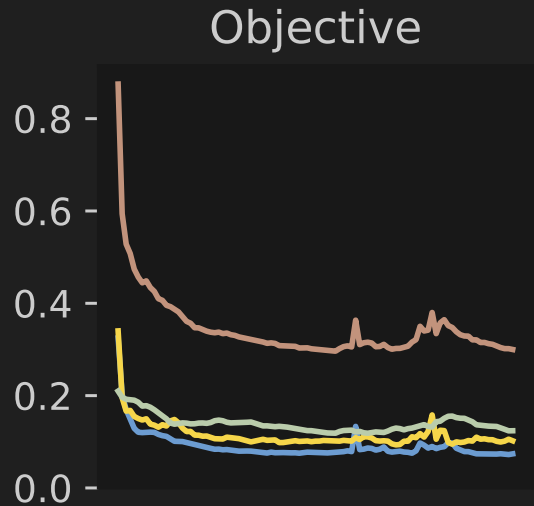
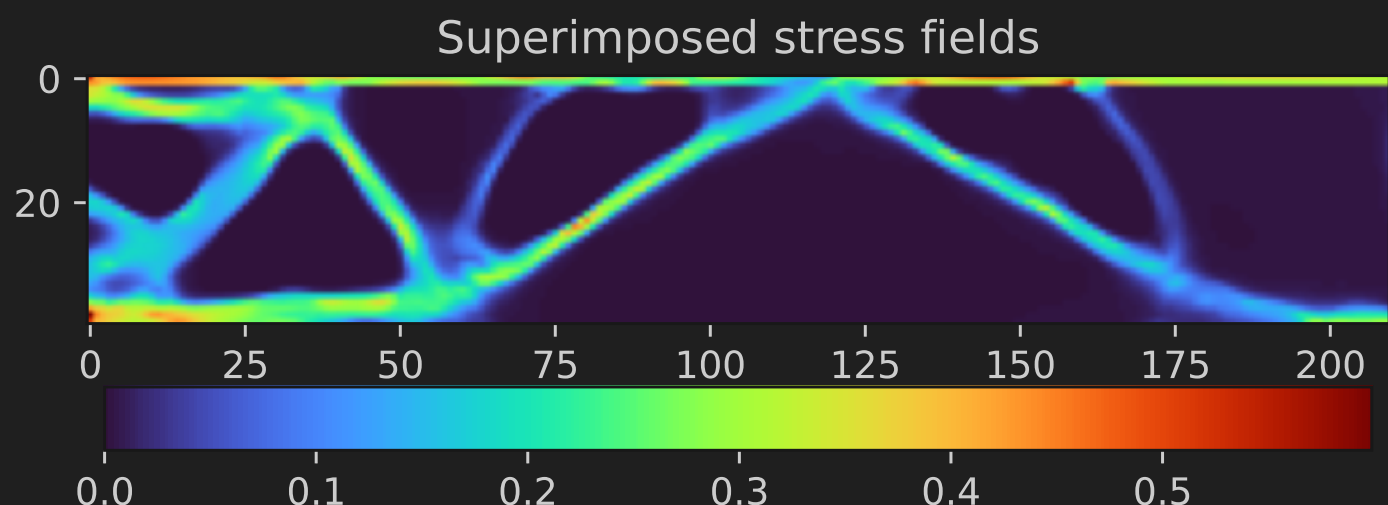
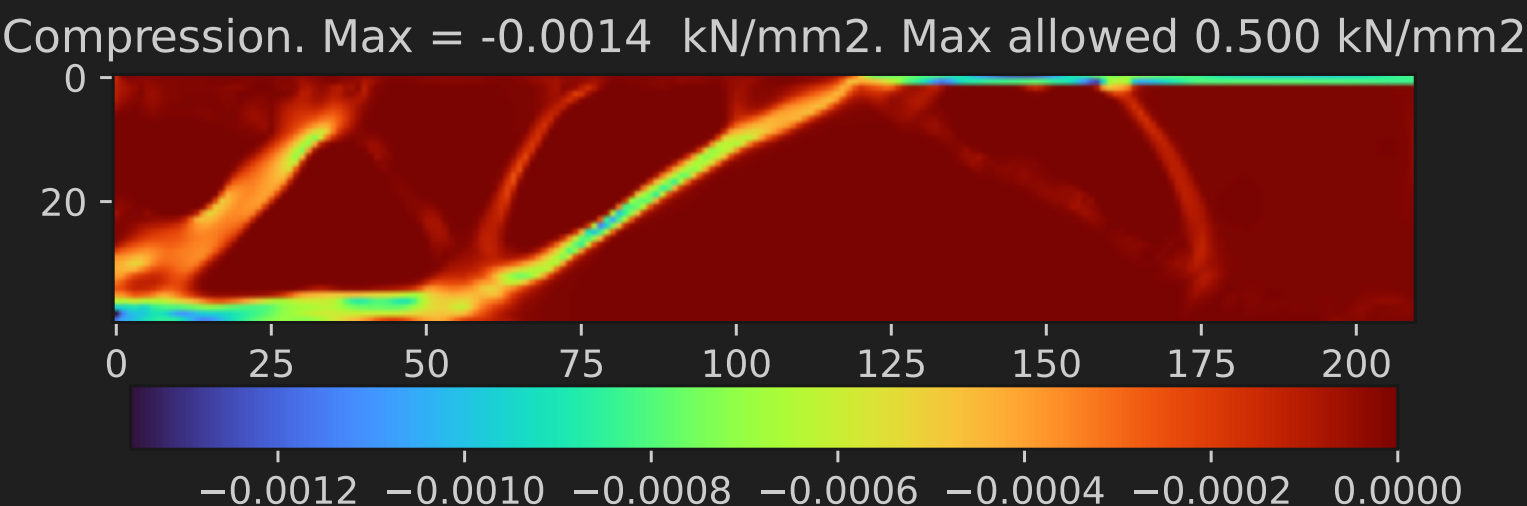
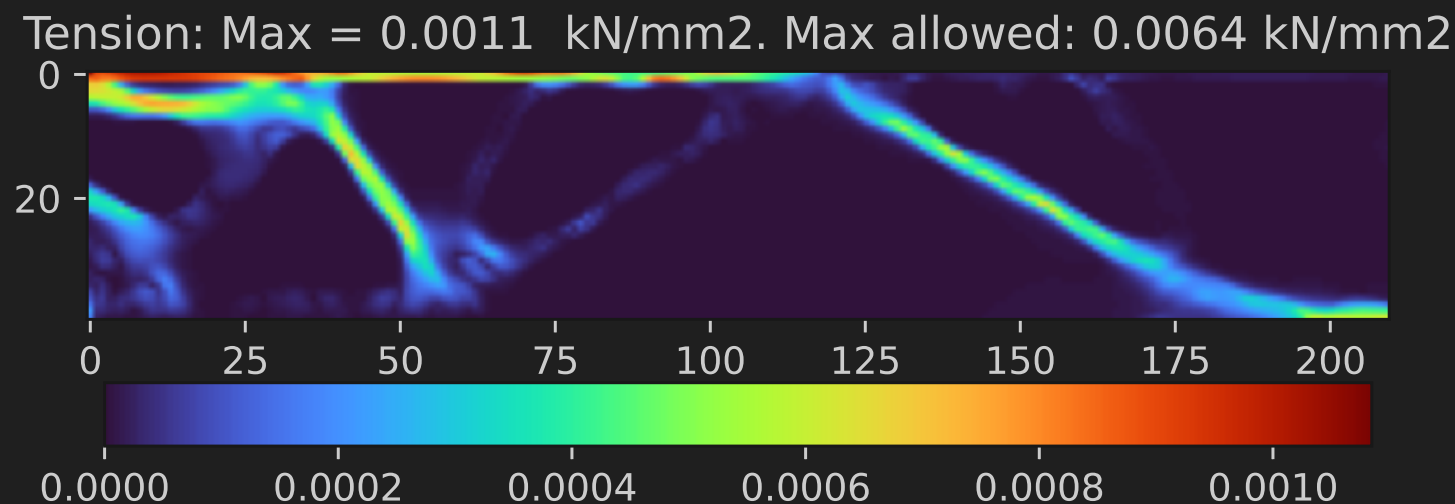
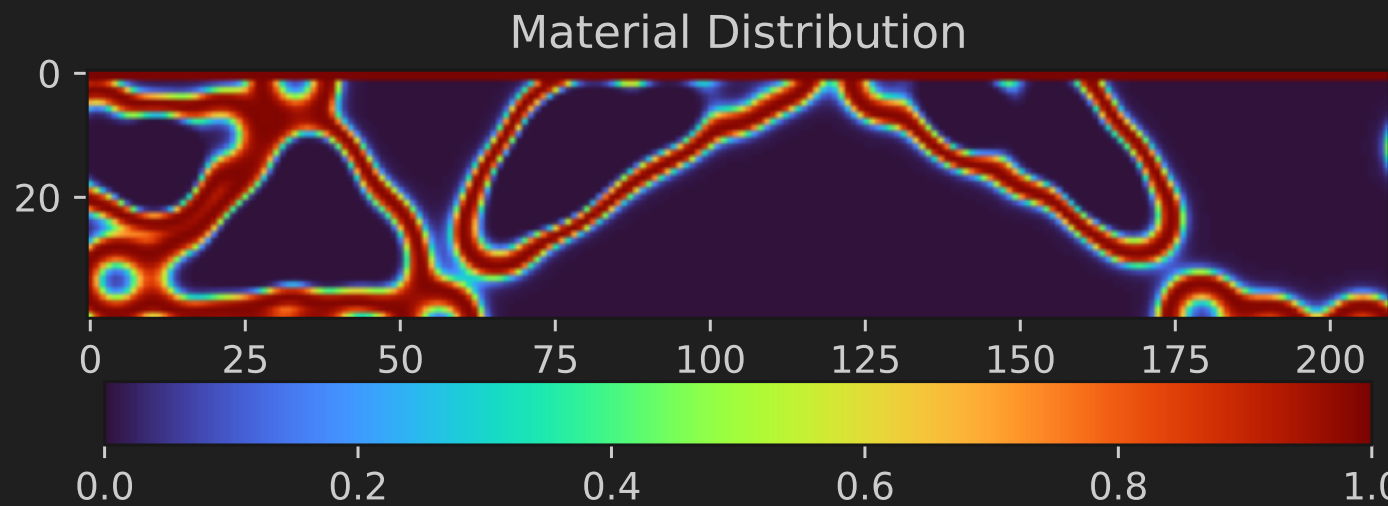
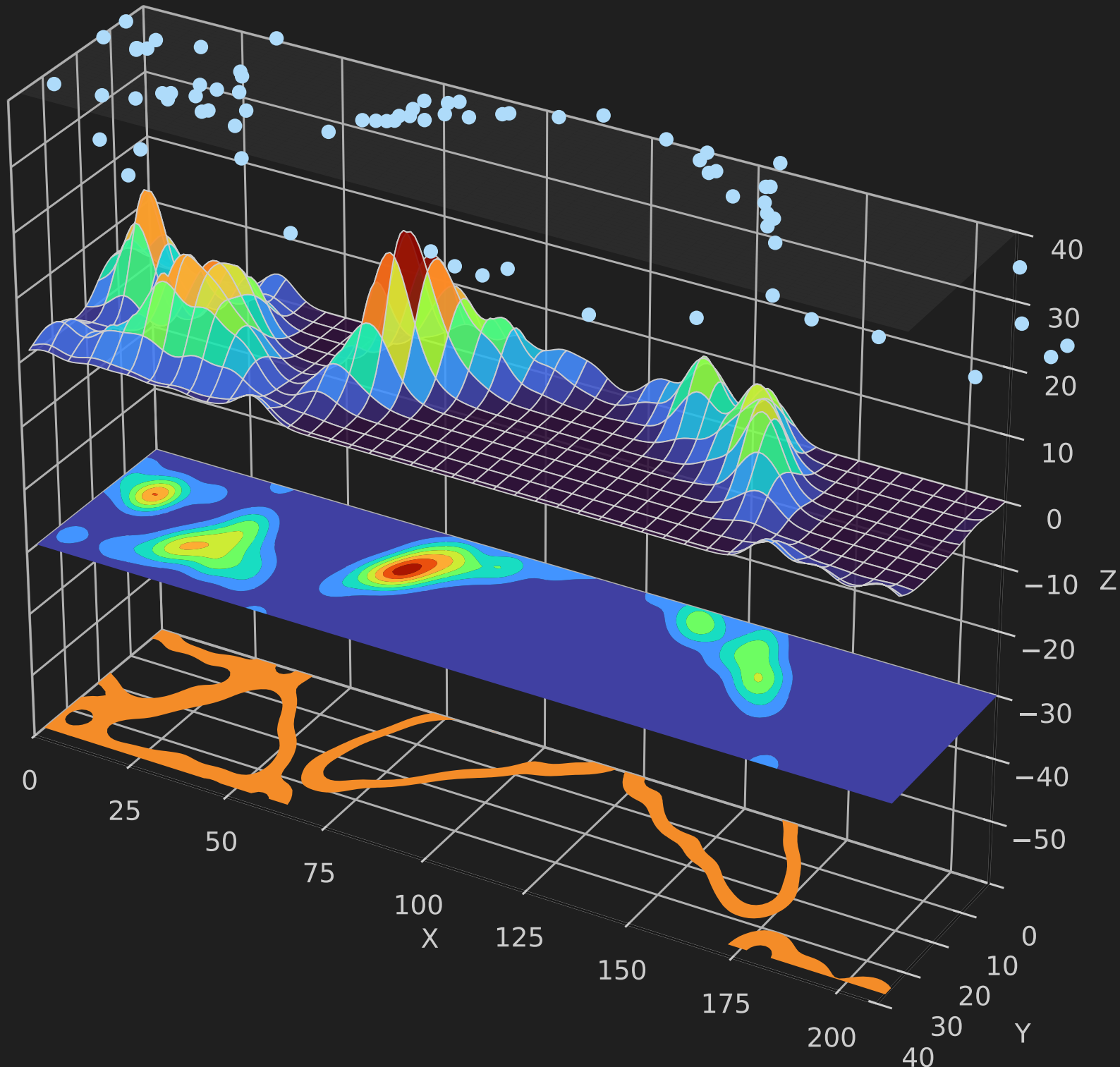
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.11) = 0.30

Spread Gaussian = 5.51 Shift = 2.43 Iteration = 097



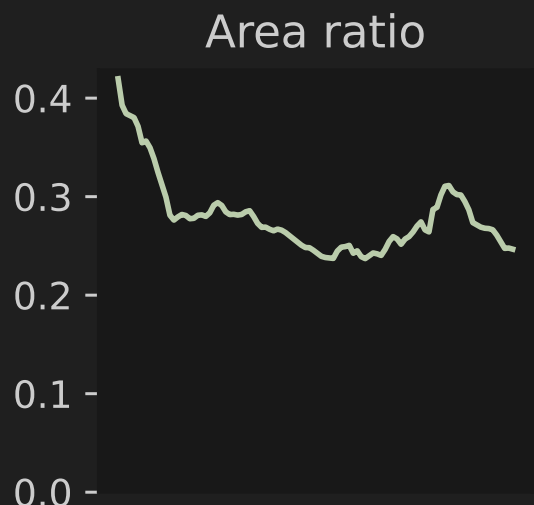
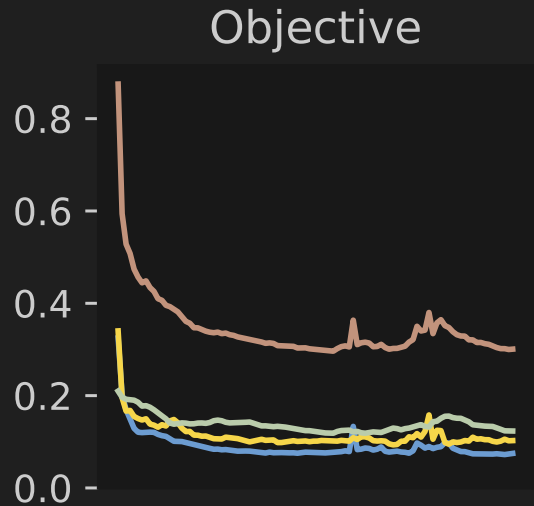
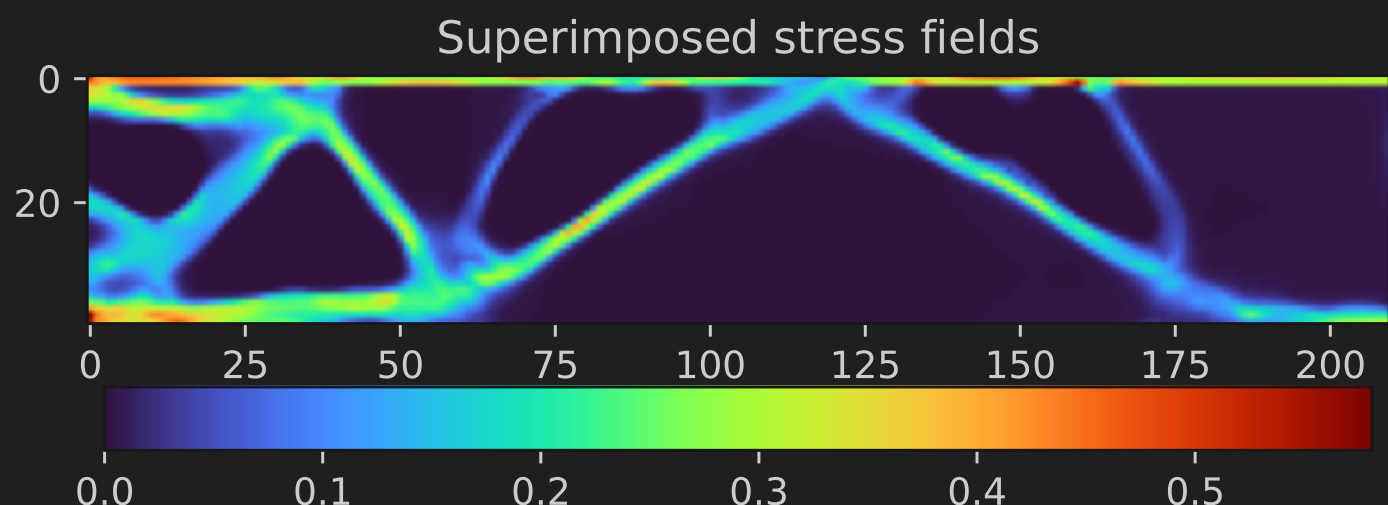
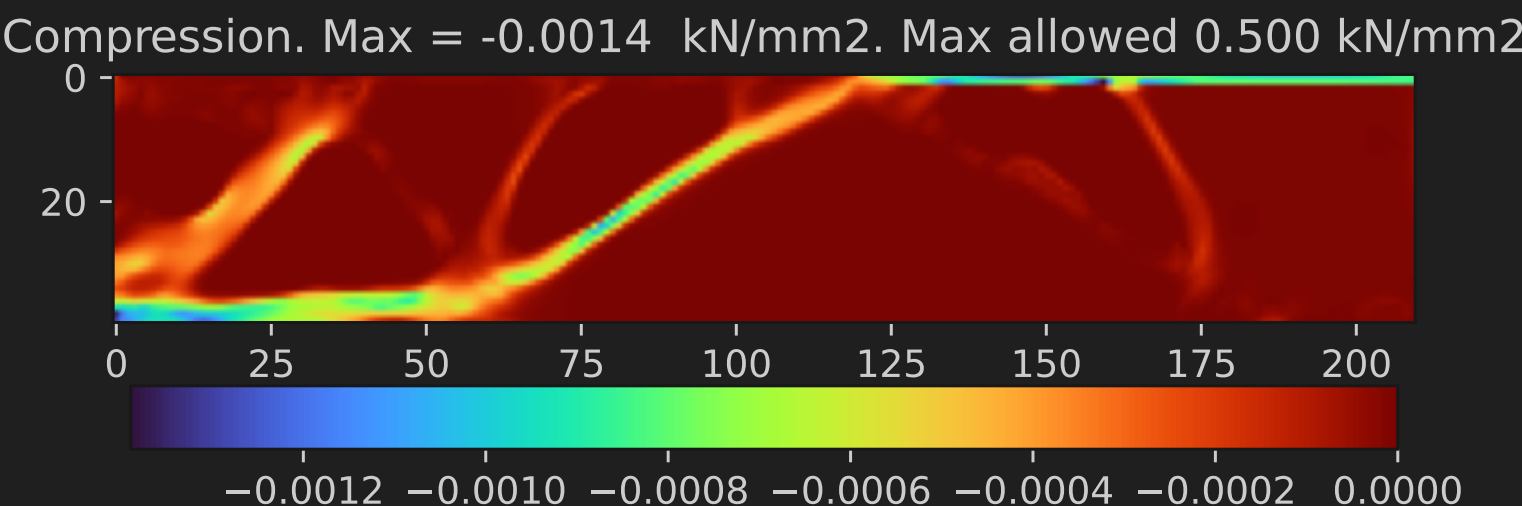
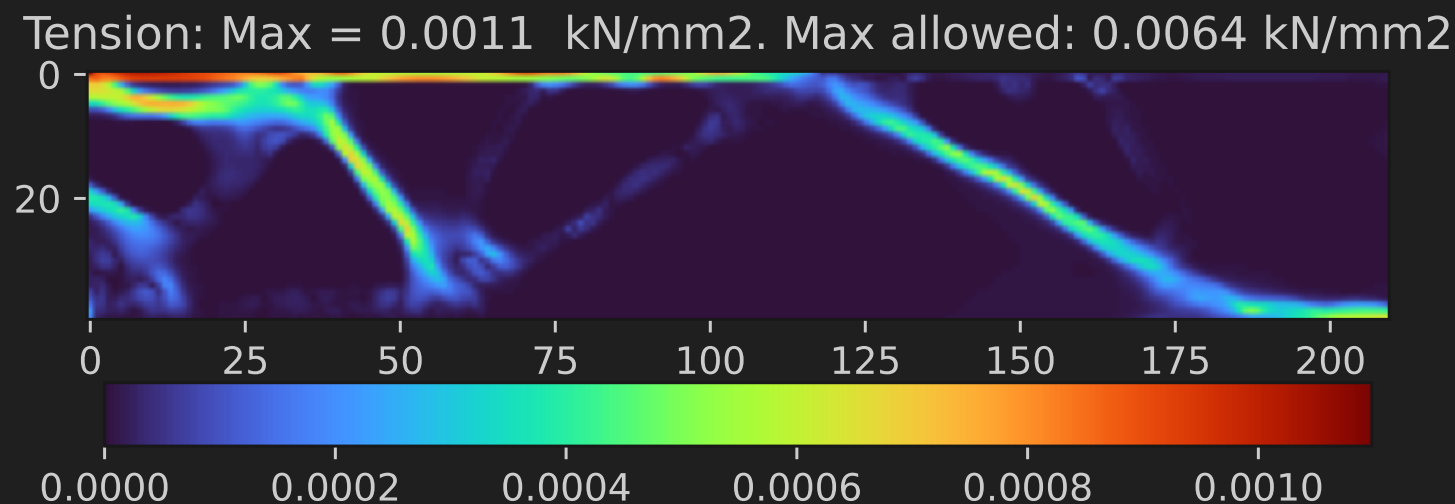
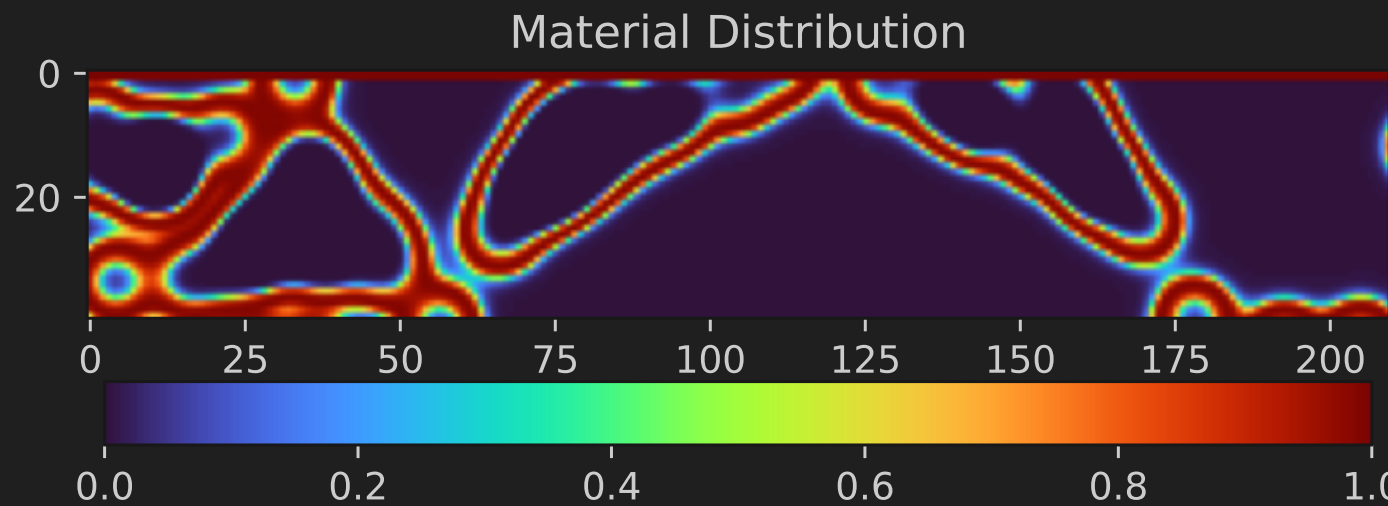
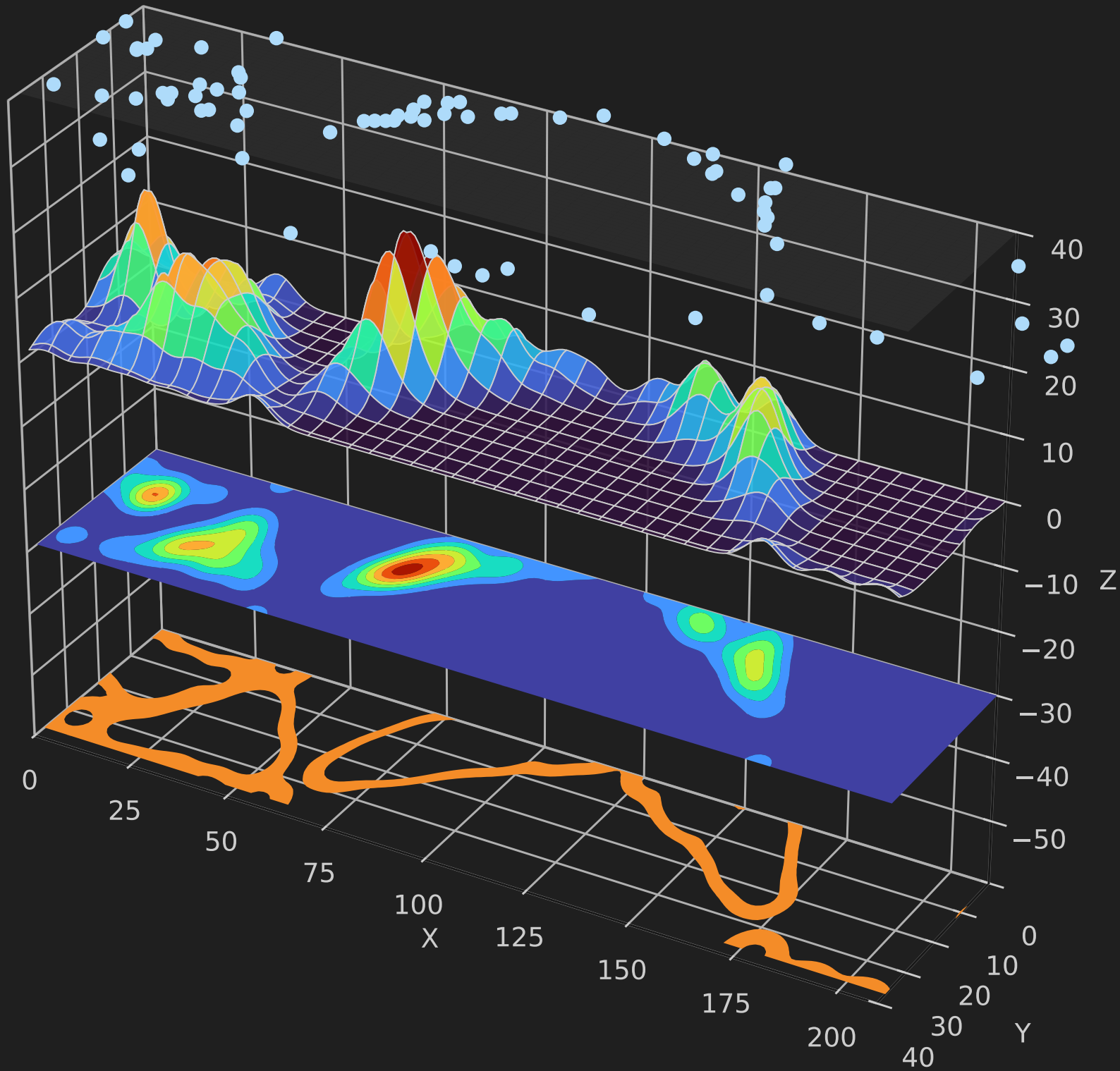
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 5.51 Shift = 2.39 Iteration = 098



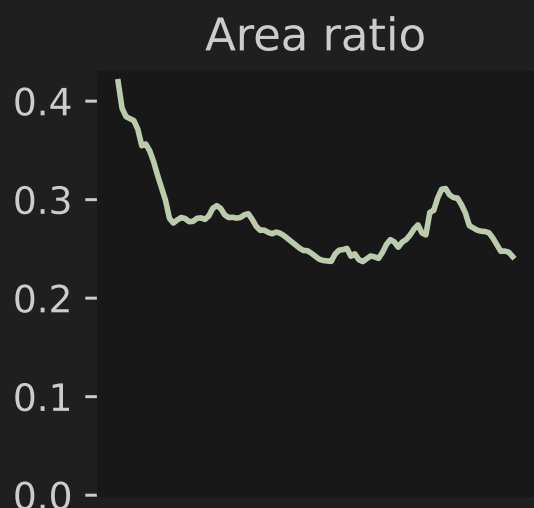
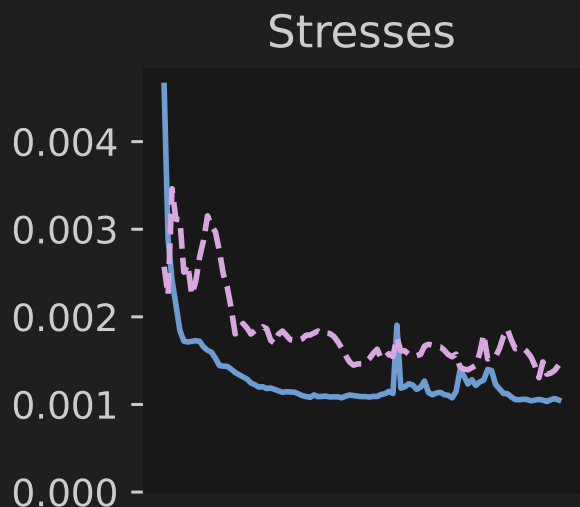
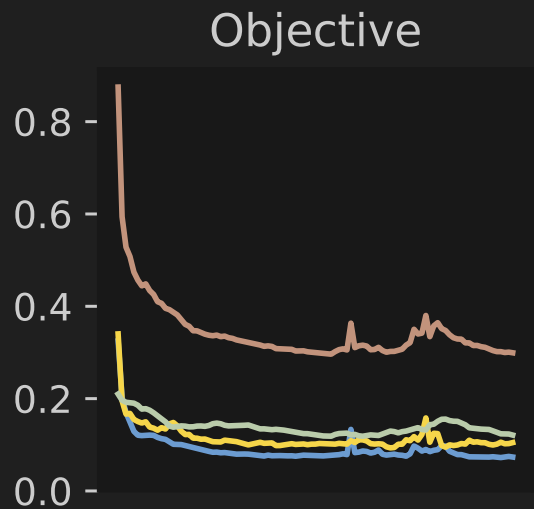
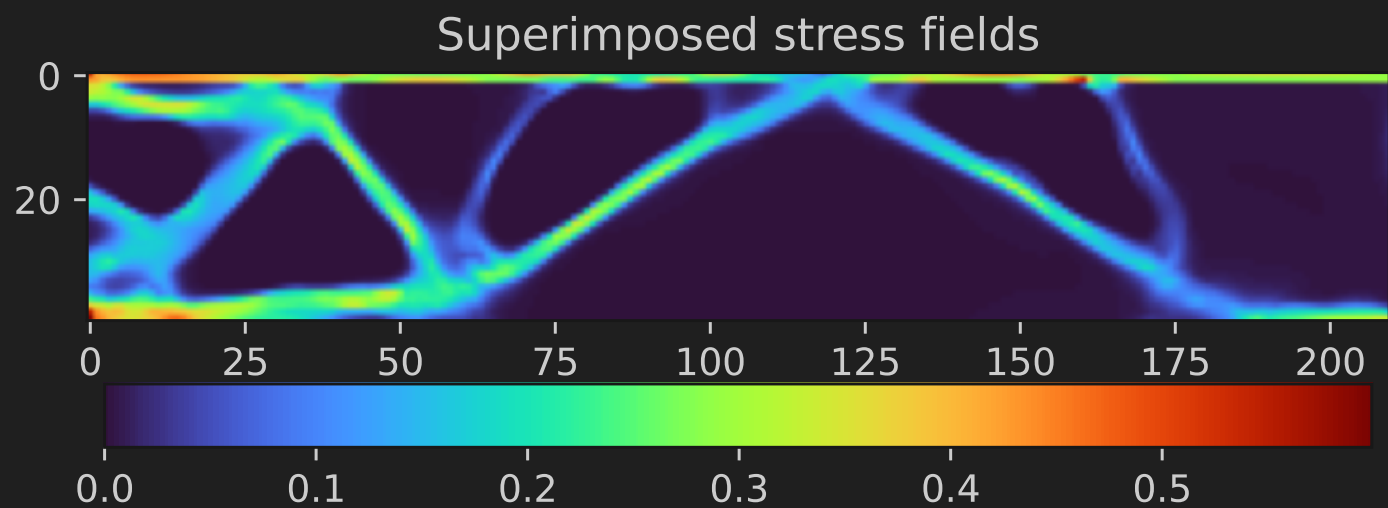
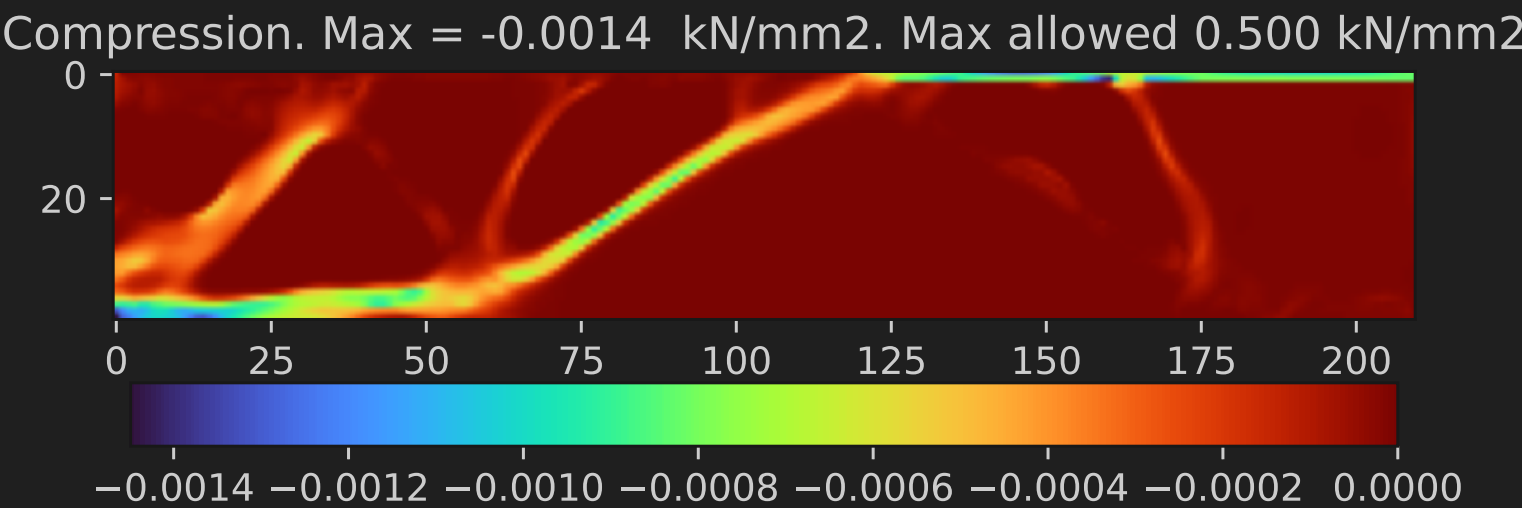
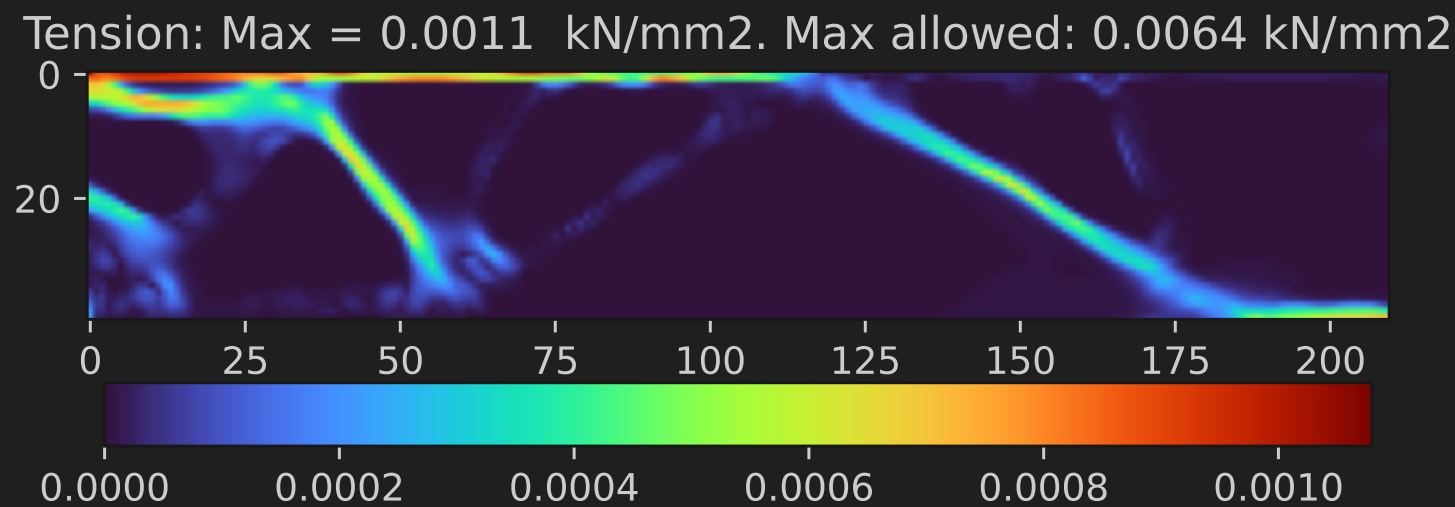
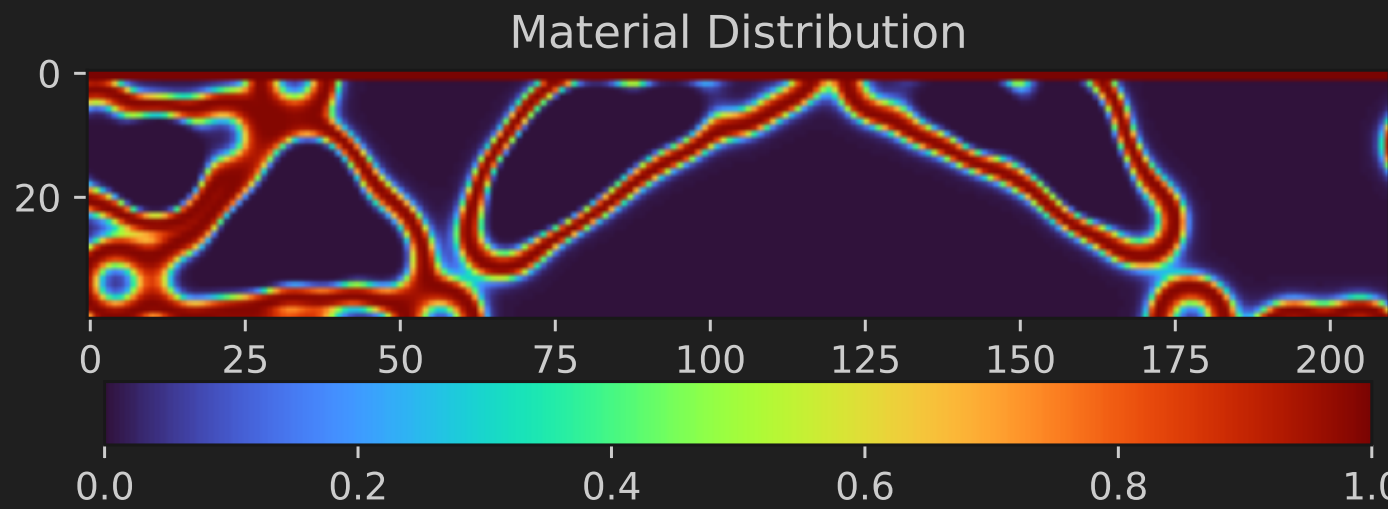
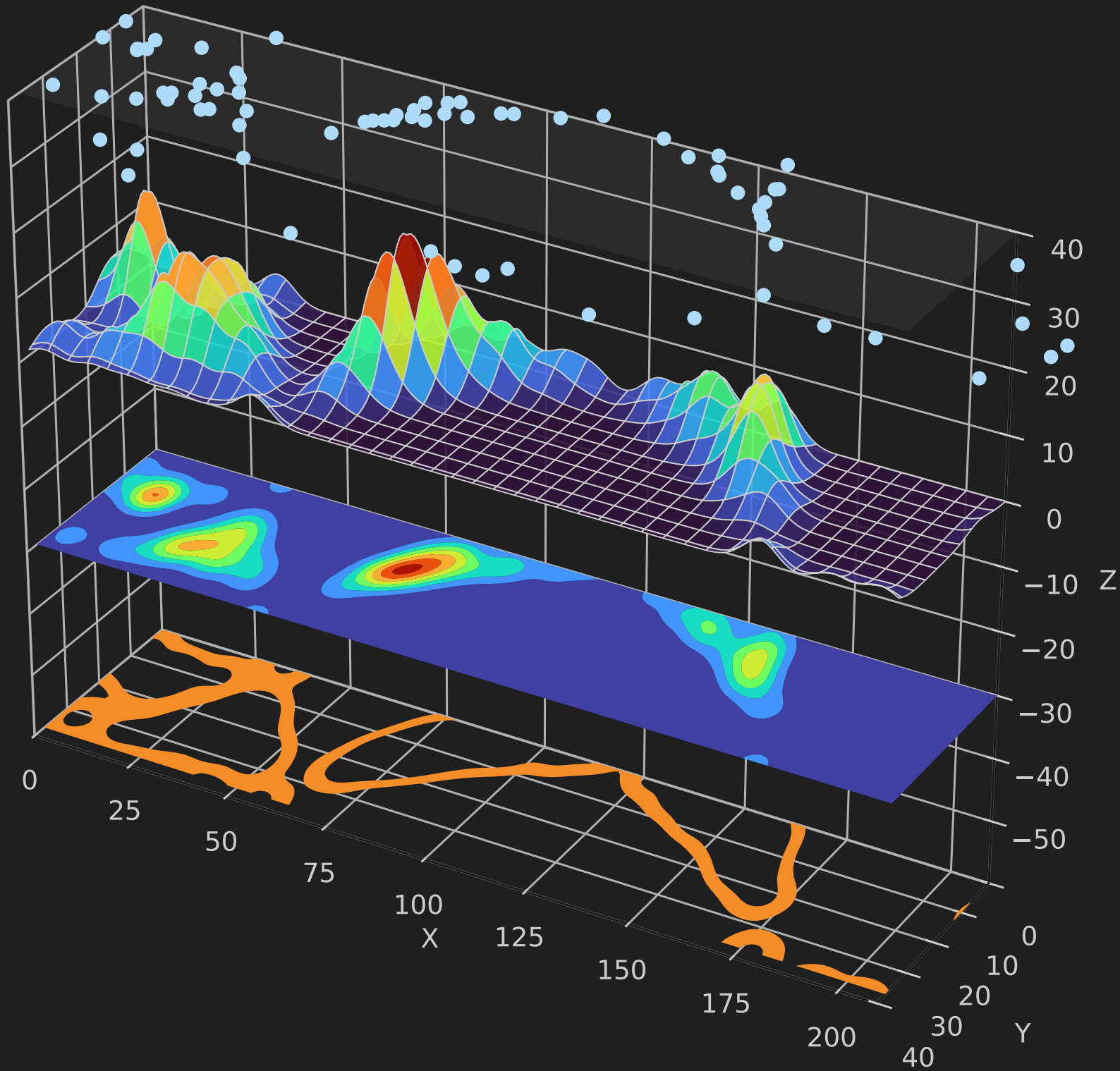
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.25) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 5.51 Shift = 2.36 Iteration = 099



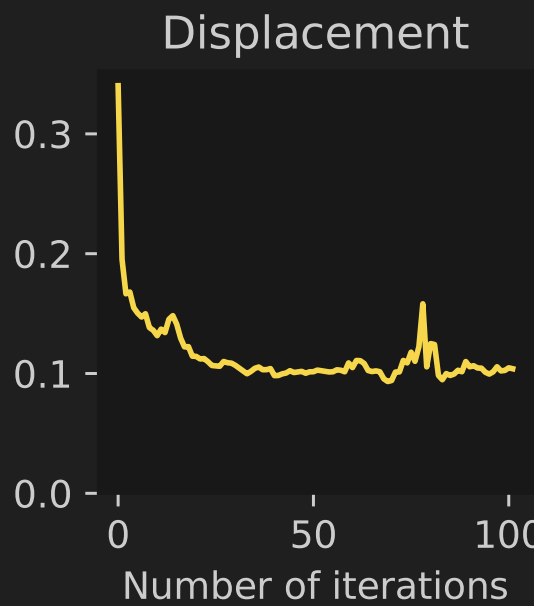
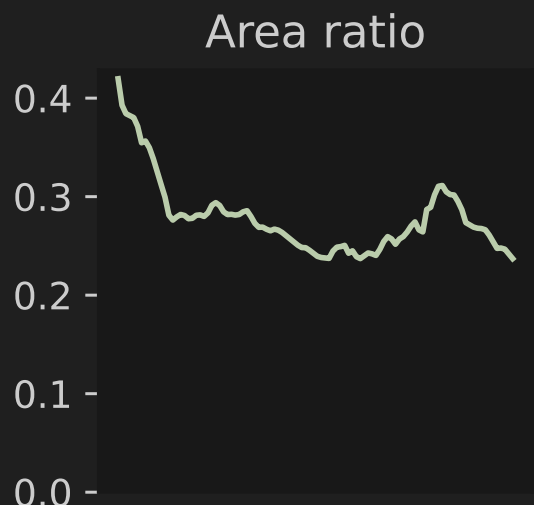
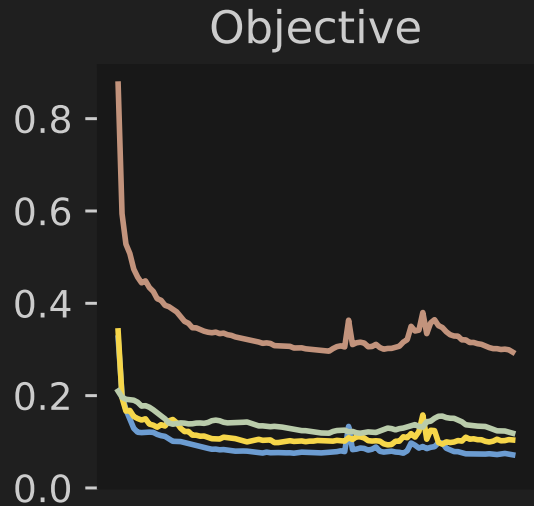
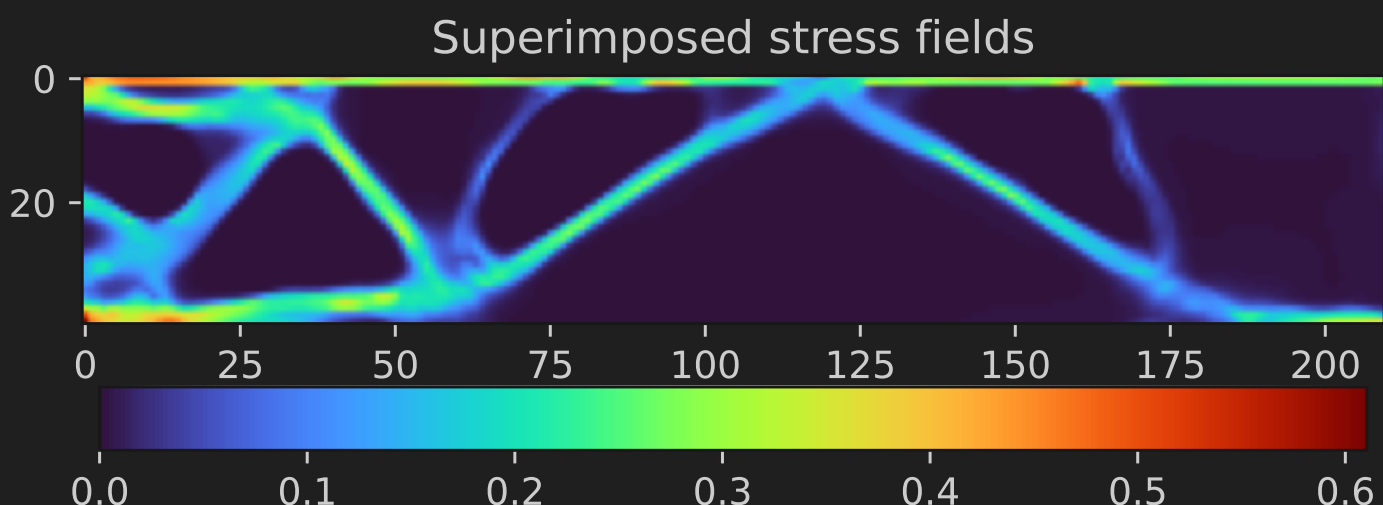
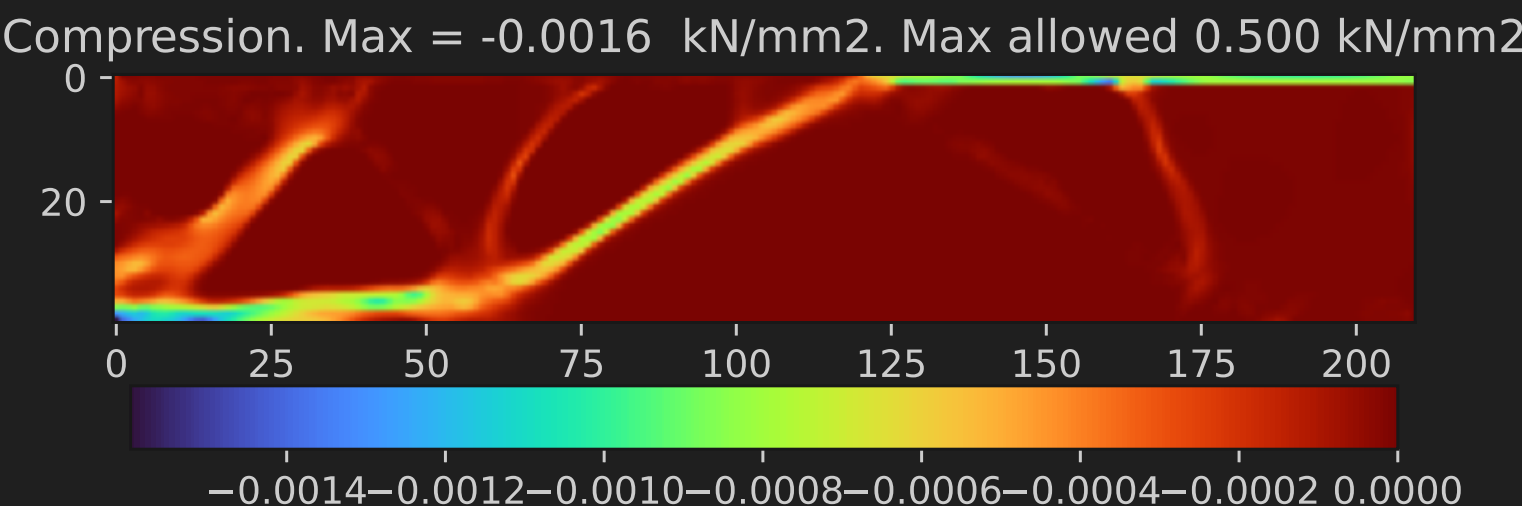
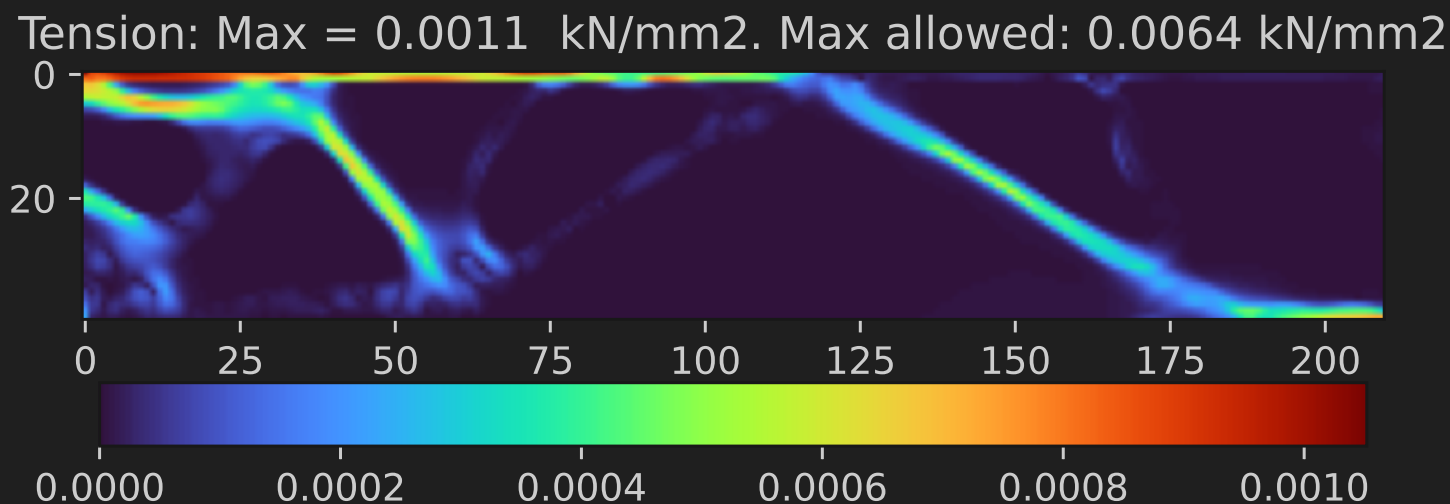
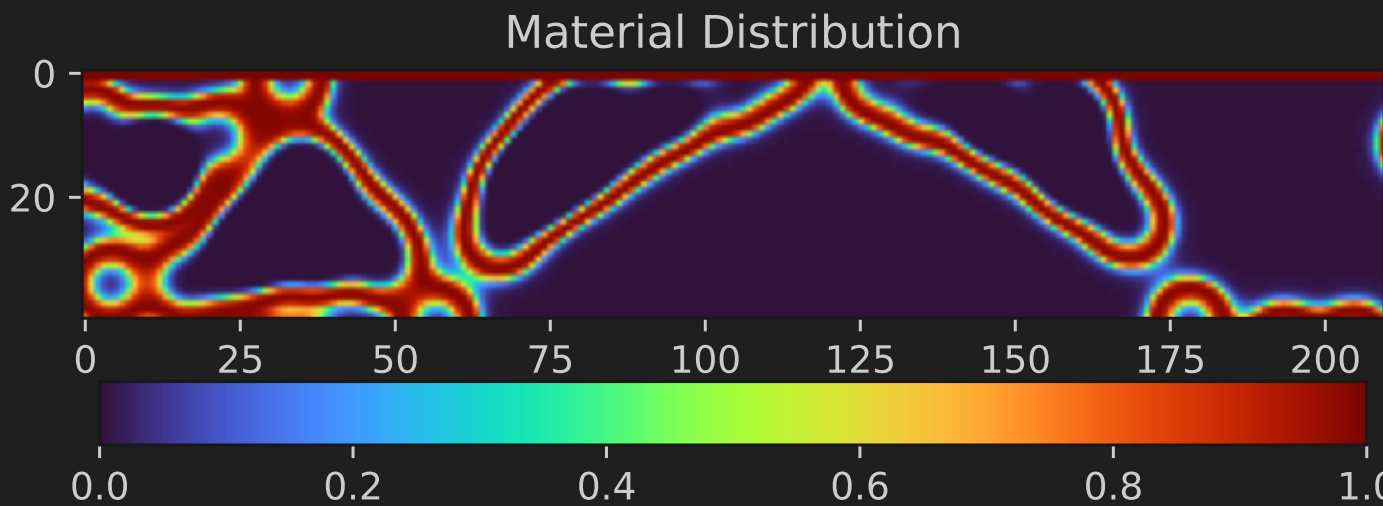
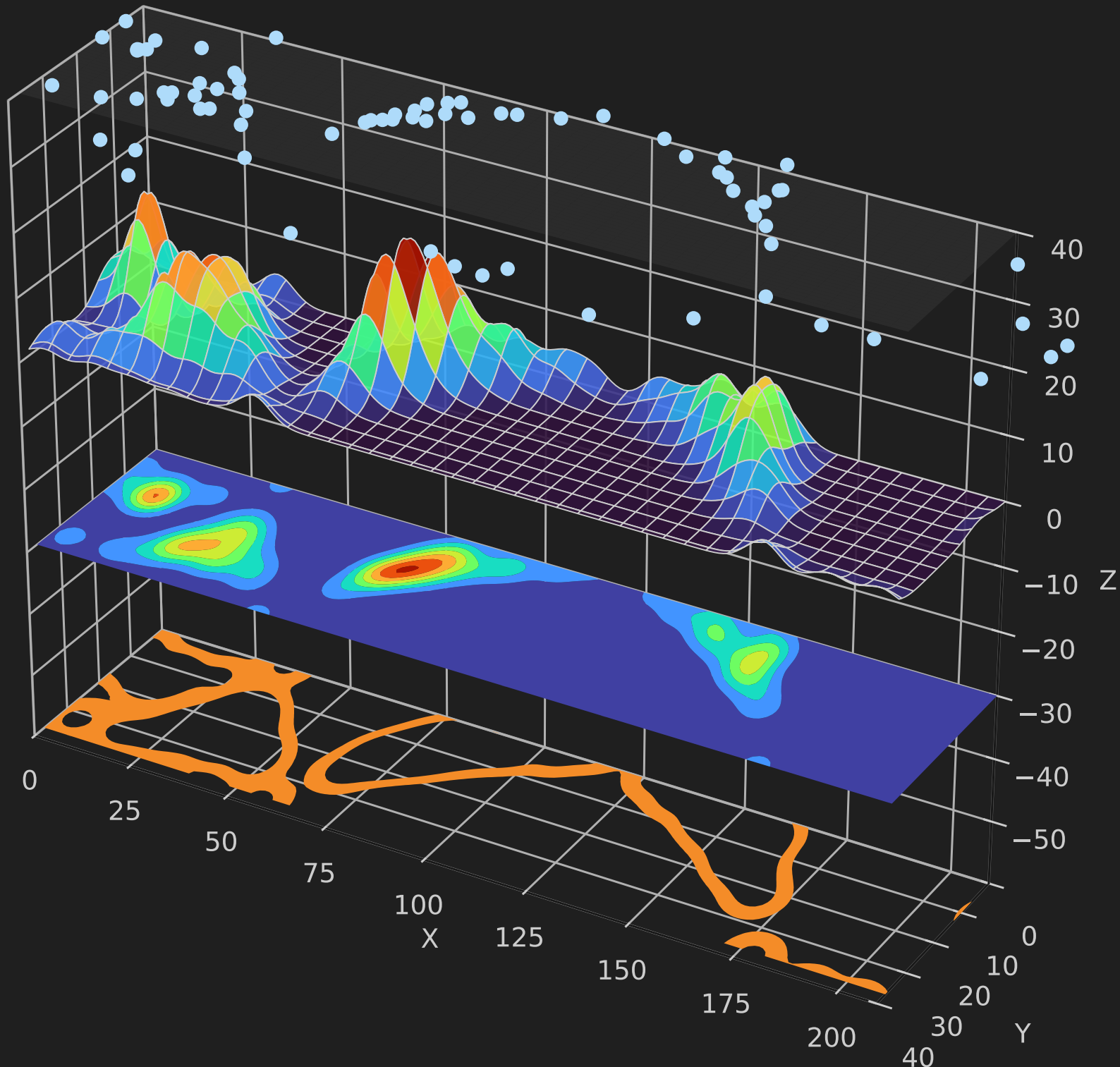
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 5.52 Shift = 2.31 Iteration = 100



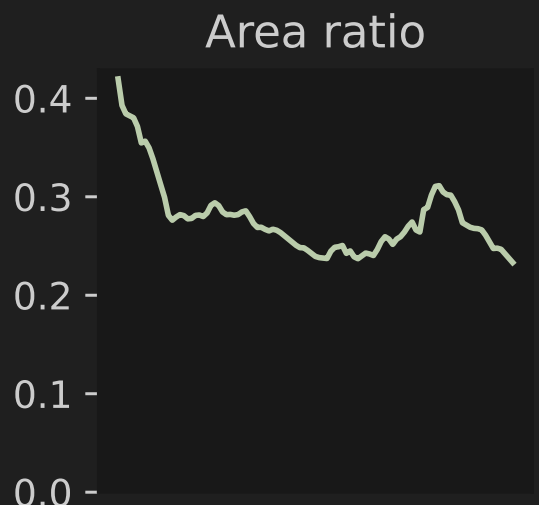
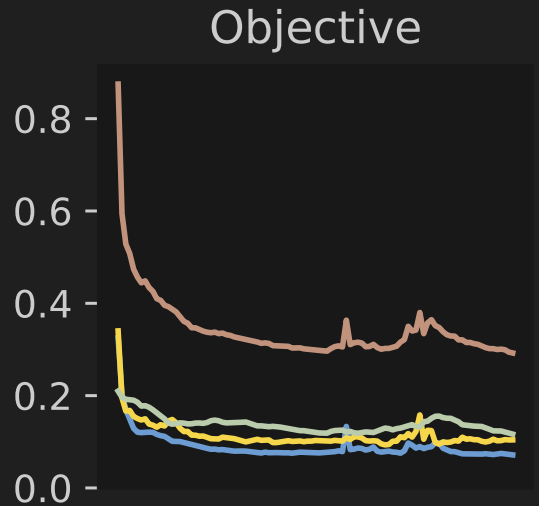
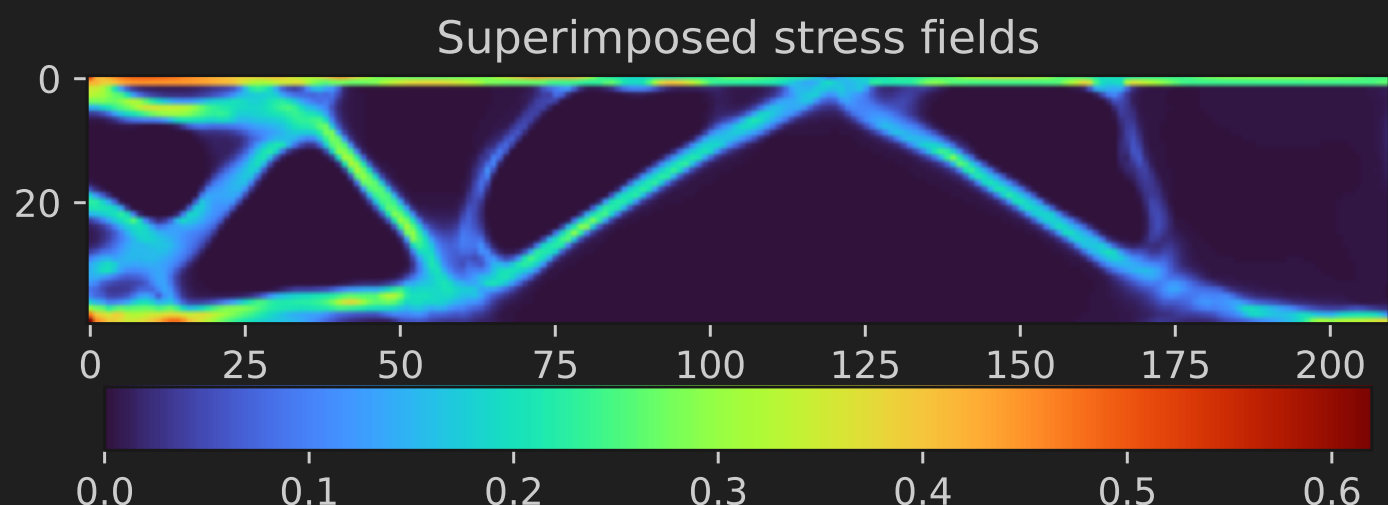
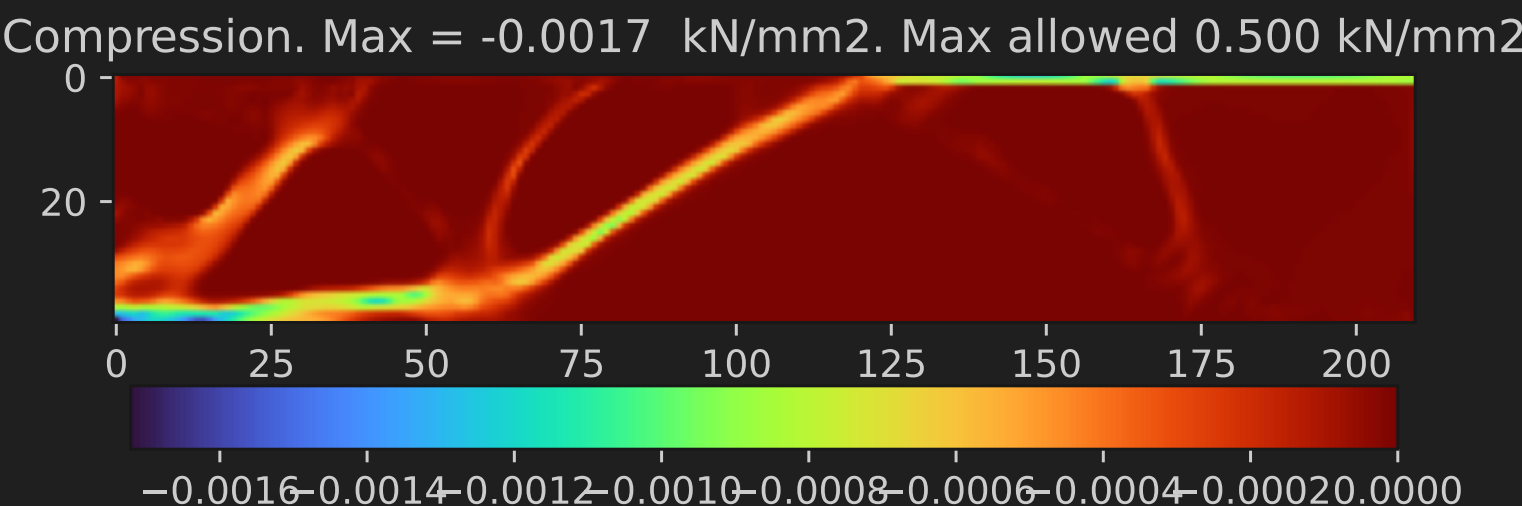
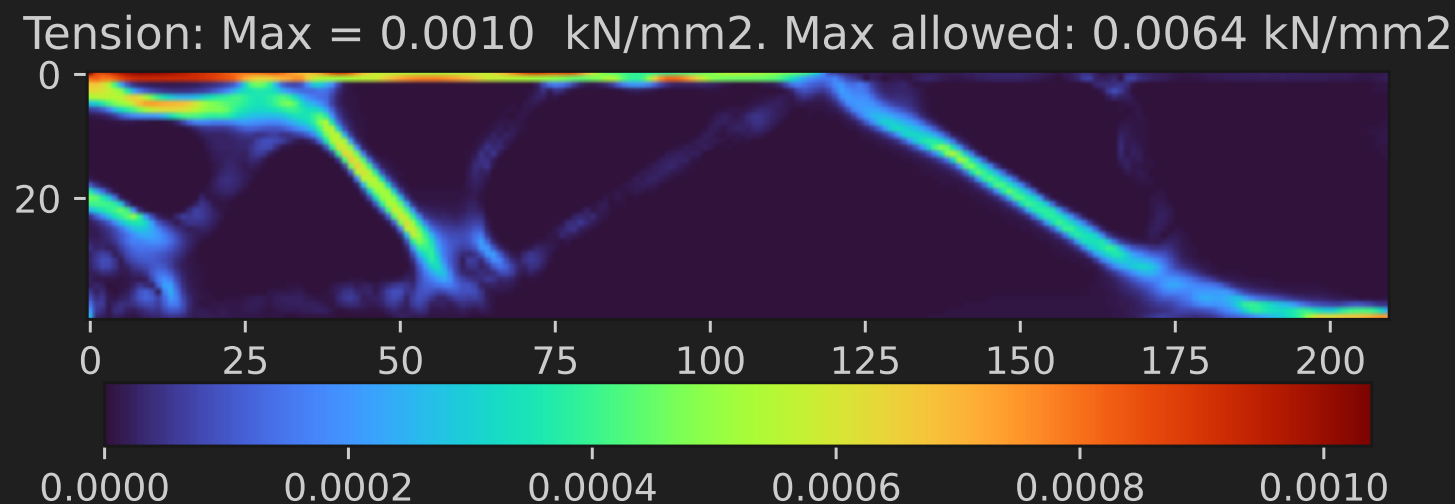
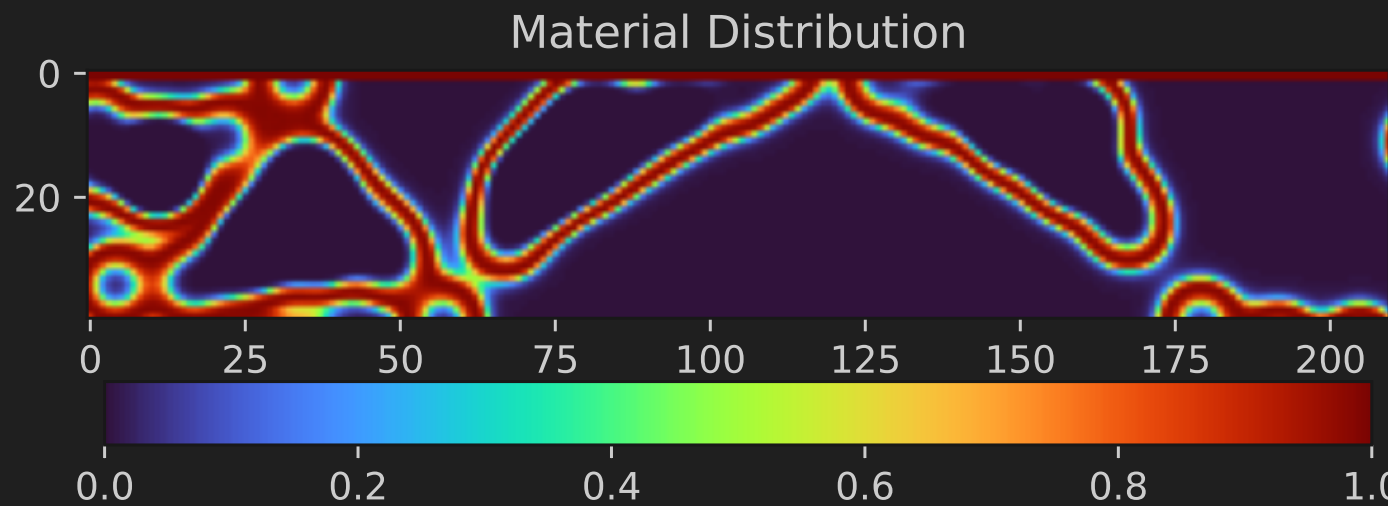
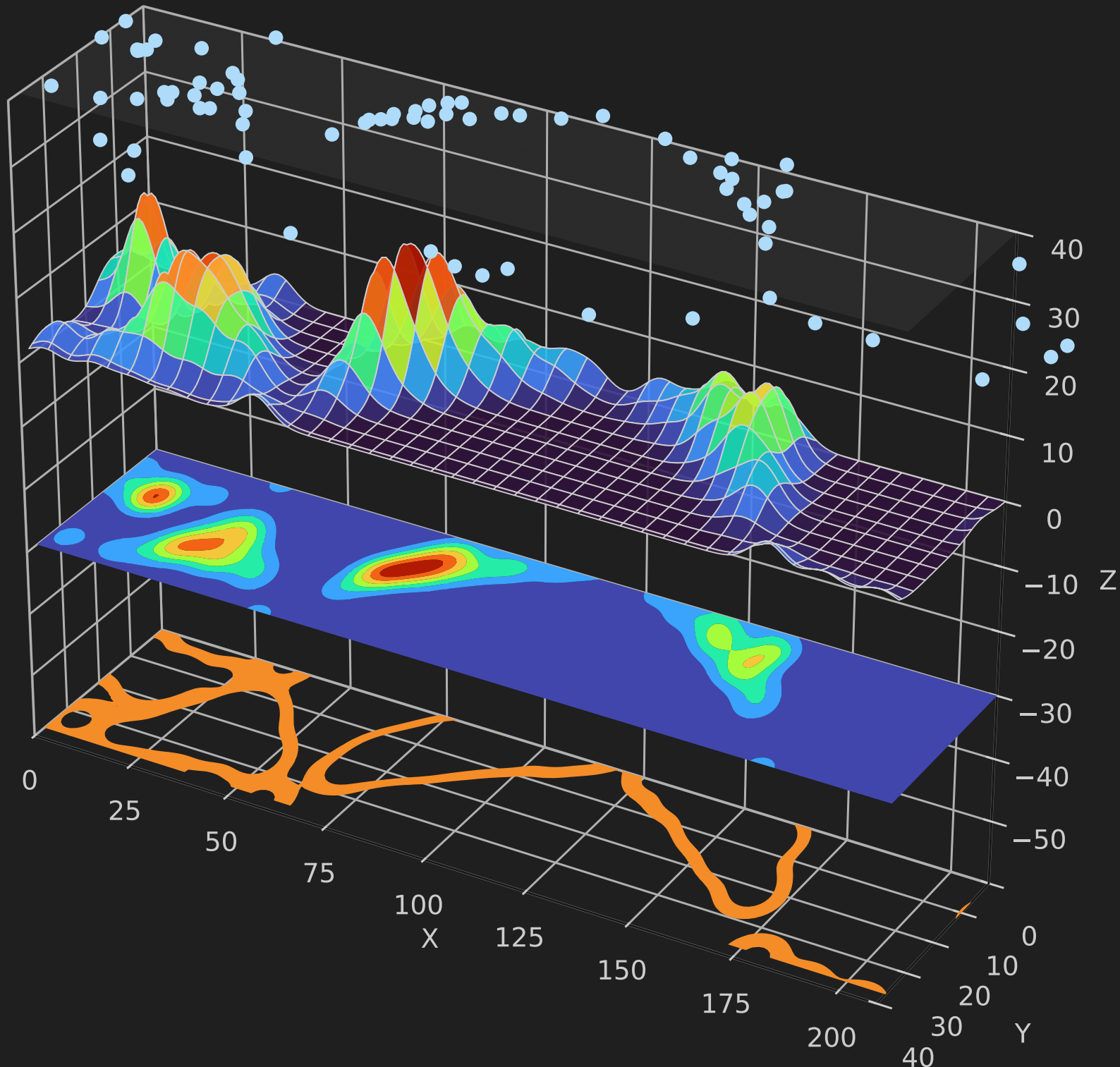
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.52 Shift = 2.27 Iteration = 101



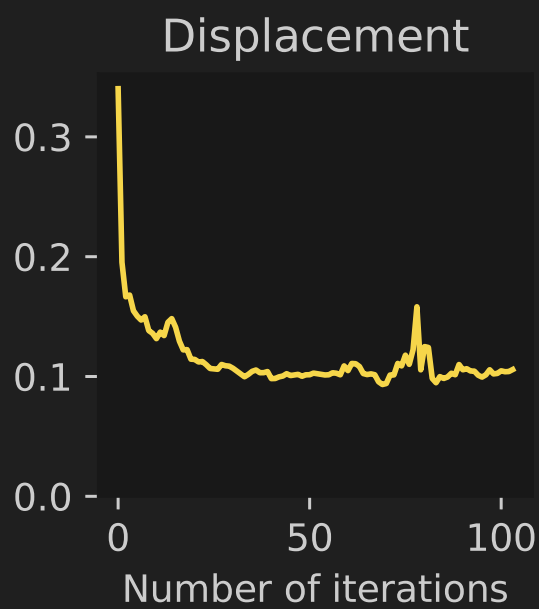
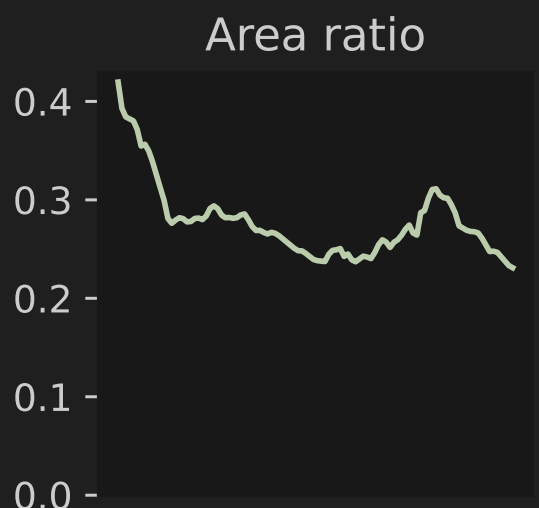
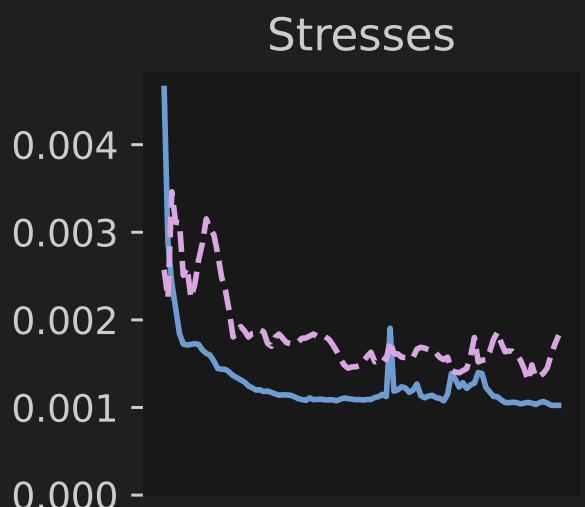
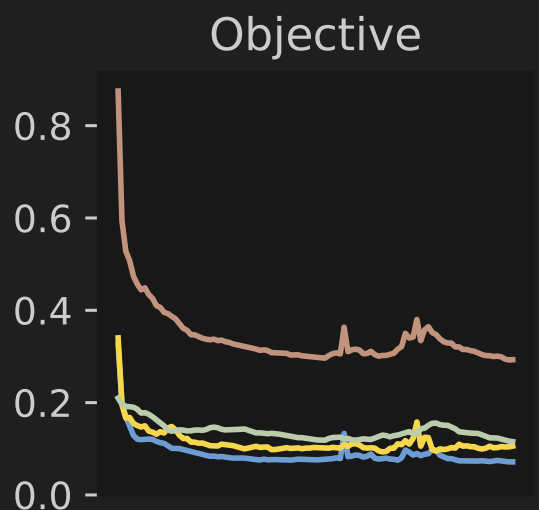
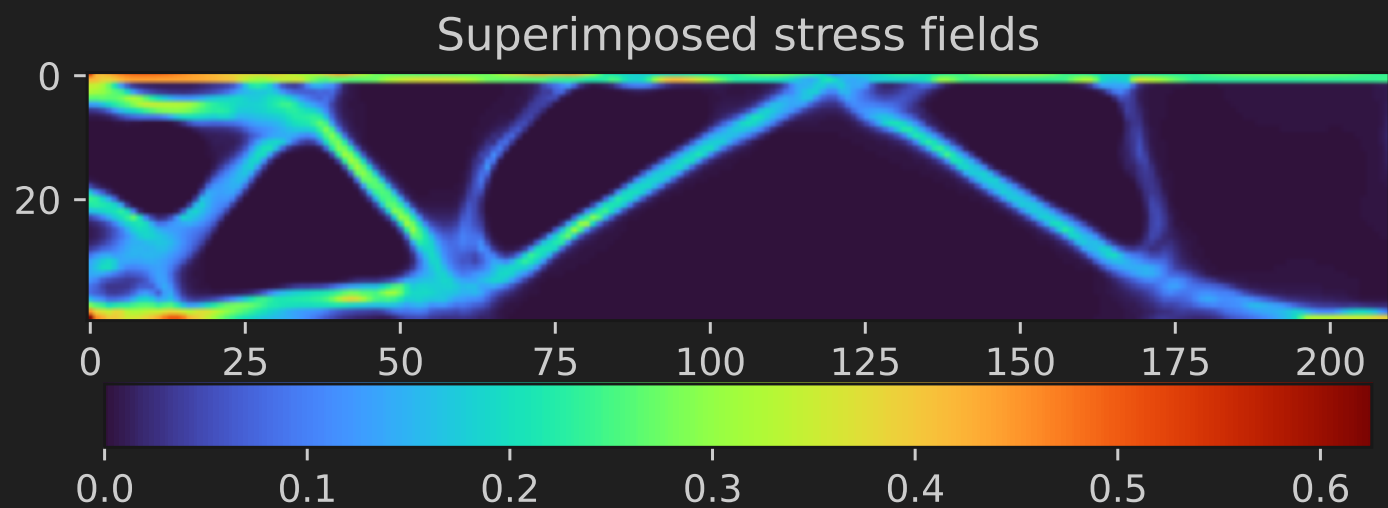
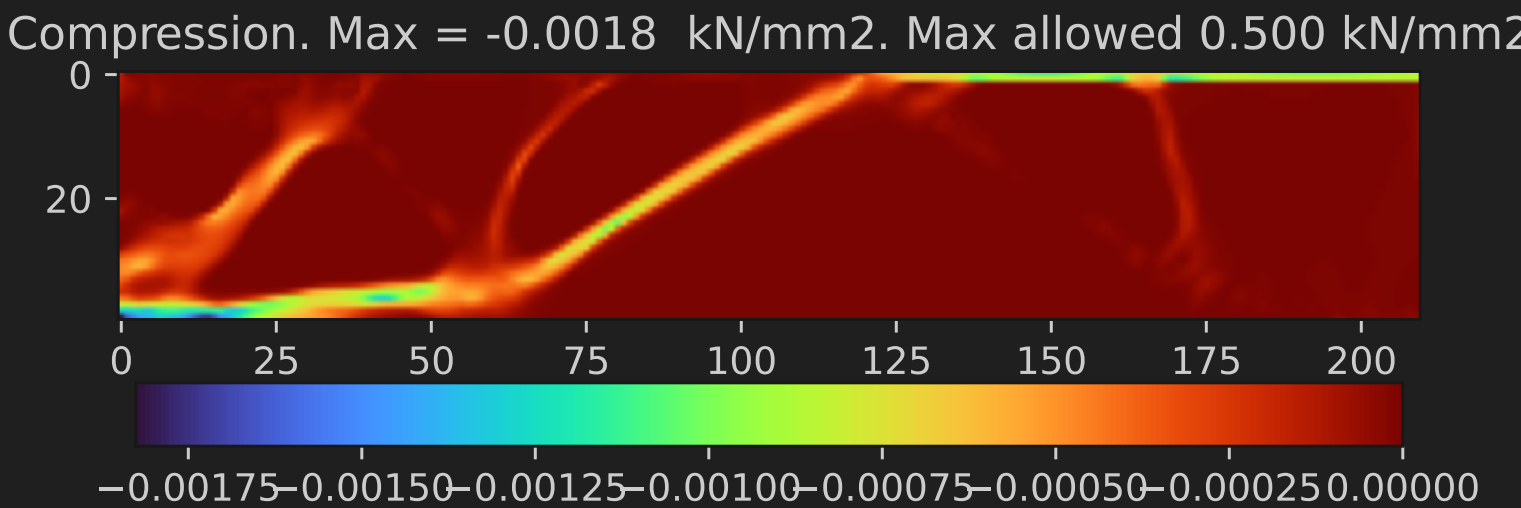
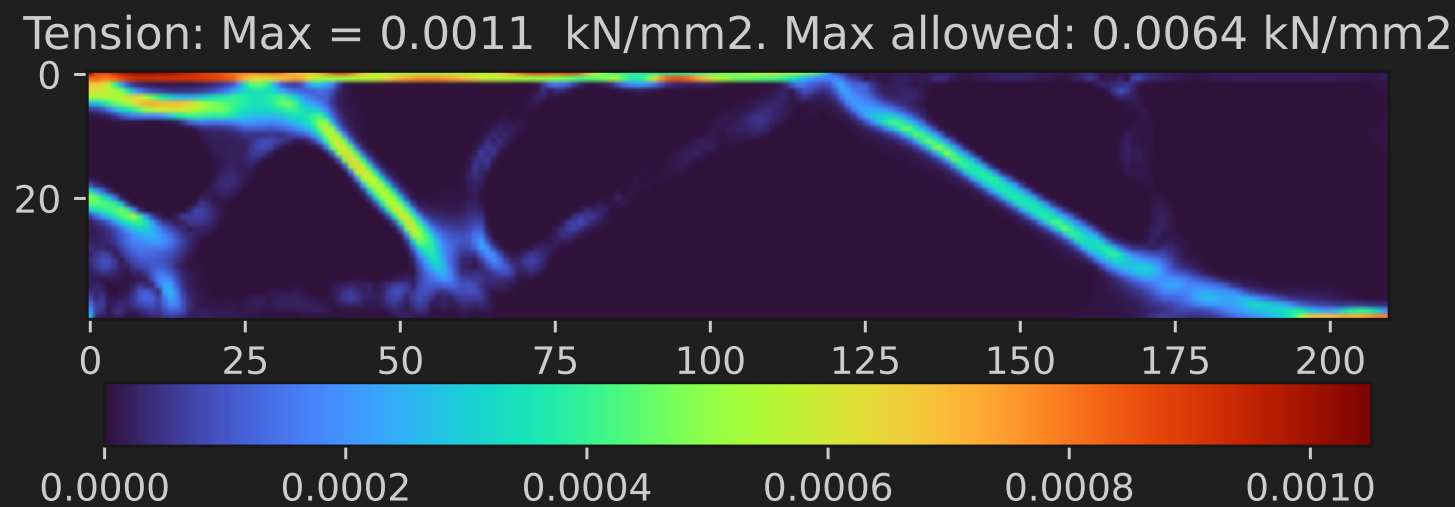
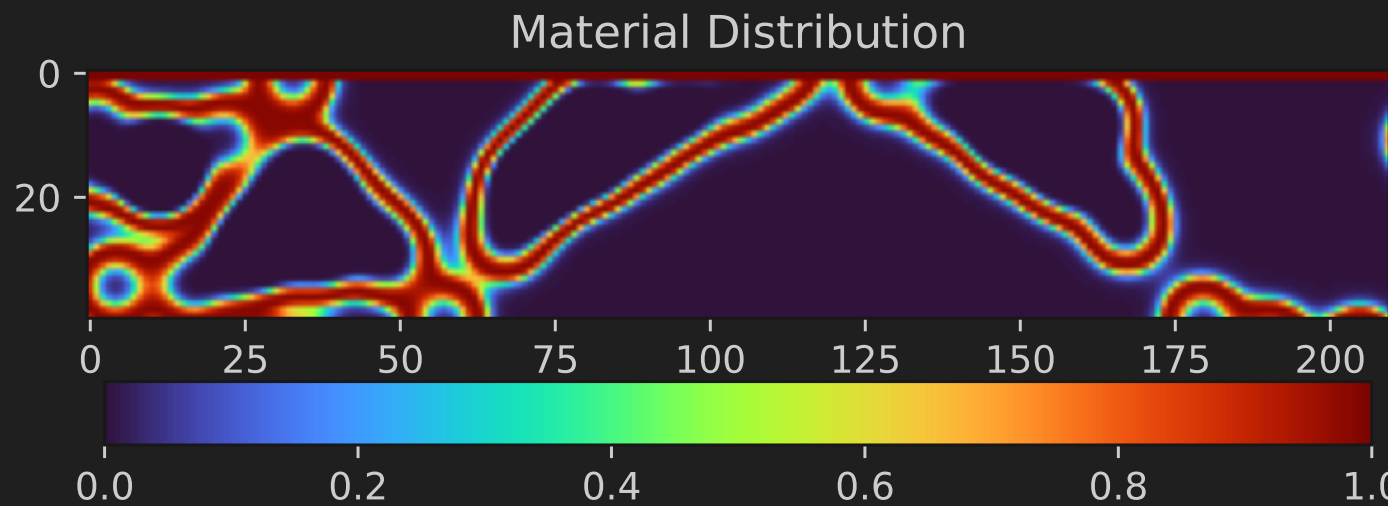
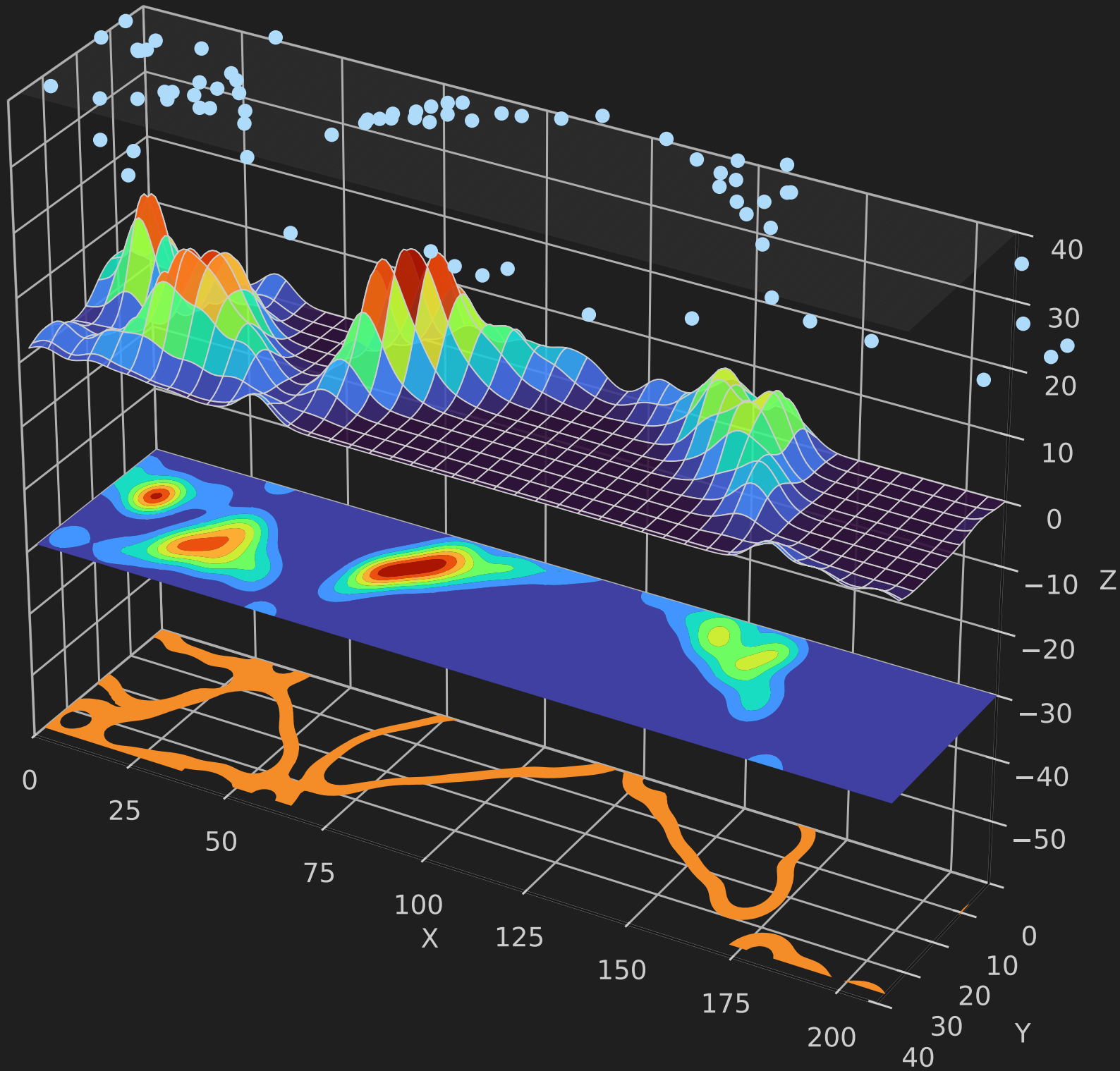
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.53 Shift = 2.22 Iteration = 102



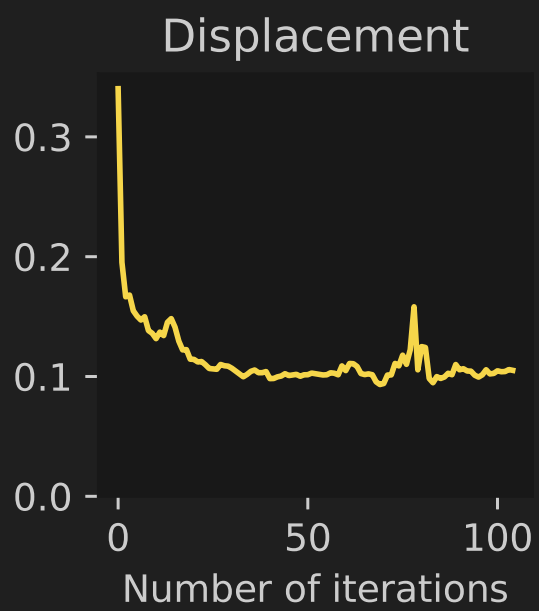
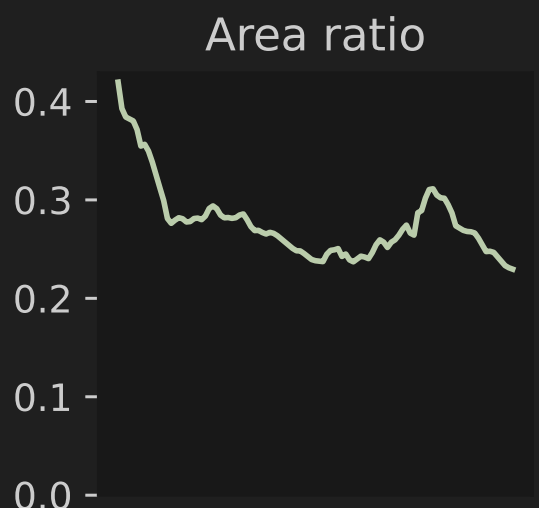
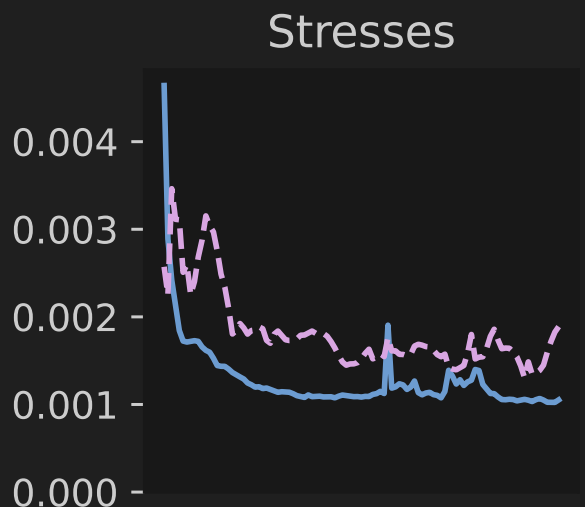
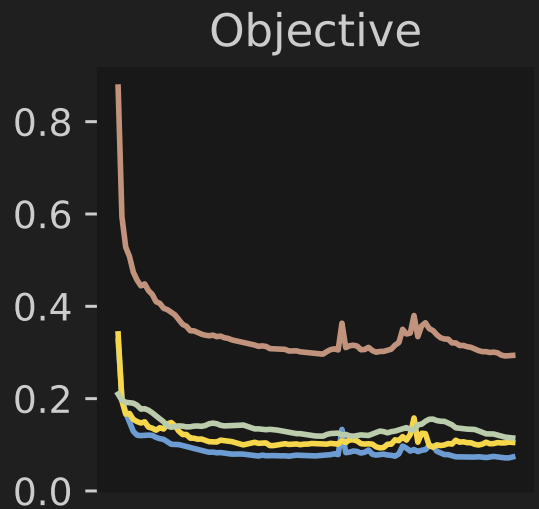
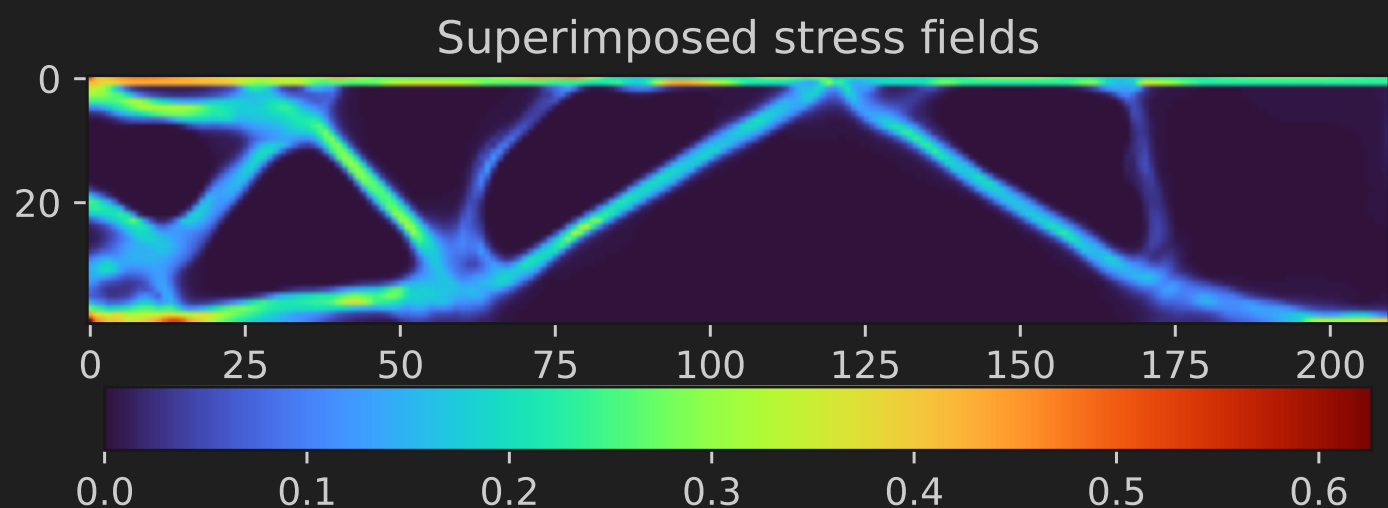
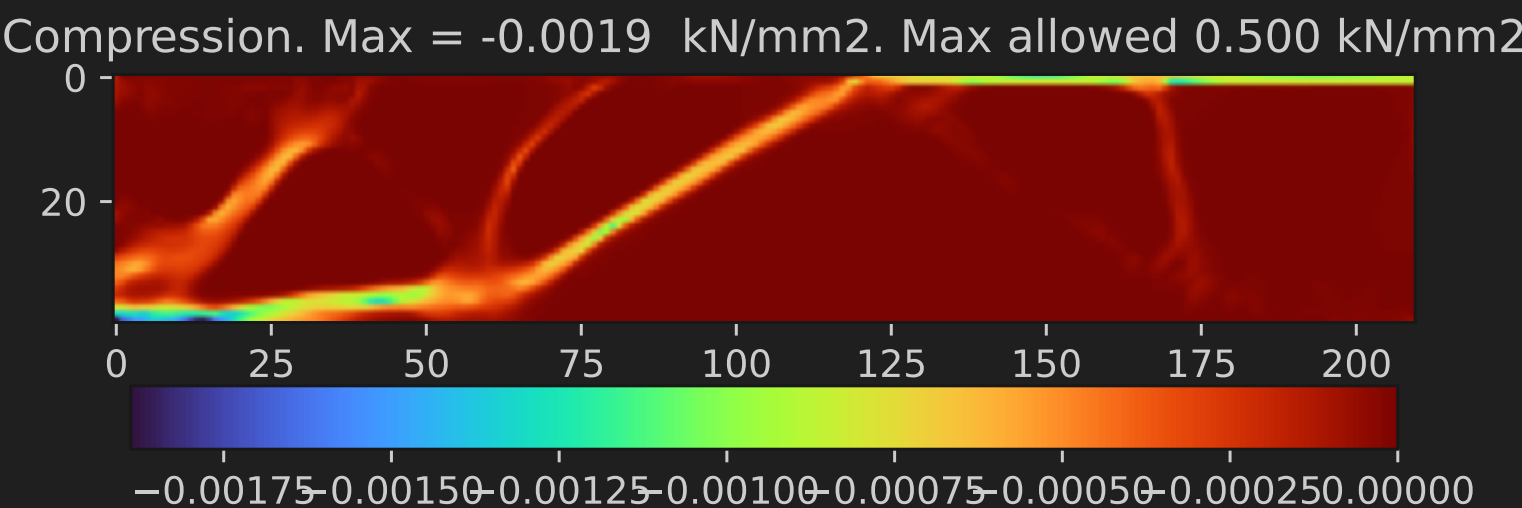
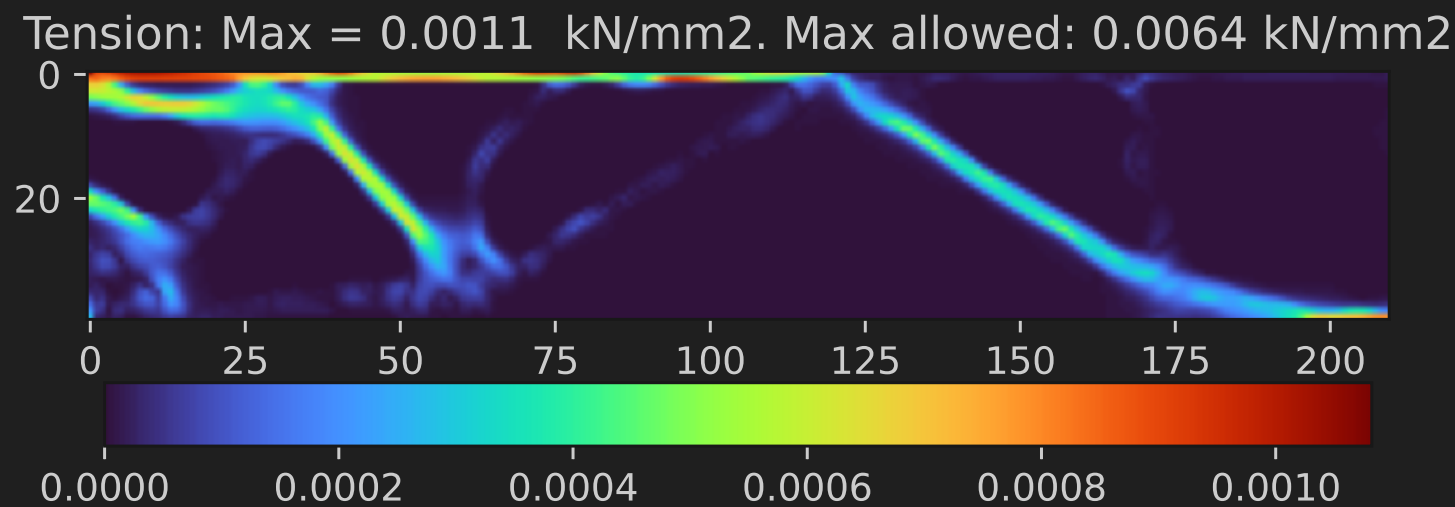
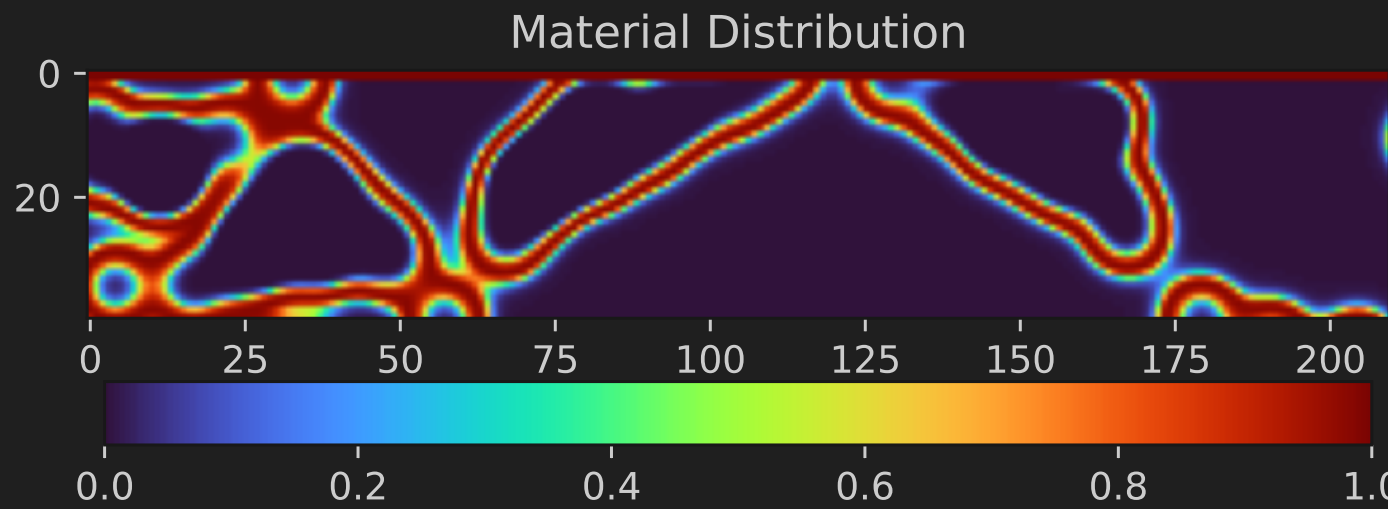
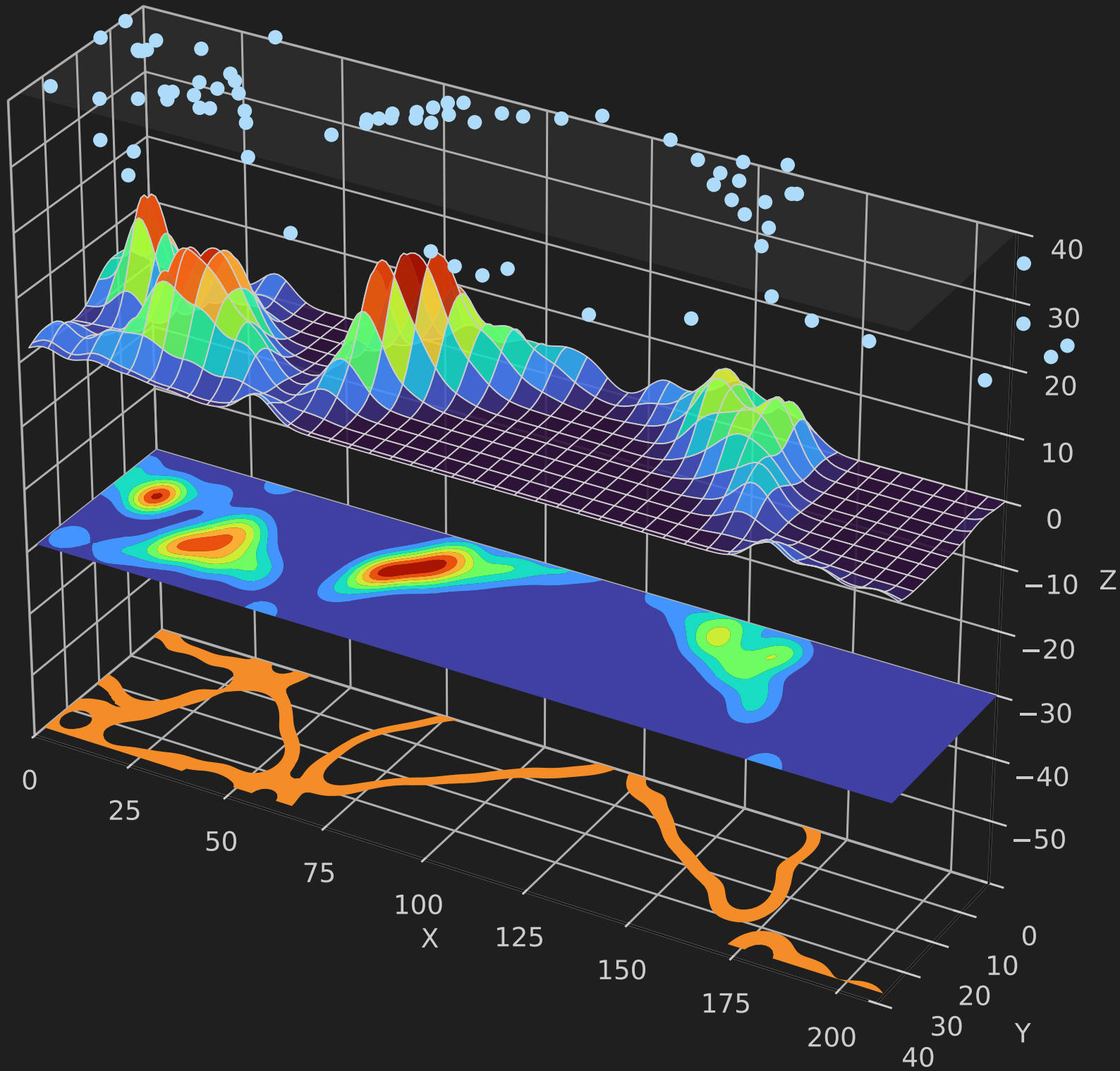
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.11) = 0.29

Spread Gaussian = 5.55 Shift = 2.18 Iteration = 103



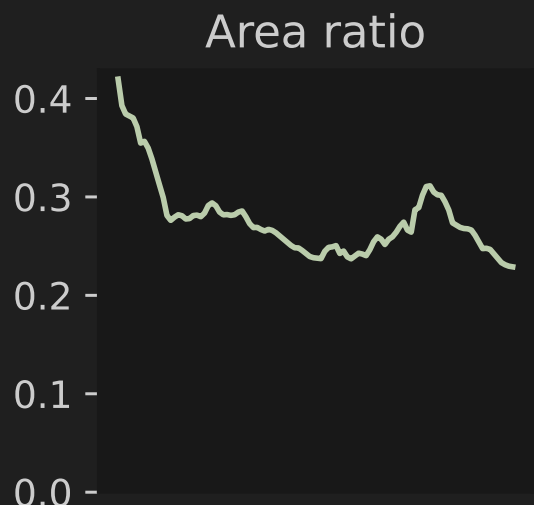
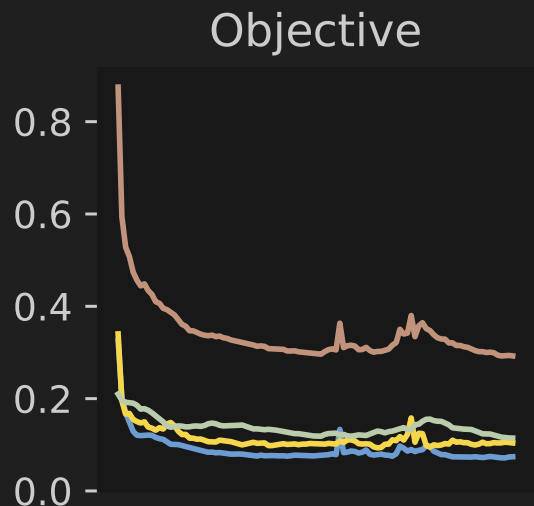
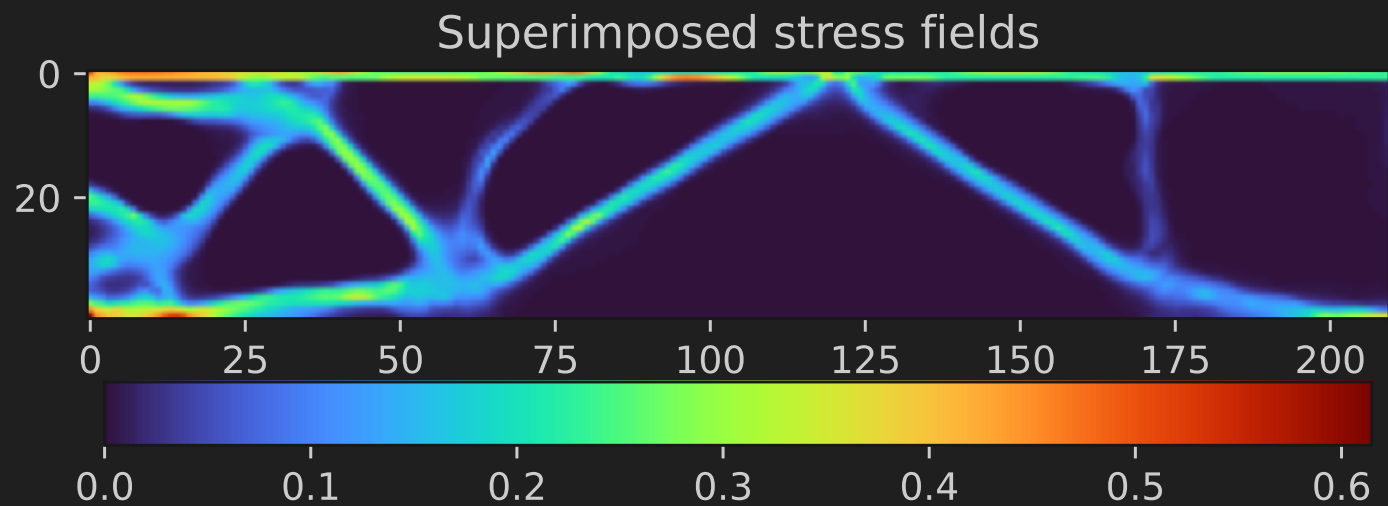
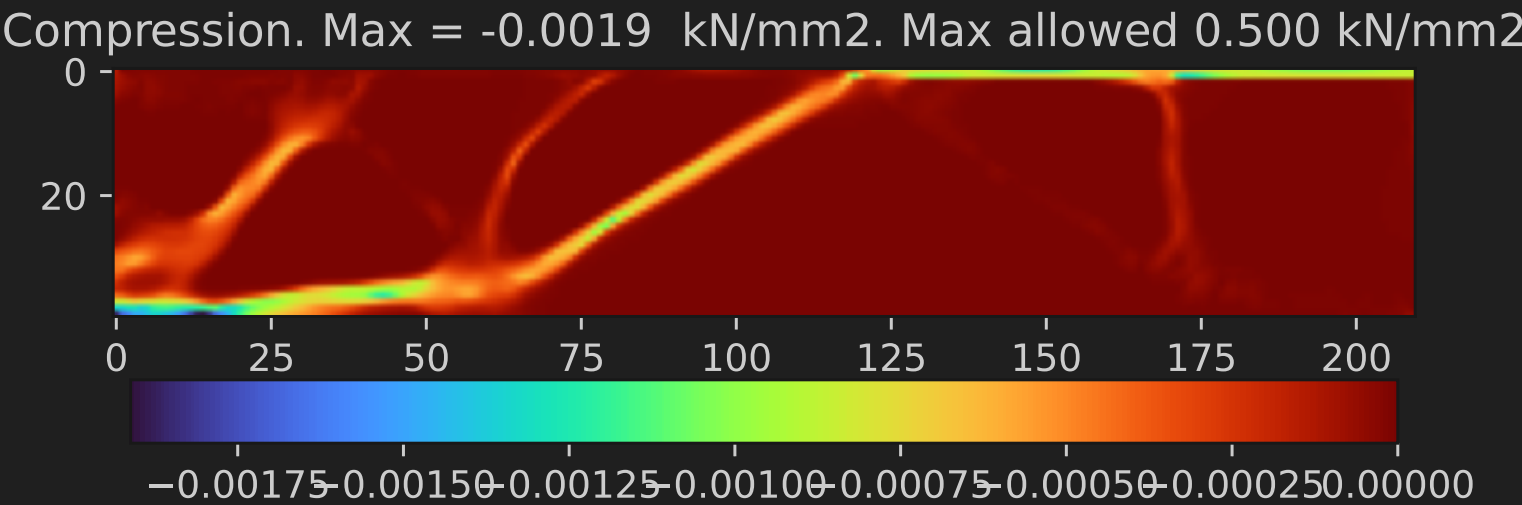
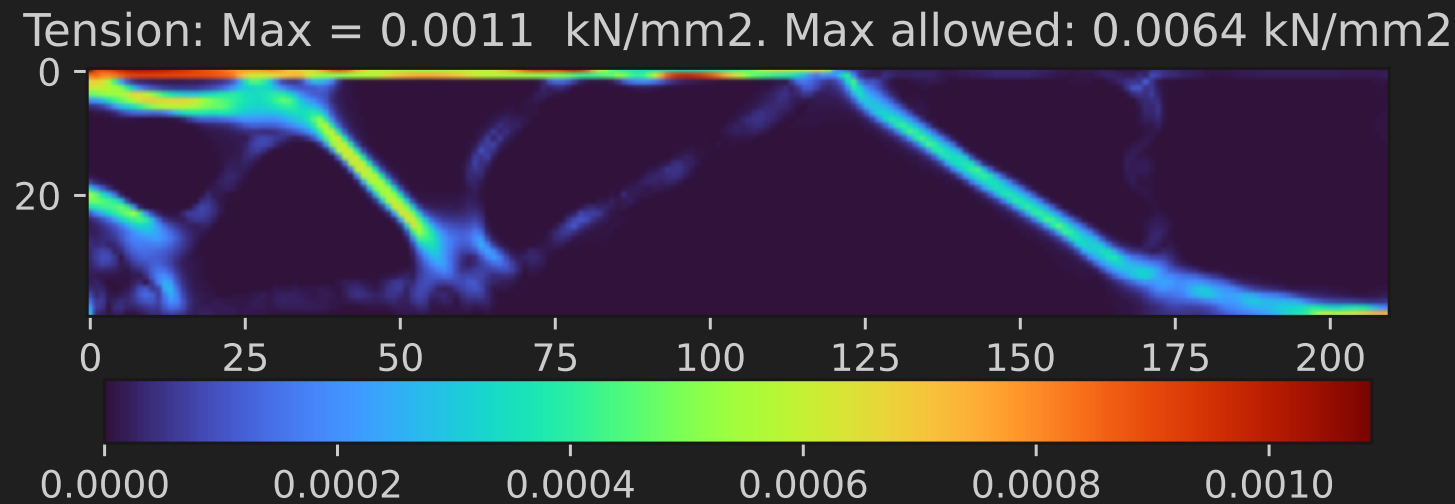
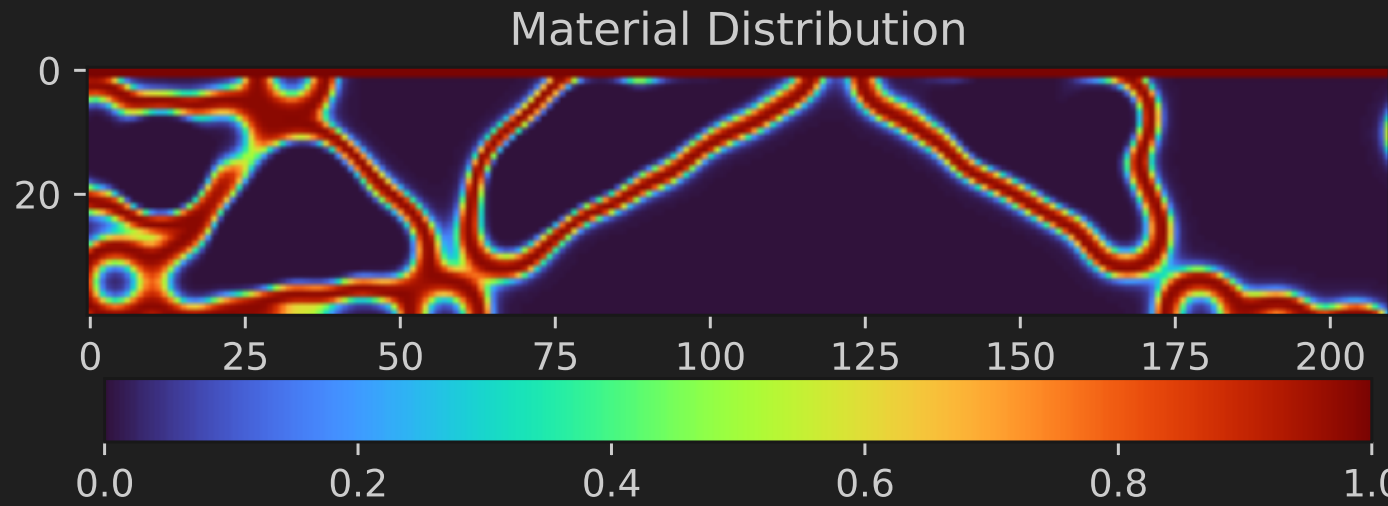
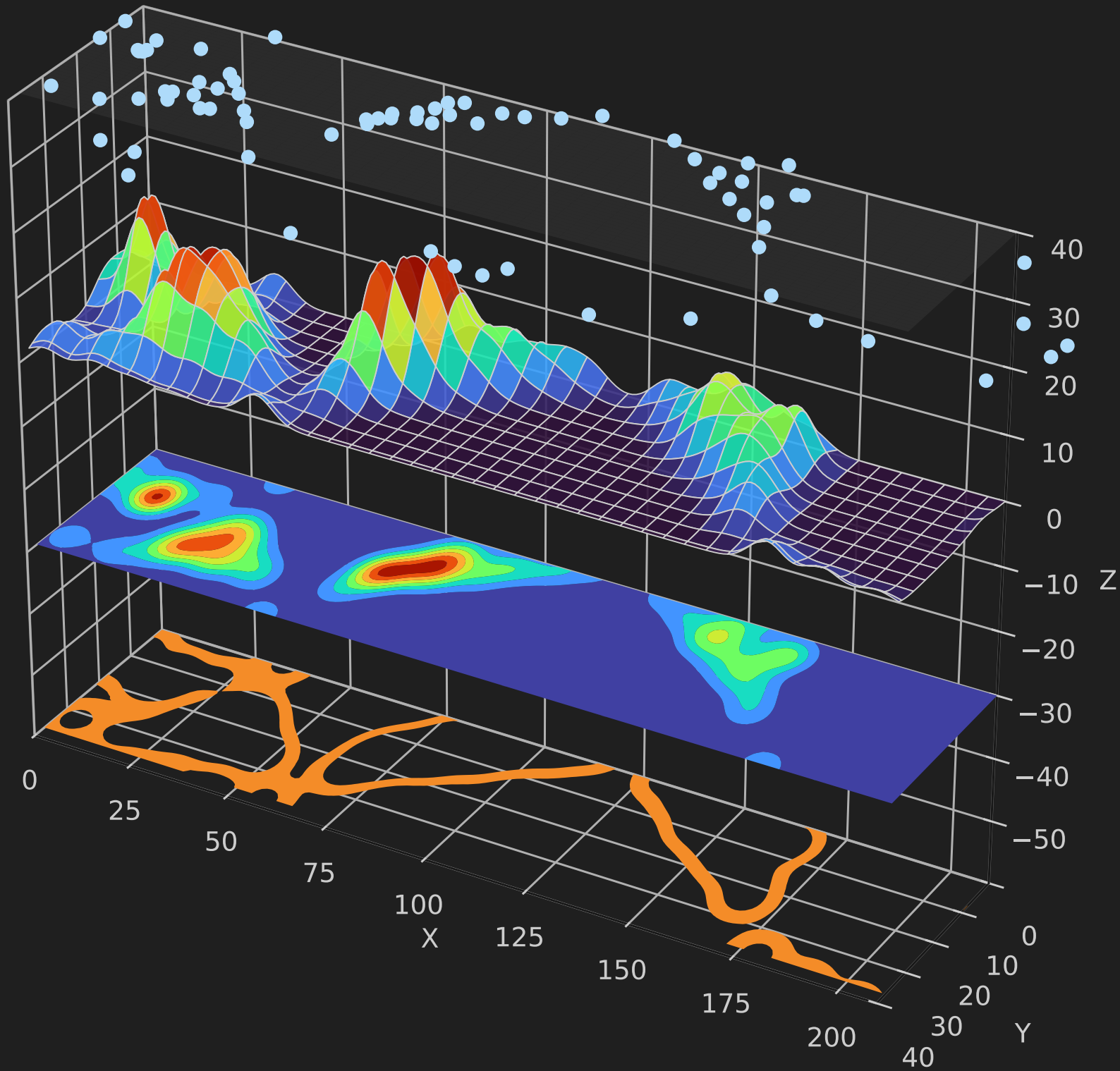
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.11) = 0.29

Spread Gaussian = 5.57 Shift = 2.14 Iteration = 104



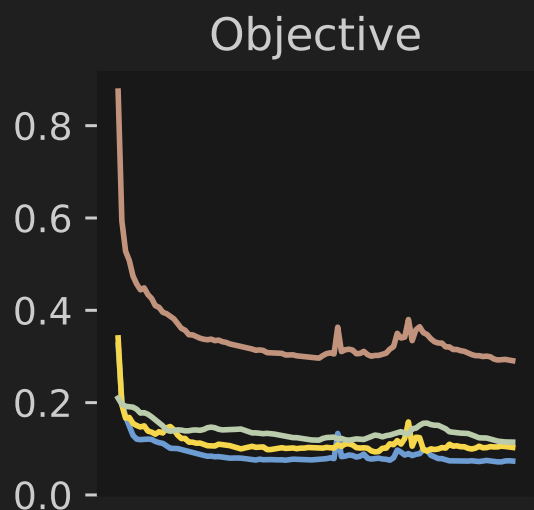
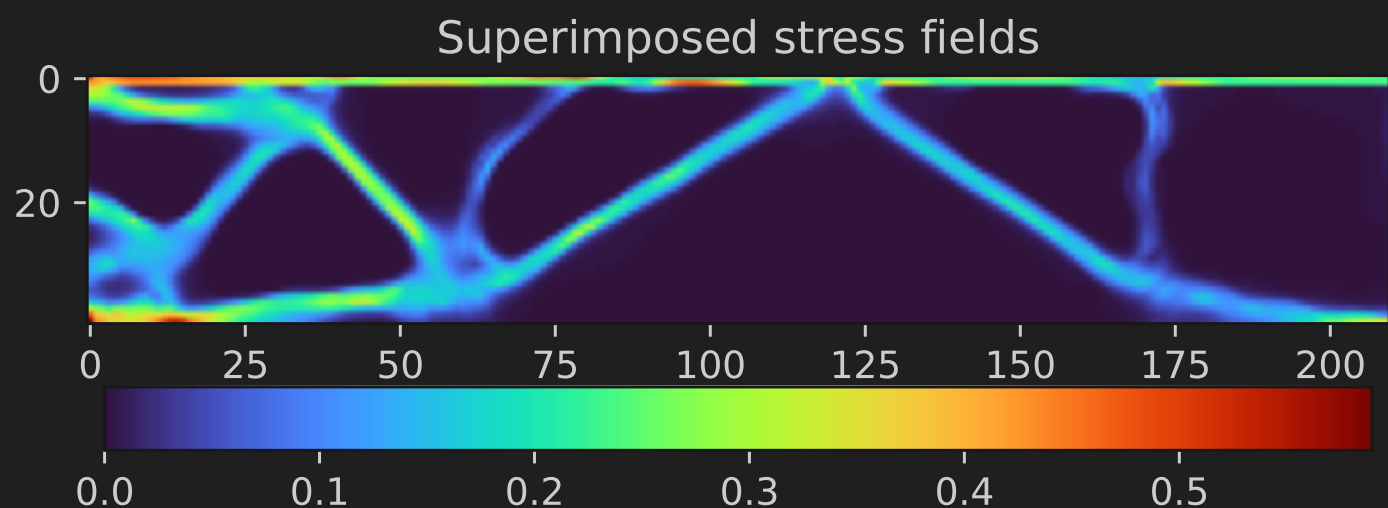
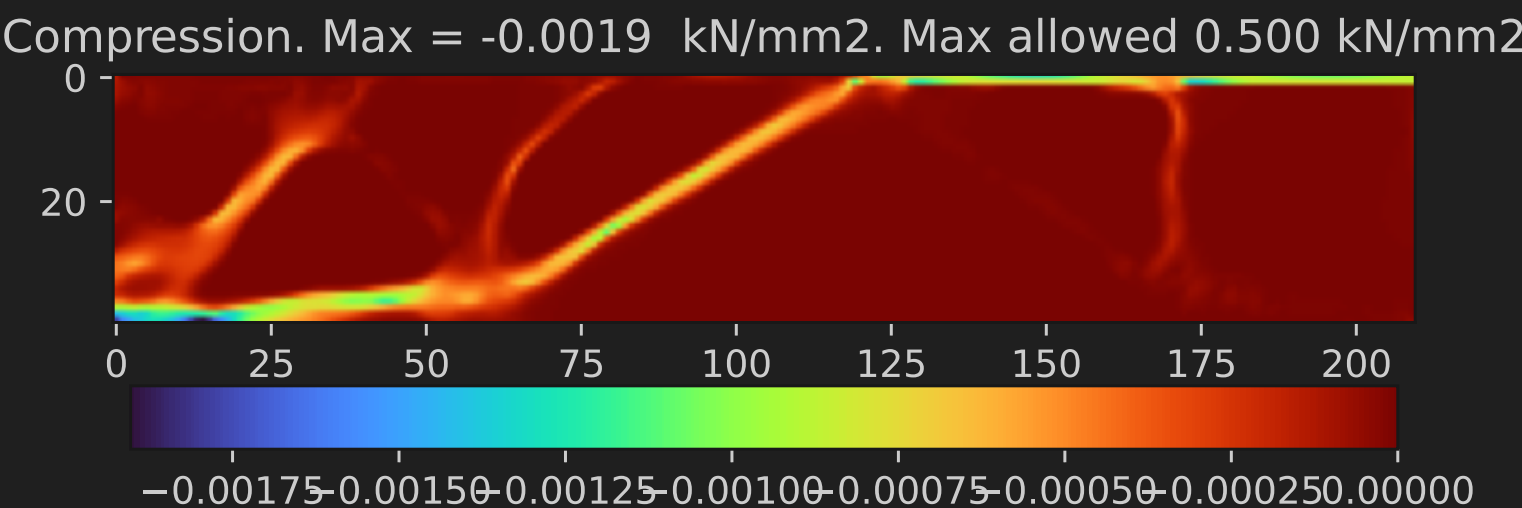
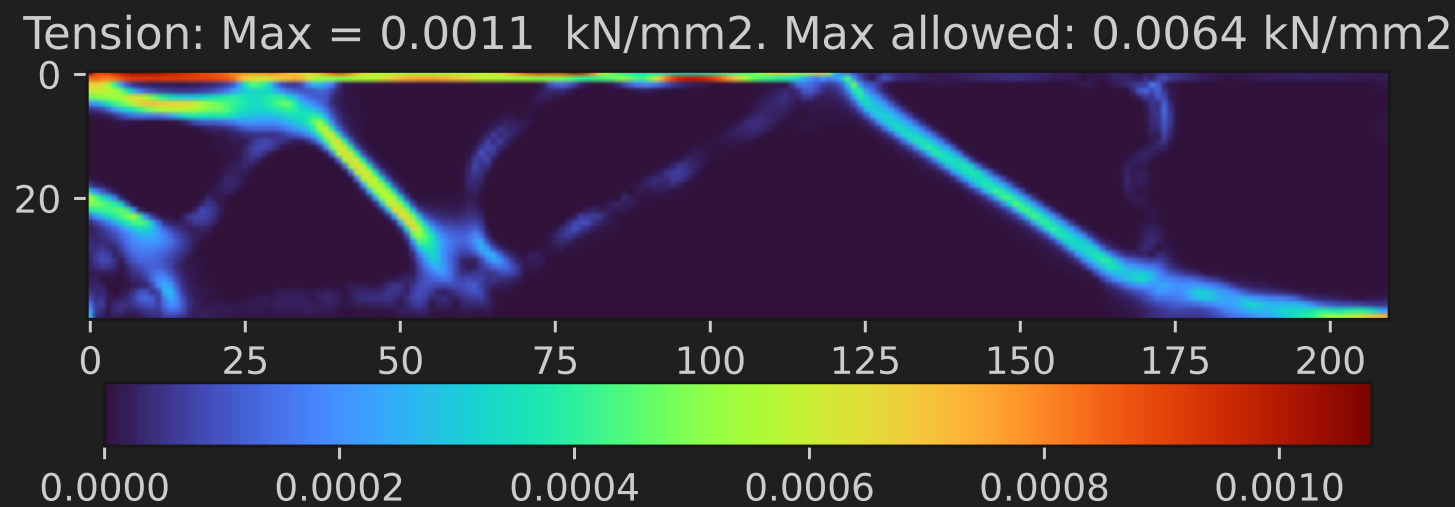
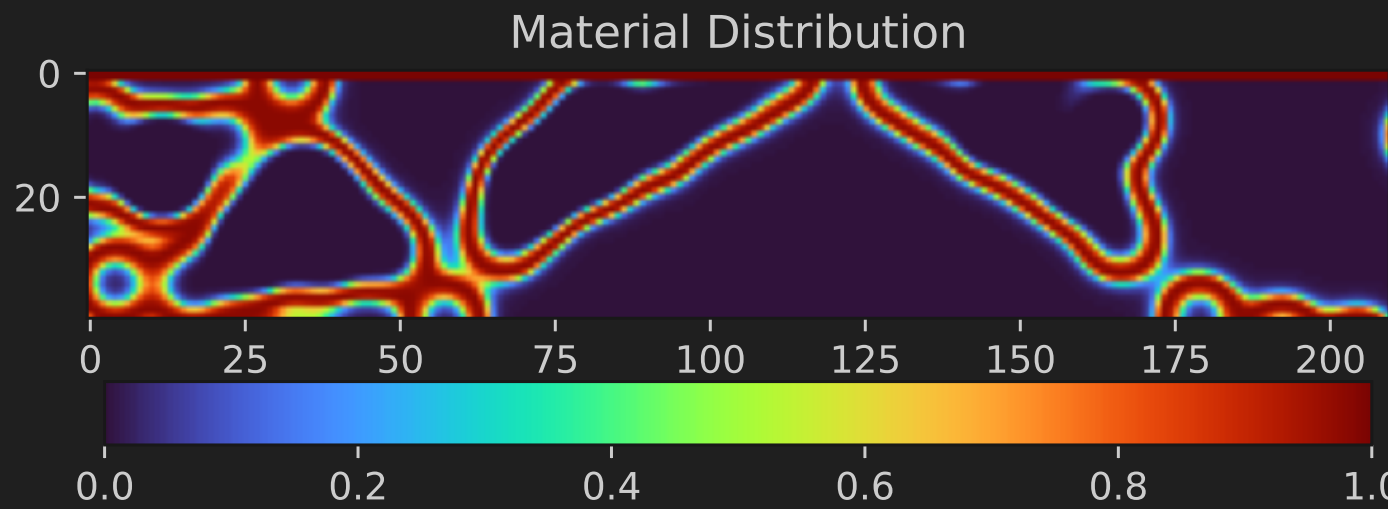
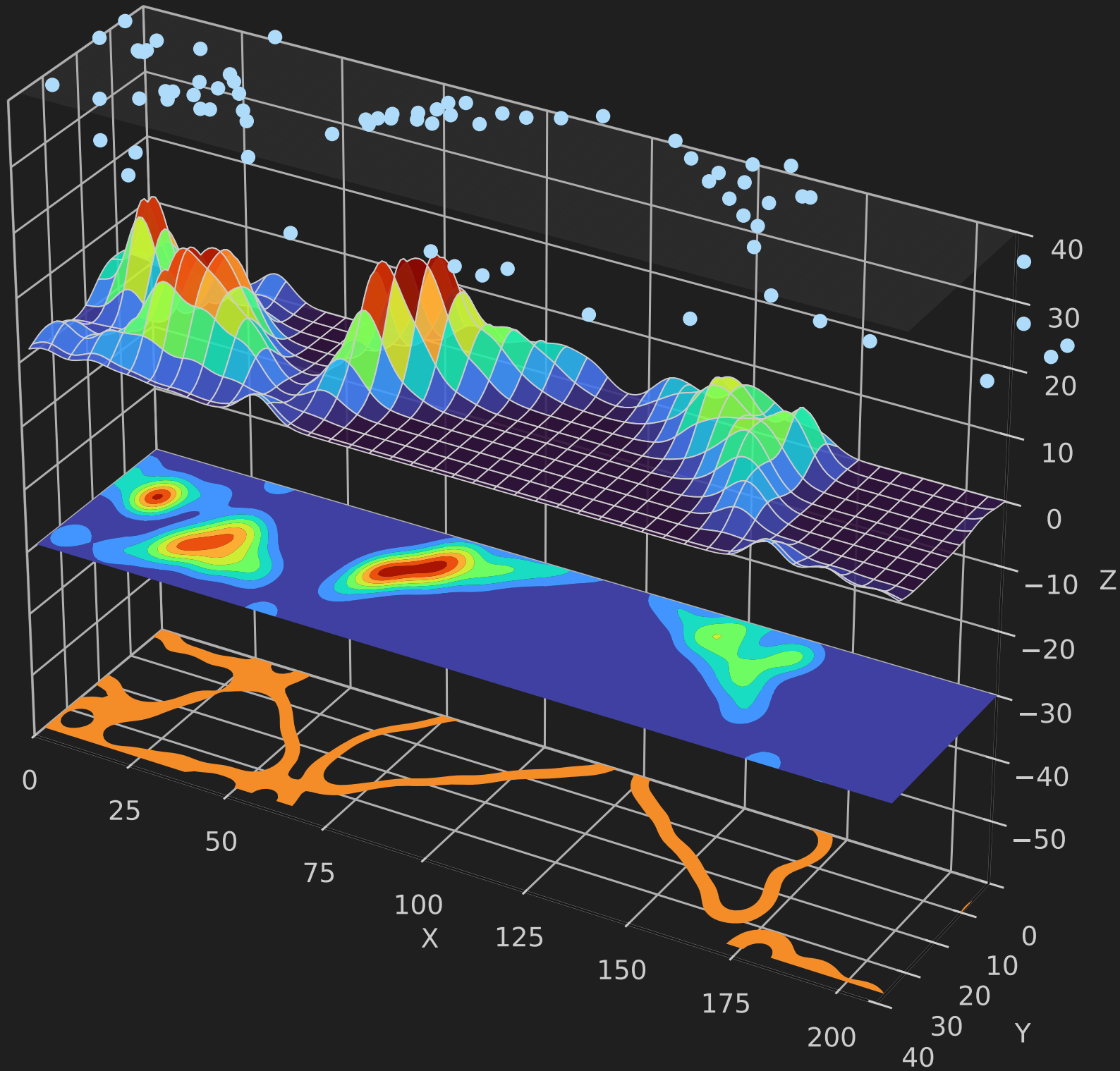
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.59 Shift = 2.11 Iteration = 105



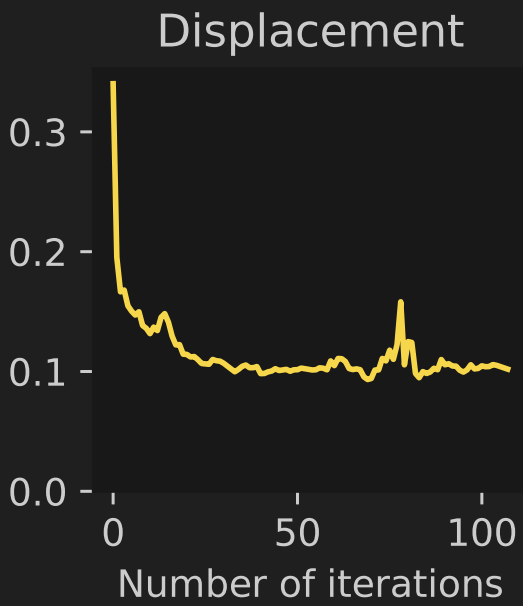
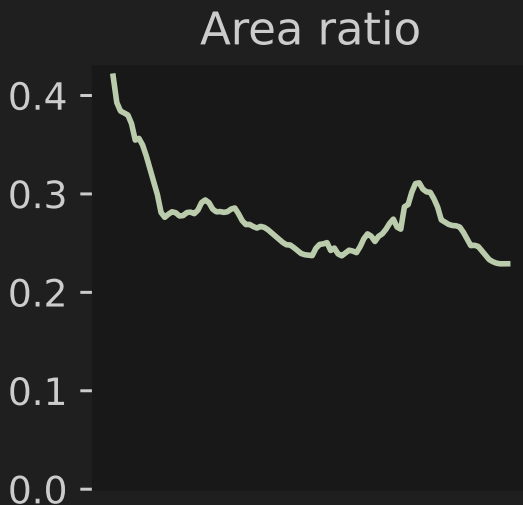
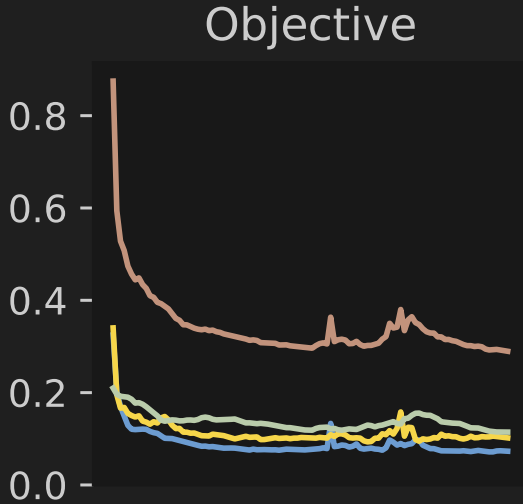
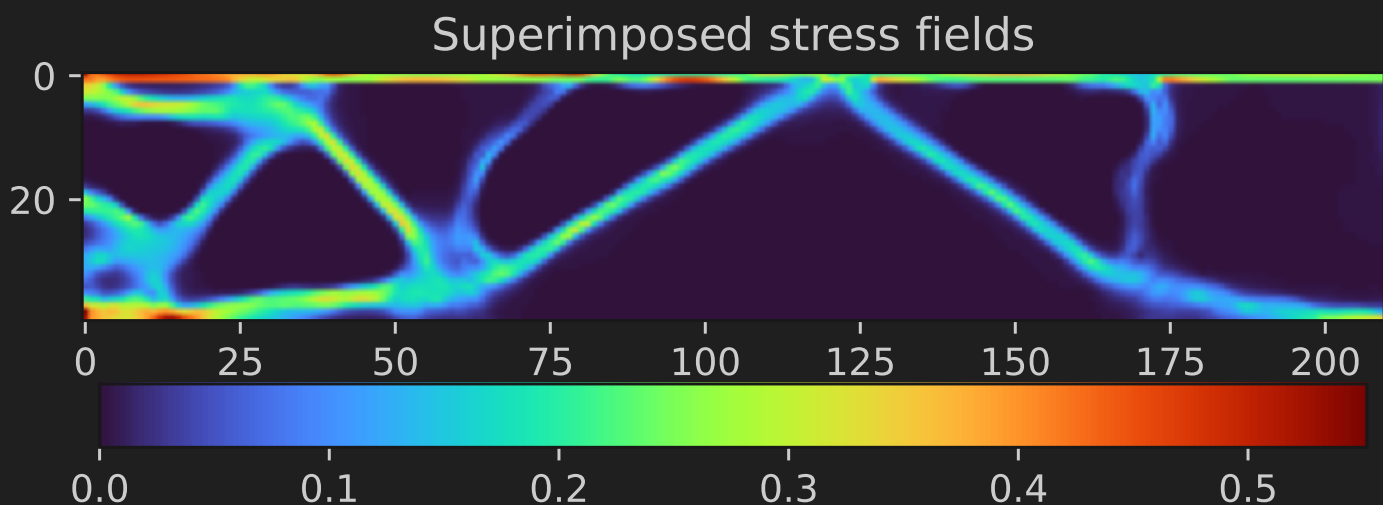
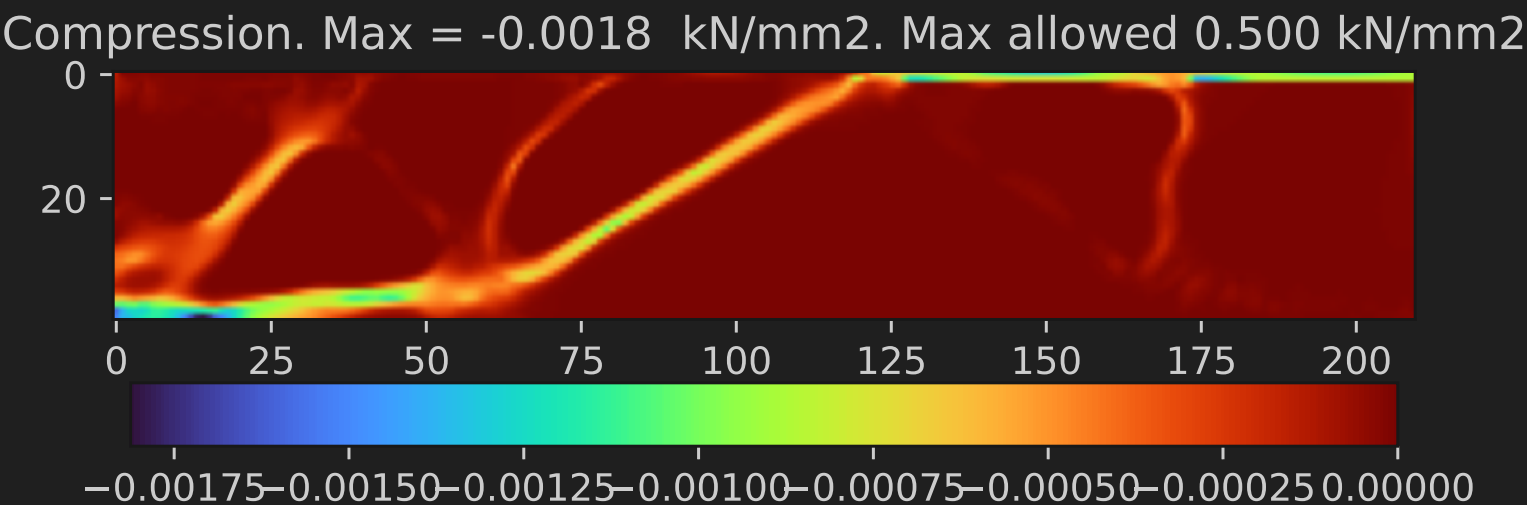
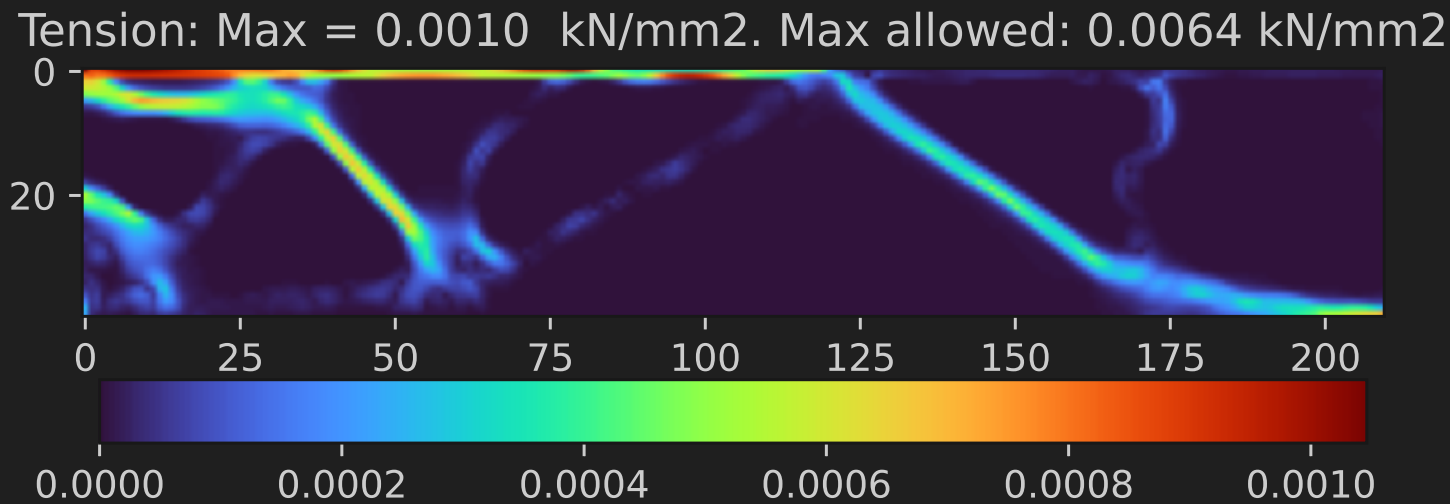
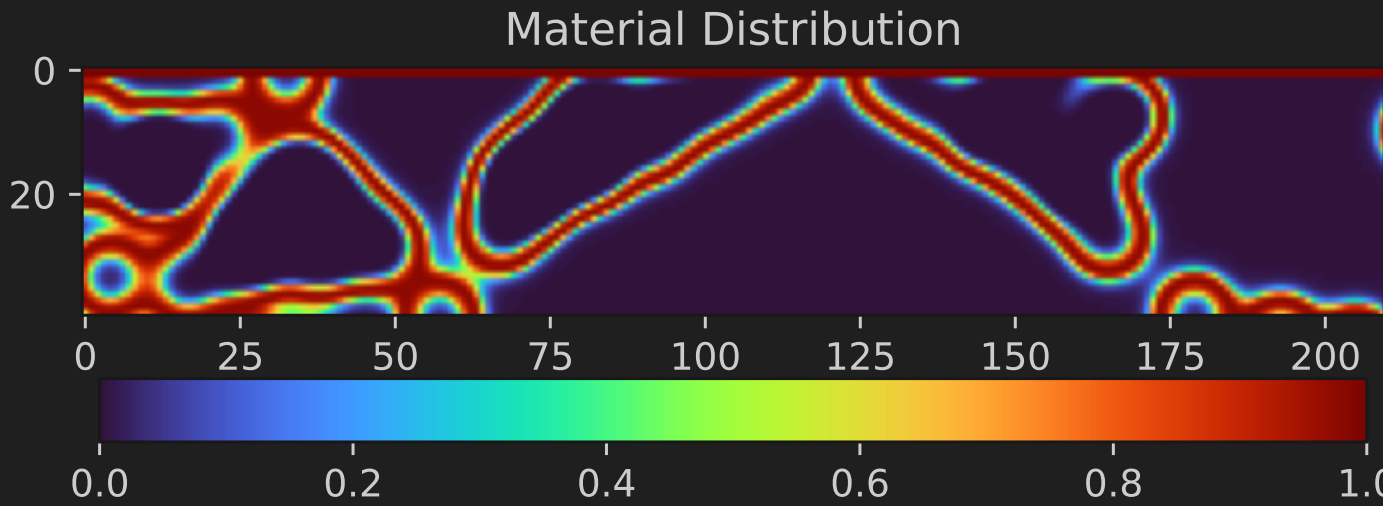
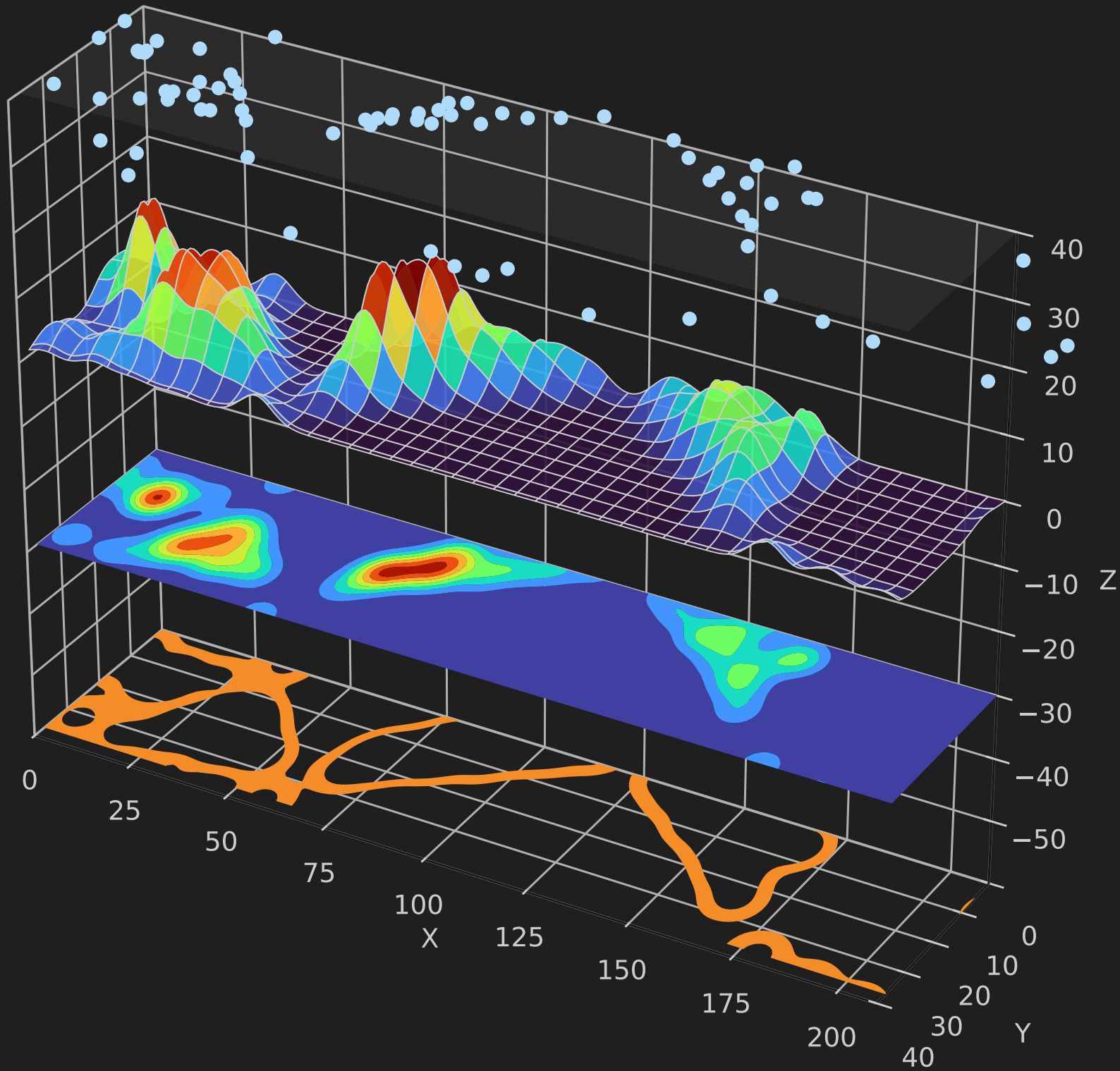
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.59 Shift = 2.09 Iteration = 106



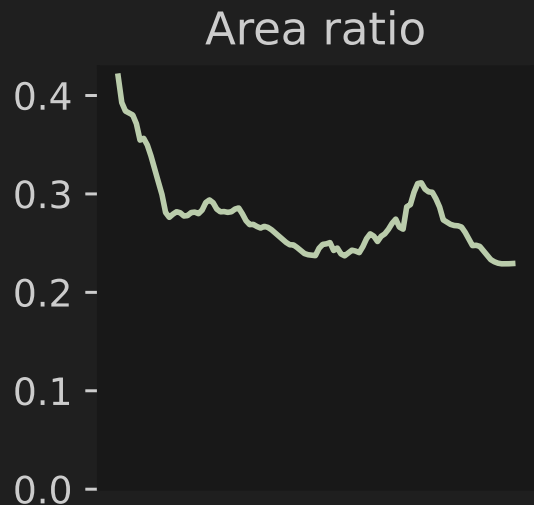
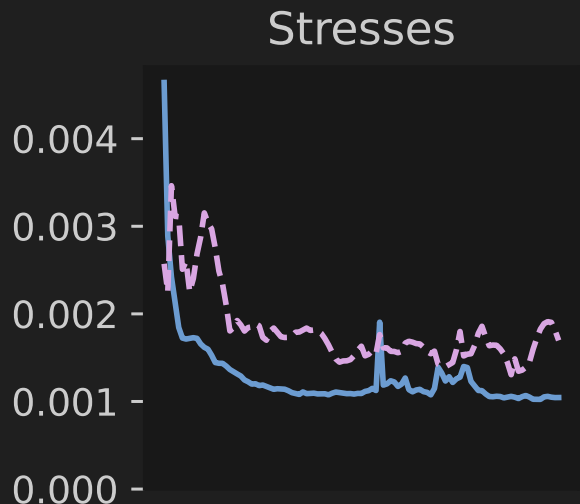
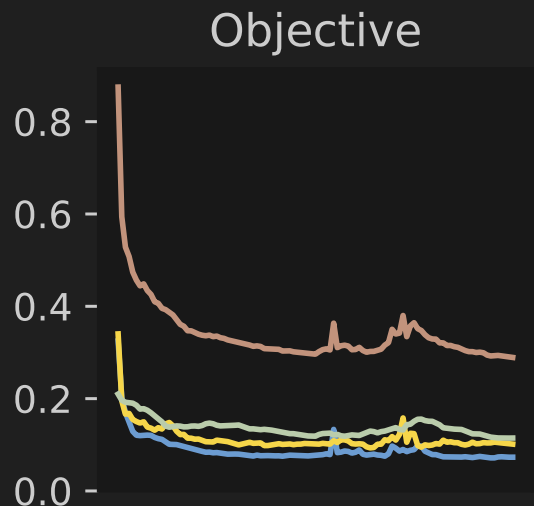
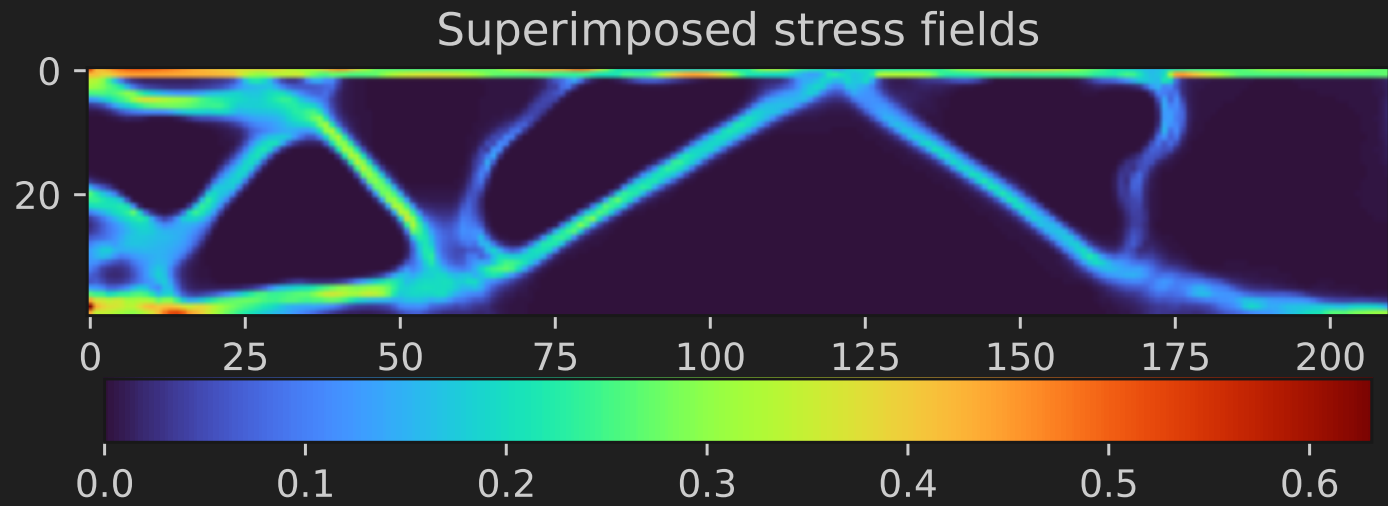
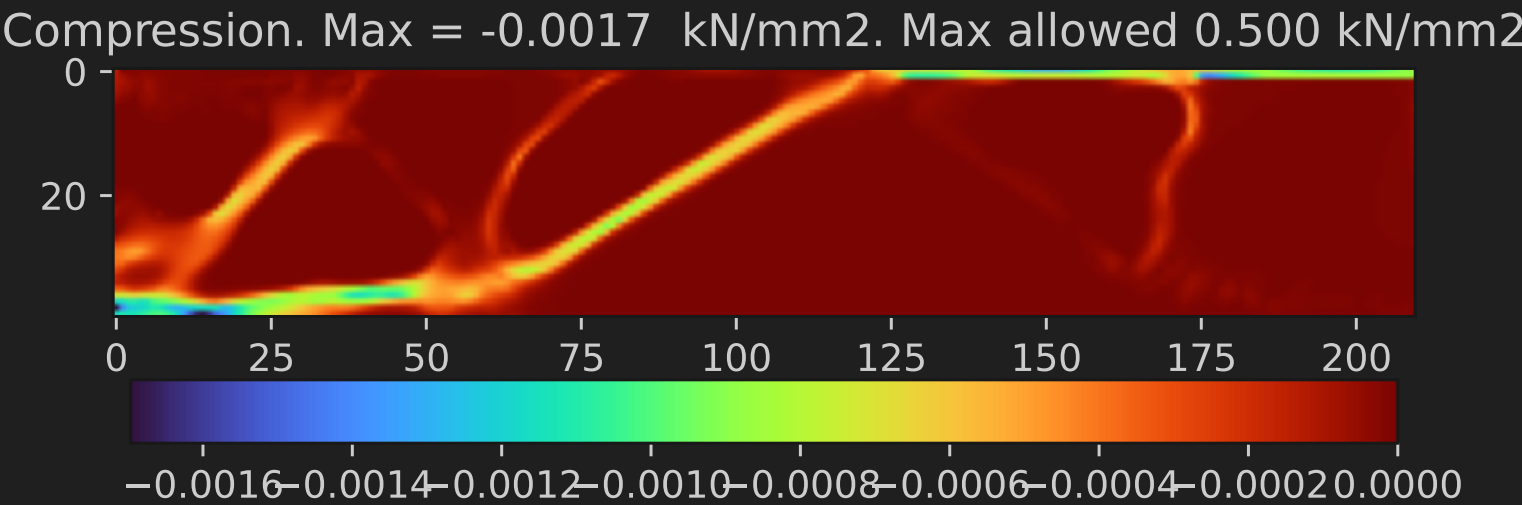
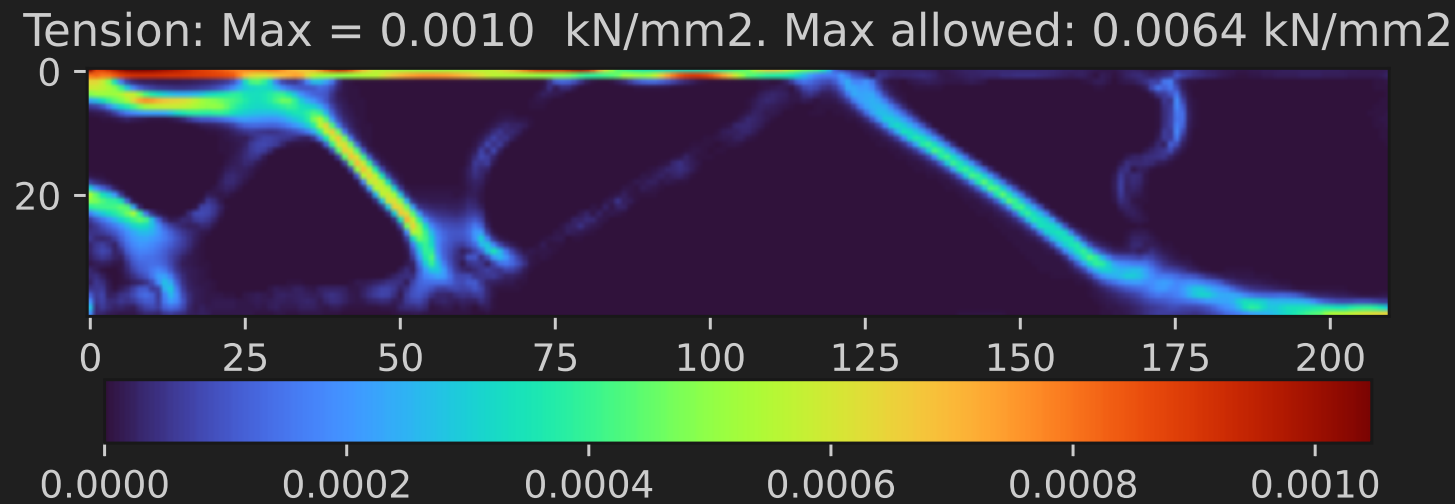
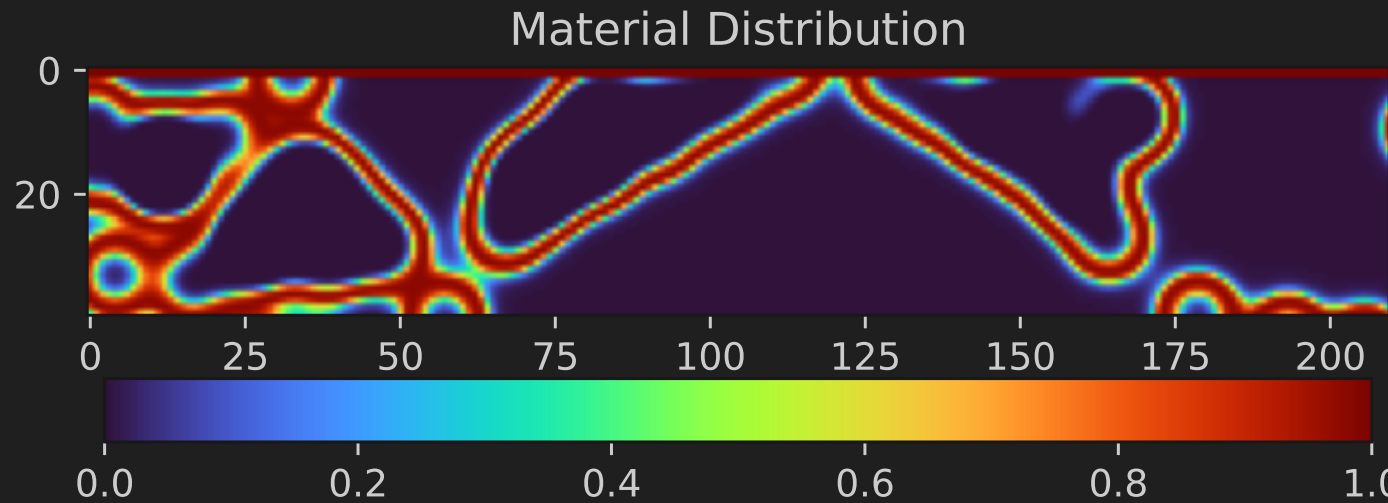
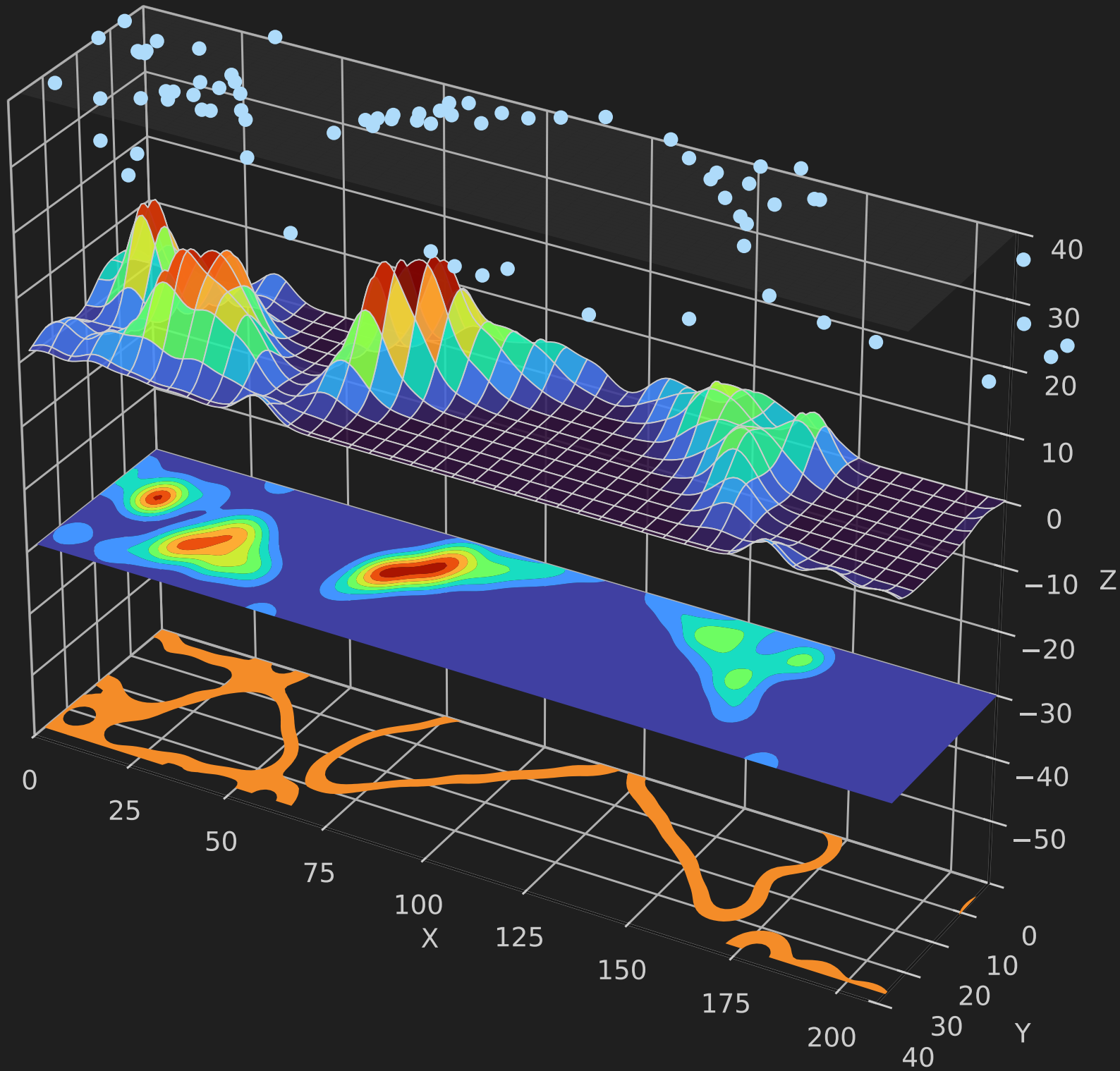
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.57 Shift = 2.08 Iteration = 107



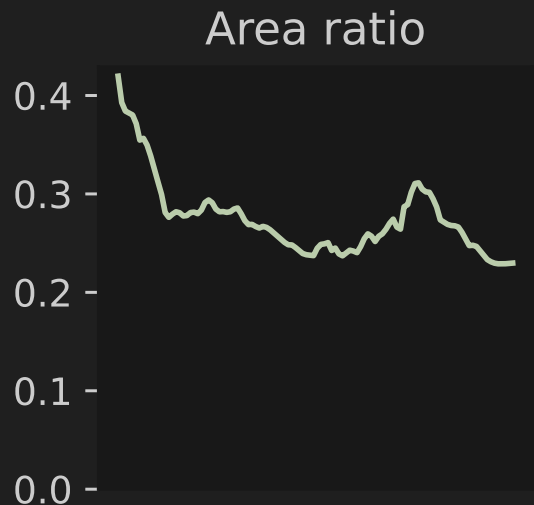
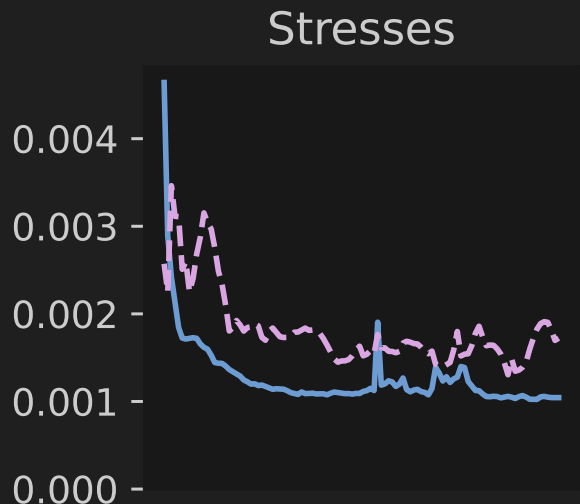
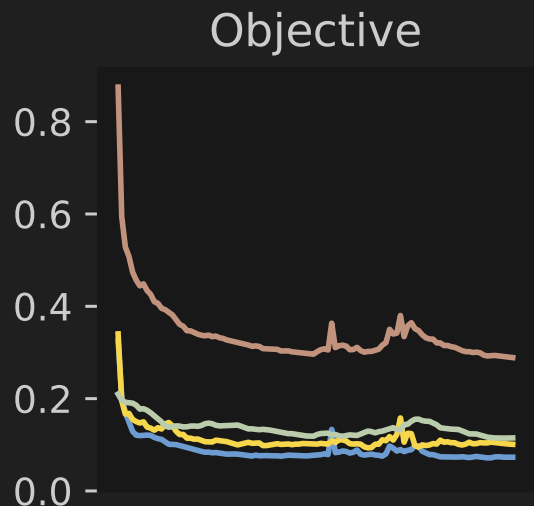
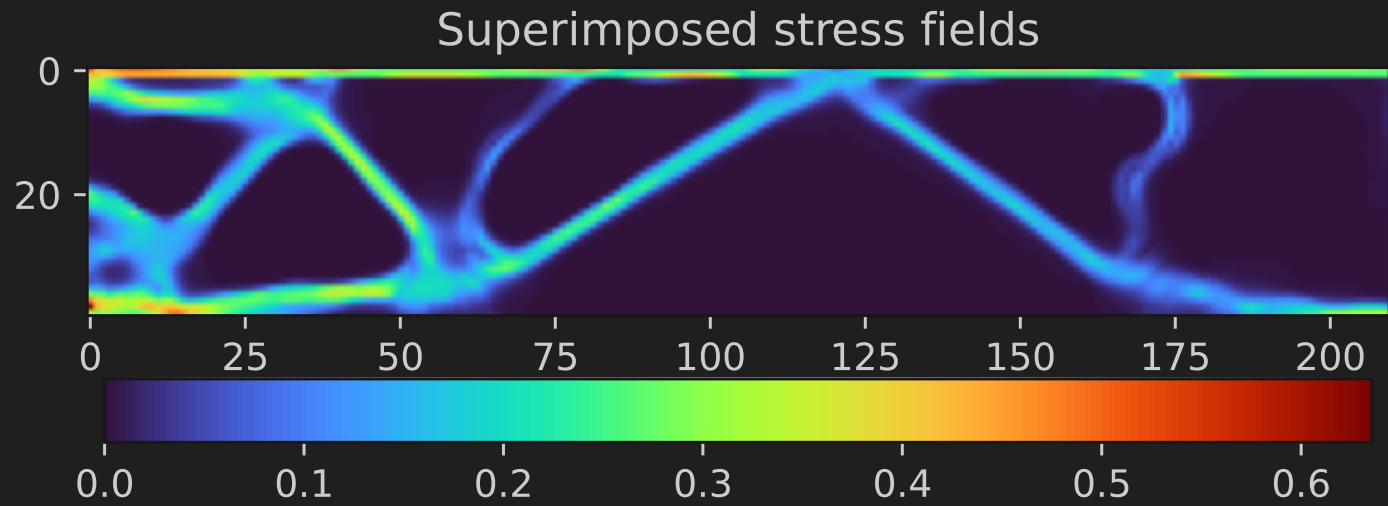
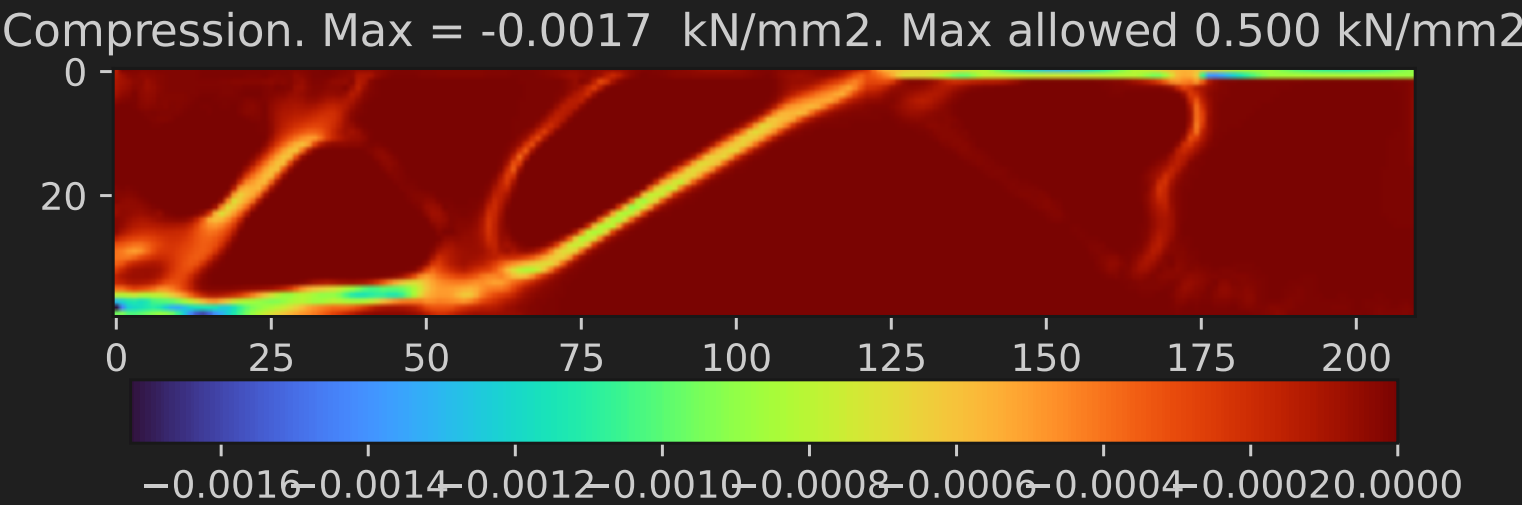
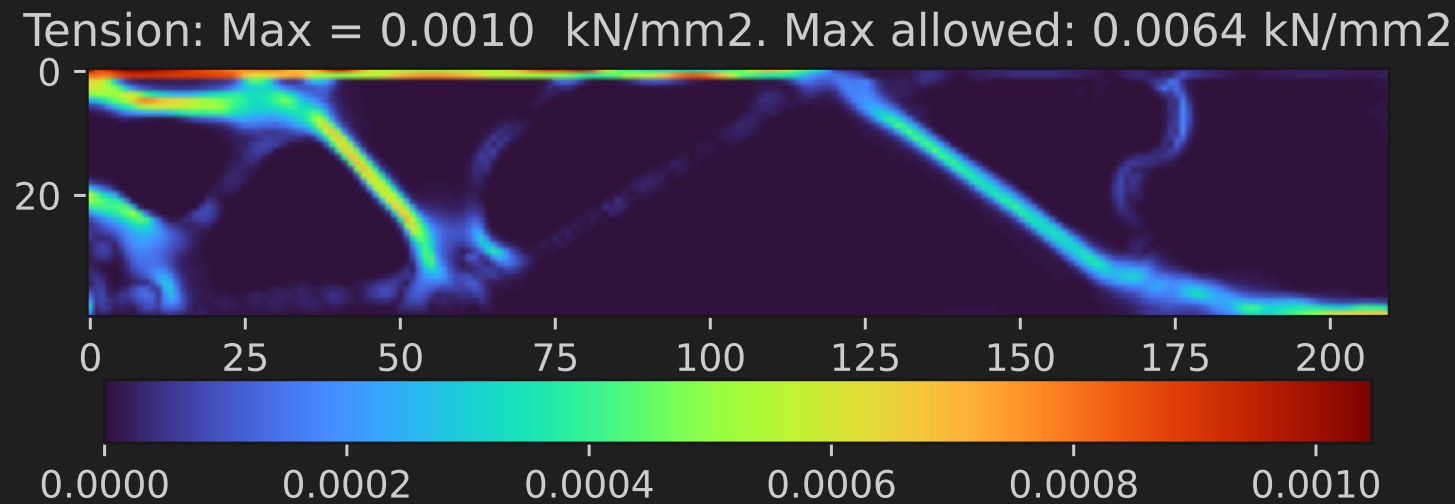
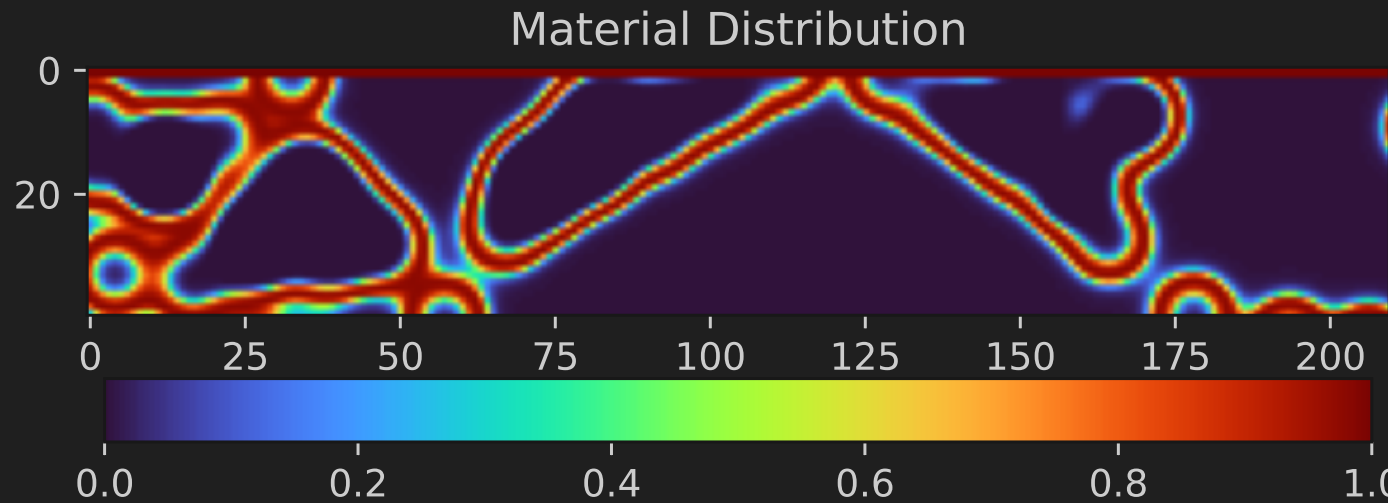
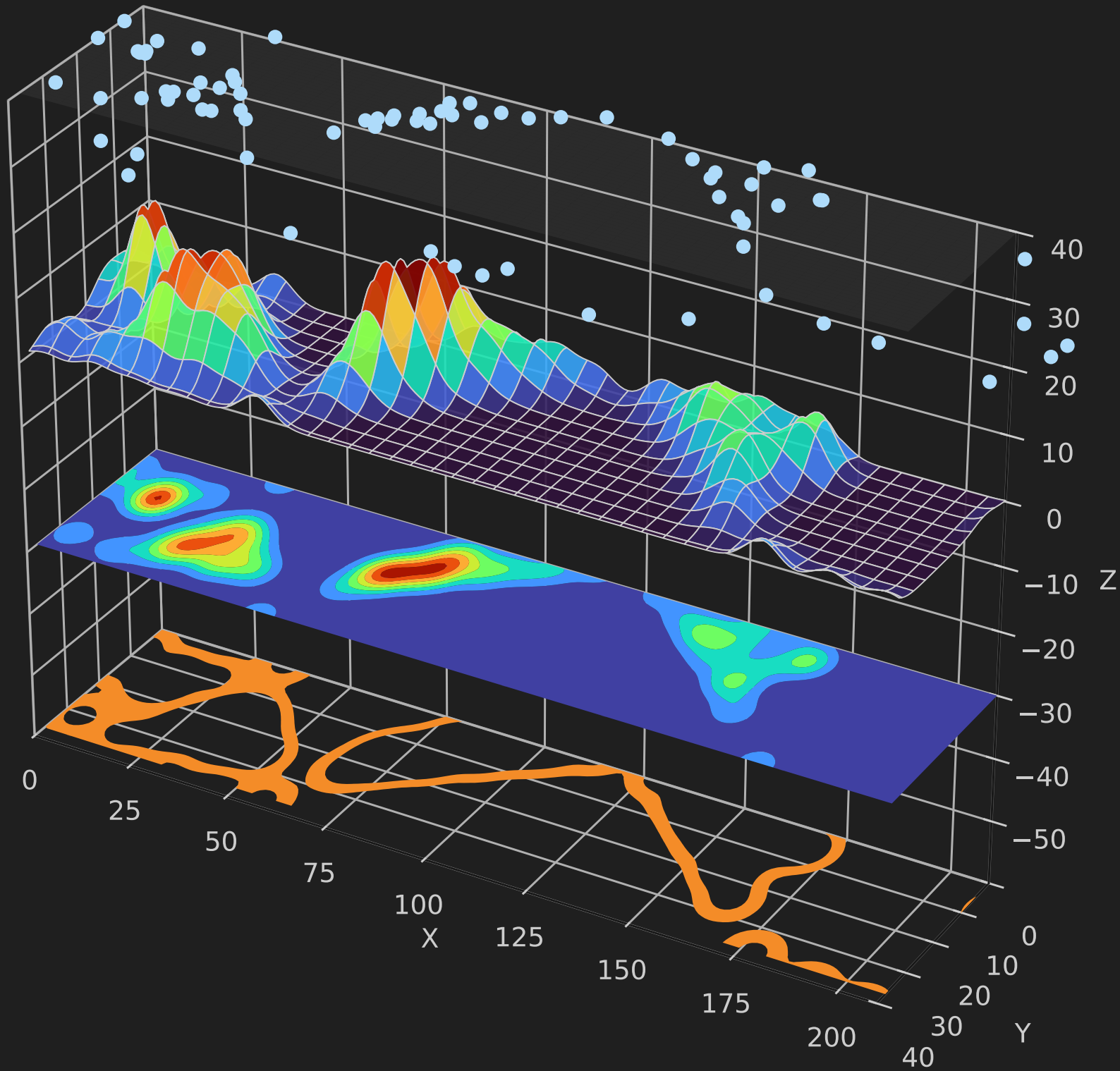
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.55 Shift = 2.08 Iteration = 108



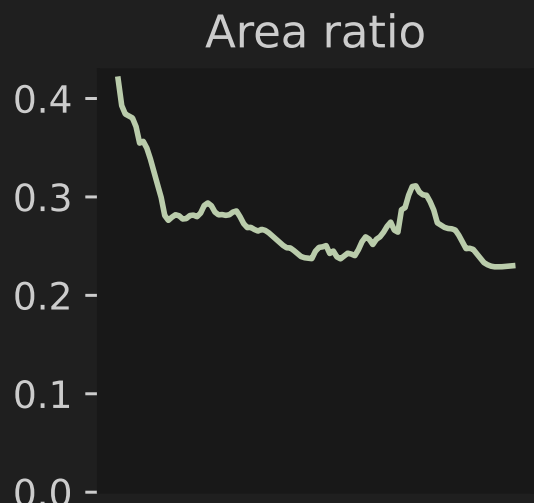
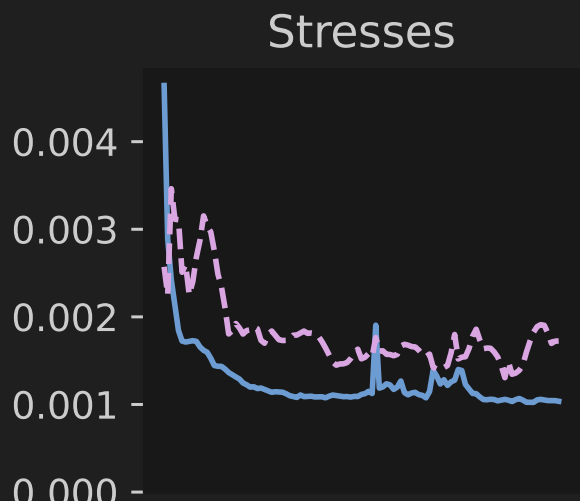
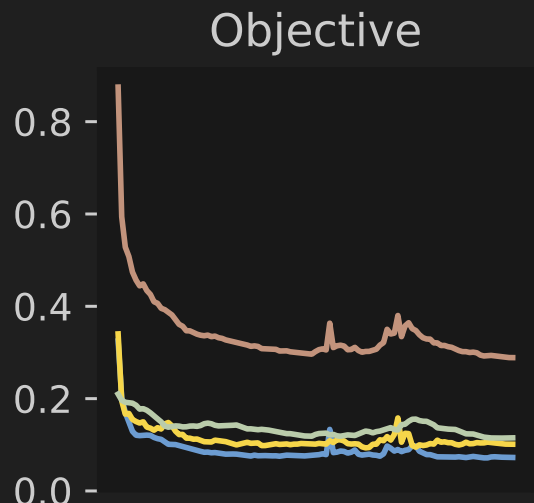
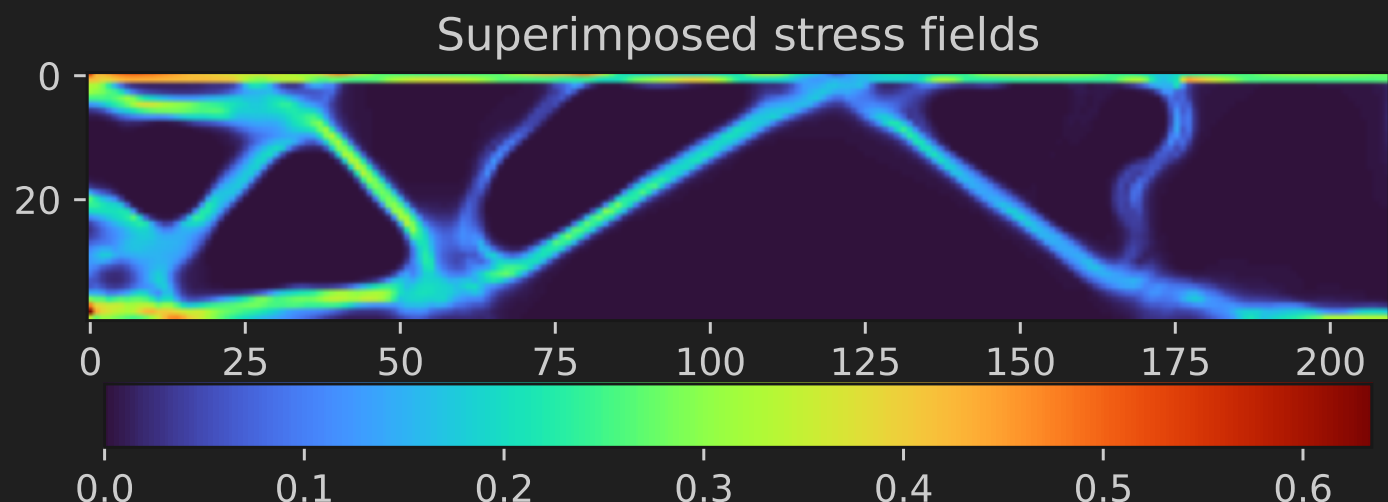
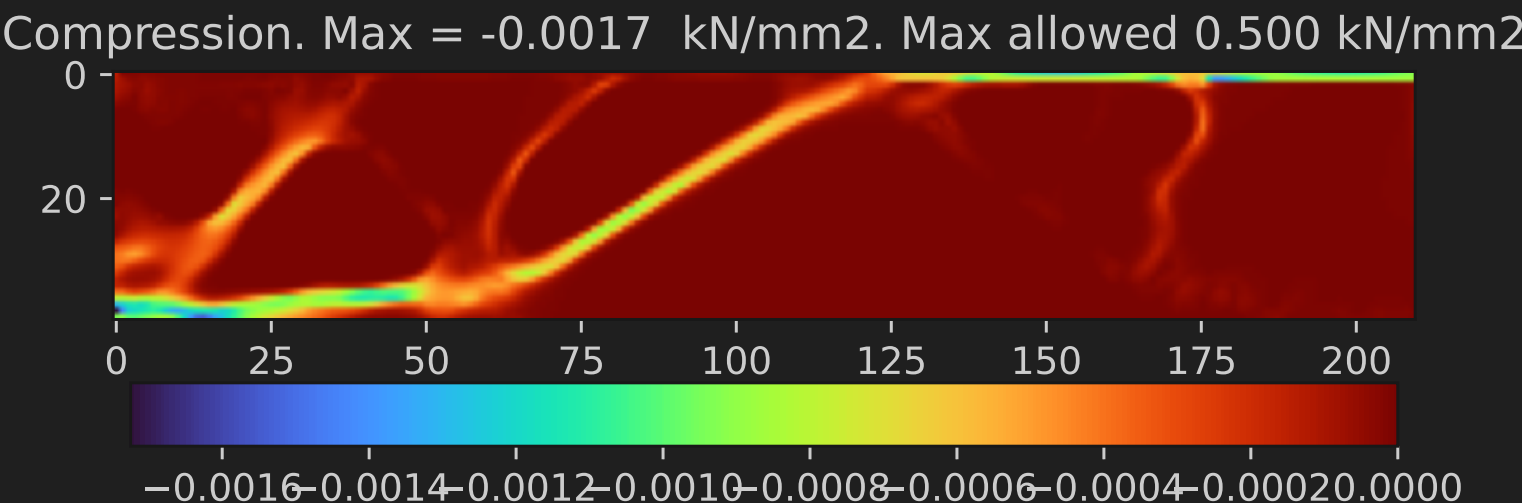
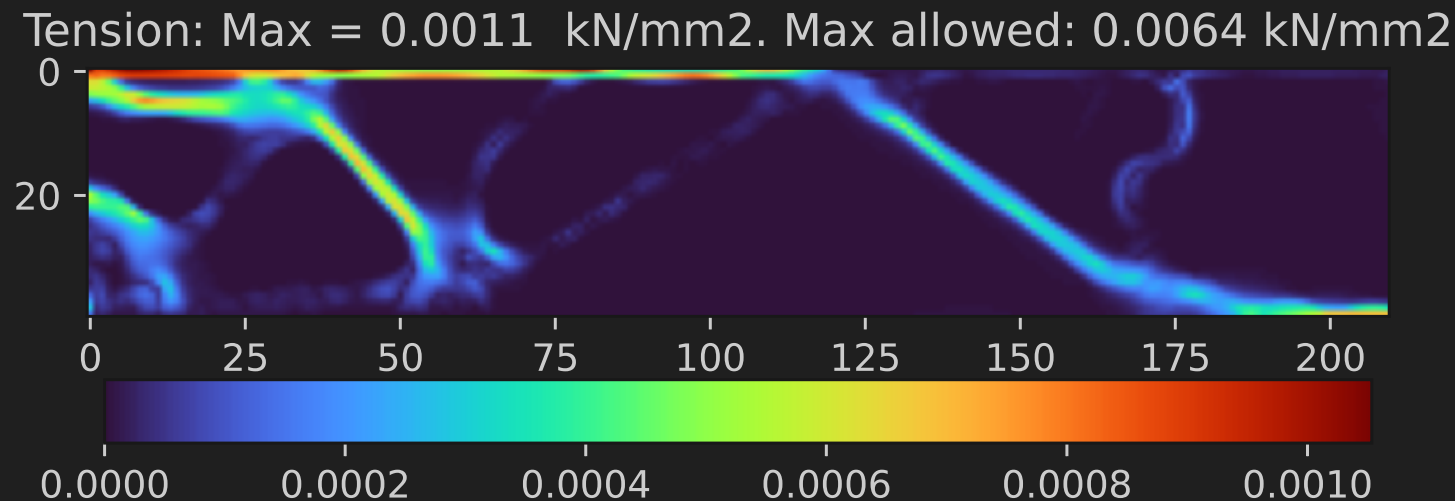
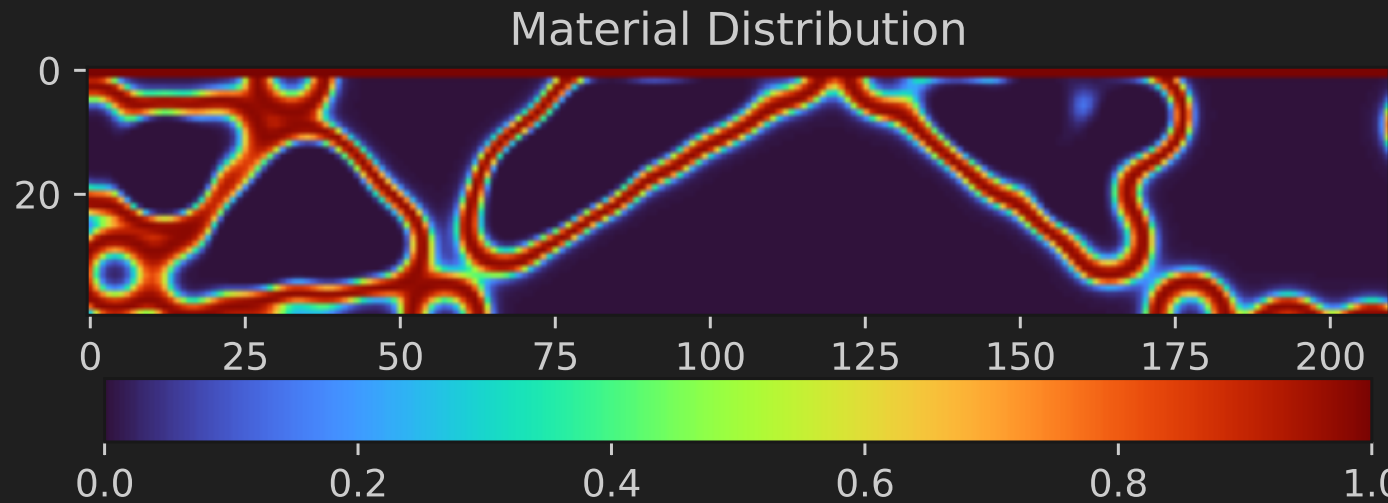
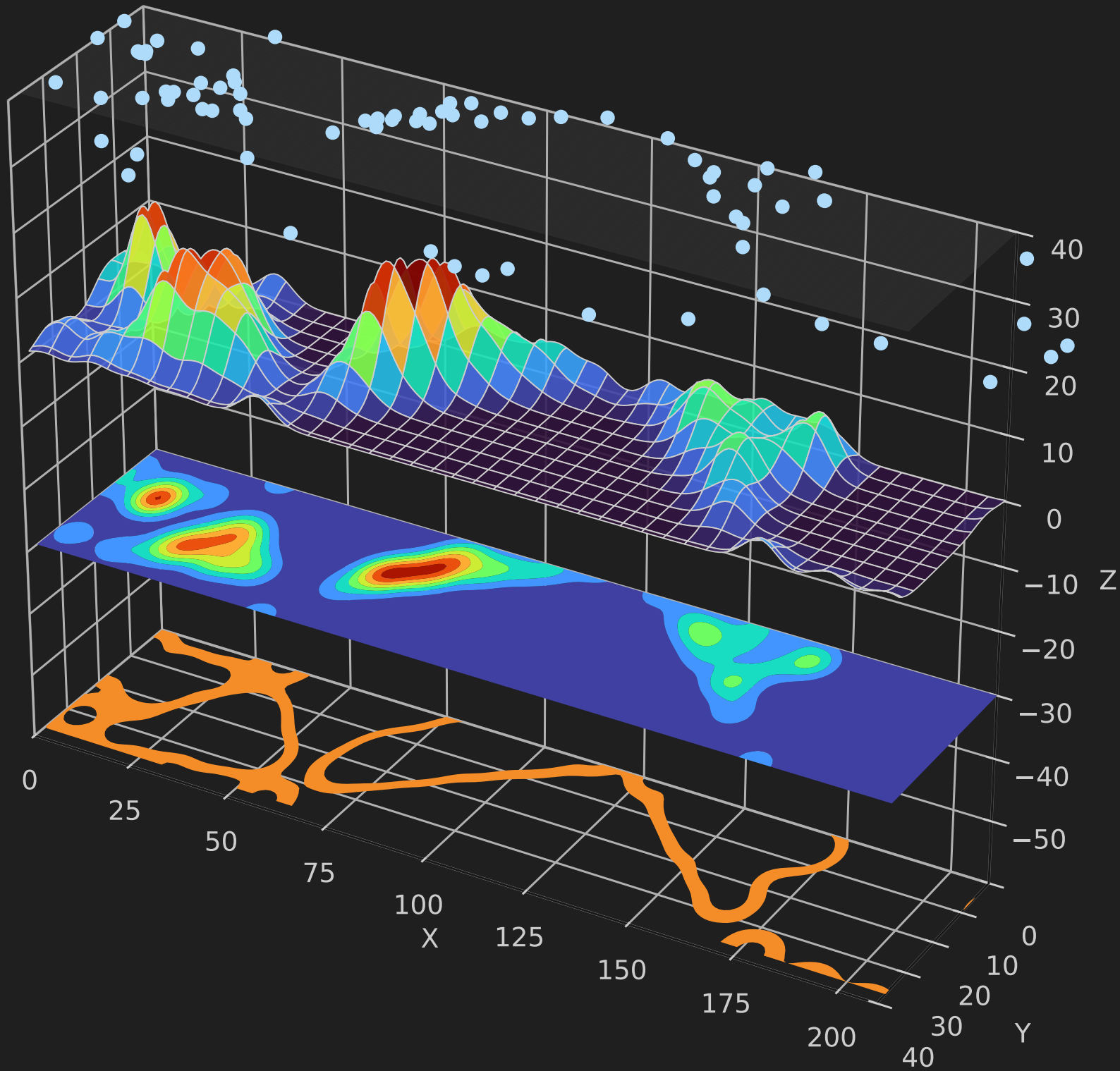
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.53 Shift = 2.07 Iteration = 109



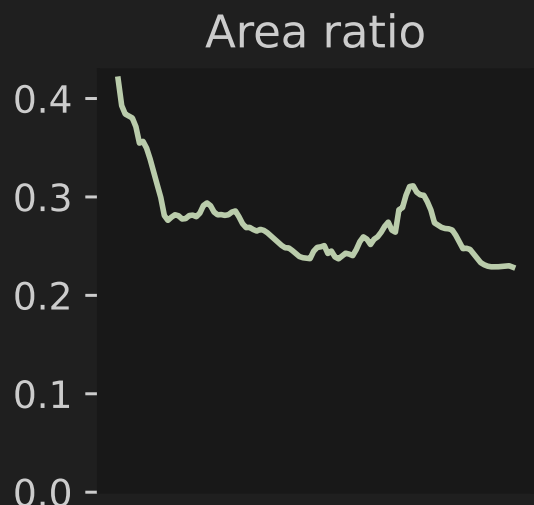
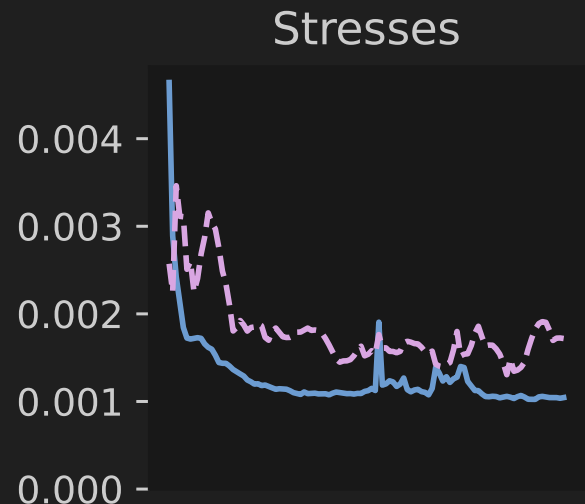
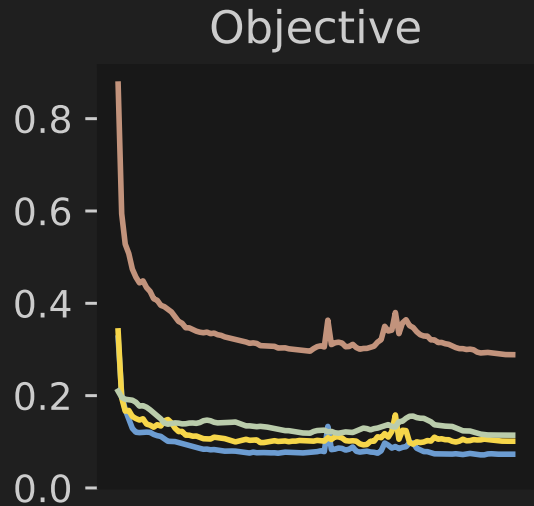
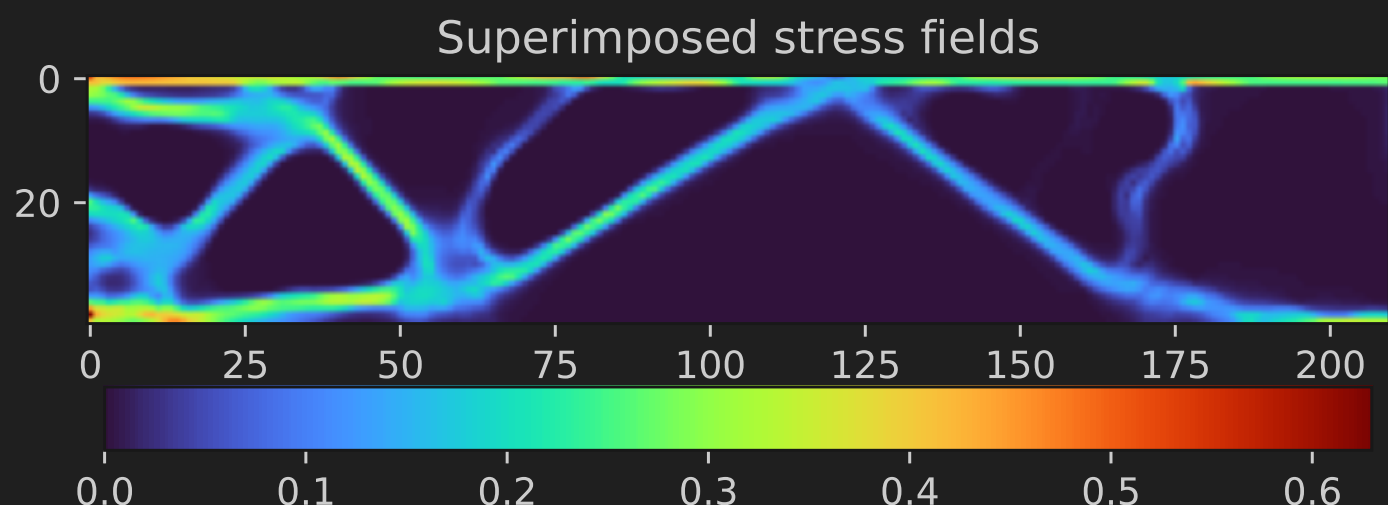
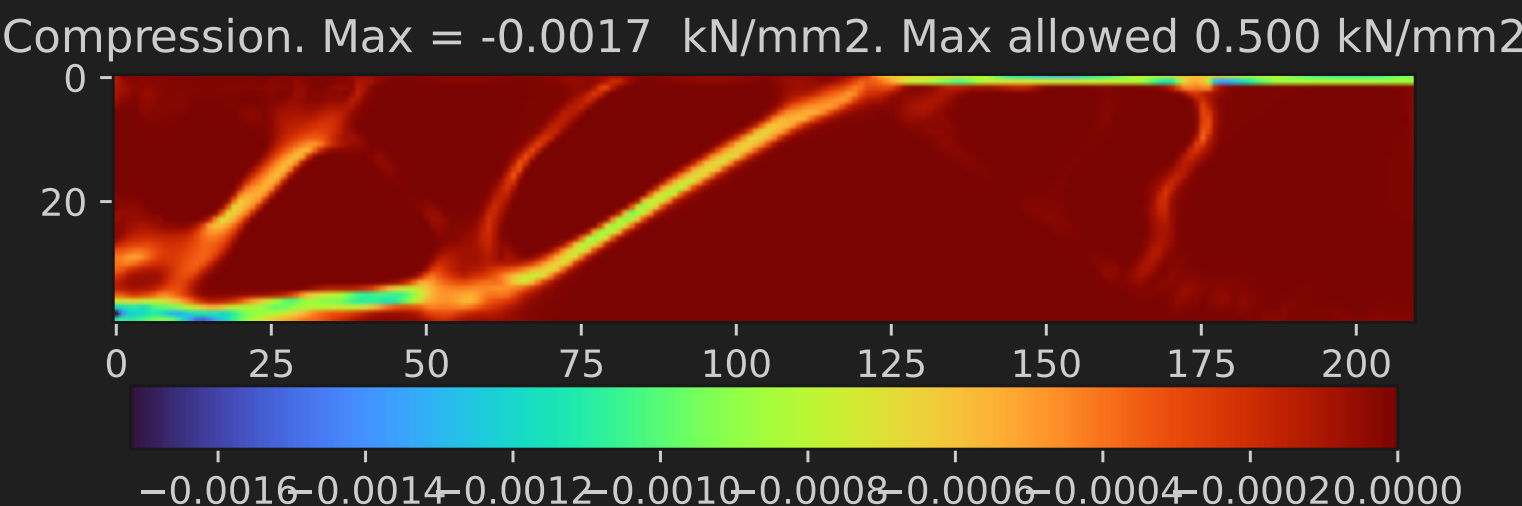
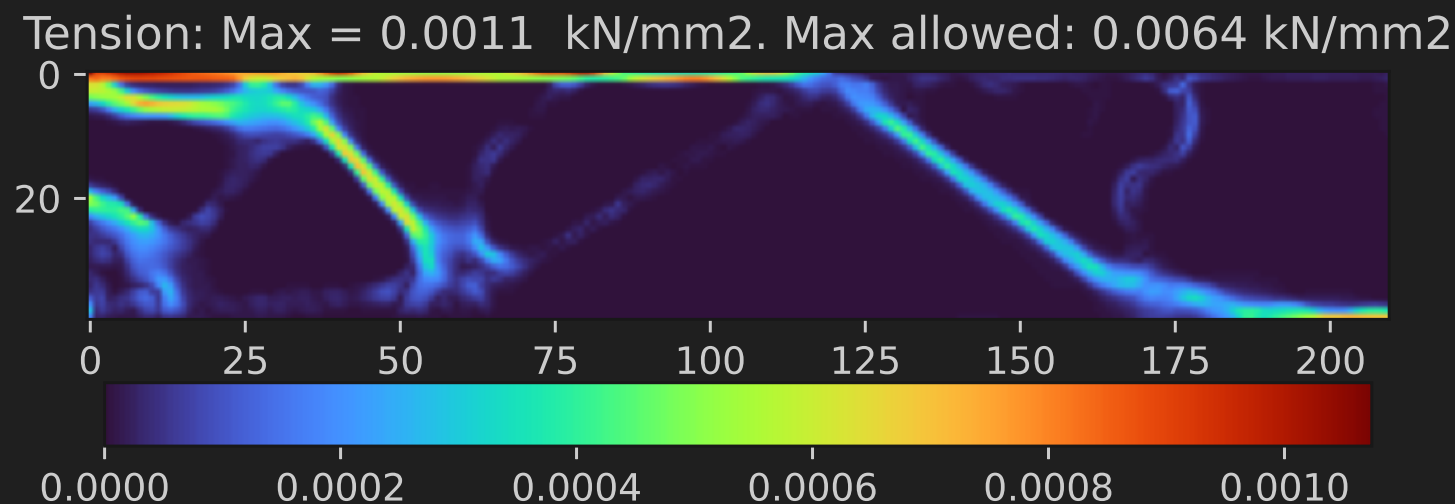
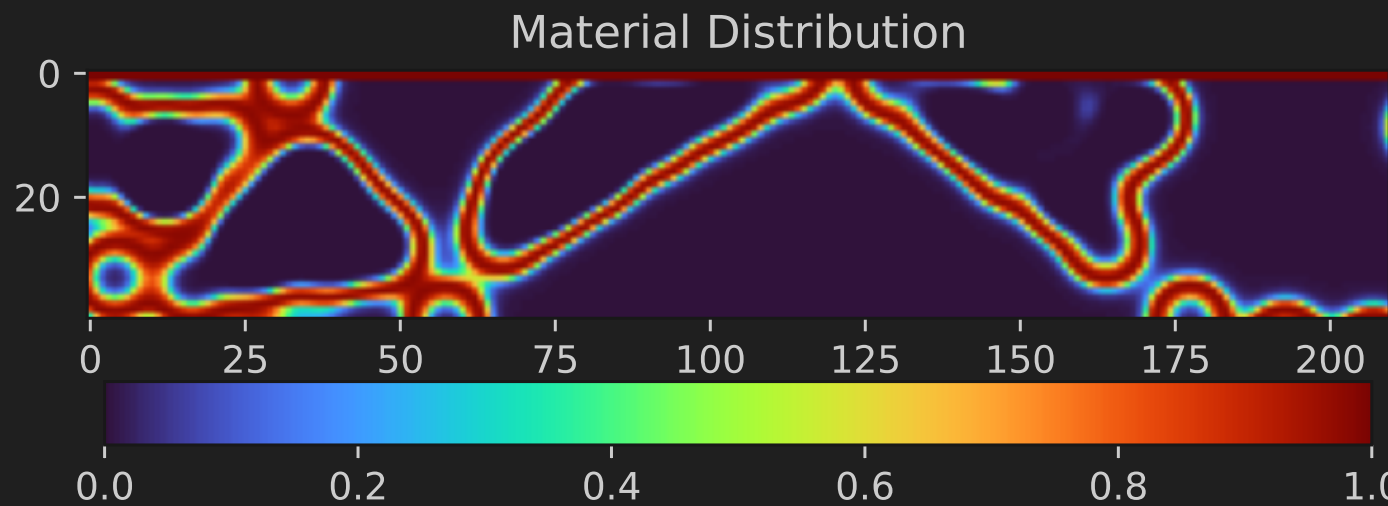
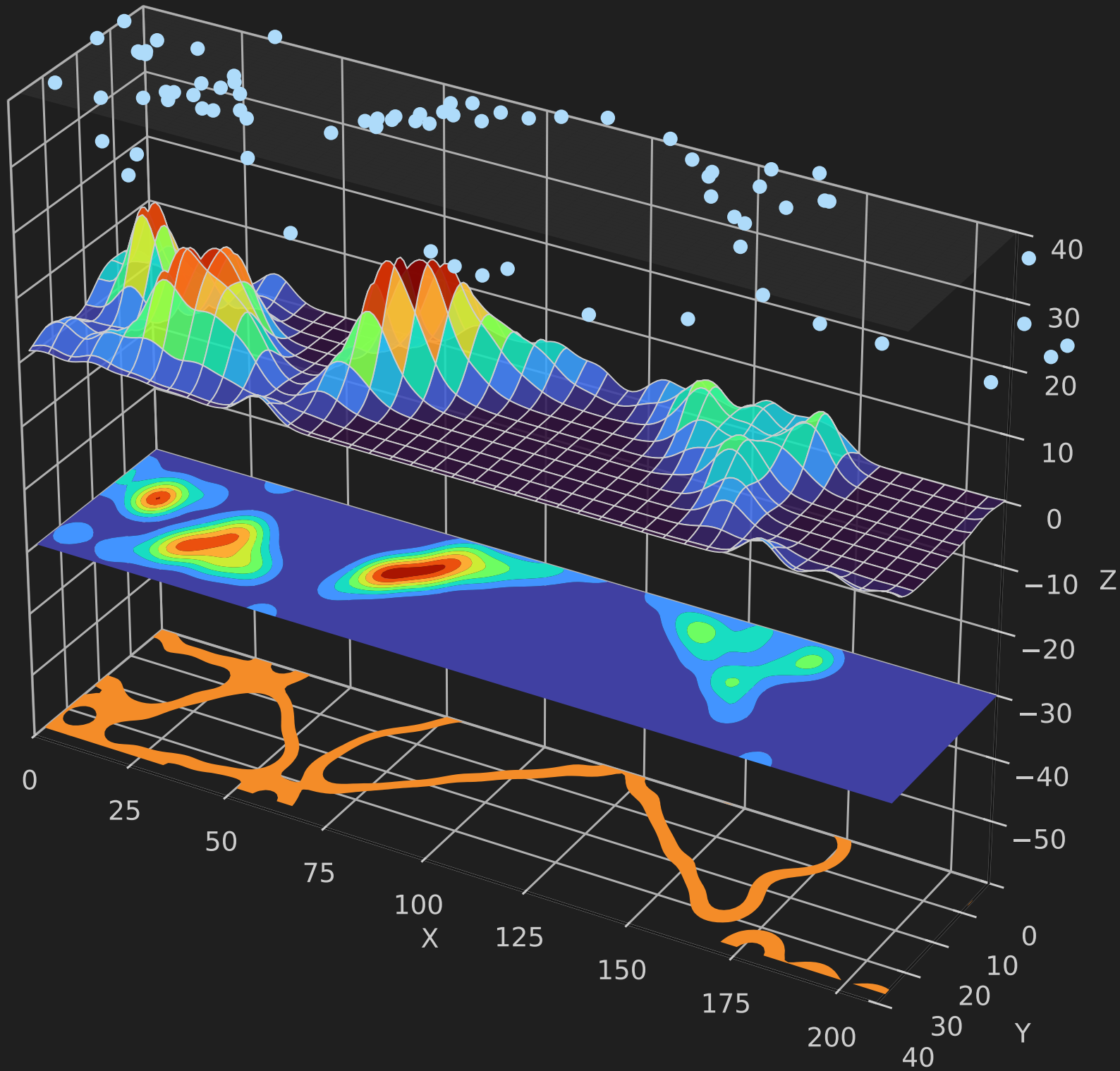
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.53 Shift = 2.06 Iteration = 110



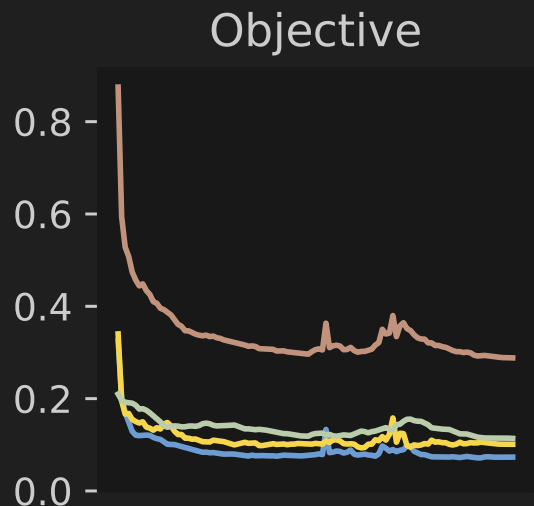
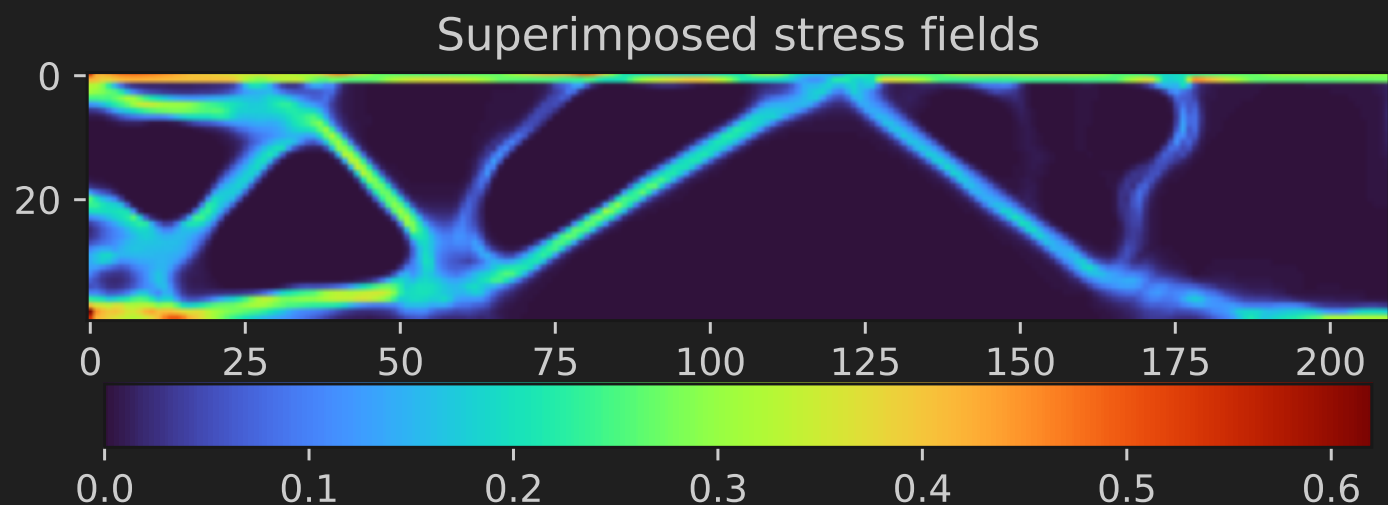
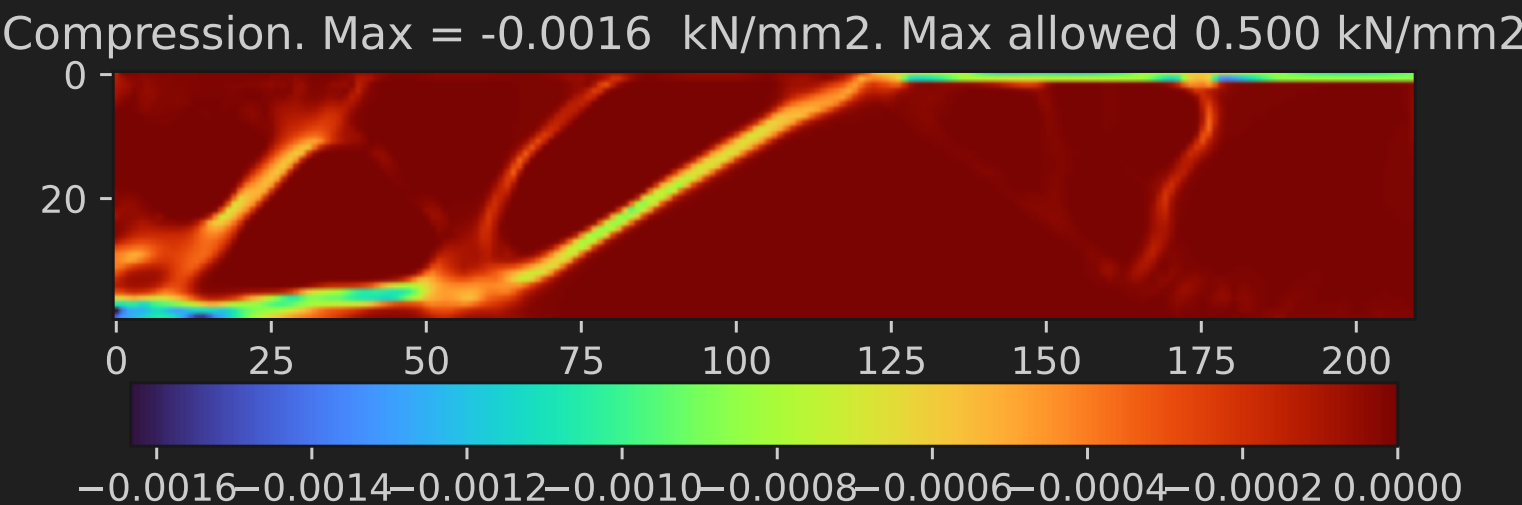
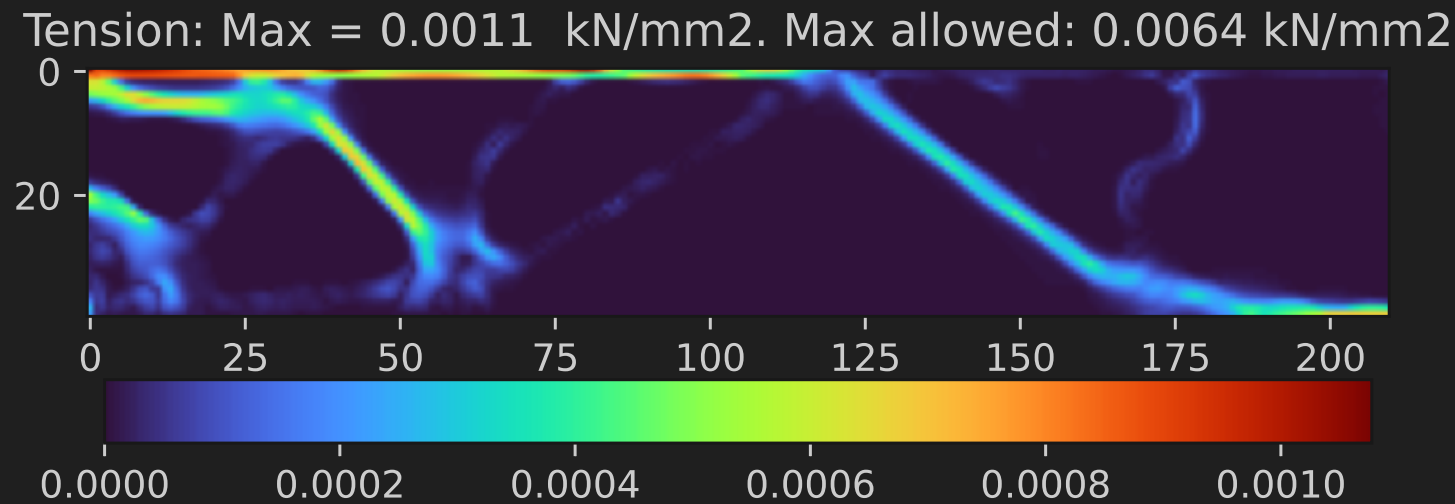
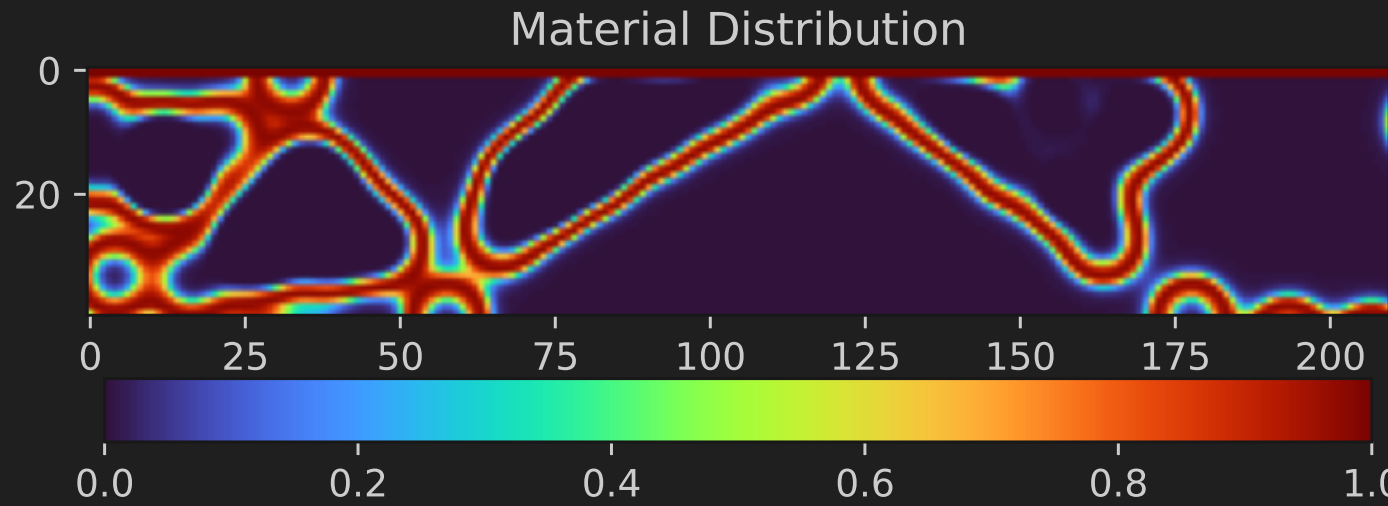
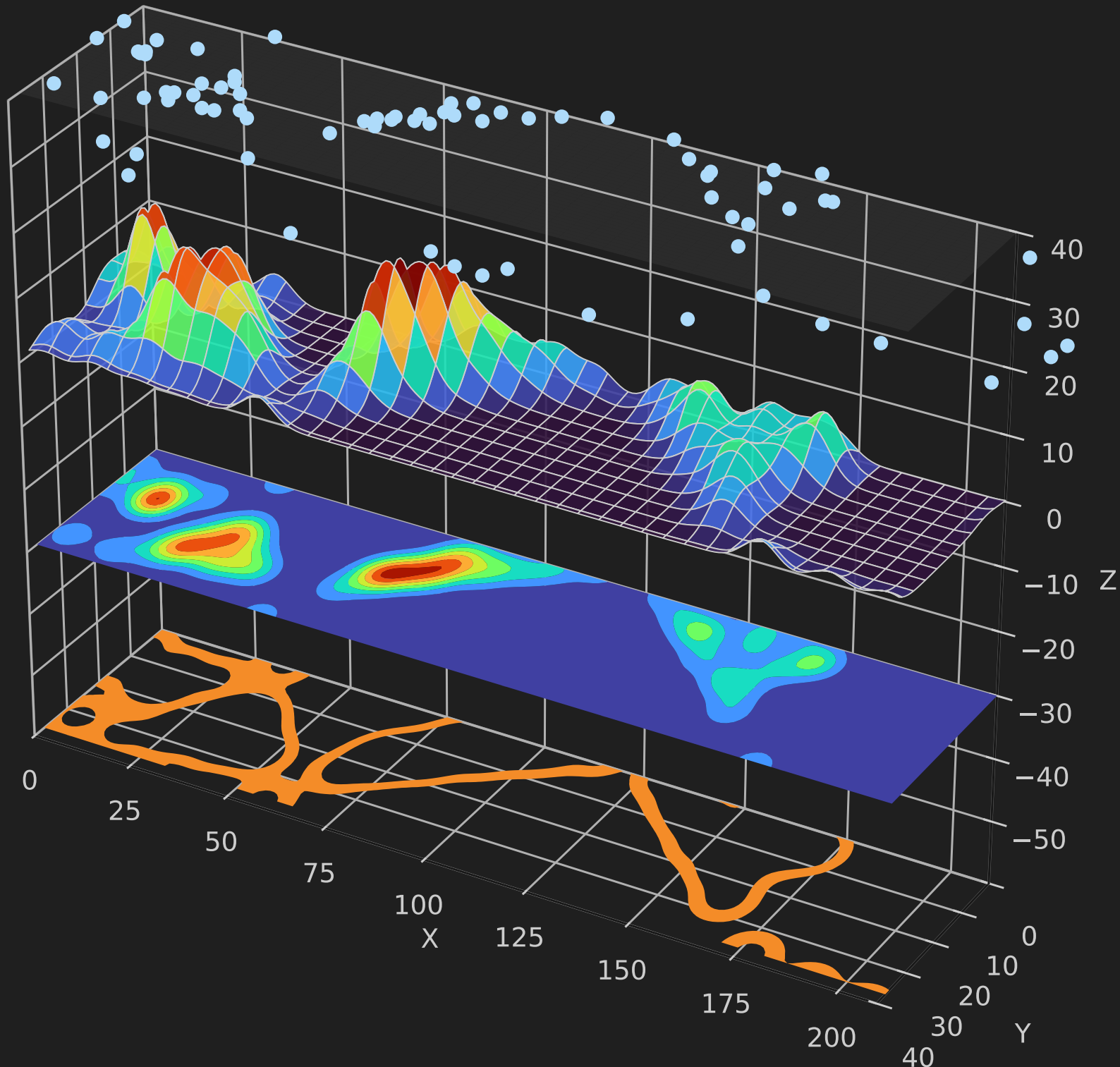
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.54 Shift = 2.05 Iteration = 111



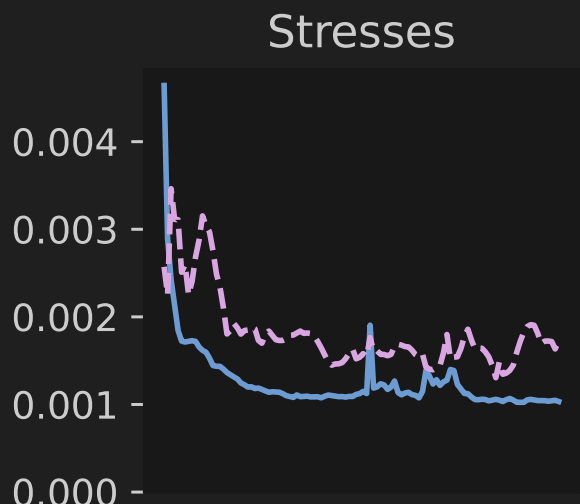
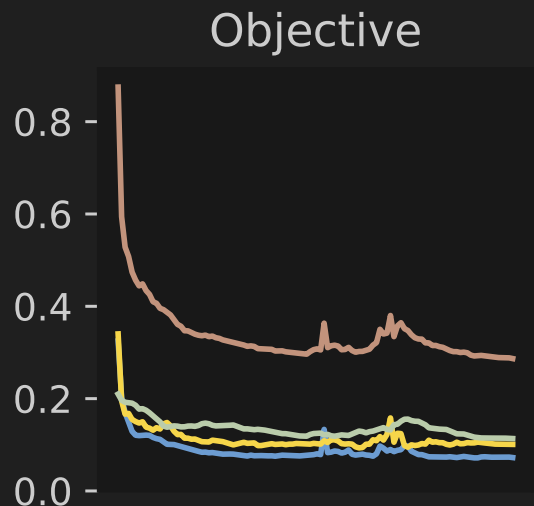
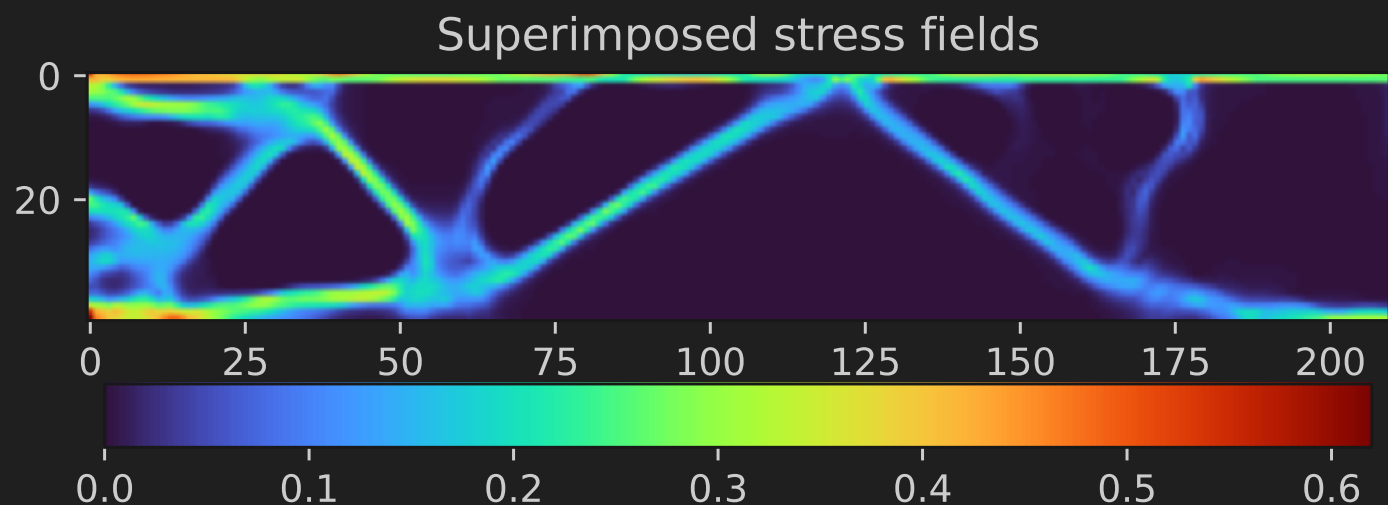
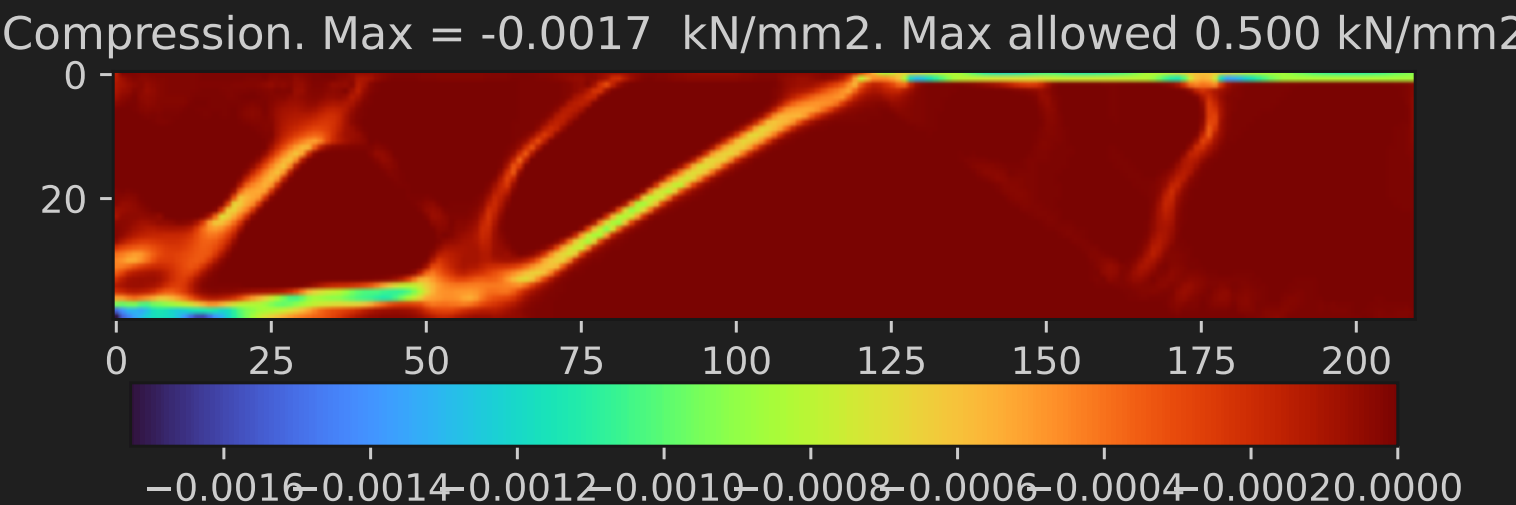
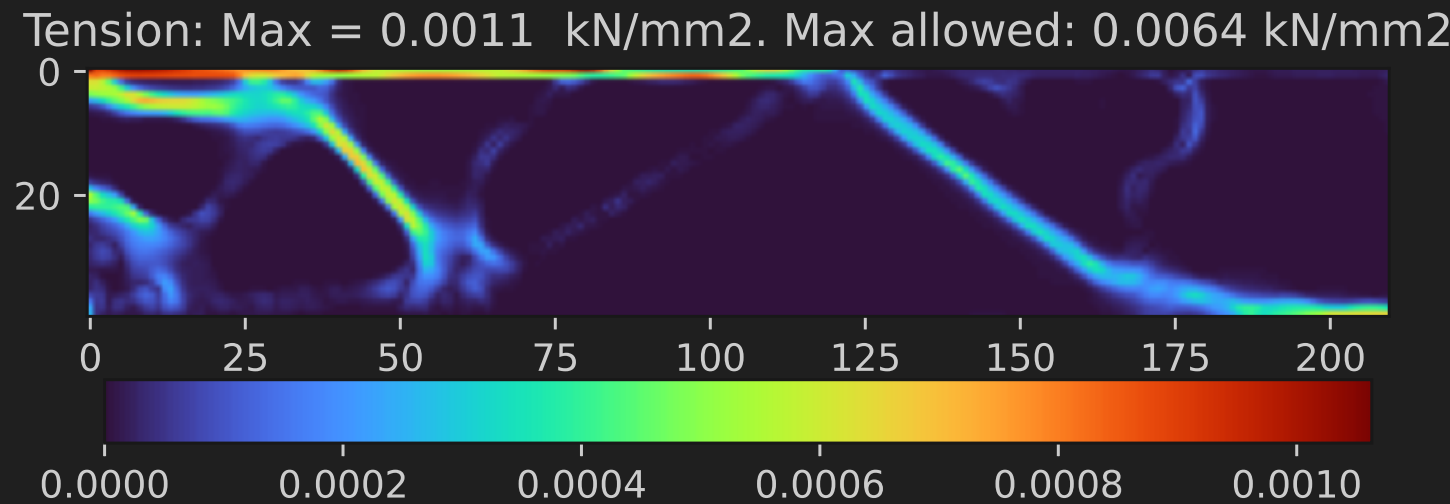
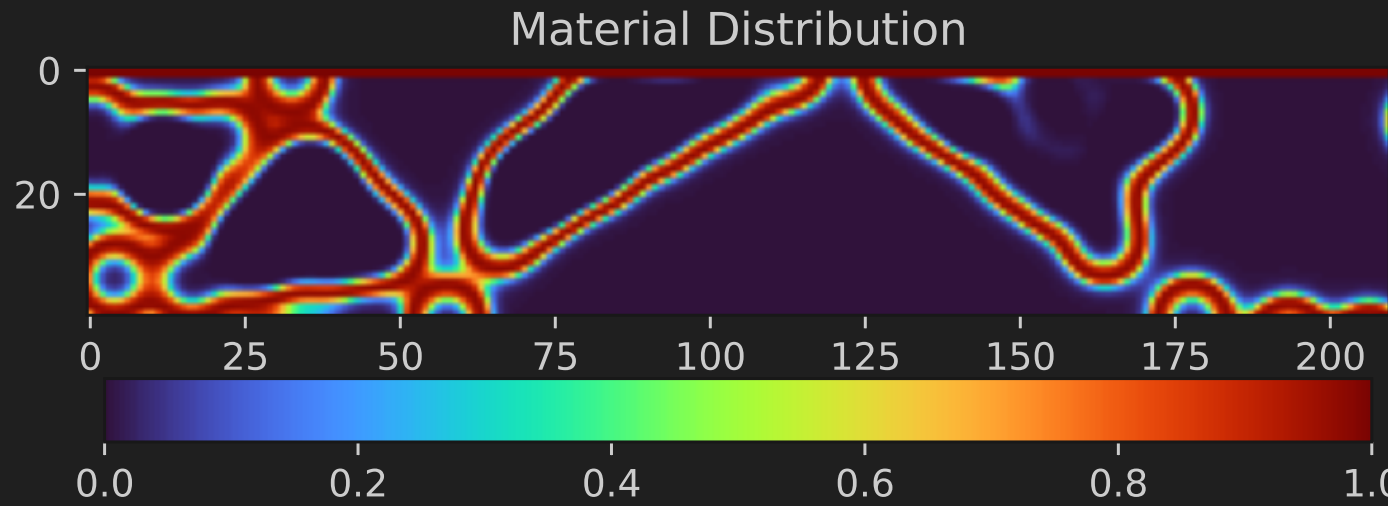
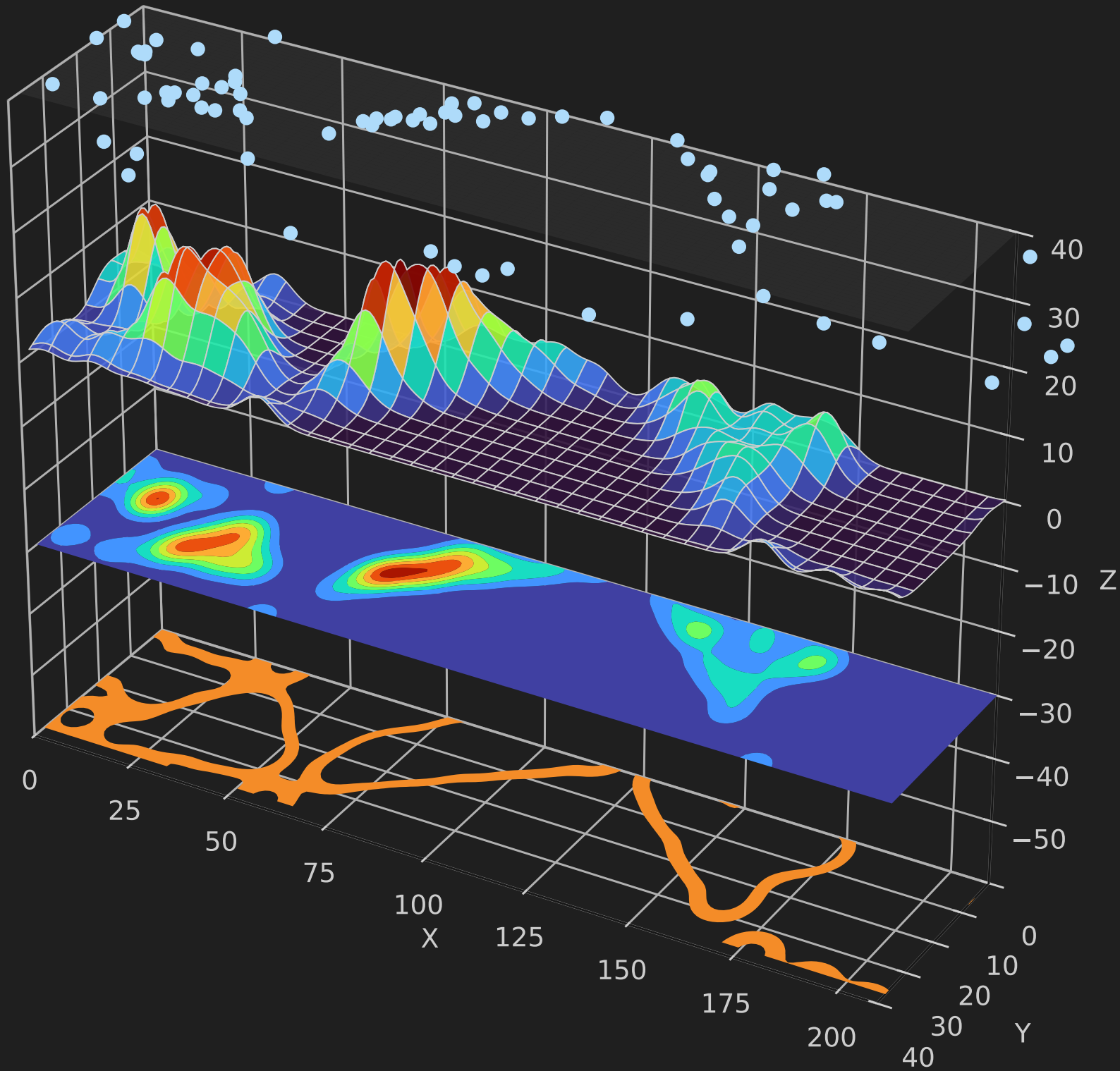
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.54 Shift = 2.04 Iteration = 112



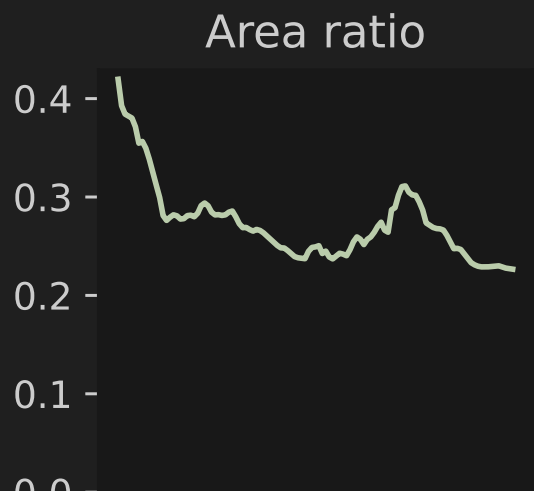
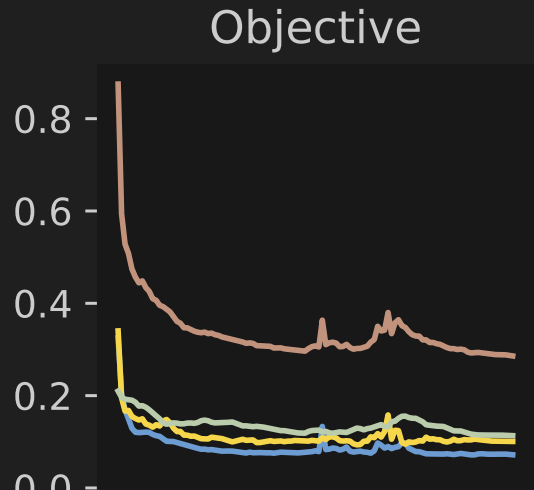
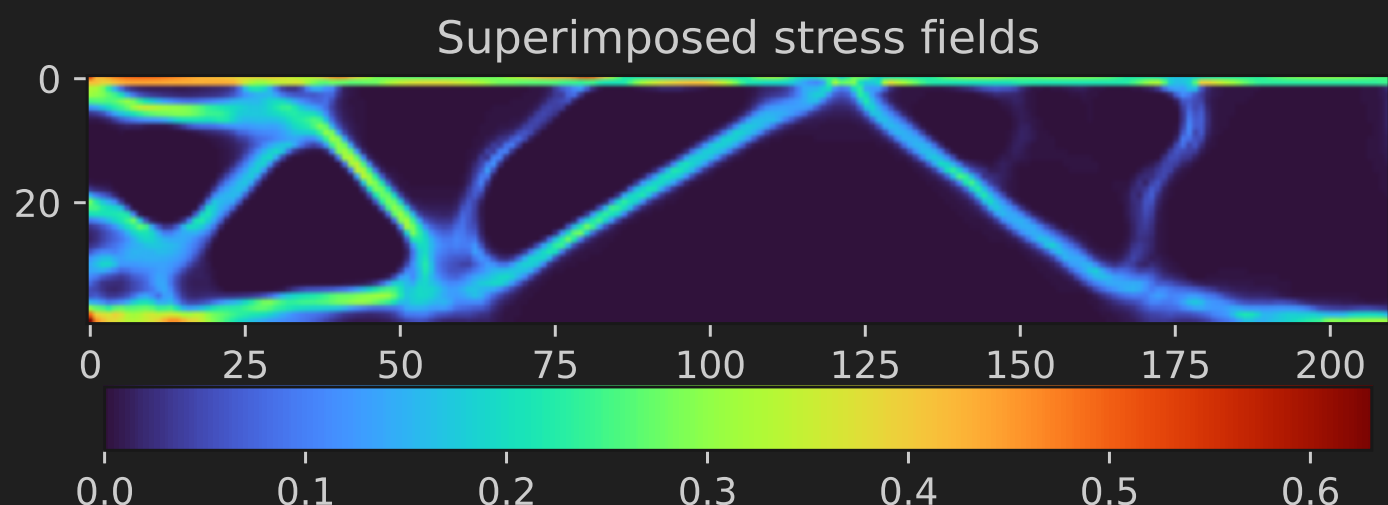
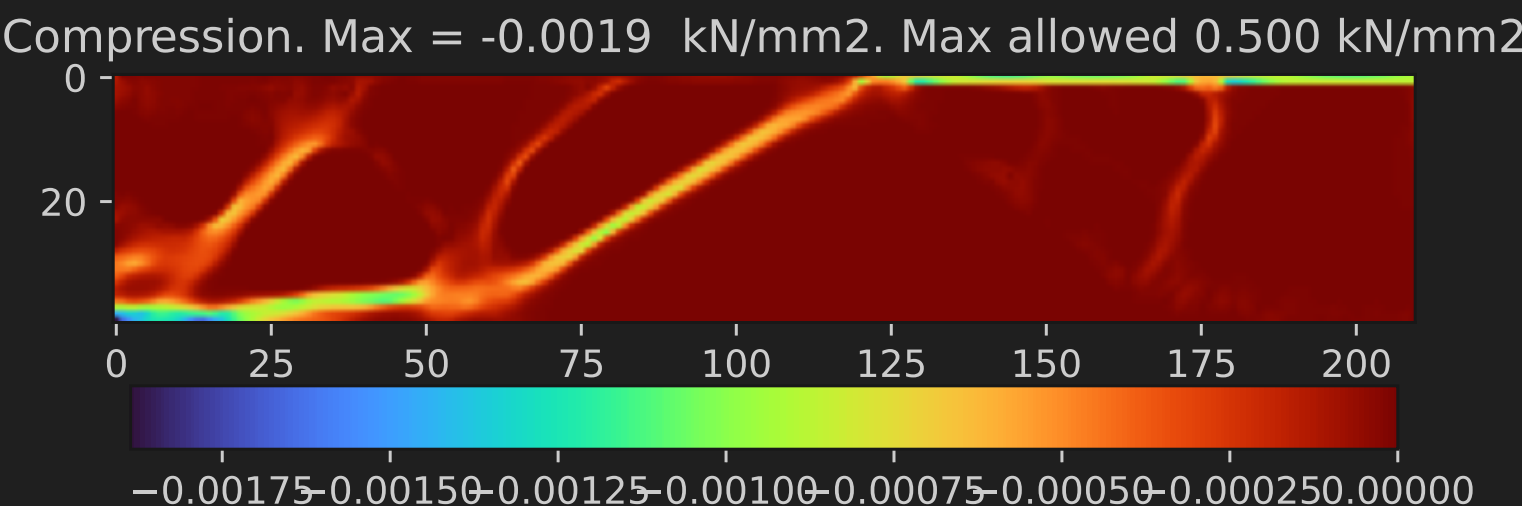
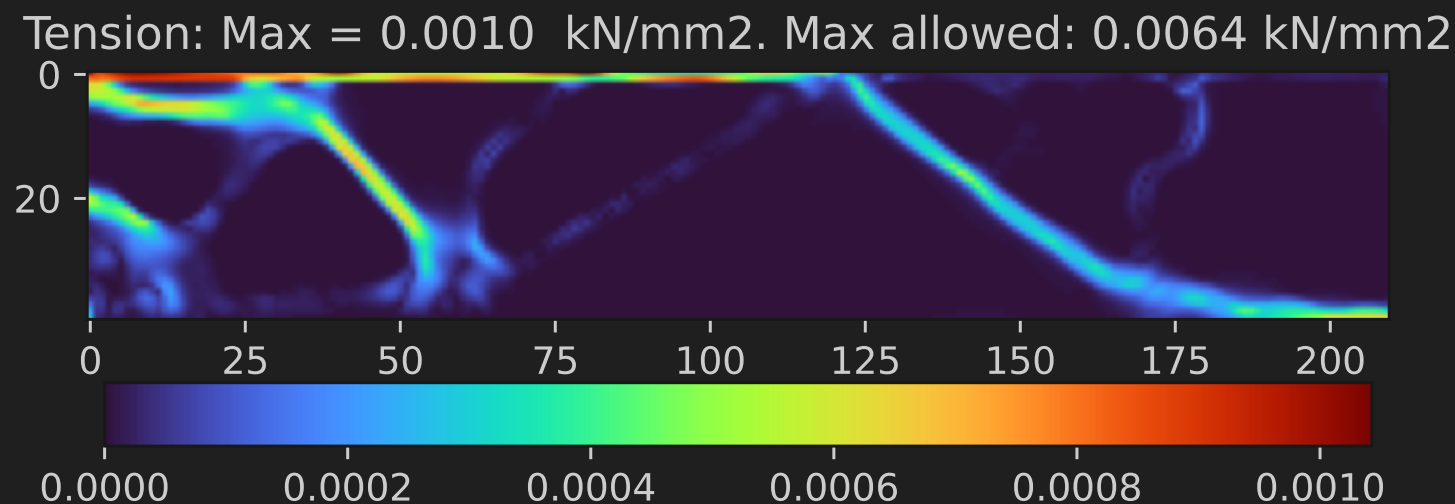
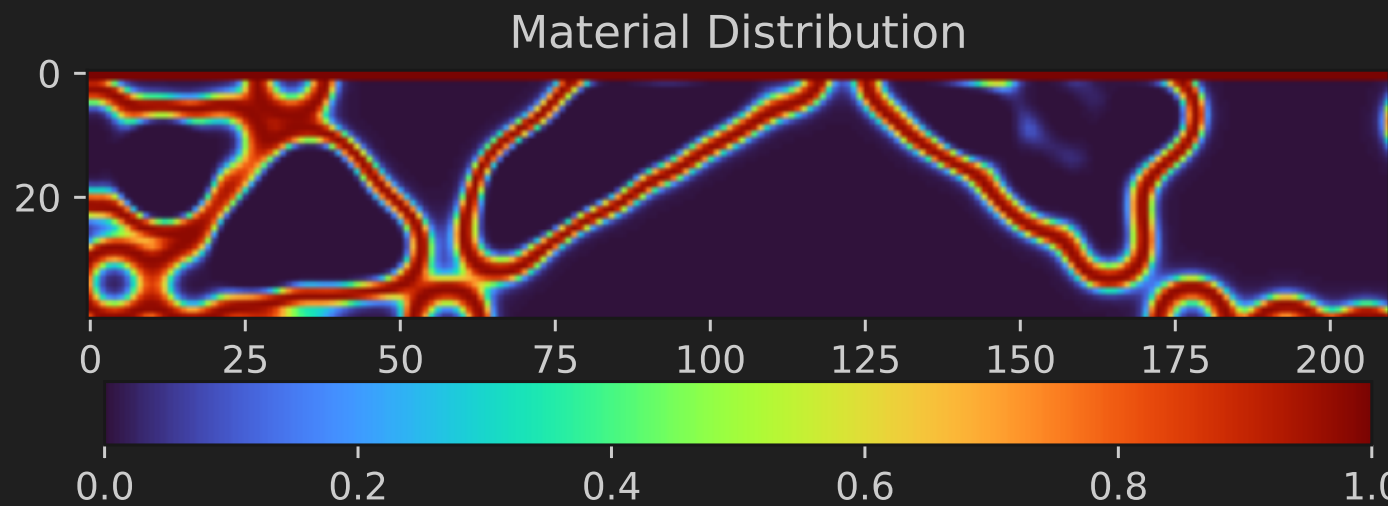
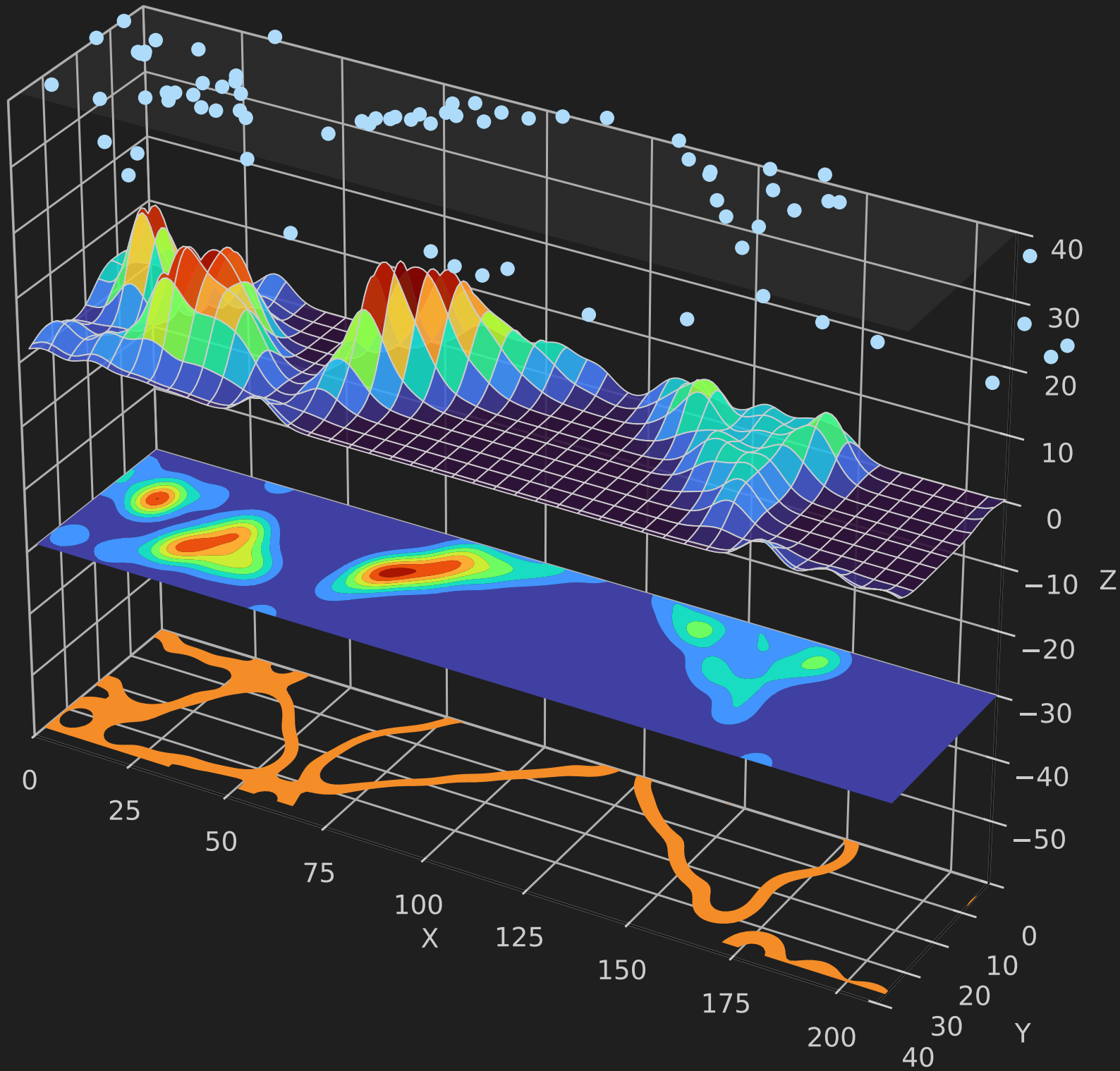
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.53 Shift = 2.03 Iteration = 113



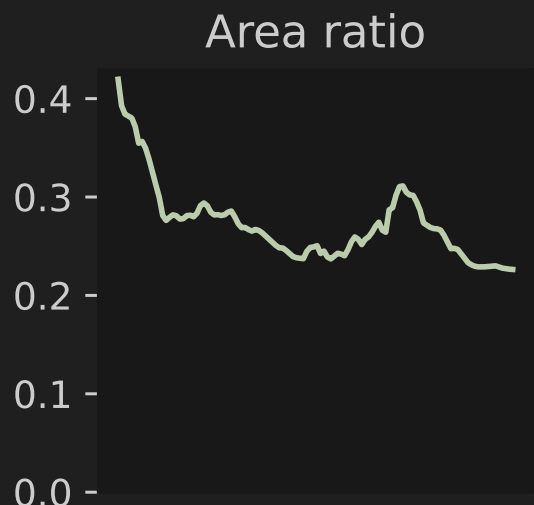
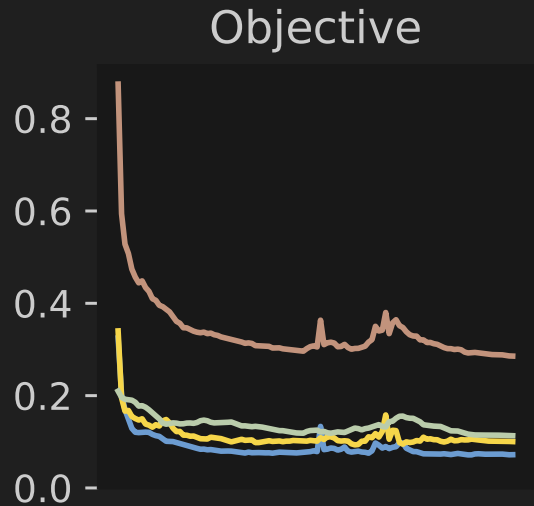
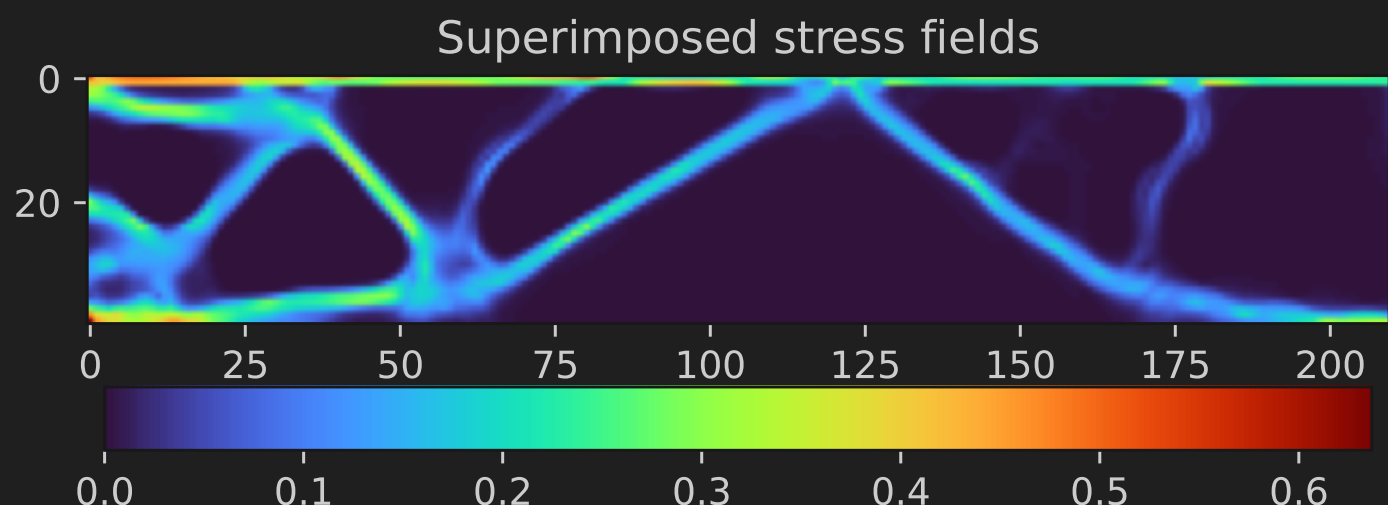
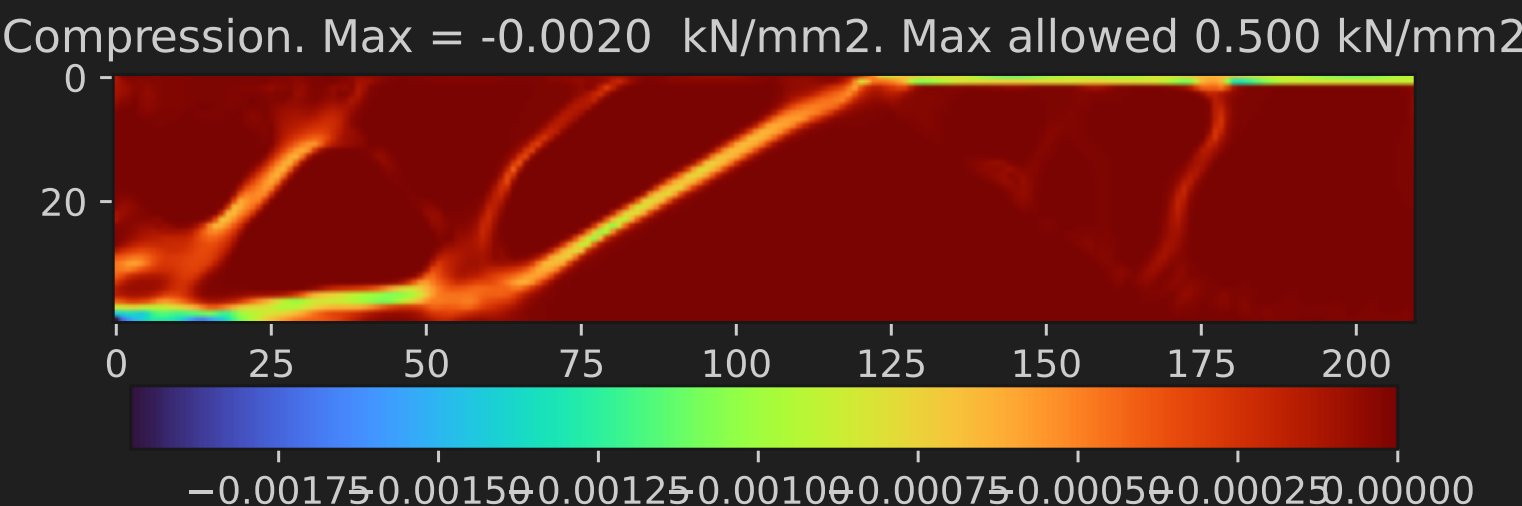
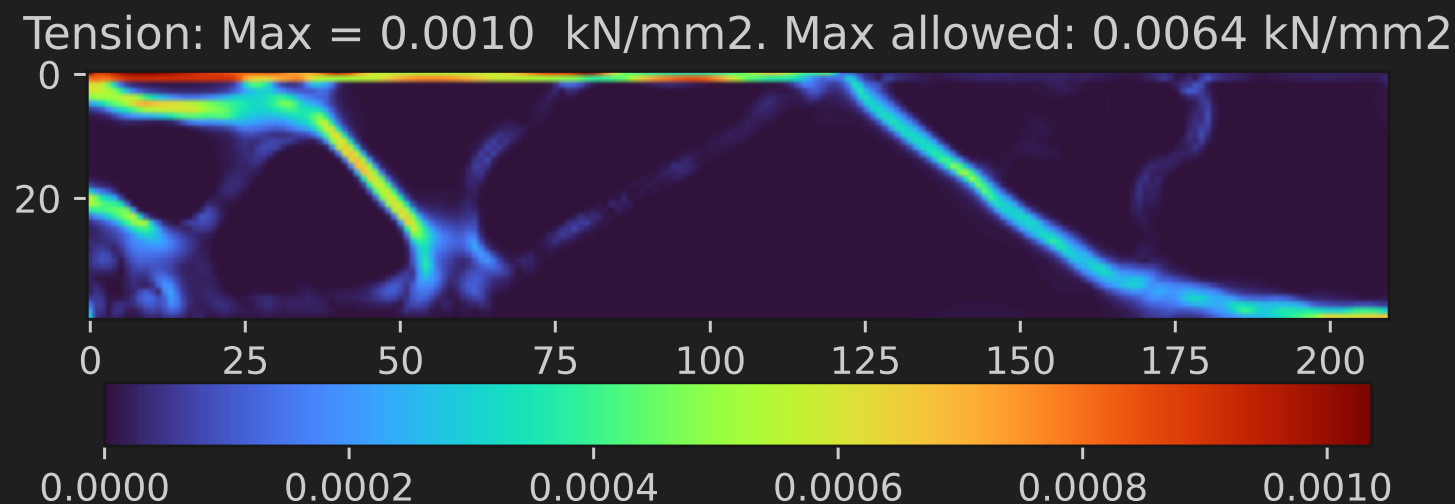
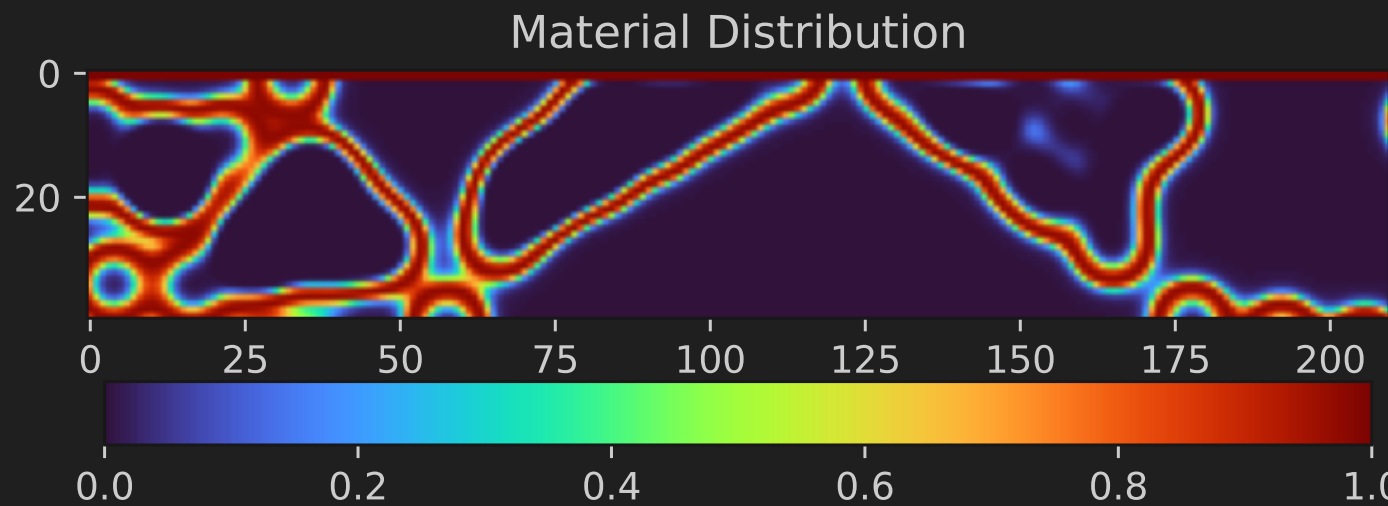
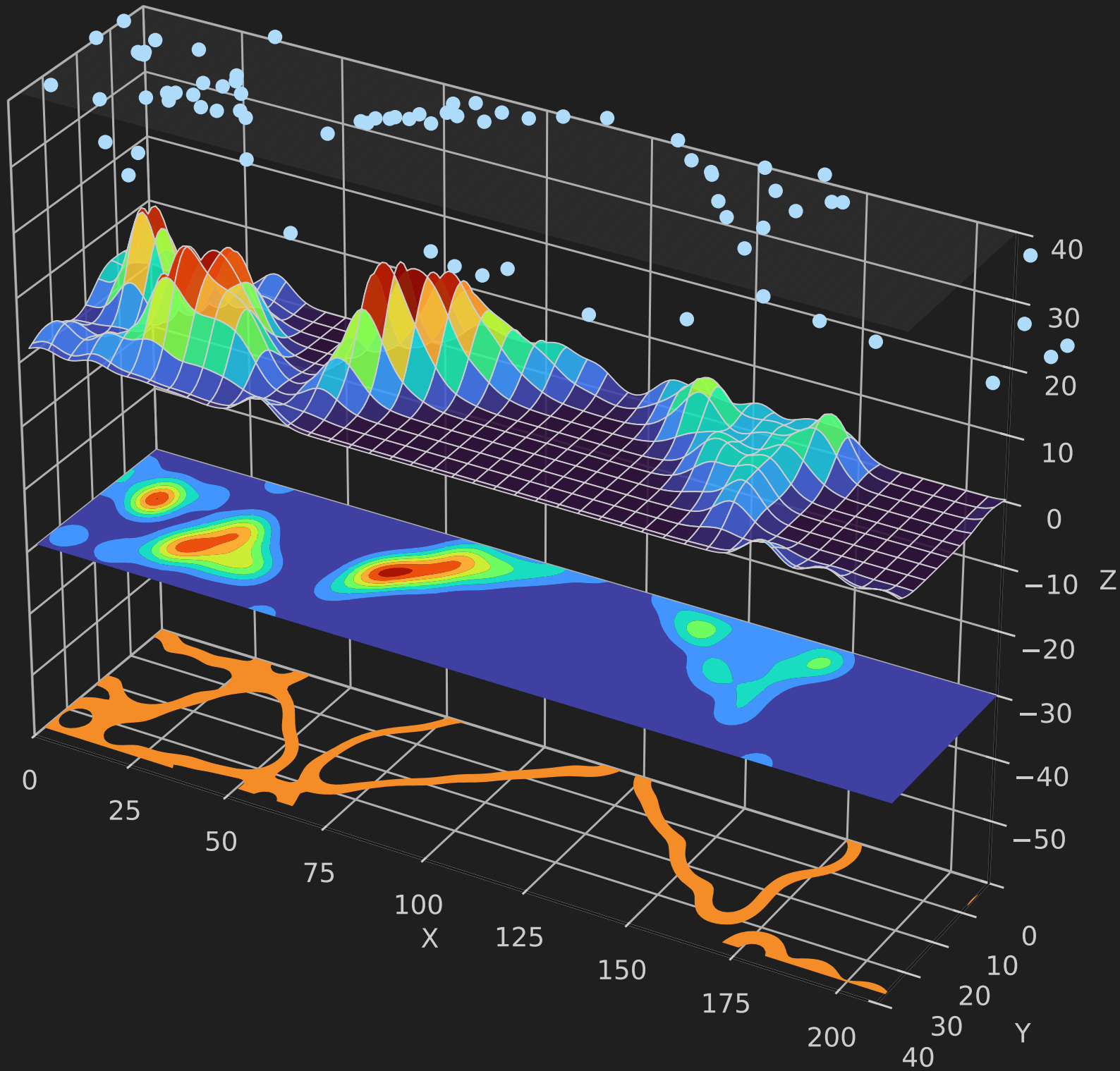
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.52 Shift = 2.02 Iteration = 114



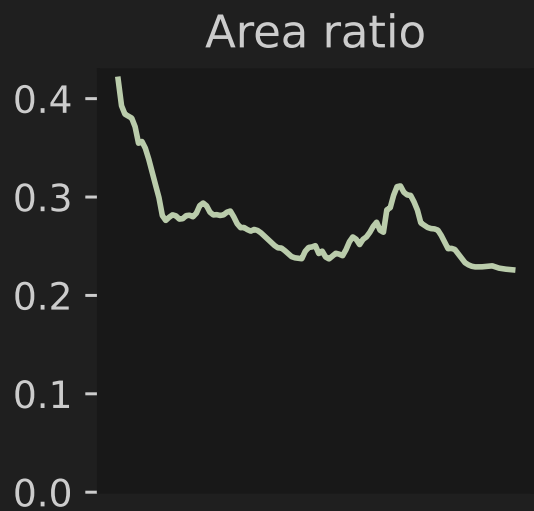
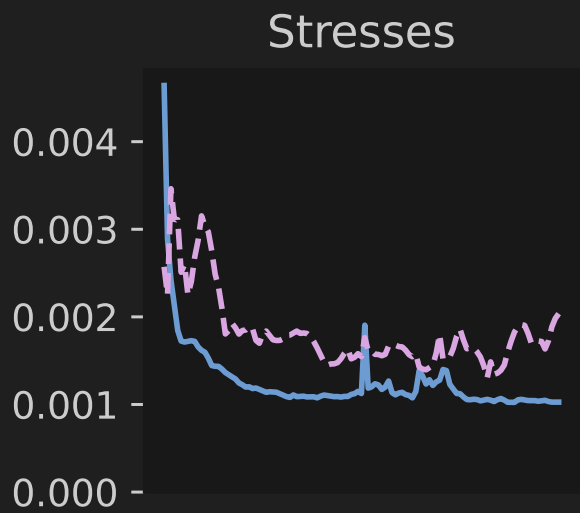
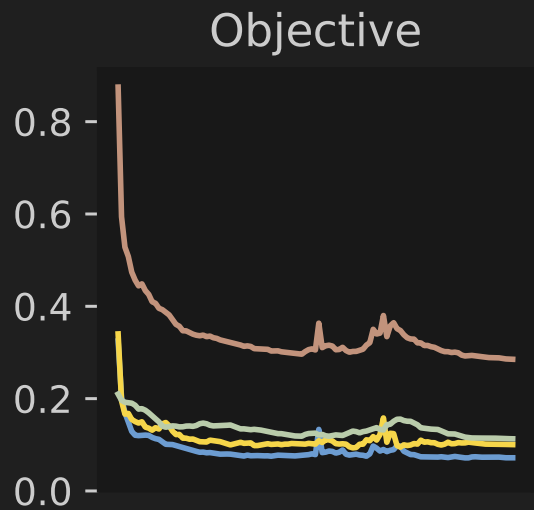
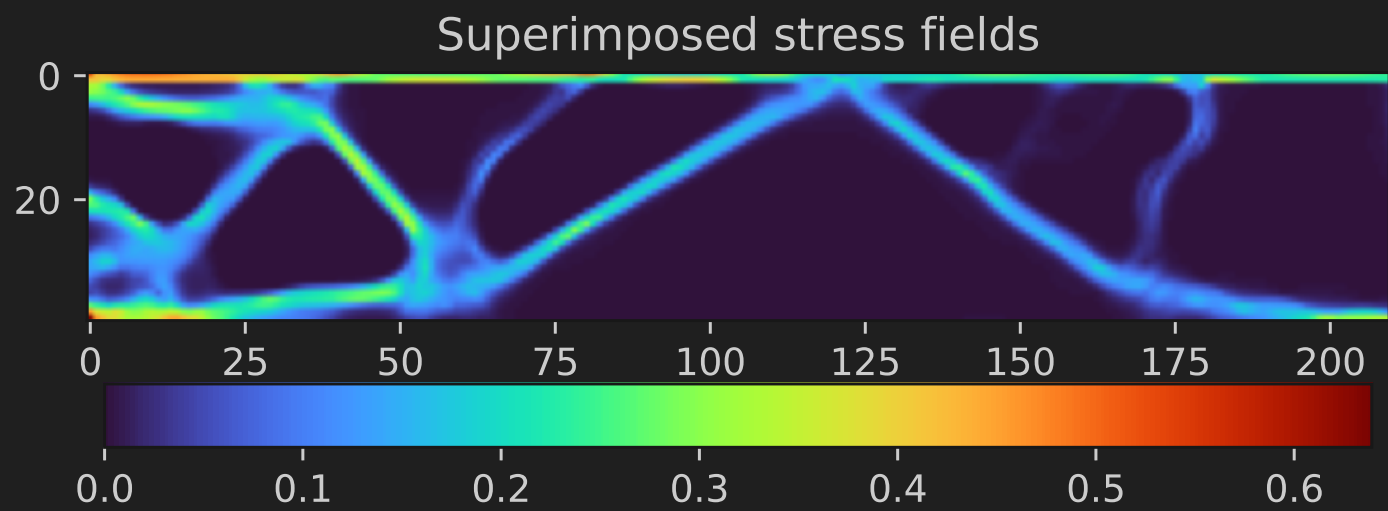
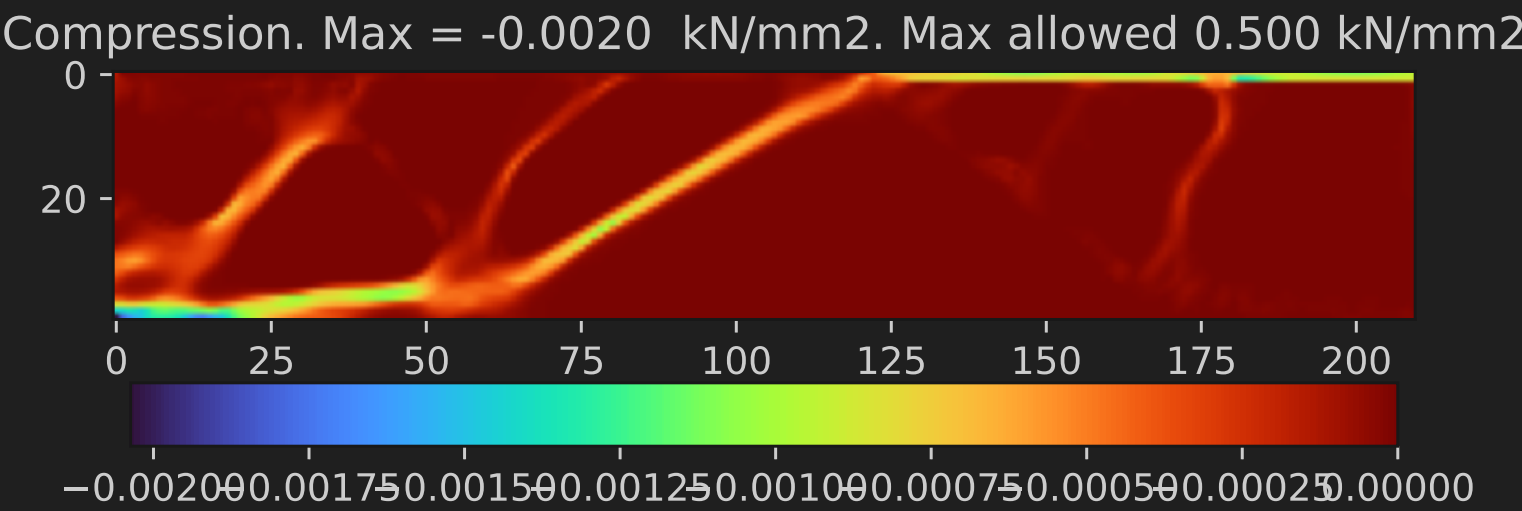
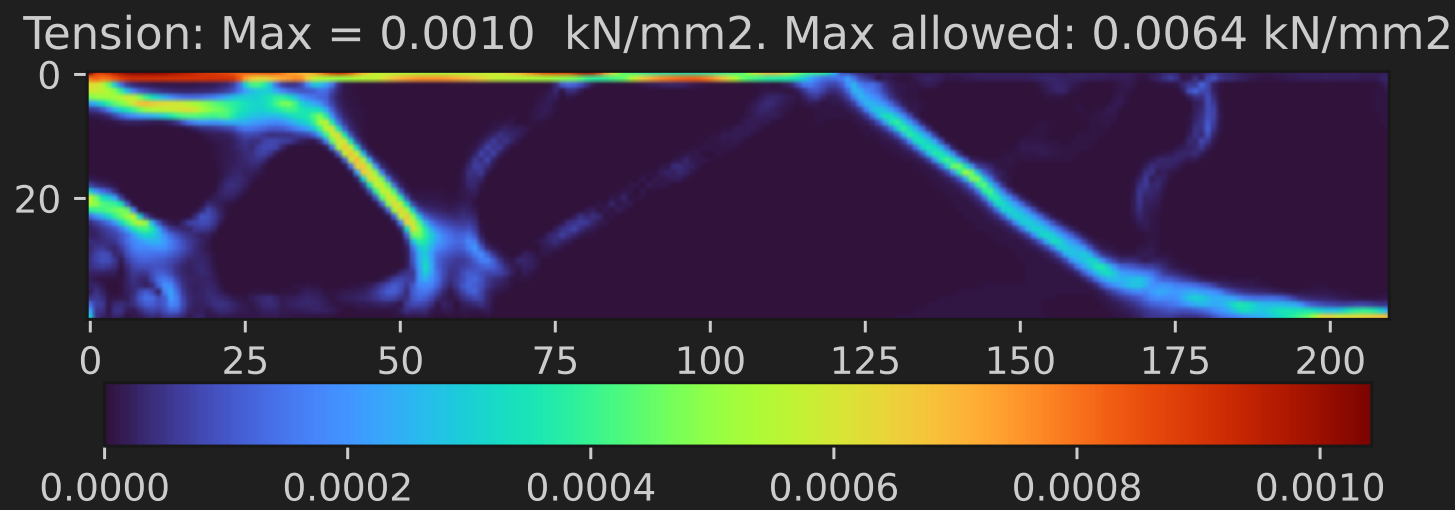
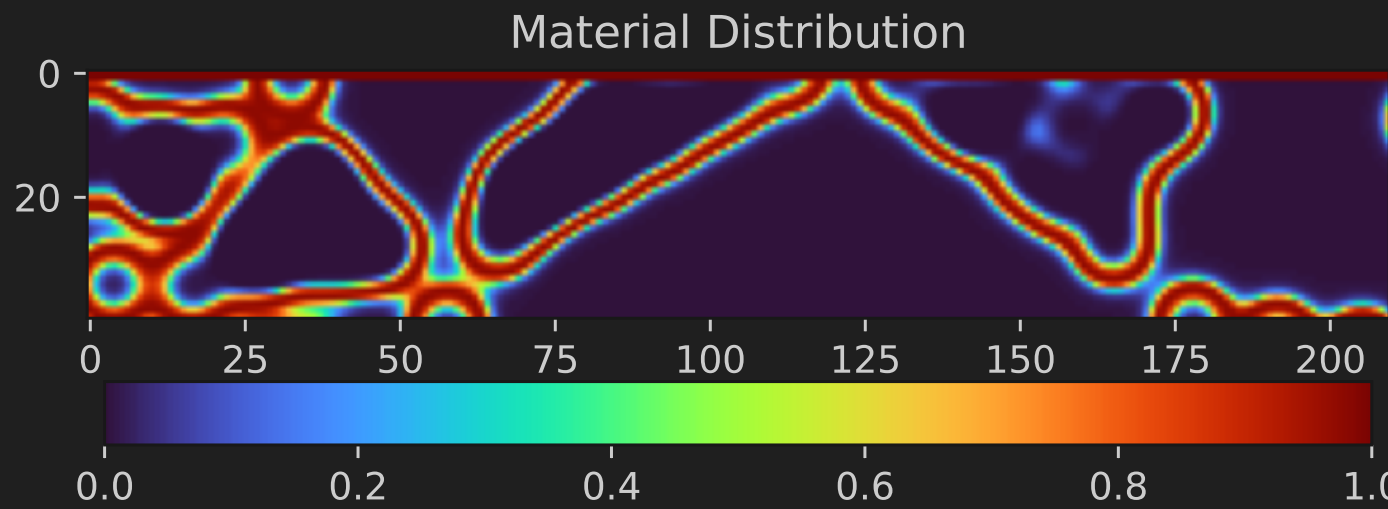
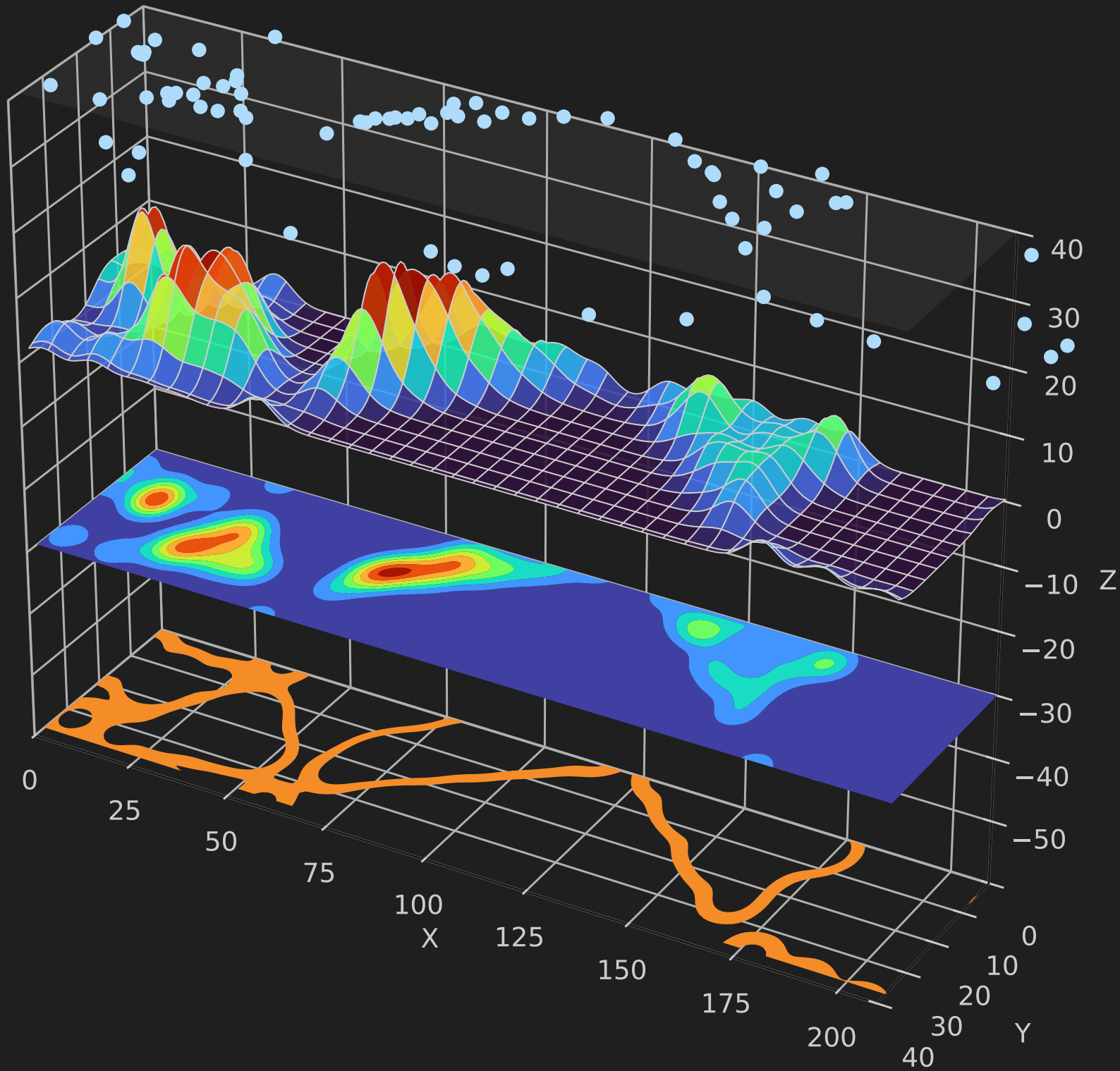
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.52 Shift = 2.01 Iteration = 115



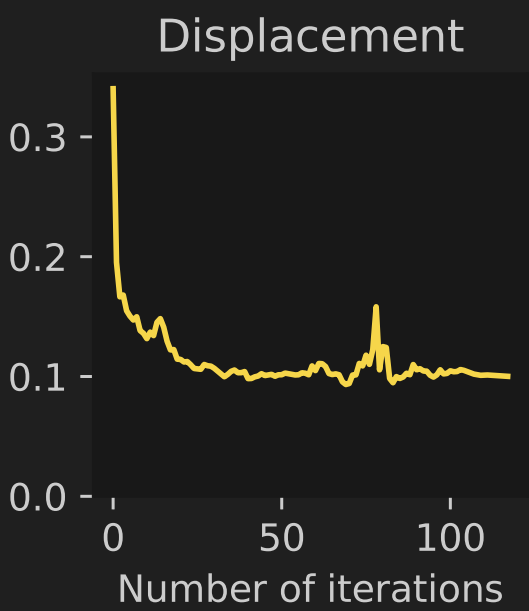
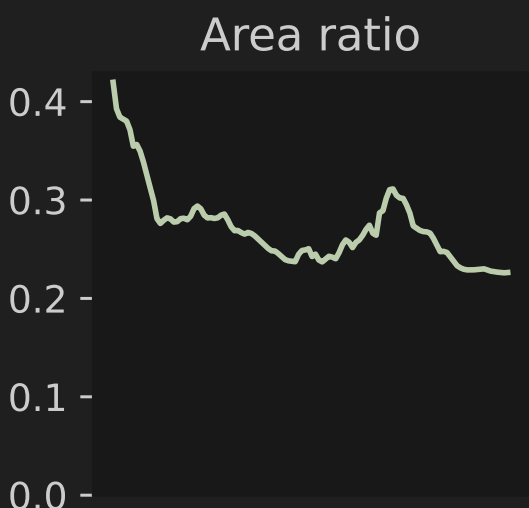
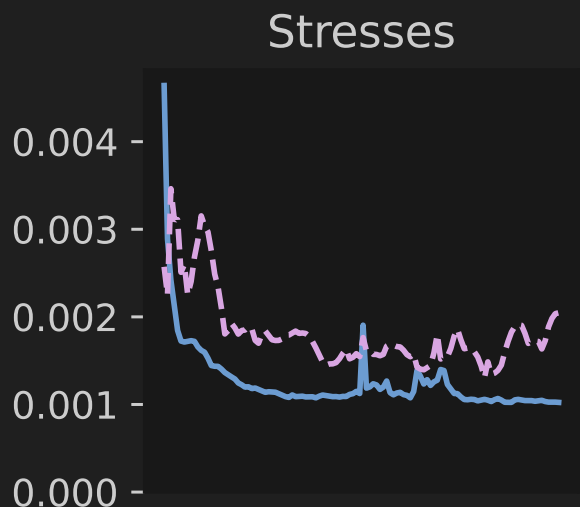
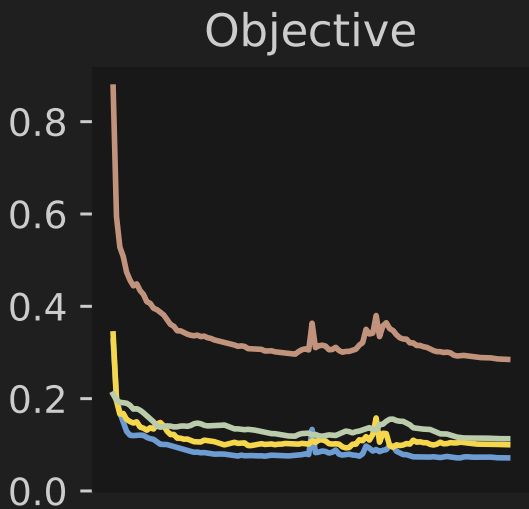
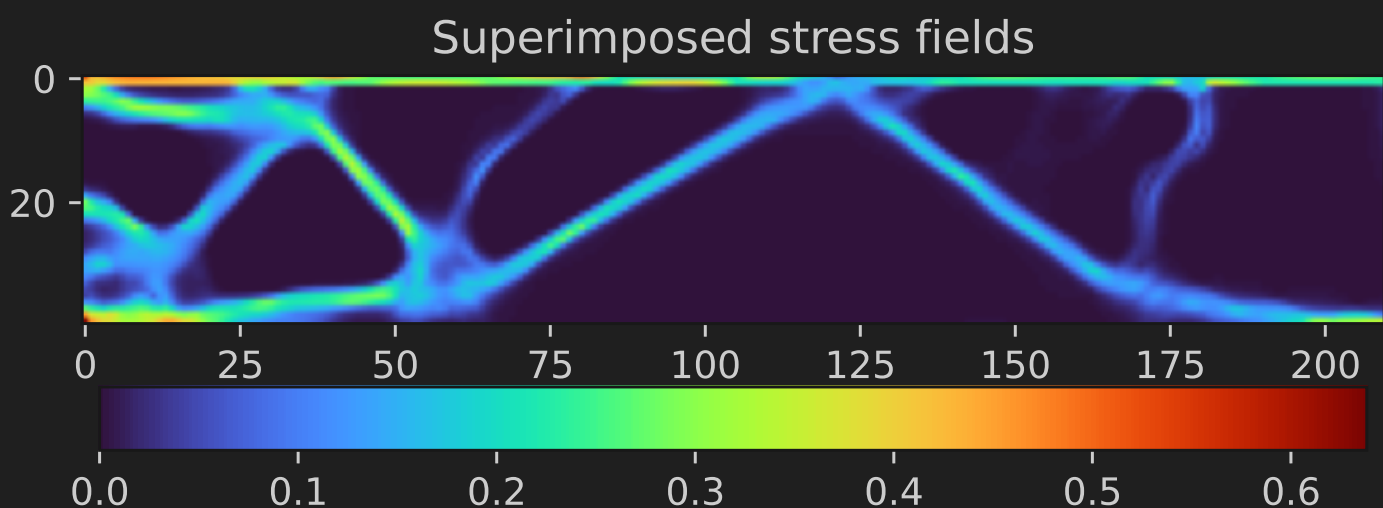
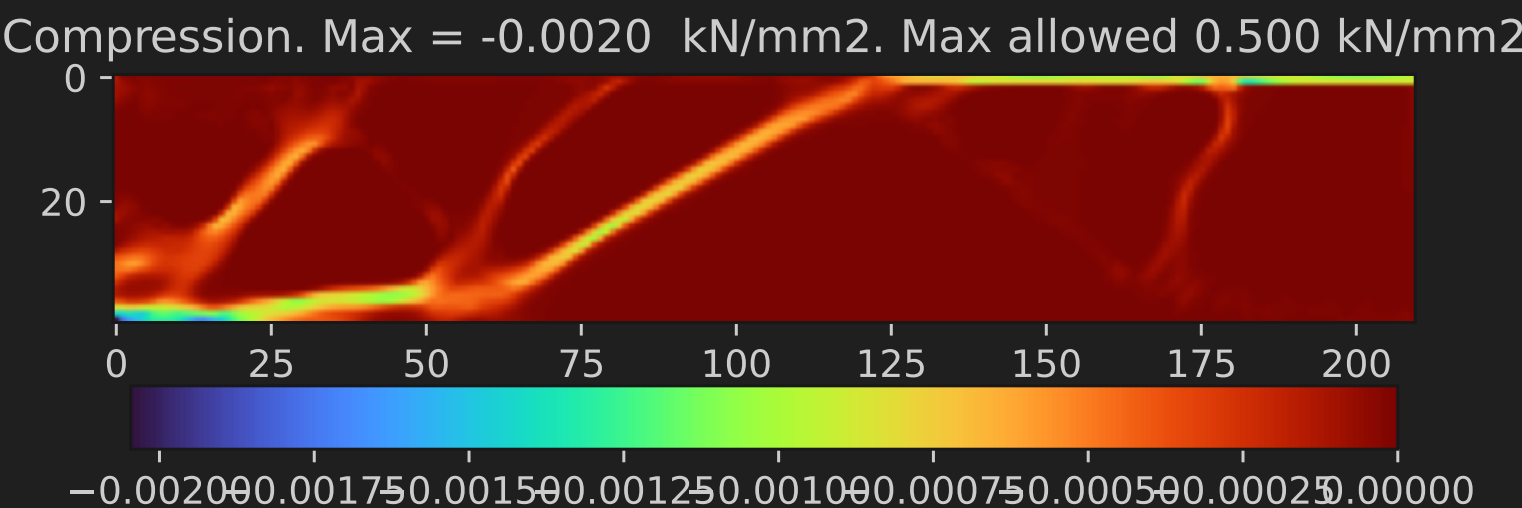
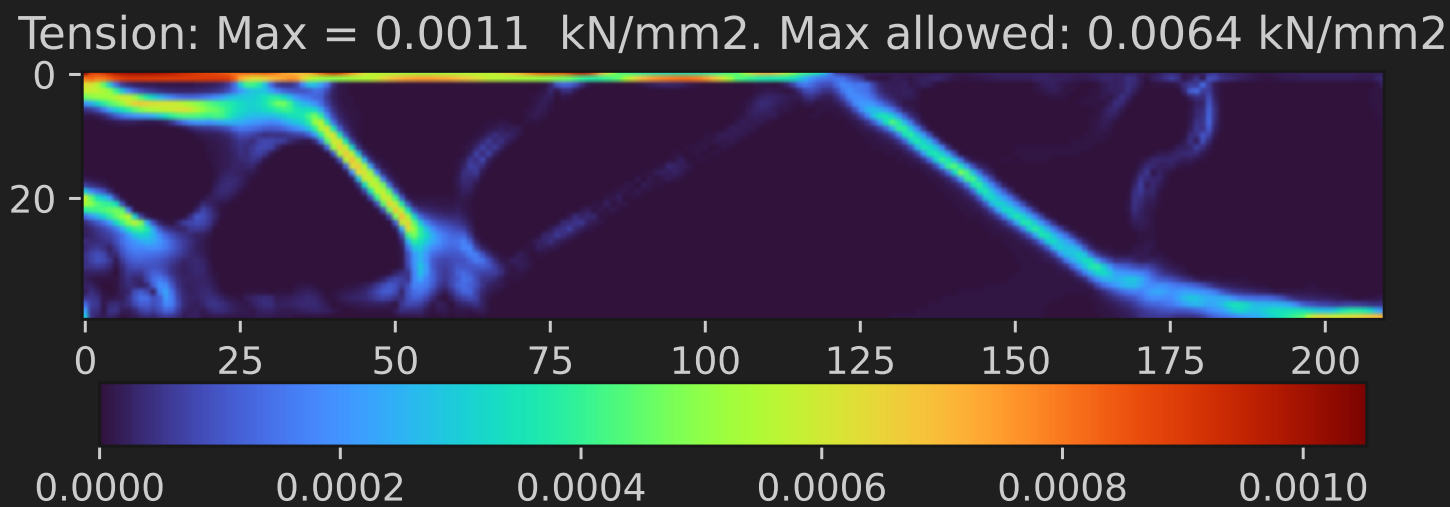
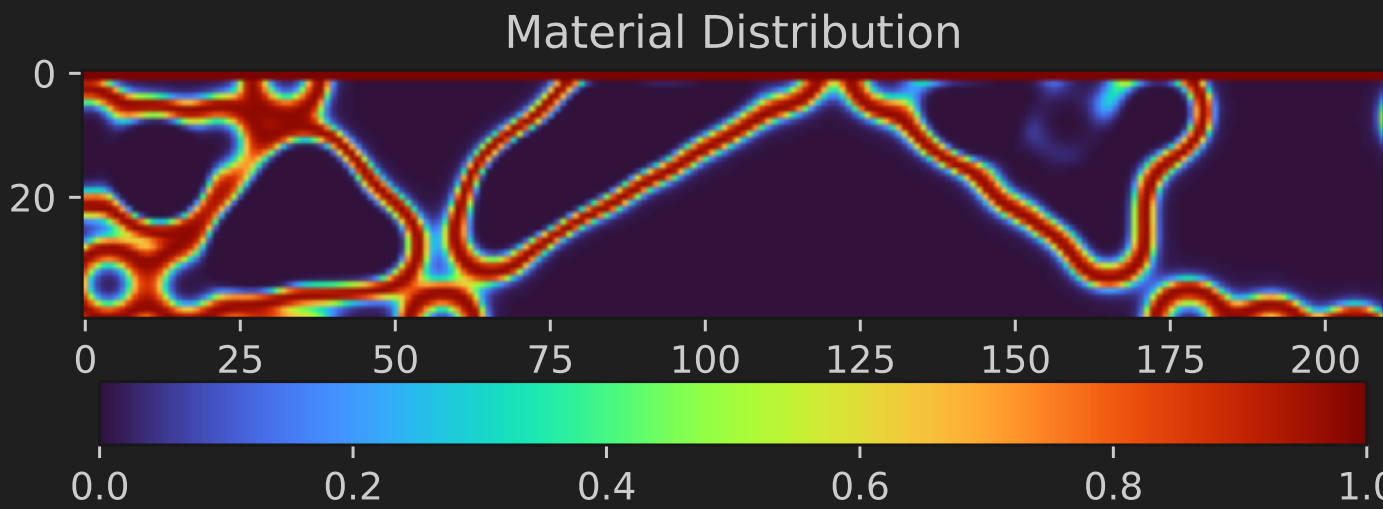
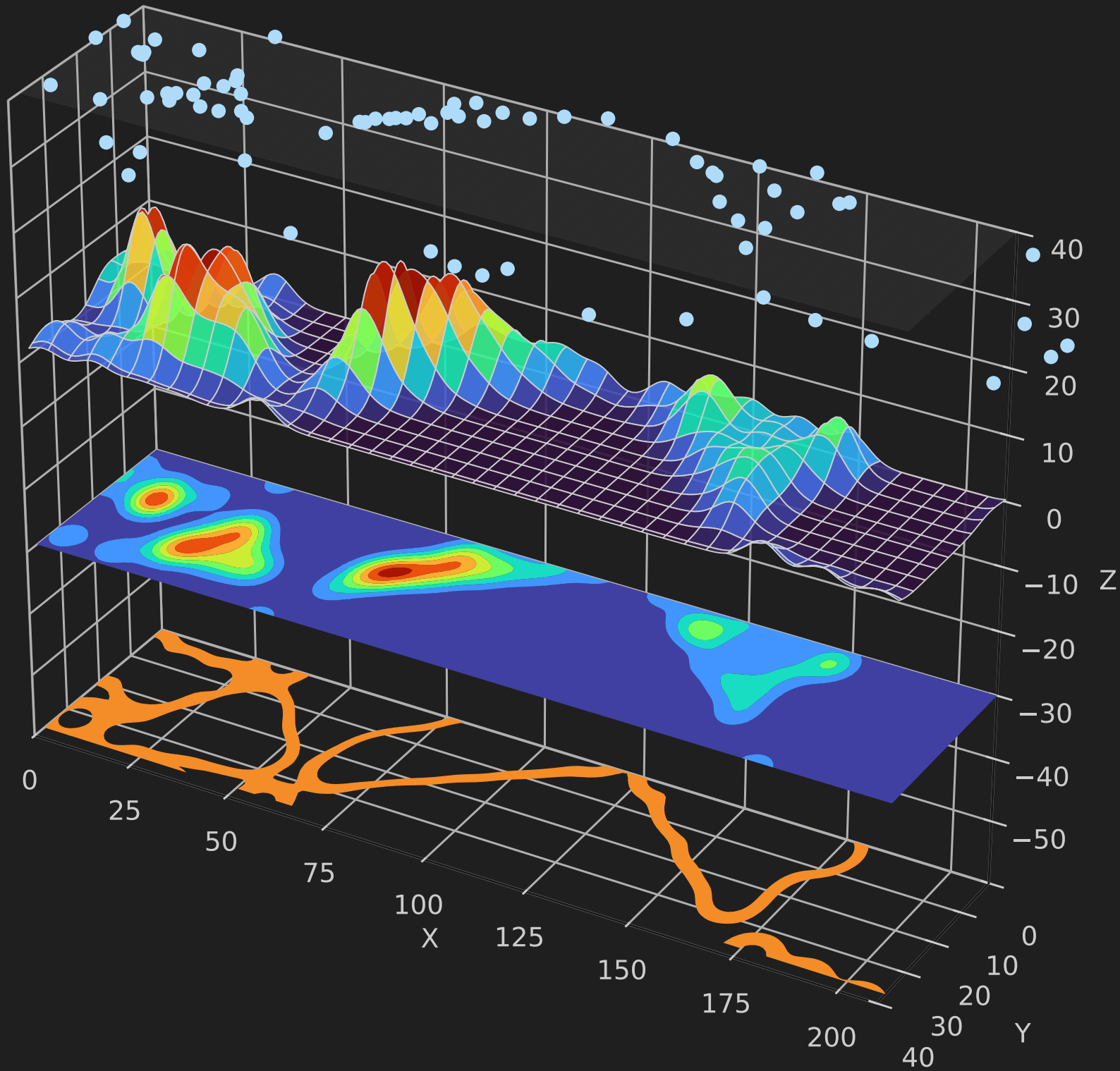
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.52 Shift = 2.00 Iteration = 116



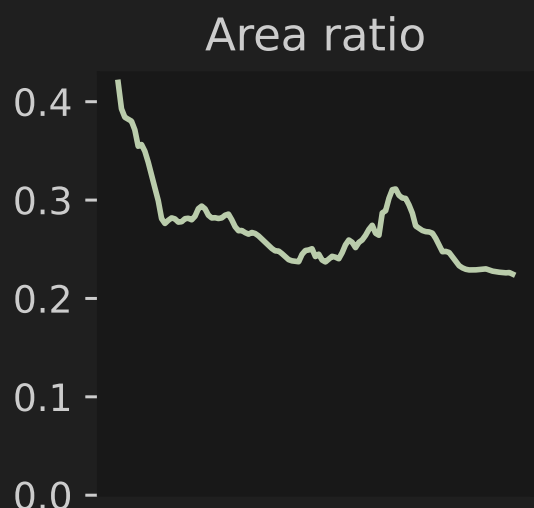
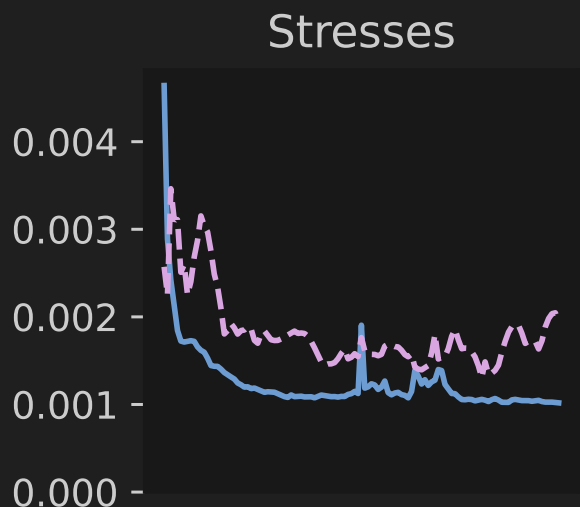
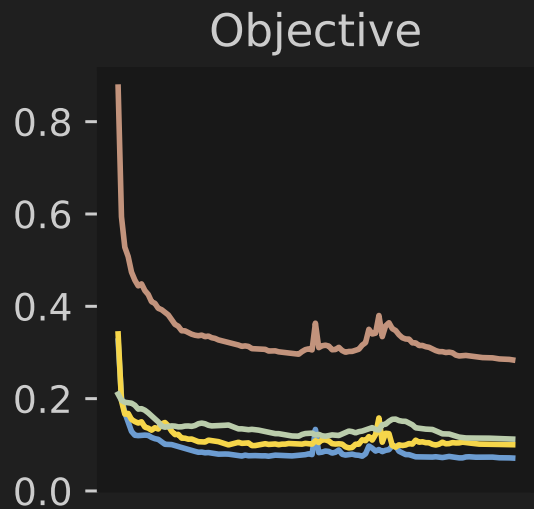
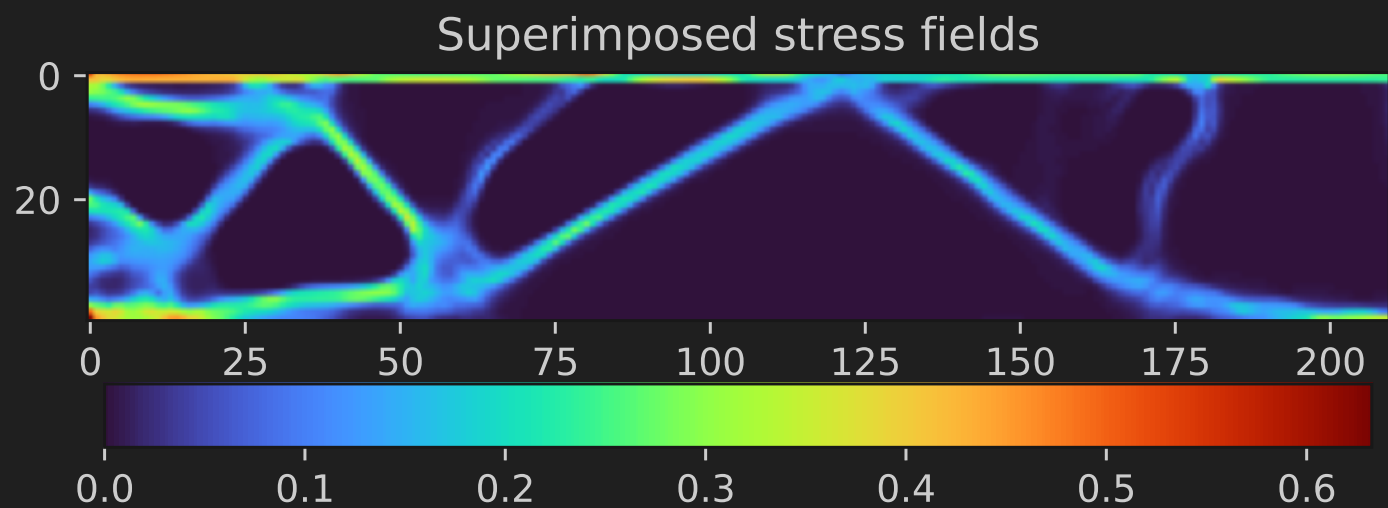
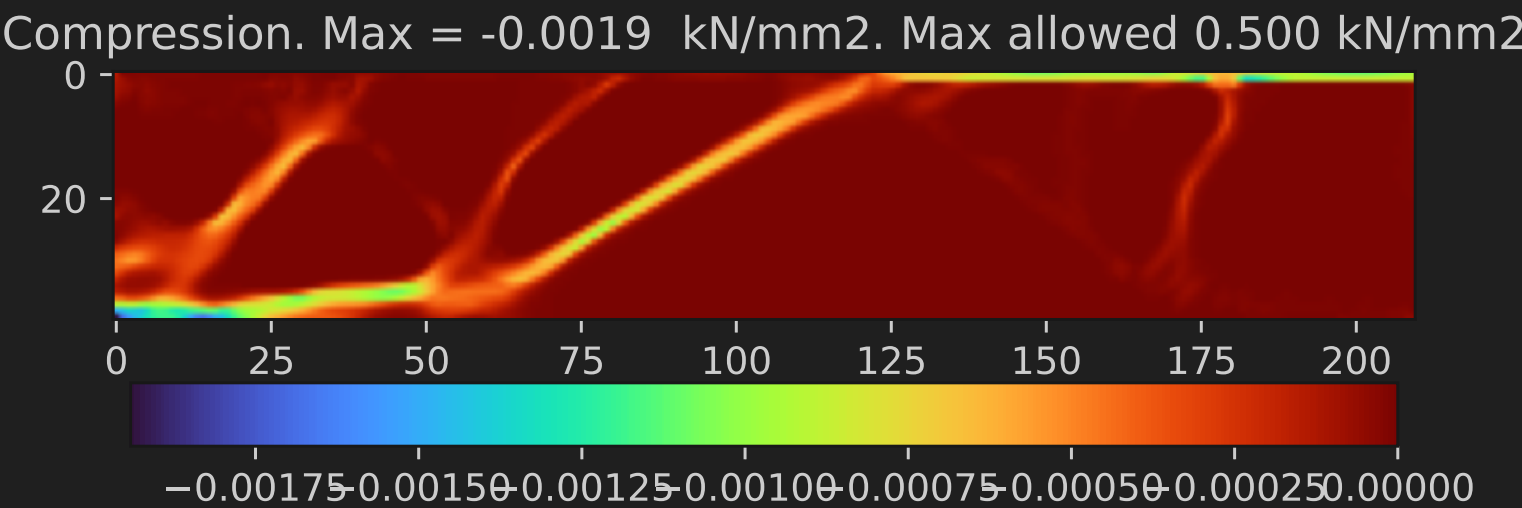
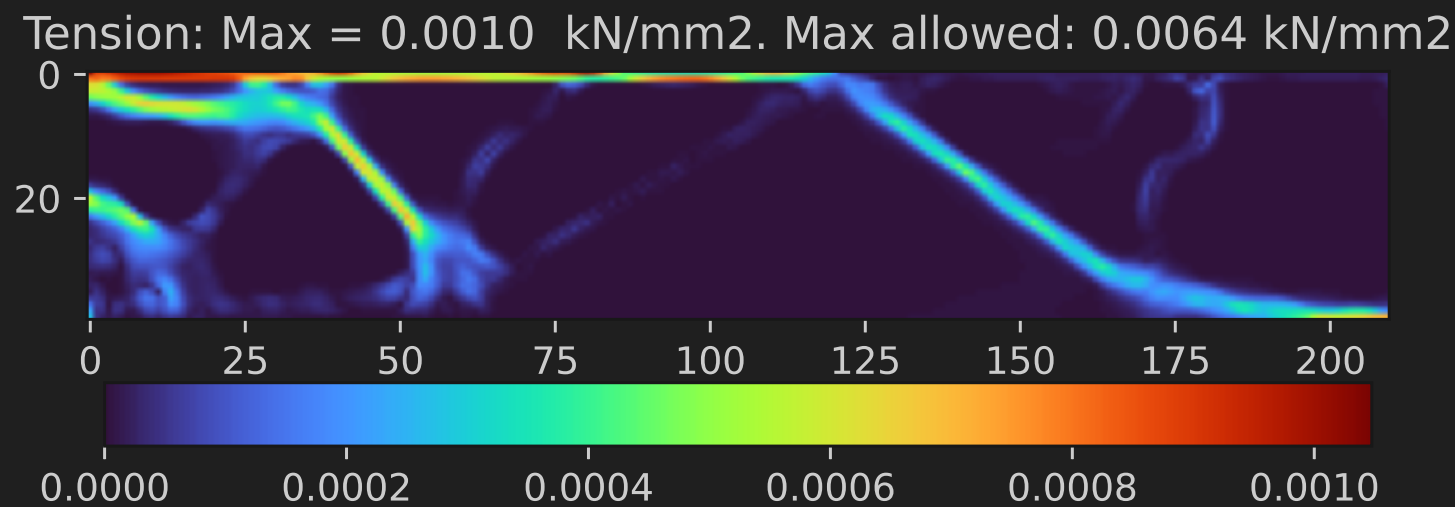
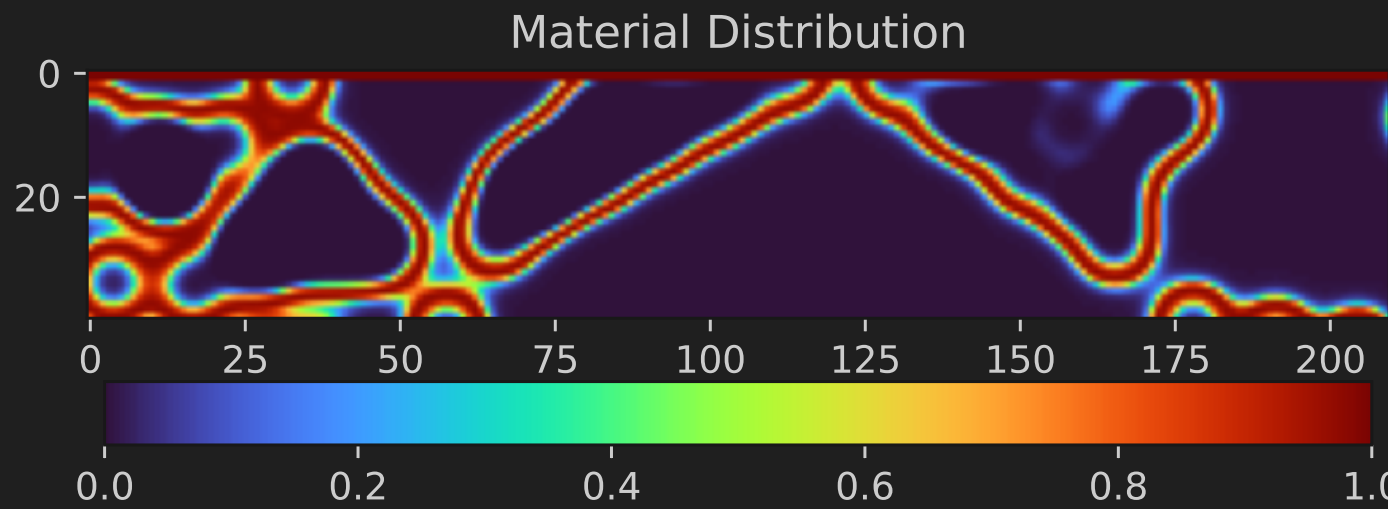
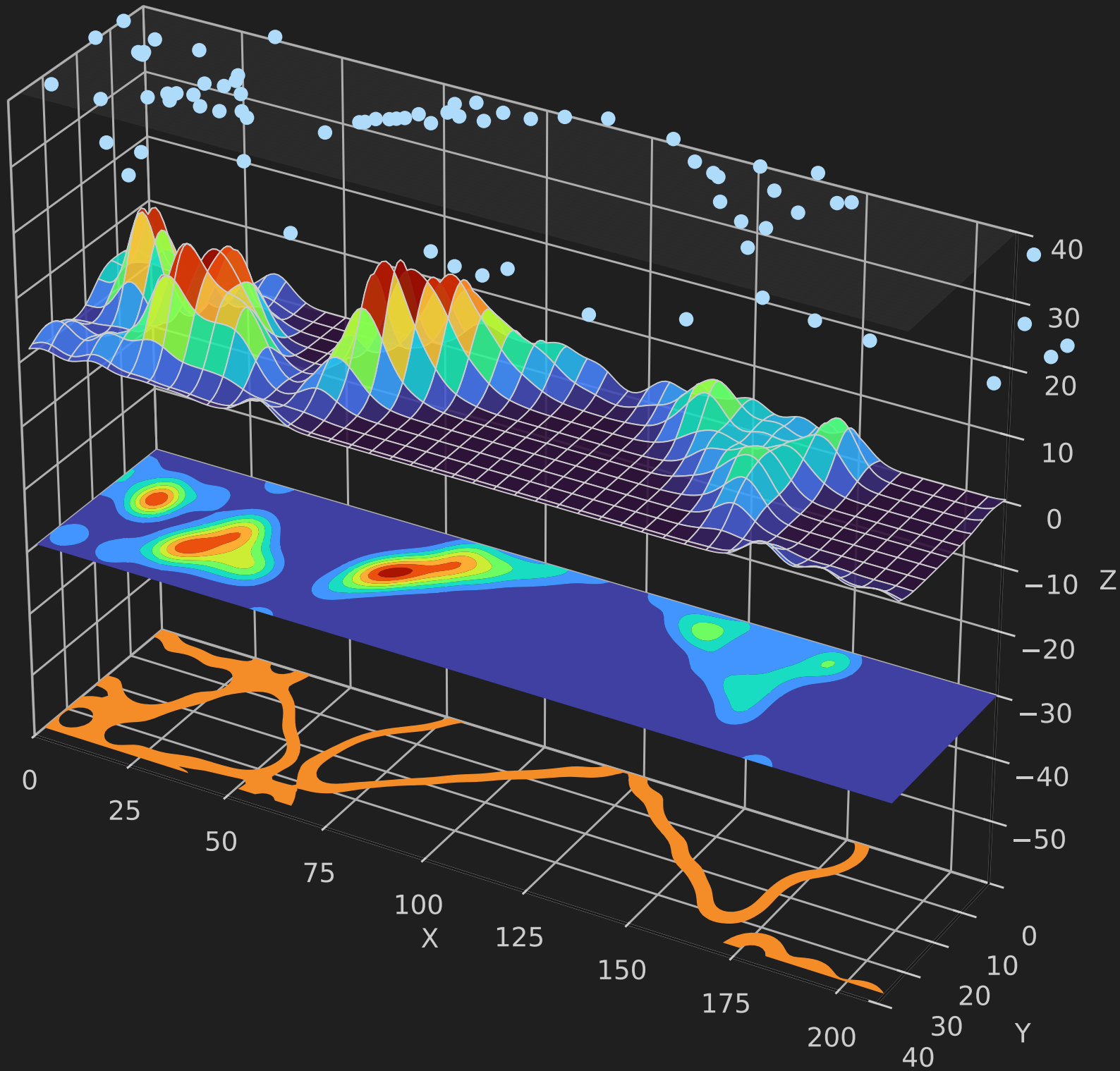
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.53 Shift = 1.98 Iteration = 117



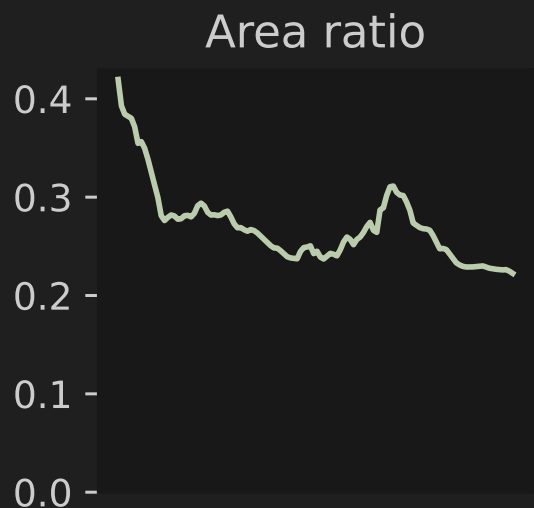
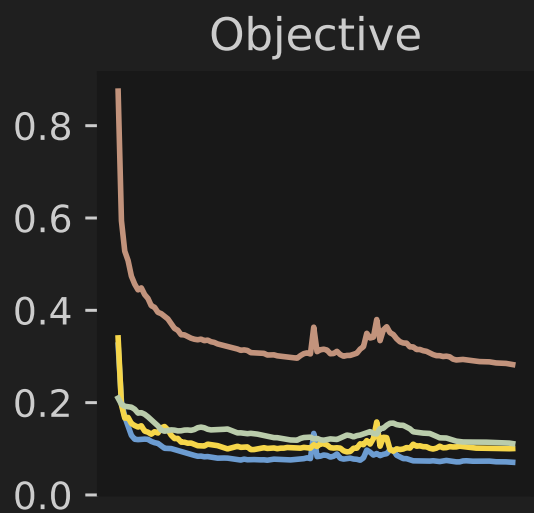
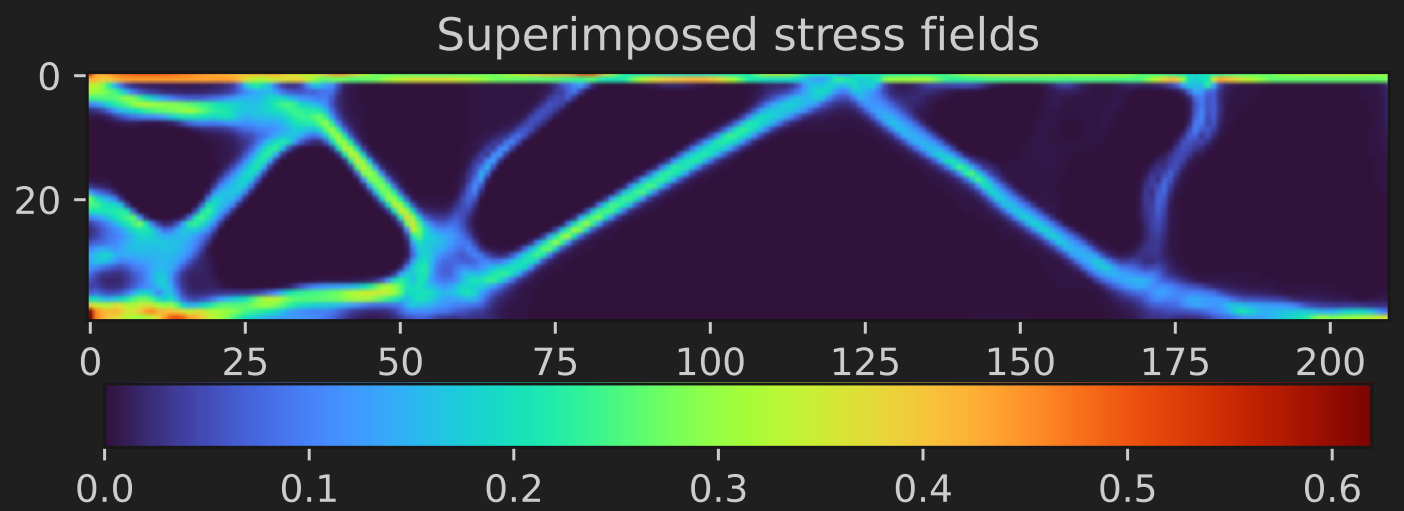
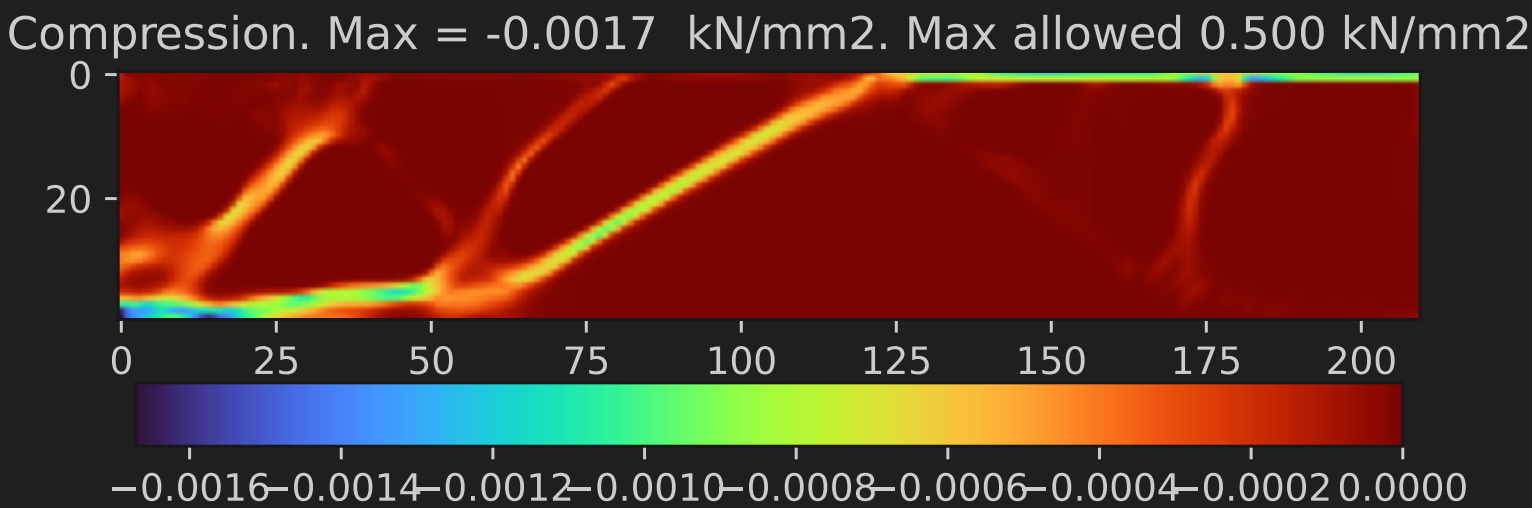
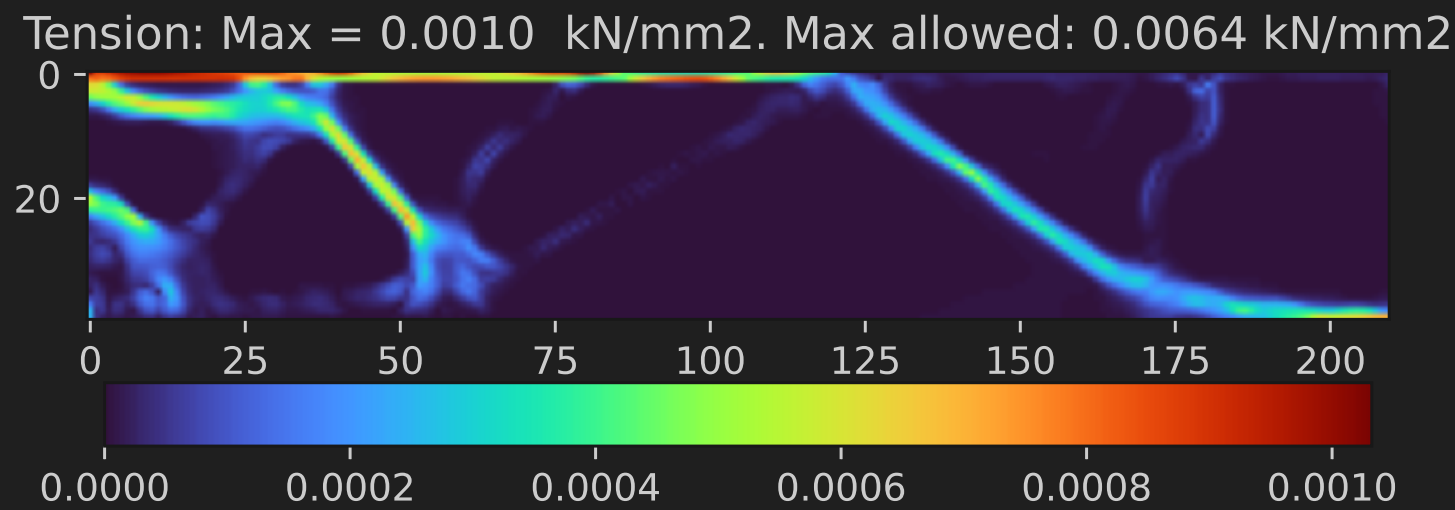
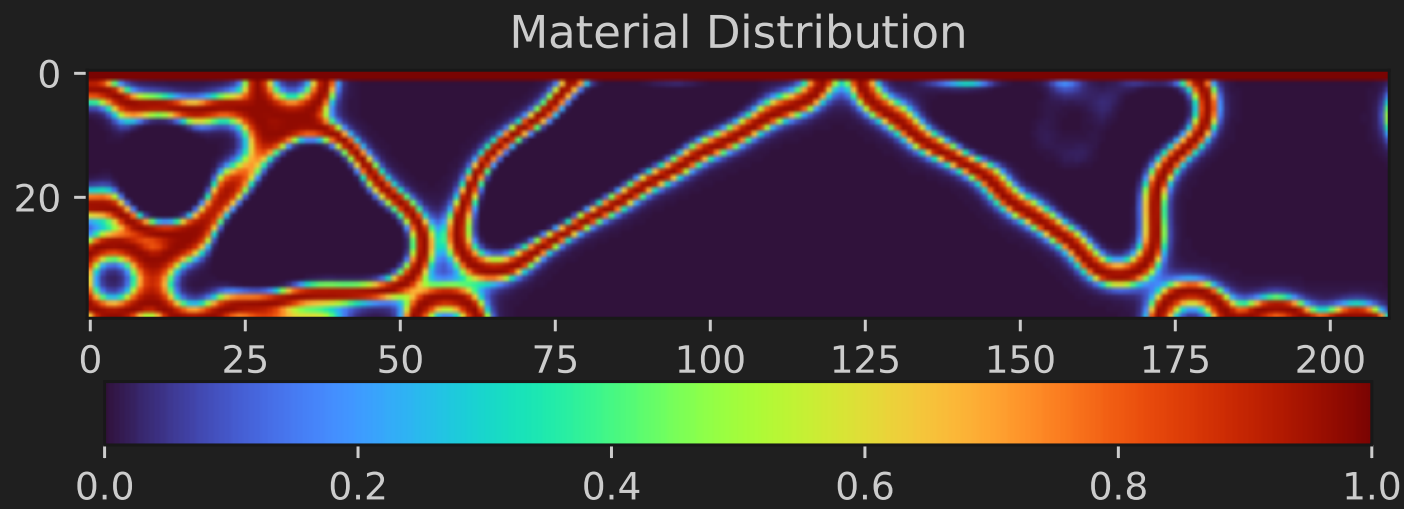
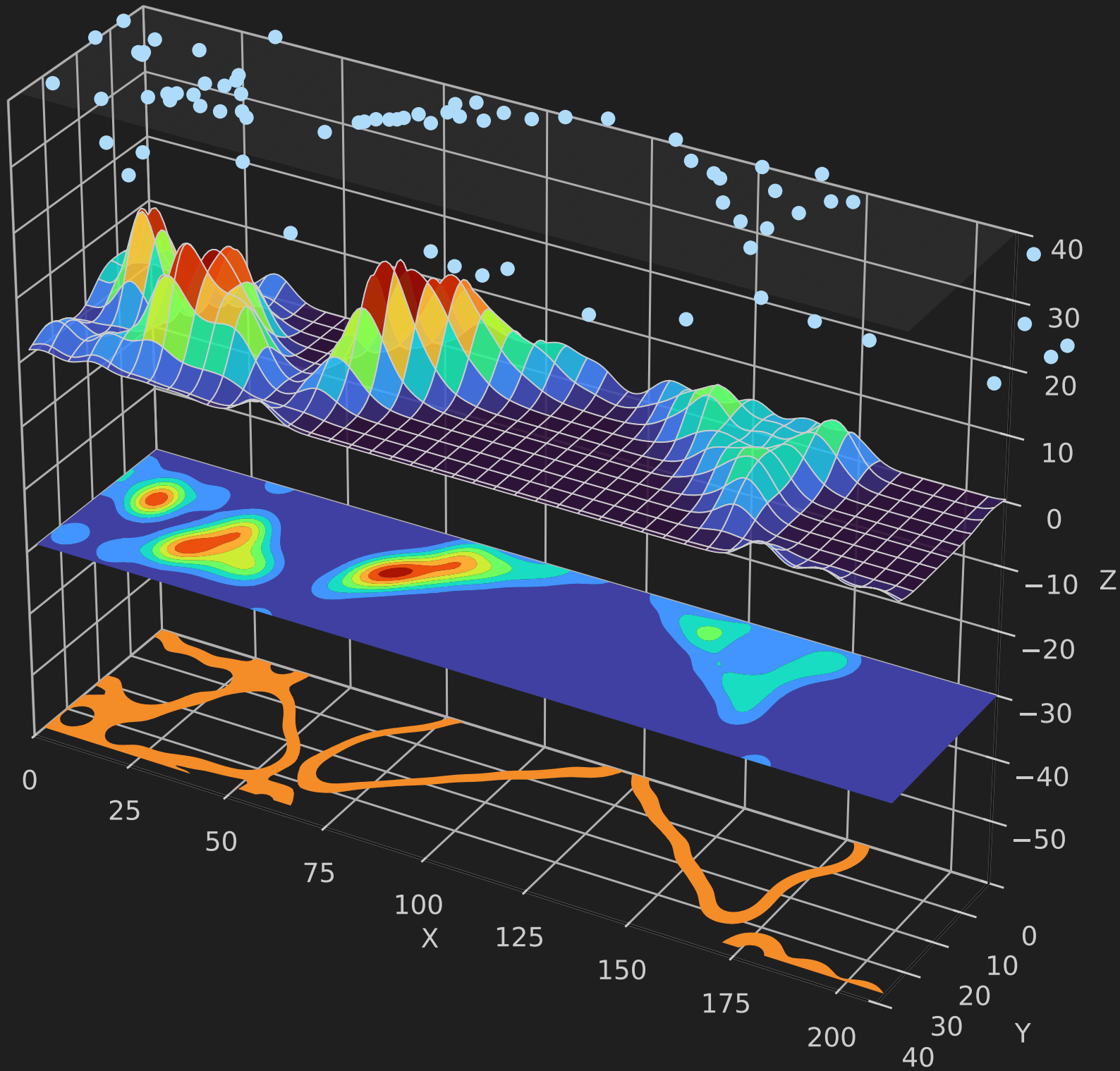
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.53 Shift = 1.97 Iteration = 118



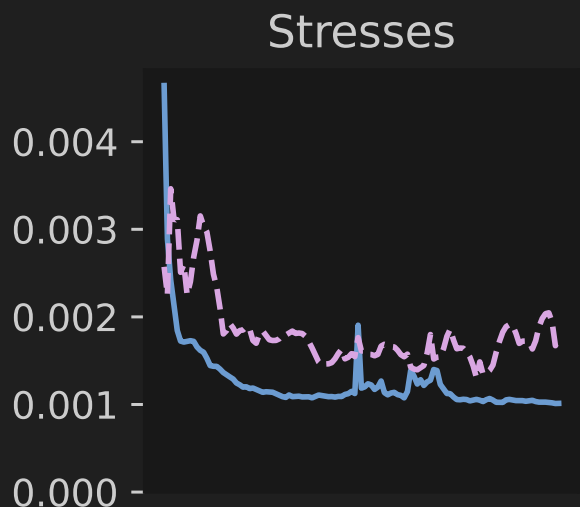
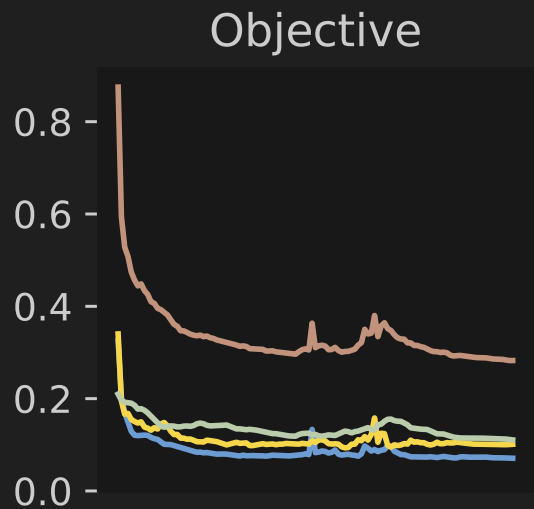
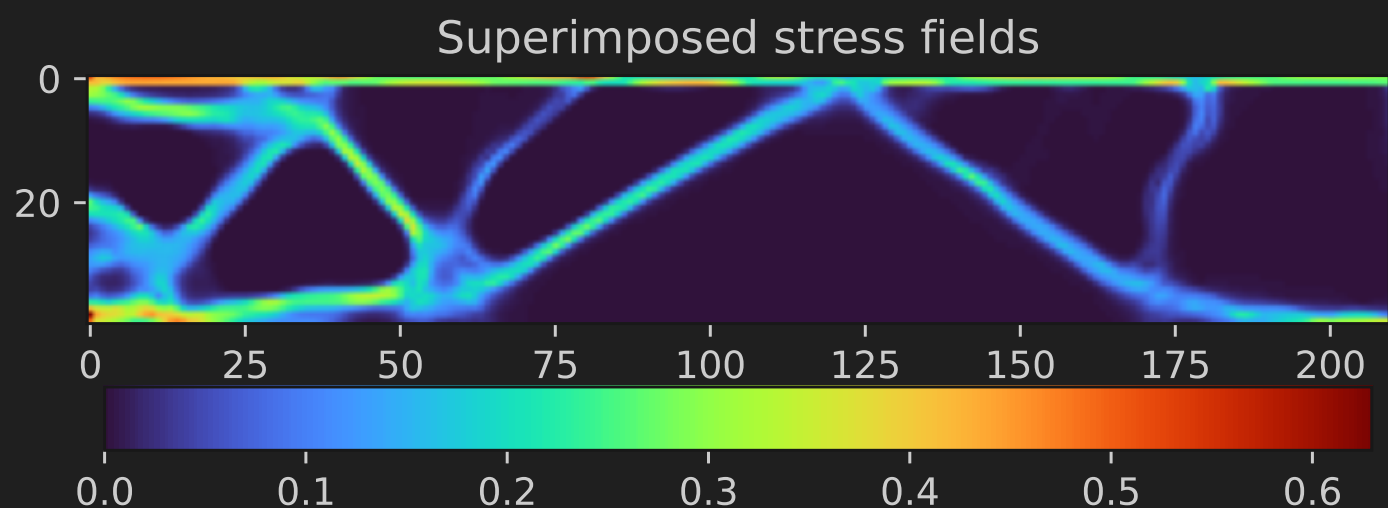
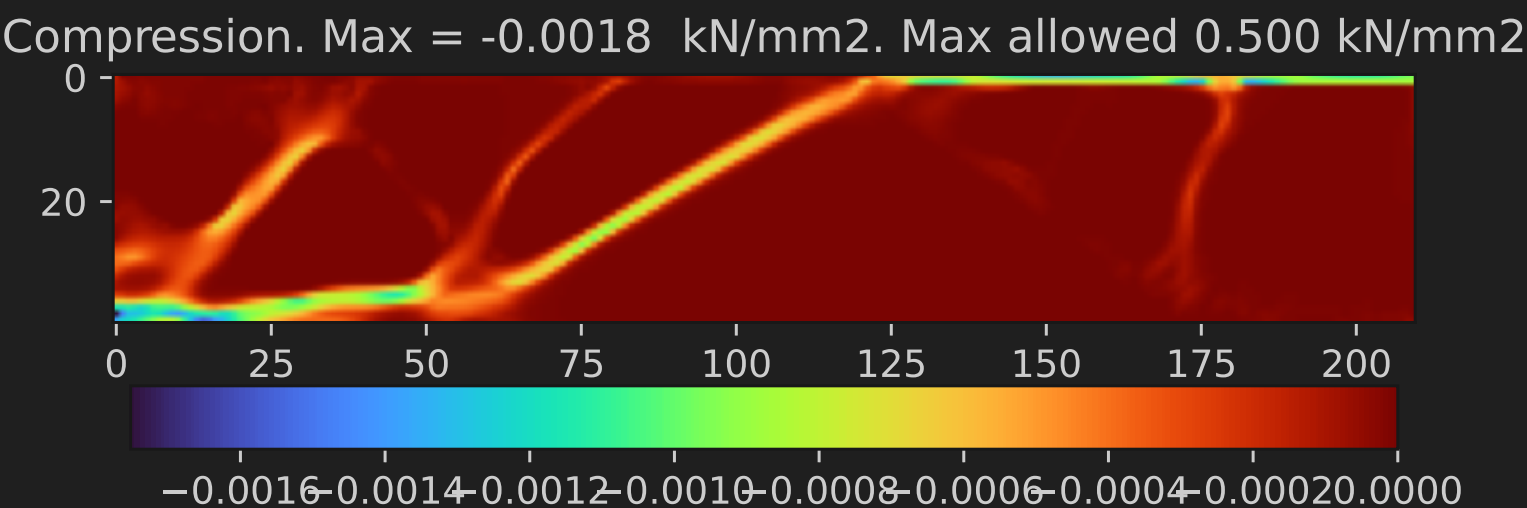
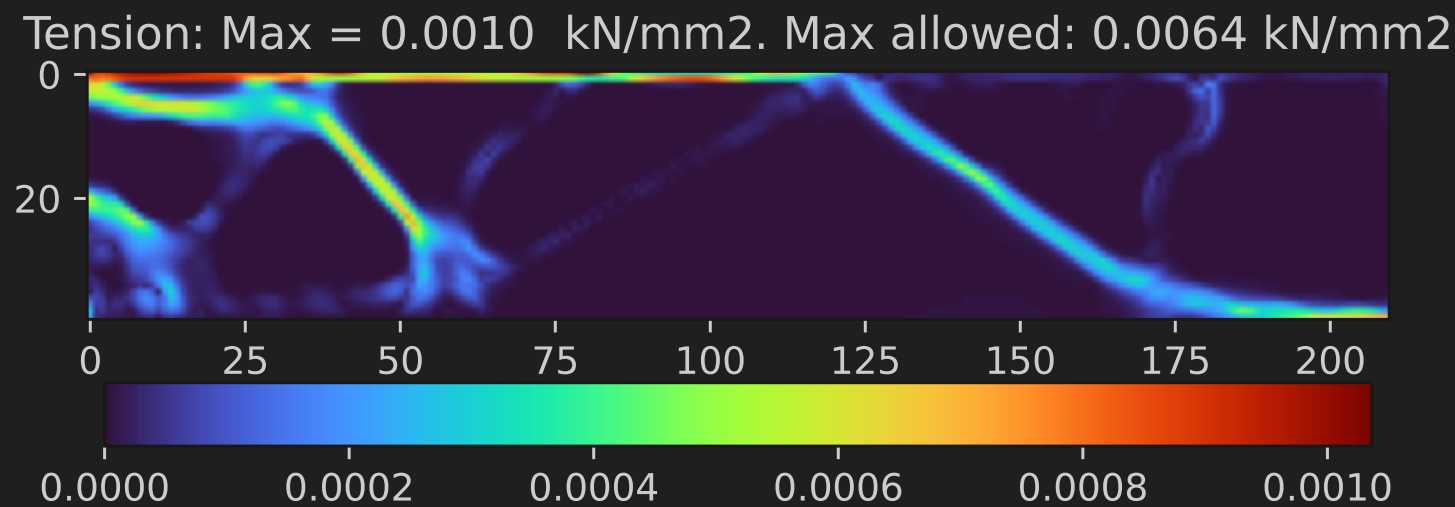
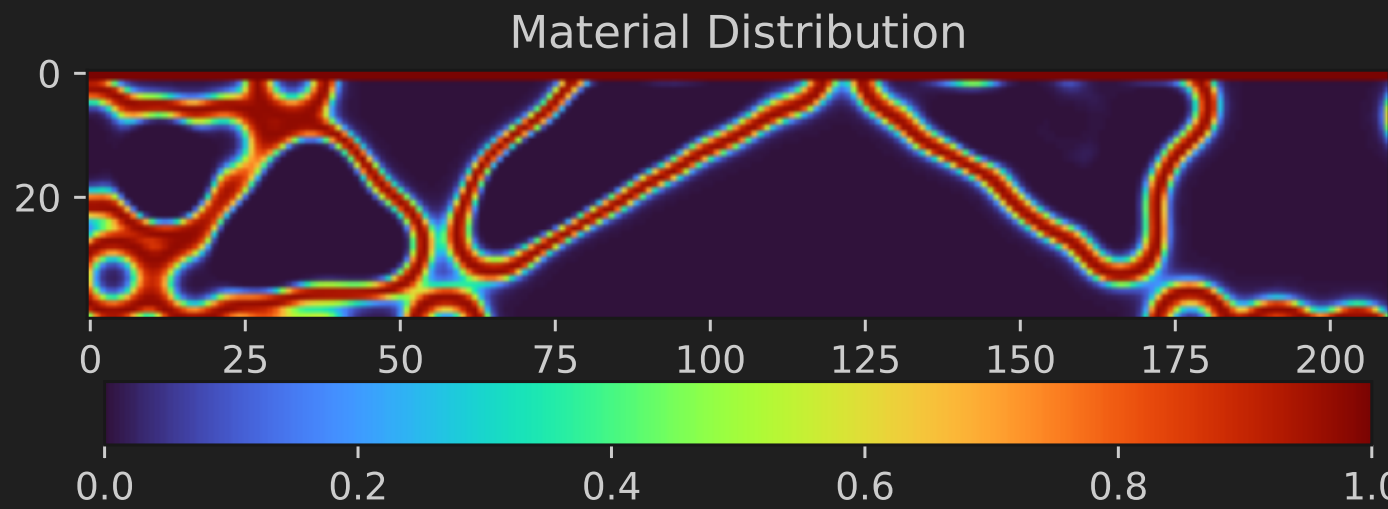
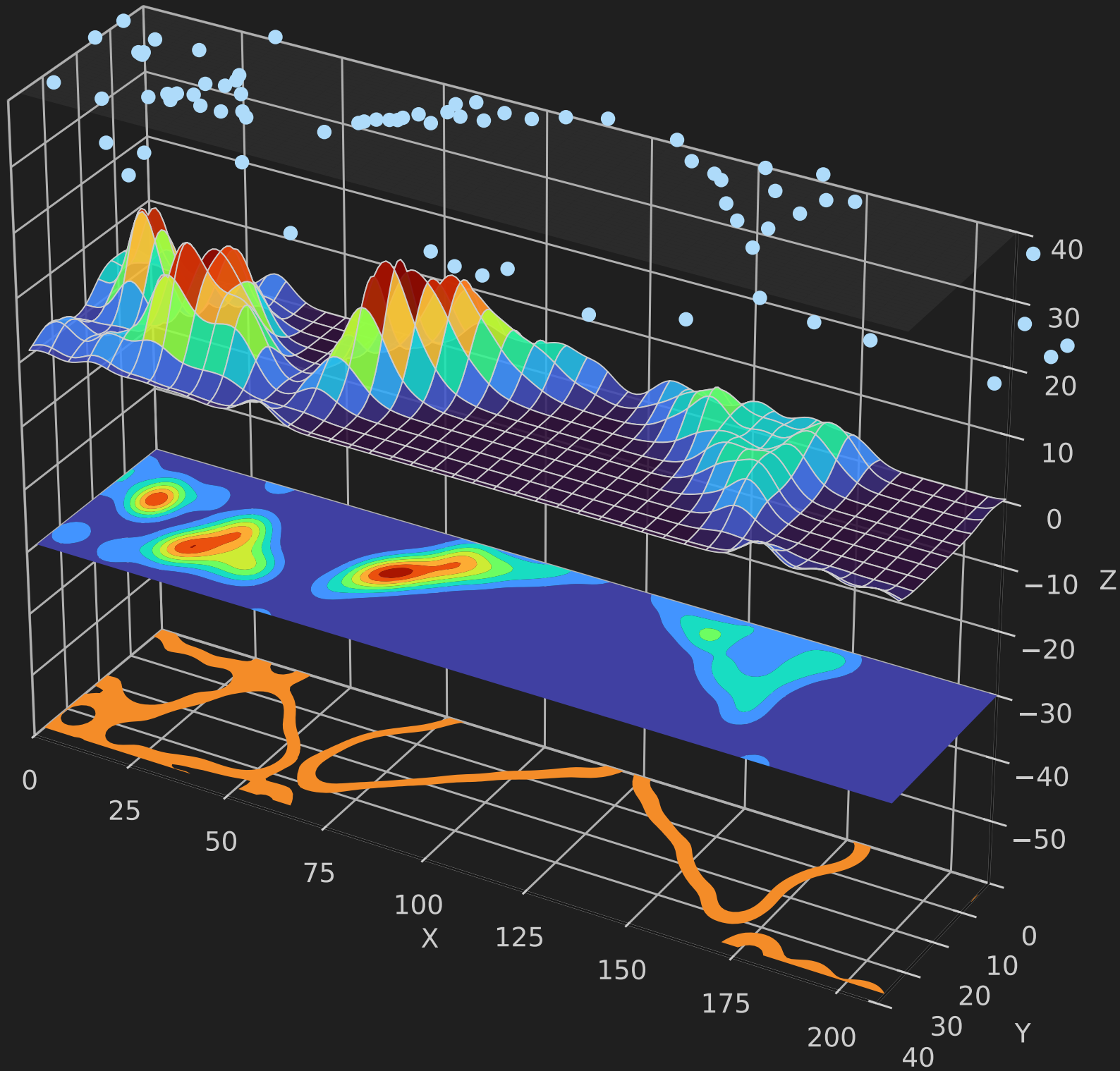
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.53 Shift = 1.95 Iteration = 119



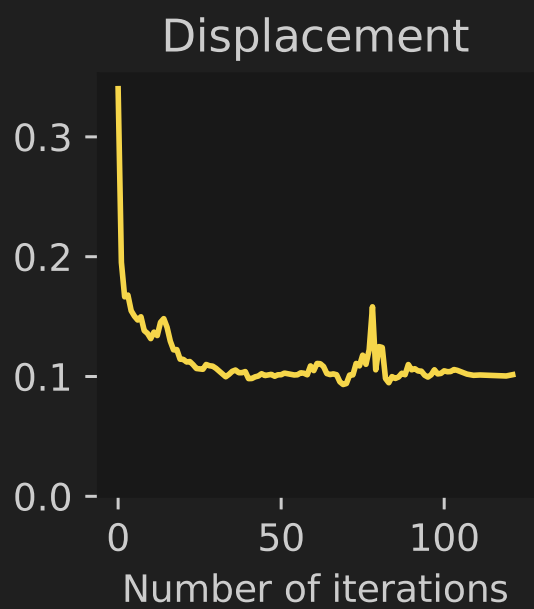
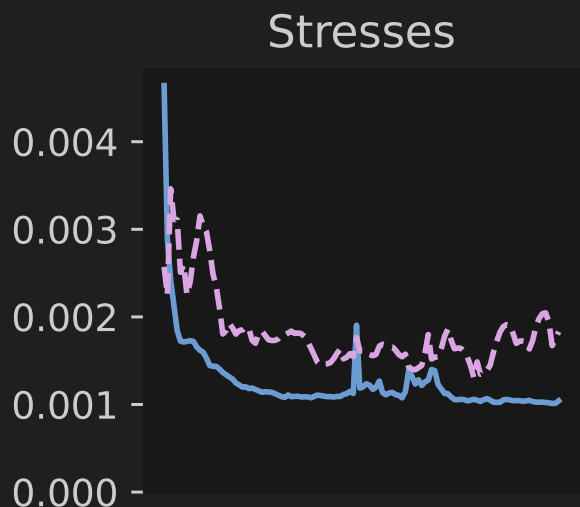
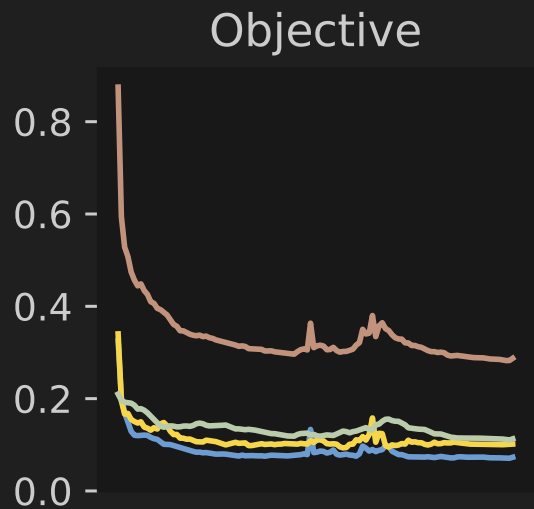
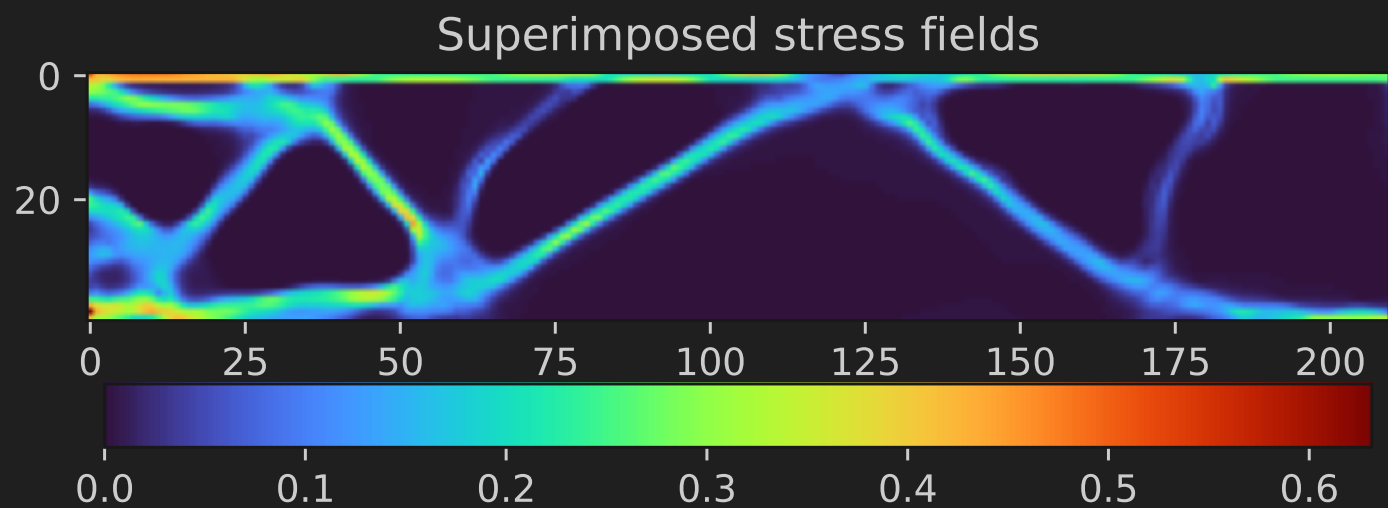
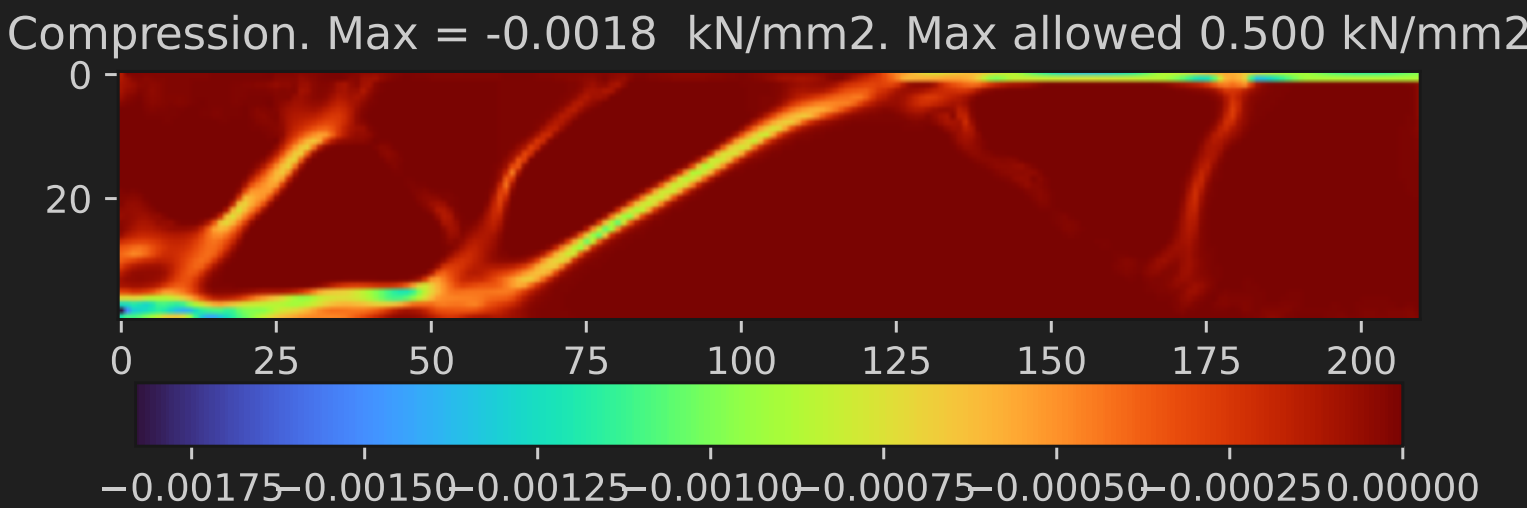
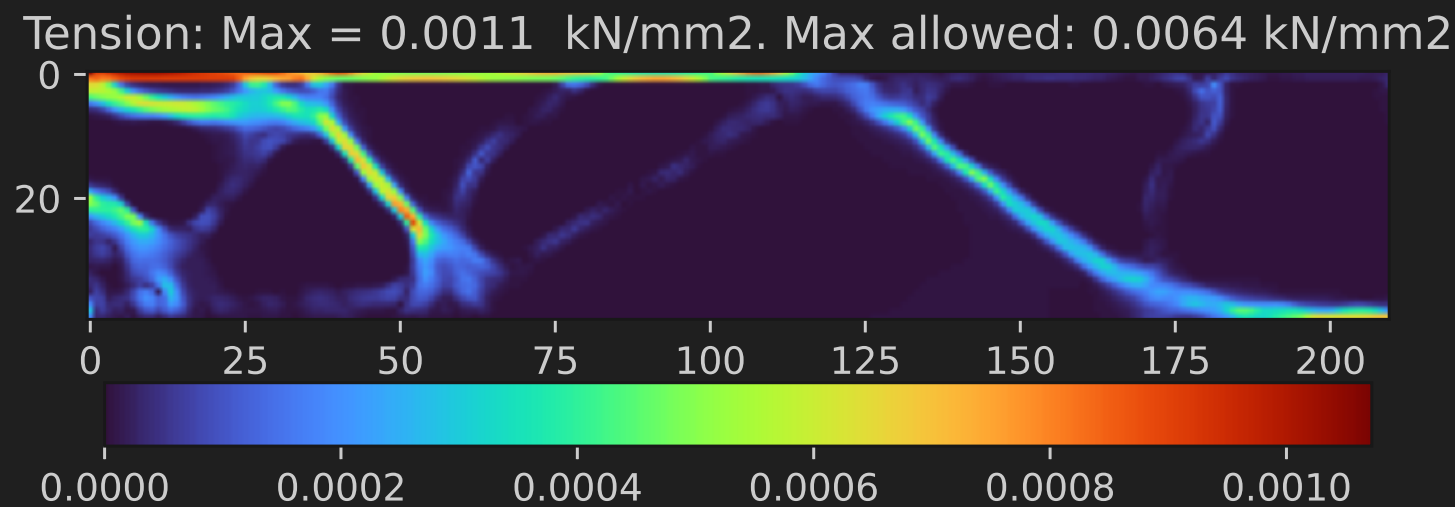
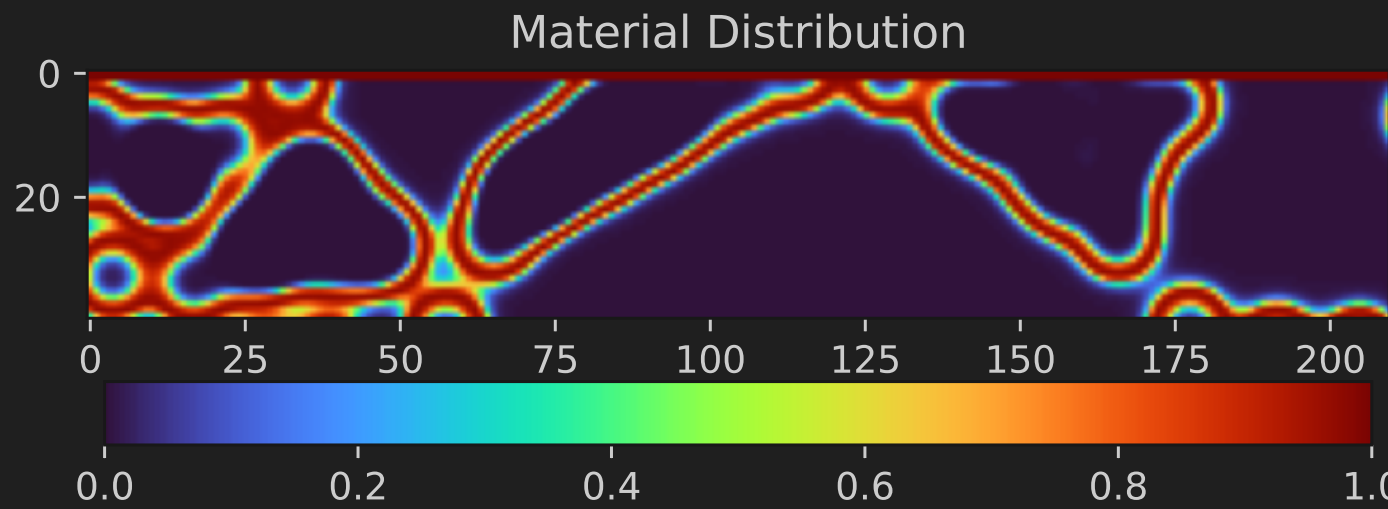
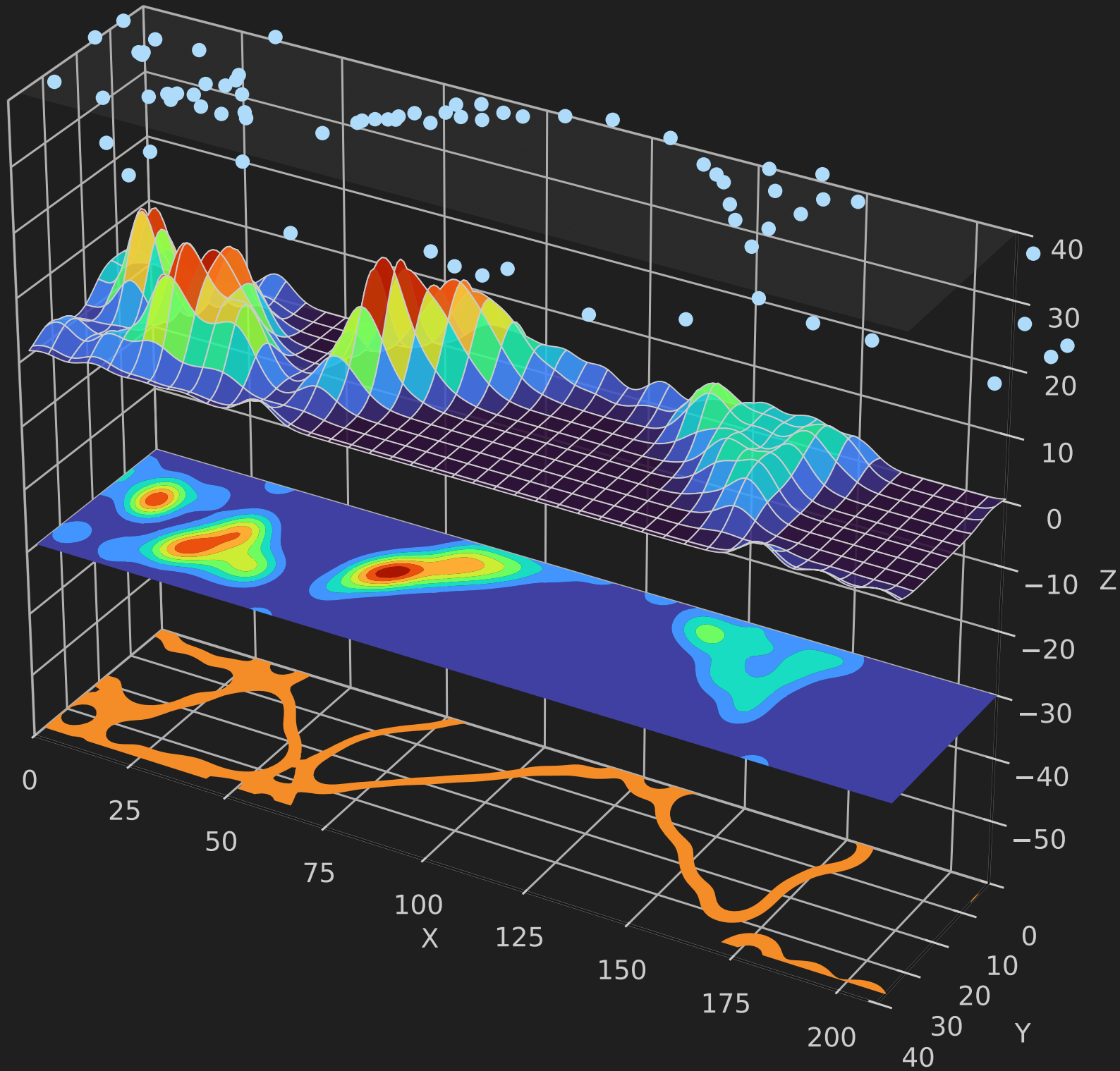
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.53 Shift = 1.93 Iteration = 120



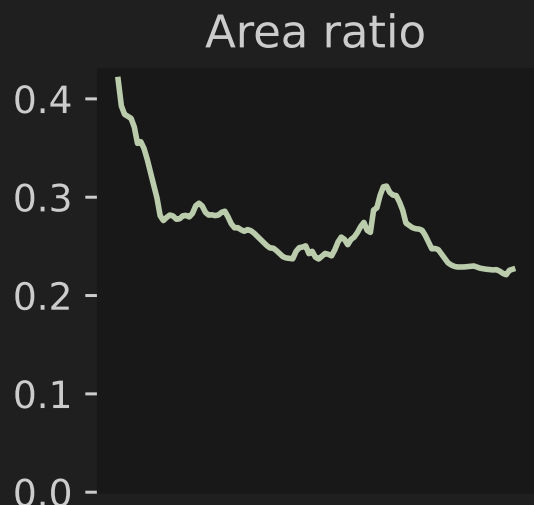
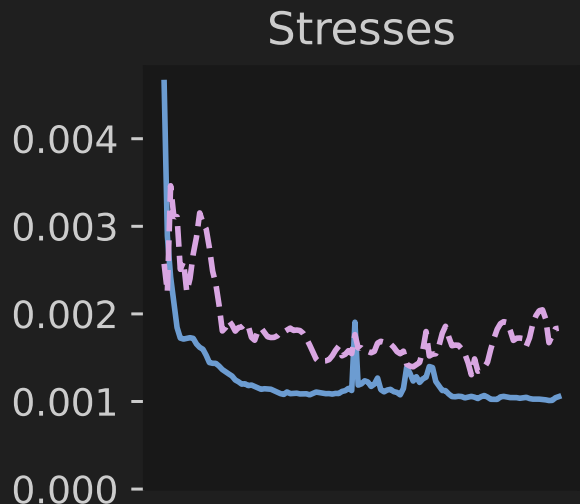
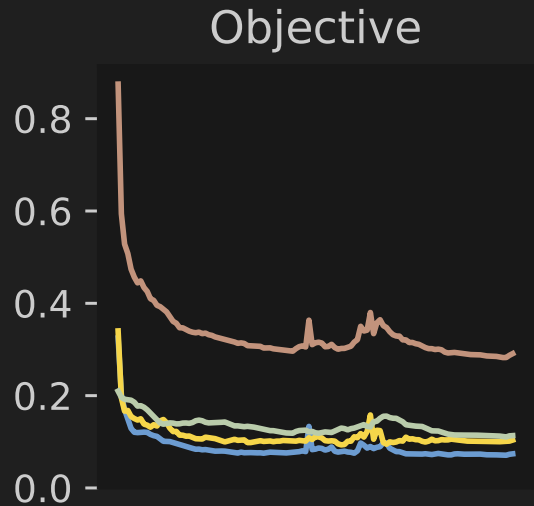
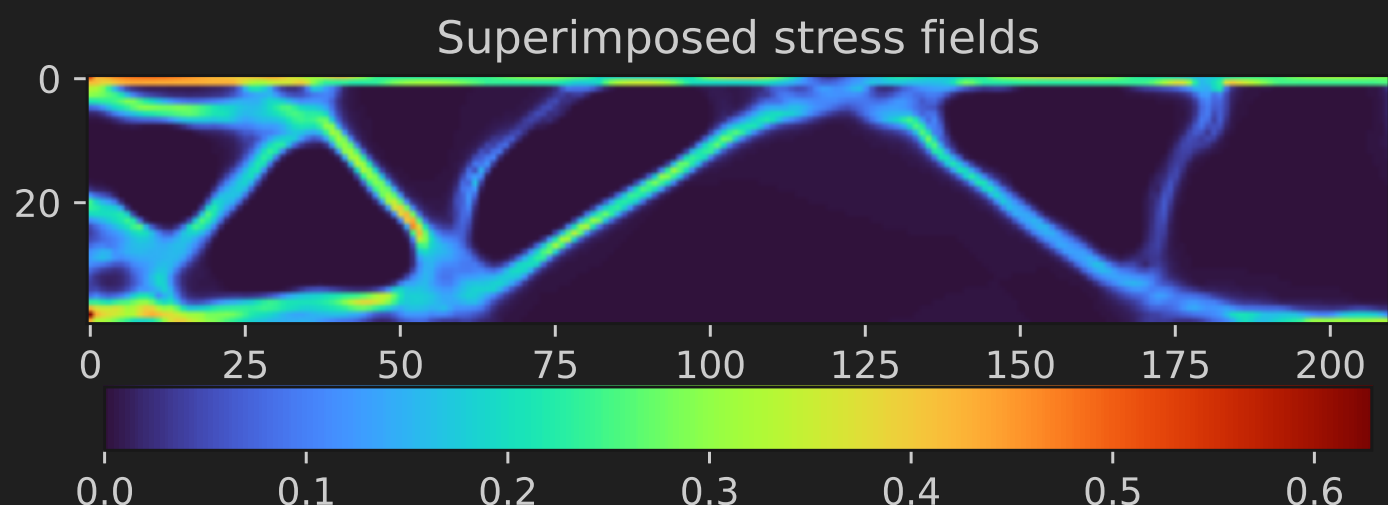
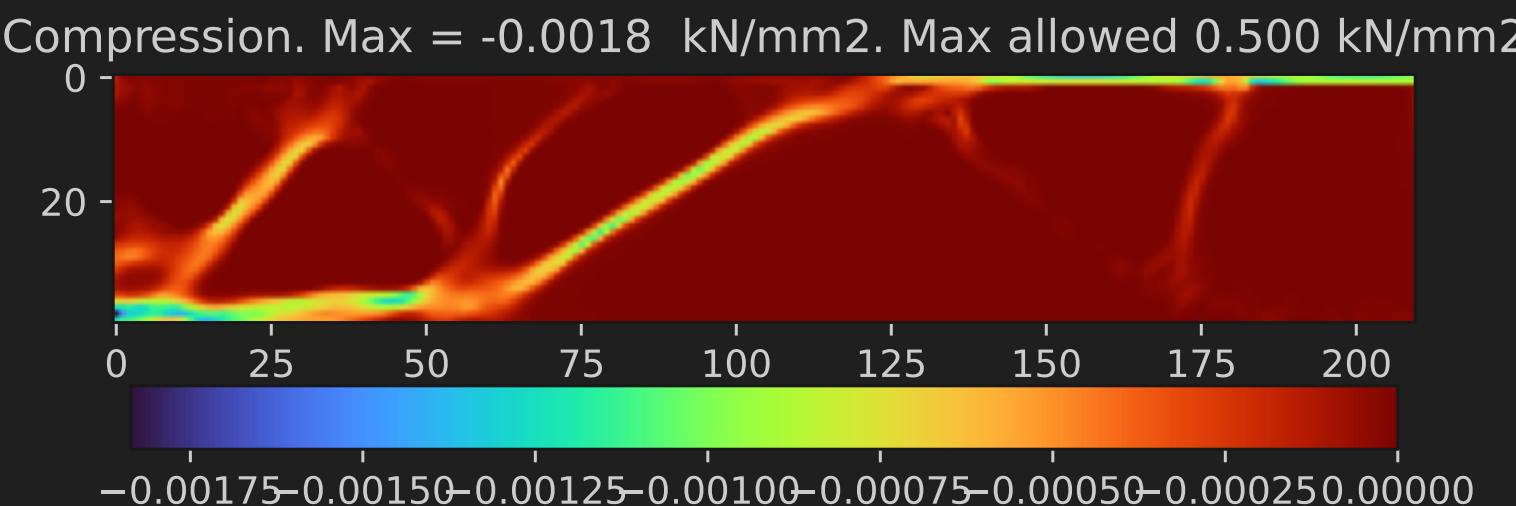
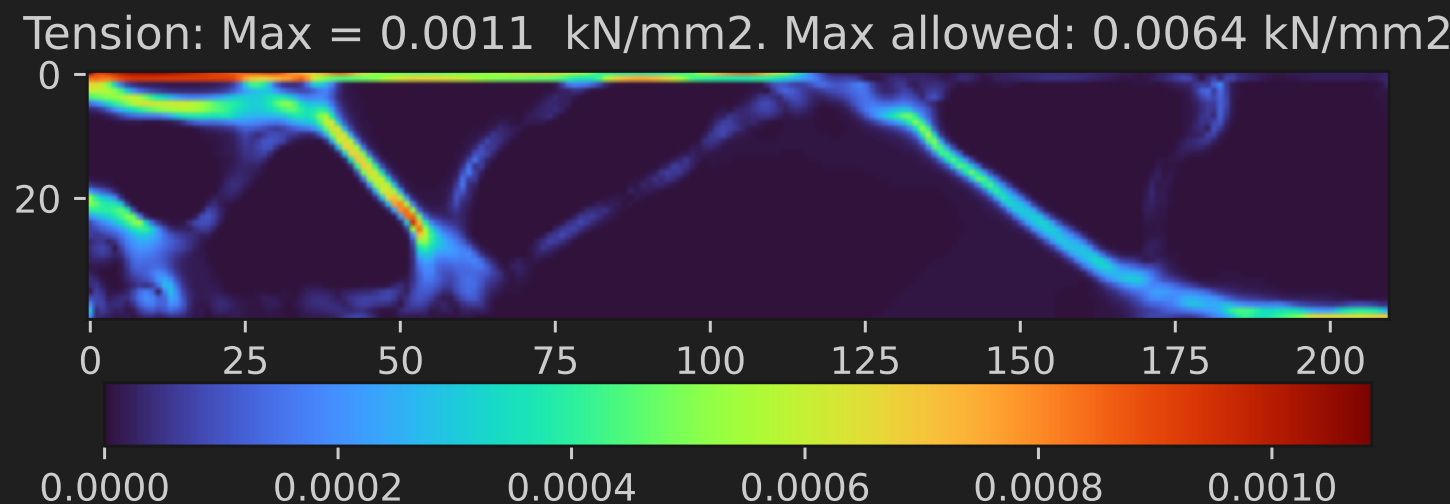
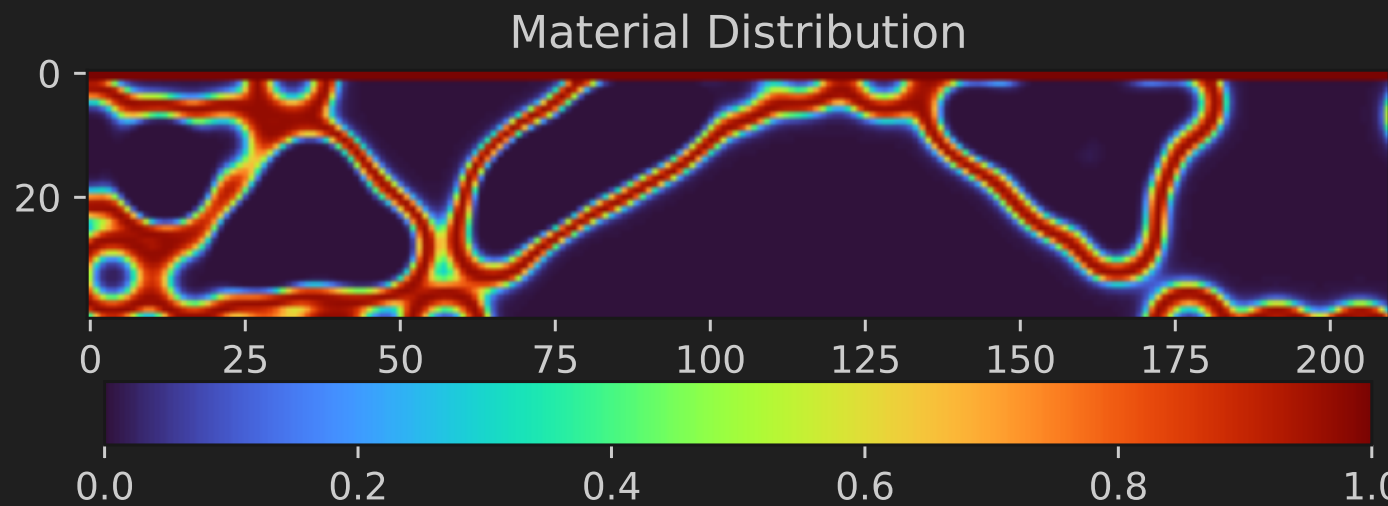
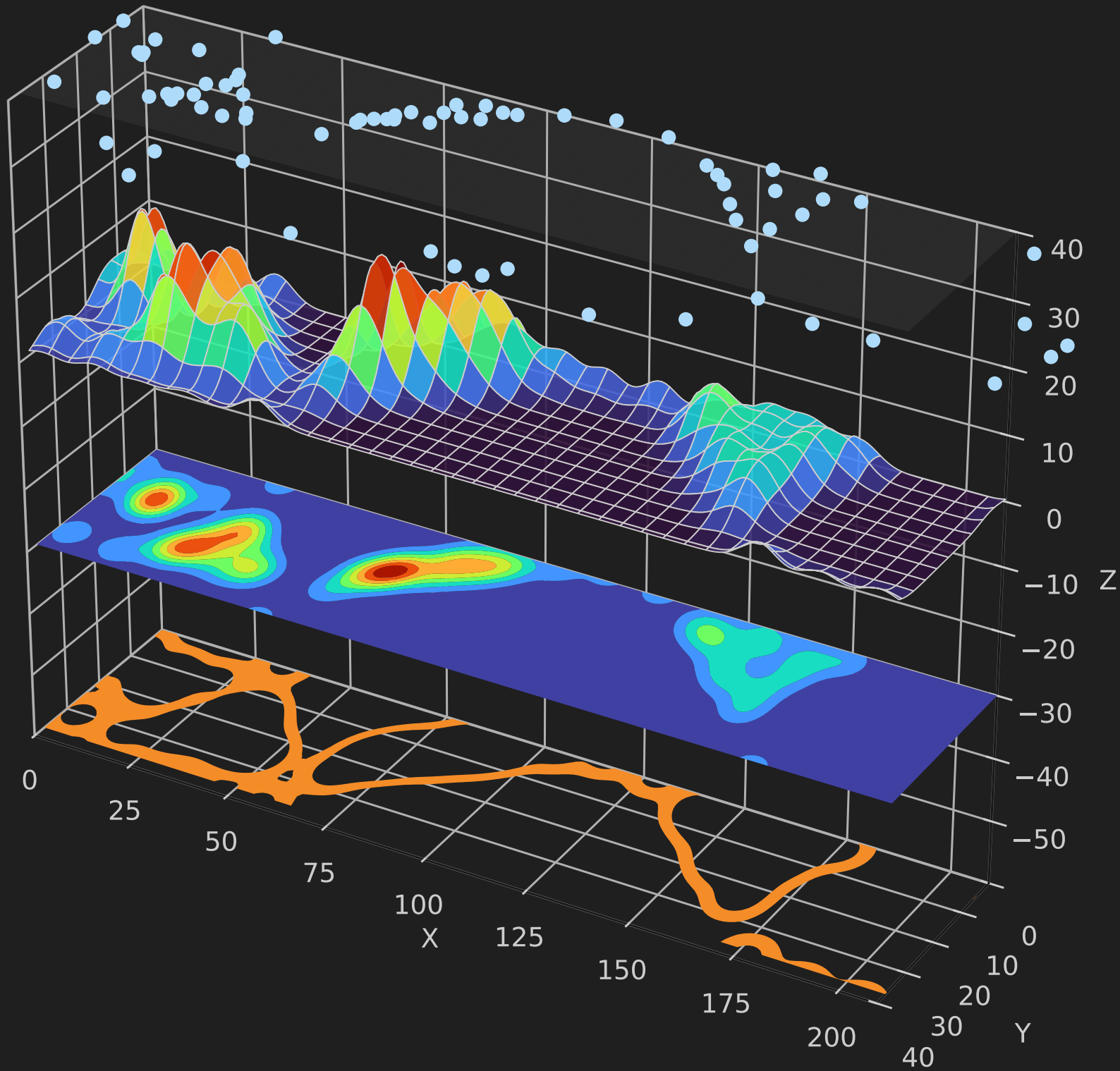
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.56 Shift = 1.91 Iteration = 121



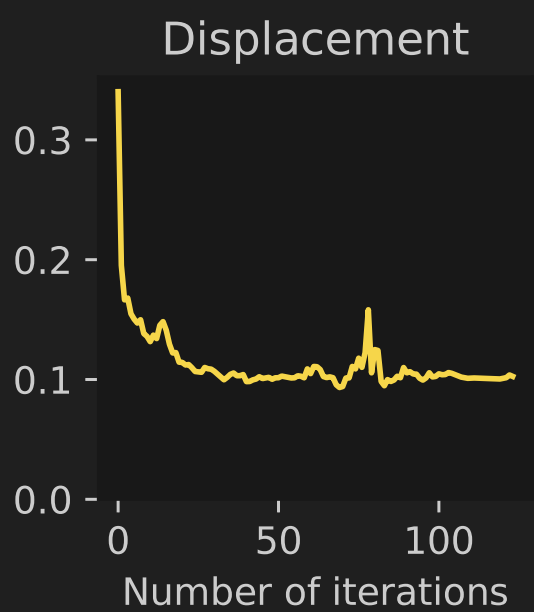
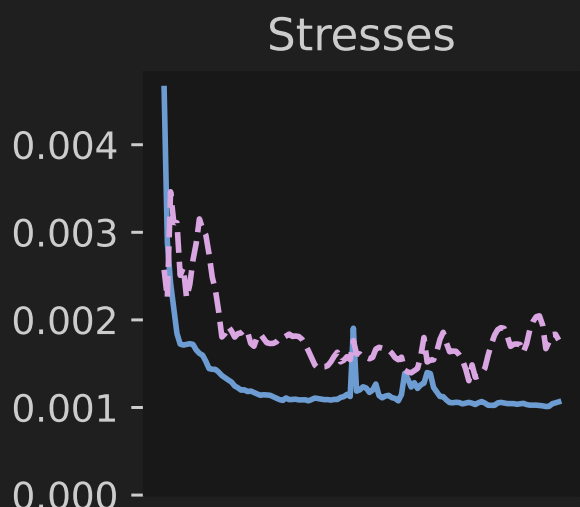
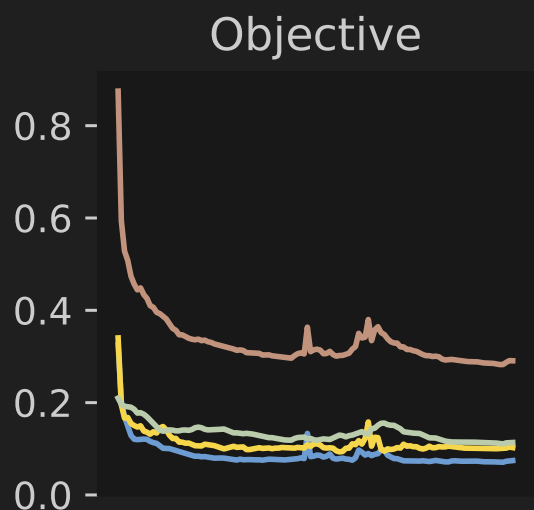
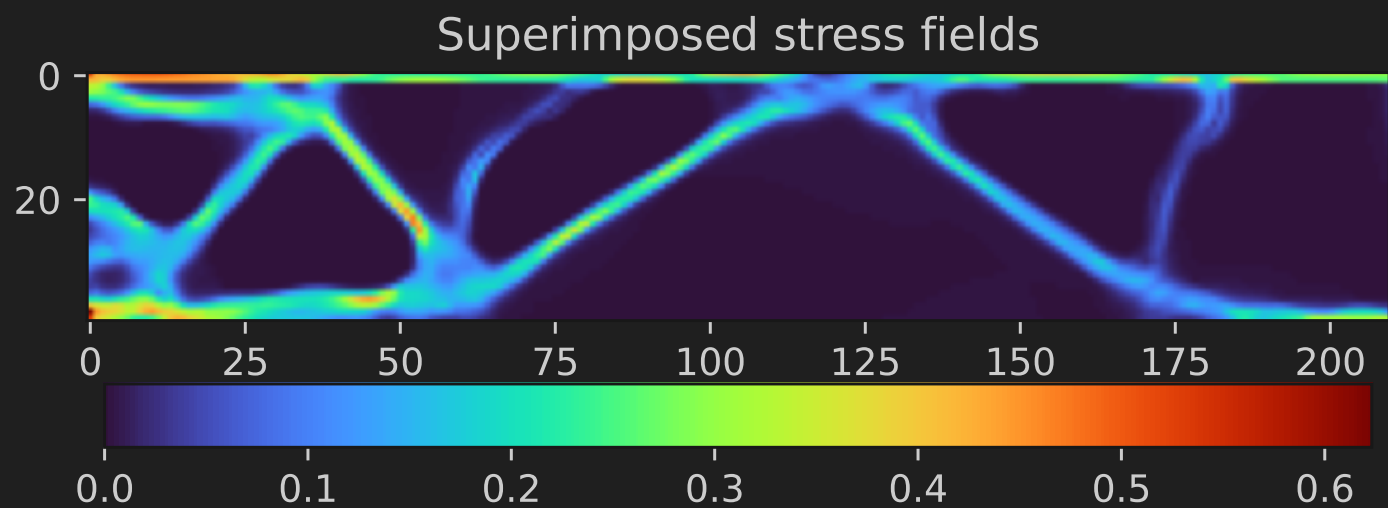
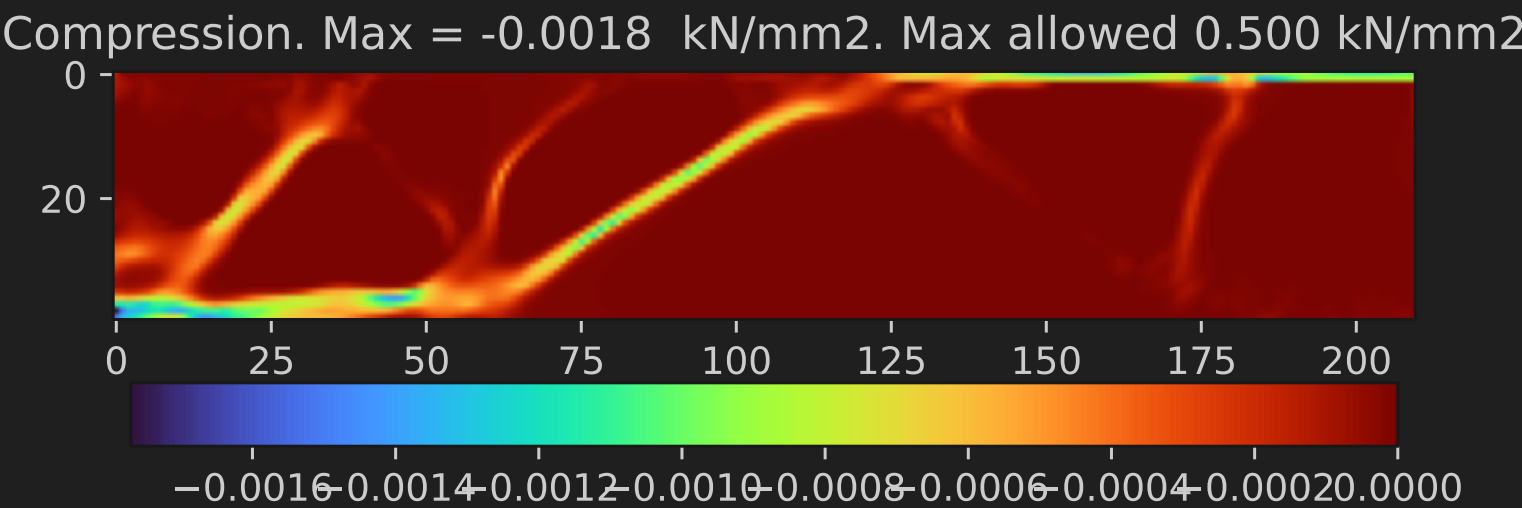
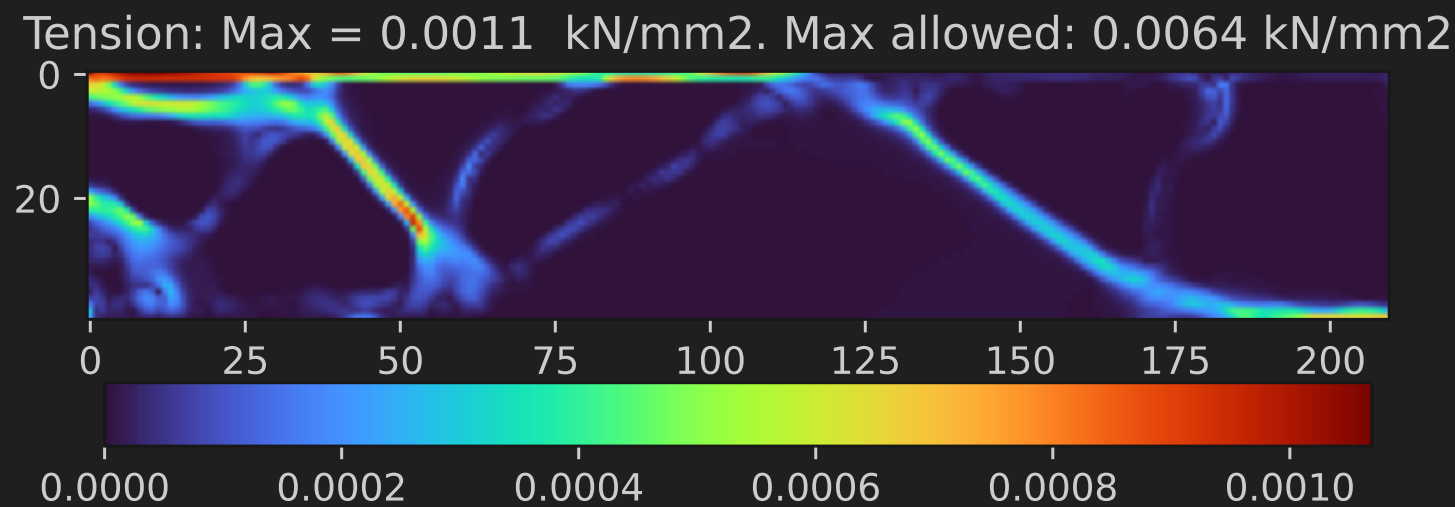
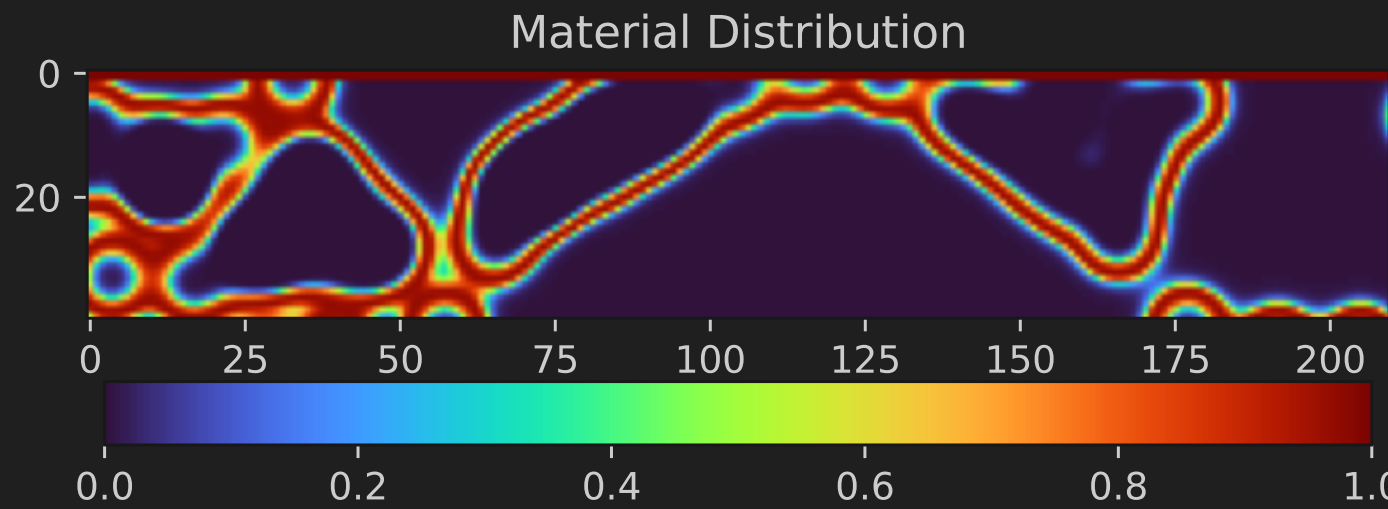
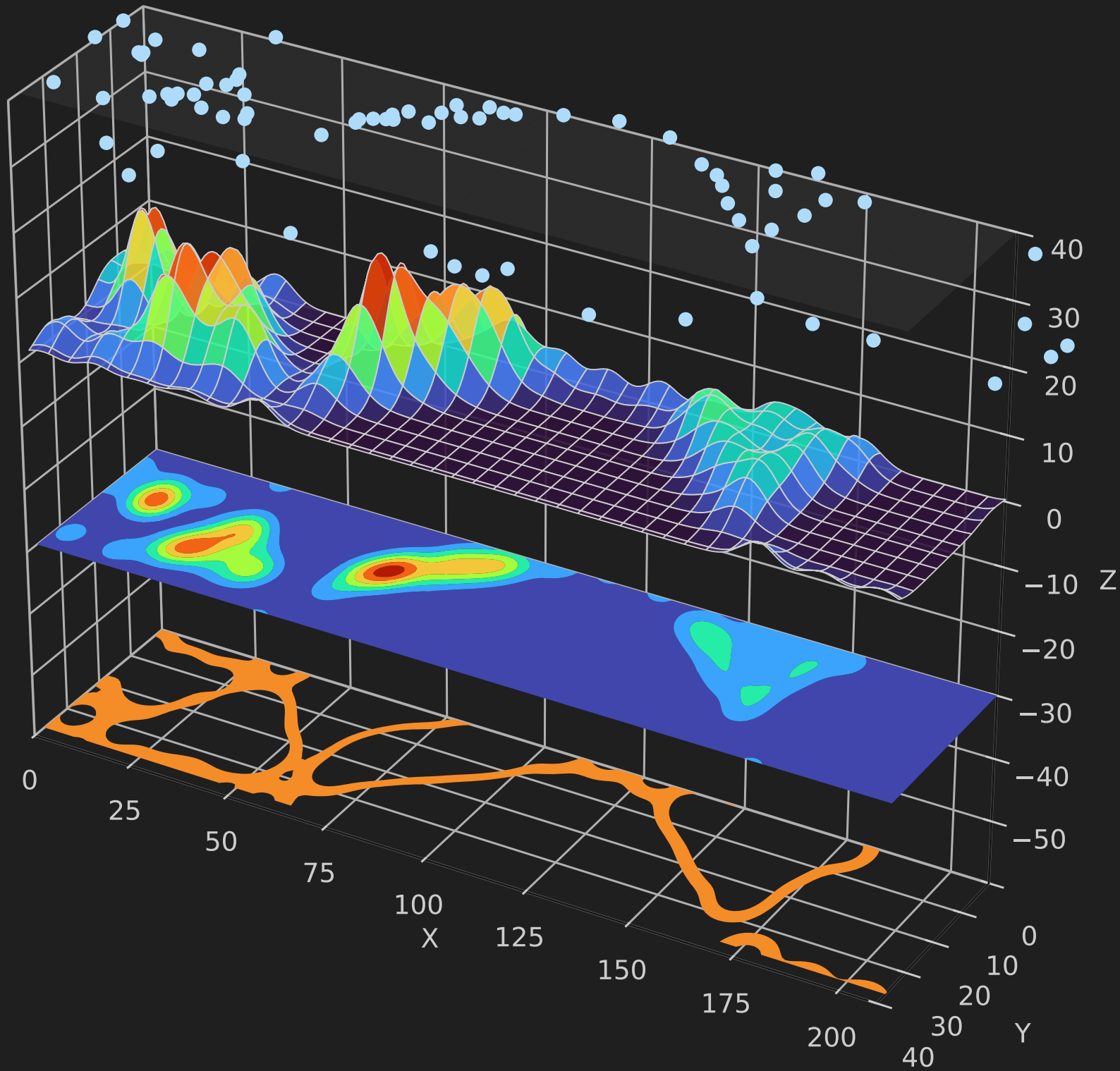
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.58 Shift = 1.89 Iteration = 122



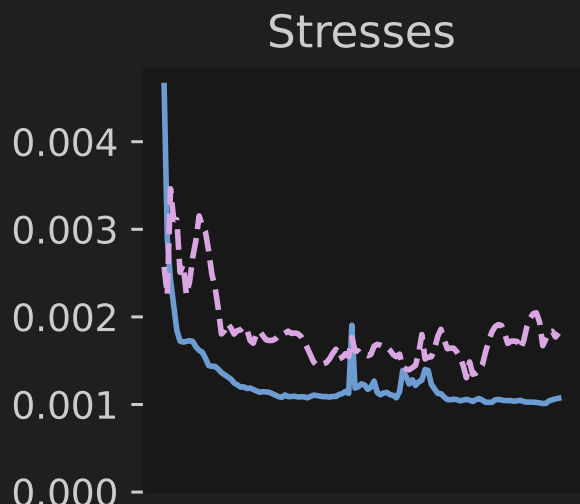
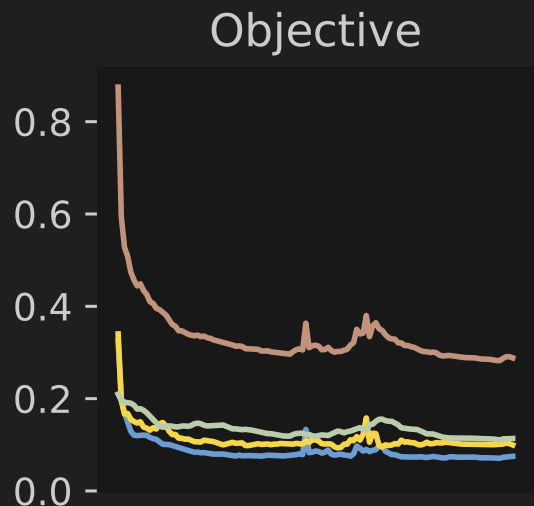
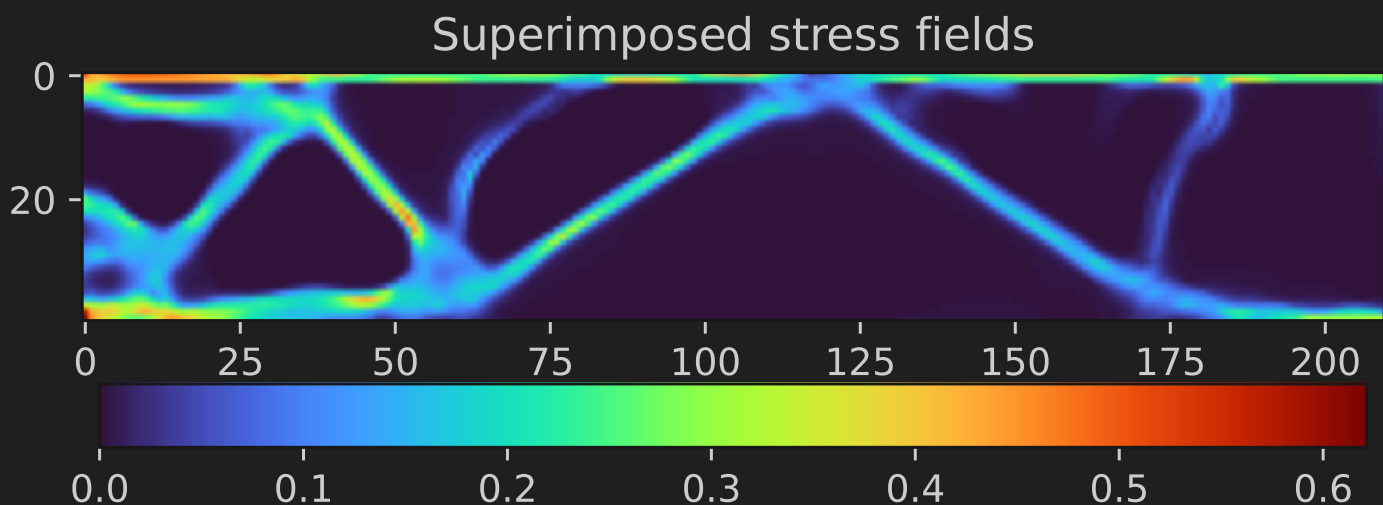
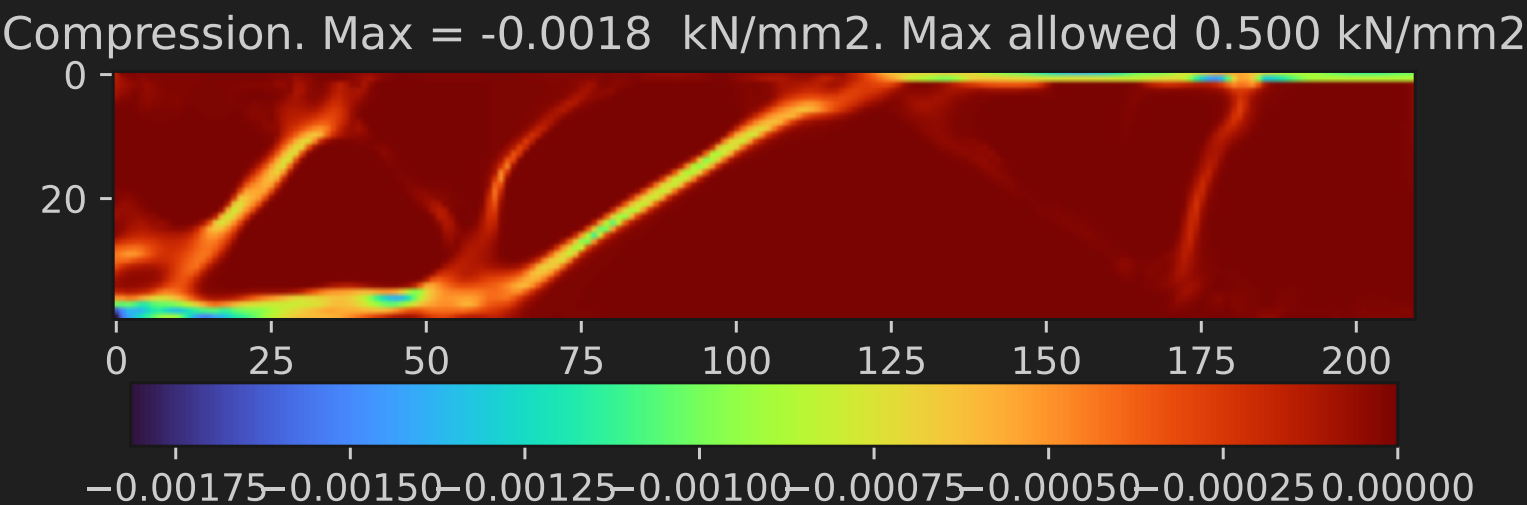
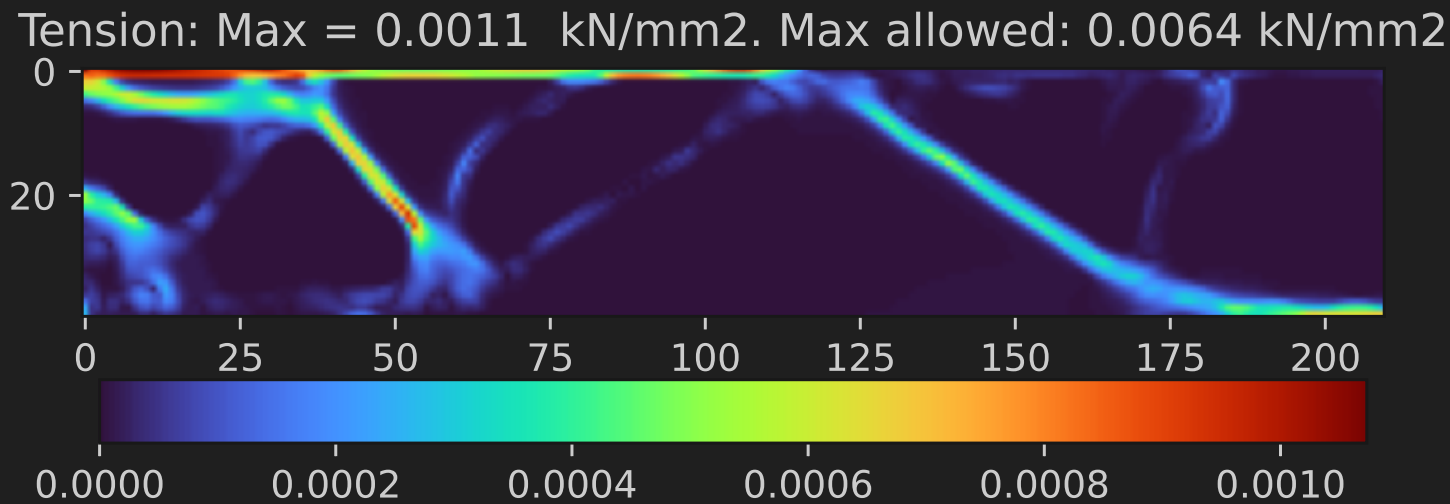
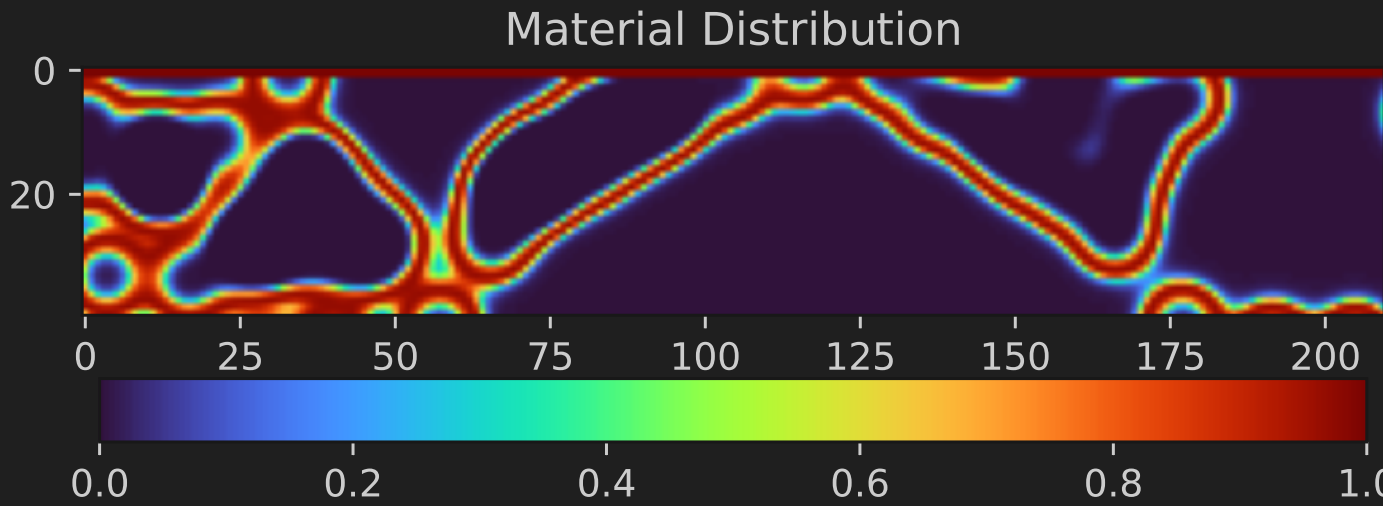
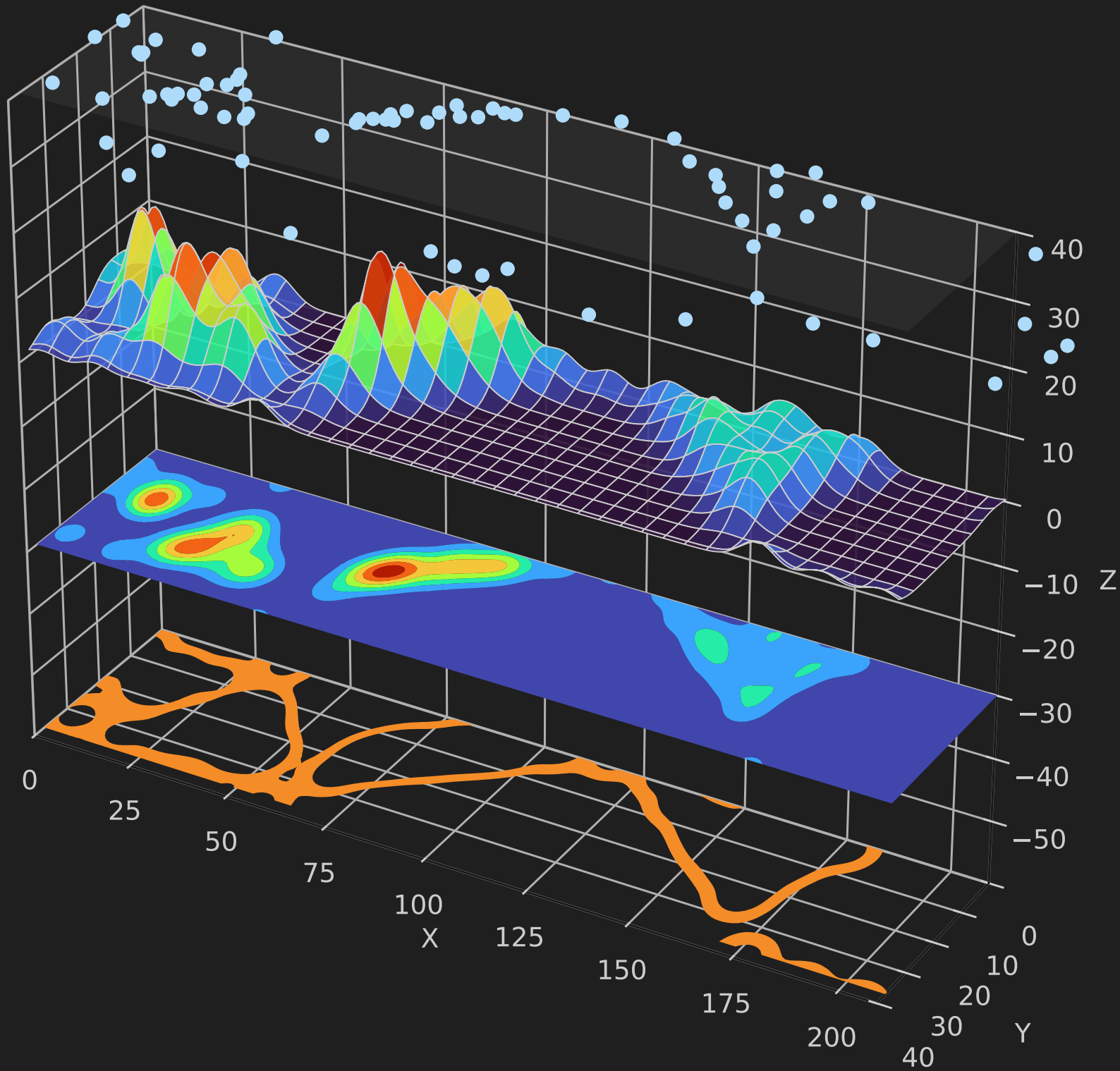
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.60 Shift = 1.88 Iteration = 123



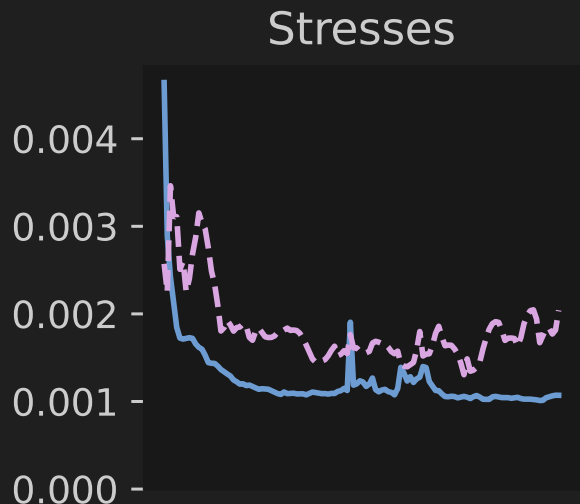
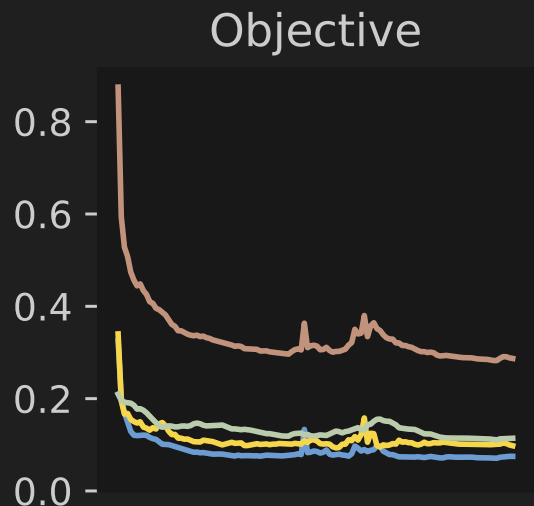
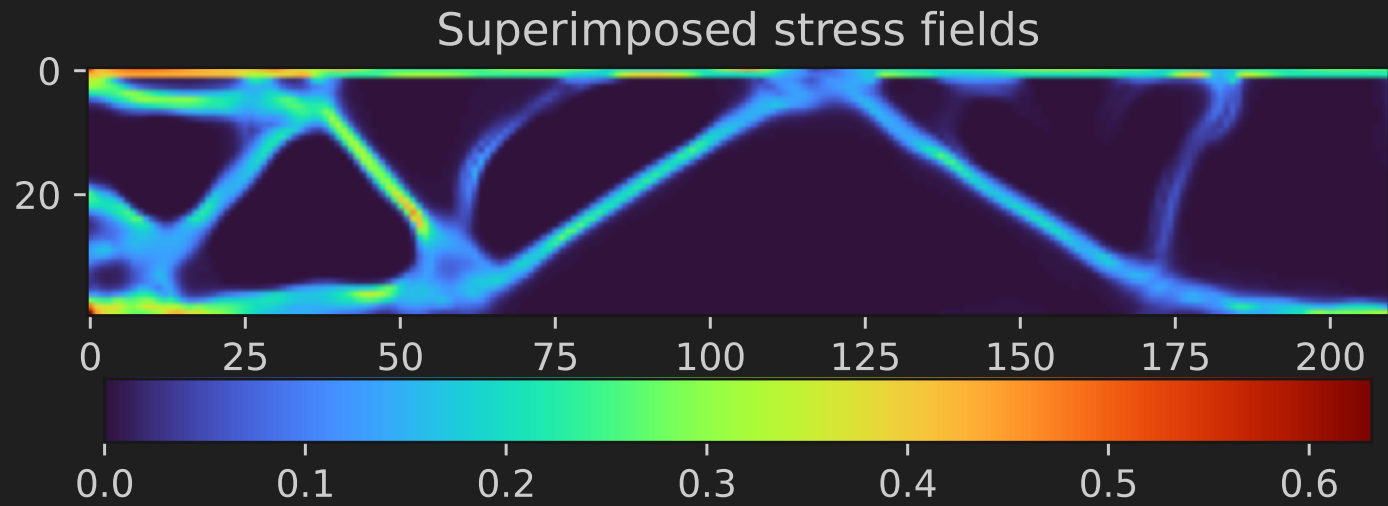
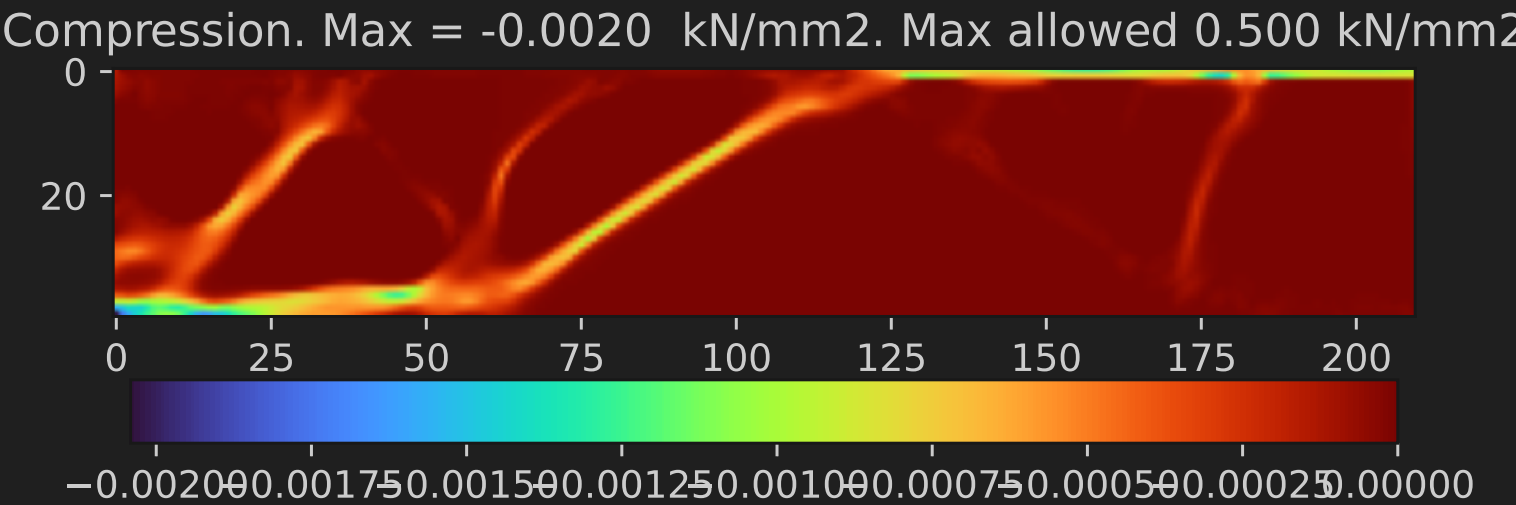
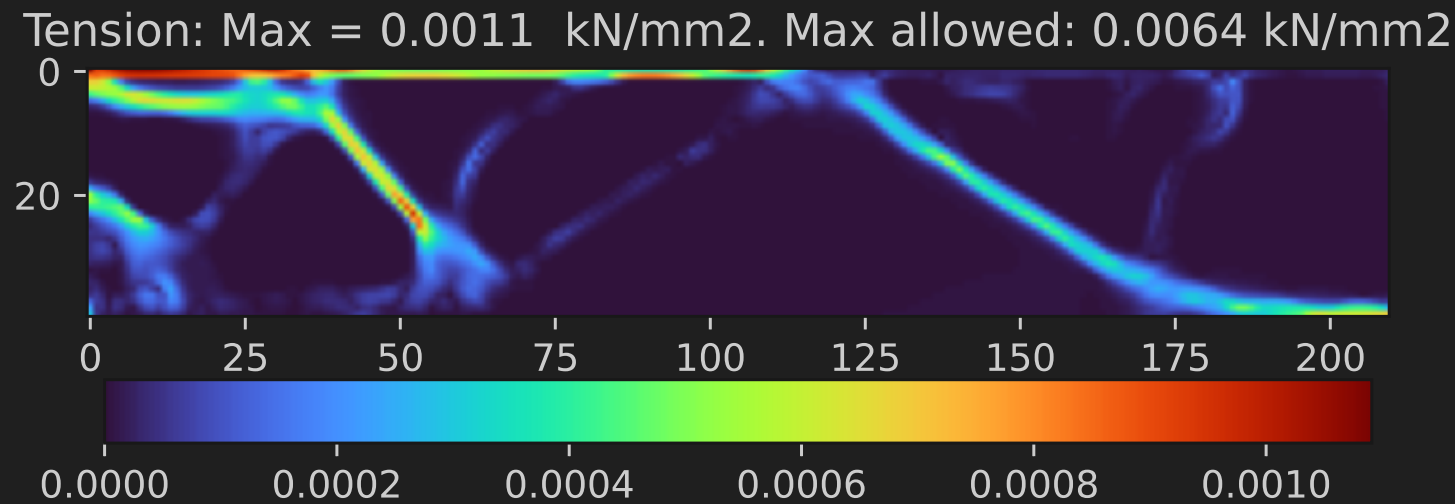
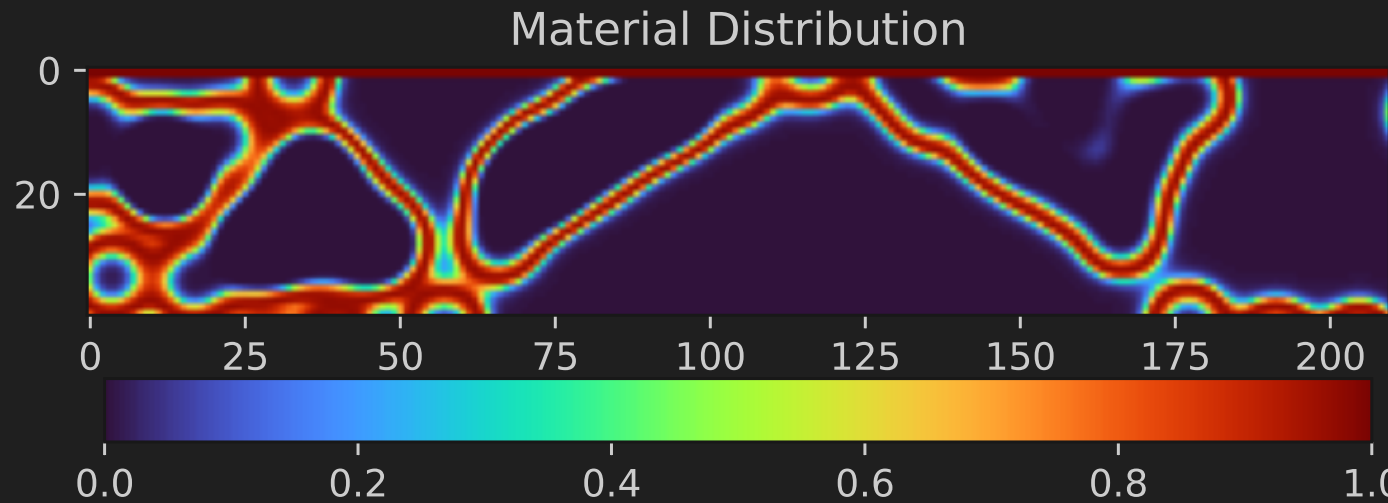
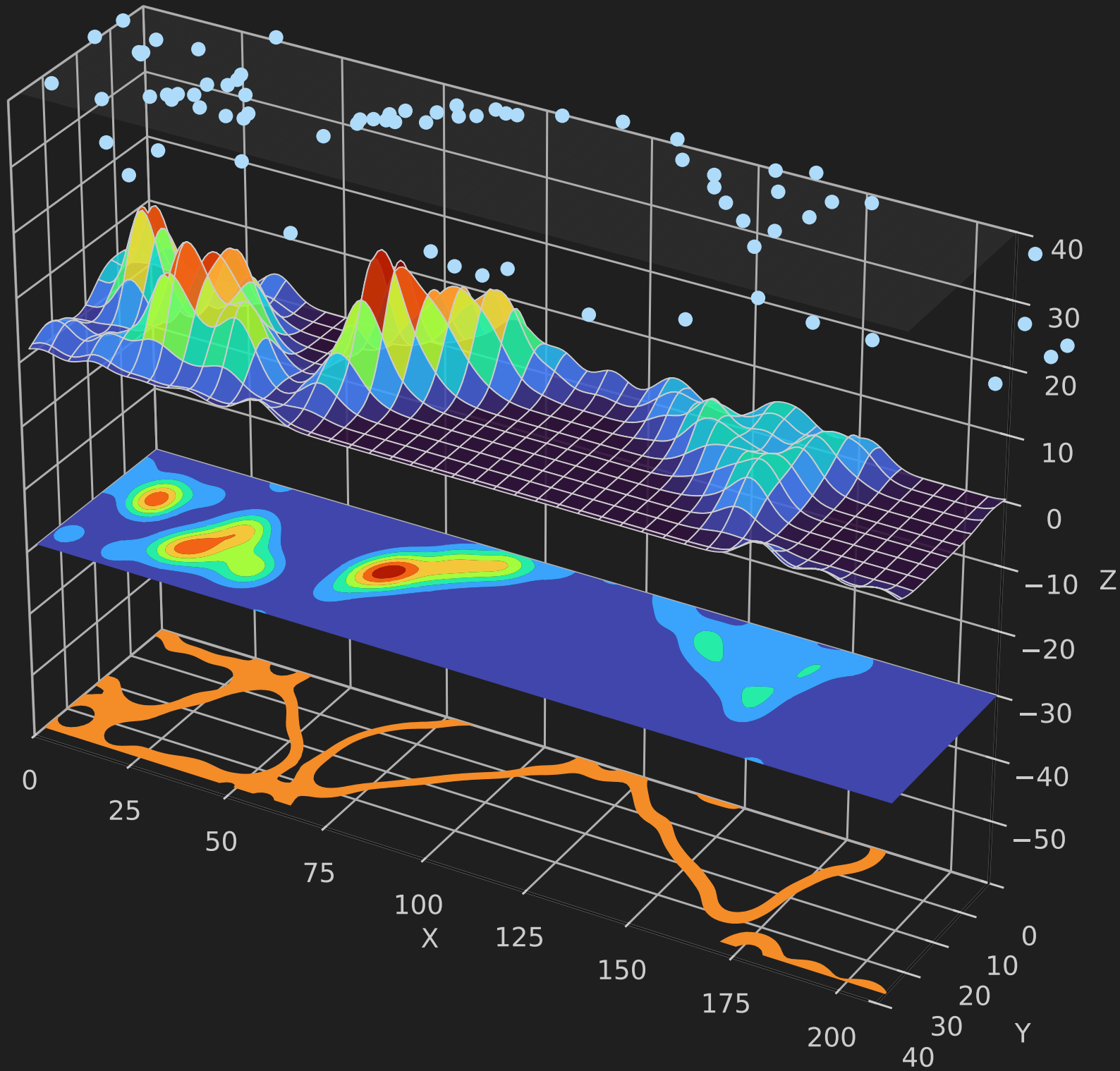
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.61 Shift = 1.86 Iteration = 124



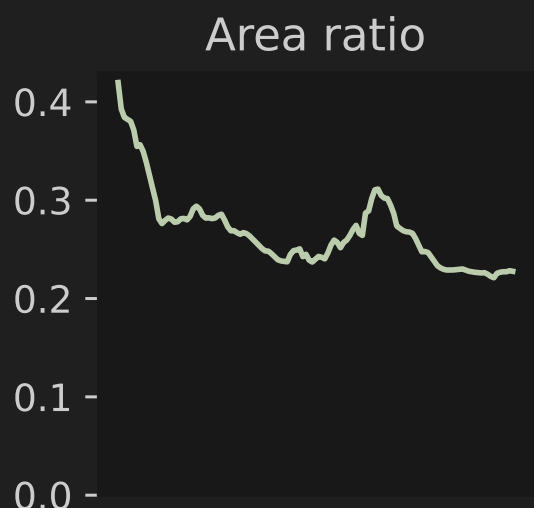
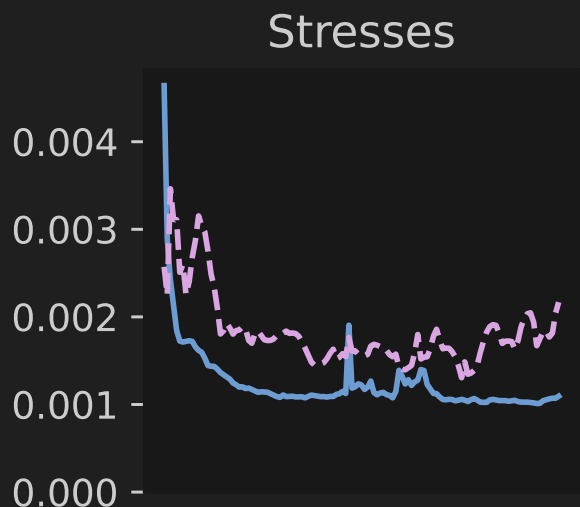
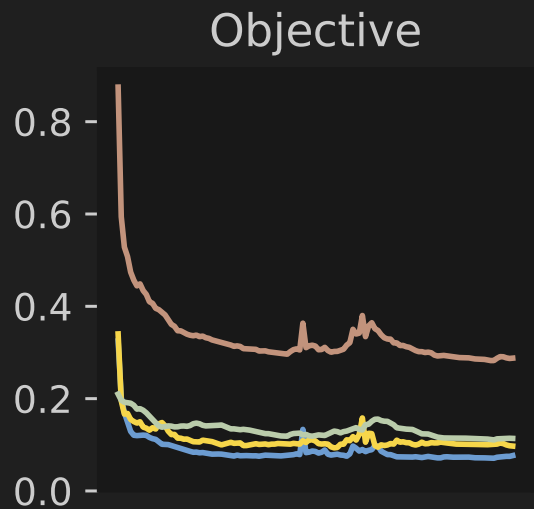
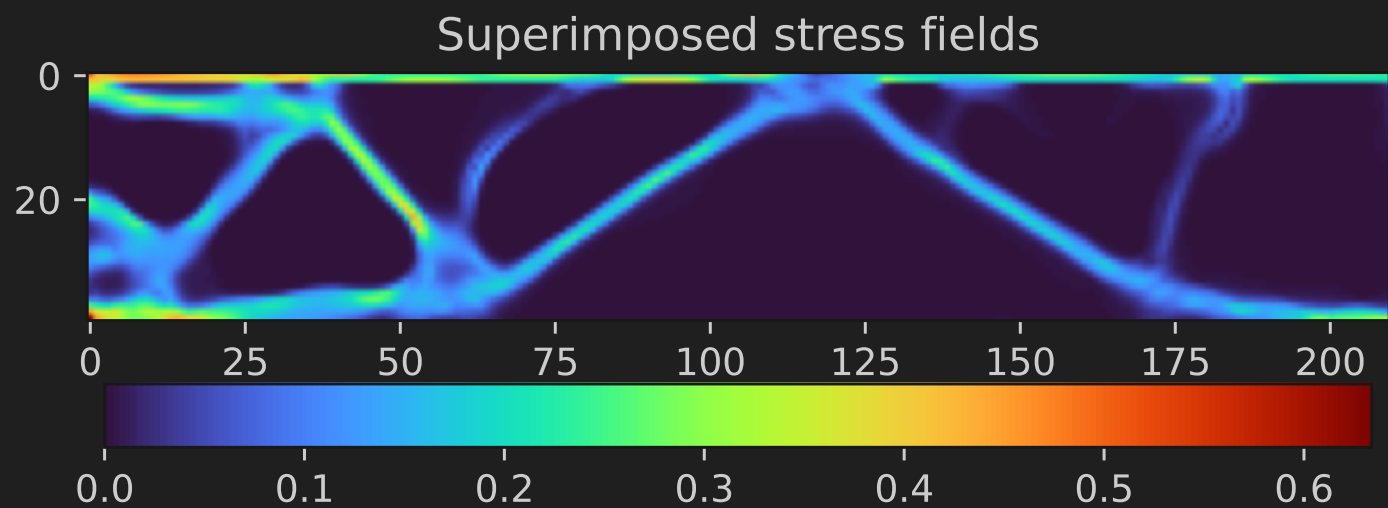
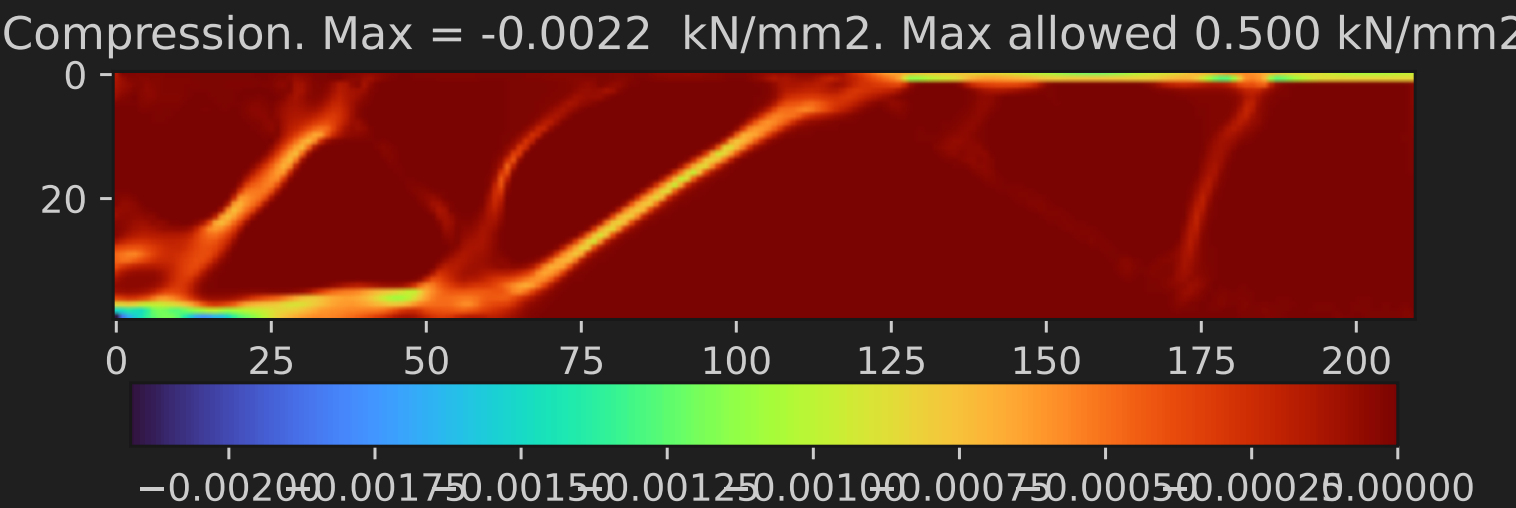
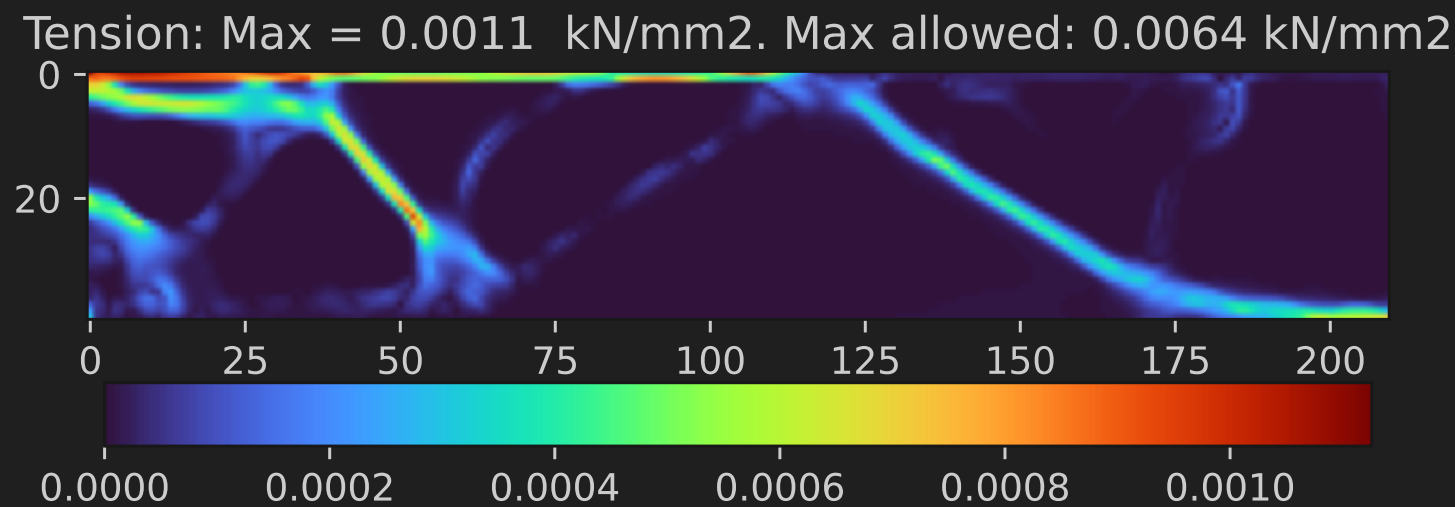
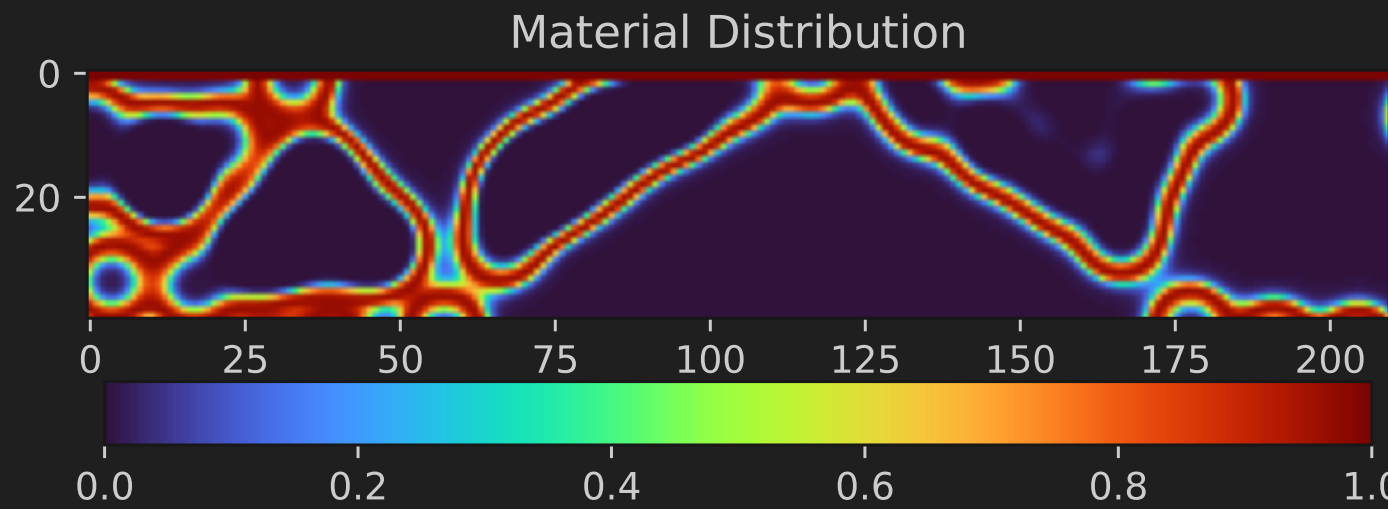
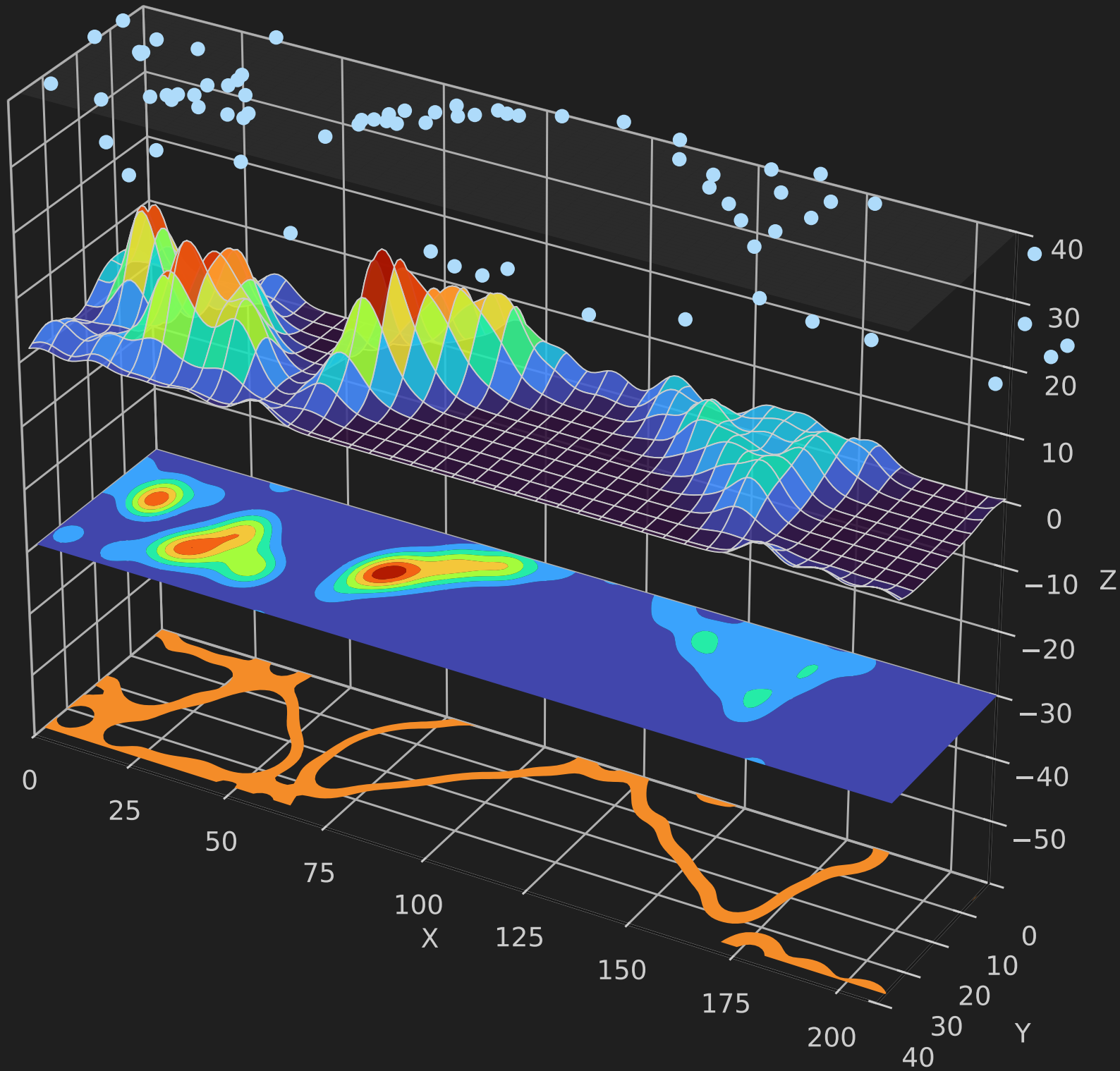
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.64 Shift = 1.84 Iteration = 125



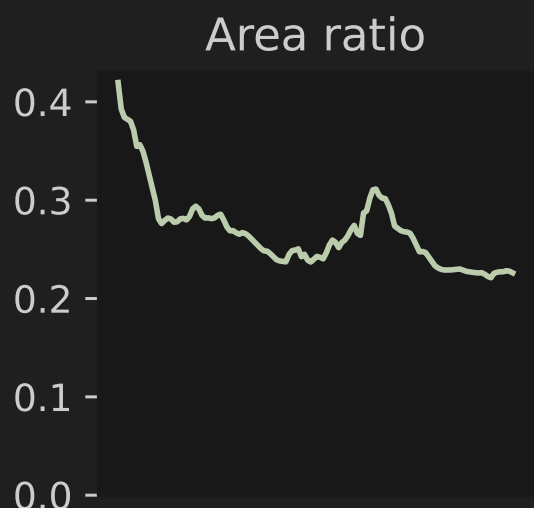
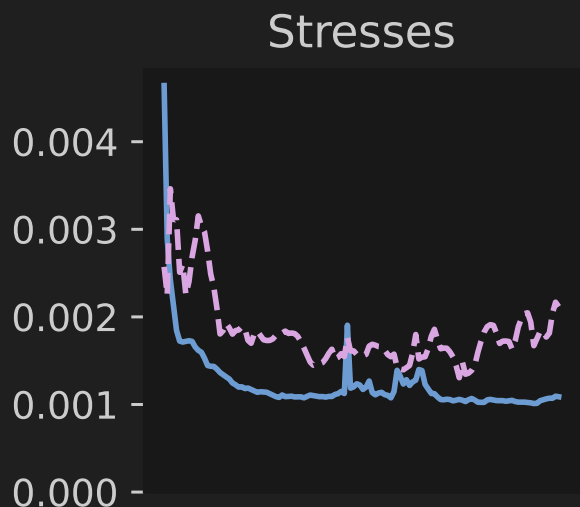
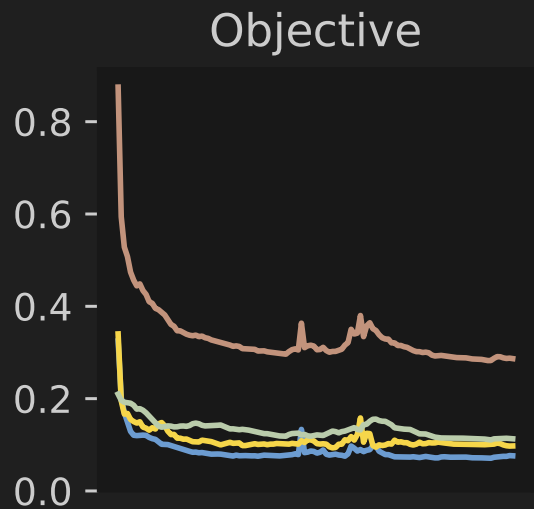
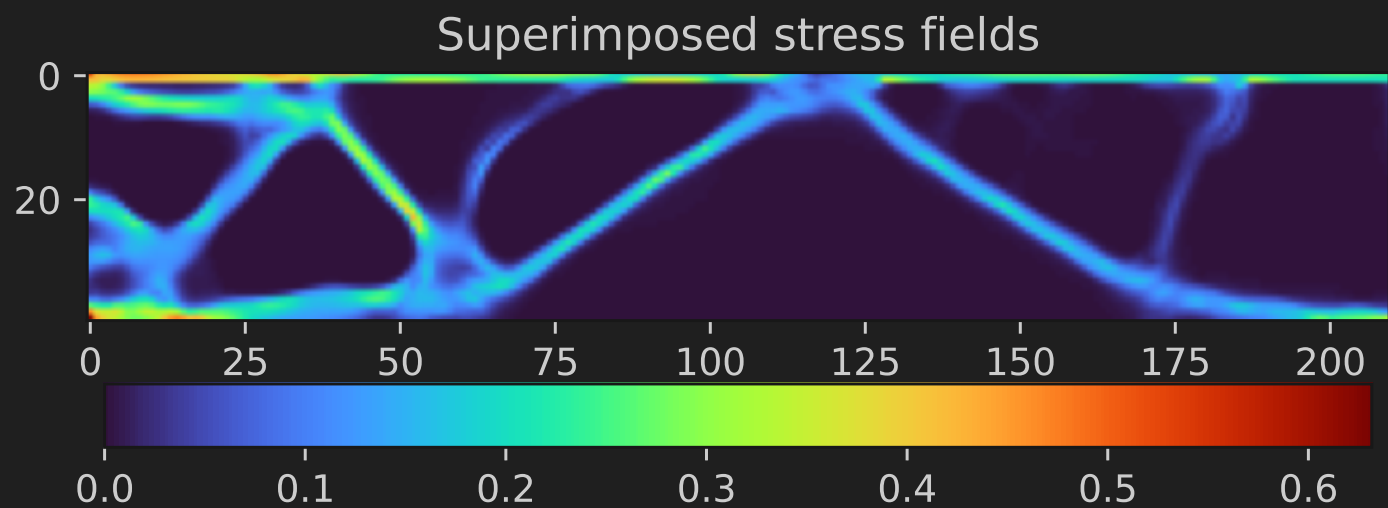
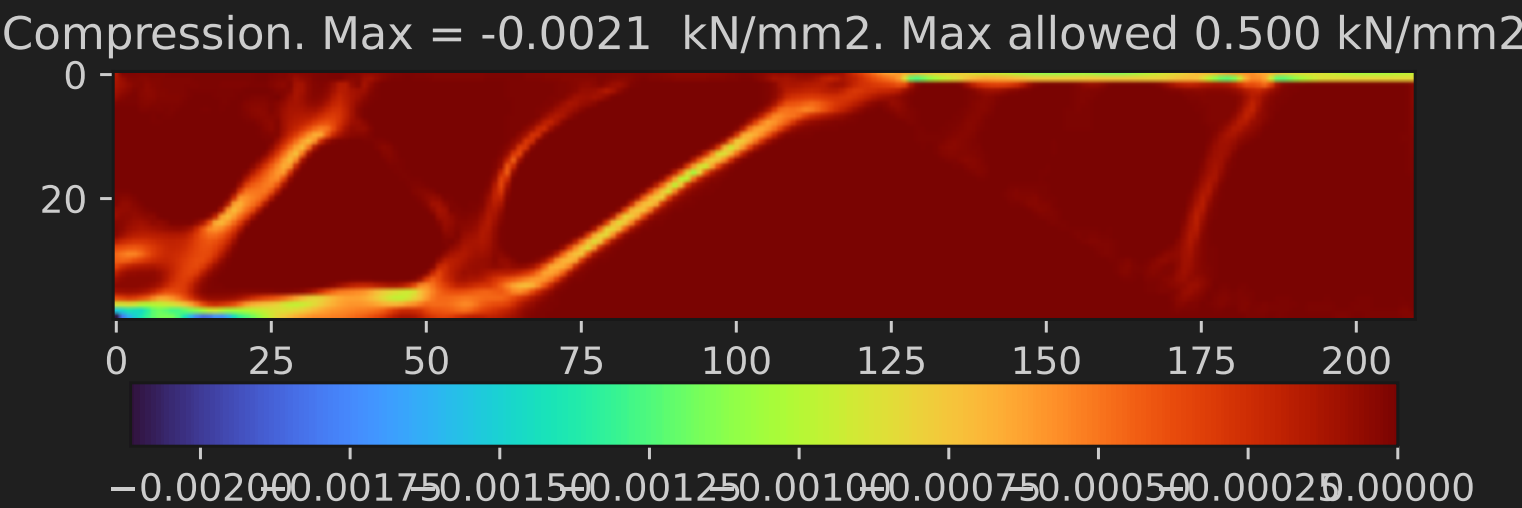
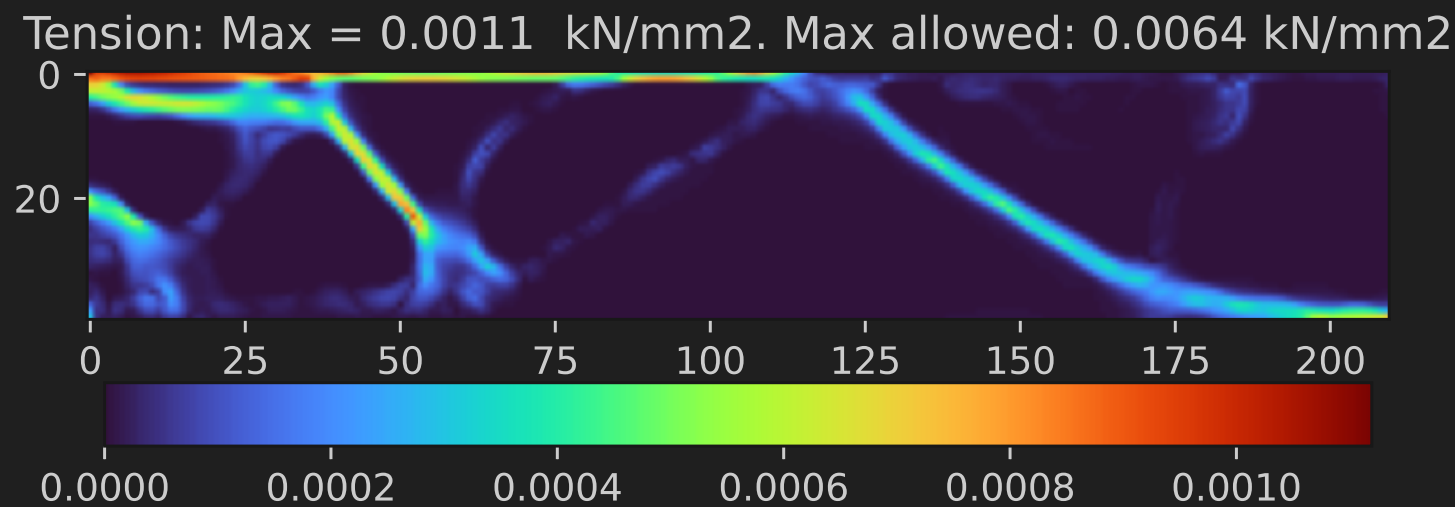
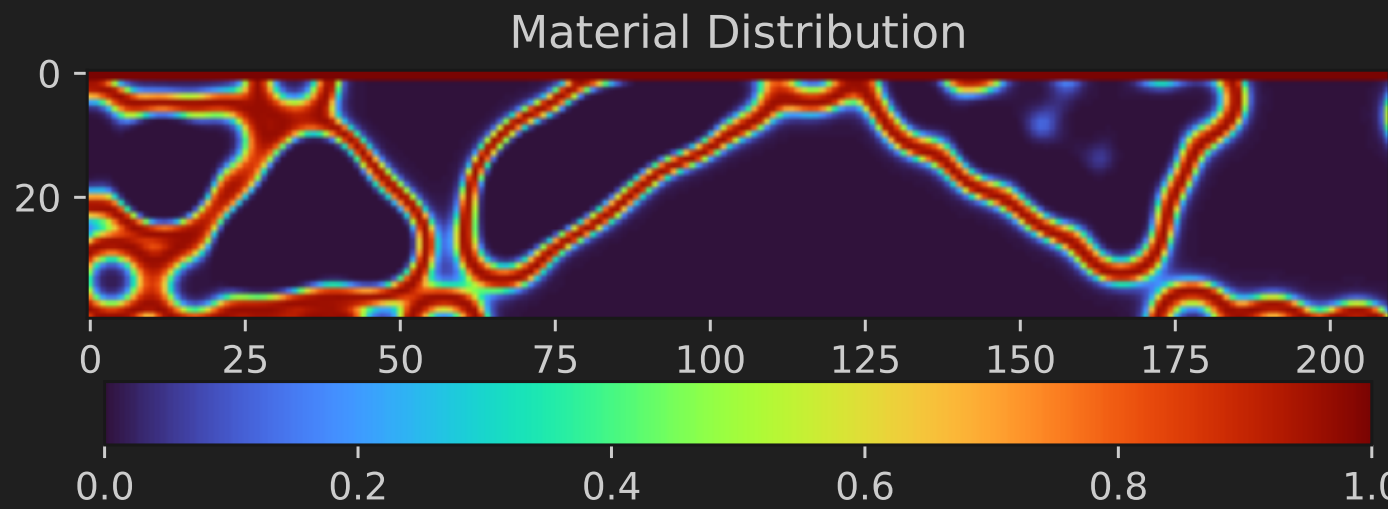
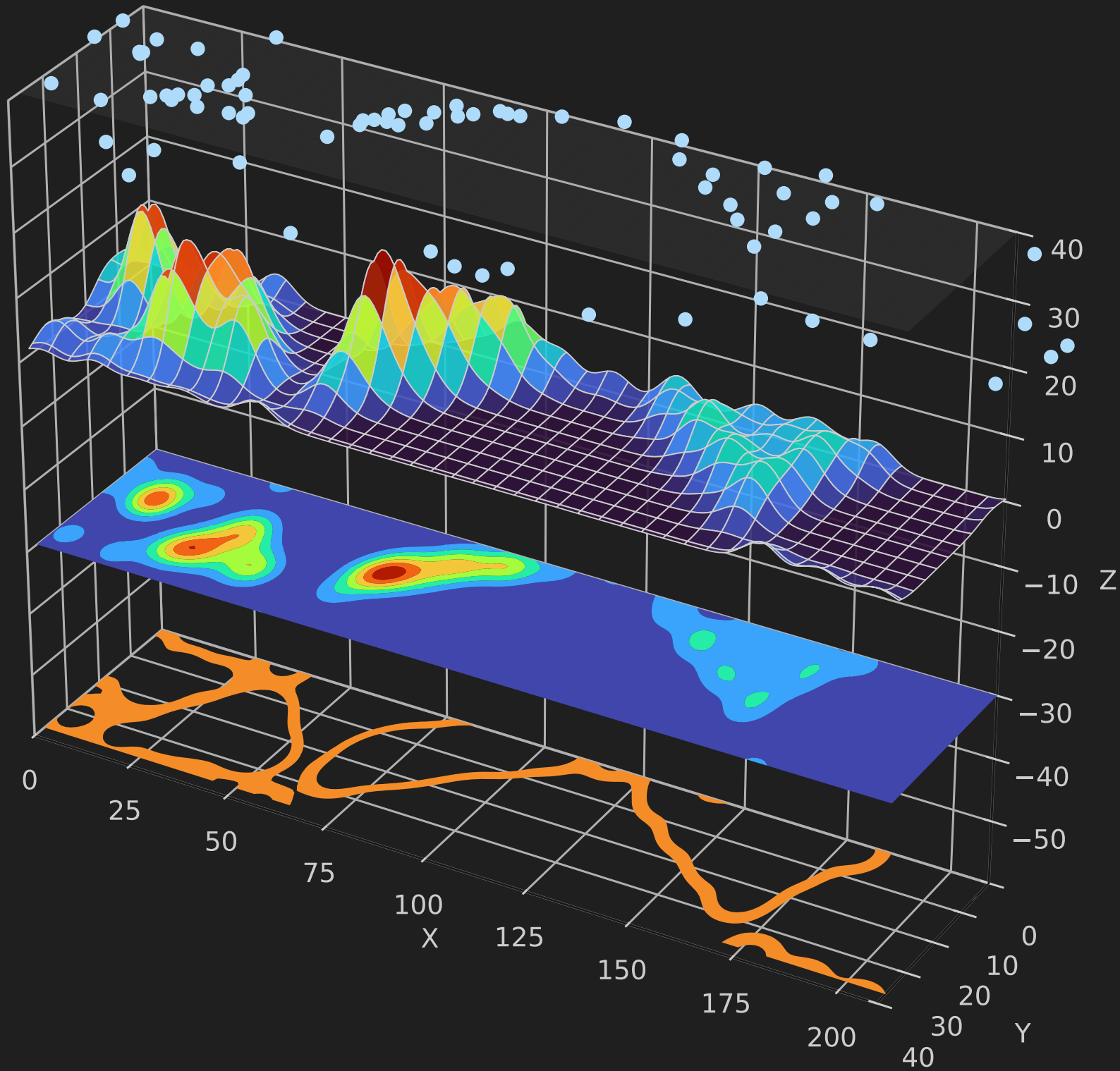
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.67 Shift = 1.82 Iteration = 126



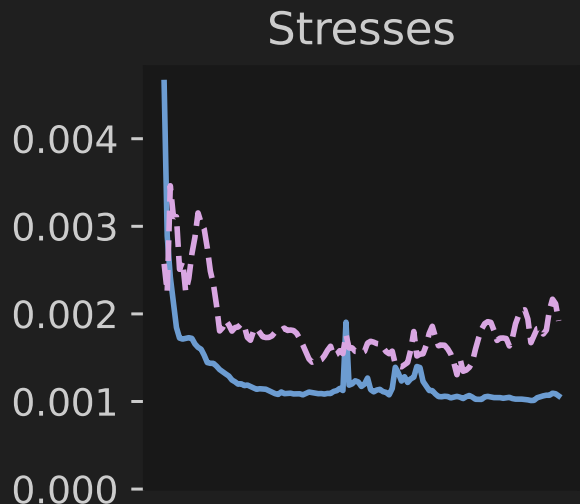
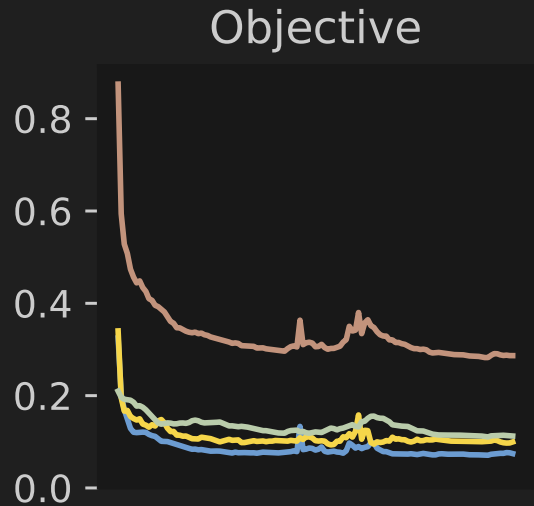
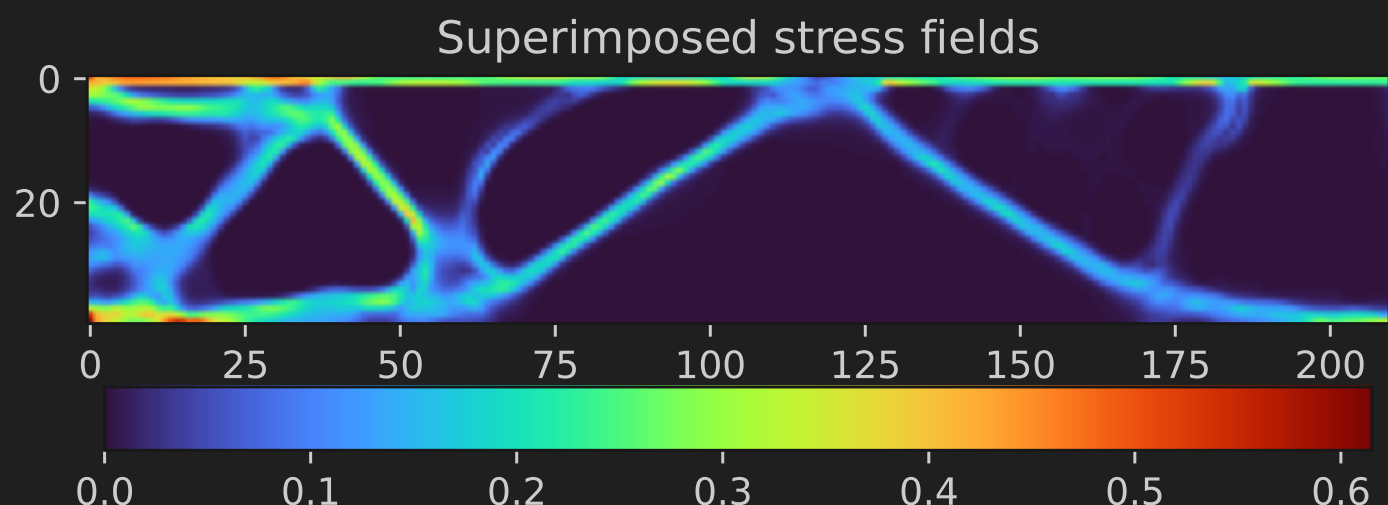
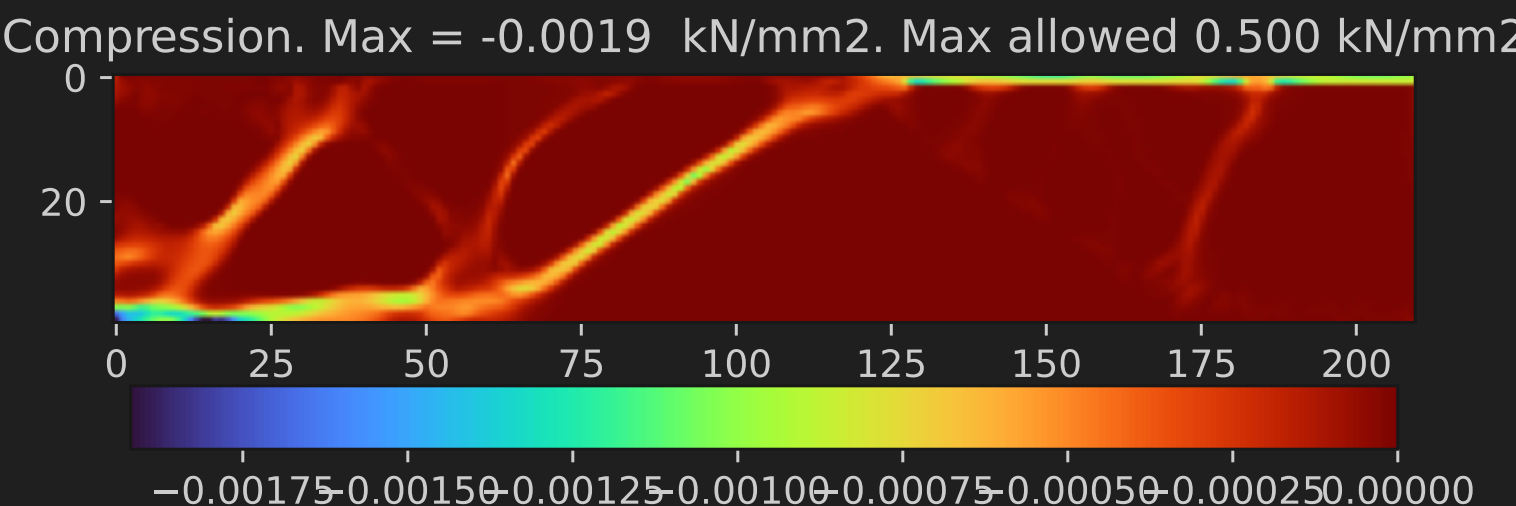
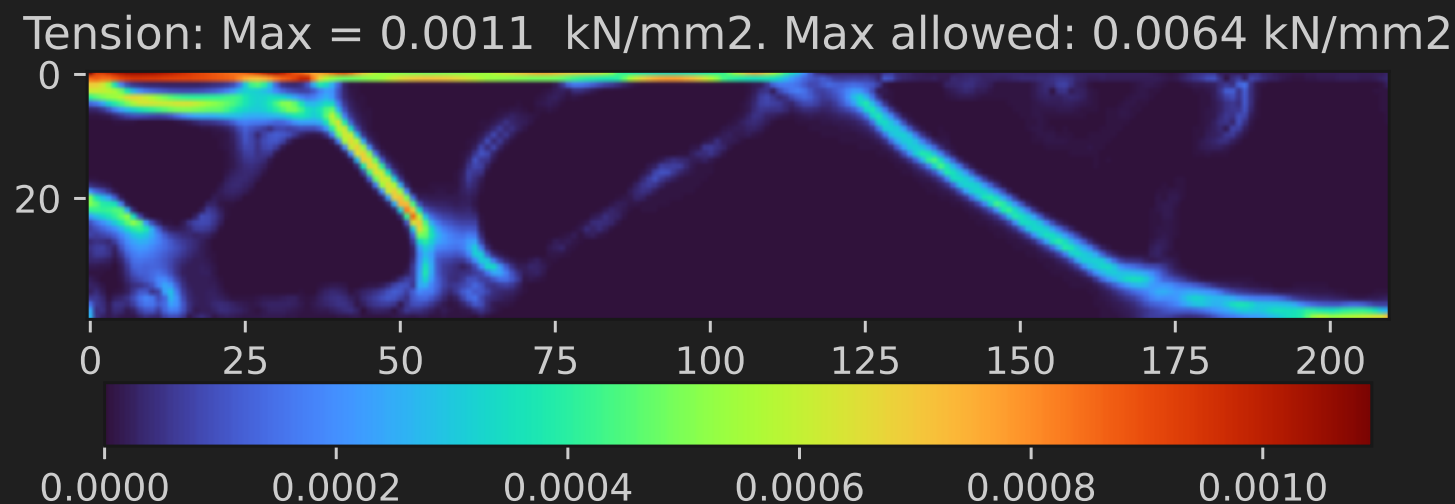
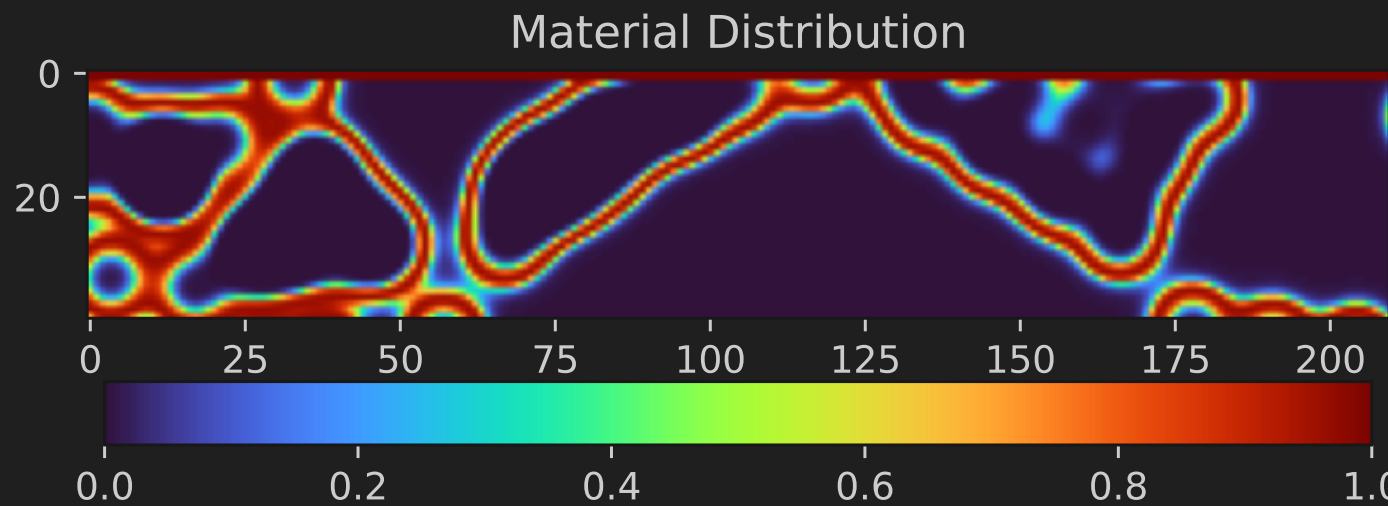
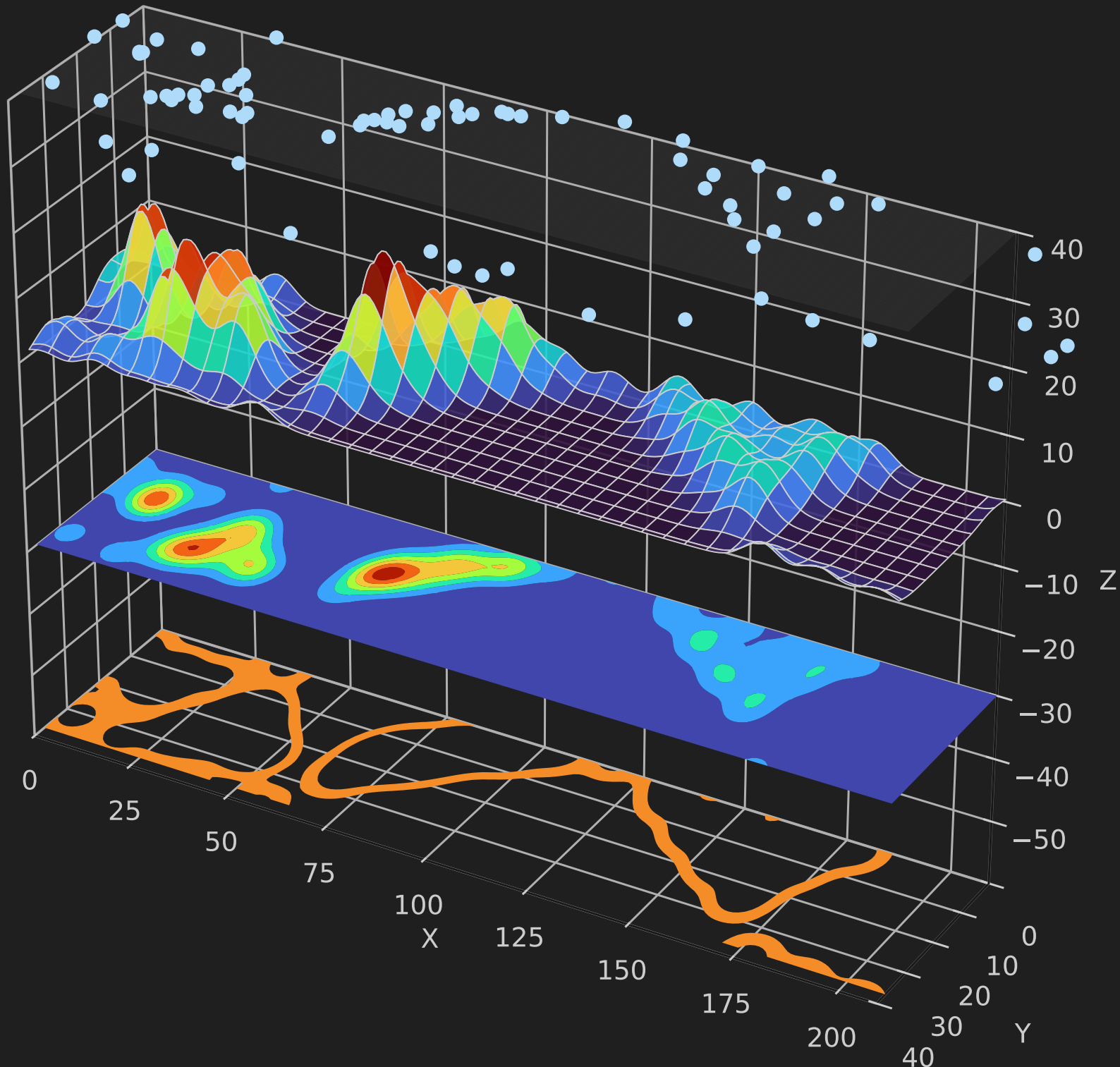
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.68 Shift = 1.81 Iteration = 127



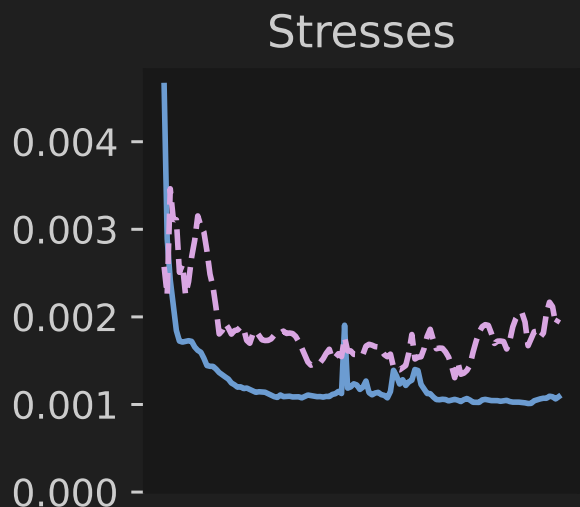
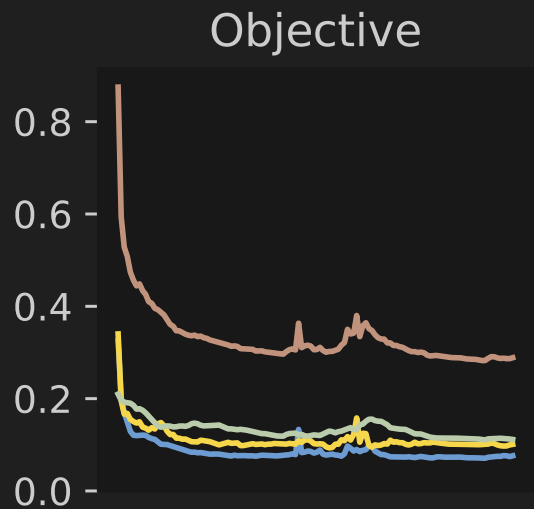
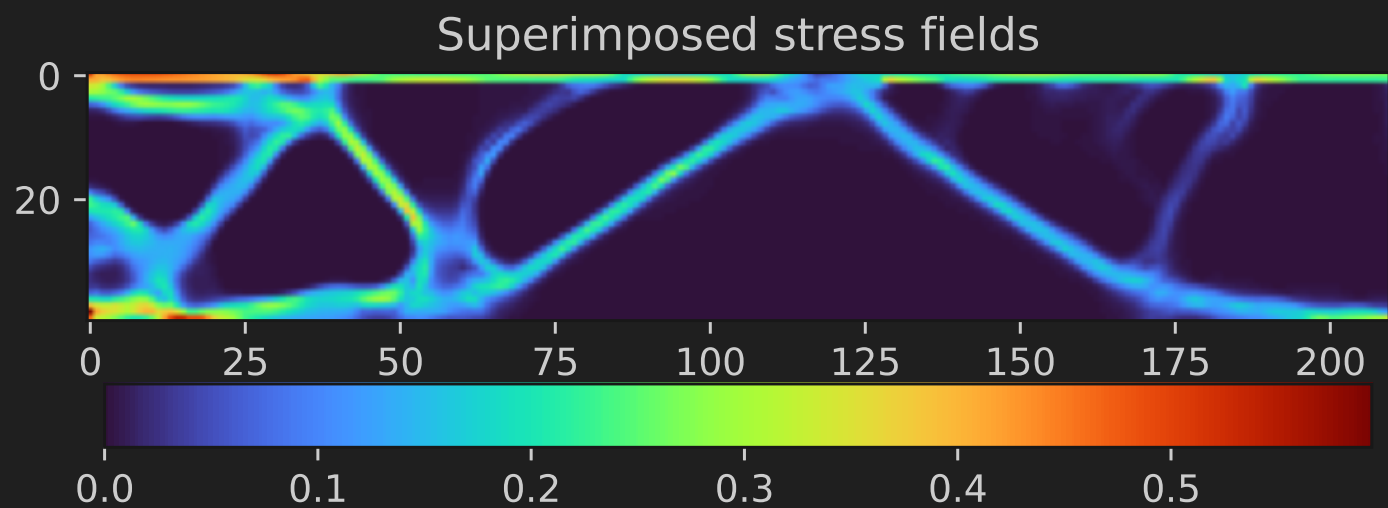
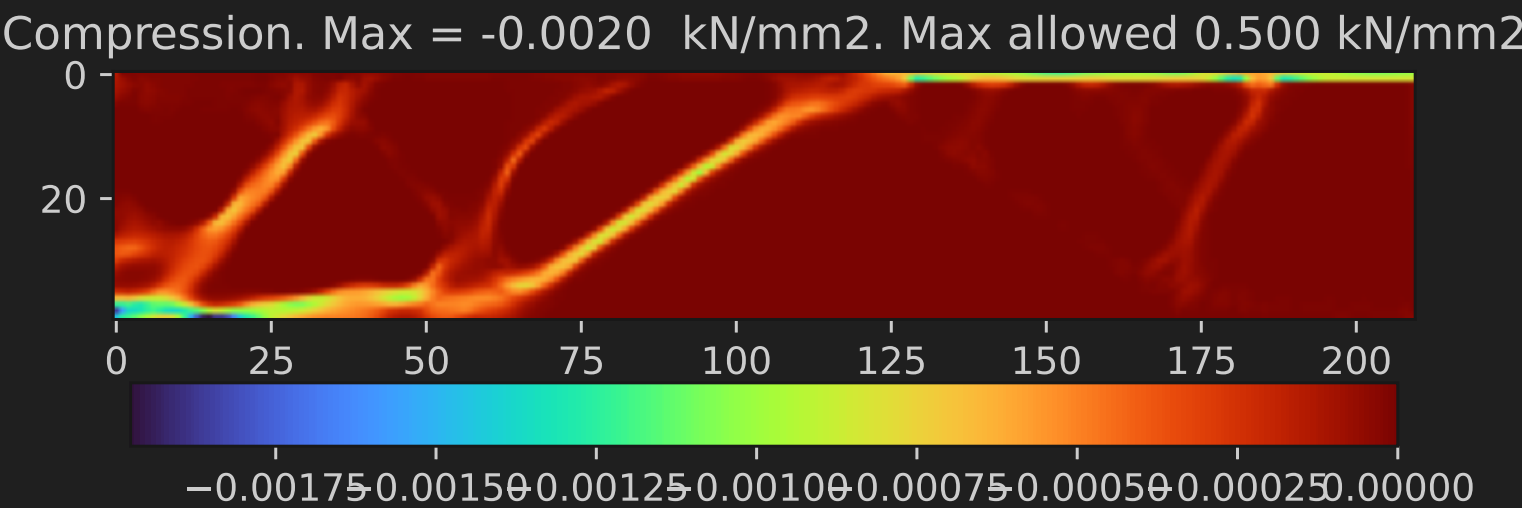
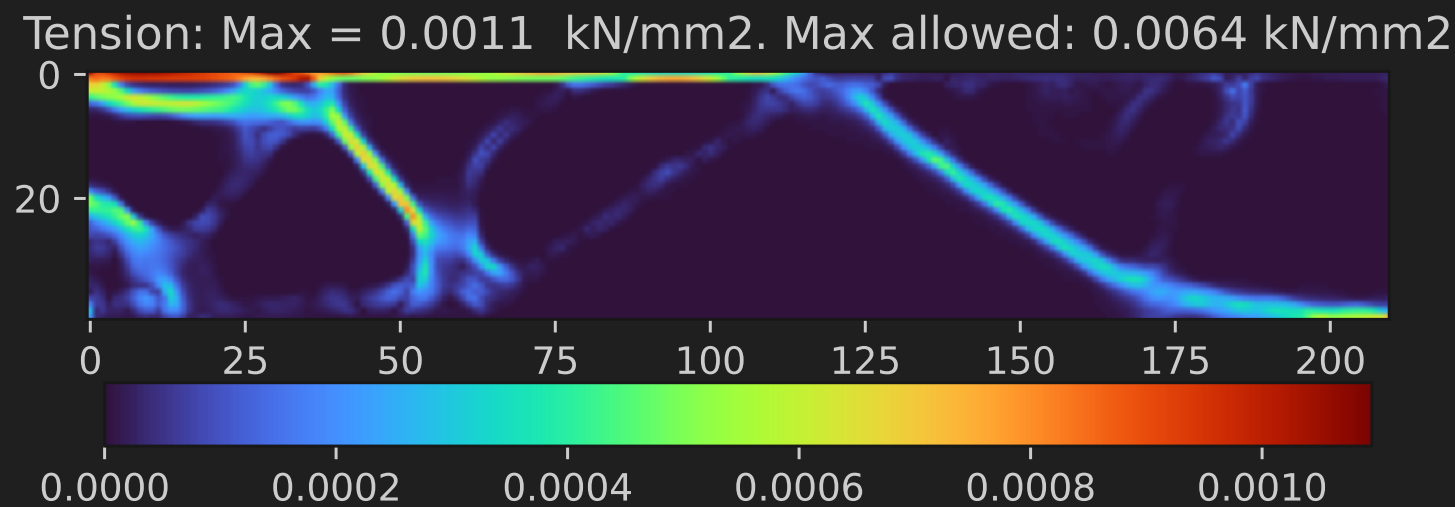
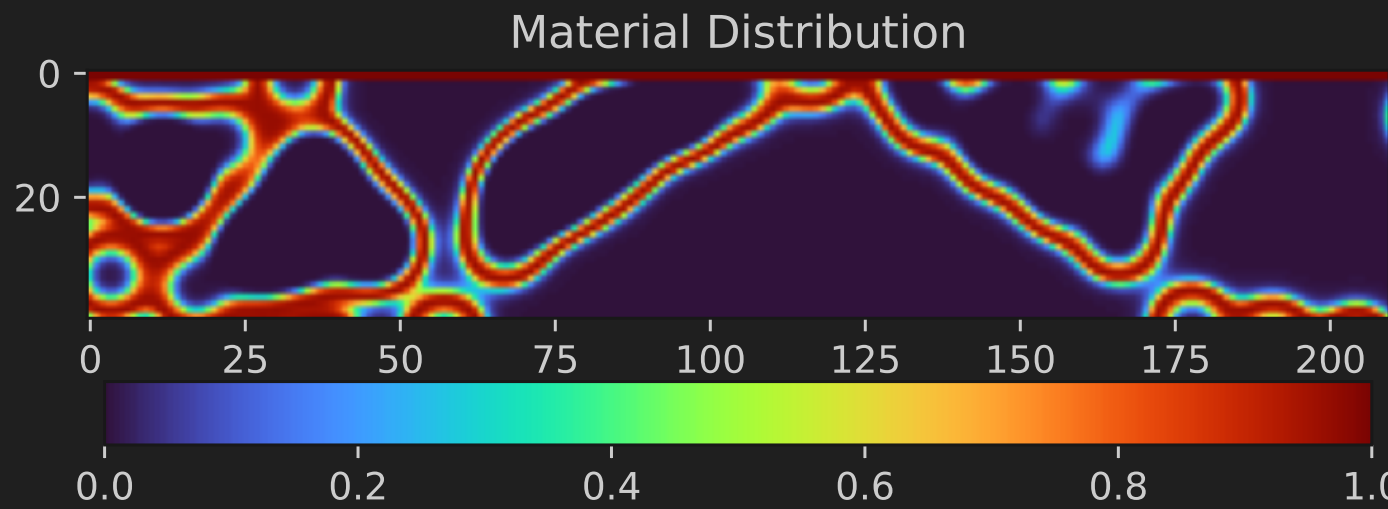
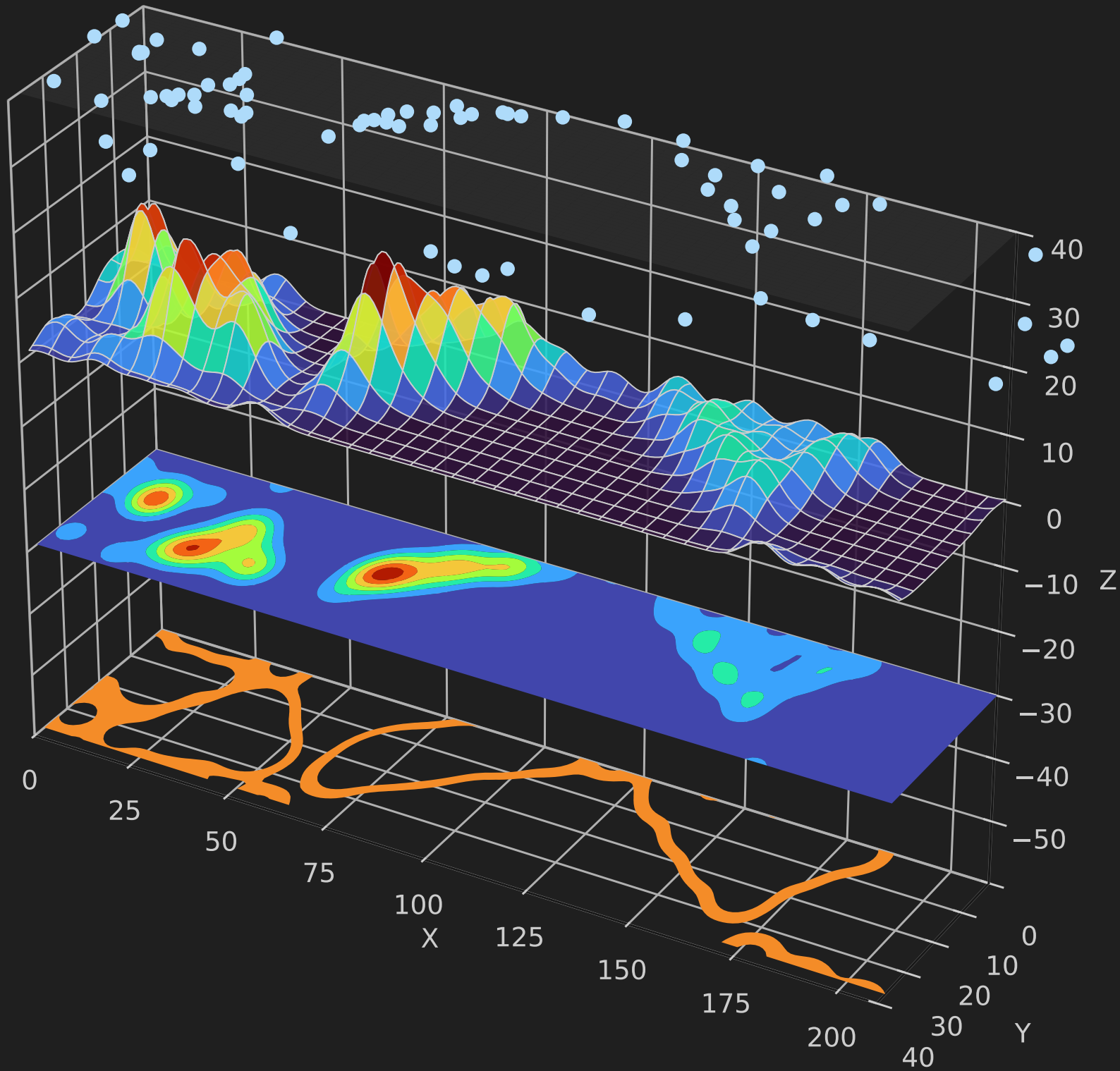
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.69 Shift = 1.80 Iteration = 128



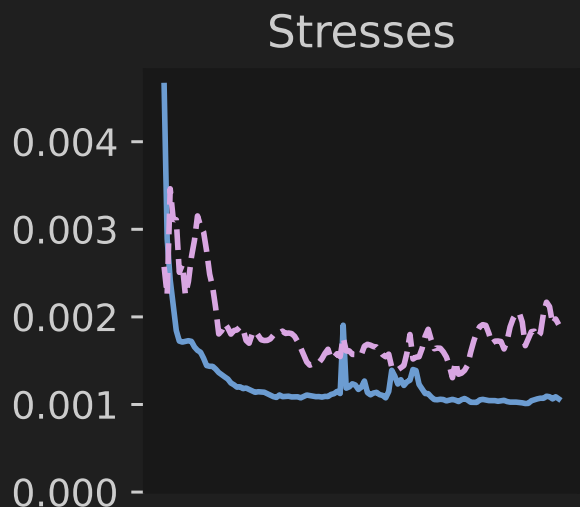
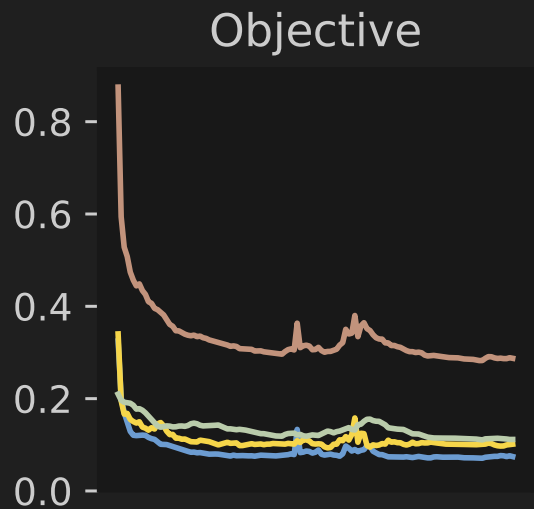
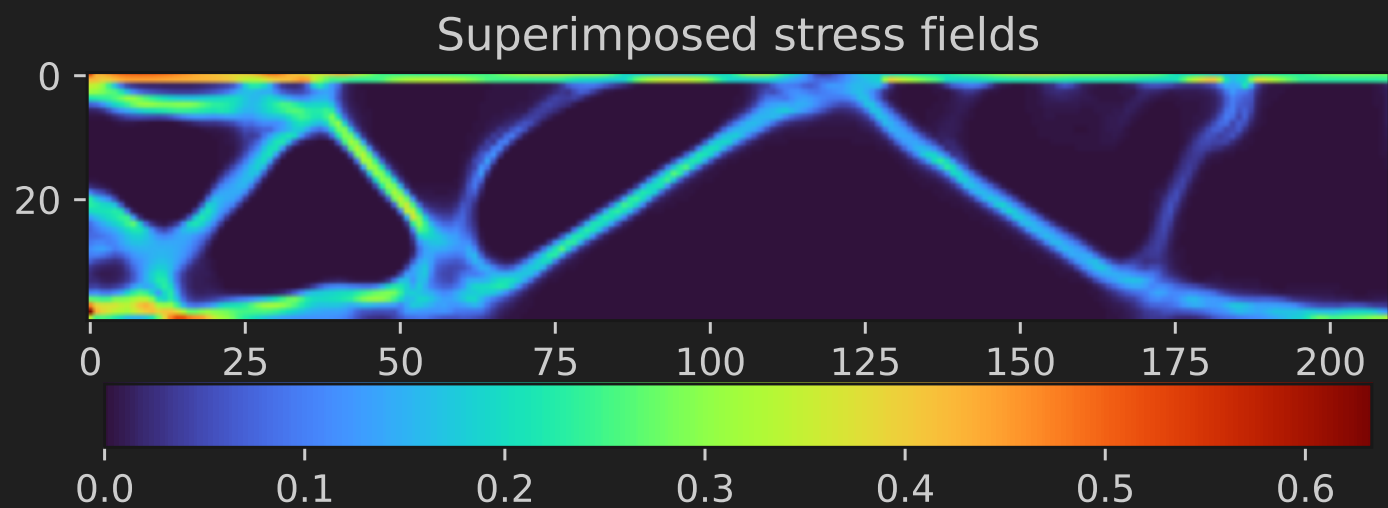
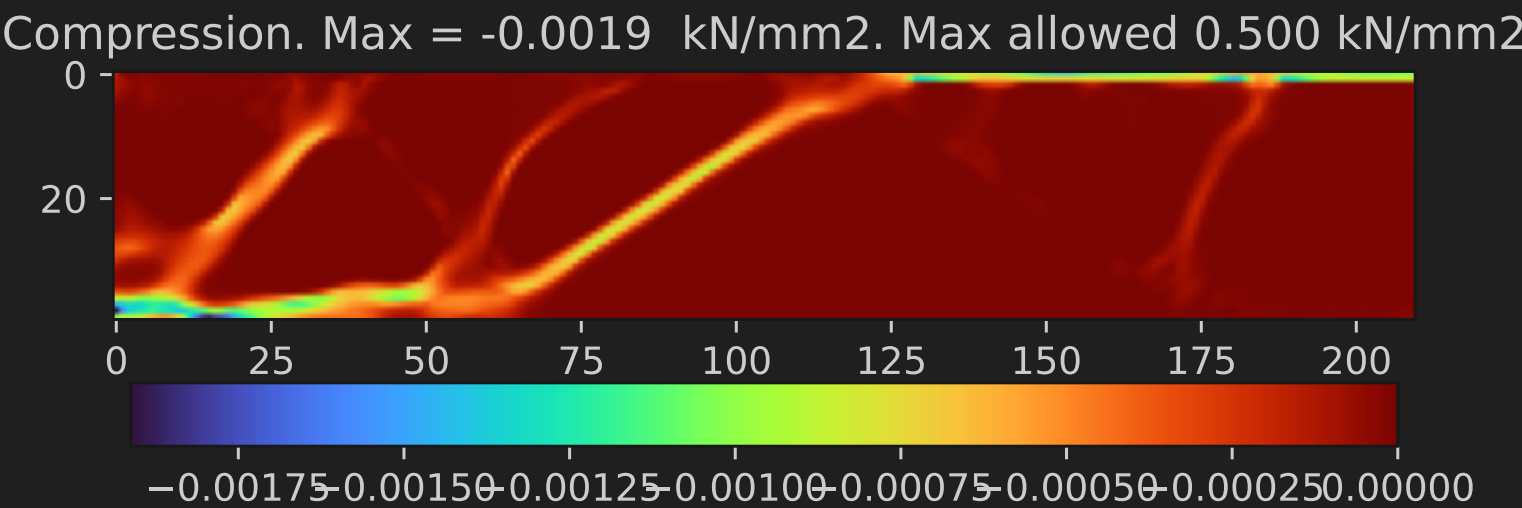
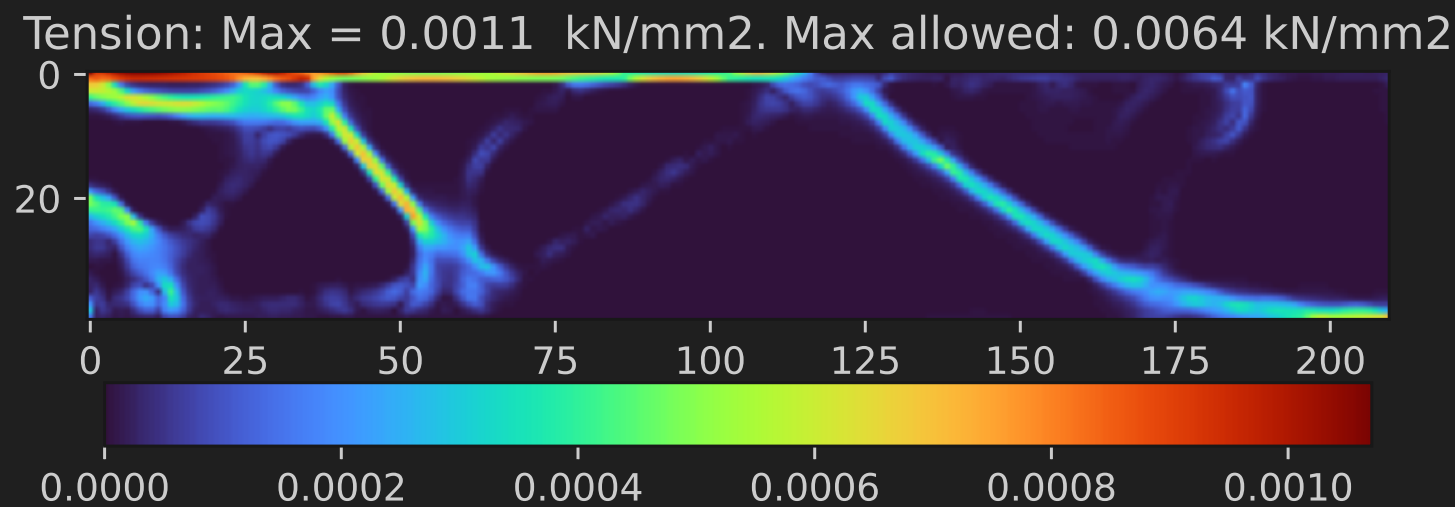
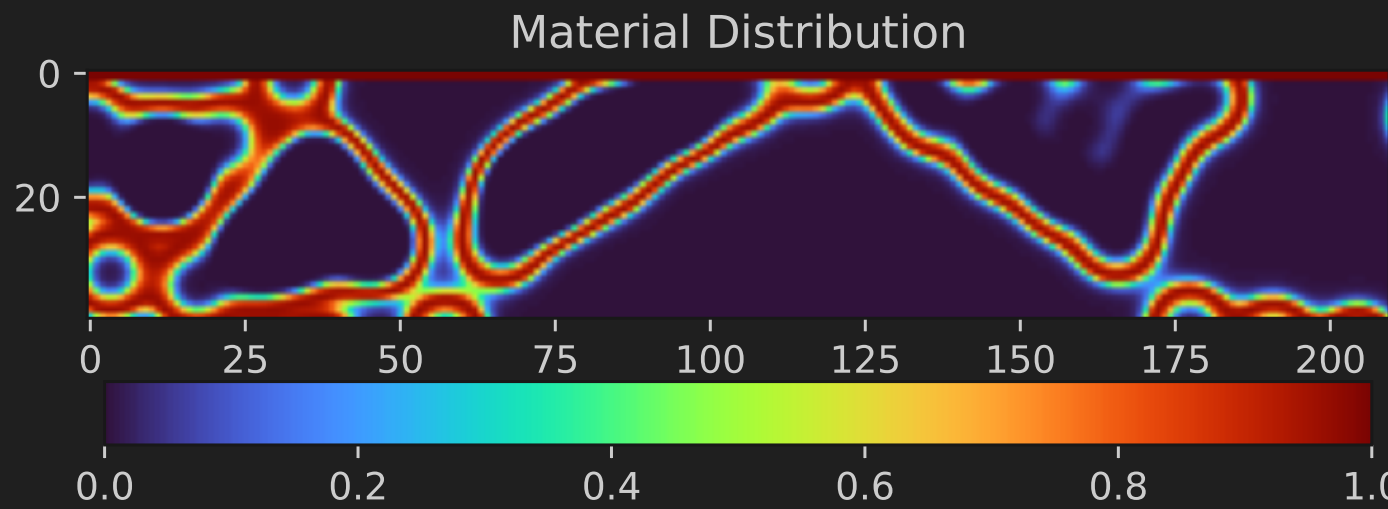
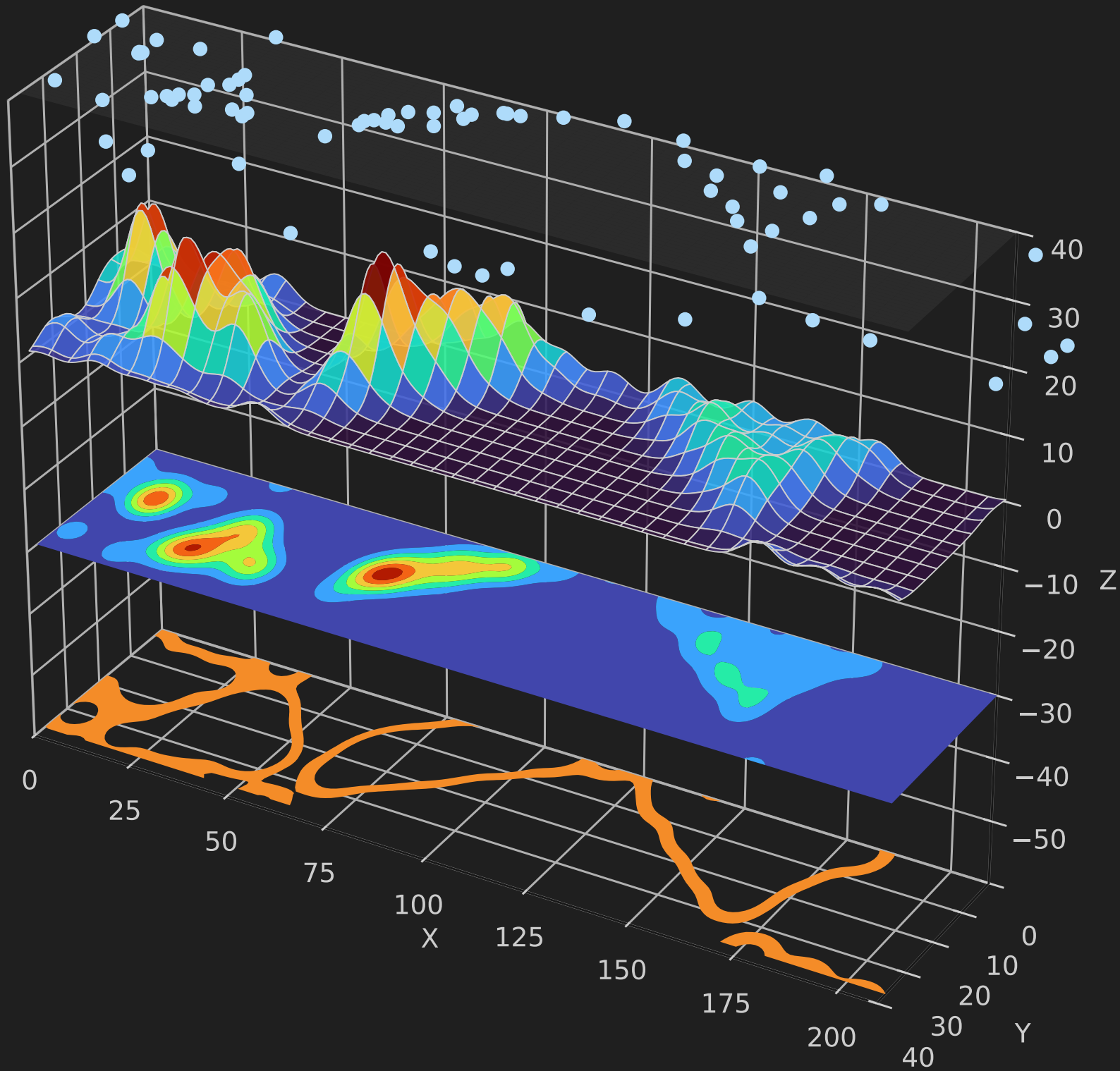
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.70 Shift = 1.79 Iteration = 129



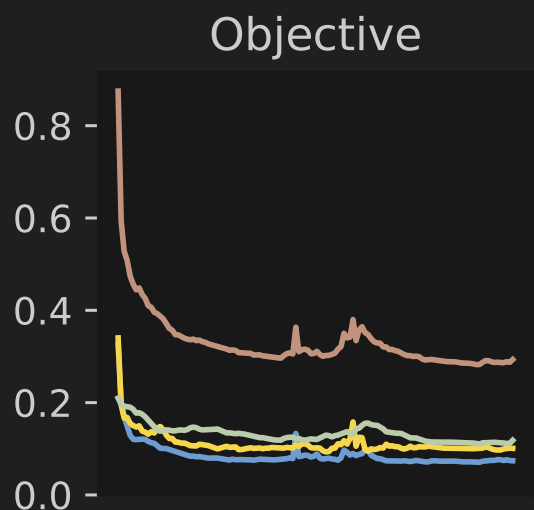
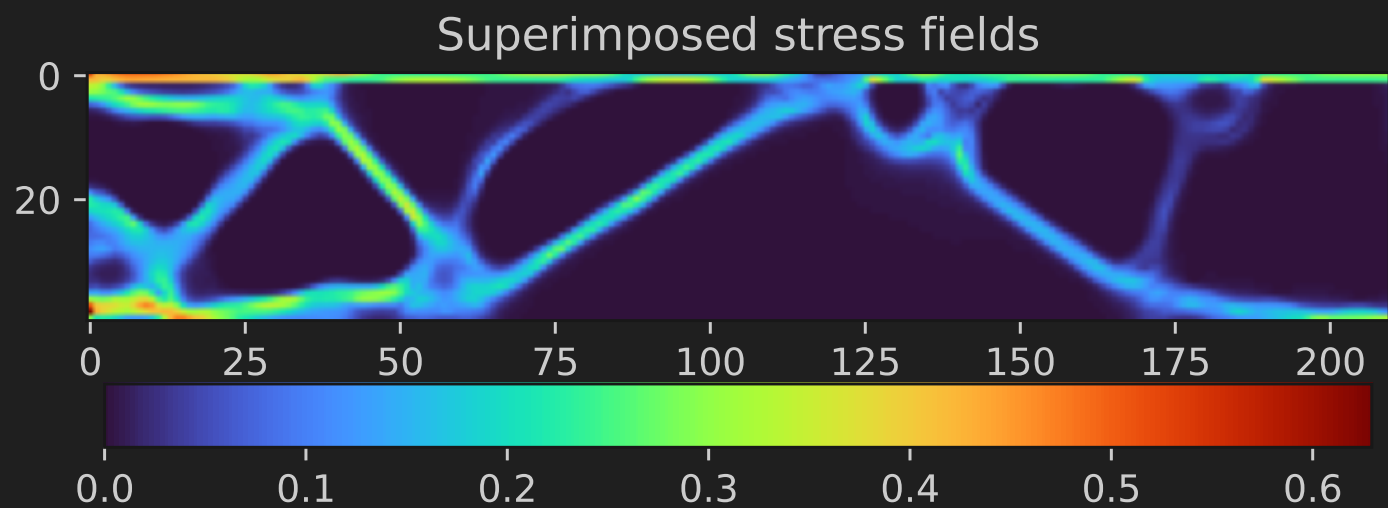
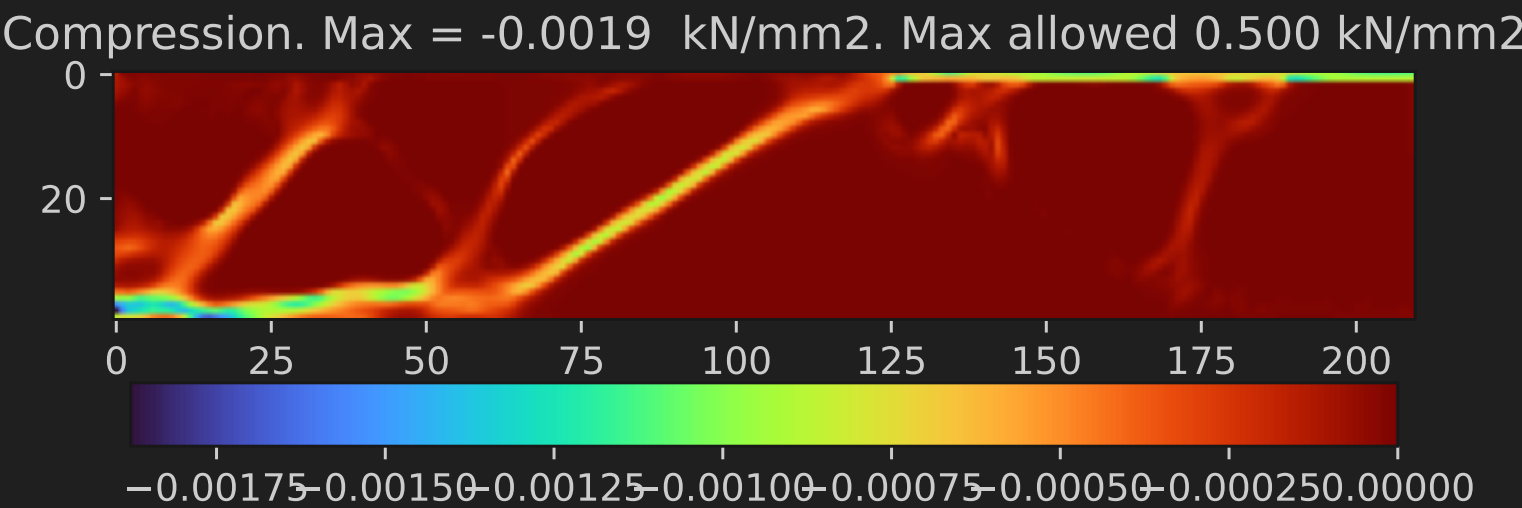
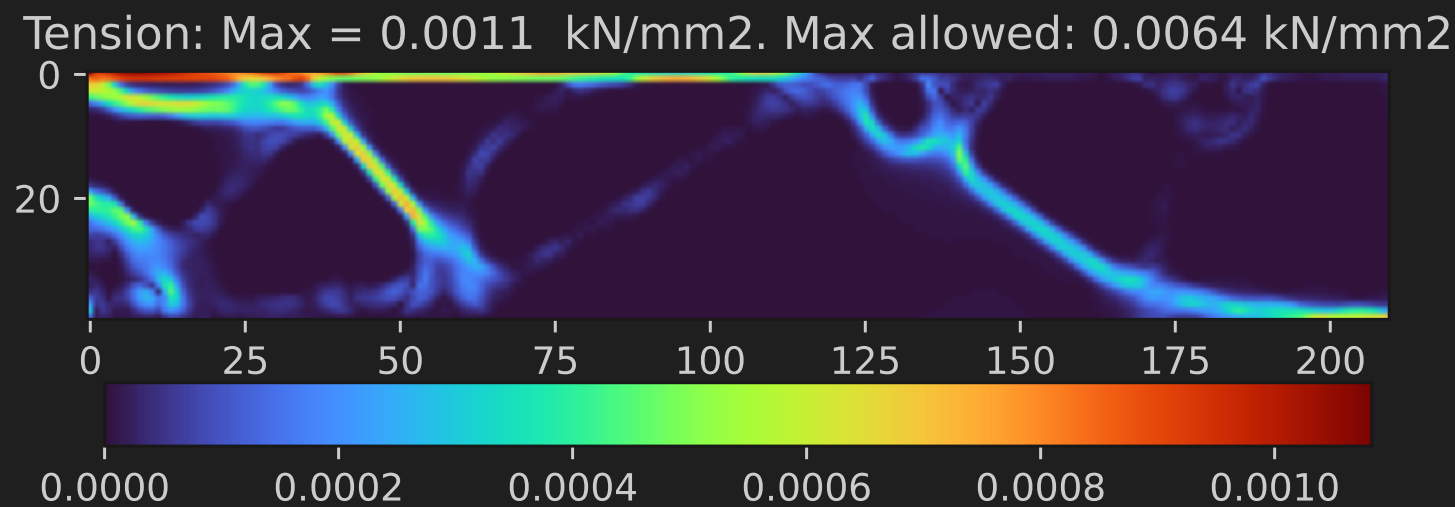
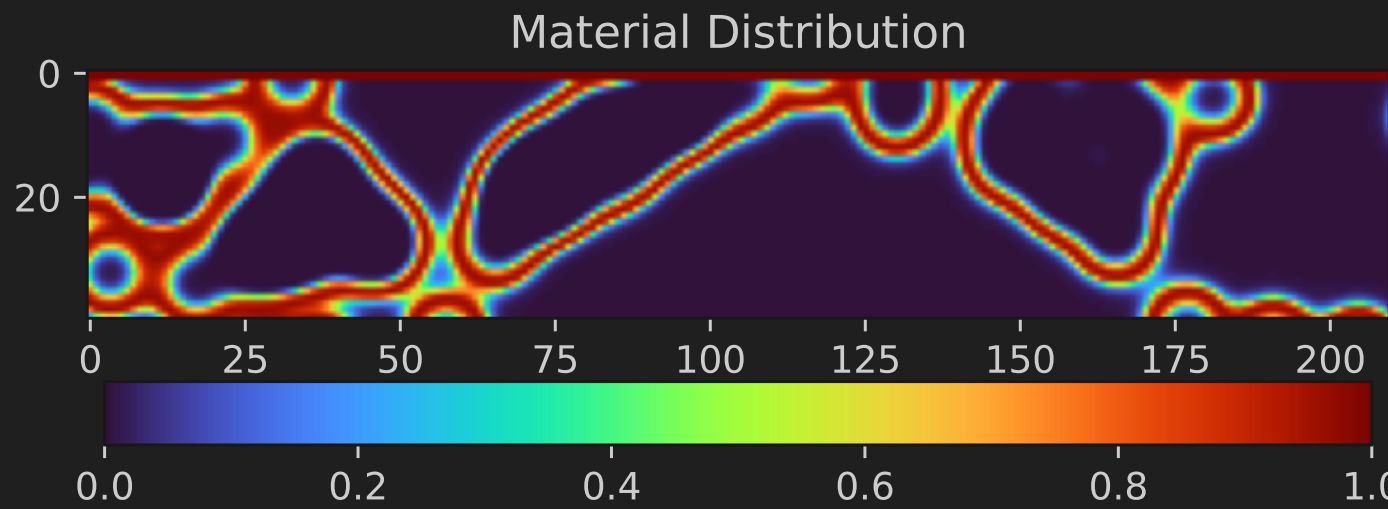
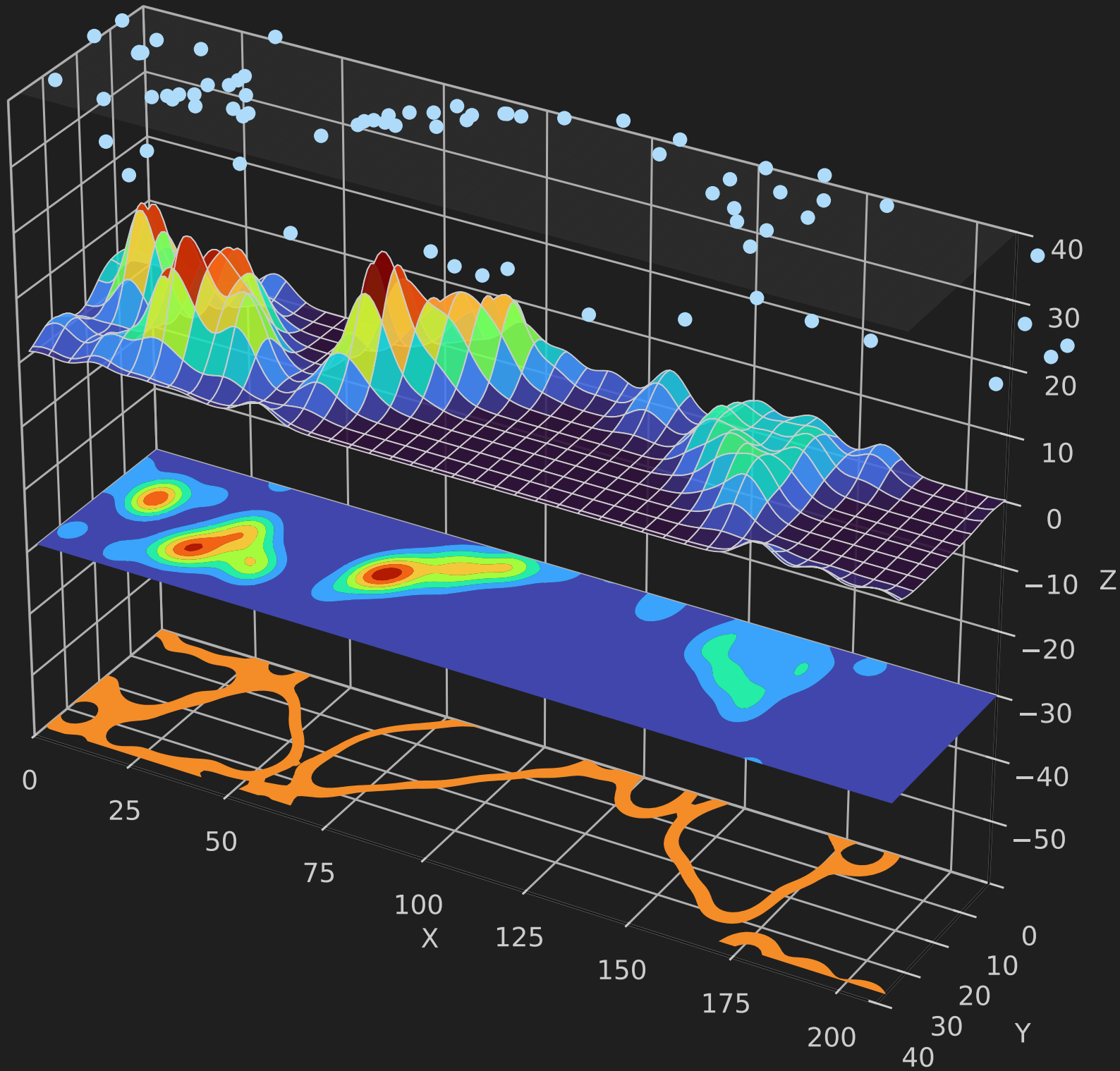
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.70 Shift = 1.79 Iteration = 130



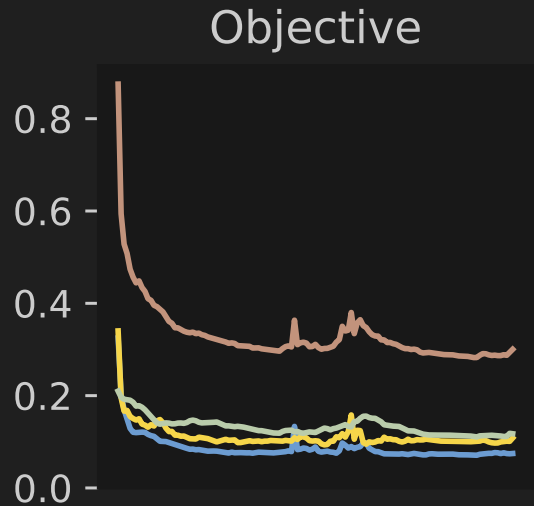
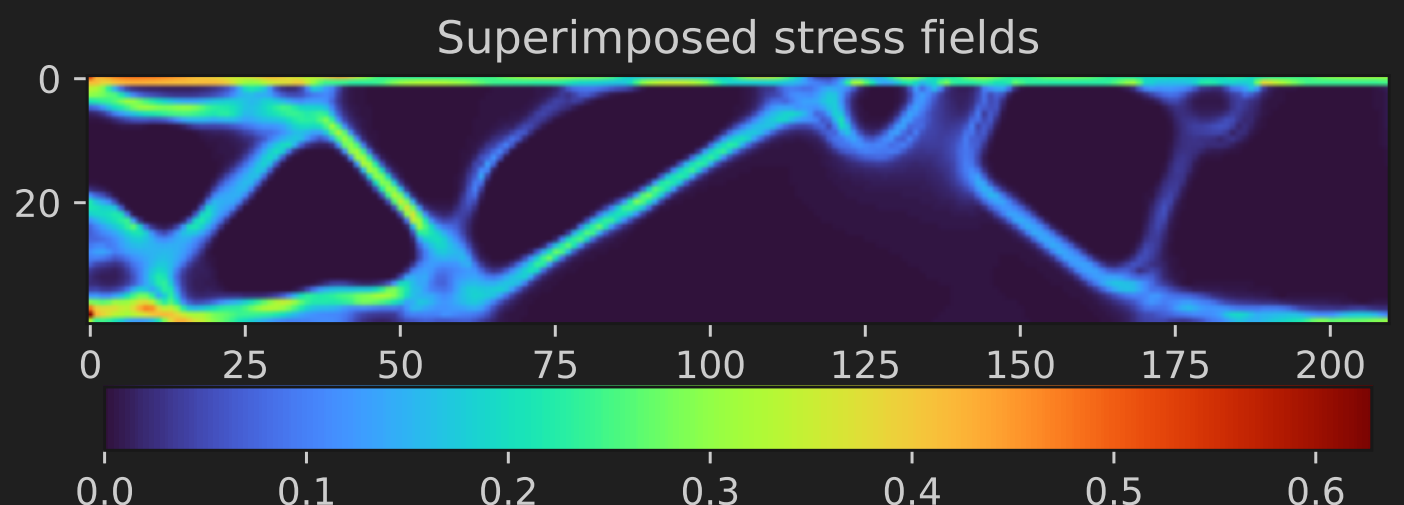
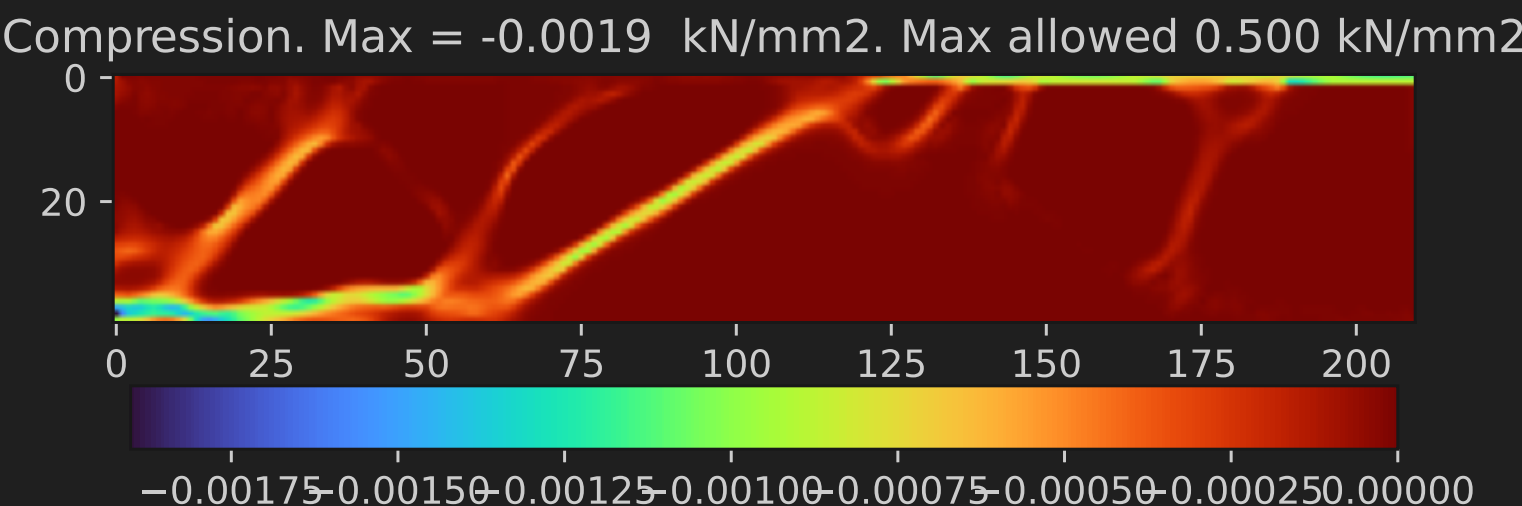
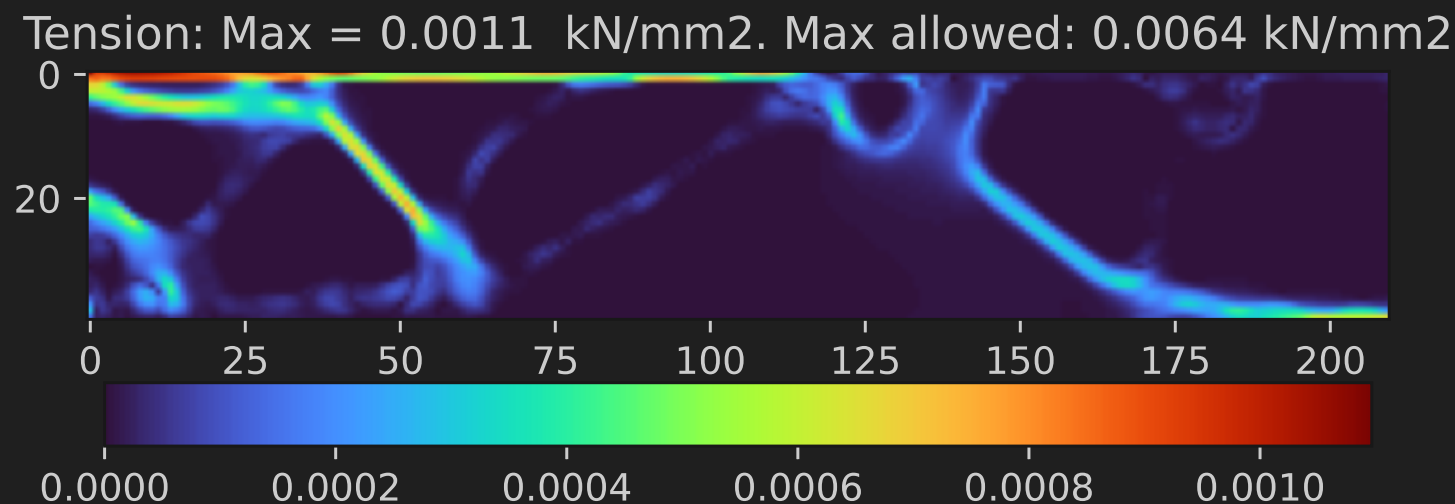
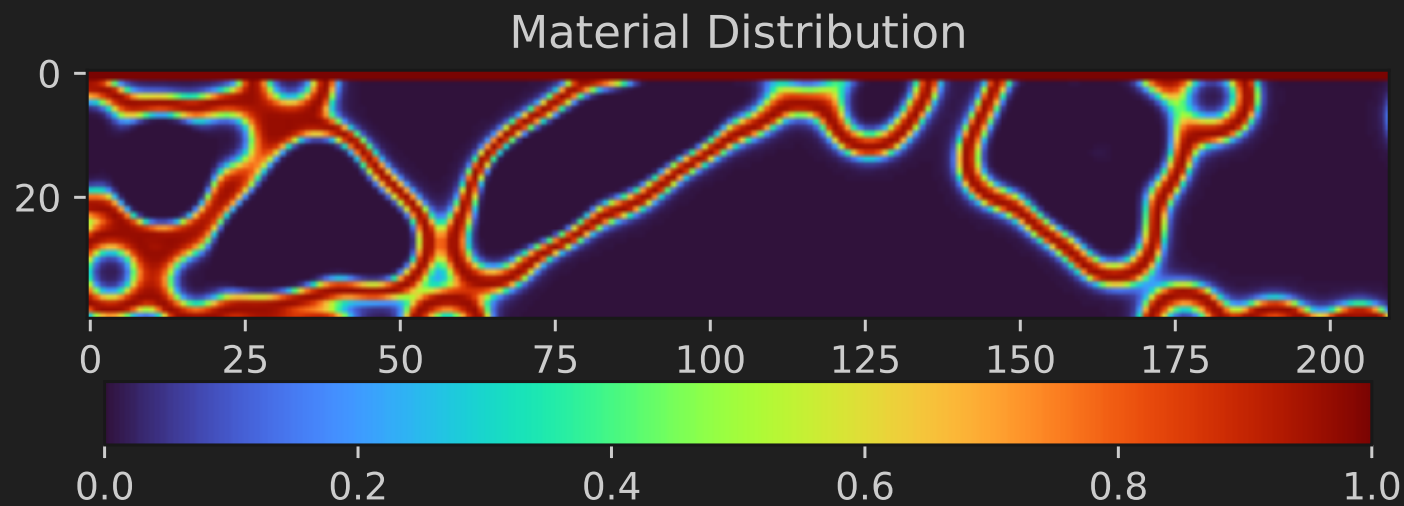
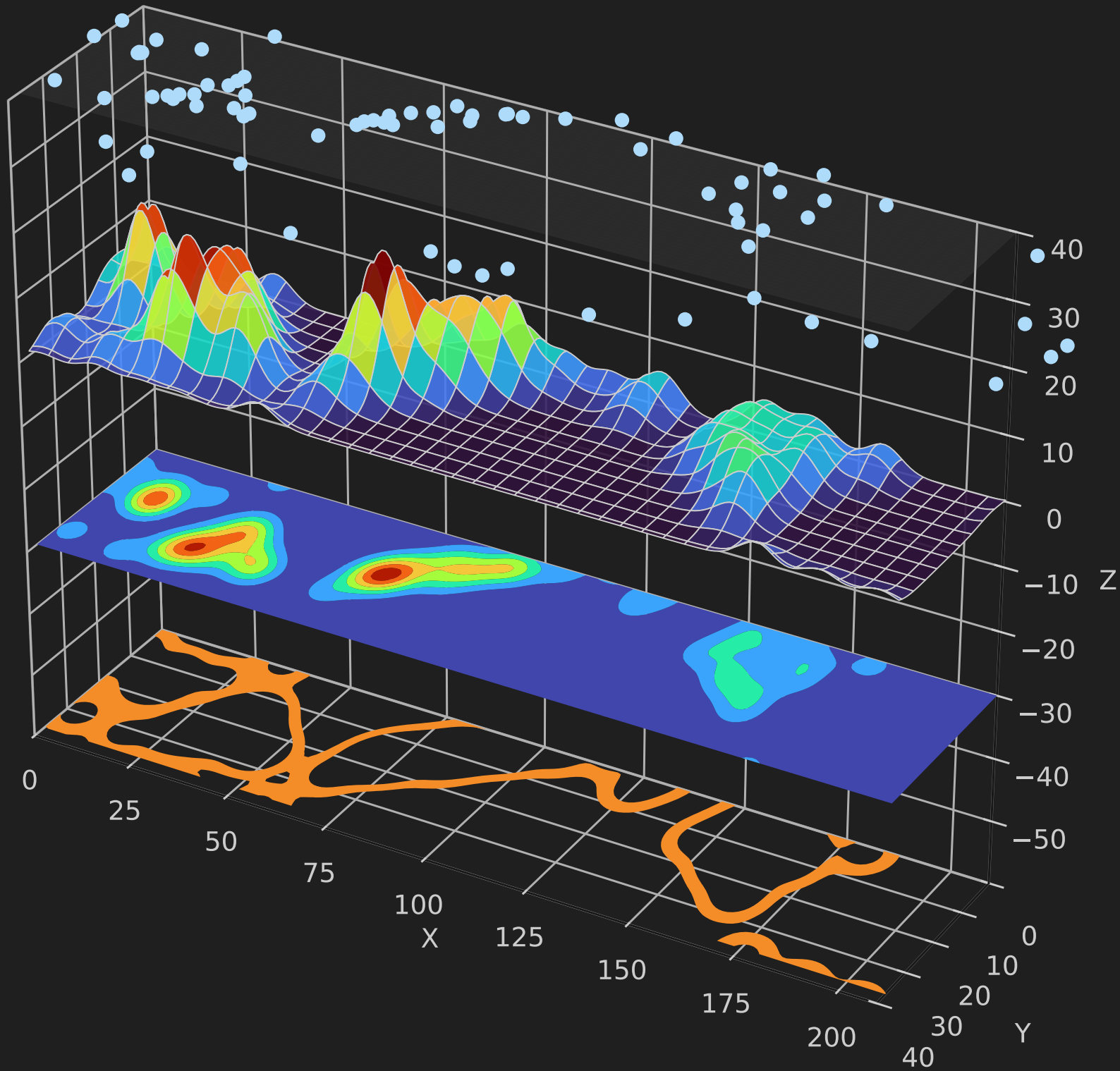
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.68 Shift = 1.82 Iteration = 131



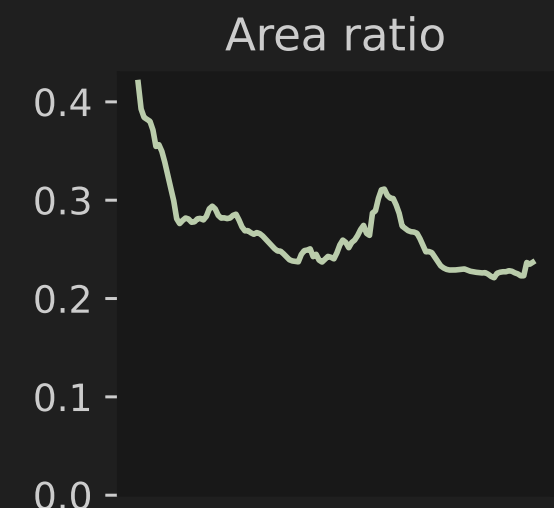
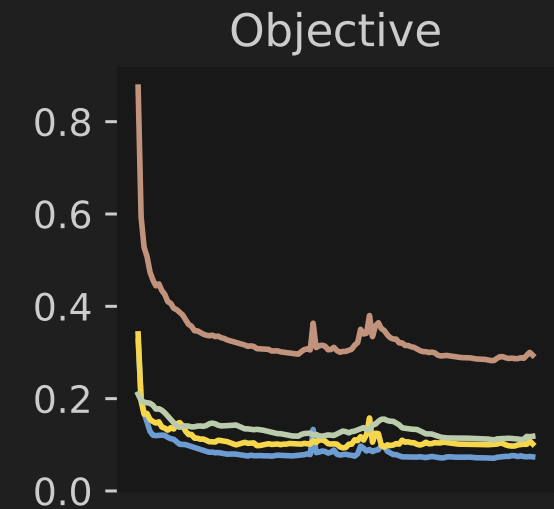
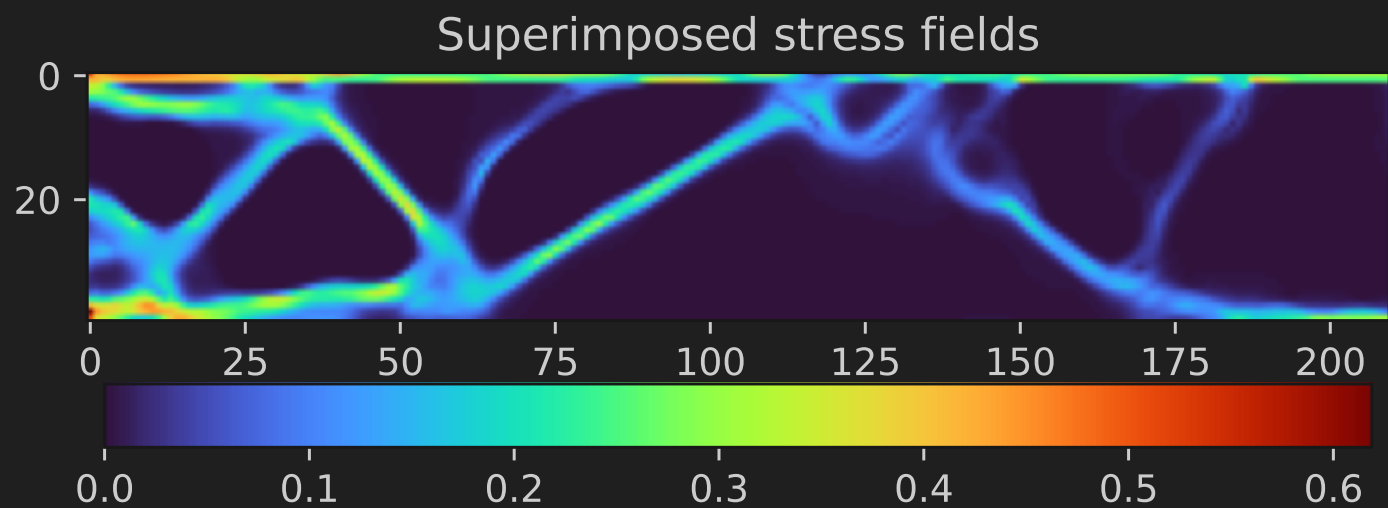
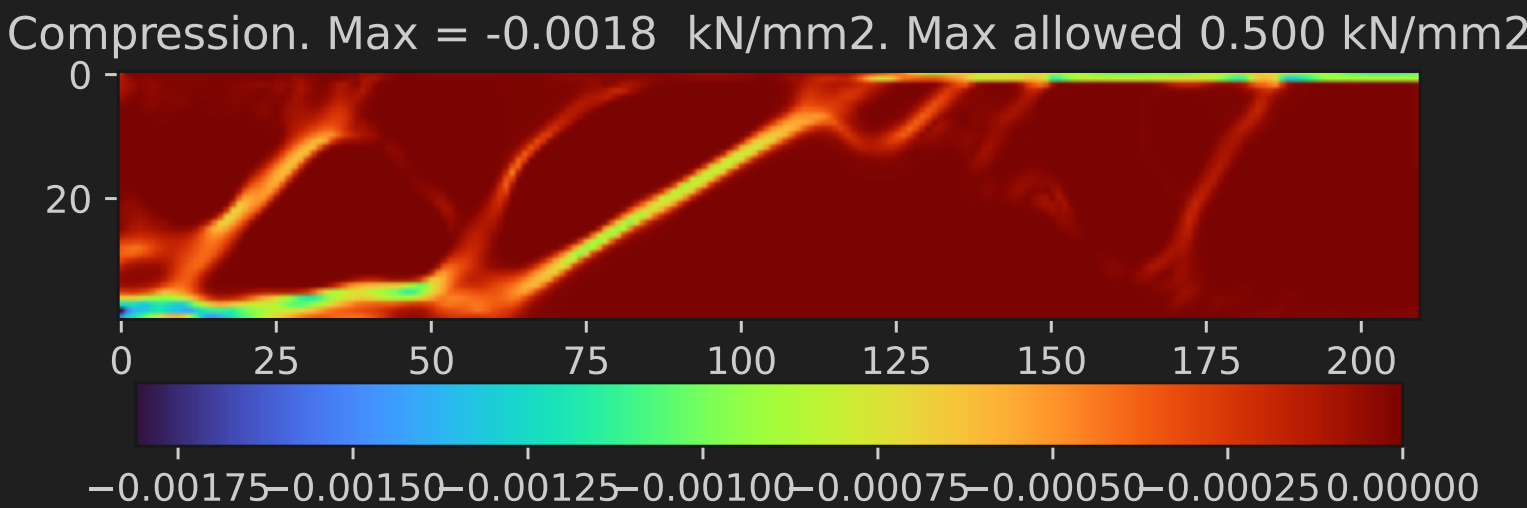
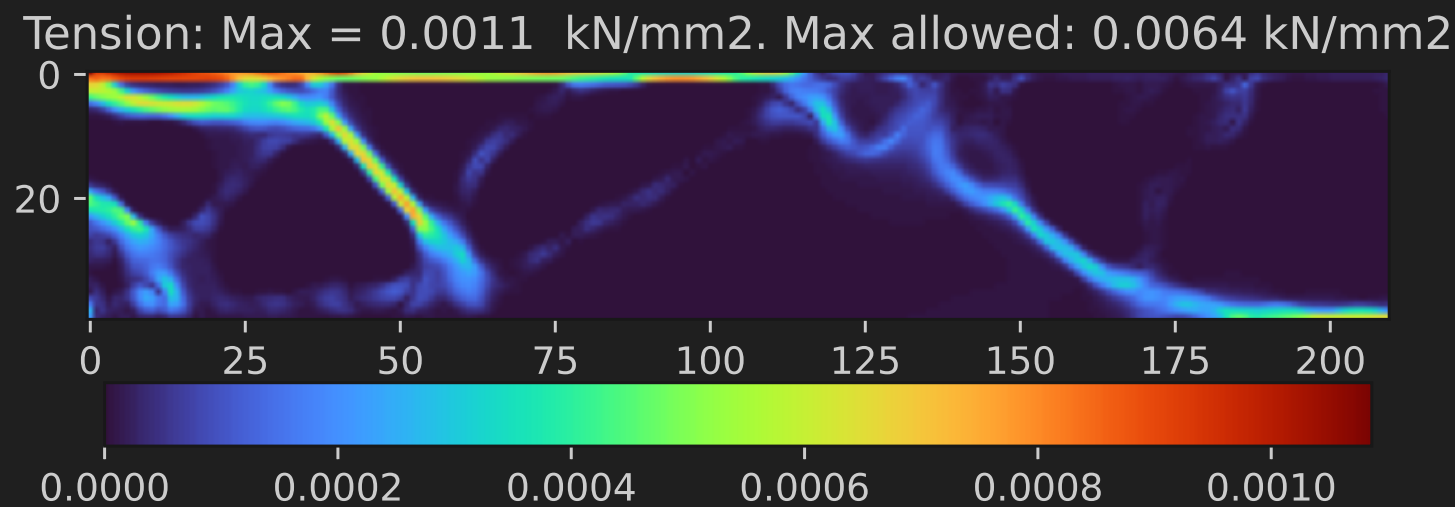
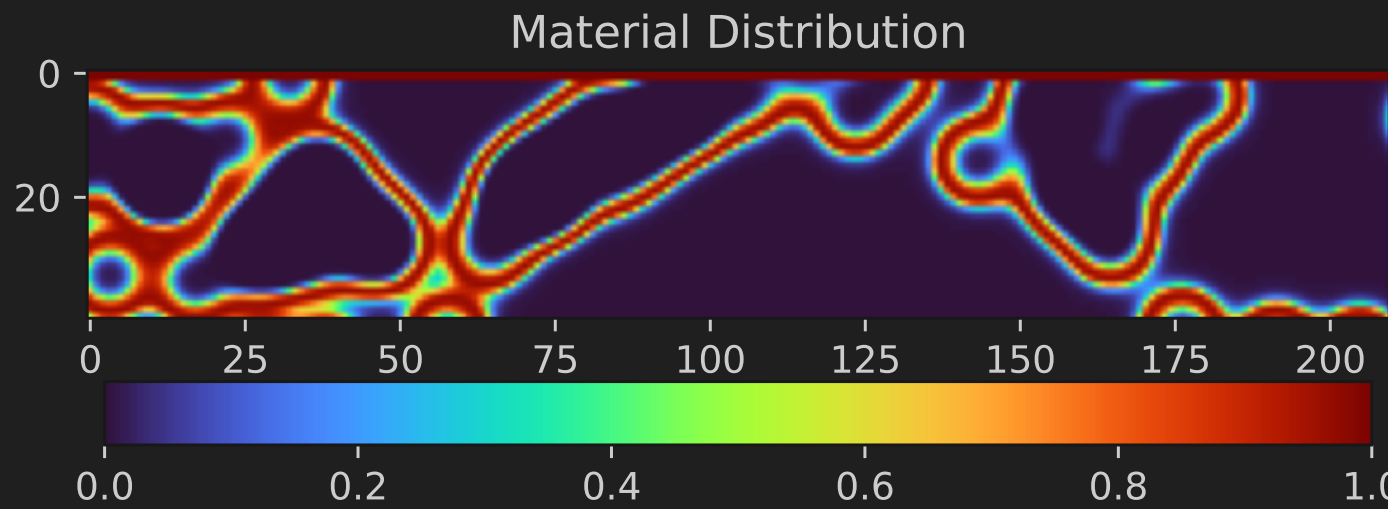
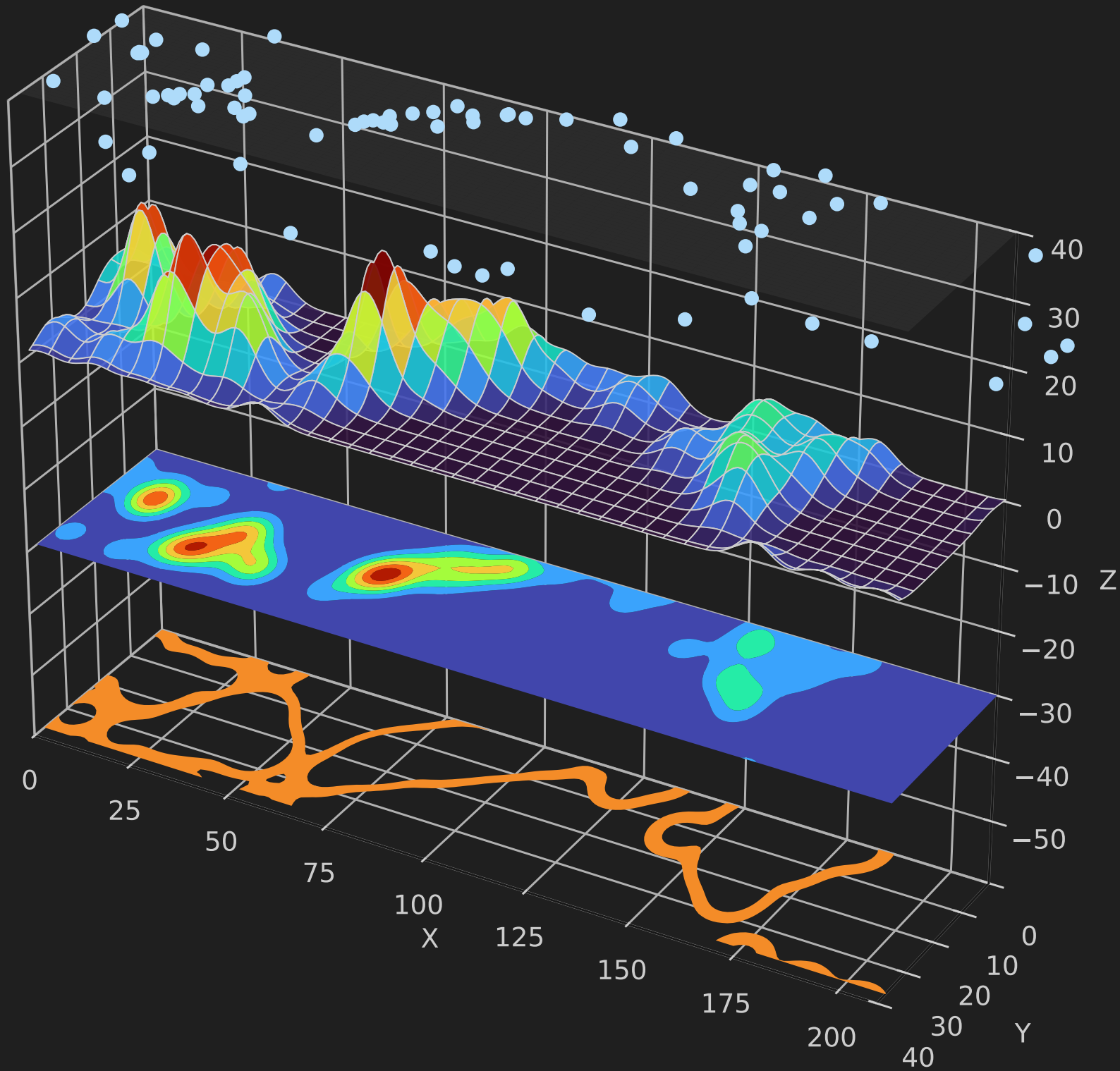
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.11) = 0.30

Spread Gaussian = 5.68 Shift = 1.83 Iteration = 132



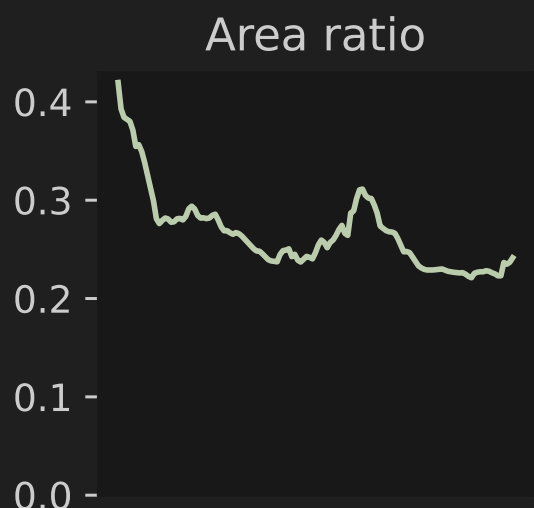
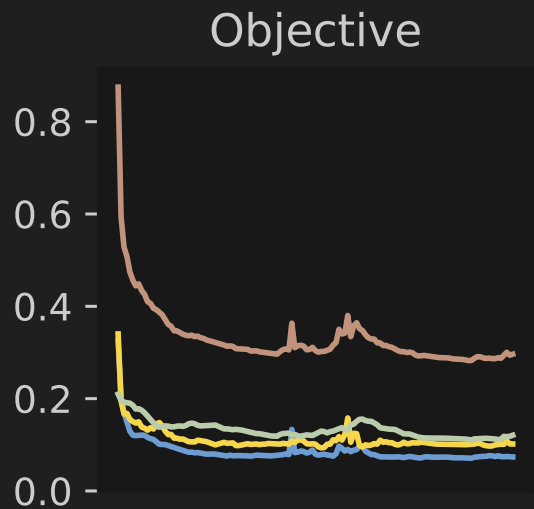
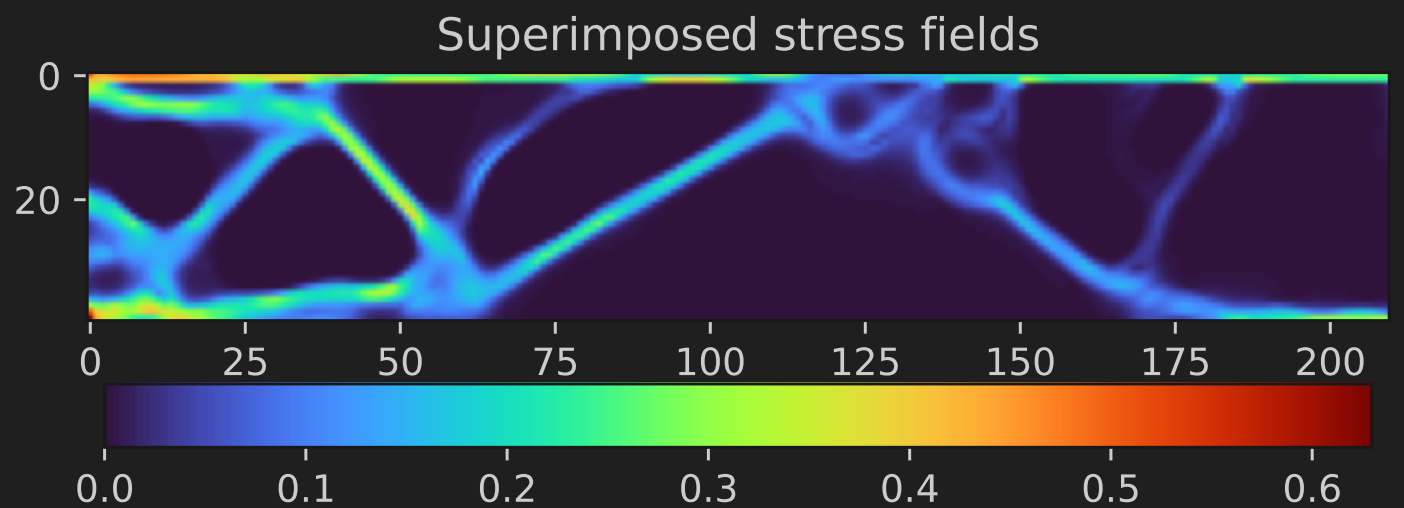
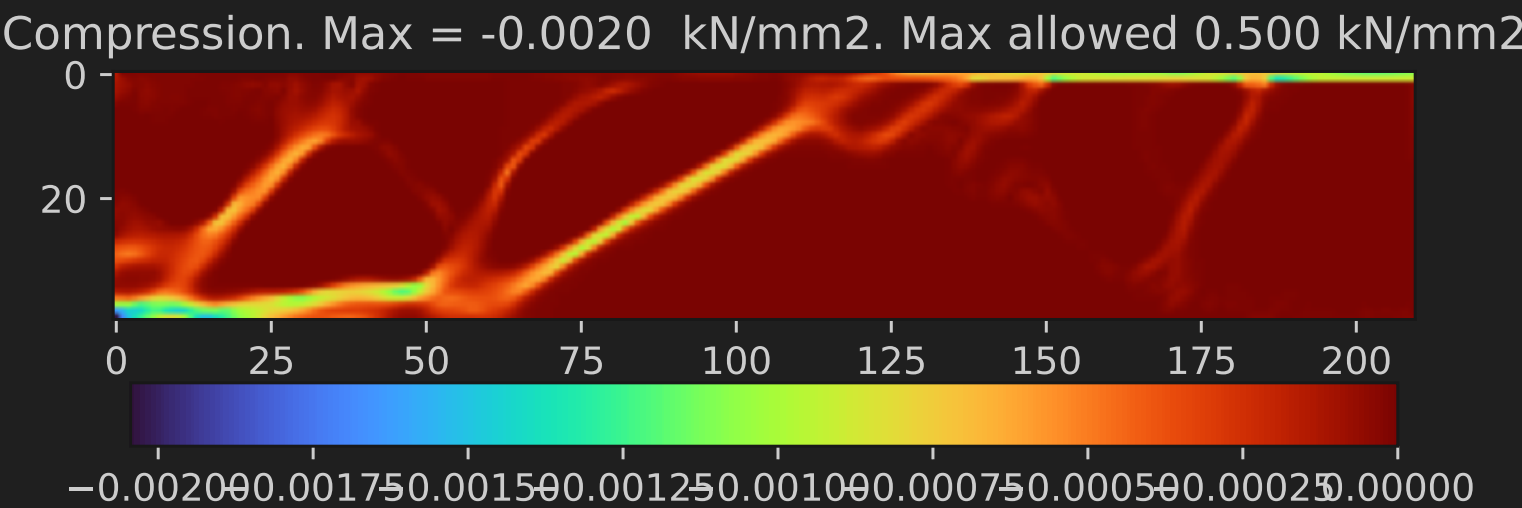
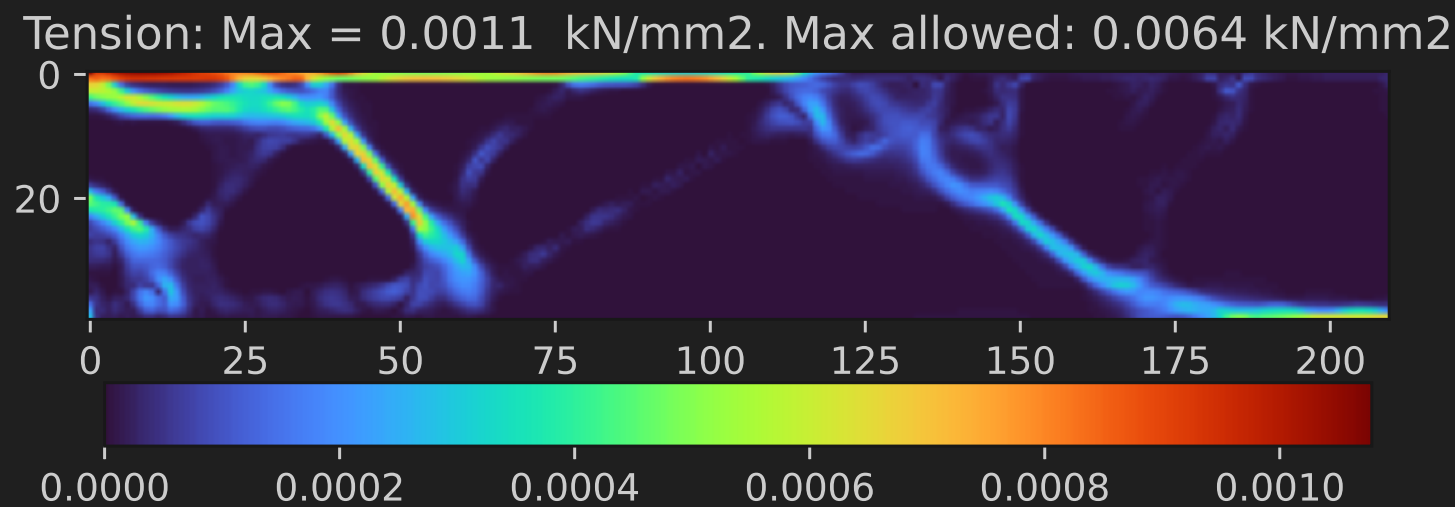
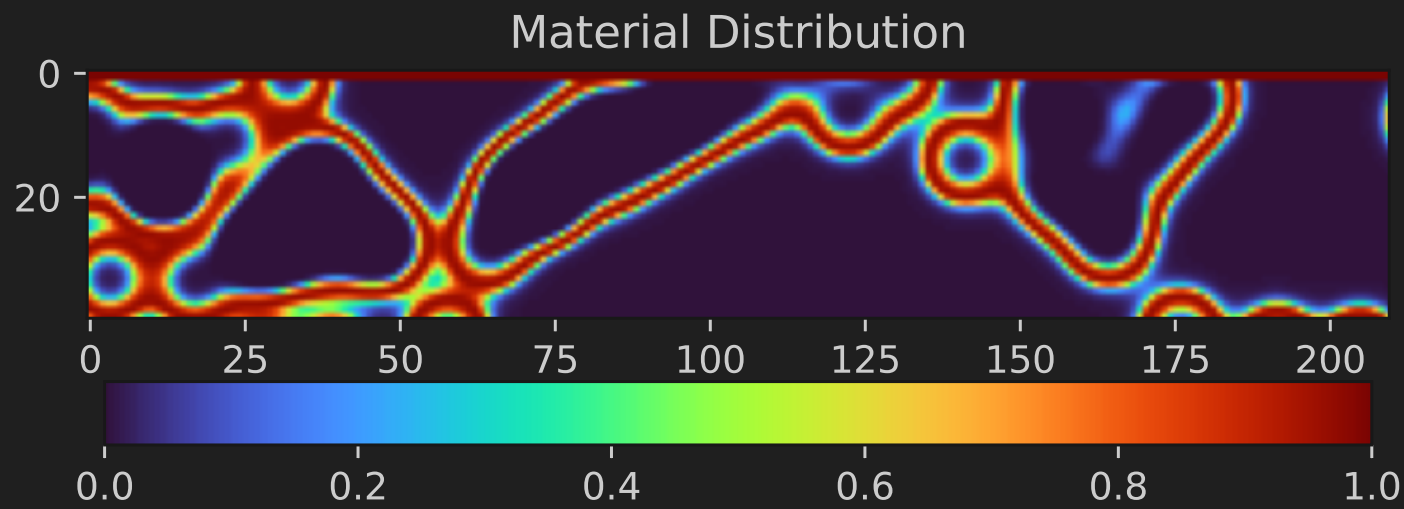
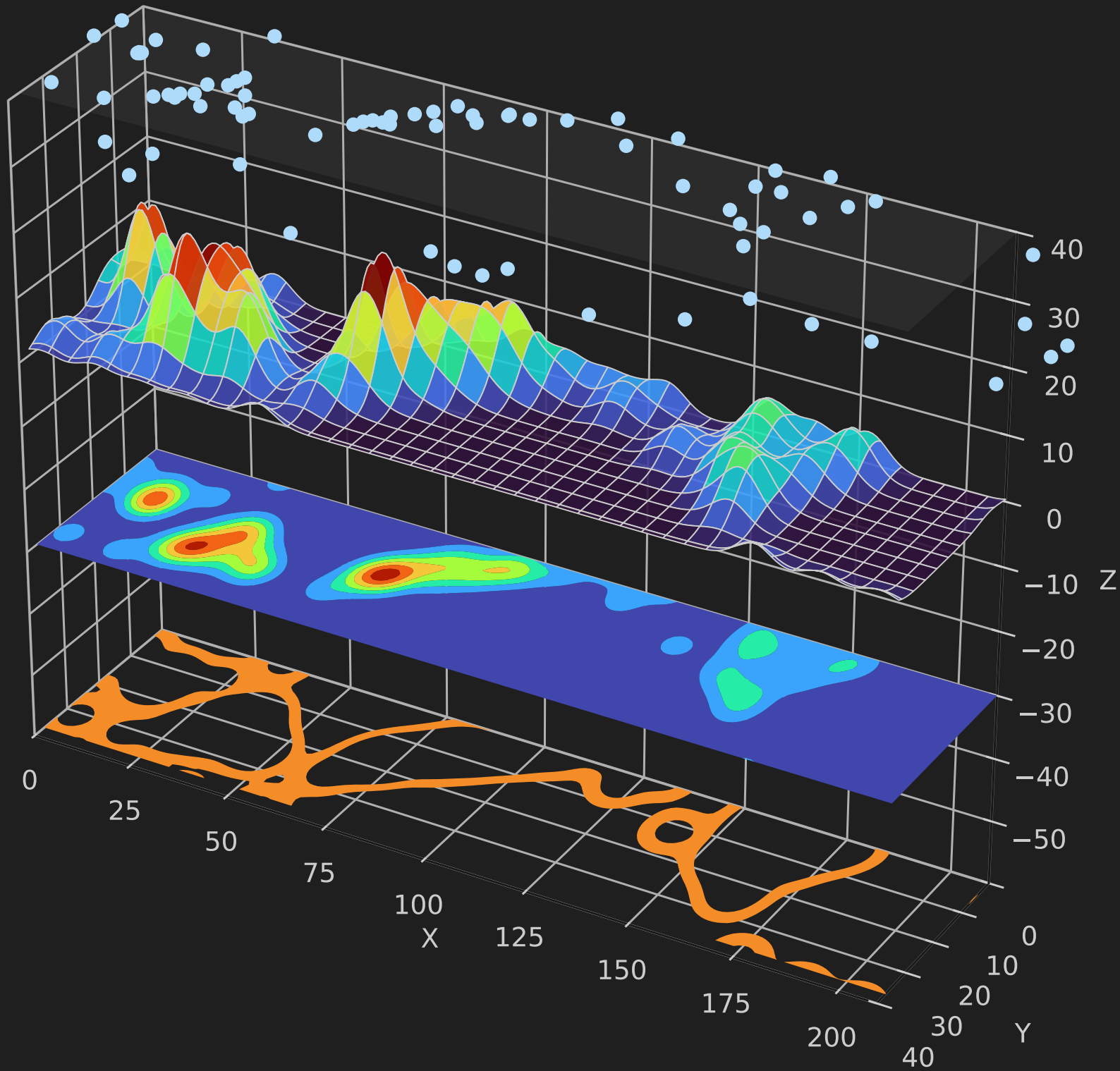
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.69 Shift = 1.85 Iteration = 133



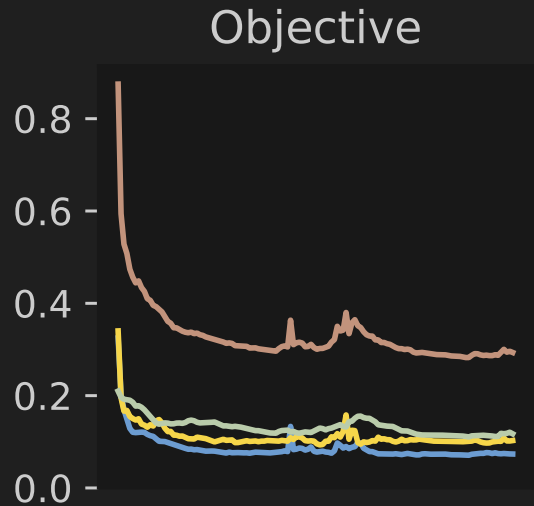
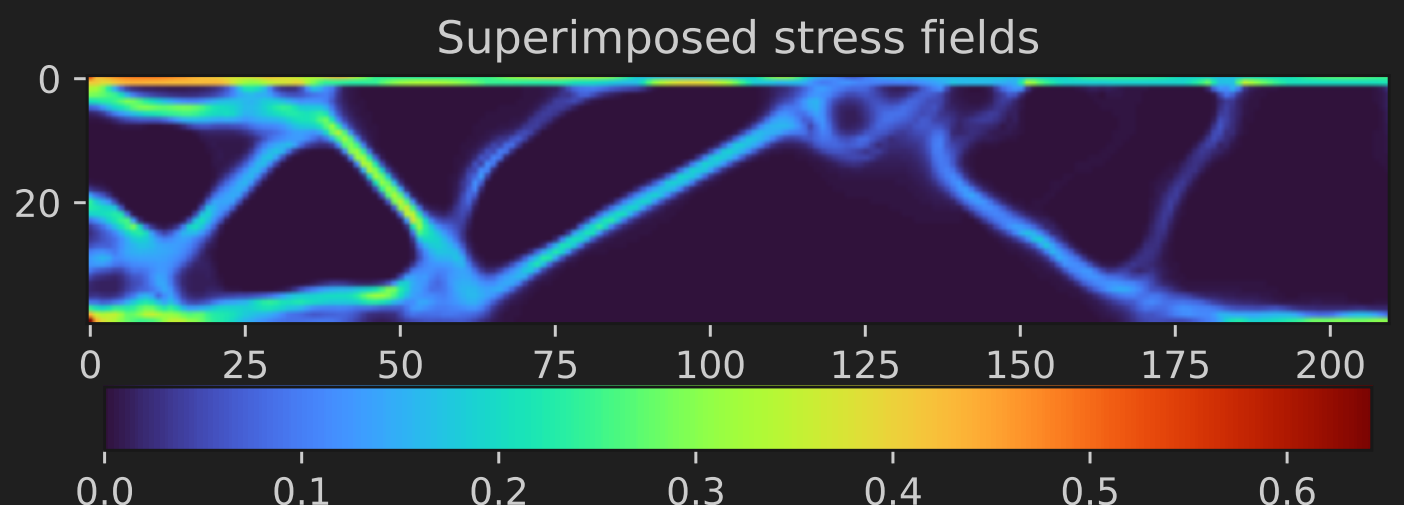
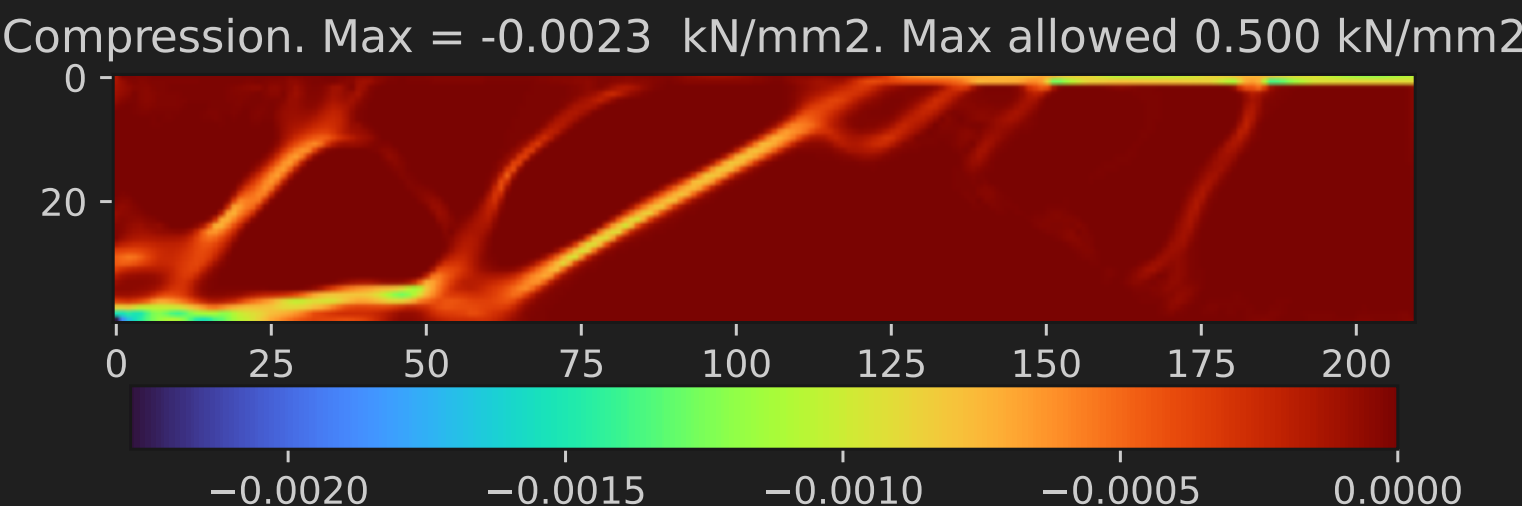
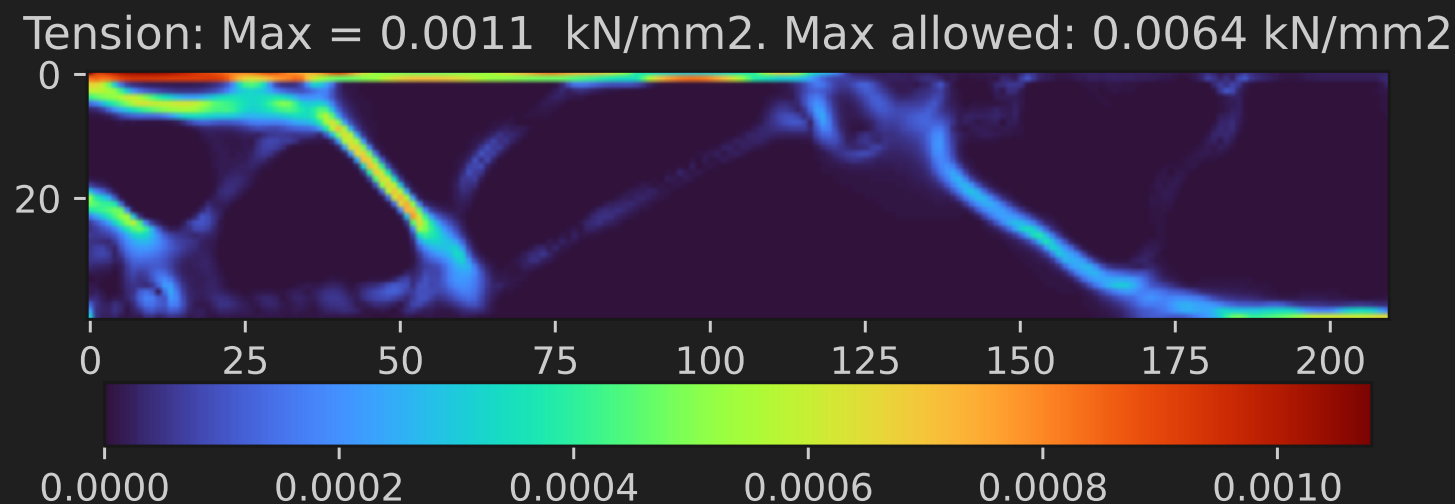
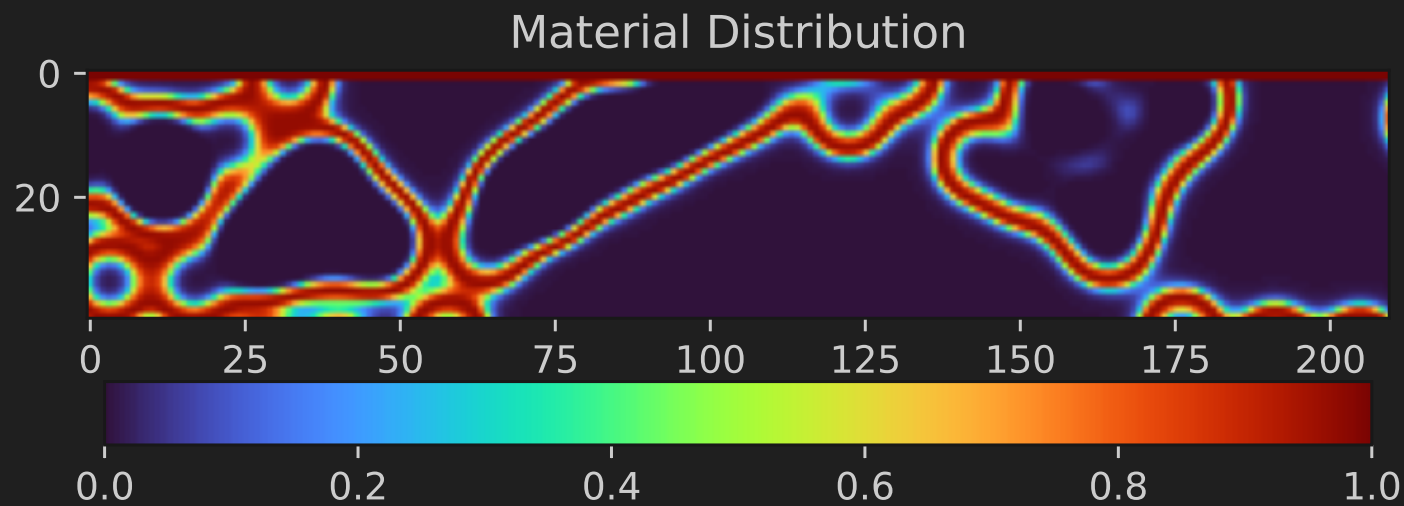
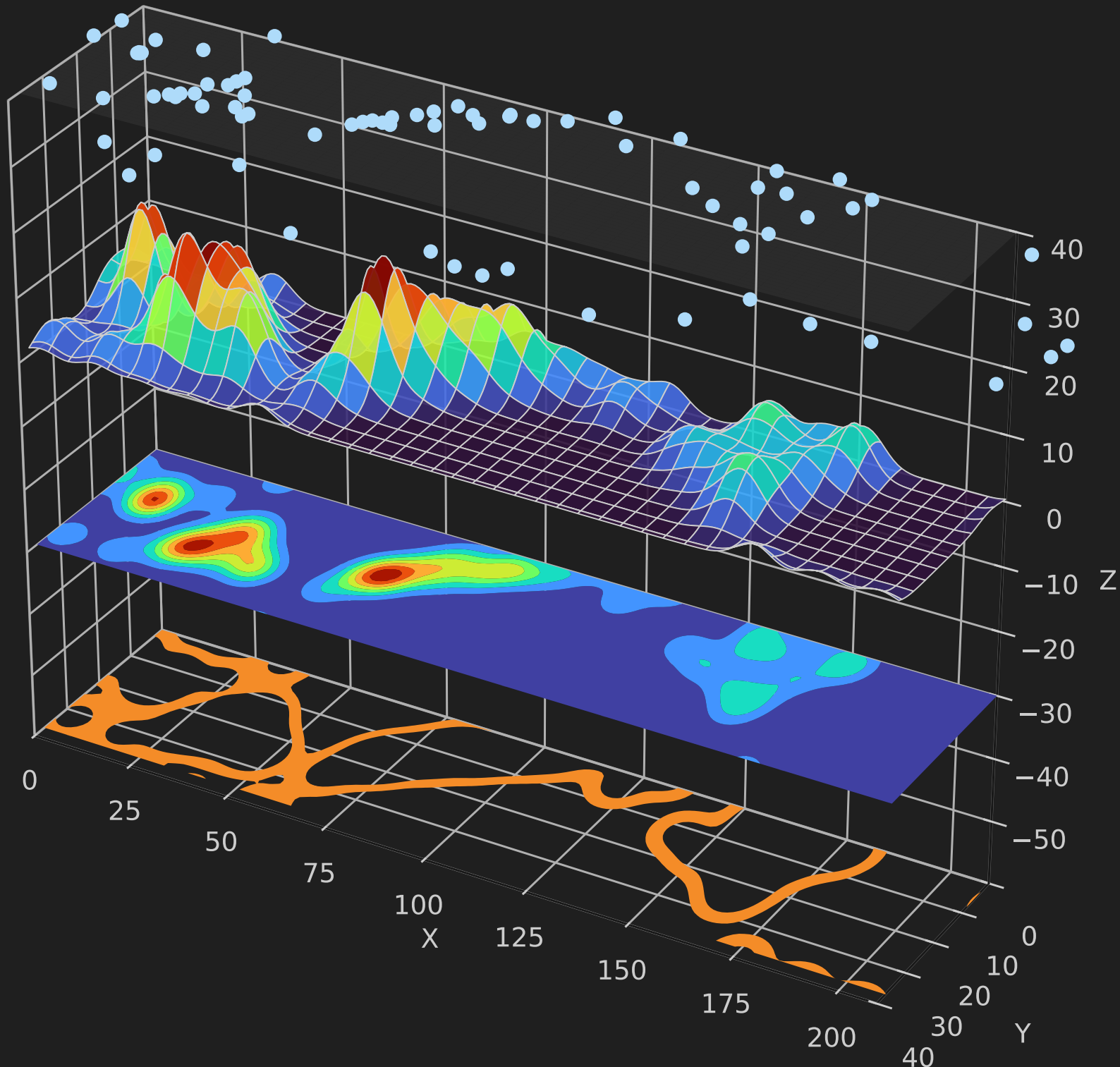
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.30

Spread Gaussian = 5.70 Shift = 1.86 Iteration = 134



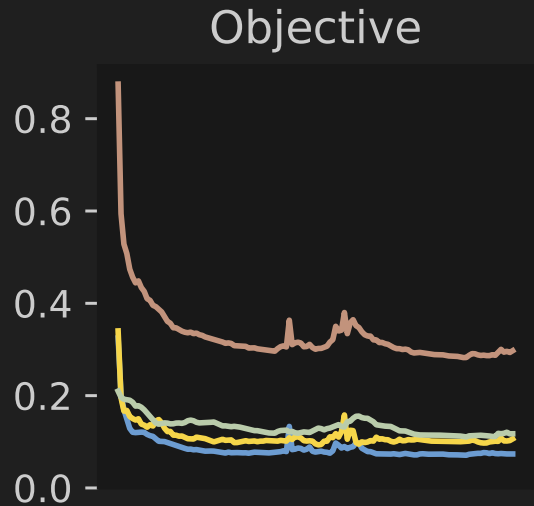
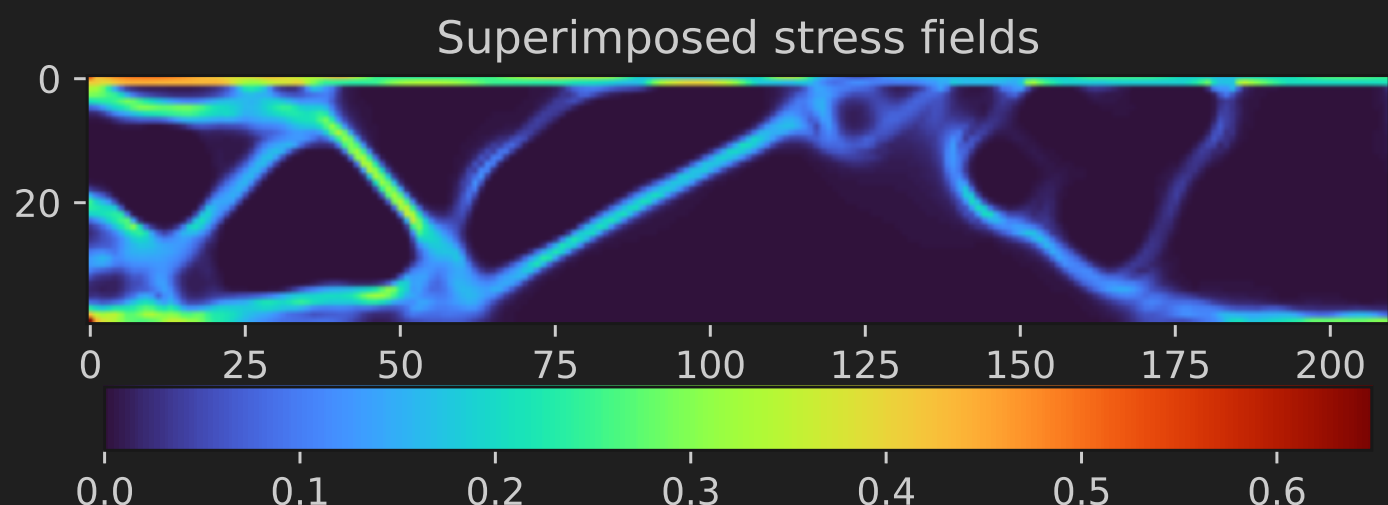
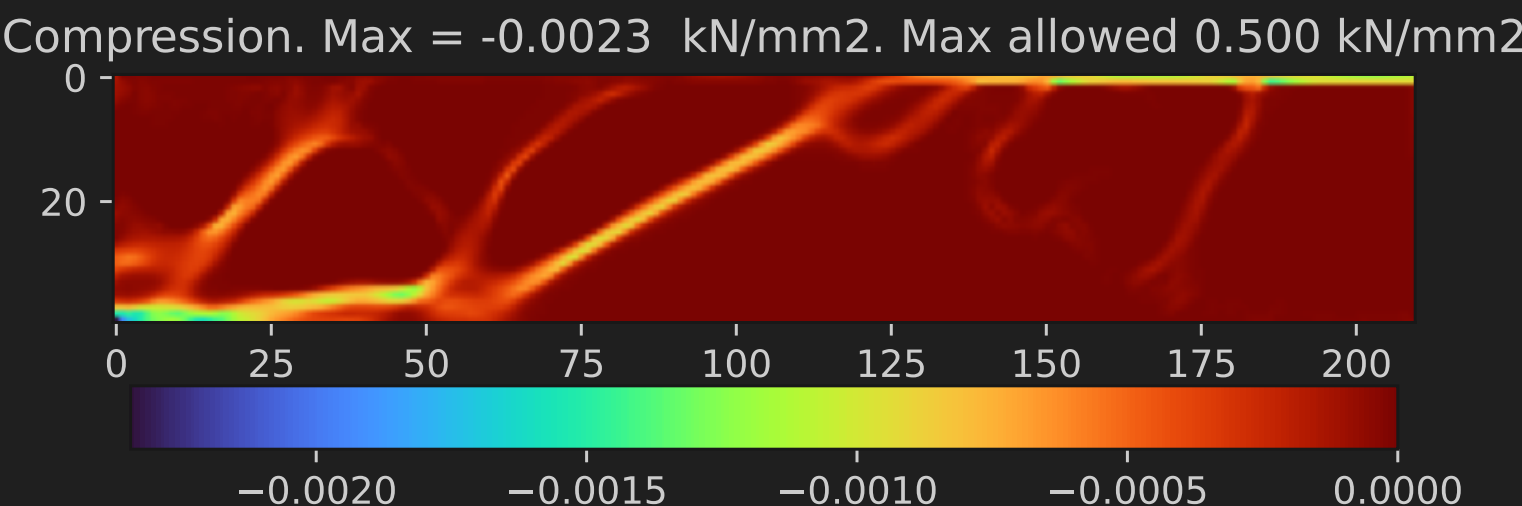
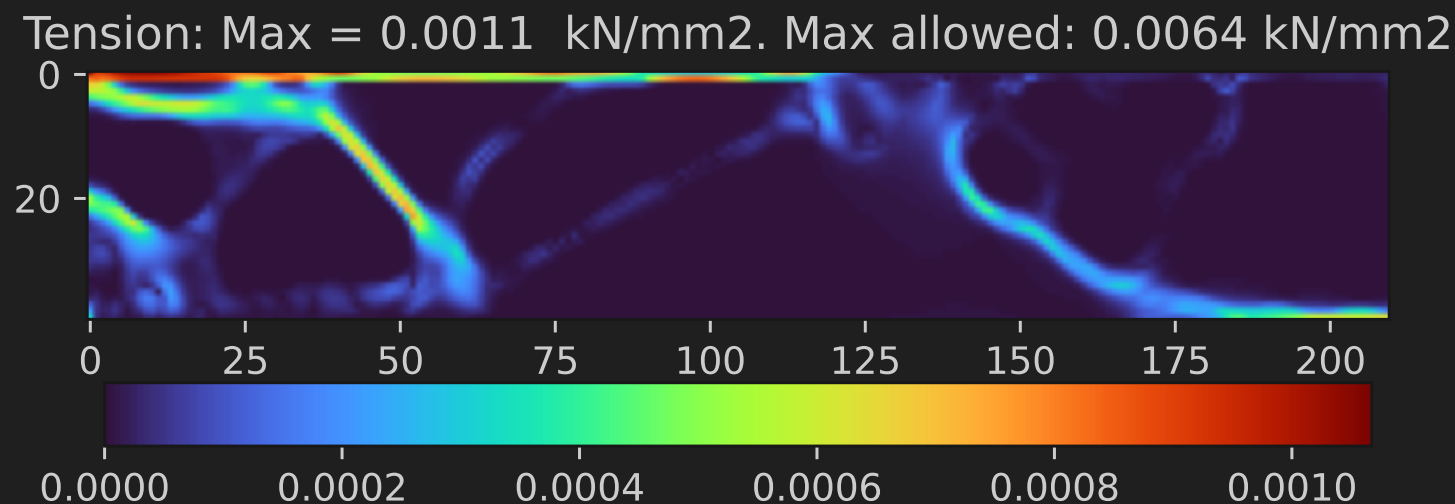
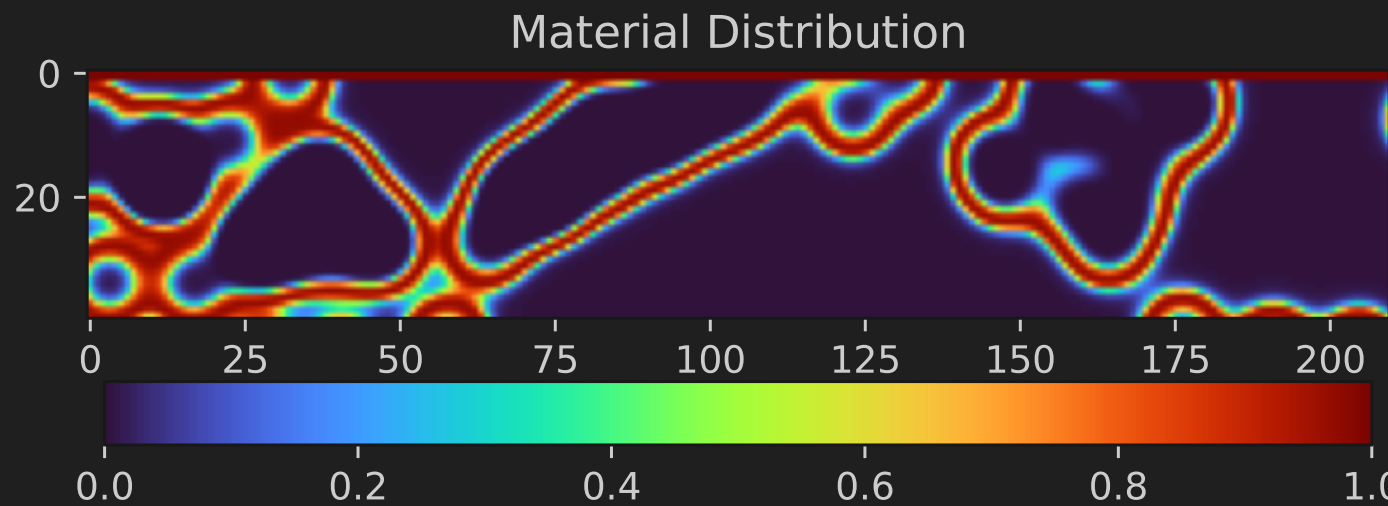
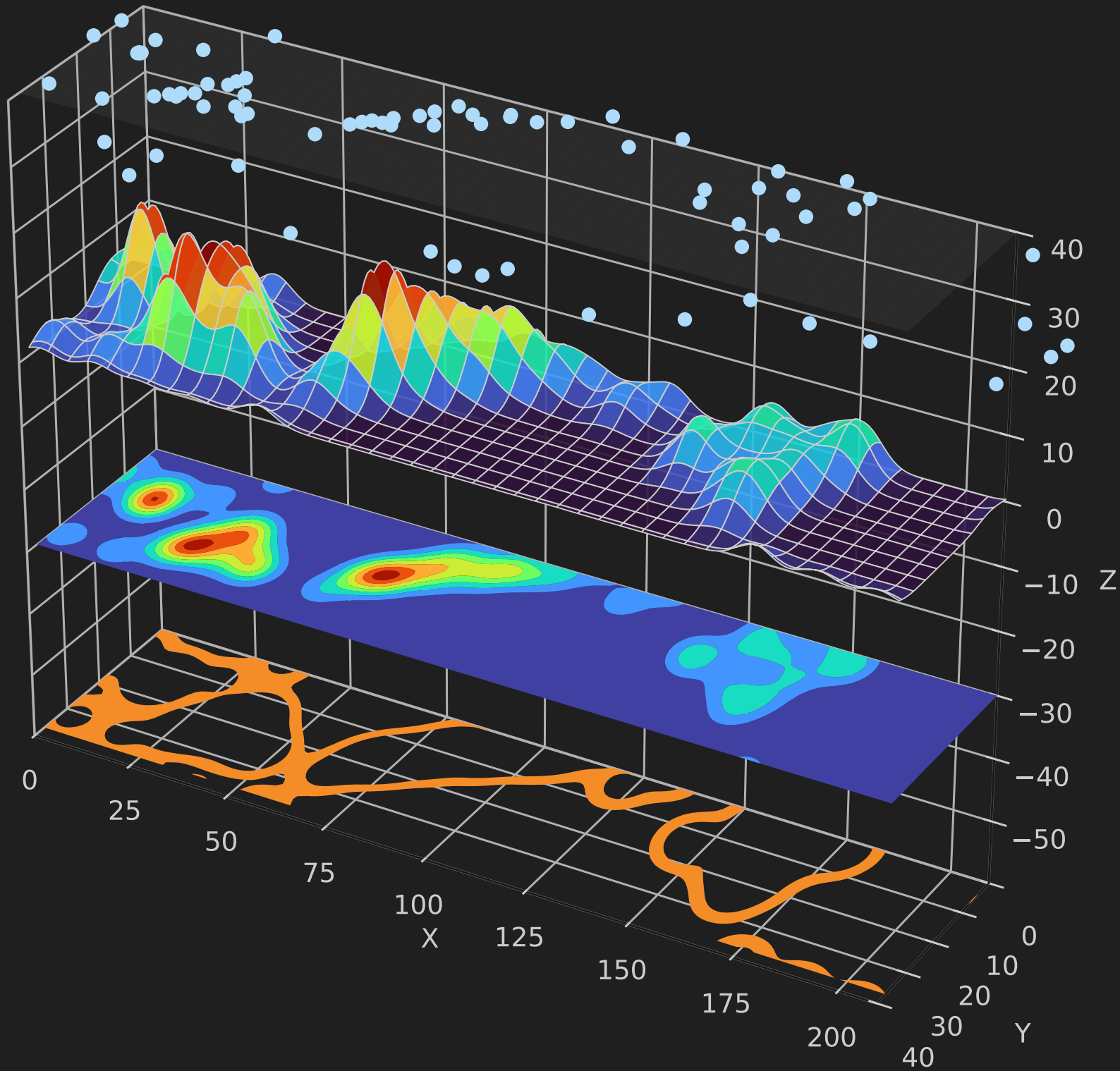
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.71 Shift = 1.87 Iteration = 135



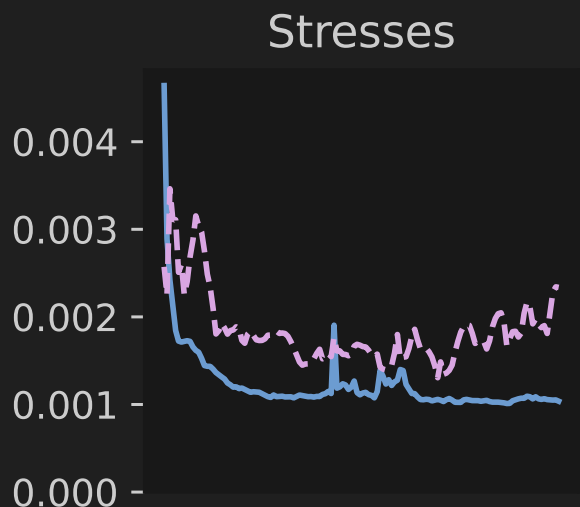
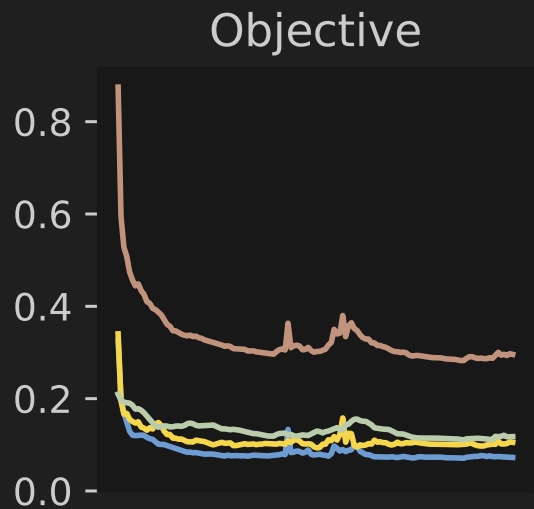
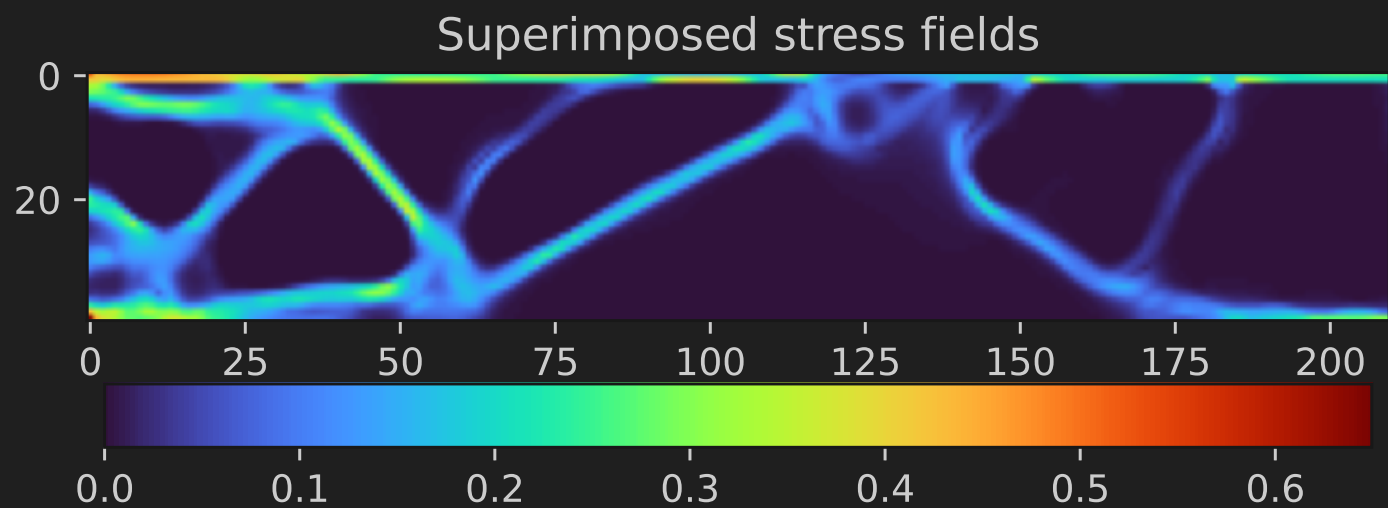
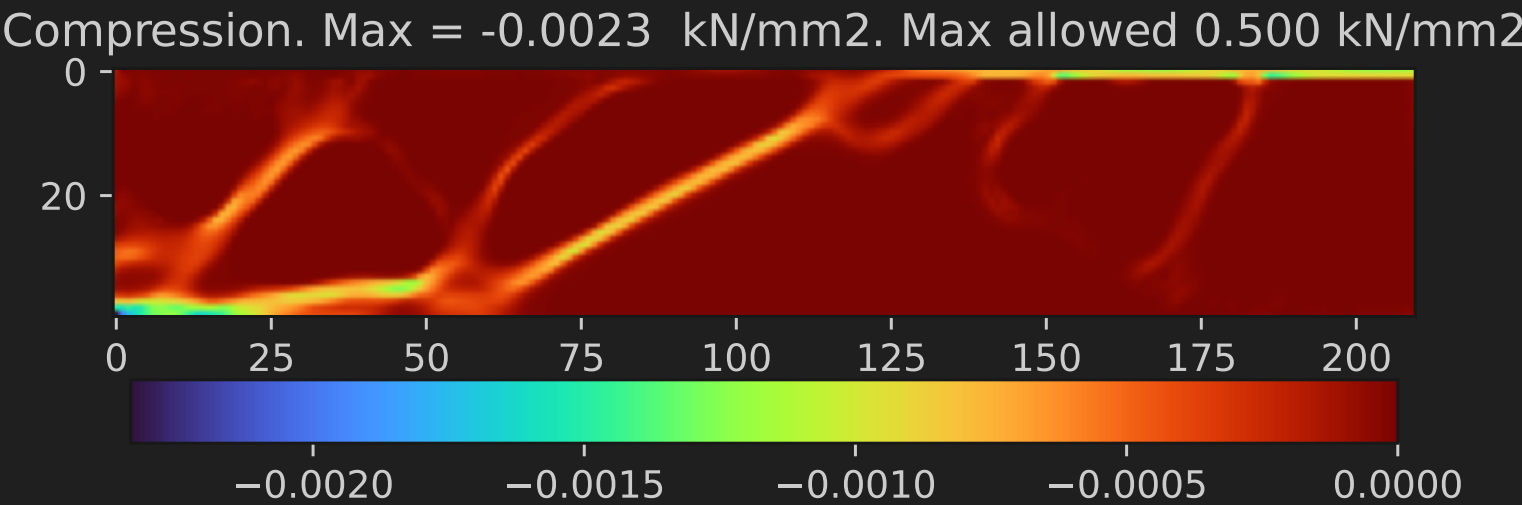
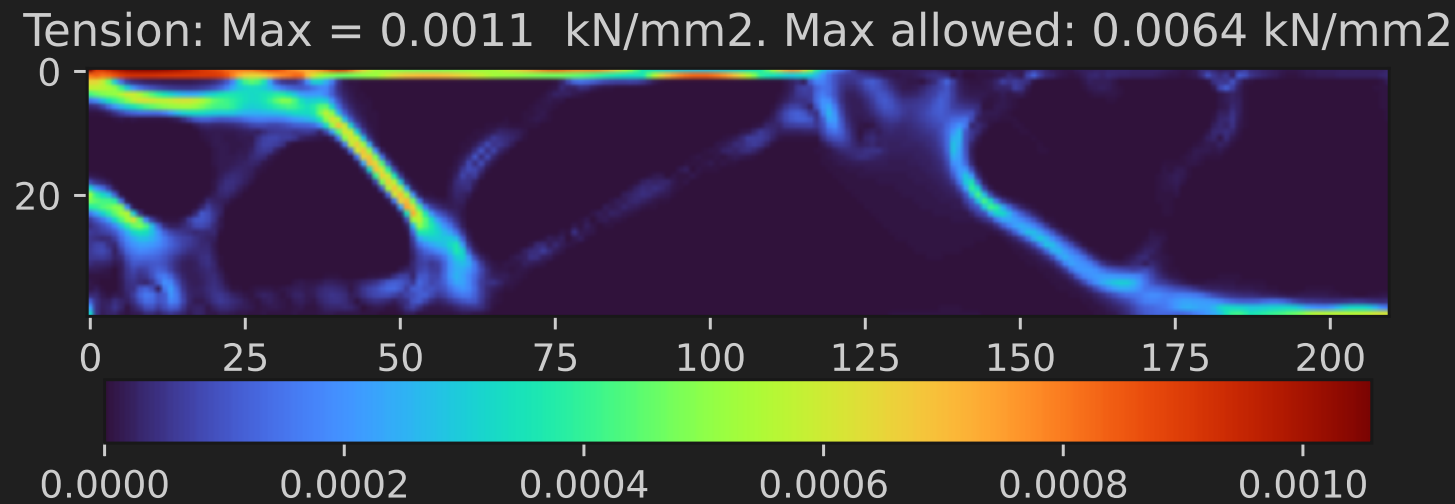
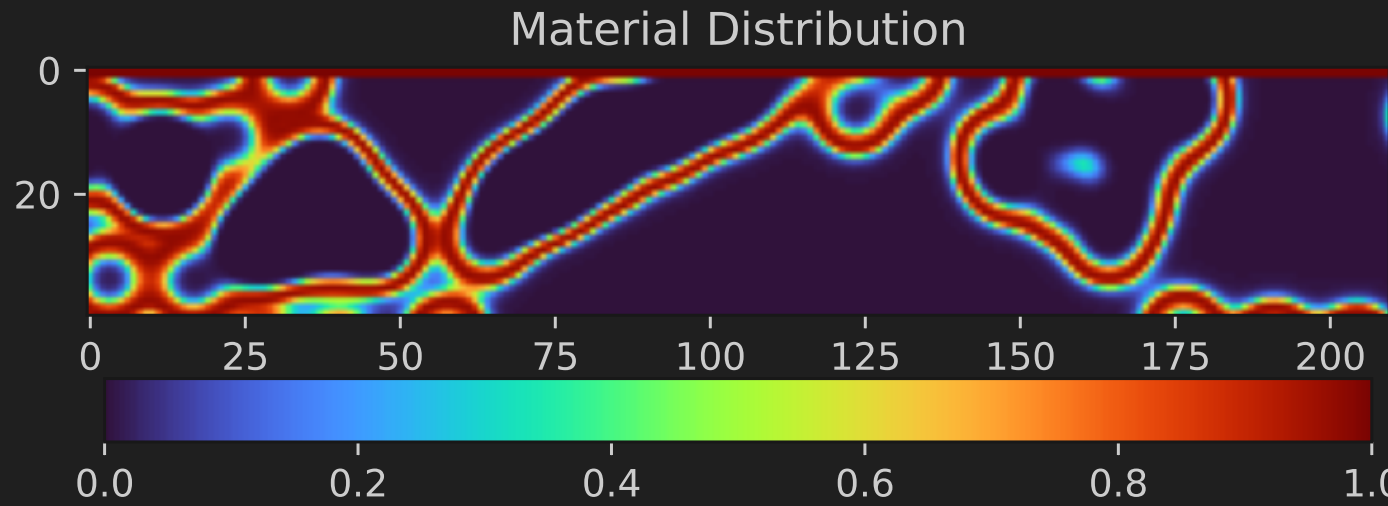
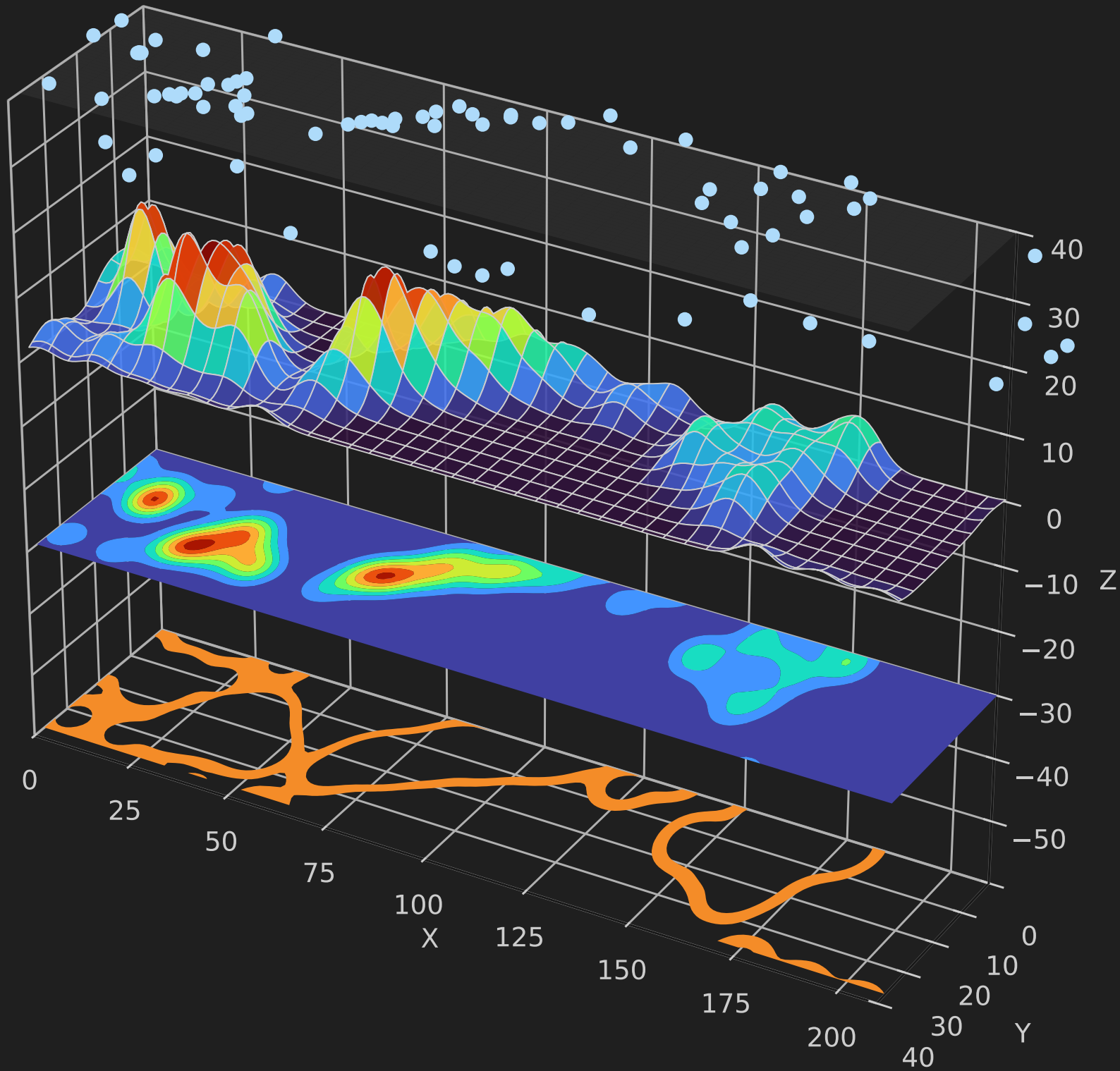
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.11) = 0.30

Spread Gaussian = 5.72 Shift = 1.89 Iteration = 136



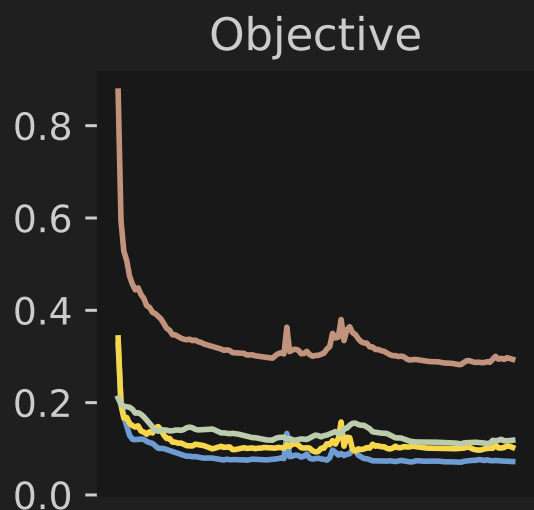
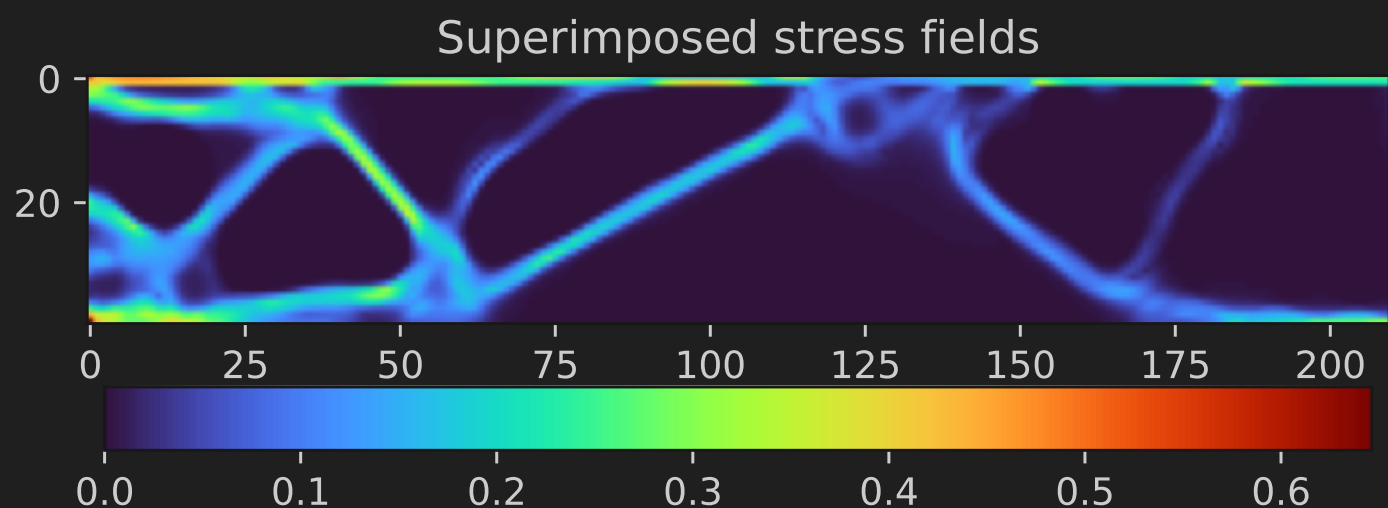
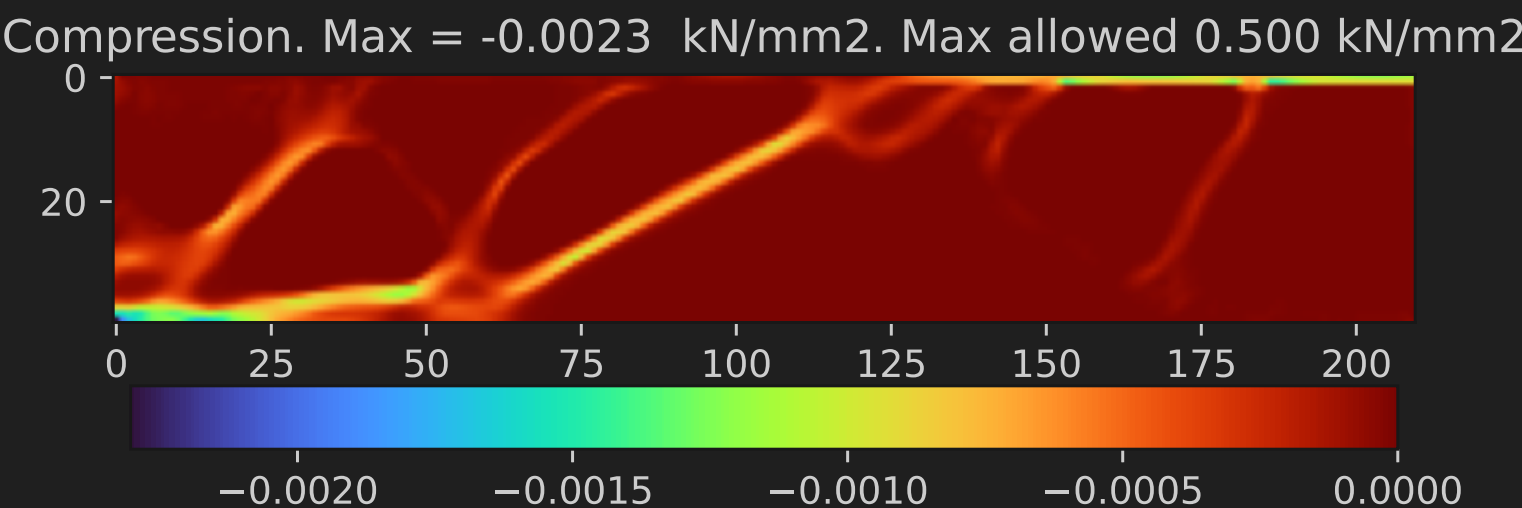
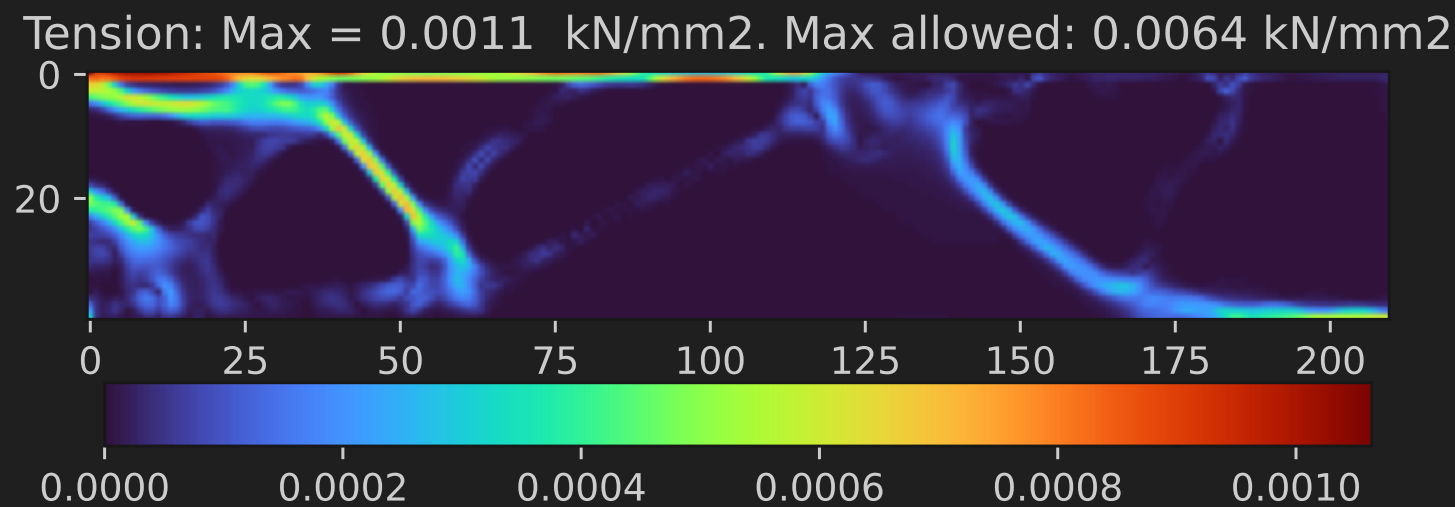
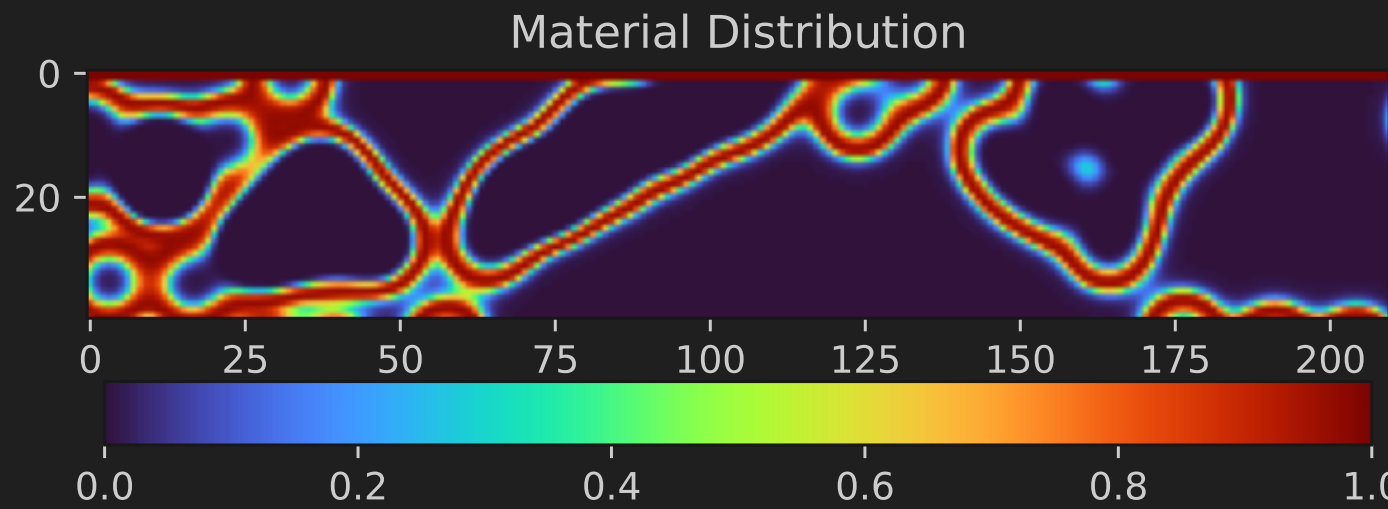
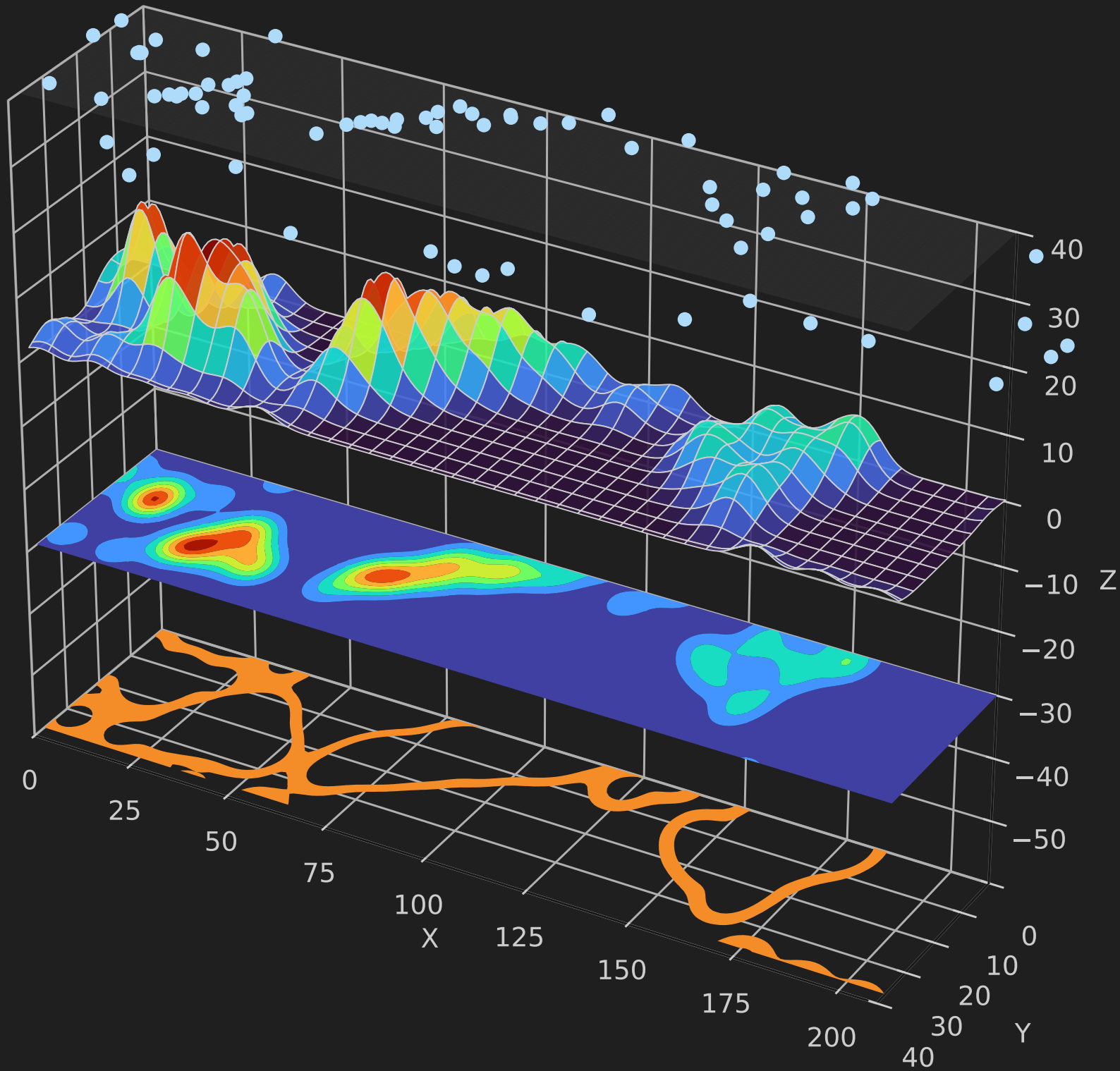
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.11) = 0.30

Spread Gaussian = 5.73 Shift = 1.90 Iteration = 137



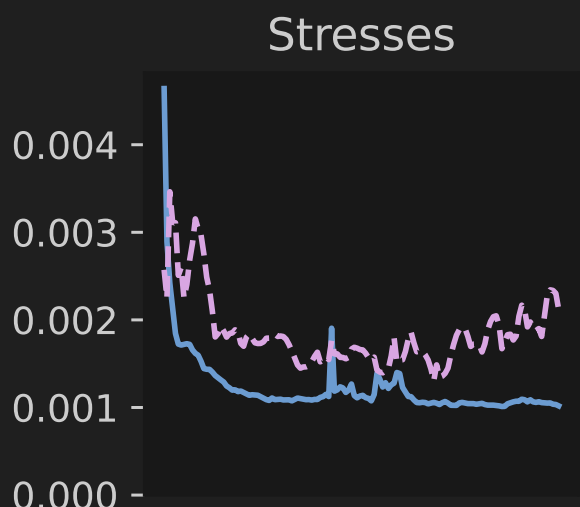
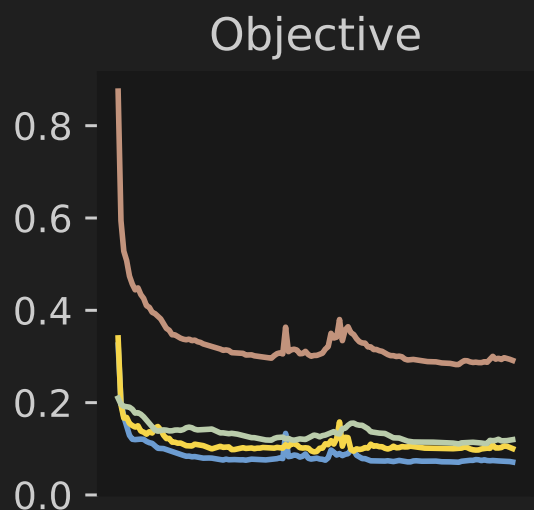
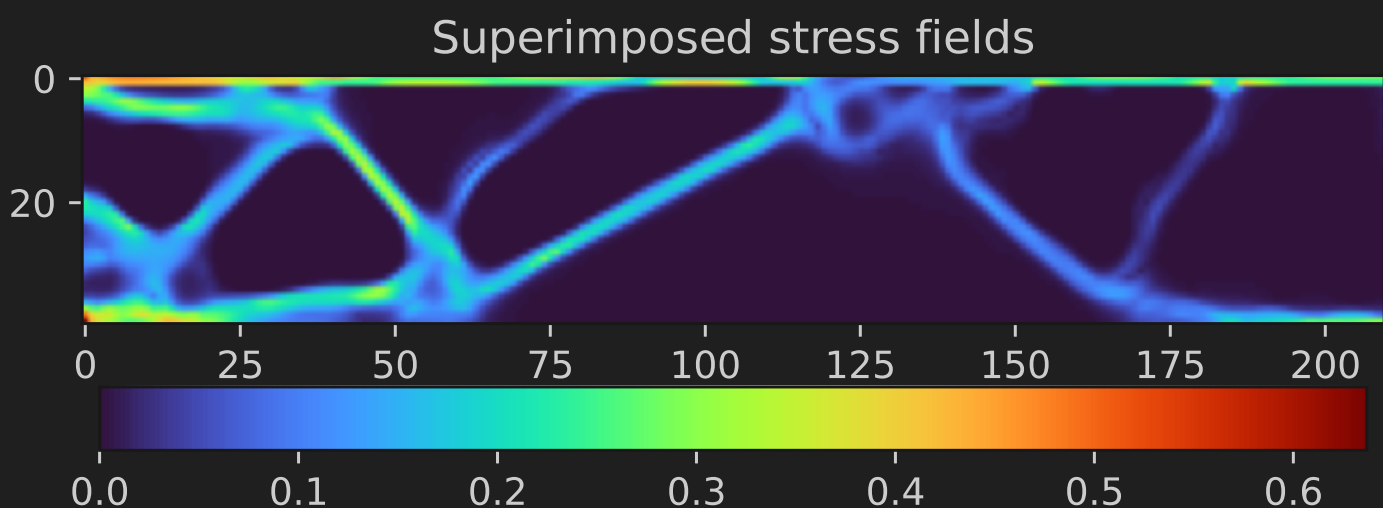
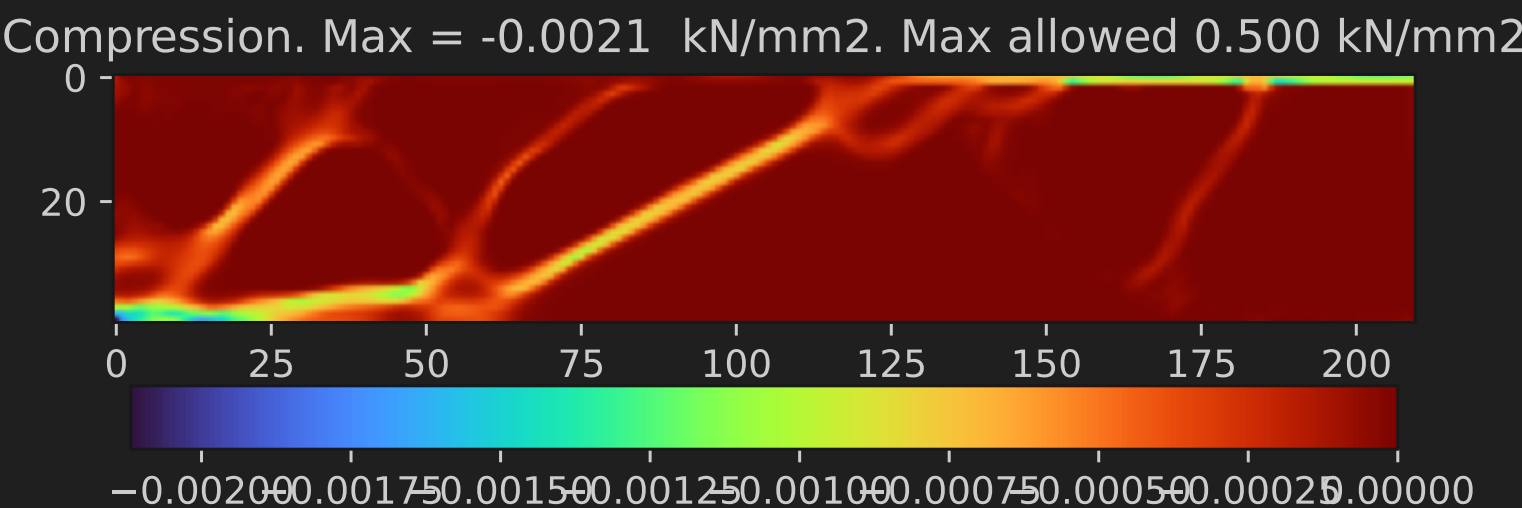
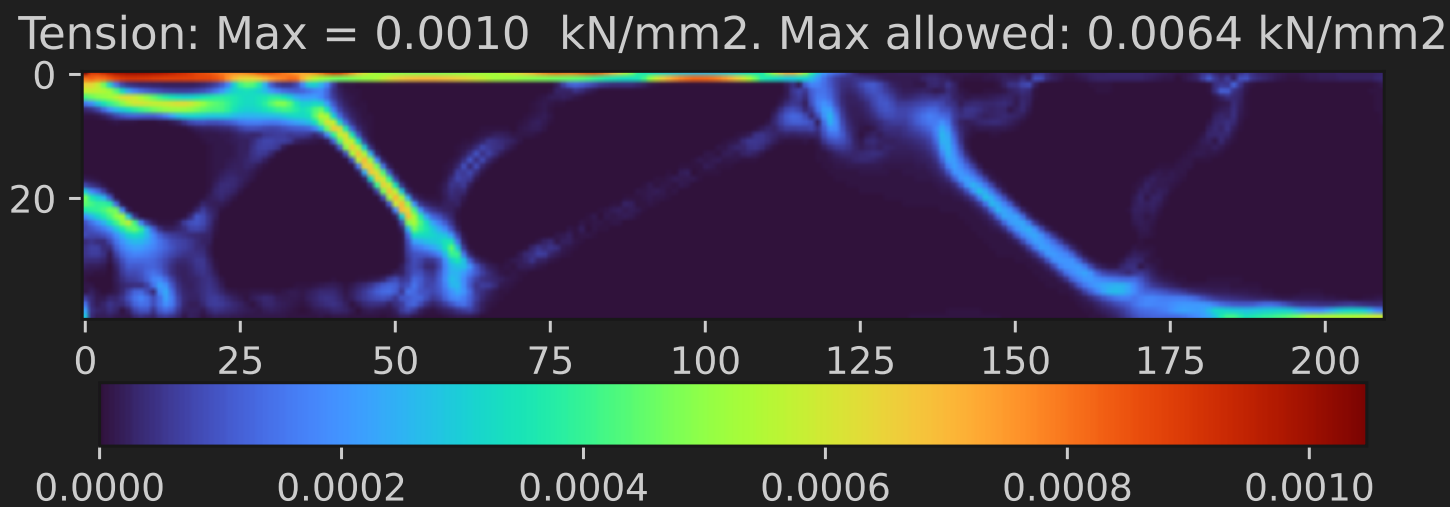
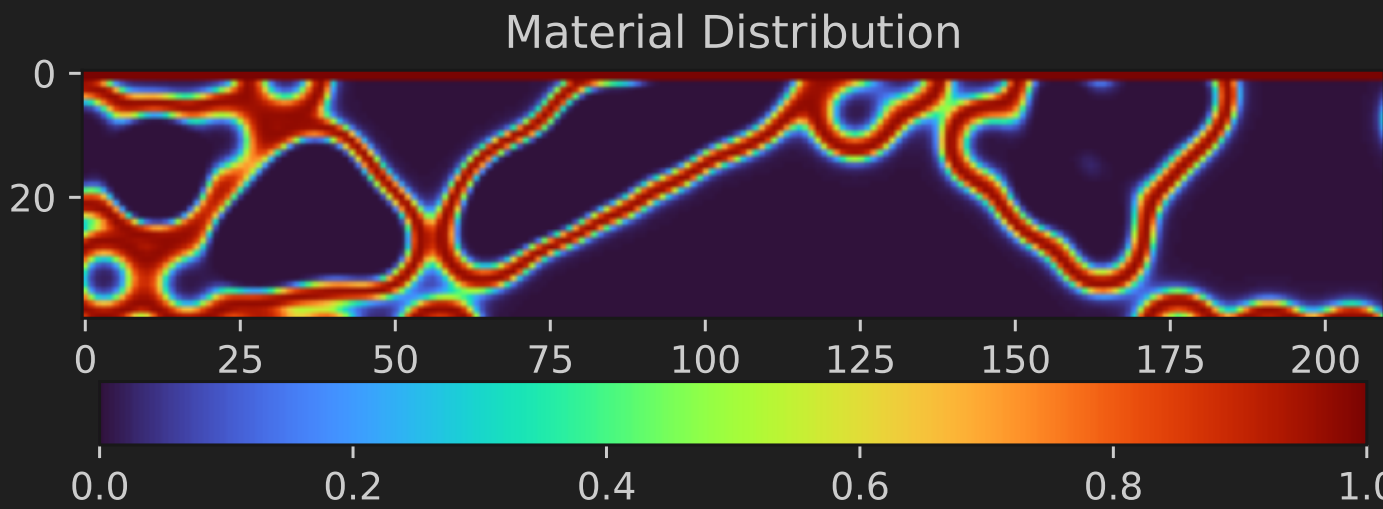
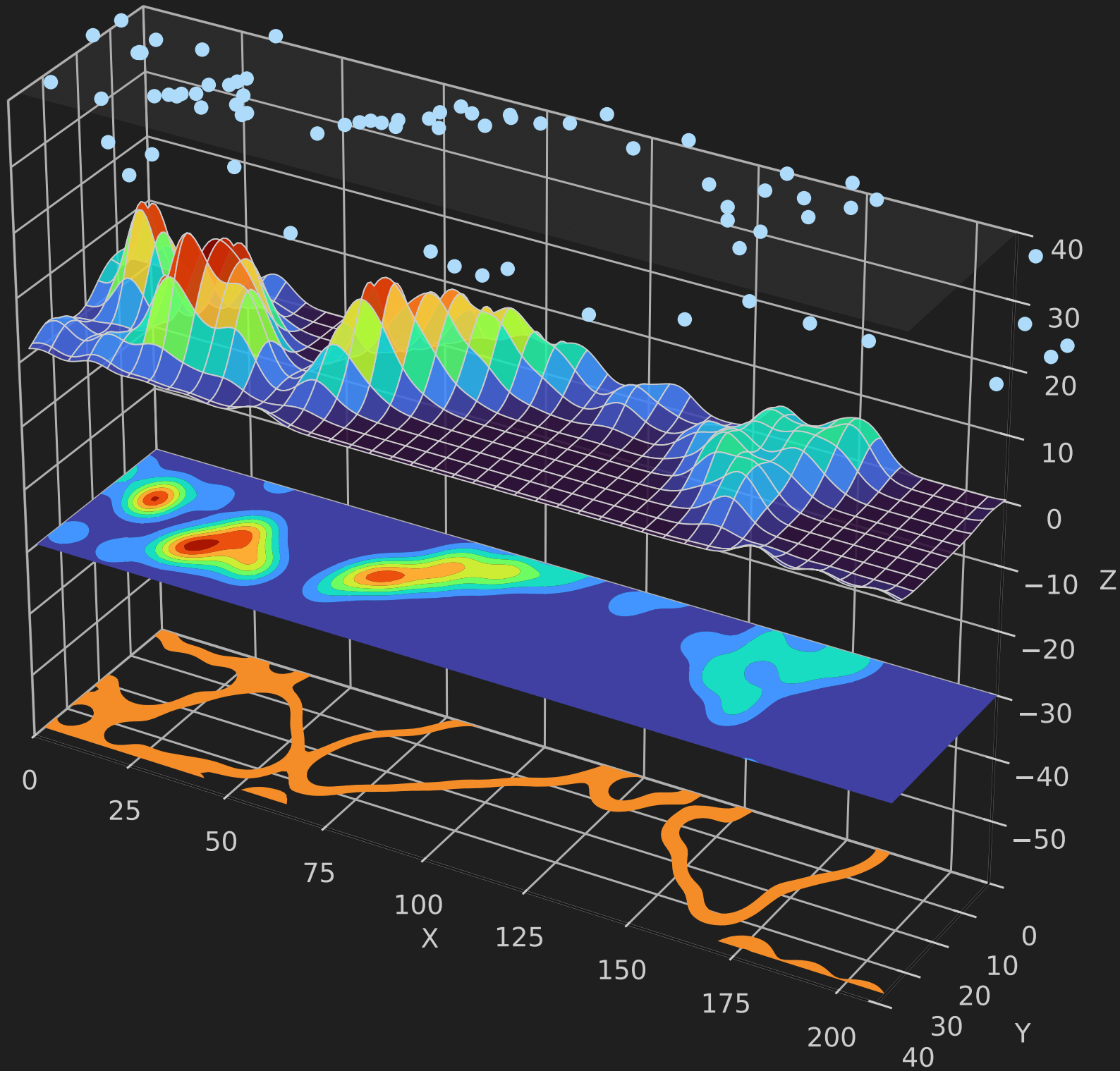
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.75 Shift = 1.91 Iteration = 138



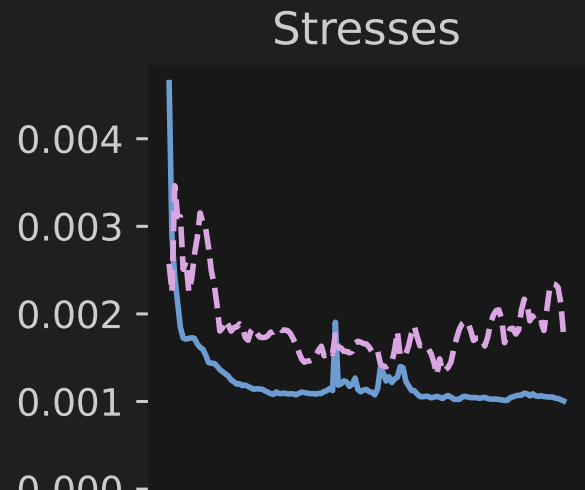
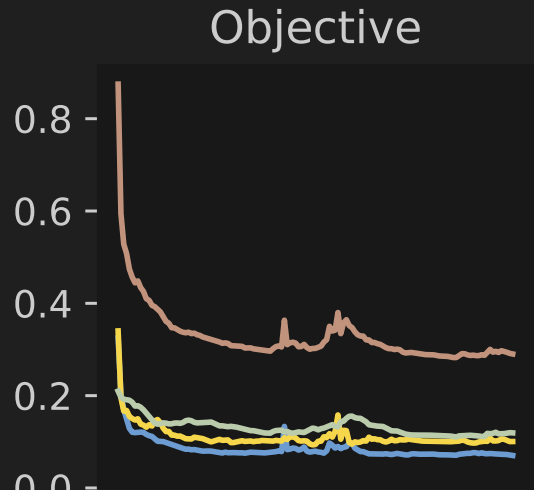
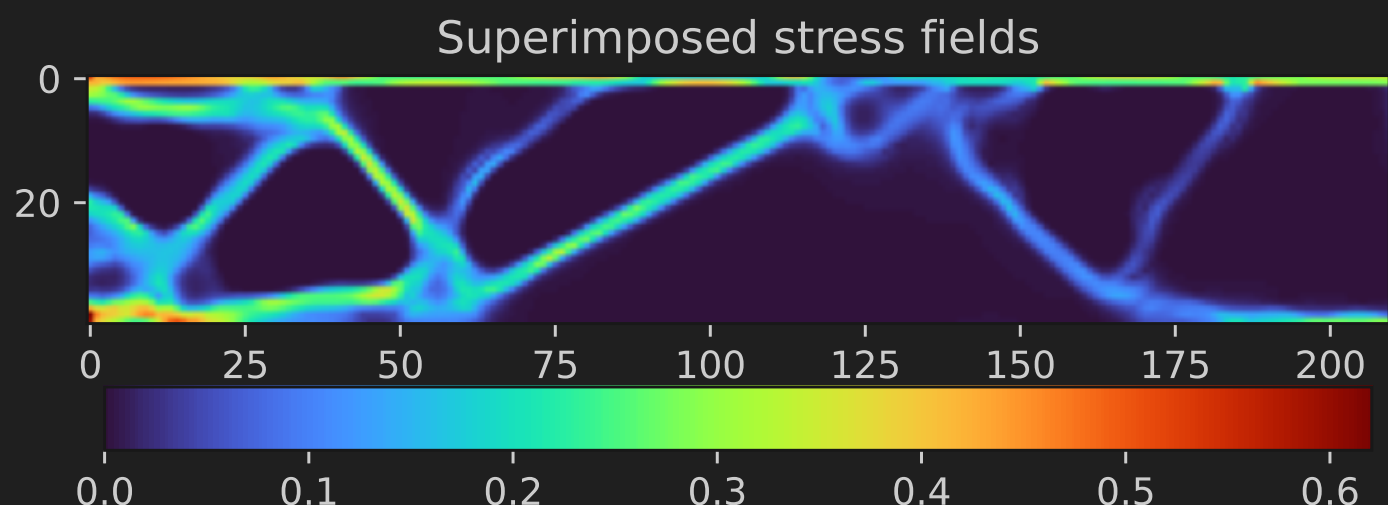
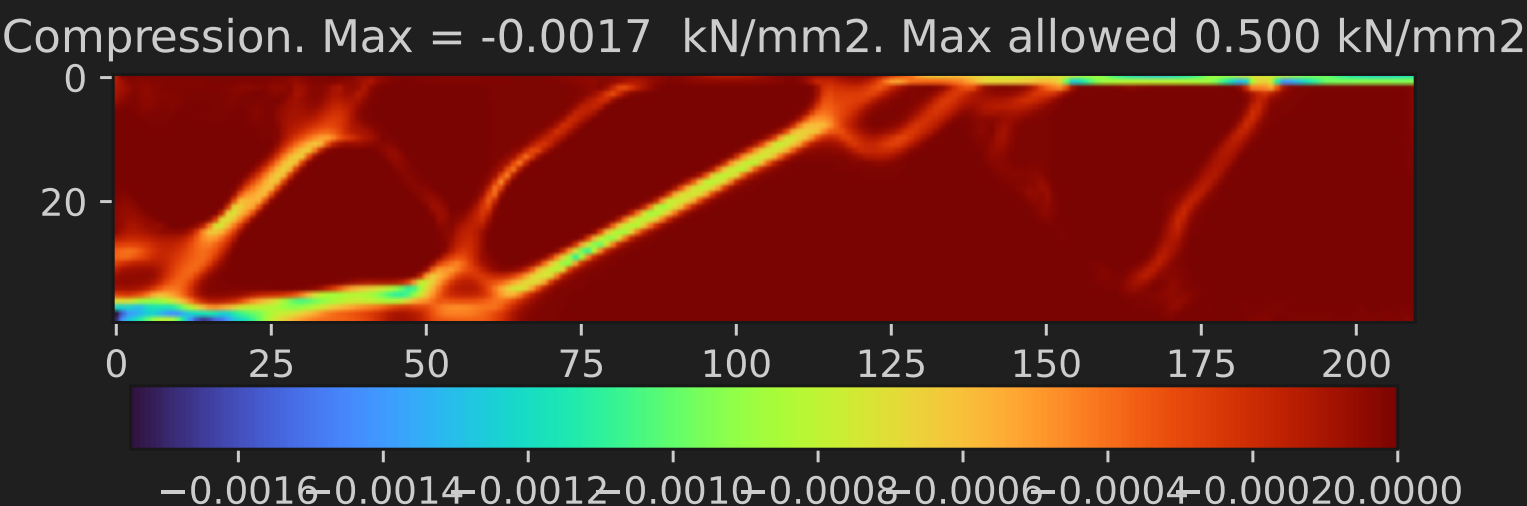
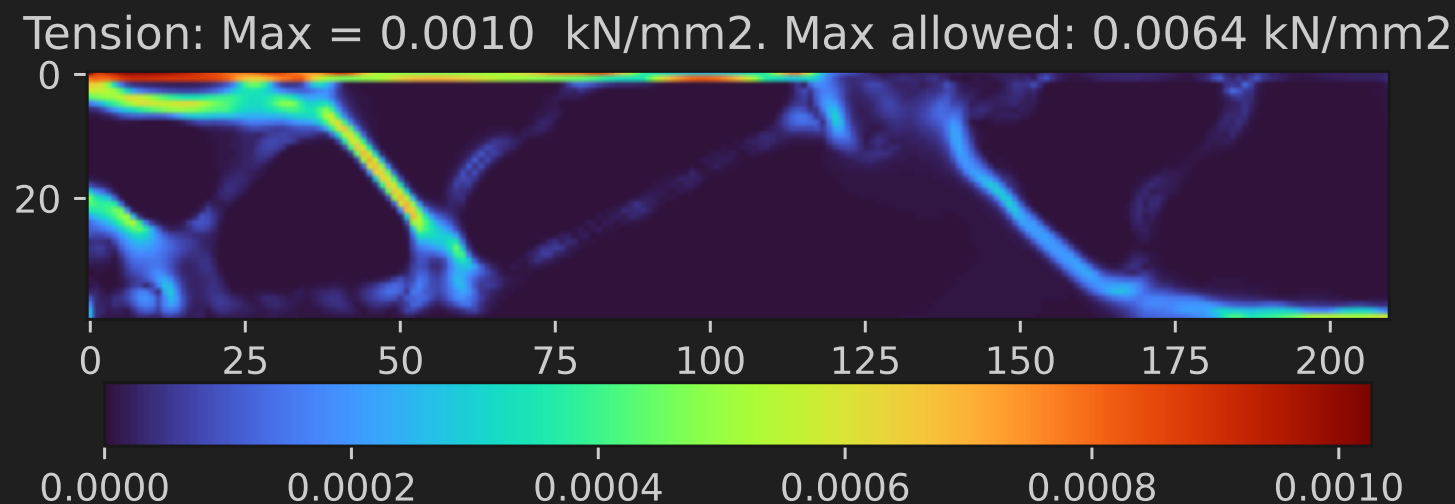
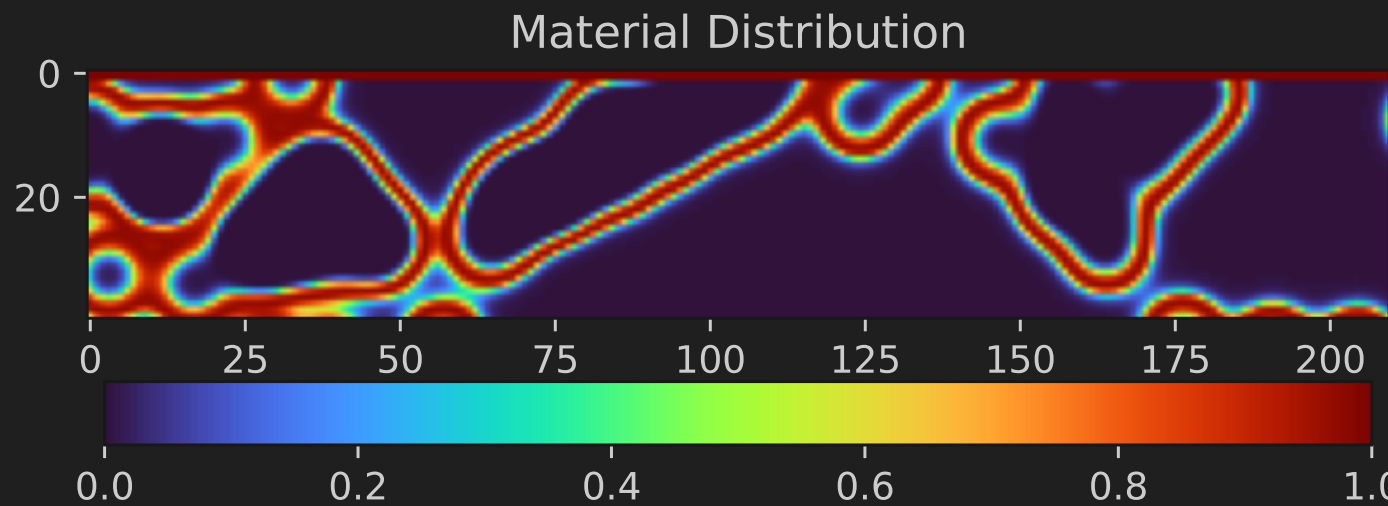
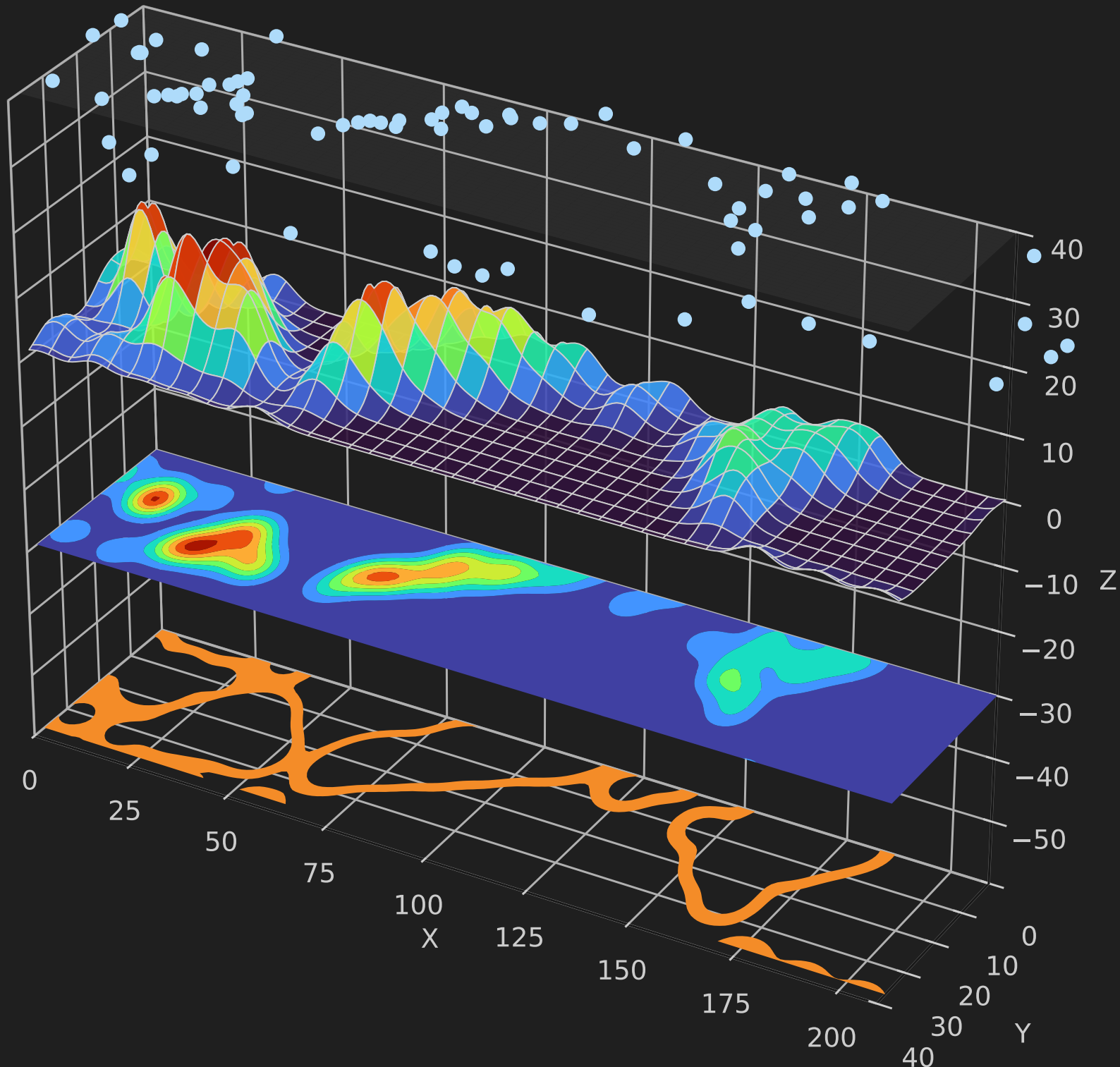
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.77 Shift = 1.91 Iteration = 139



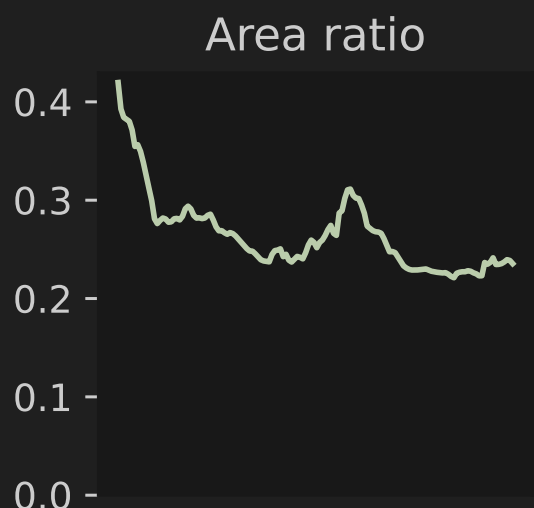
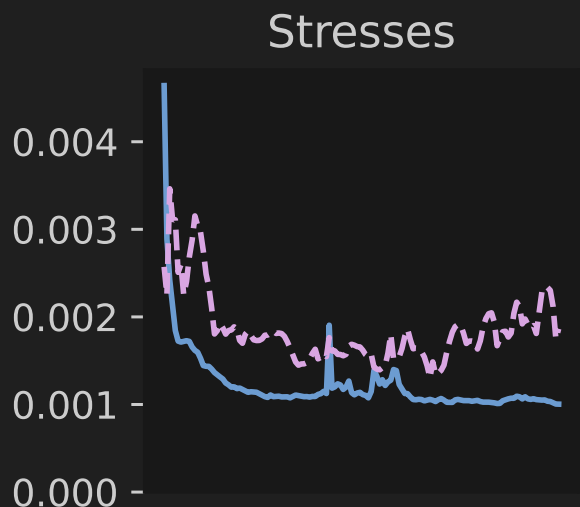
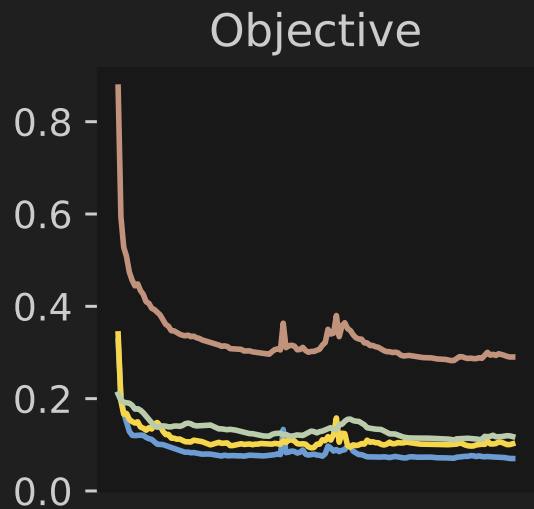
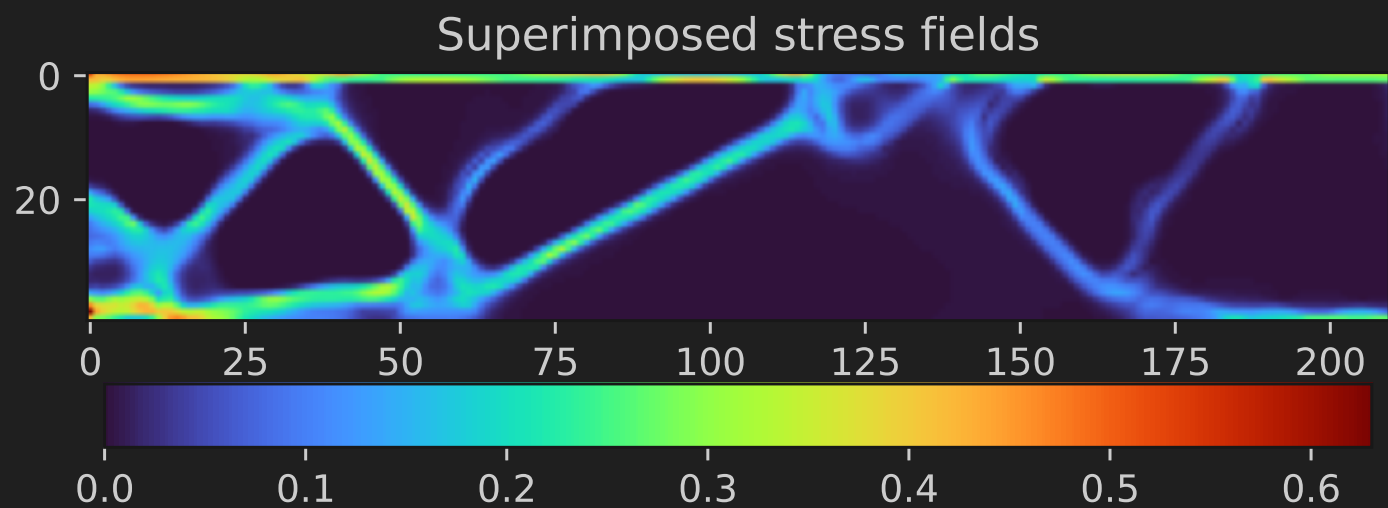
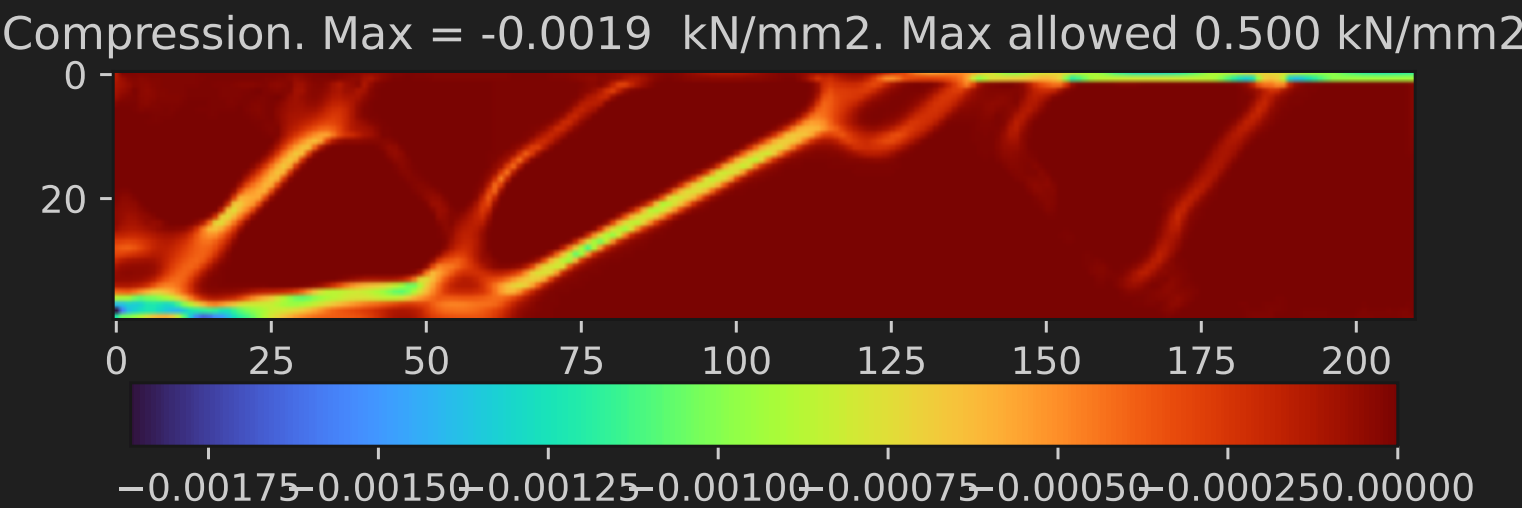
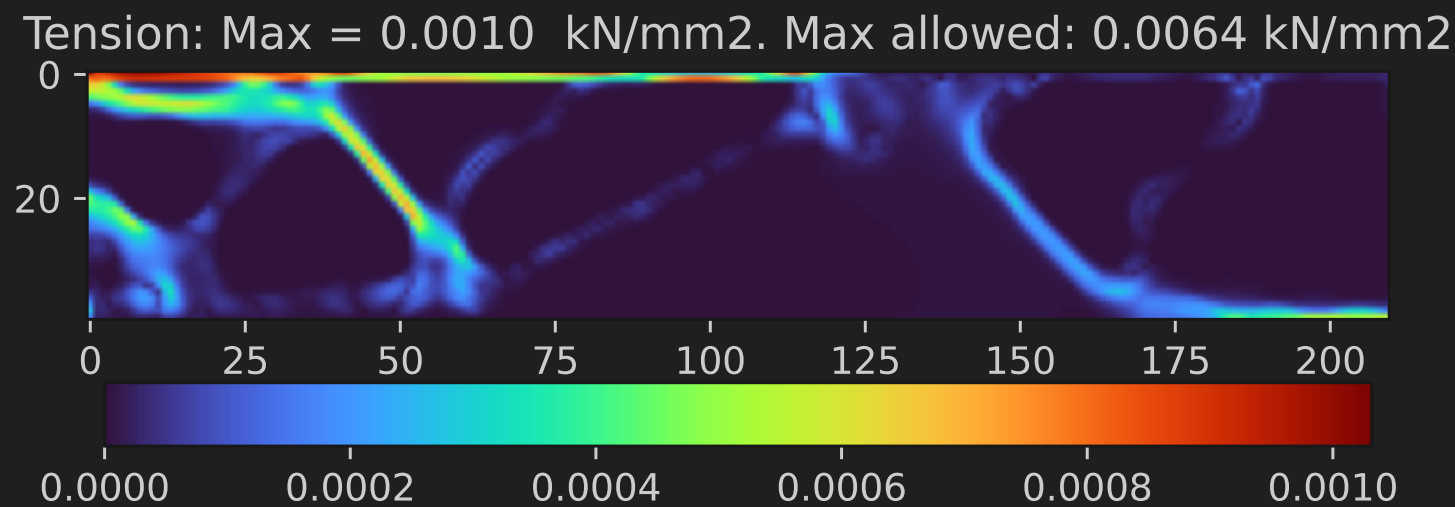
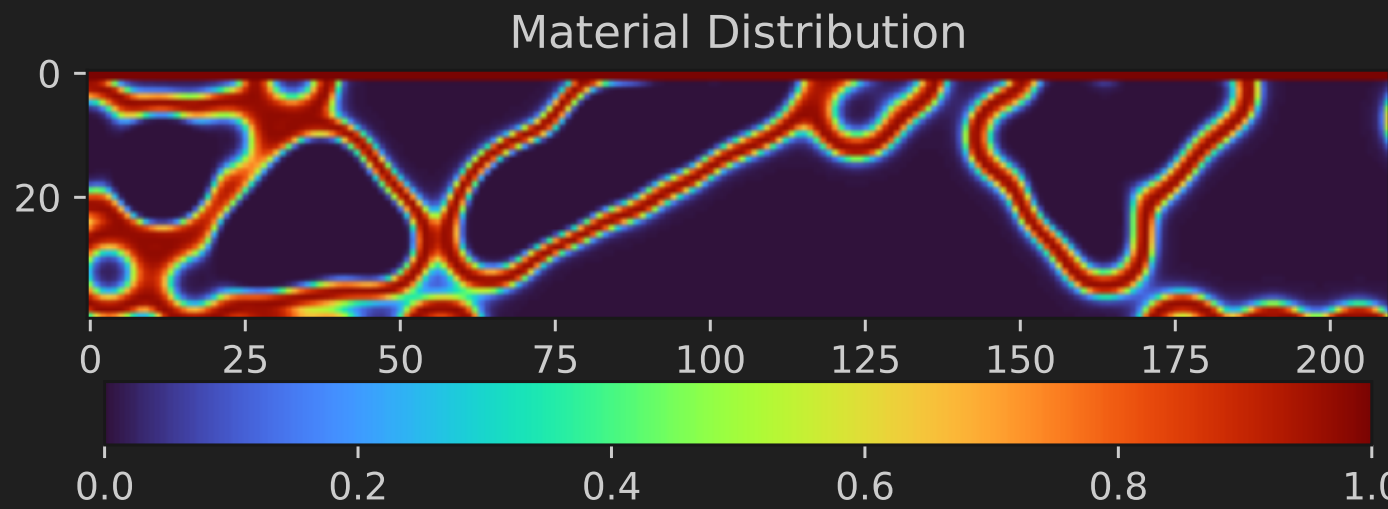
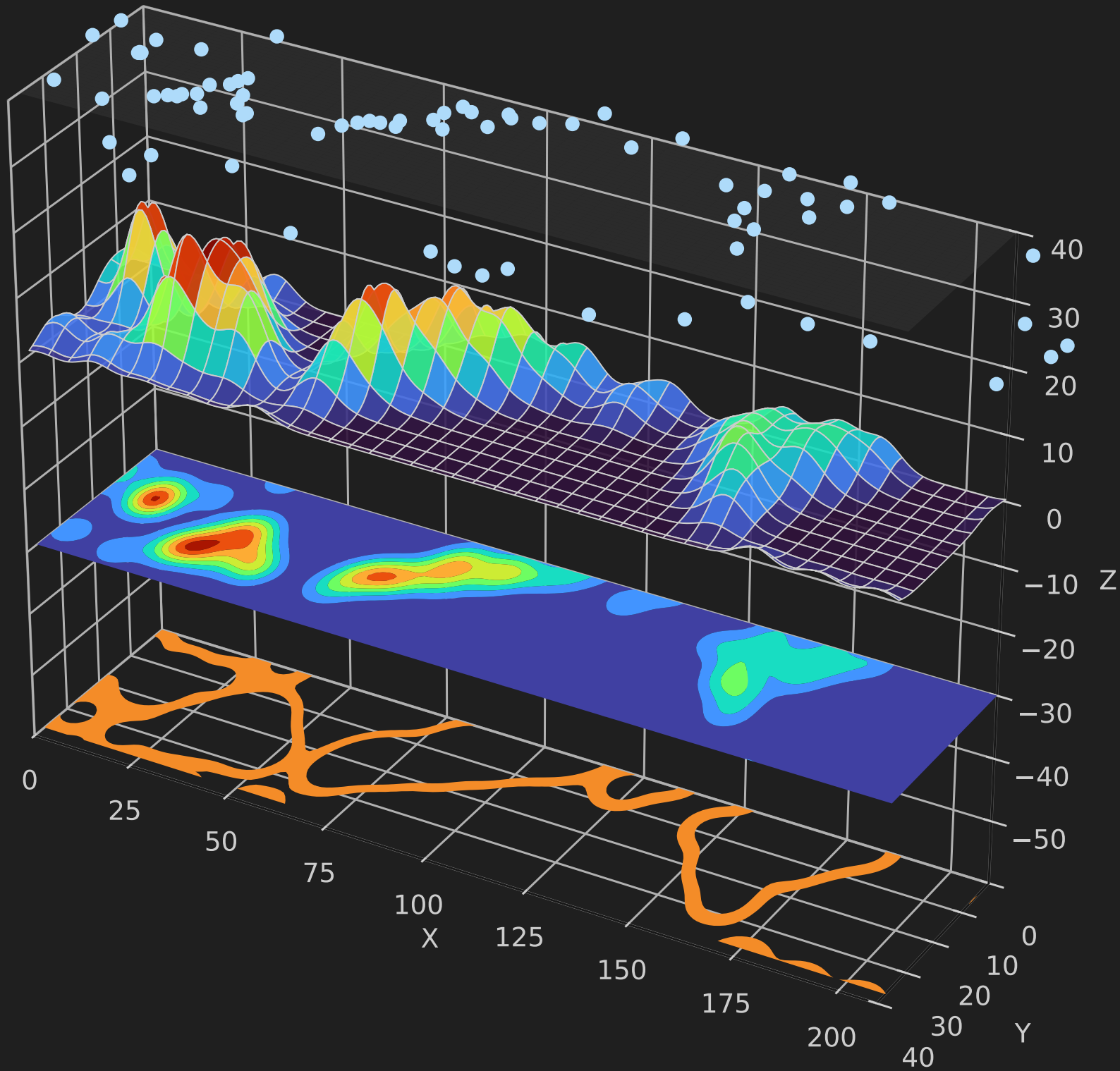
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.78 Shift = 1.92 Iteration = 140



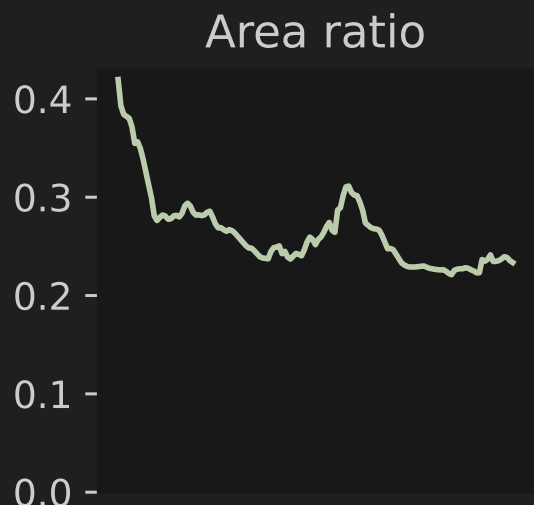
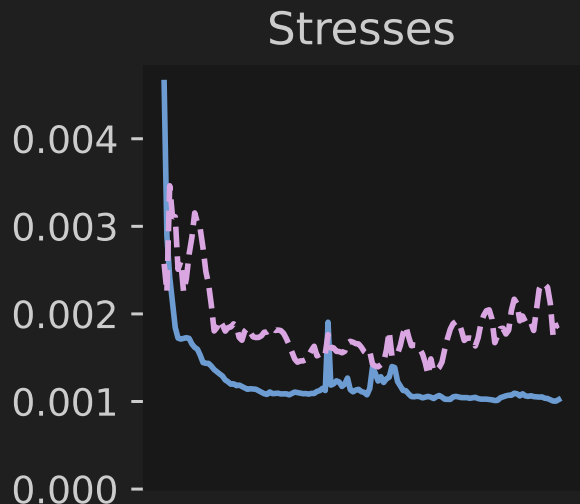
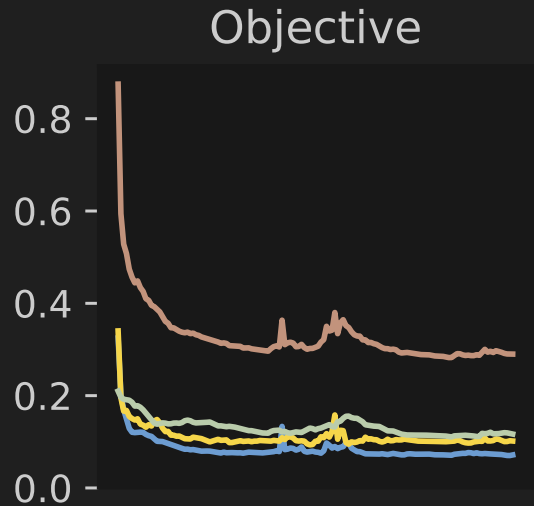
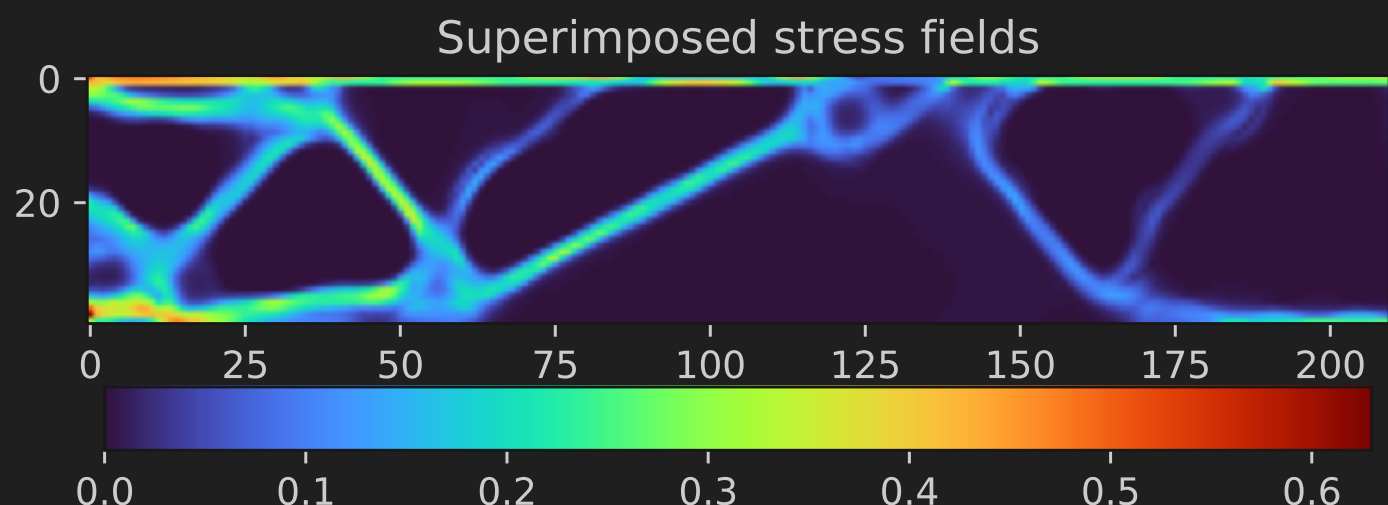
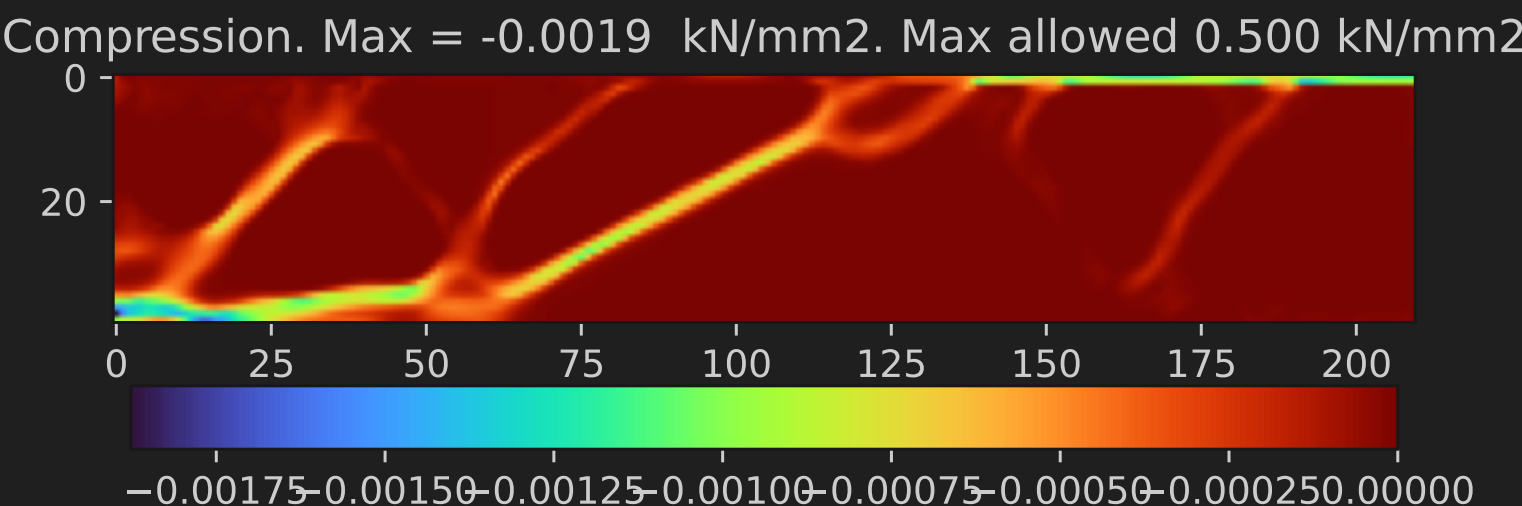
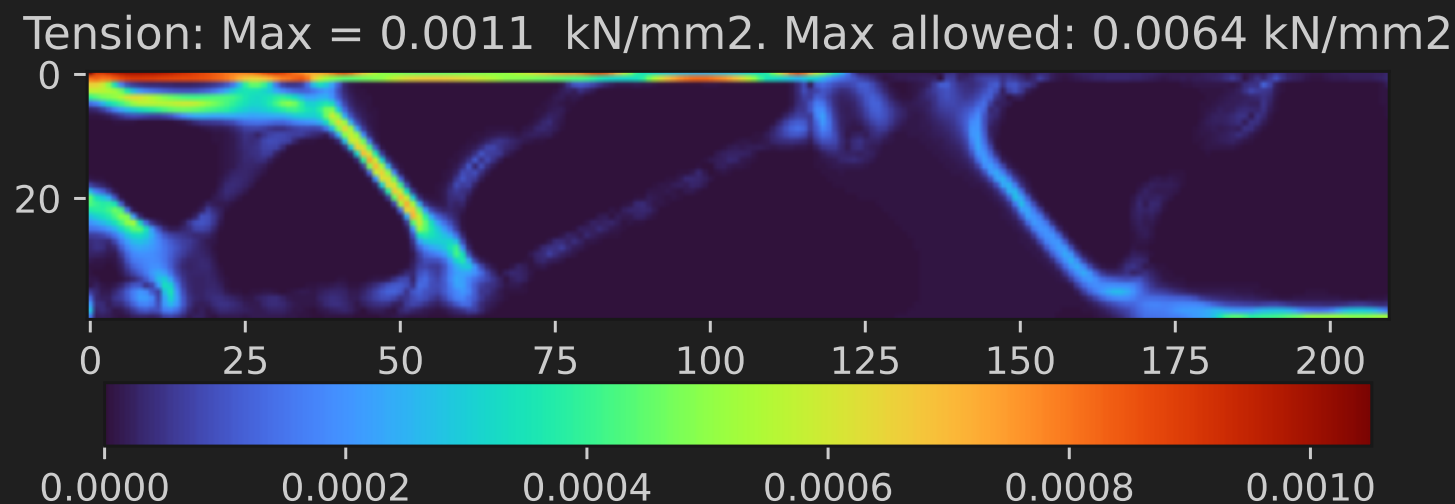
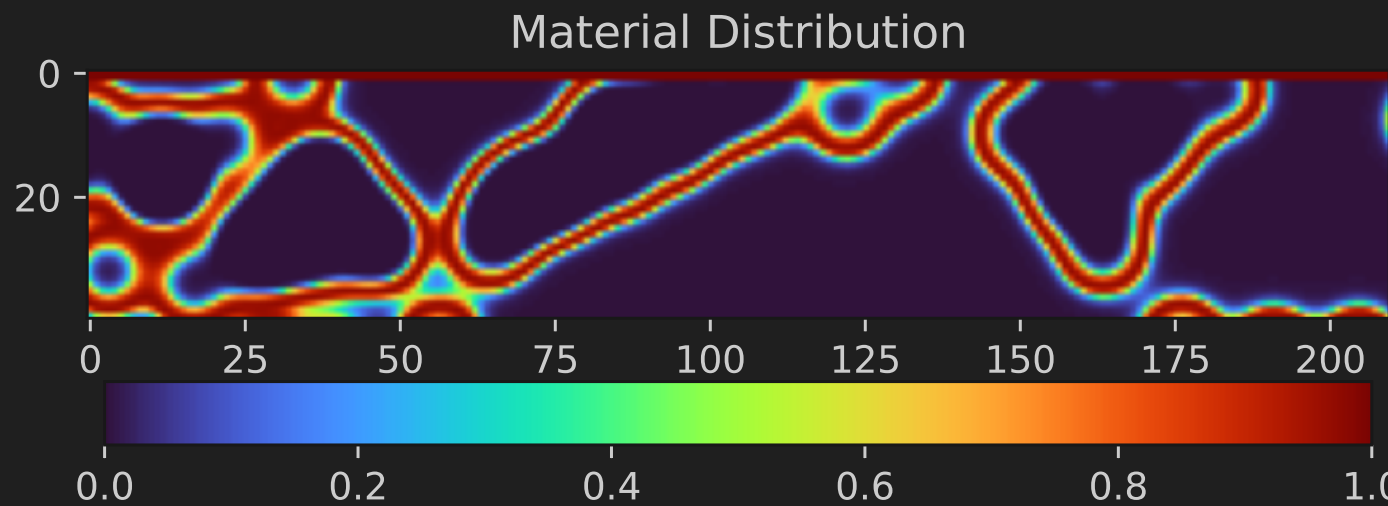
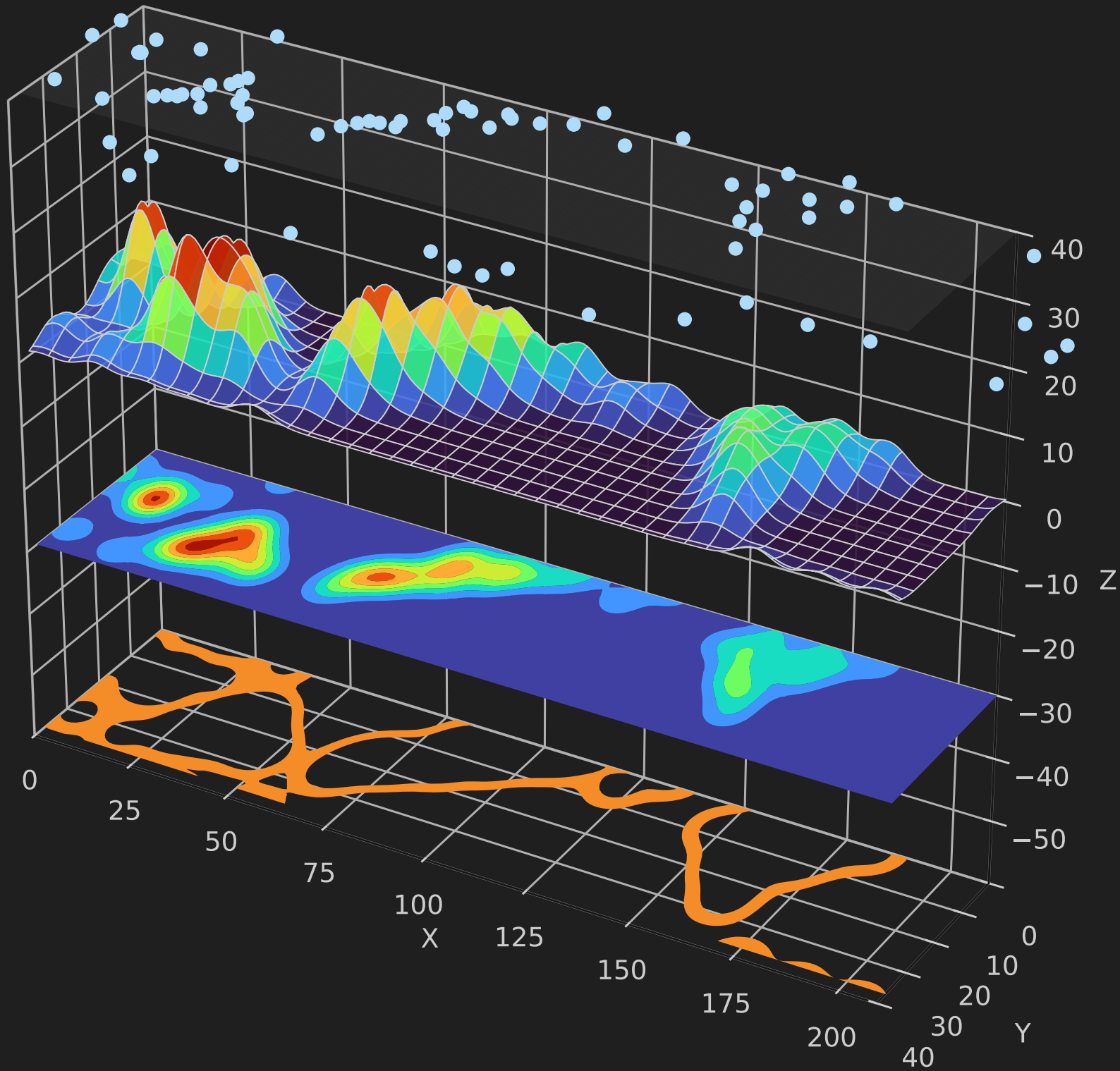
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.80 Shift = 1.92 Iteration = 141



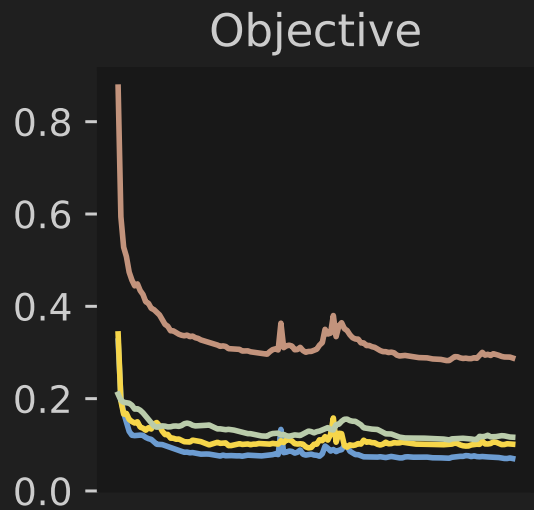
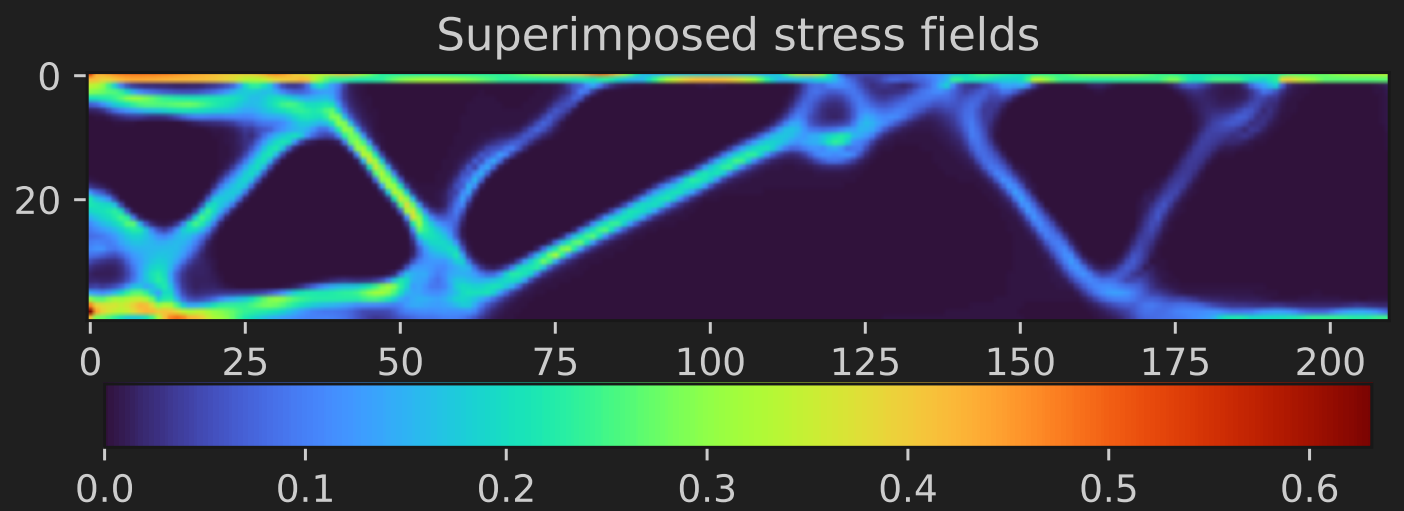
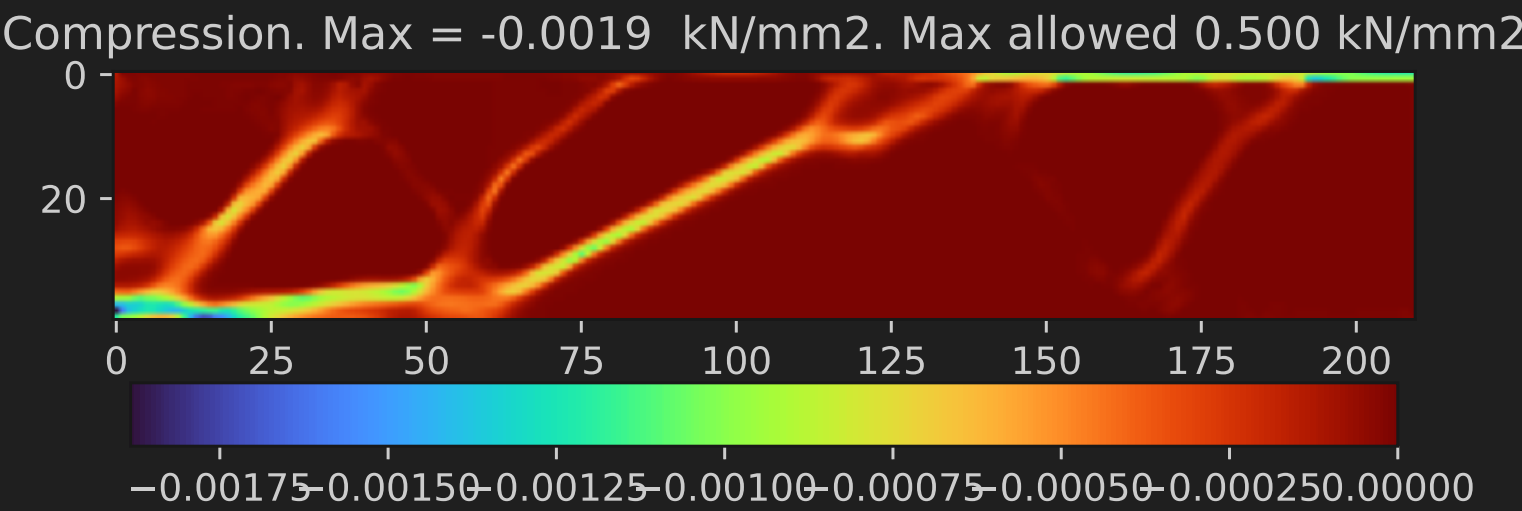
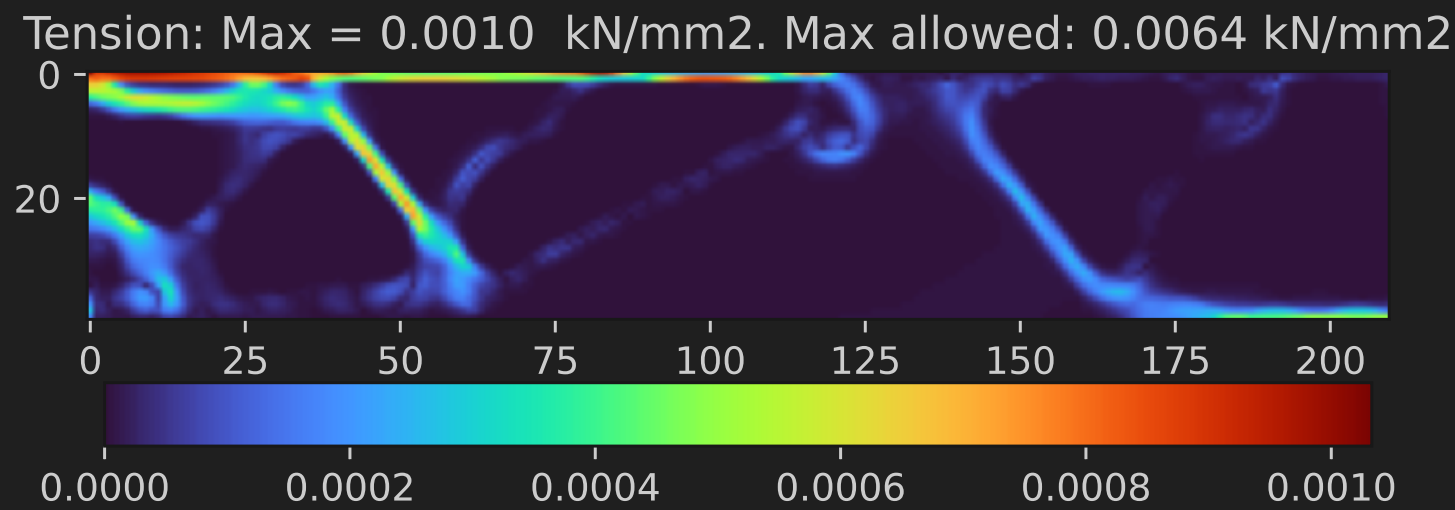
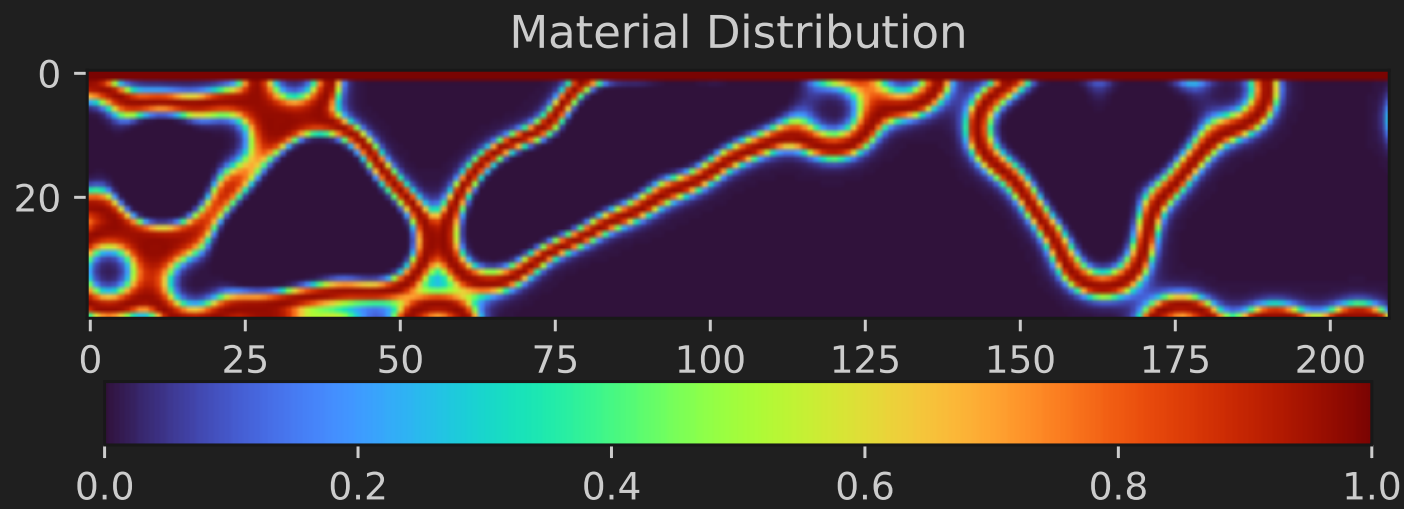
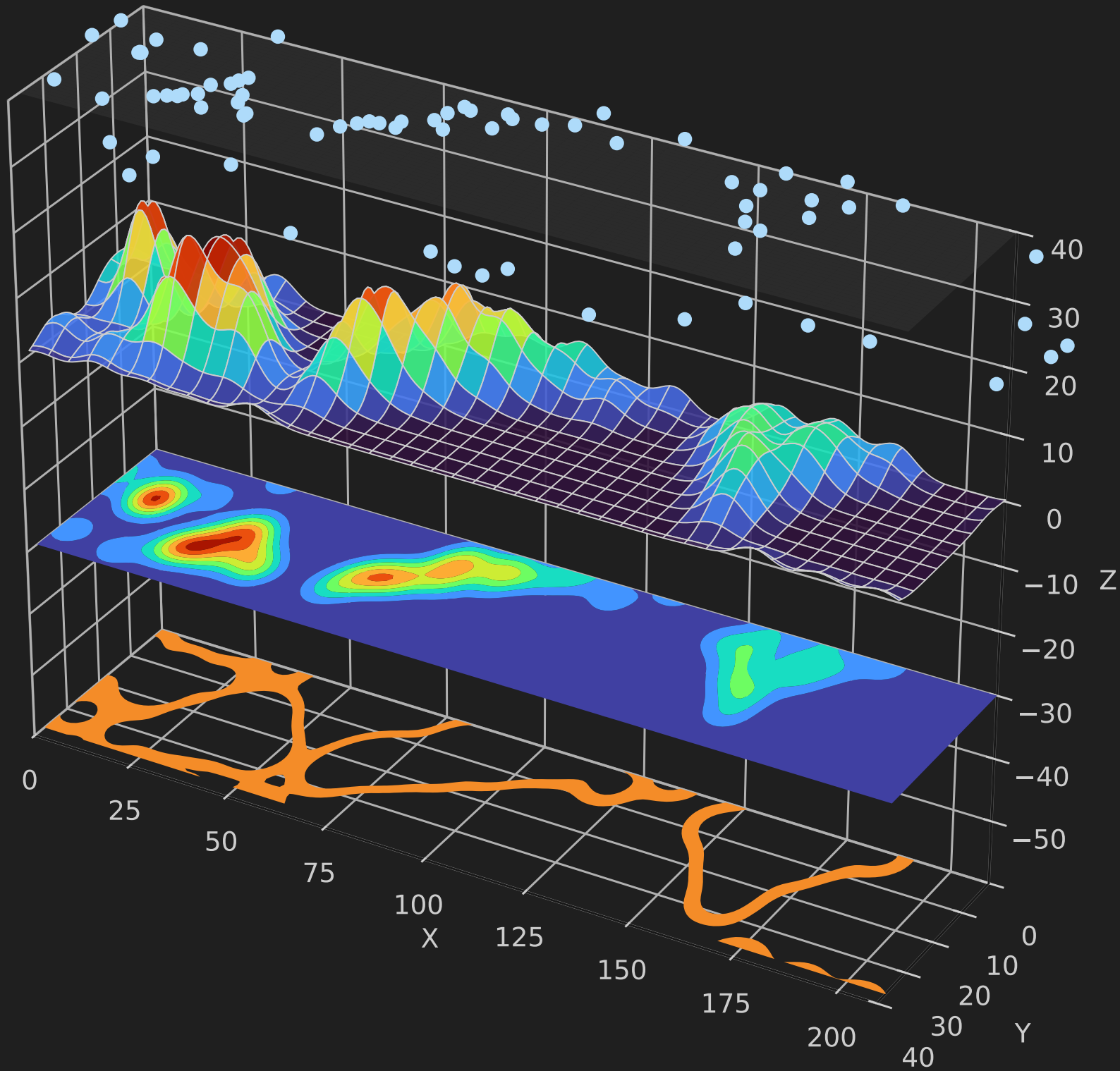
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.83 Shift = 1.91 Iteration = 142



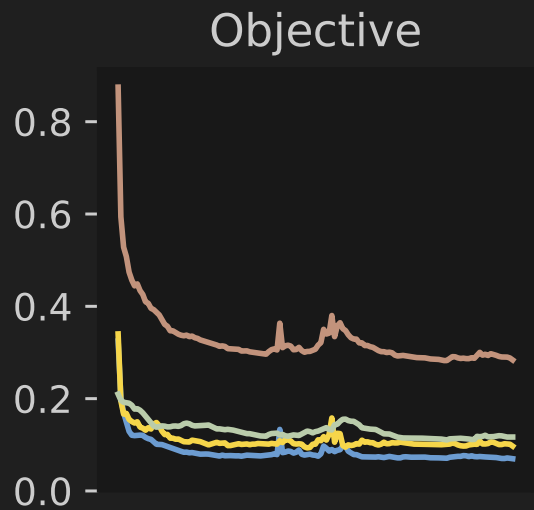
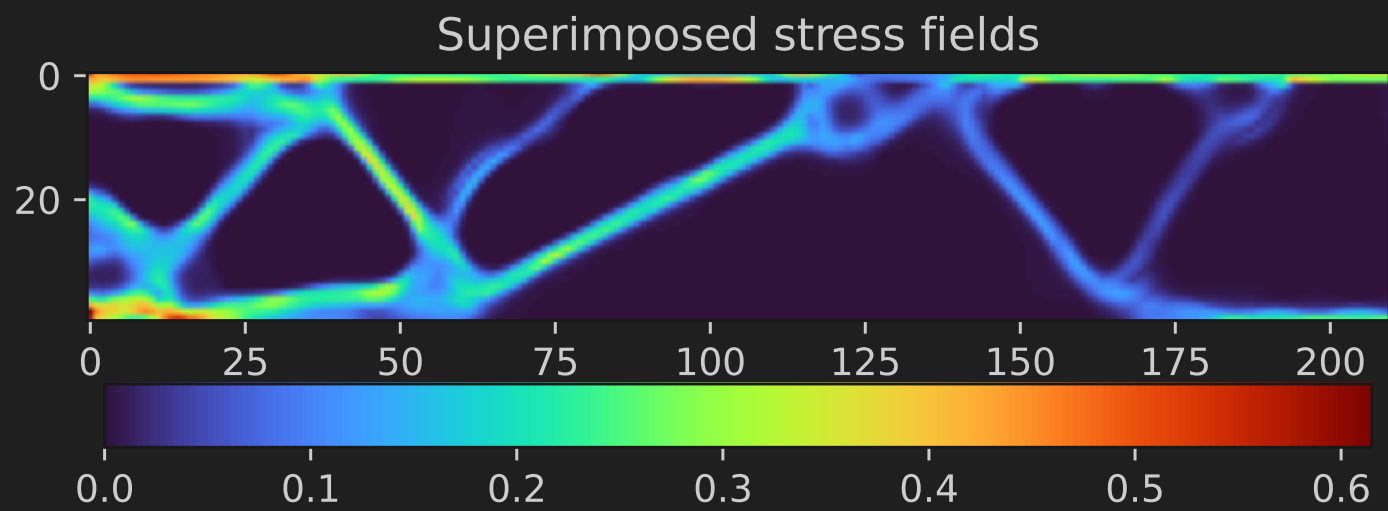
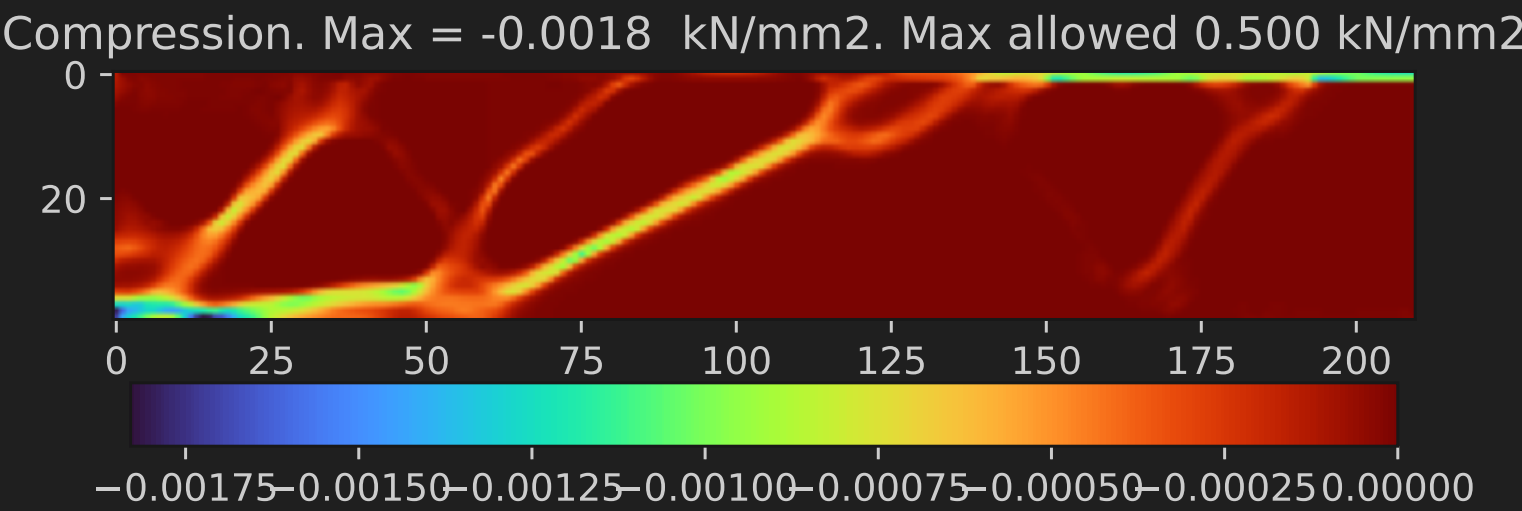
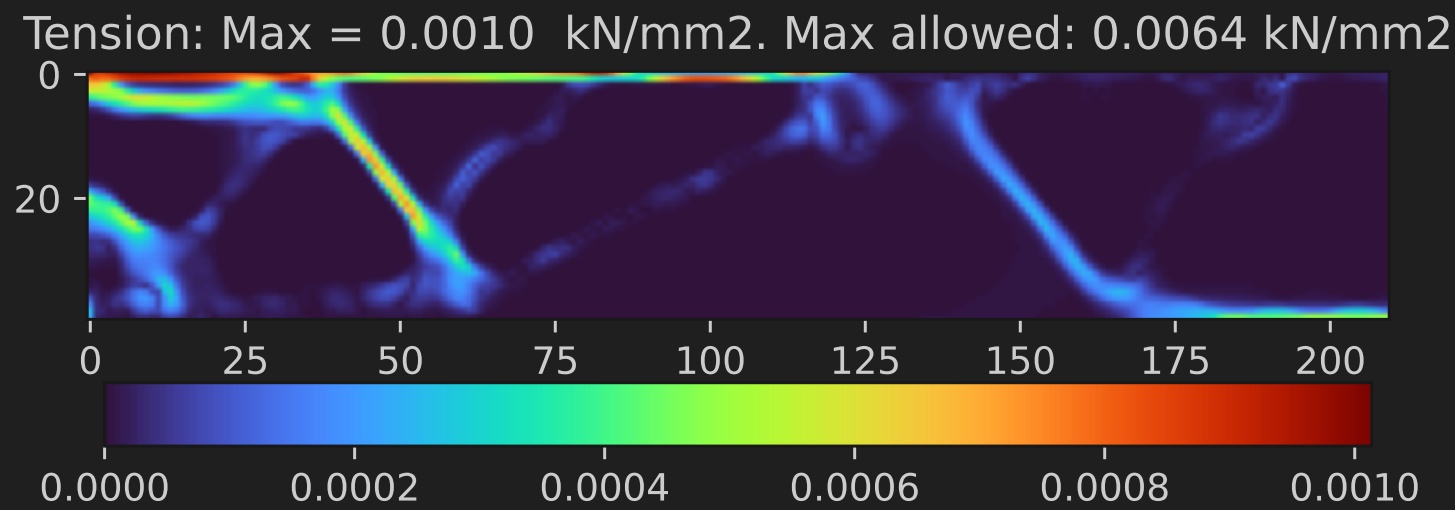
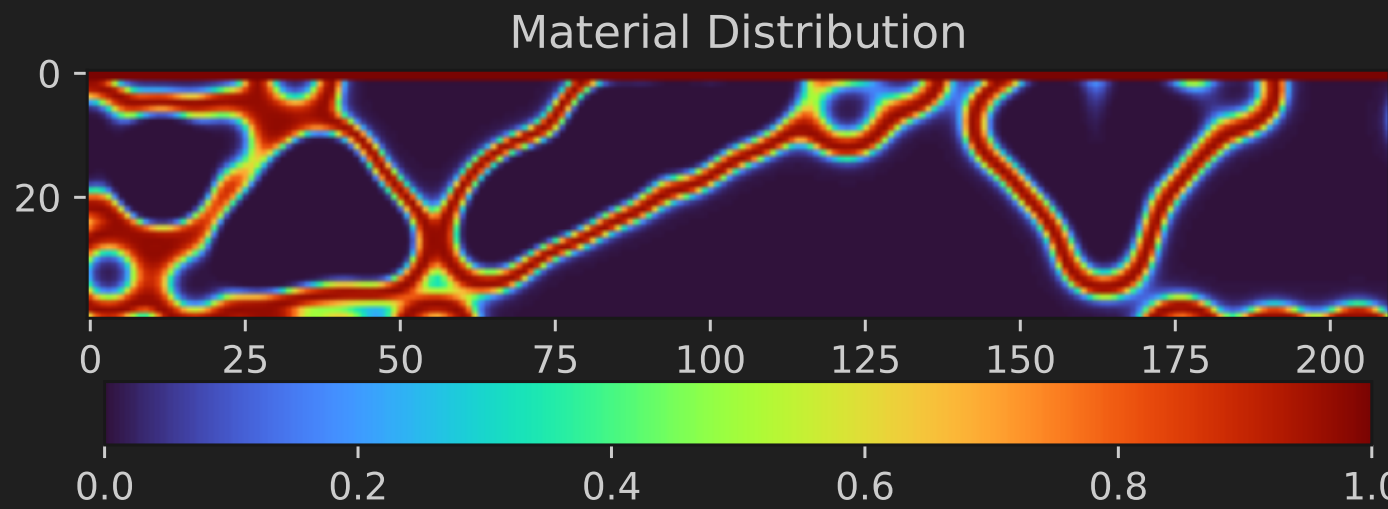
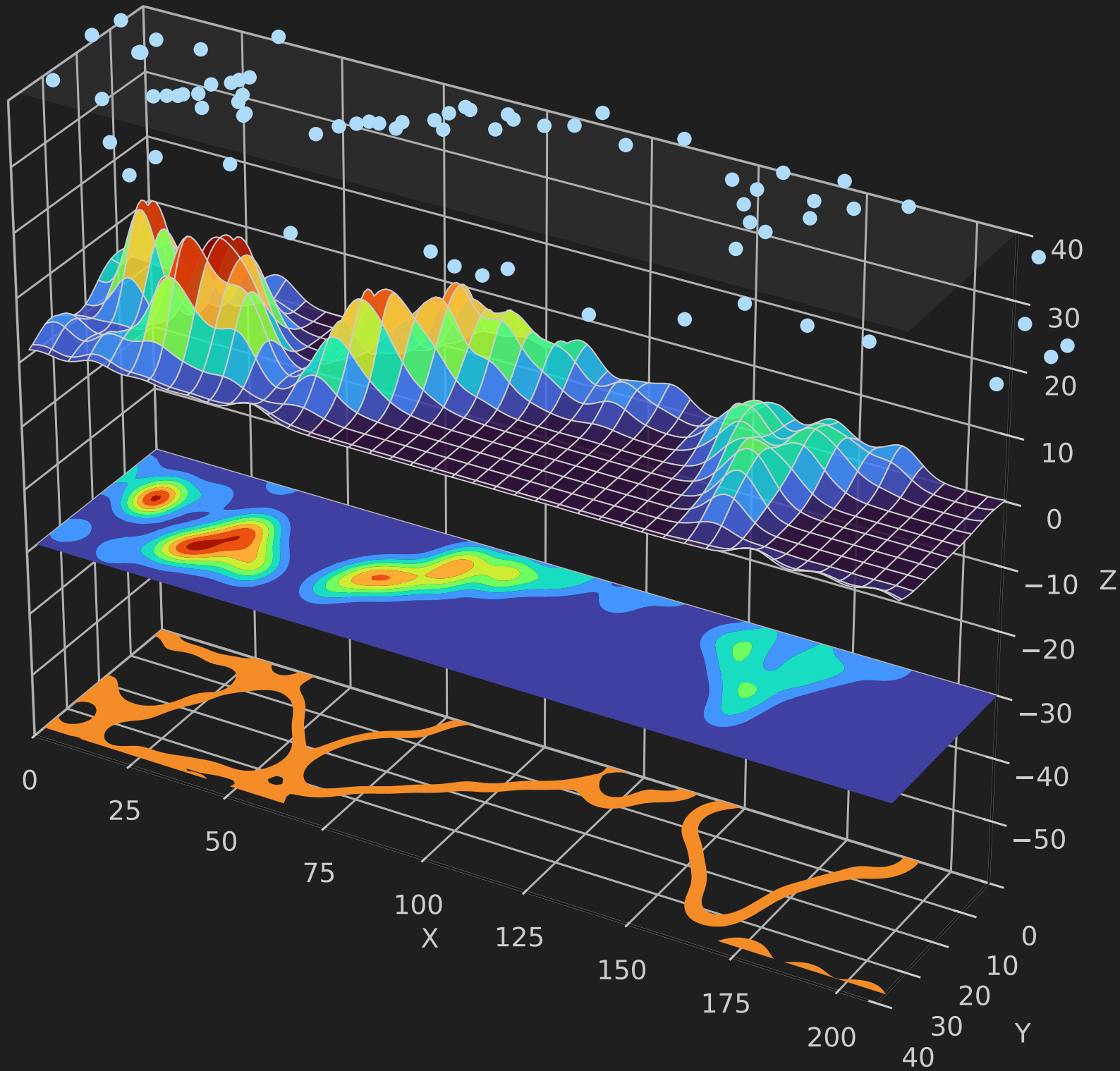
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.87 Shift = 1.90 Iteration = 143



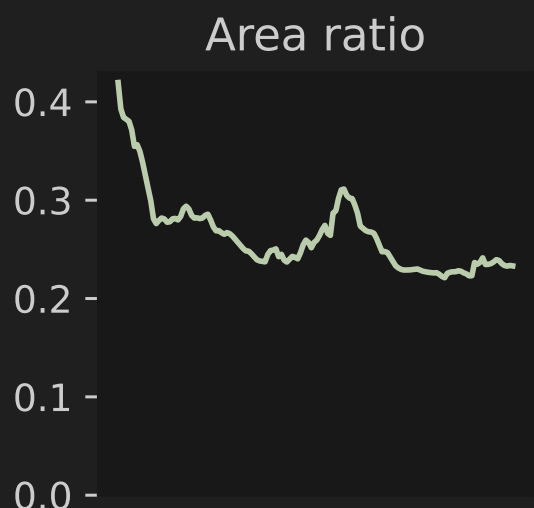
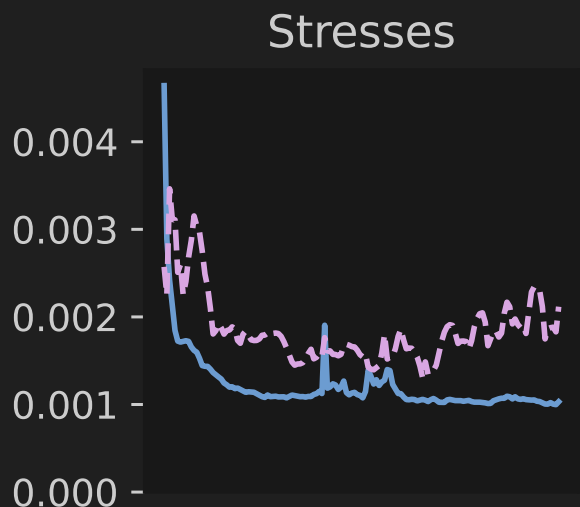
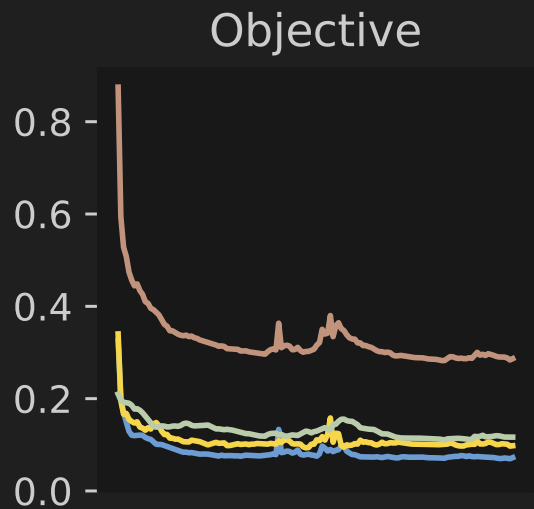
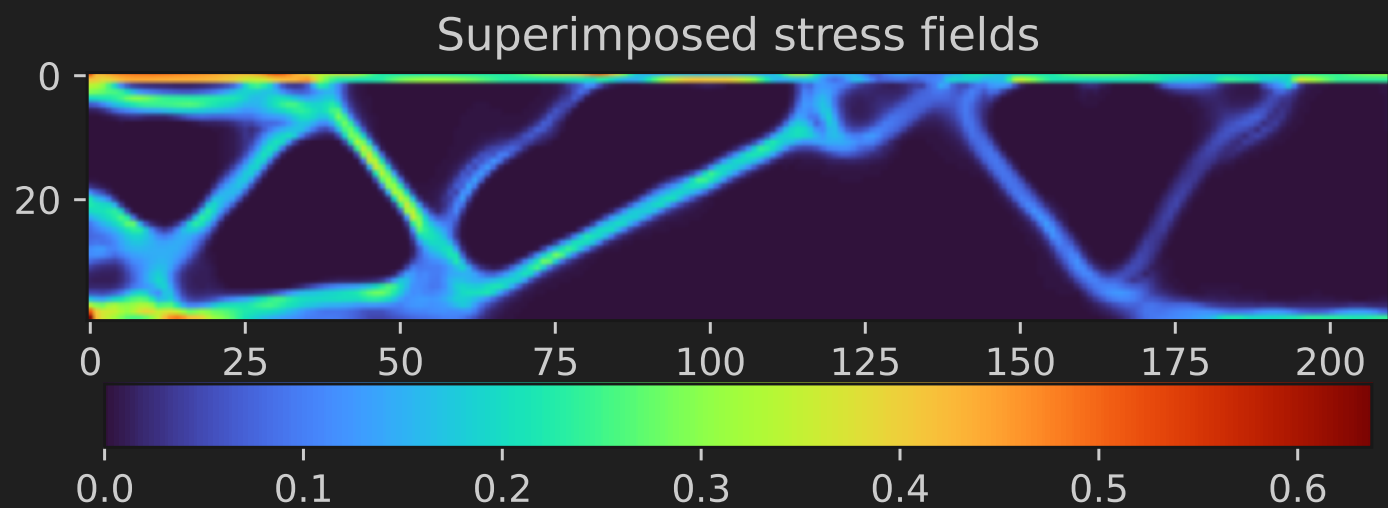
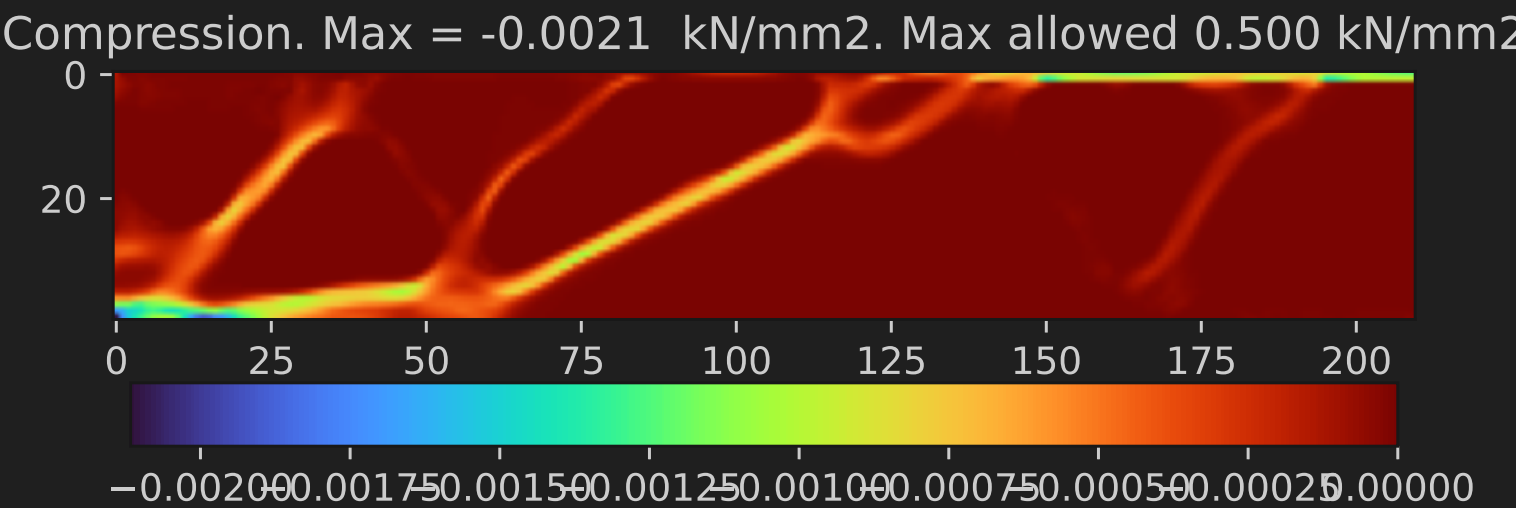
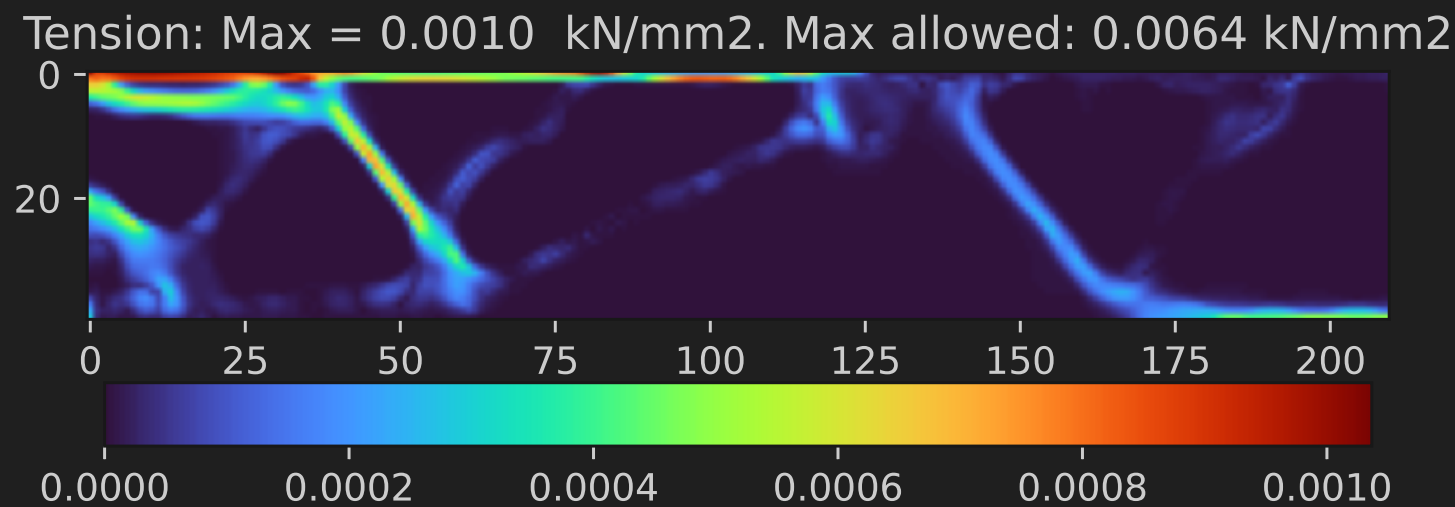
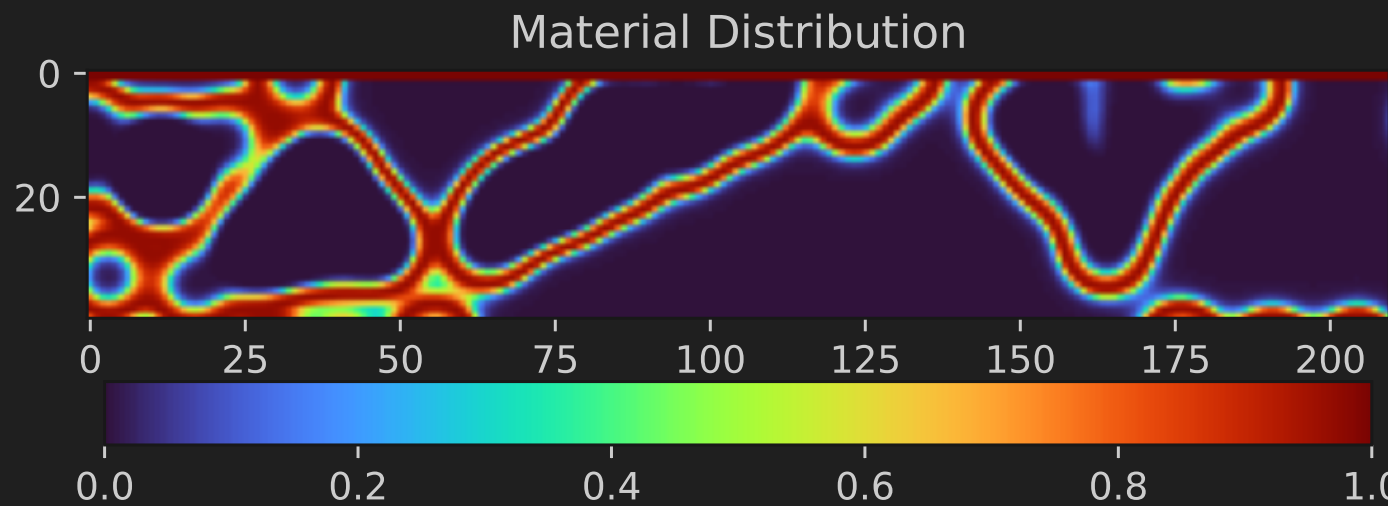
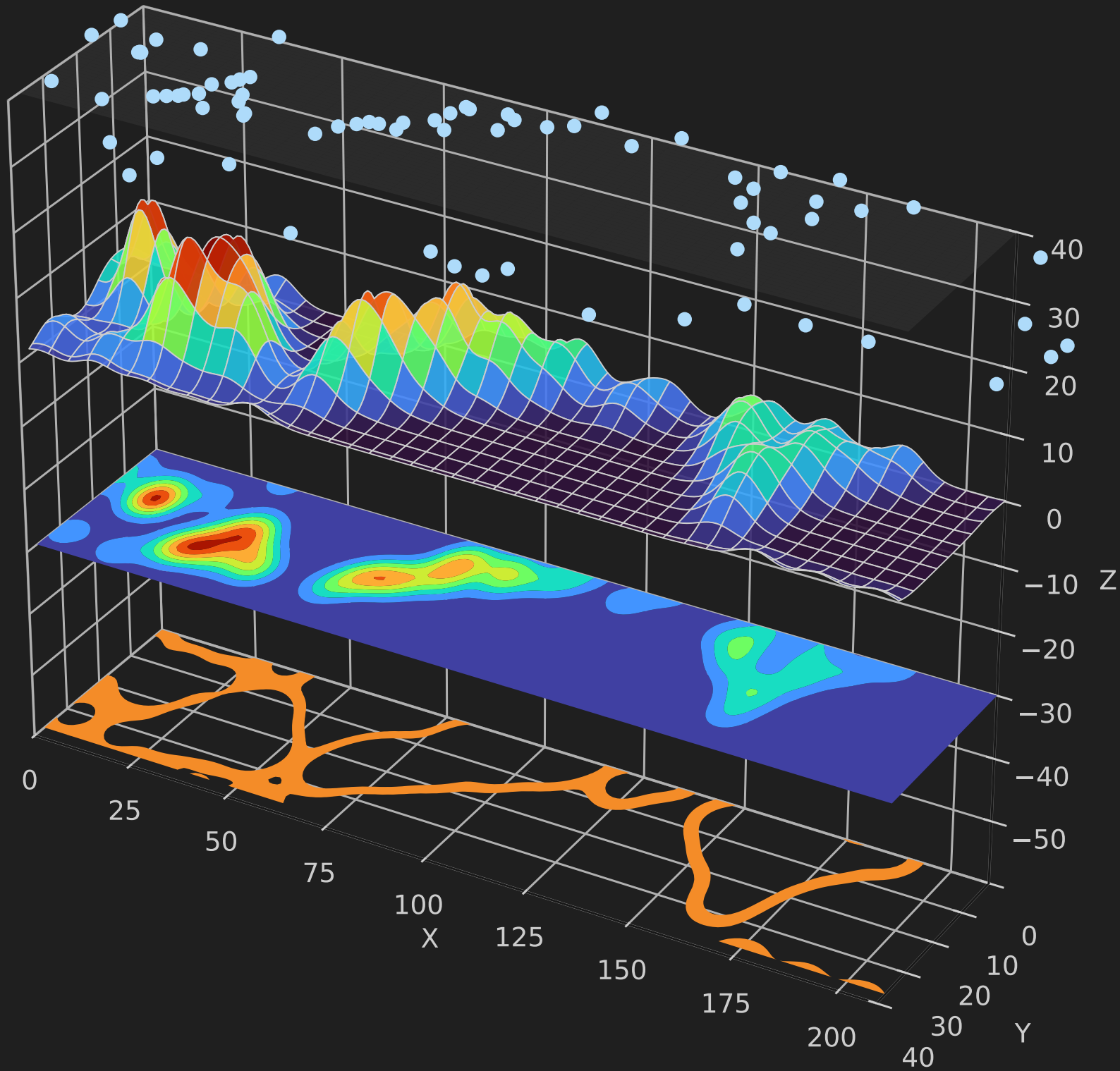
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.89 Shift = 1.89 Iteration = 144



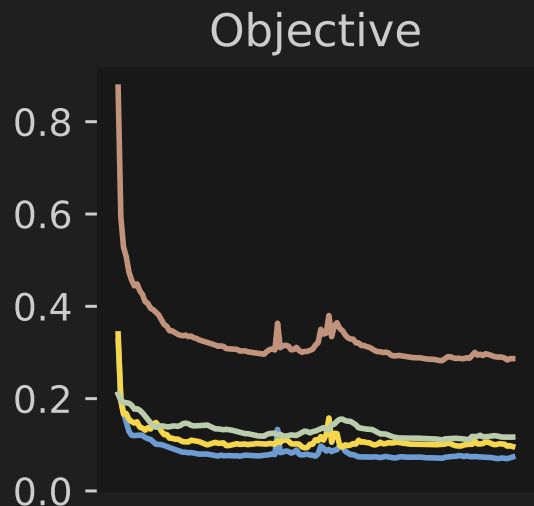
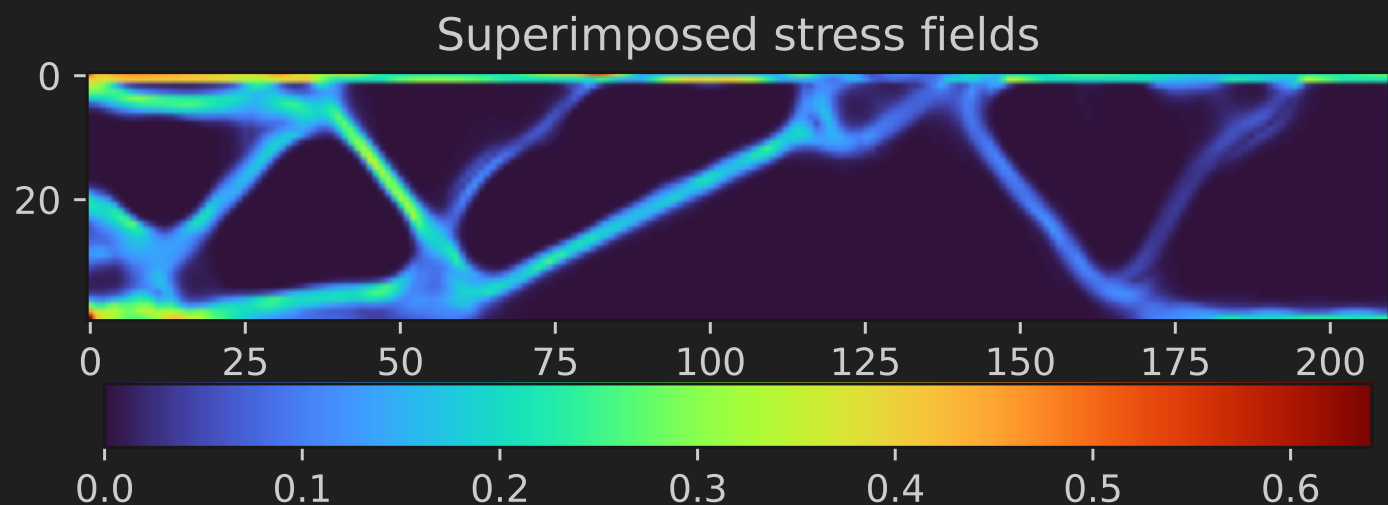
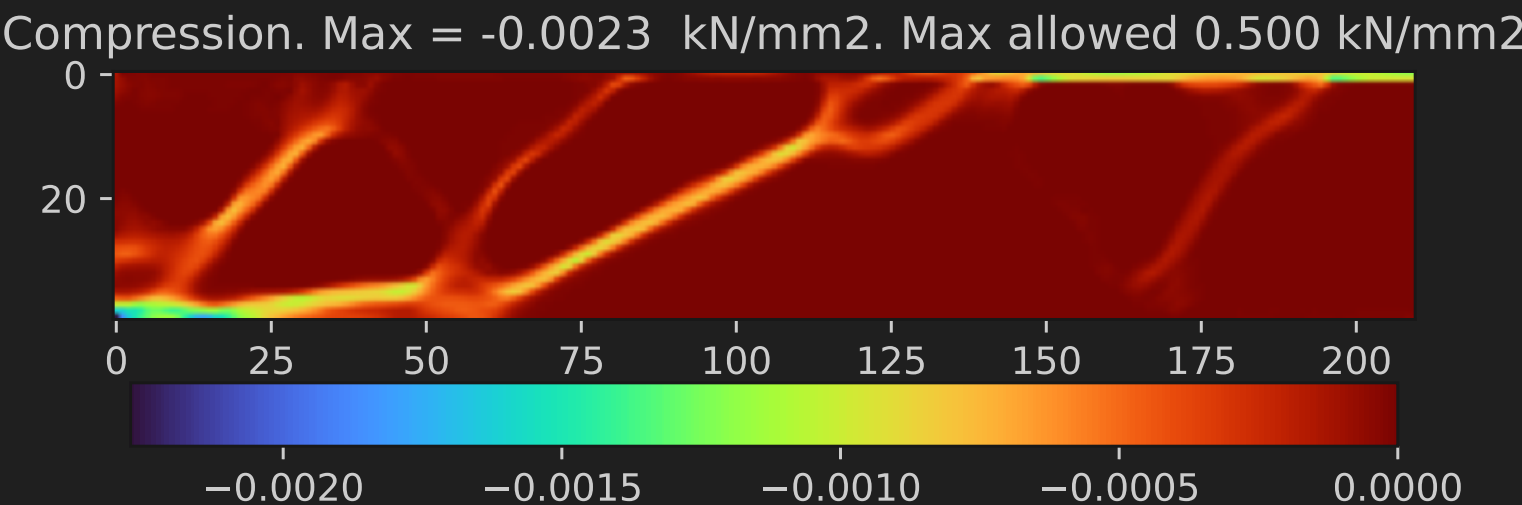
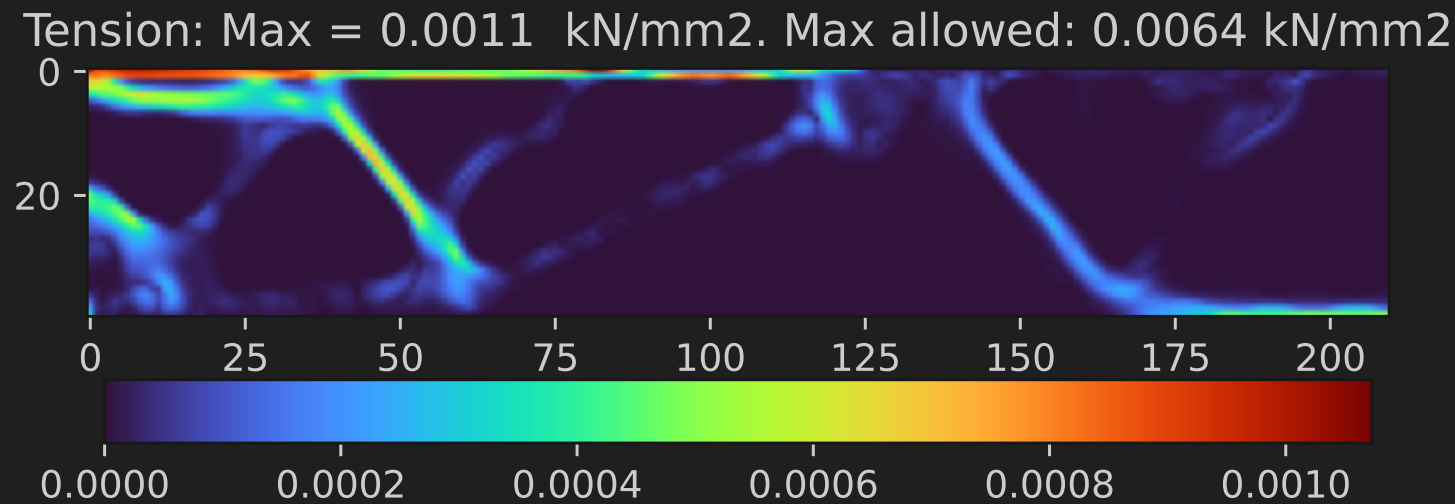
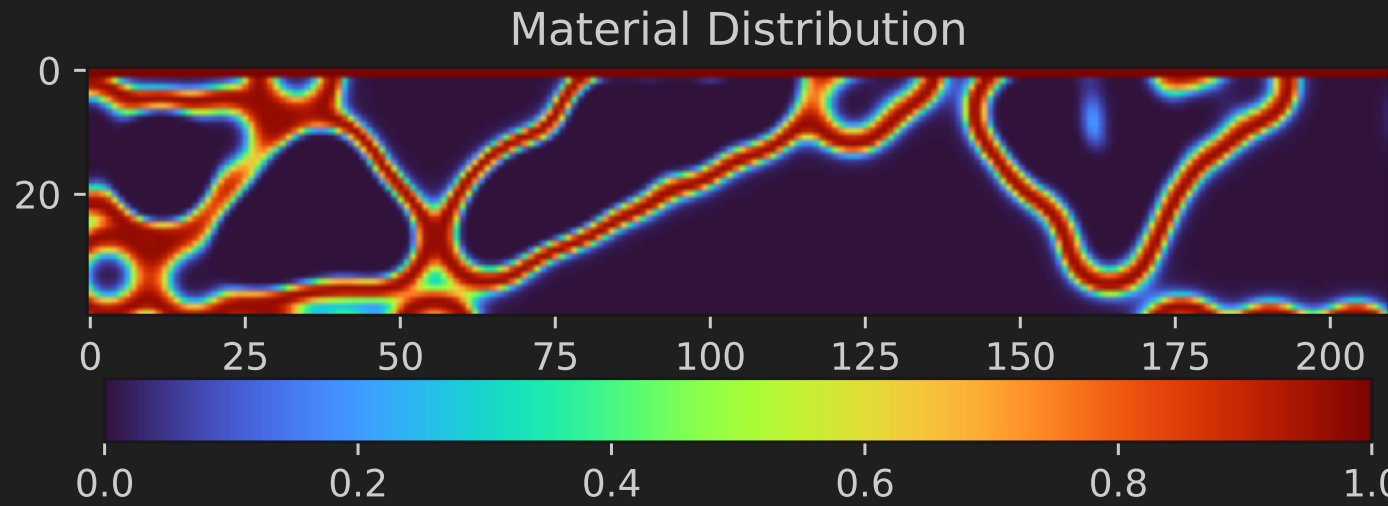
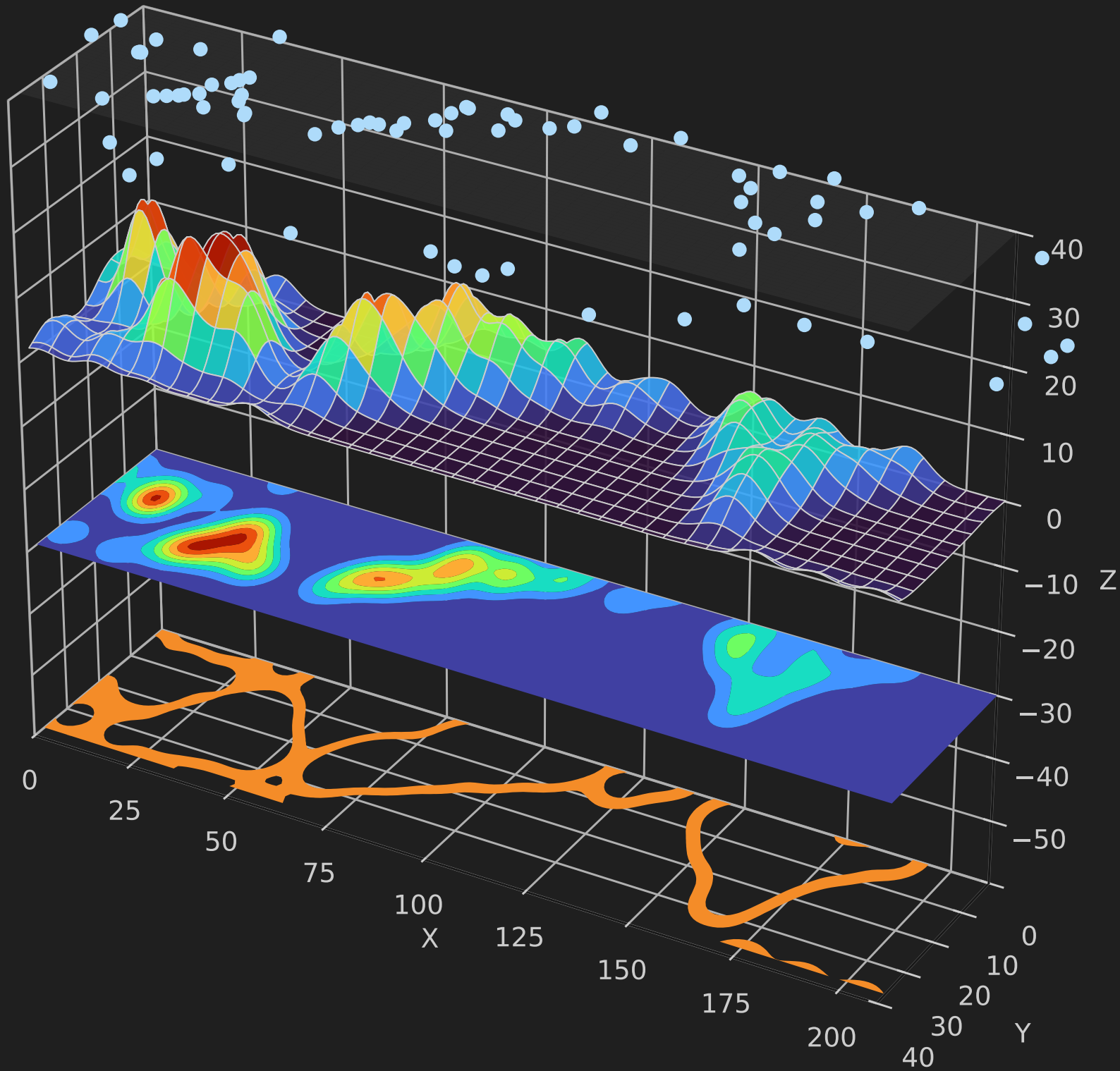
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.92 Shift = 1.88 Iteration = 145



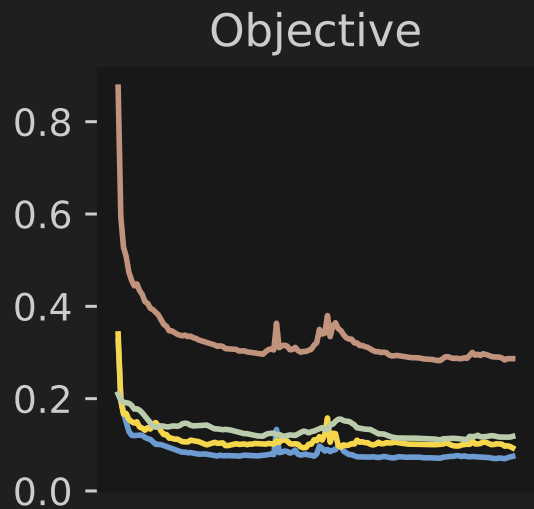
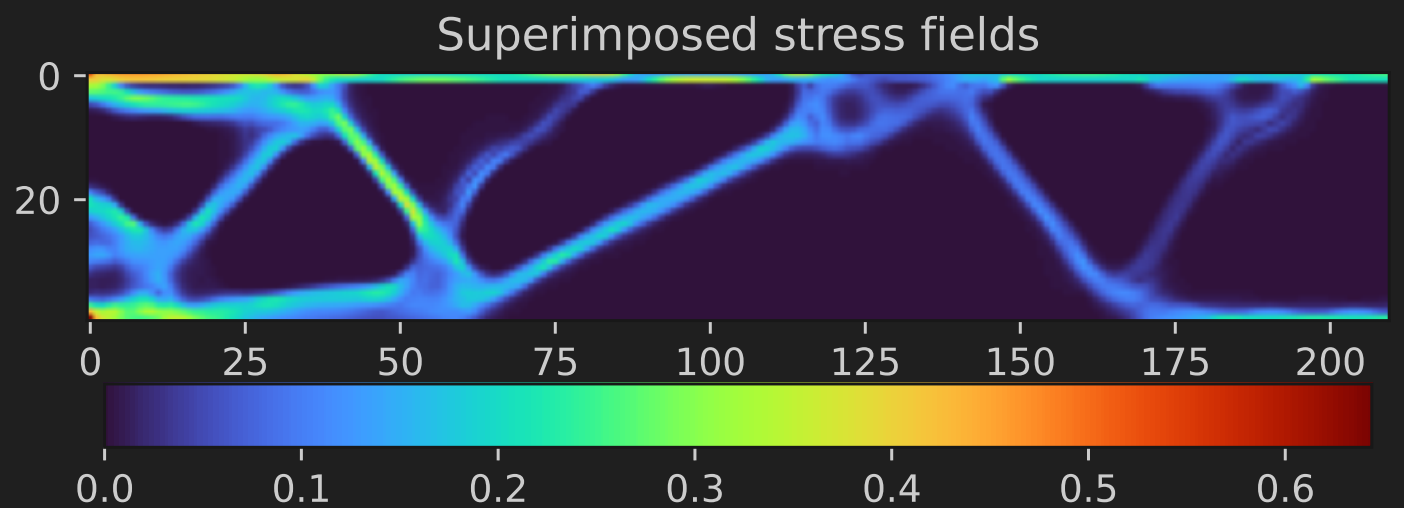
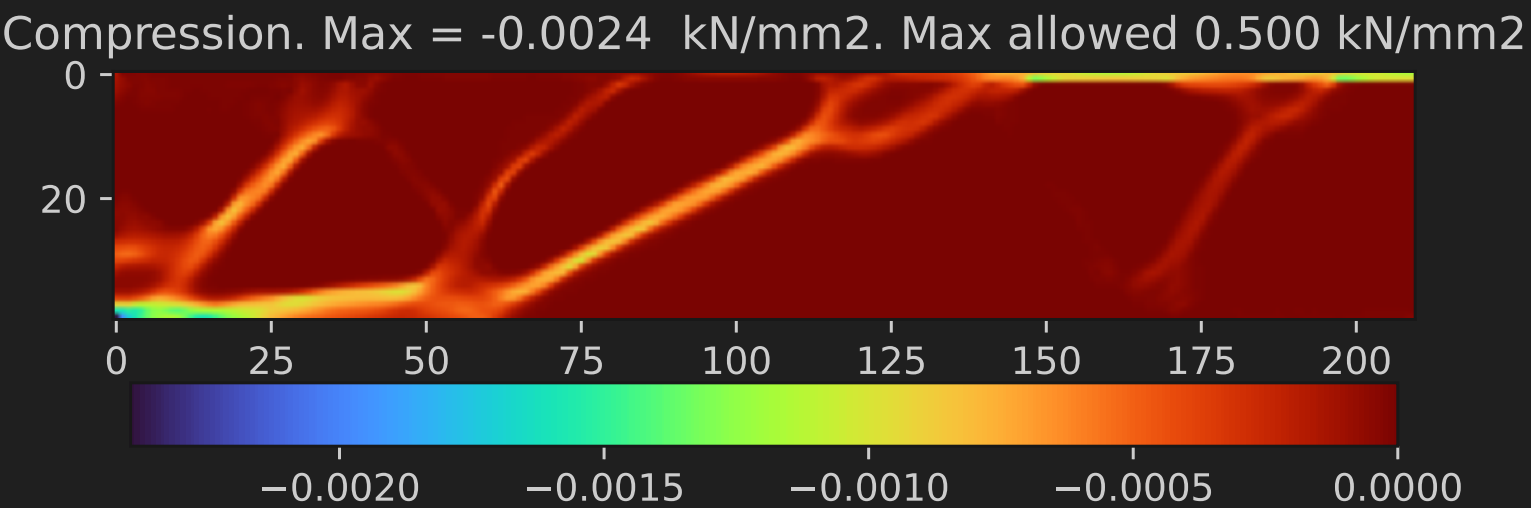
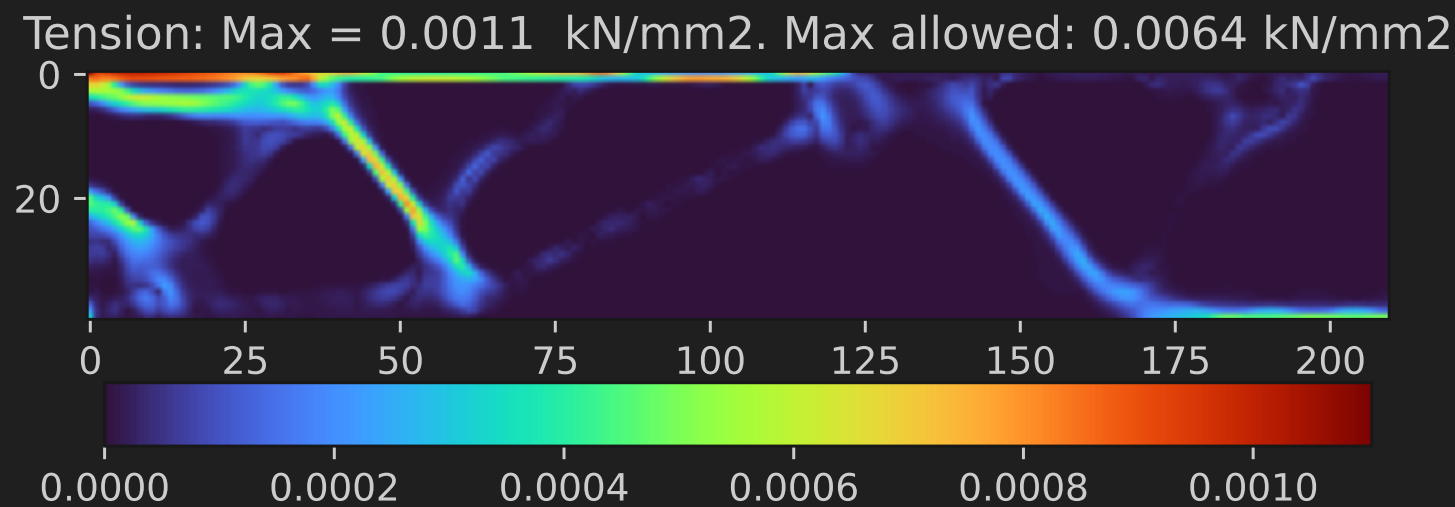
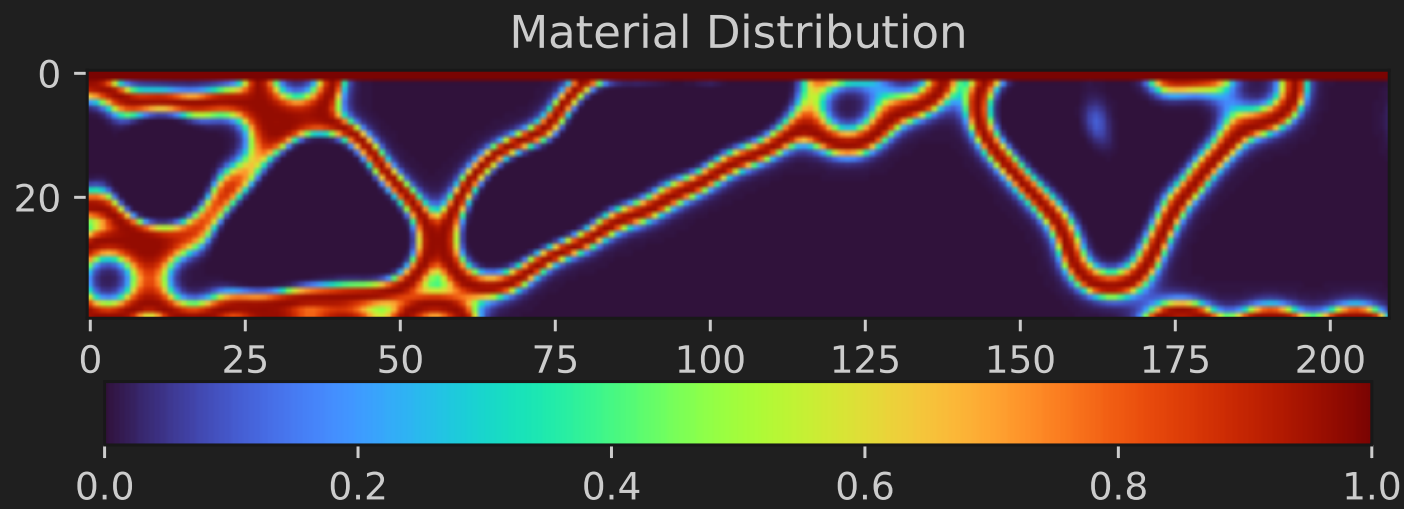
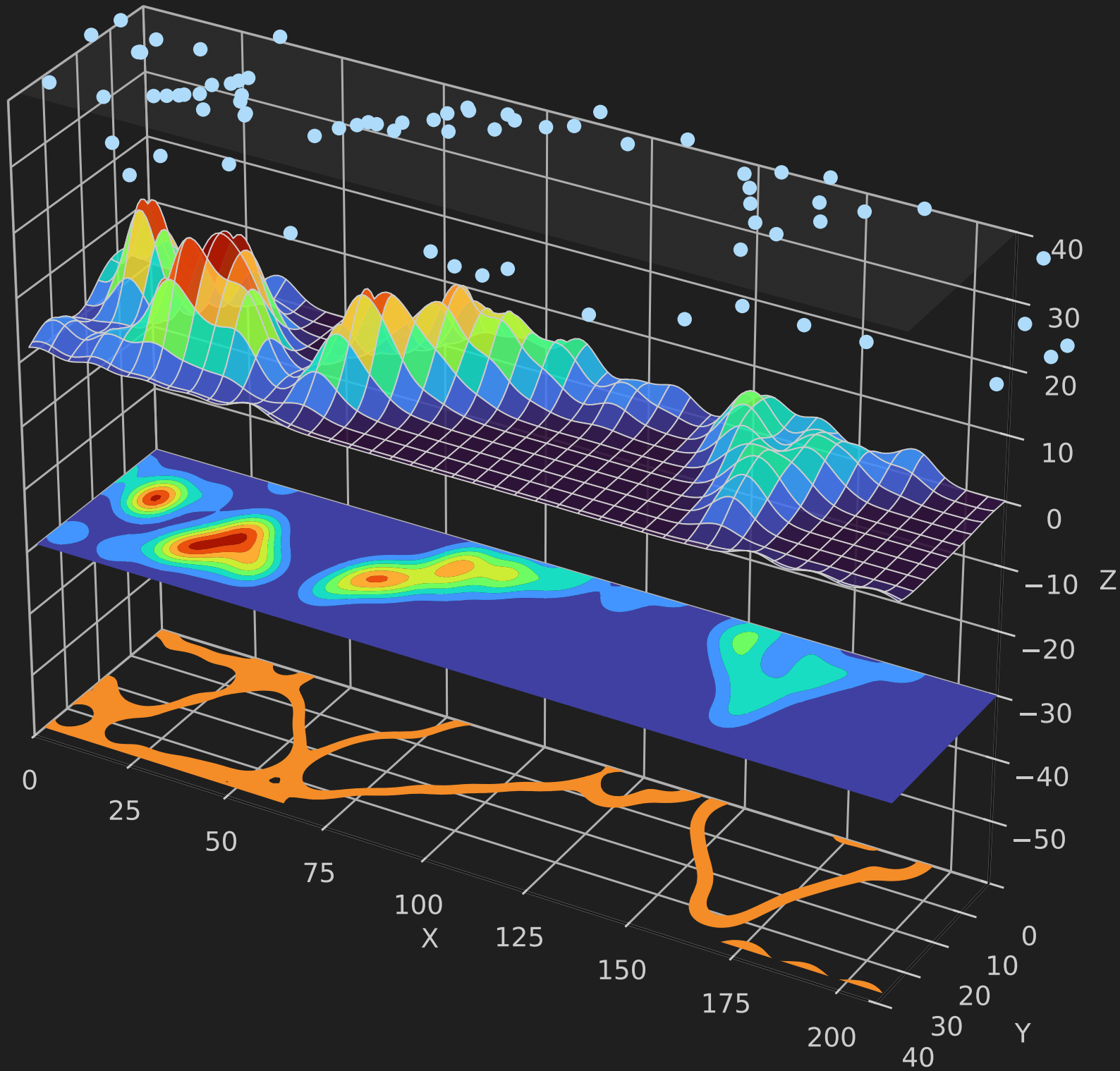
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.91 Shift = 1.89 Iteration = 146



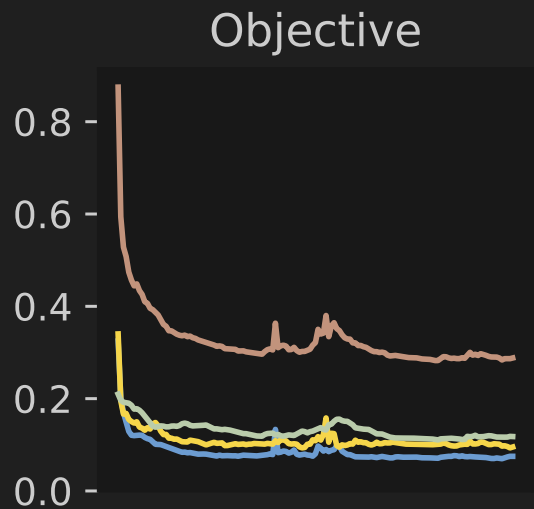
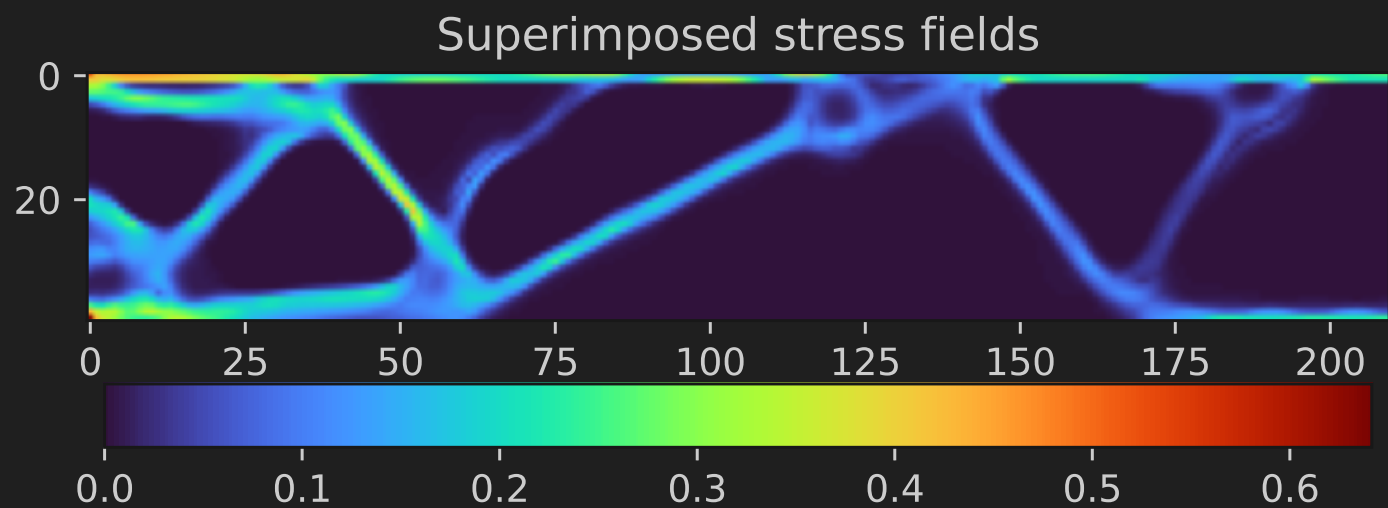
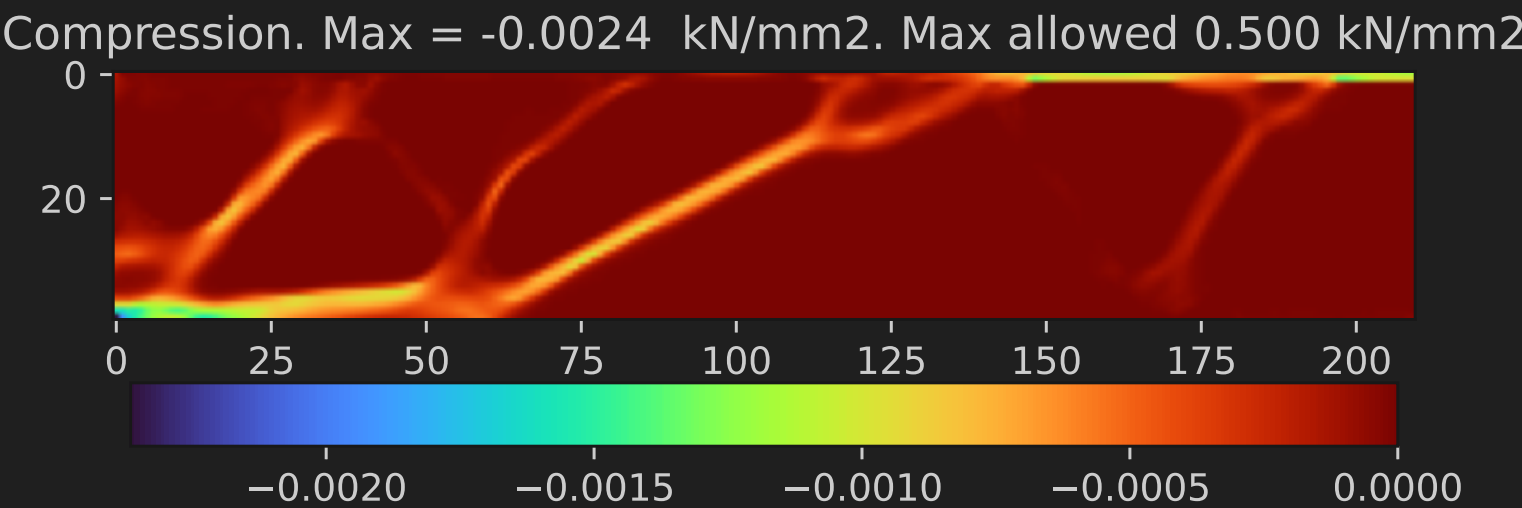
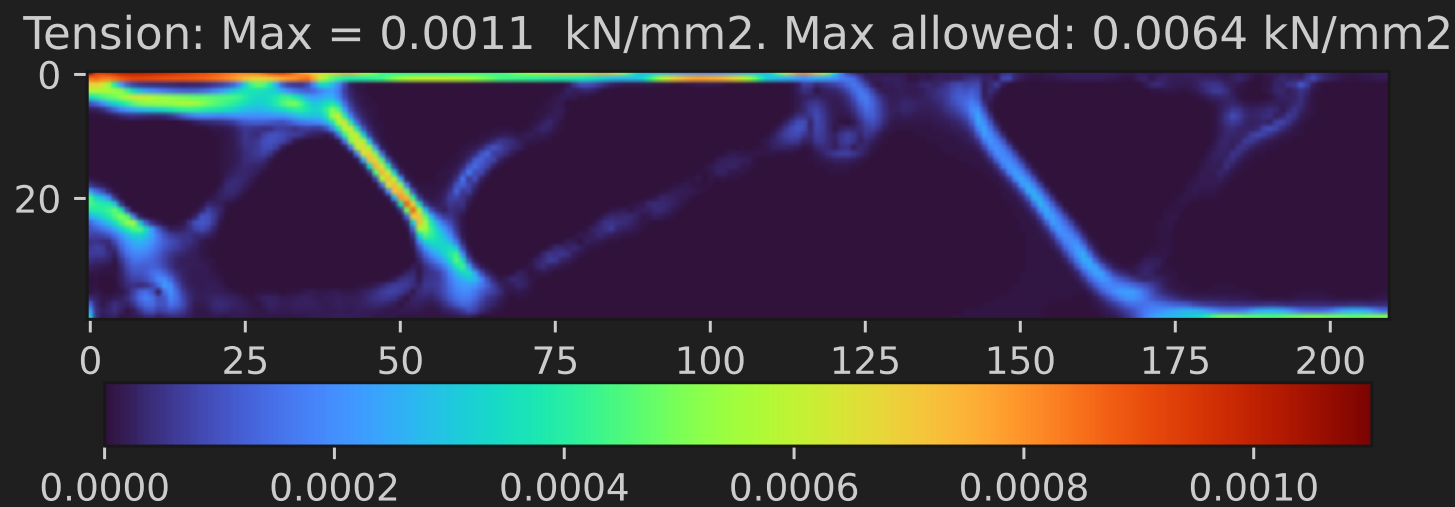
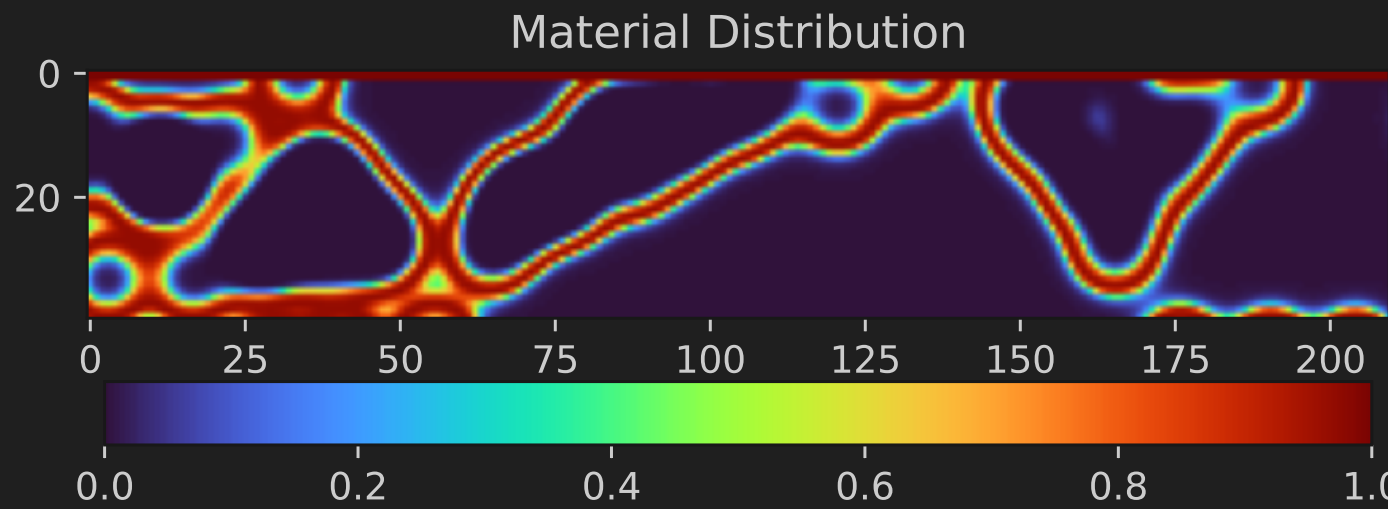
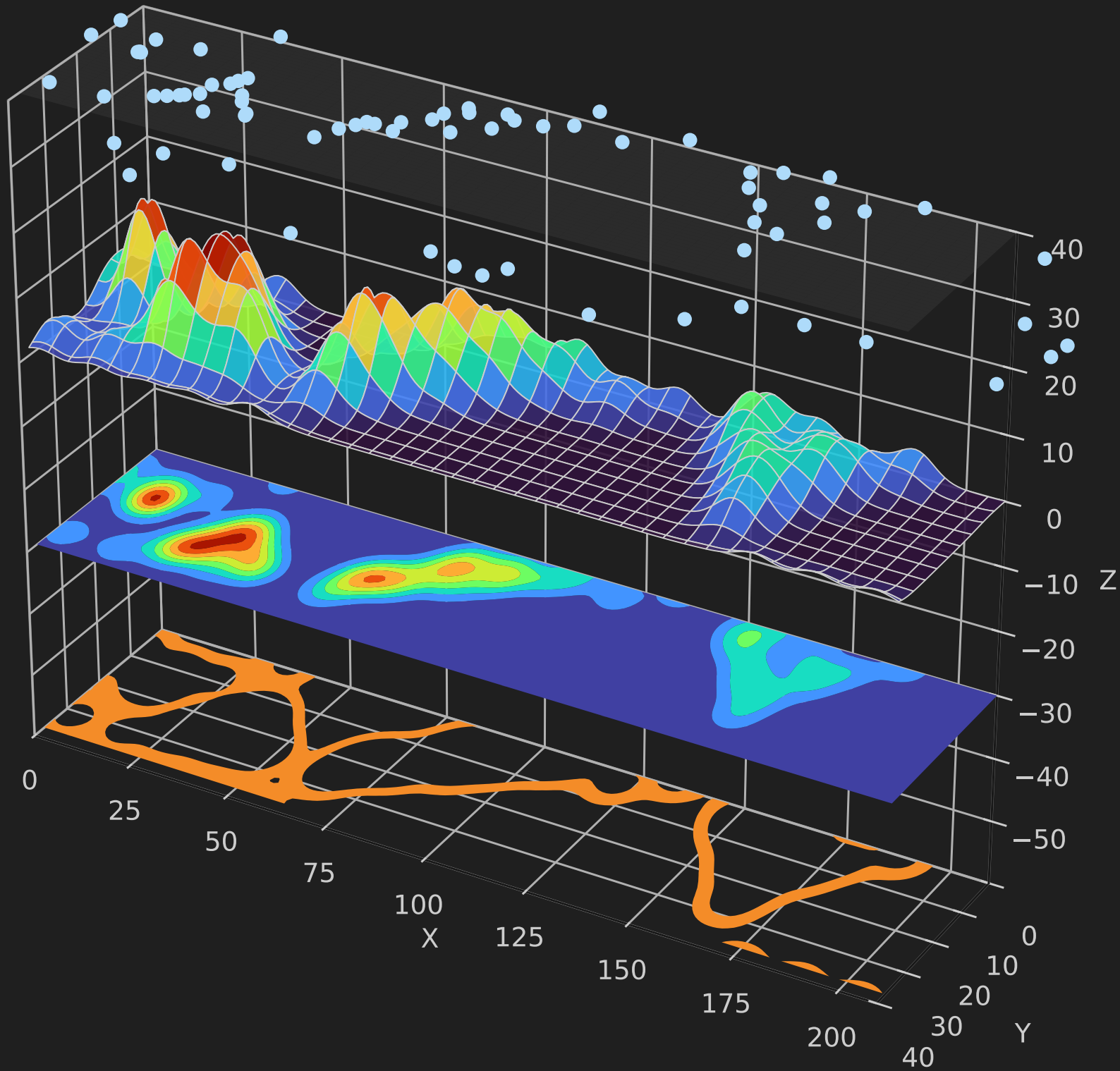
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.09) = 0.29

Spread Gaussian = 5.93 Shift = 1.89 Iteration = 147



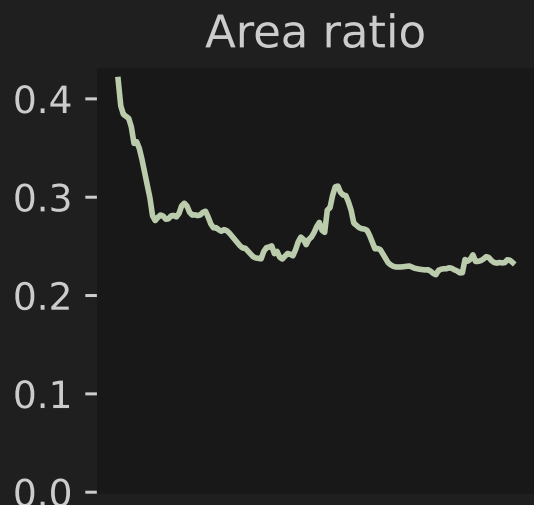
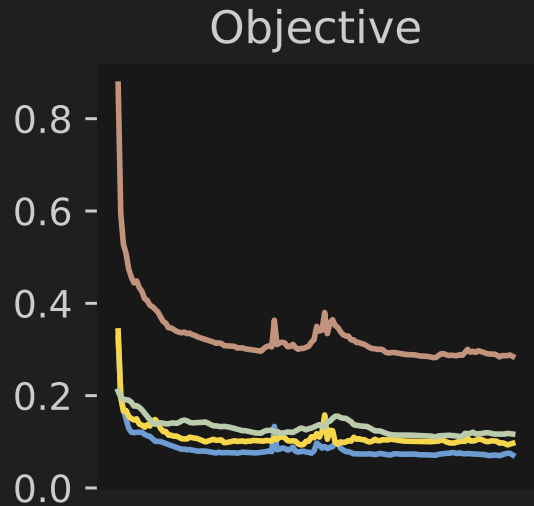
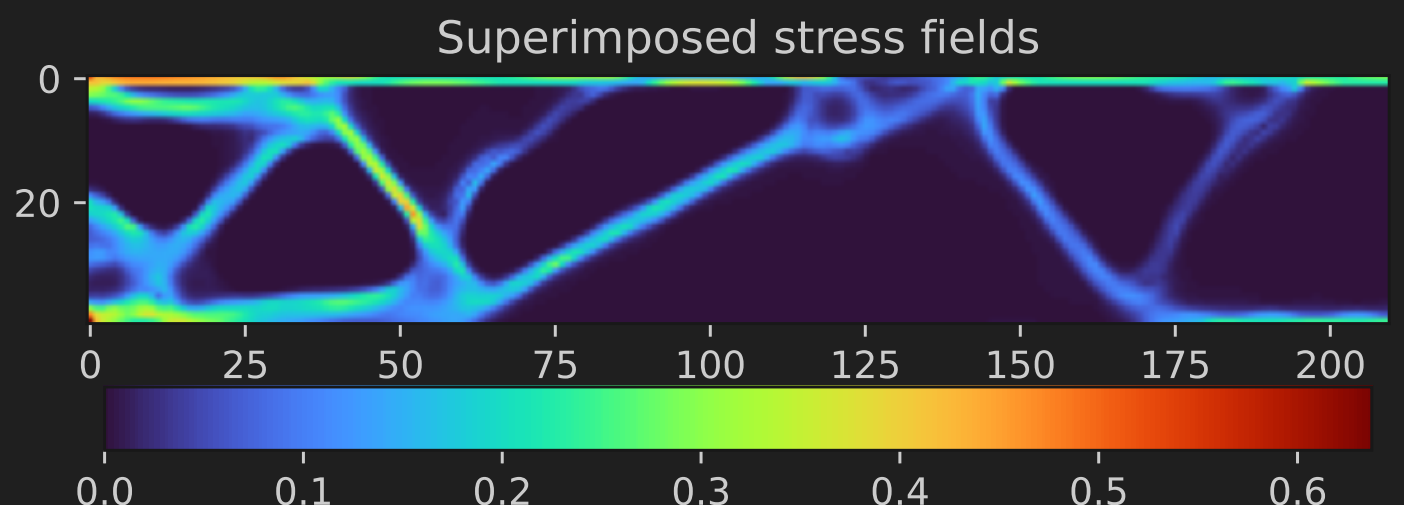
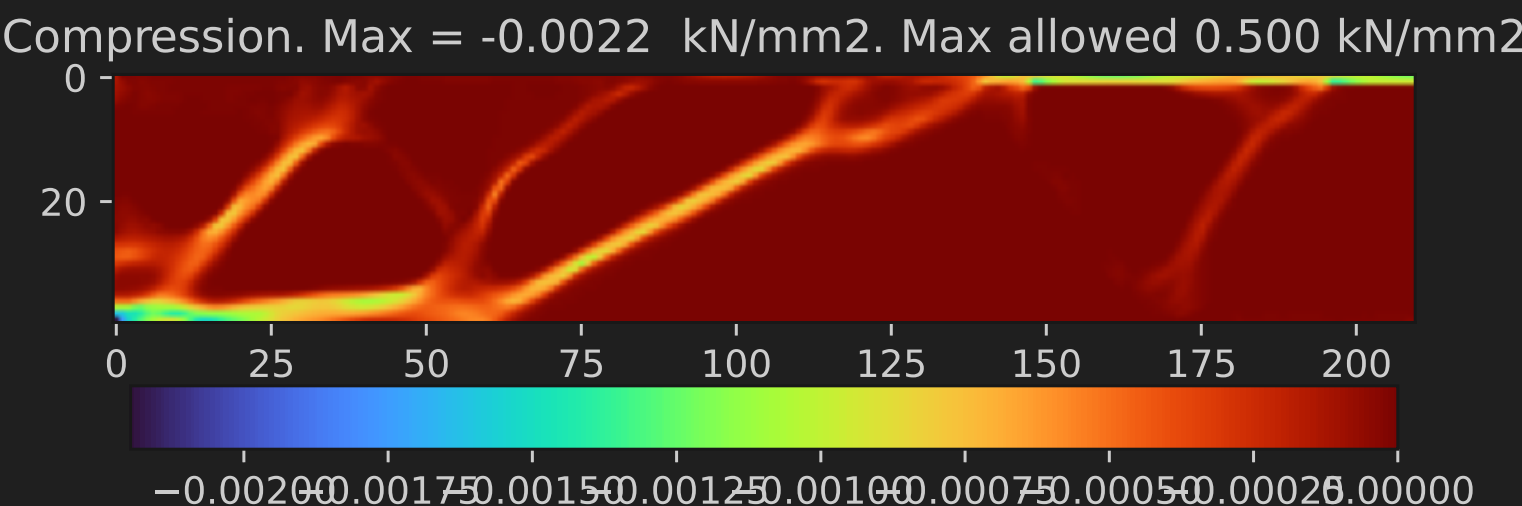
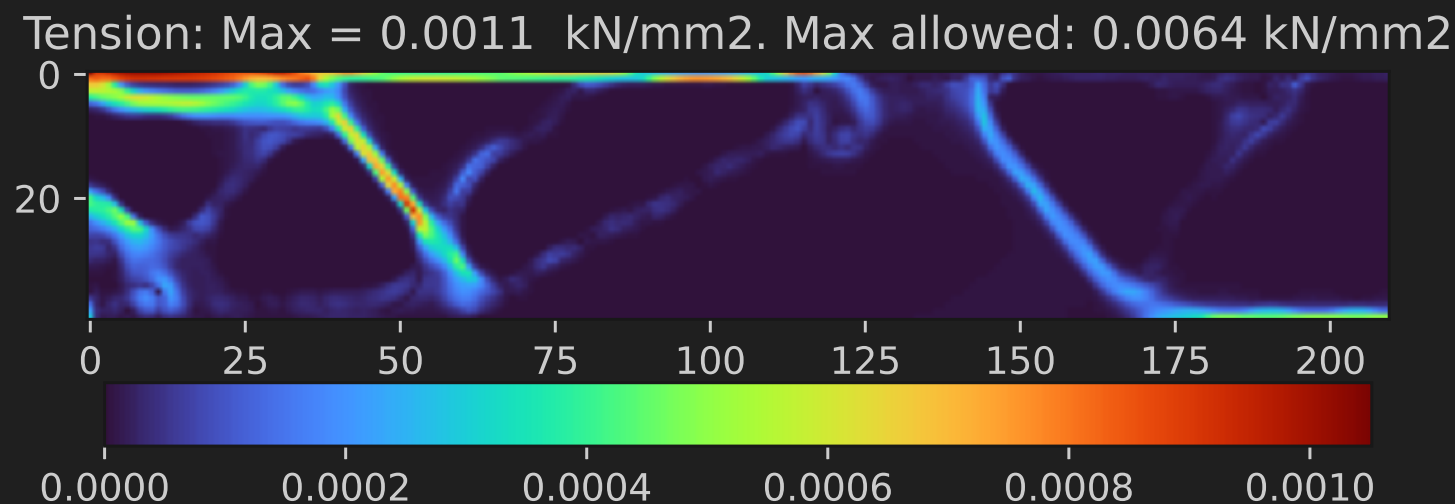
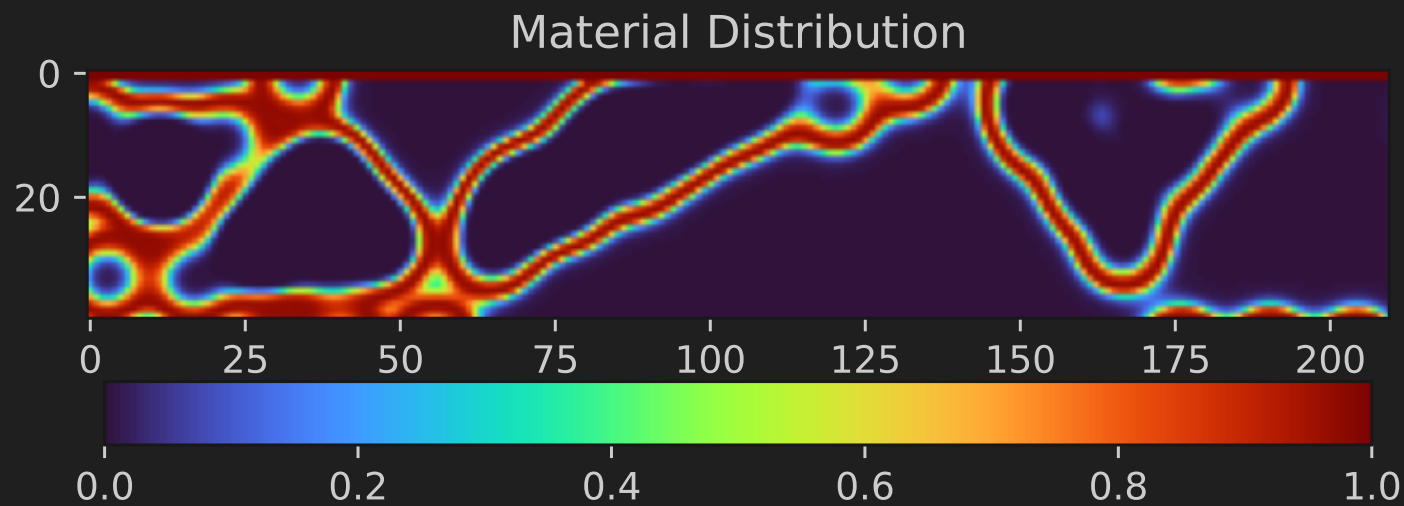
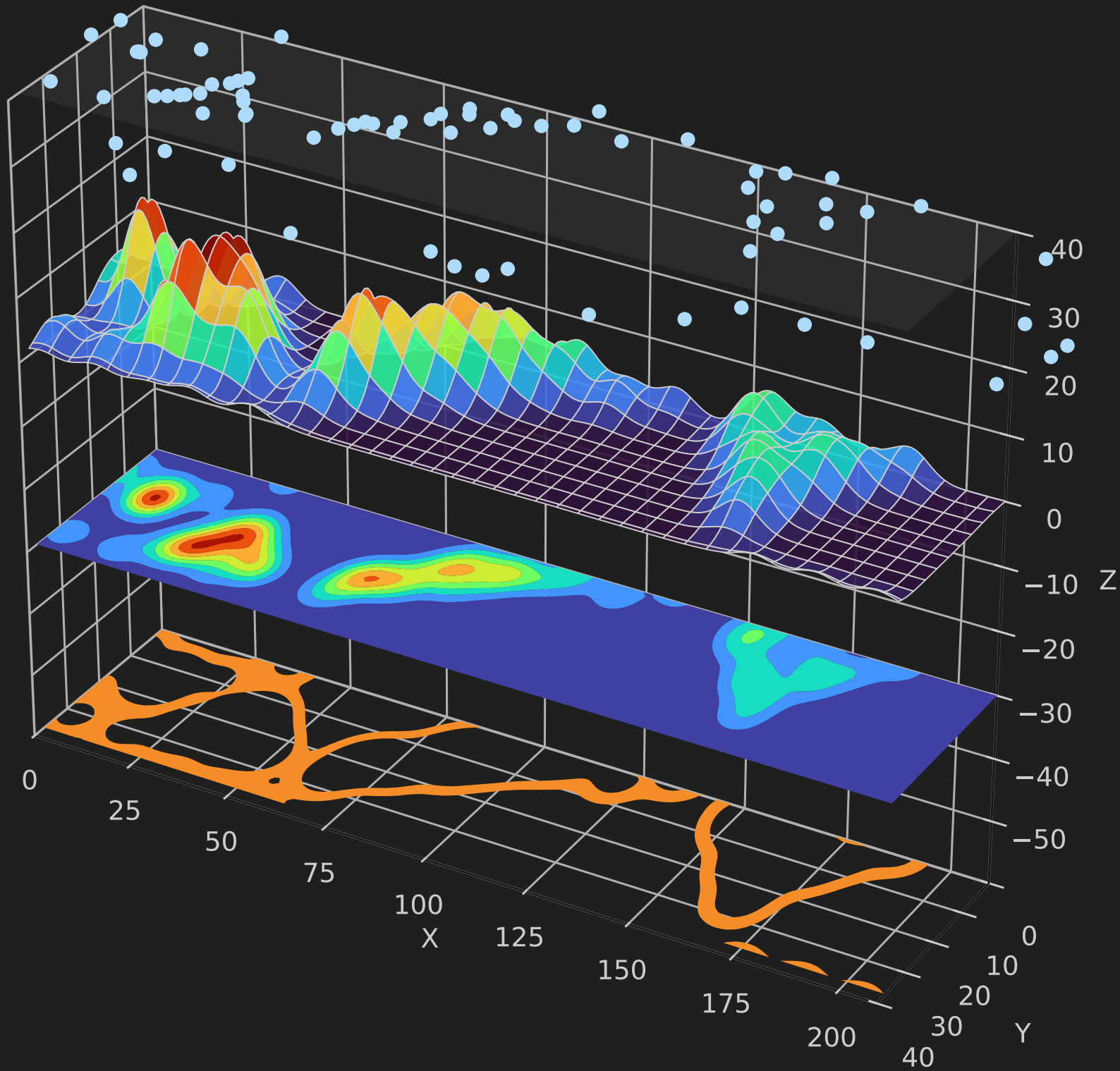
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.93 Shift = 1.89 Iteration = 148



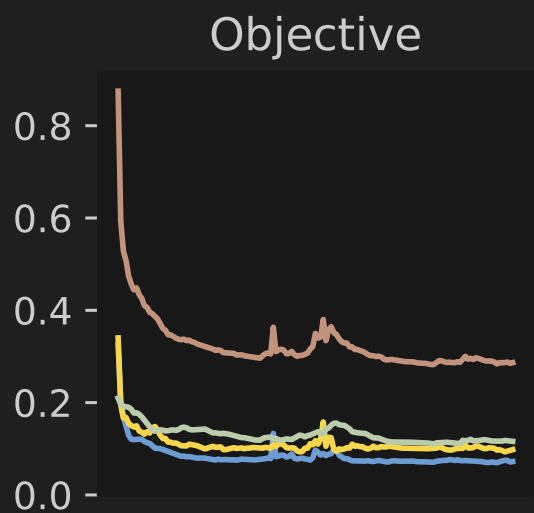
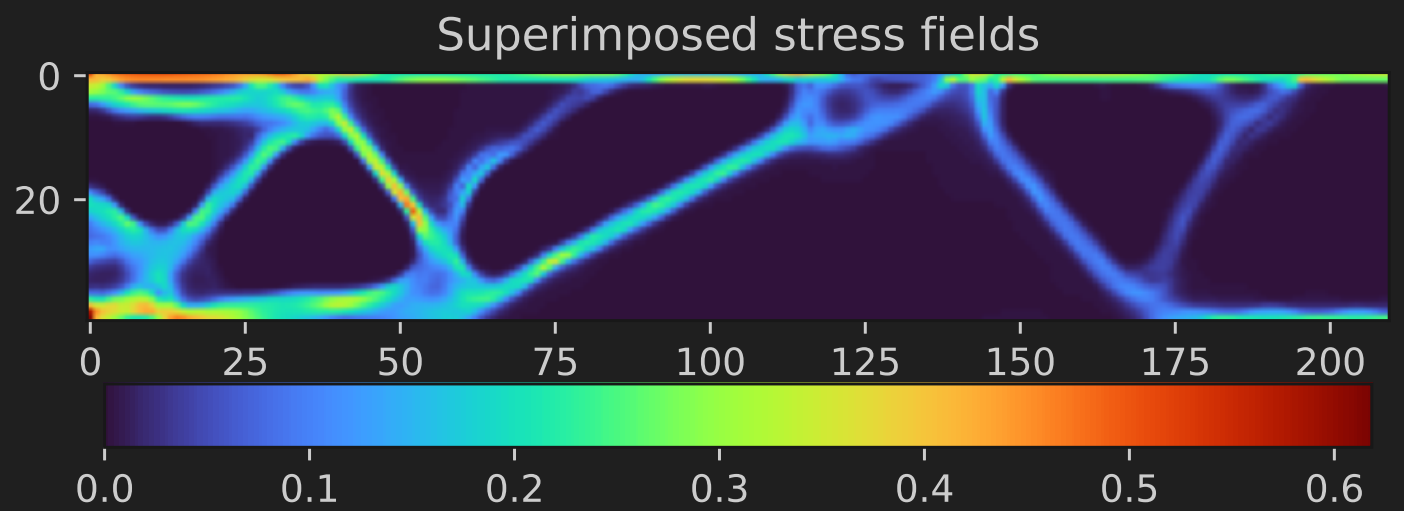
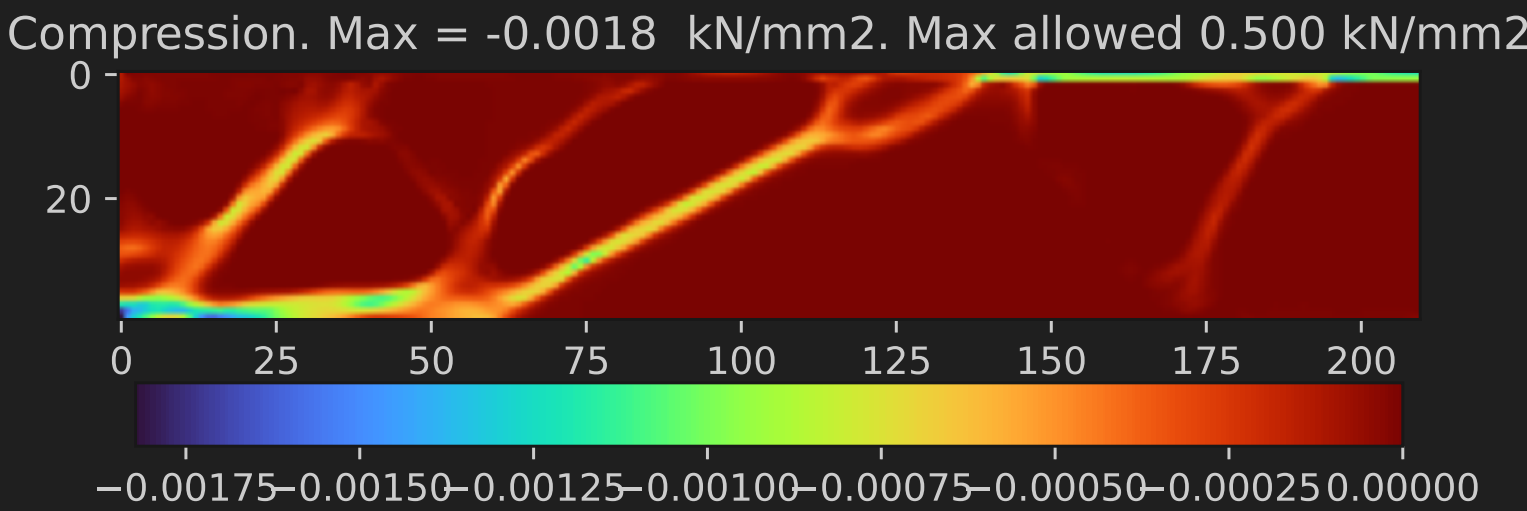
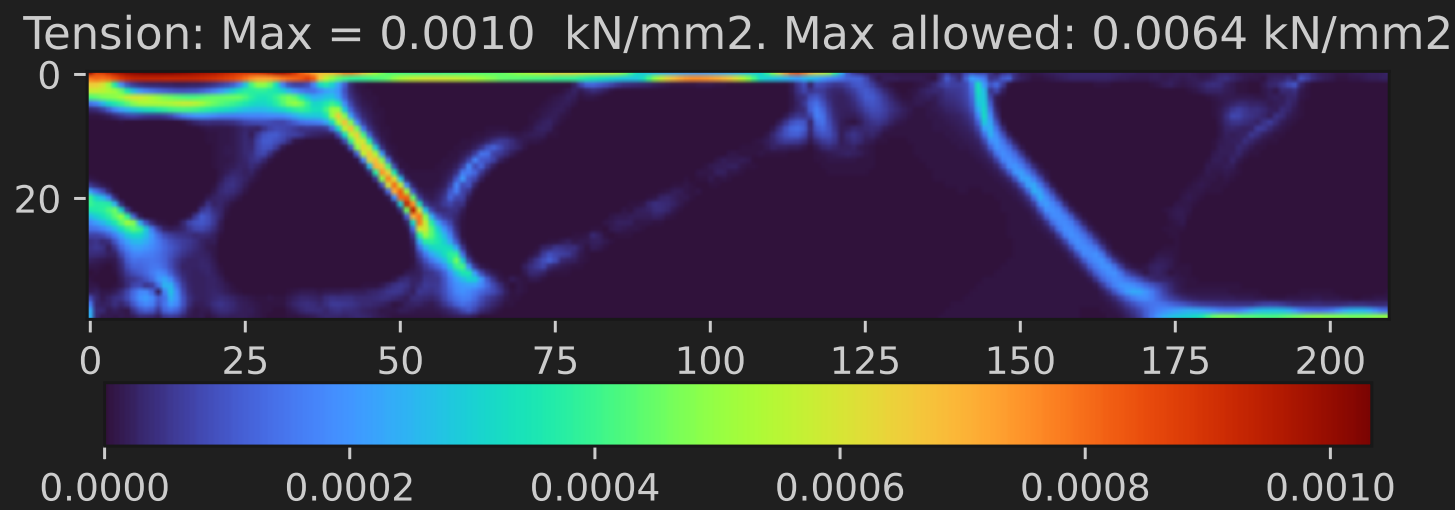
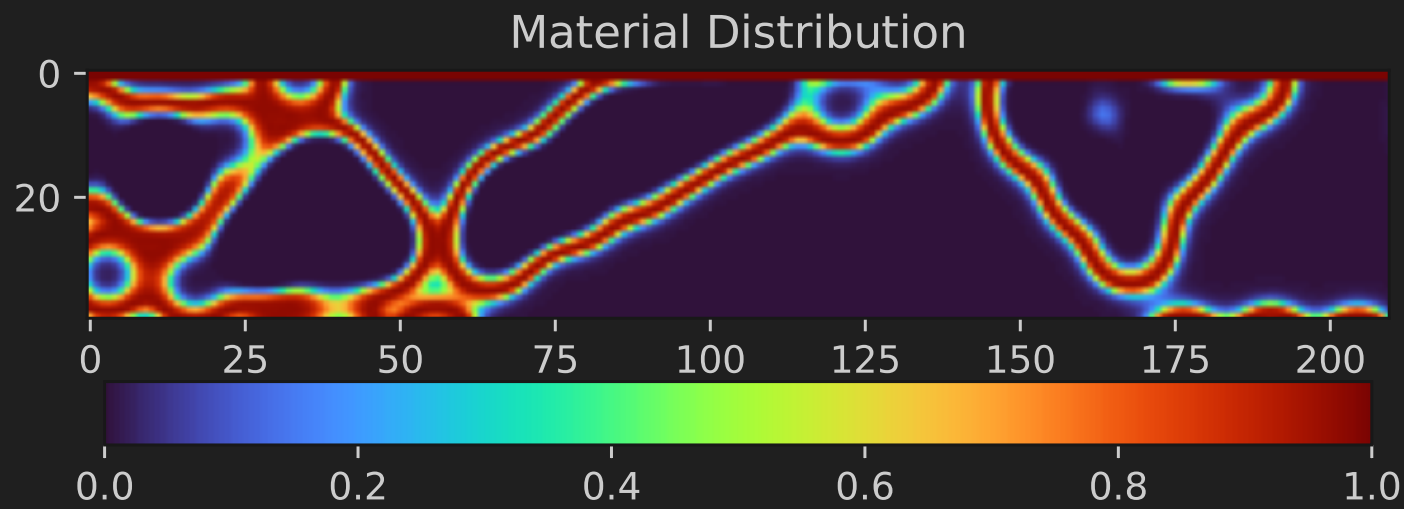
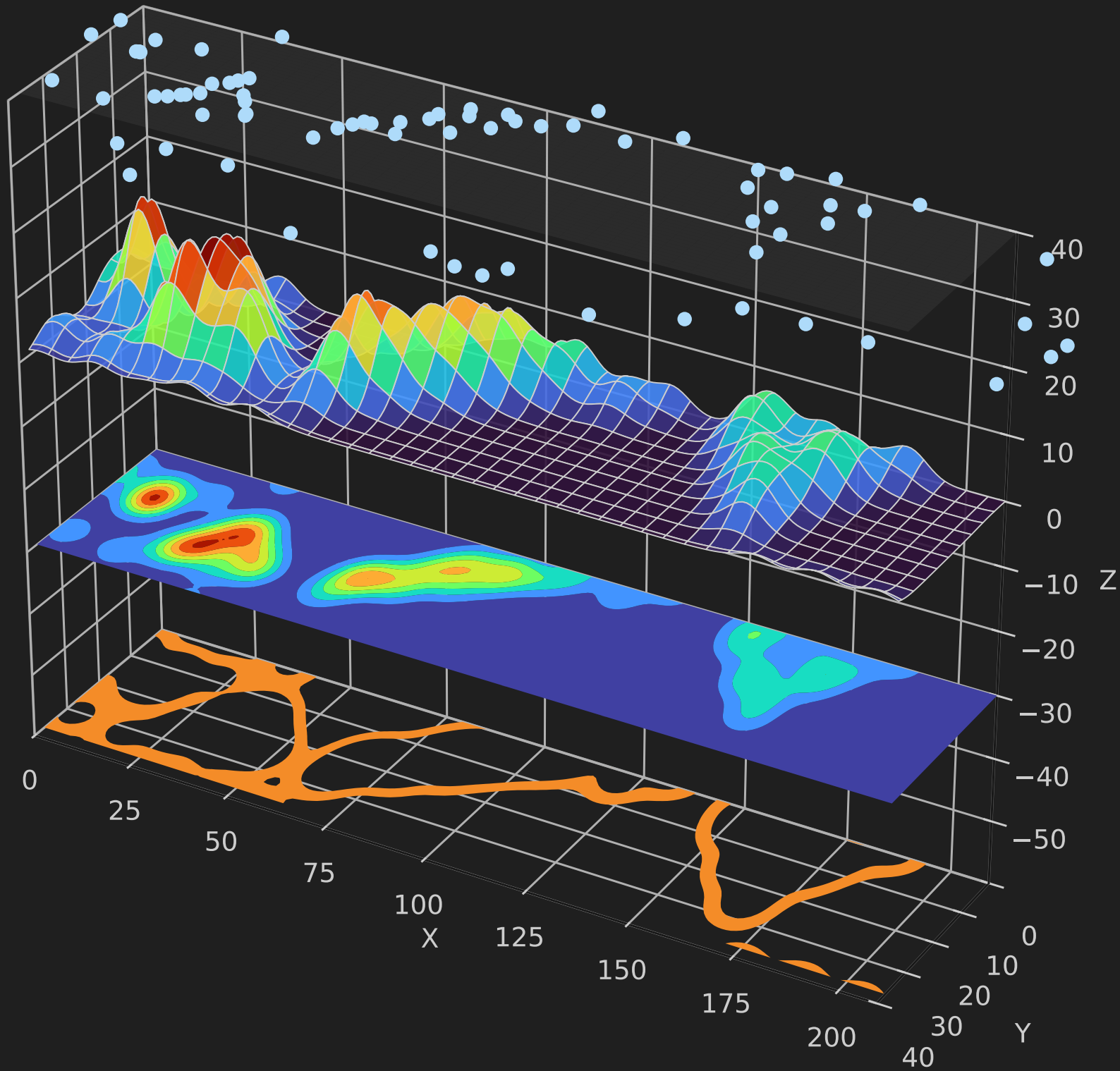
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.91 Shift = 1.89 Iteration = 149



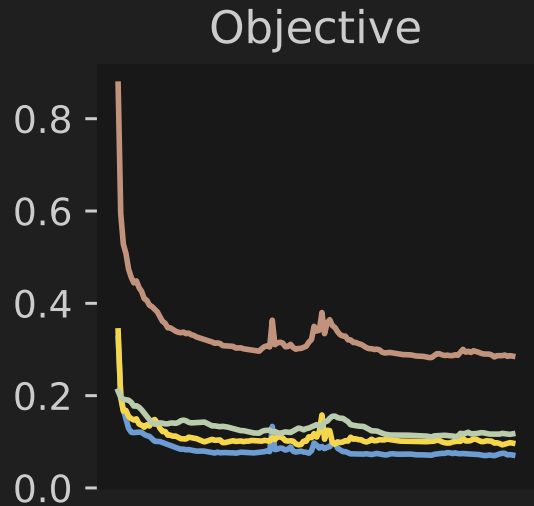
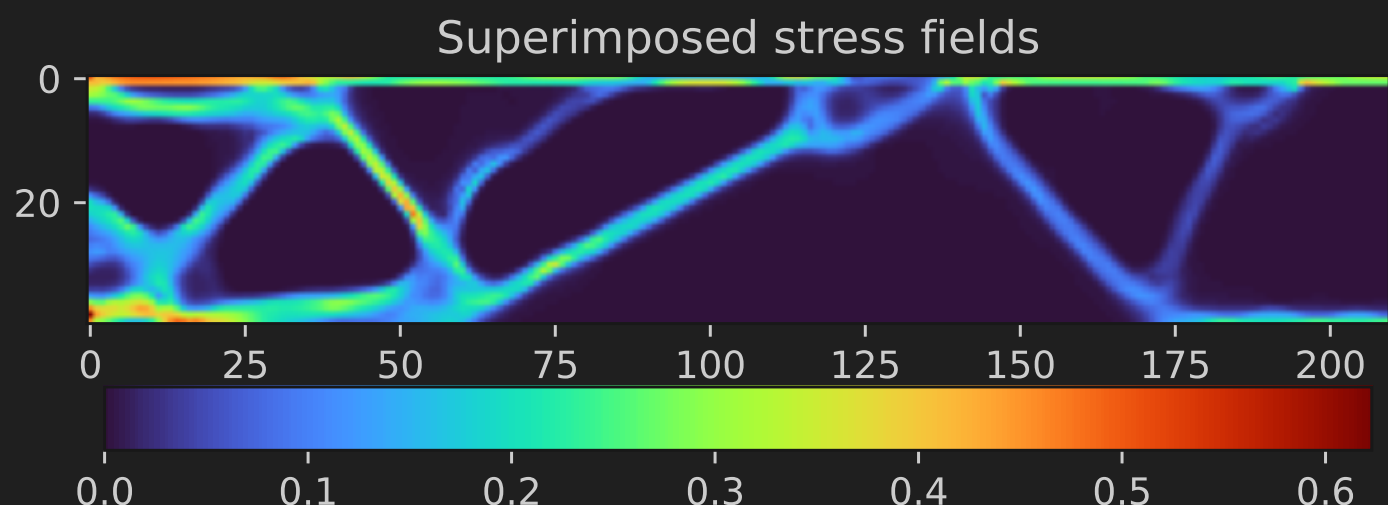
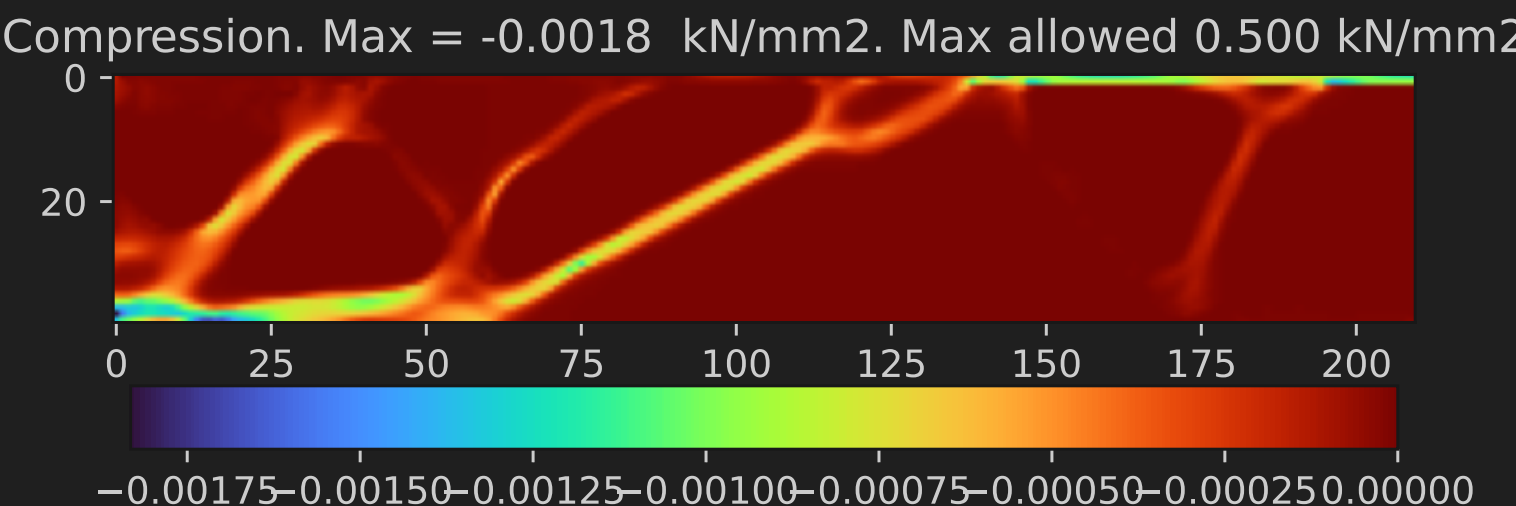
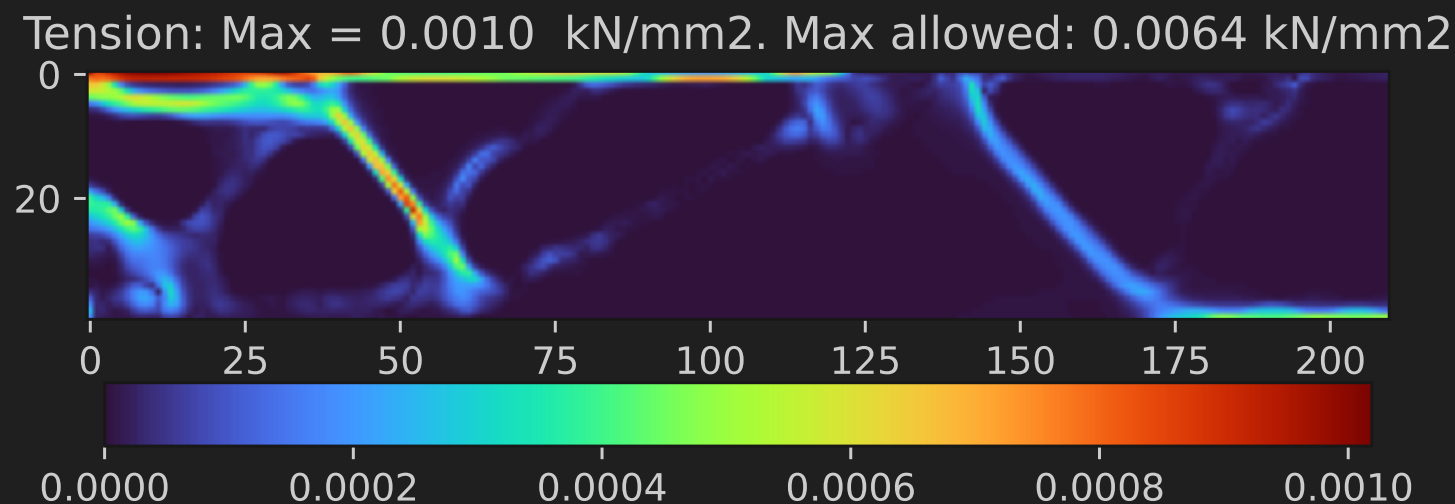
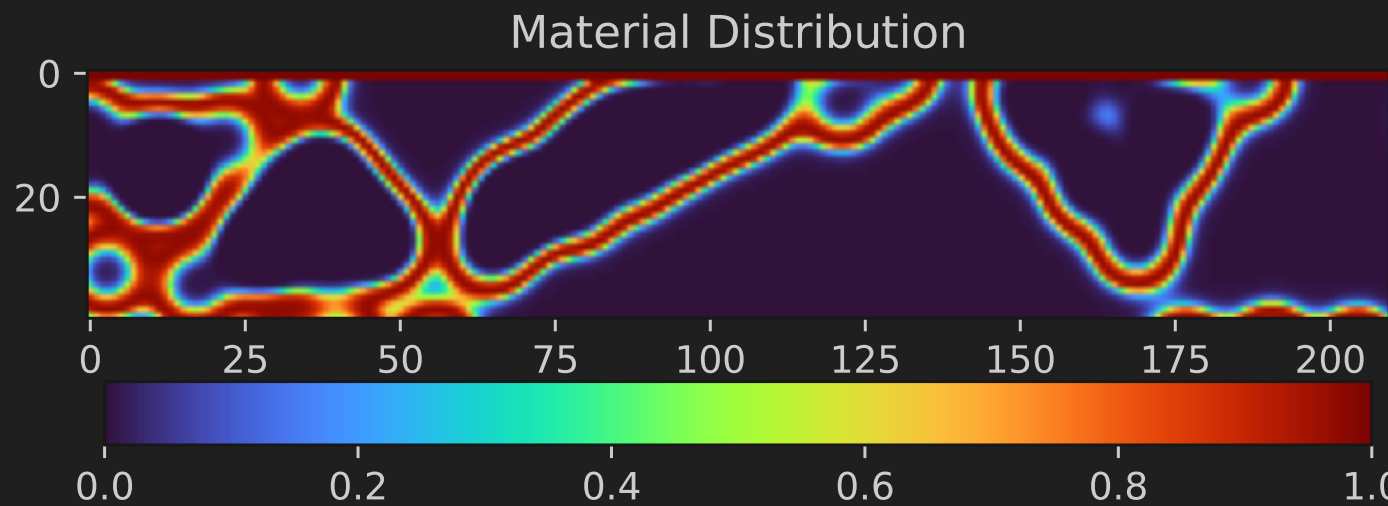
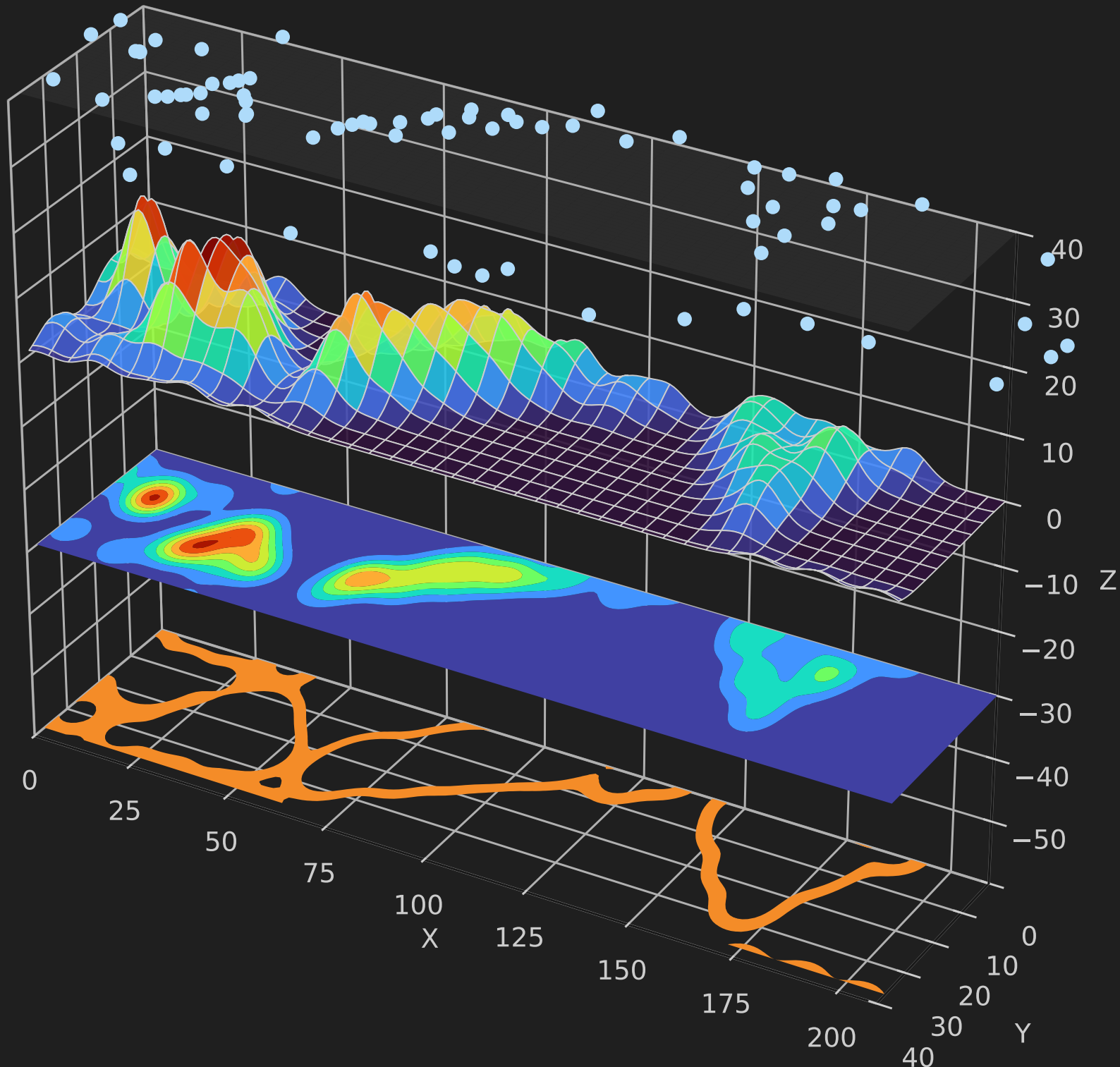
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.89 Shift = 1.90 Iteration = 150



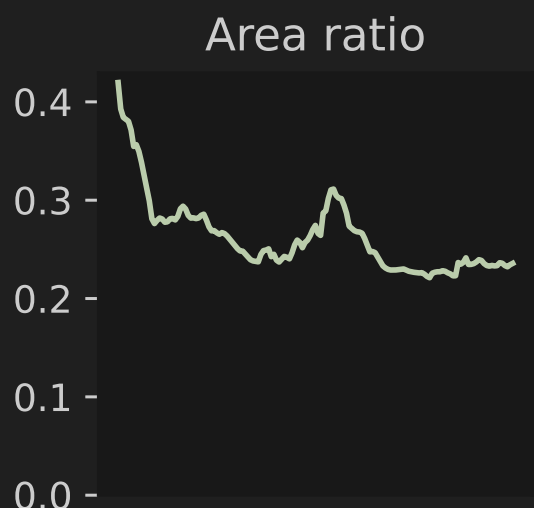
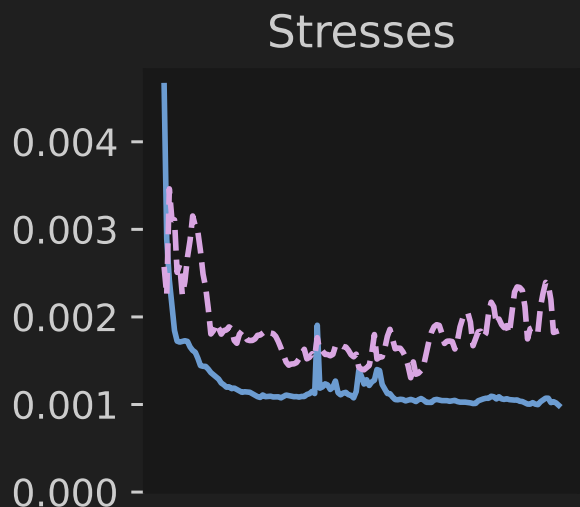
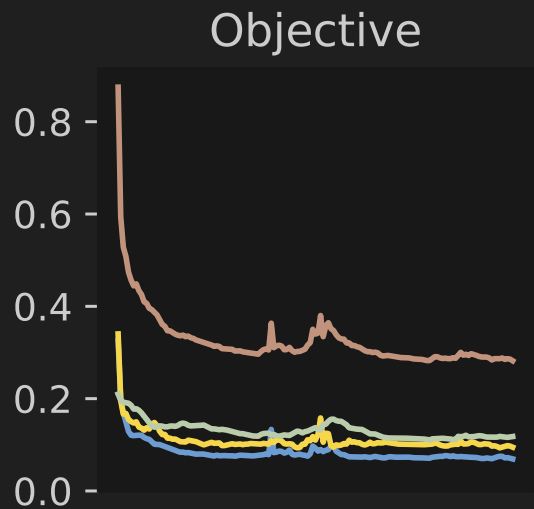
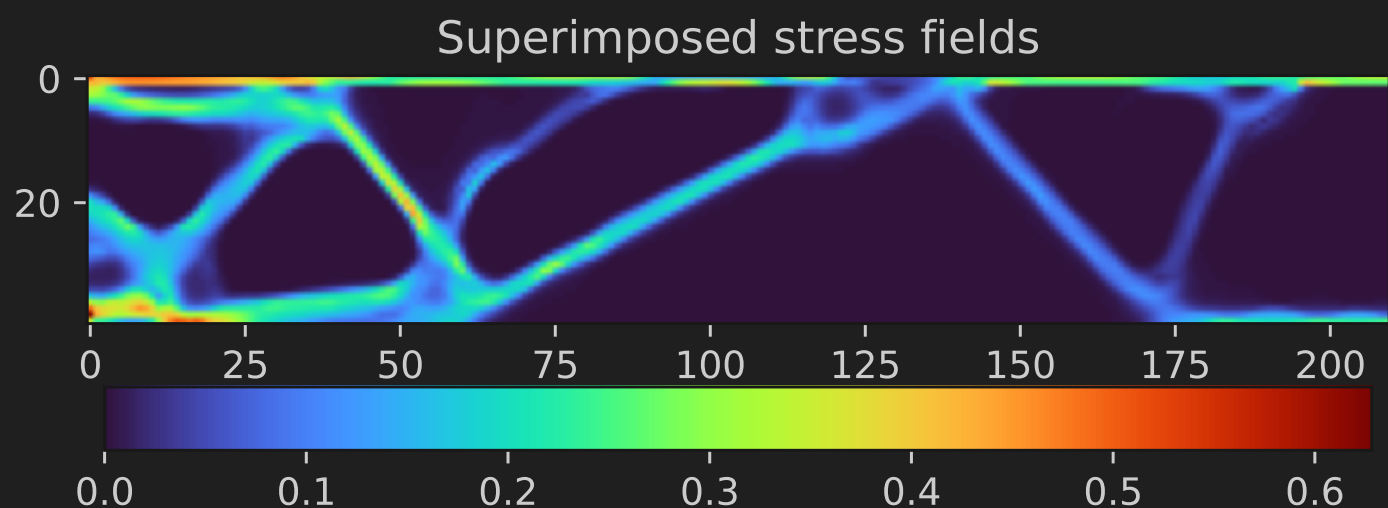
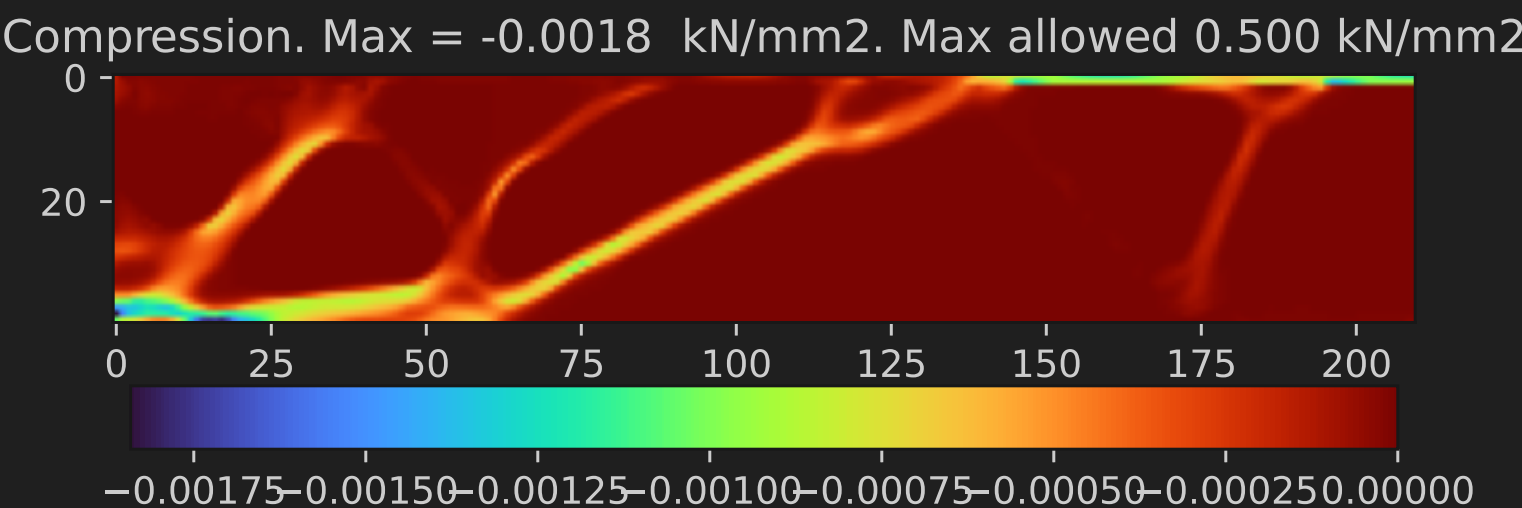
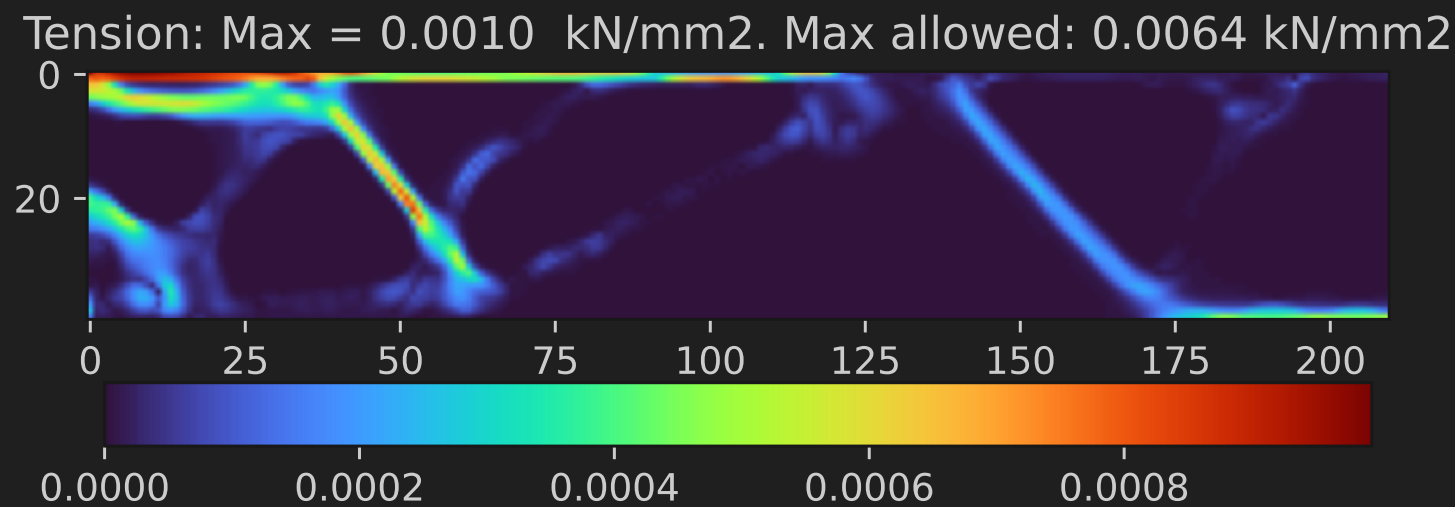
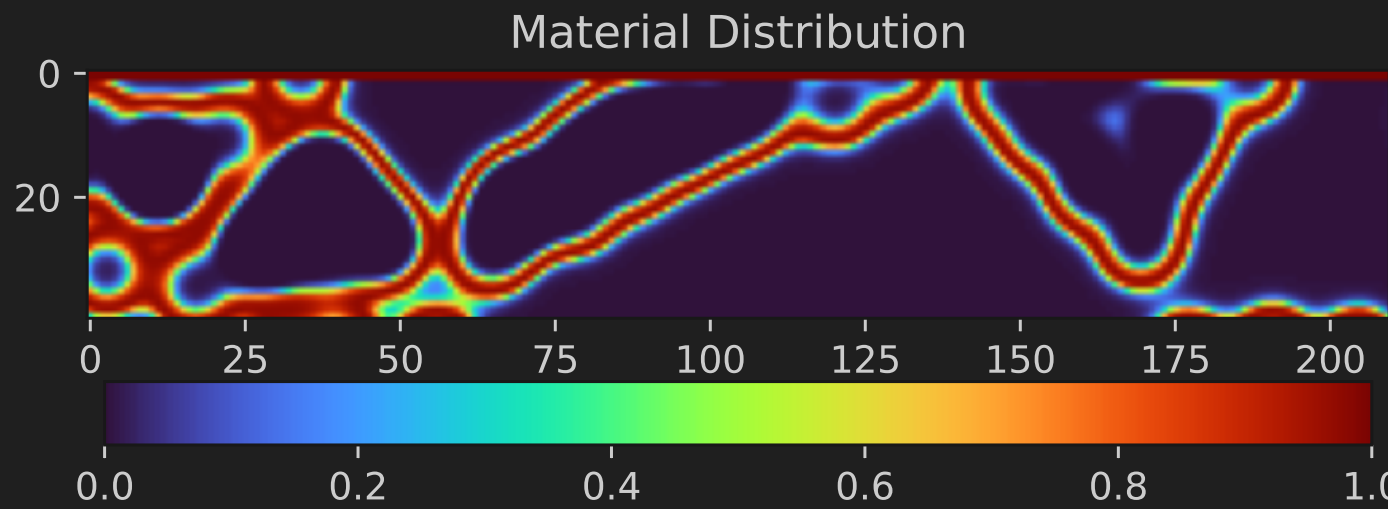
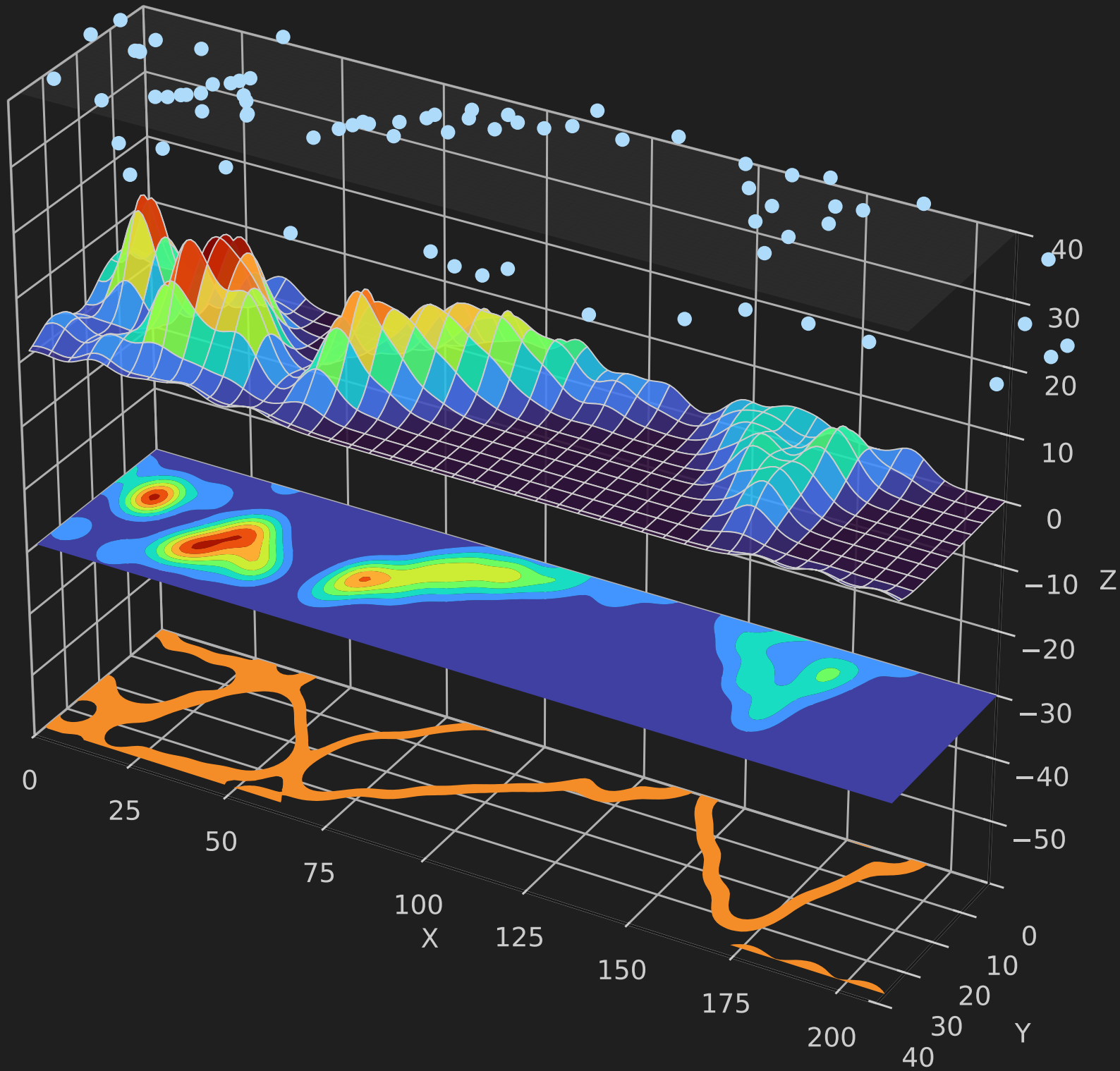
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.29

Spread Gaussian = 5.87 Shift = 1.91 Iteration = 151



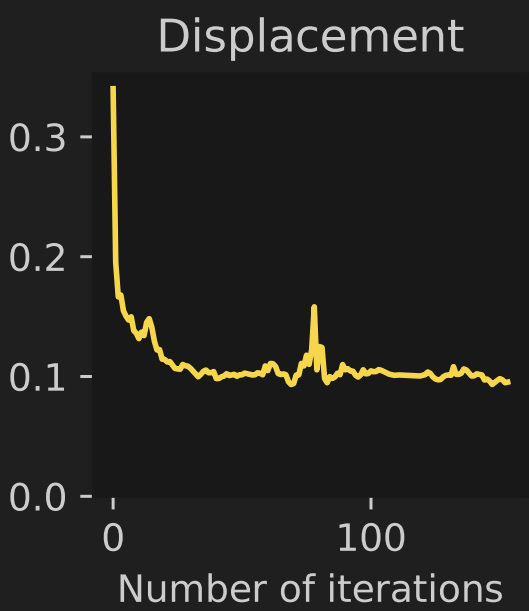
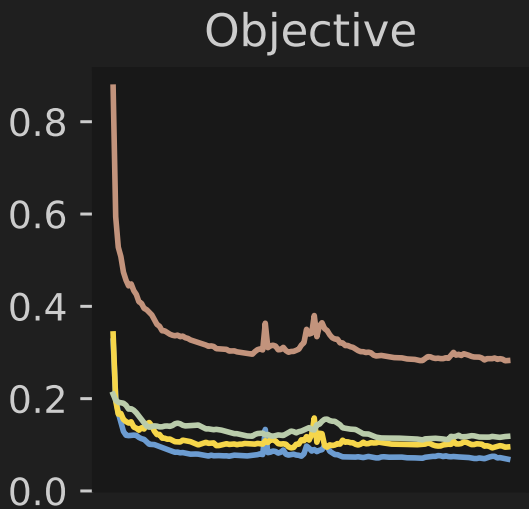
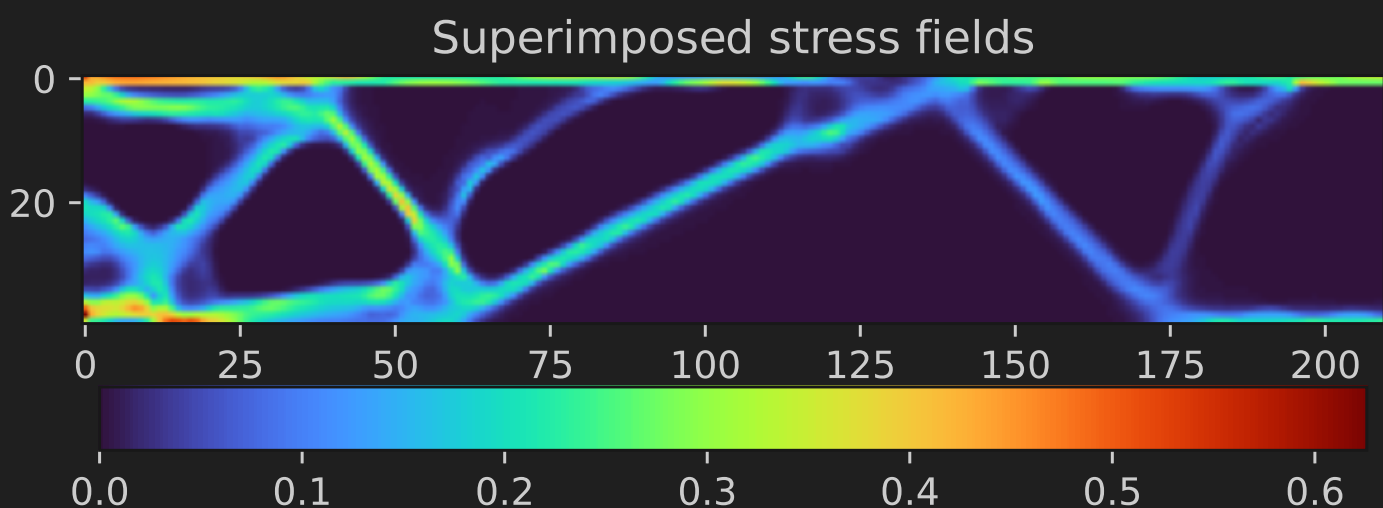
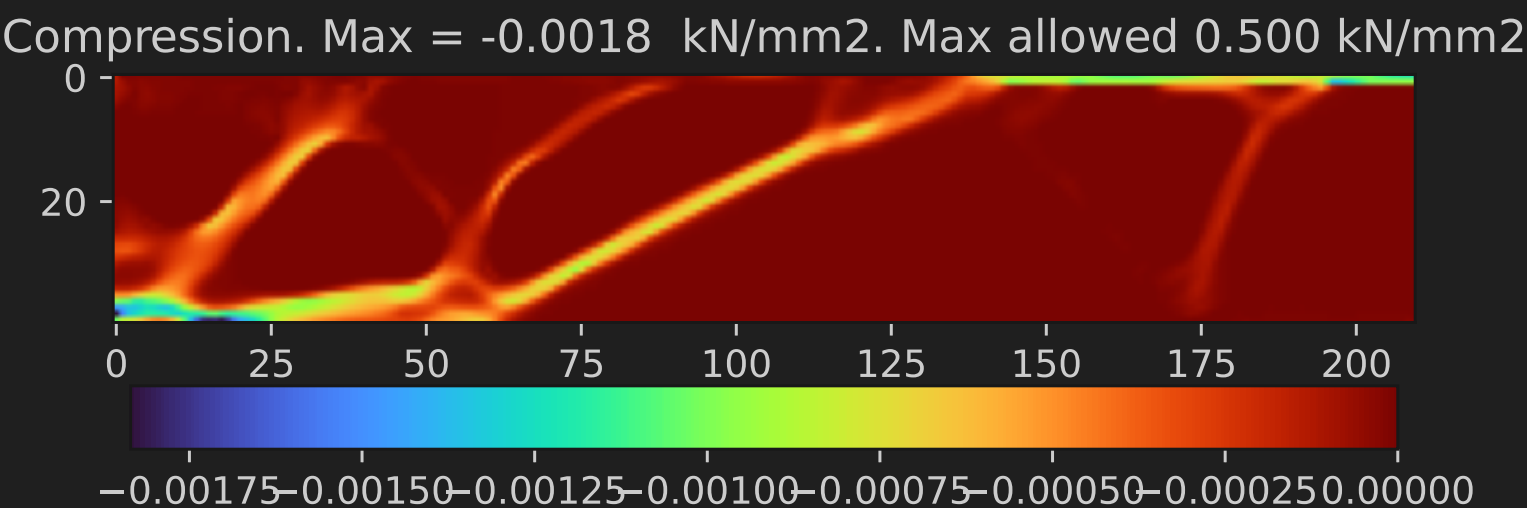
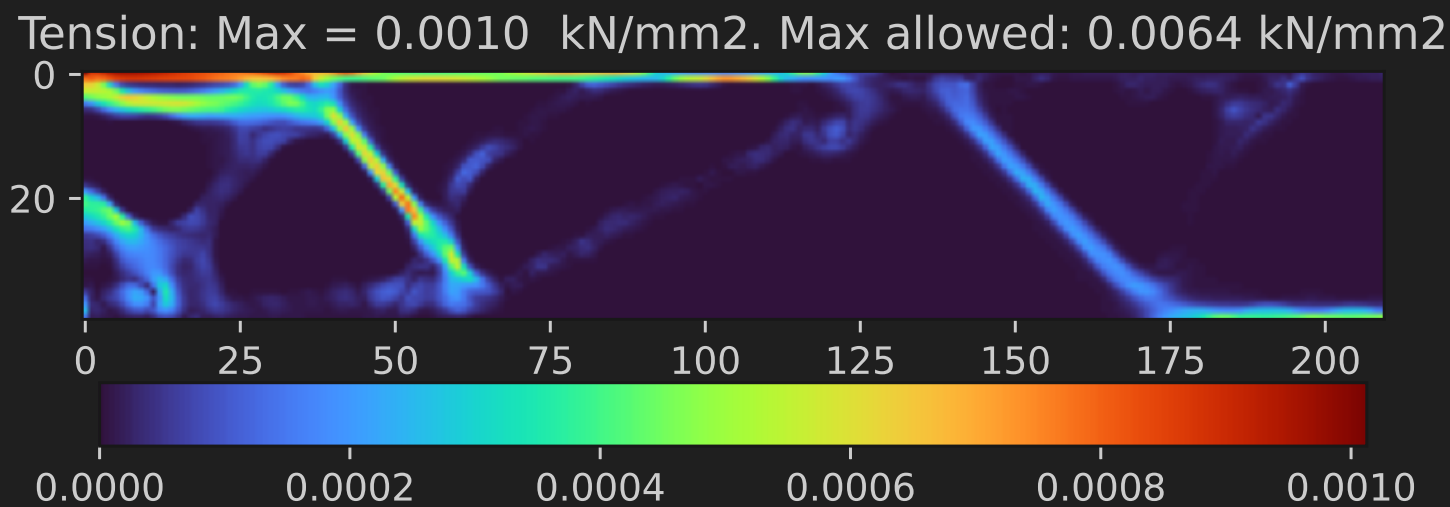
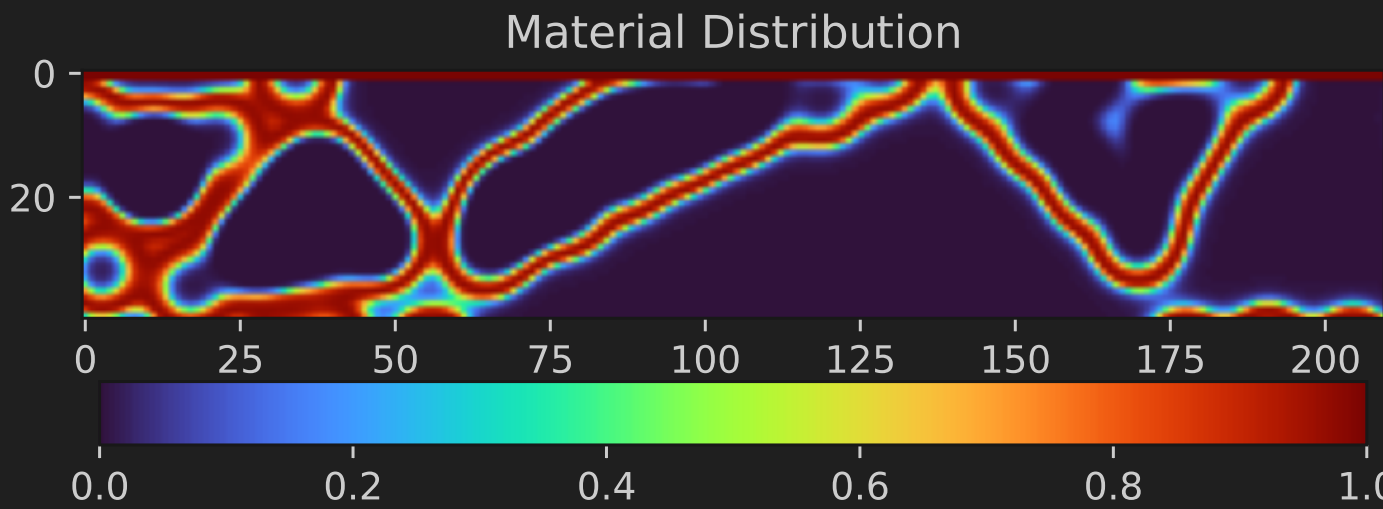
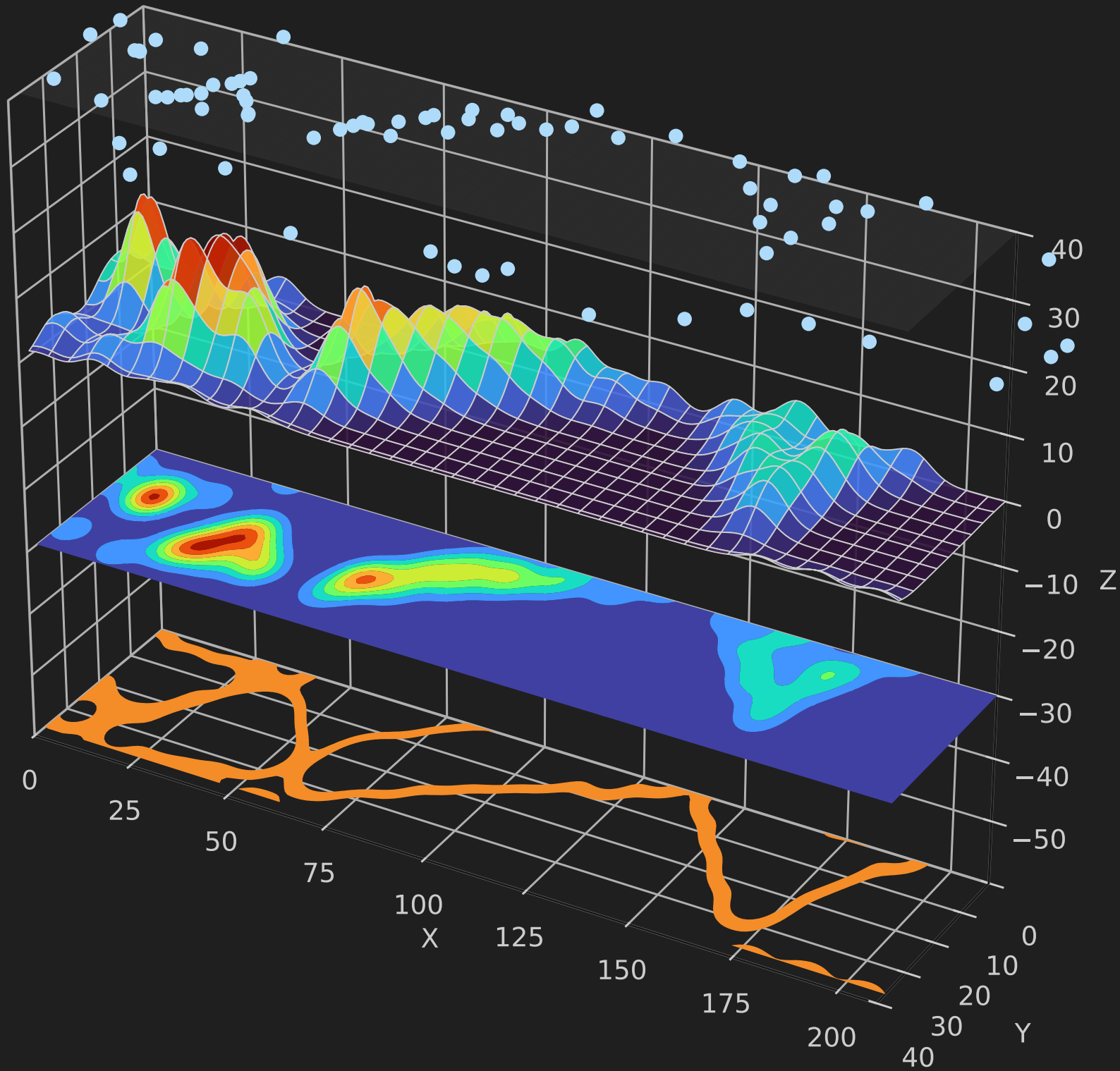
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 5.85 Shift = 1.92 Iteration = 152



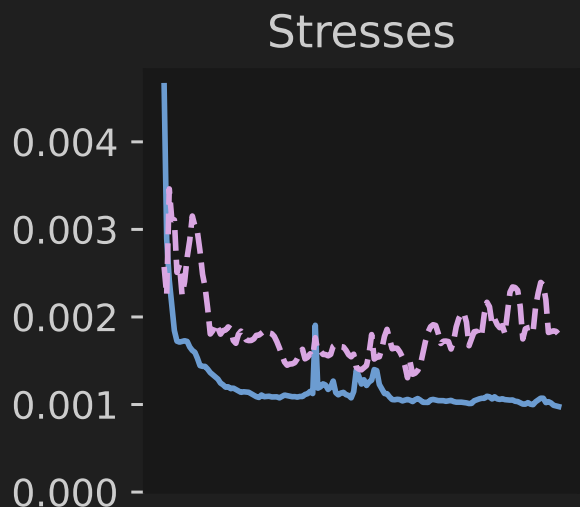
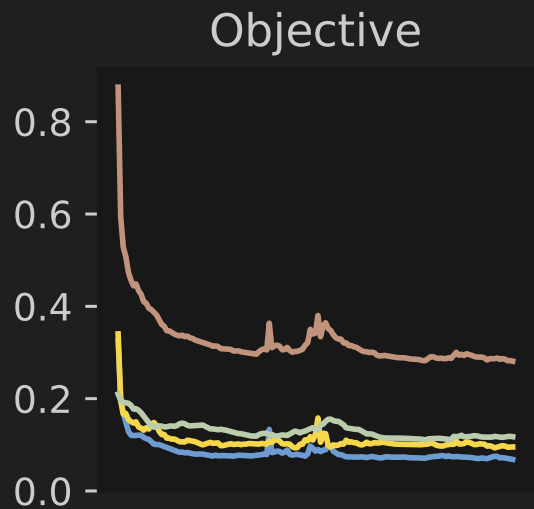
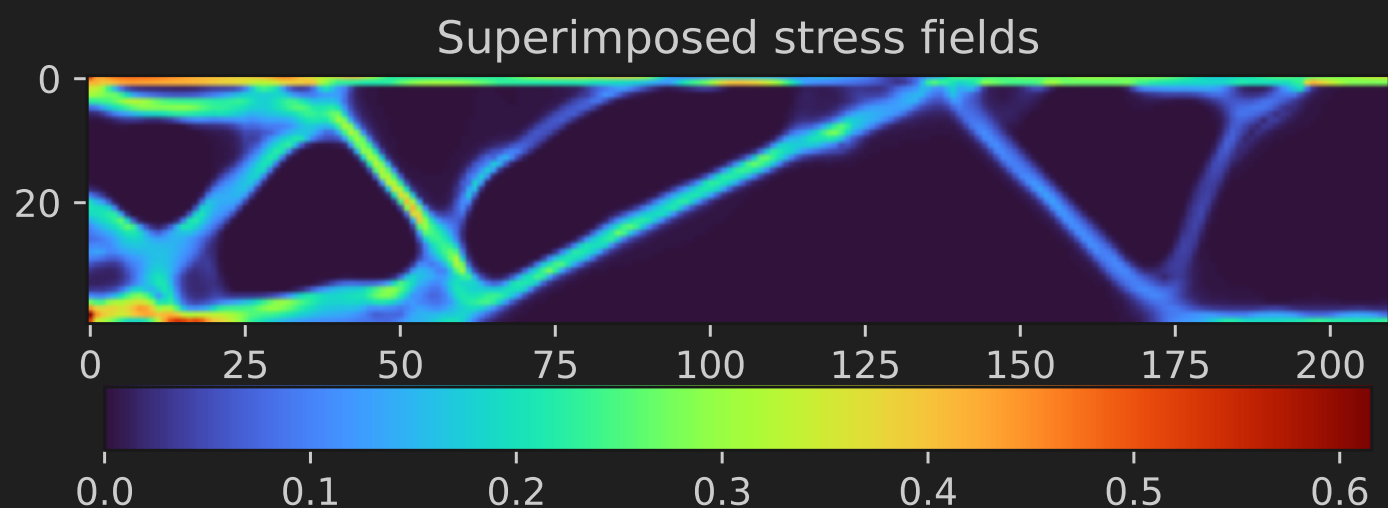
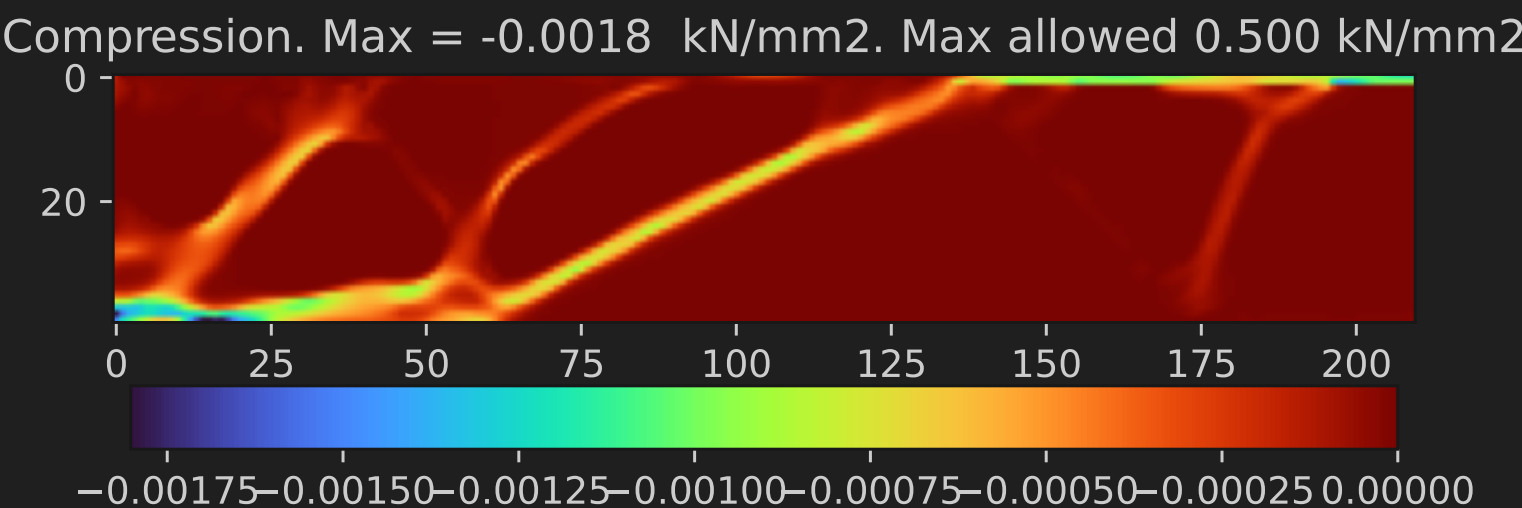
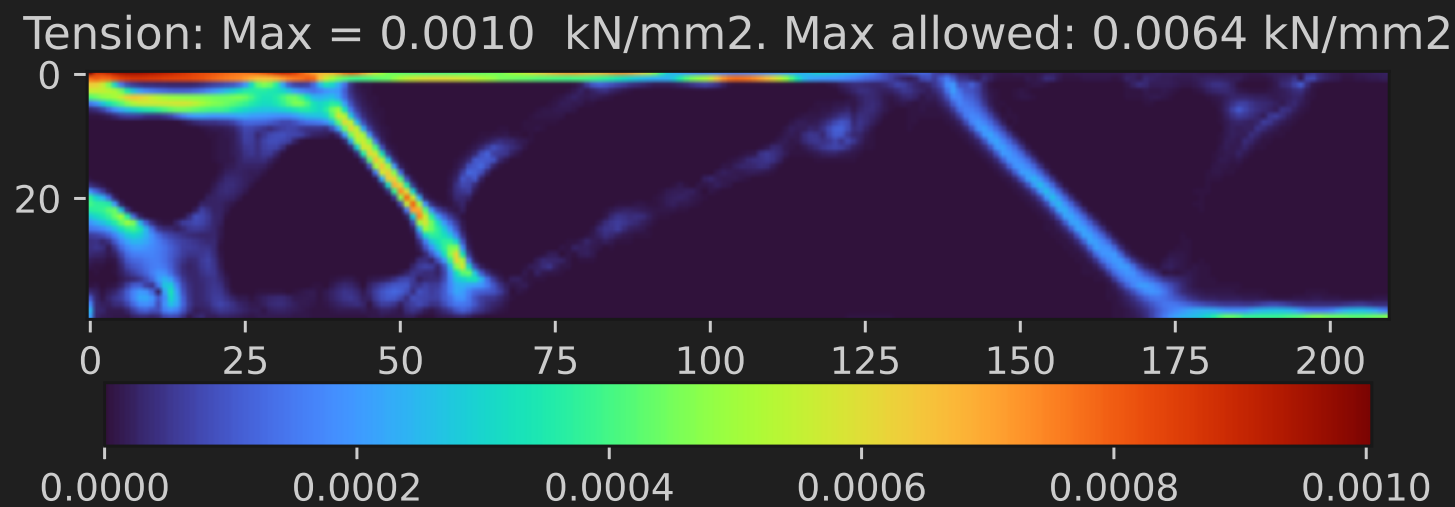
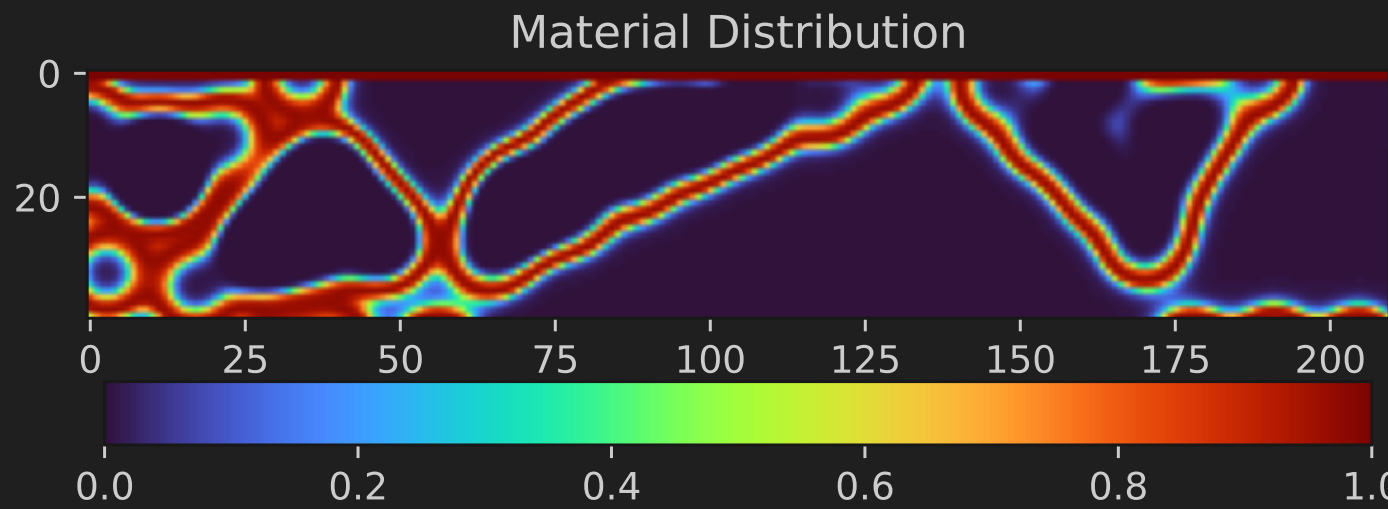
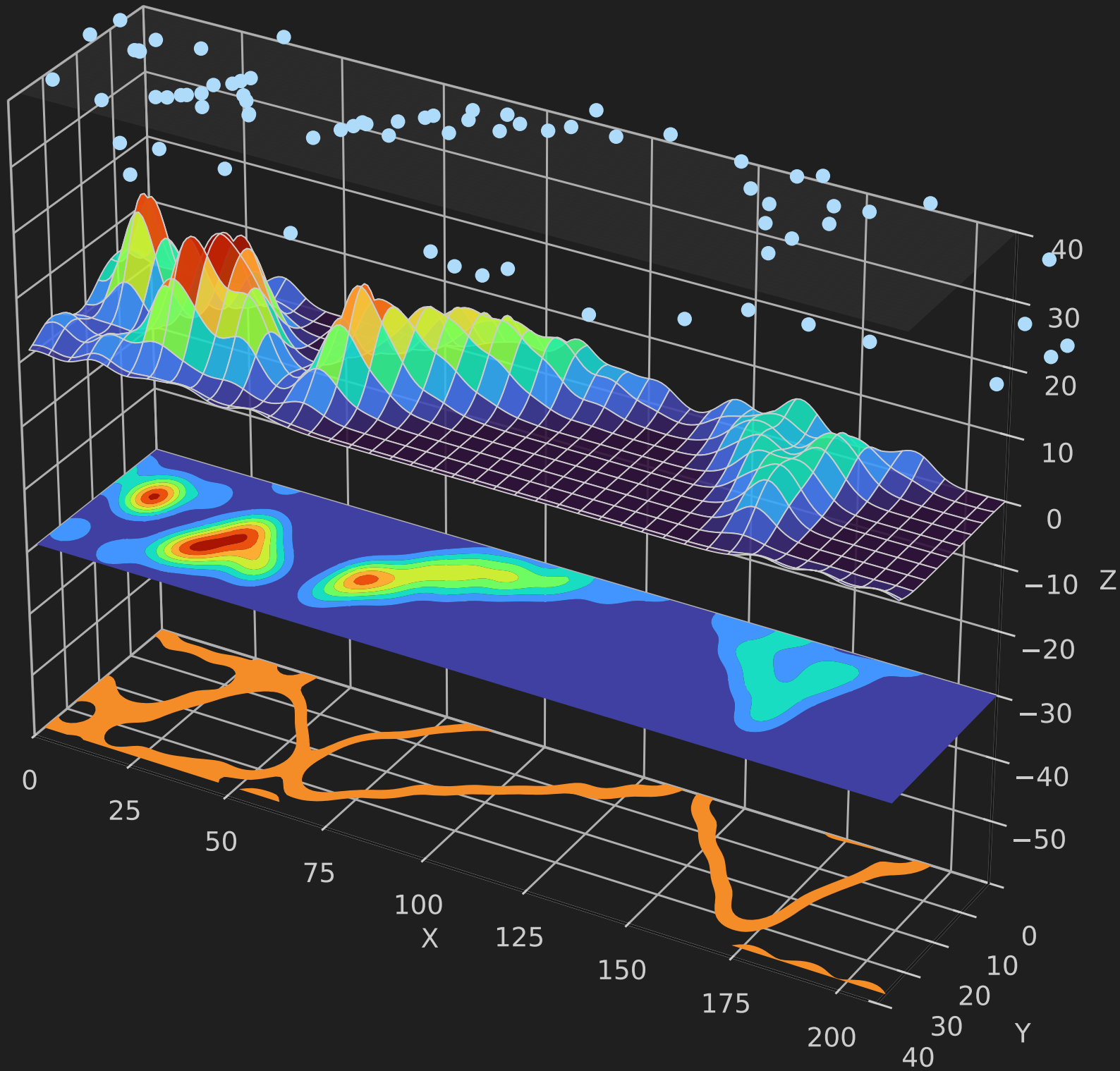
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.85 Shift = 1.91 Iteration = 153



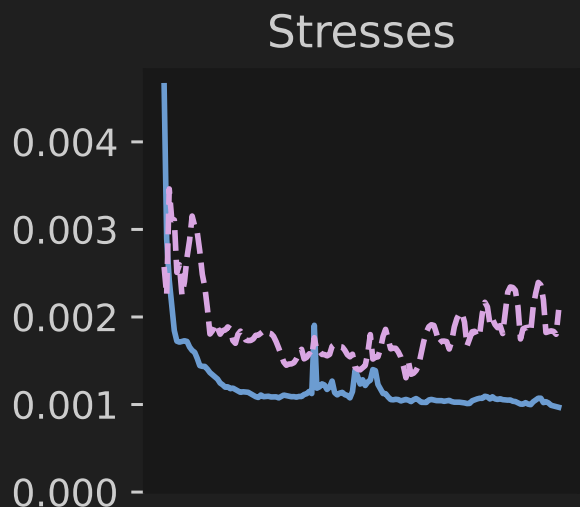
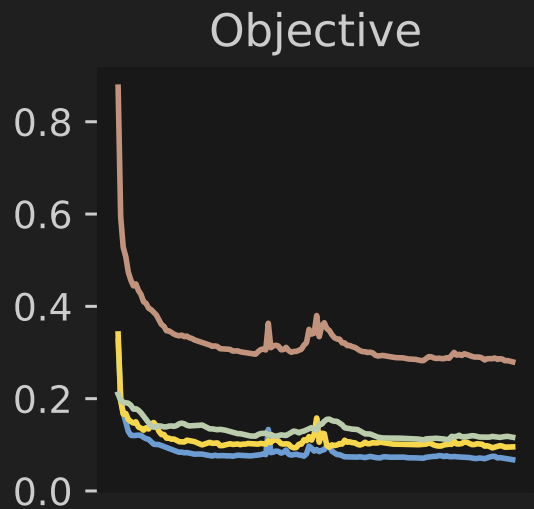
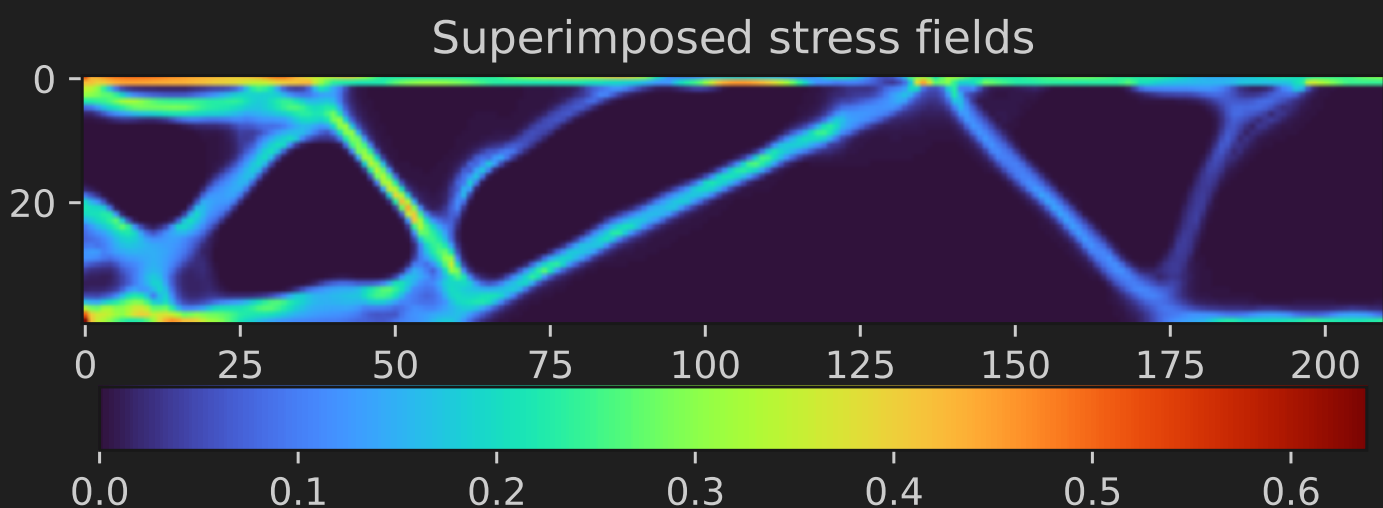
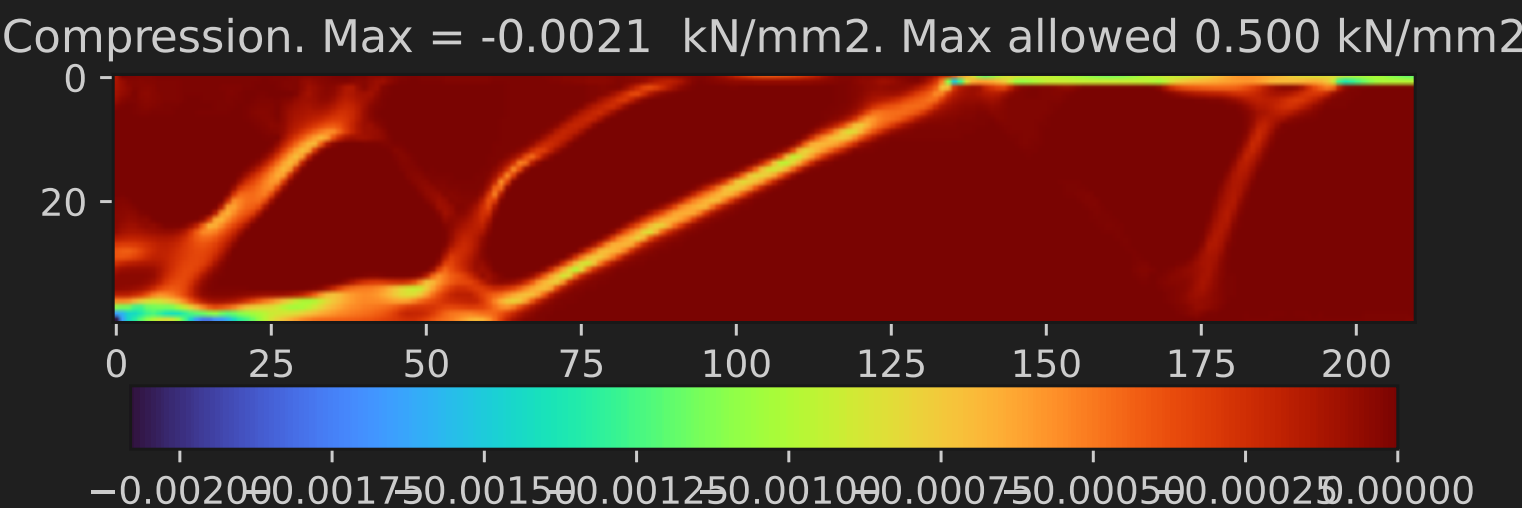
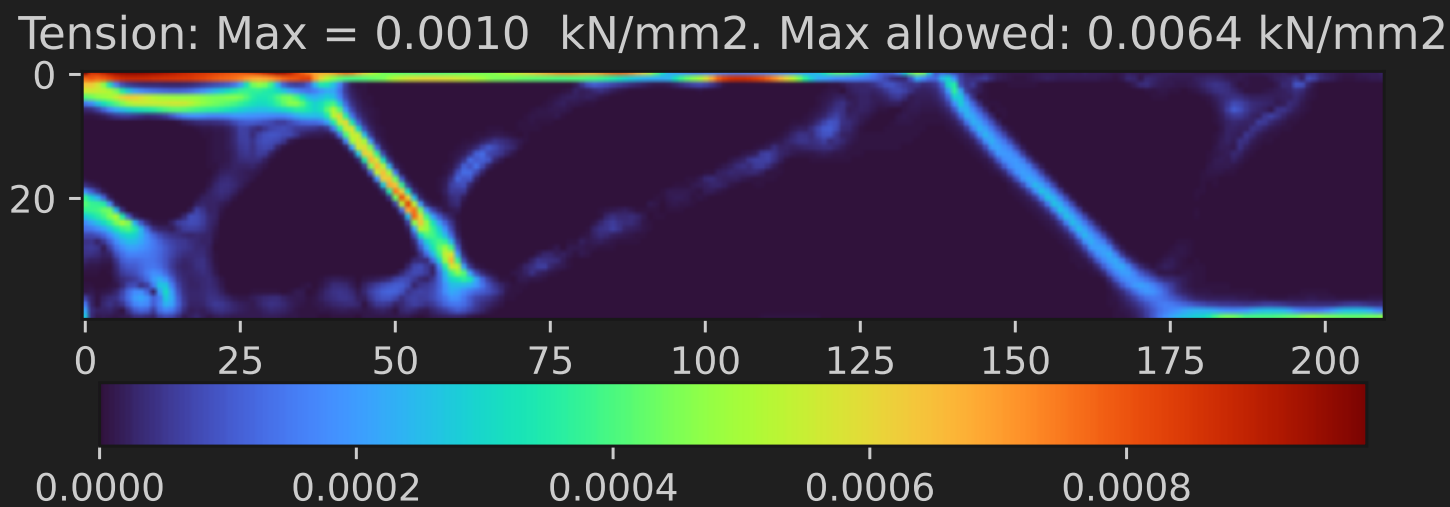
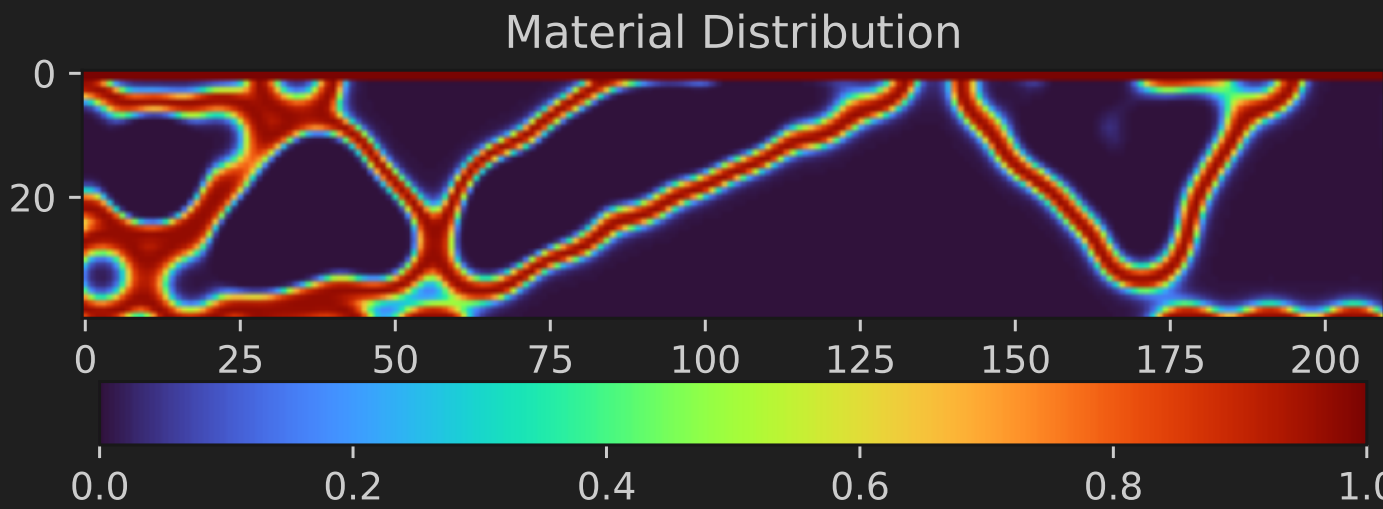
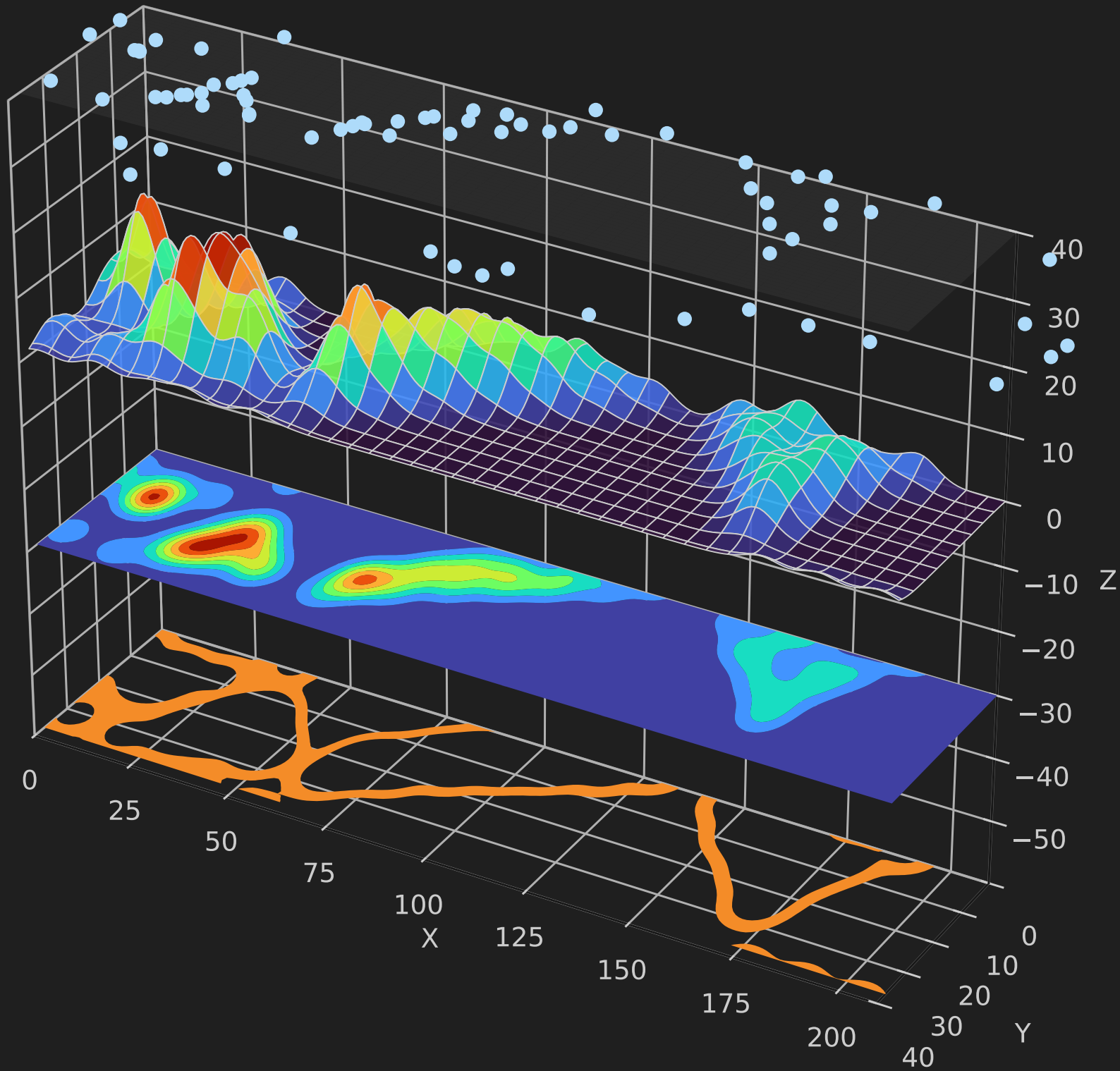
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.24) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.86 Shift = 1.90 Iteration = 154



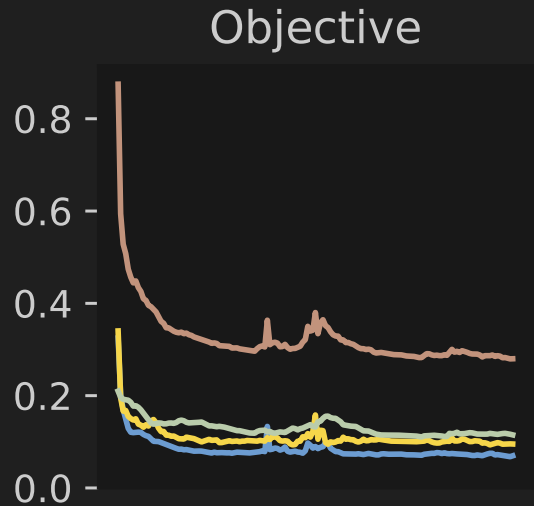
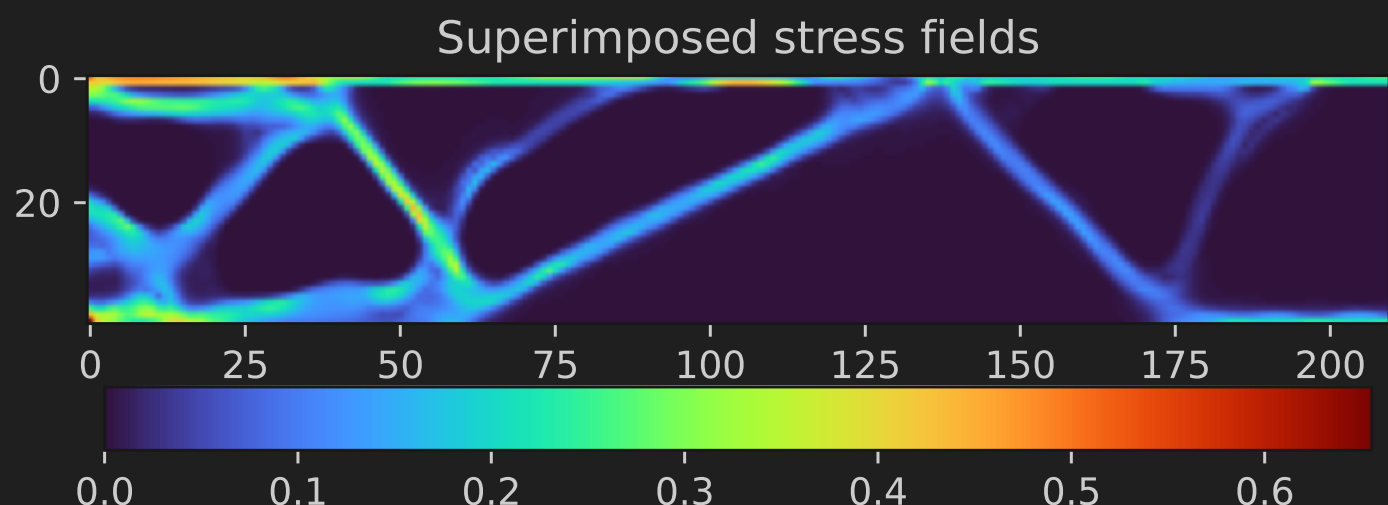
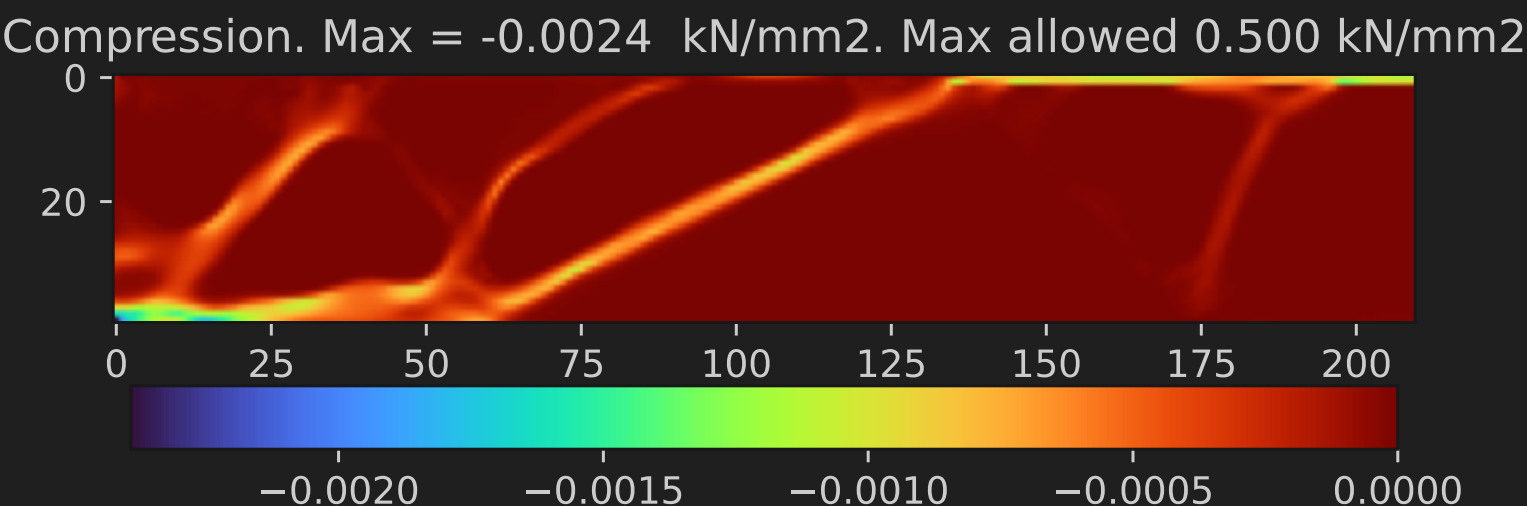
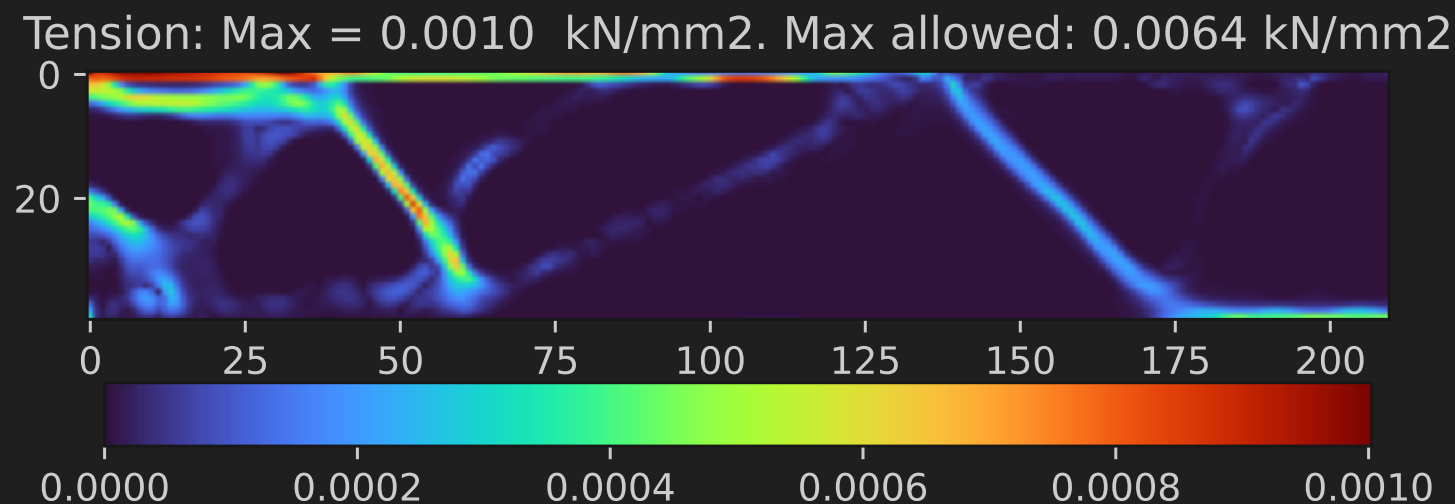
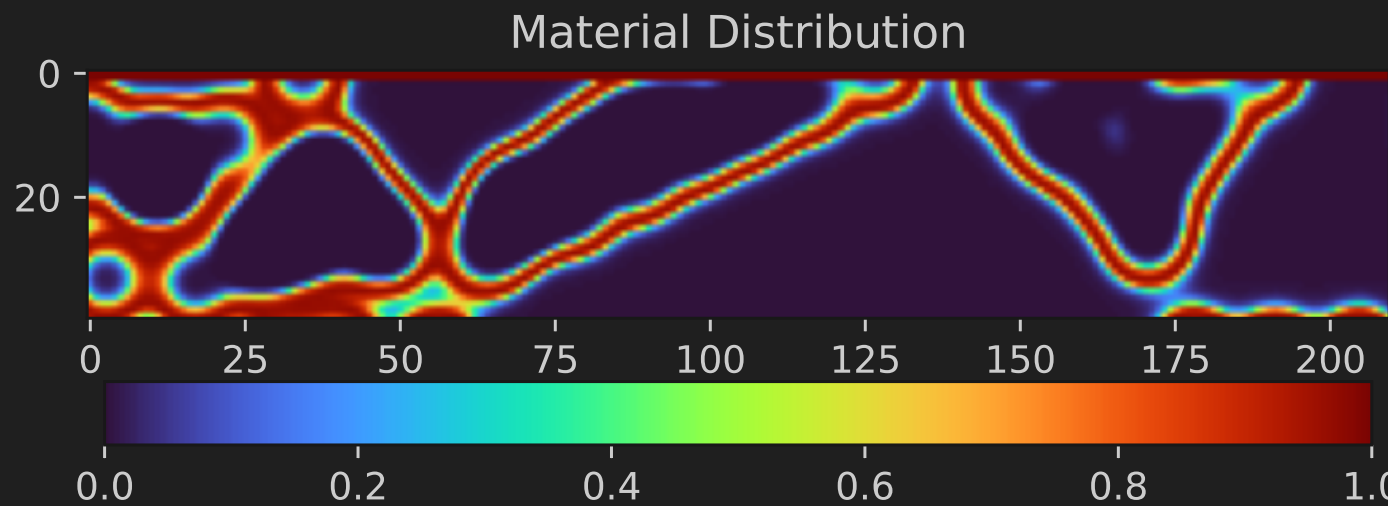
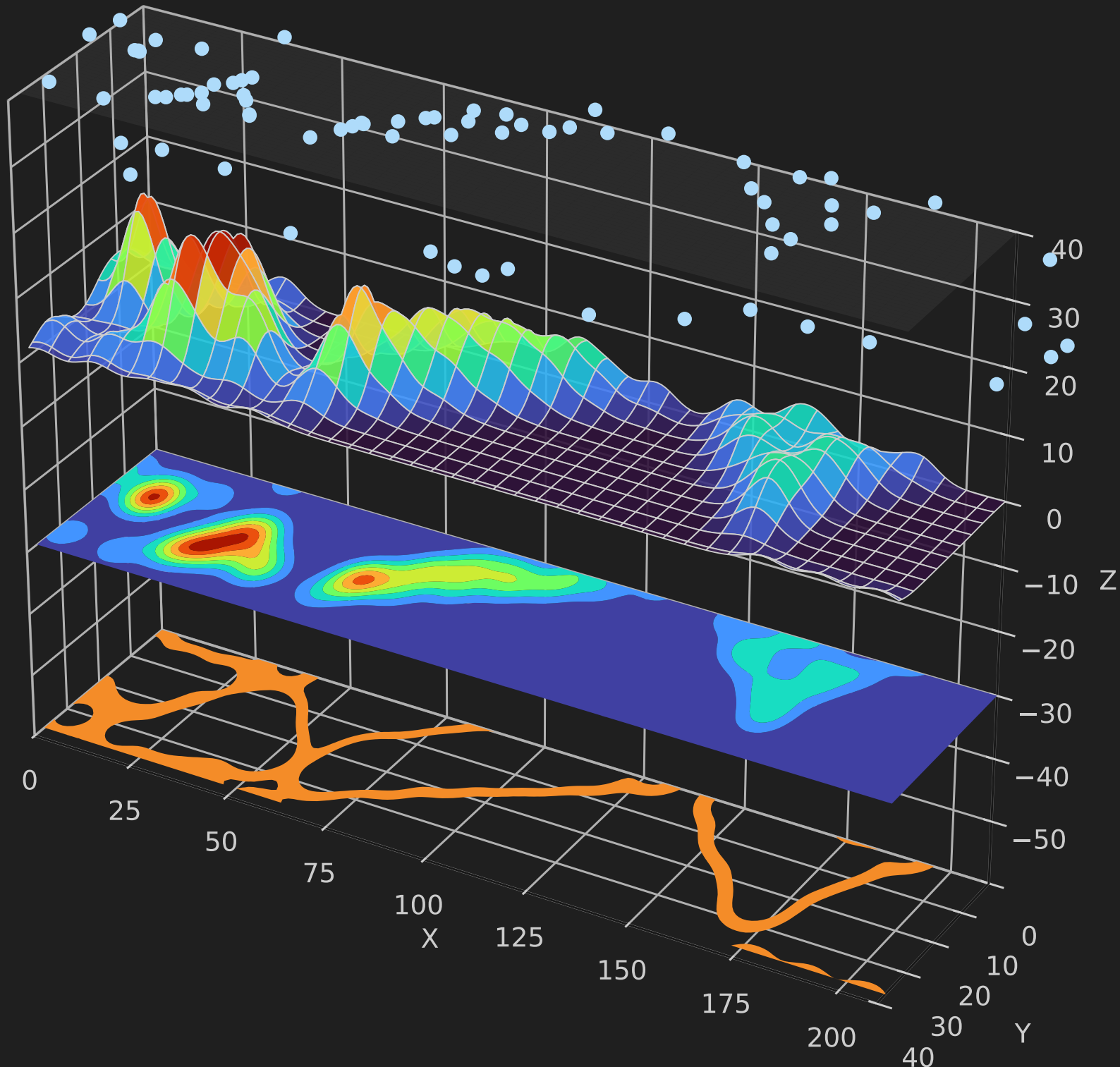
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.89 Shift = 1.87 Iteration = 155



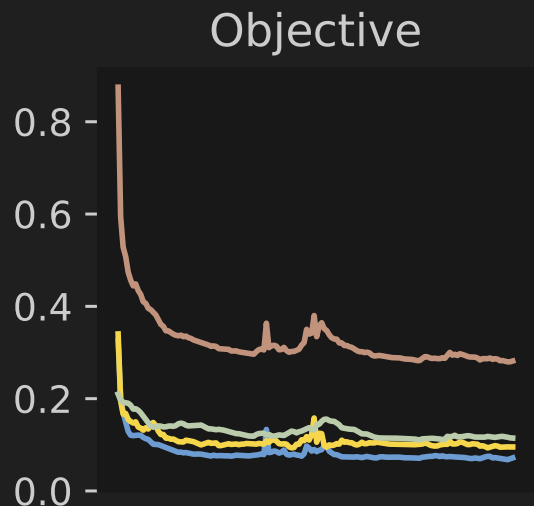
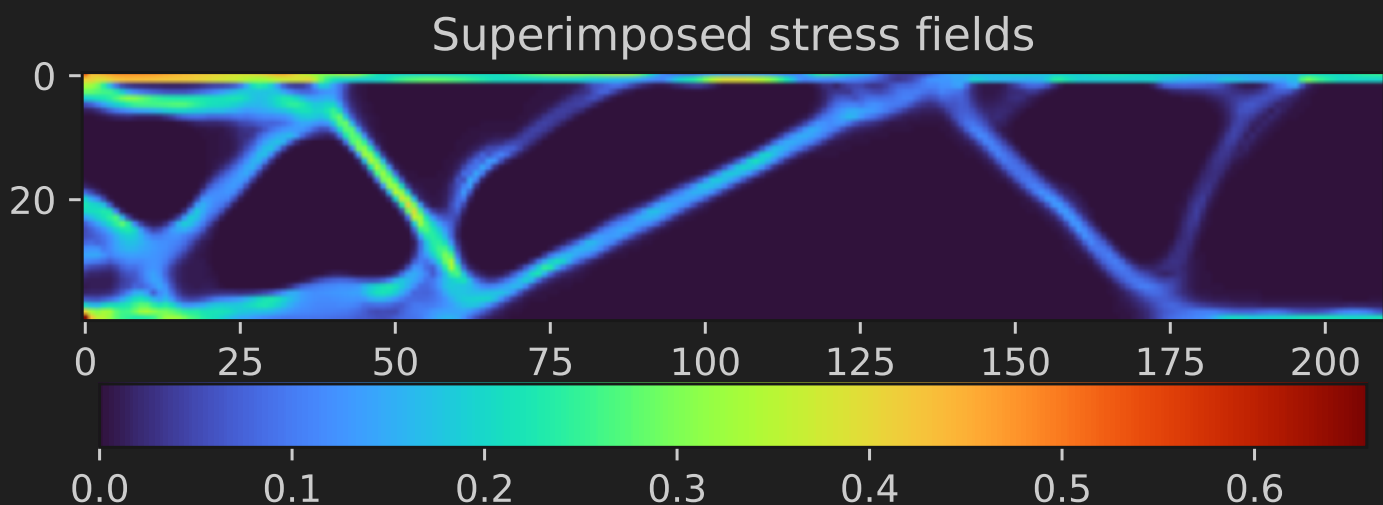
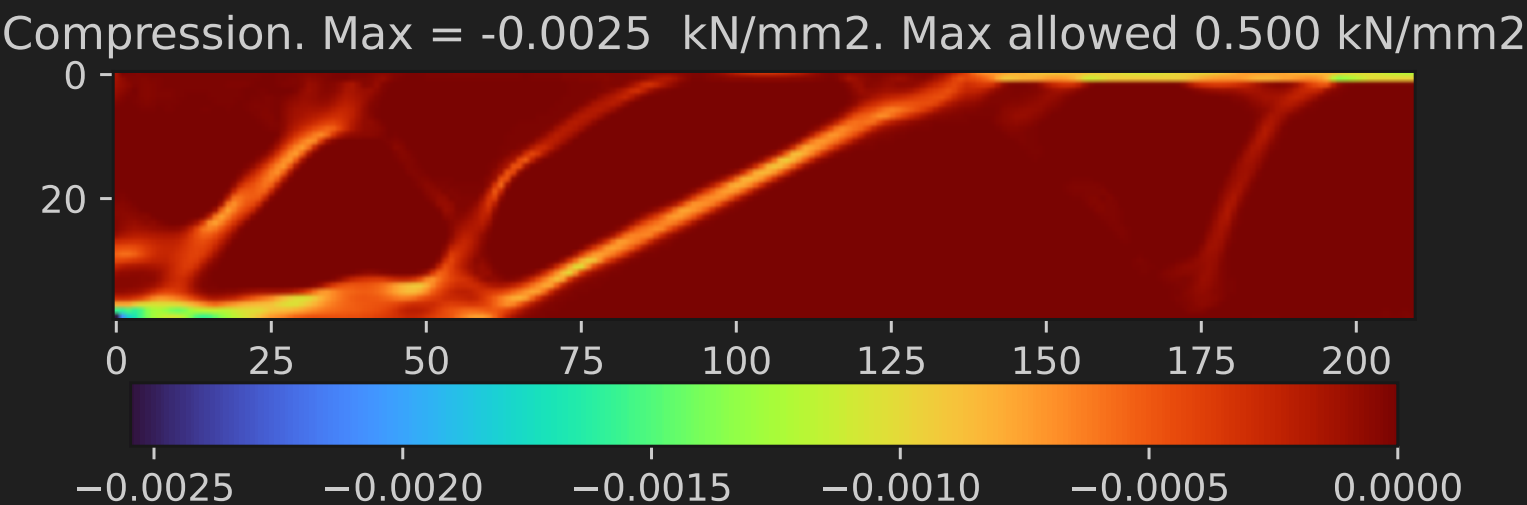
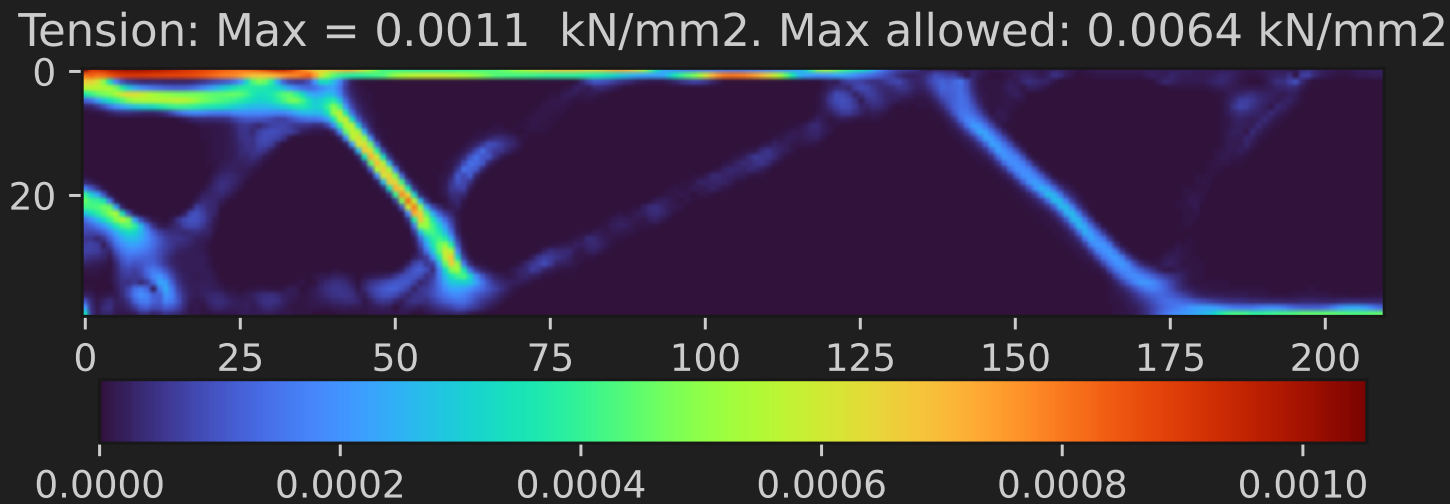
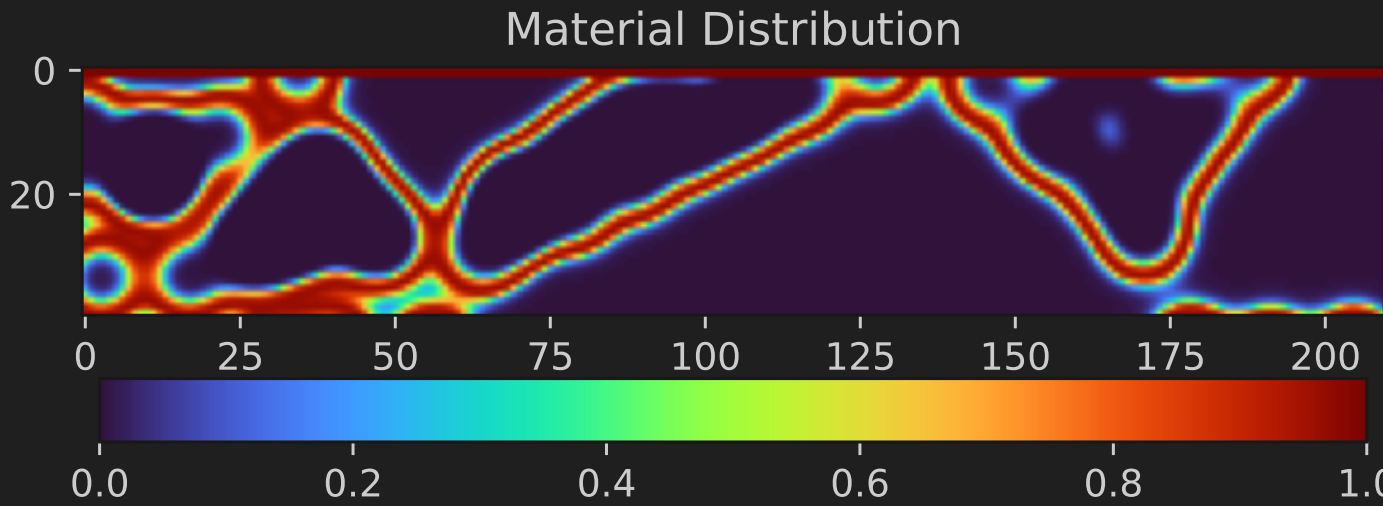
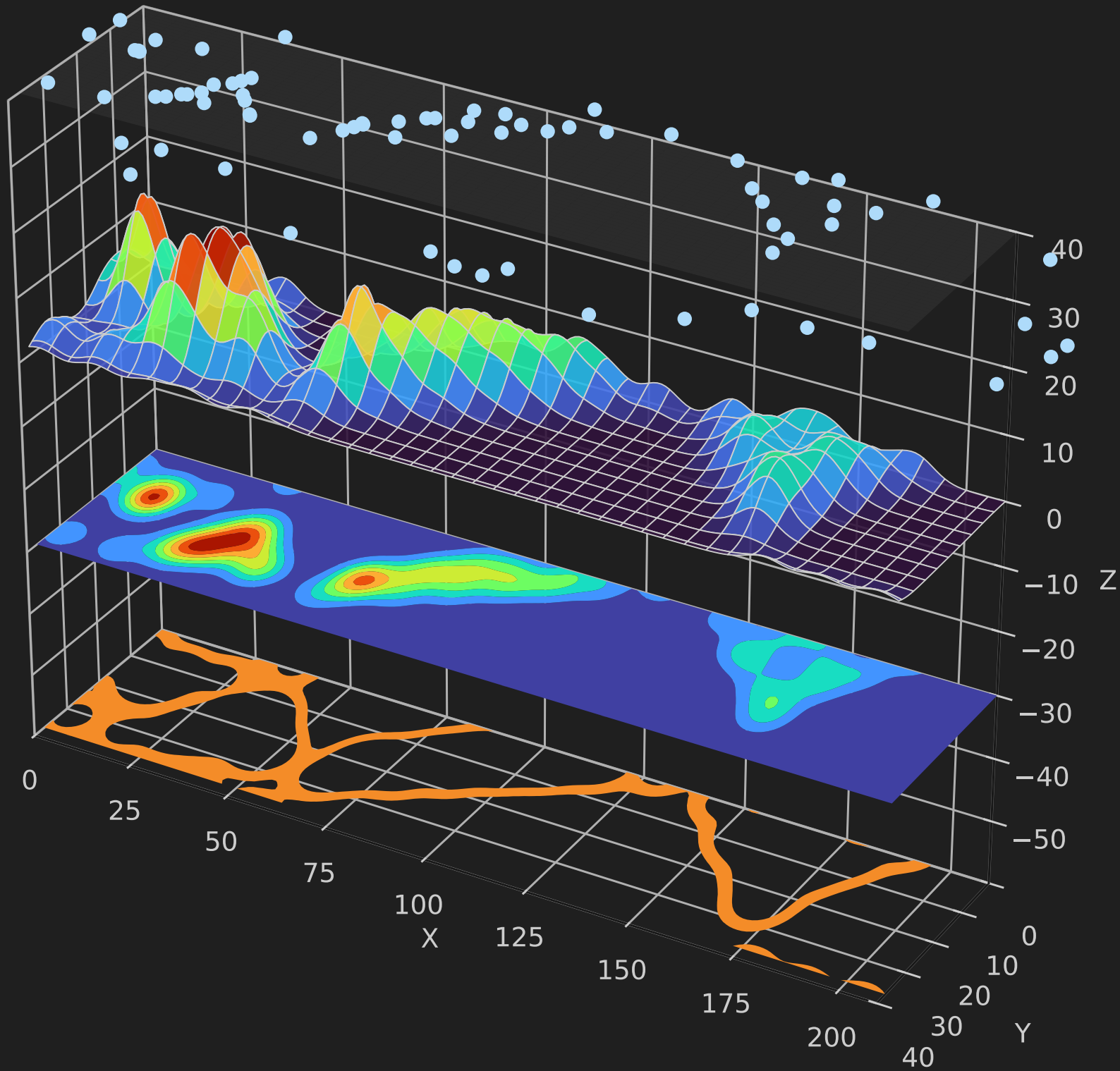
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.92 Shift = 1.84 Iteration = 156



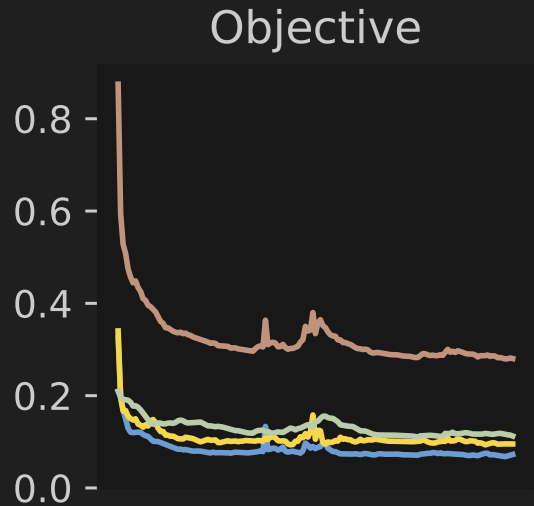
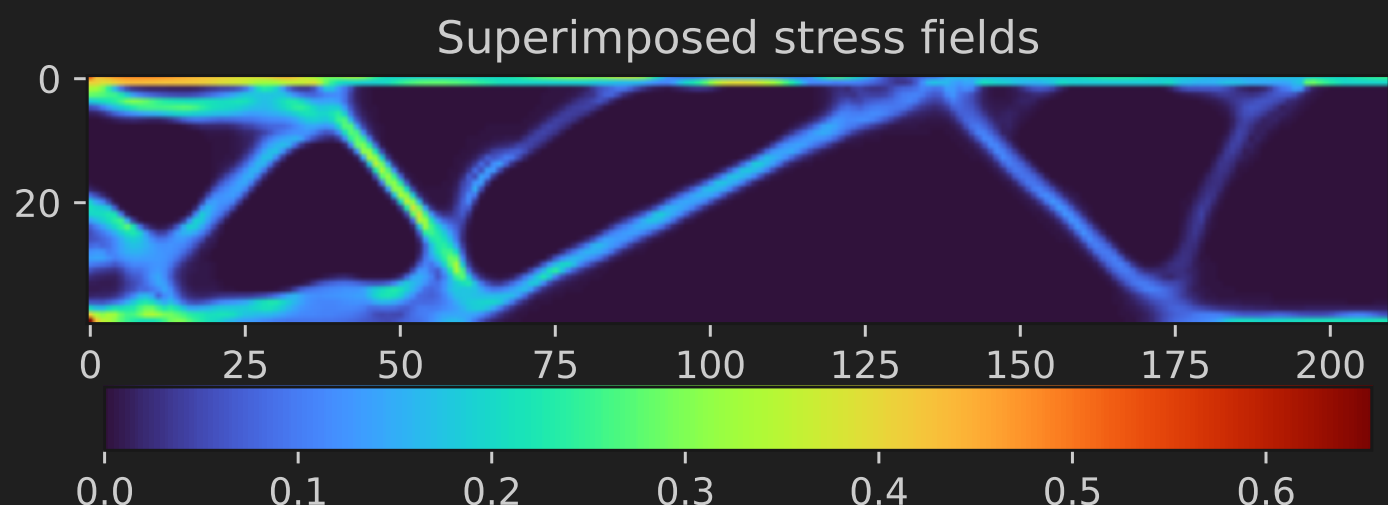
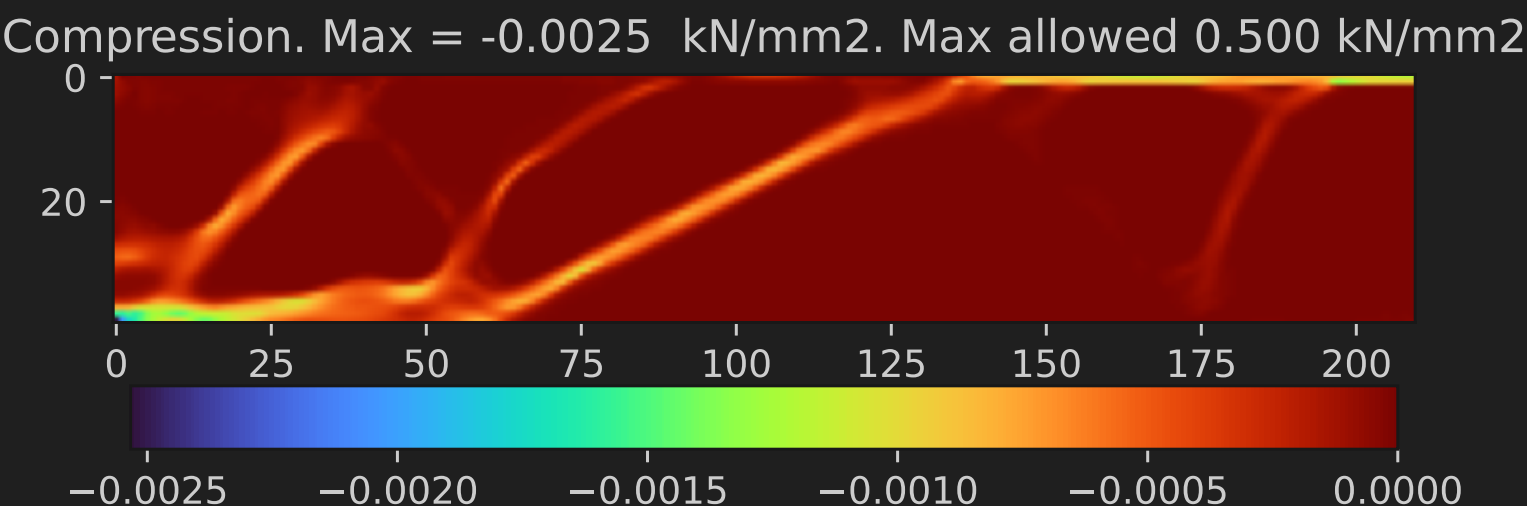
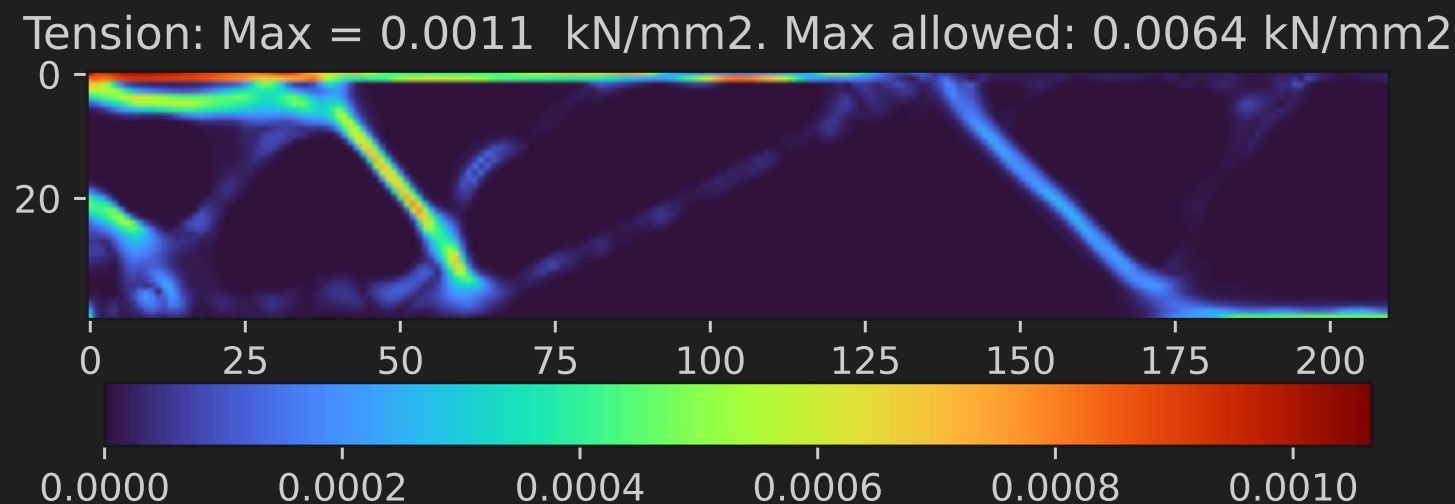
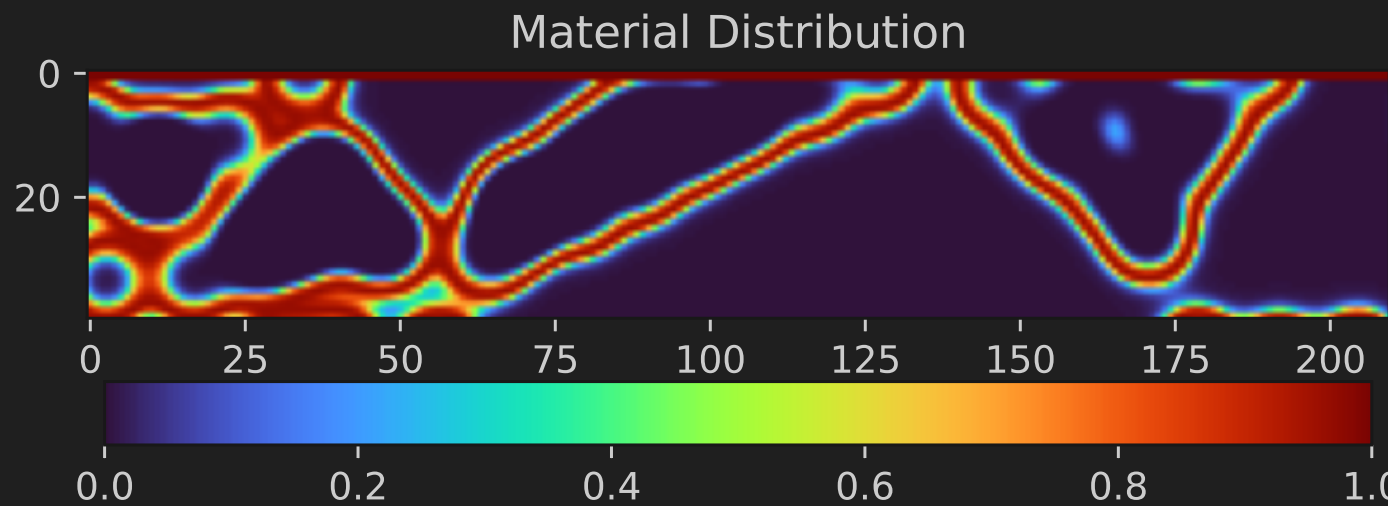
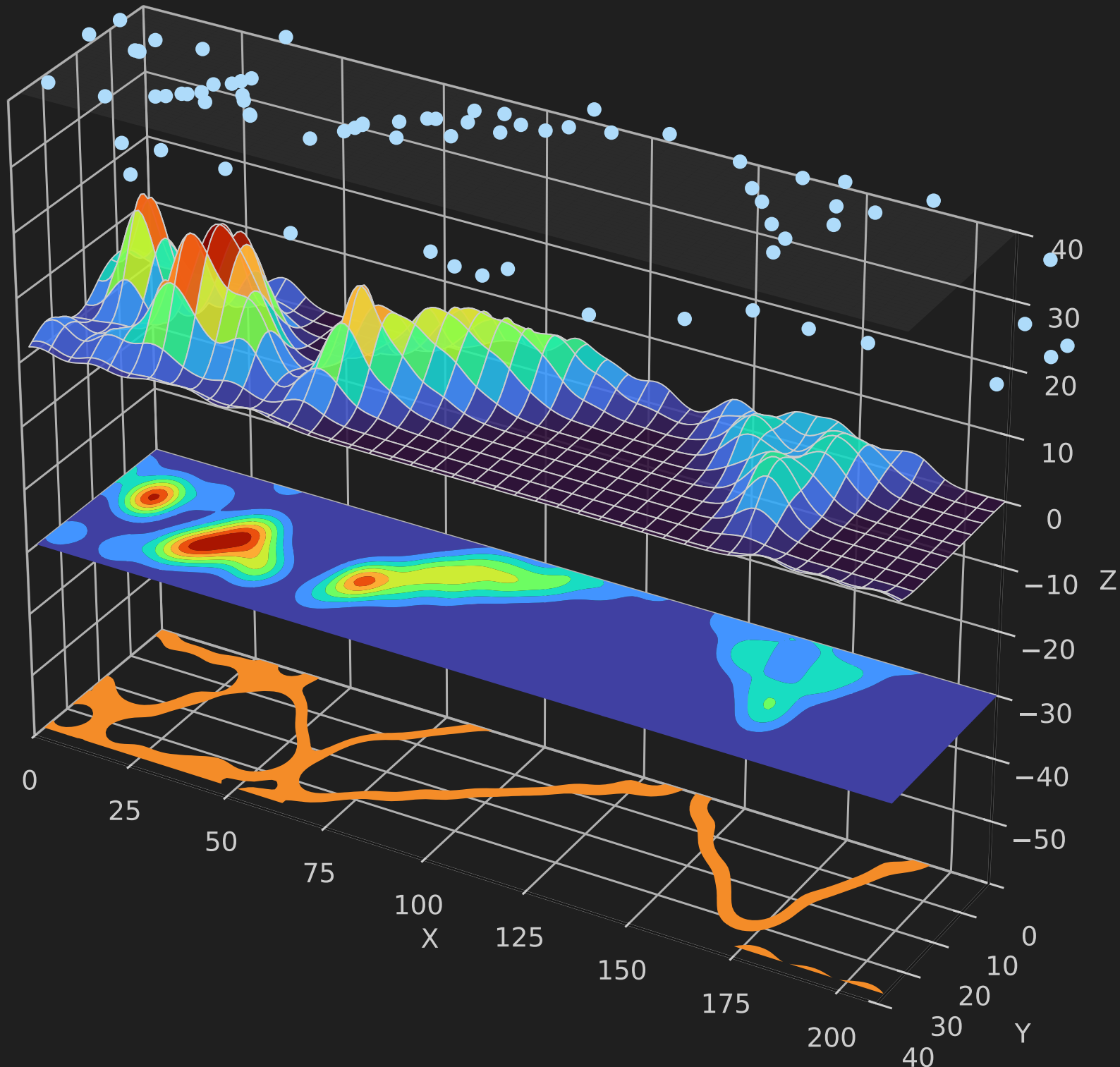
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.92 Shift = 1.82 Iteration = 157



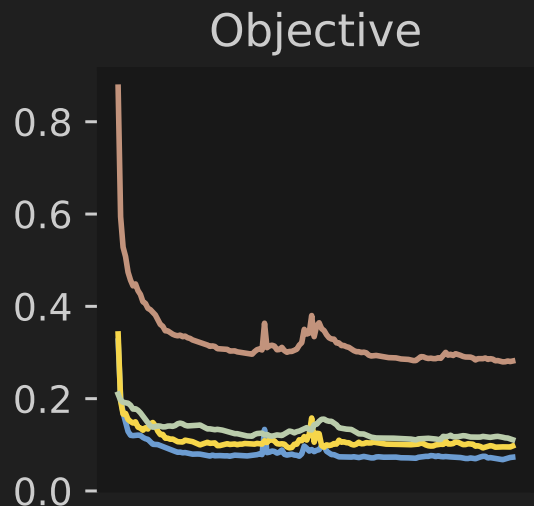
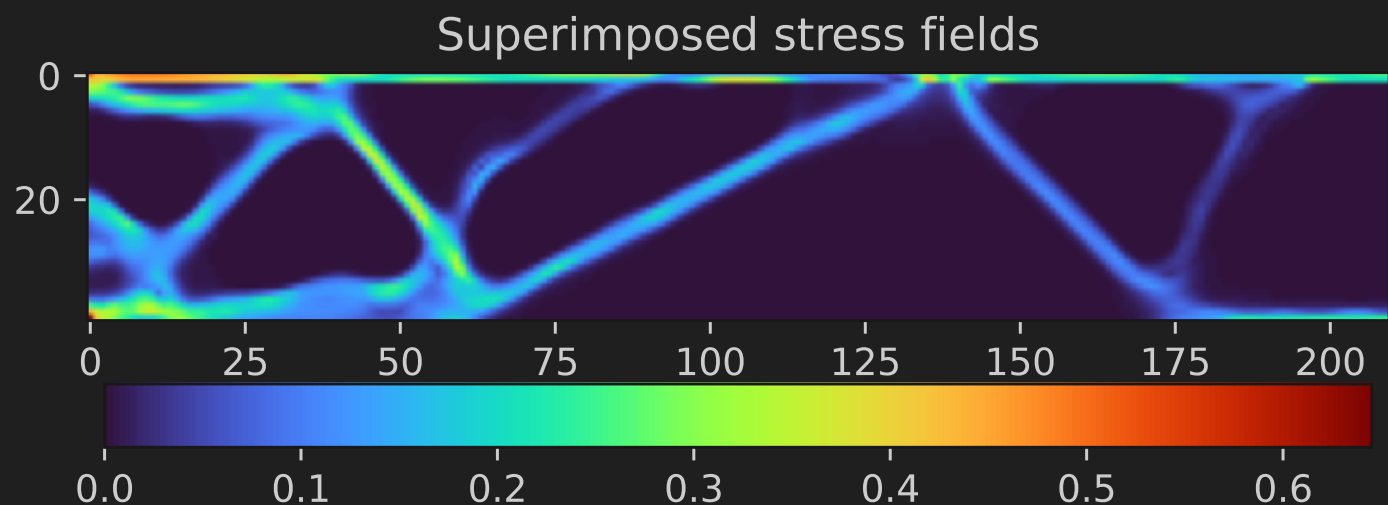
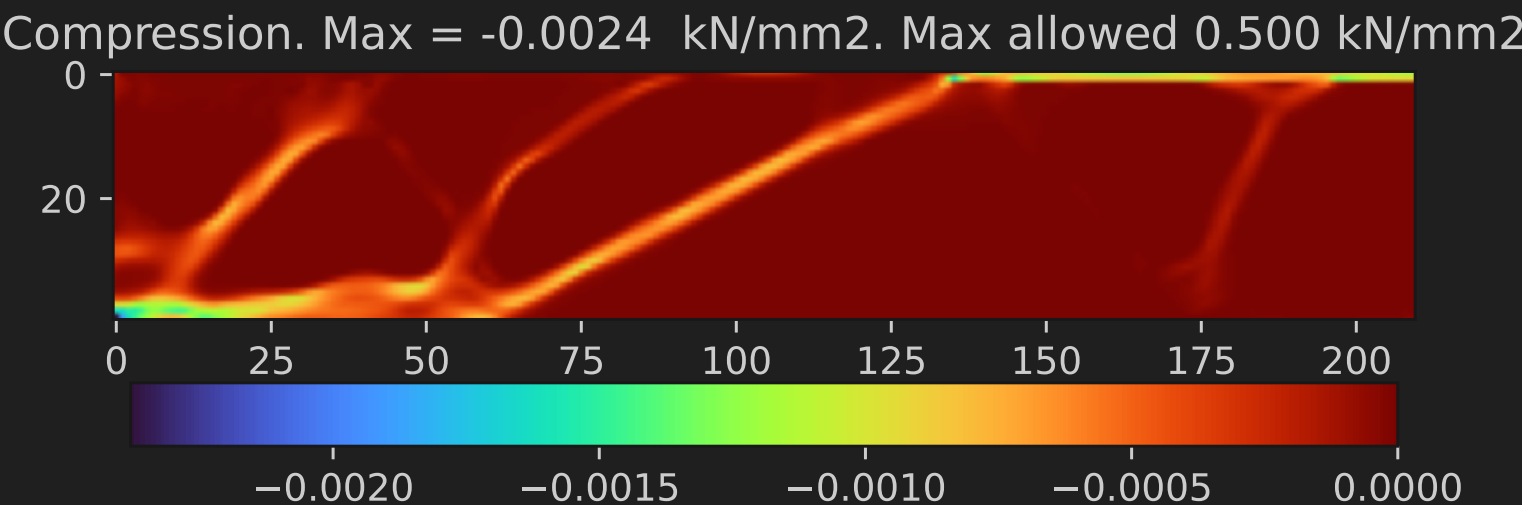
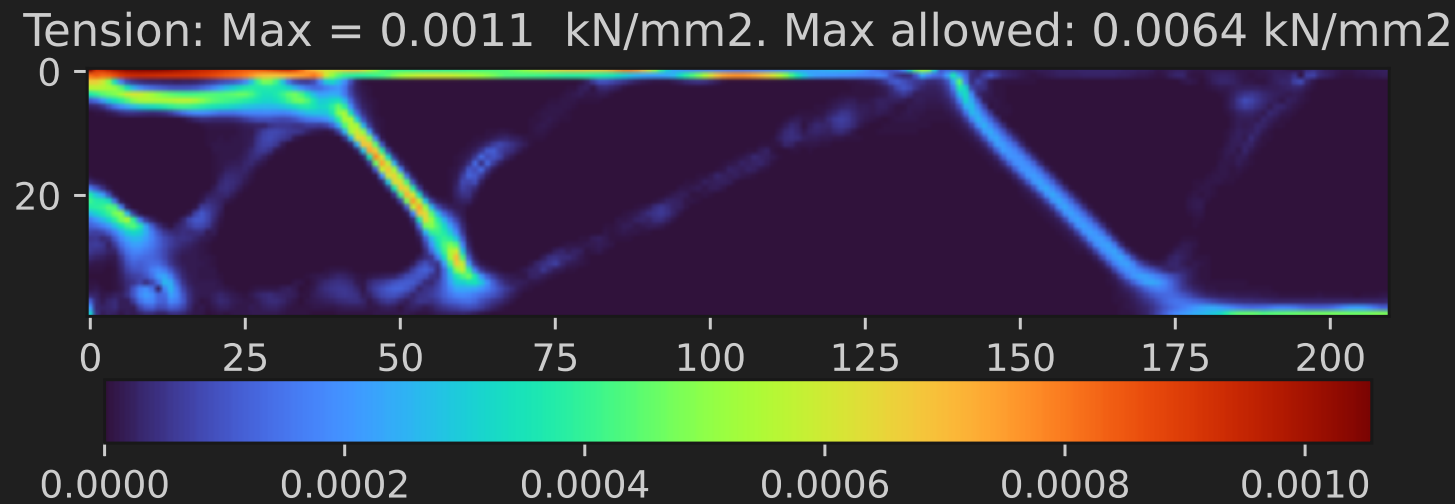
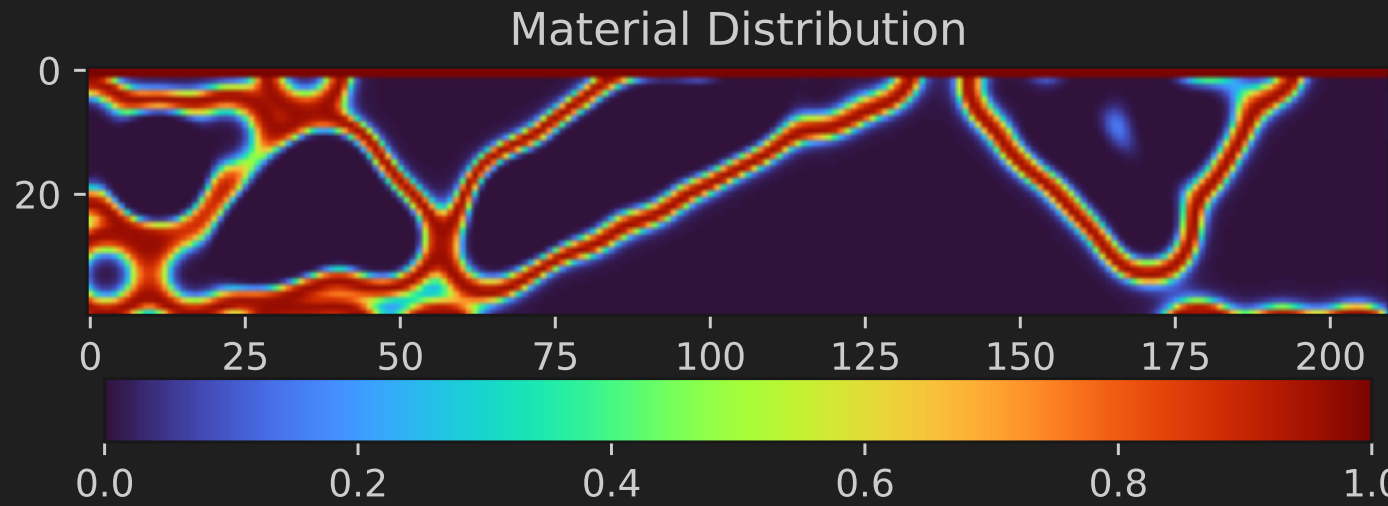
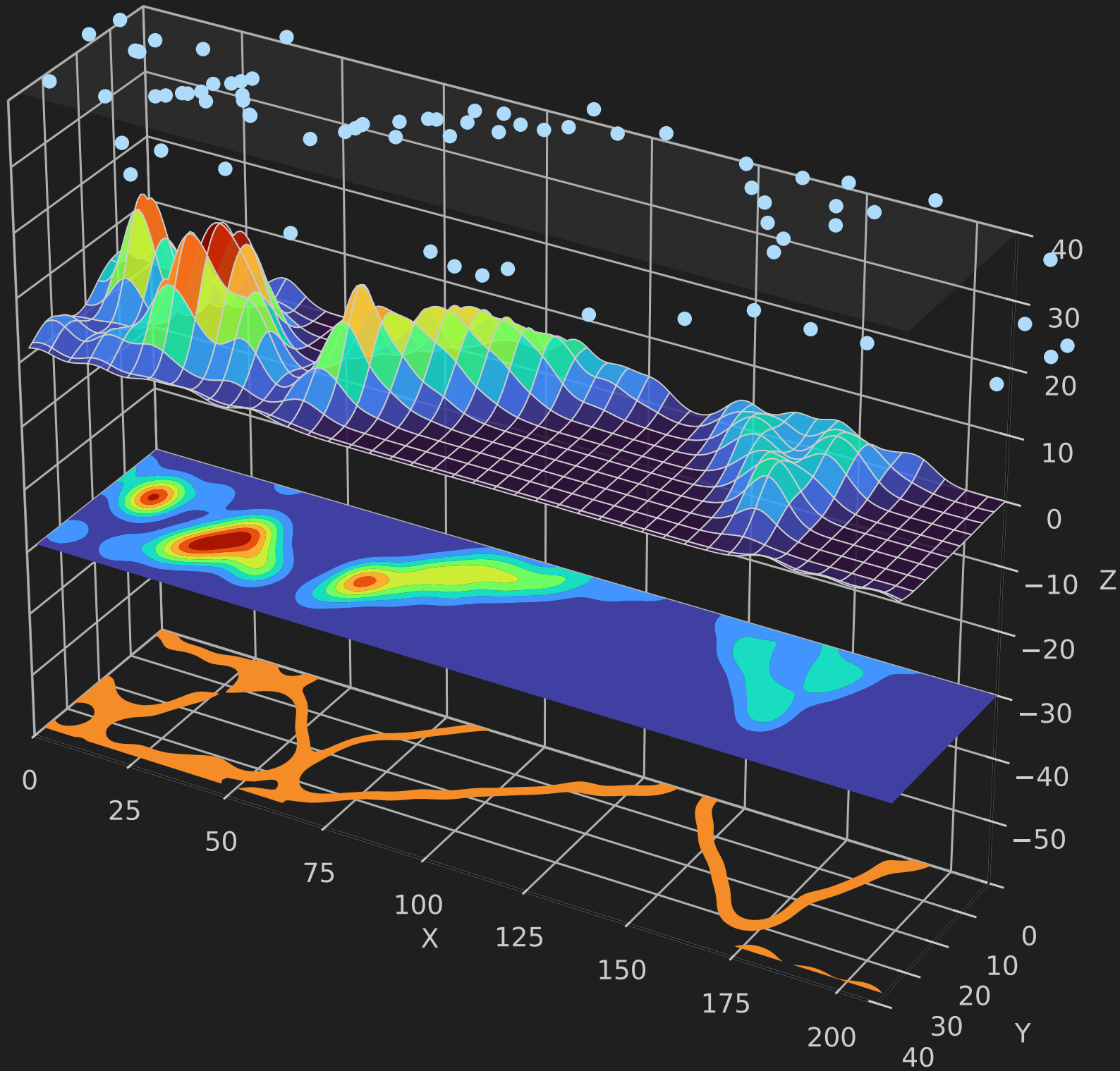
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.92 Shift = 1.80 Iteration = 158



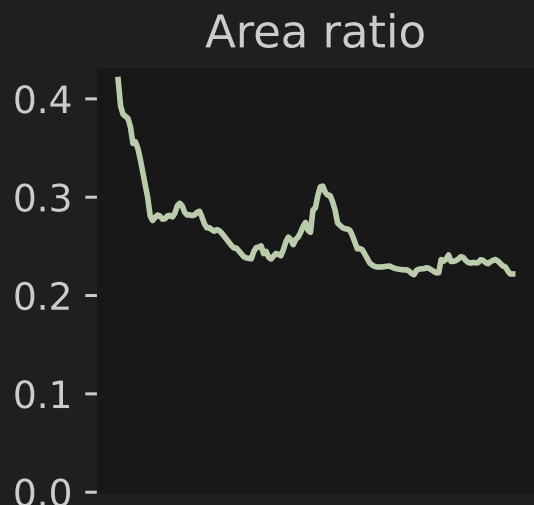
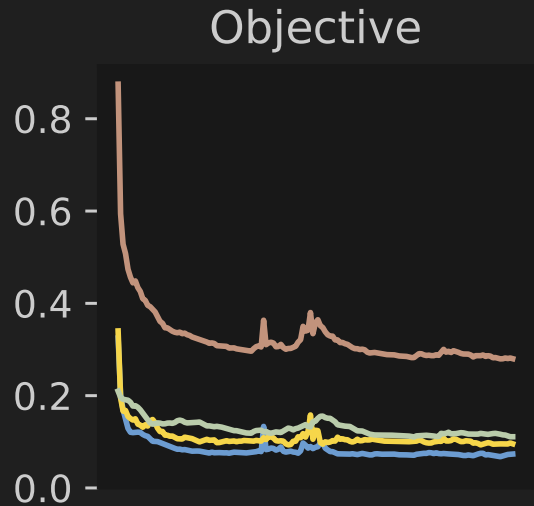
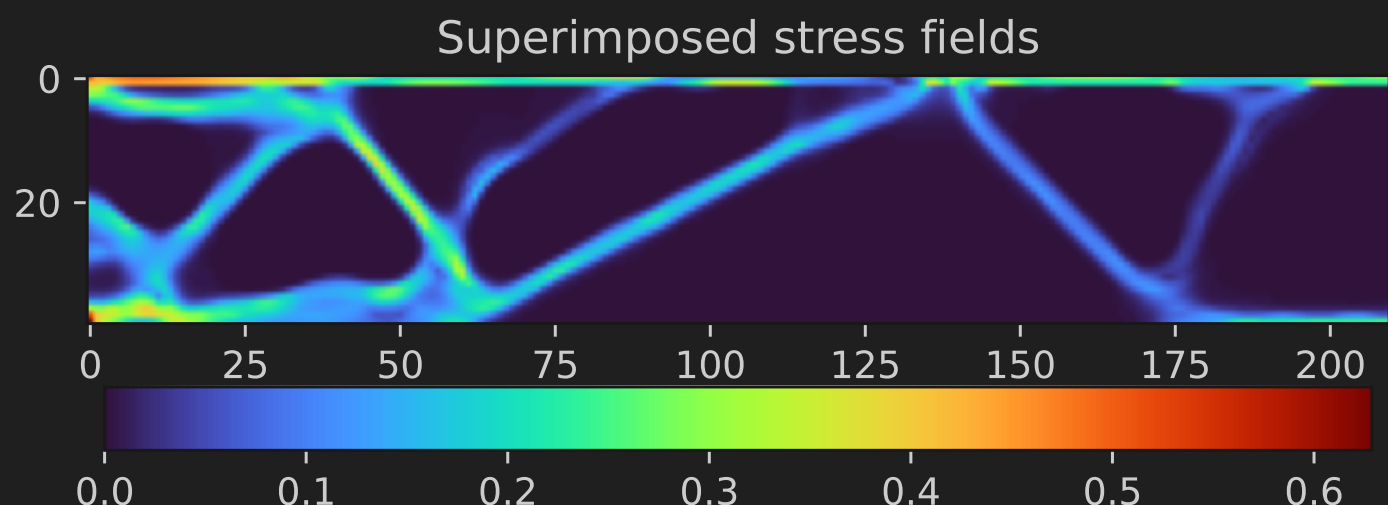
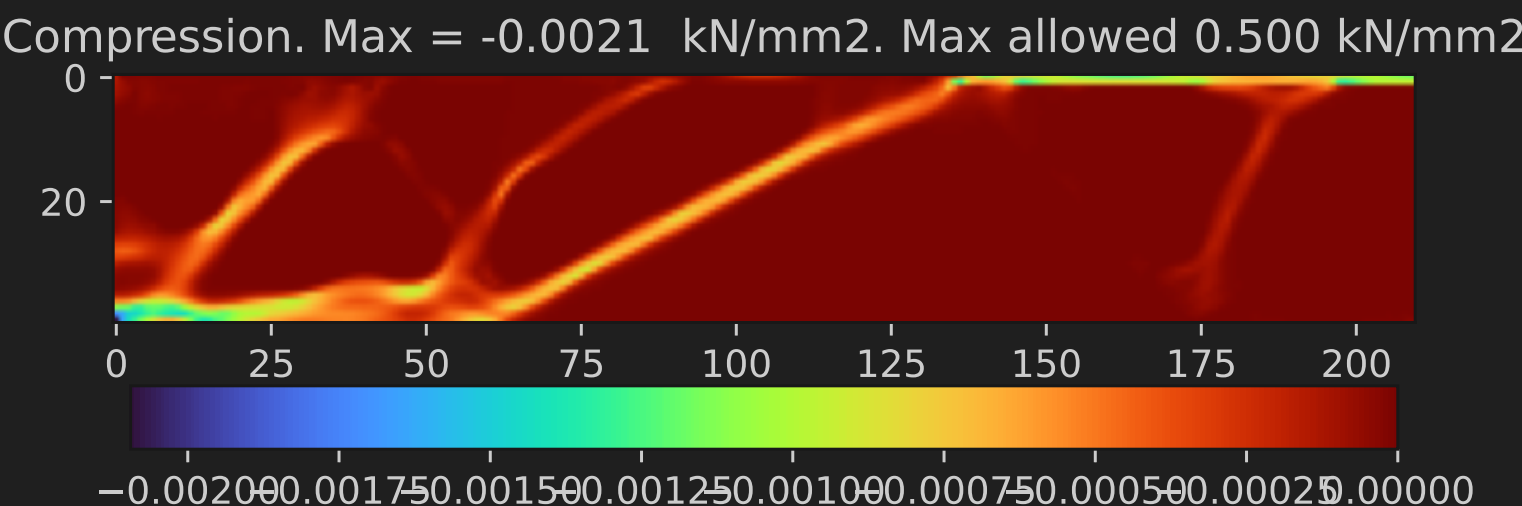
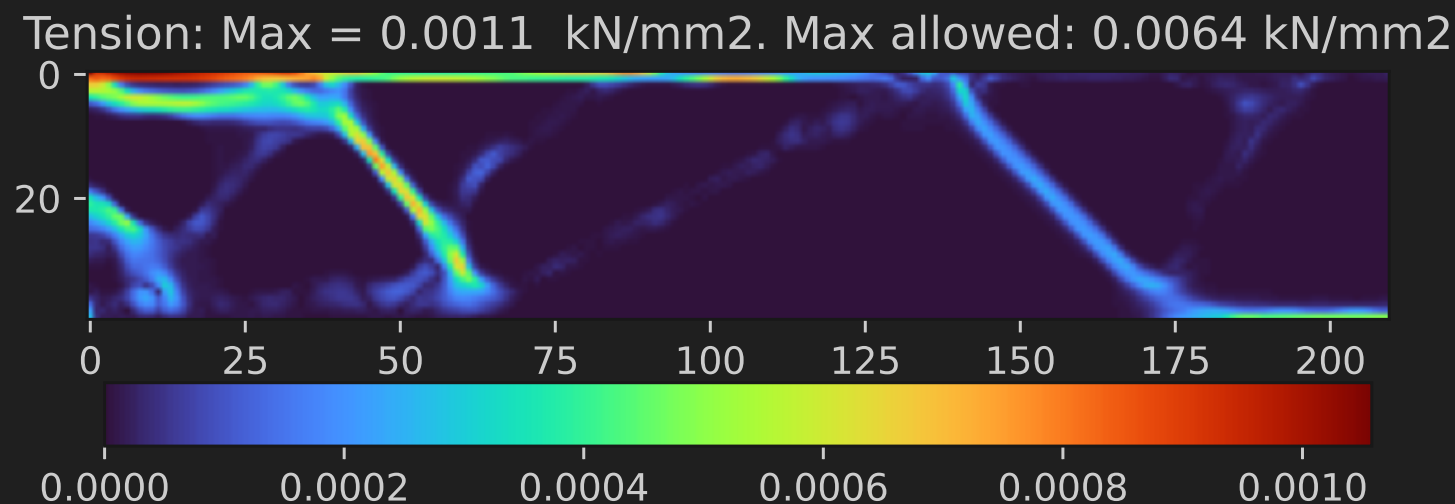
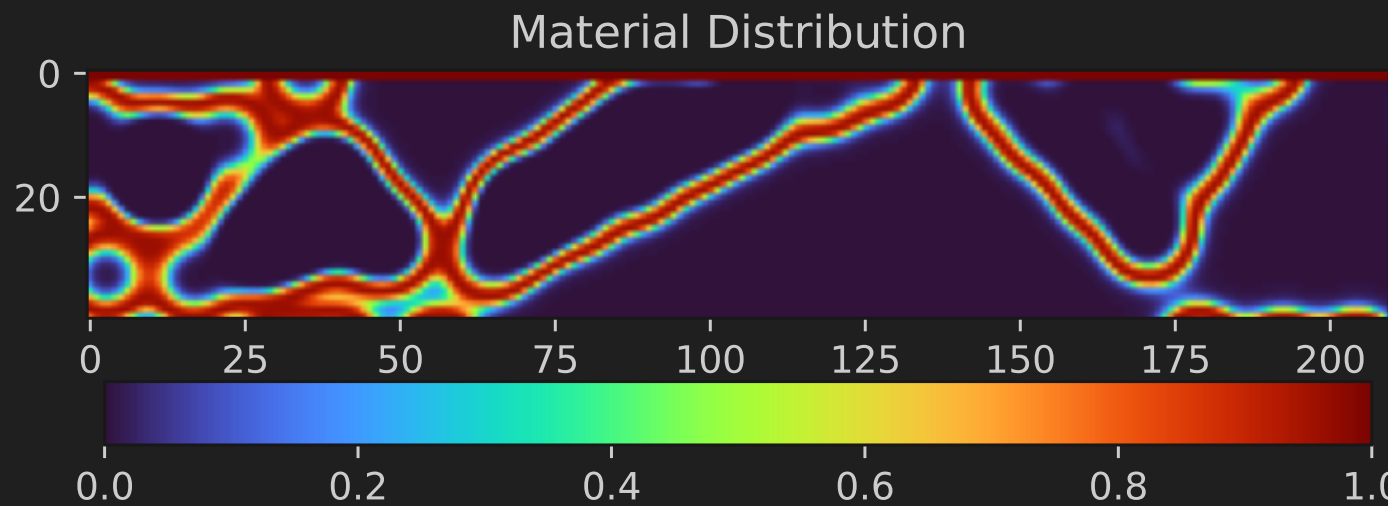
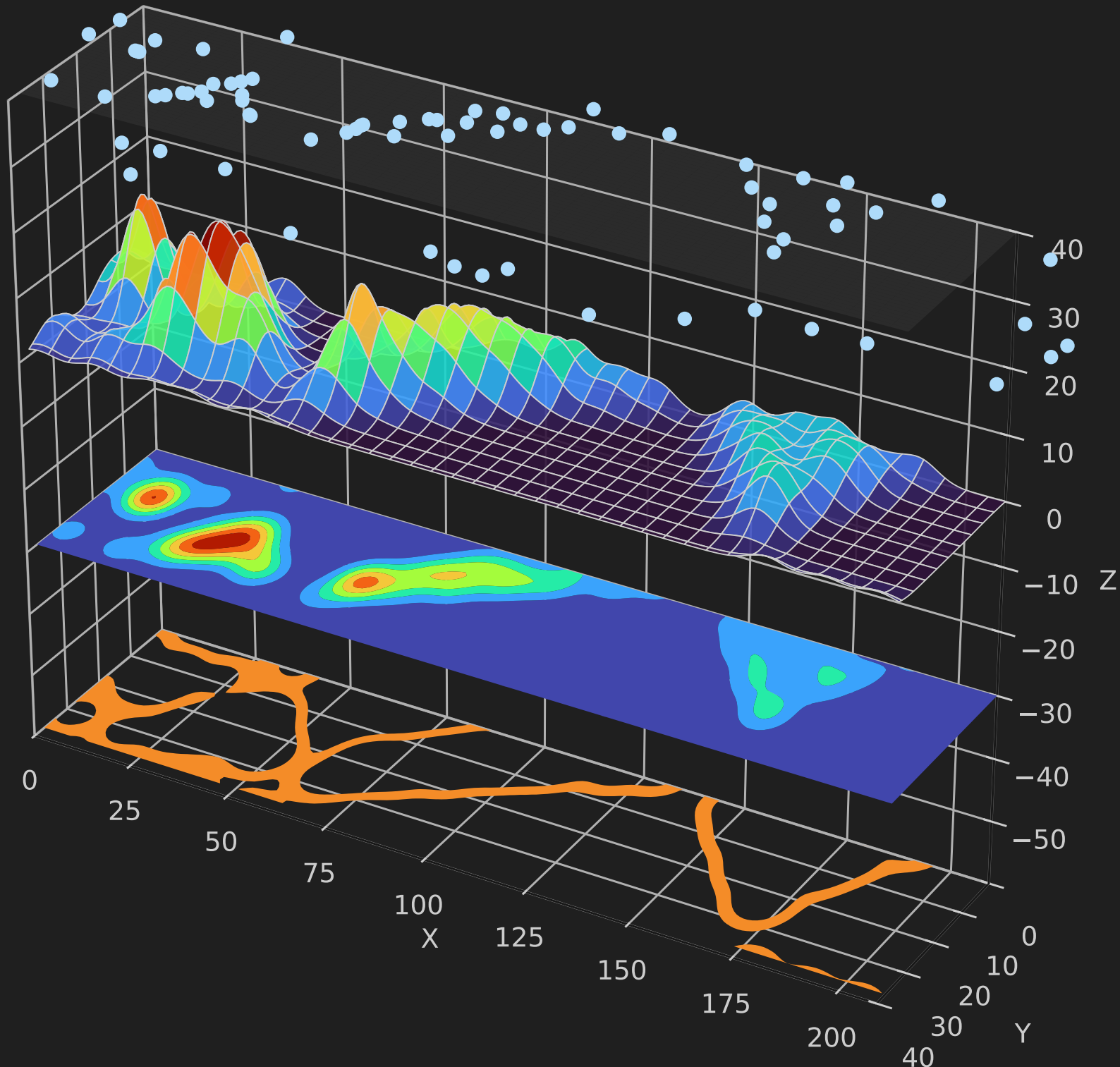
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.91 Shift = 1.79 Iteration = 159



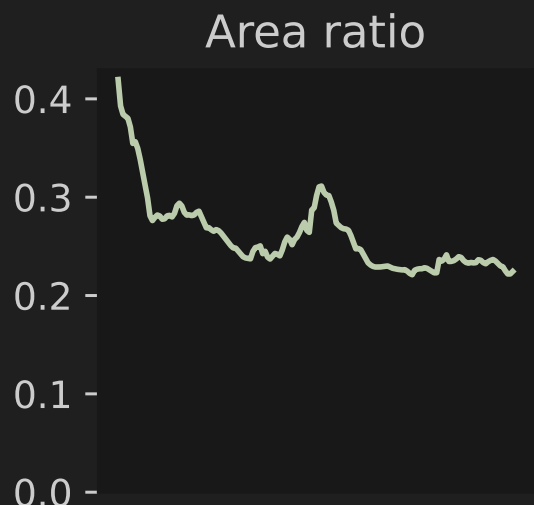
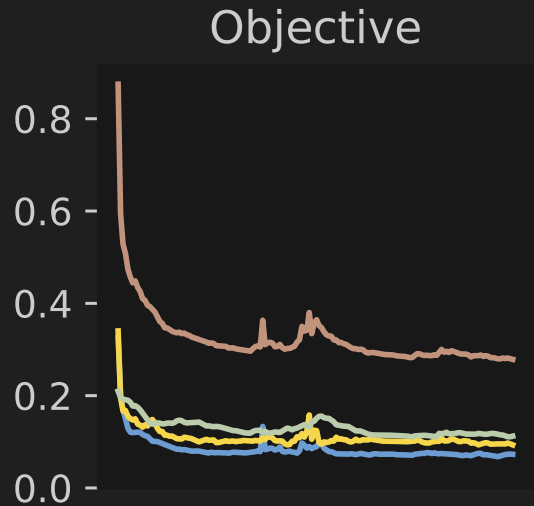
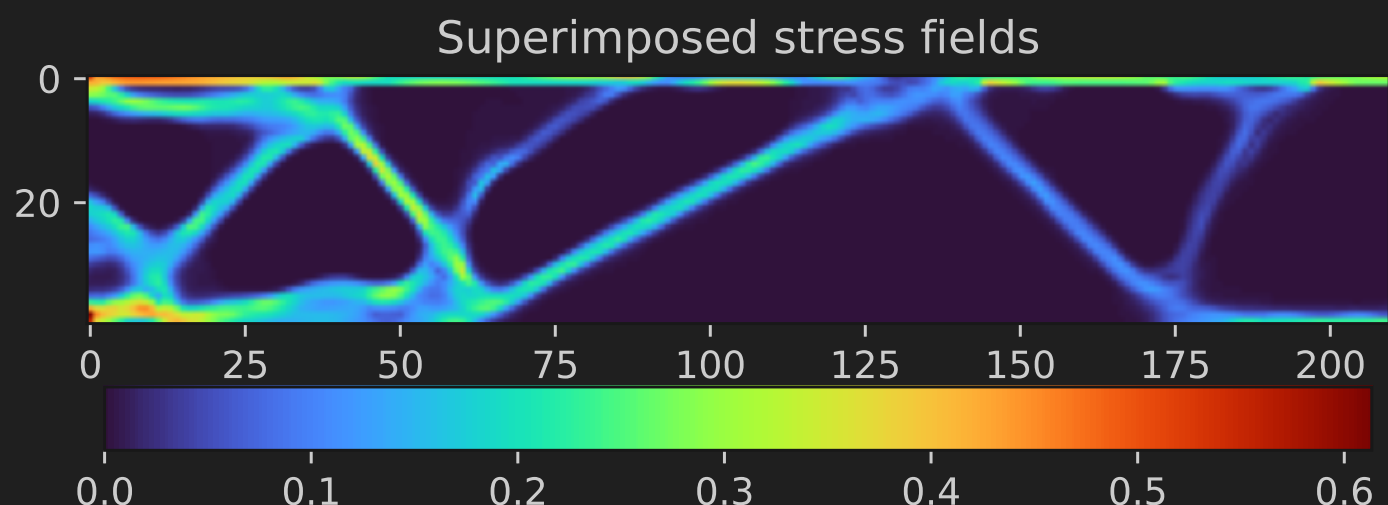
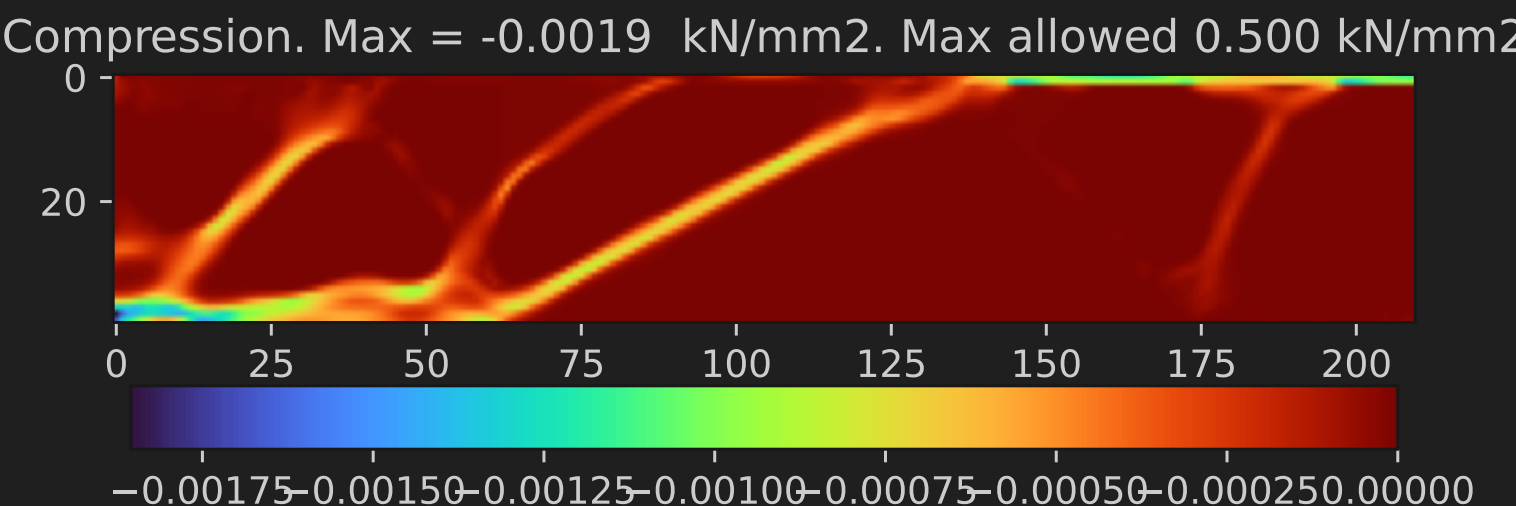
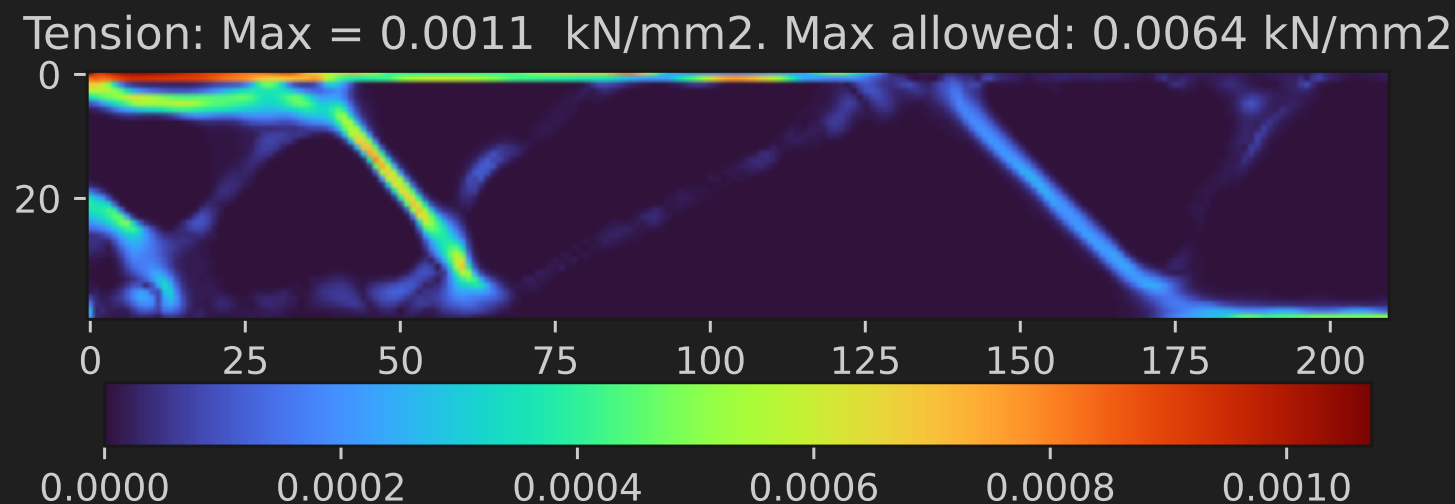
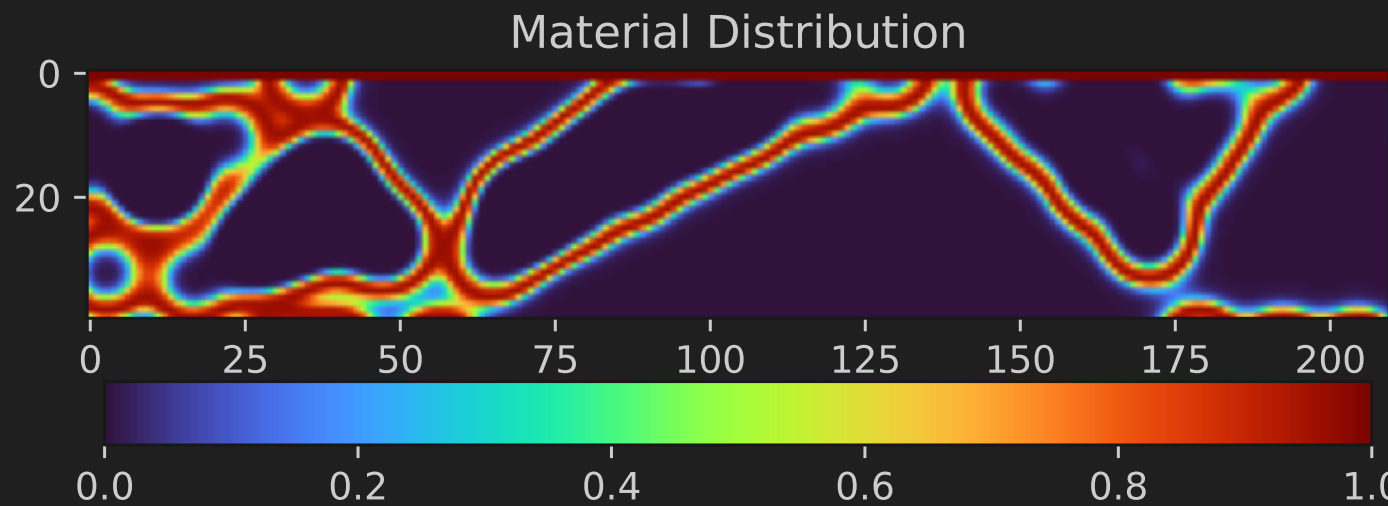
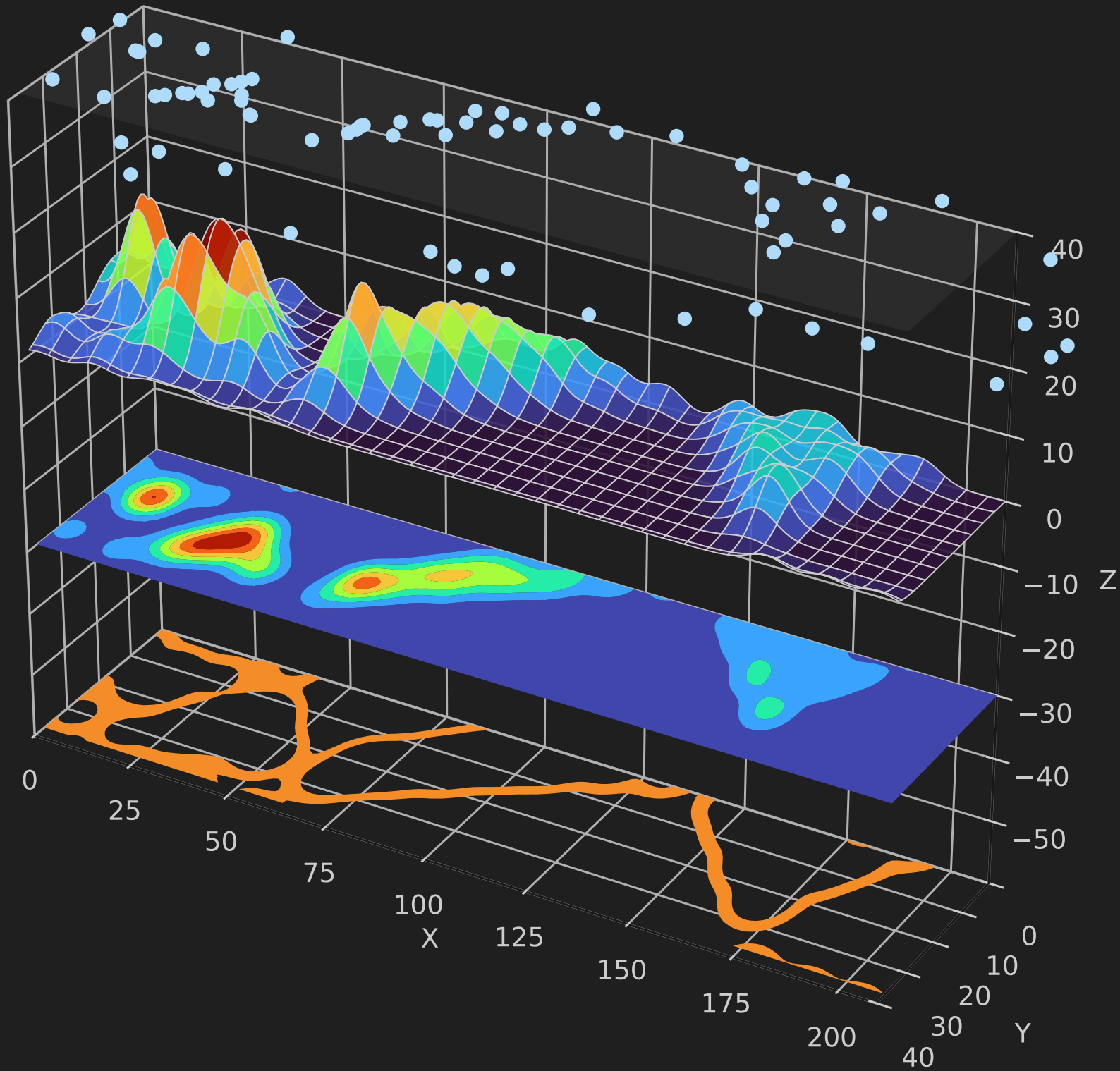
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.92 Shift = 1.78 Iteration = 160



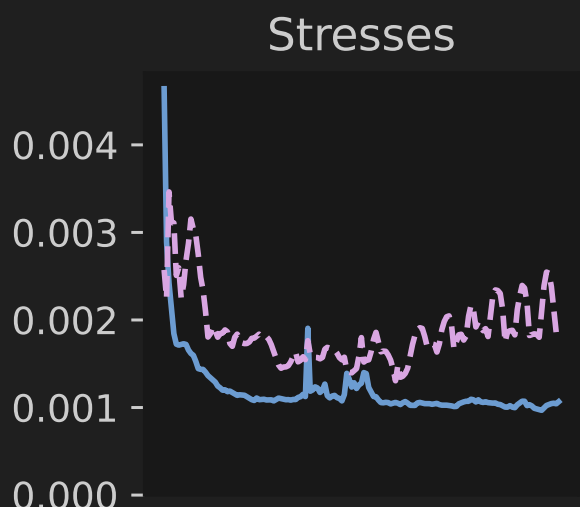
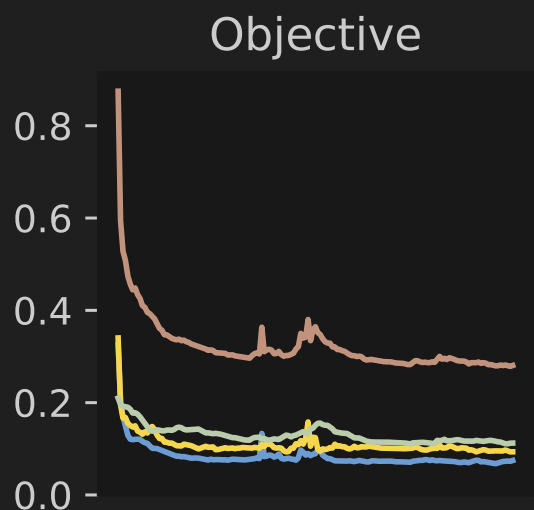
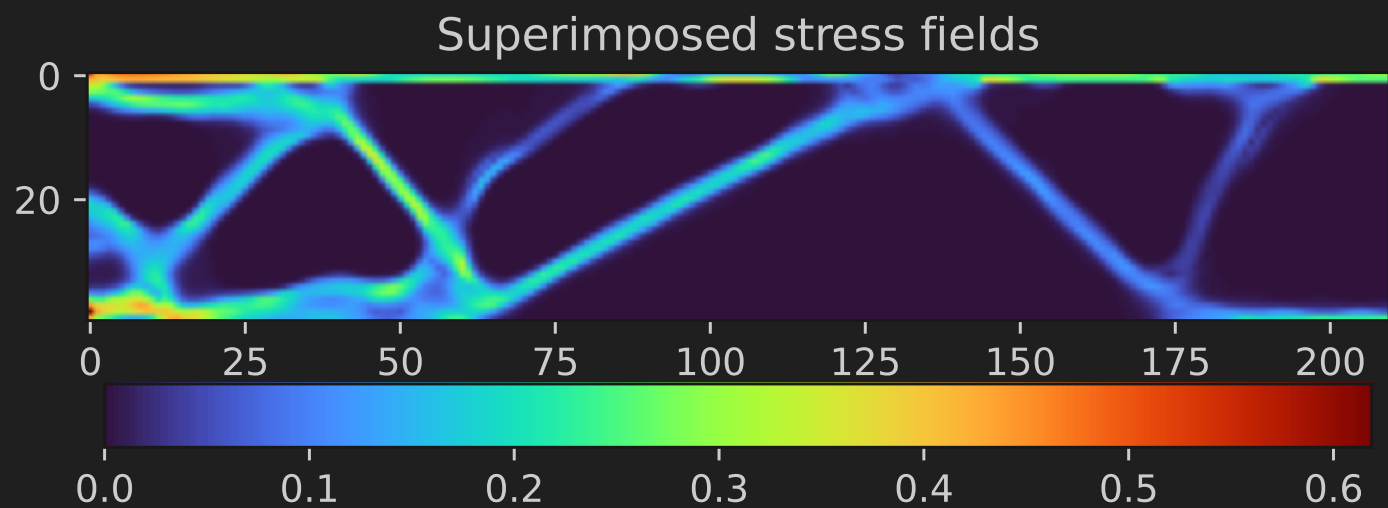
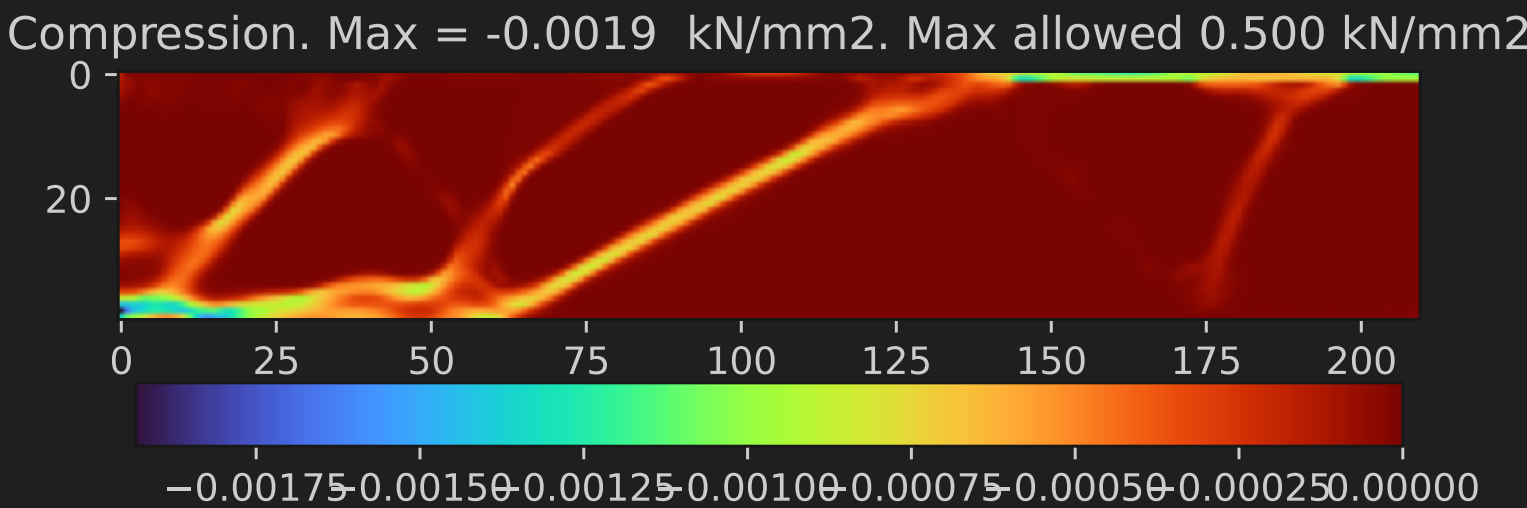
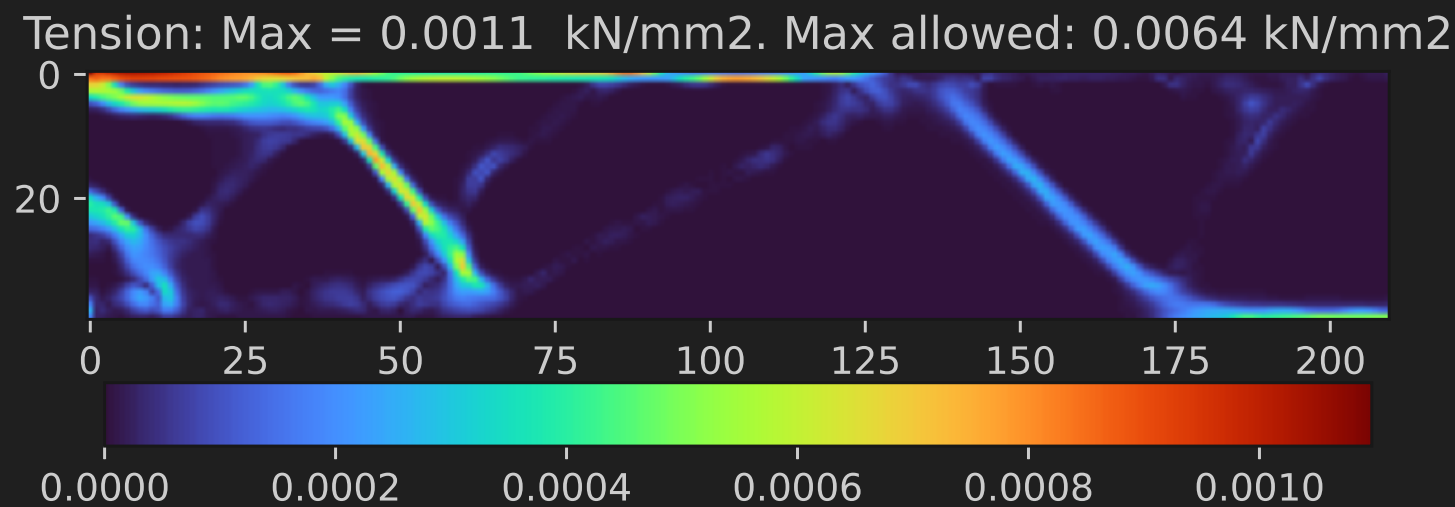
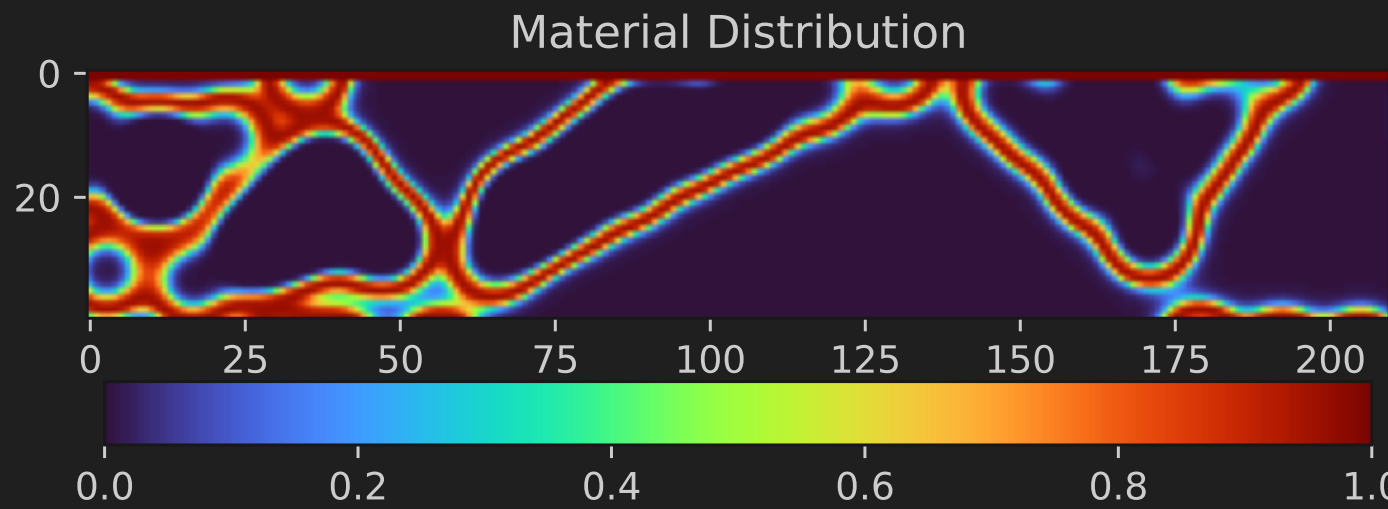
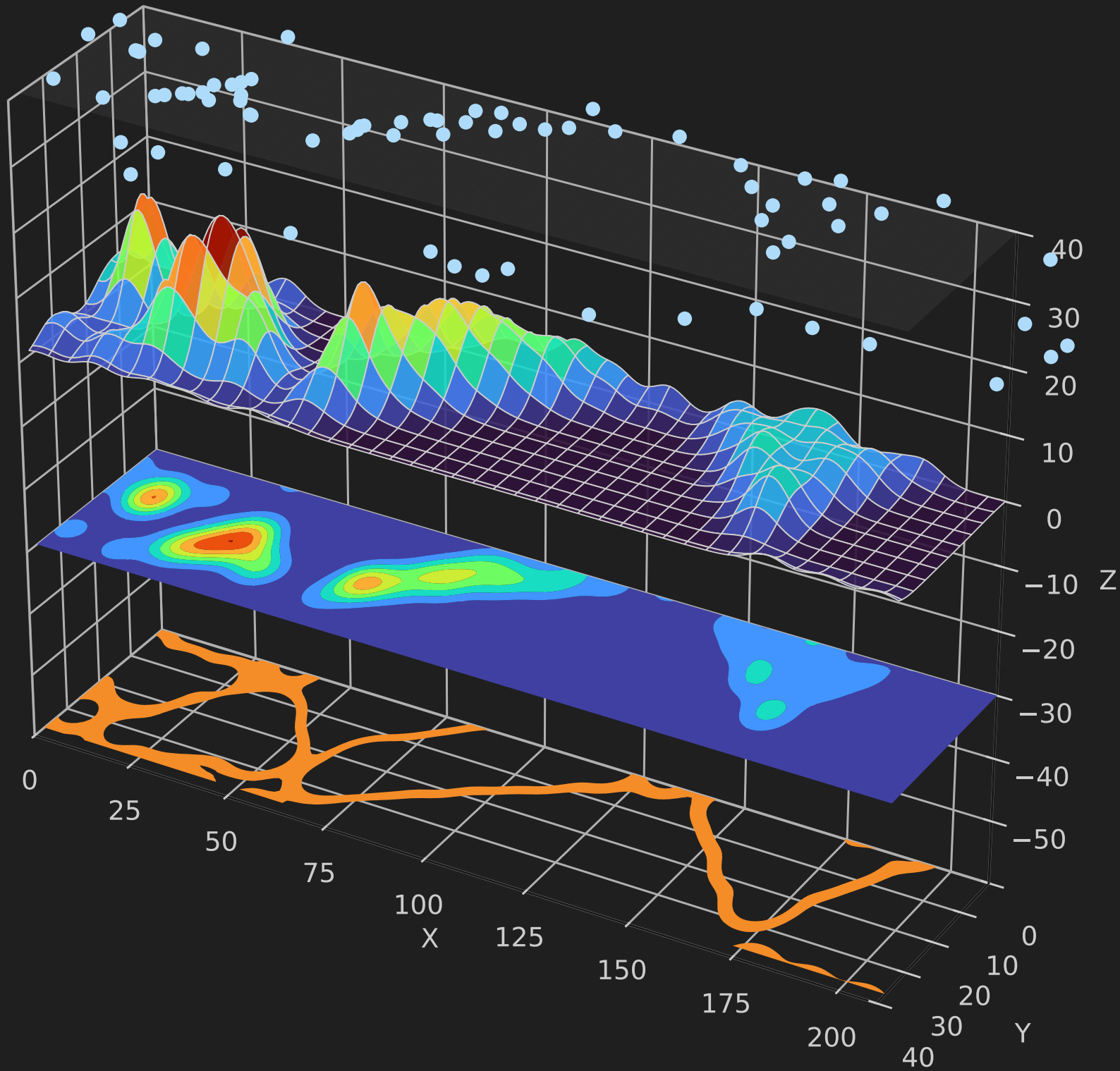
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 5.92 Shift = 1.76 Iteration = 161



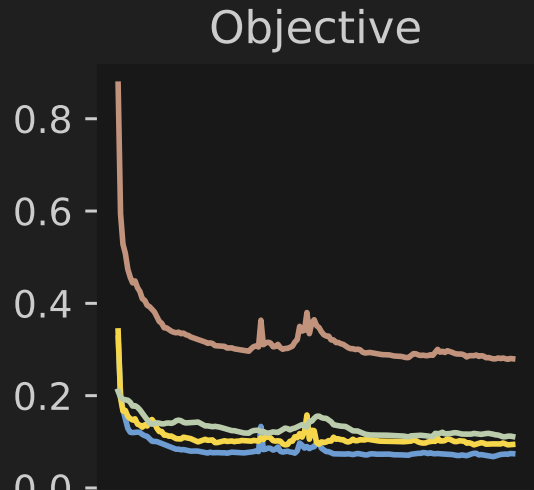
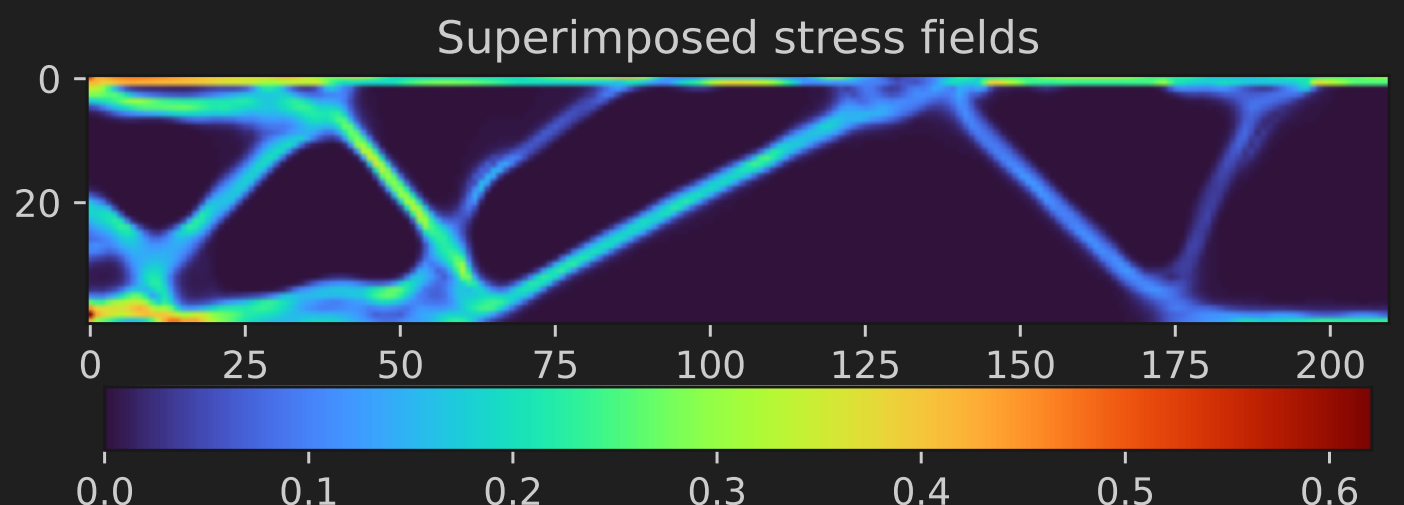
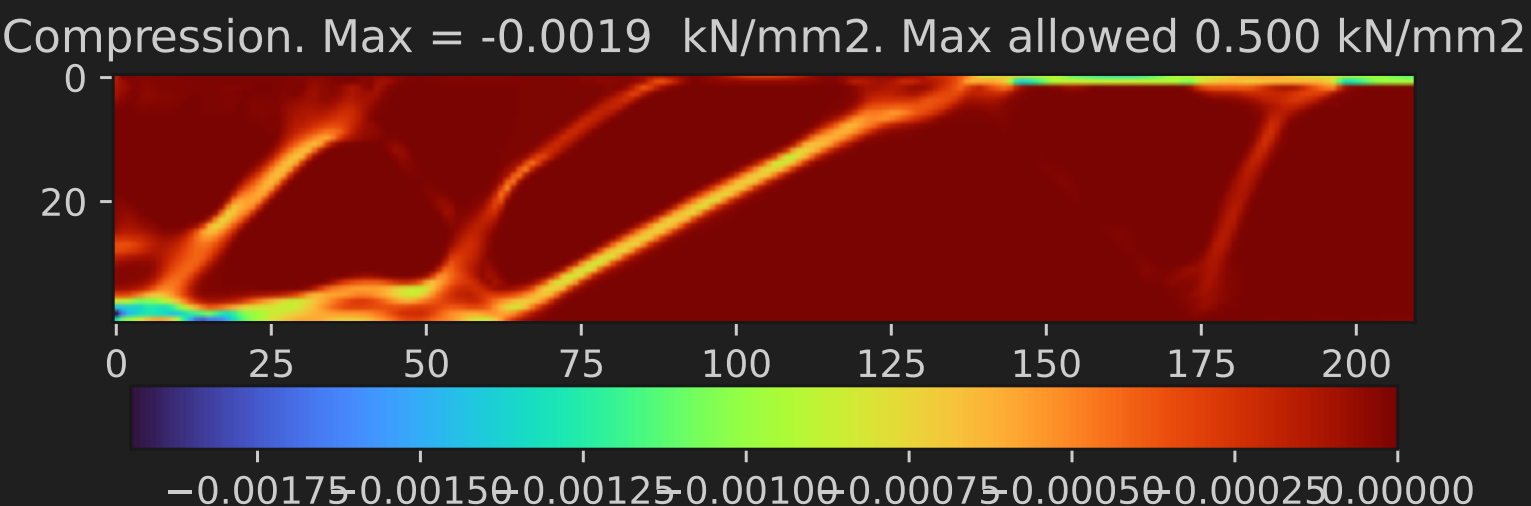
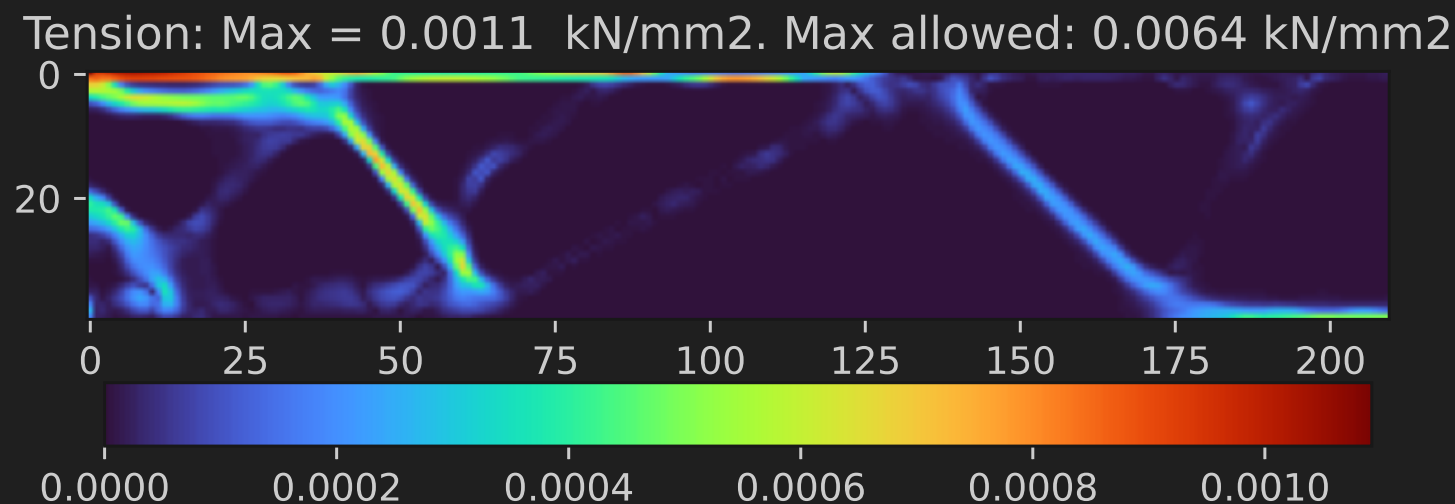
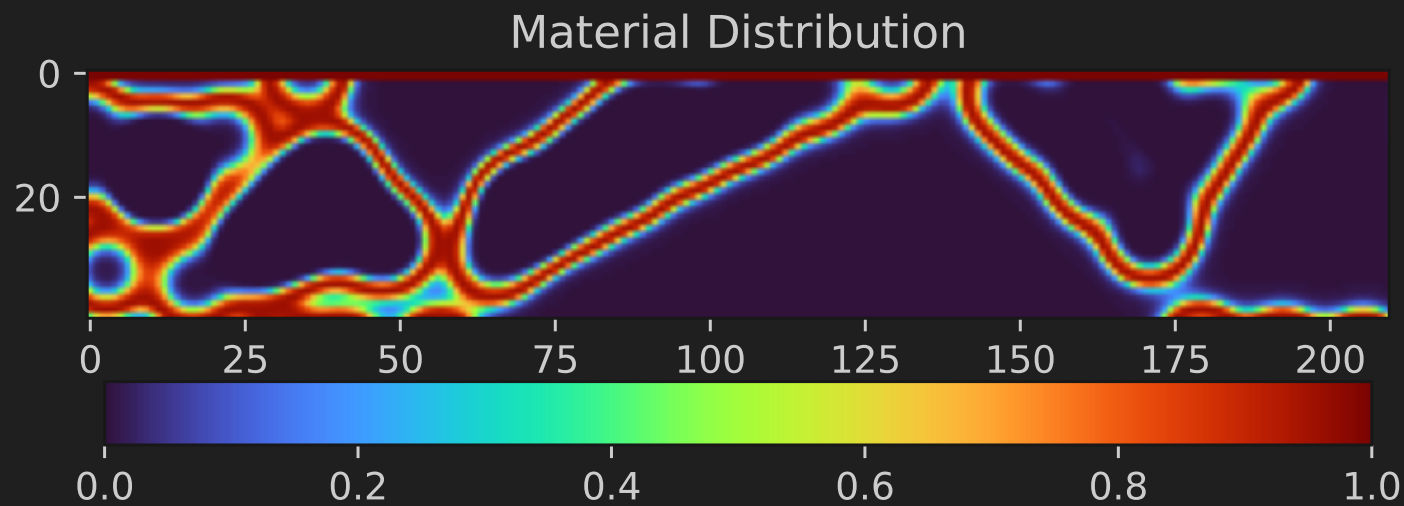
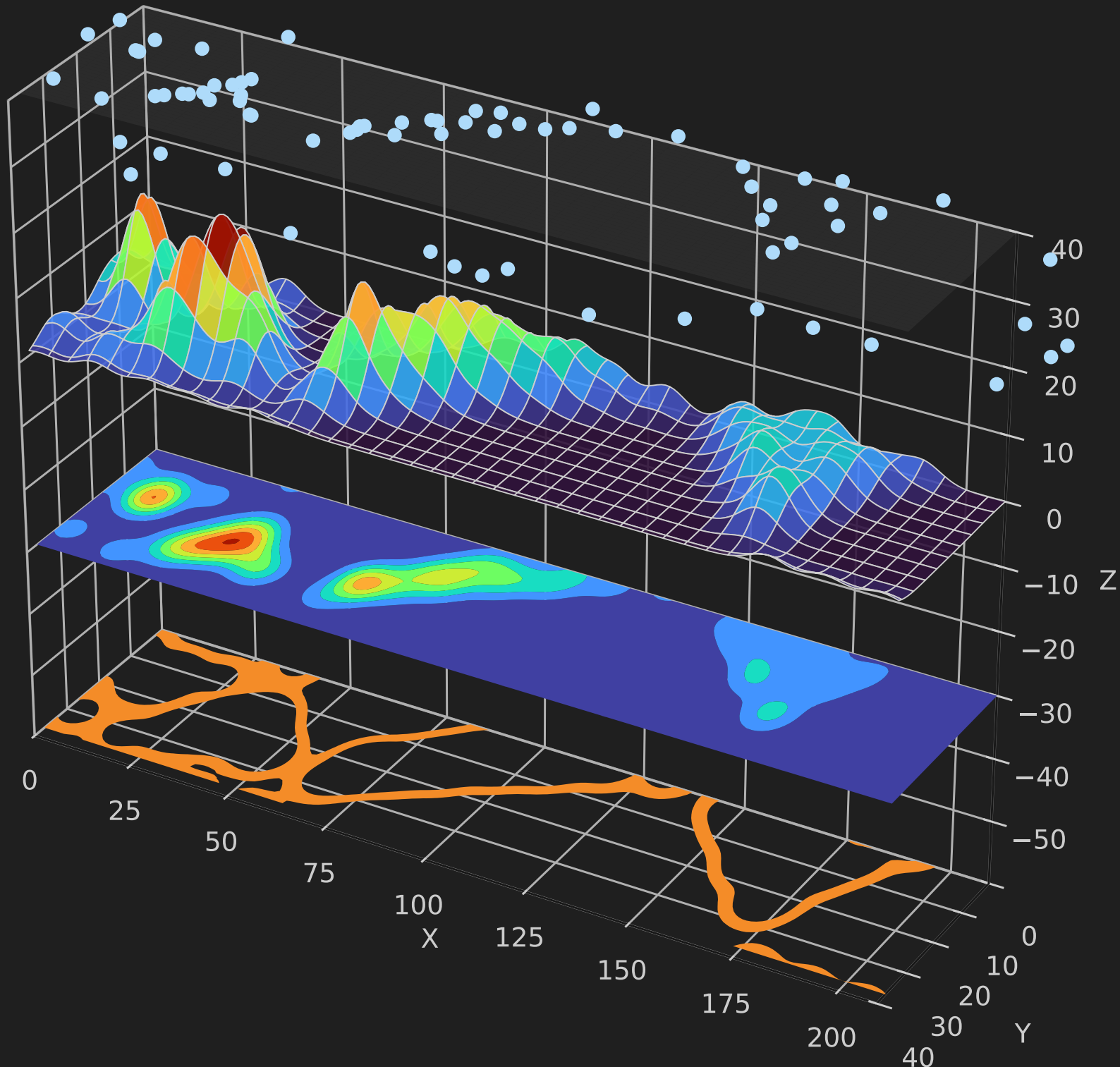
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 5.93 Shift = 1.75 Iteration = 162



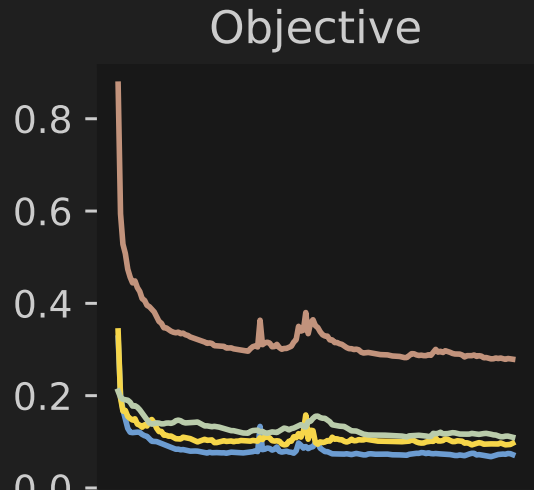
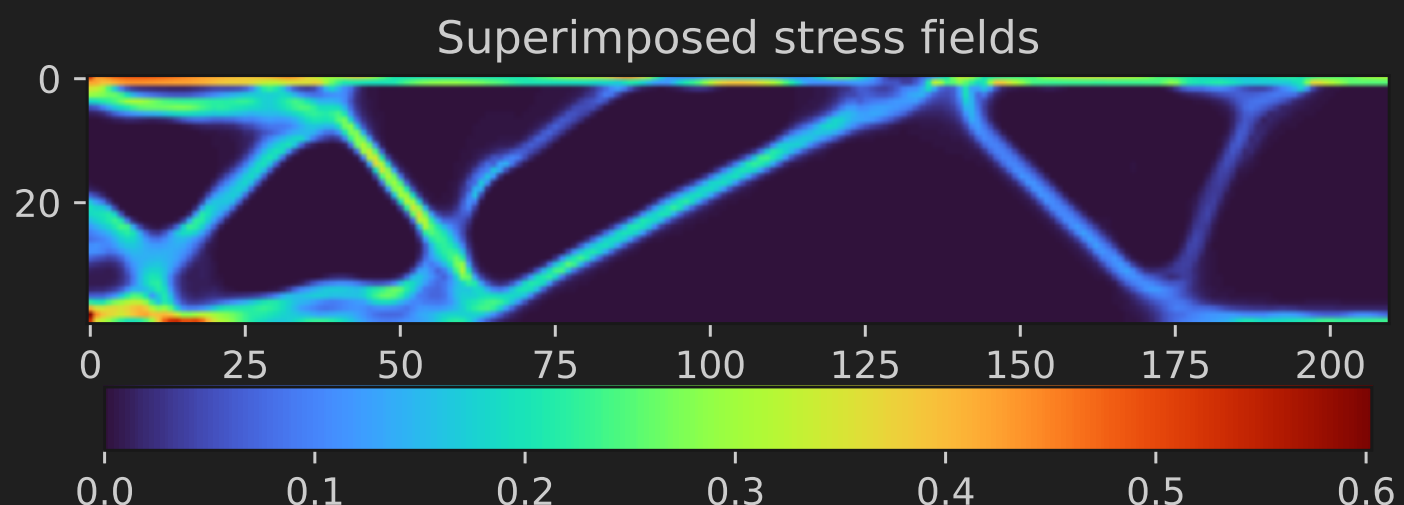
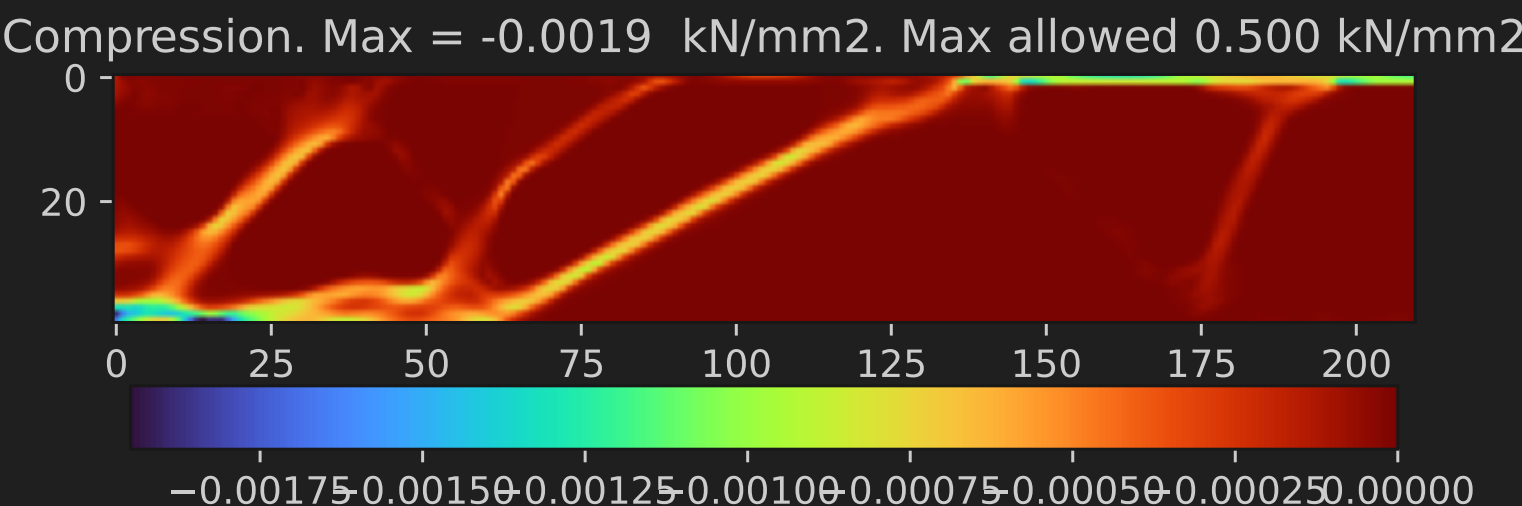
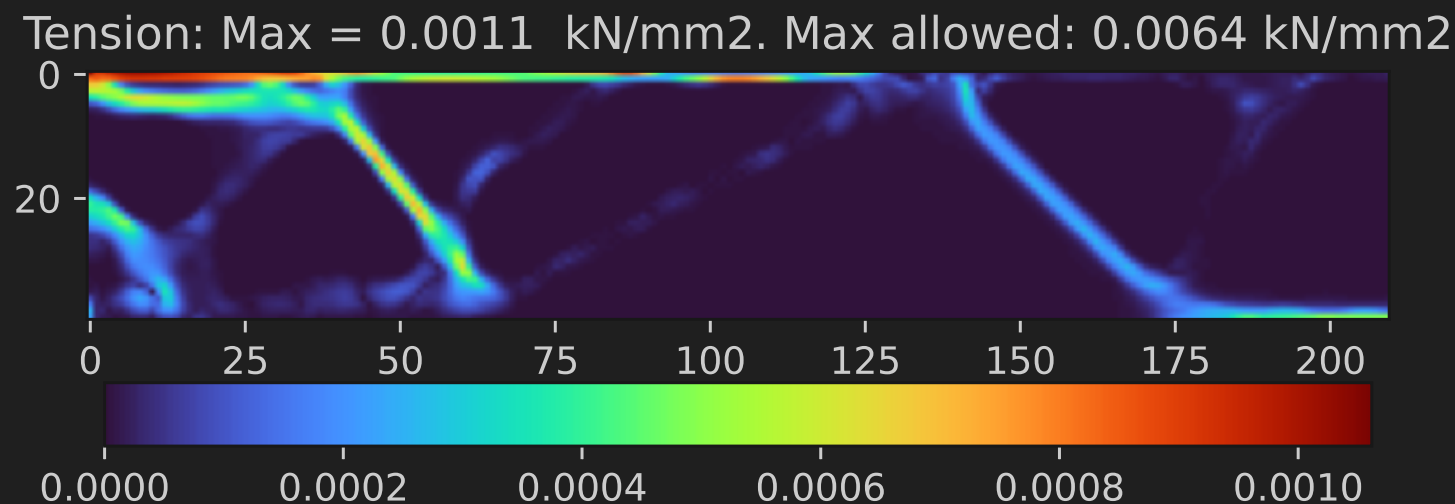
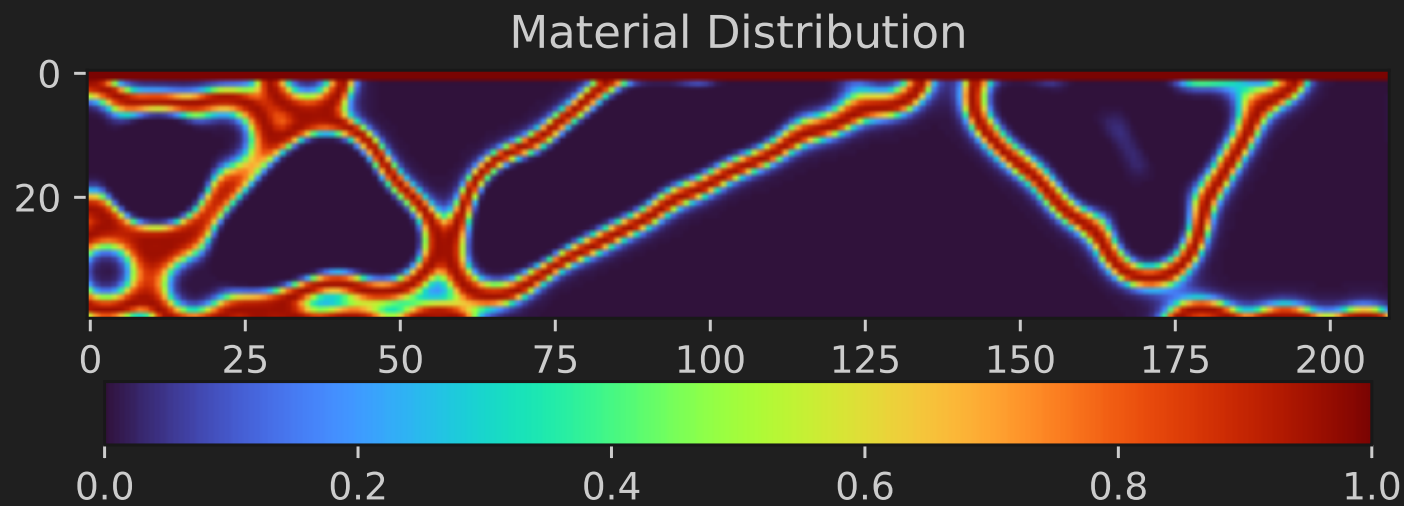
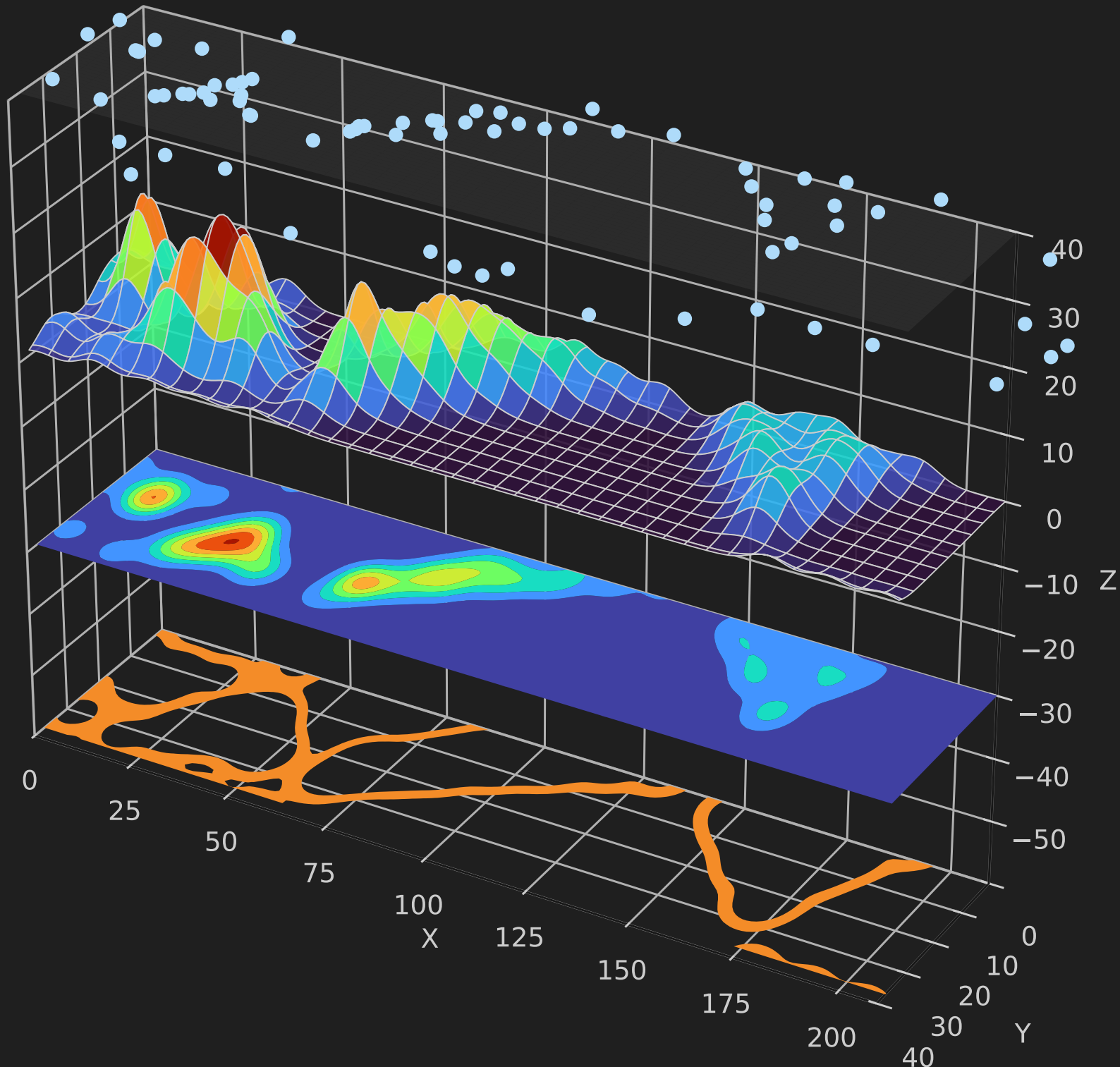
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 5.93 Shift = 1.73 Iteration = 163



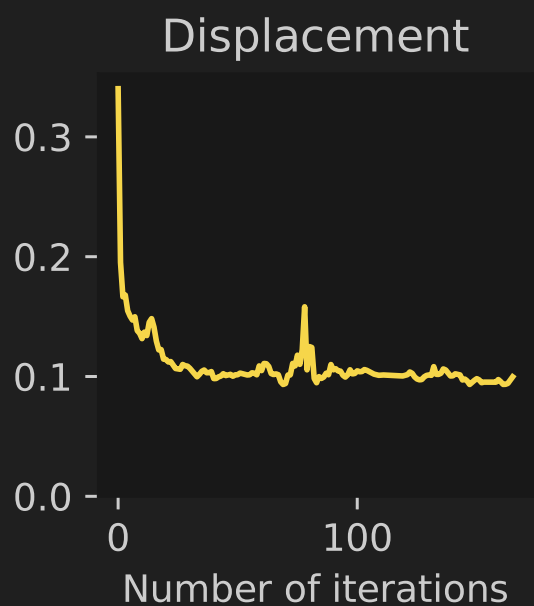
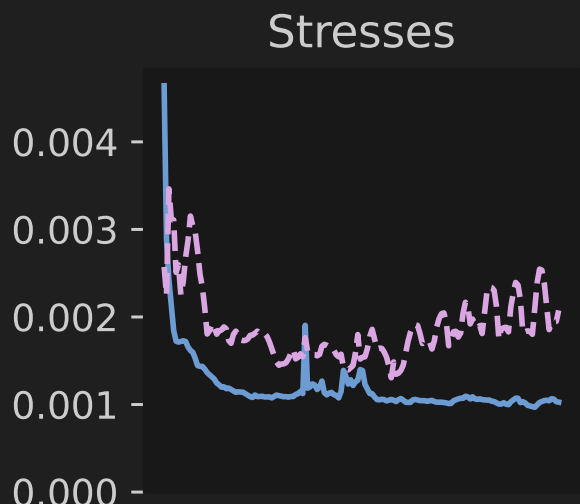
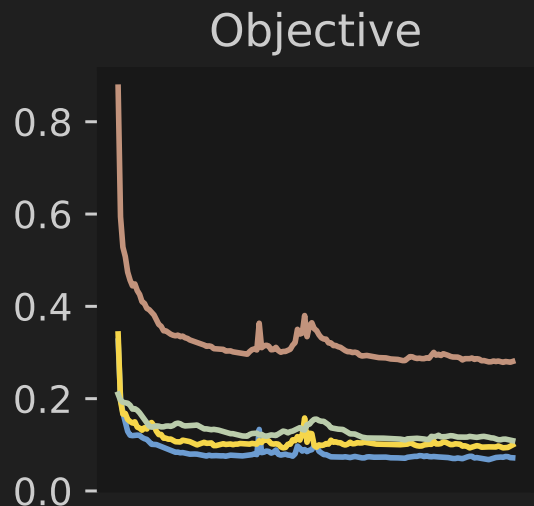
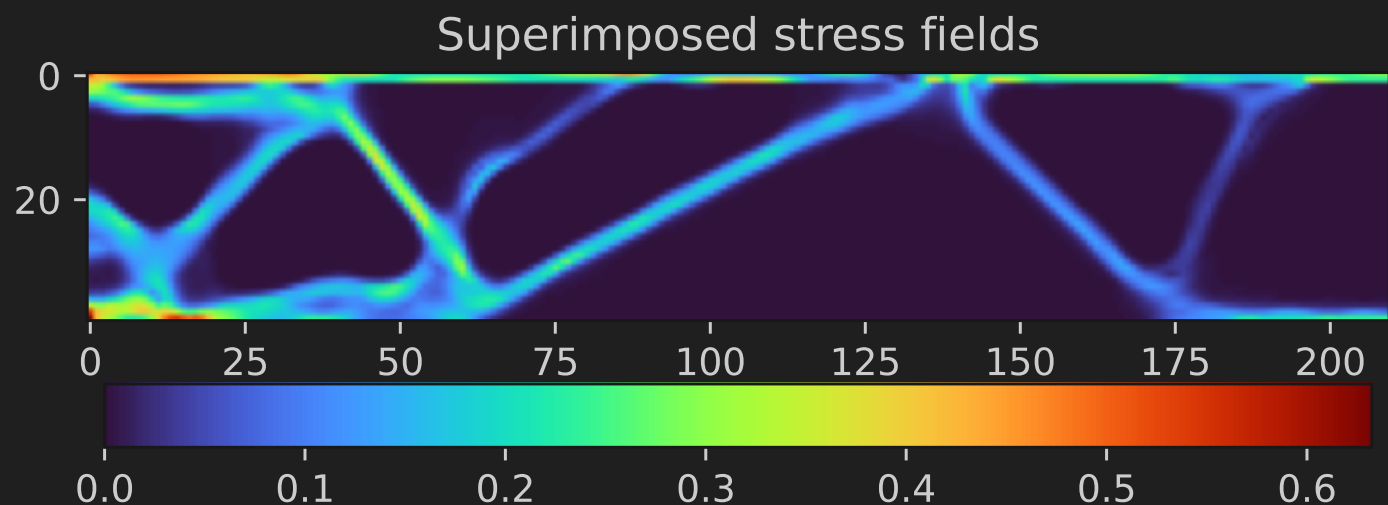
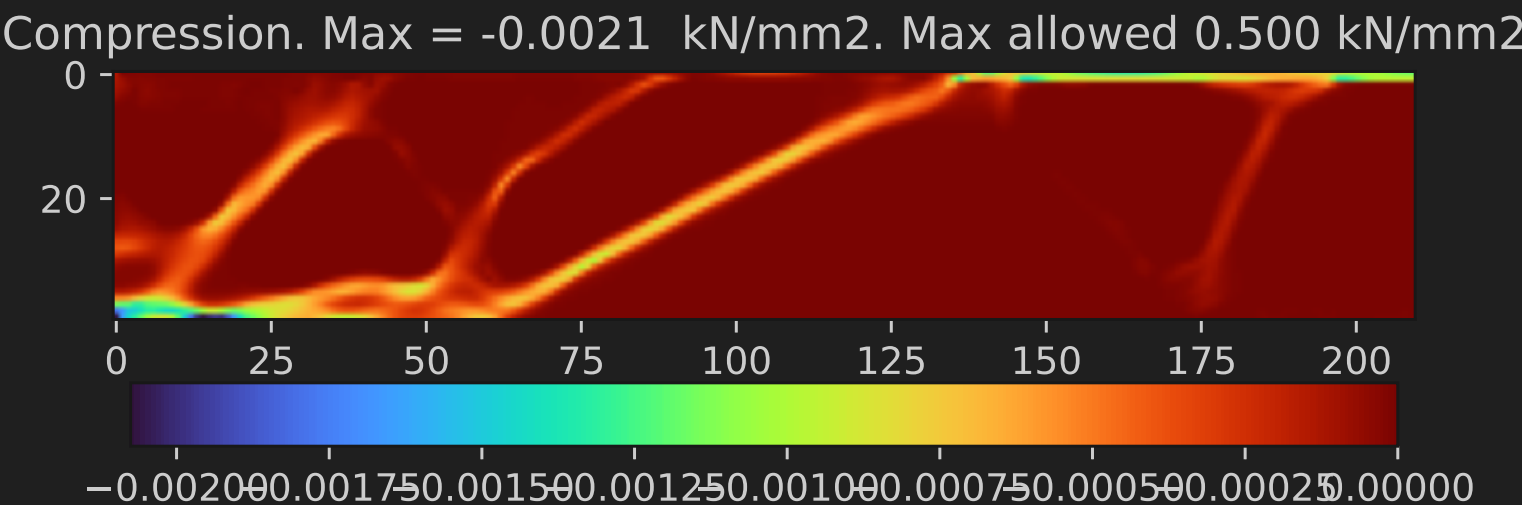
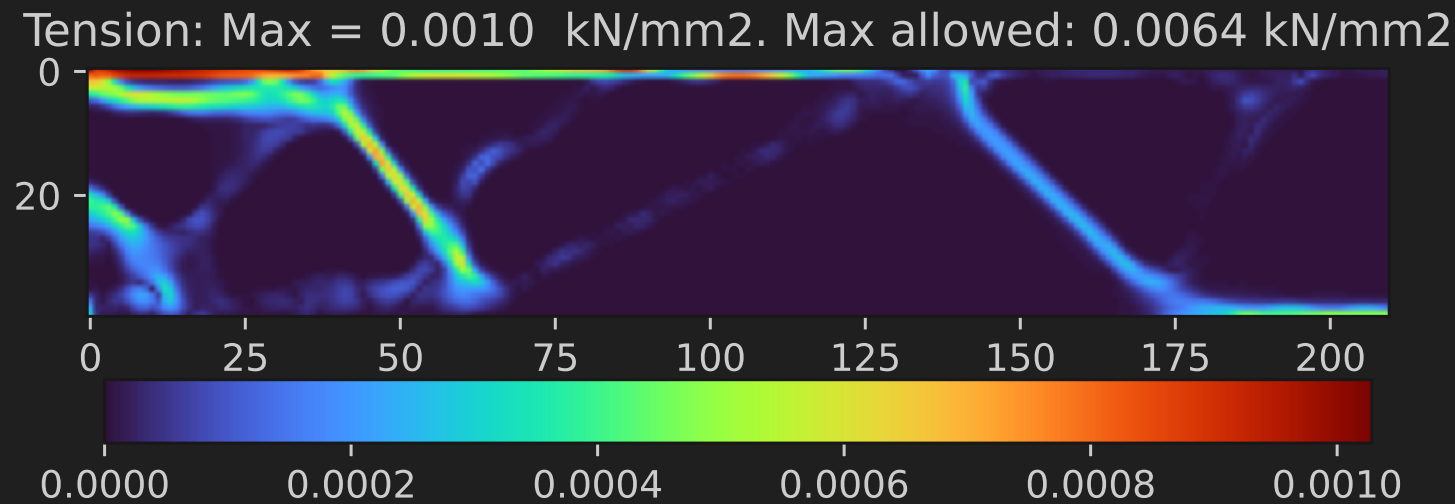
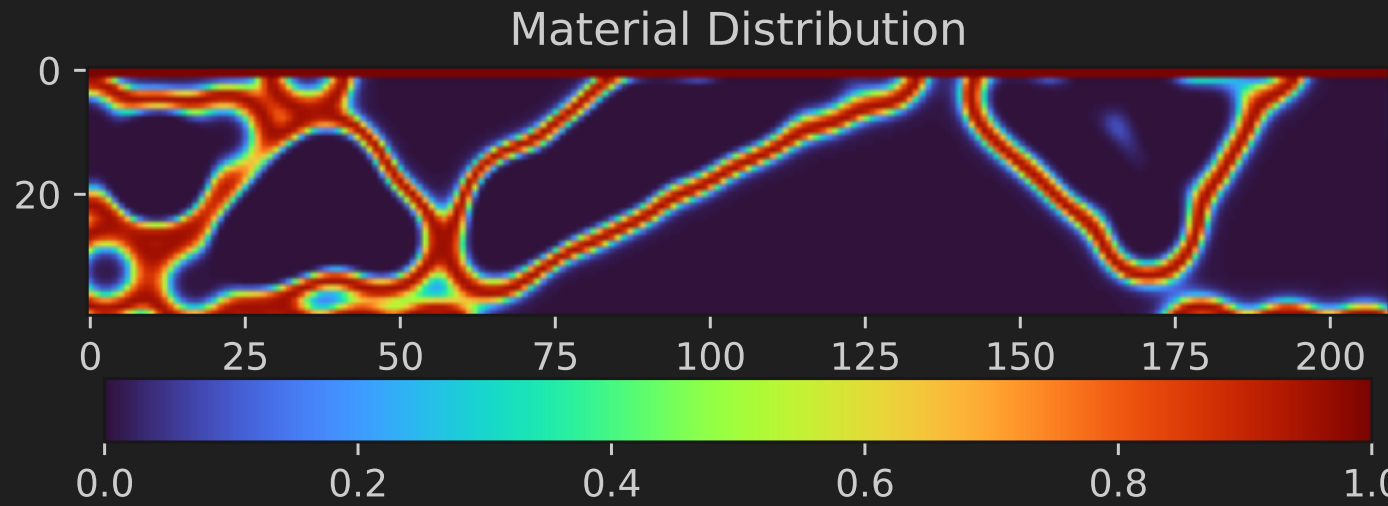
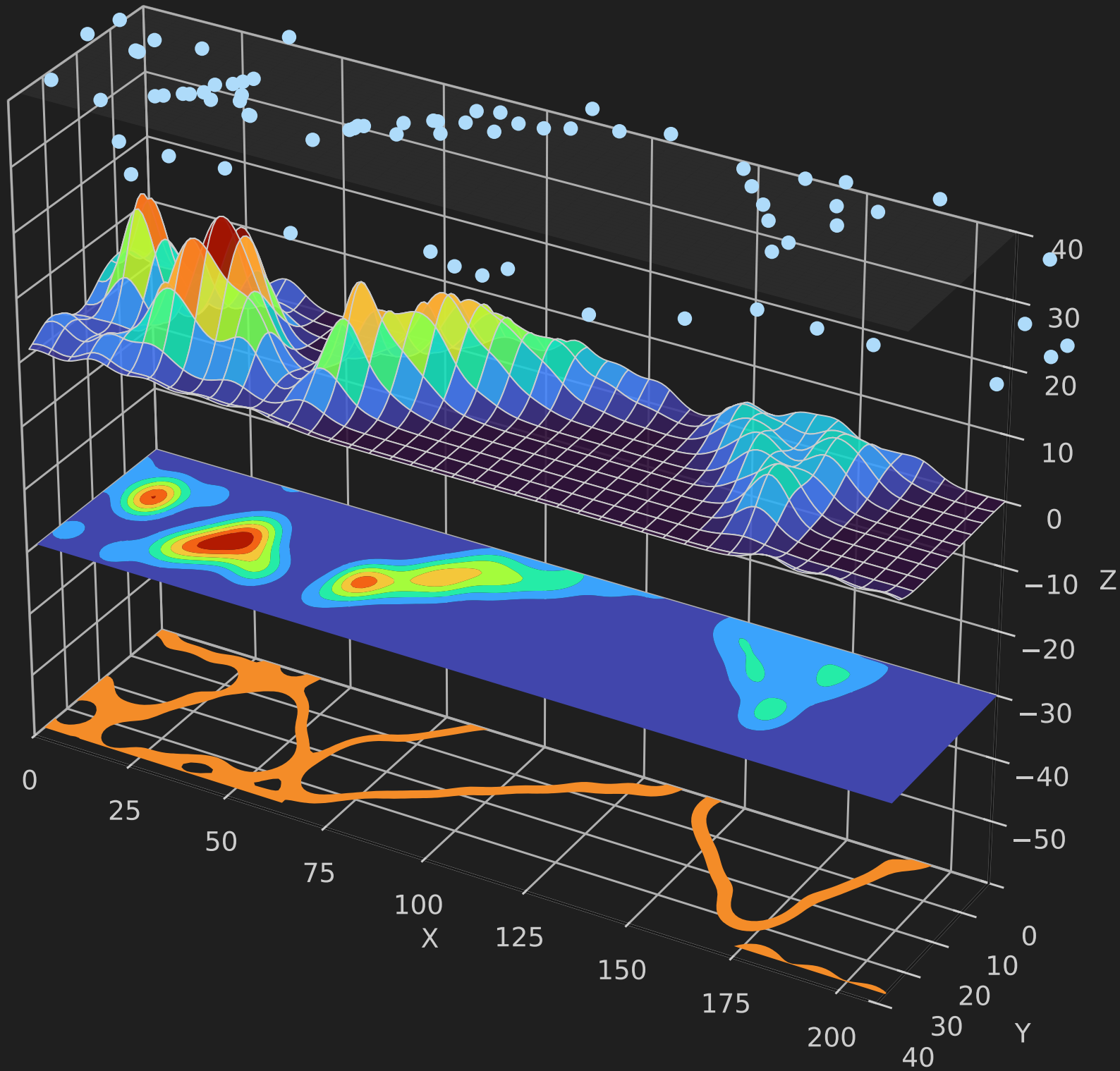
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.93 Shift = 1.71 Iteration = 164



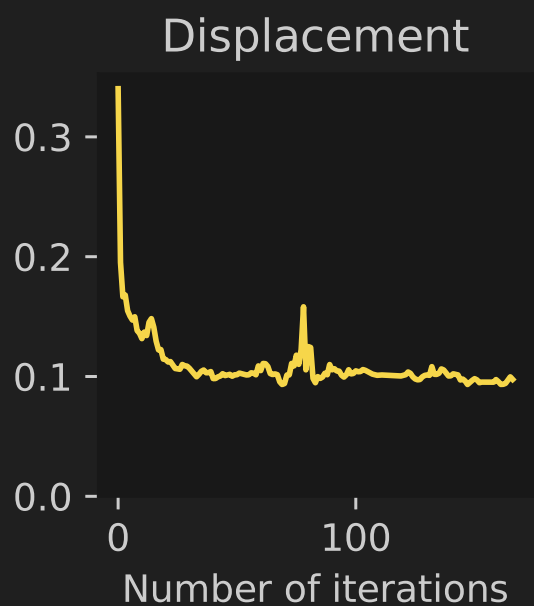
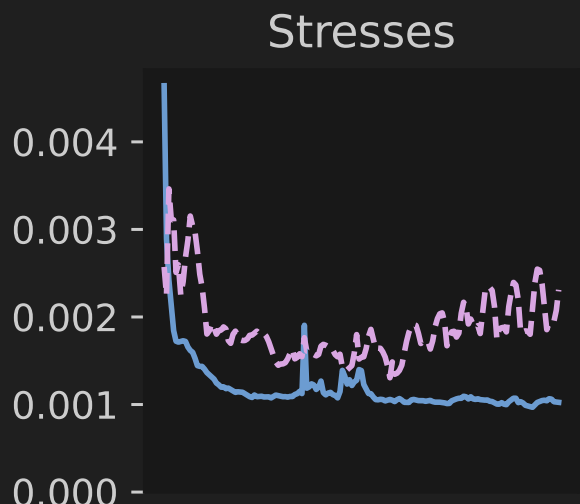
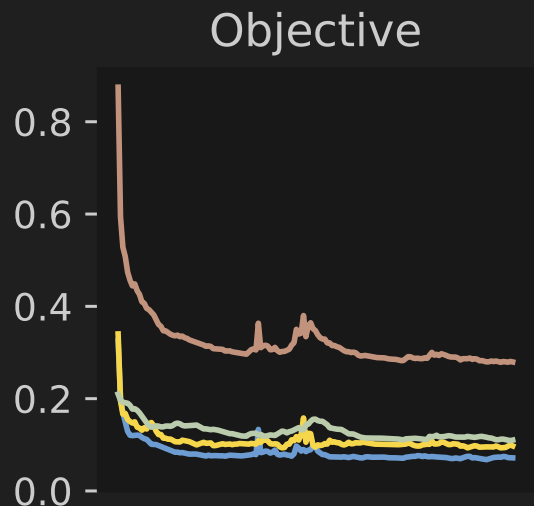
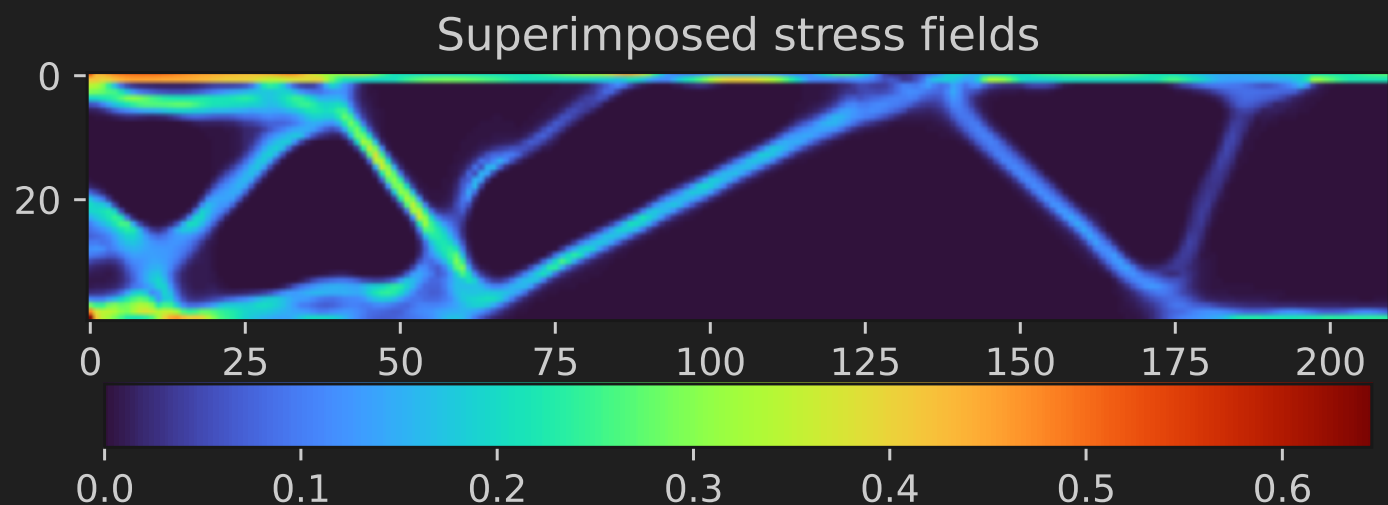
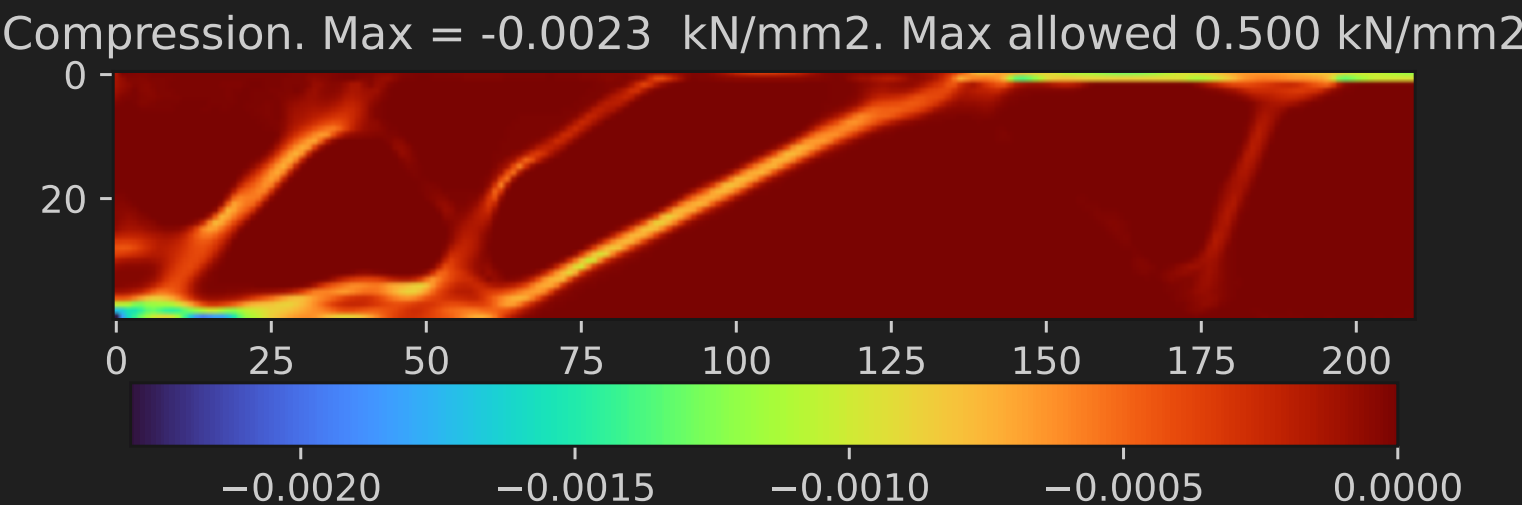
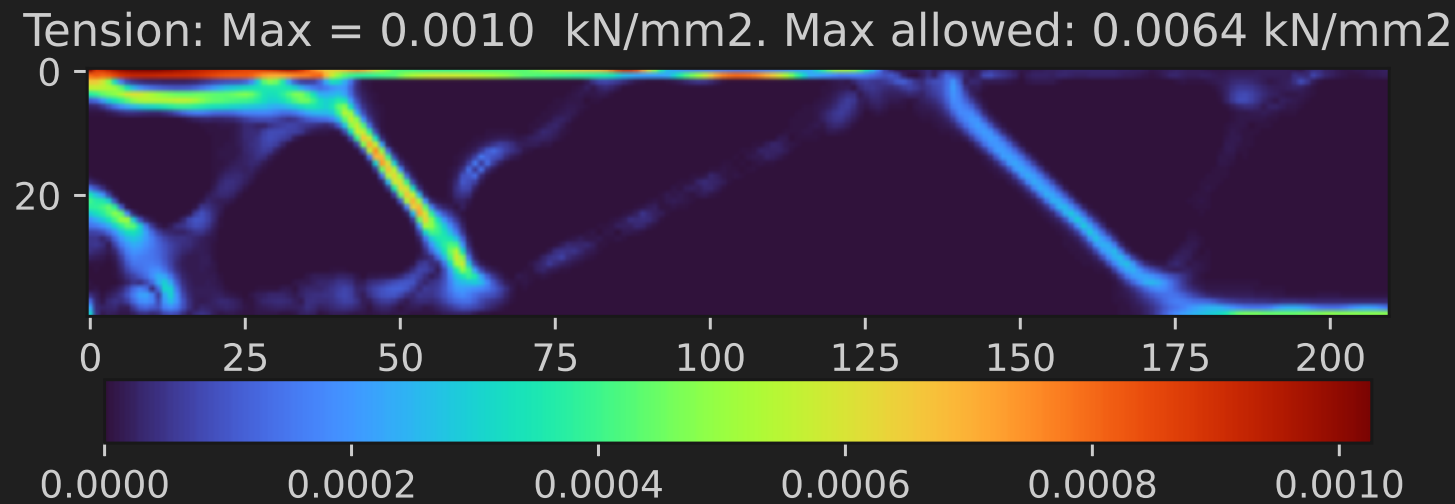
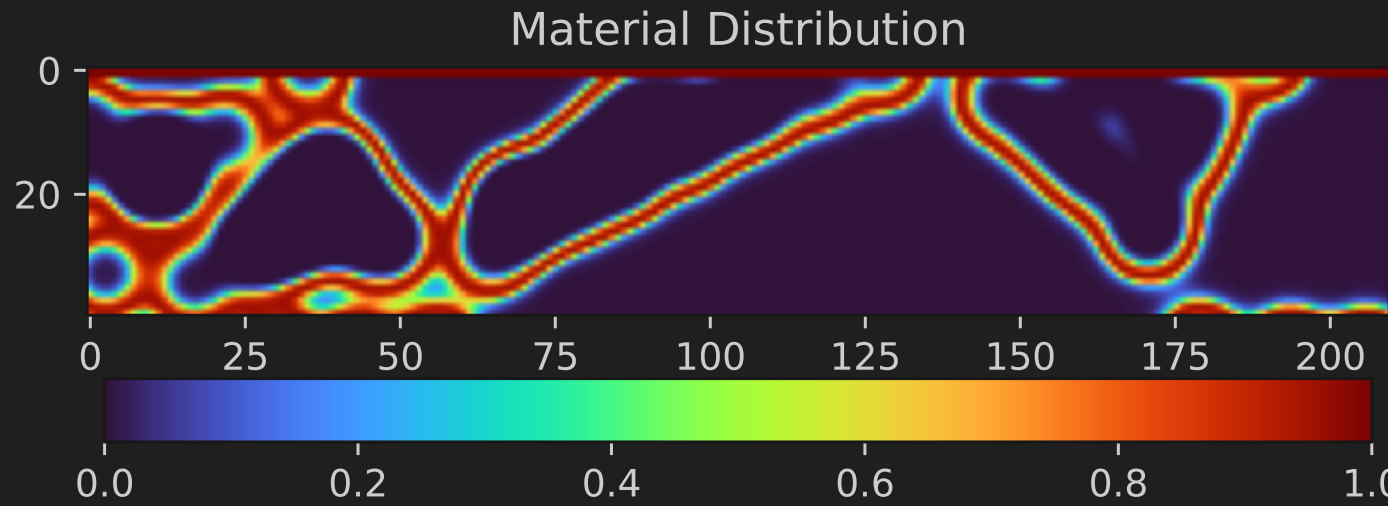
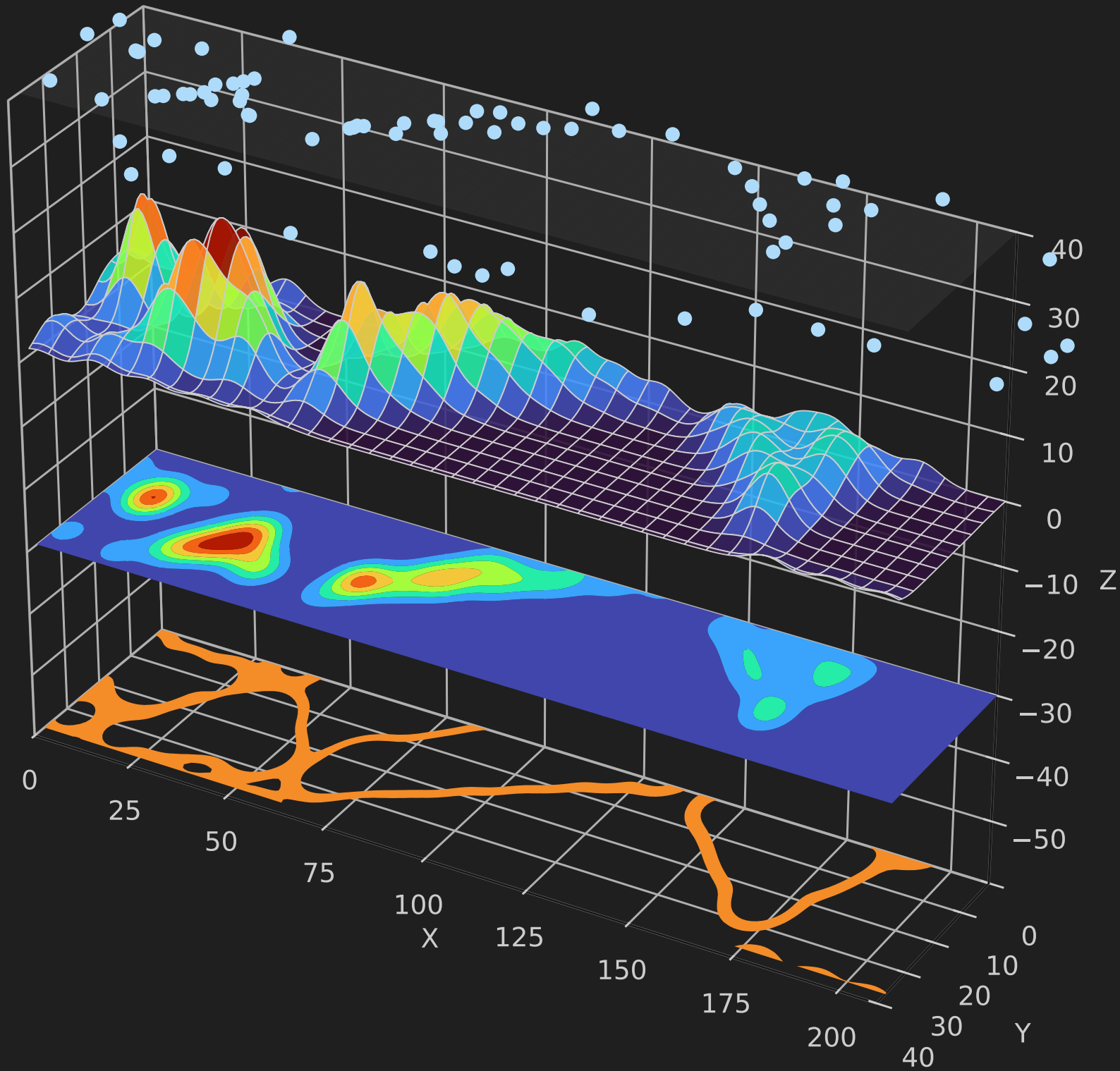
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.93 Shift = 1.70 Iteration = 165



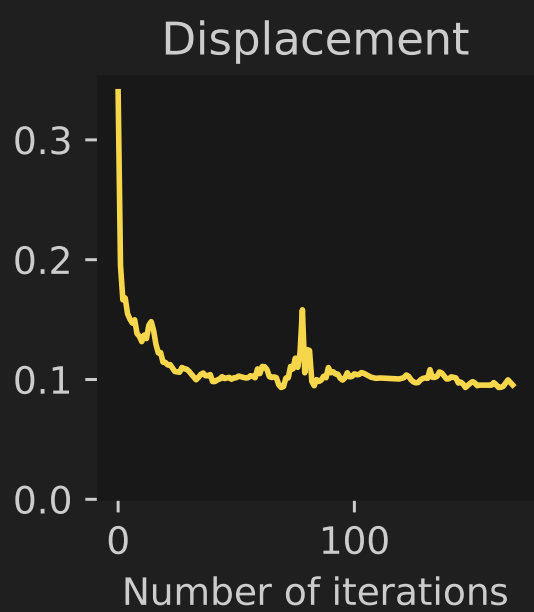
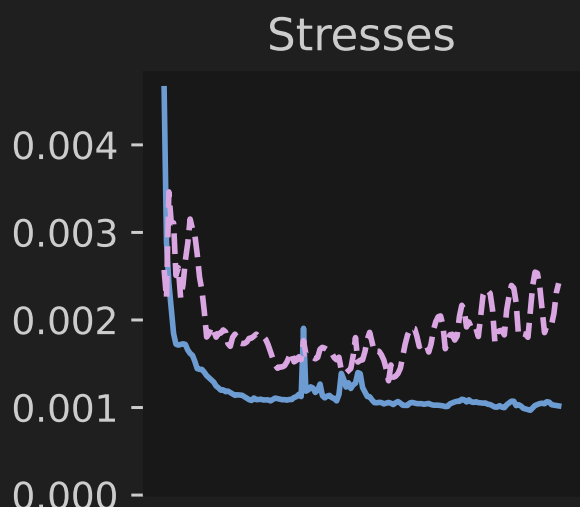
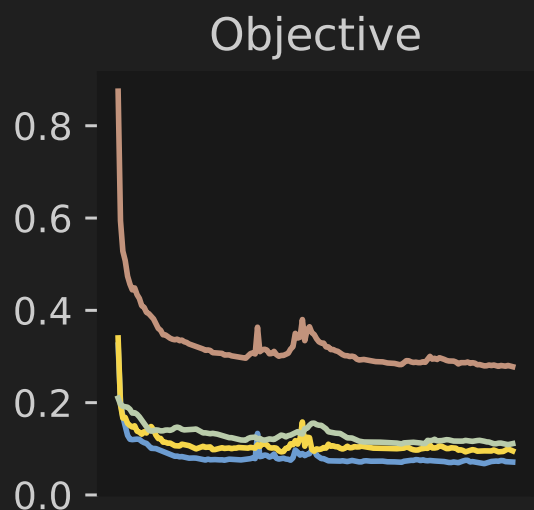
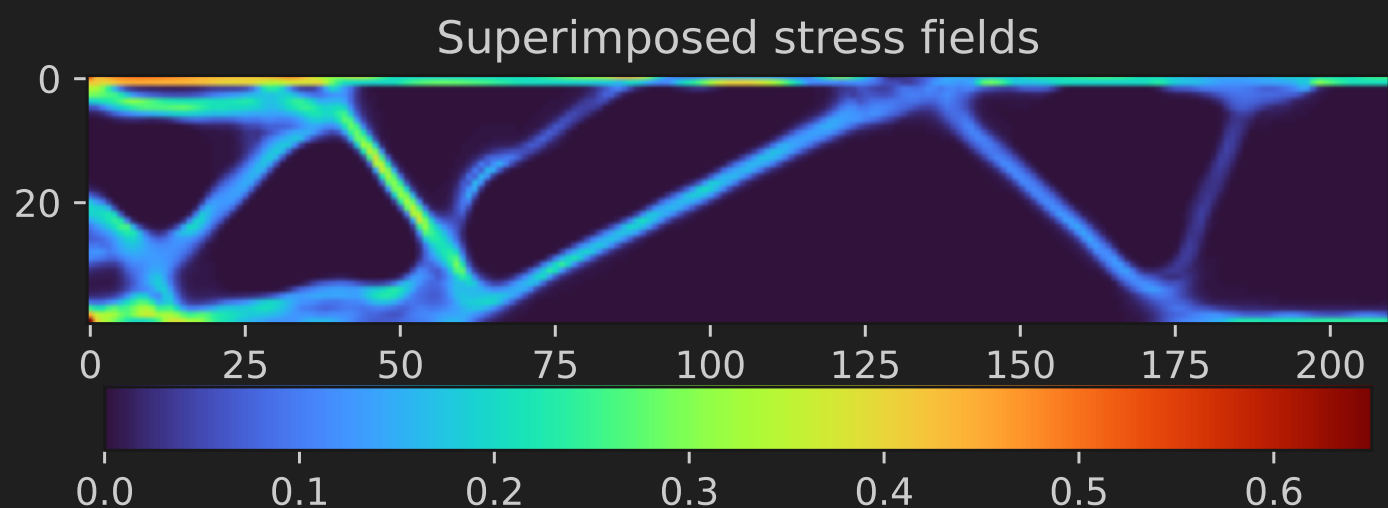
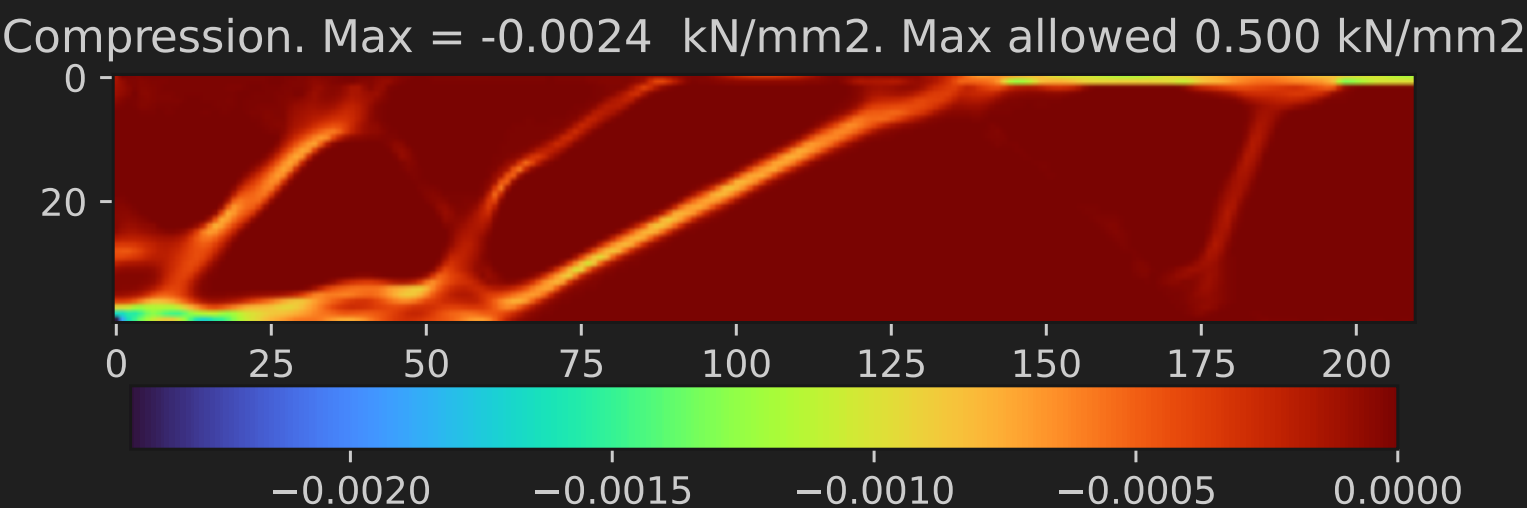
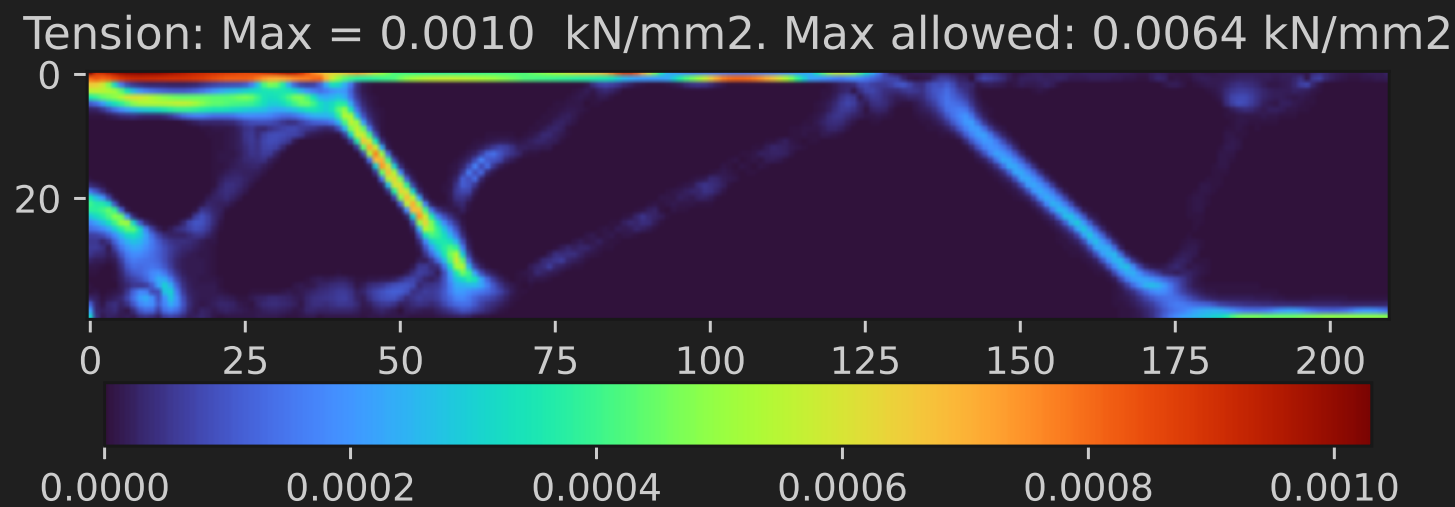
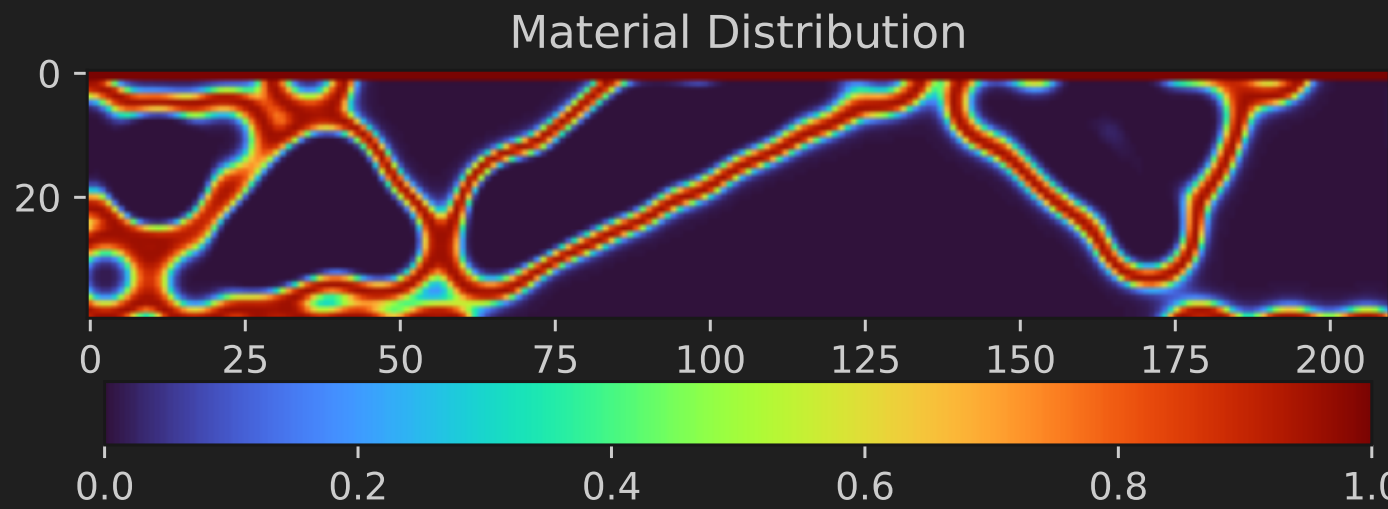
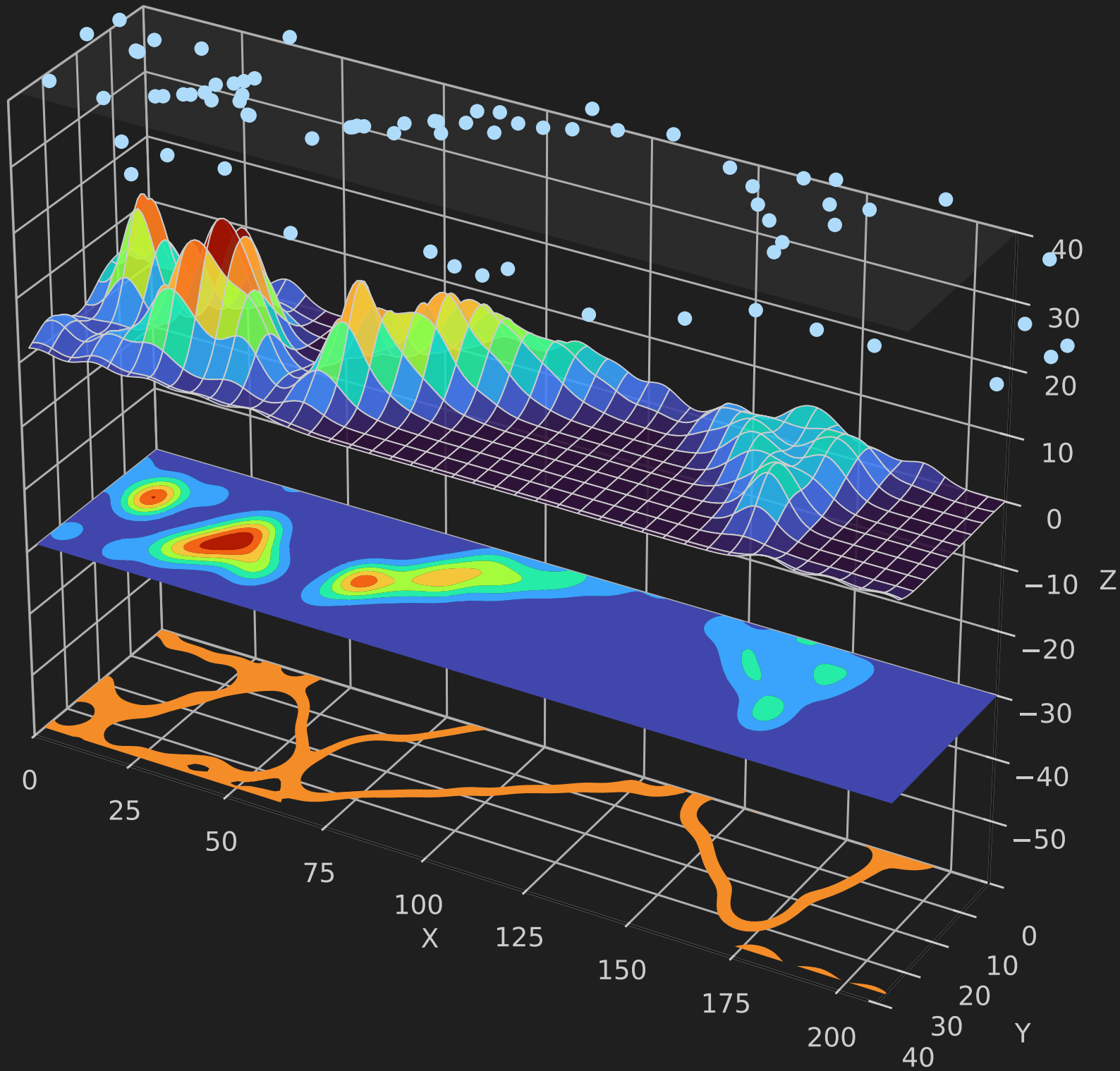
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.92 Shift = 1.71 Iteration = 166



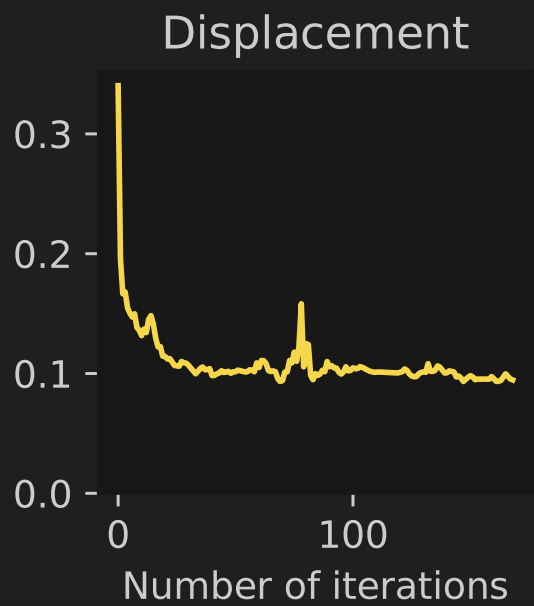
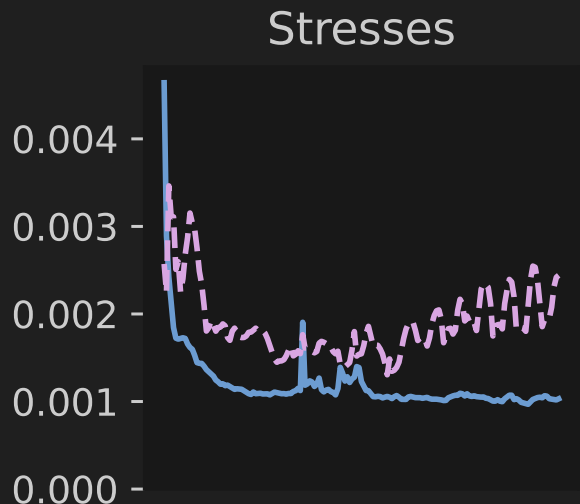
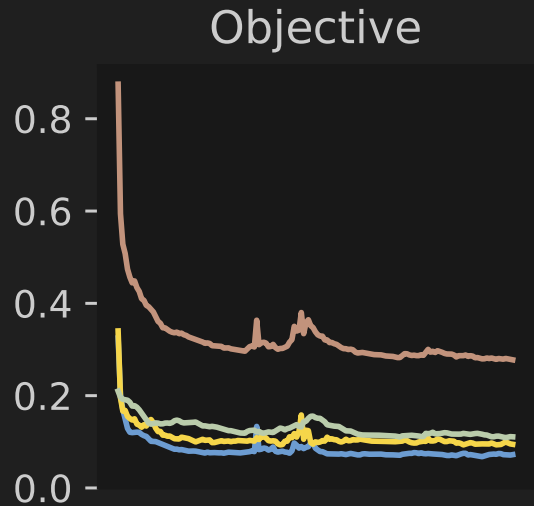
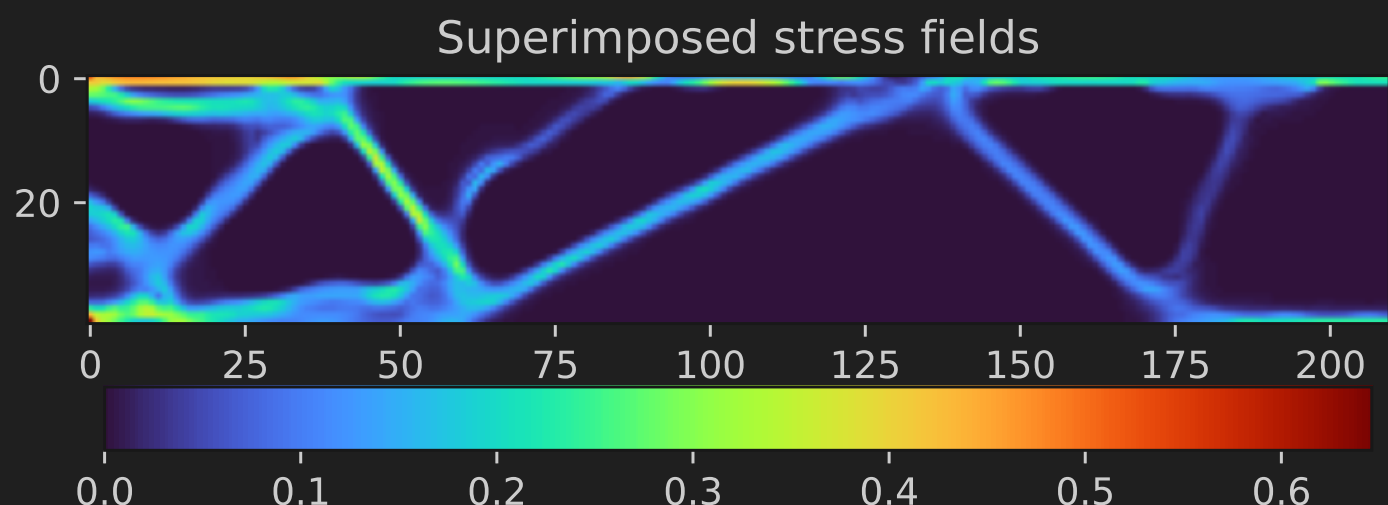
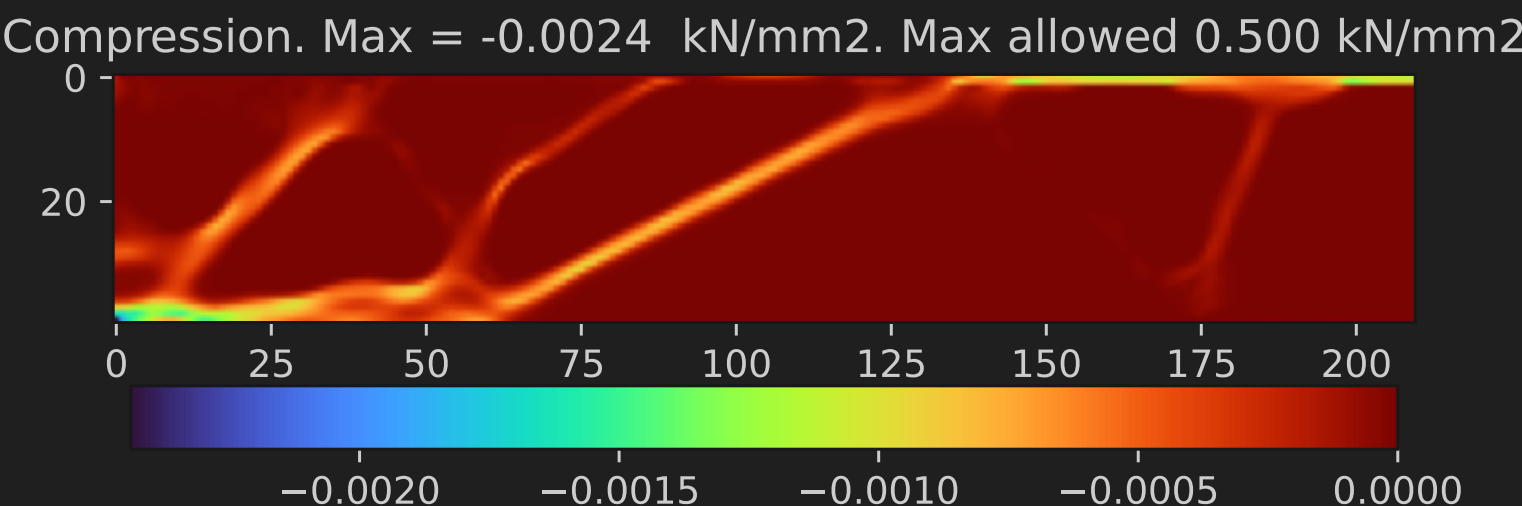
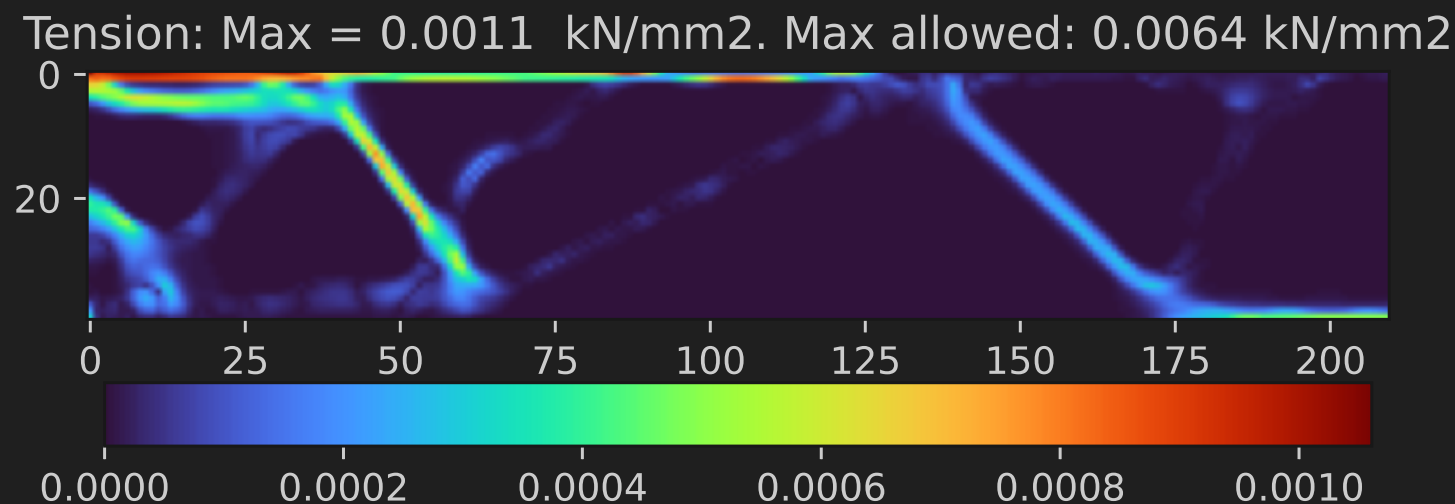
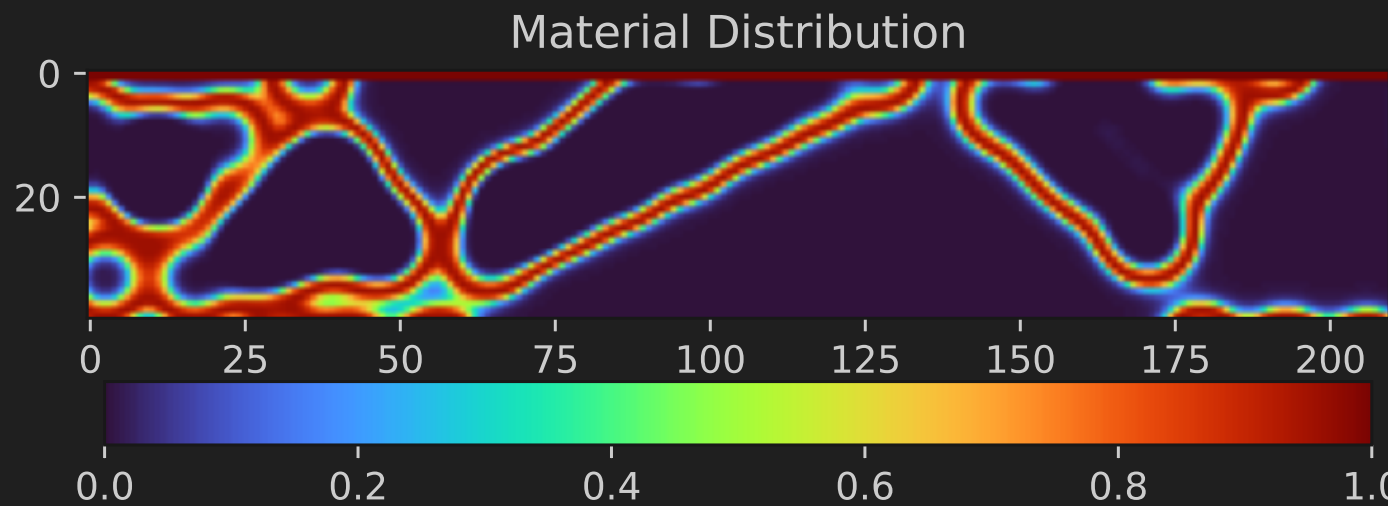
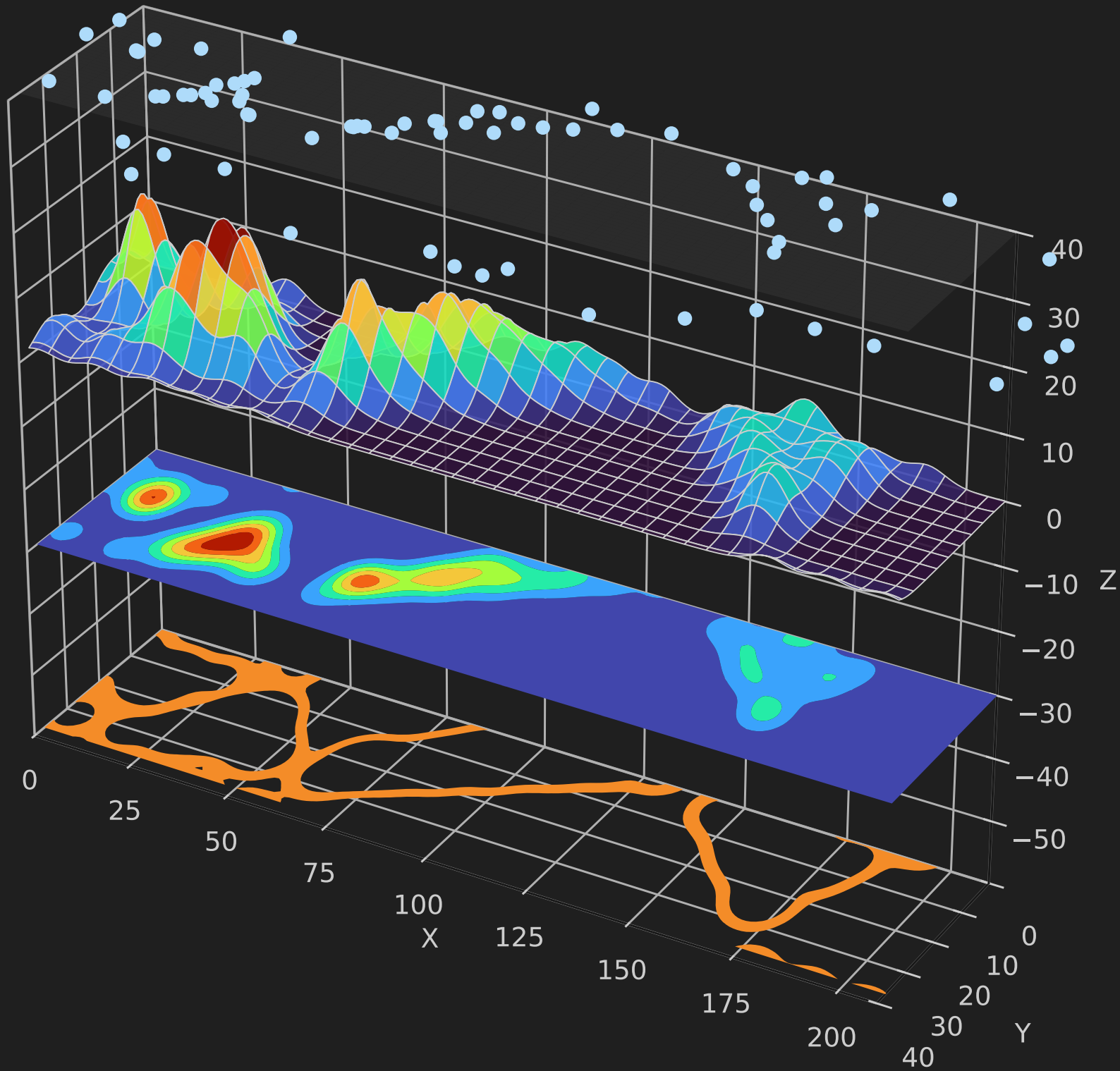
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.92 Shift = 1.72 Iteration = 167



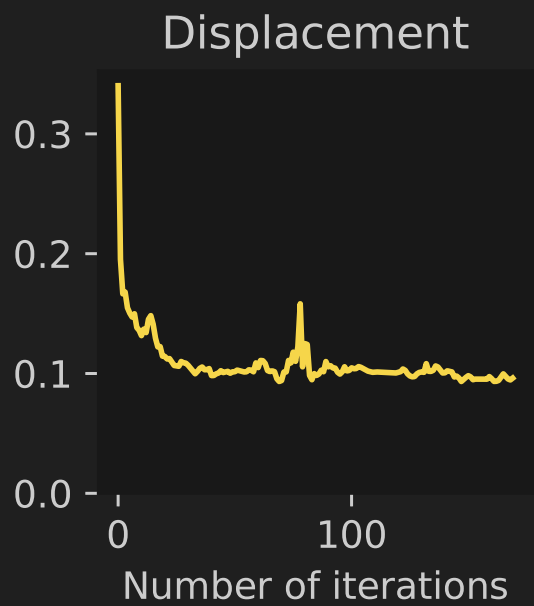
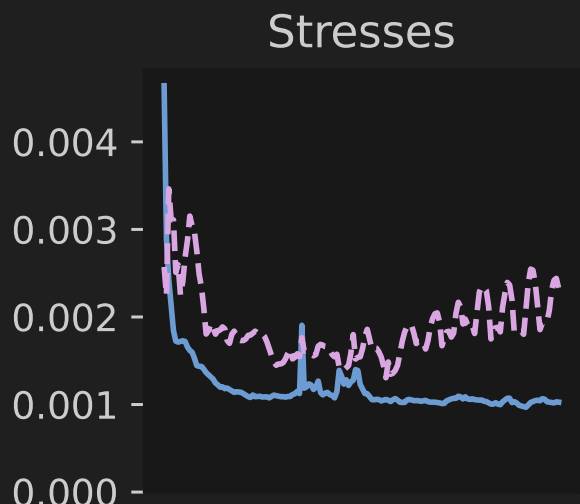
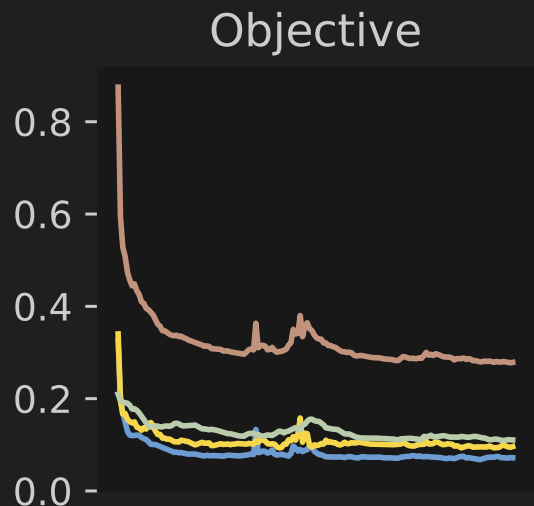
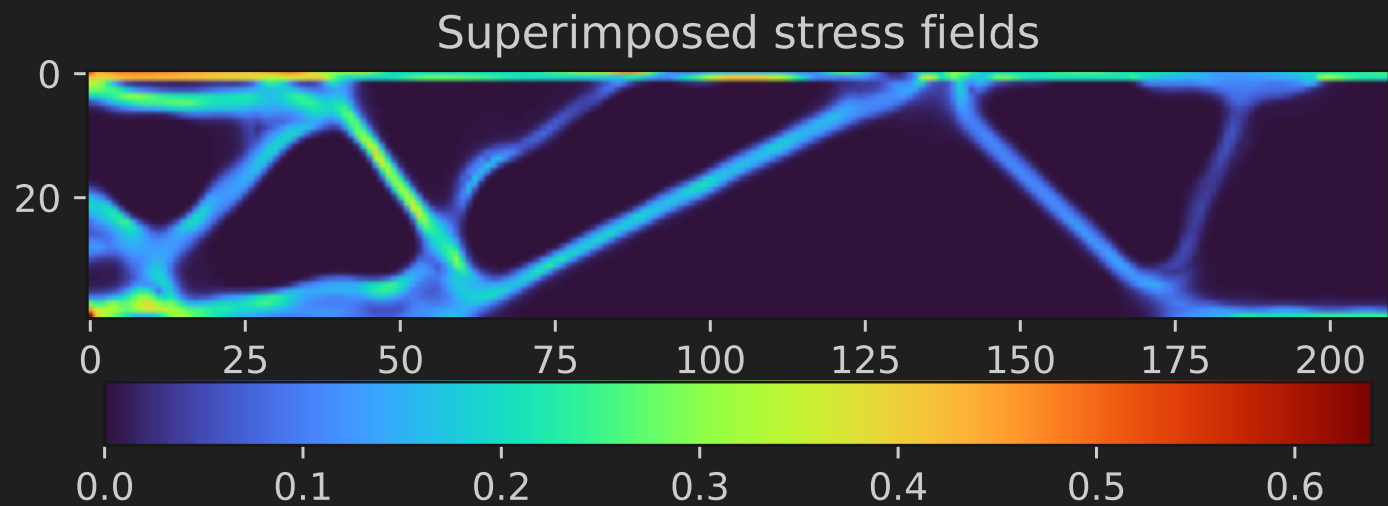
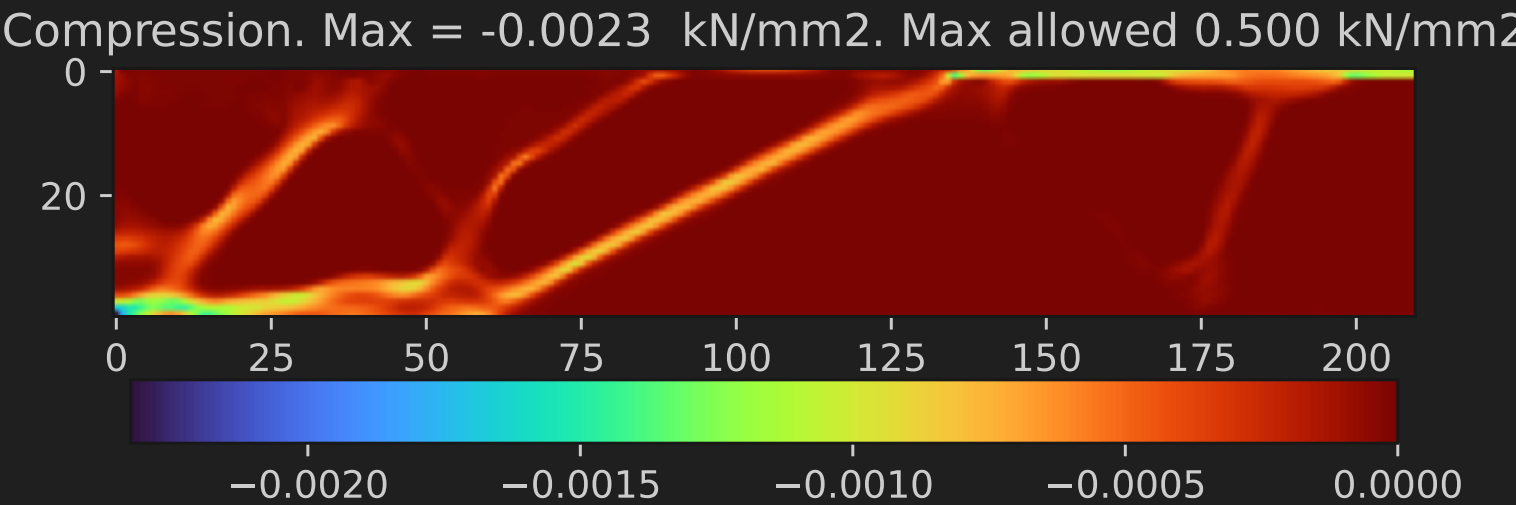
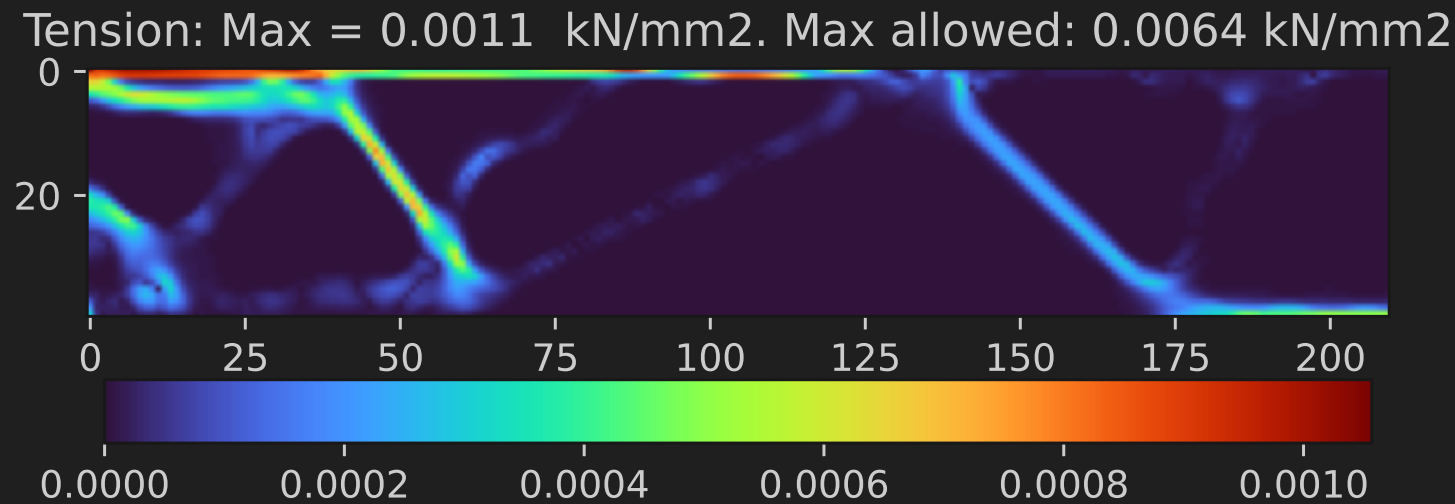
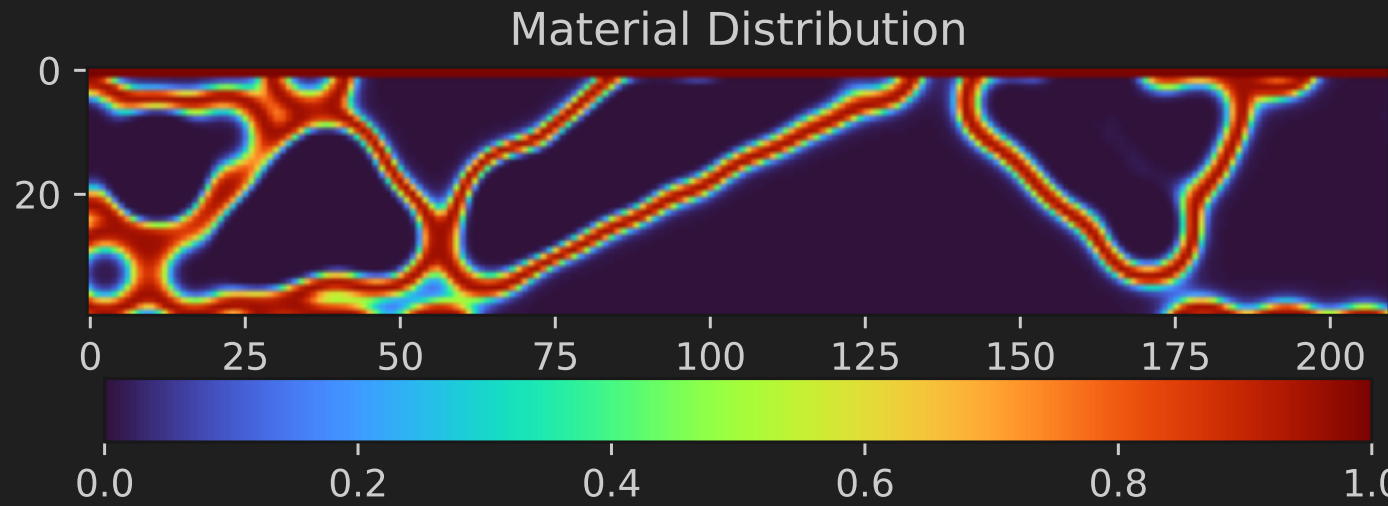
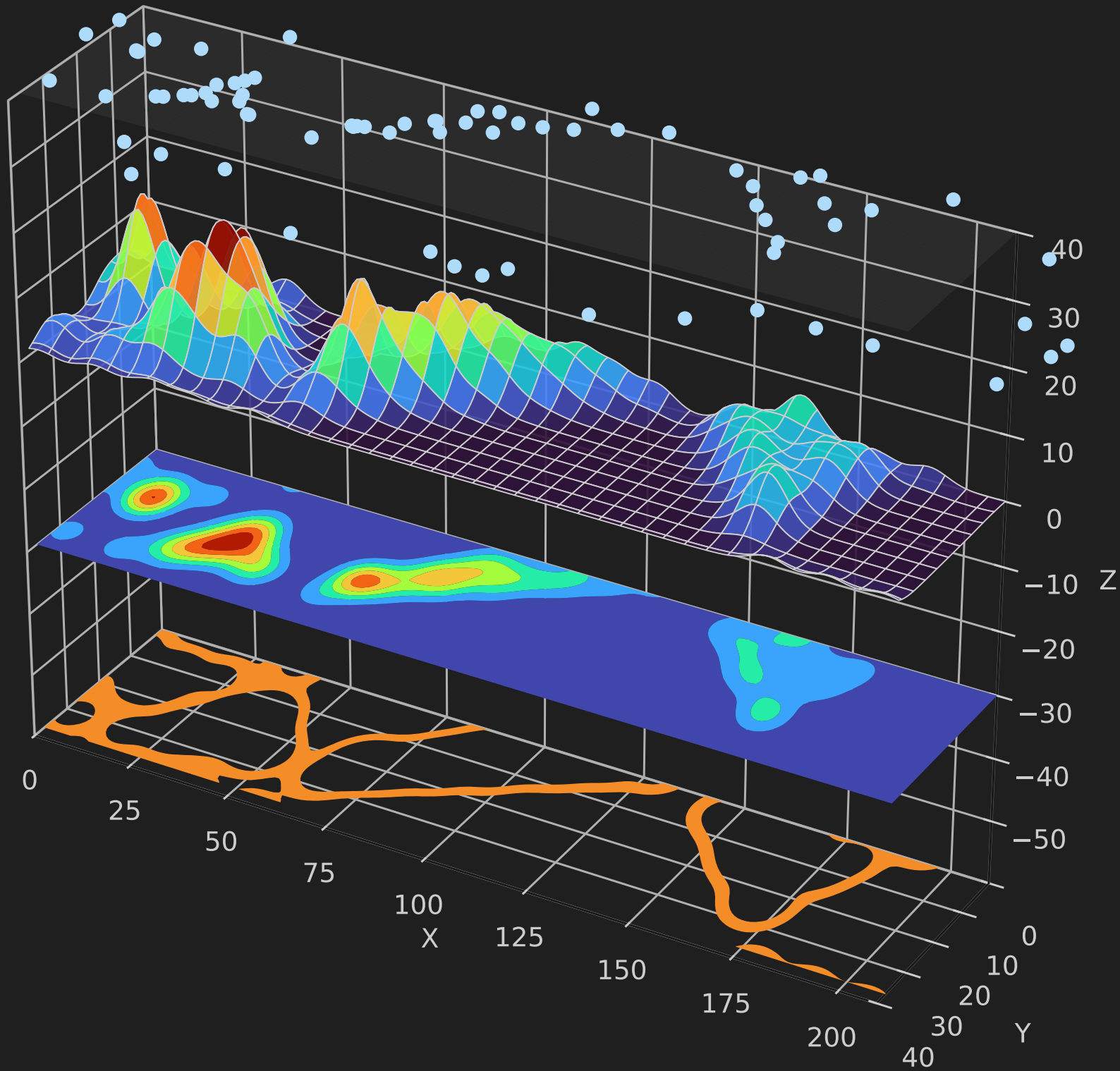
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 5.92 Shift = 1.72 Iteration = 168



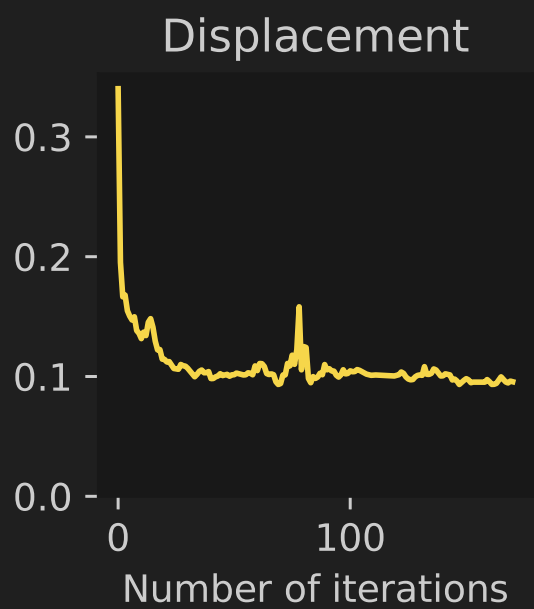
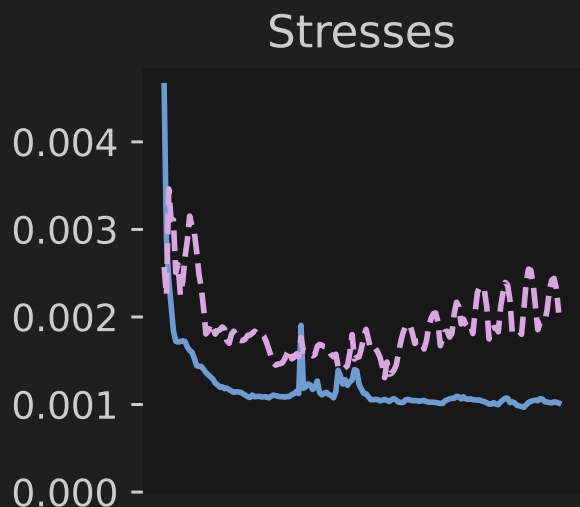
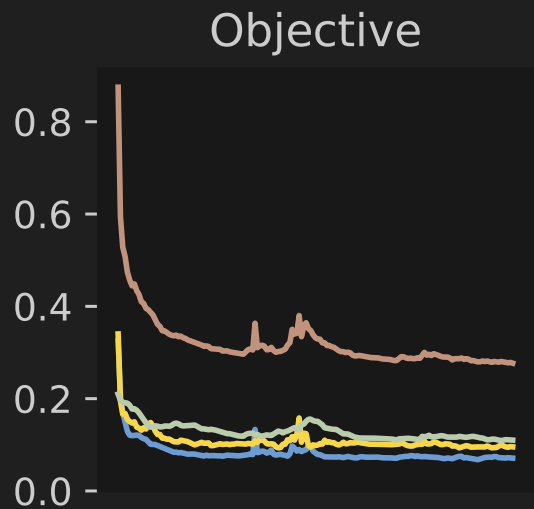
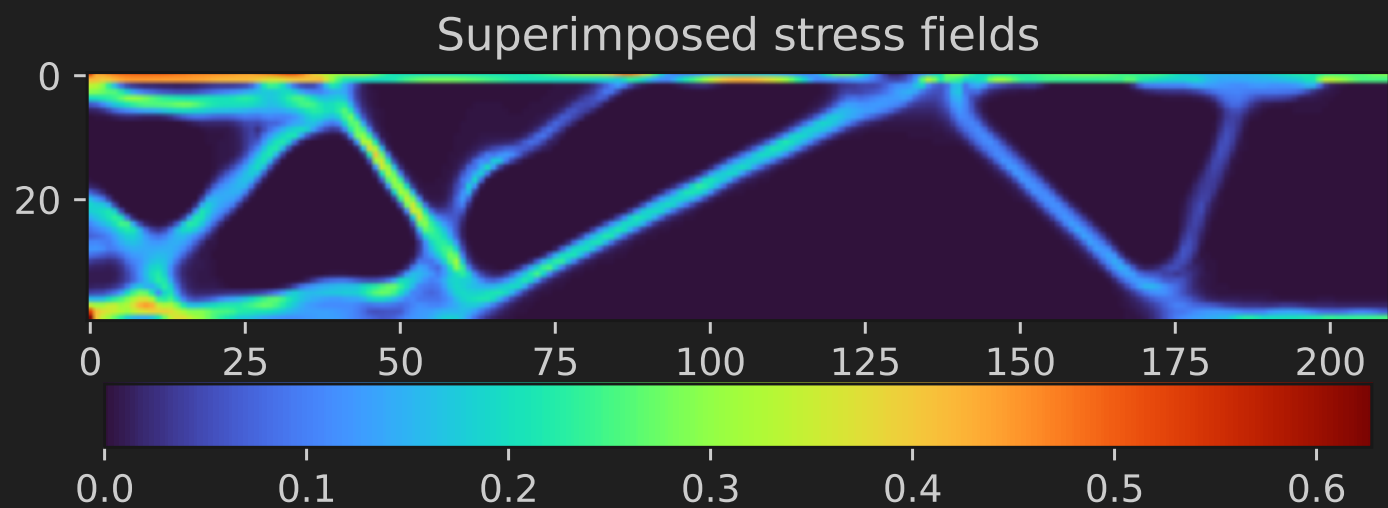
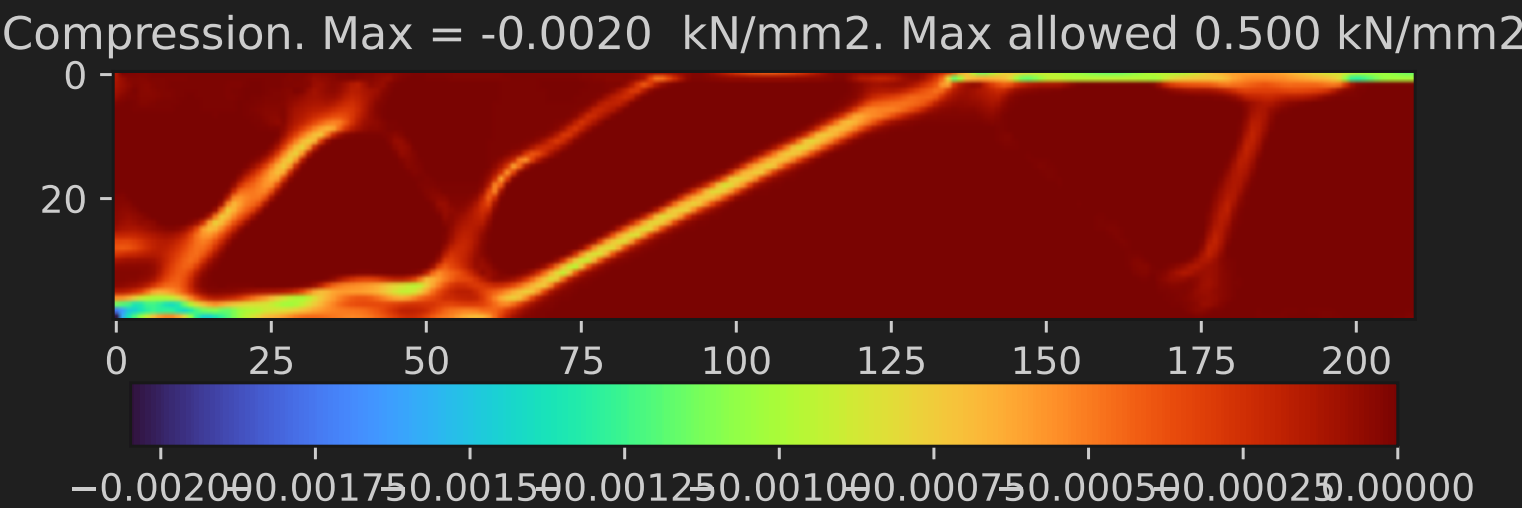
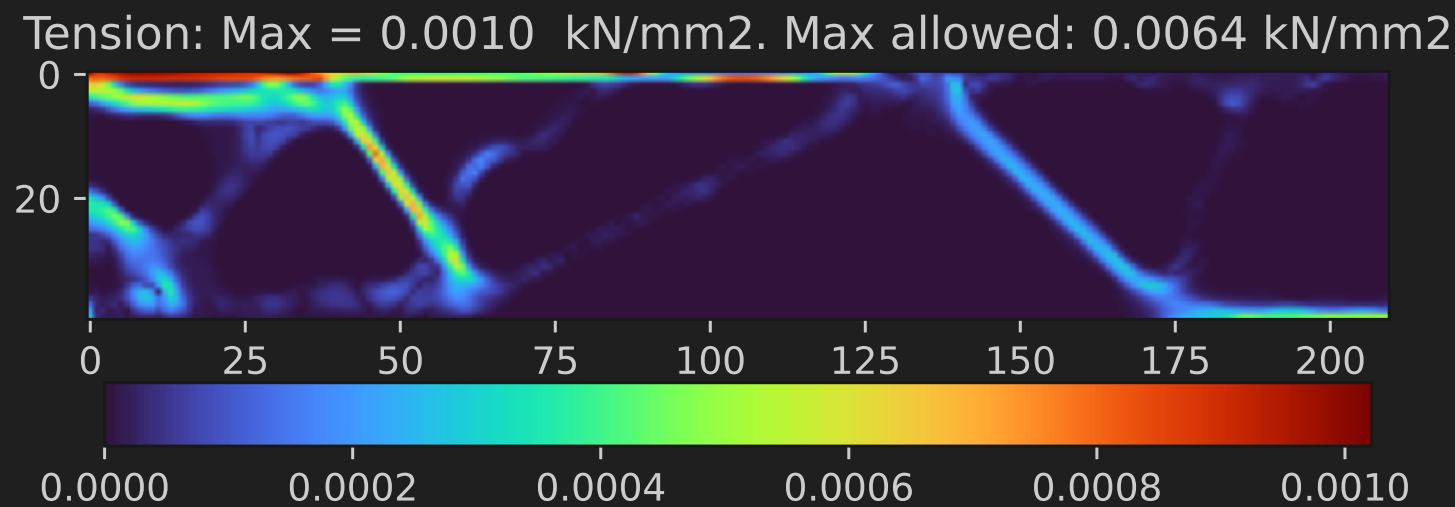
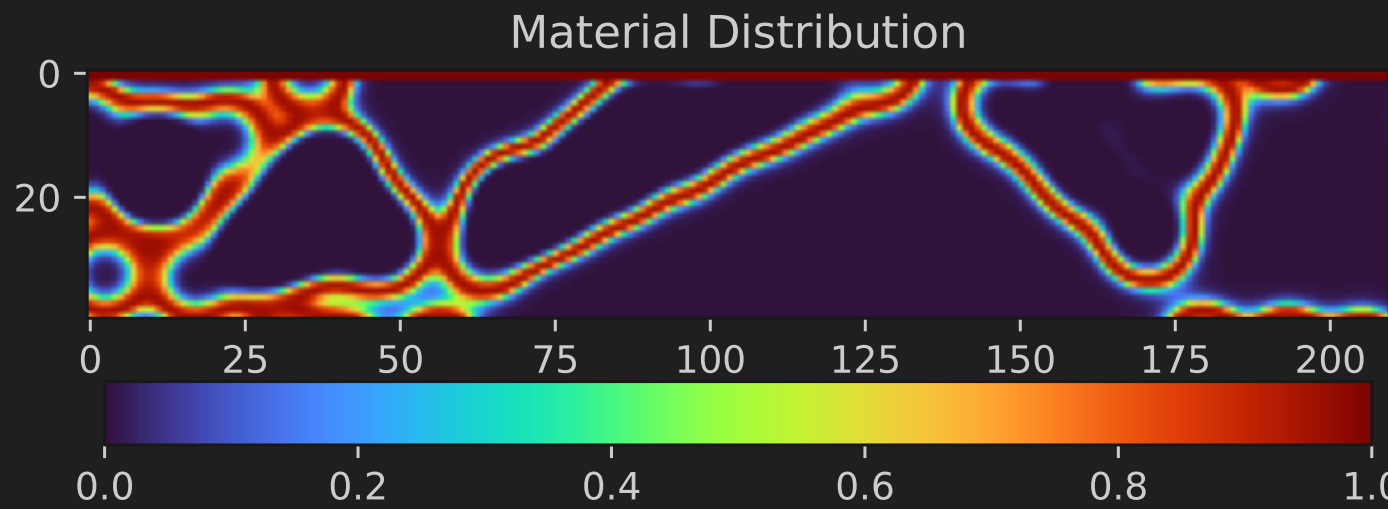
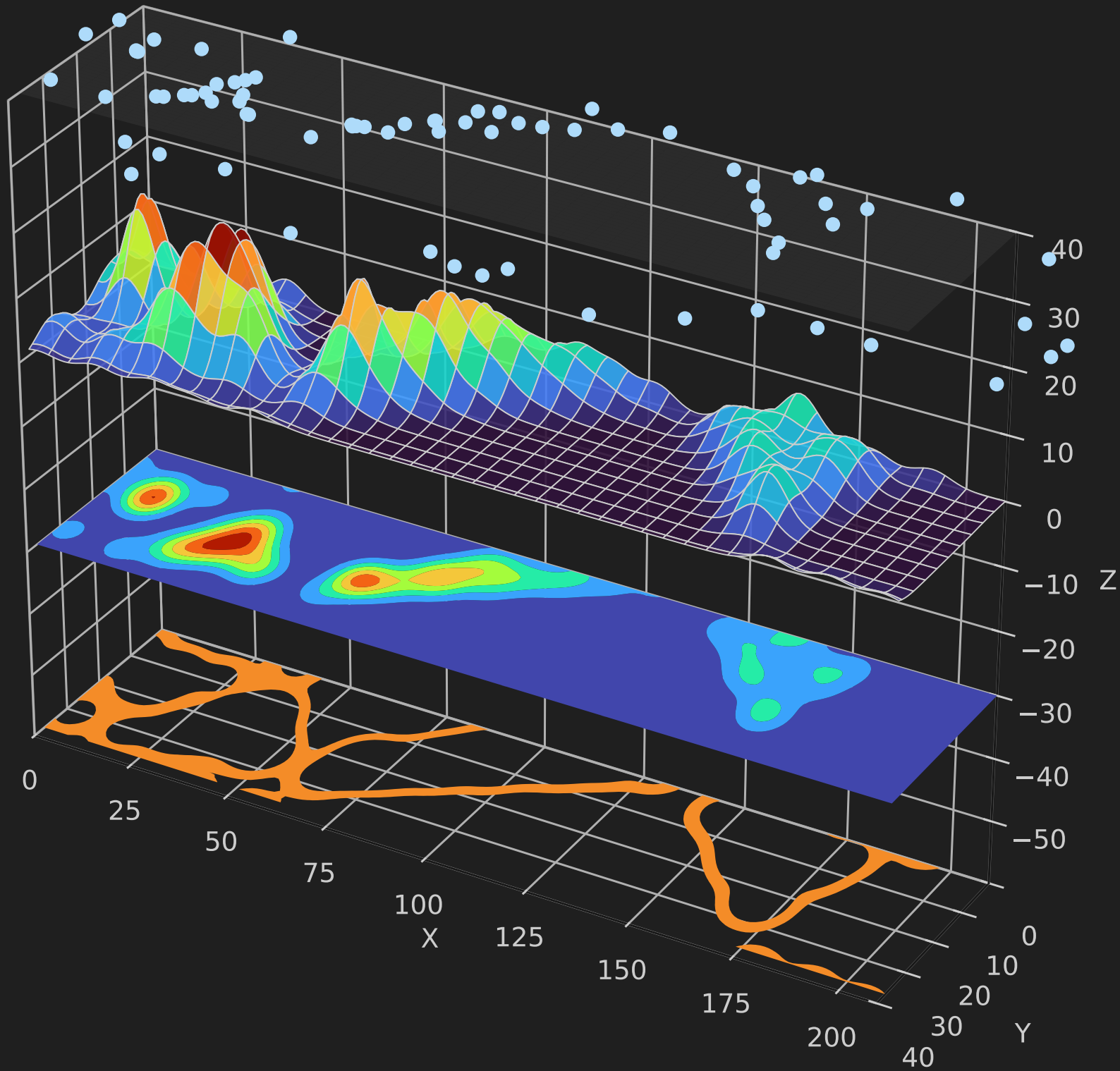
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.92 Shift = 1.72 Iteration = 169



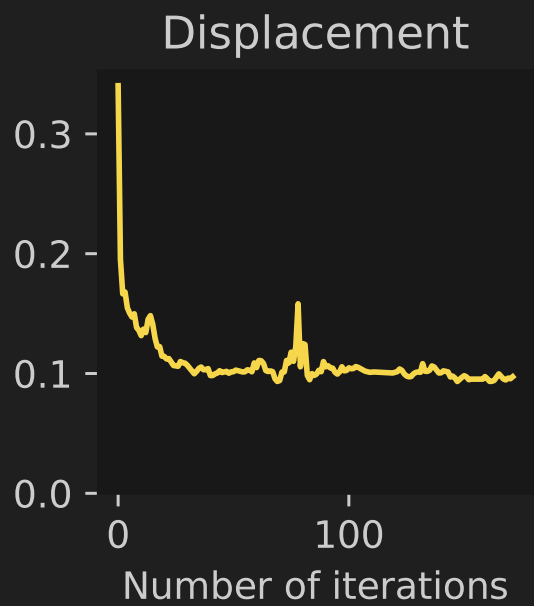
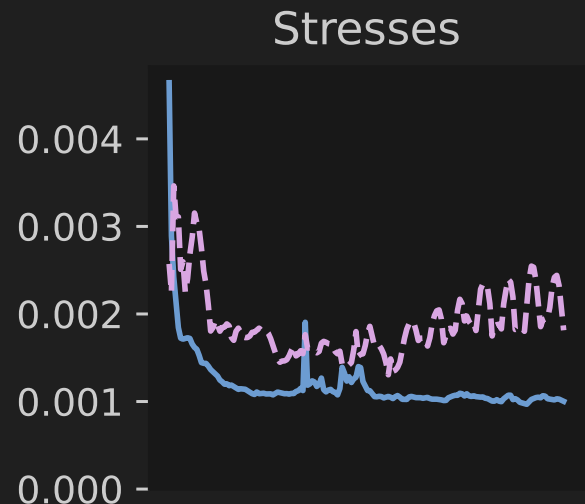
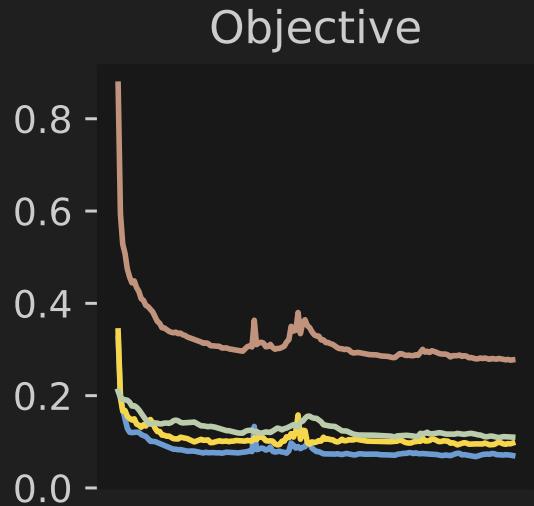
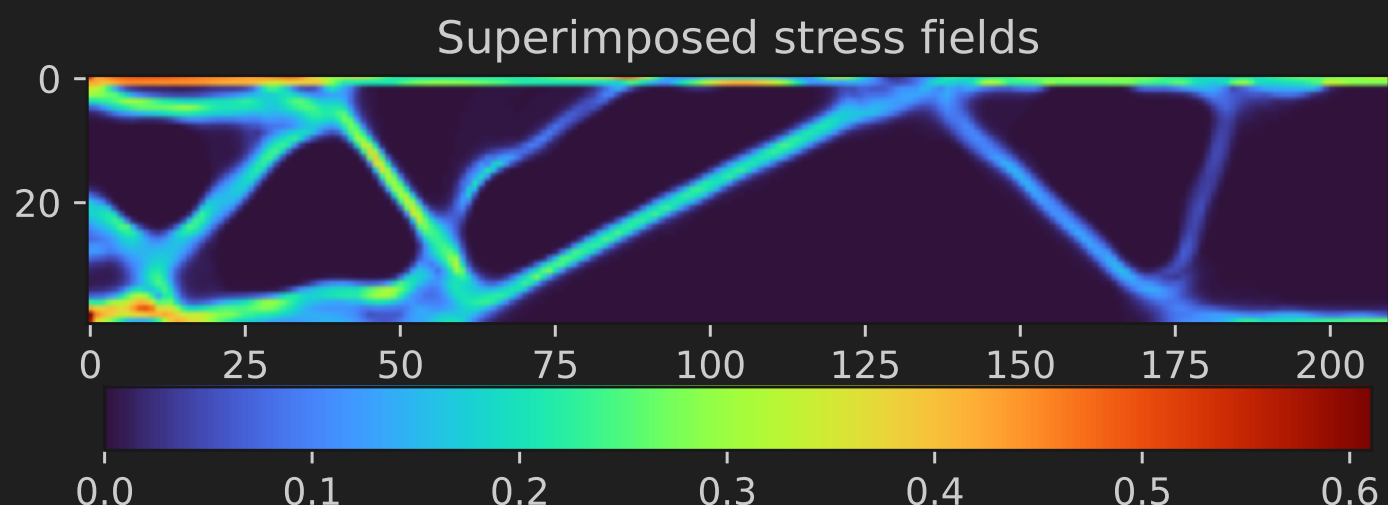
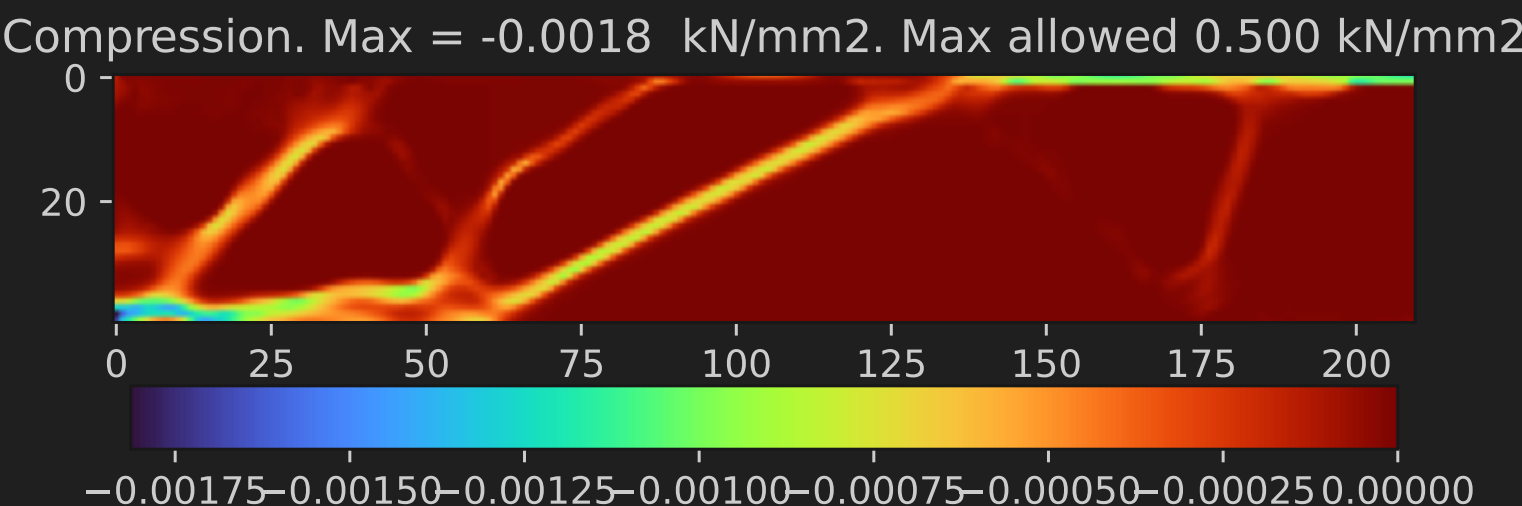
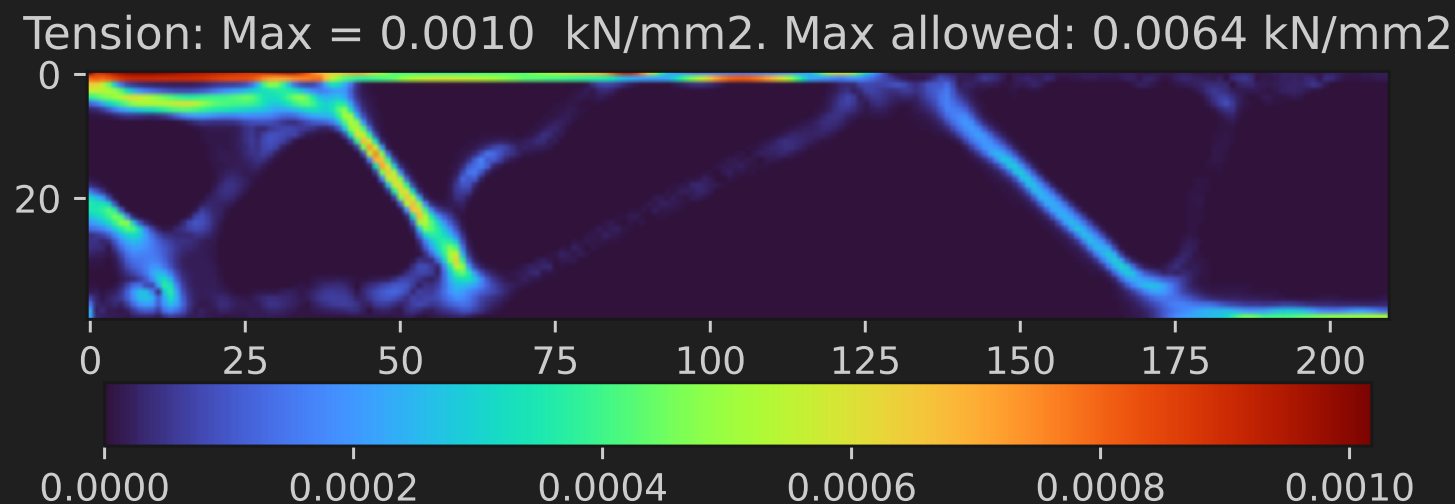
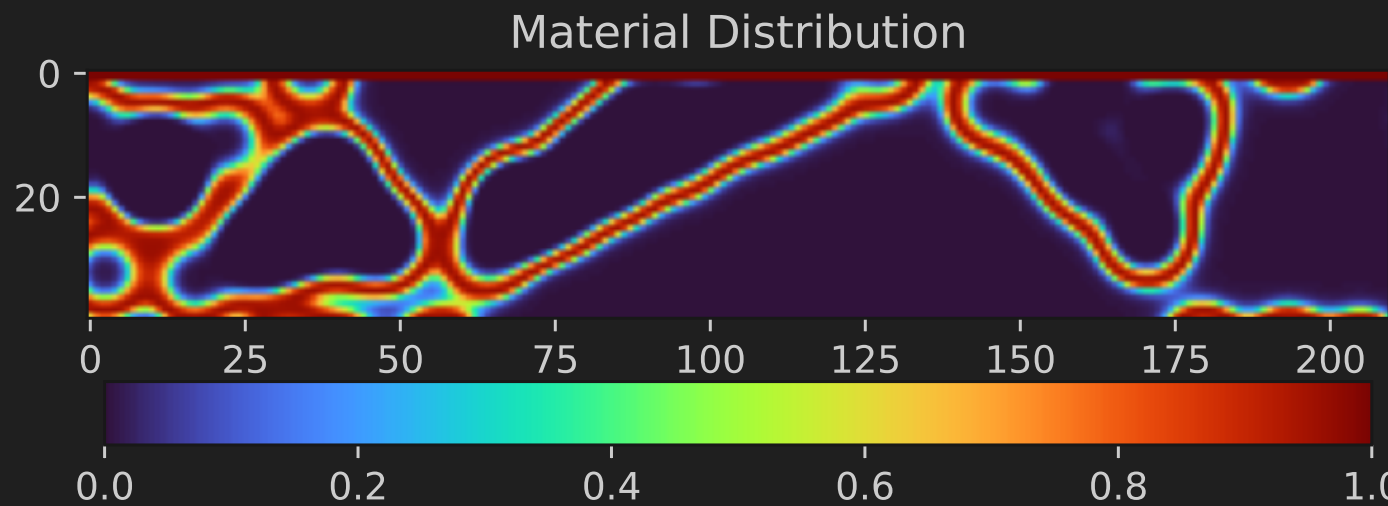
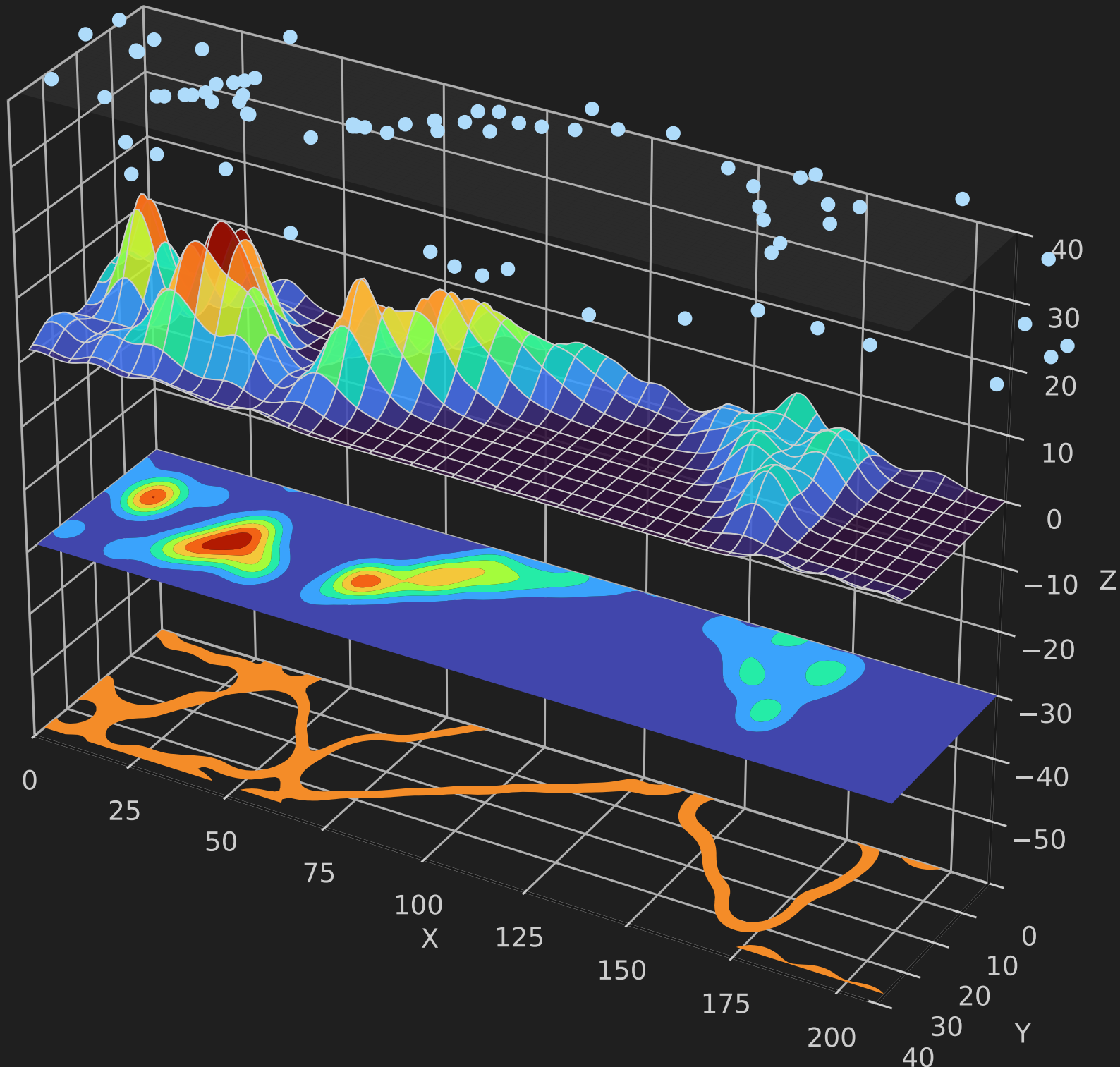
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.92 Shift = 1.73 Iteration = 170



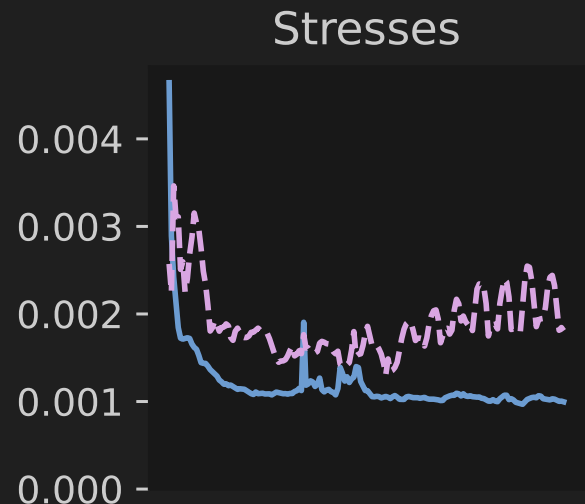
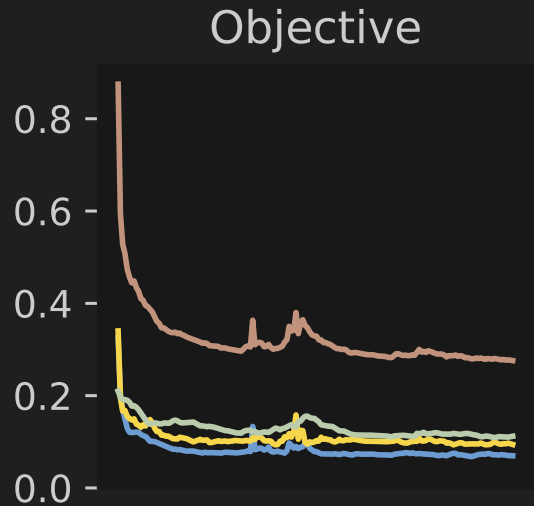
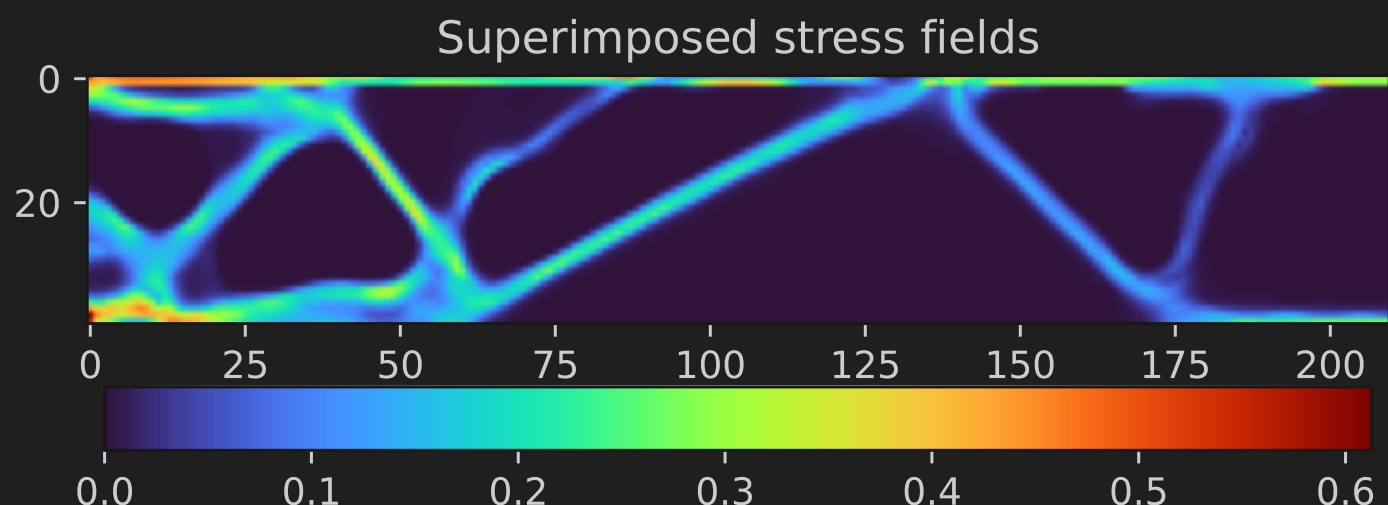
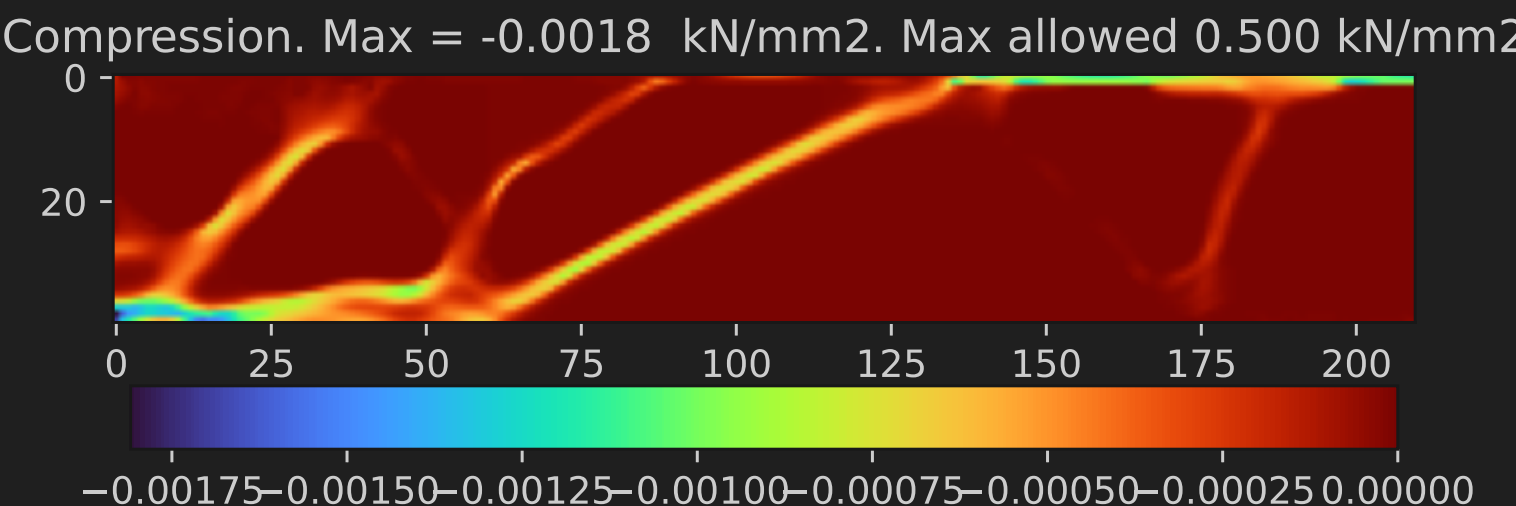
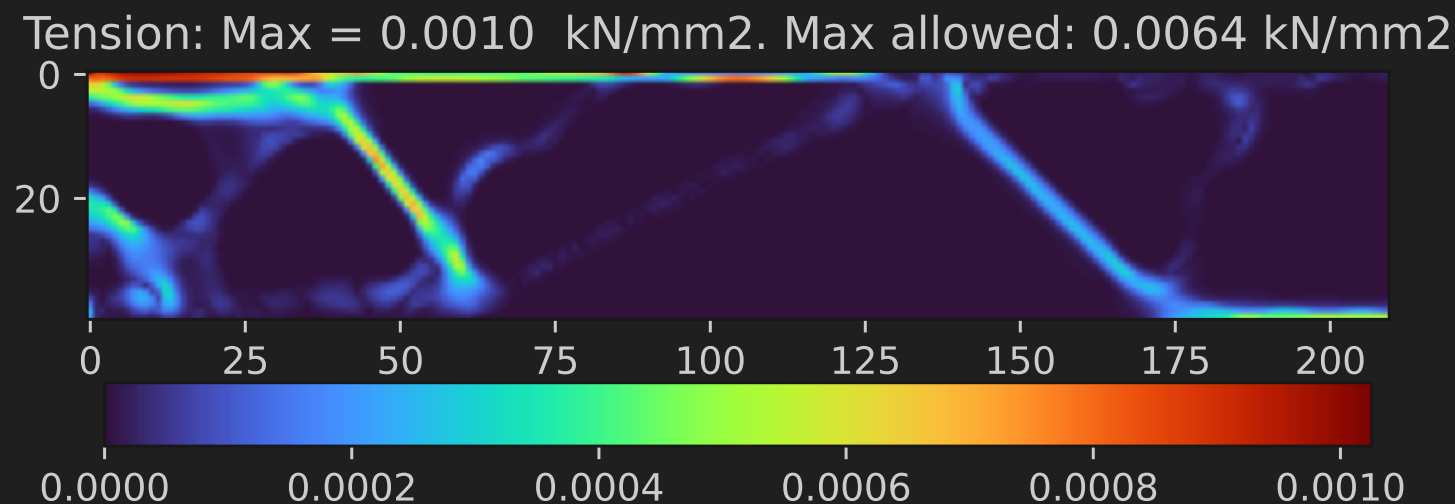
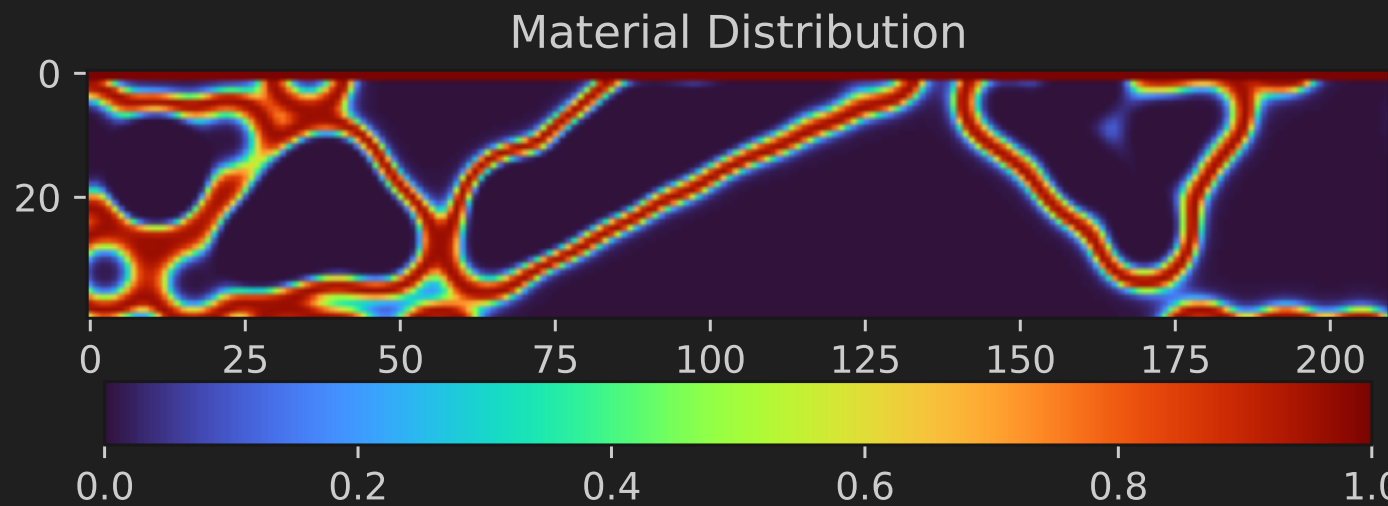
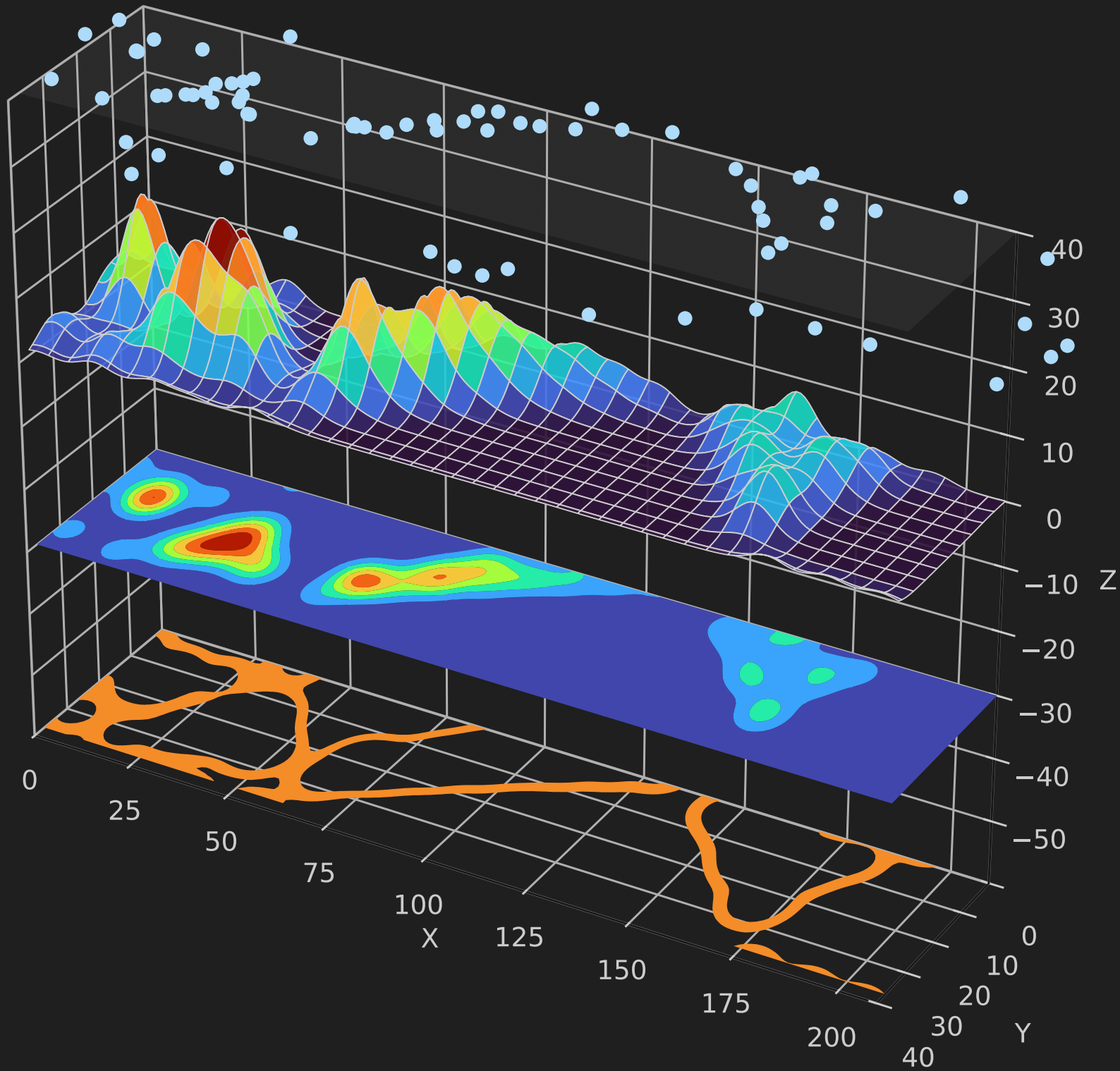
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 5.89 Shift = 1.74 Iteration = 171



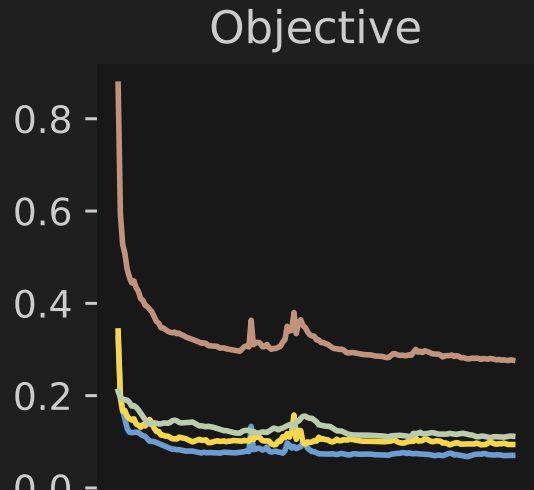
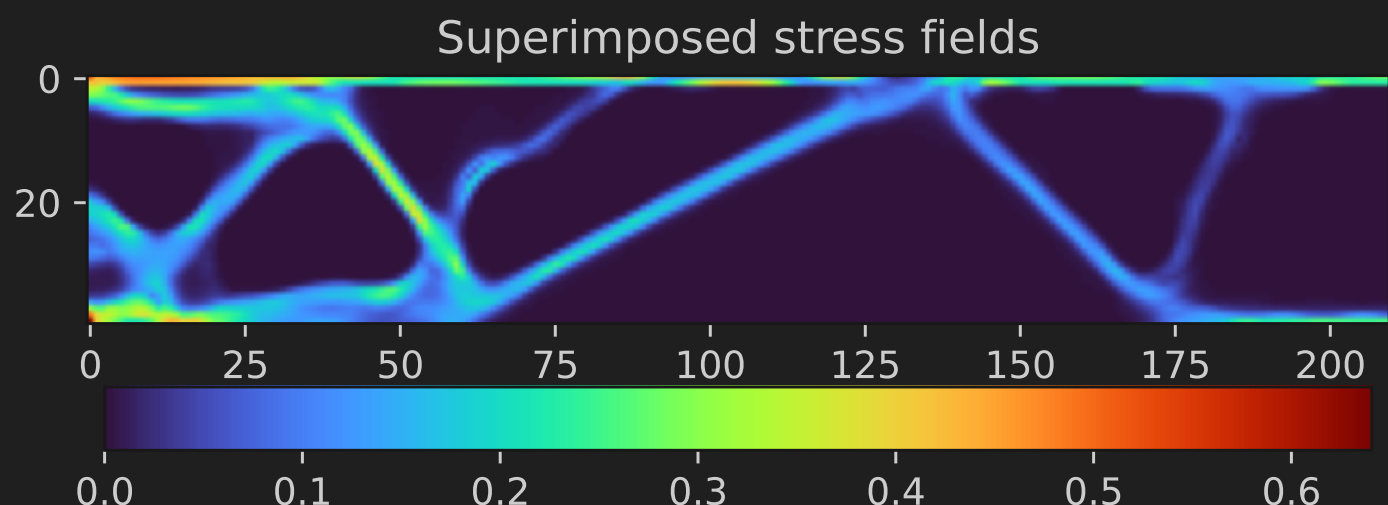
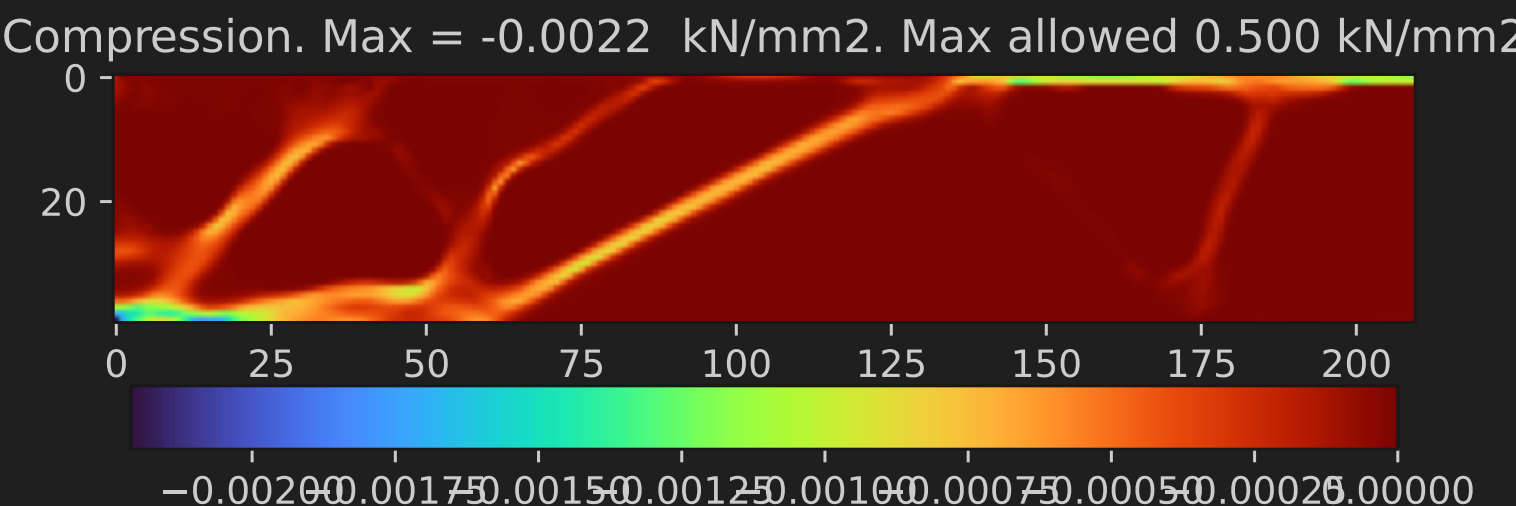
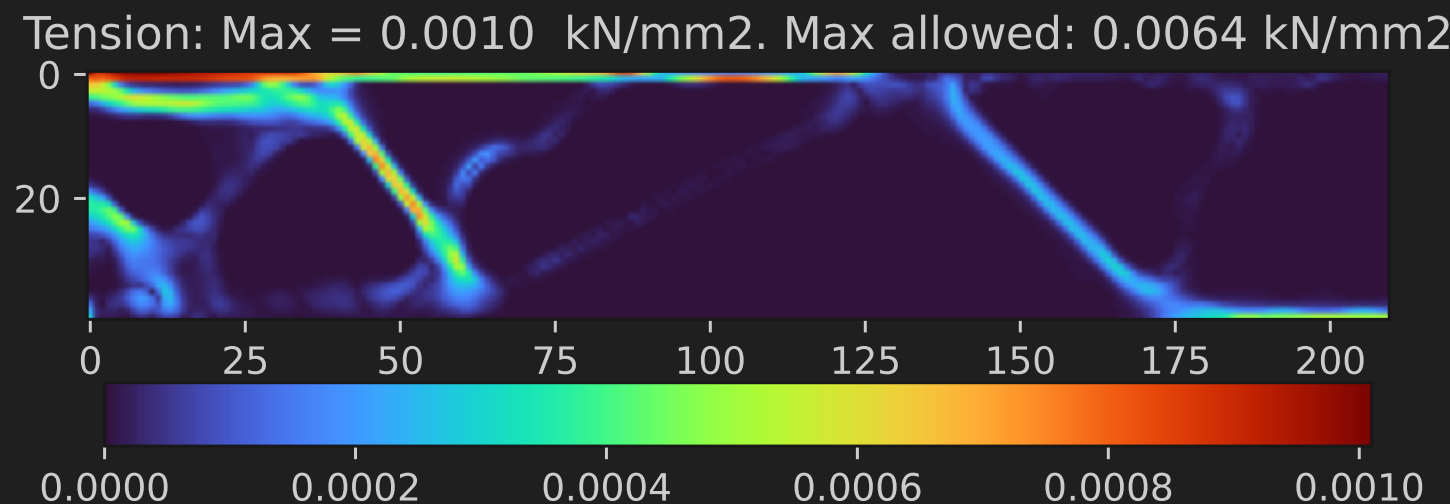
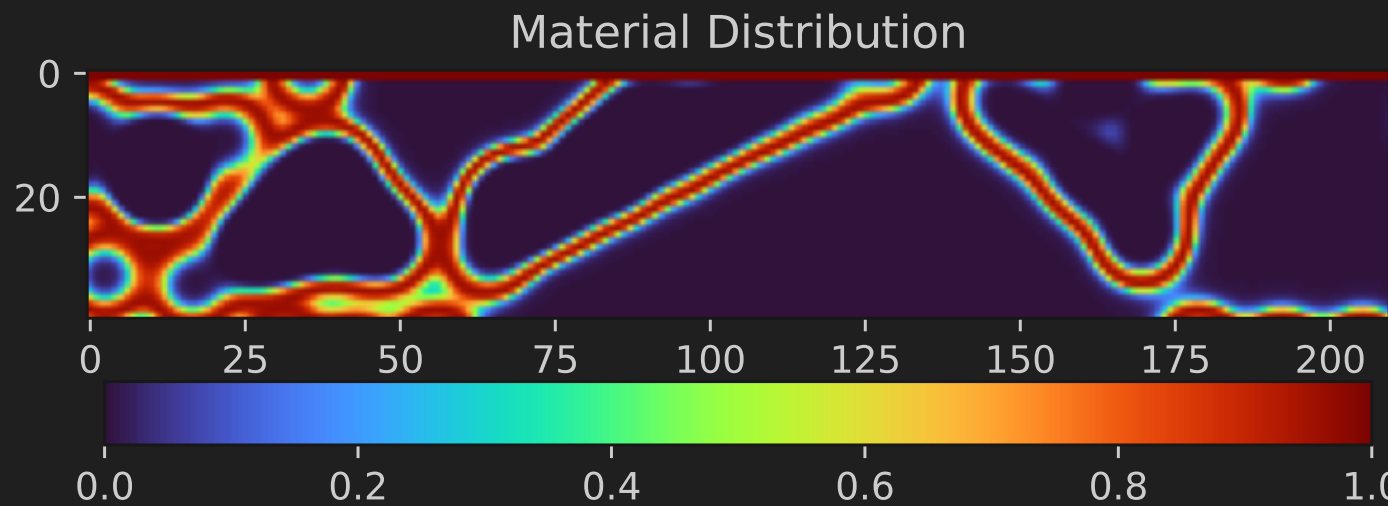
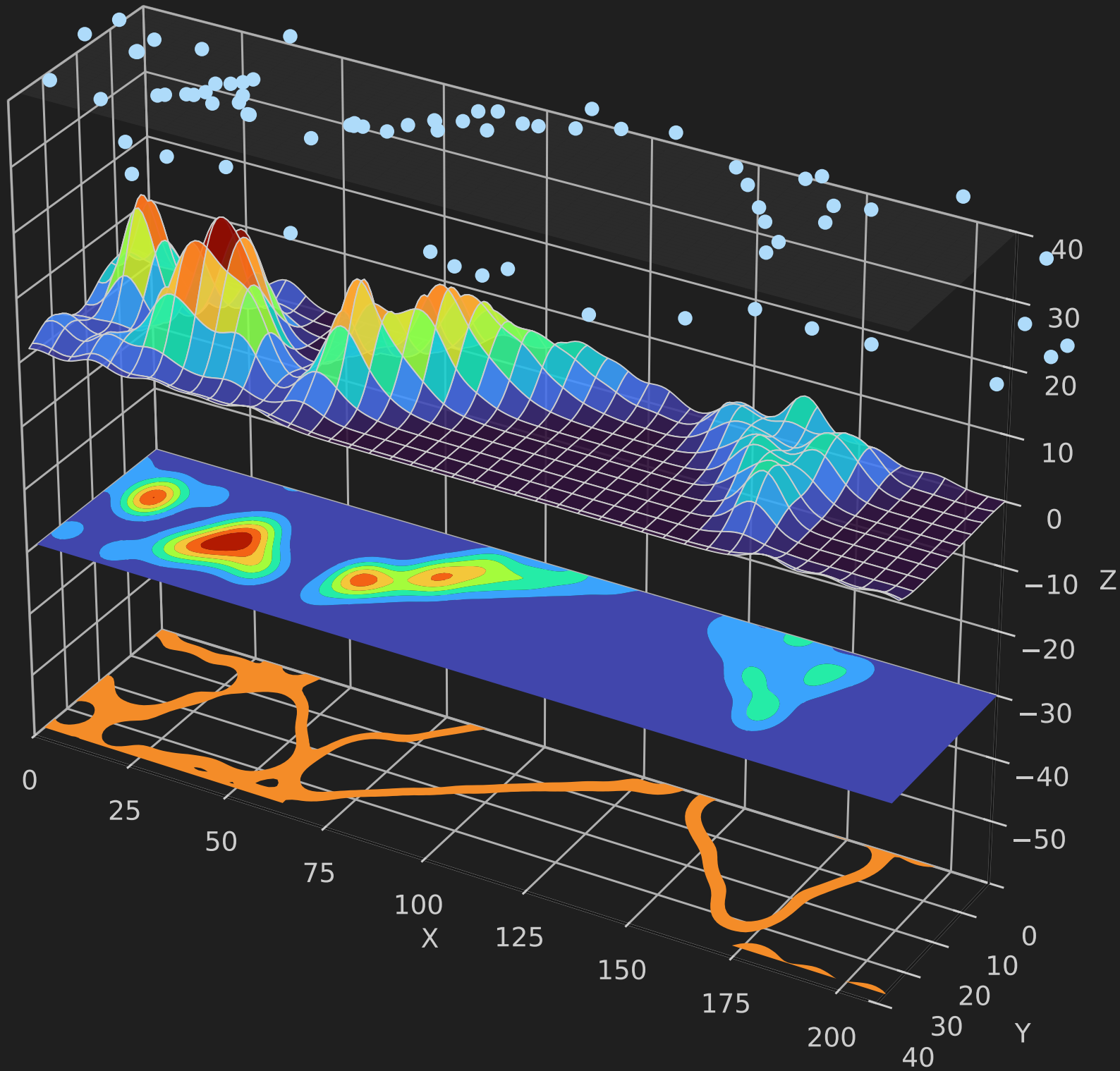
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 5.90 Shift = 1.77 Iteration = 173



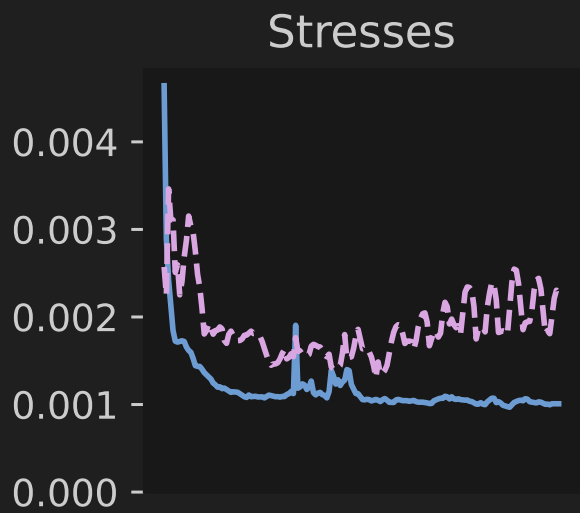
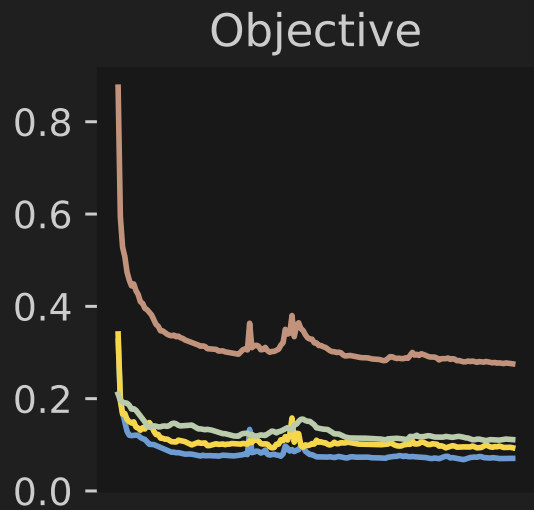
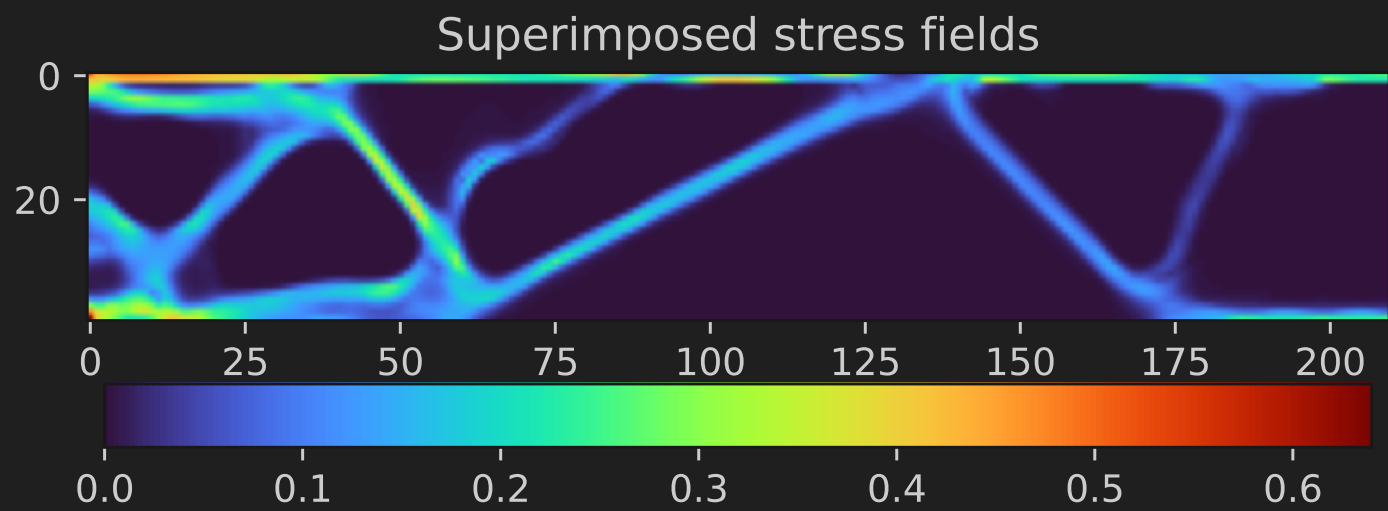
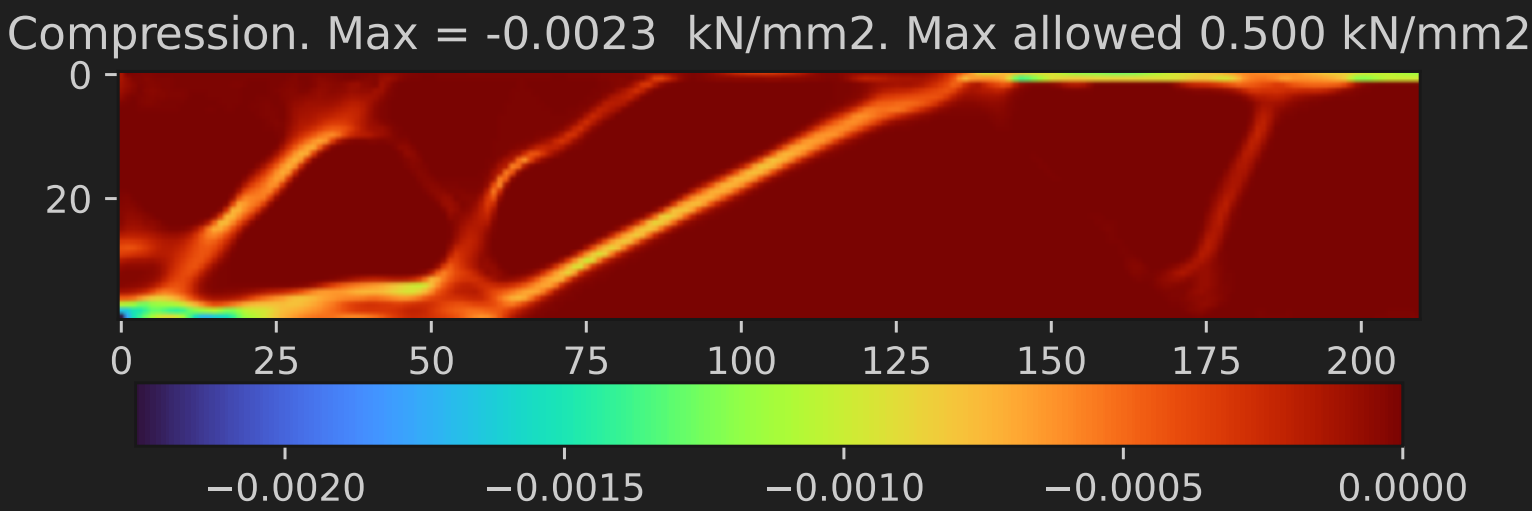
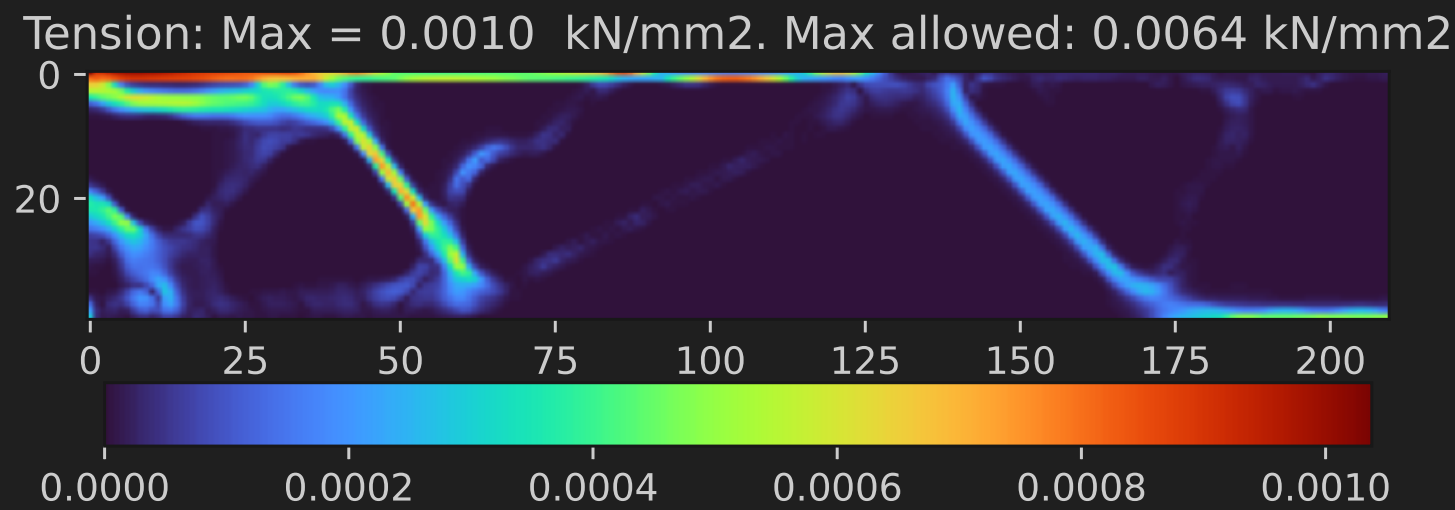
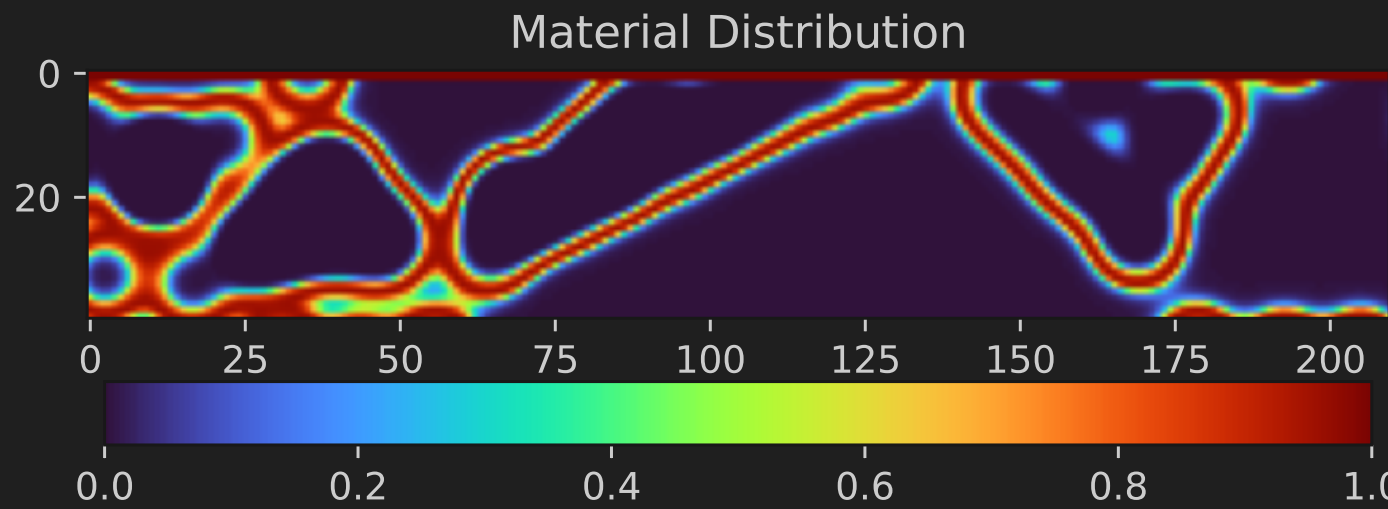
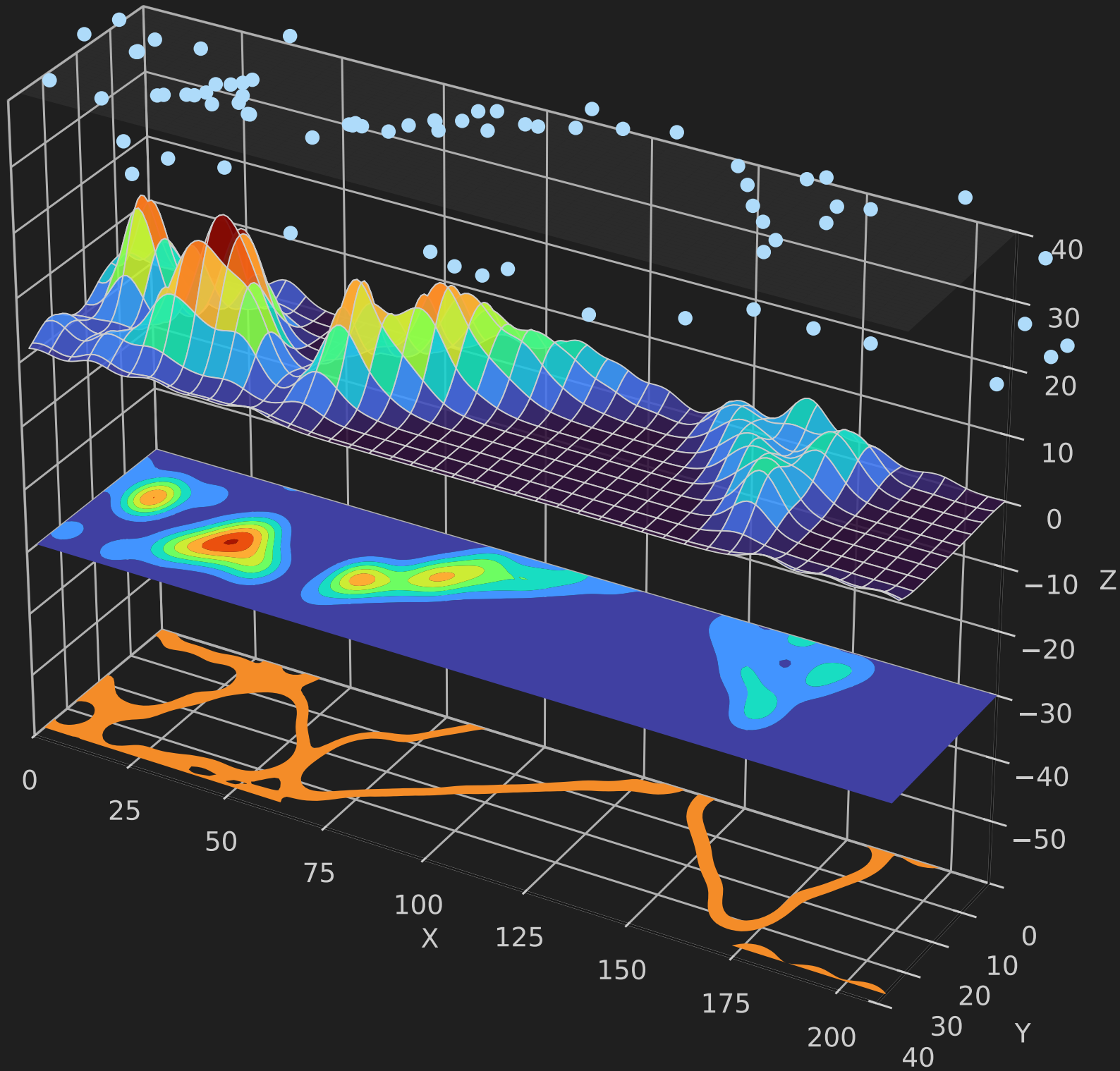
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 5.93 Shift = 1.77 Iteration = 175



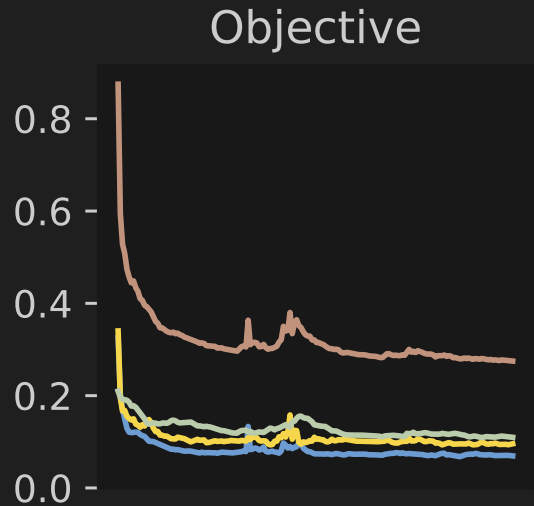
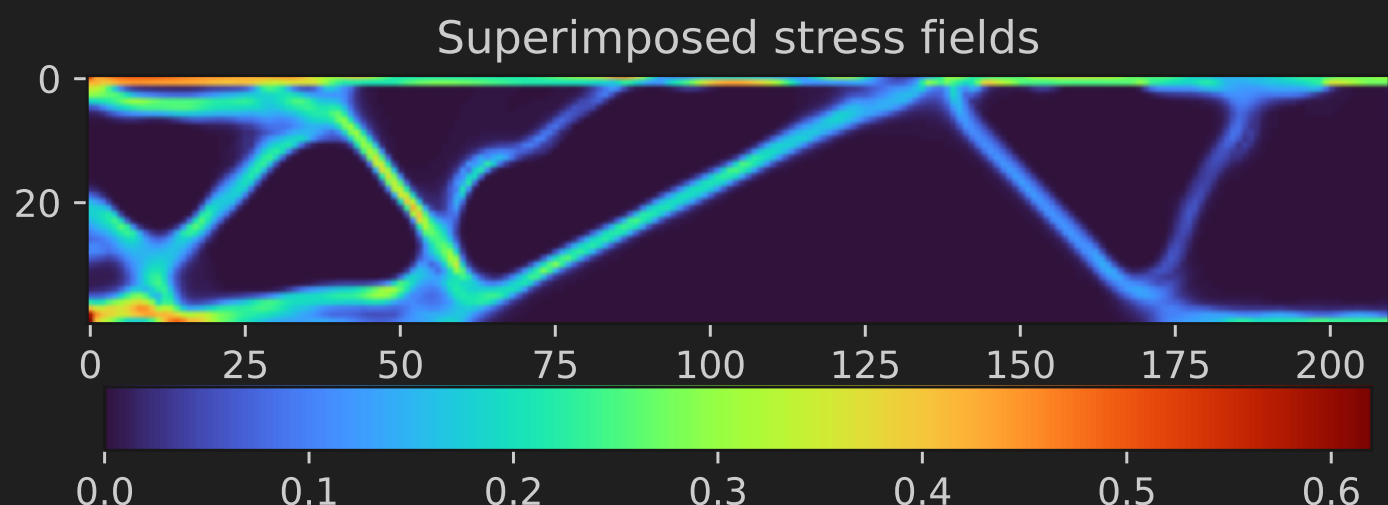
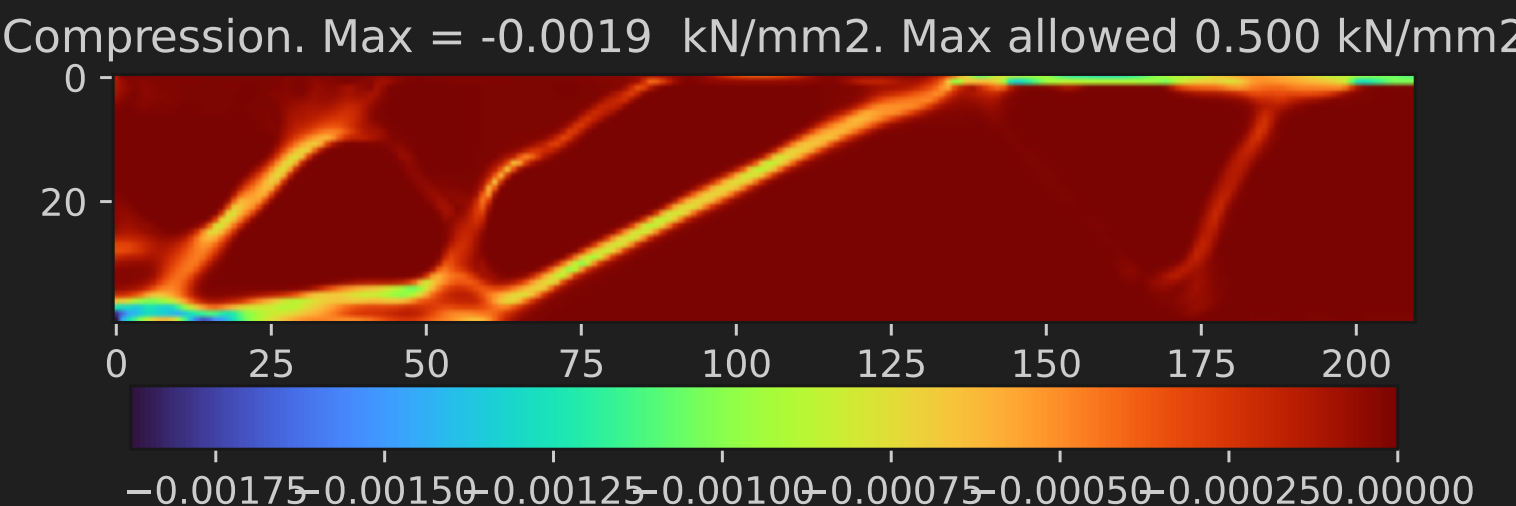
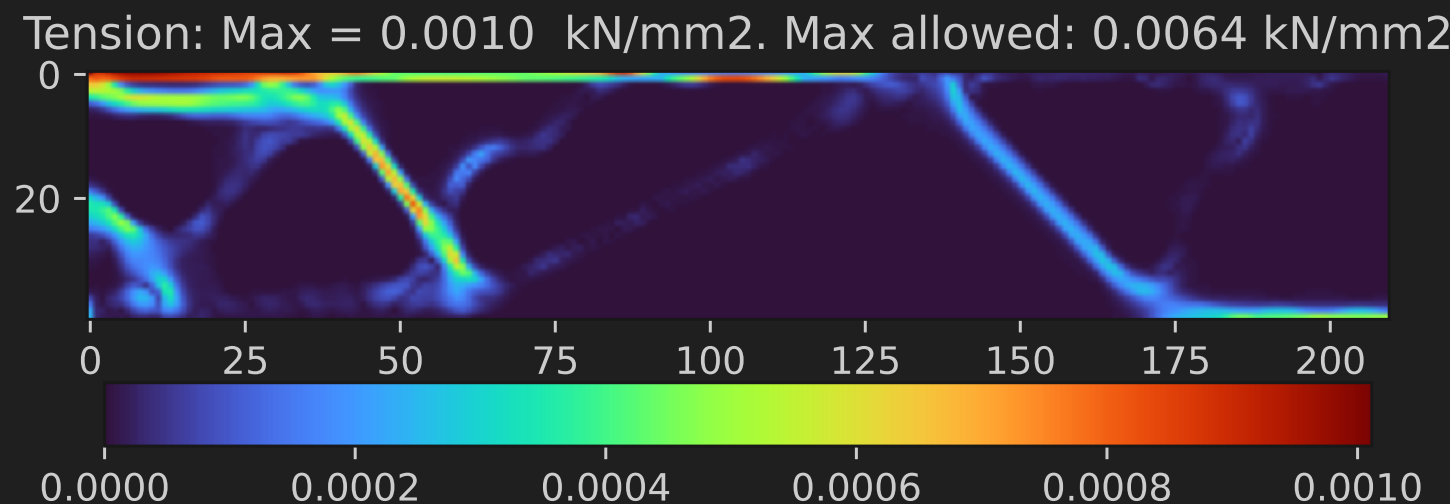
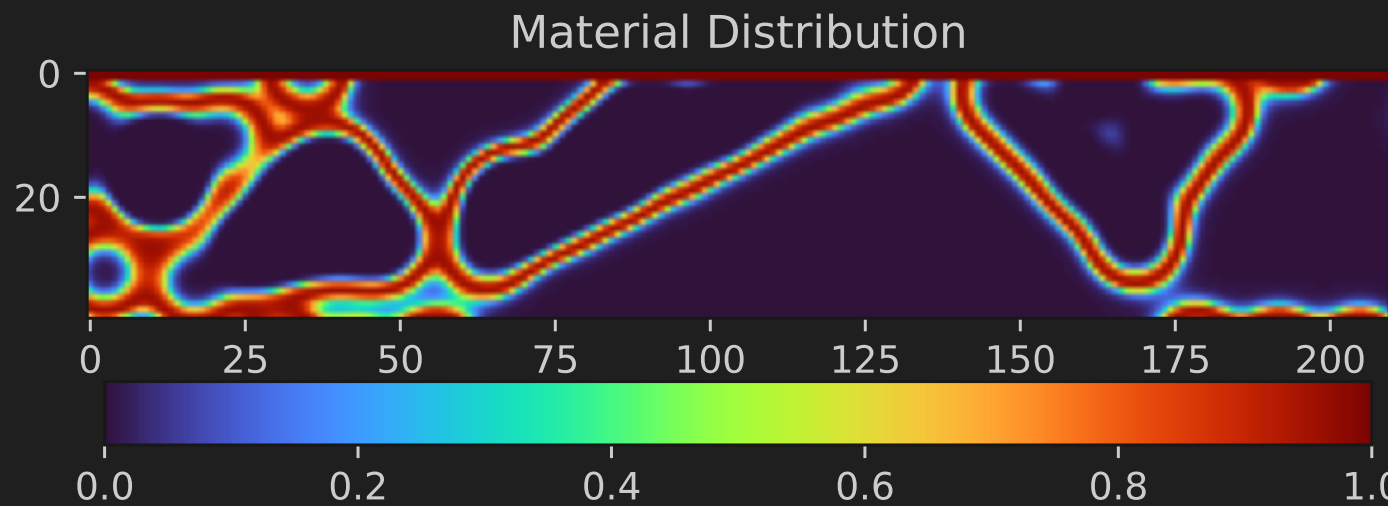
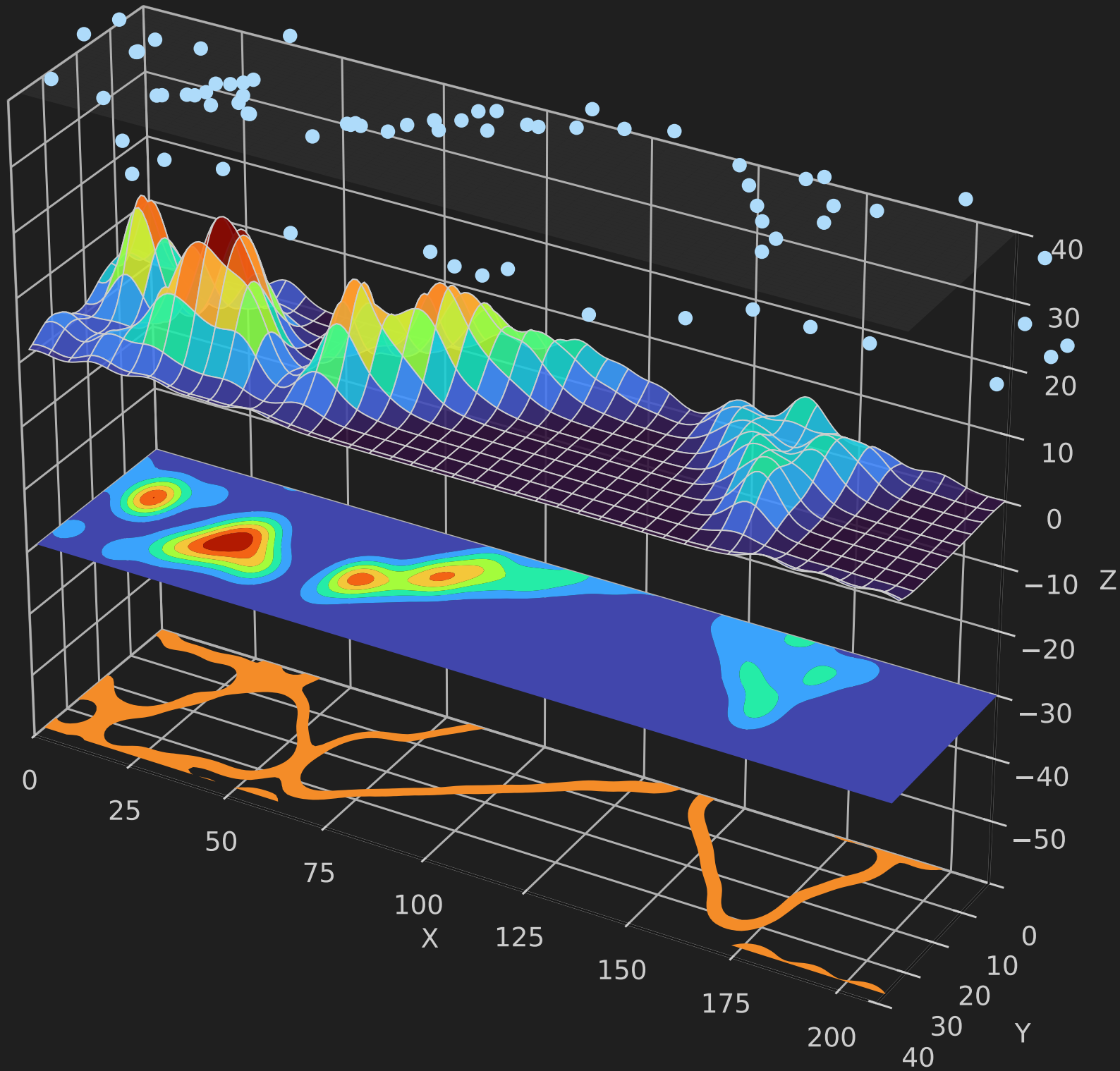
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 5.95 Shift = 1.77 Iteration = 177



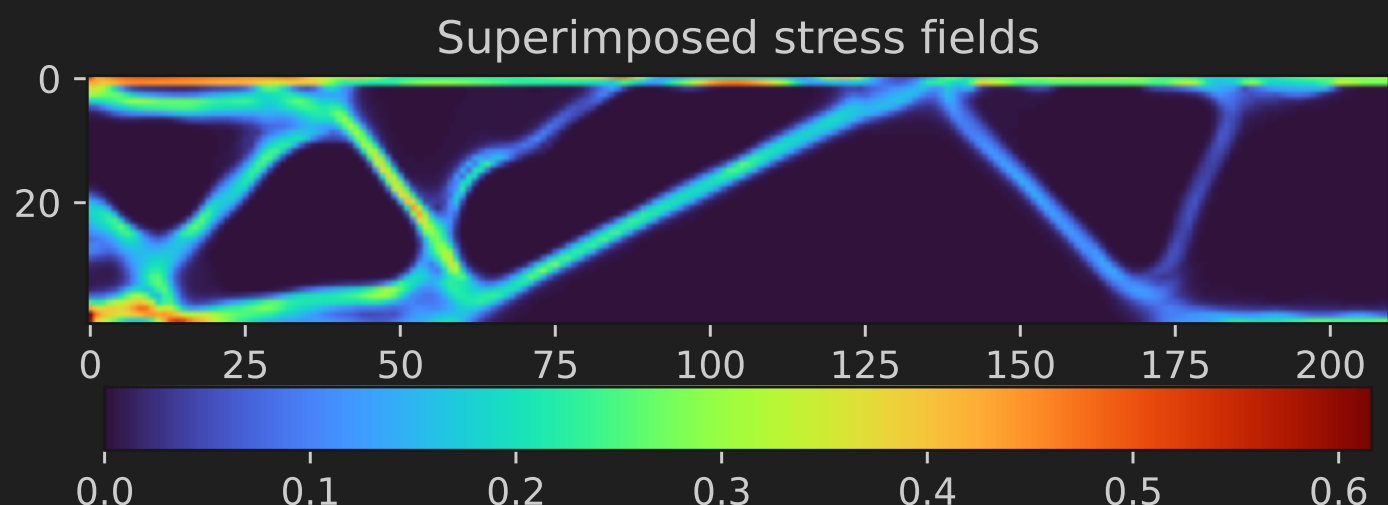
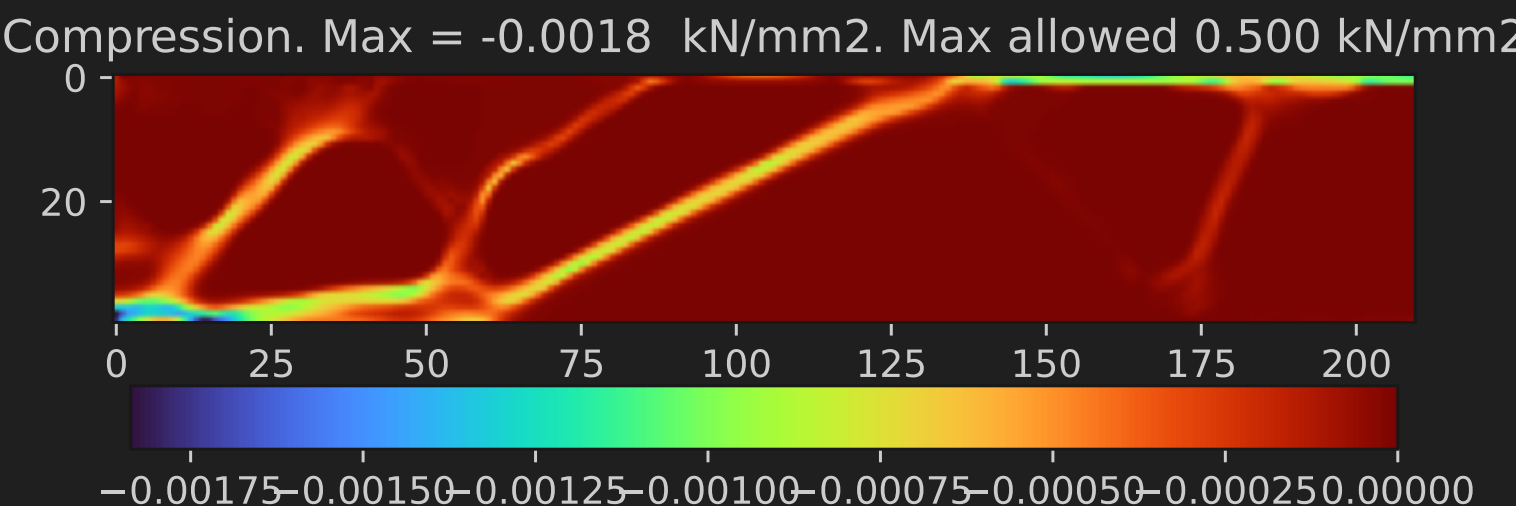
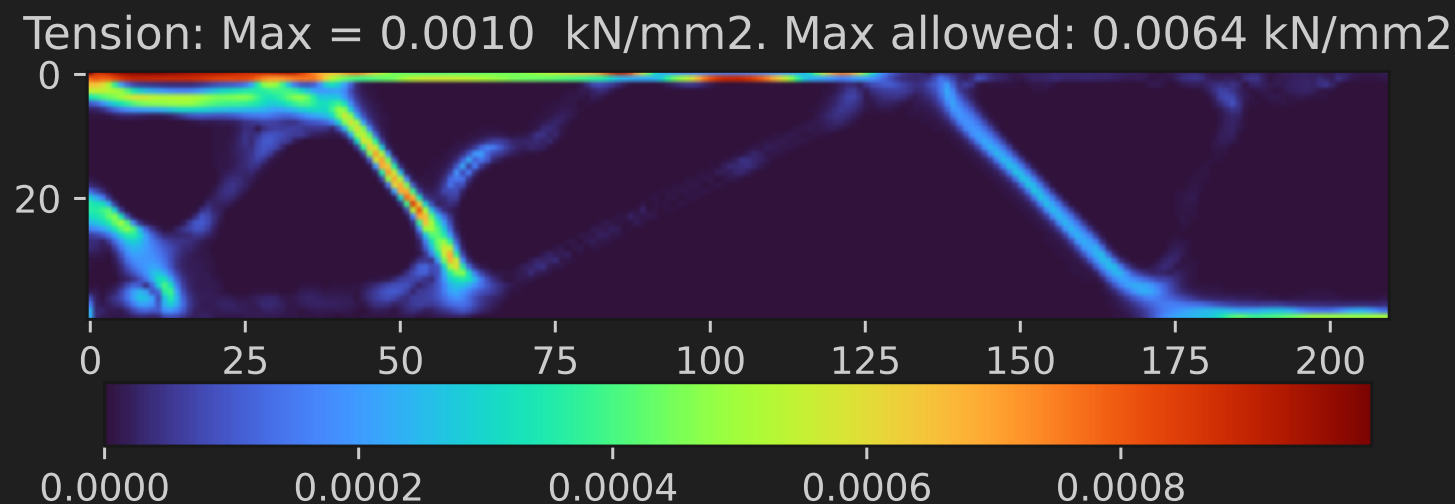
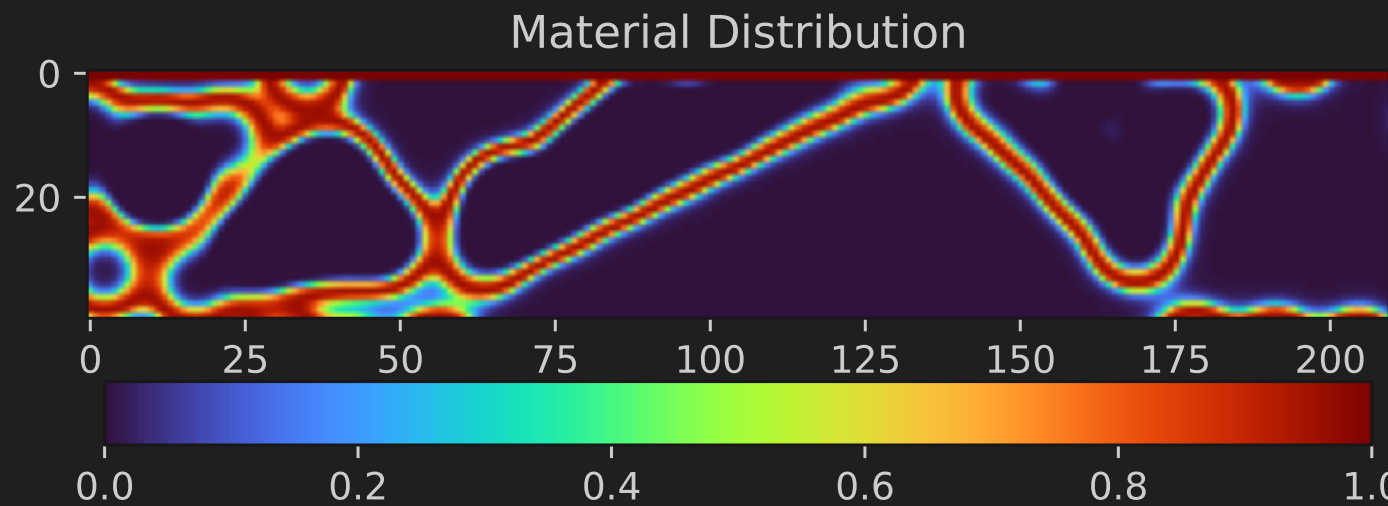
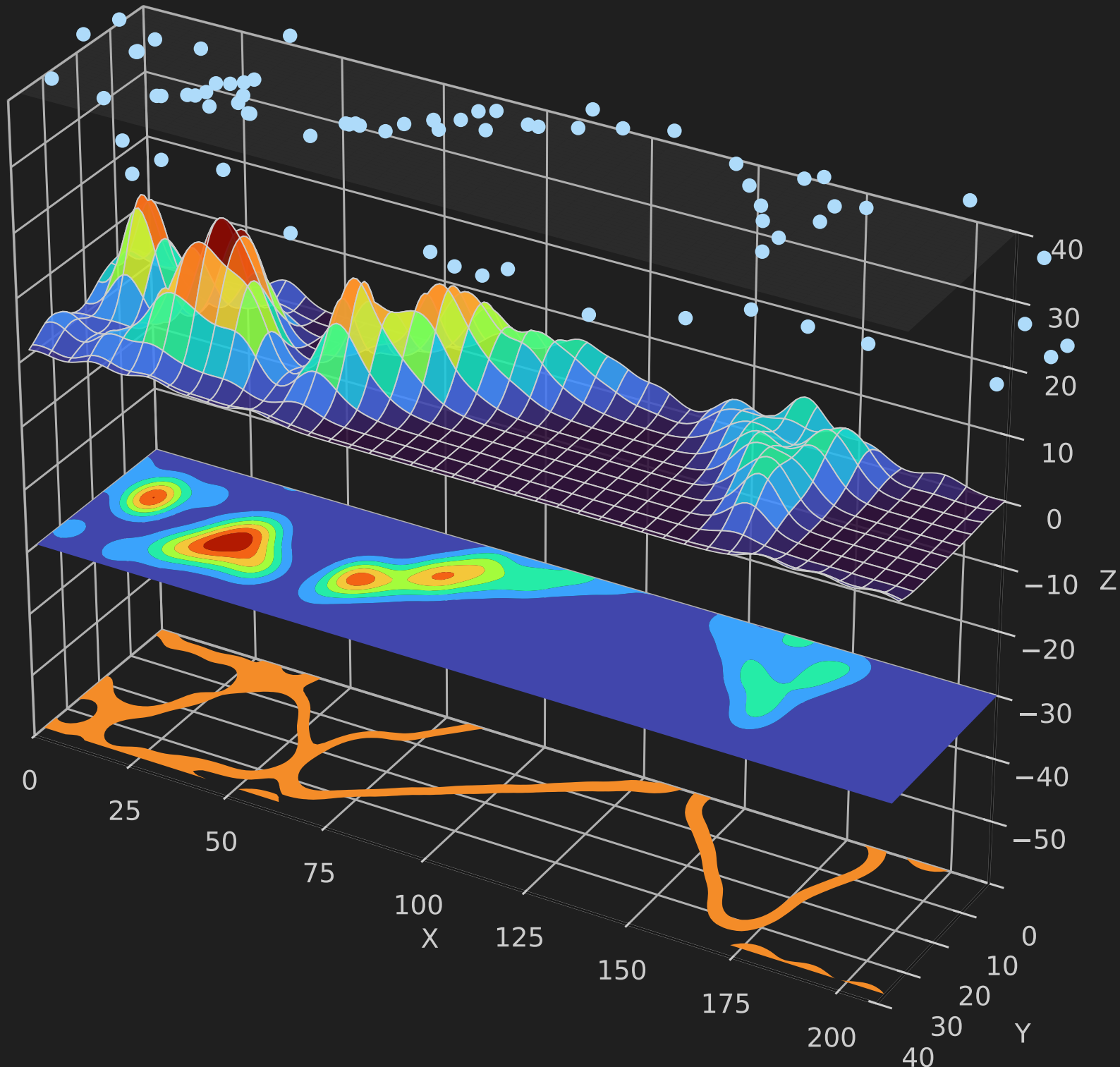
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 5.99 Shift = 1.76 Iteration = 179



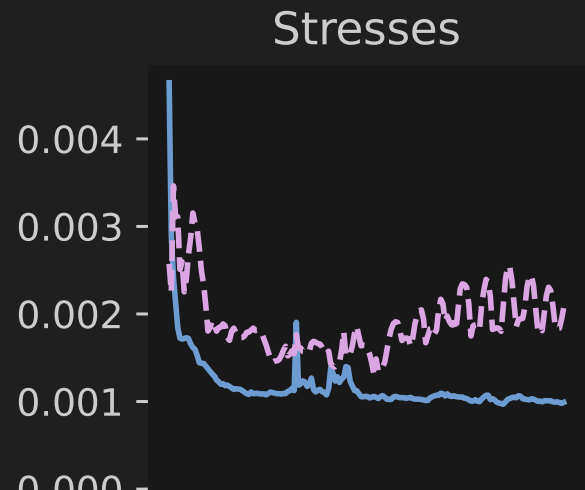
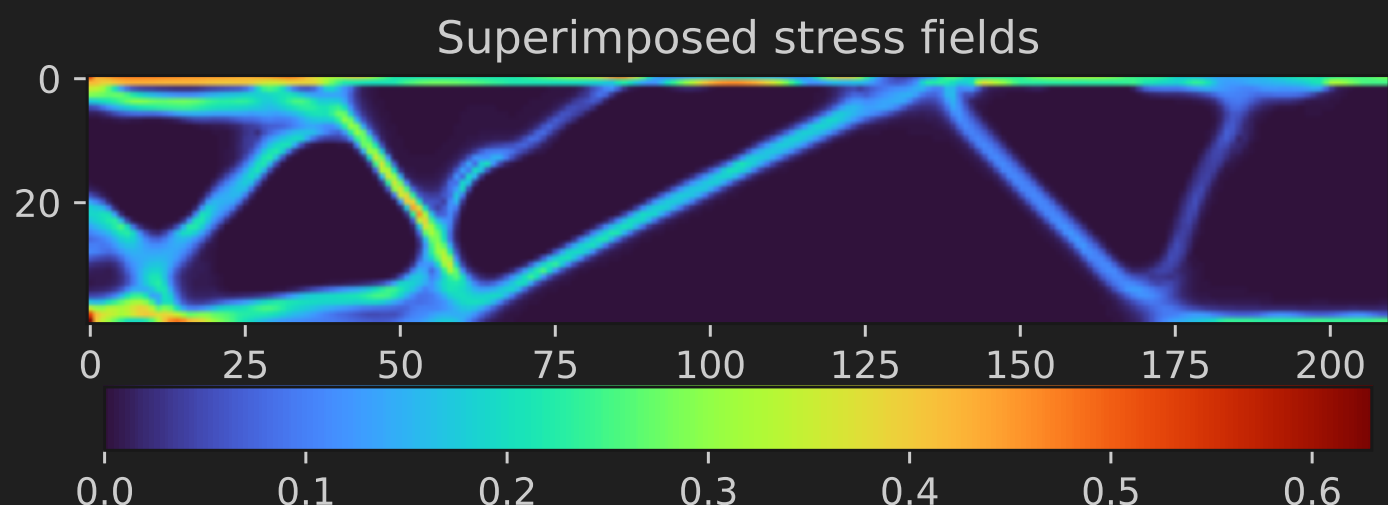
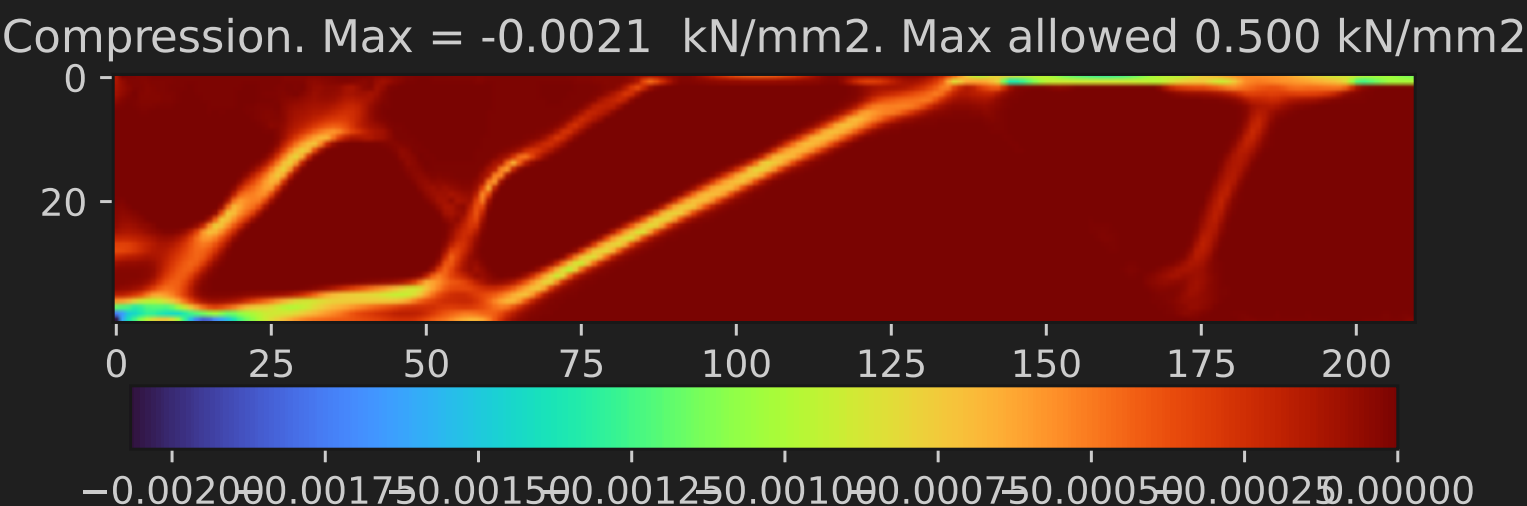
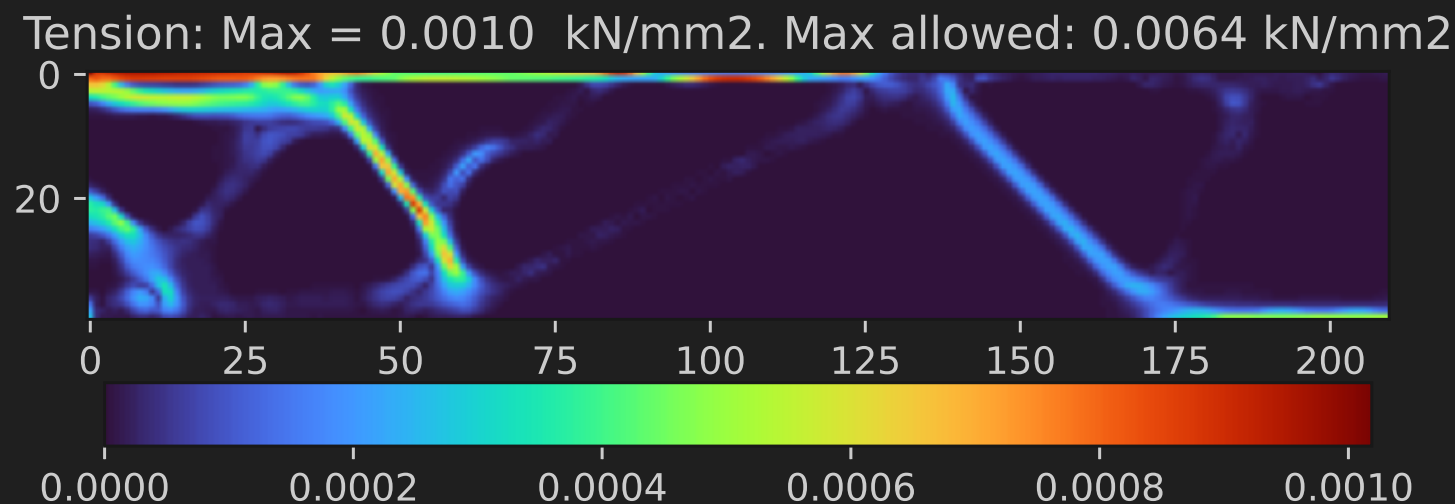
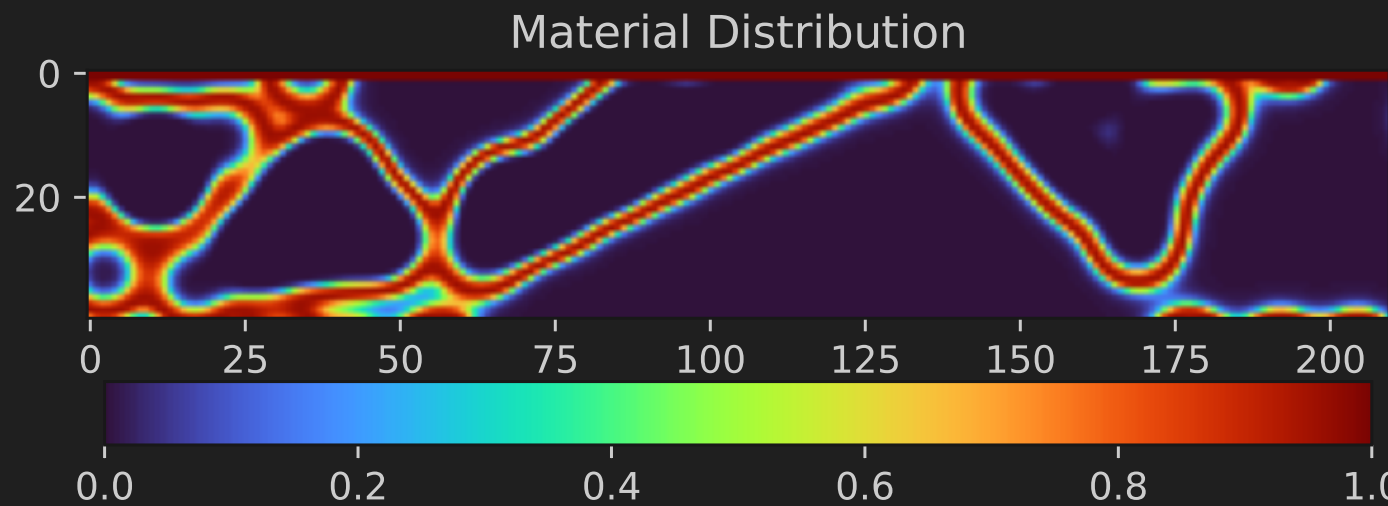
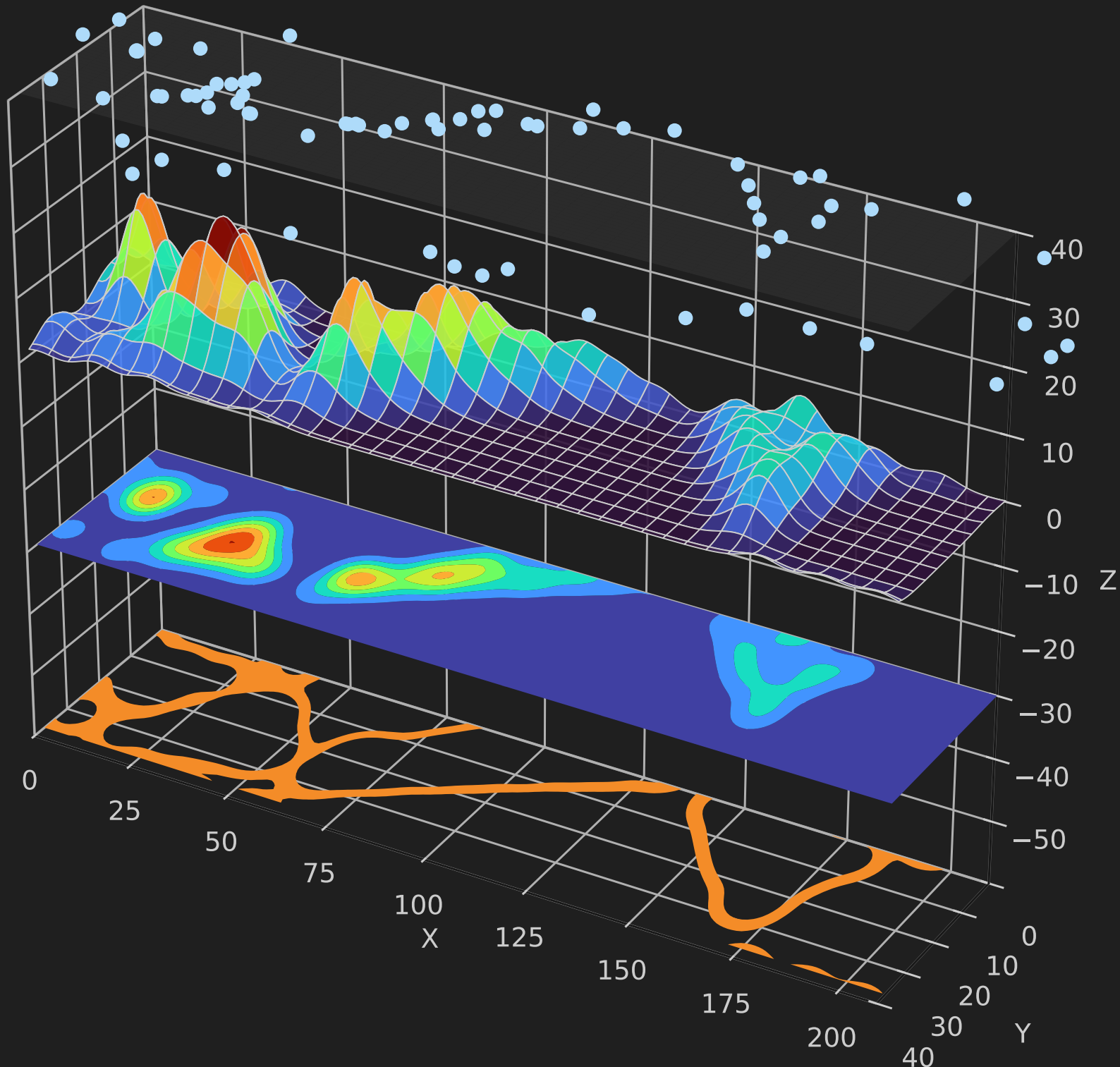
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.21) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.02 Shift = 1.74 Iteration = 181



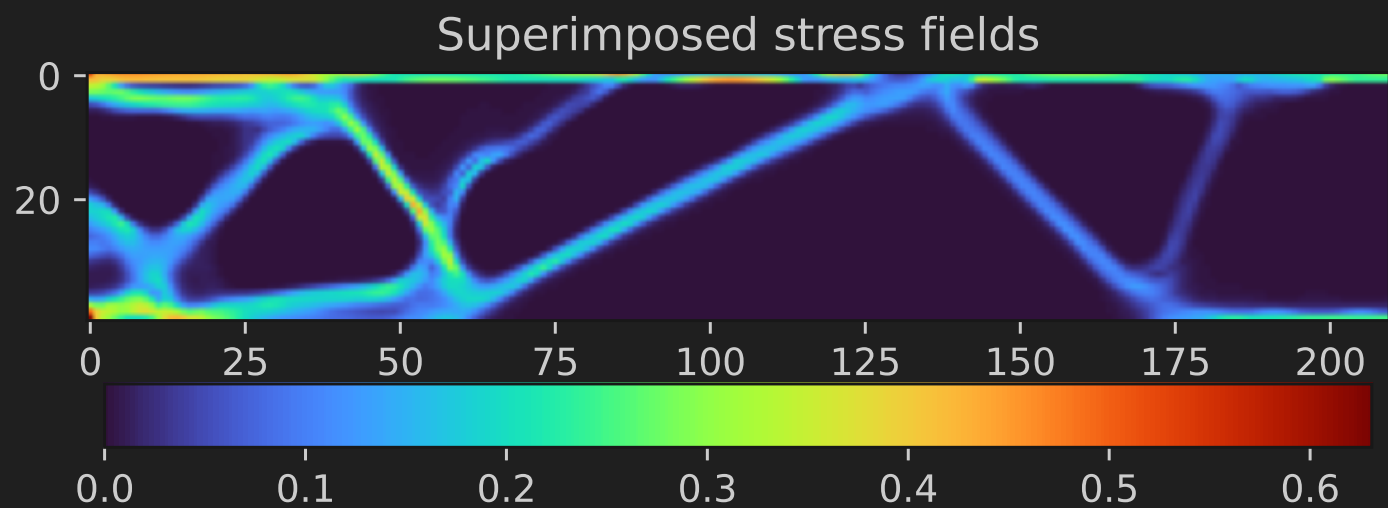
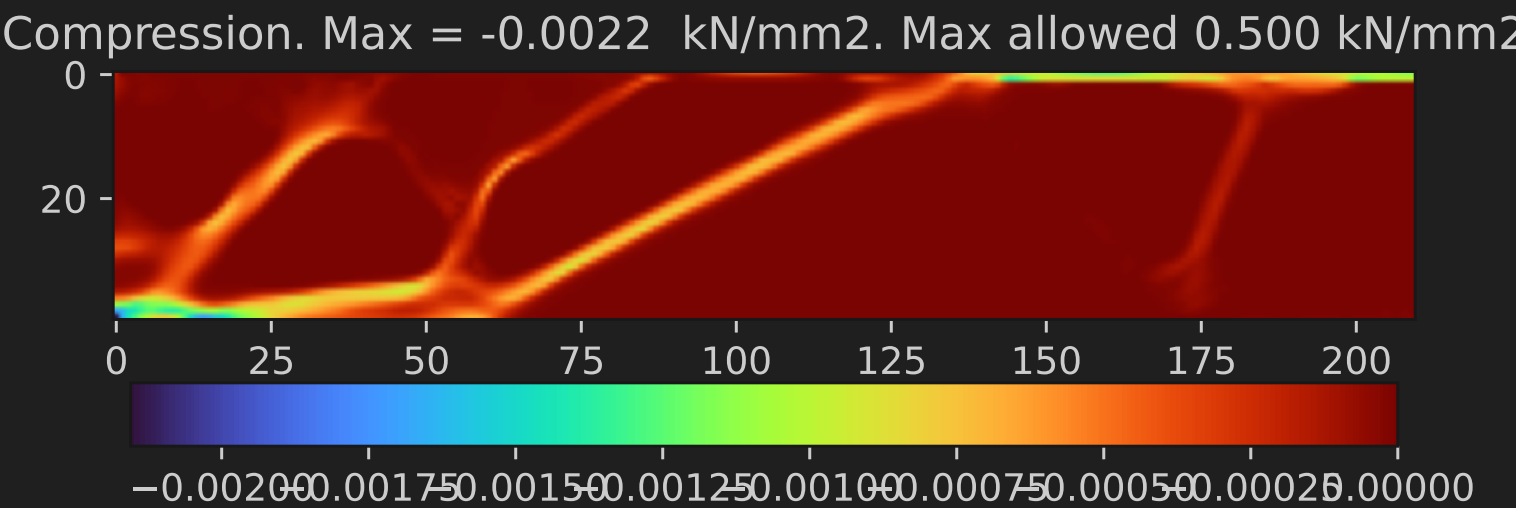
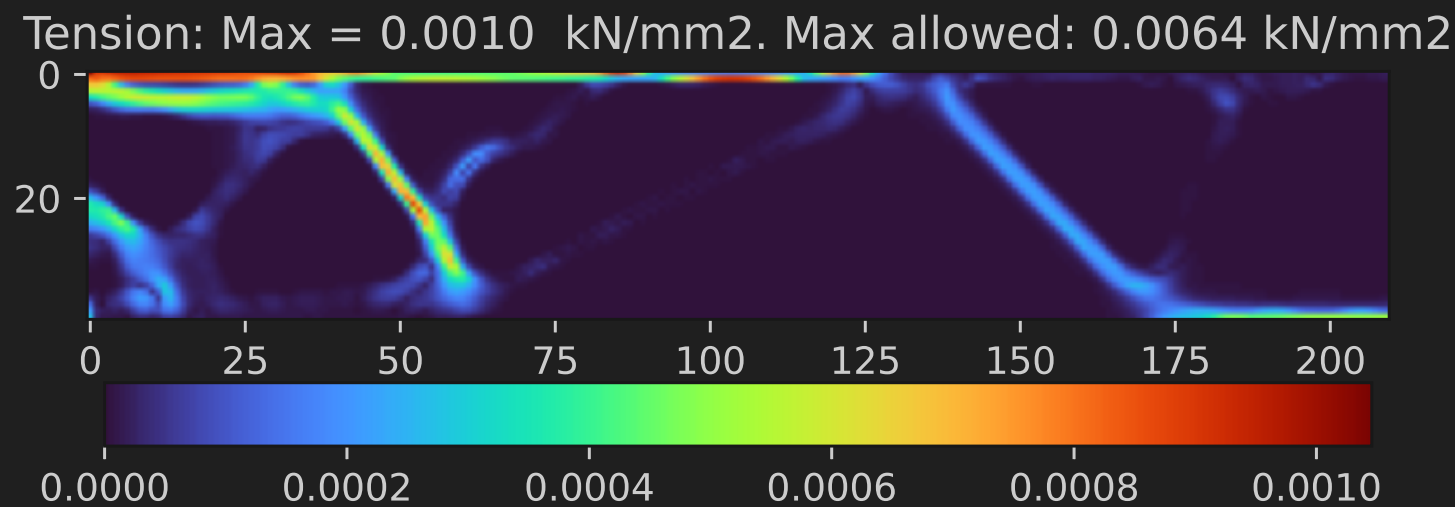
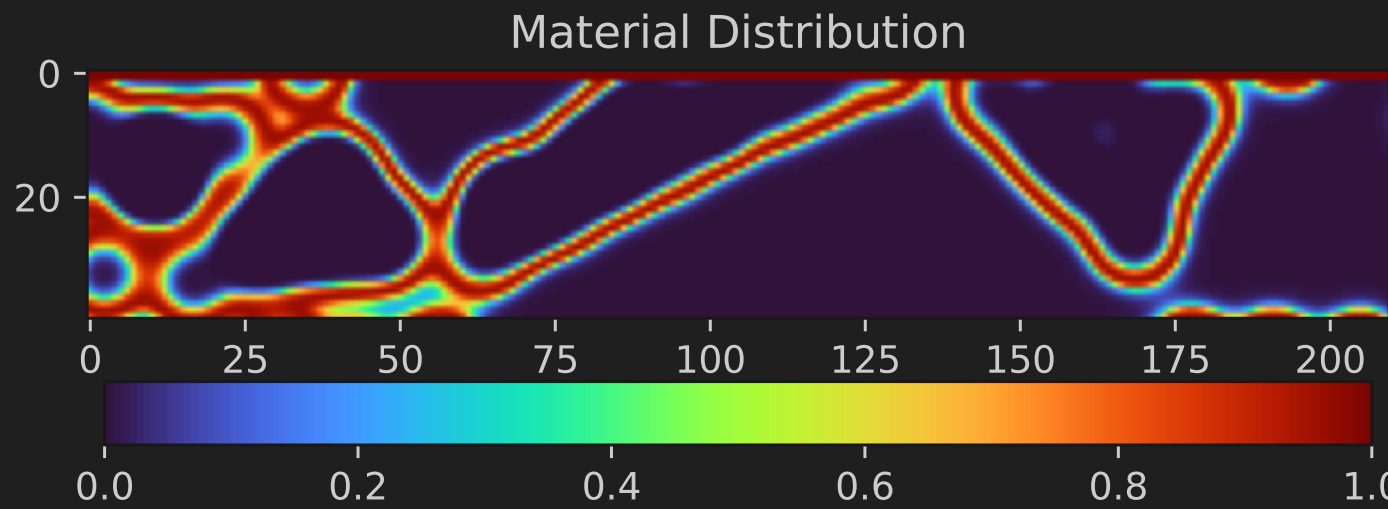
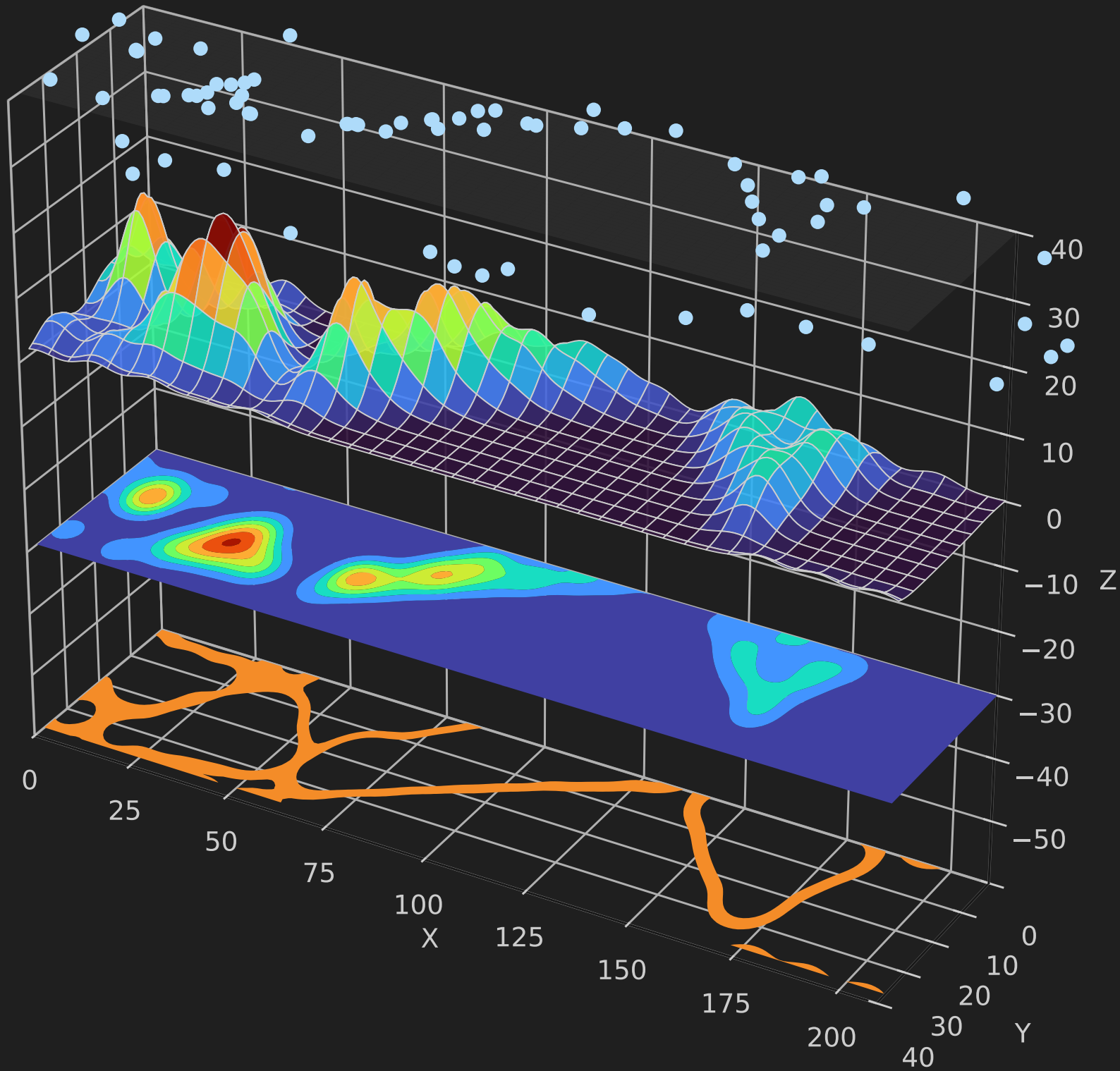
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.06 Shift = 1.74 Iteration = 183



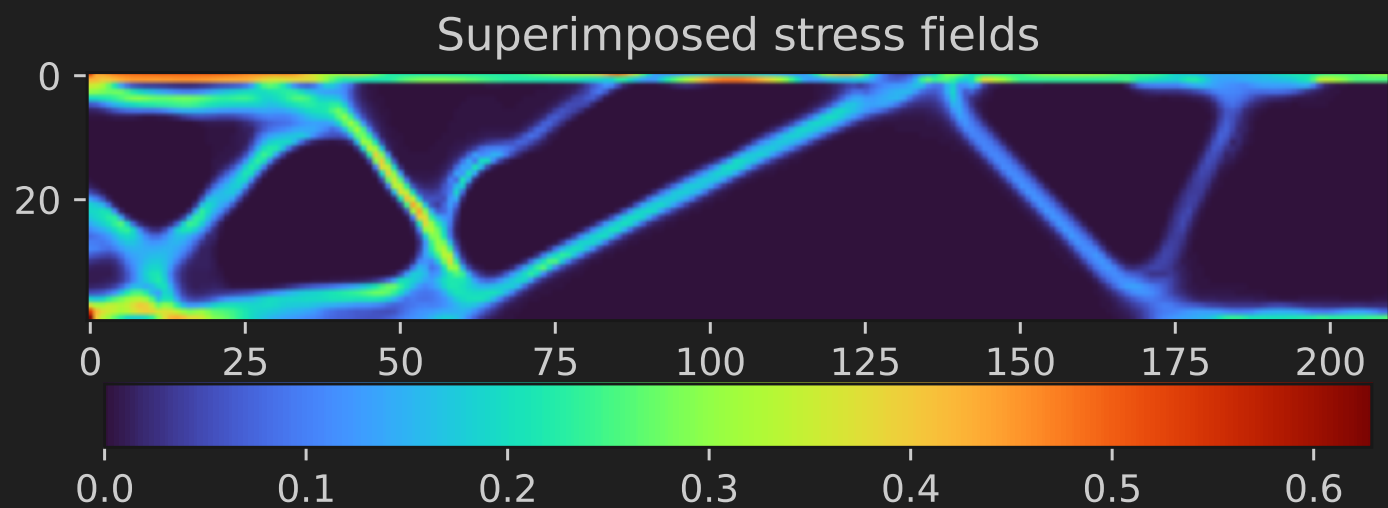
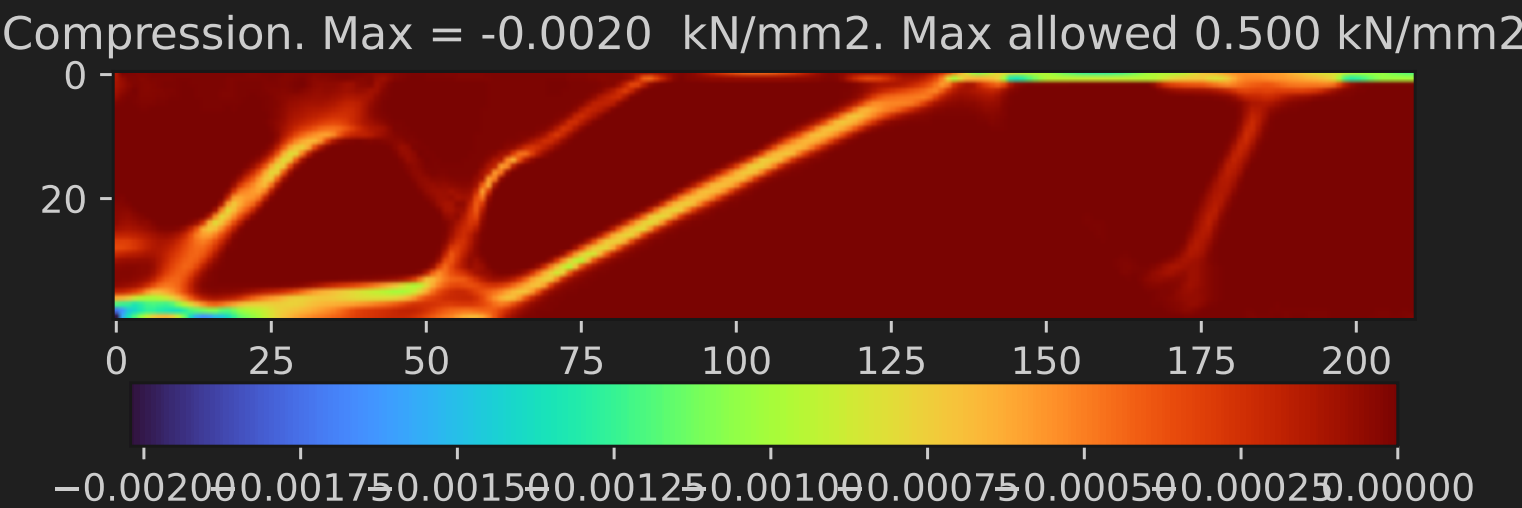
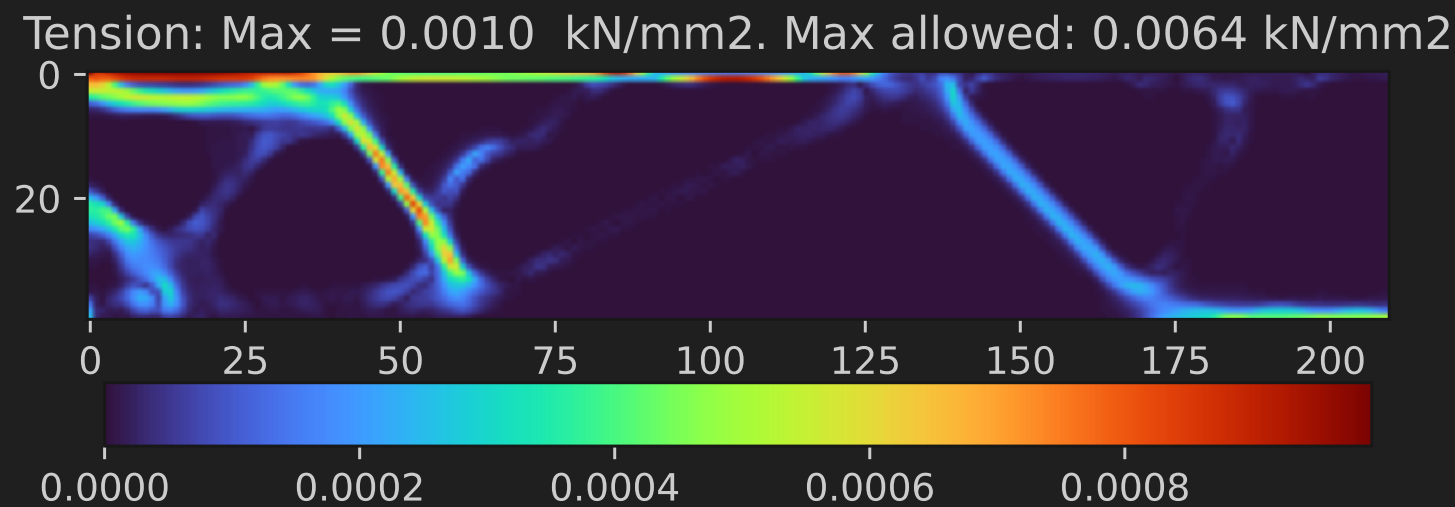
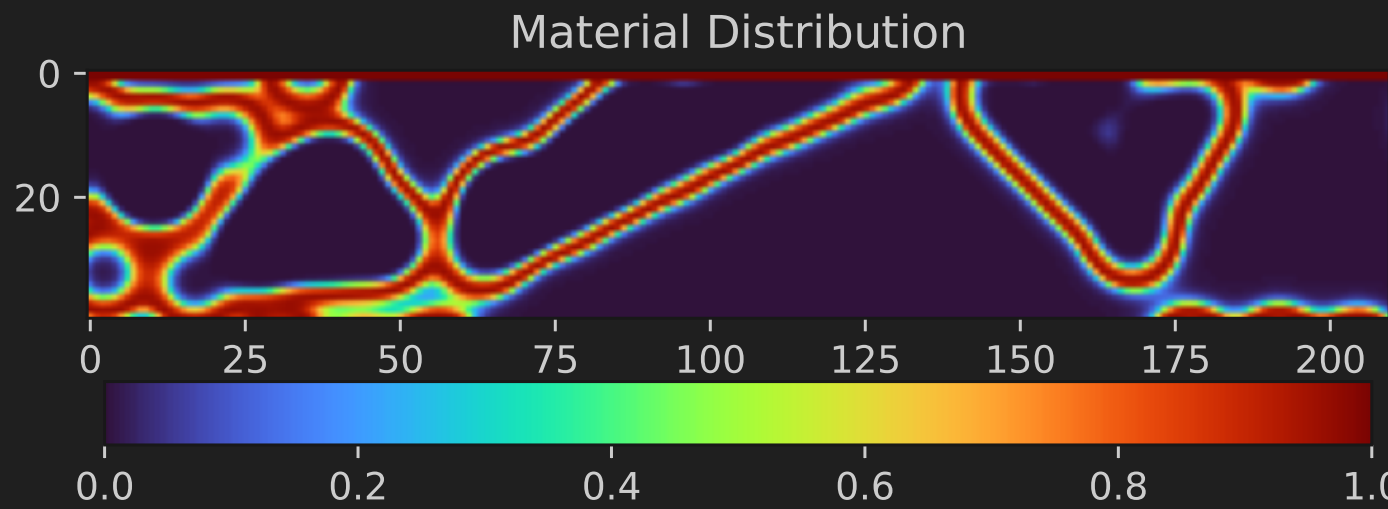
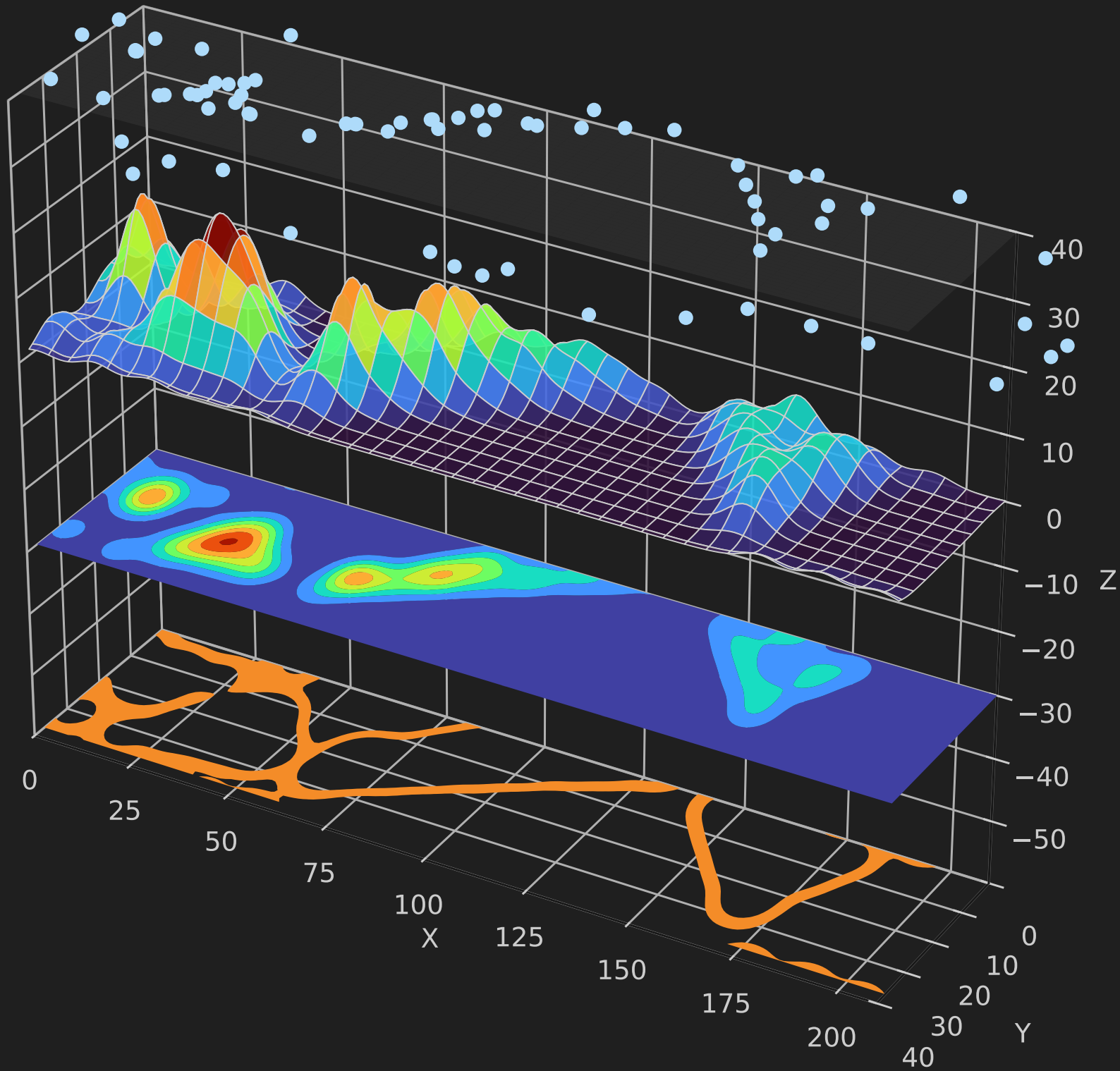
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.05 Shift = 1.77 Iteration = 185



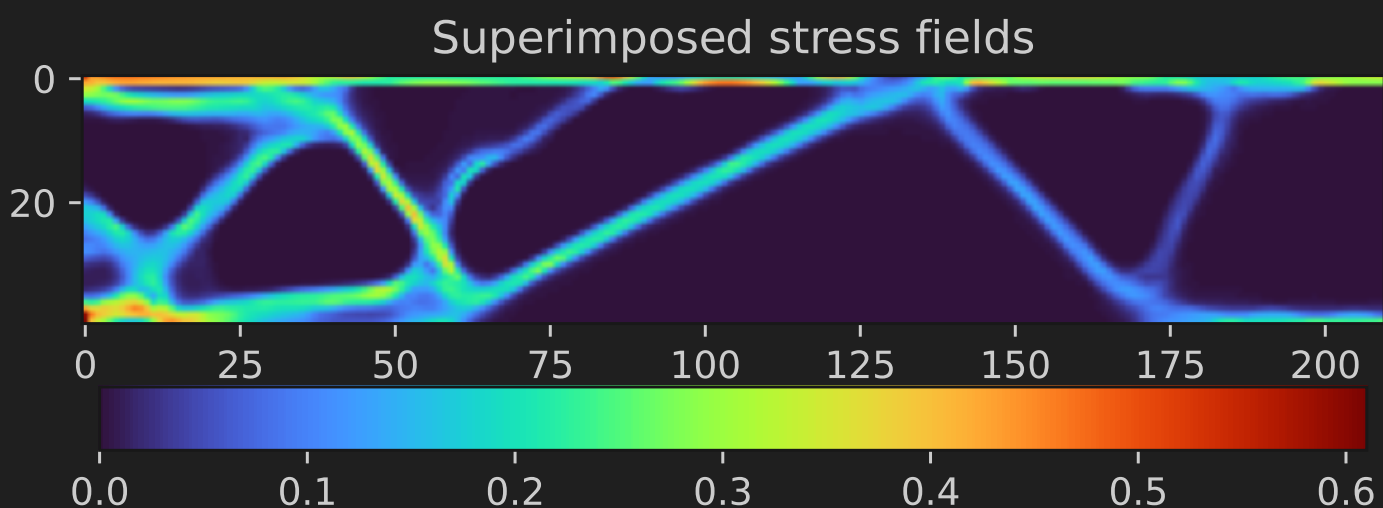
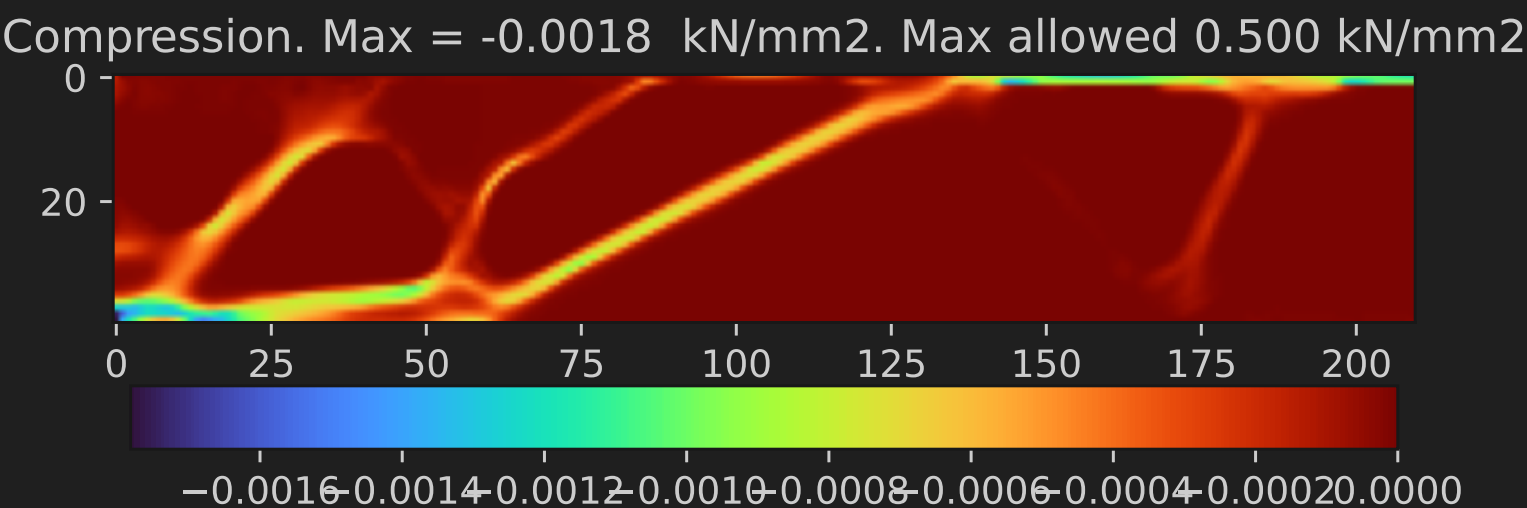
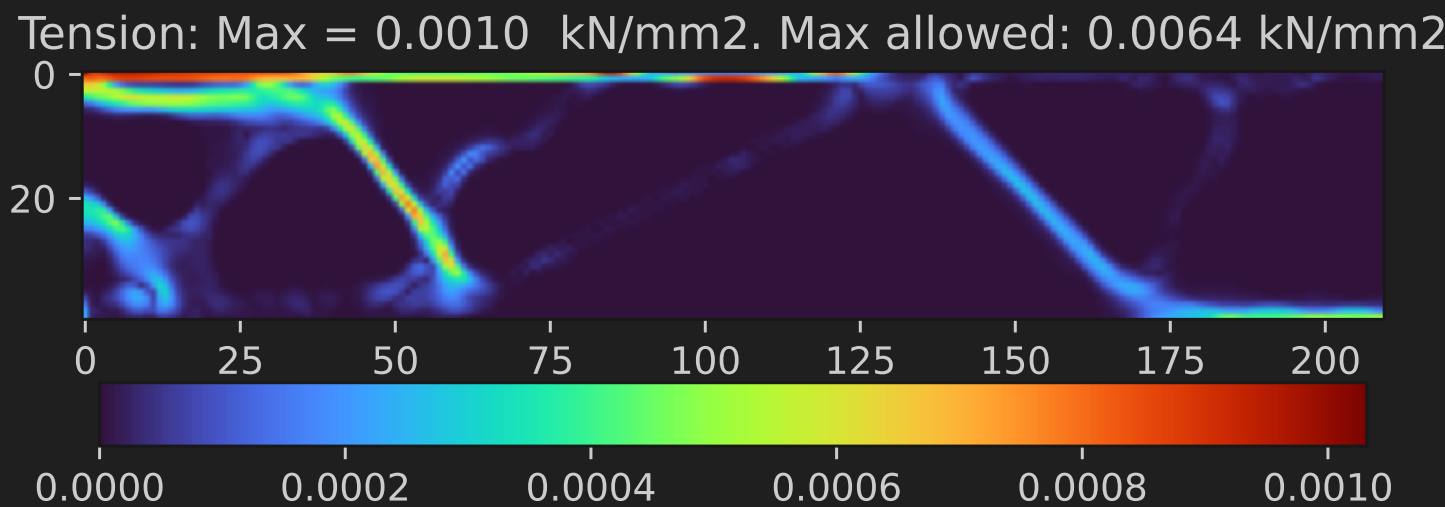
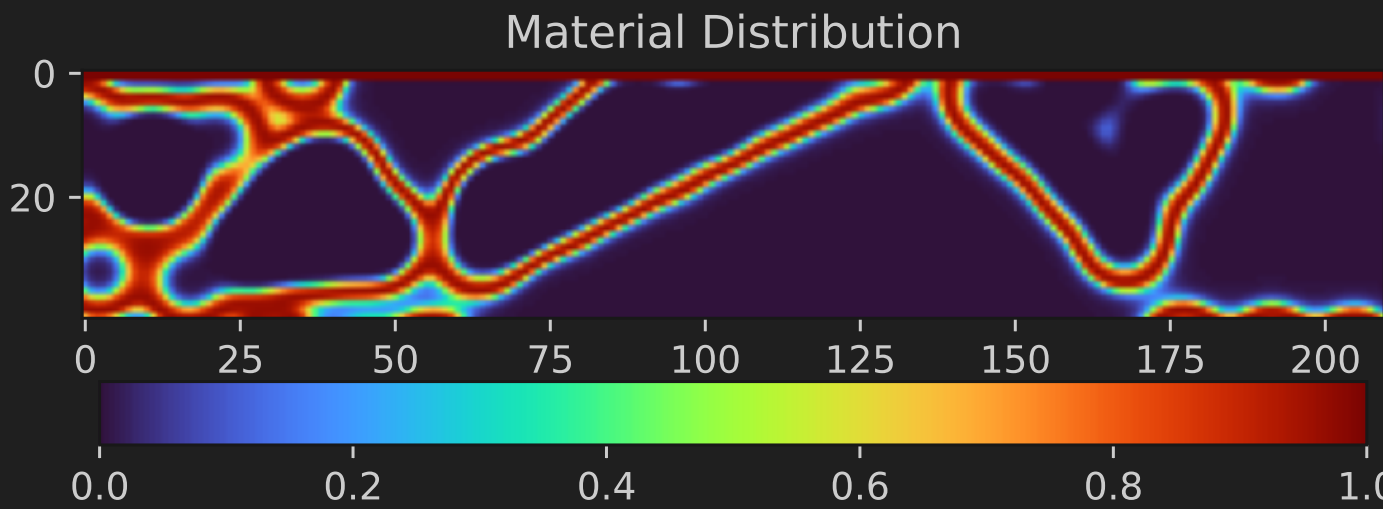
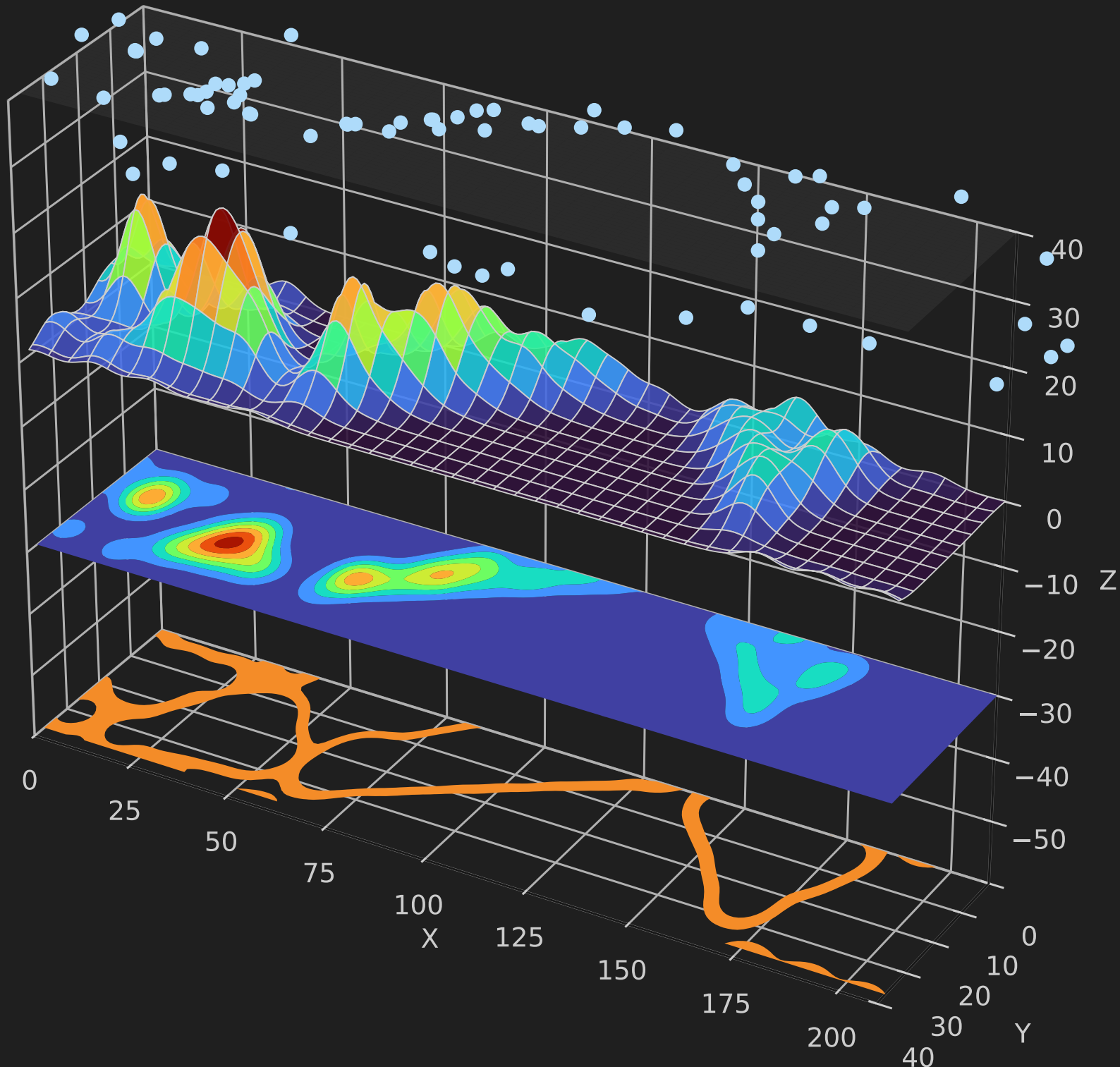
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.05 Shift = 1.79 Iteration = 187



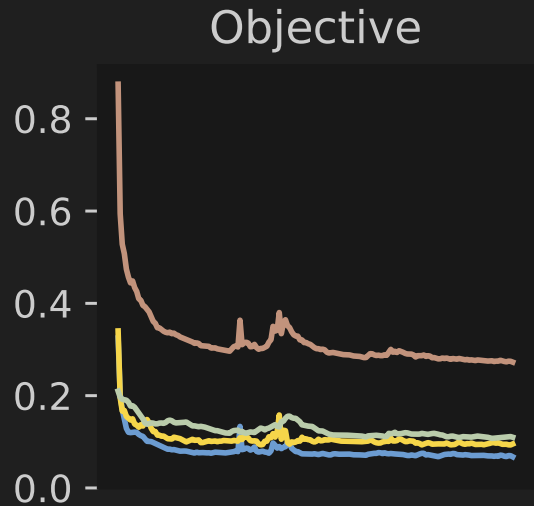
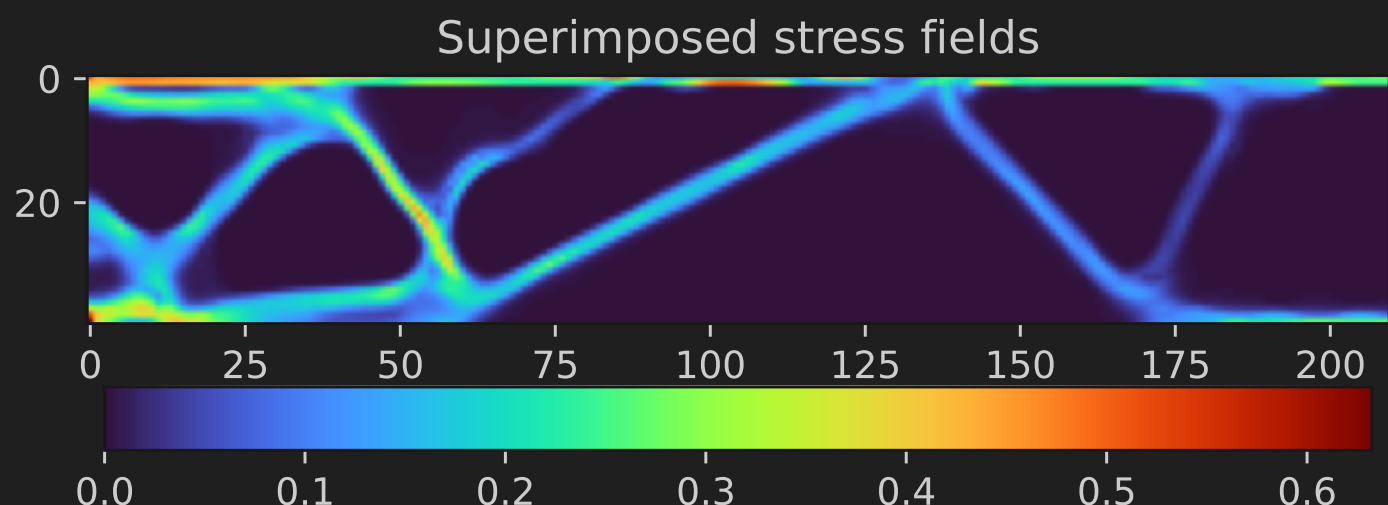
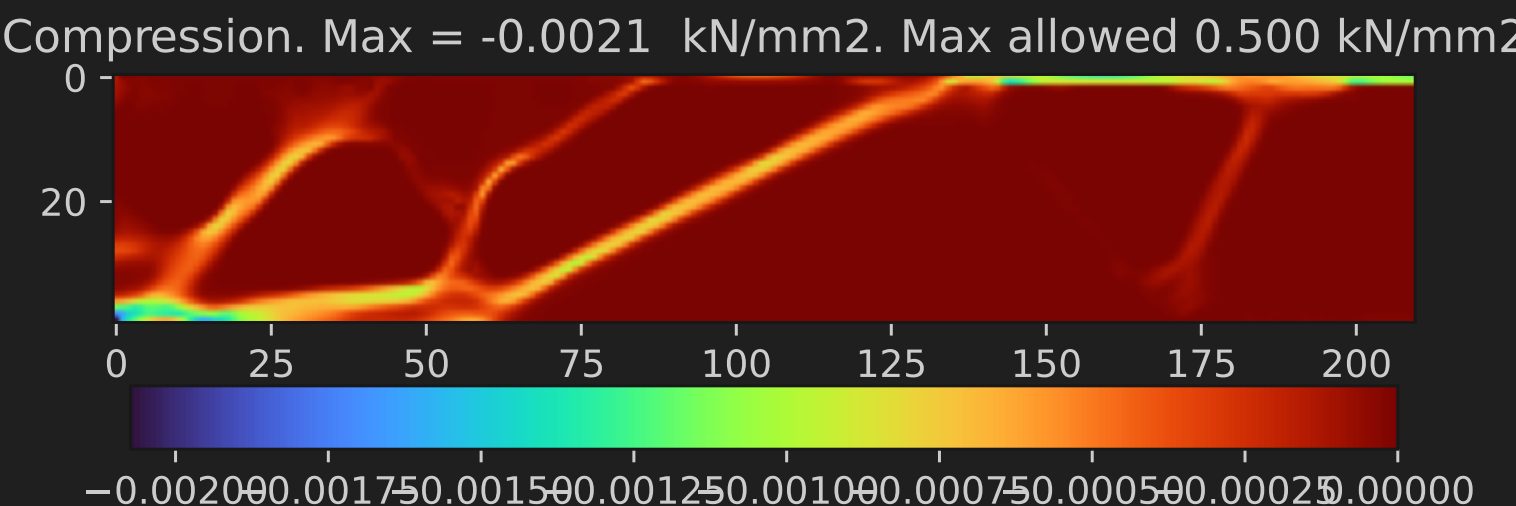
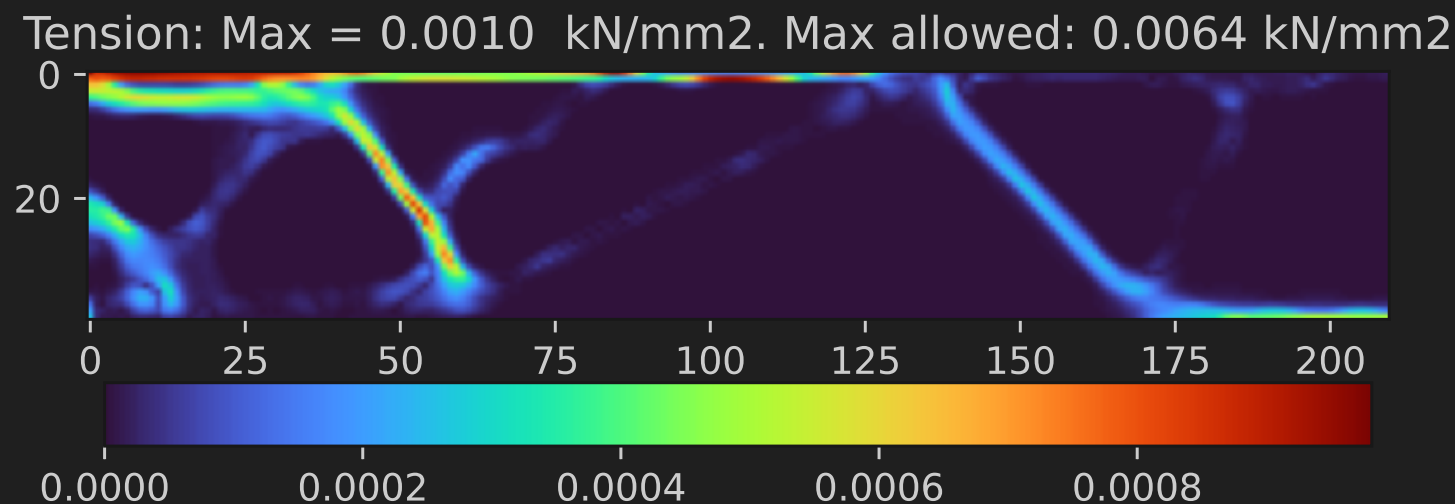
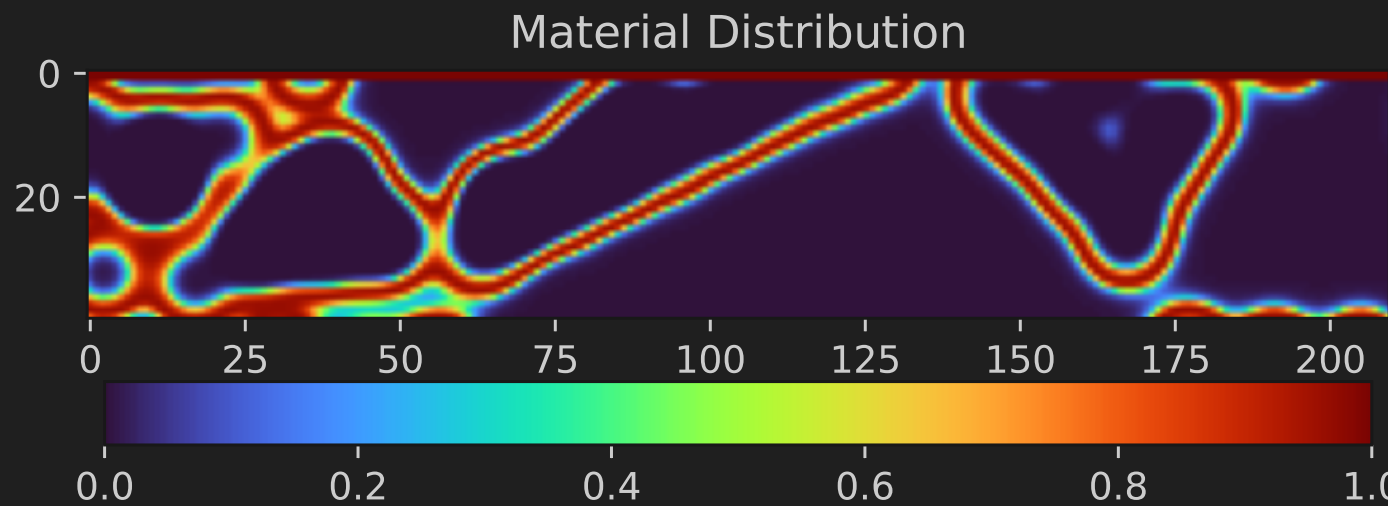
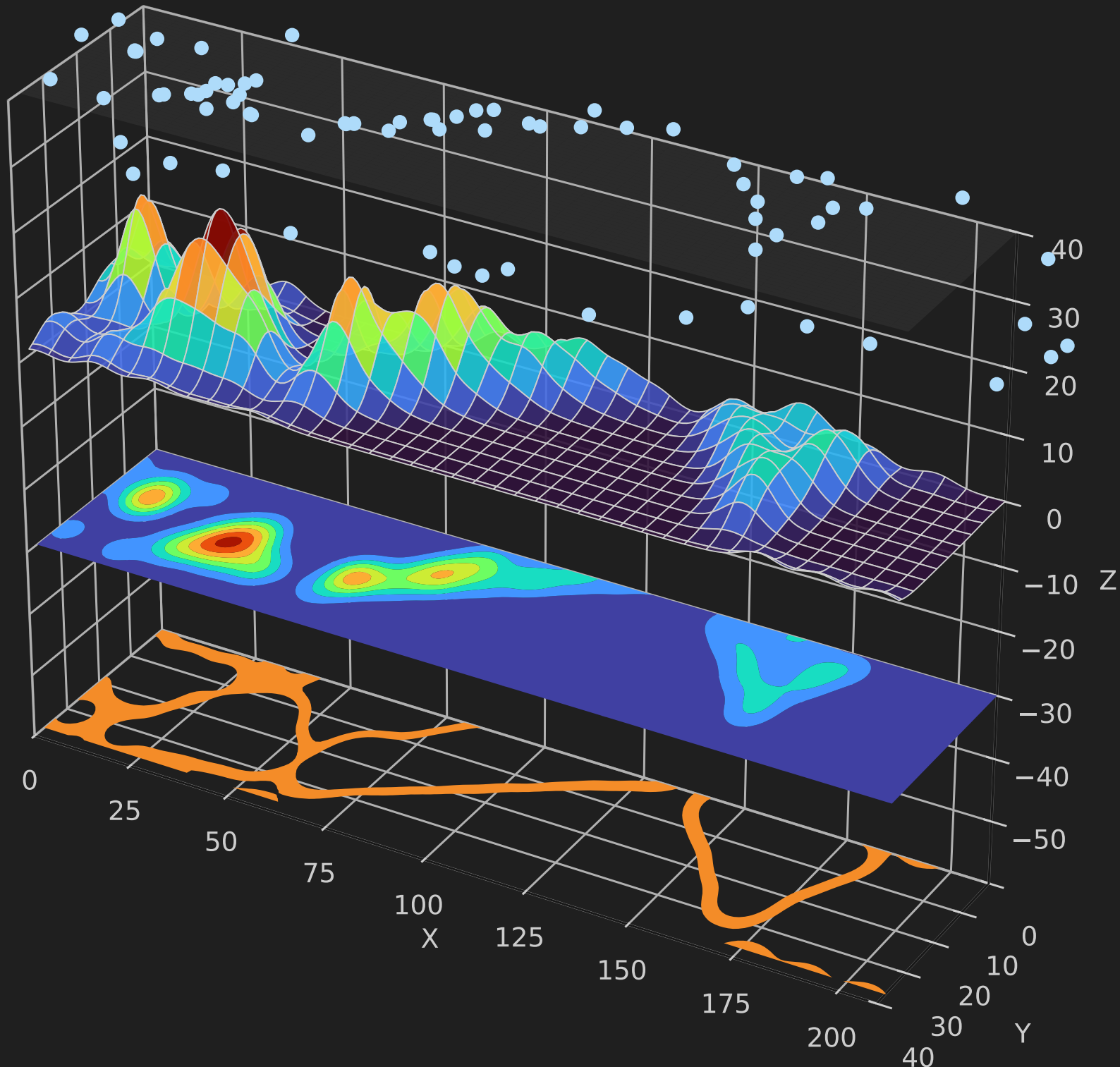
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.02 Shift = 1.81 Iteration = 189



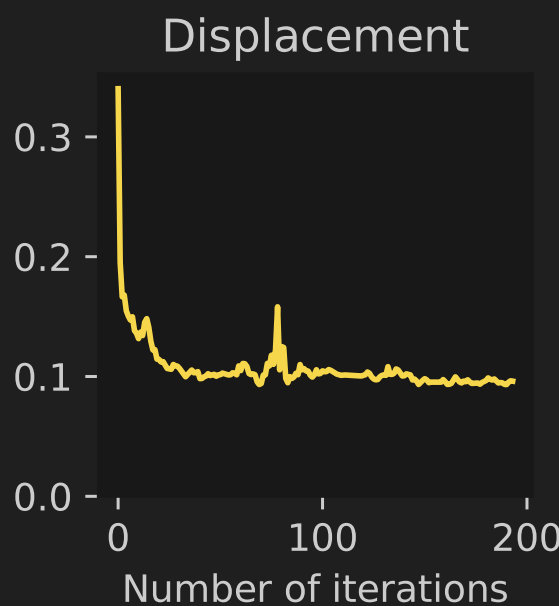
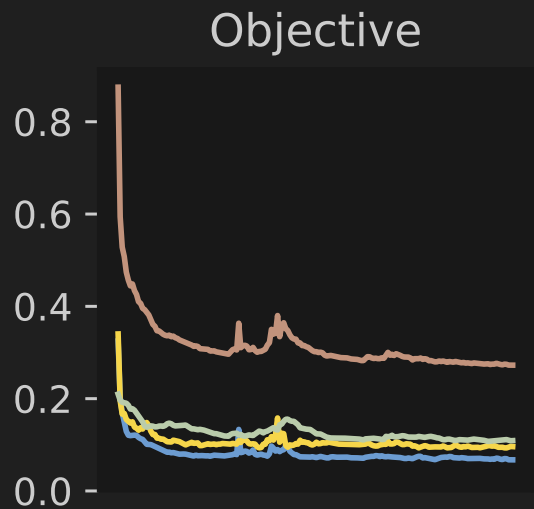
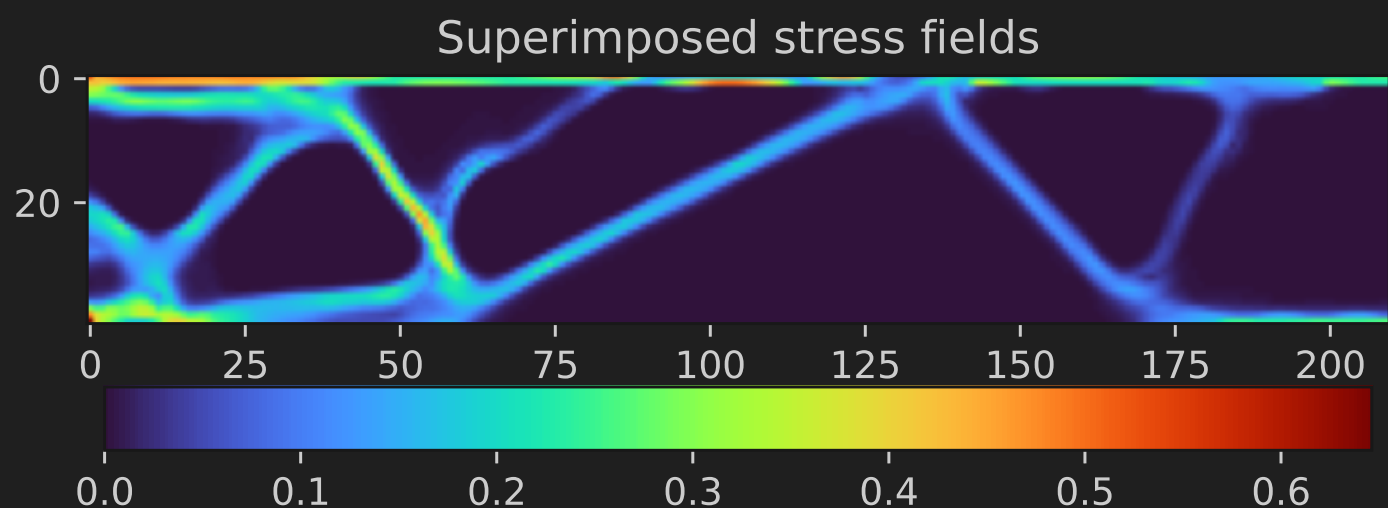
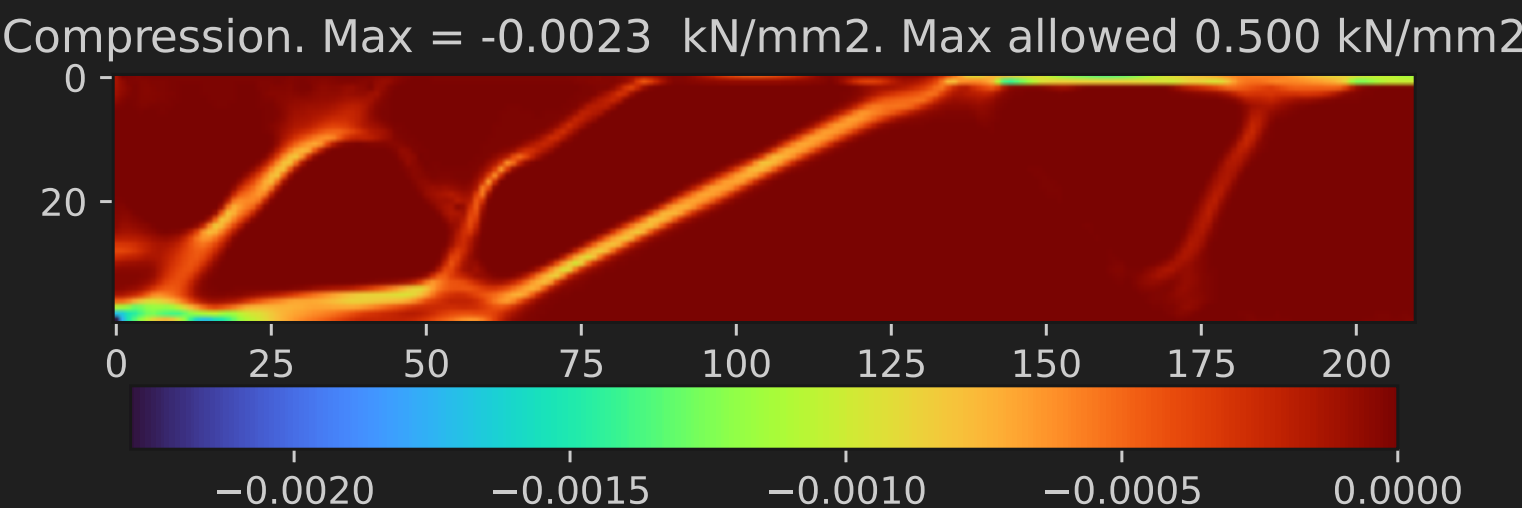
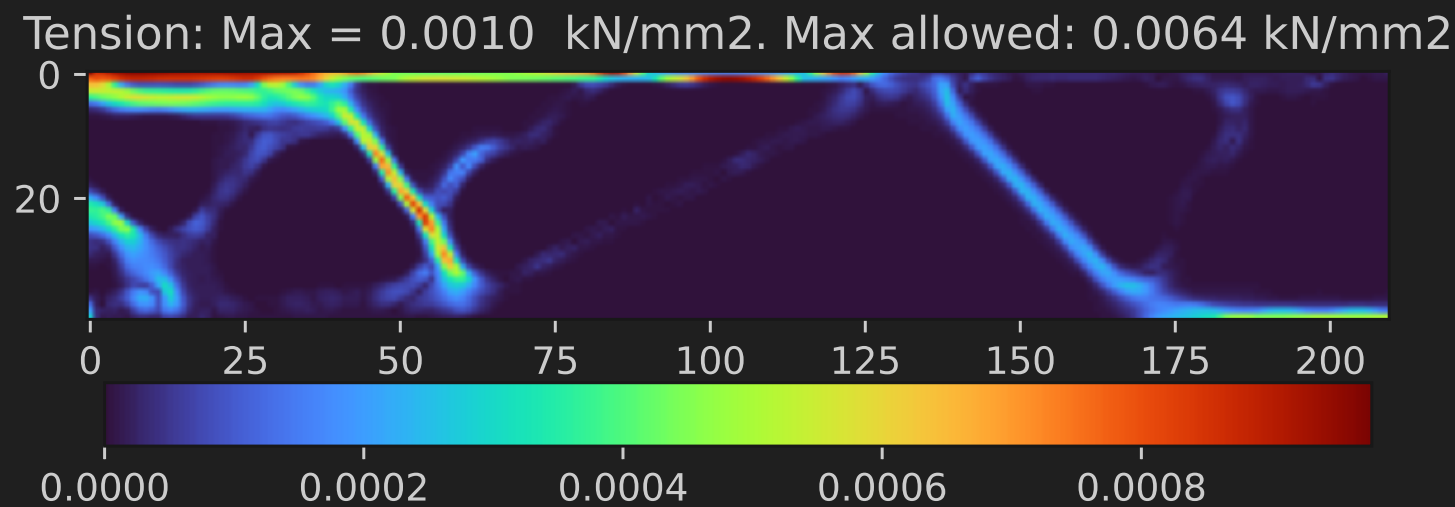
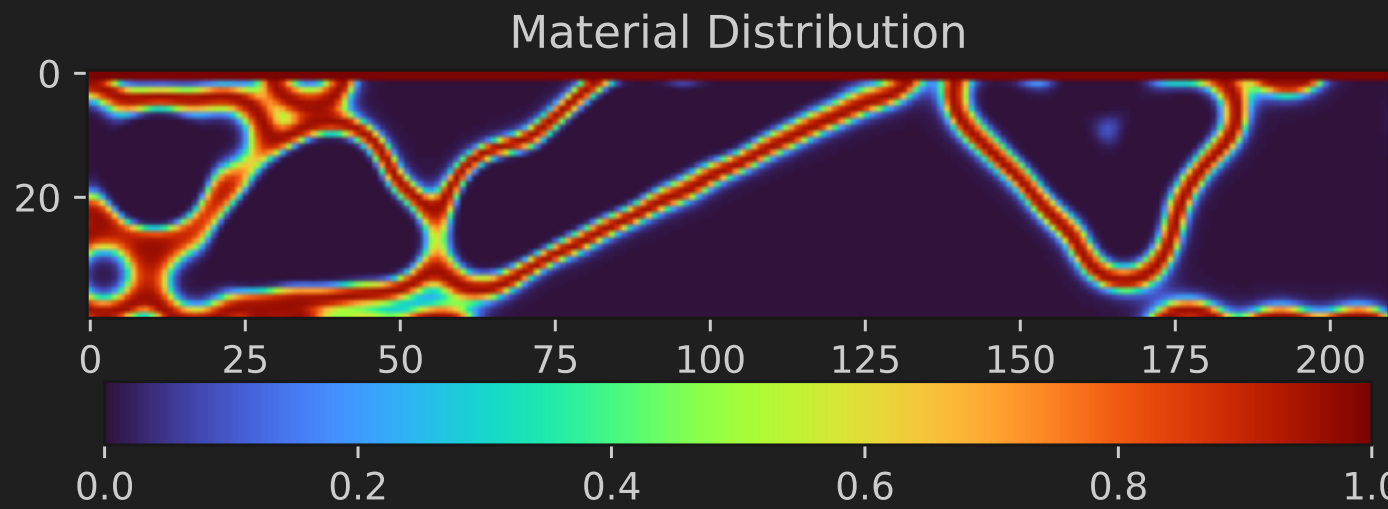
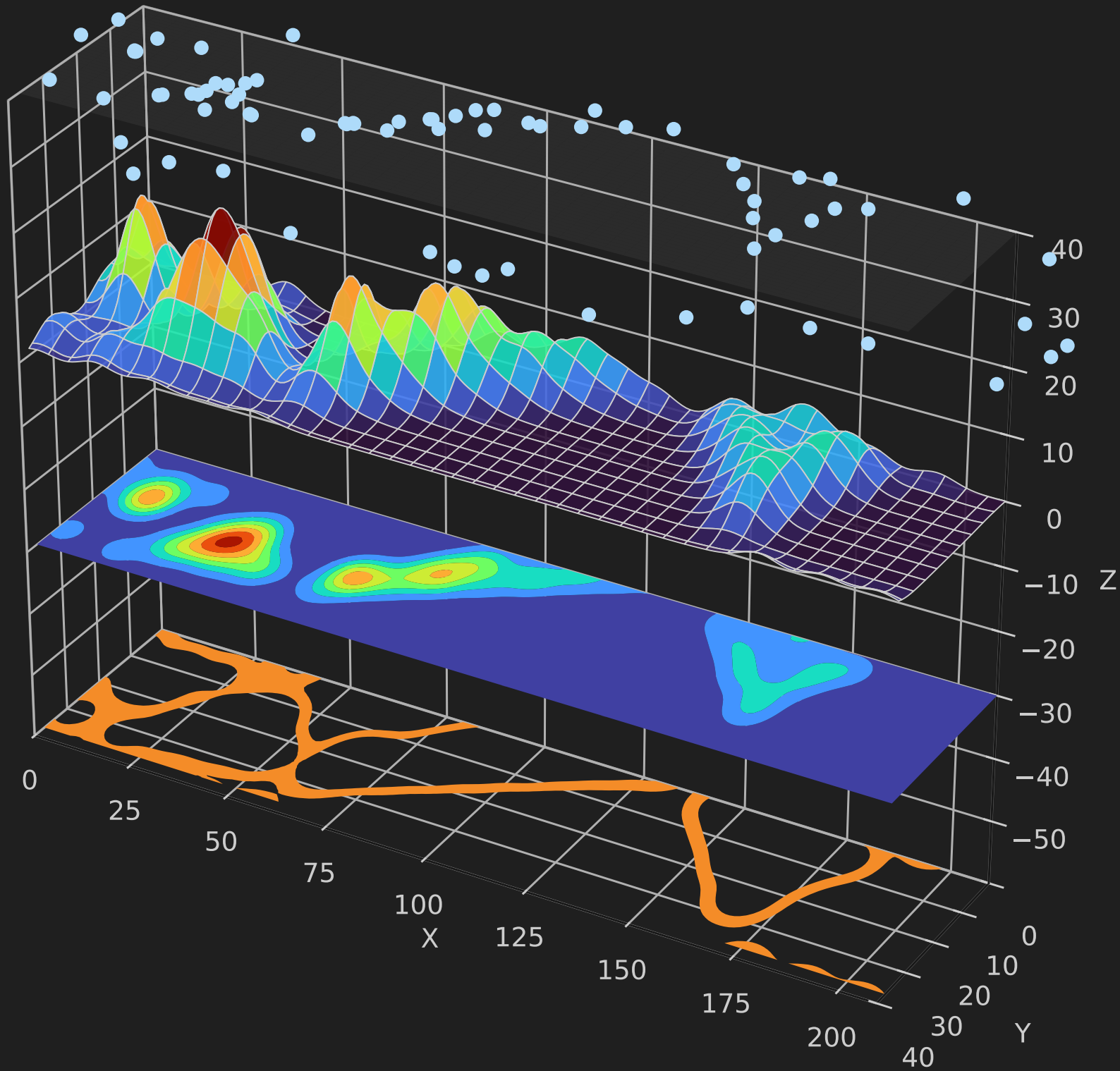
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.03 Shift = 1.80 Iteration = 191



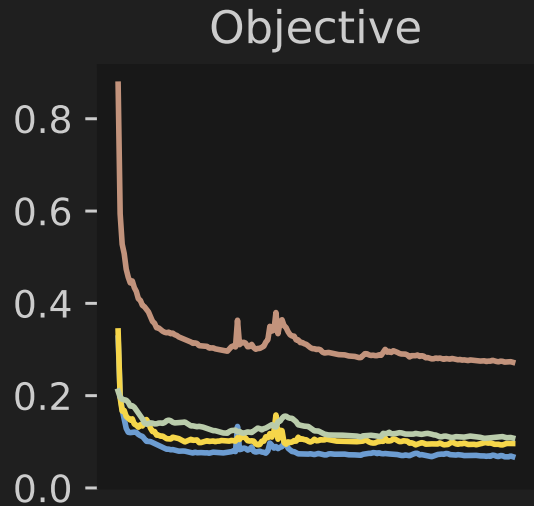
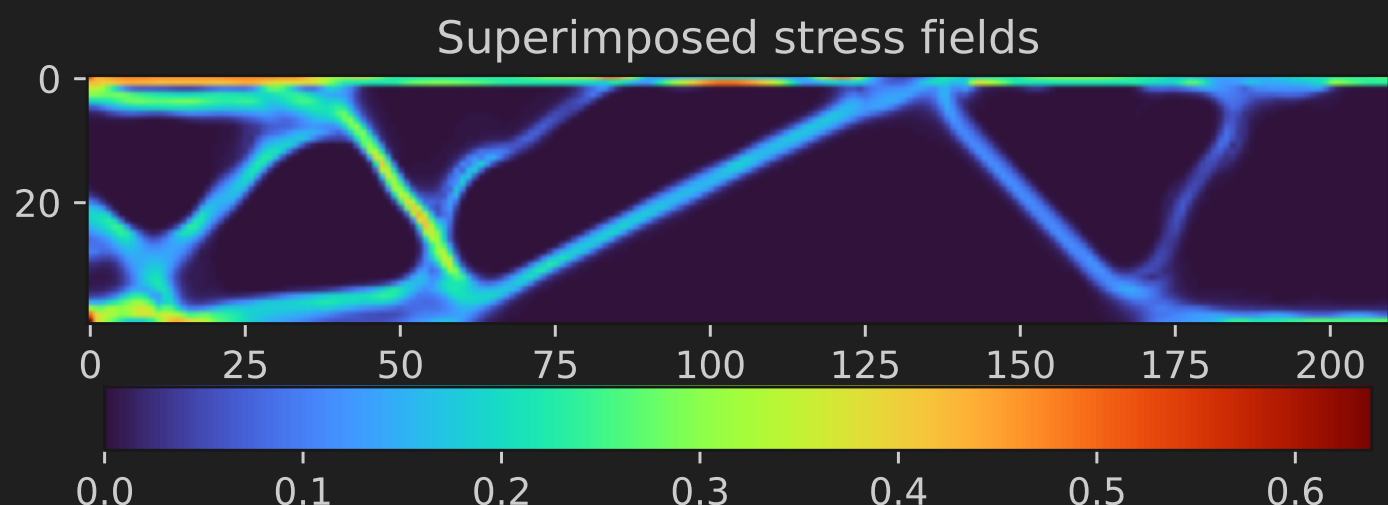
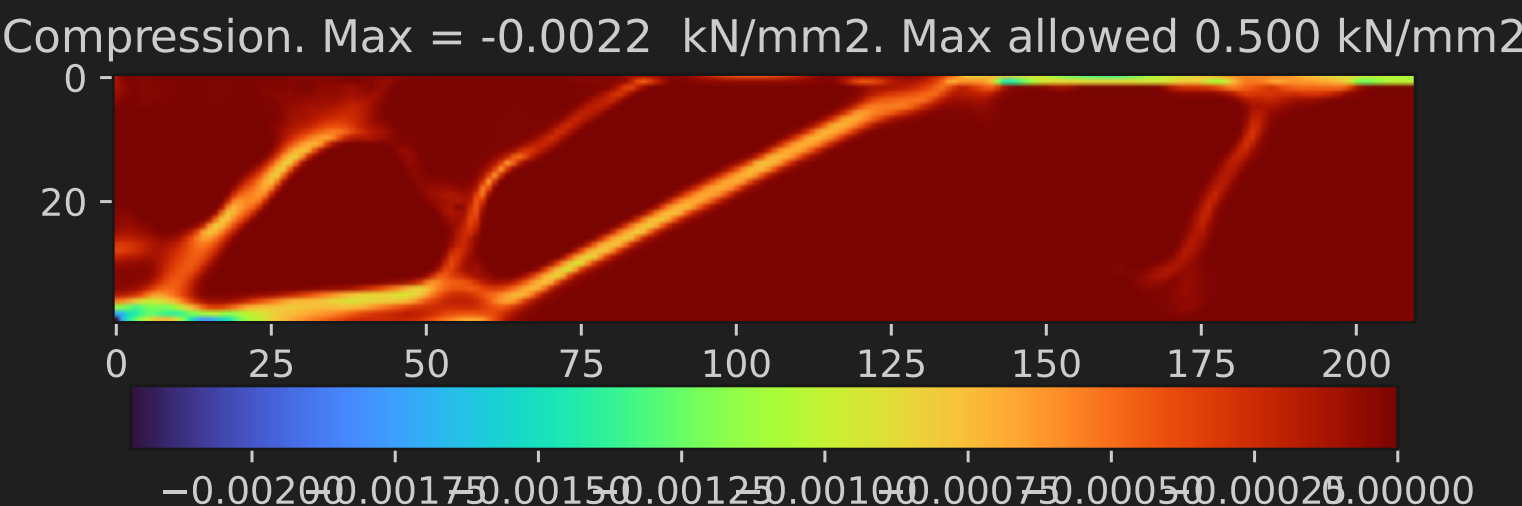
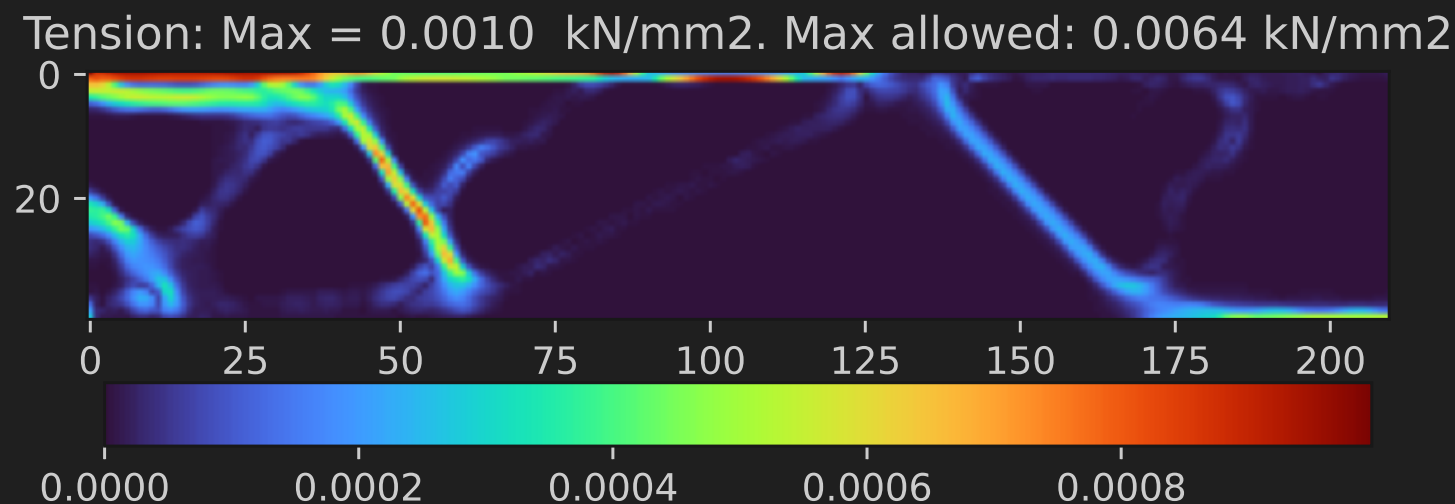
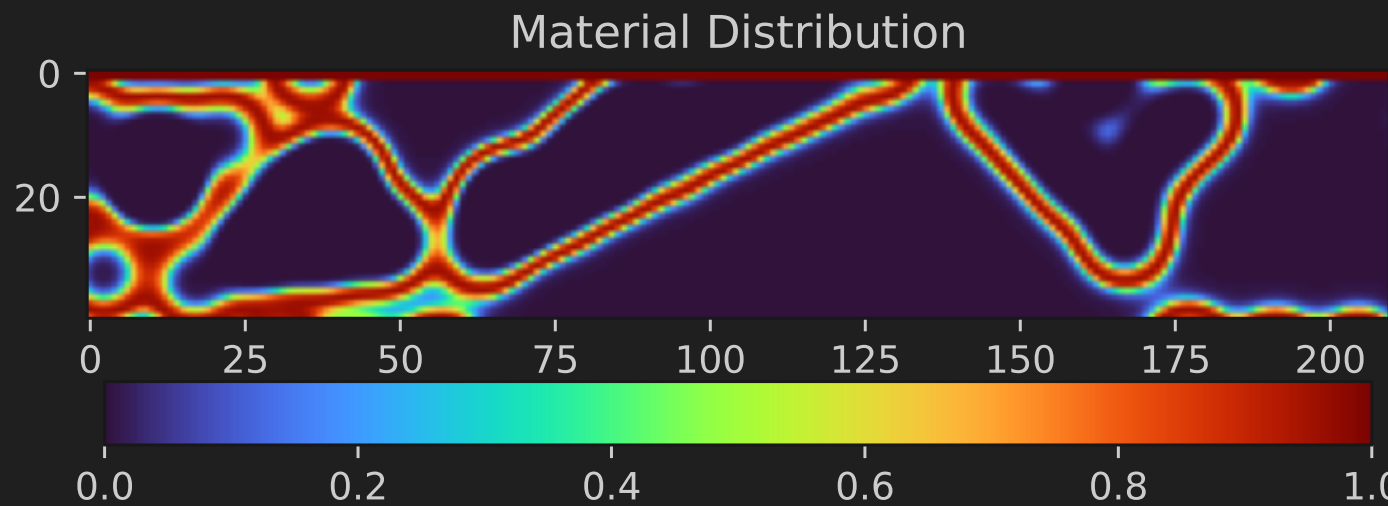
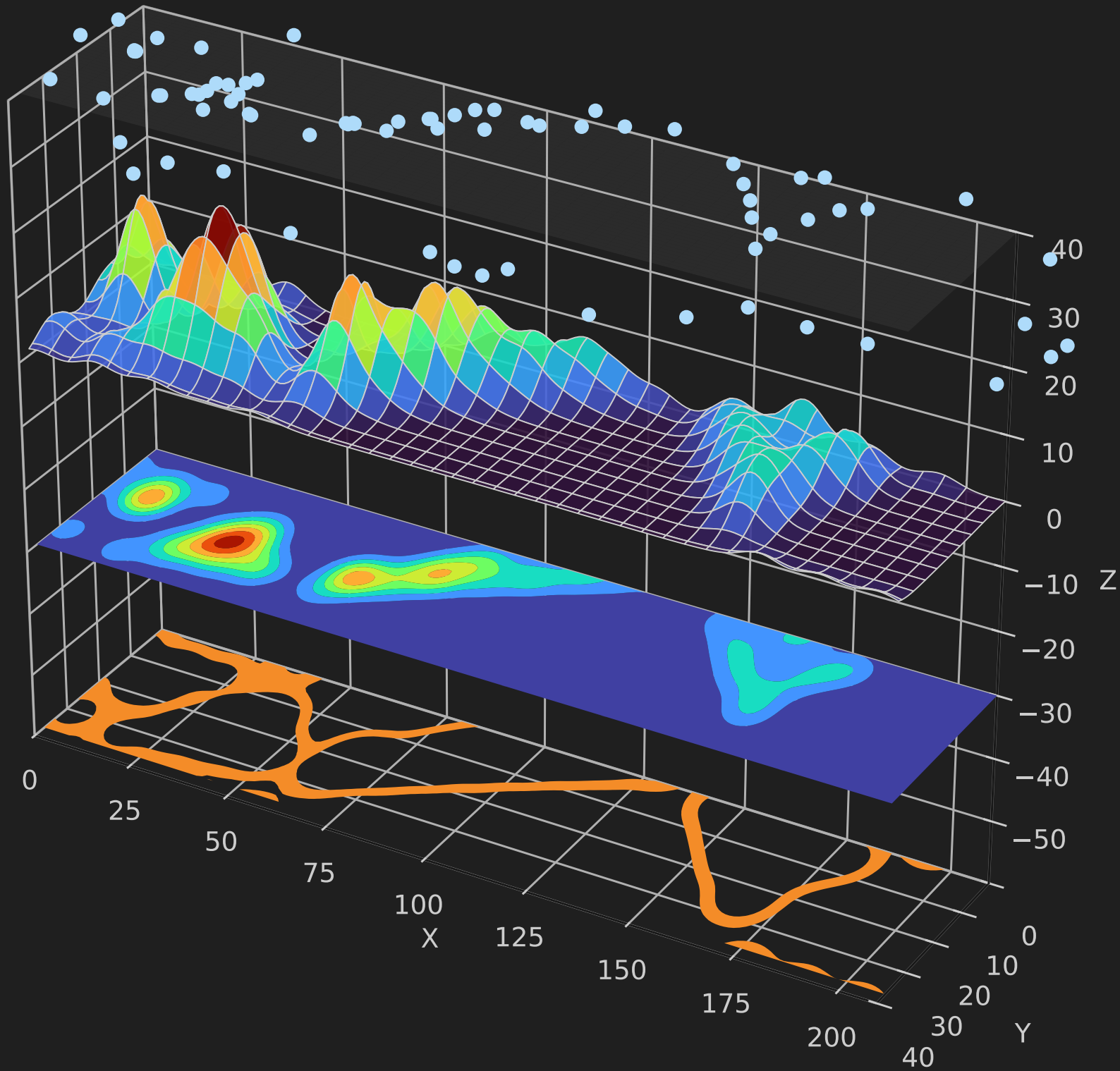
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.06 Shift = 1.78 Iteration = 193



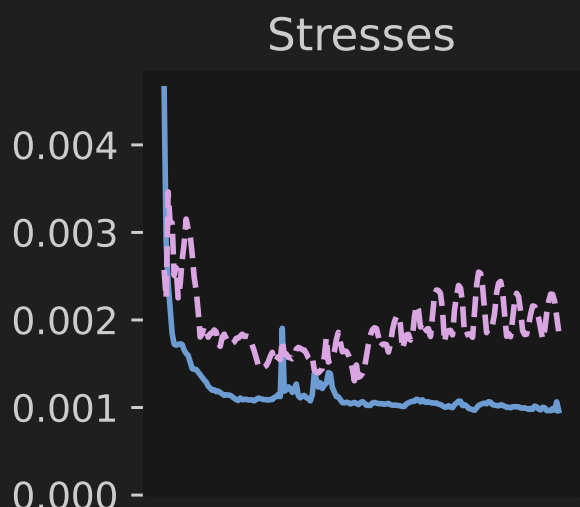
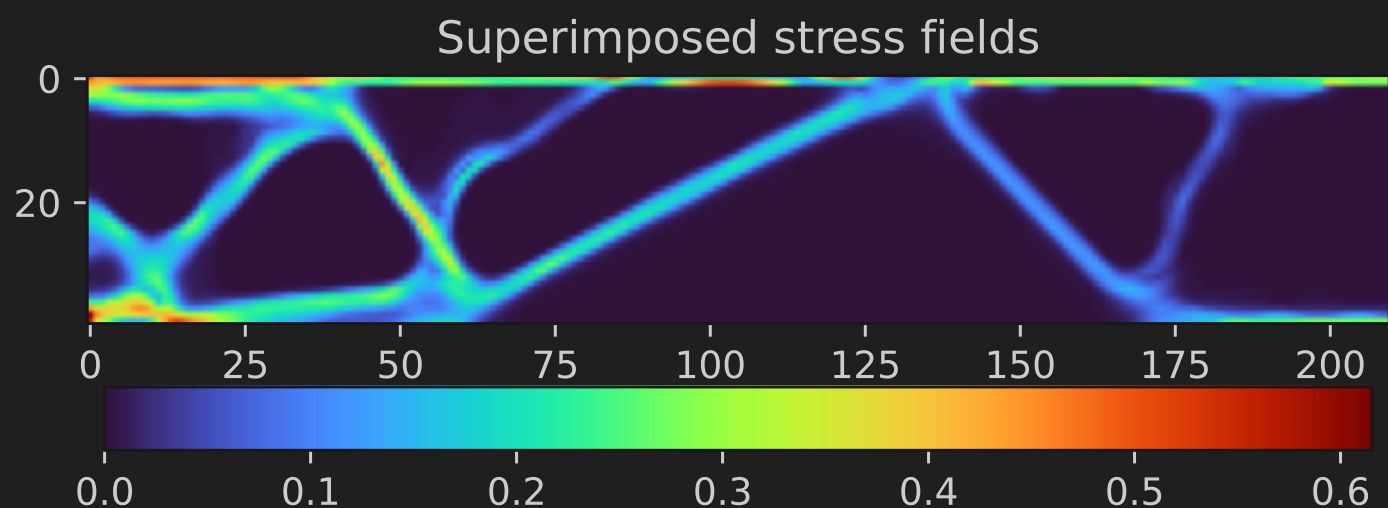
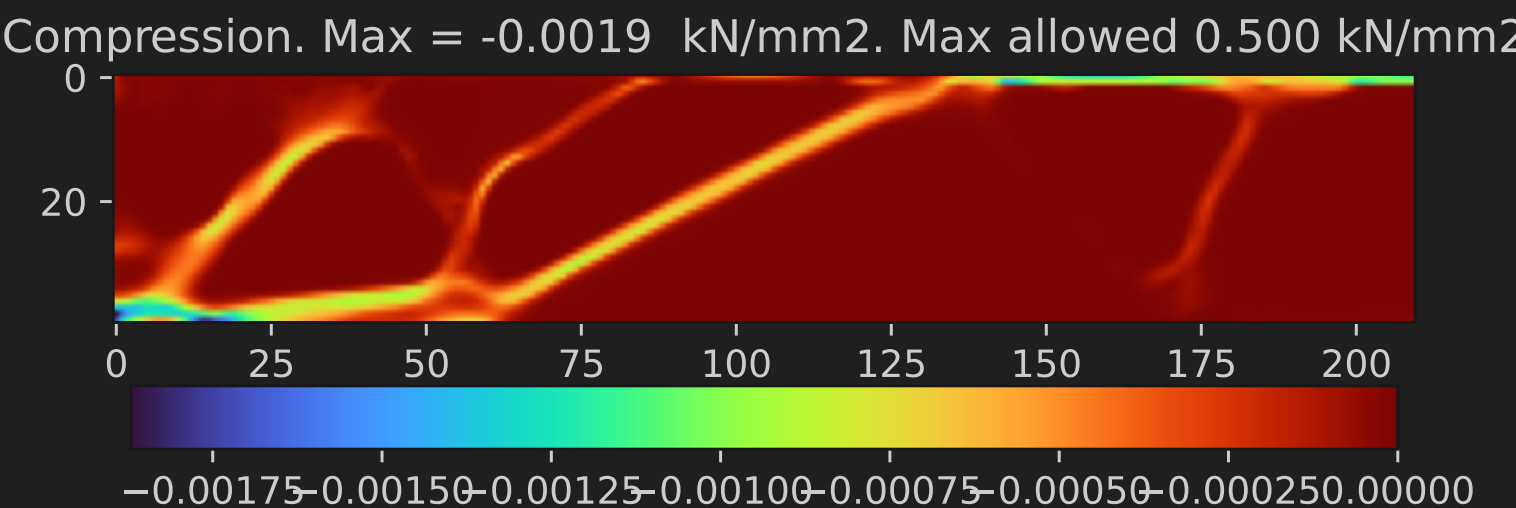
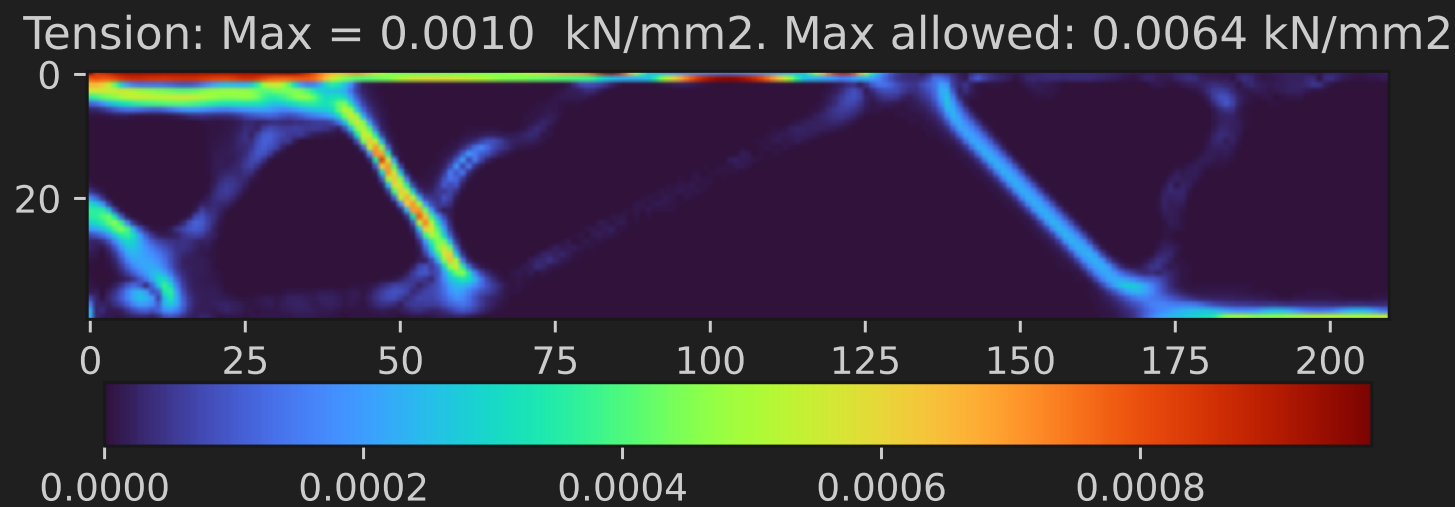
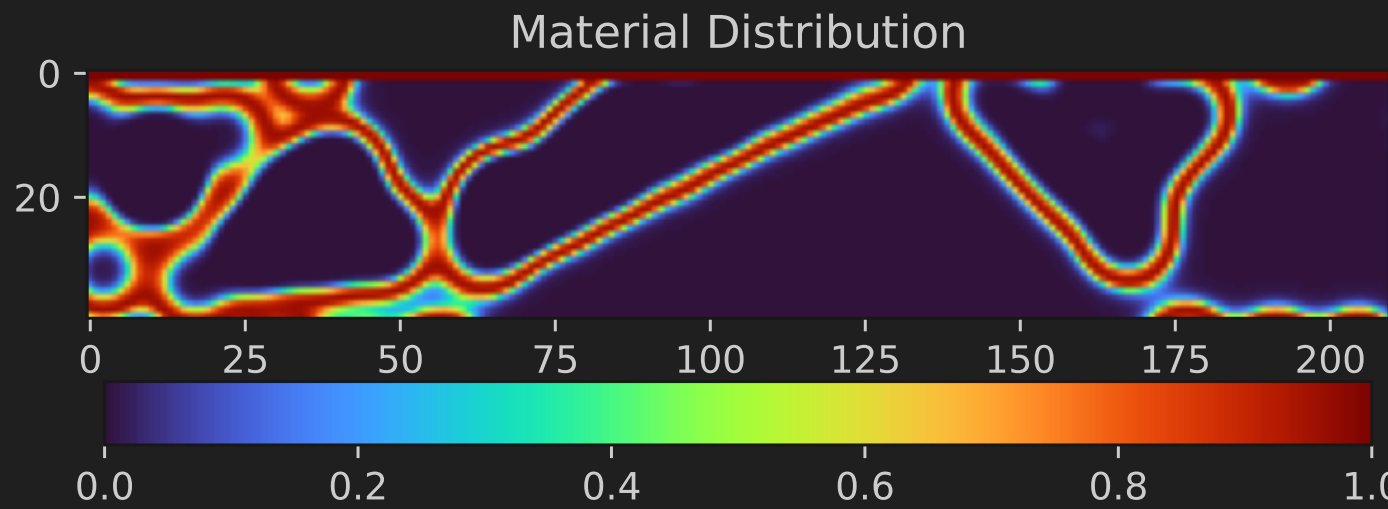
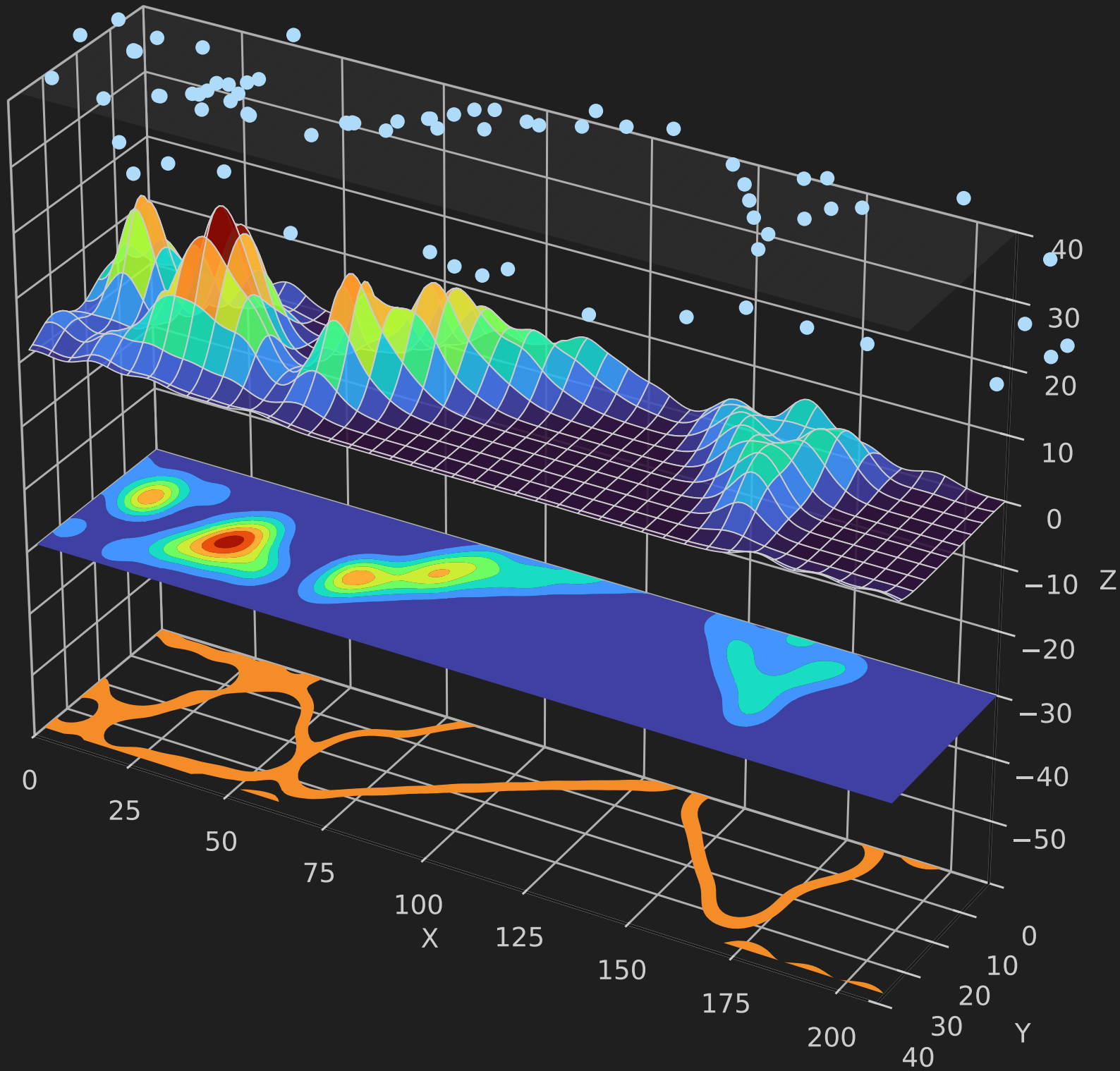
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.09 Shift = 1.76 Iteration = 195



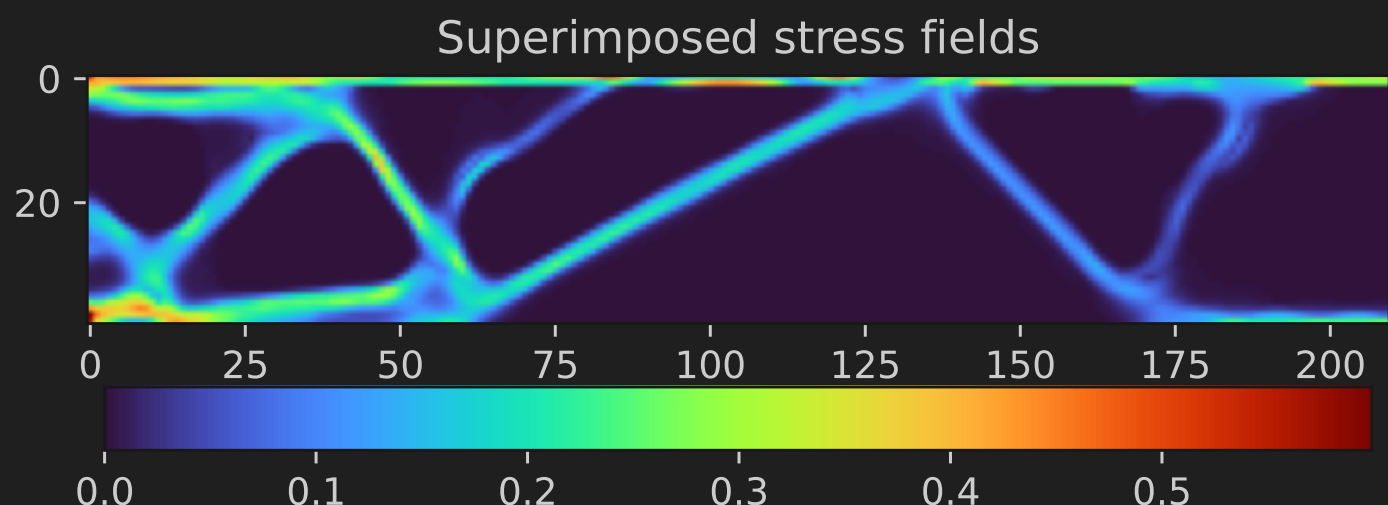
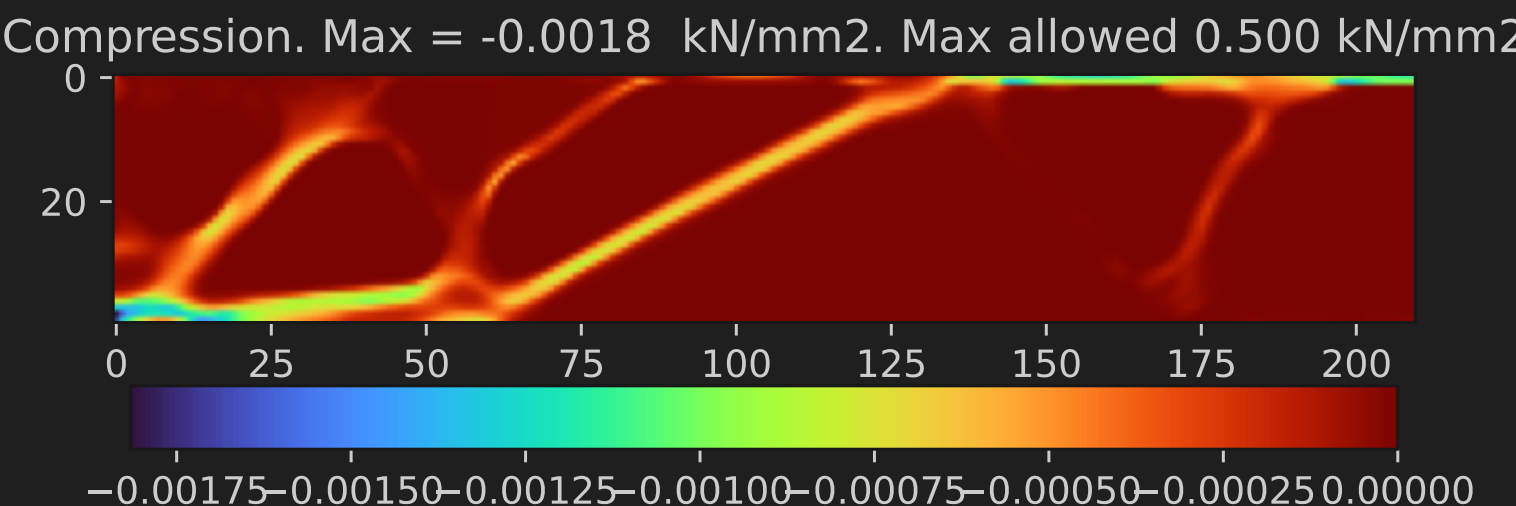
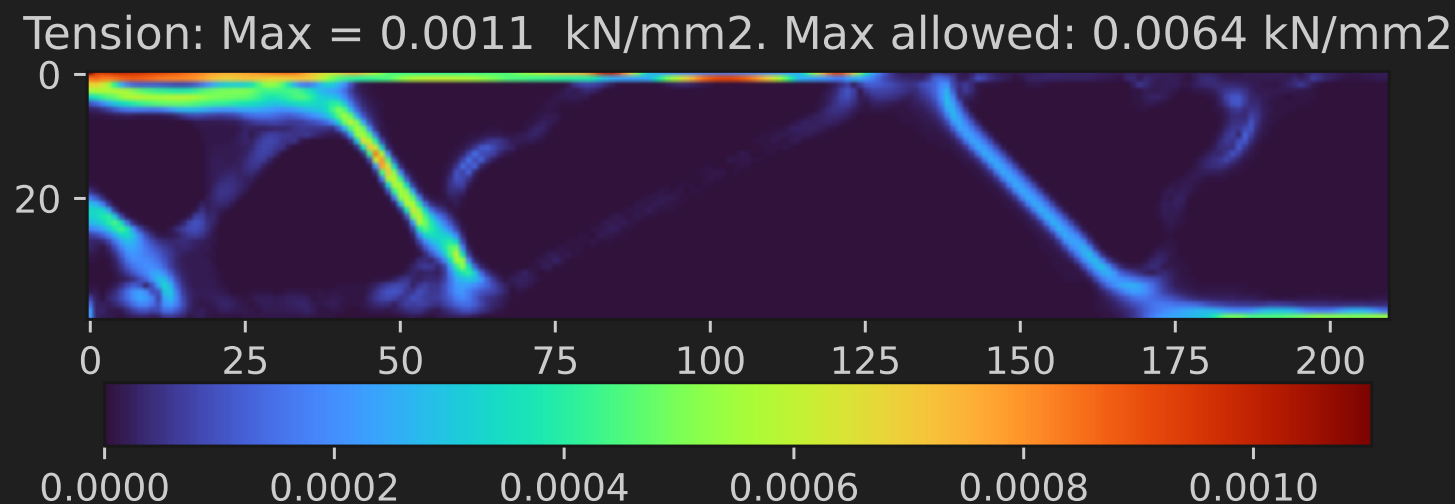
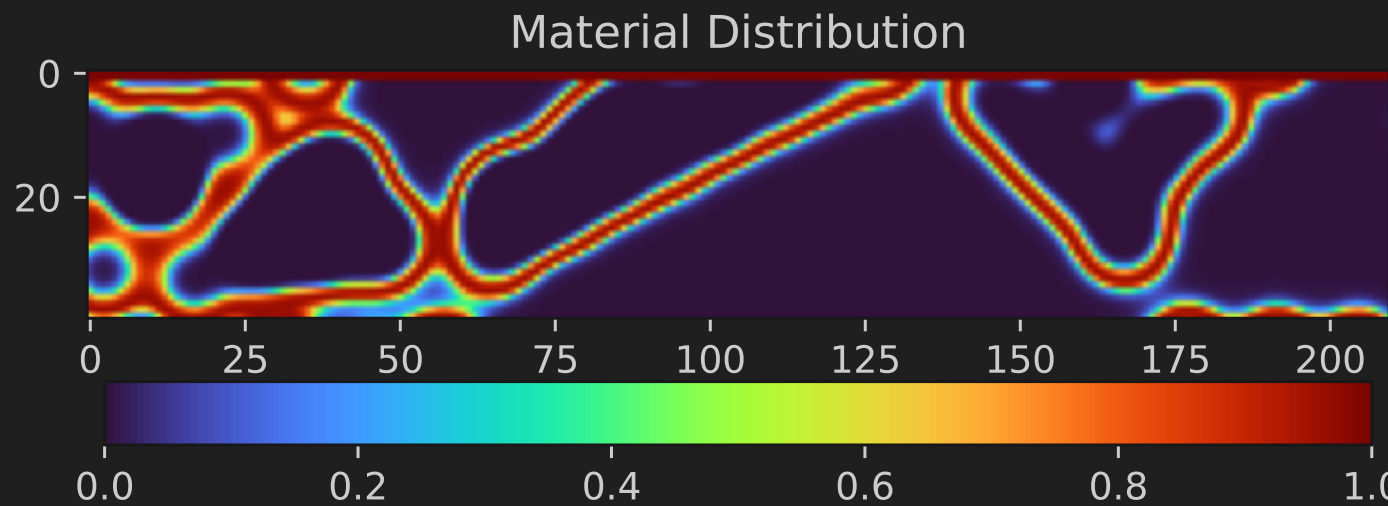
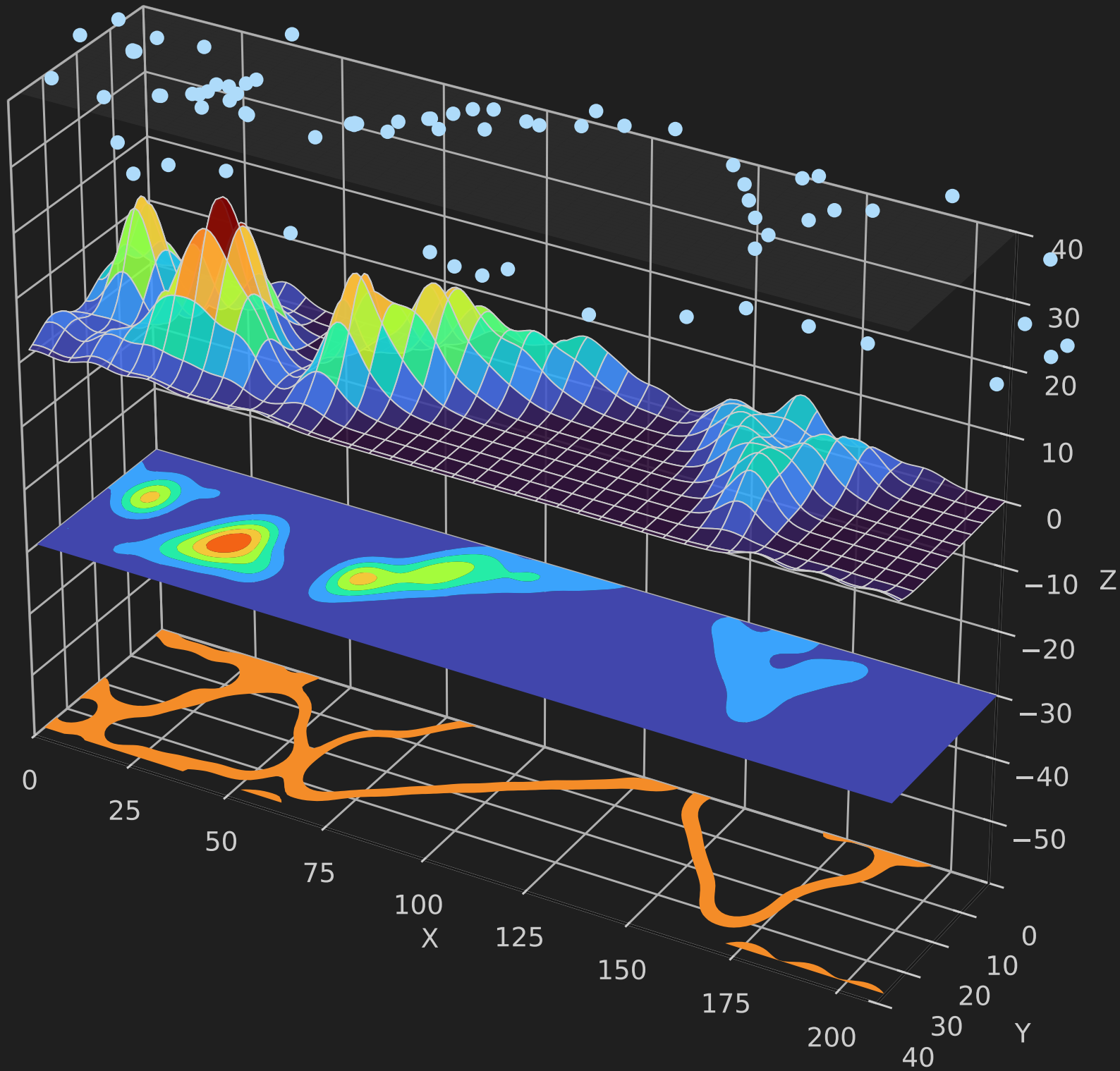
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.10 Shift = 1.76 Iteration = 197



Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.06 Shift = 1.80 Iteration = 199

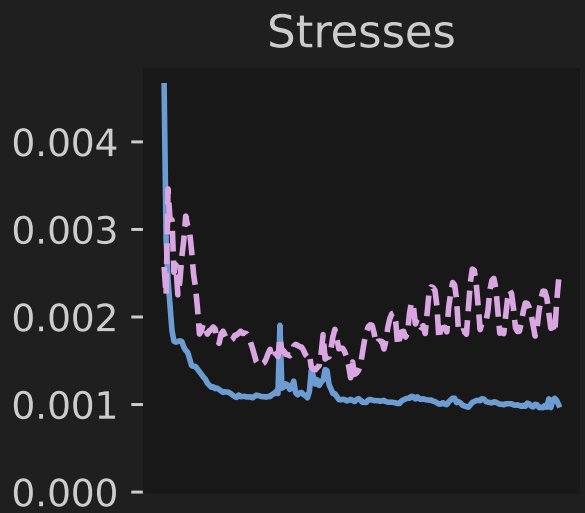
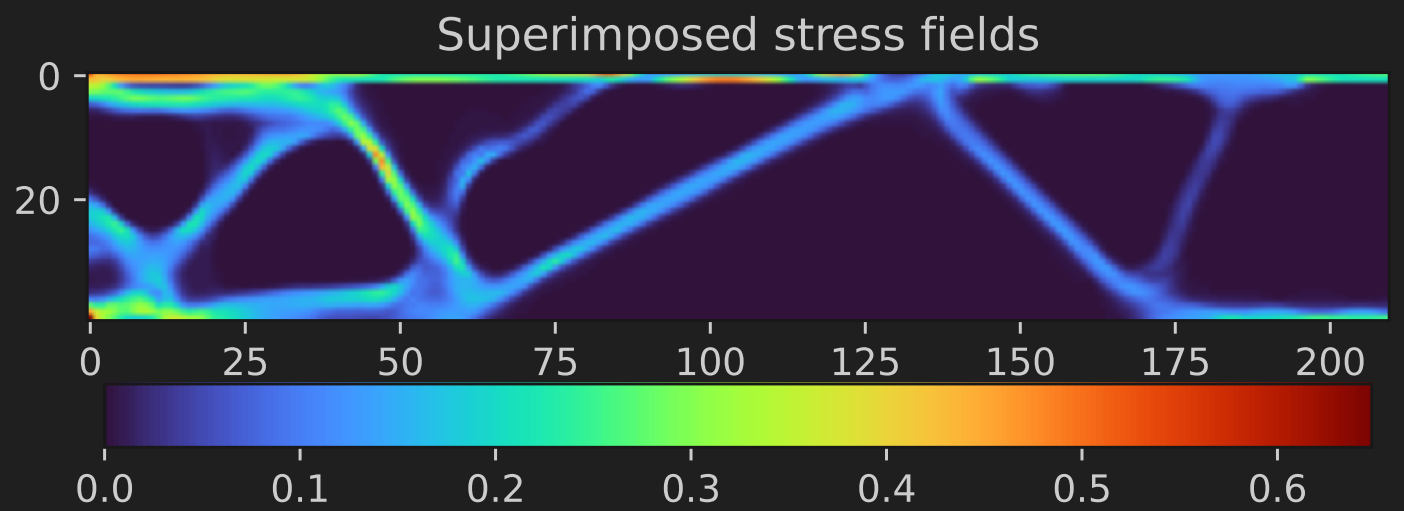
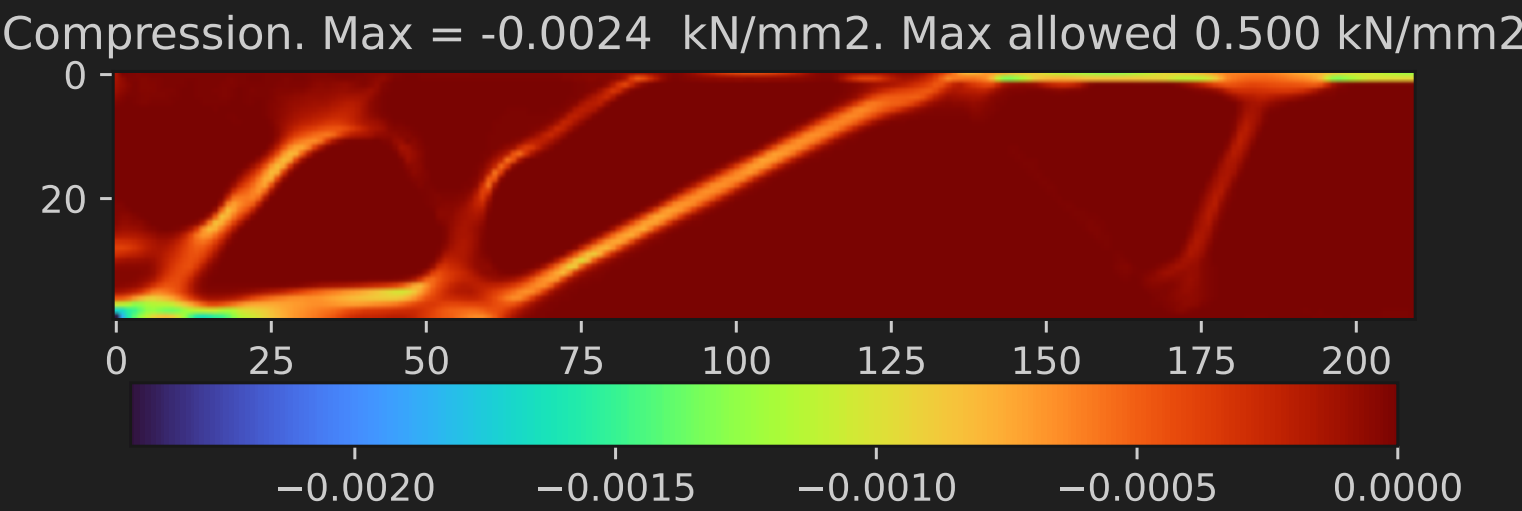
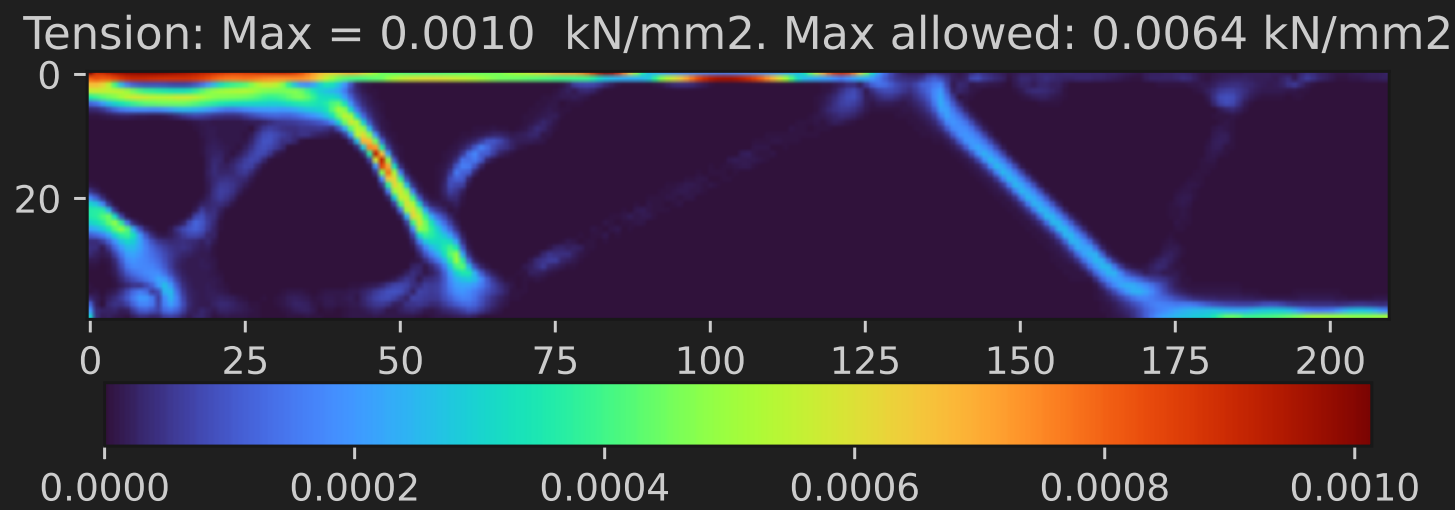
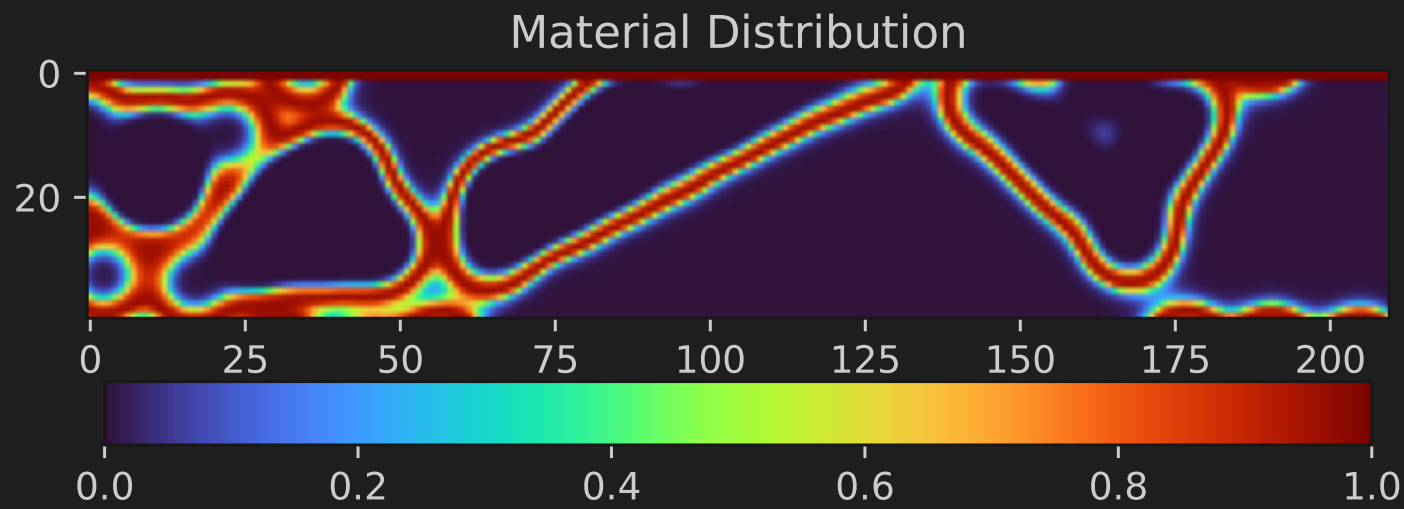
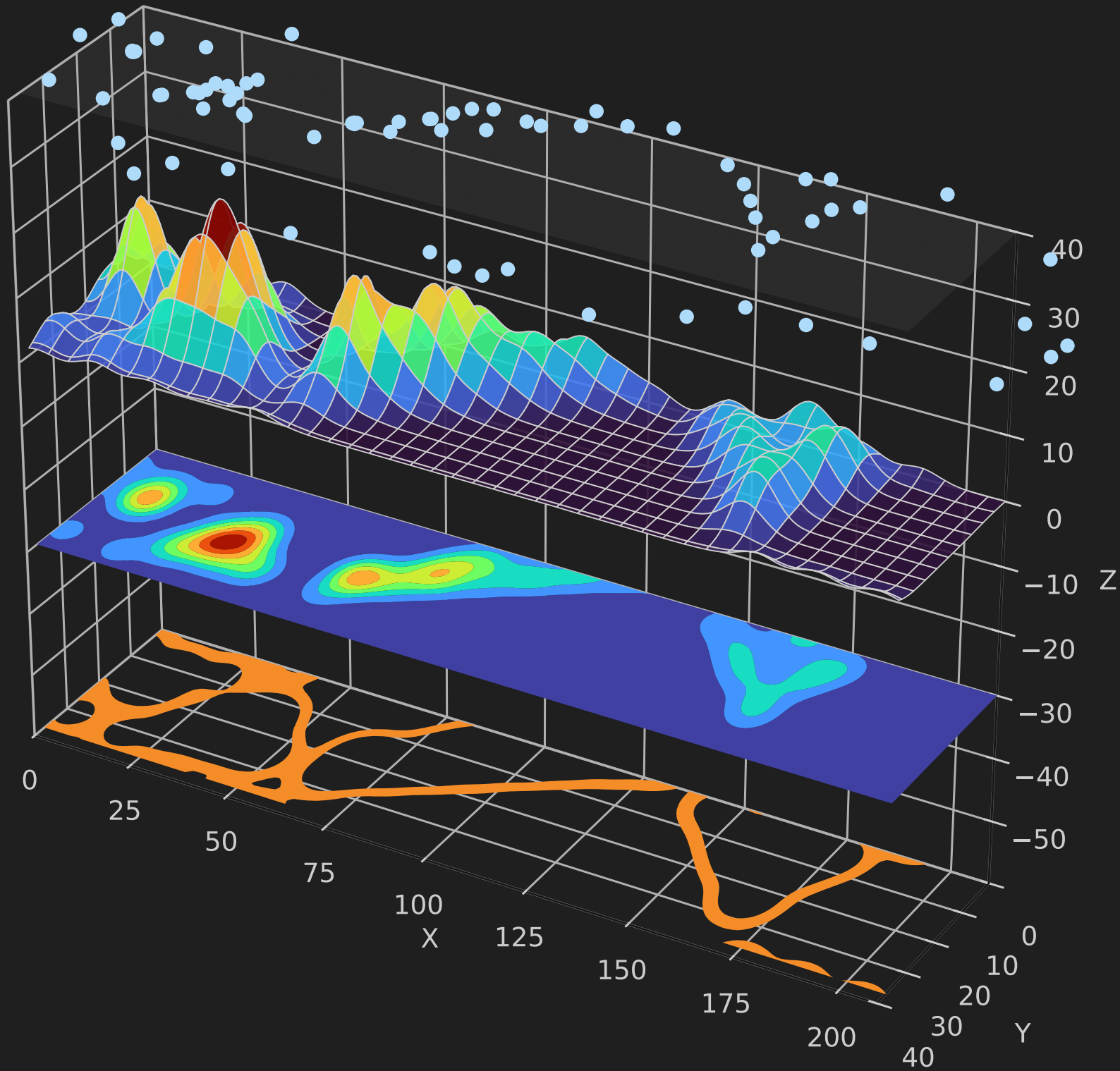


Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.09

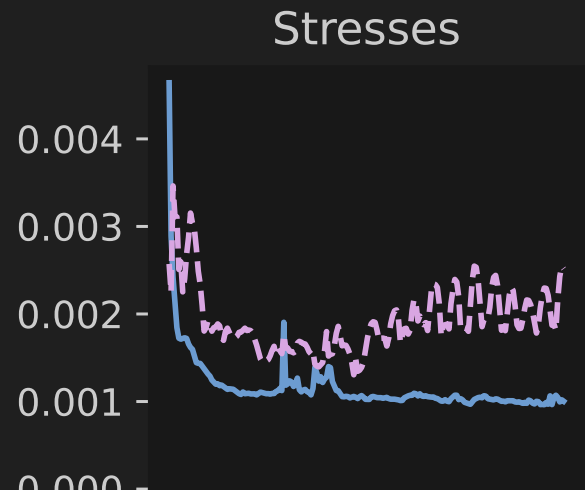
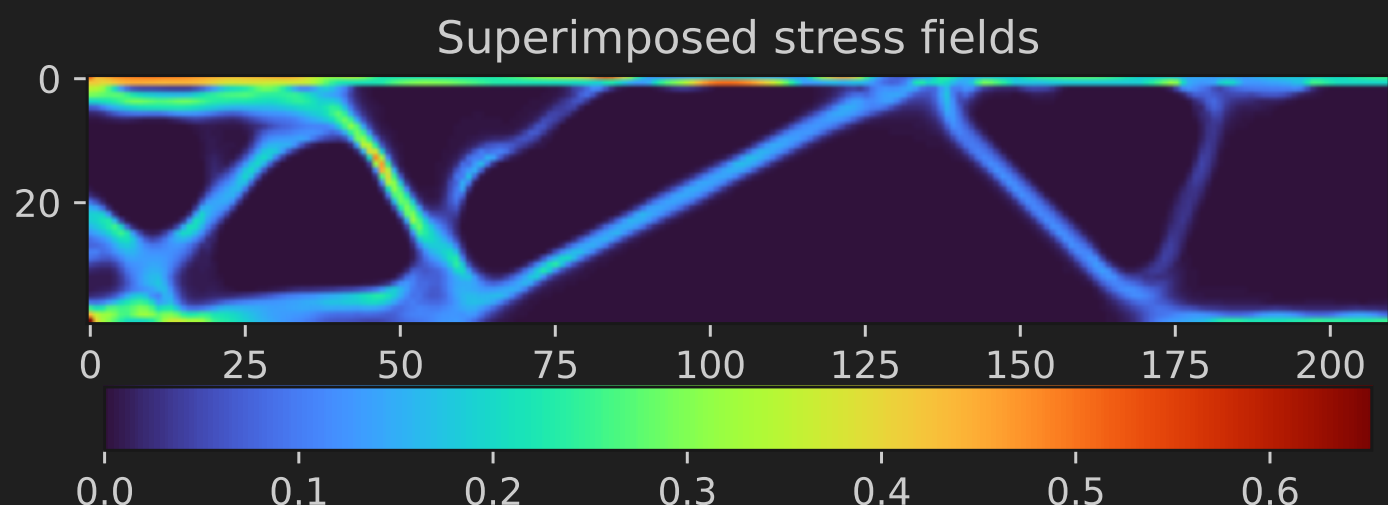
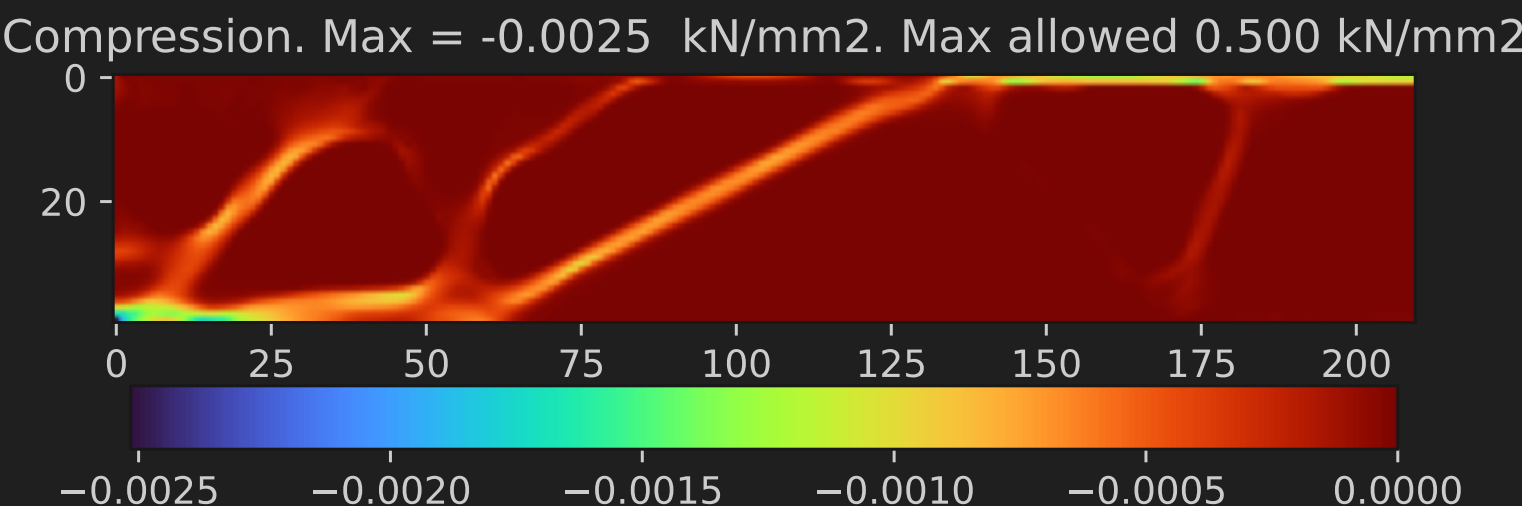
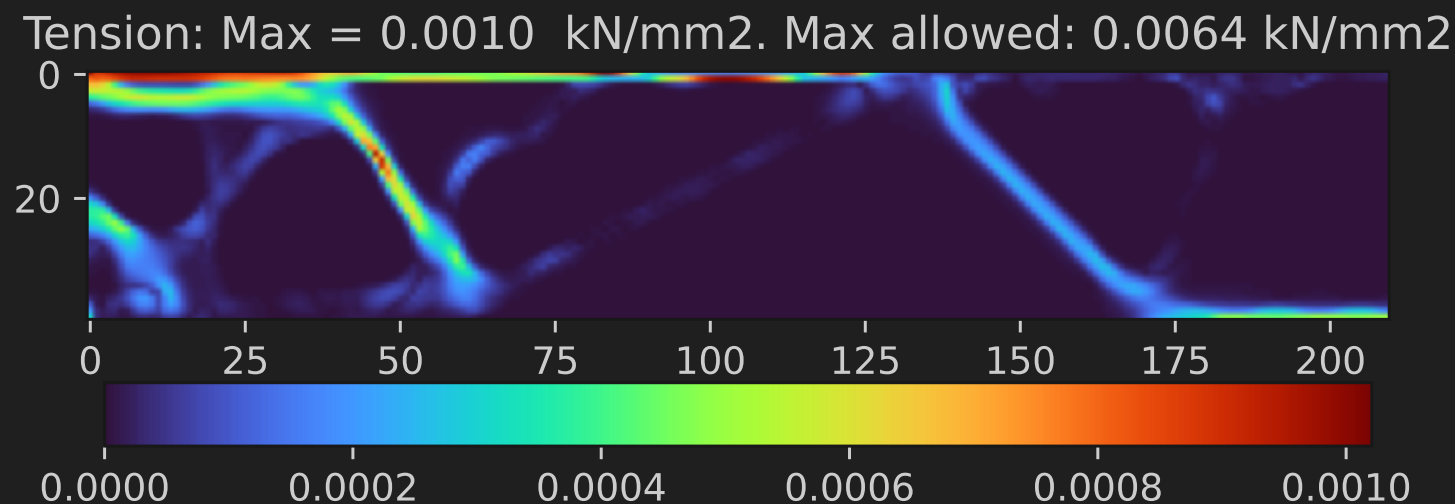
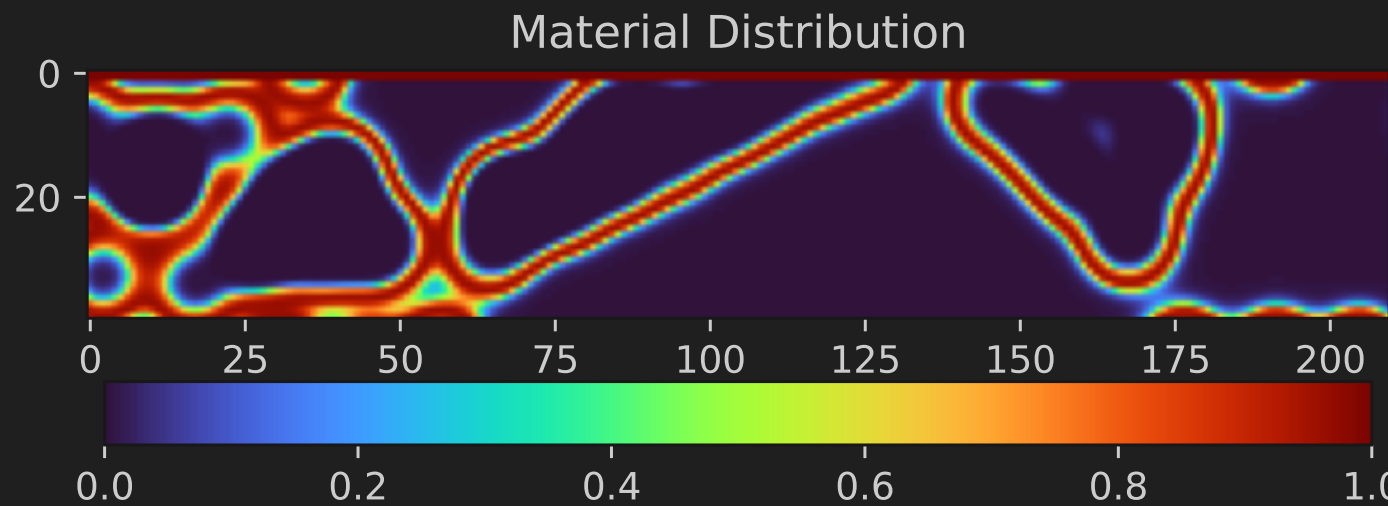
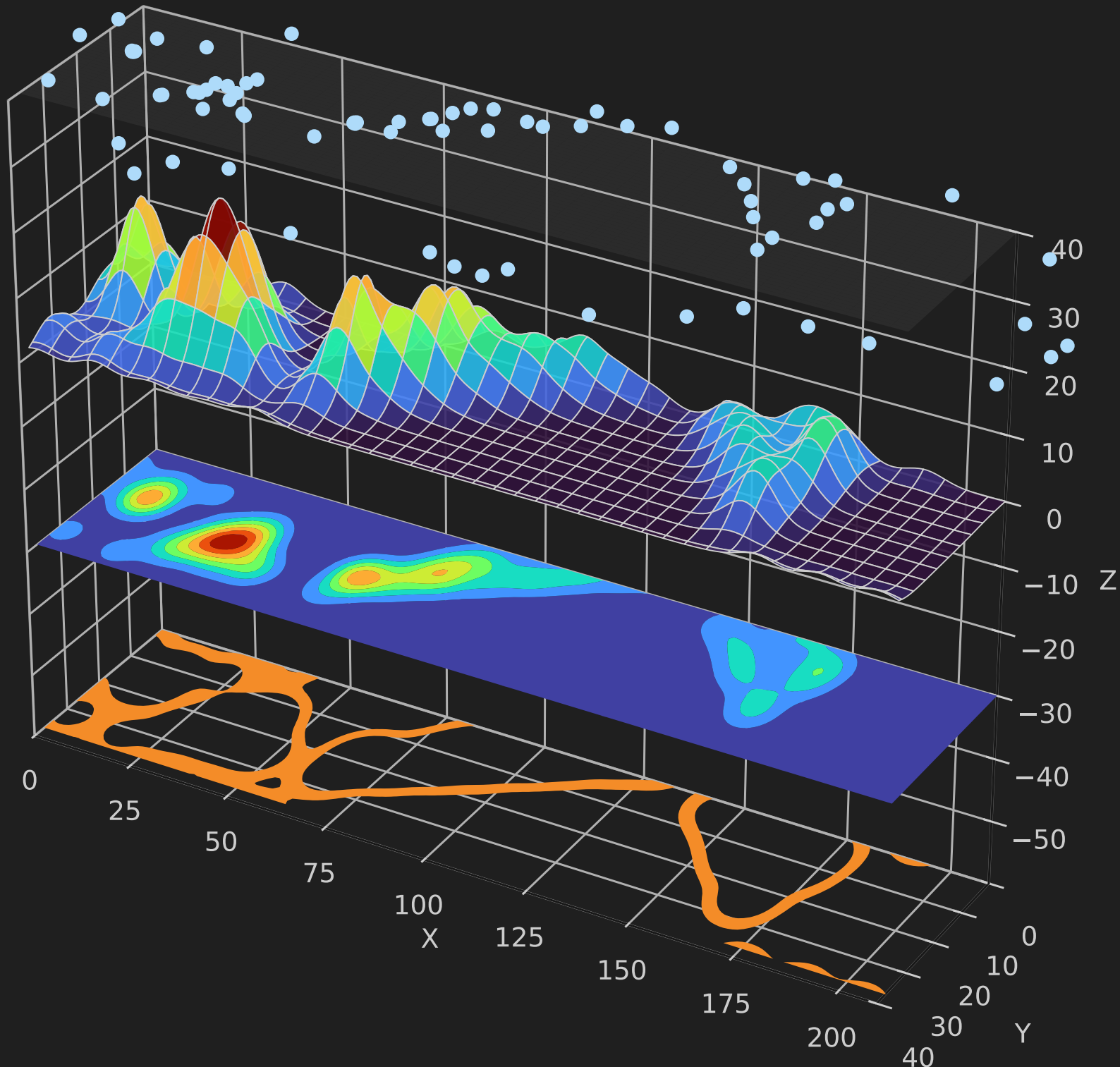
Shift = 1.80

Iteration = 201



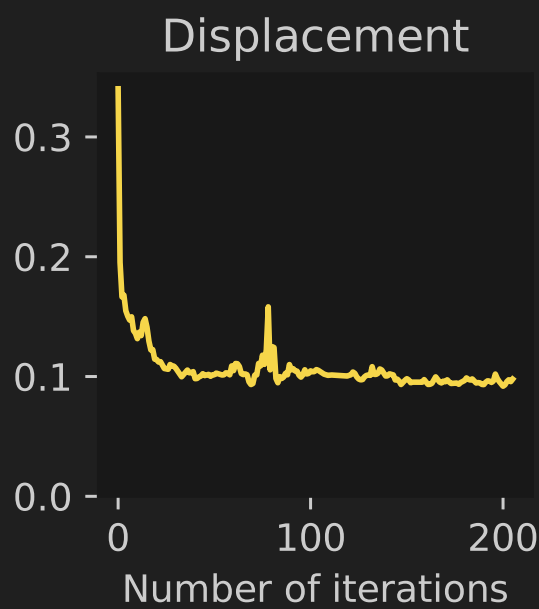
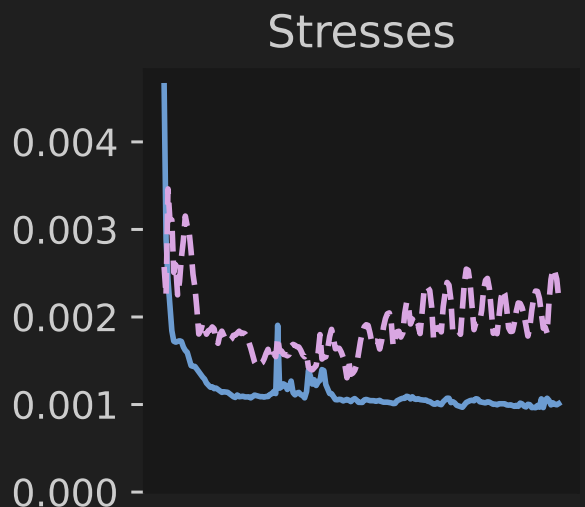
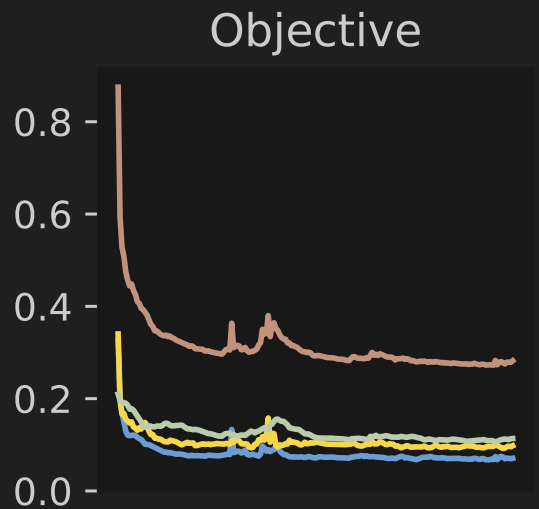
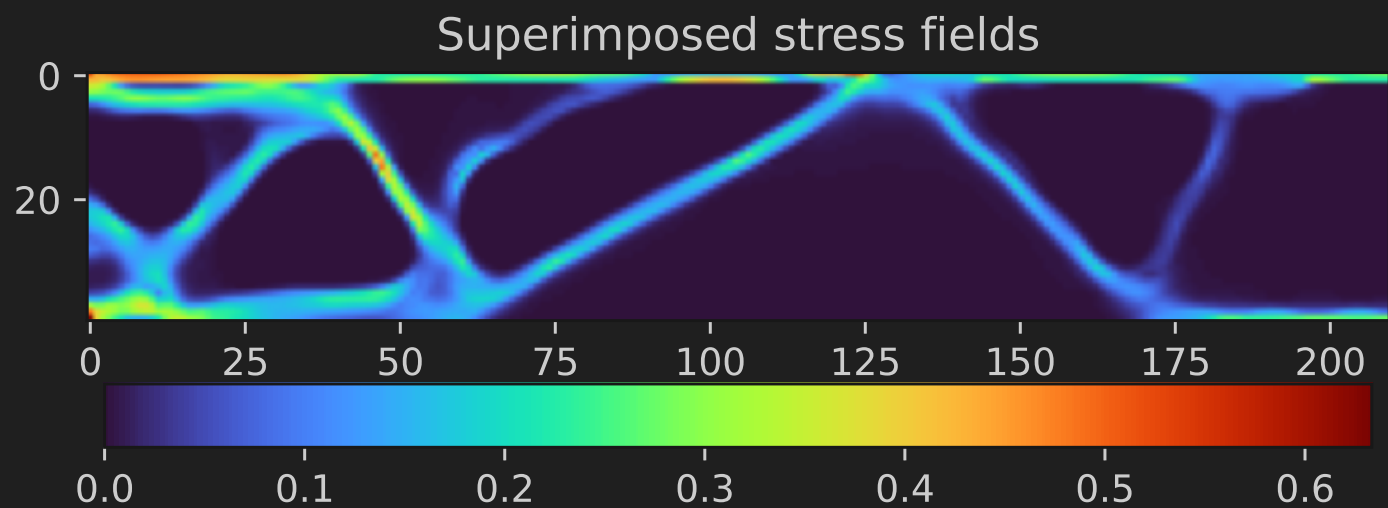
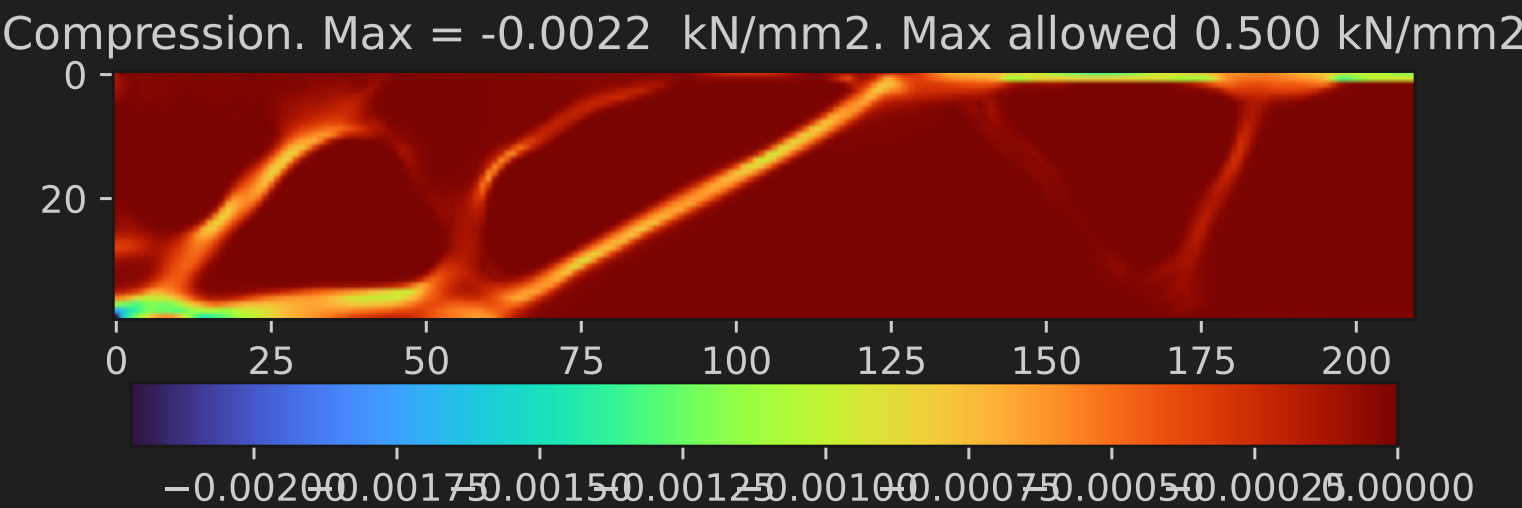
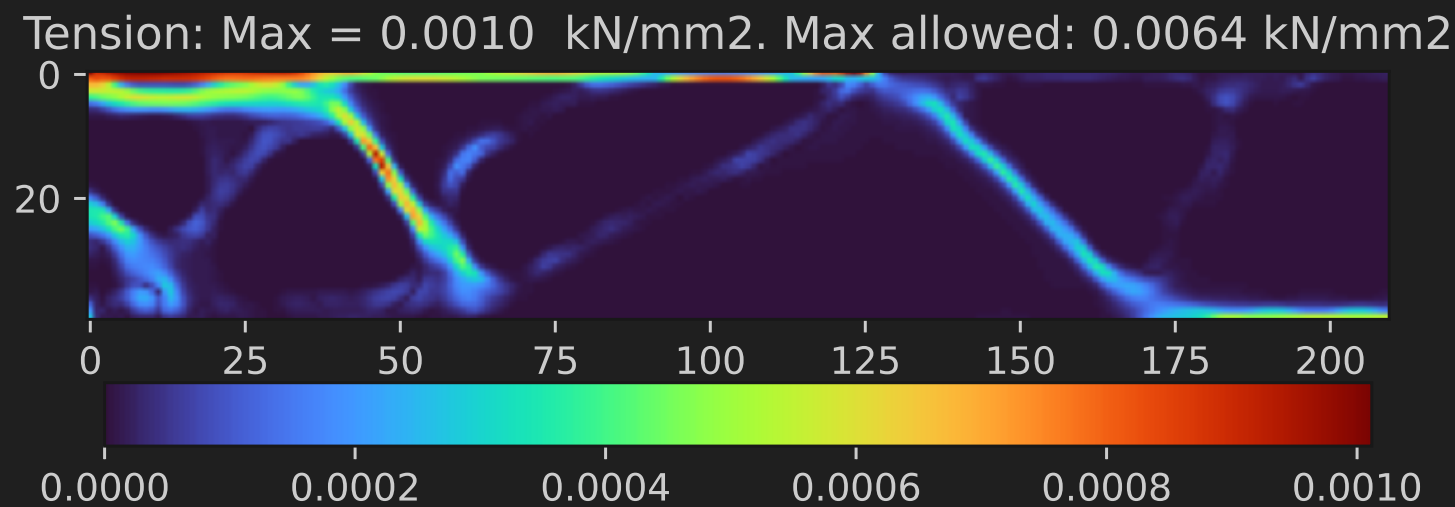
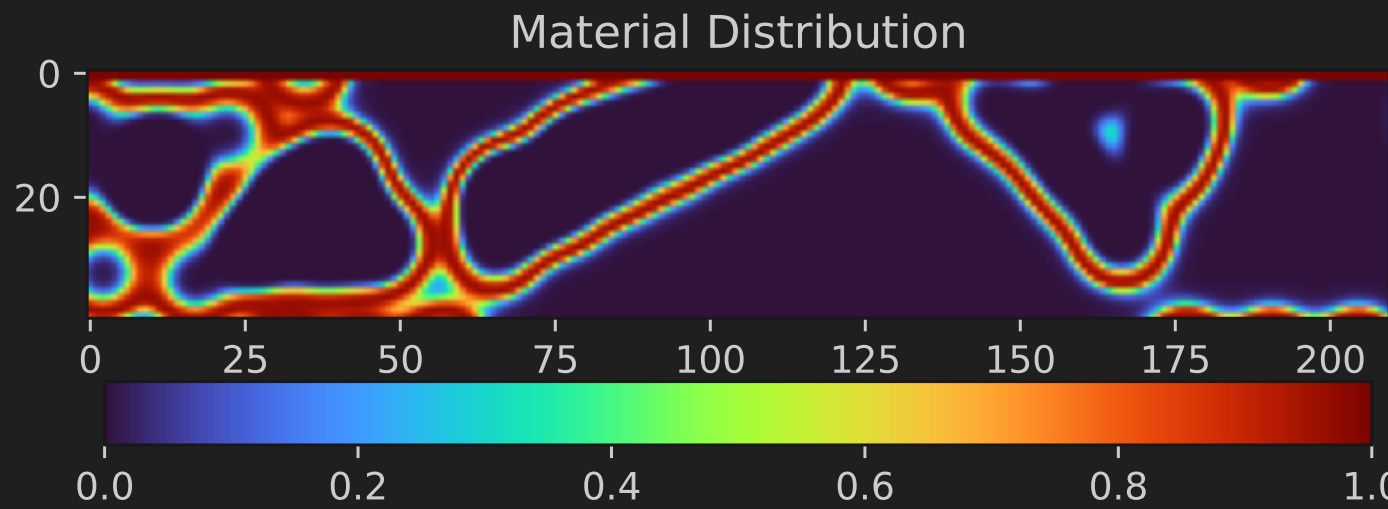
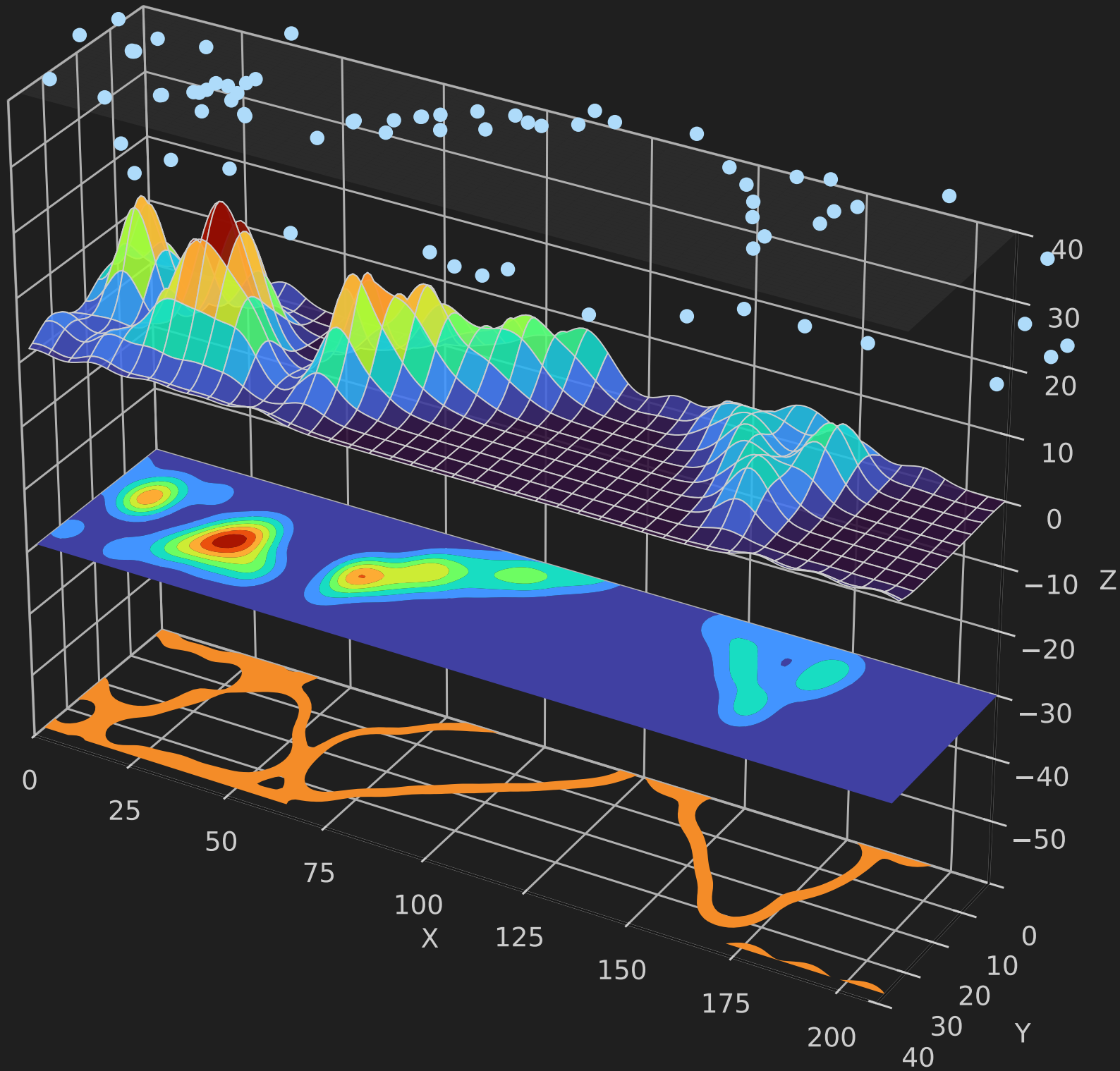
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.09 Shift = 1.80 Iteration = 203



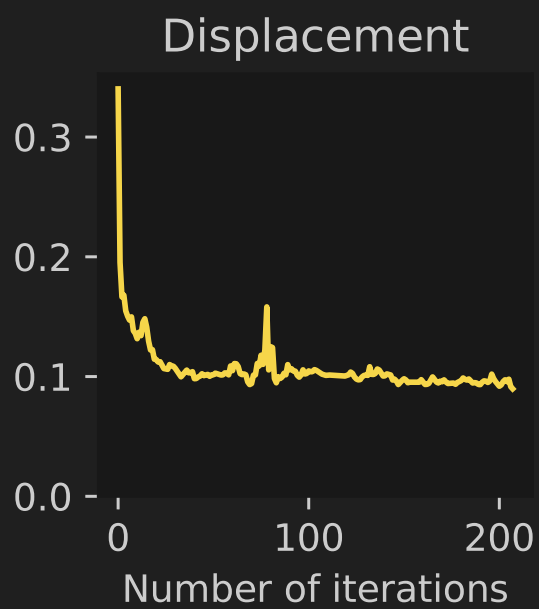
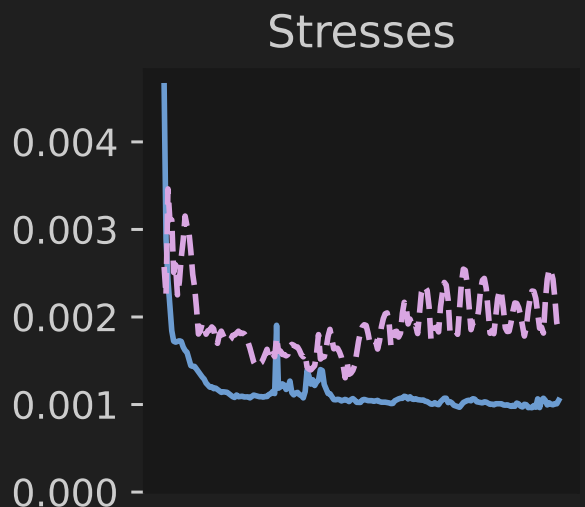
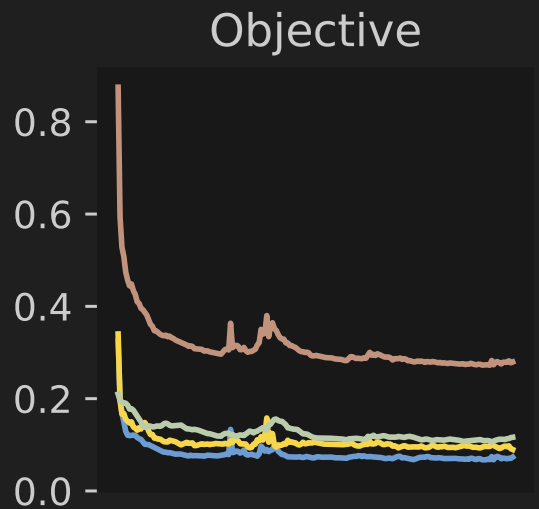
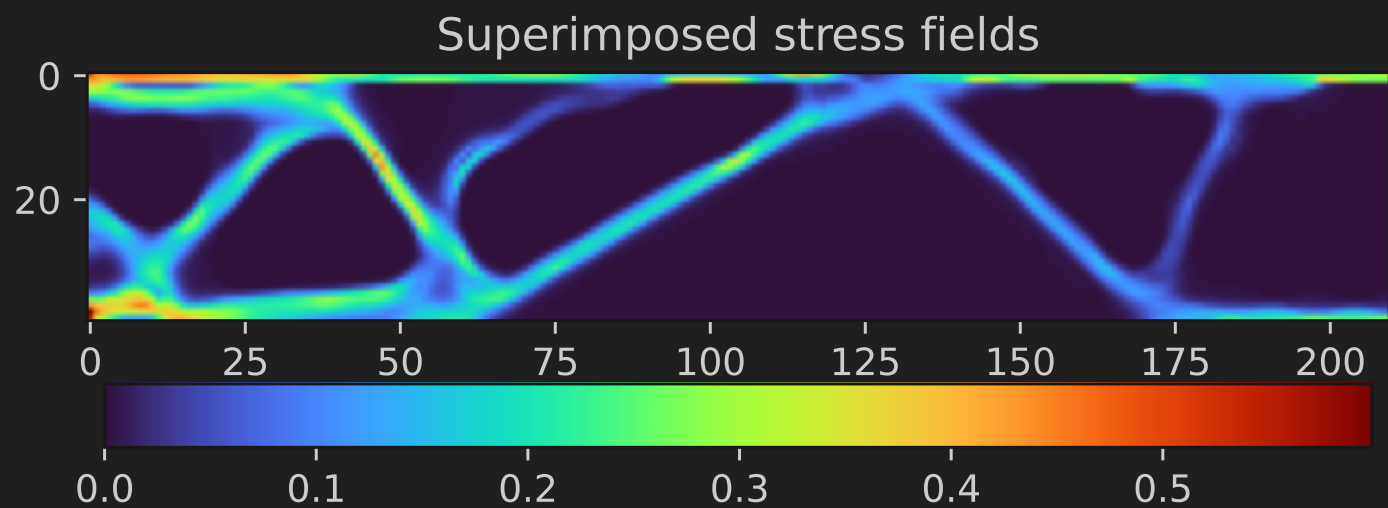
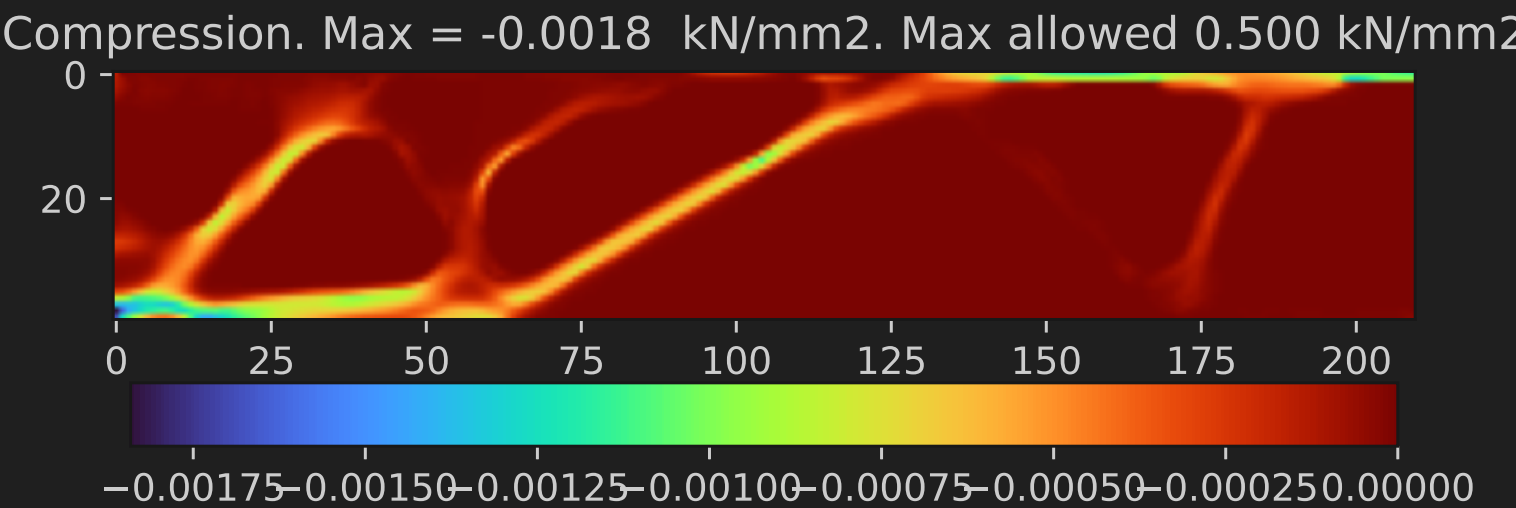
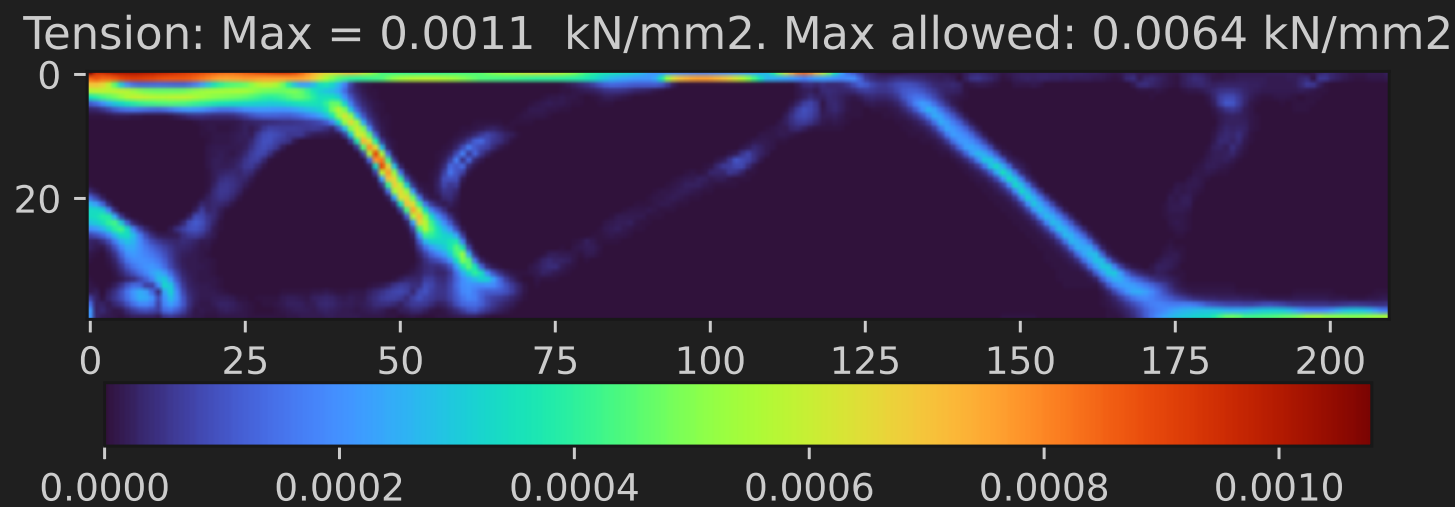
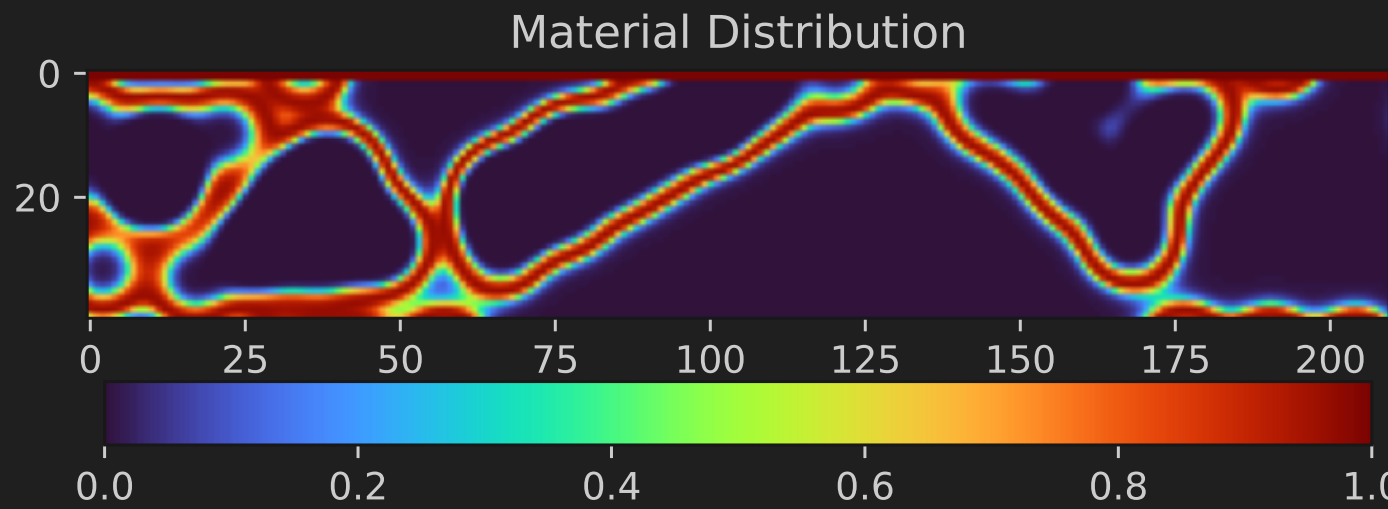
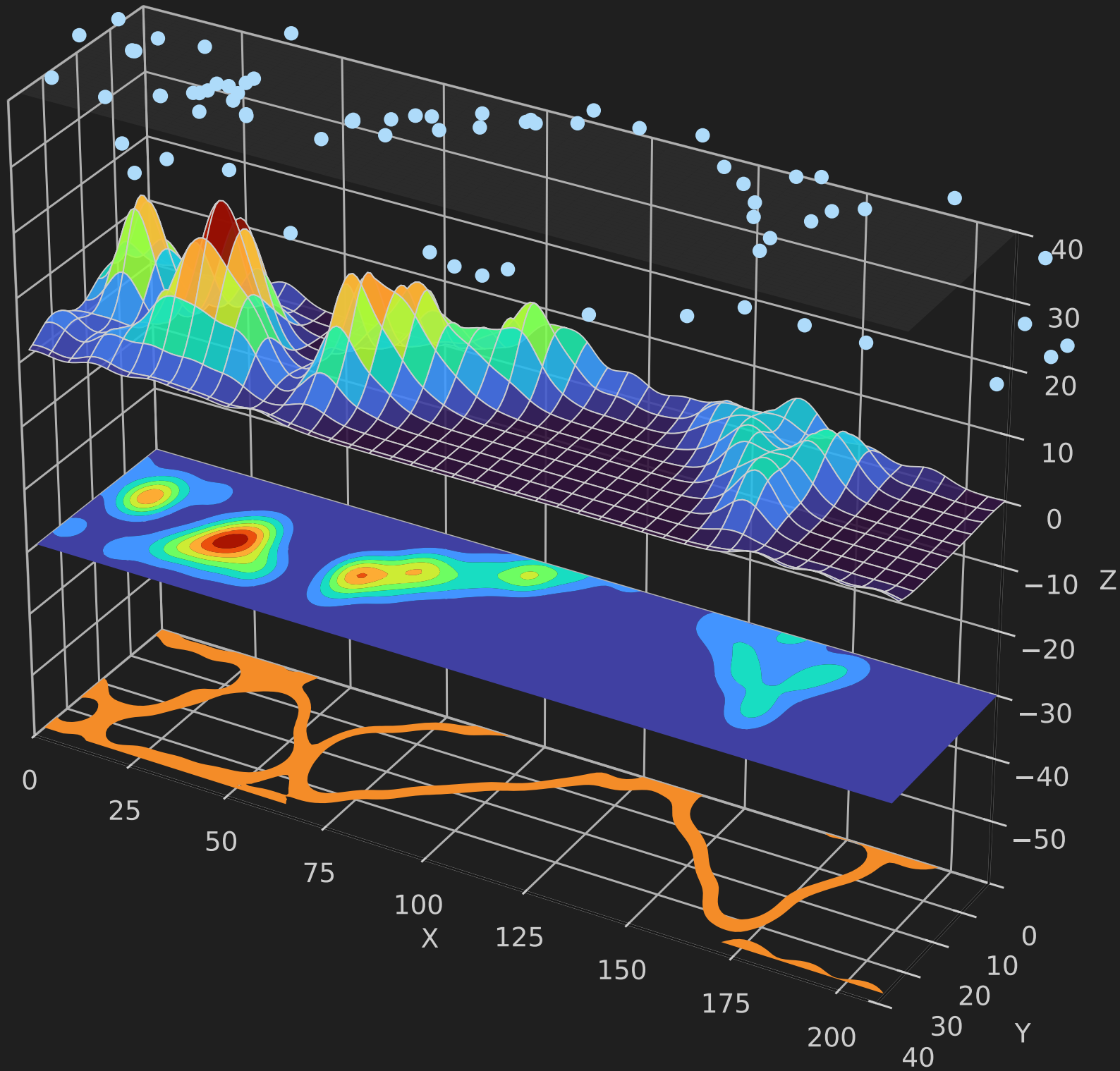
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.09 Shift = 1.82 Iteration = 205



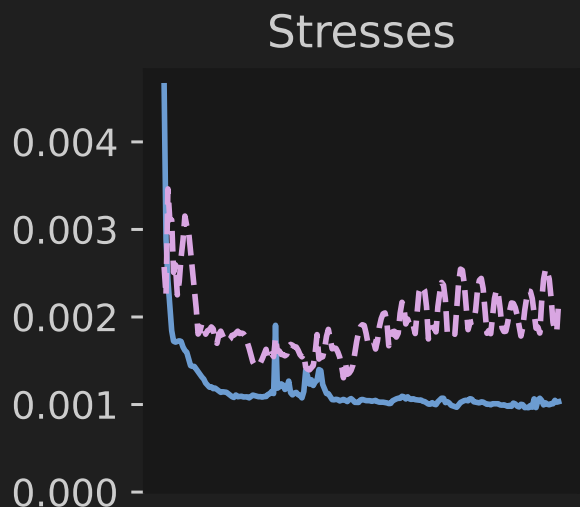
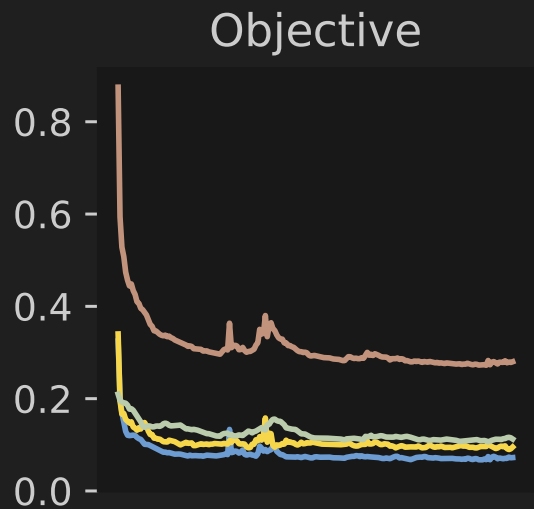
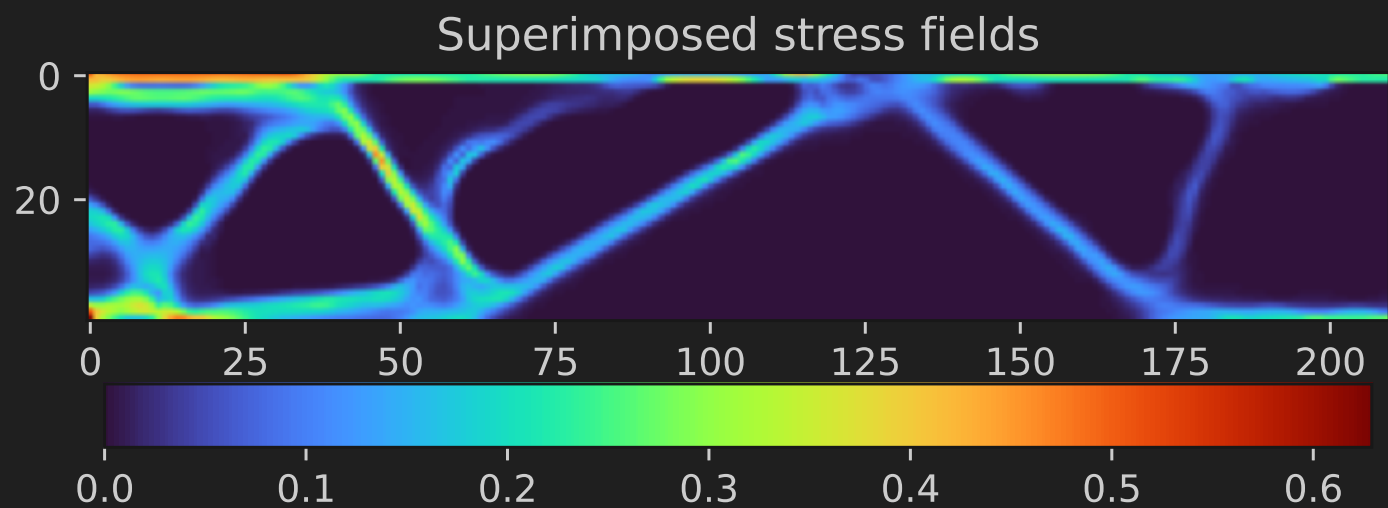
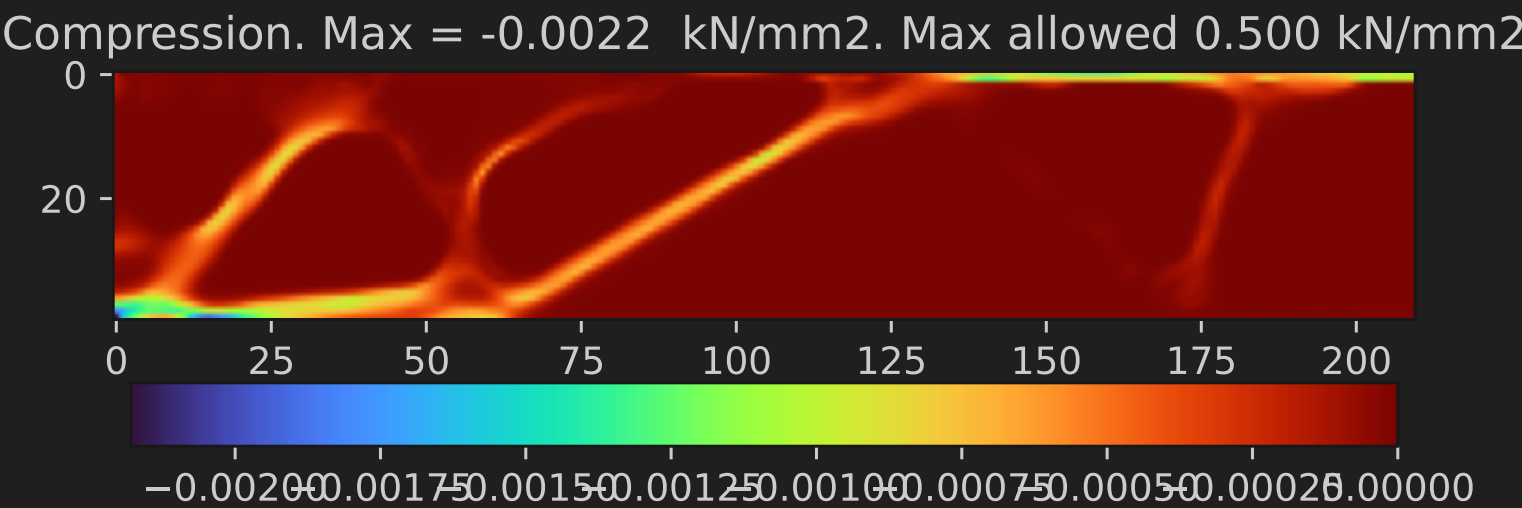
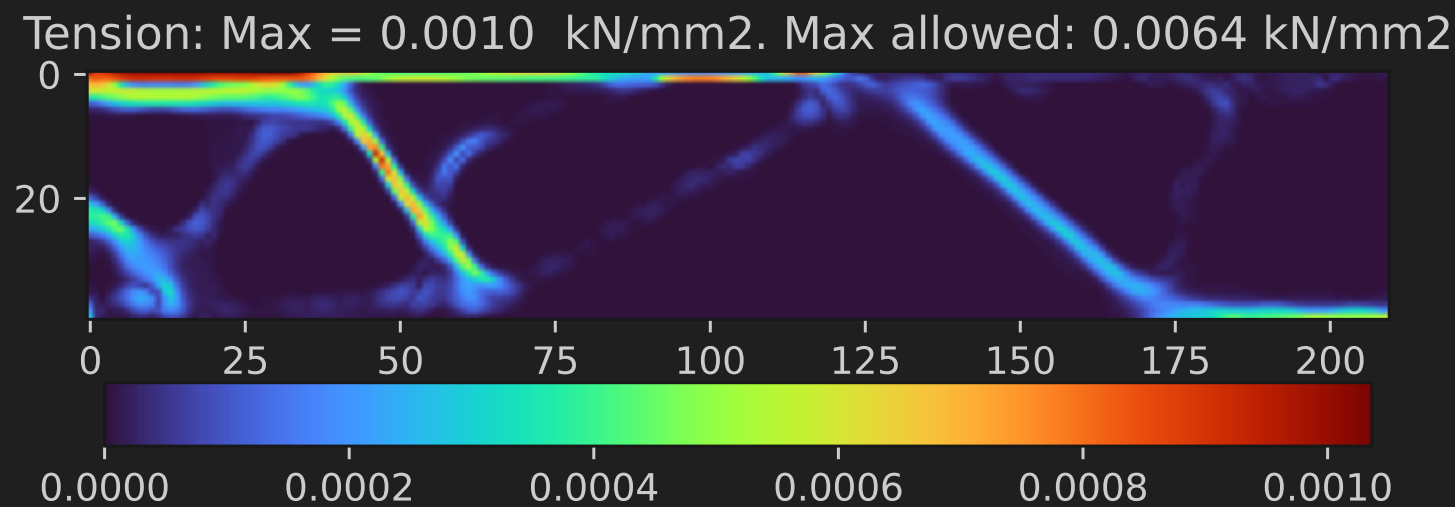
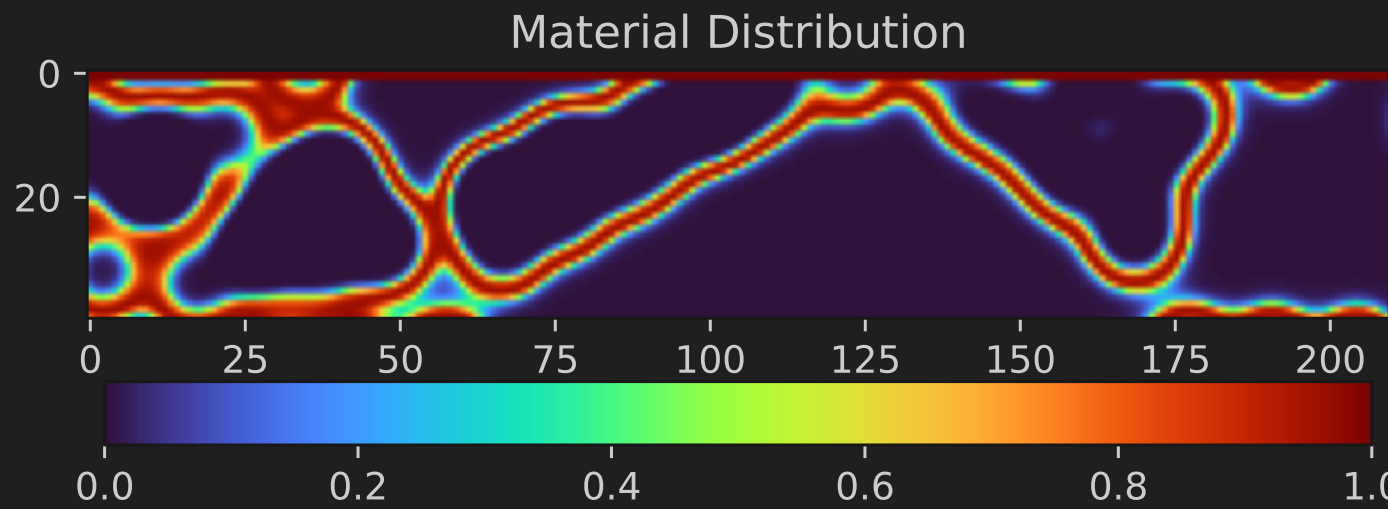
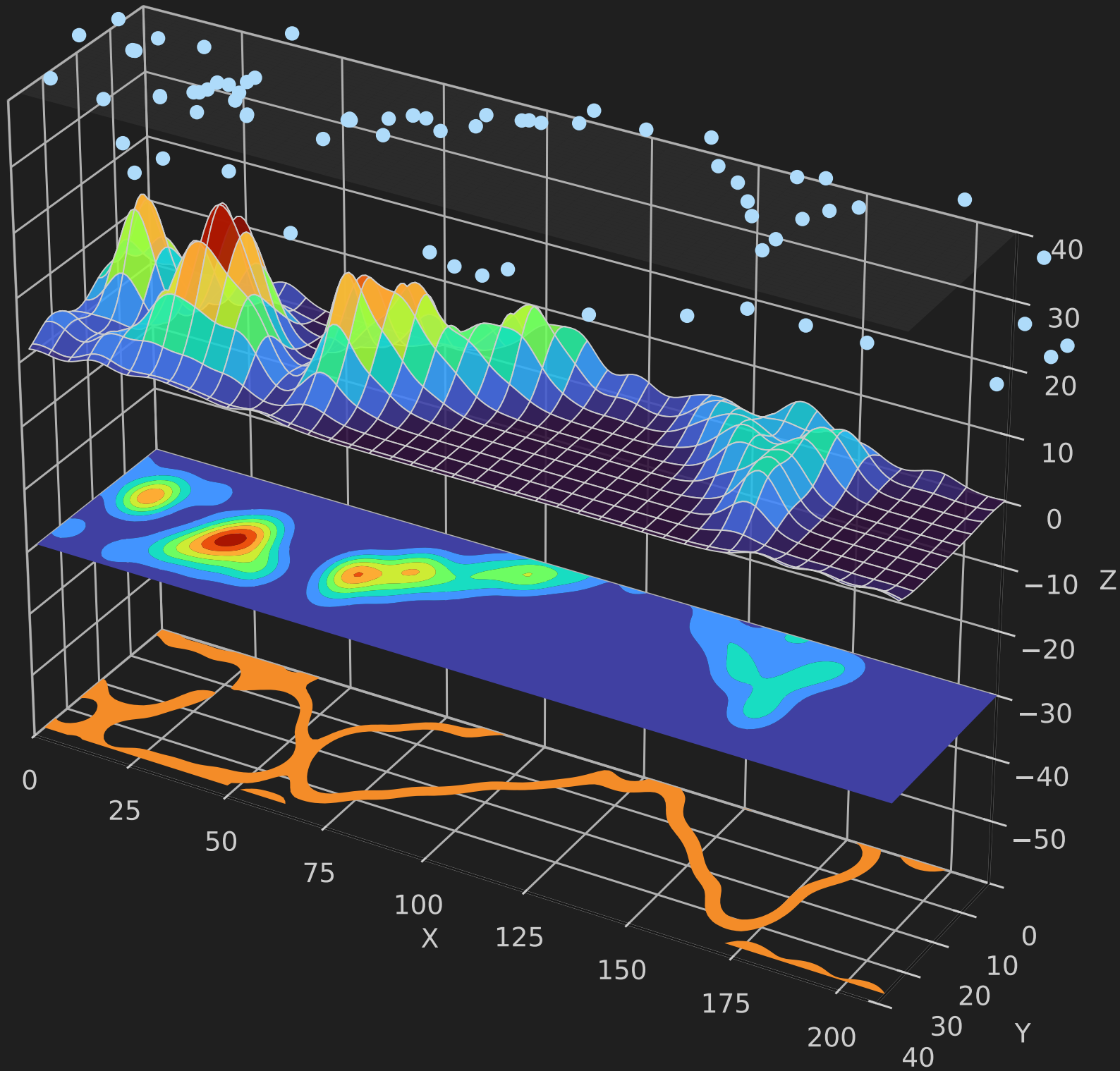
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.23) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.14 Shift = 1.82 Iteration = 207



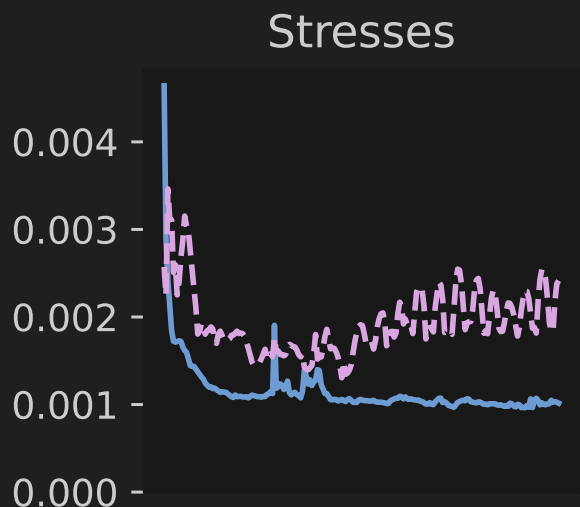
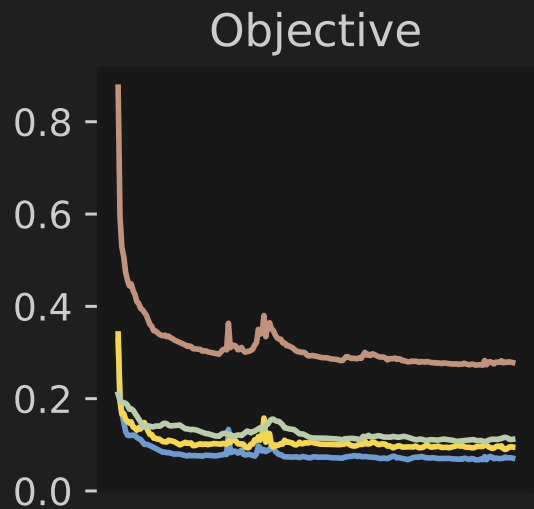
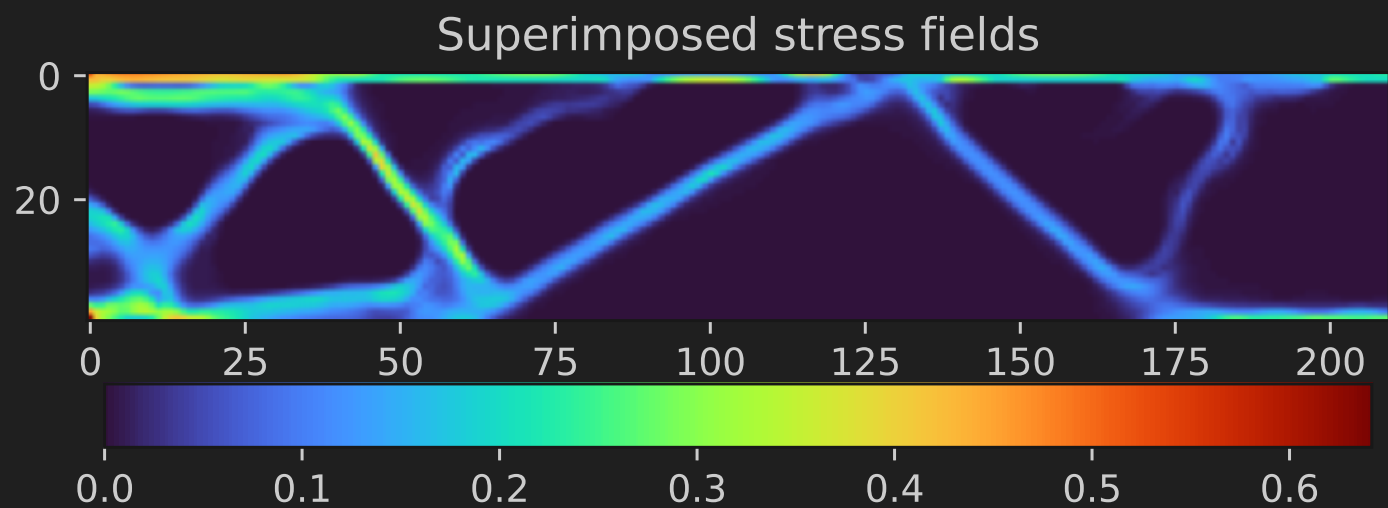
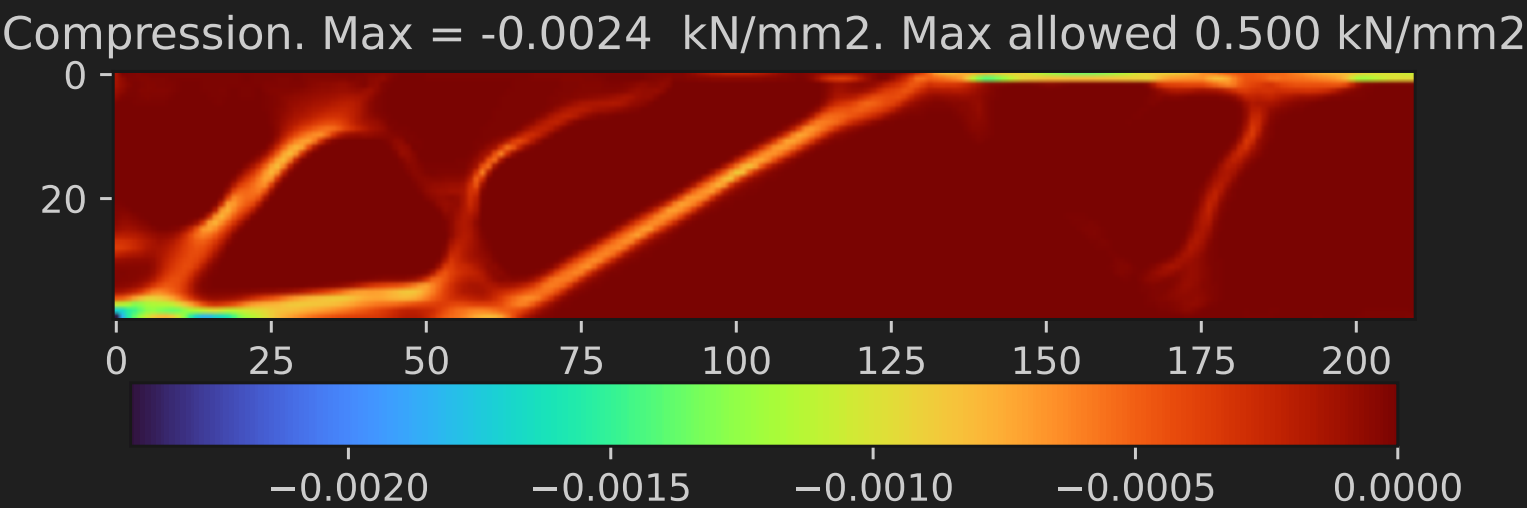
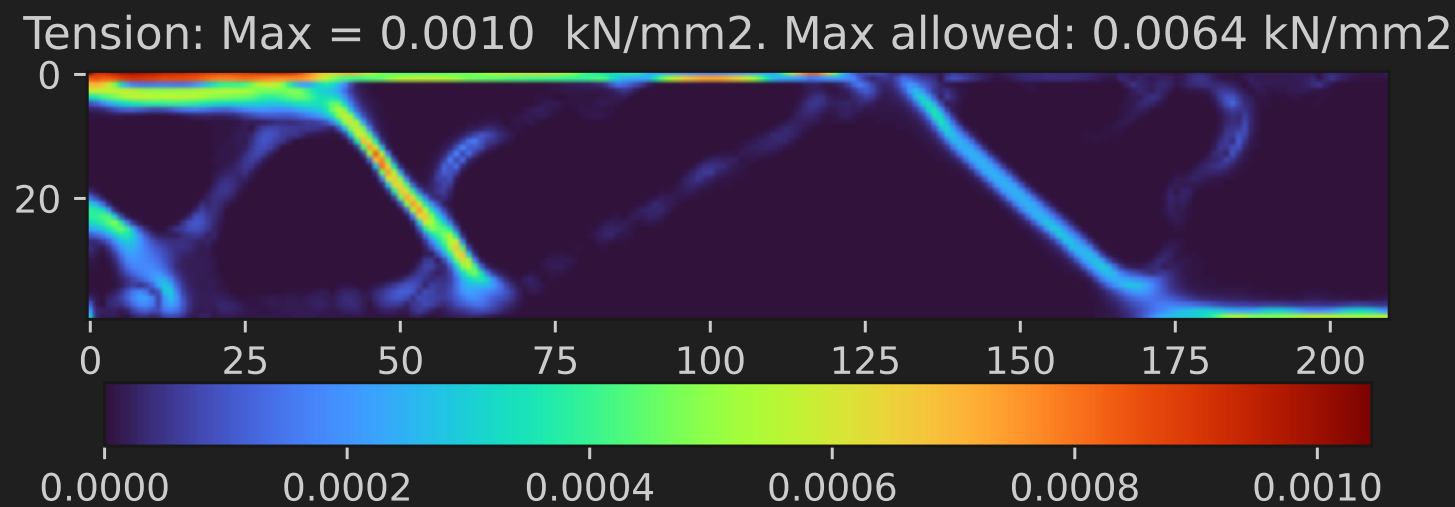
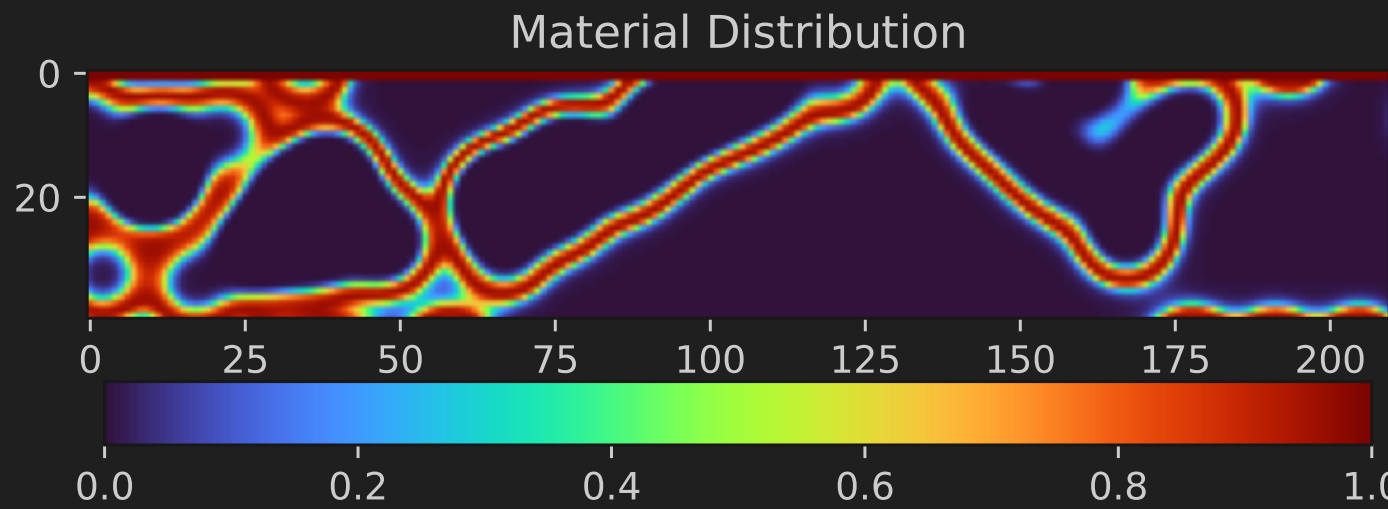
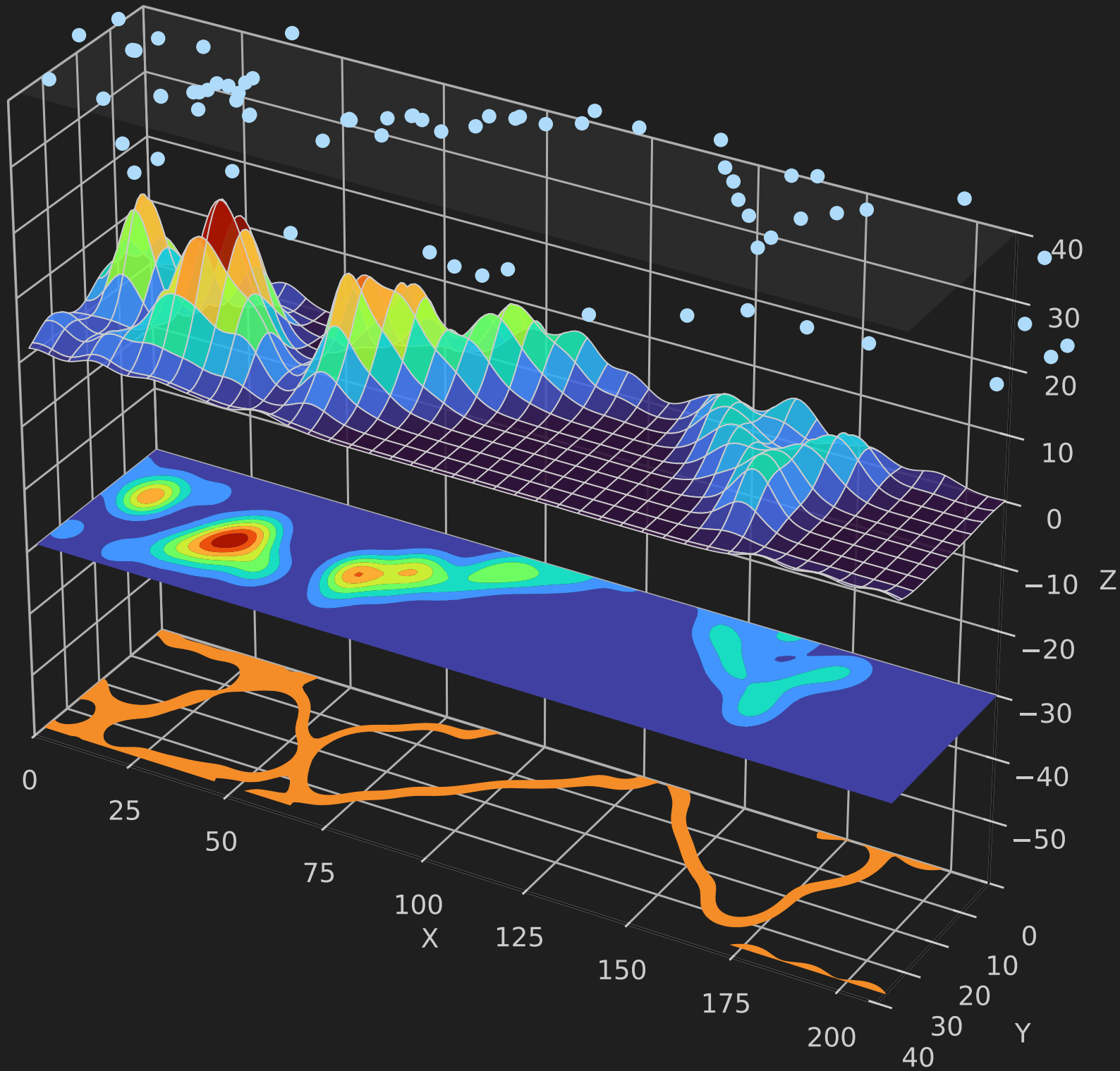
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.20 Shift = 1.77 Iteration = 209



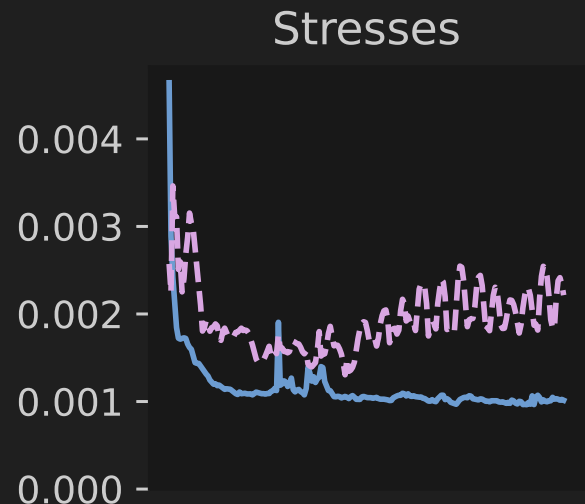
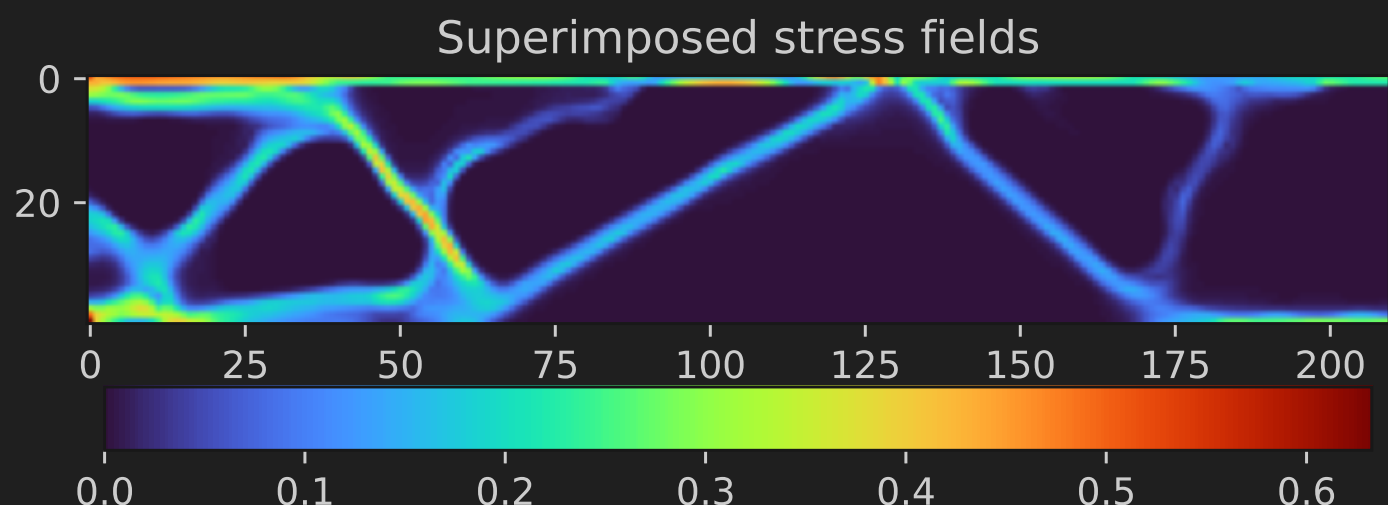
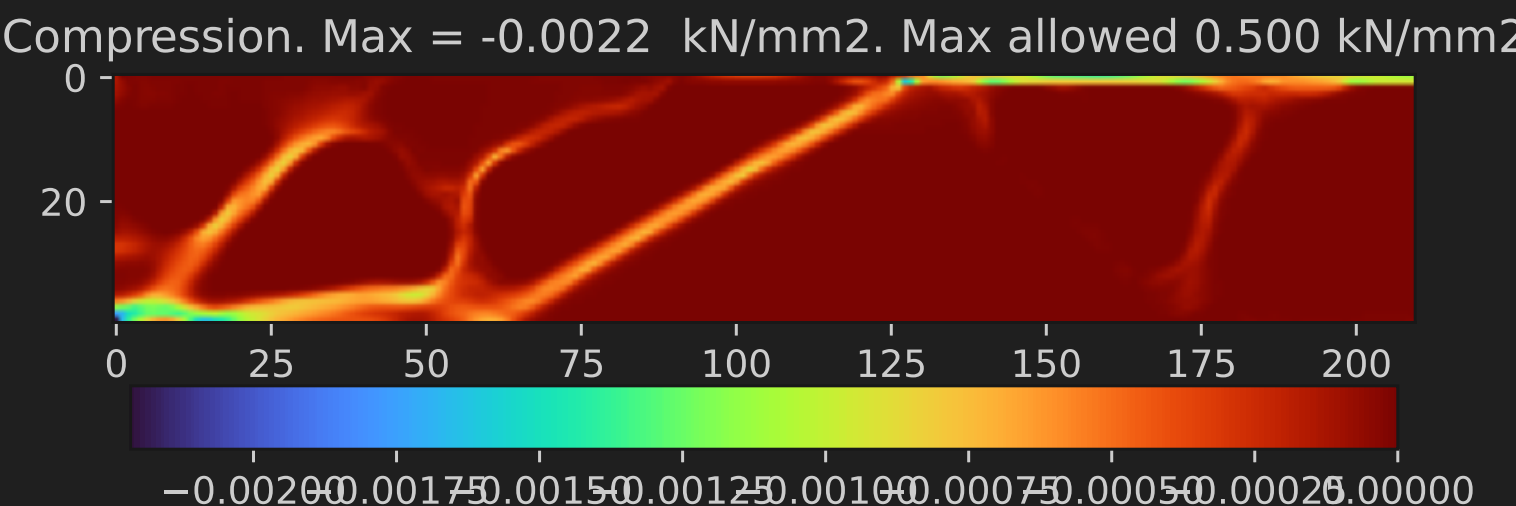
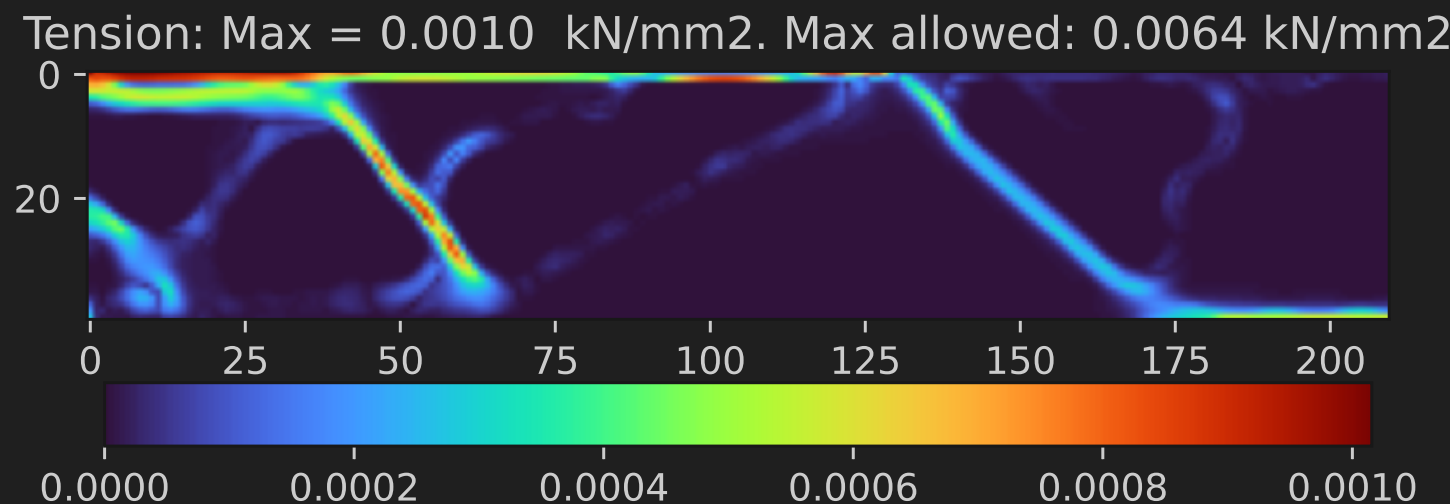
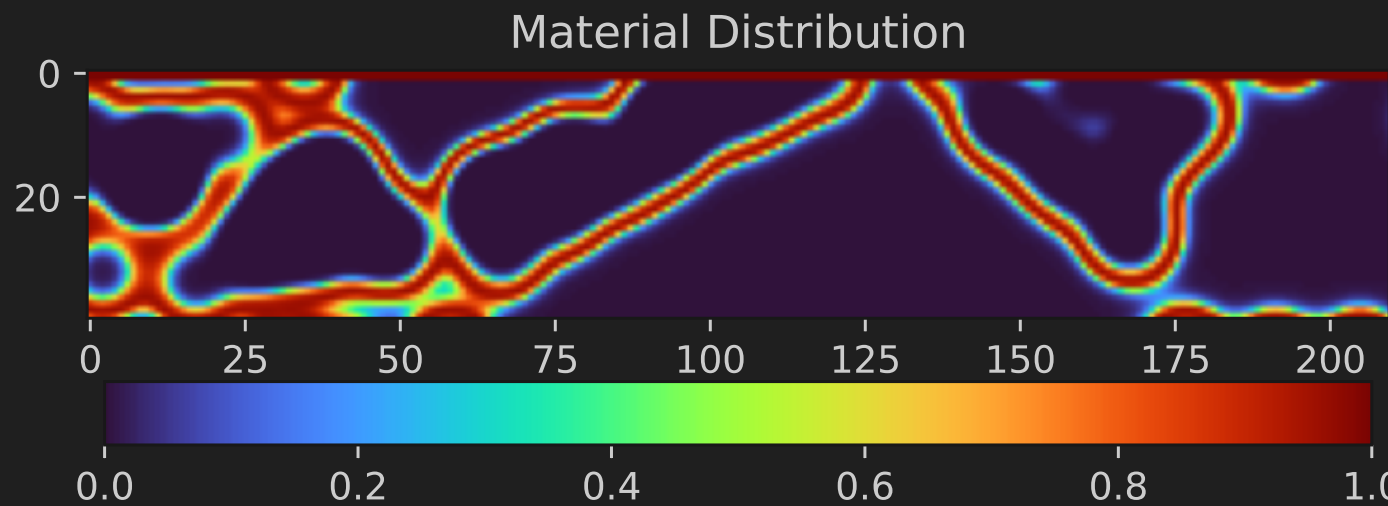
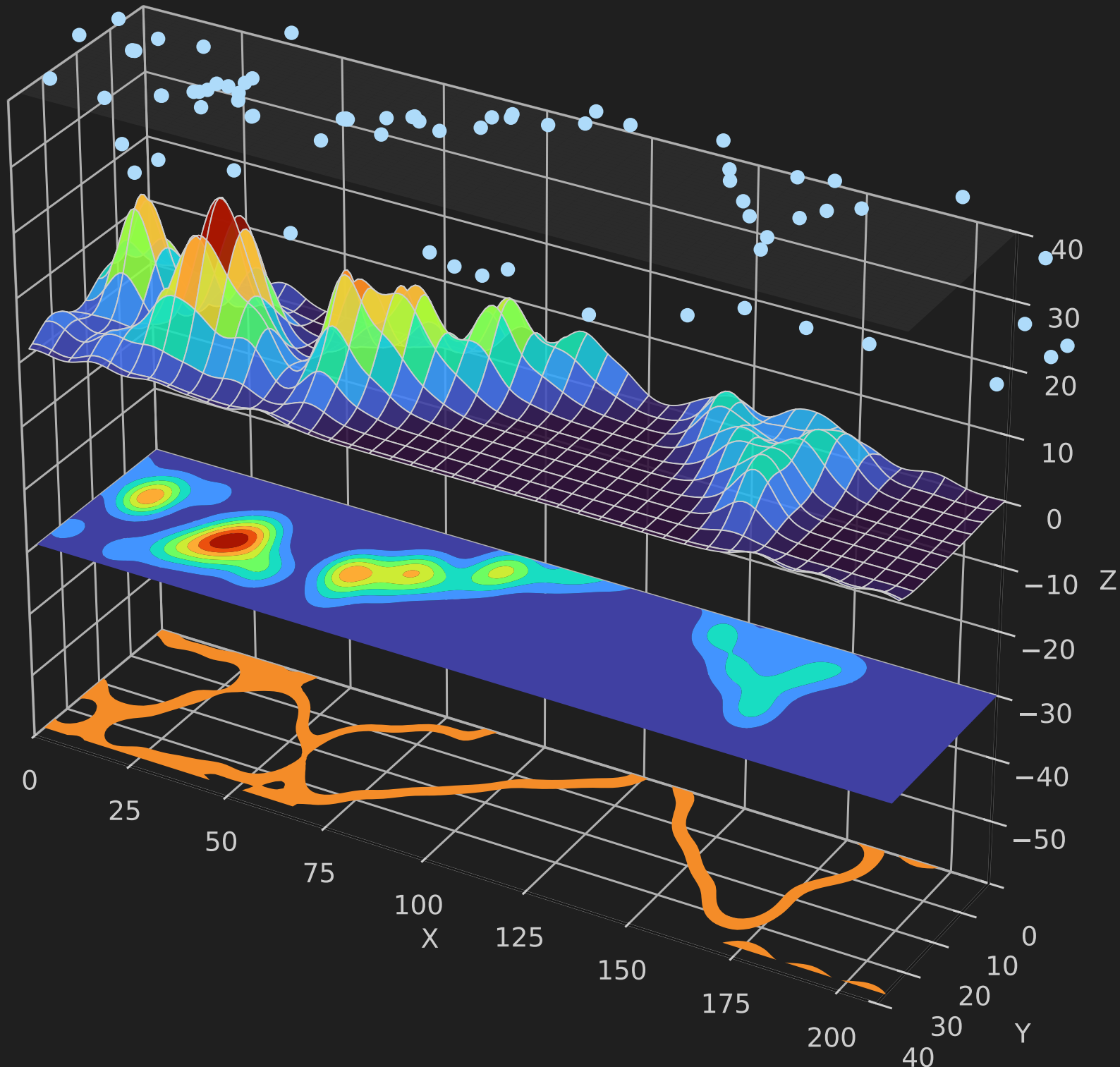
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.17 Shift = 1.75 Iteration = 211



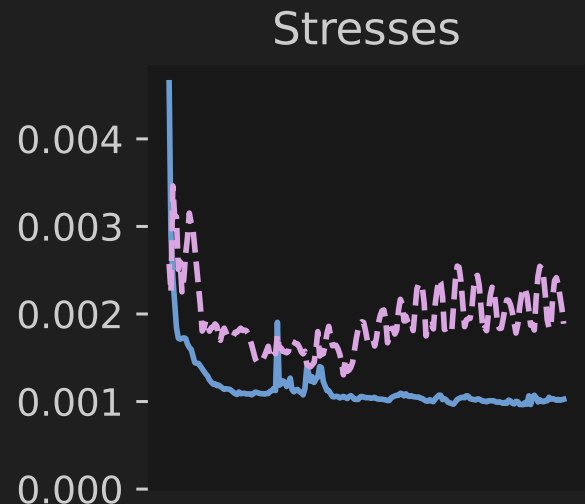
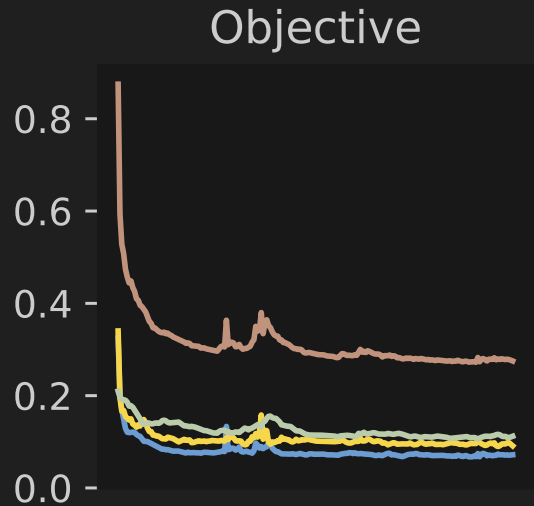
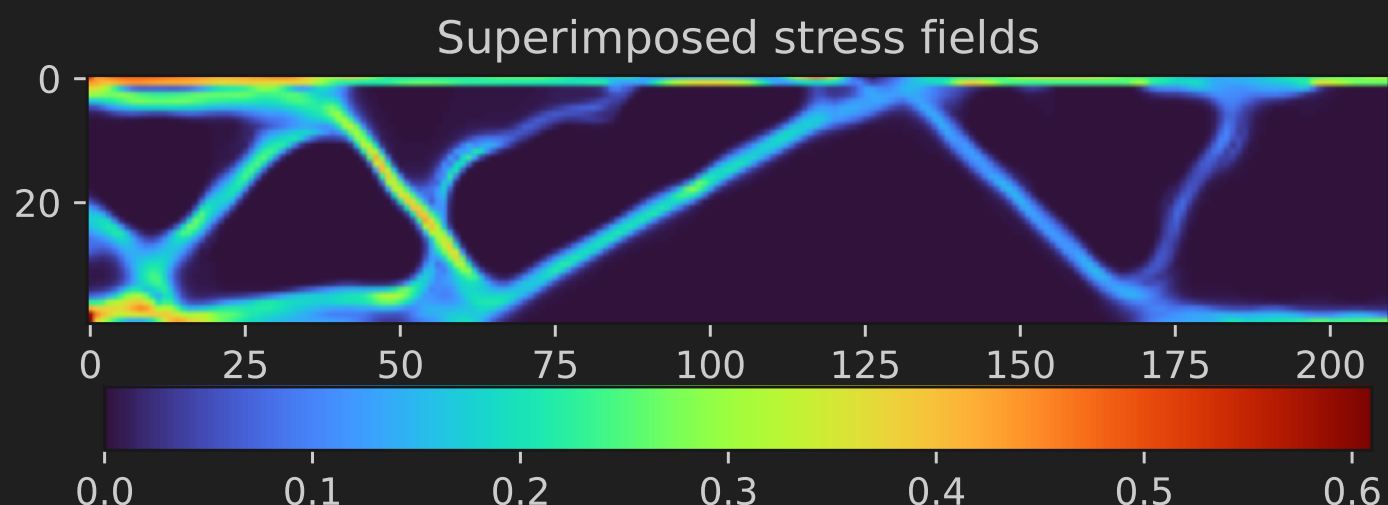
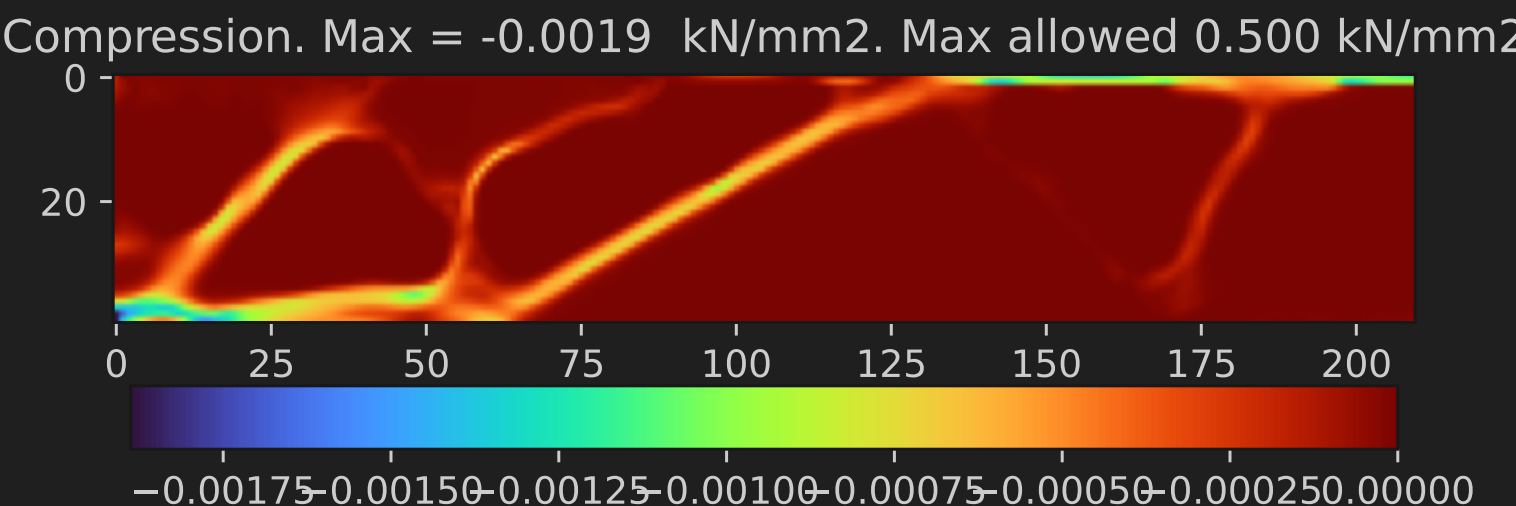
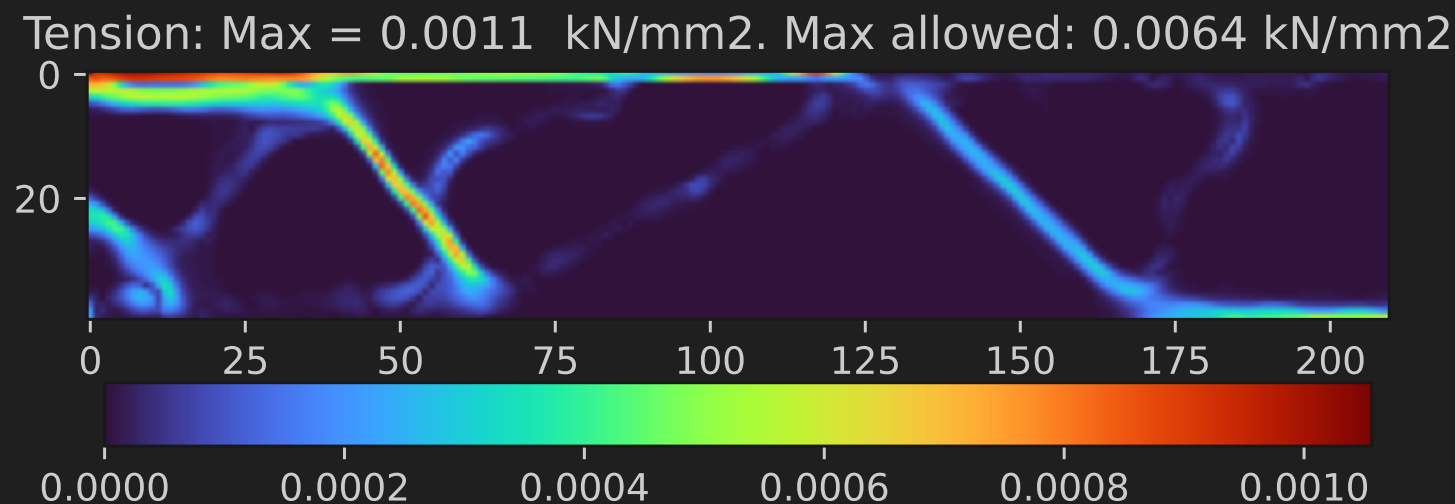
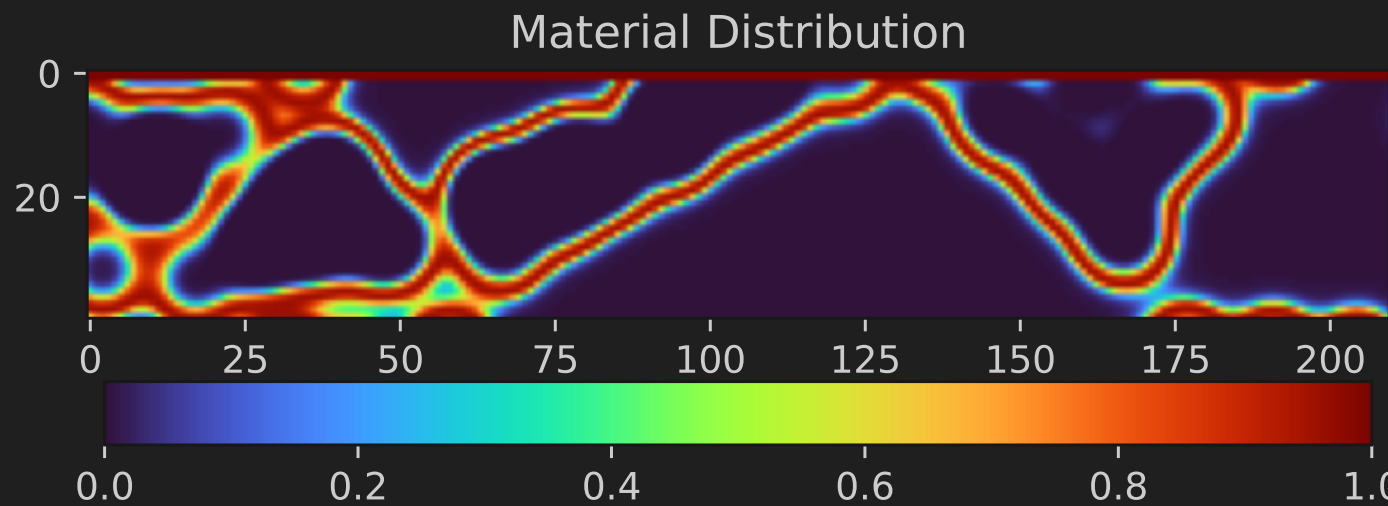
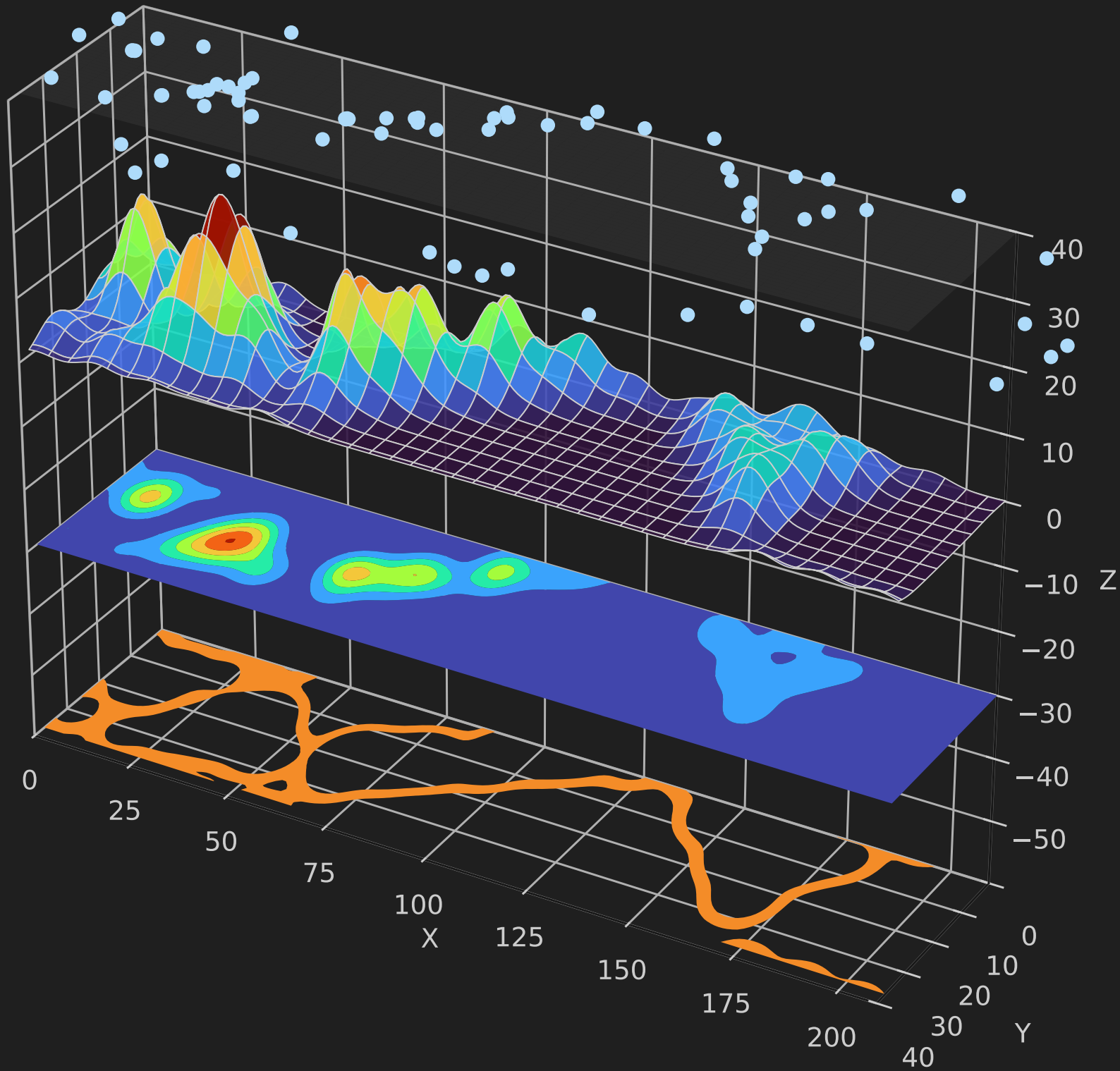
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.16 Shift = 1.74 Iteration = 213



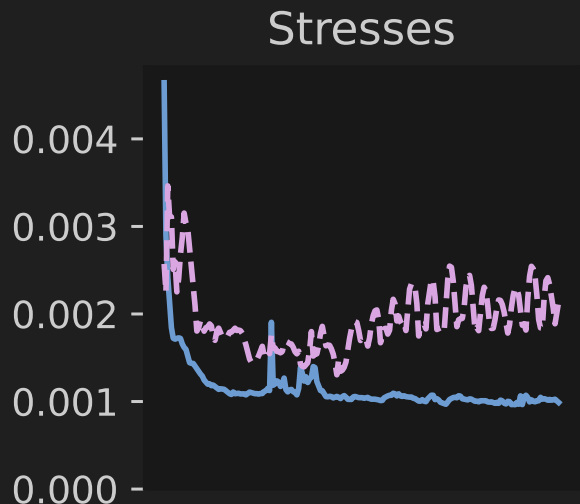
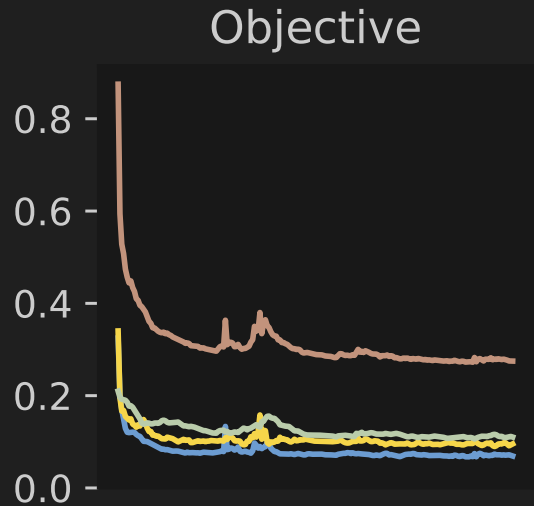
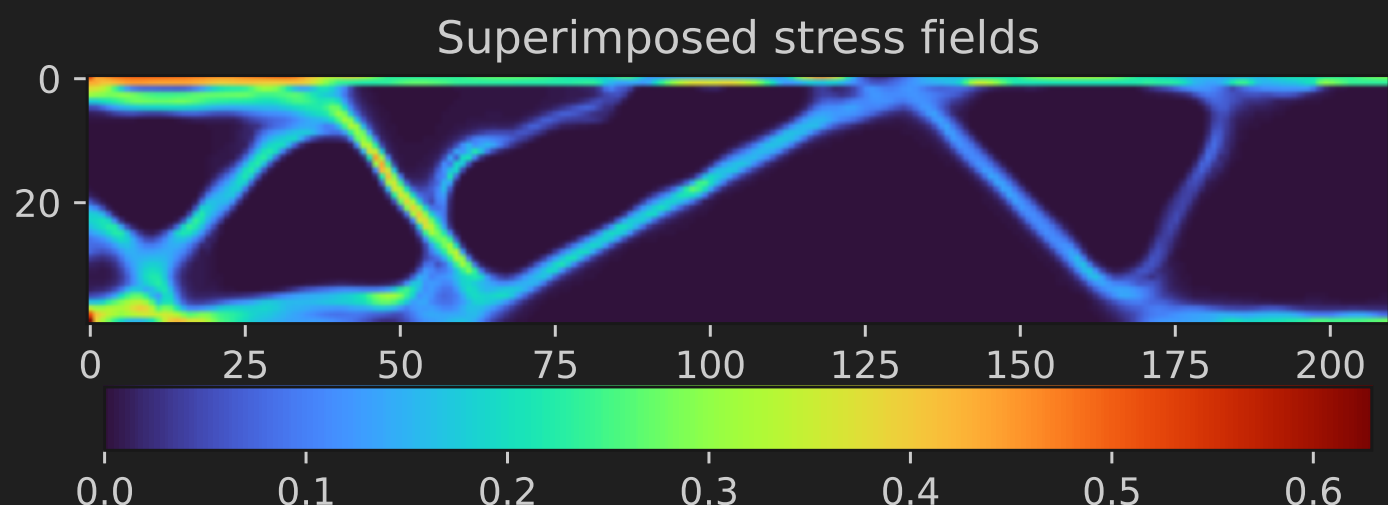
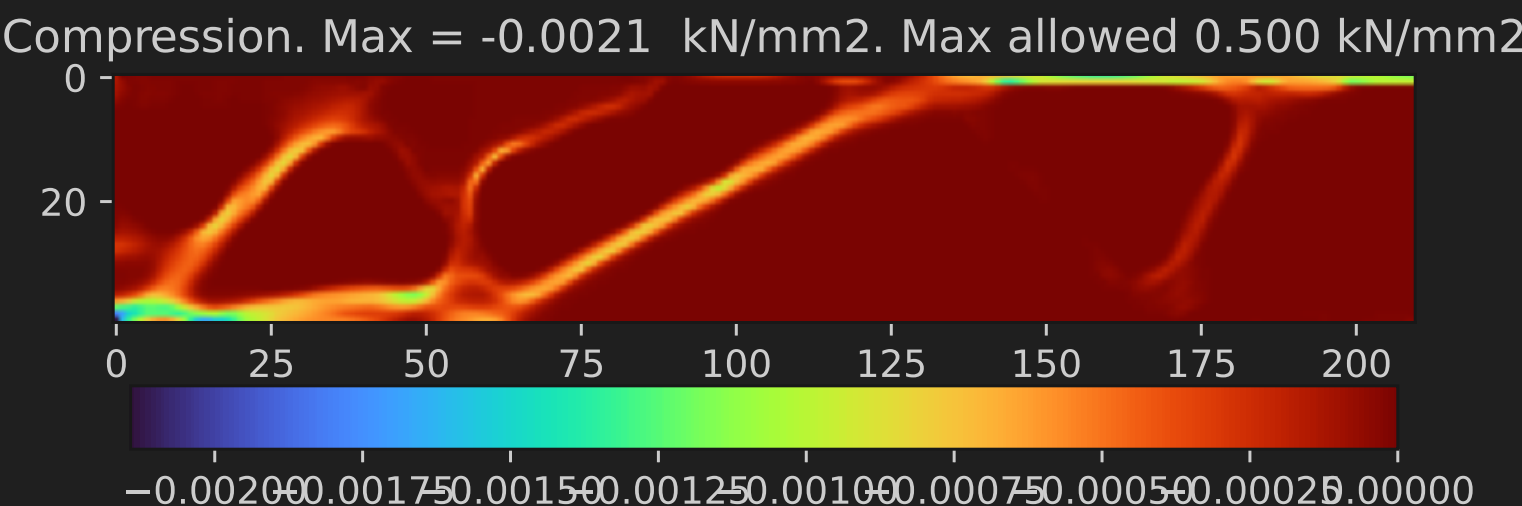
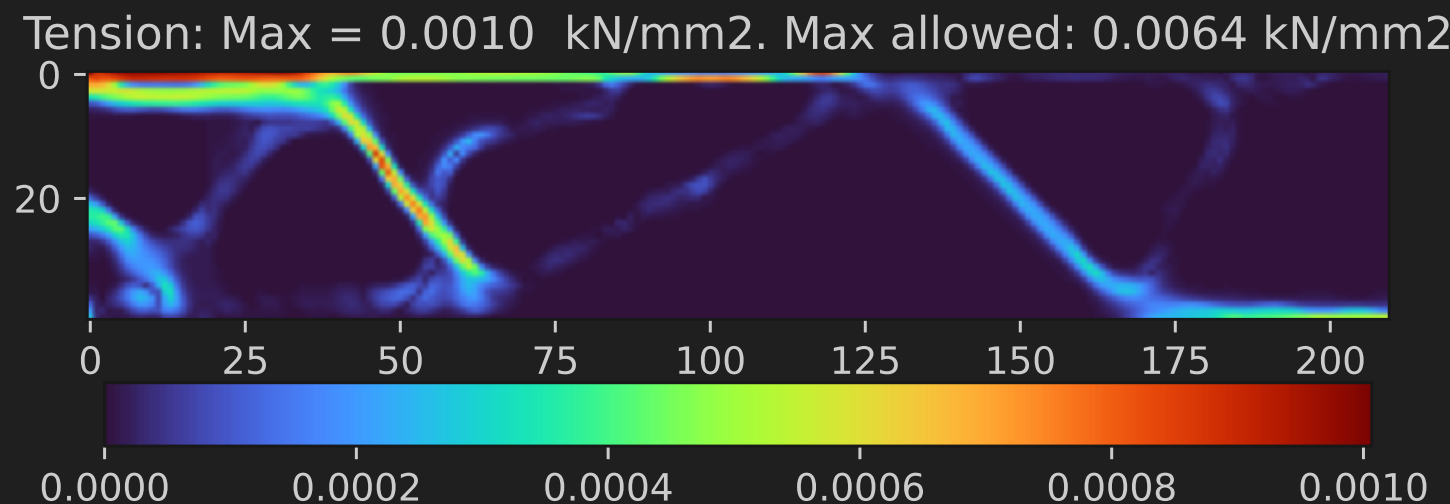
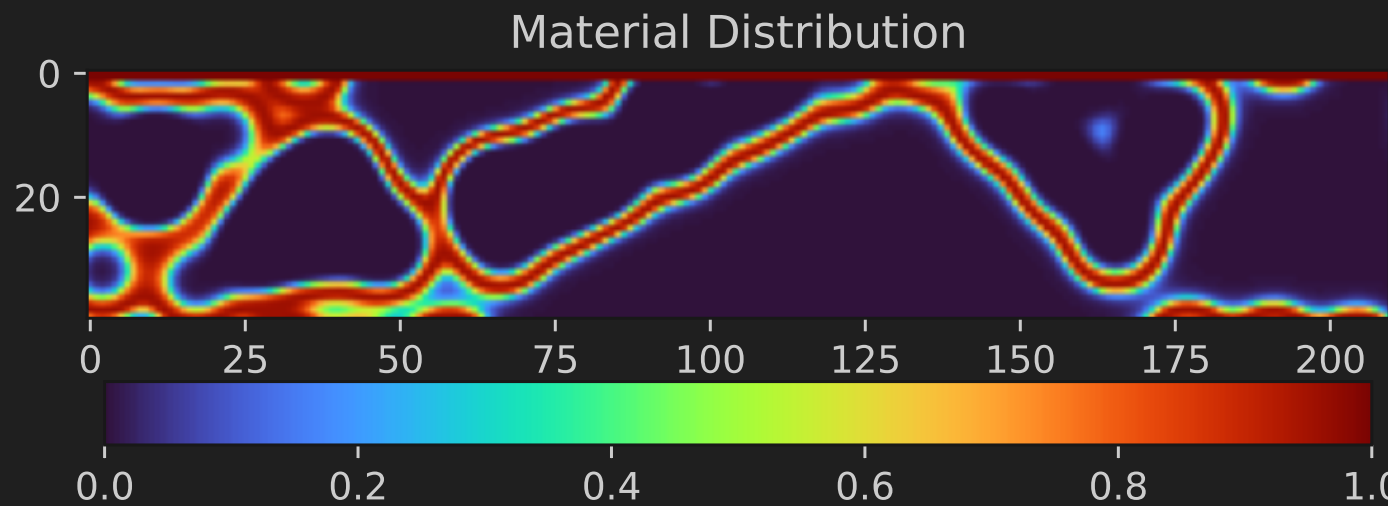
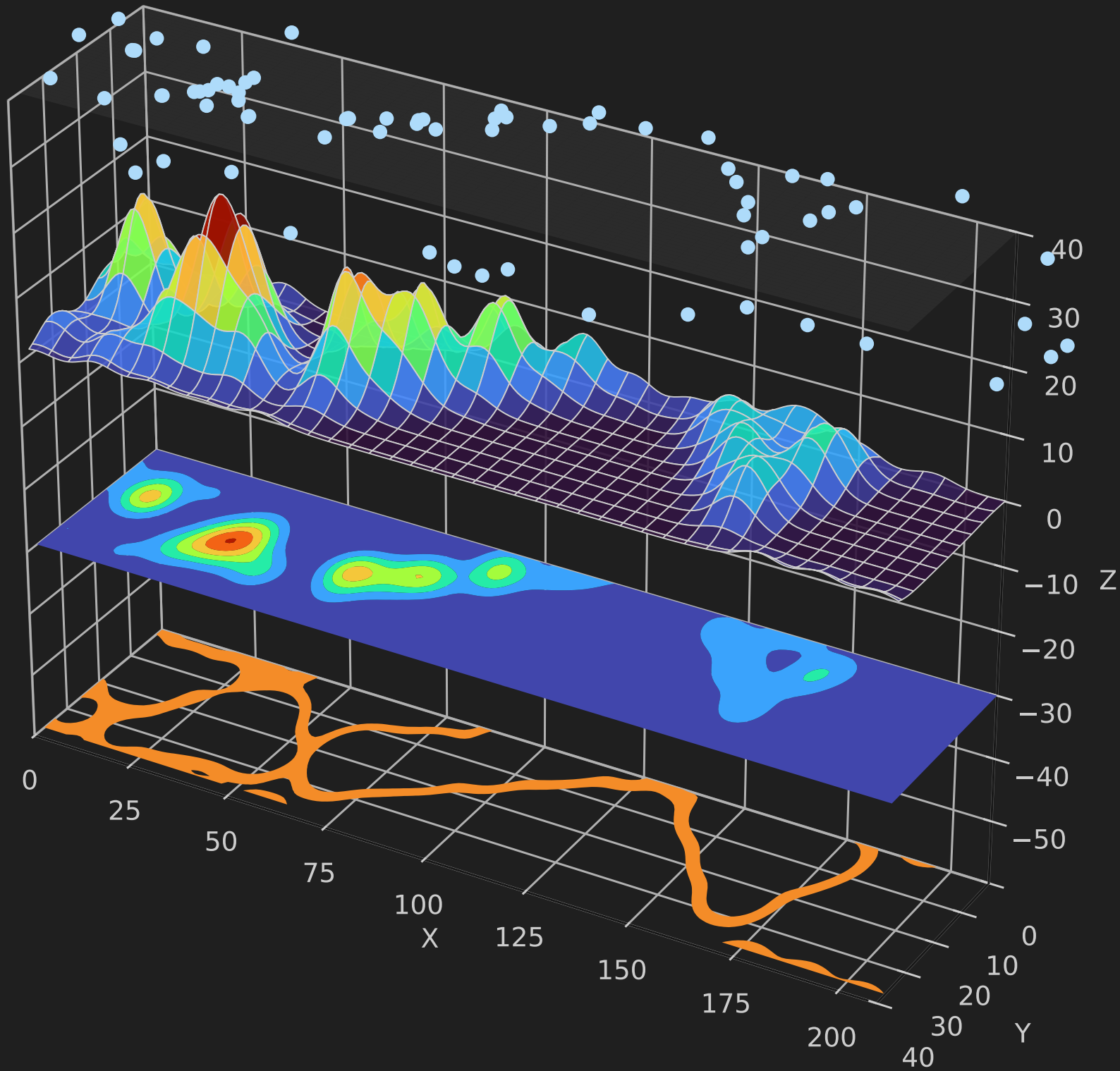
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.18 Shift = 1.74 Iteration = 215



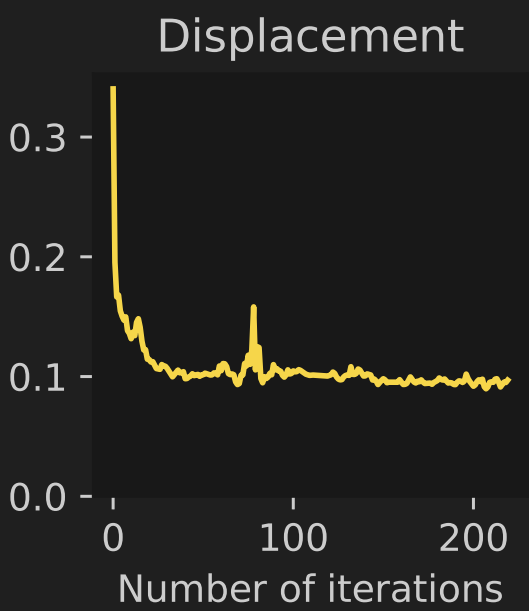
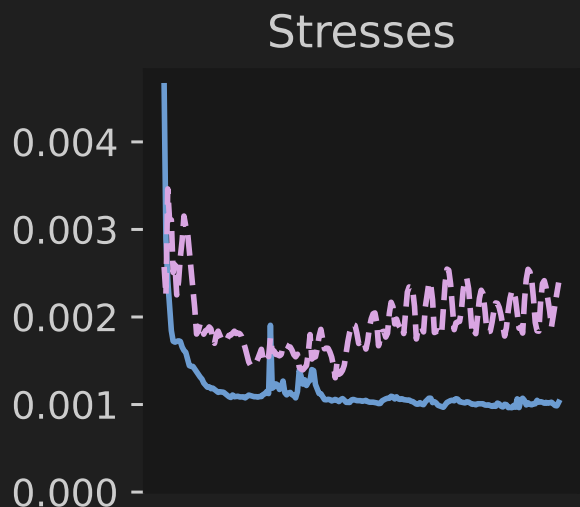
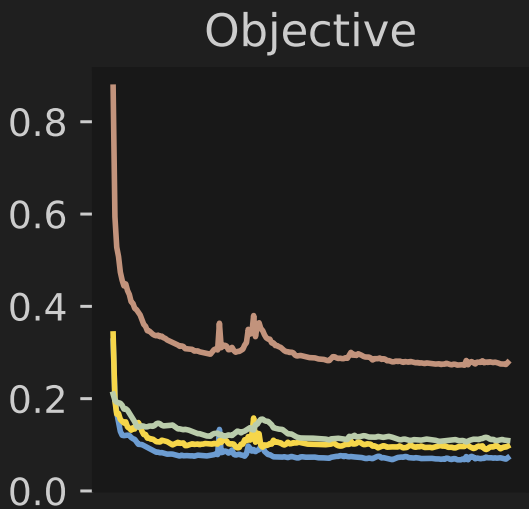
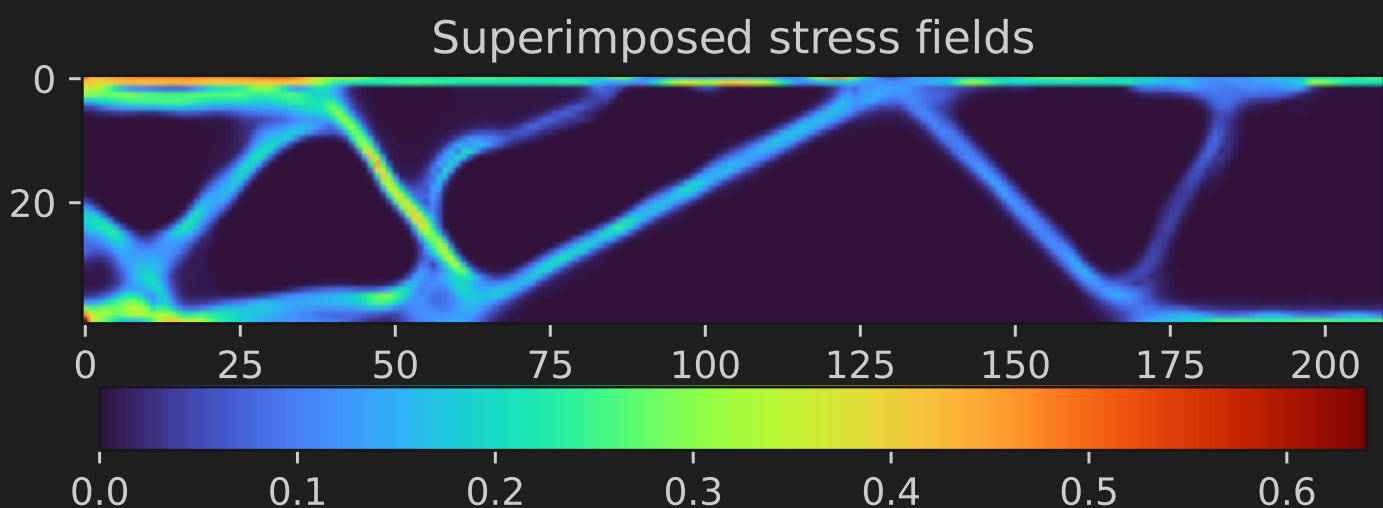
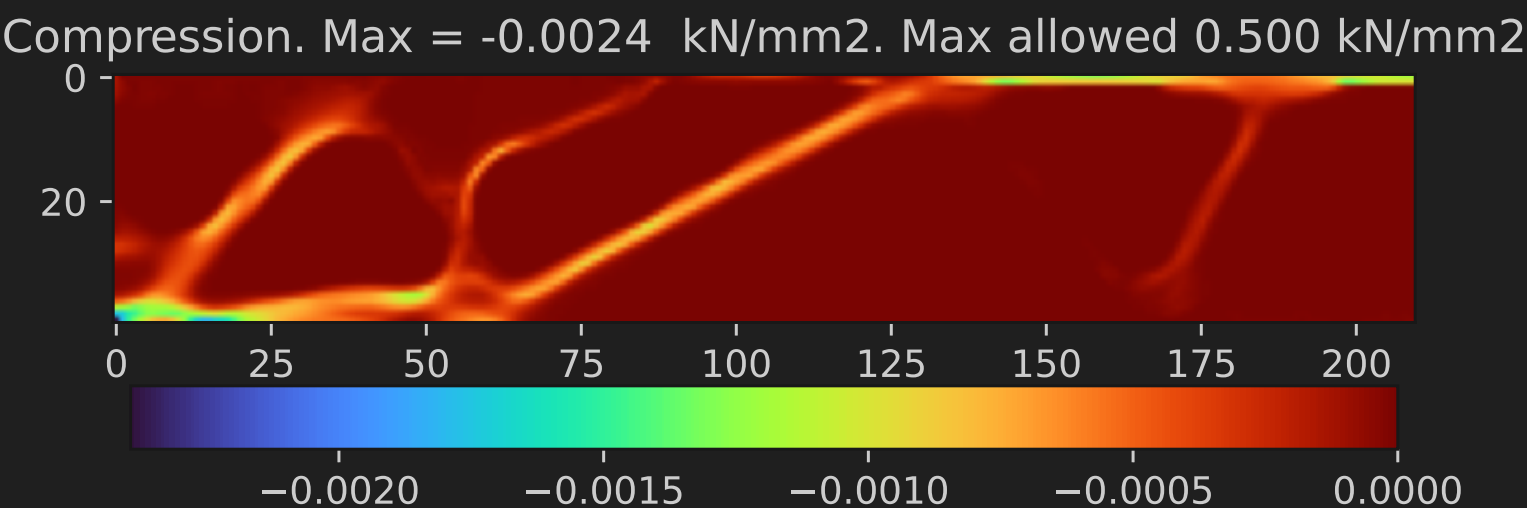
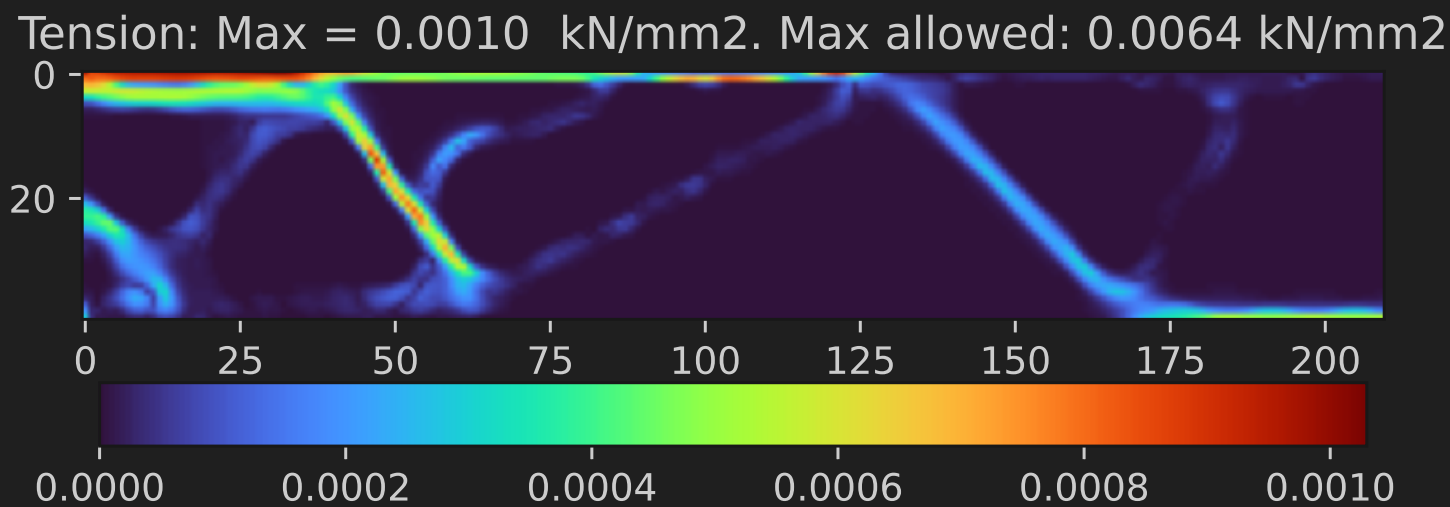
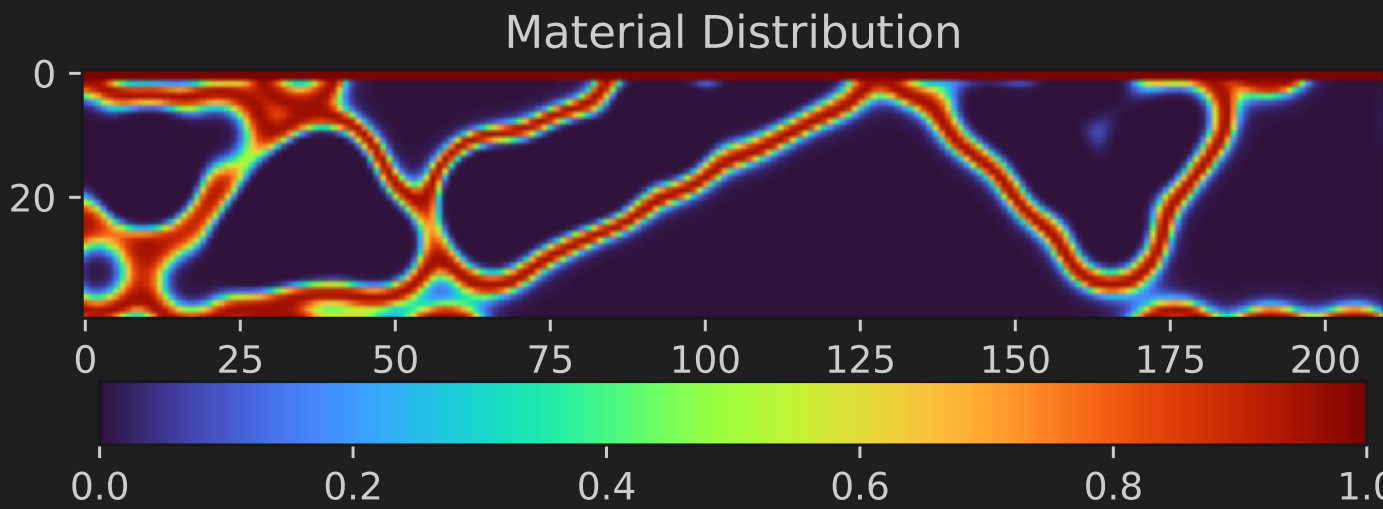
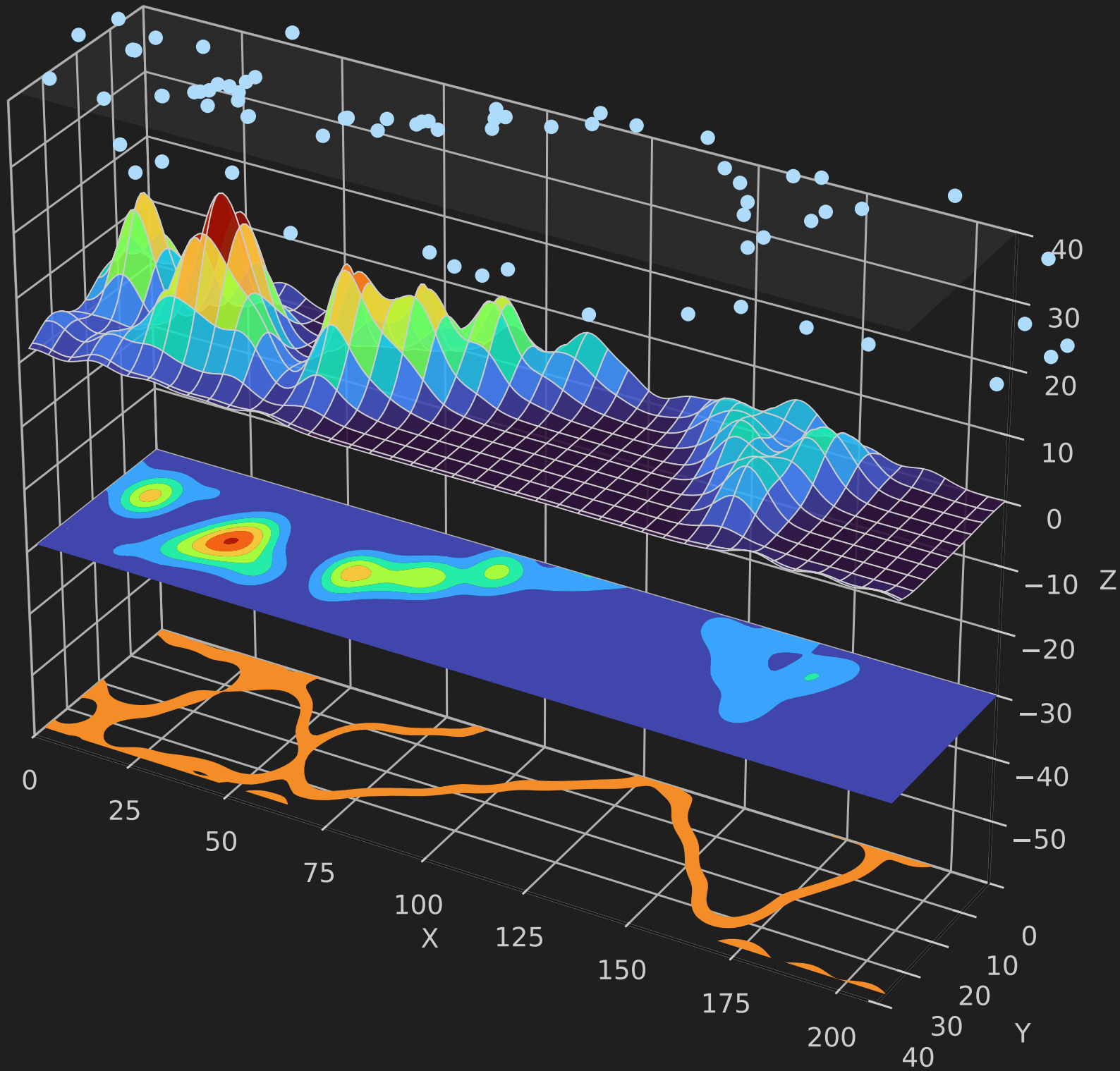
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.19 Shift = 1.74 Iteration = 217



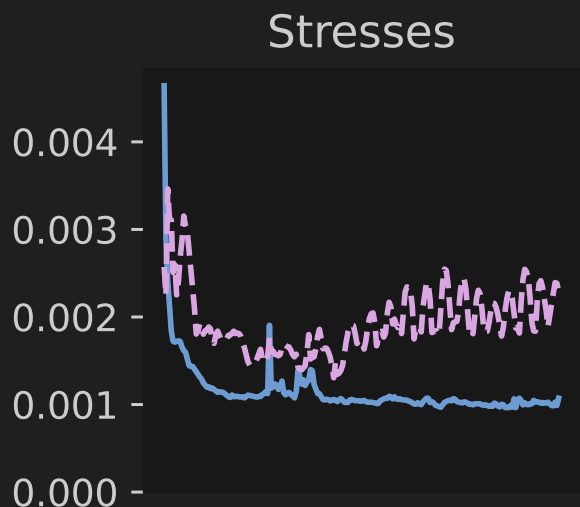
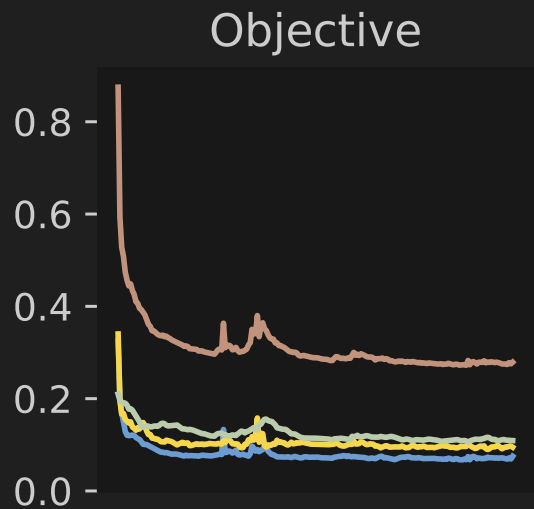
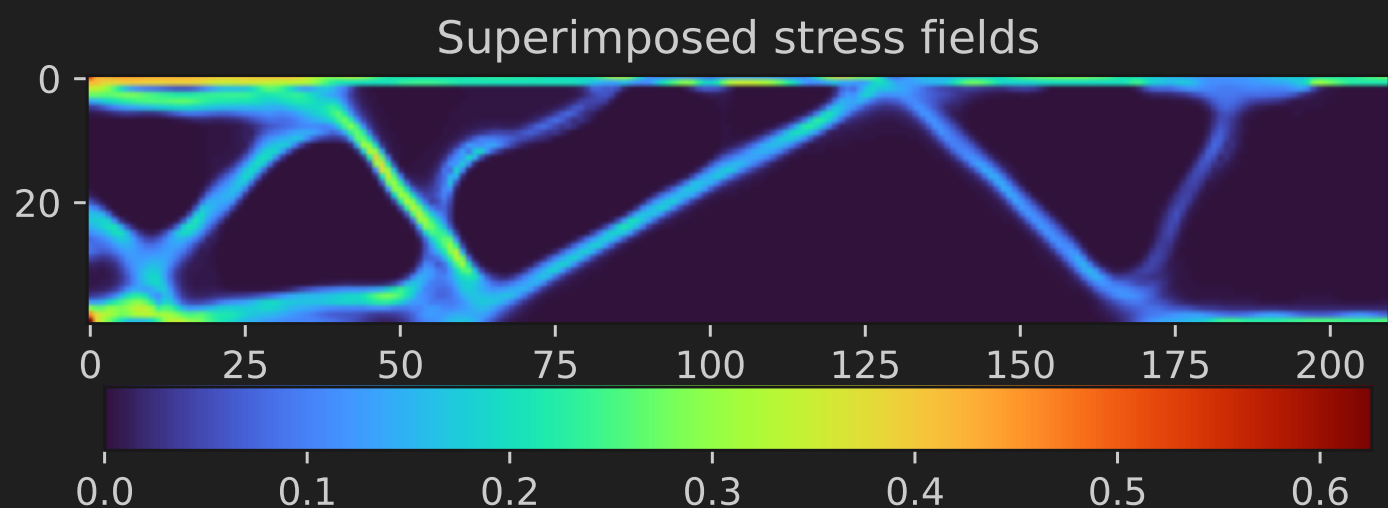
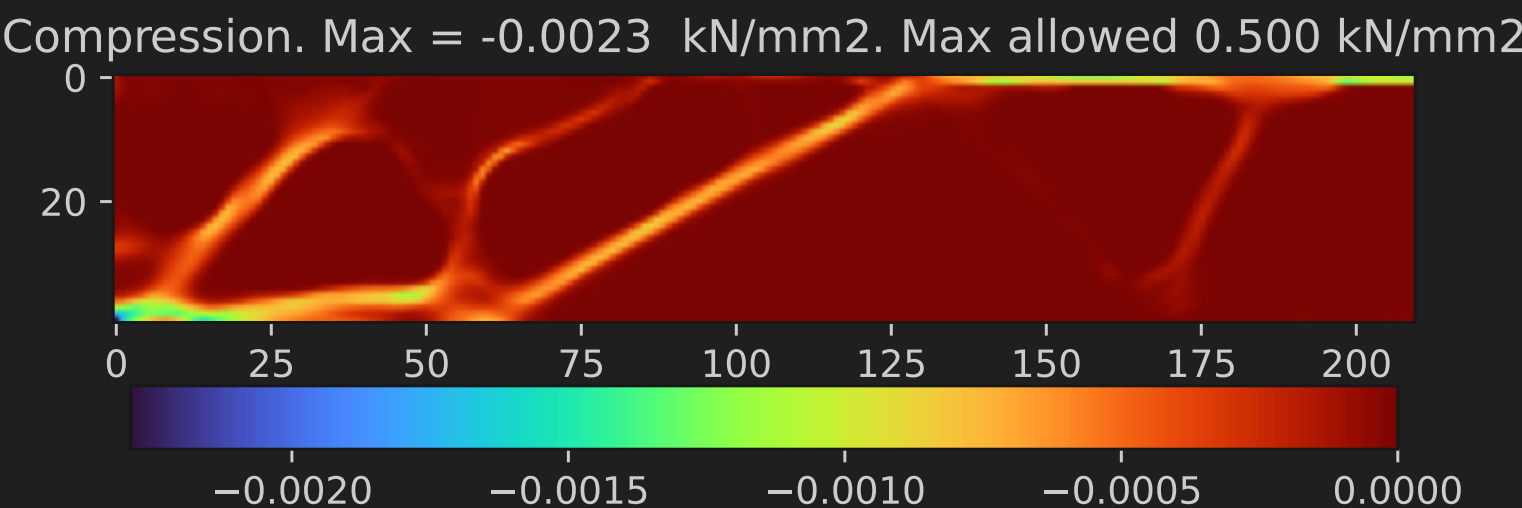
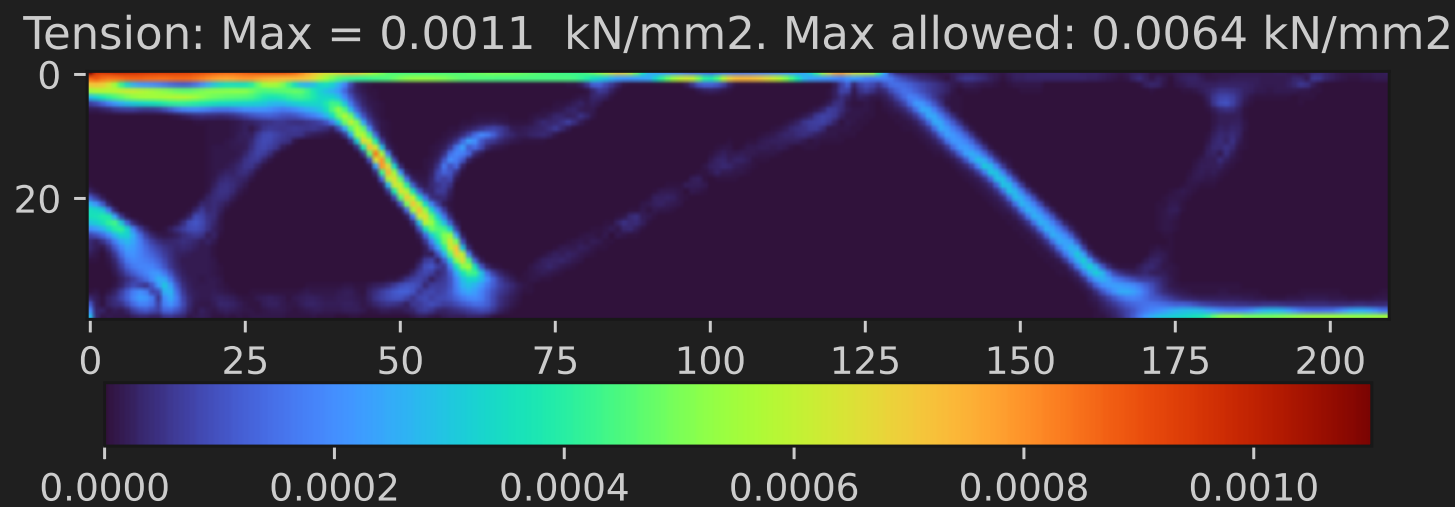
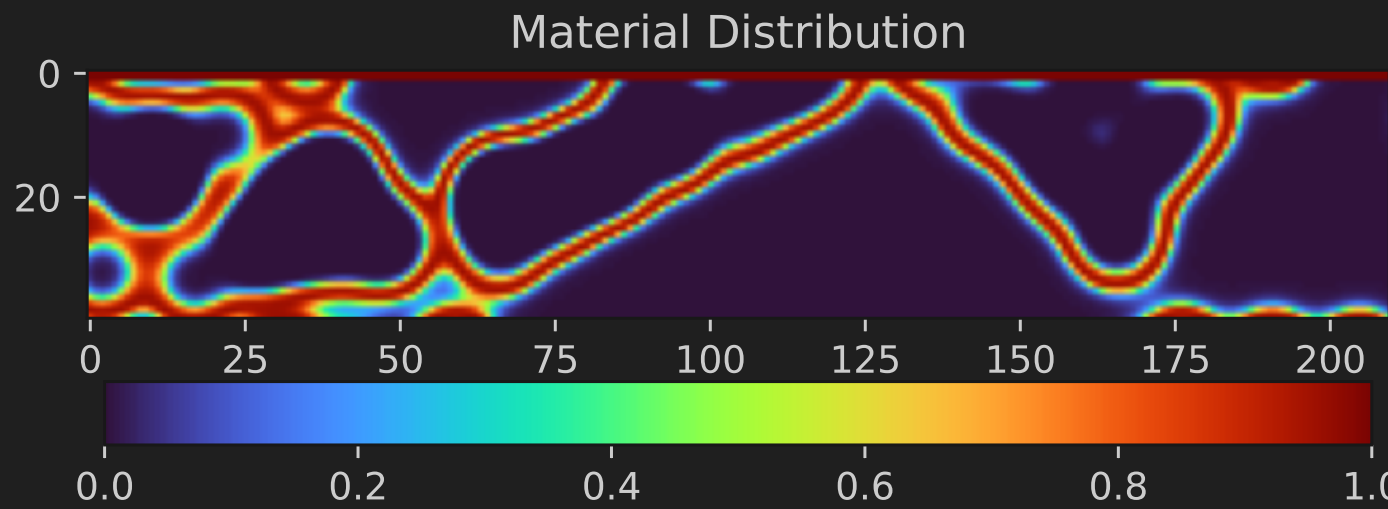
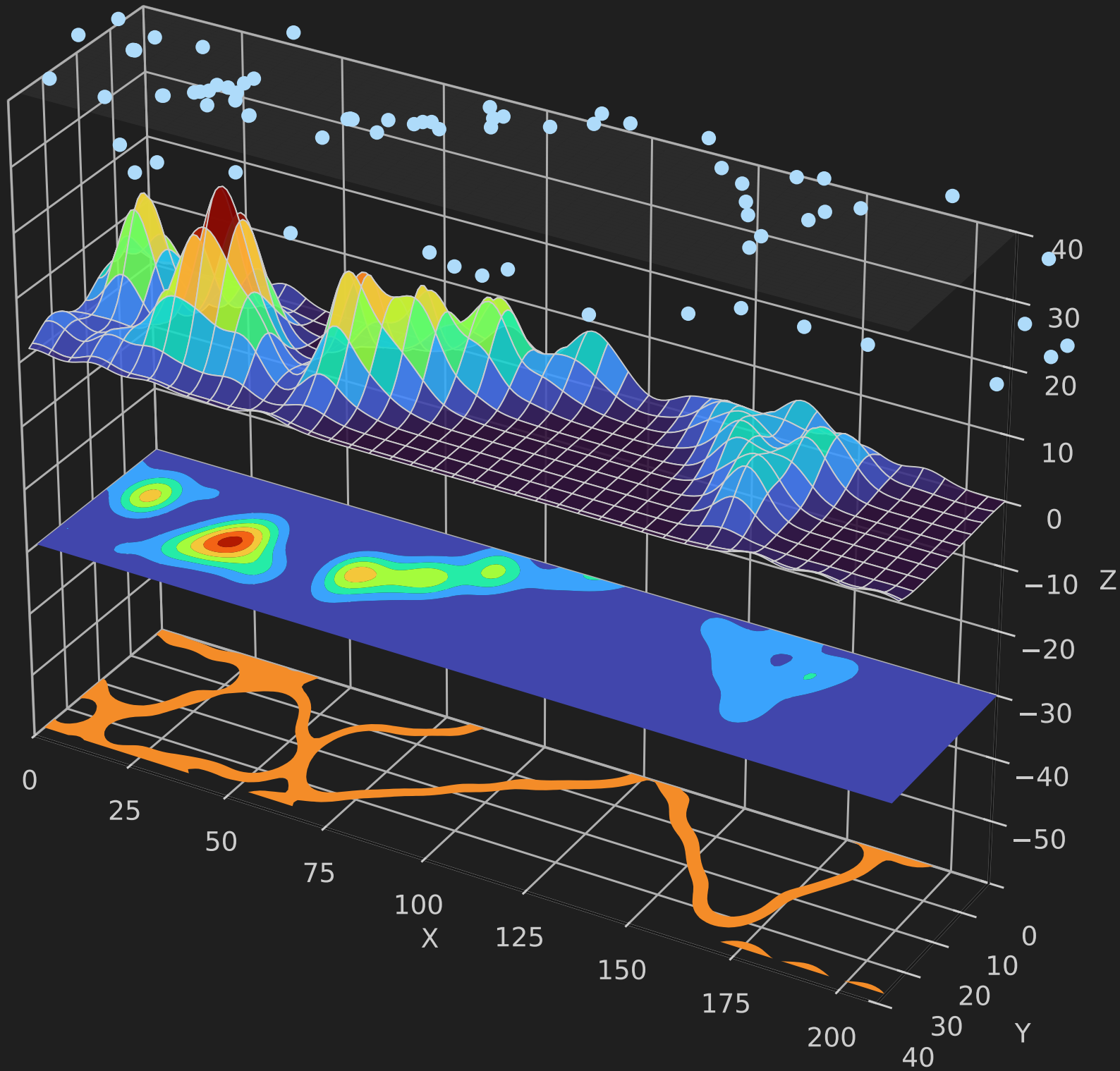
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.24 Shift = 1.72 Iteration = 219



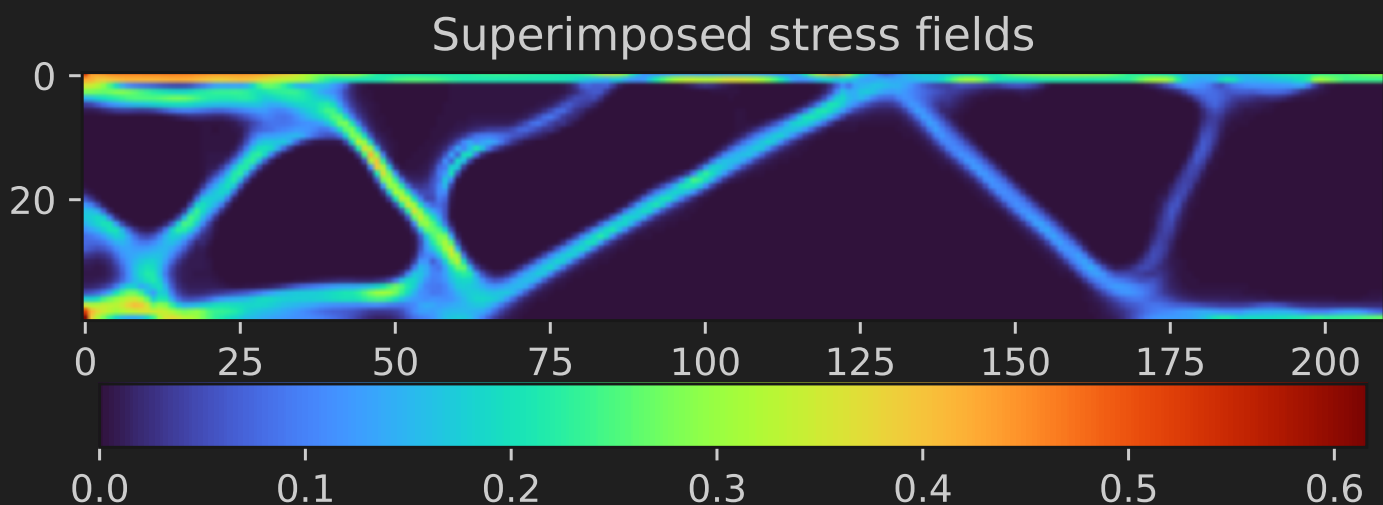
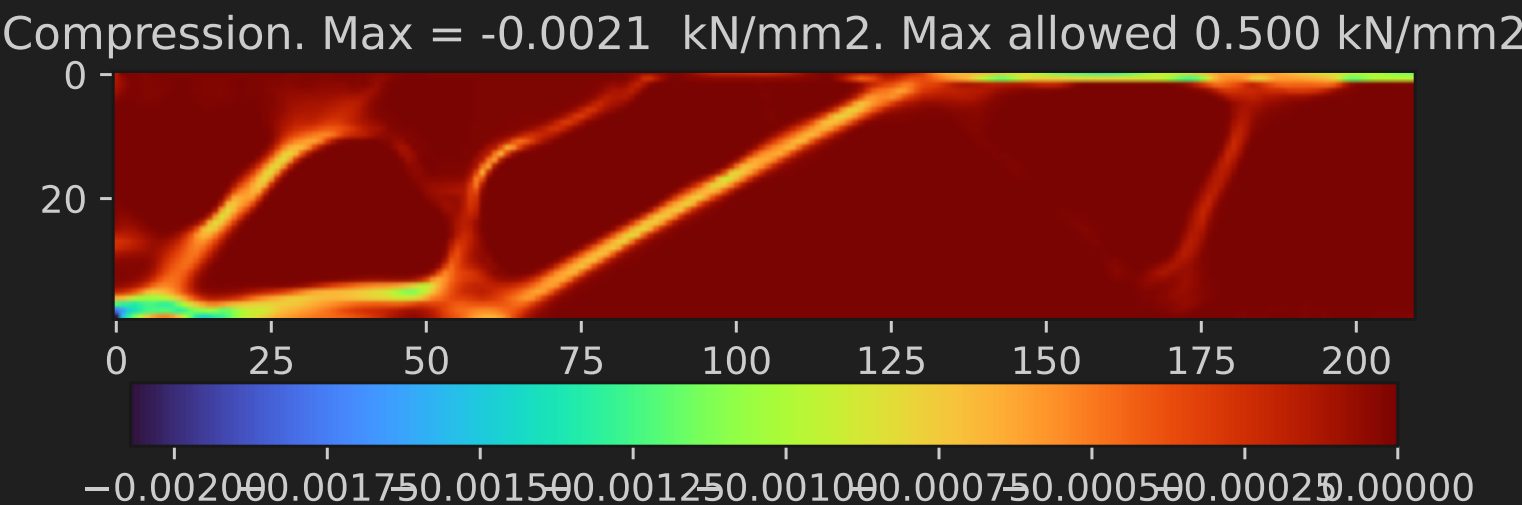
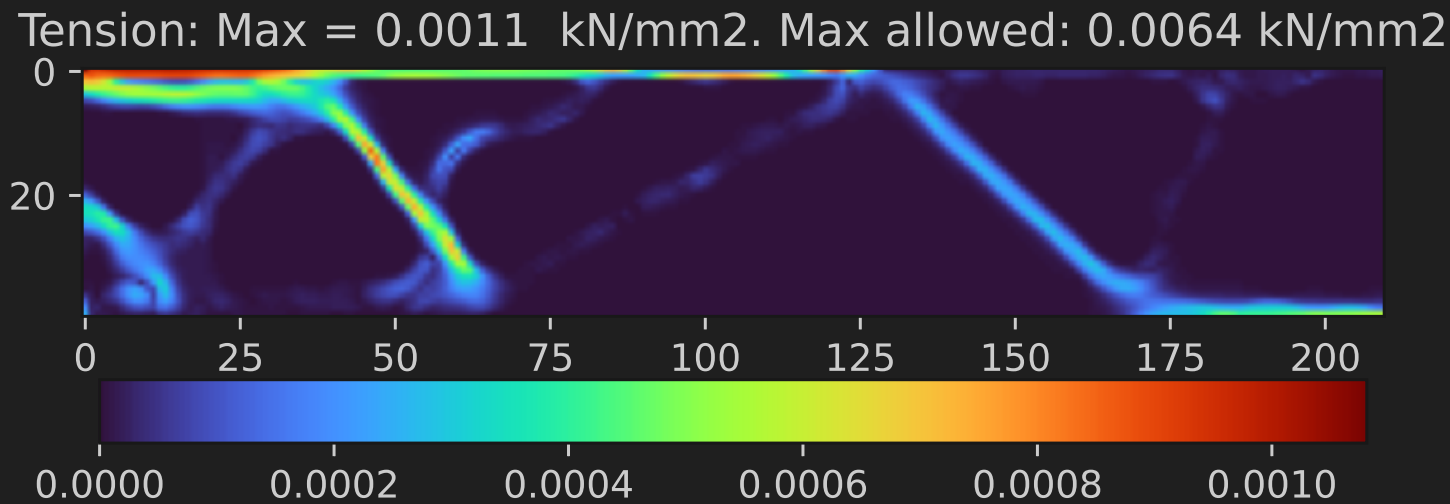
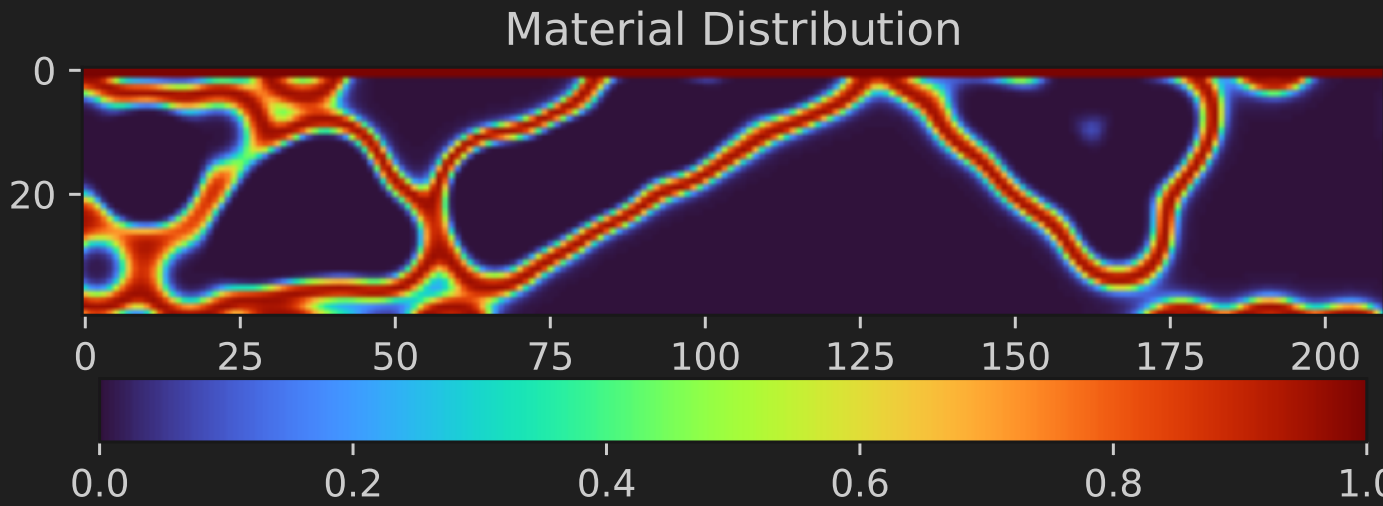
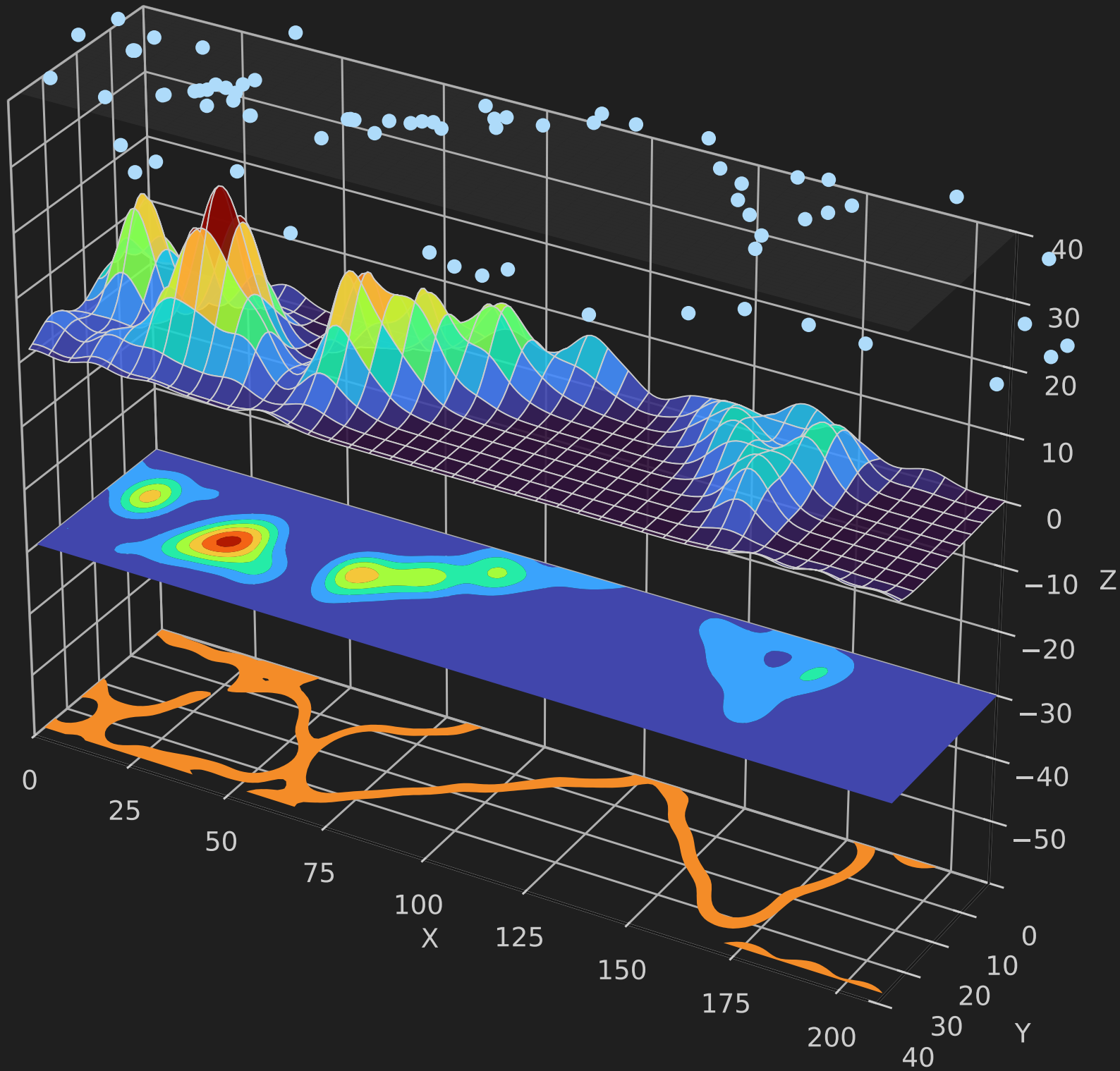
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.20 Shift = 1.74 Iteration = 221



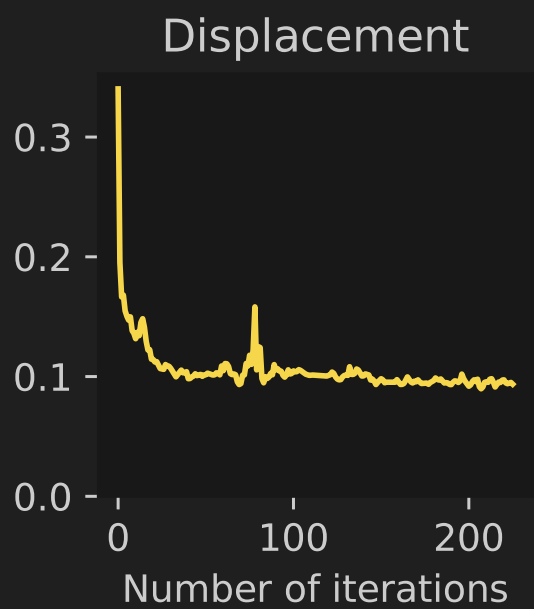
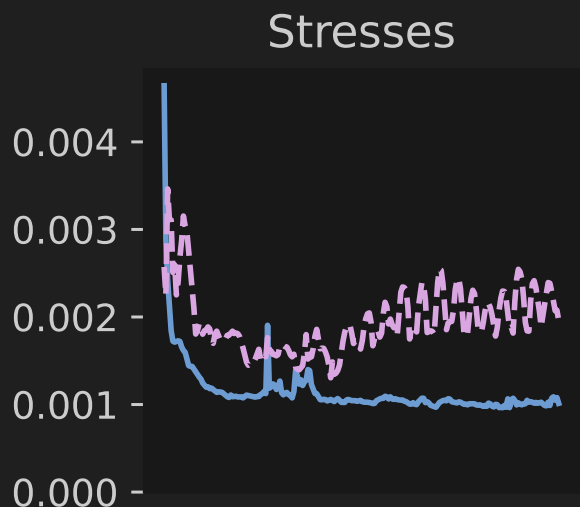
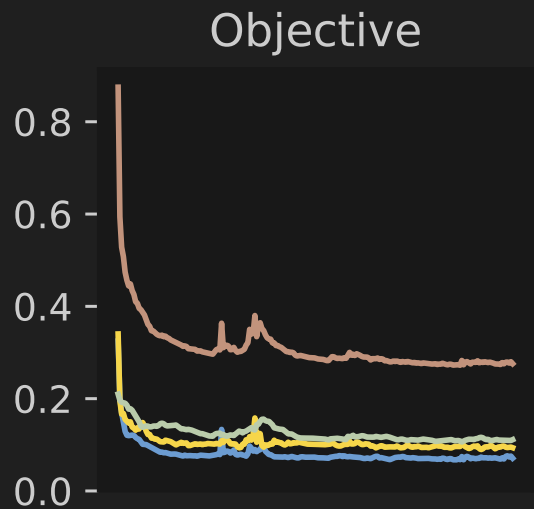
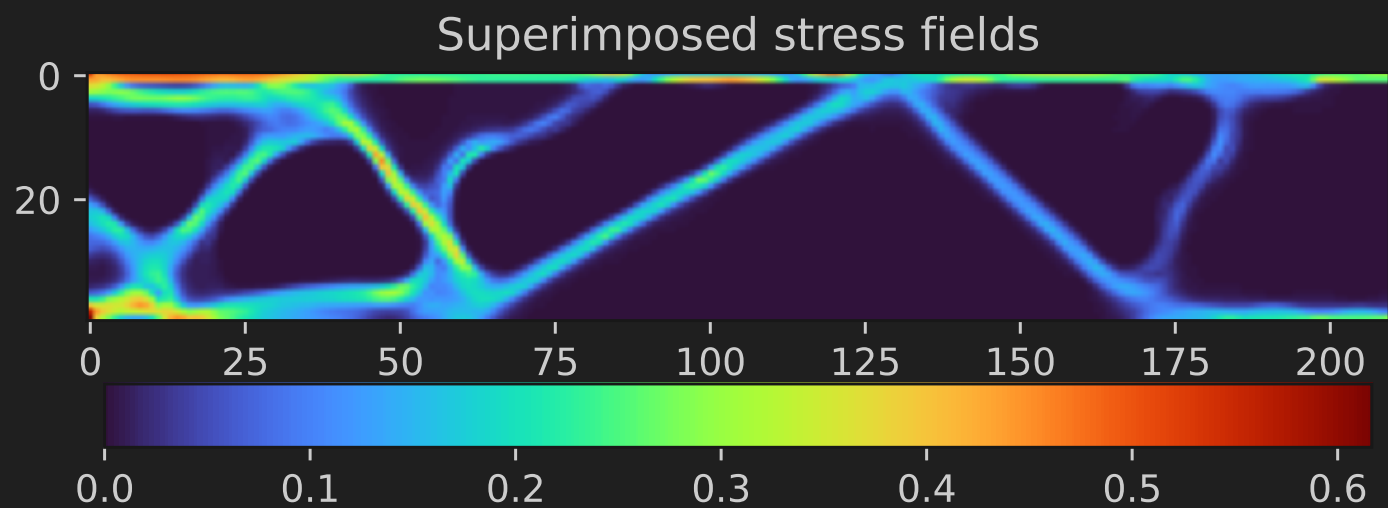
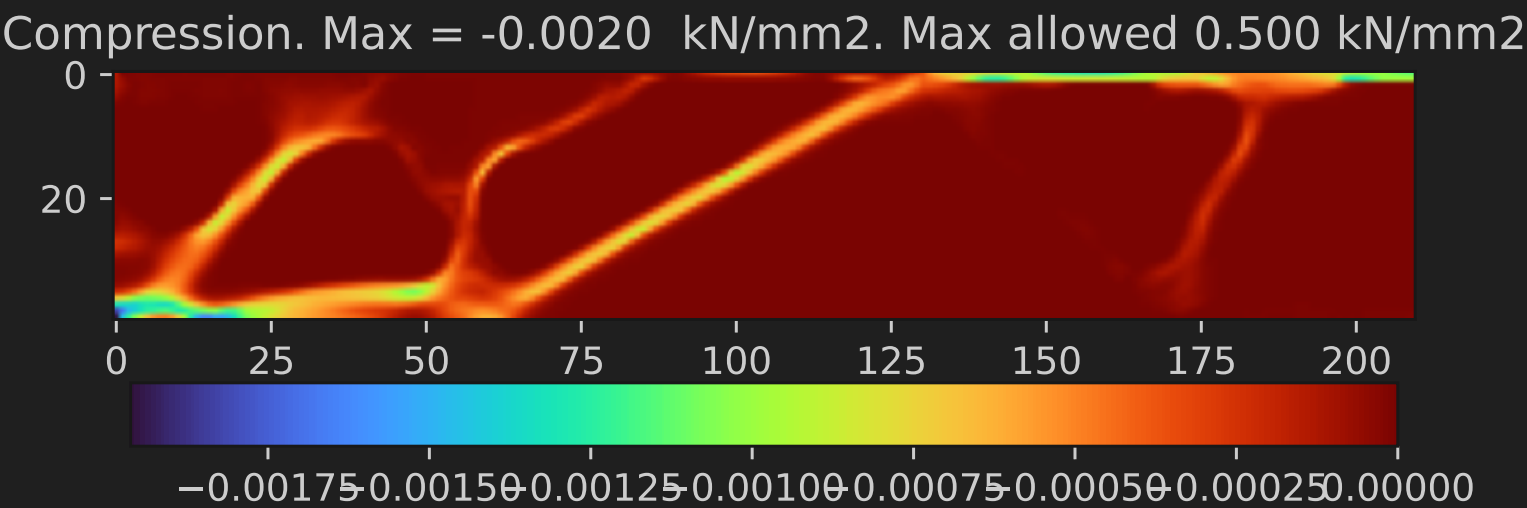
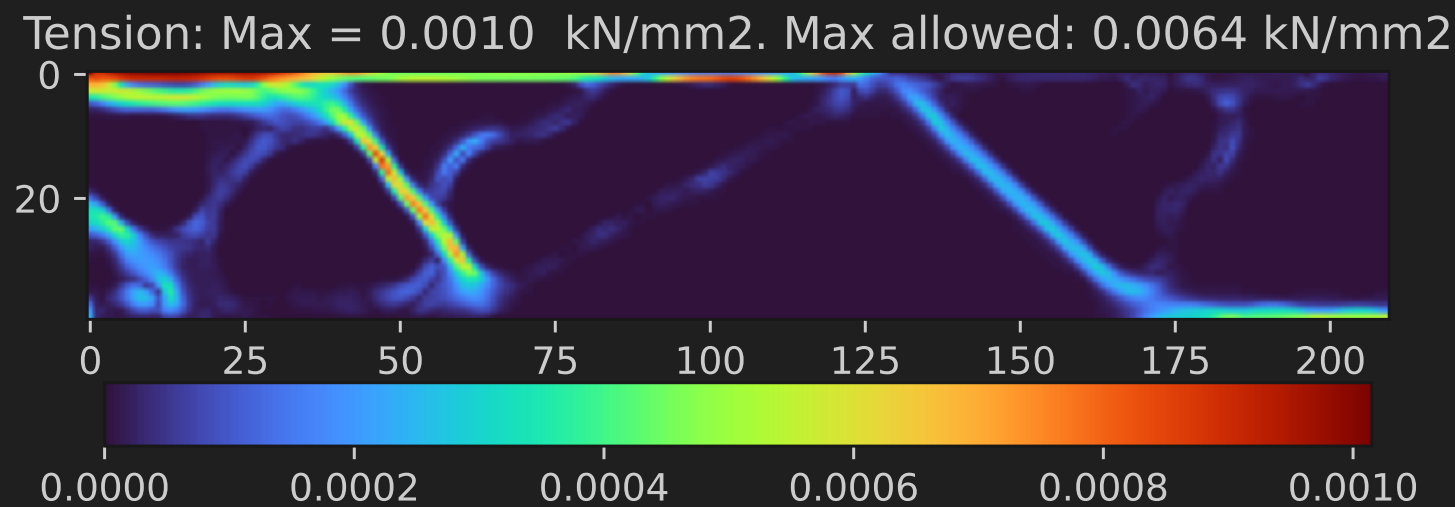
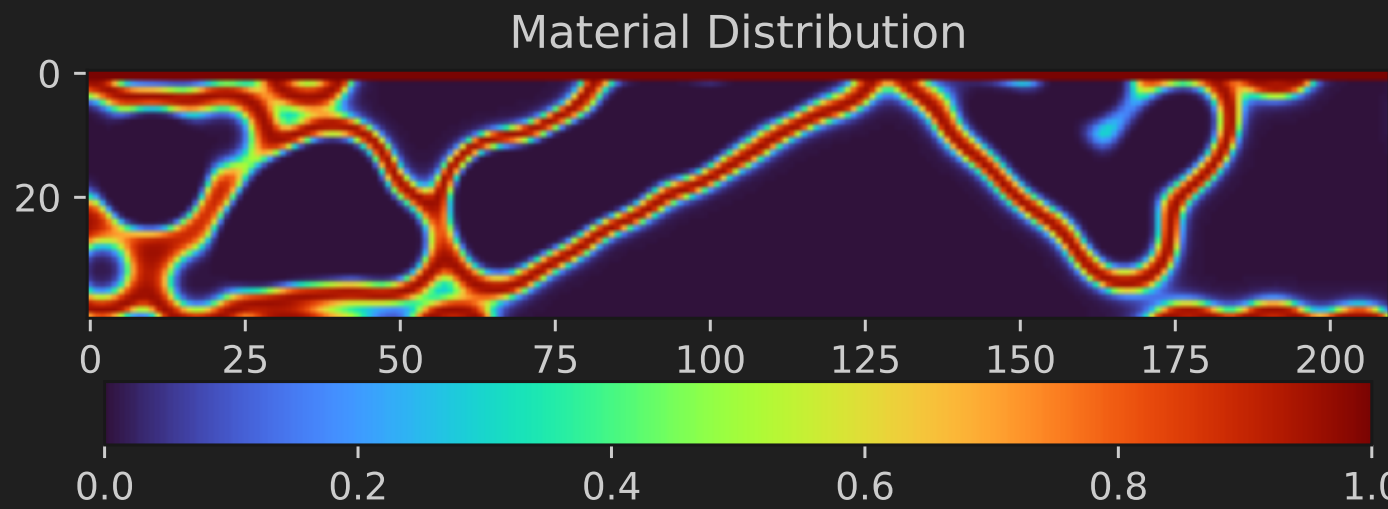
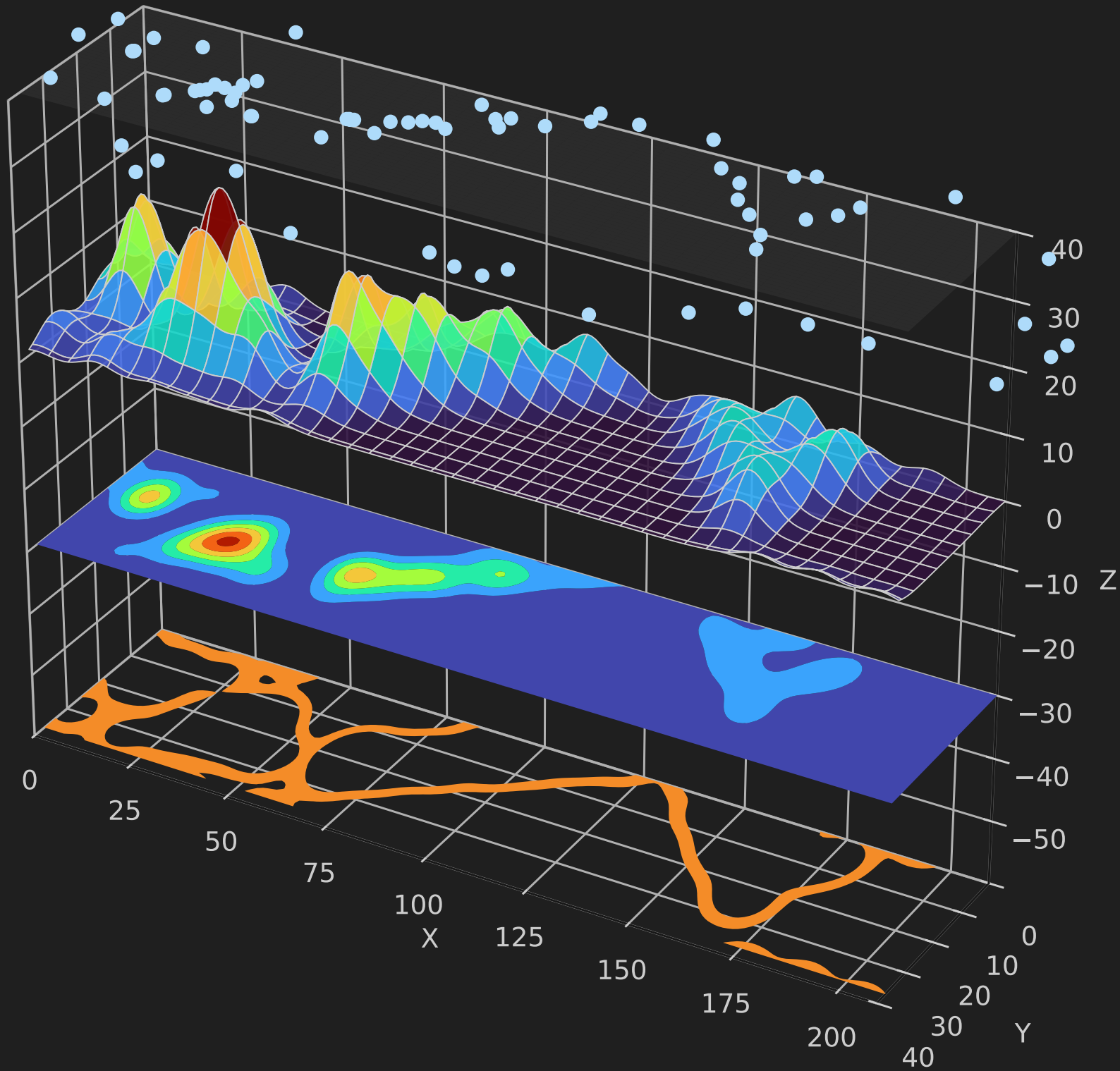
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.19 Shift = 1.74 Iteration = 223



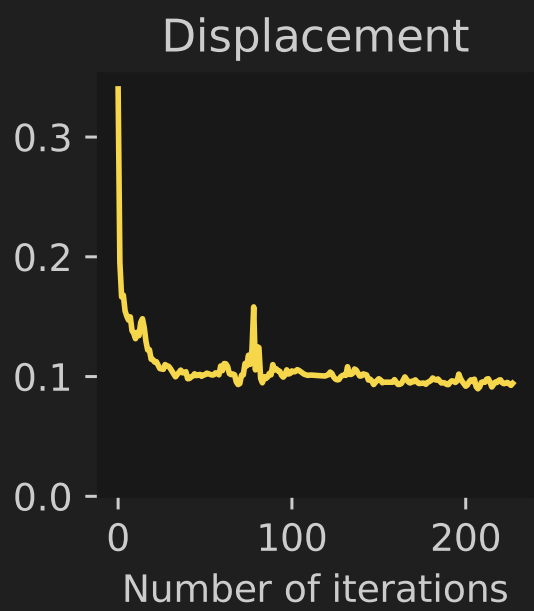
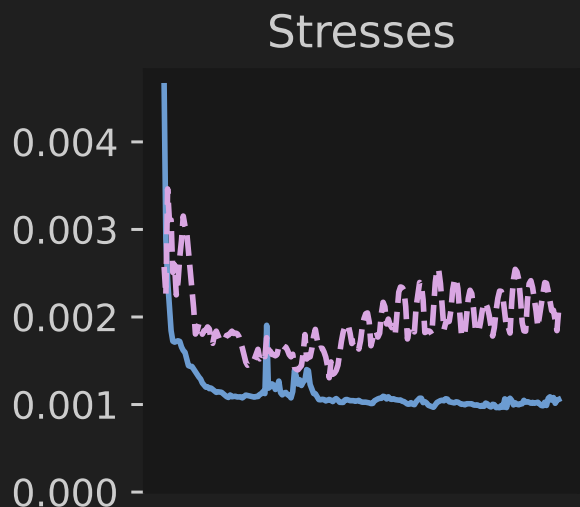
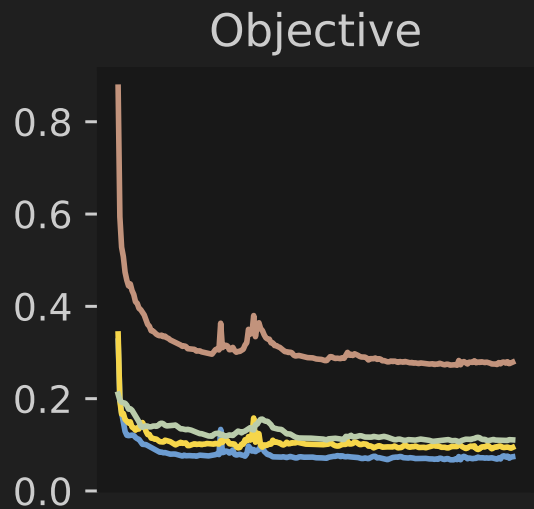
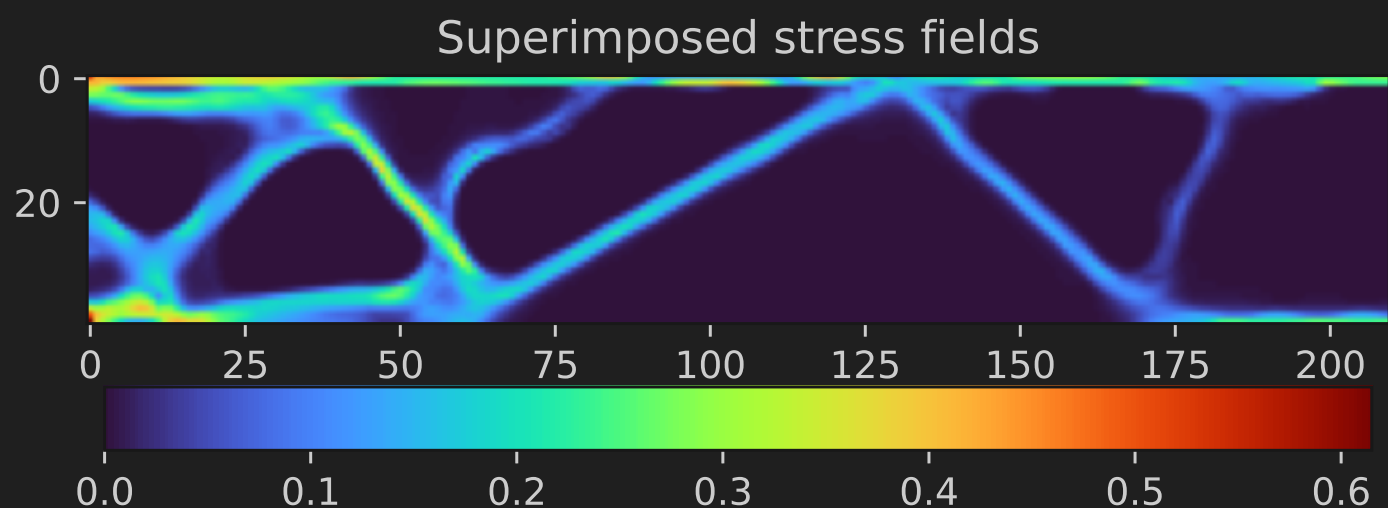
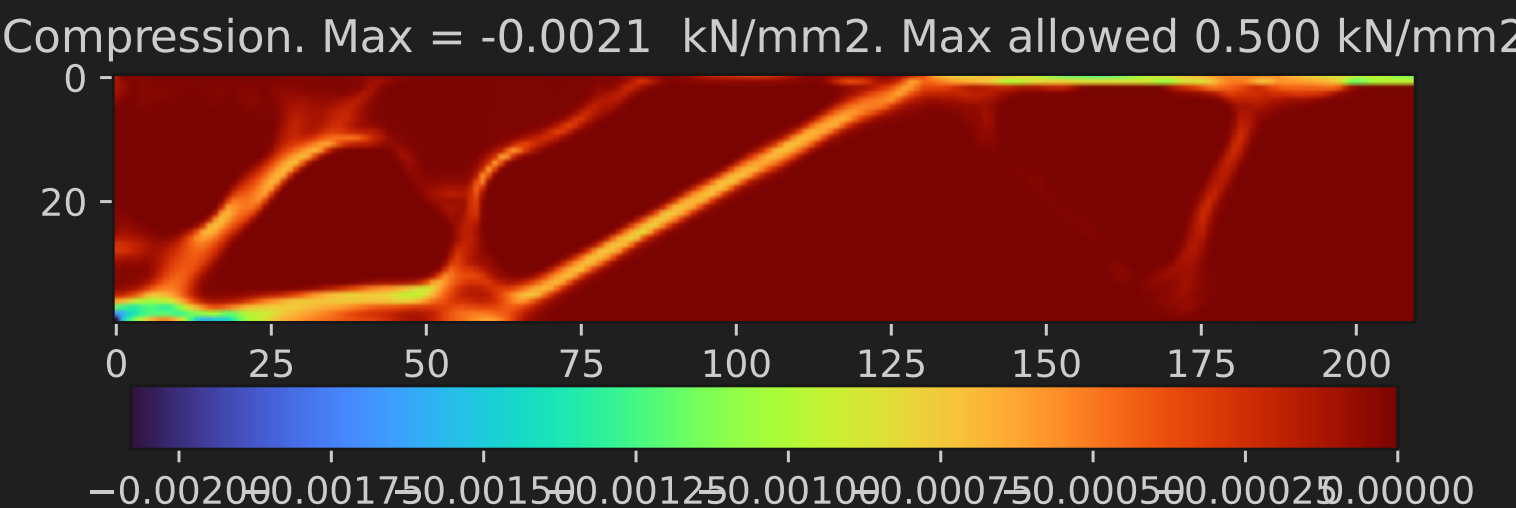
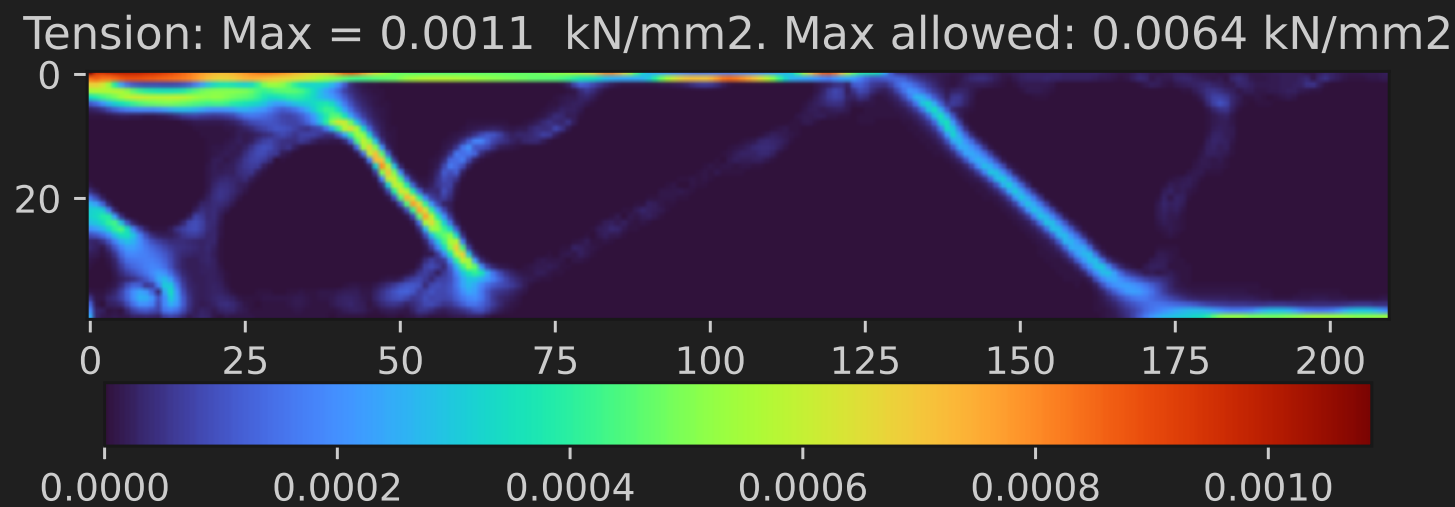
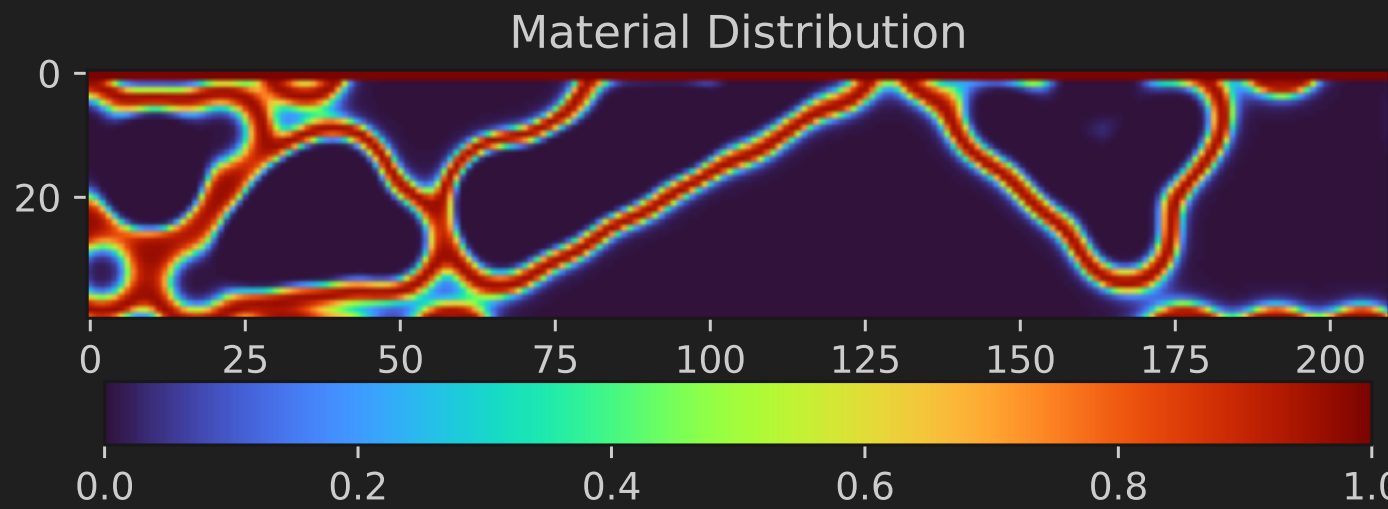
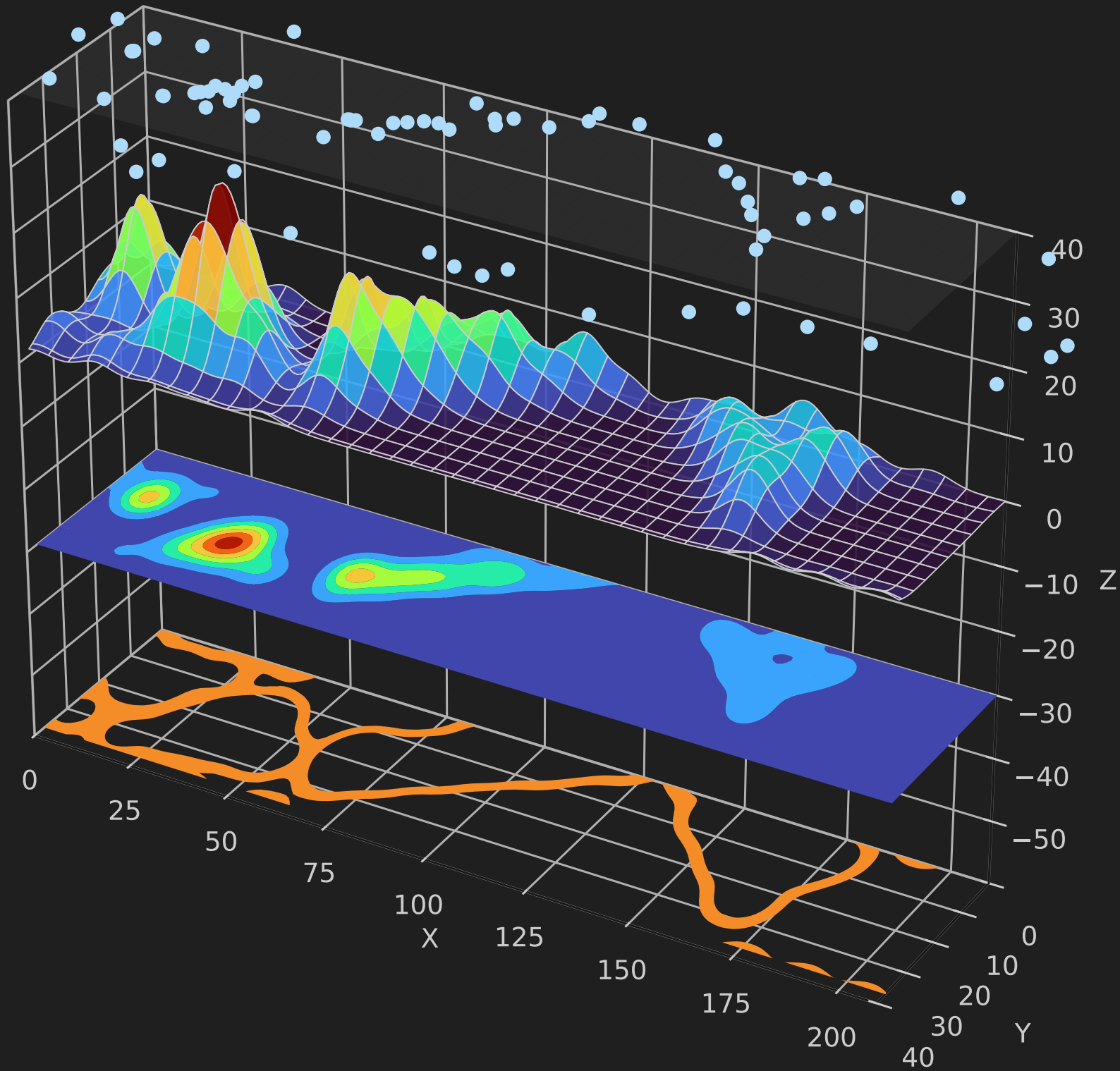
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.17 Shift = 1.75 Iteration = 225



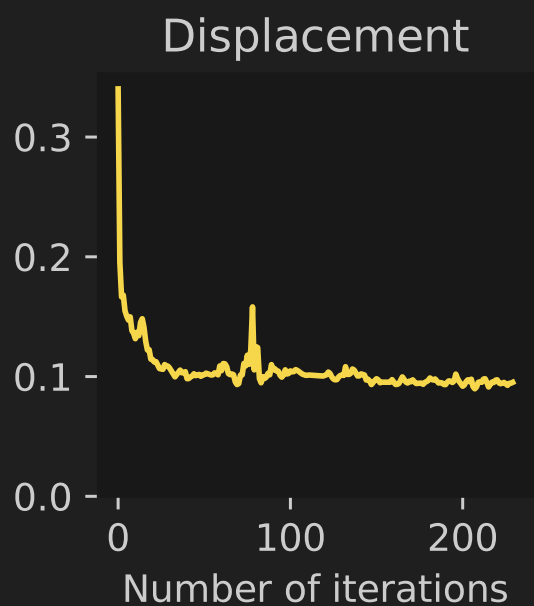
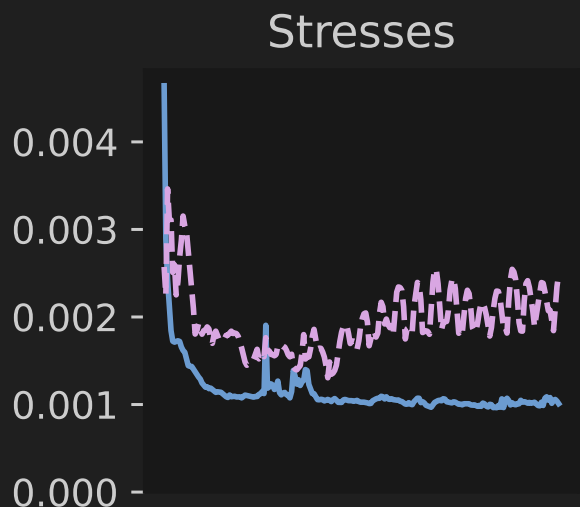
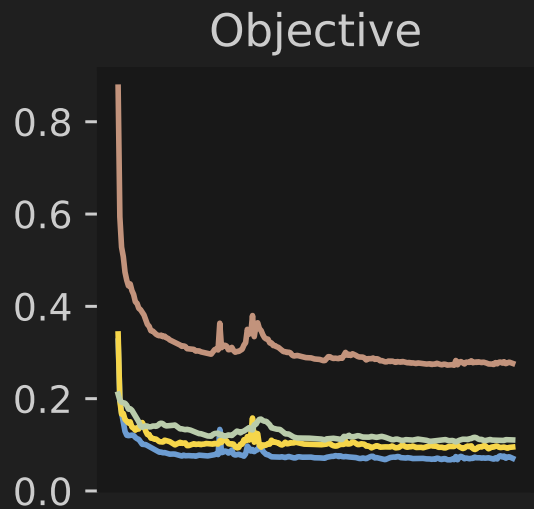
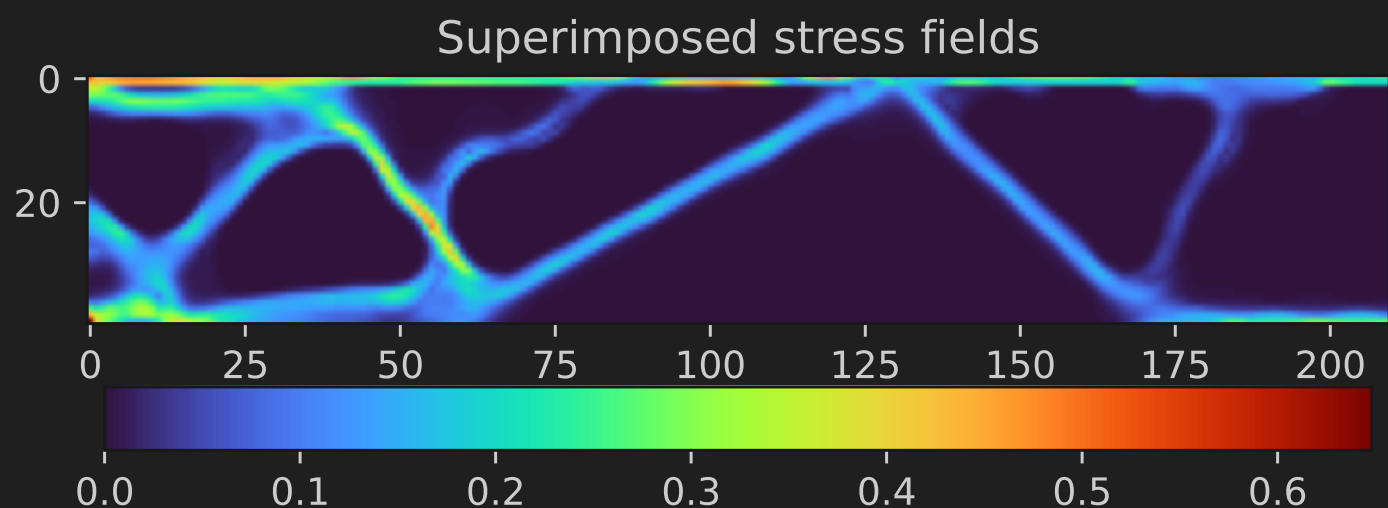
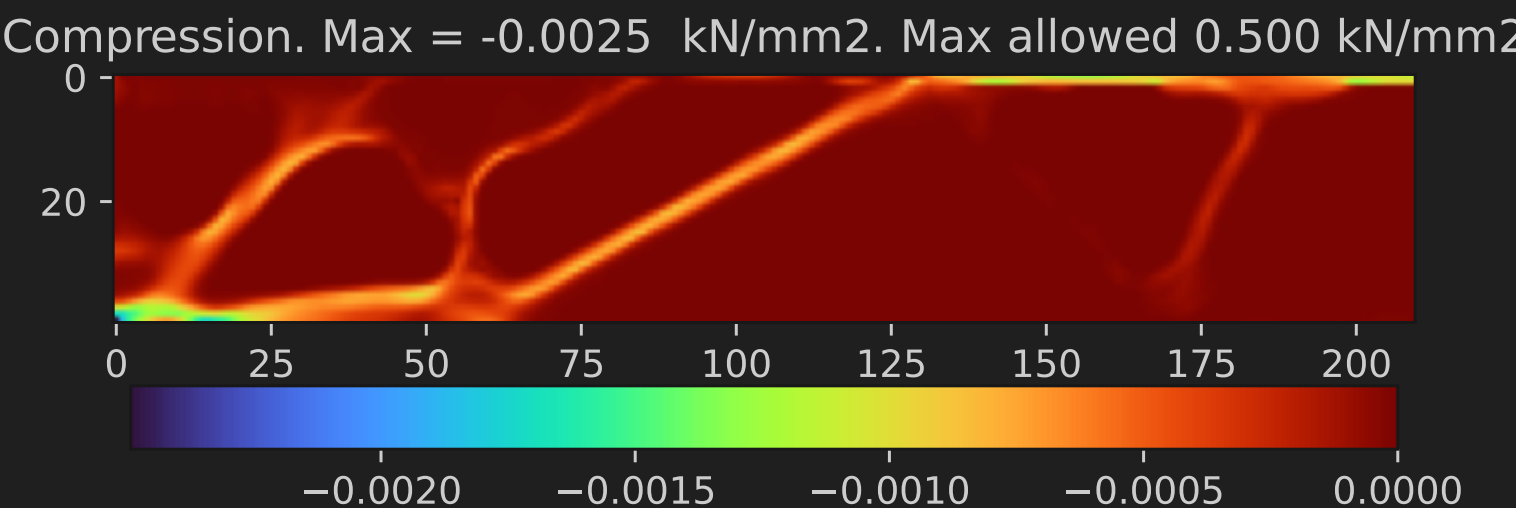
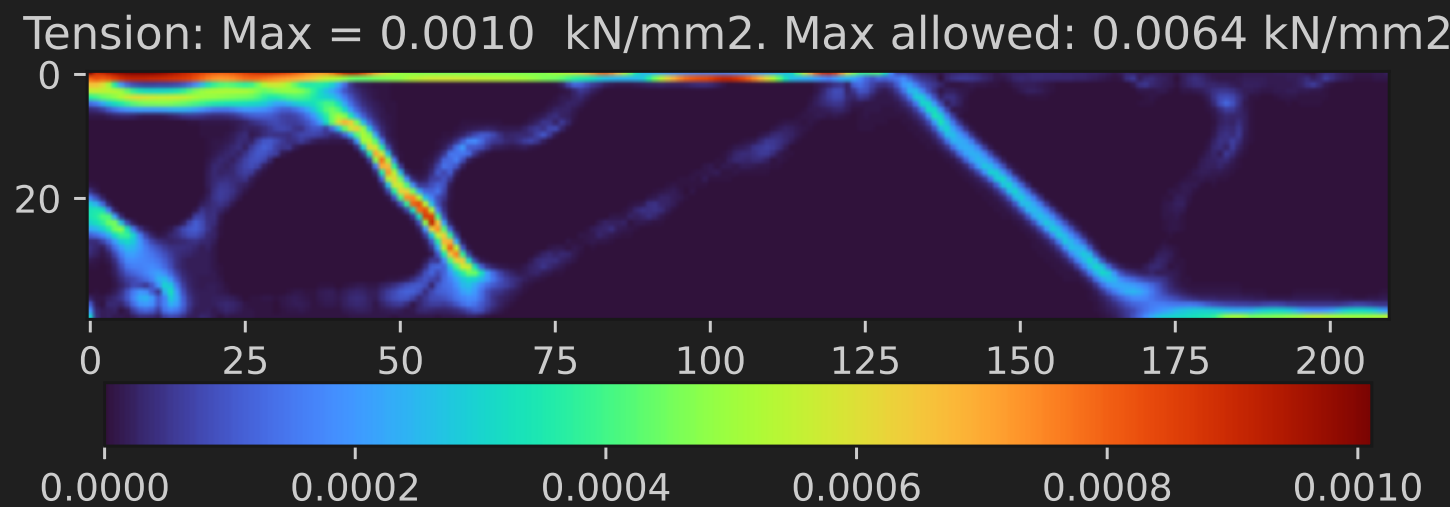
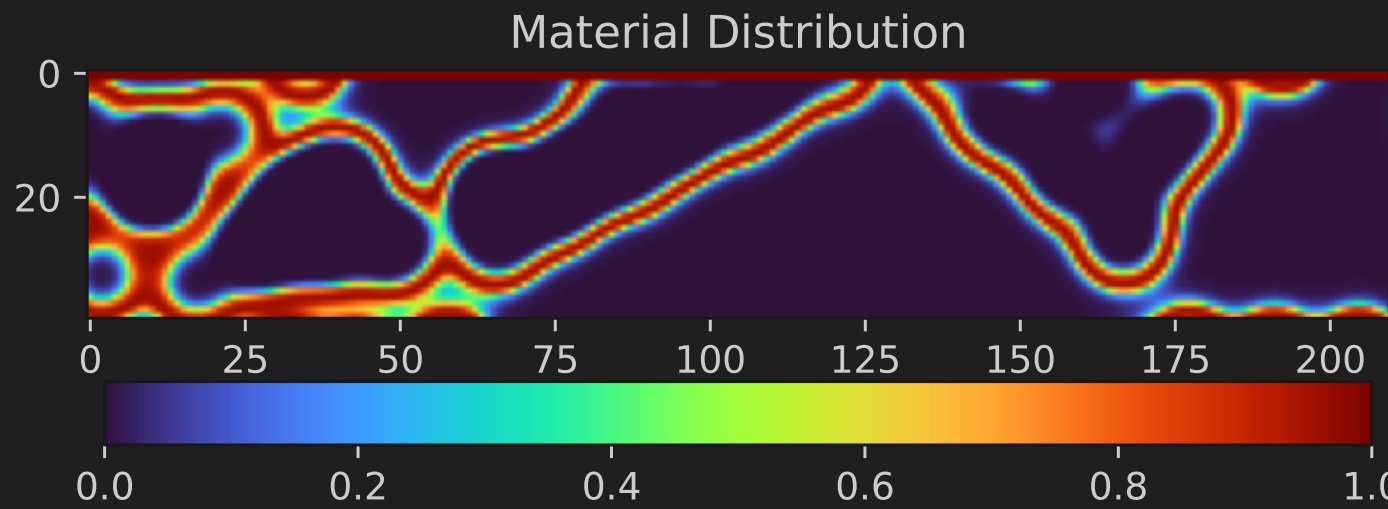
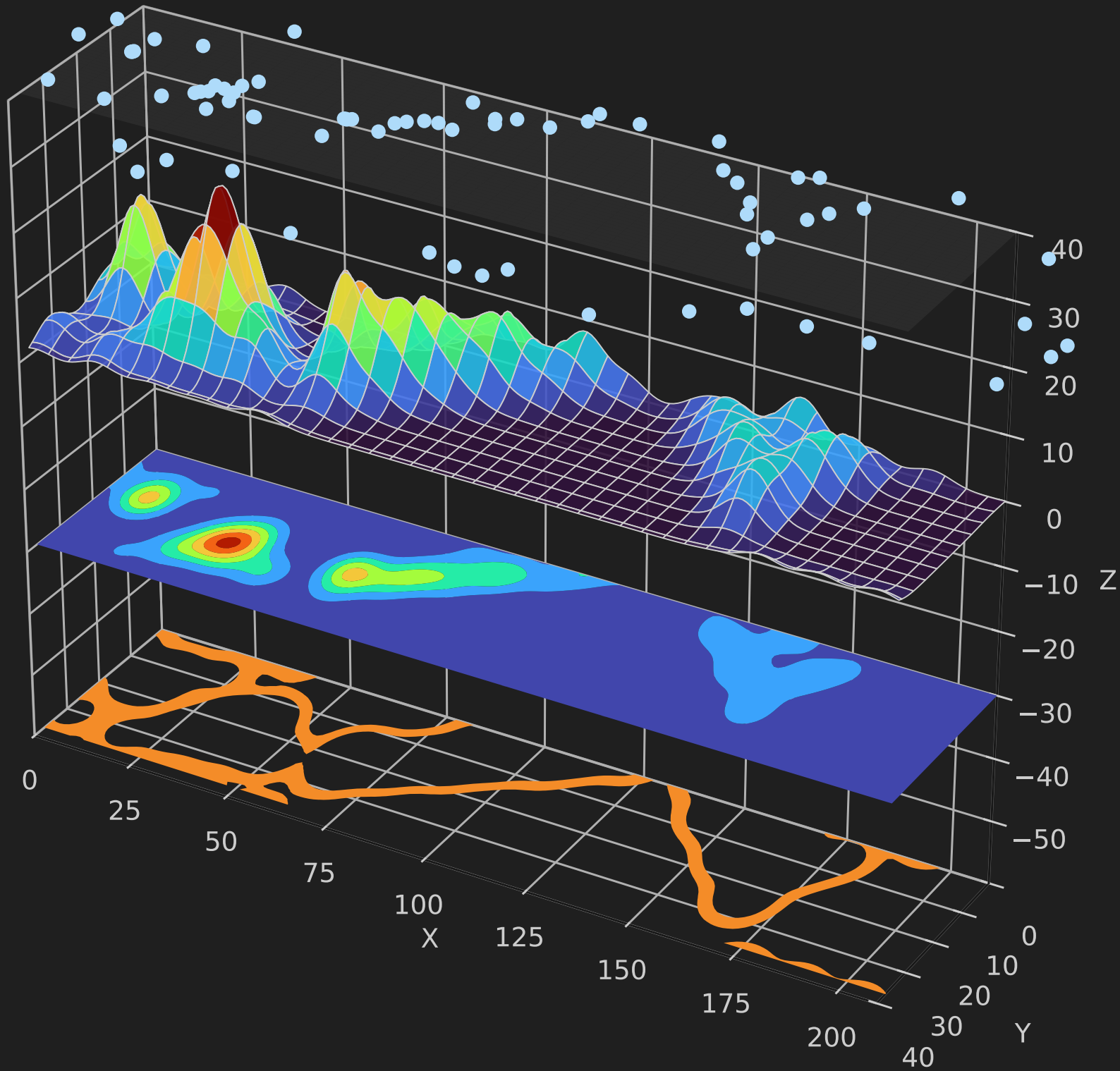
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.10 Shift = 1.79 Iteration = 227



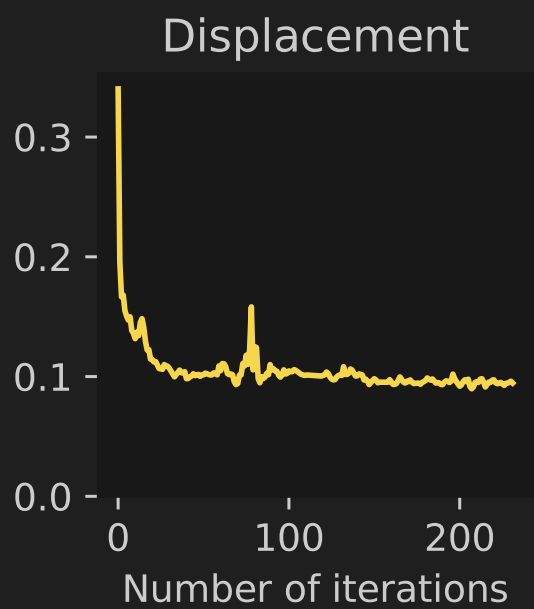
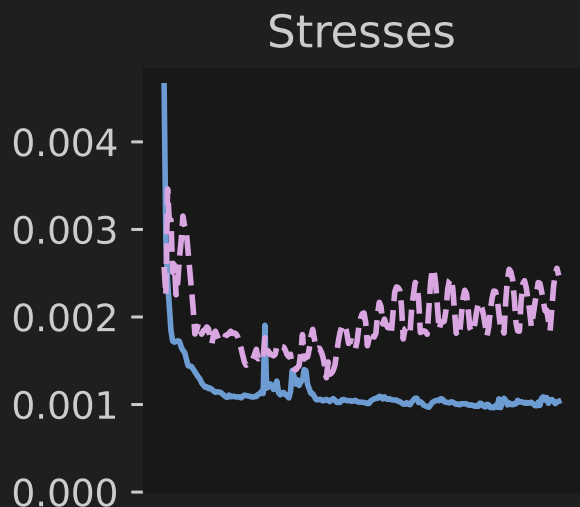
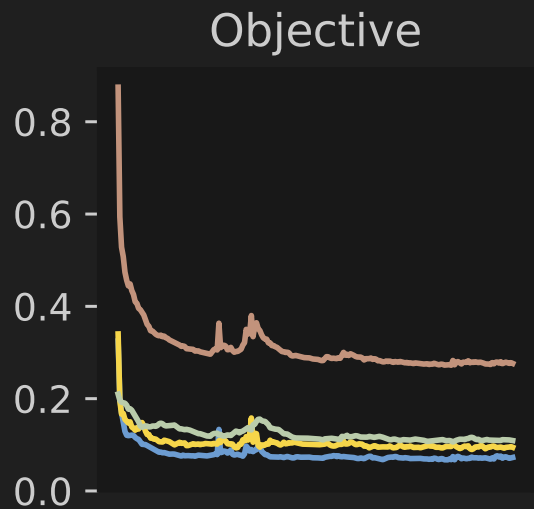
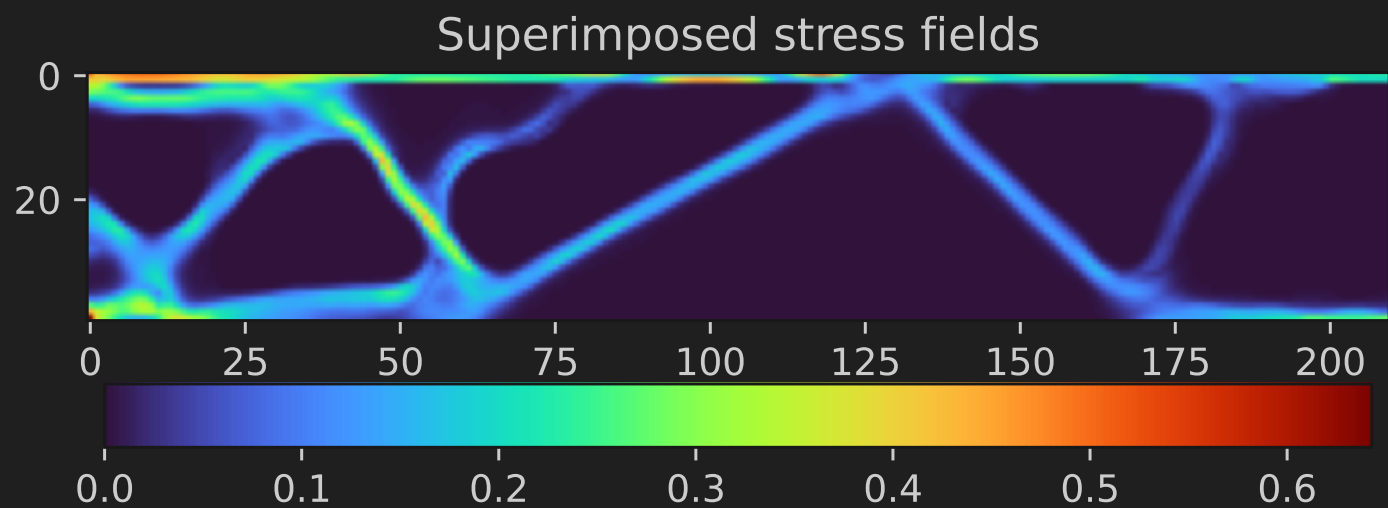
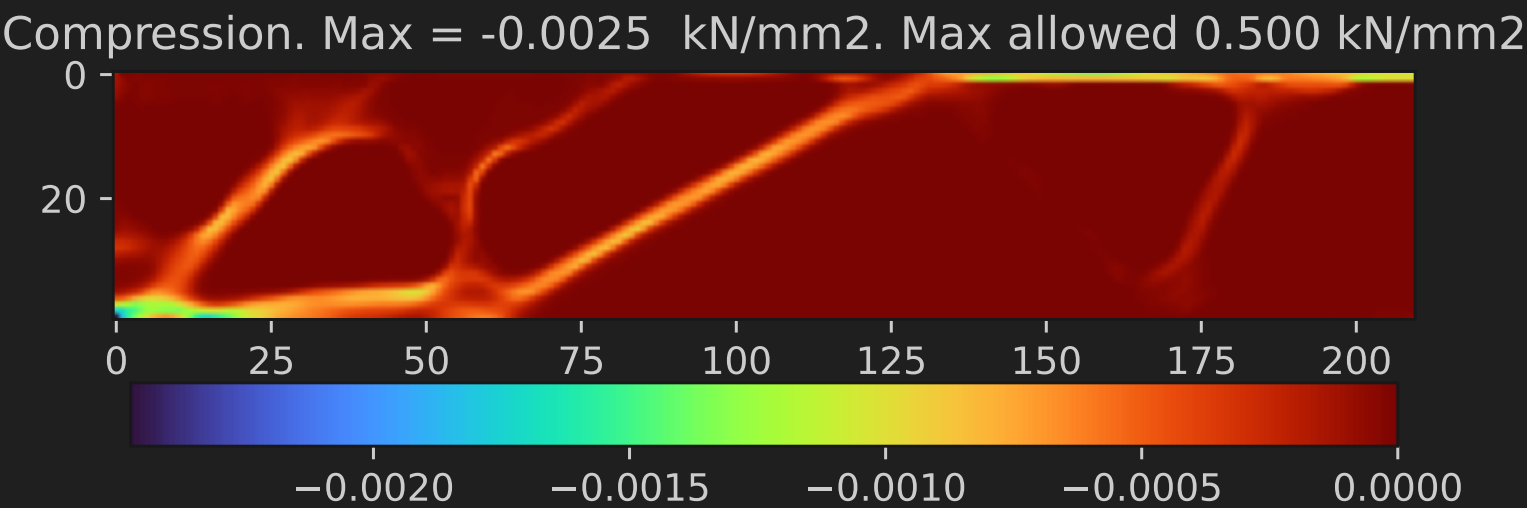
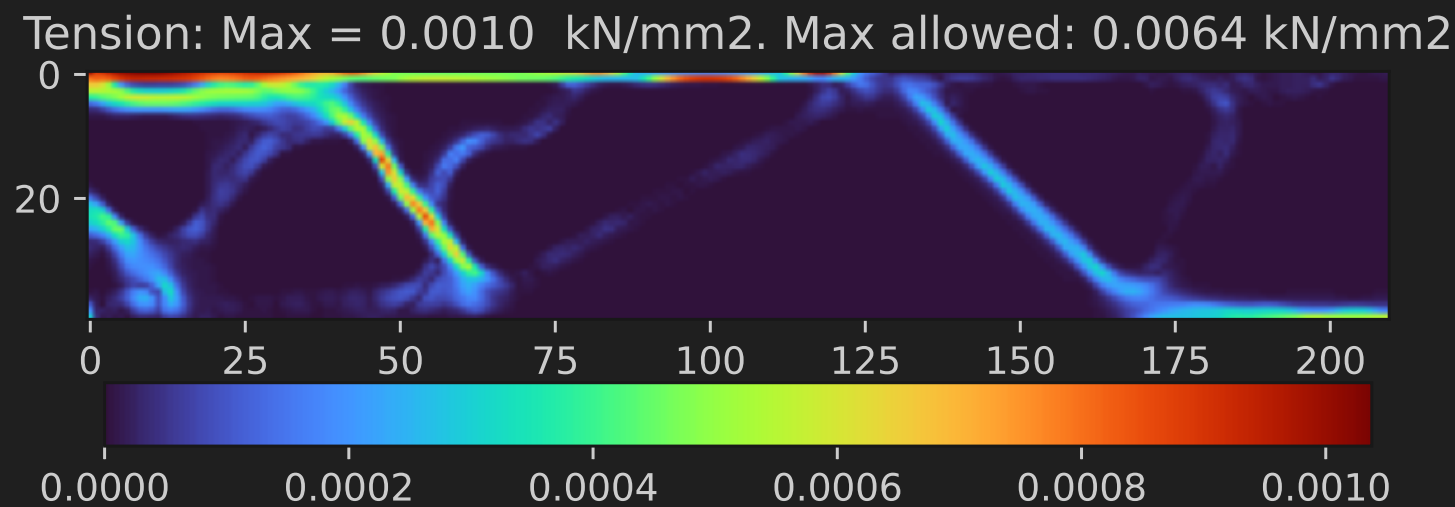
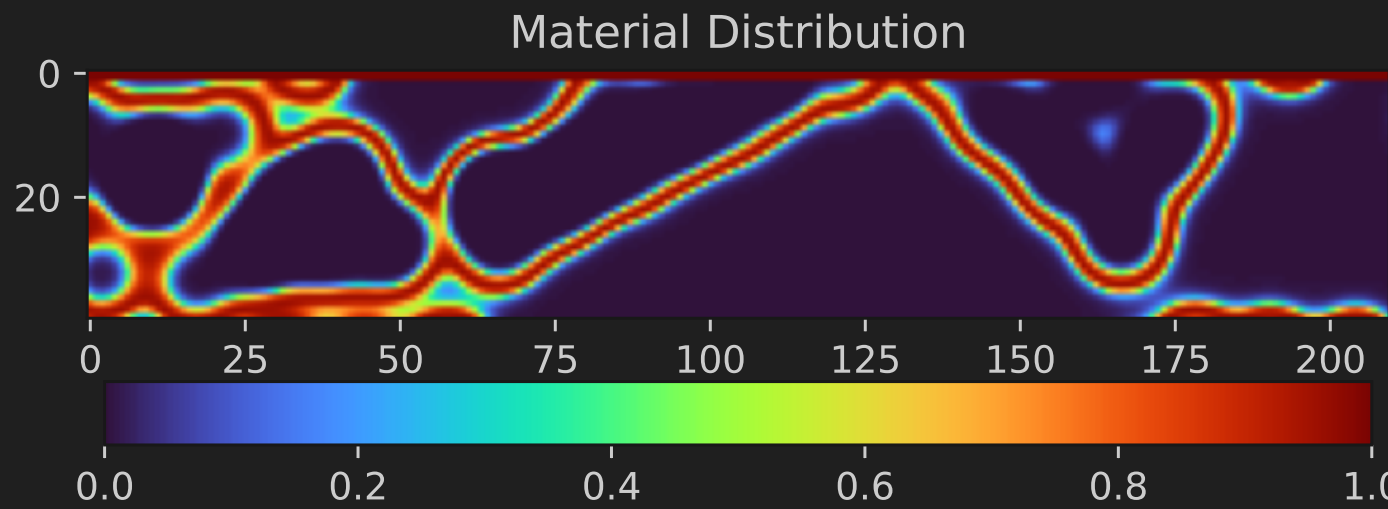
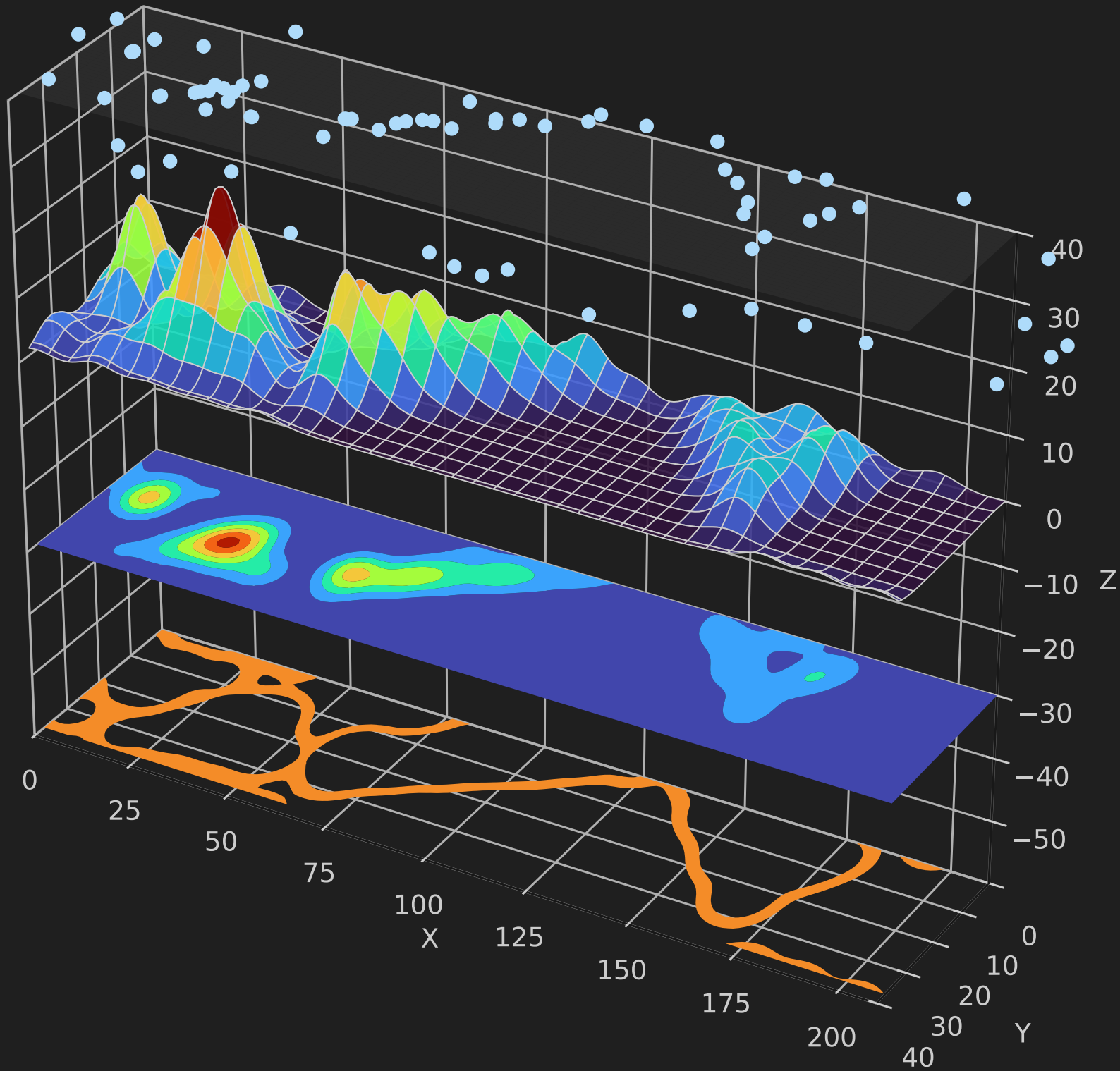
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.13 Shift = 1.77 Iteration = 229



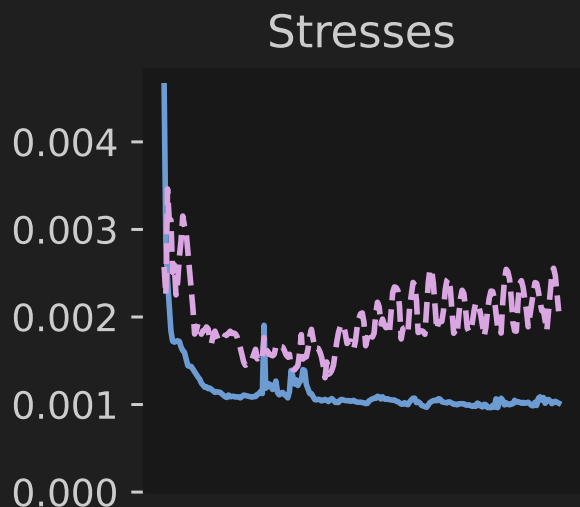
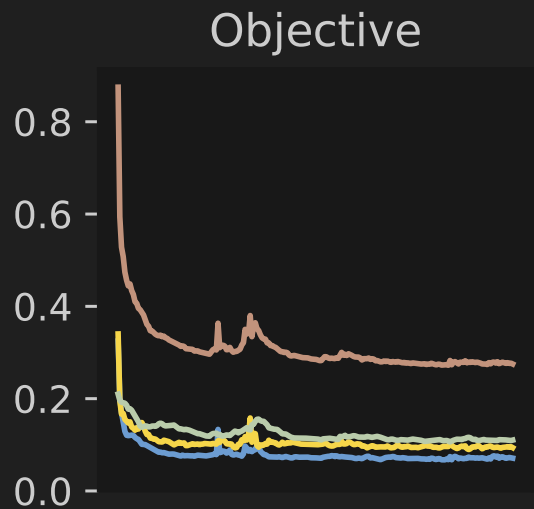
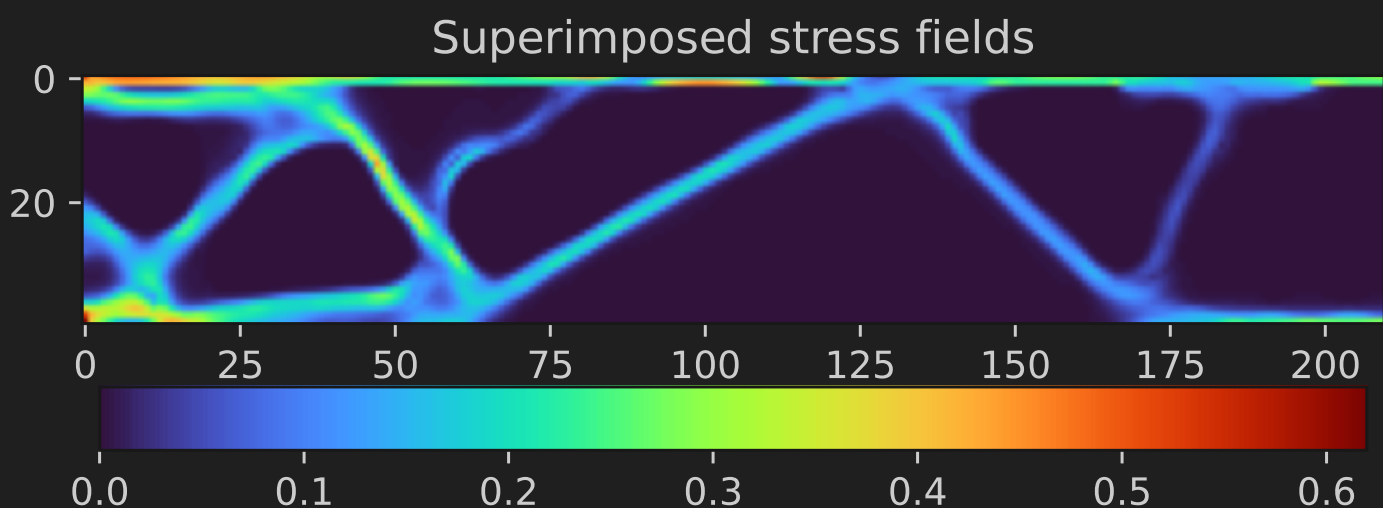
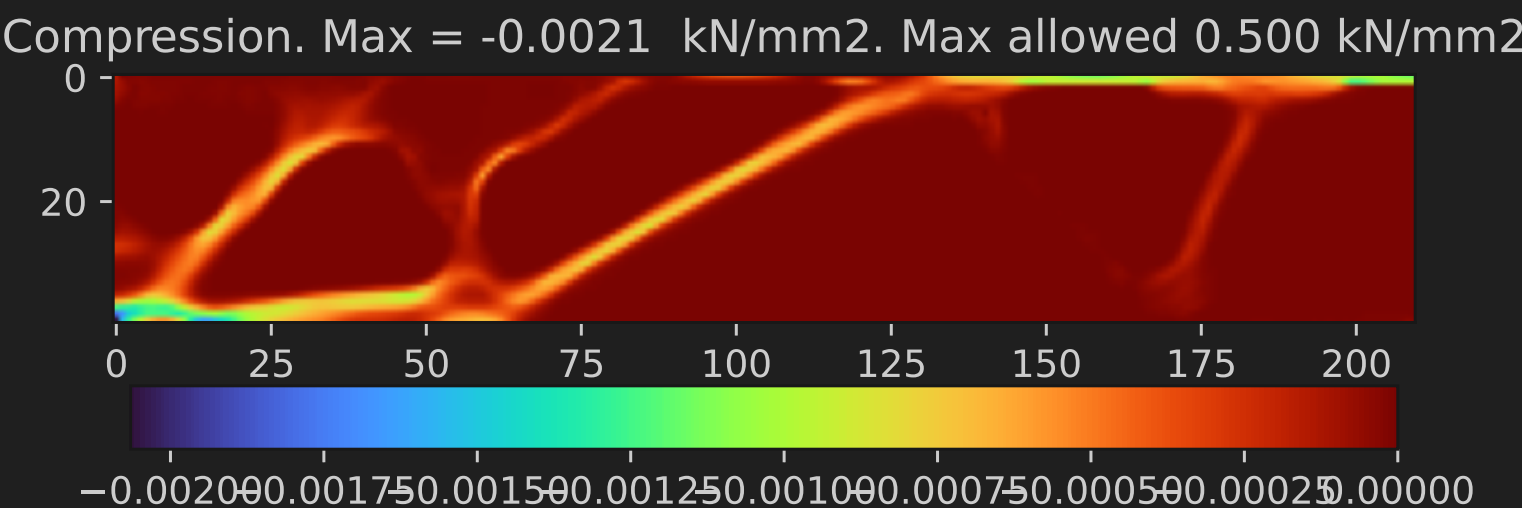
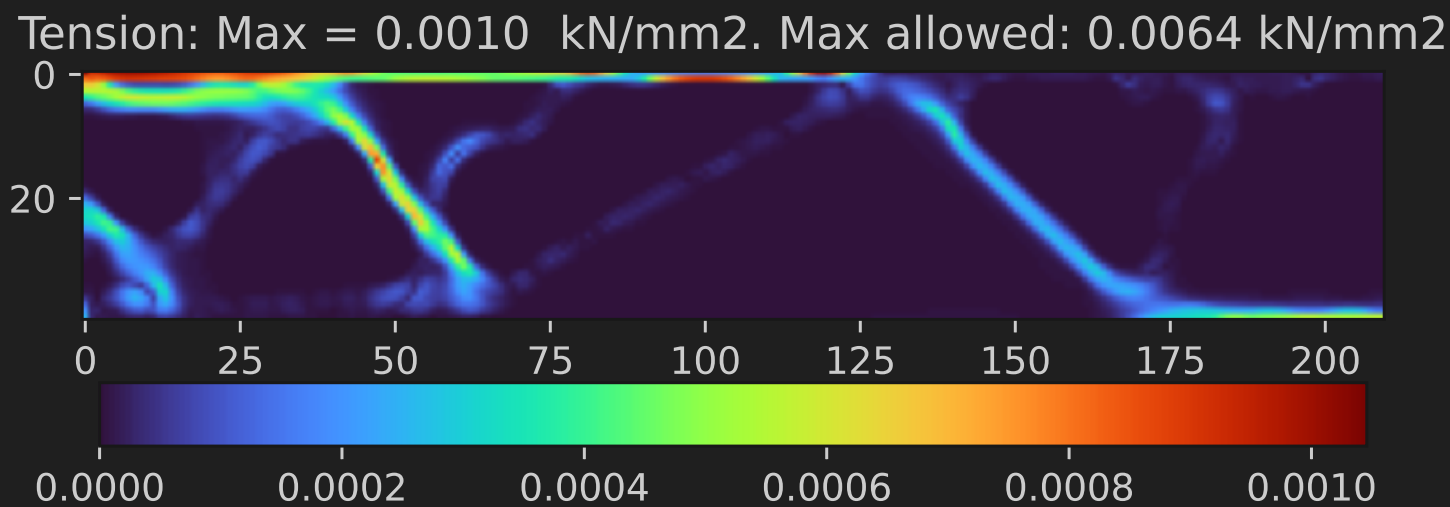
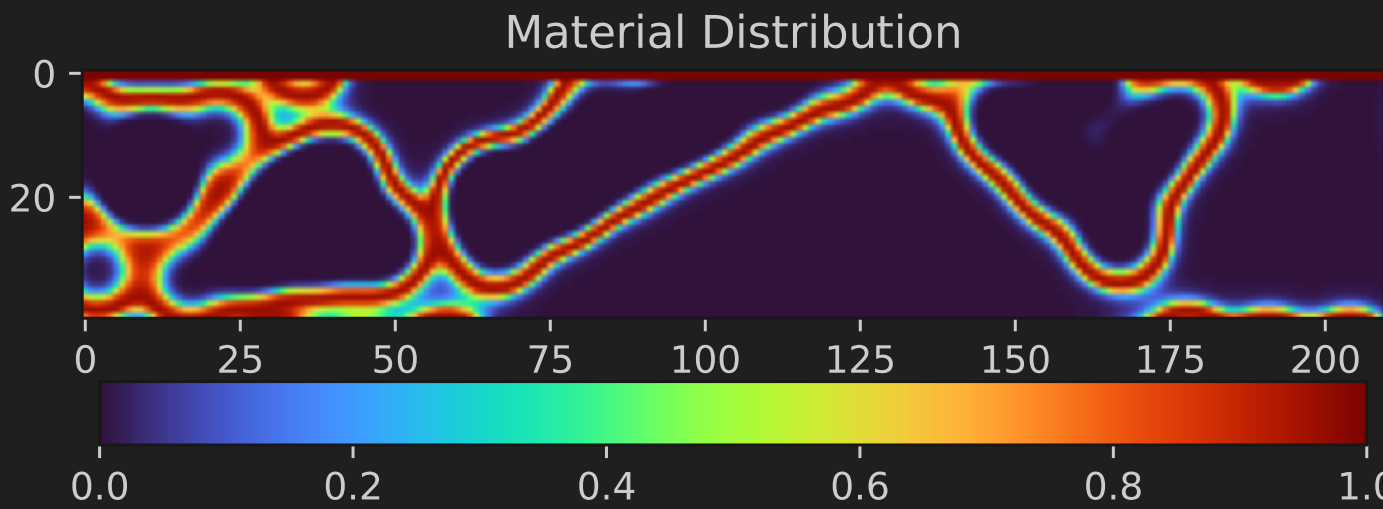
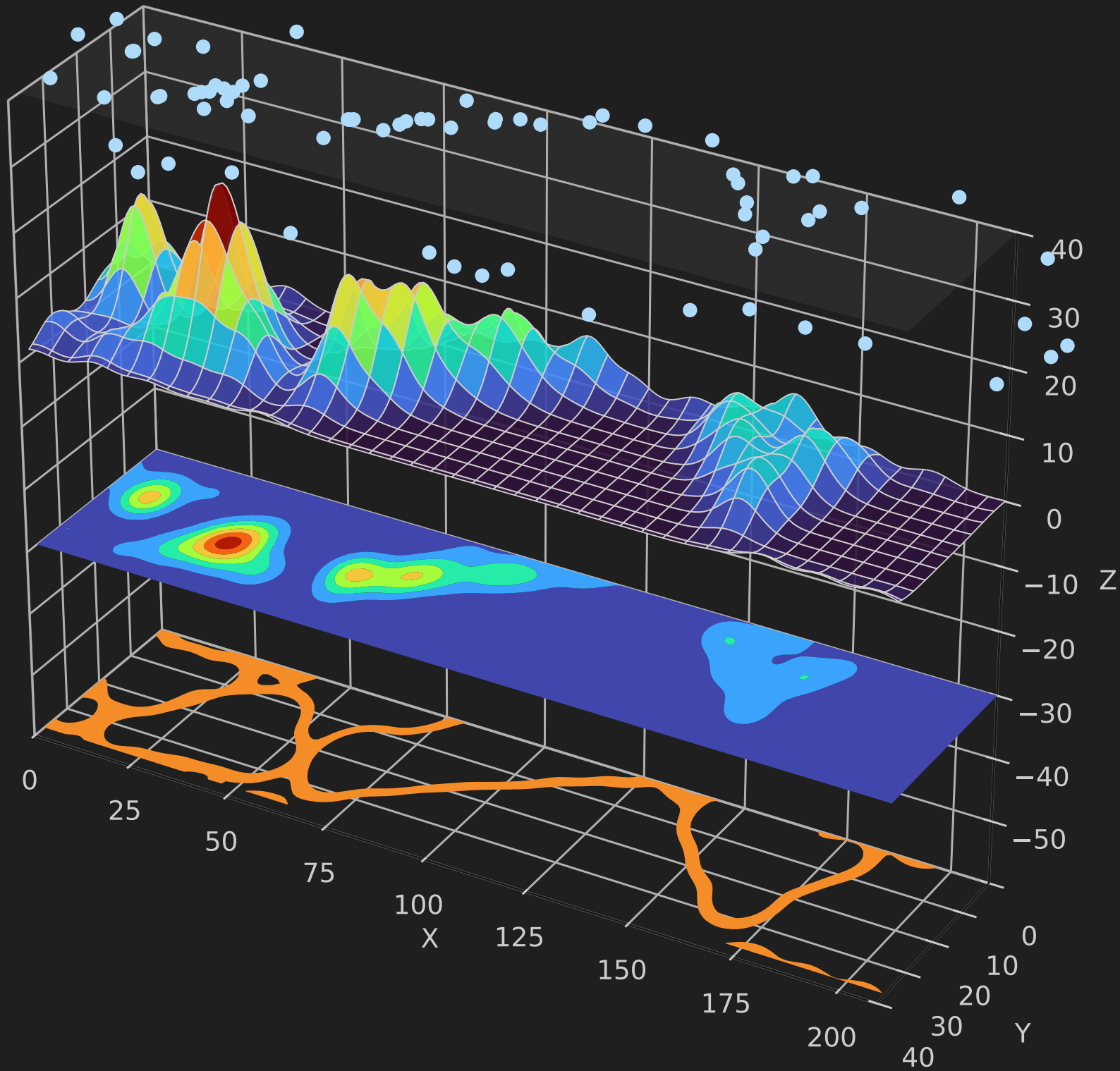
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.16 Shift = 1.75 Iteration = 231



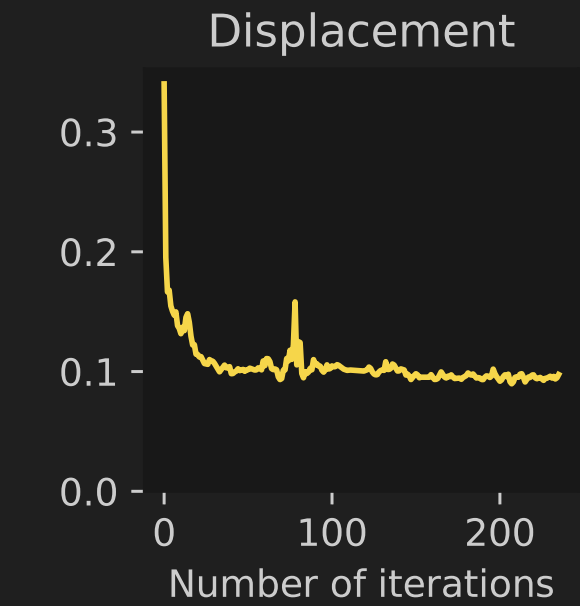
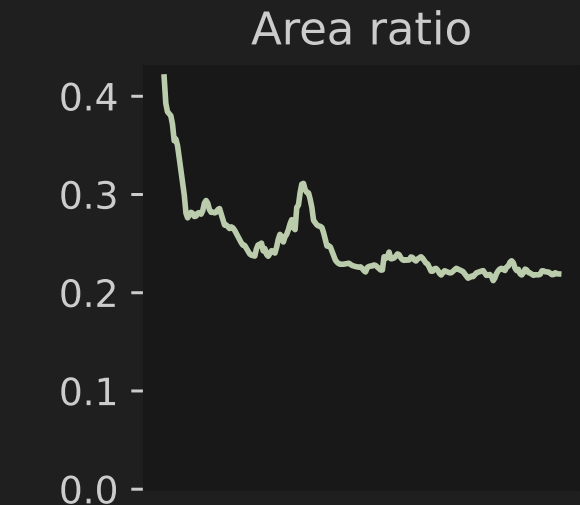
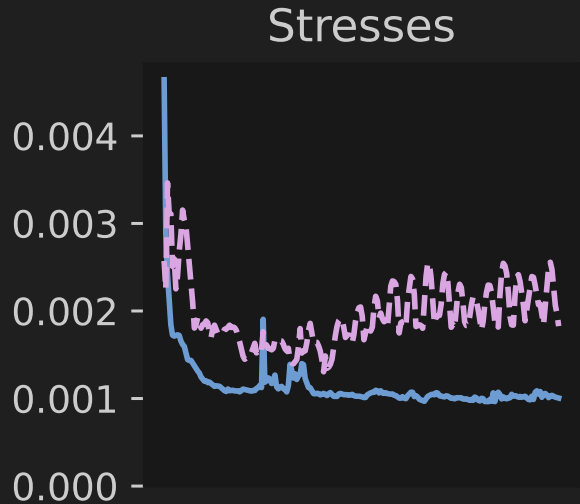
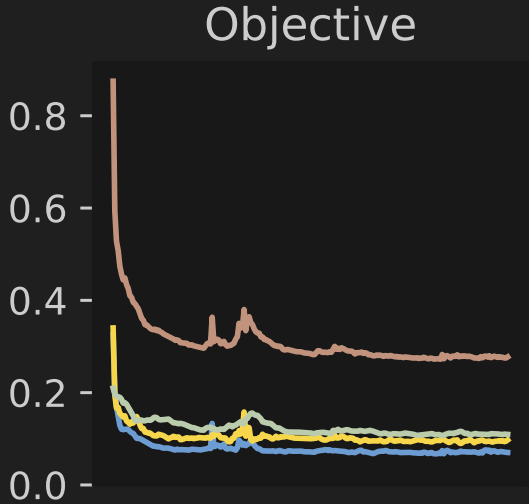
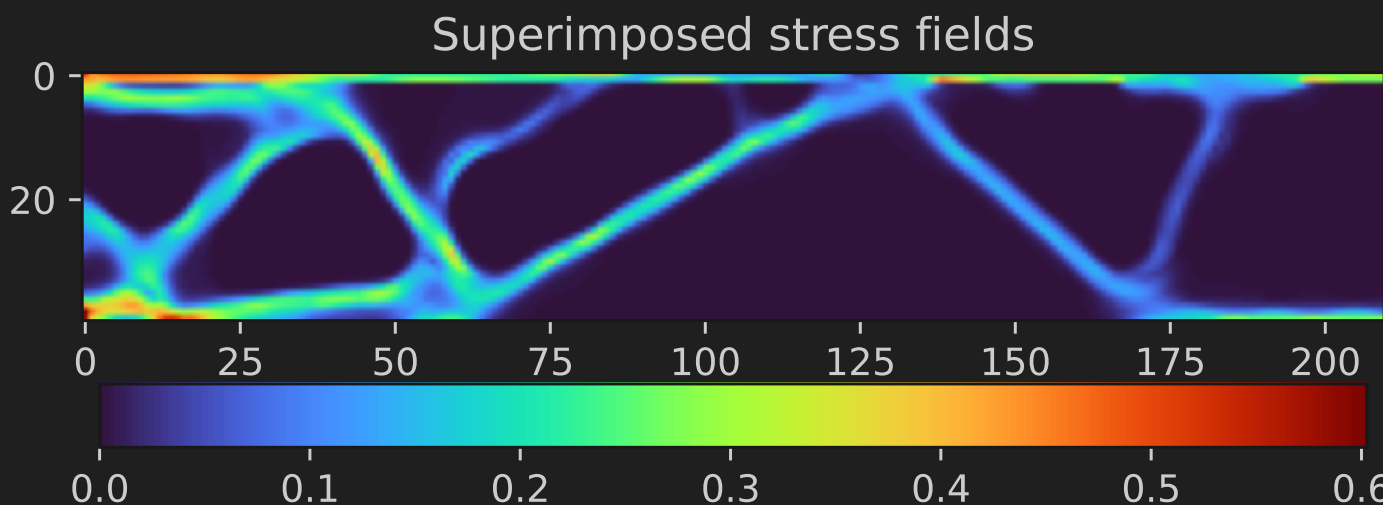
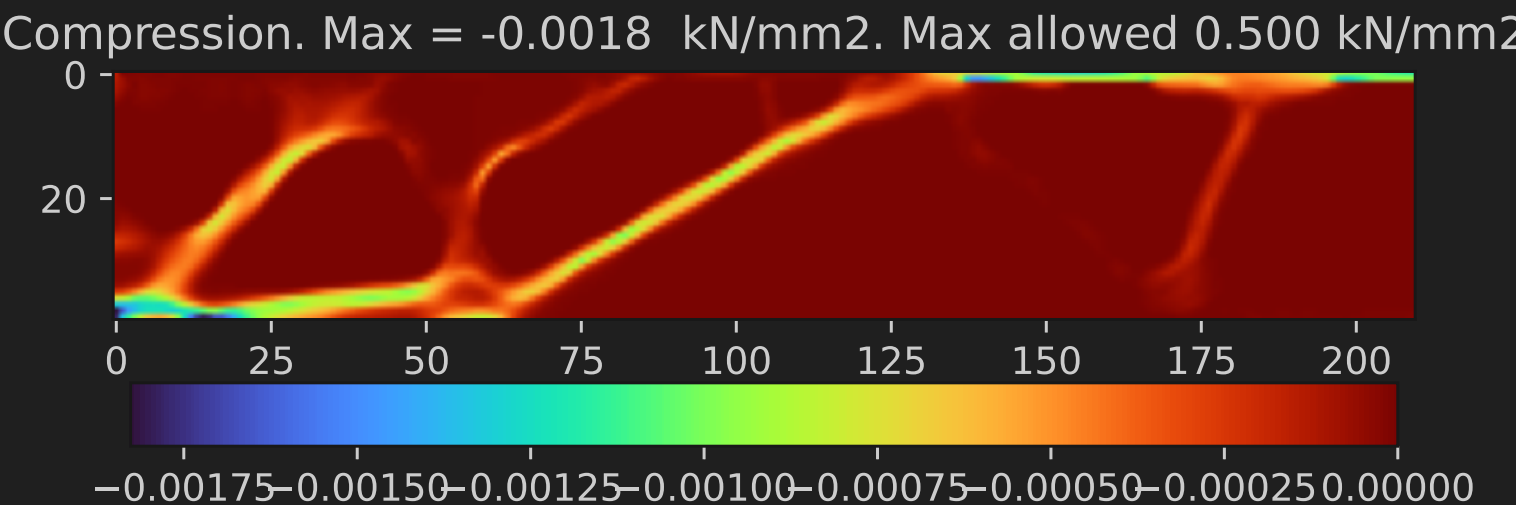
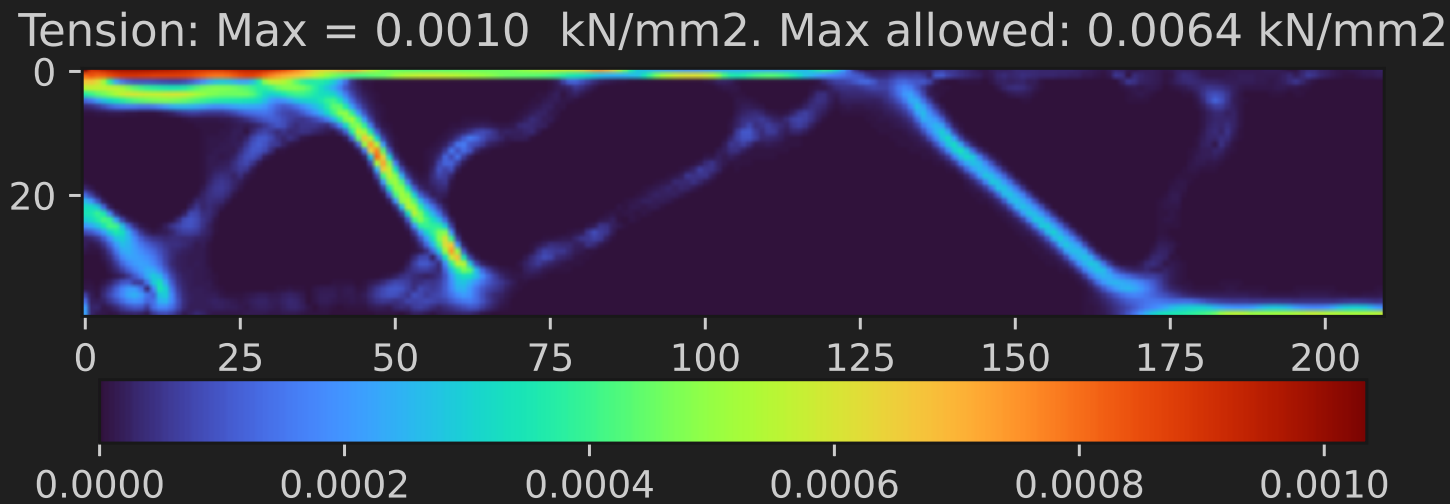
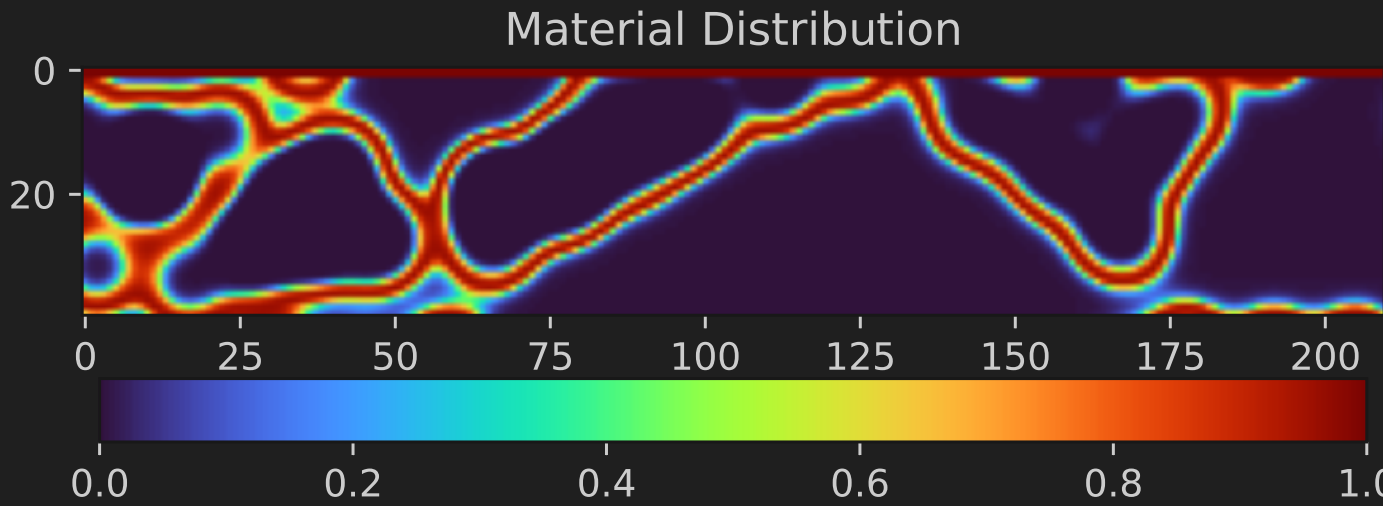
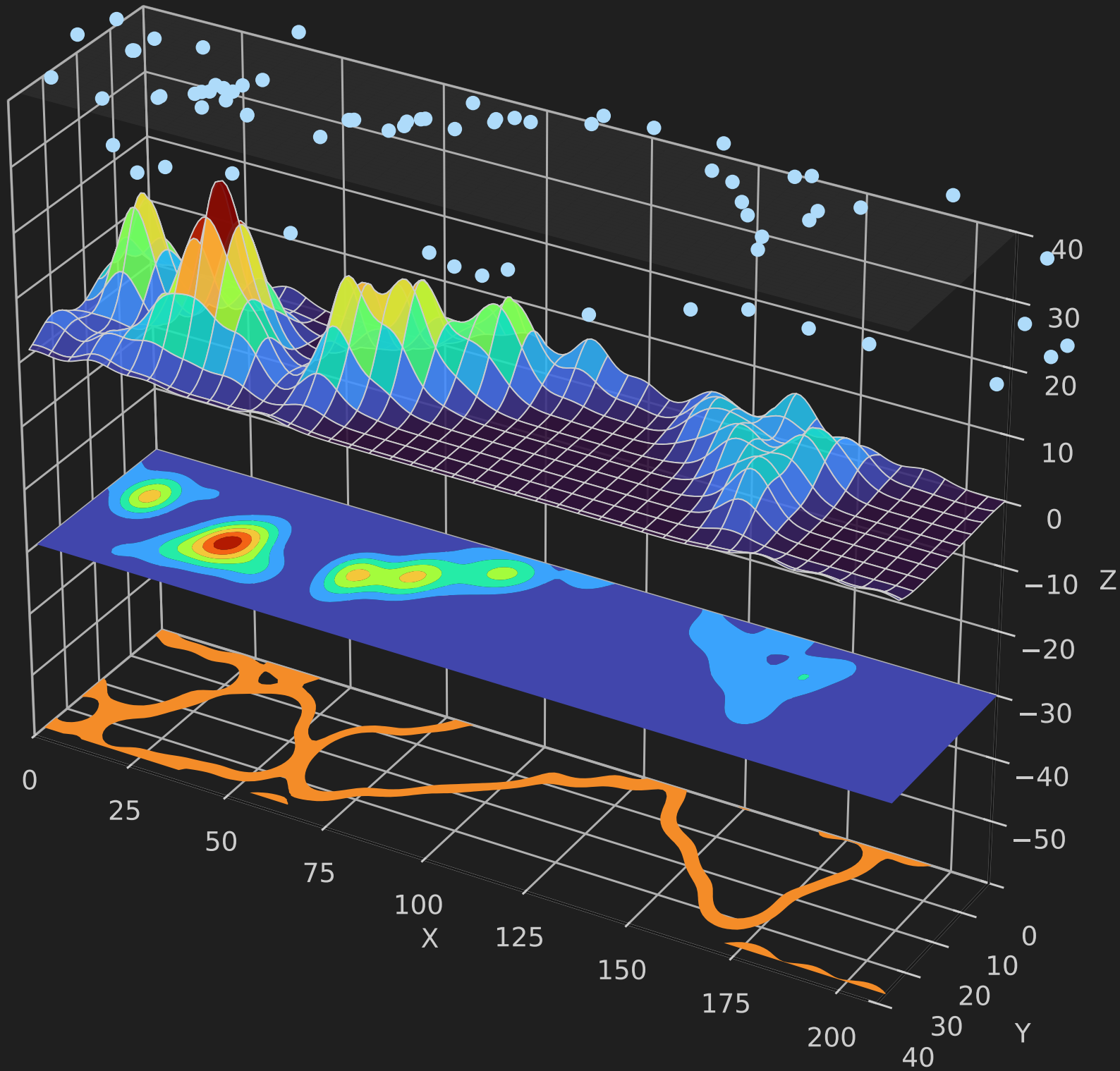
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.18 Shift = 1.76 Iteration = 233



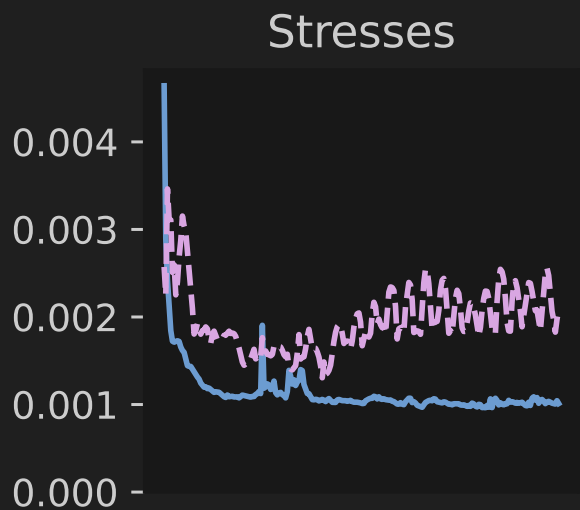
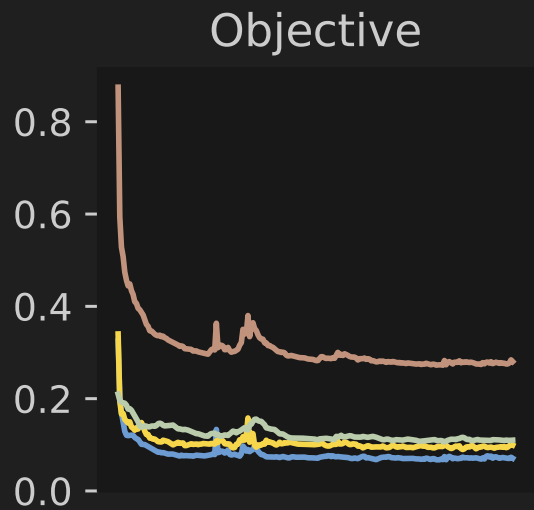
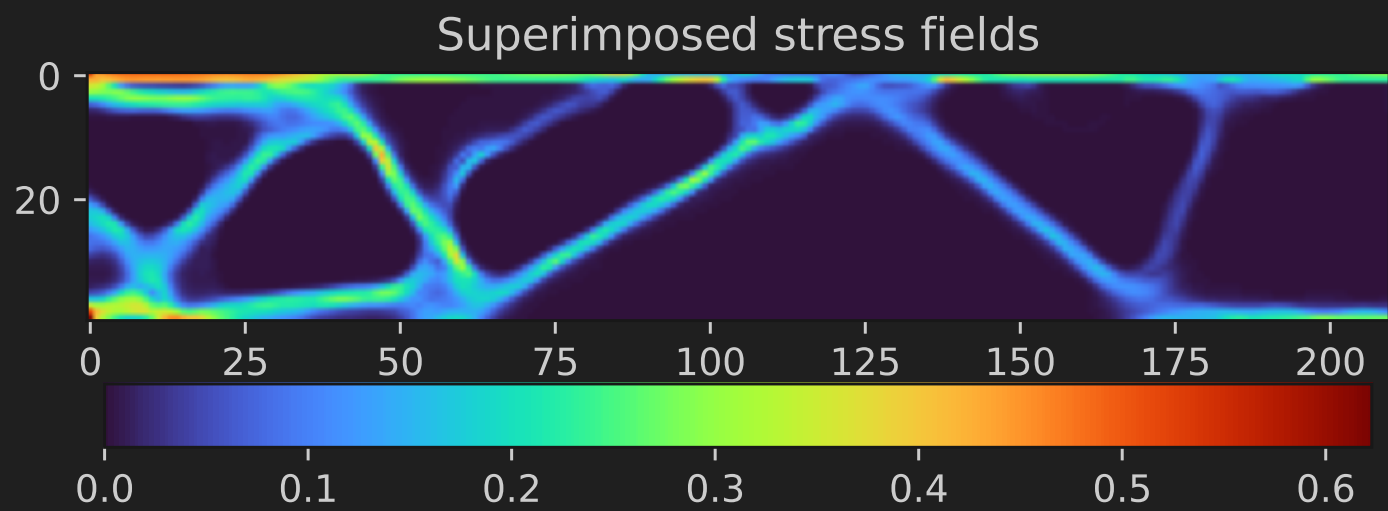
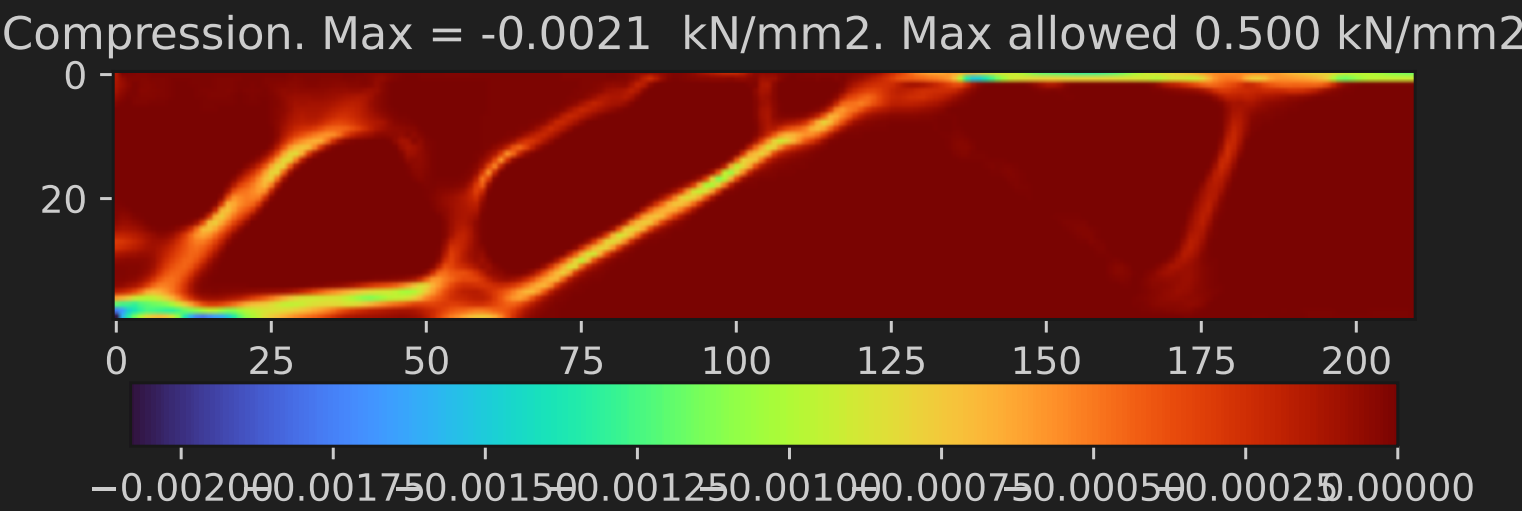
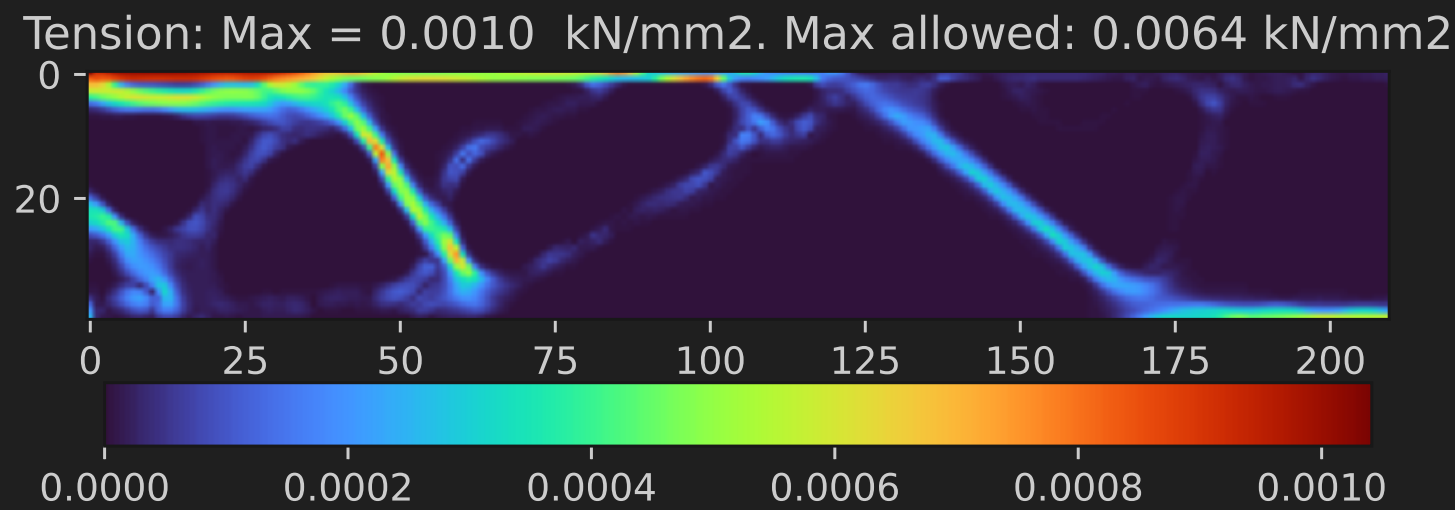
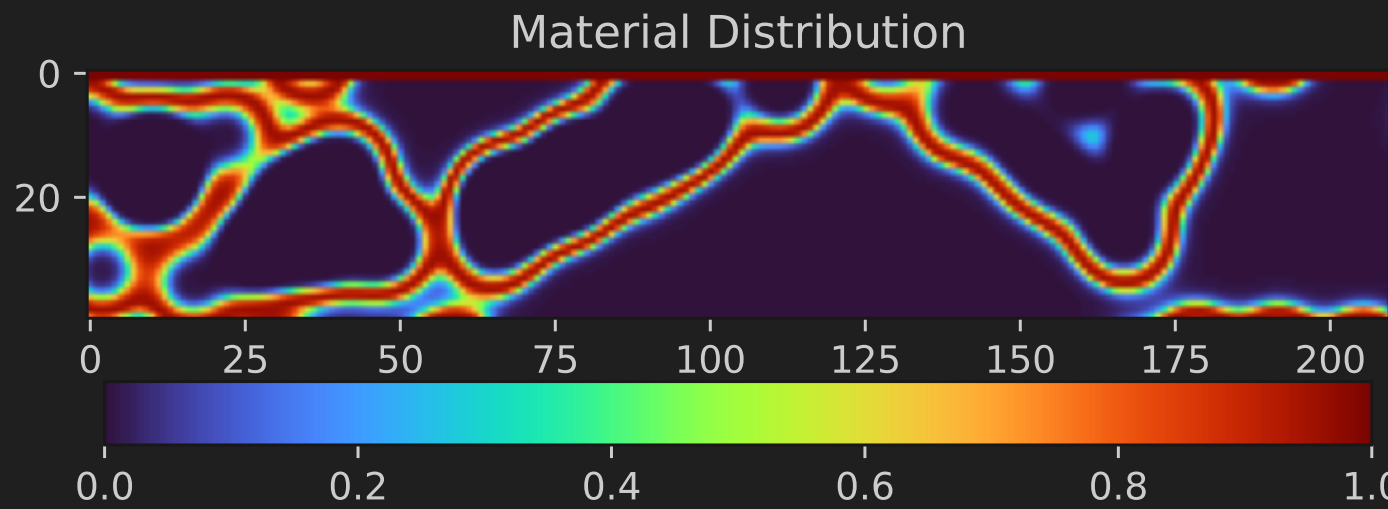
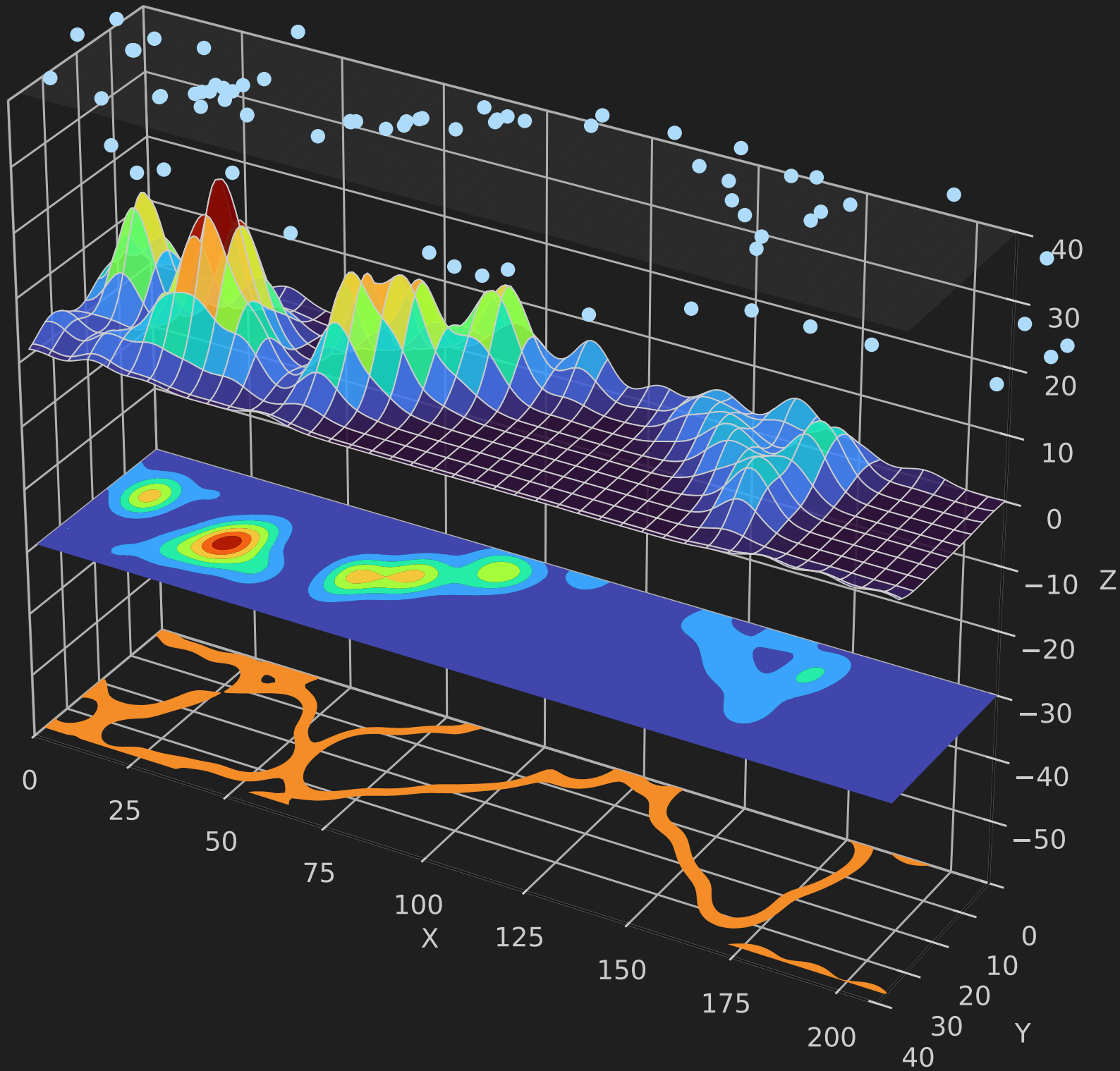
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.19 Shift = 1.76 Iteration = 235



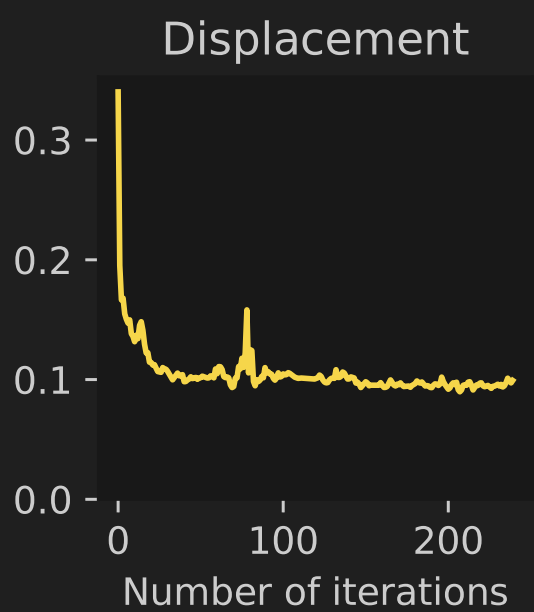
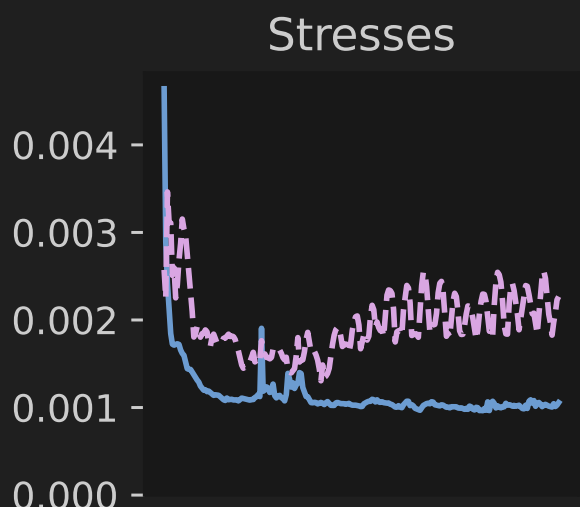
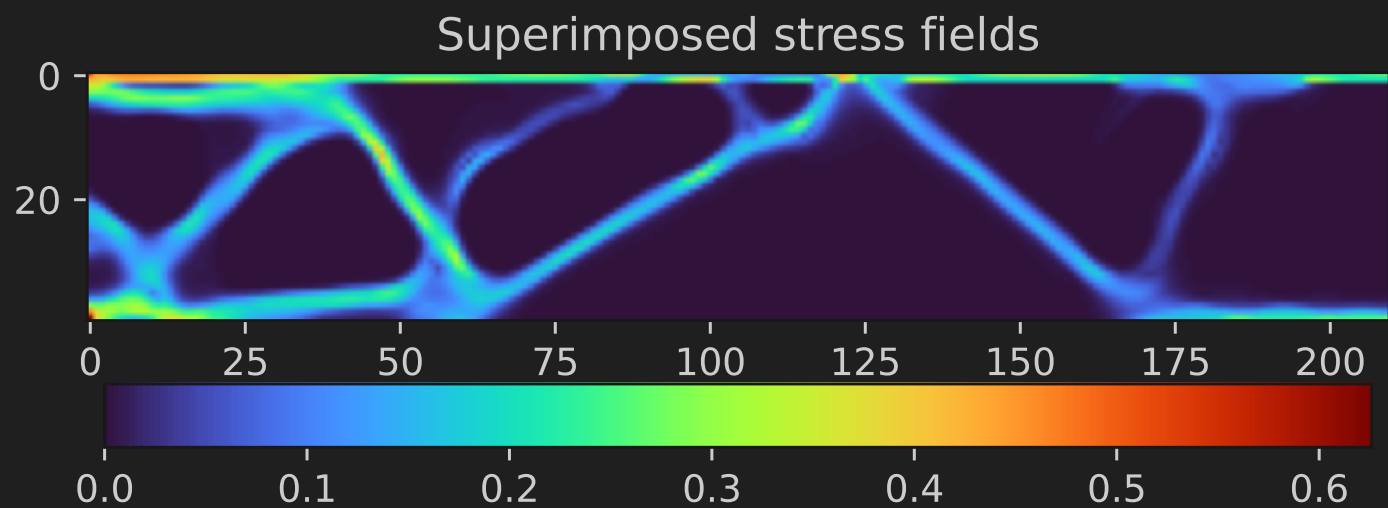
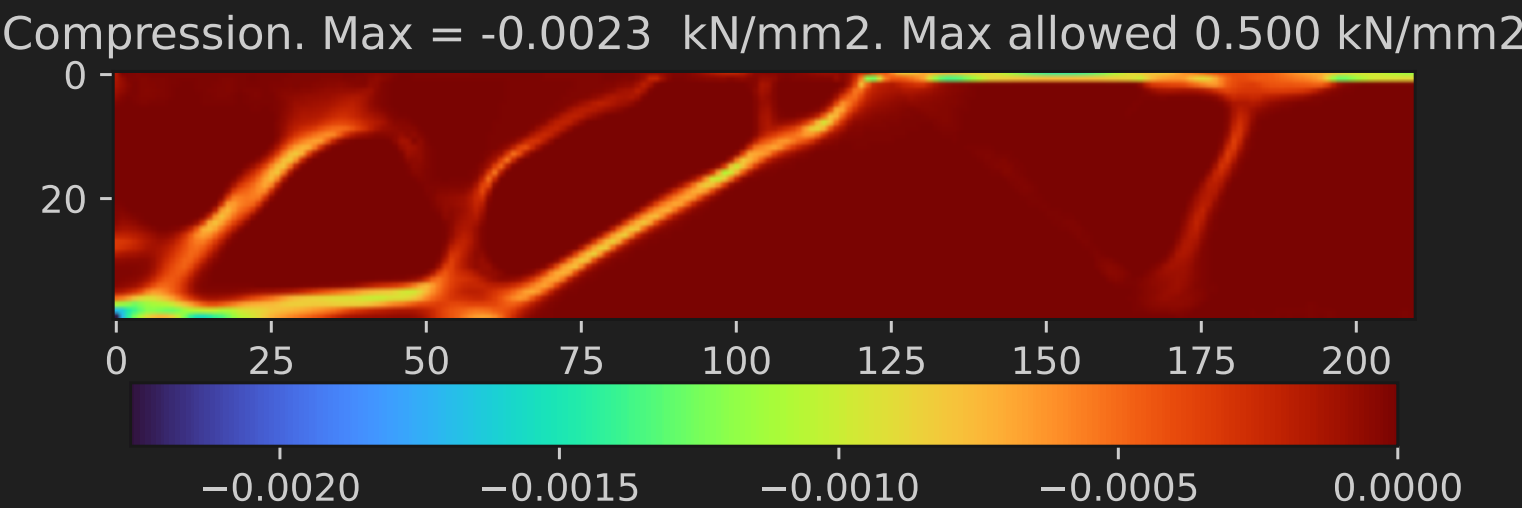
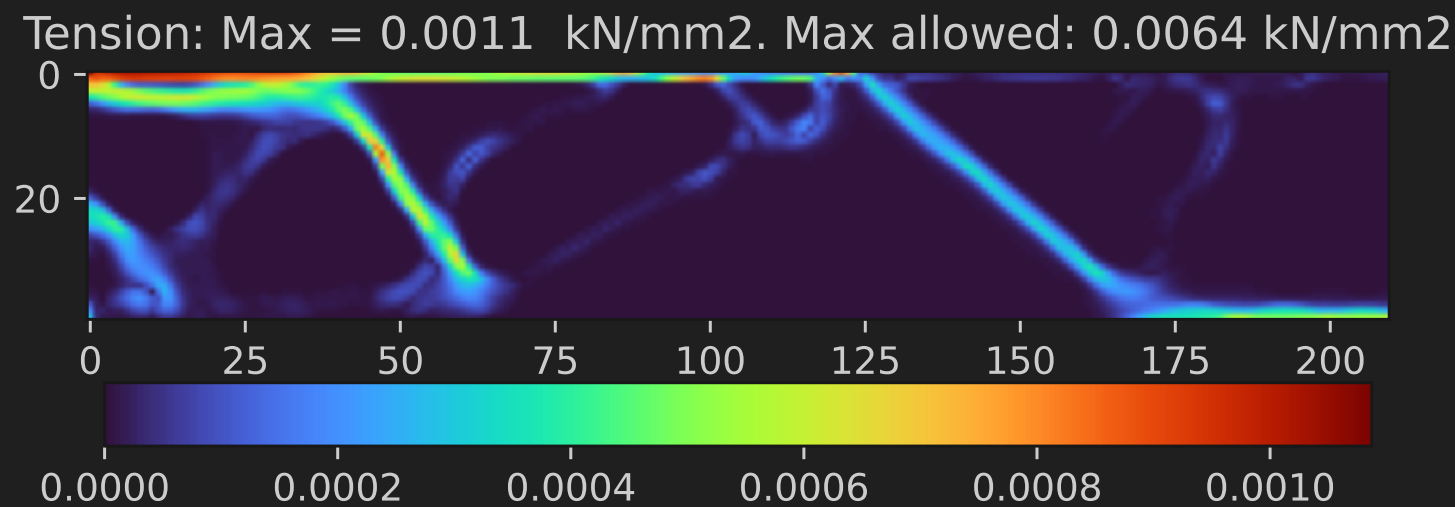
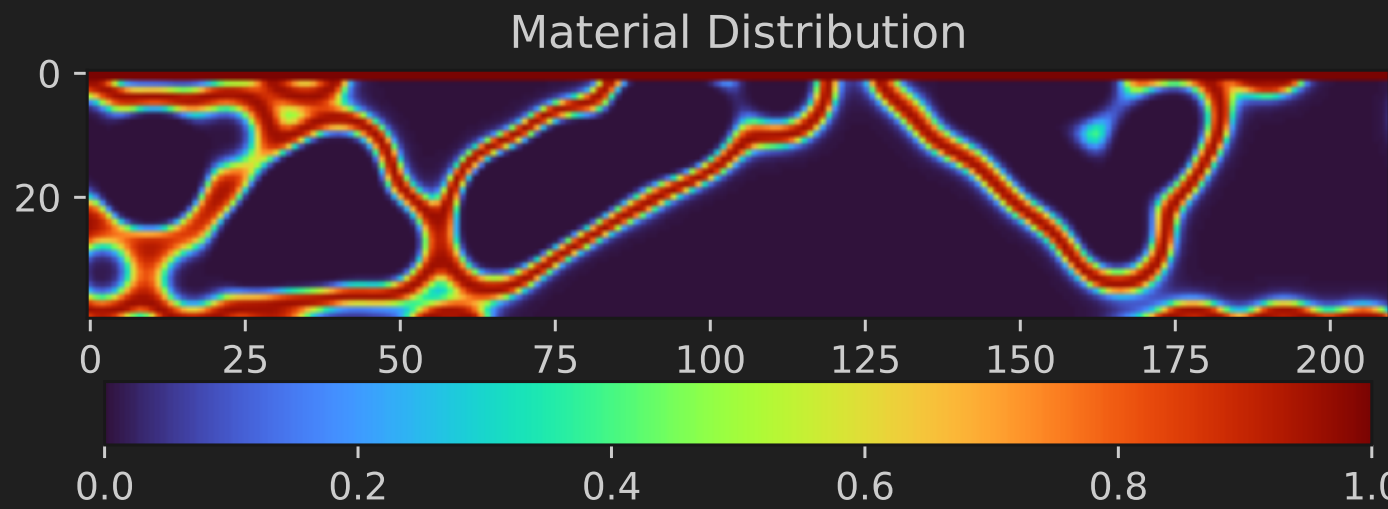
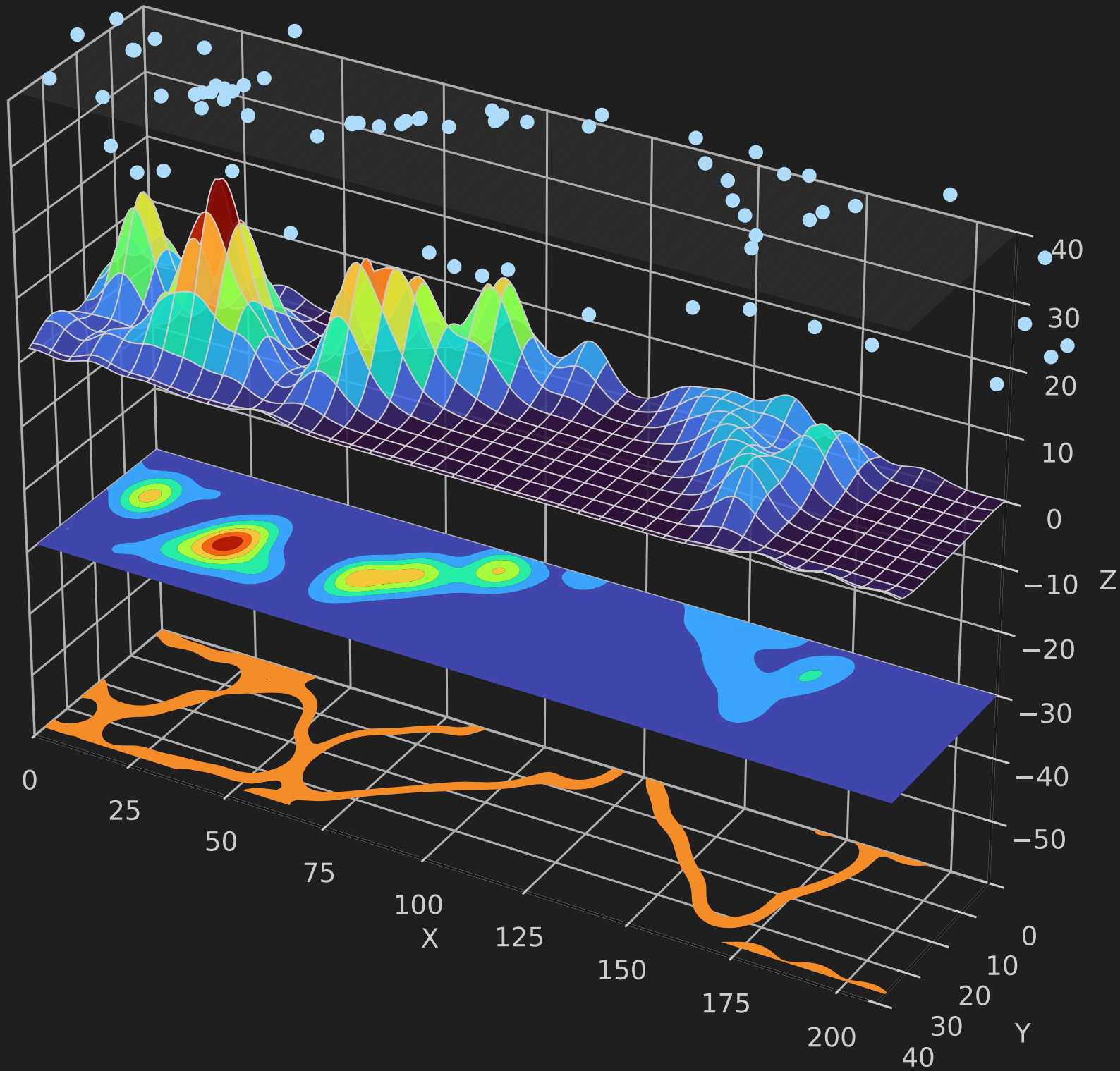
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.19 Shift = 1.75 Iteration = 237



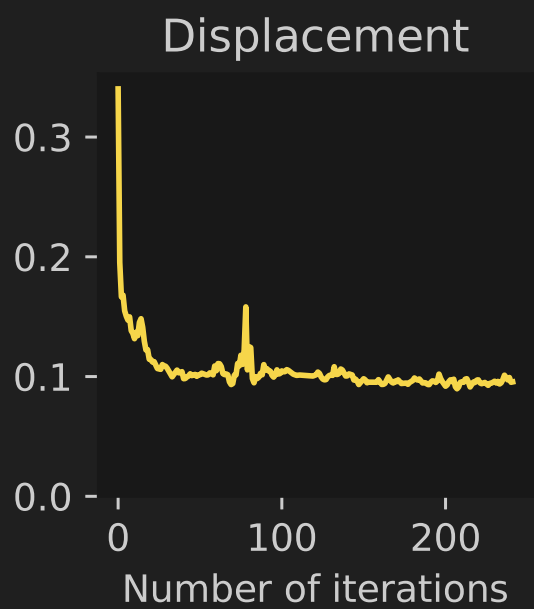
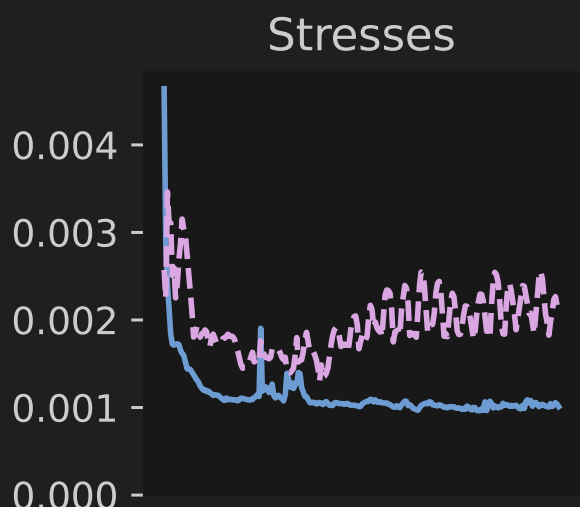
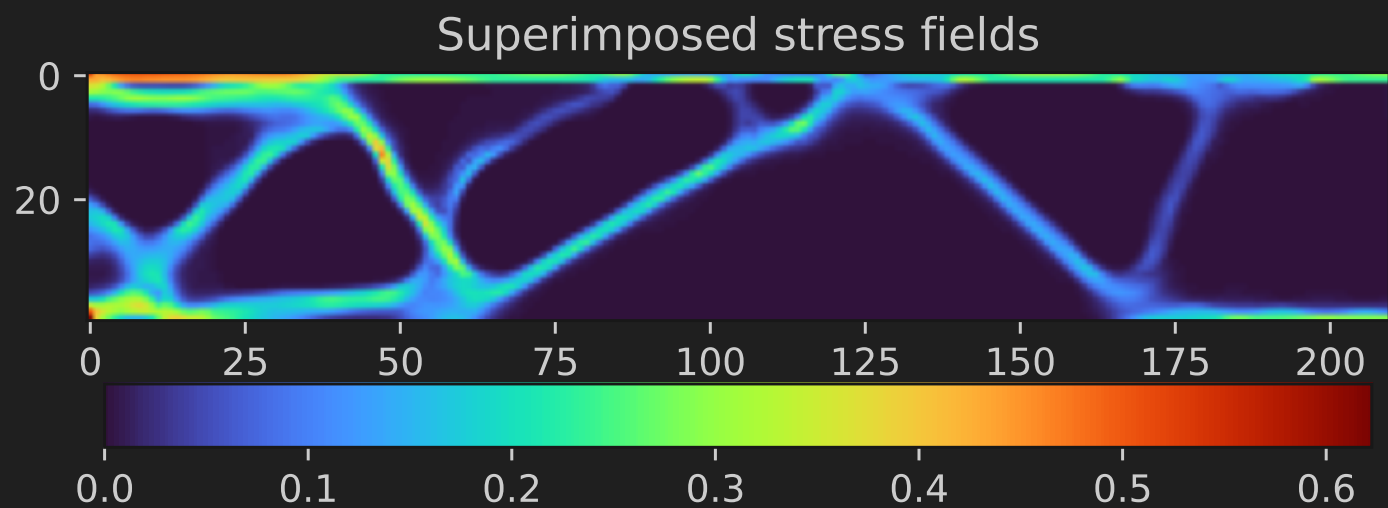
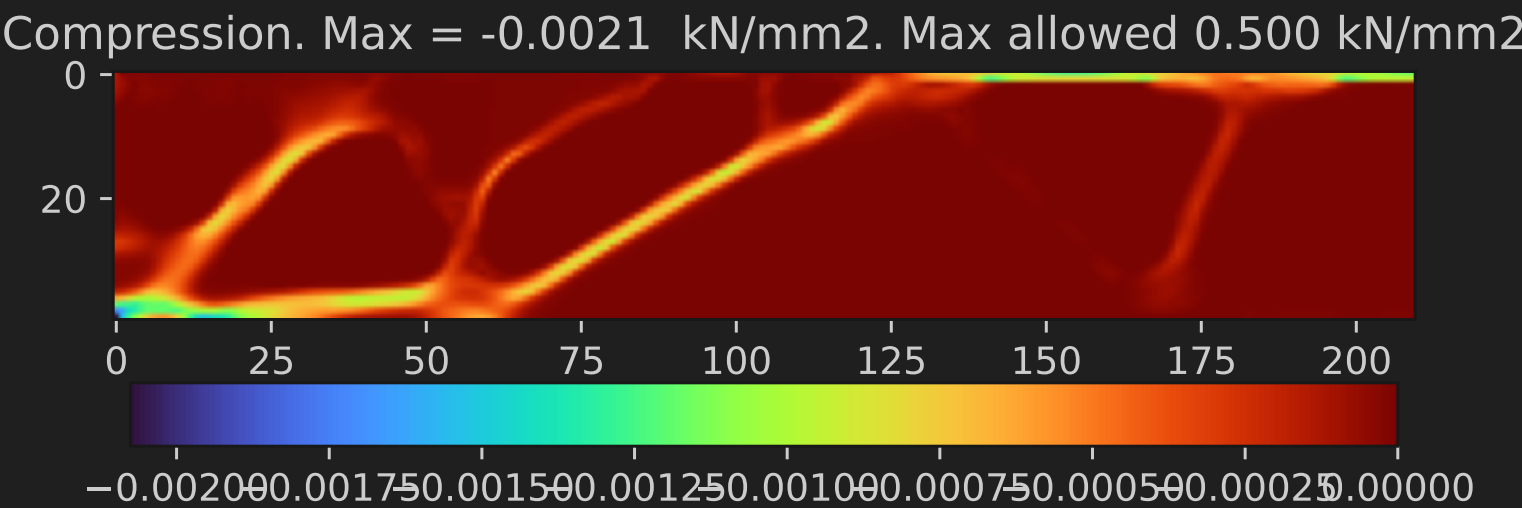
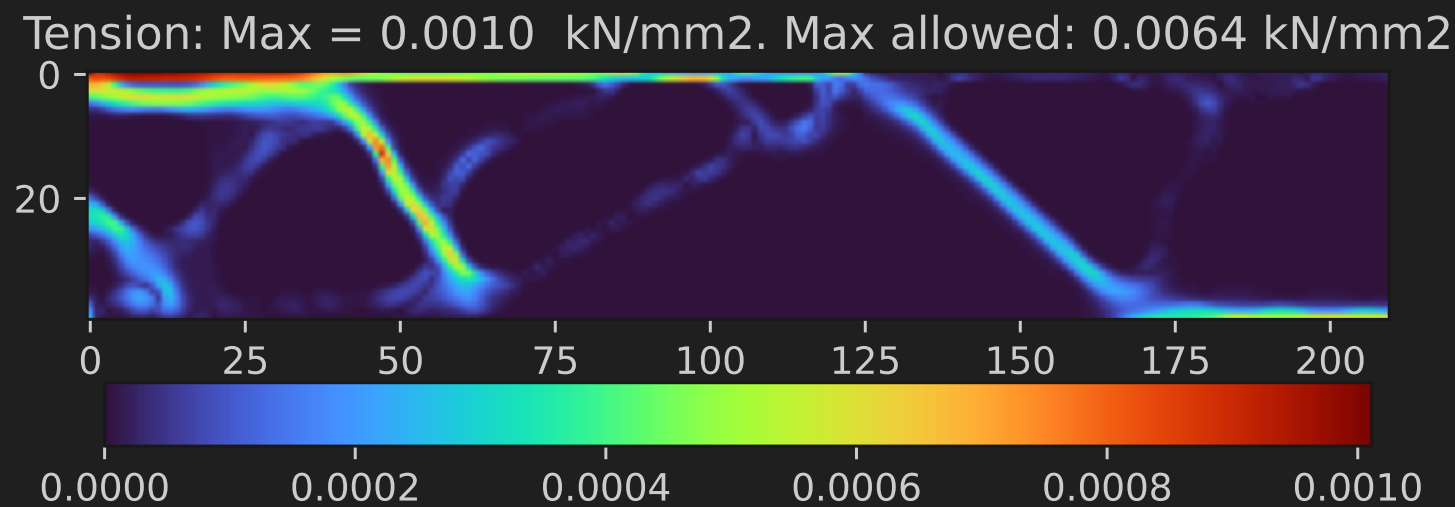
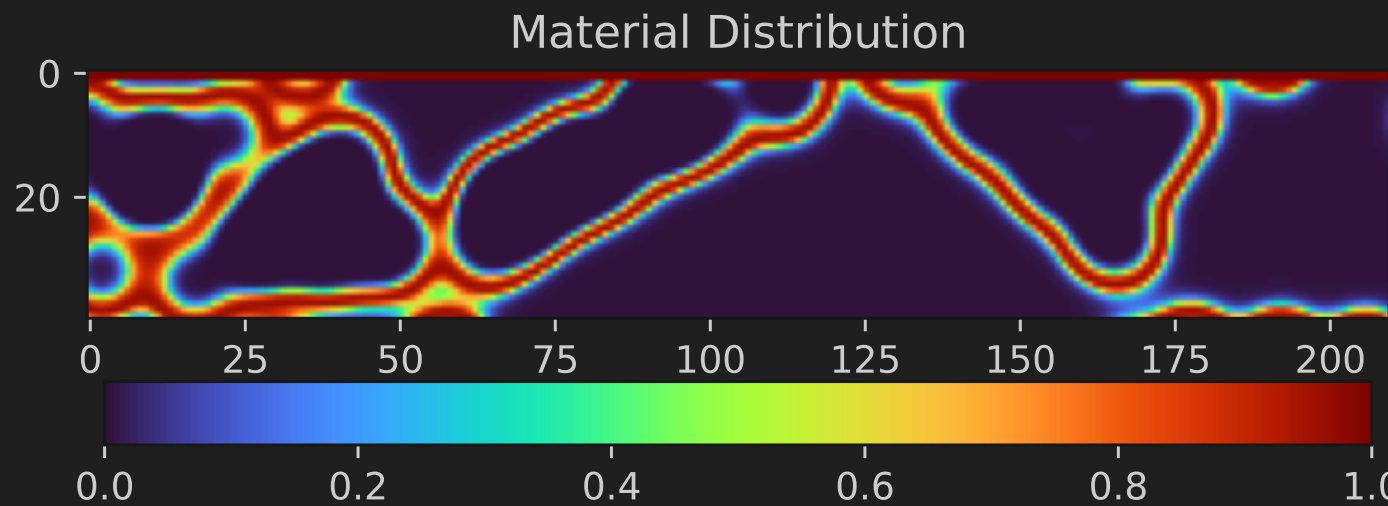
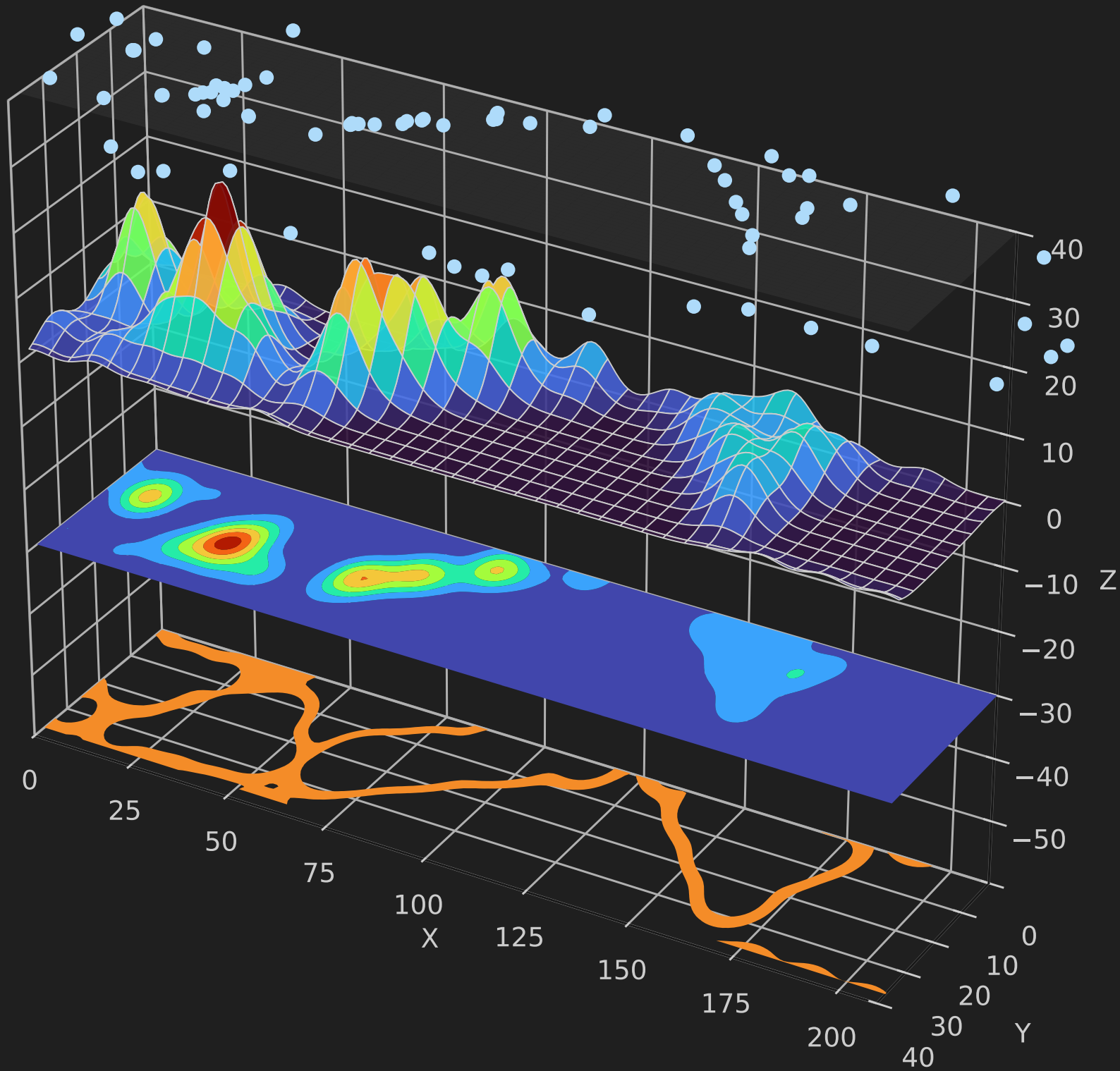
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.23 Shift = 1.75 Iteration = 239



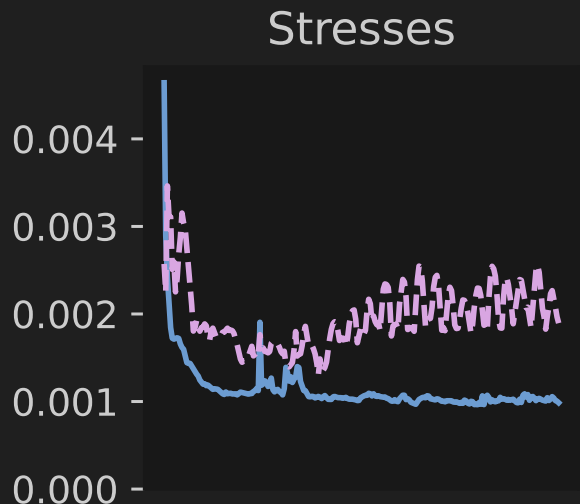
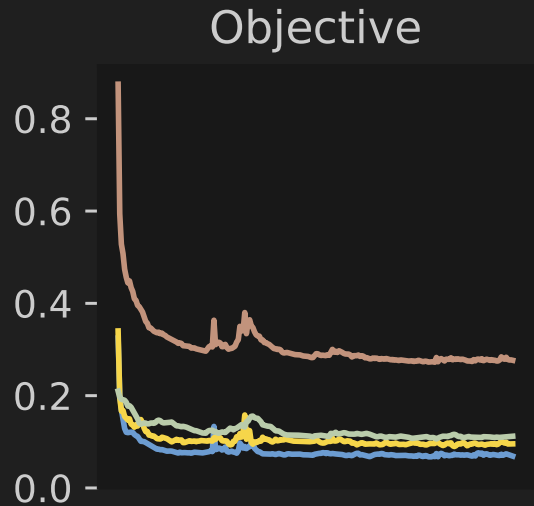
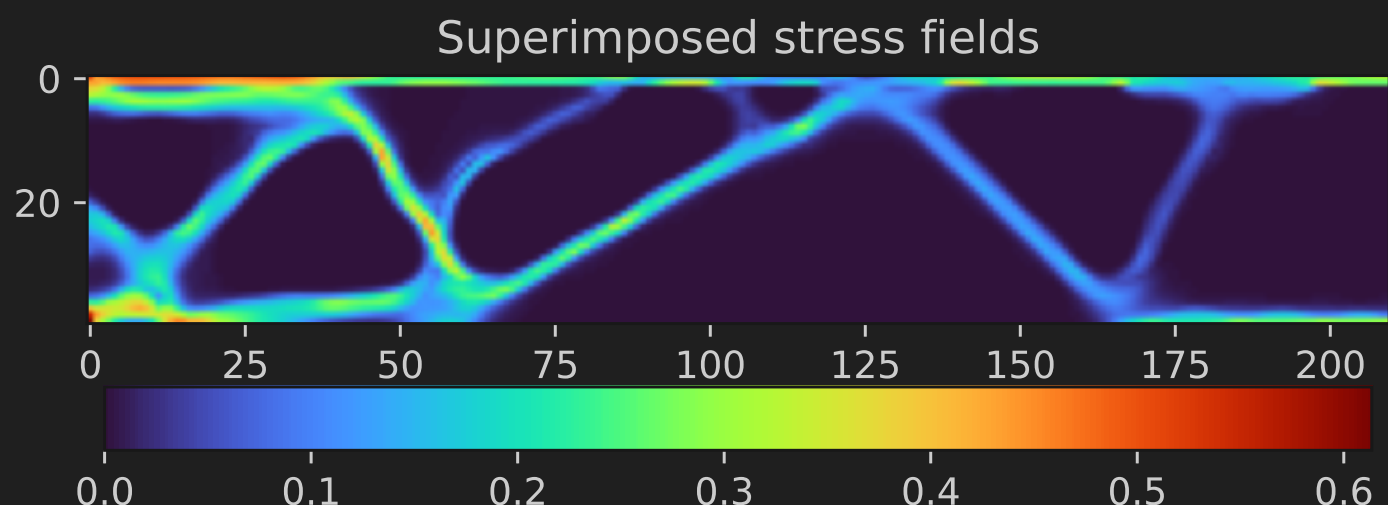
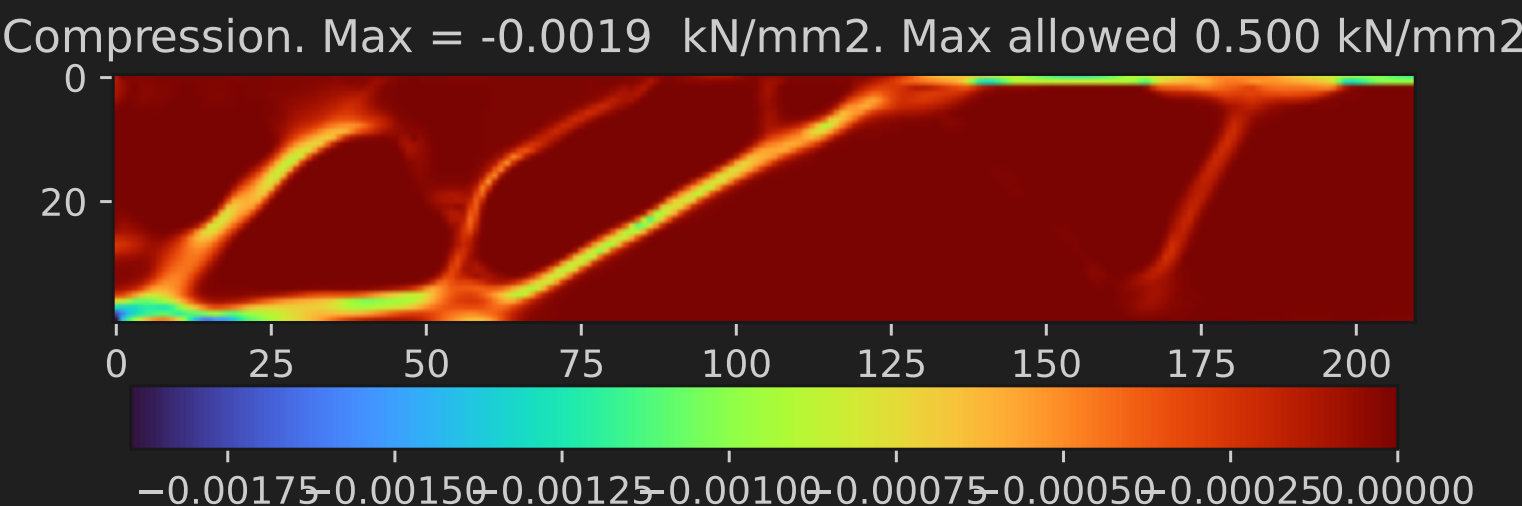
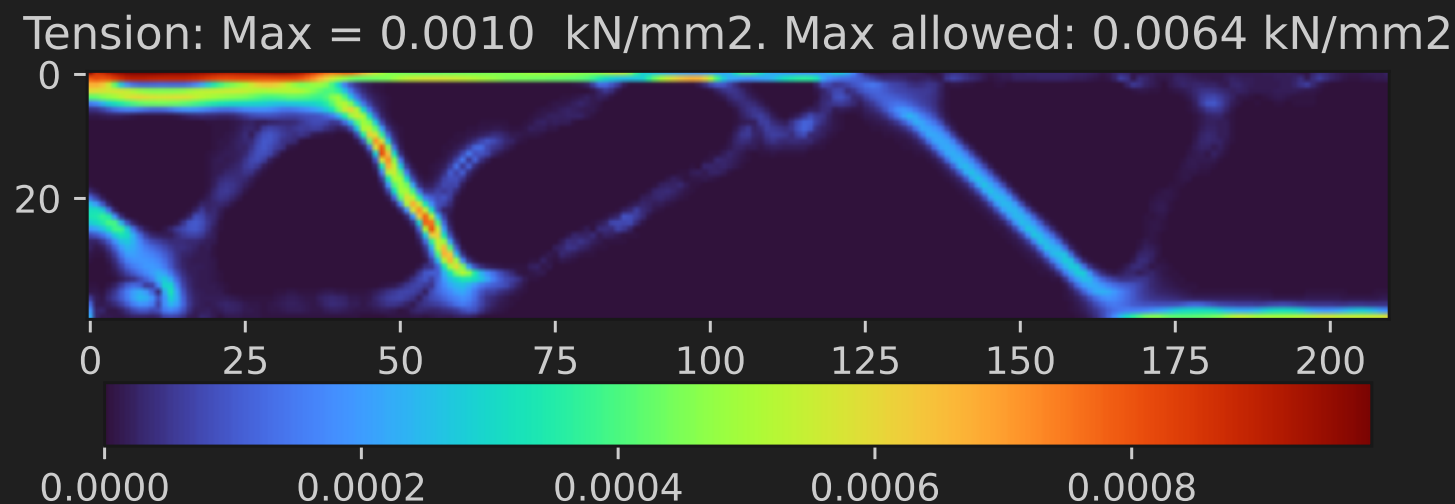
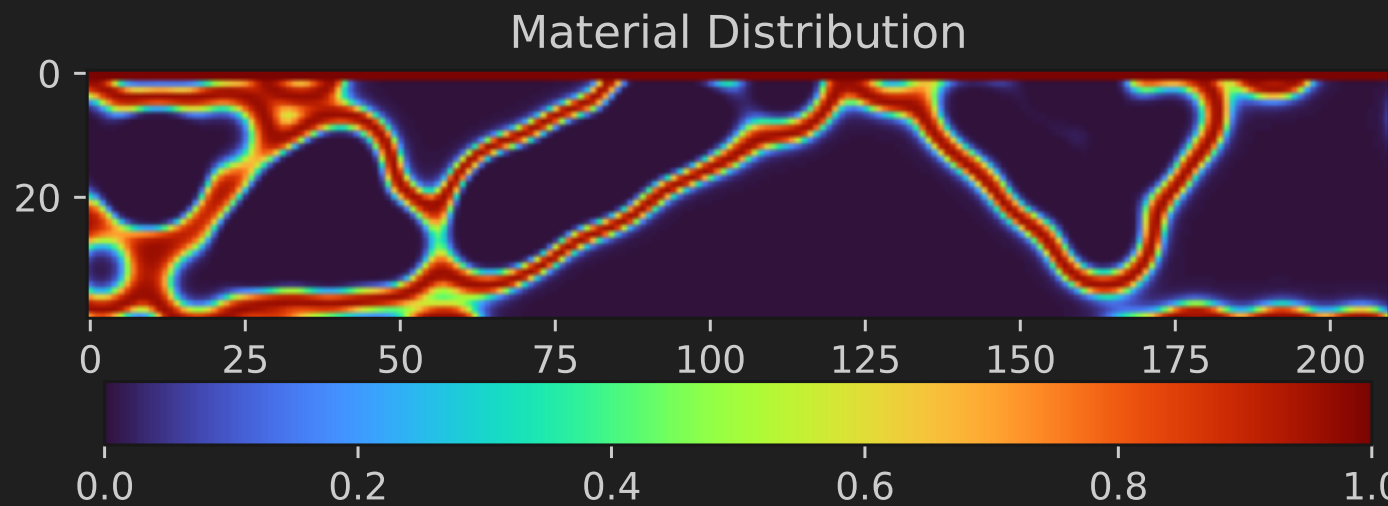
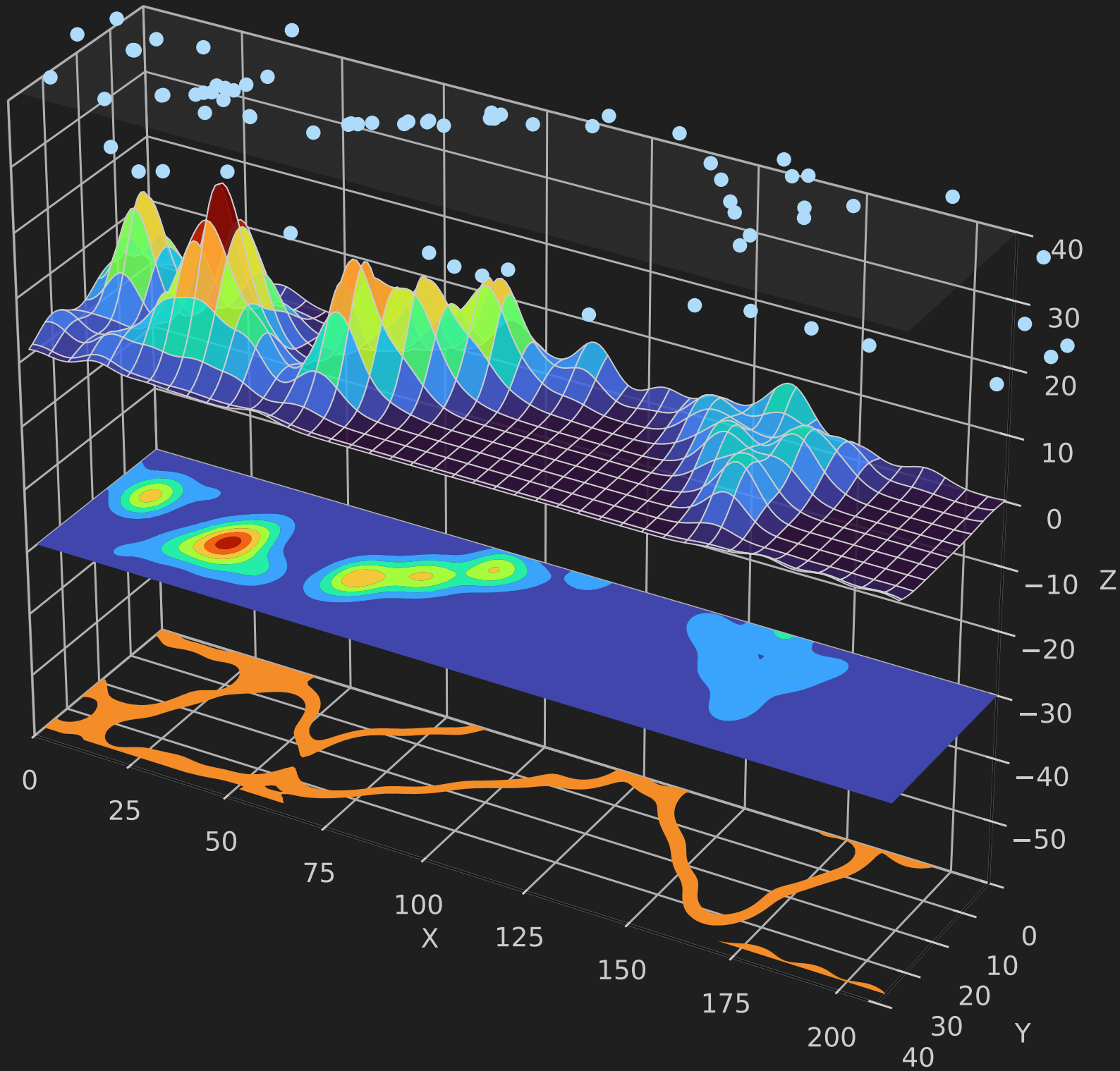
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.23 Shift = 1.78 Iteration = 241



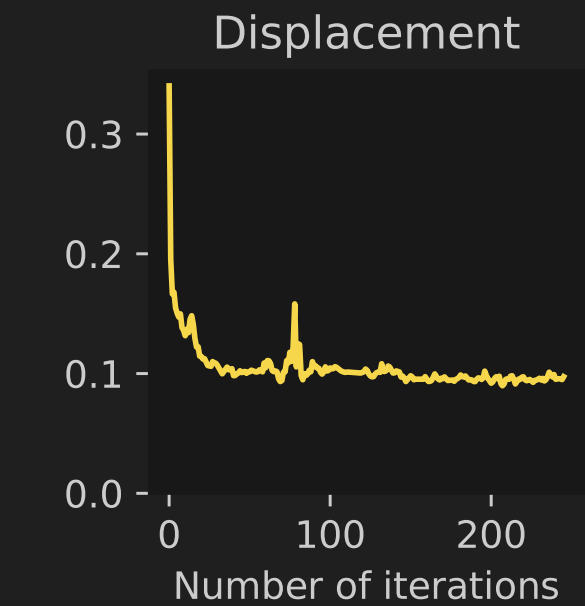
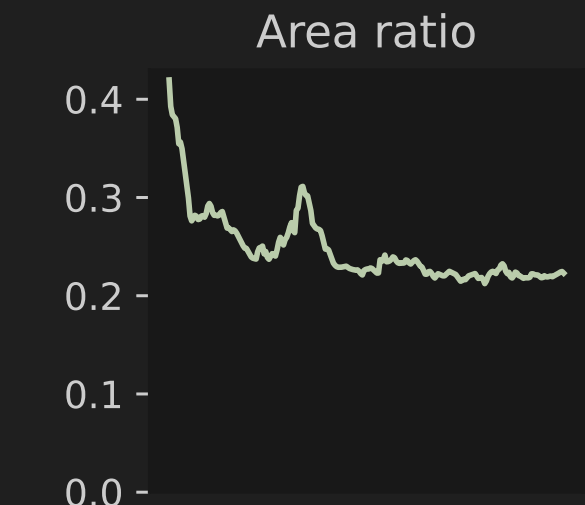
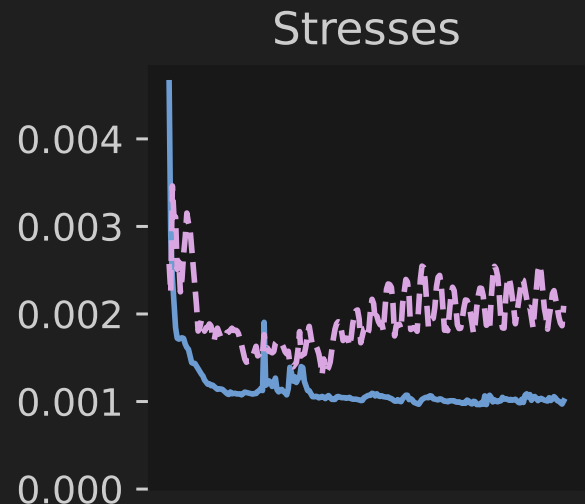
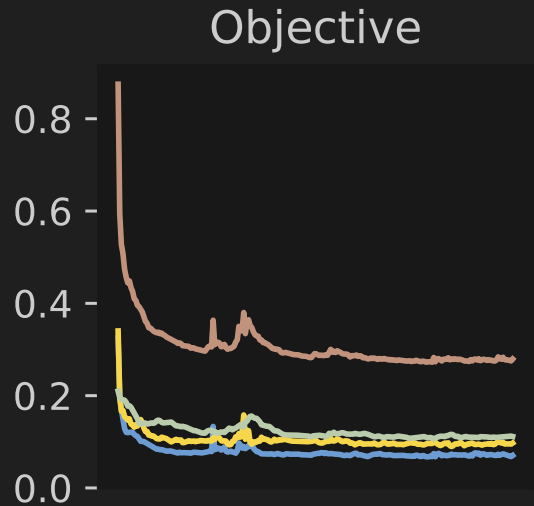
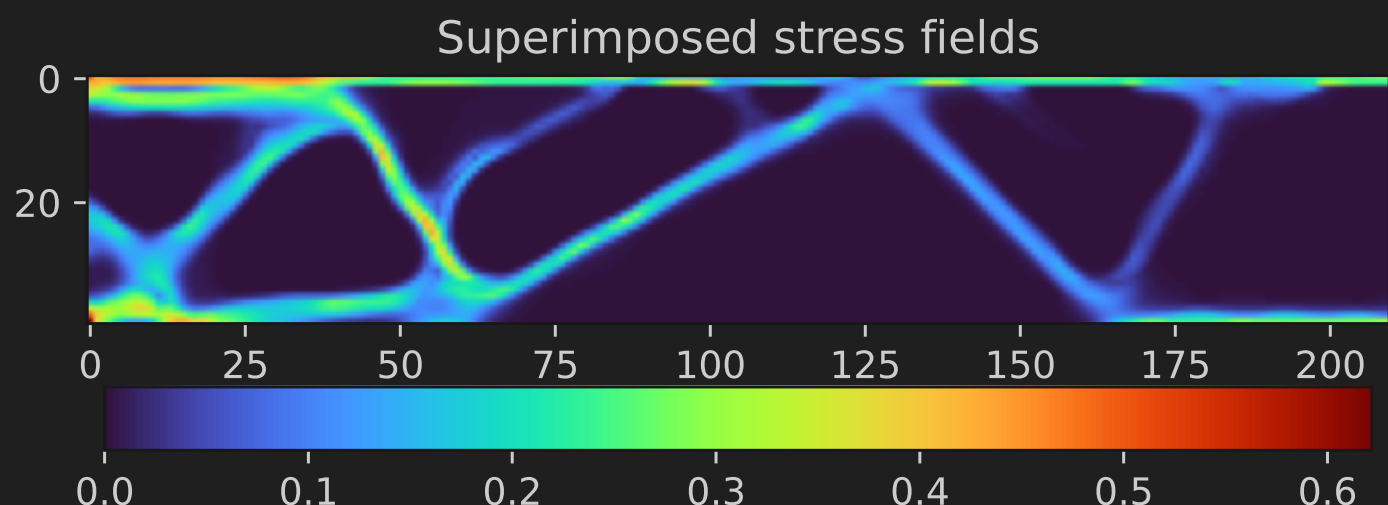
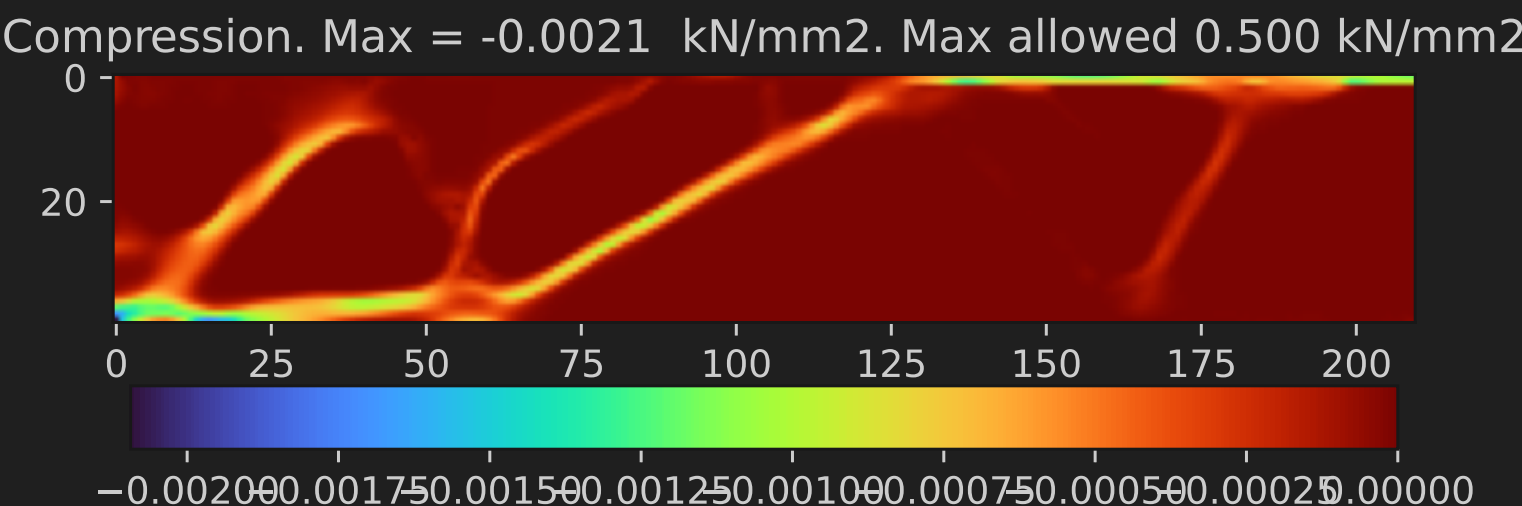
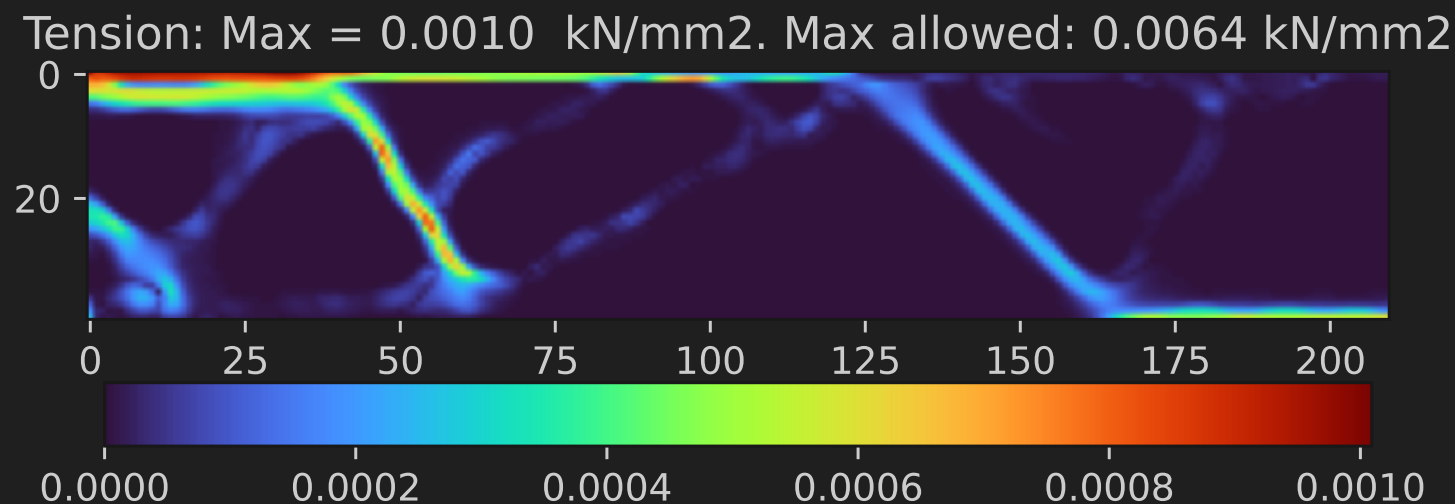
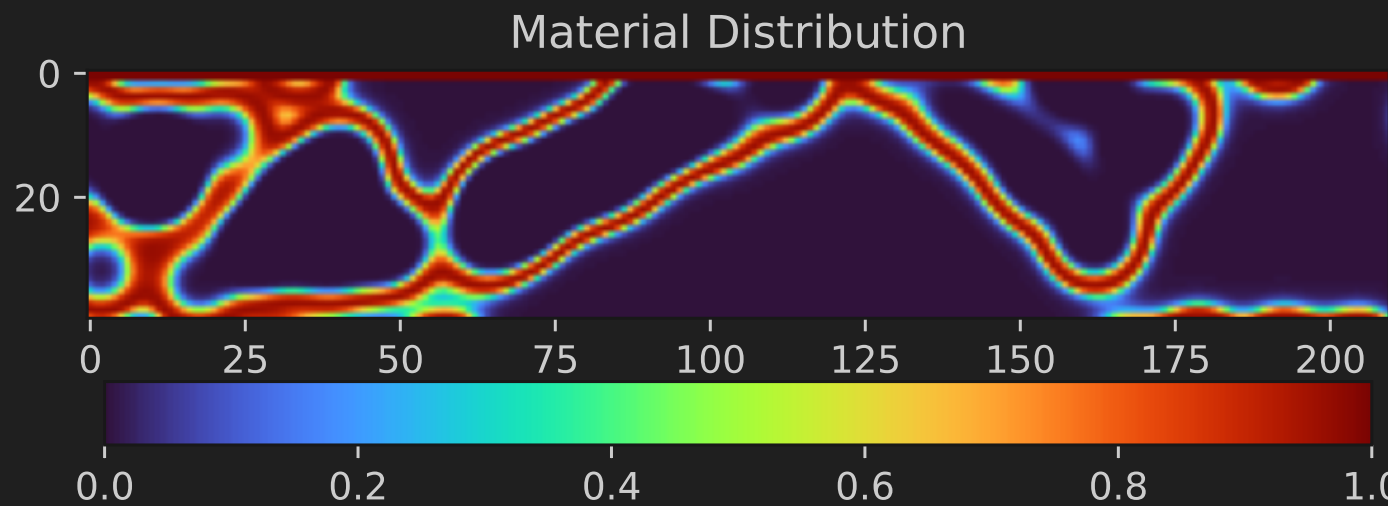
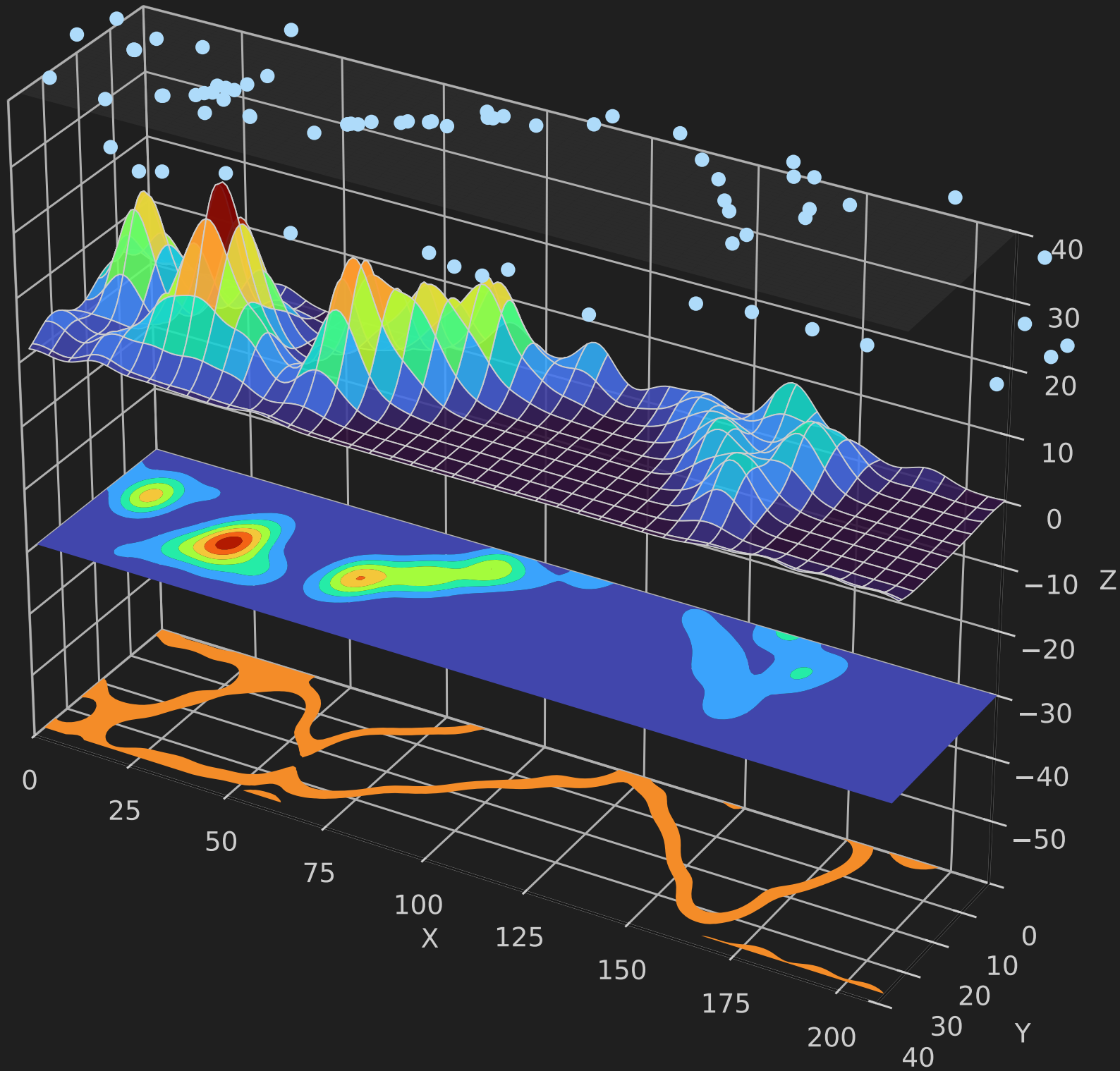
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.26 Shift = 1.81 Iteration = 243



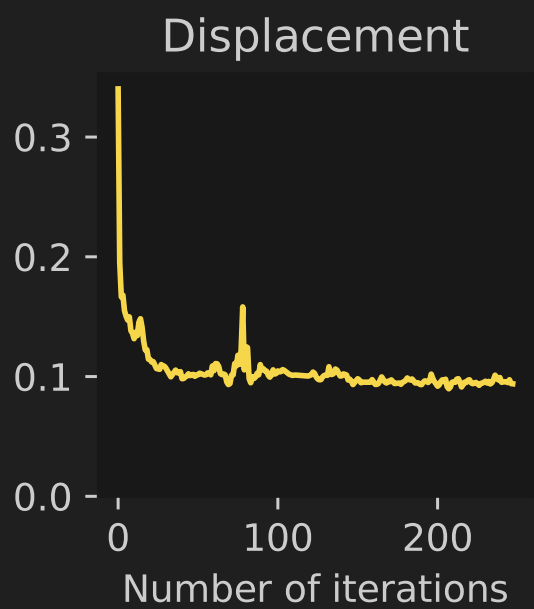
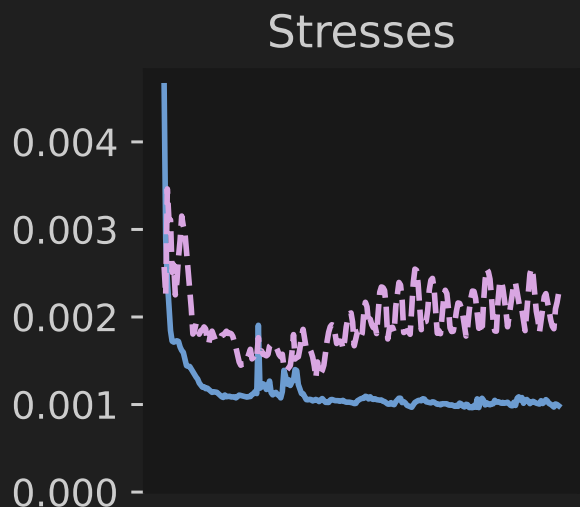
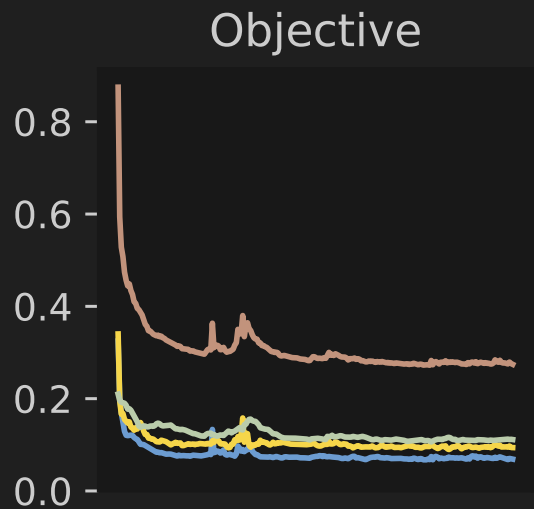
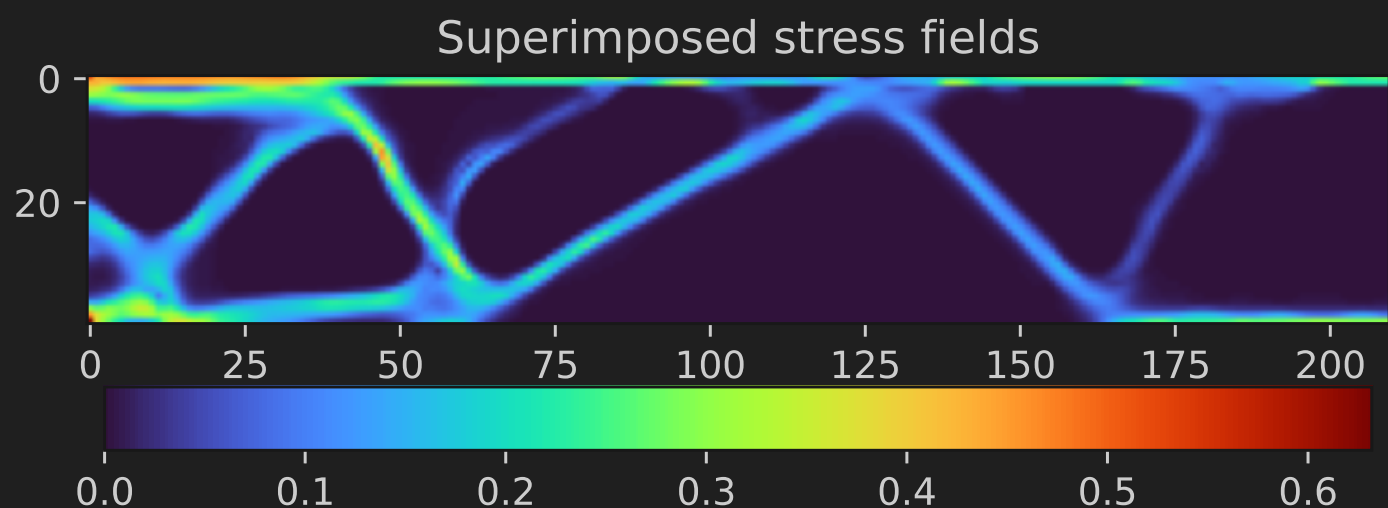
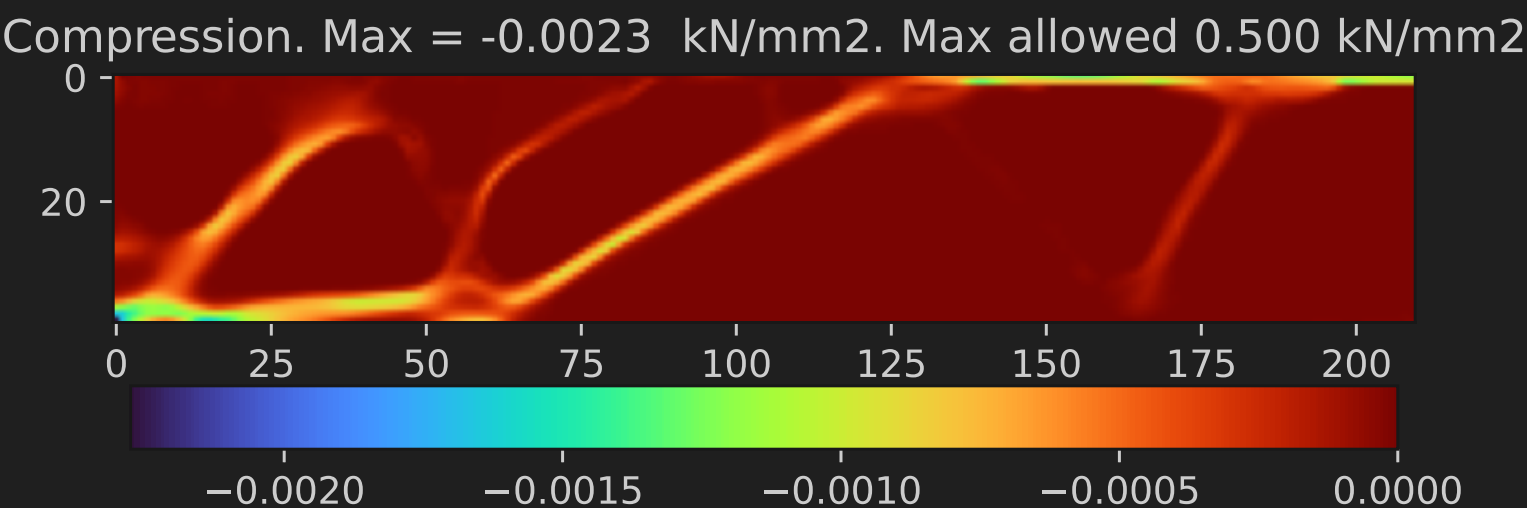
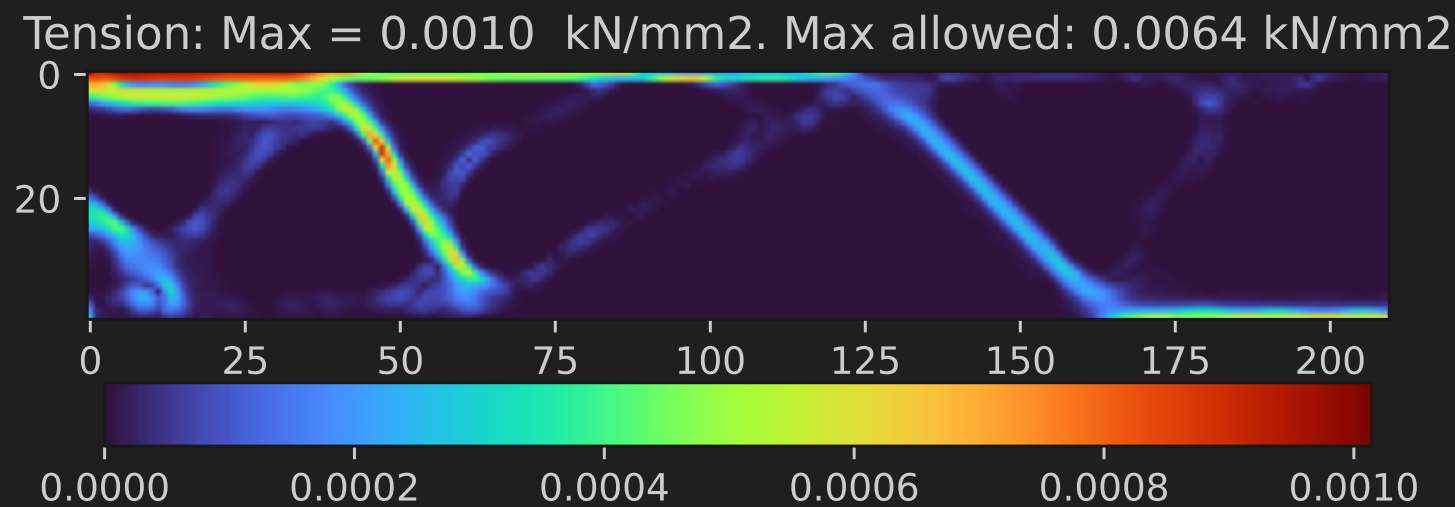
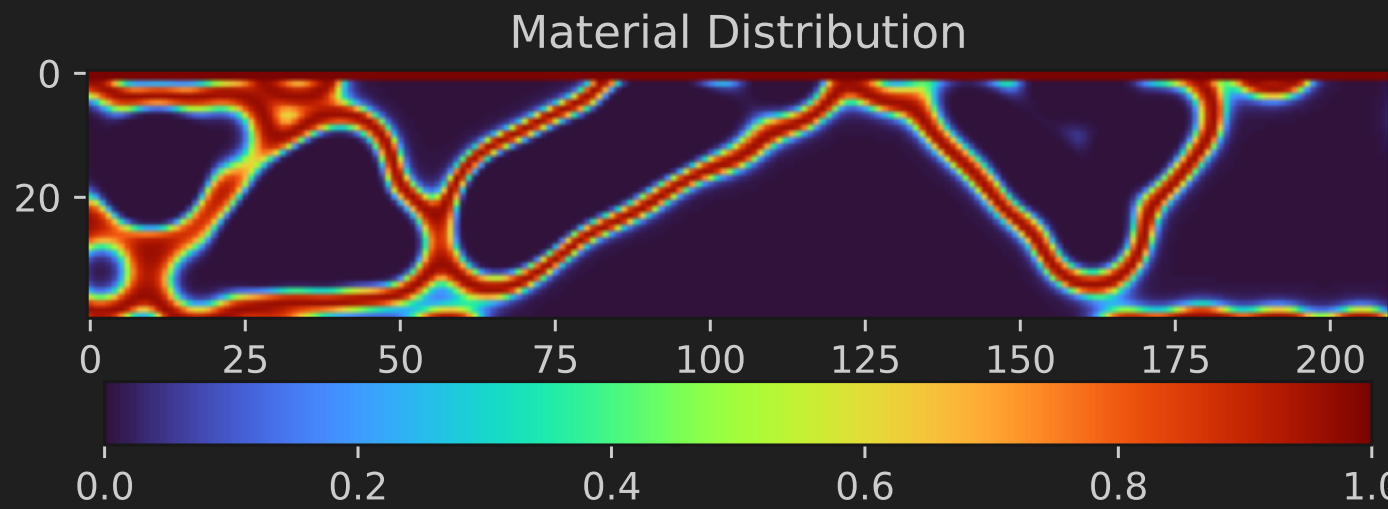
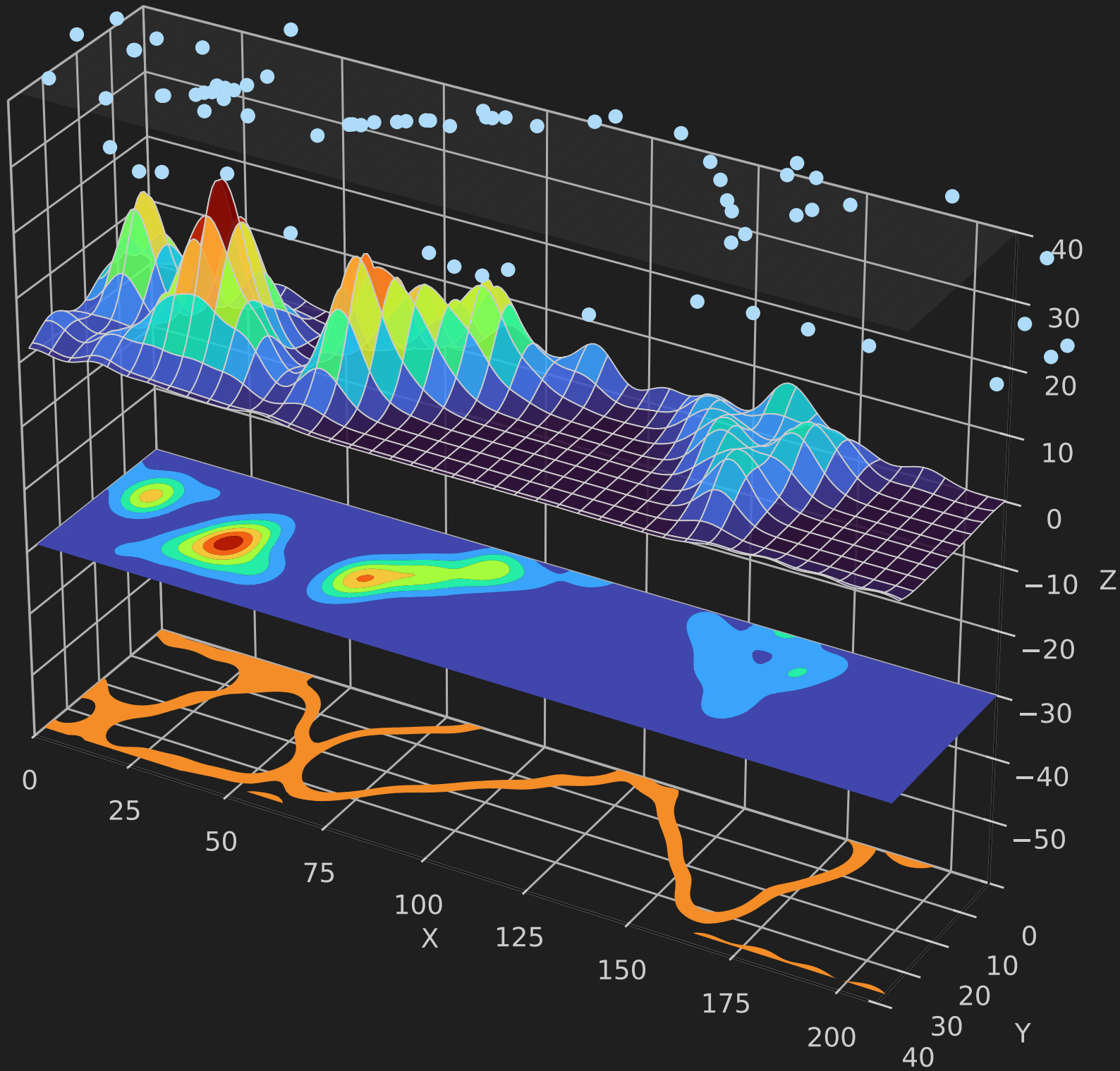
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.31 Shift = 1.82 Iteration = 245



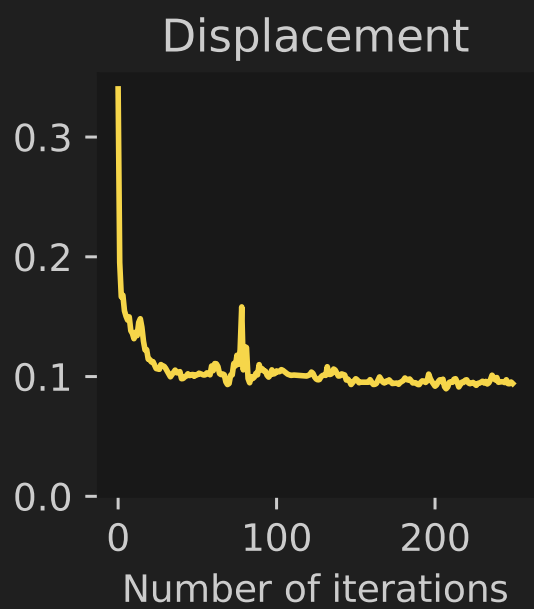
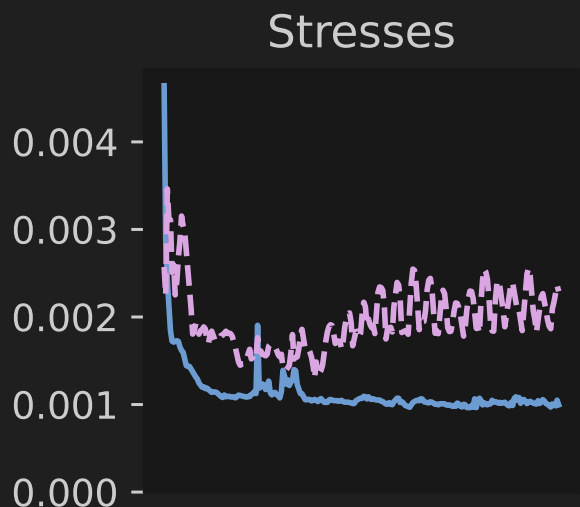
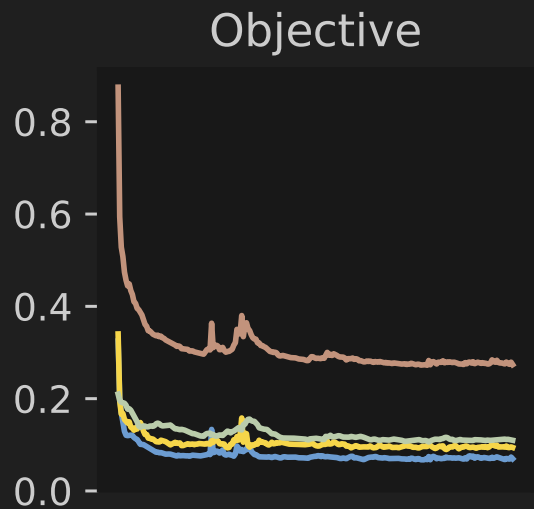
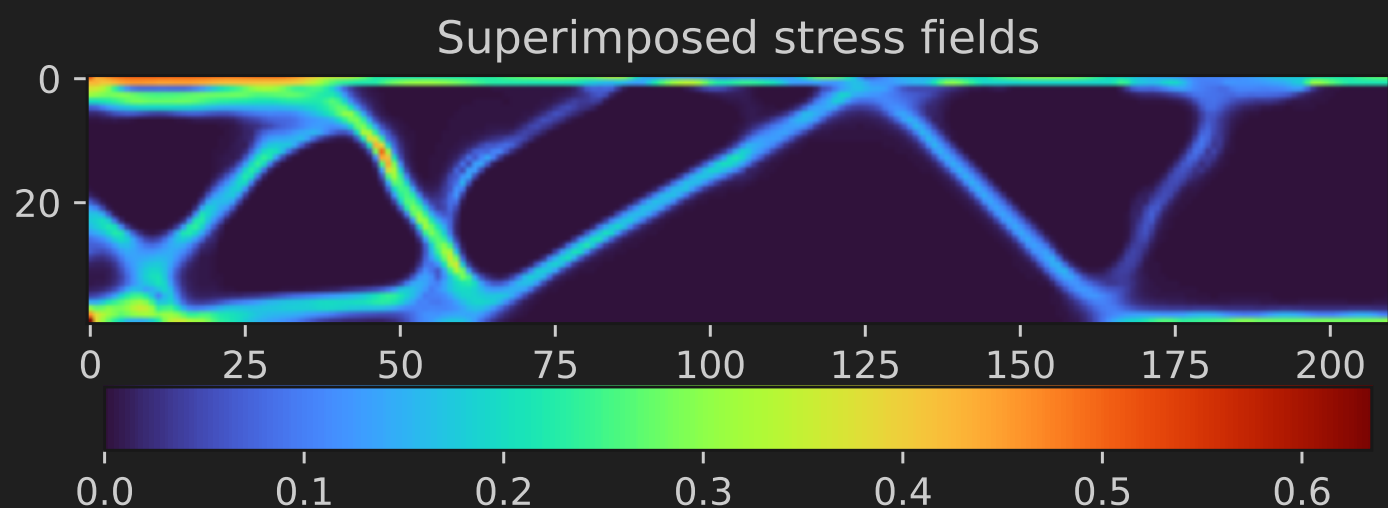
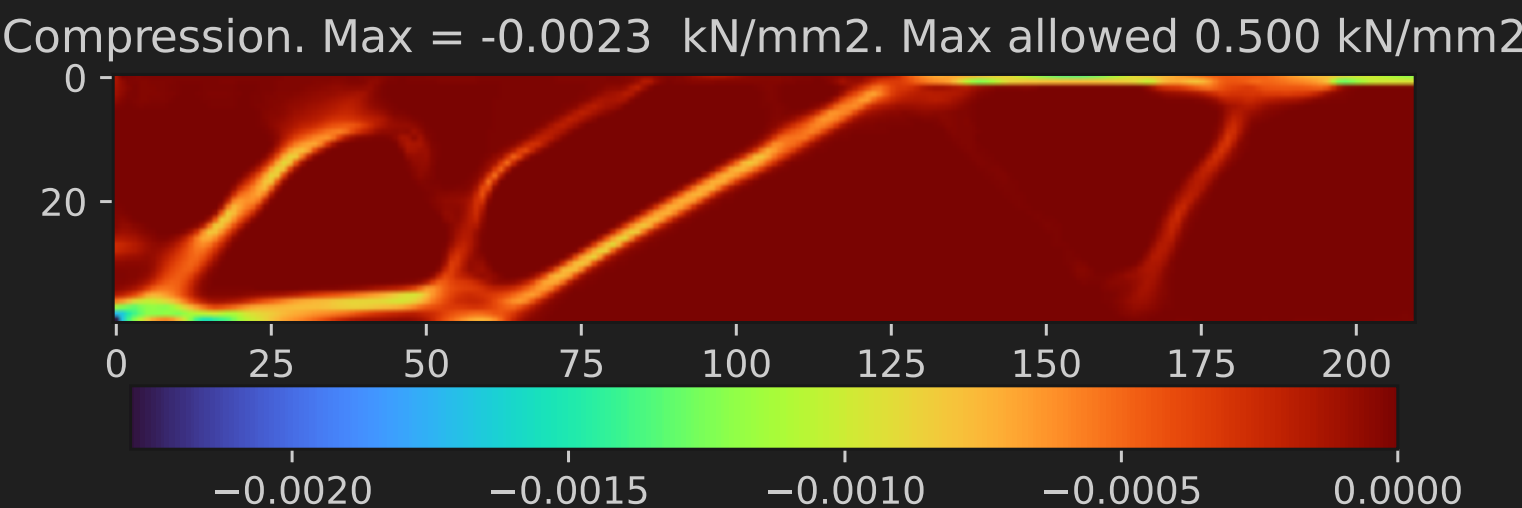
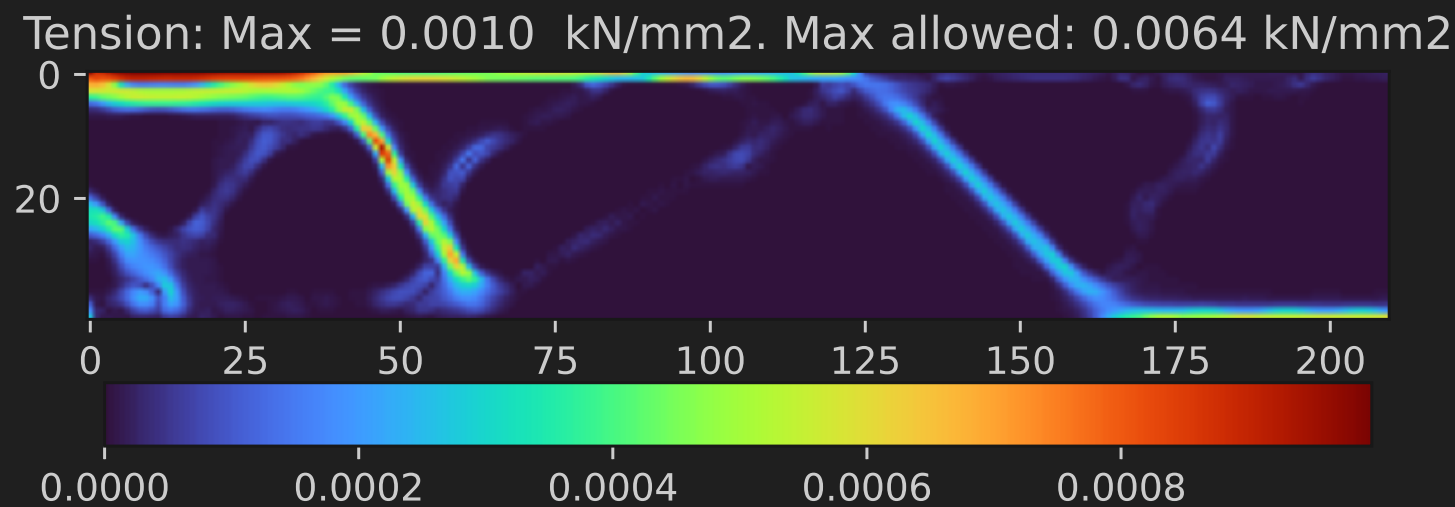
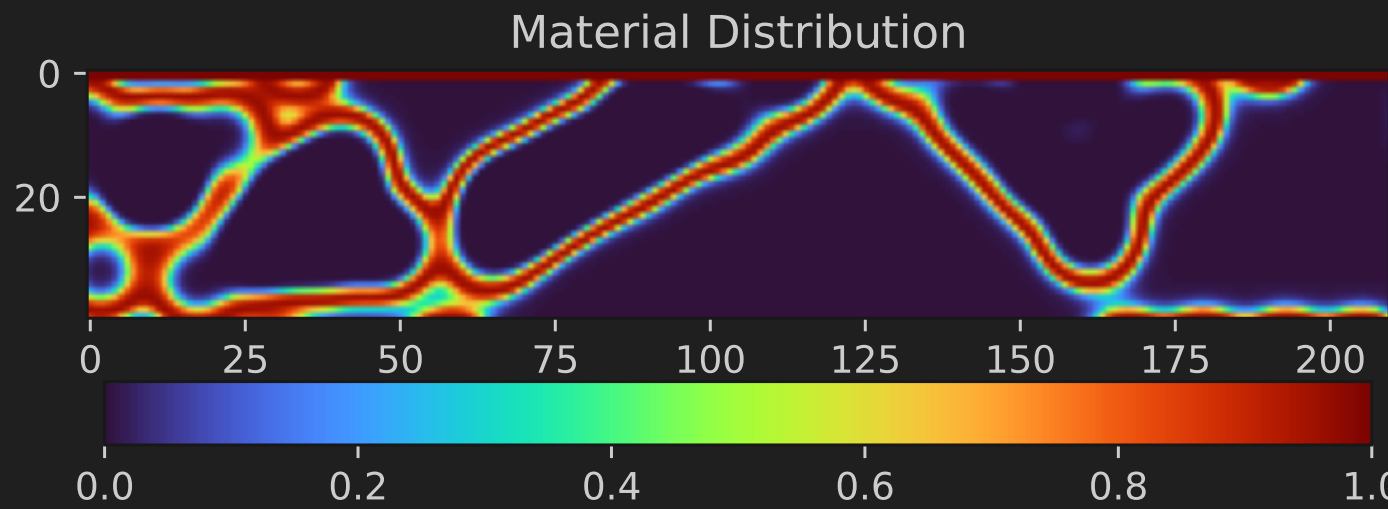
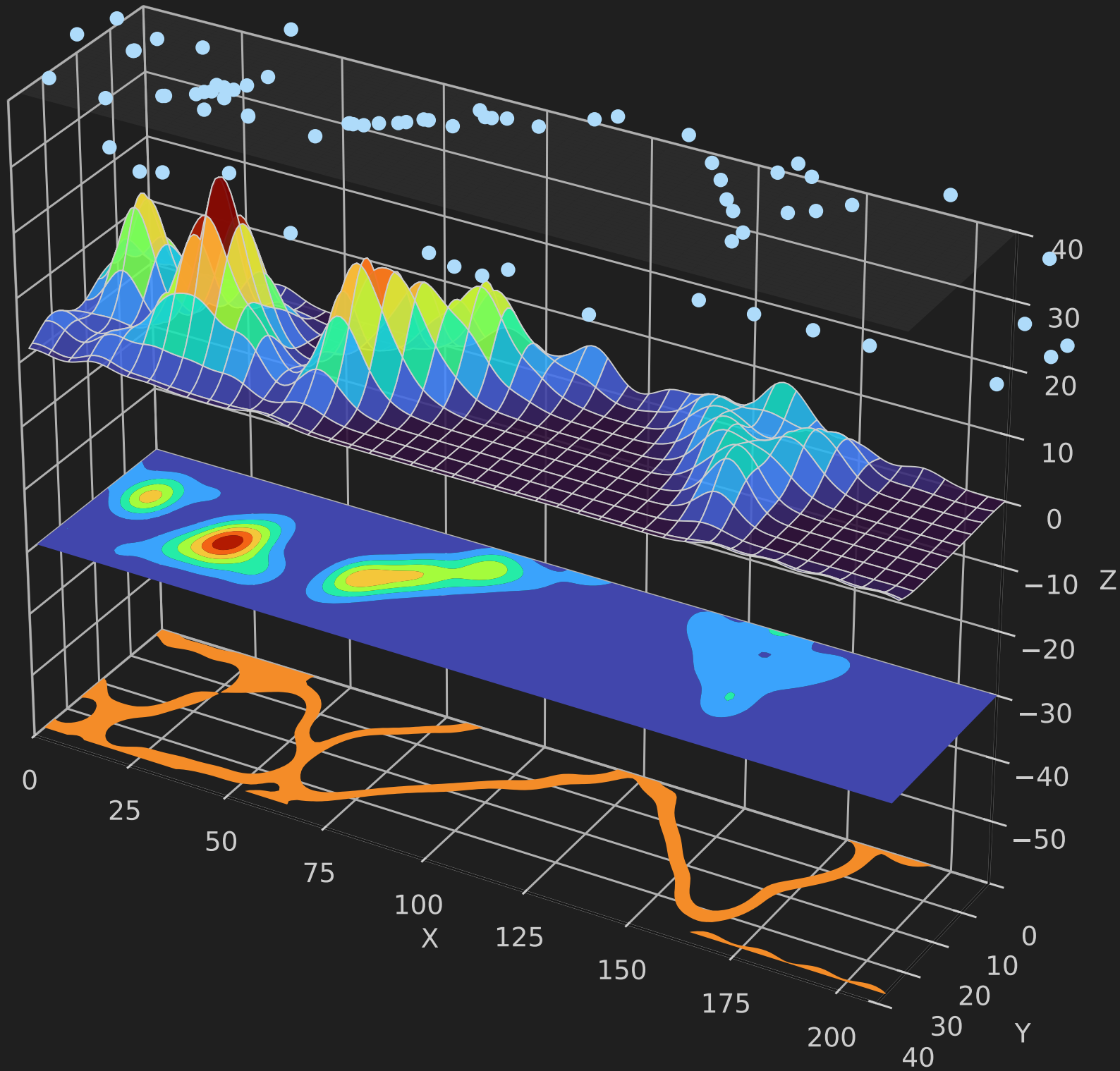
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.31 Shift = 1.82 Iteration = 247



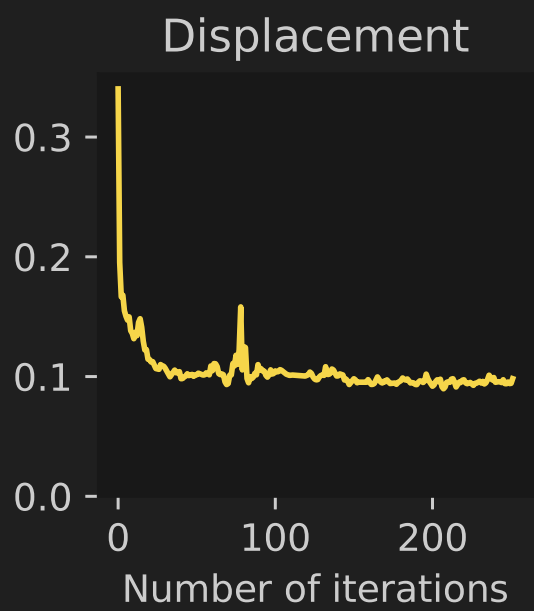
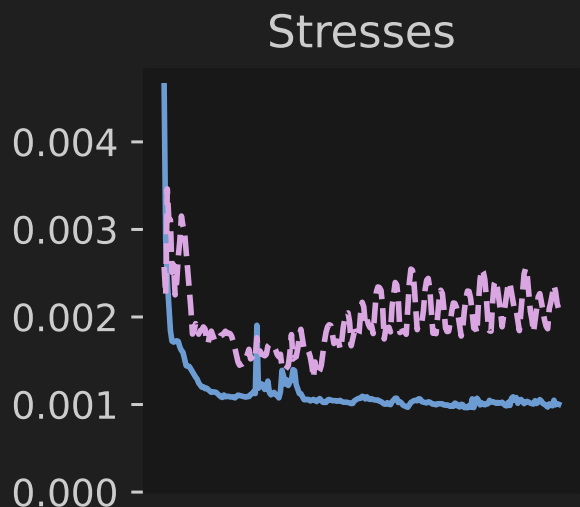
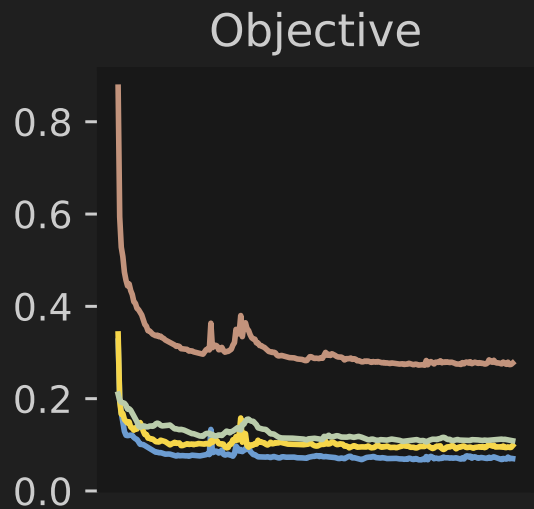
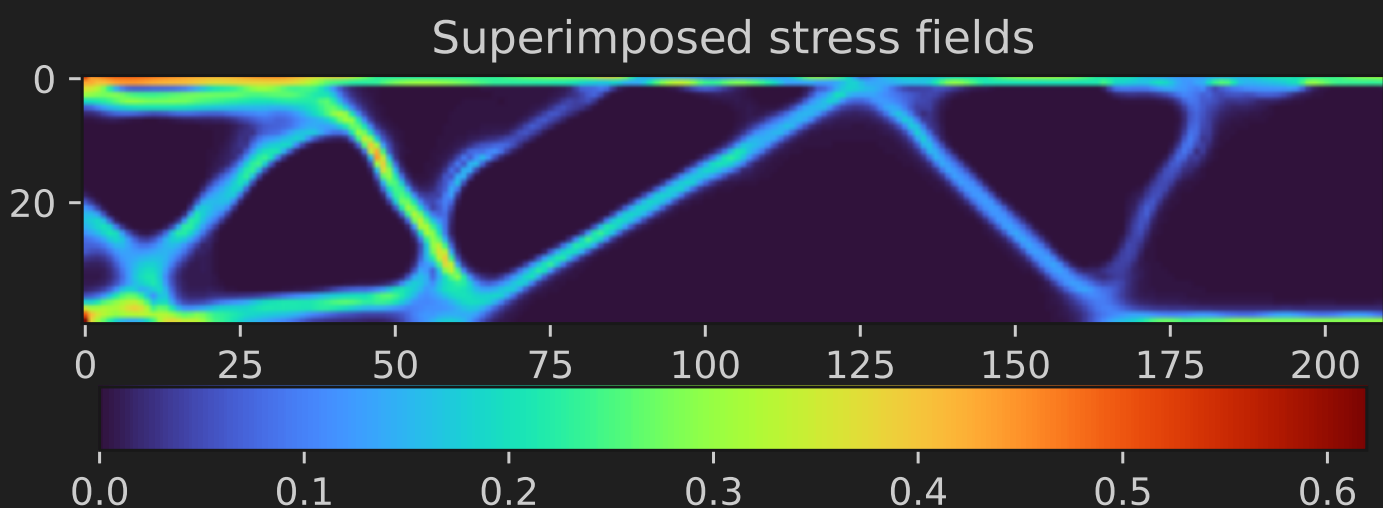
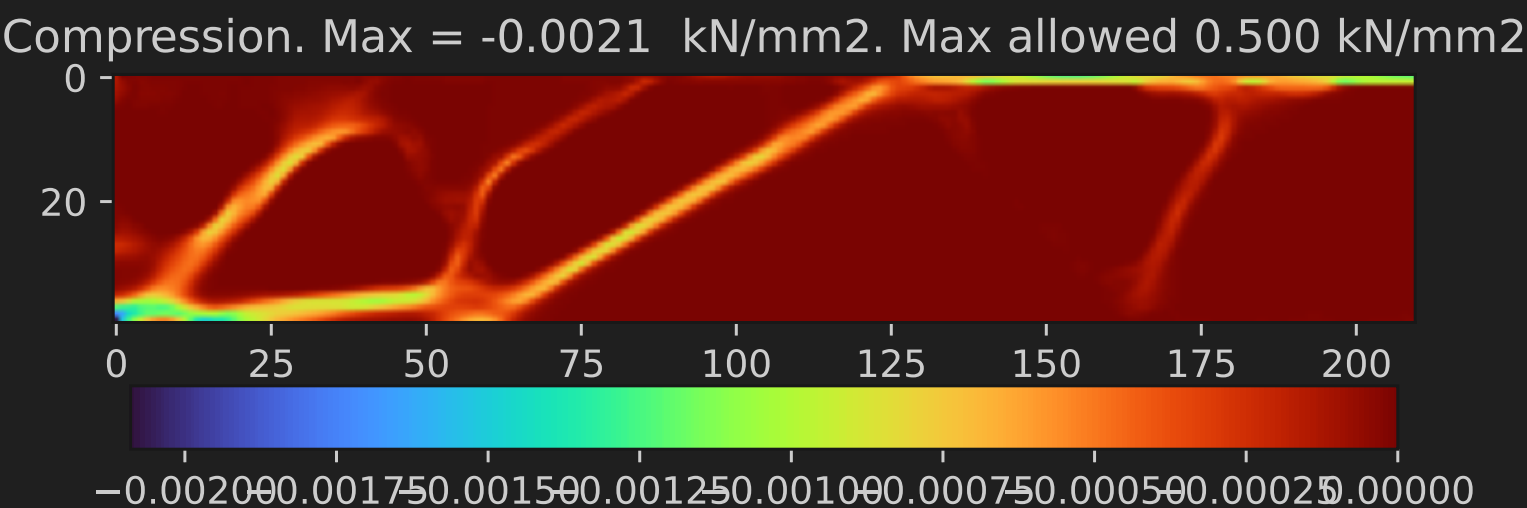
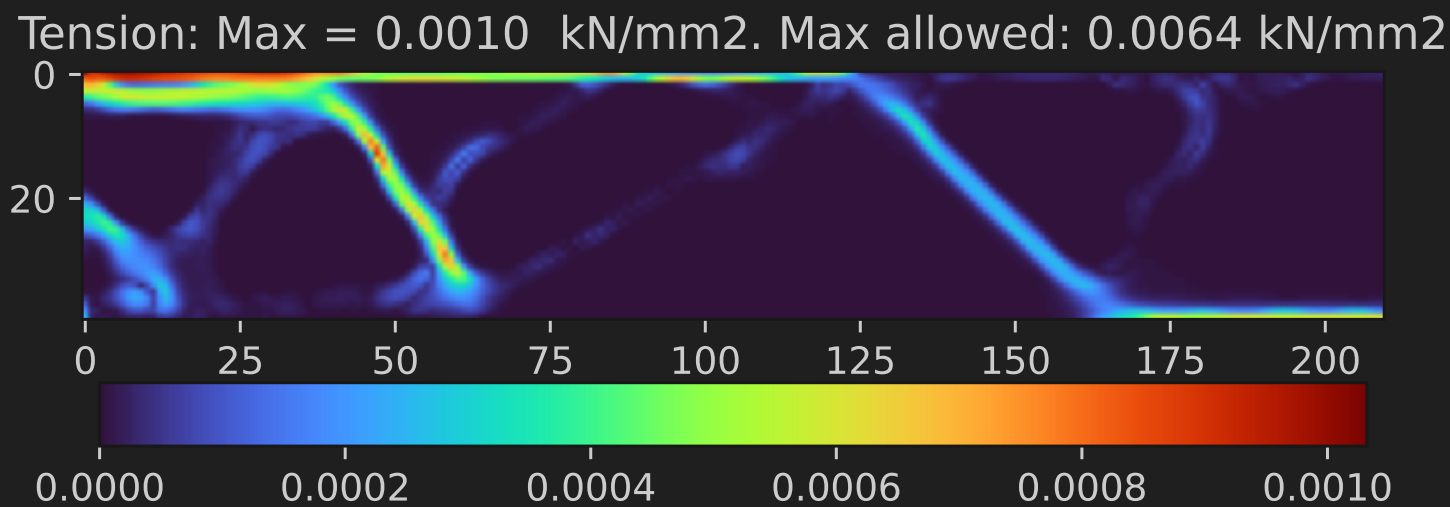
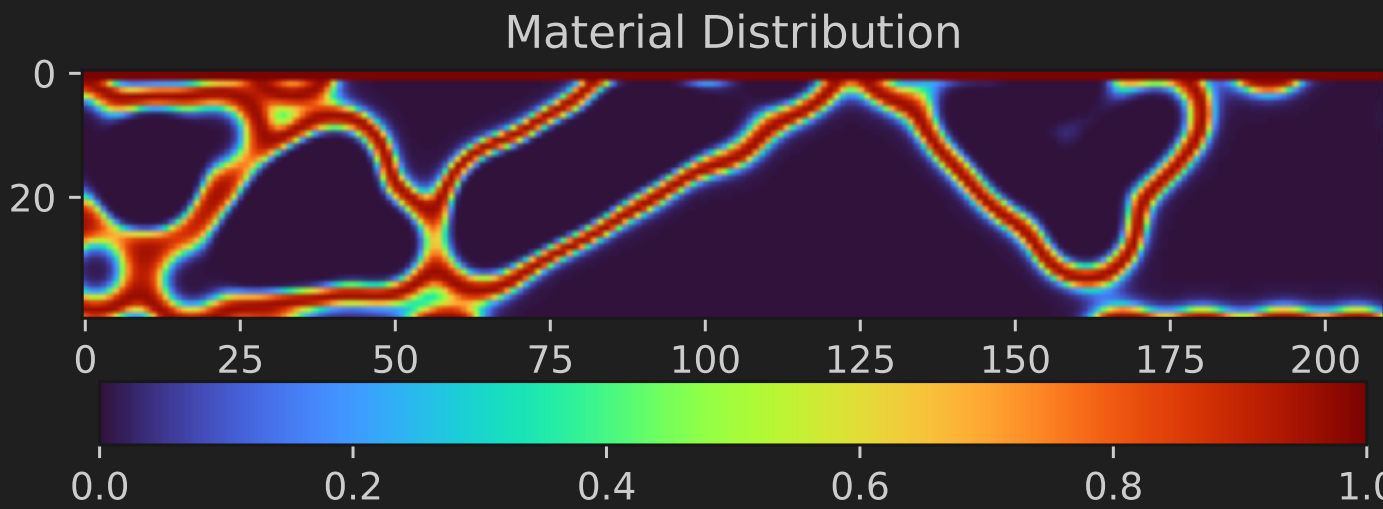
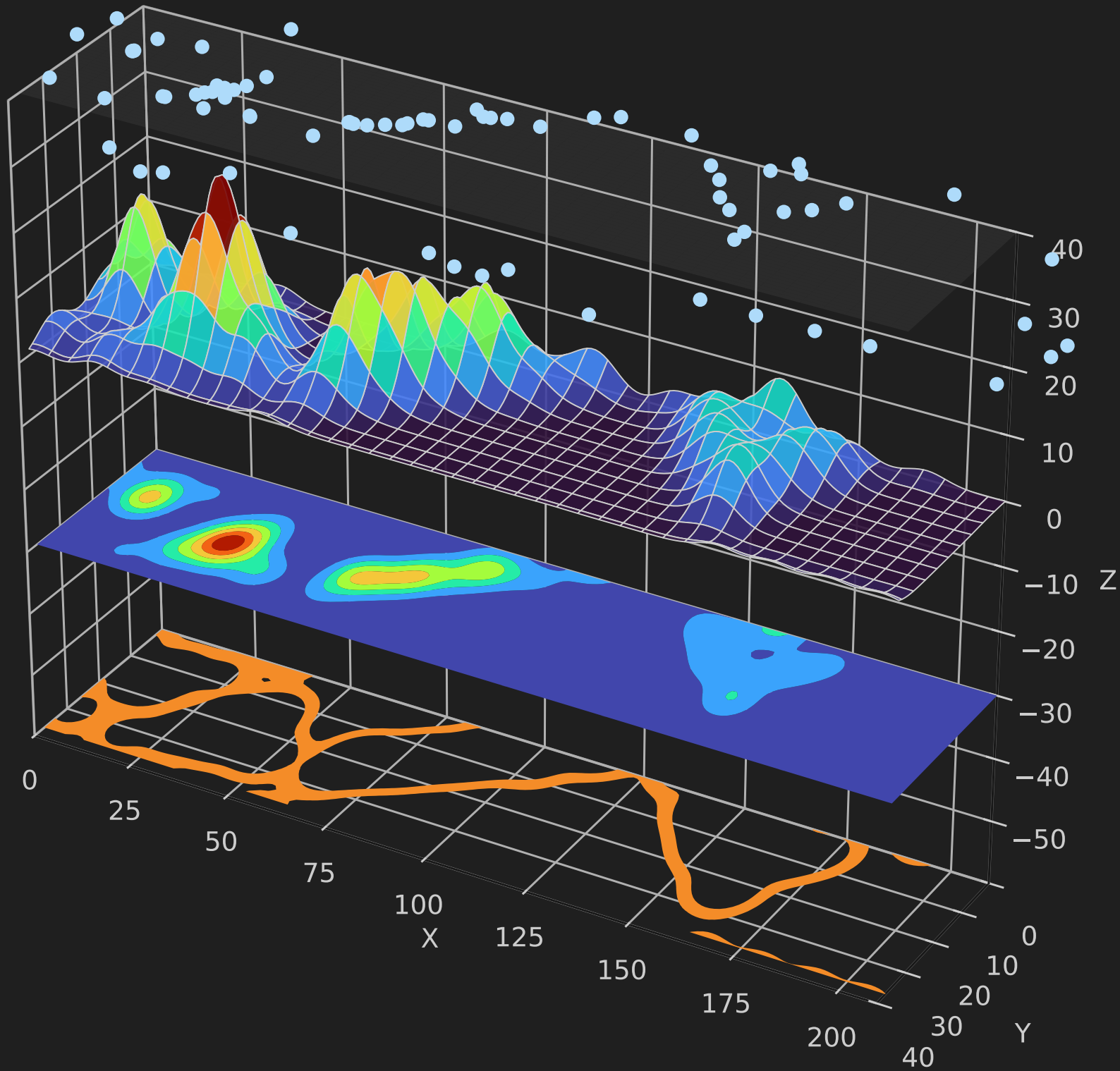
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.31 Shift = 1.79 Iteration = 249



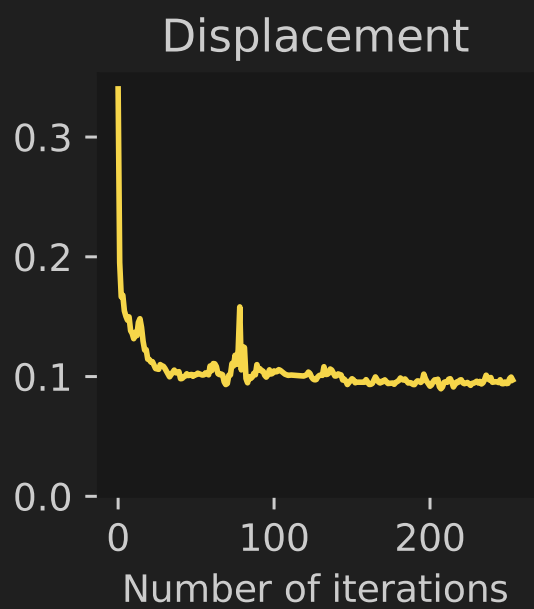
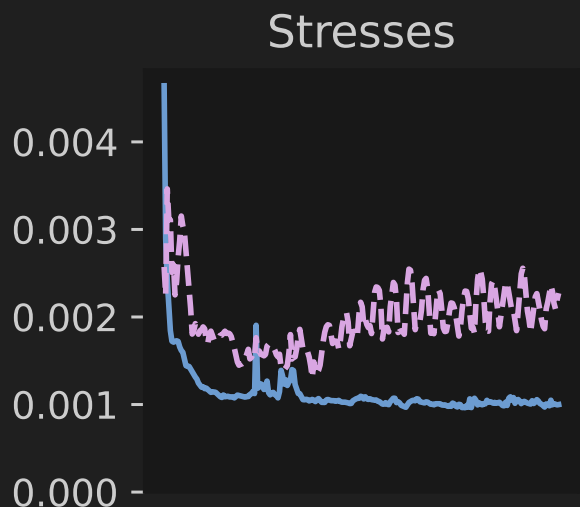
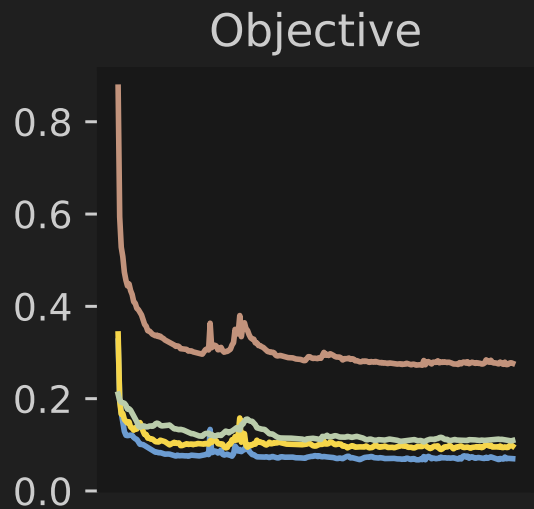
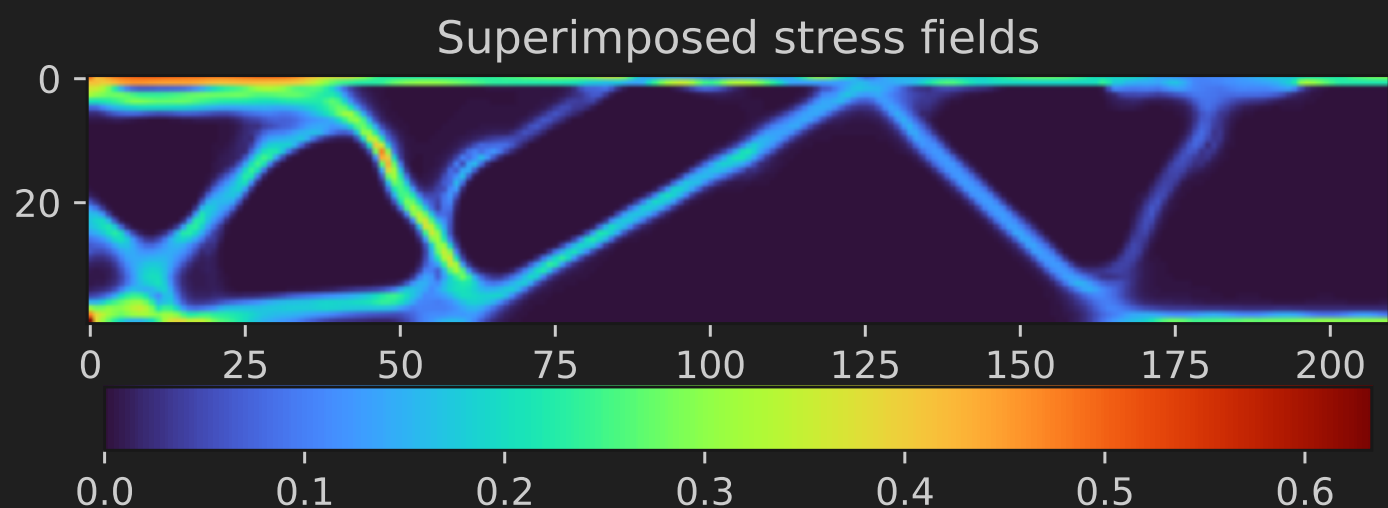
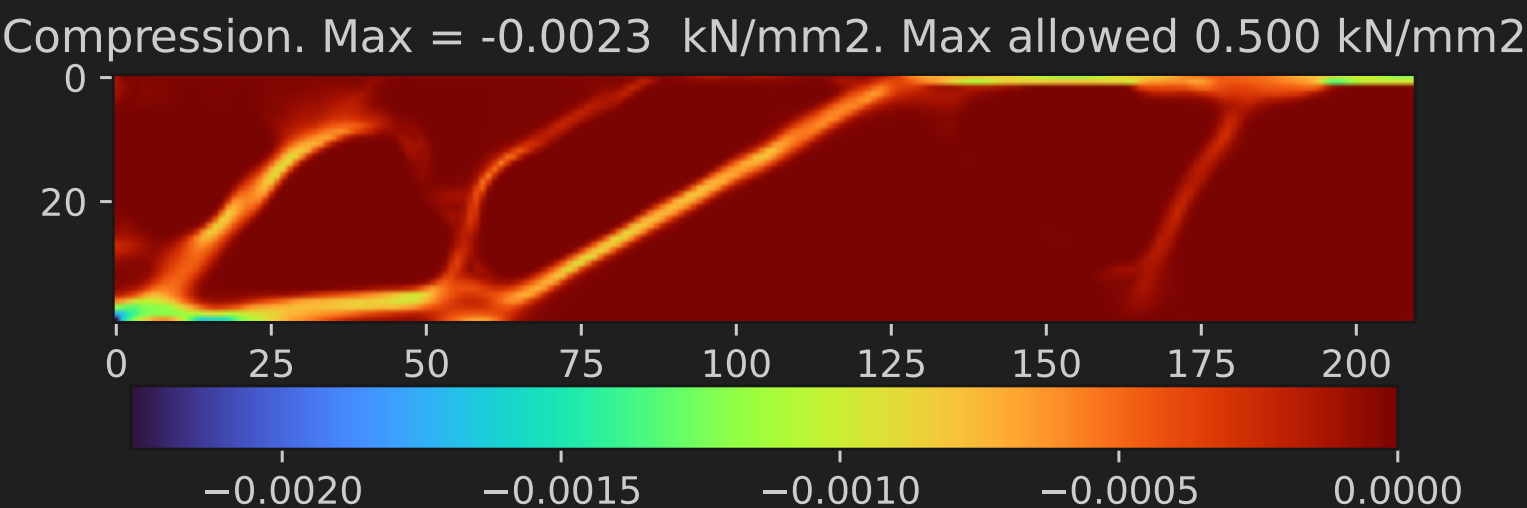
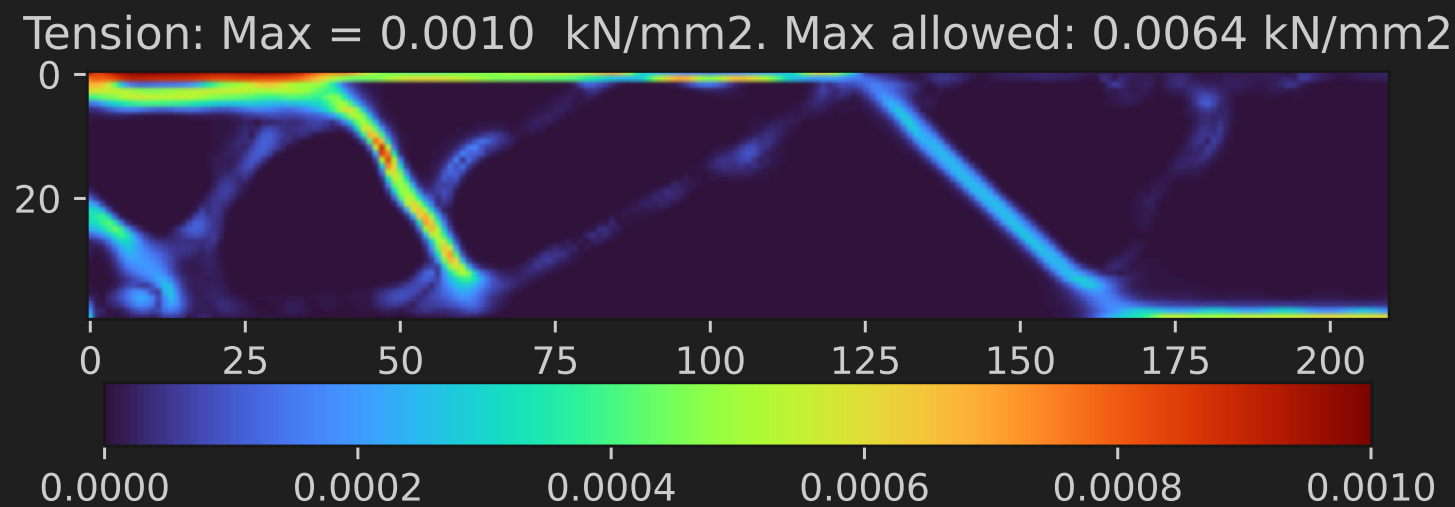
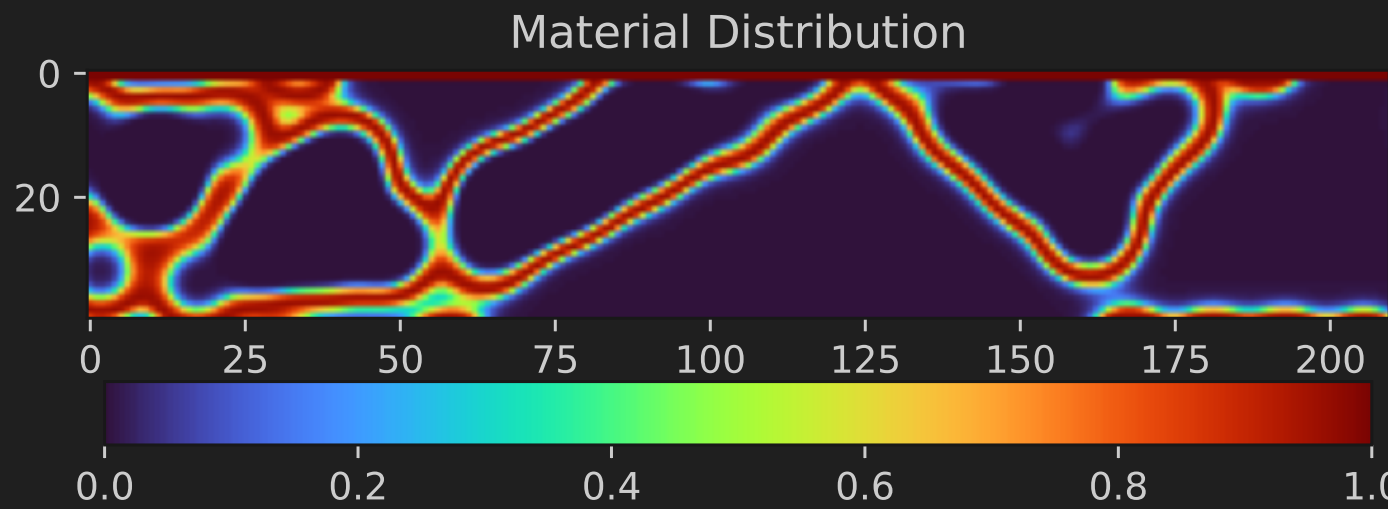
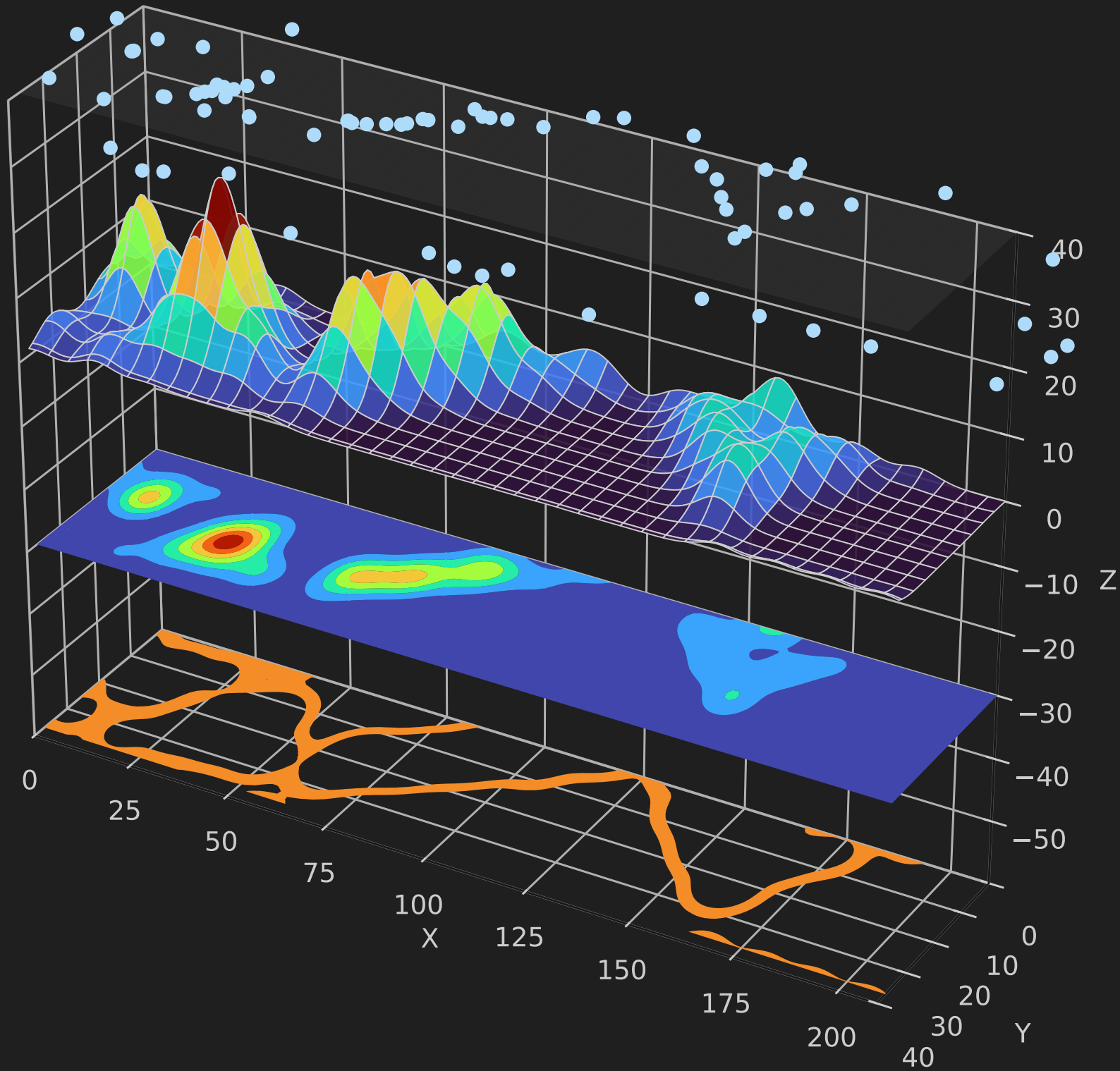
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.26 Shift = 1.80 Iteration = 251



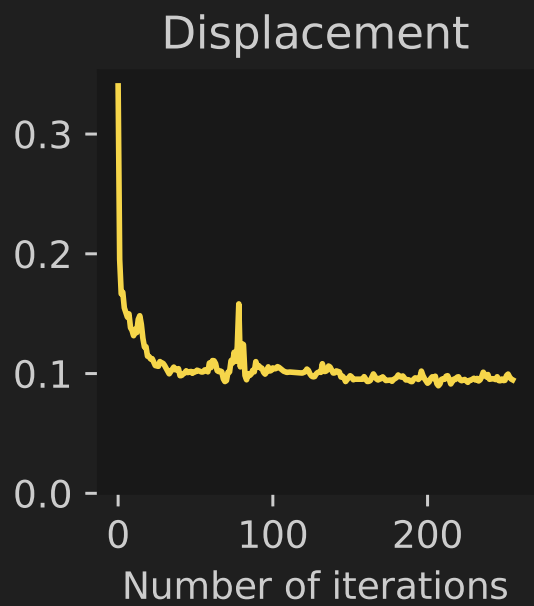
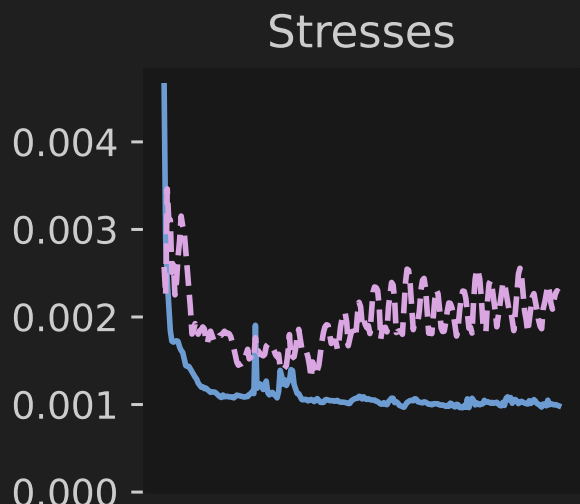
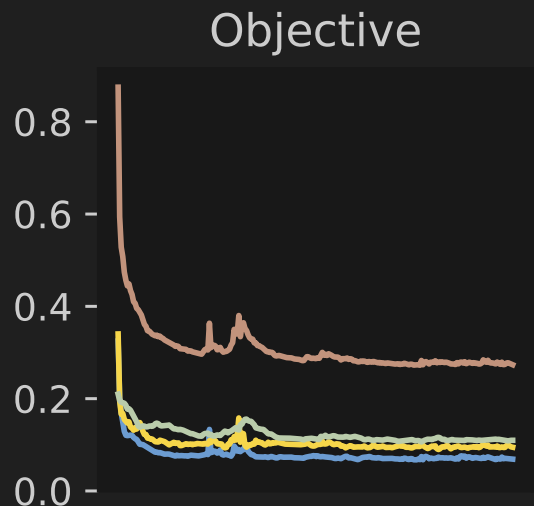
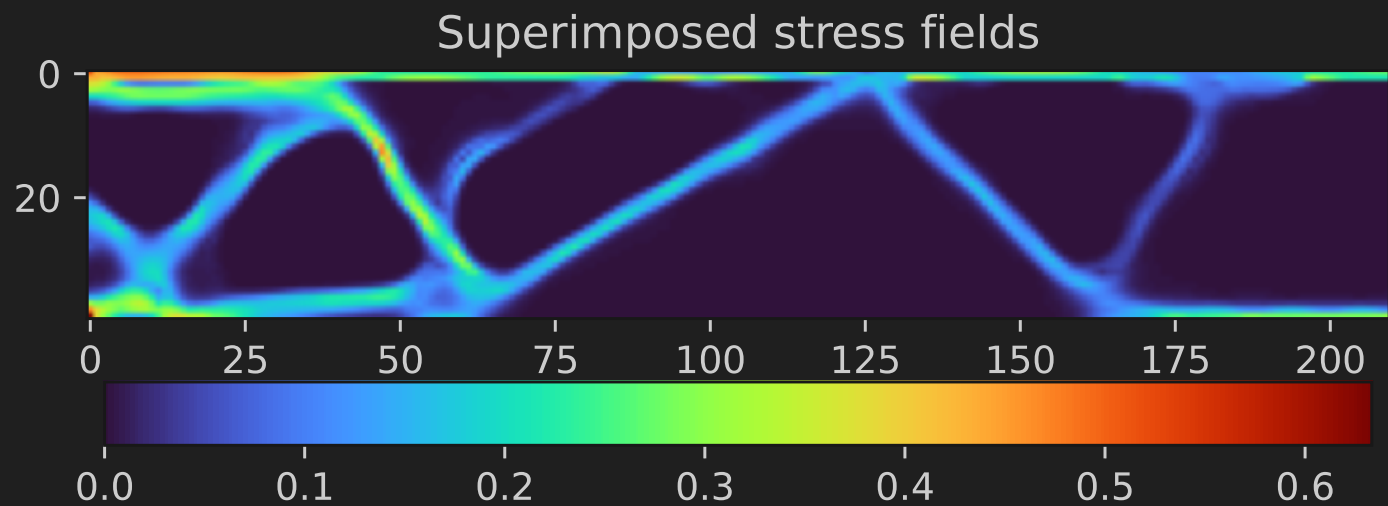
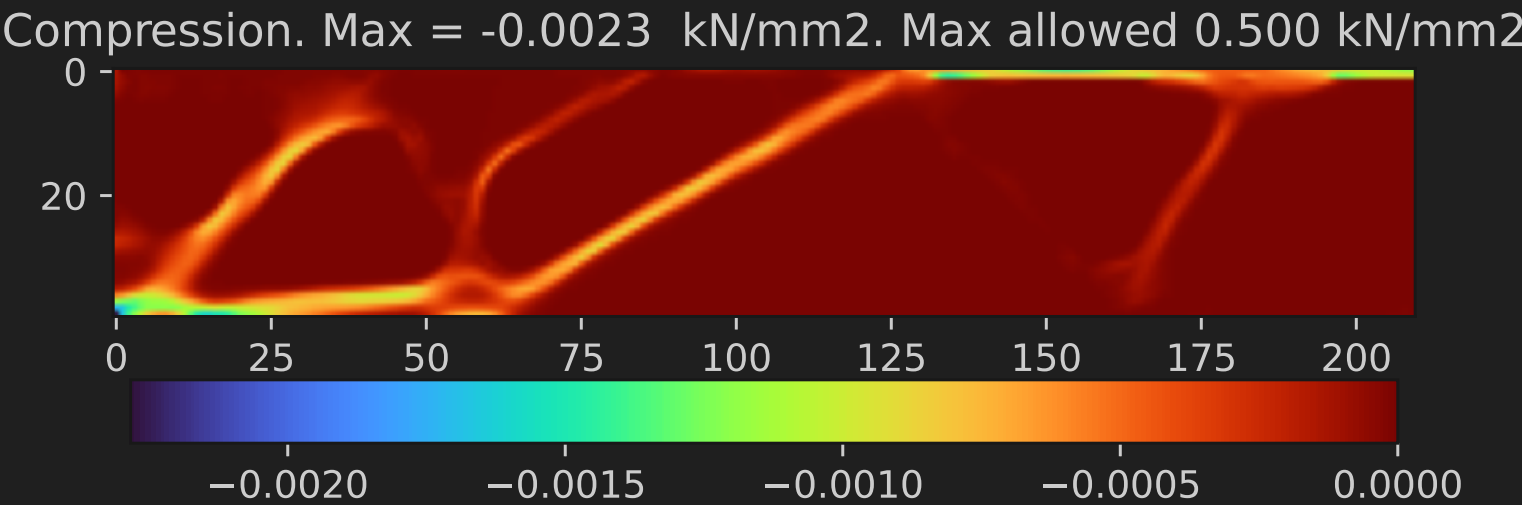
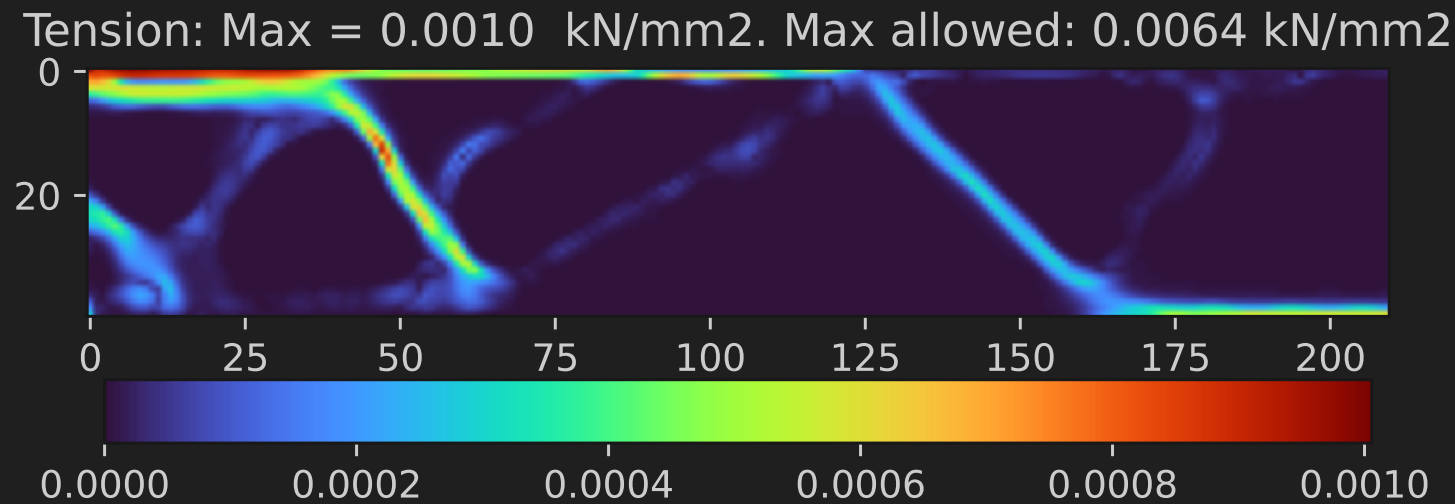
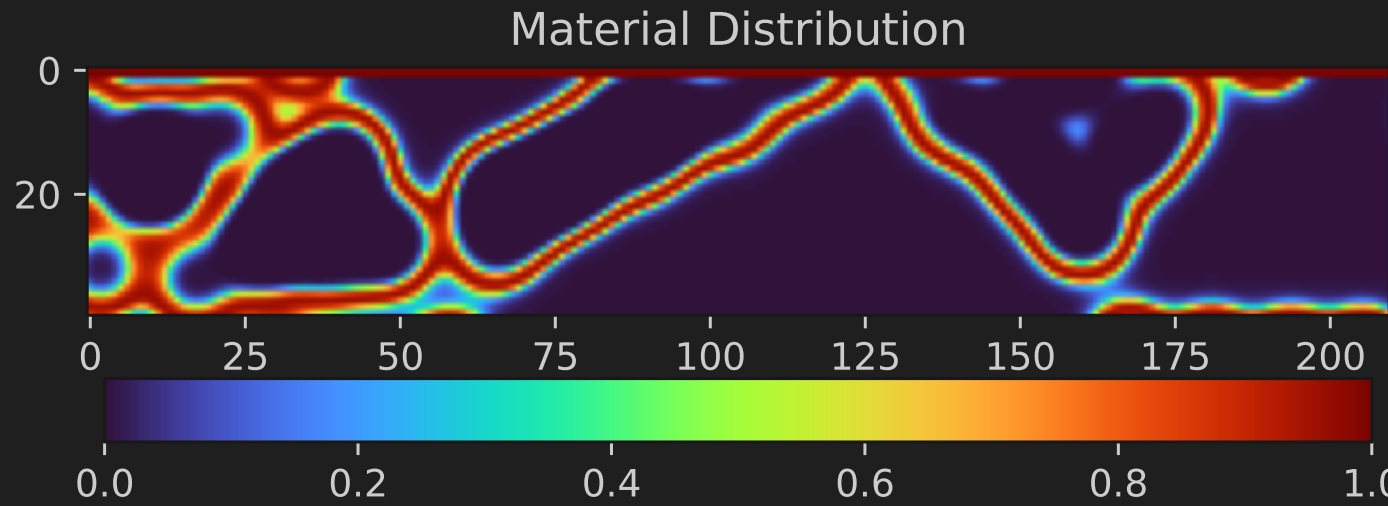
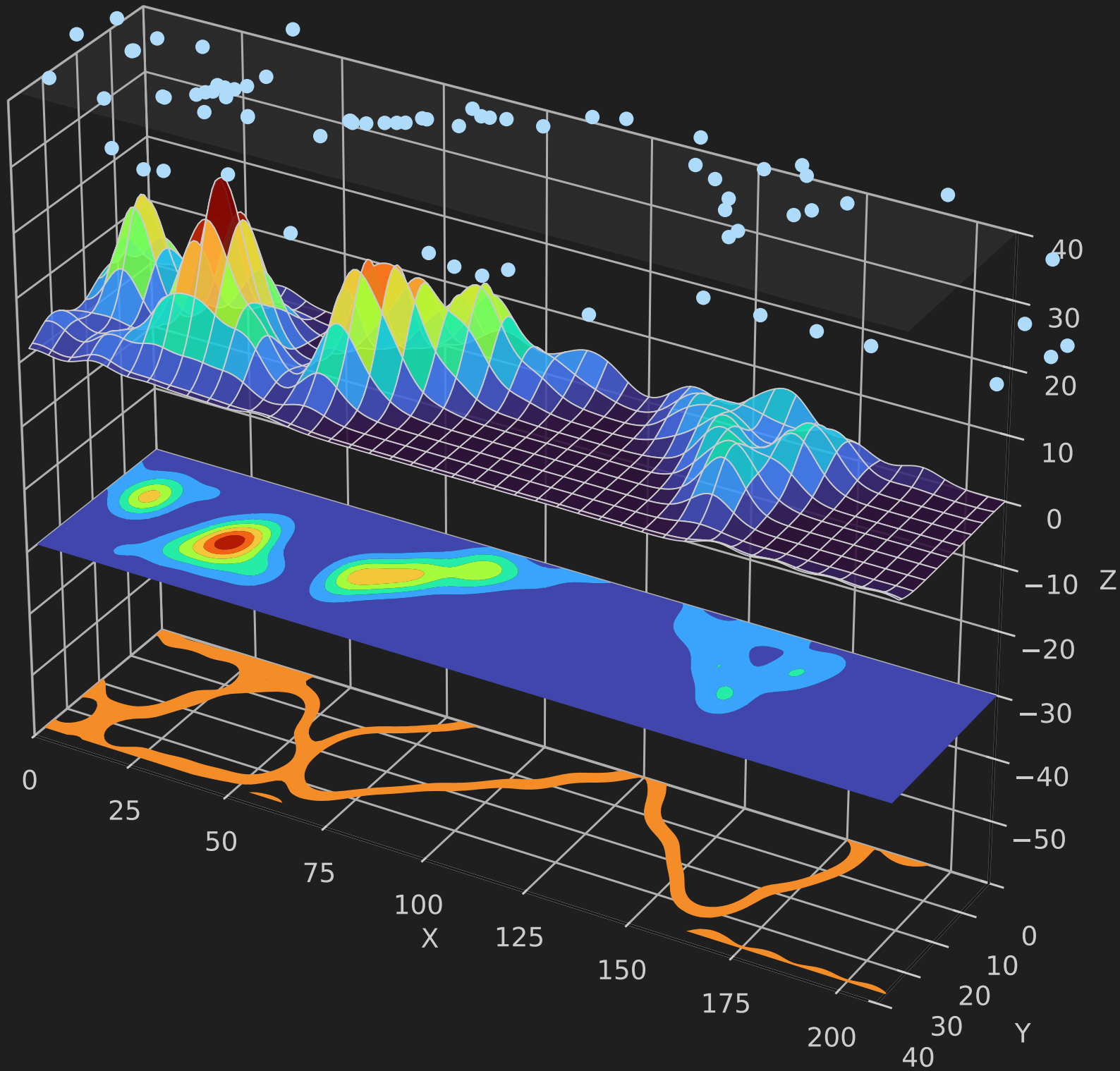
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.28 Shift = 1.79 Iteration = 253



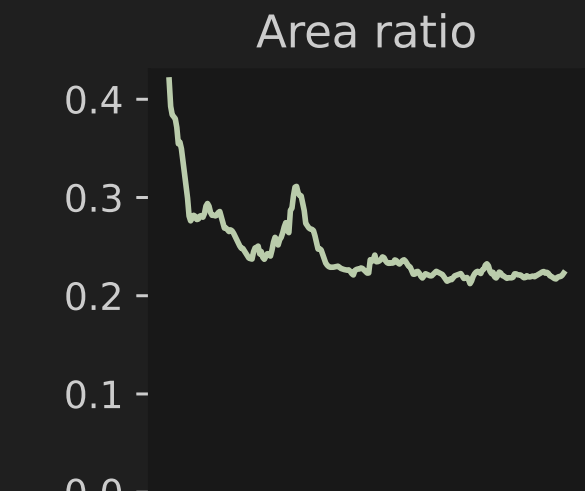
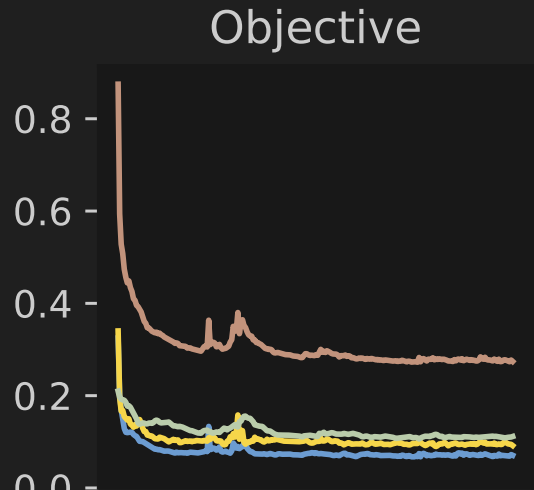
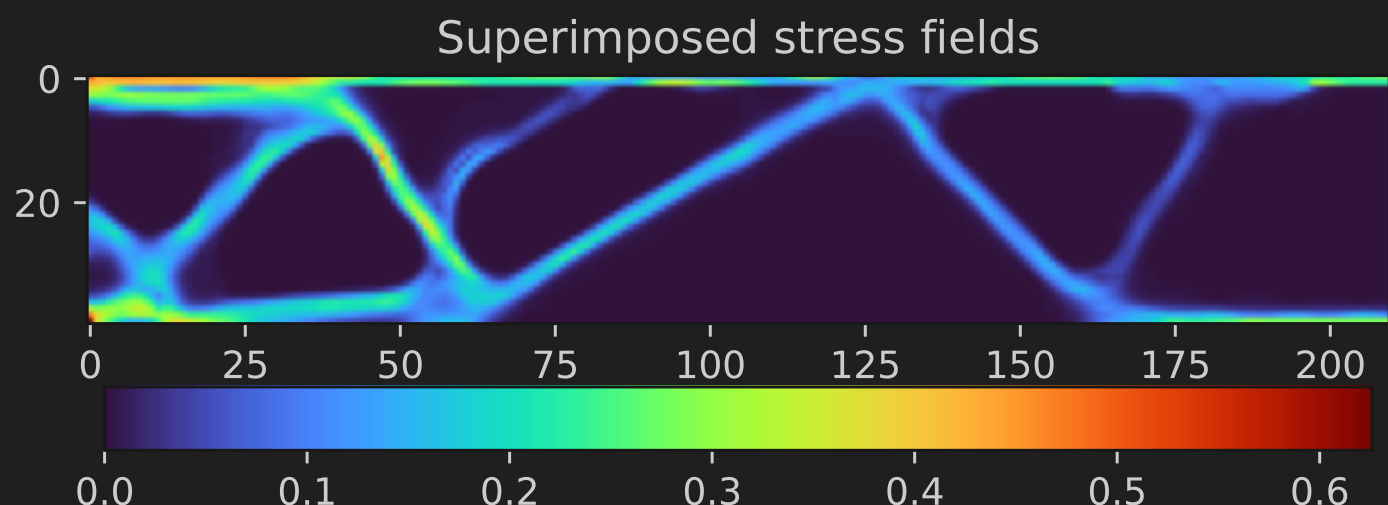
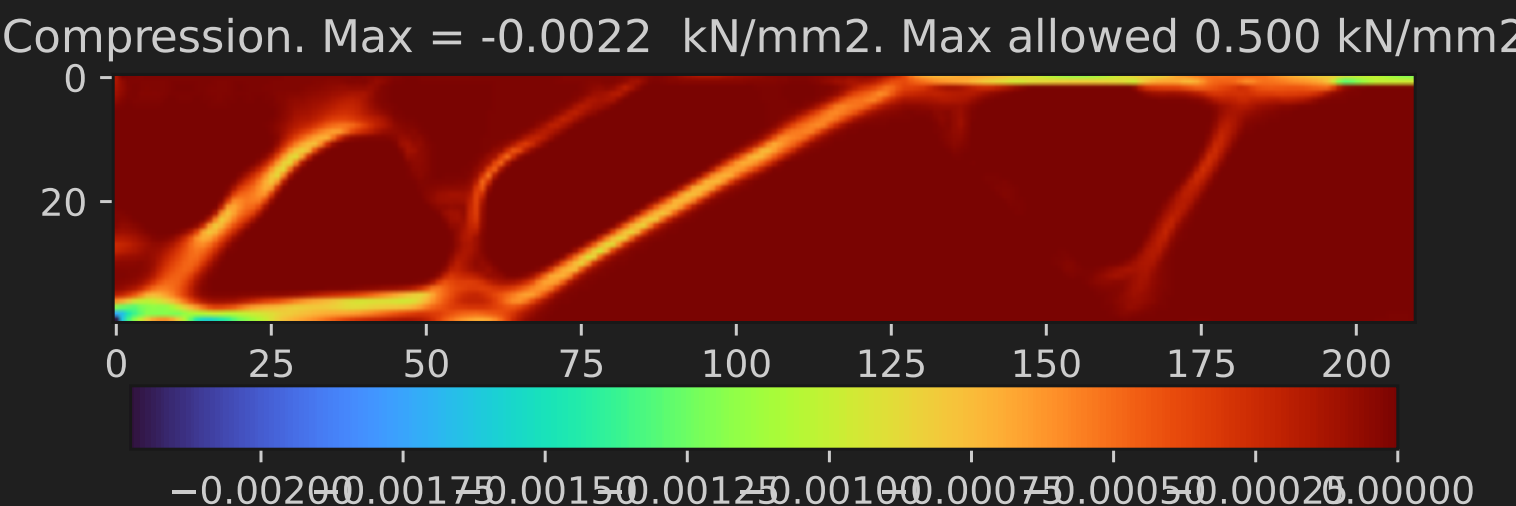
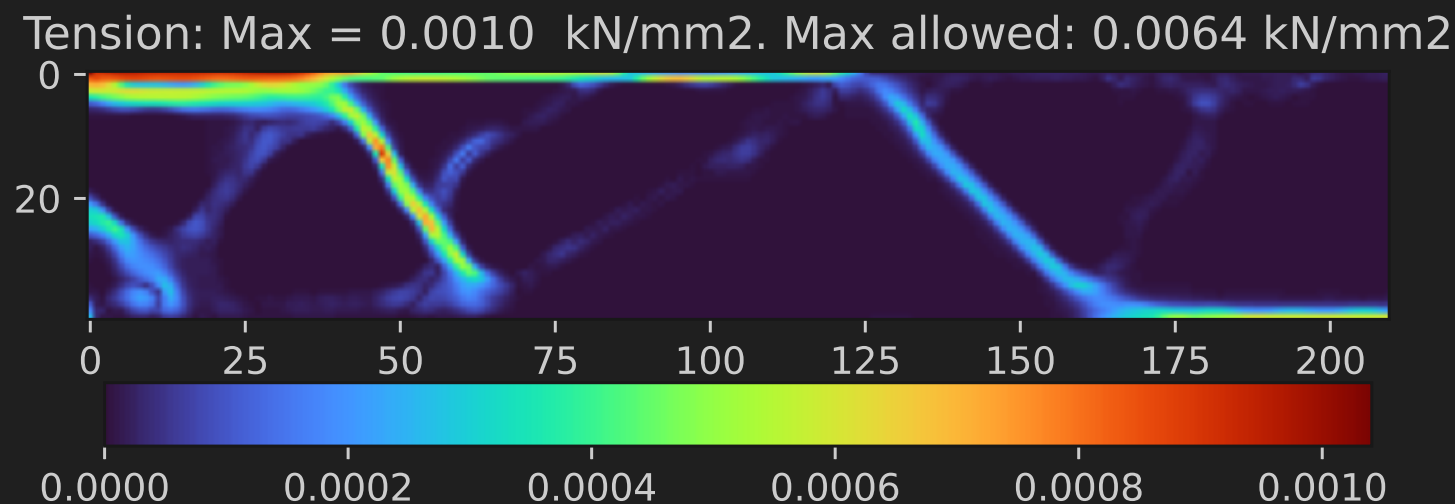
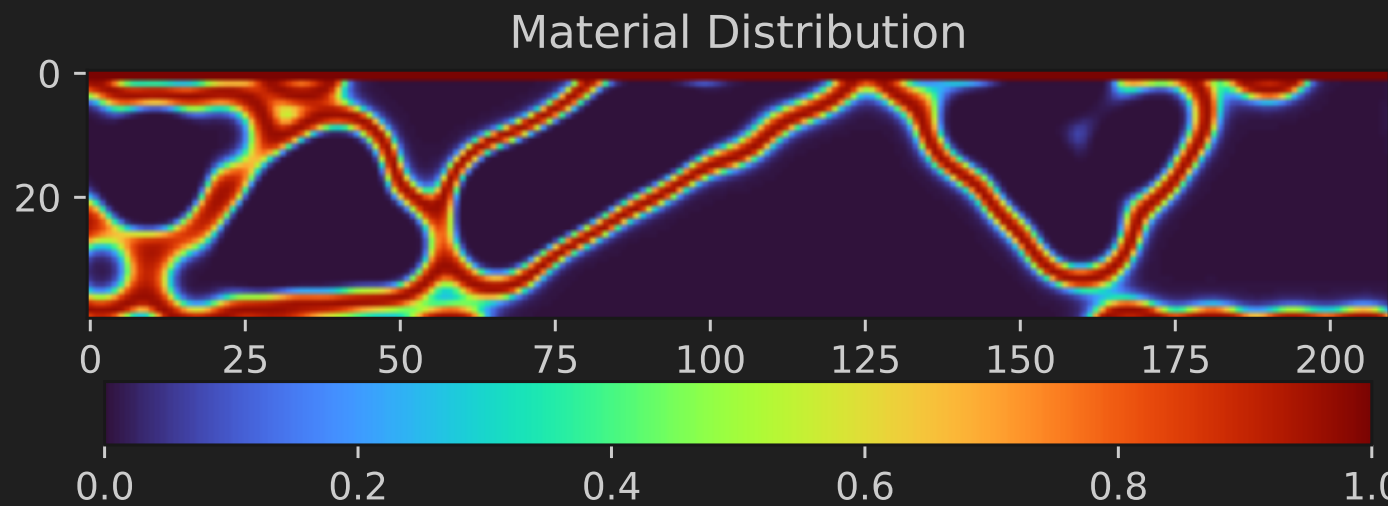
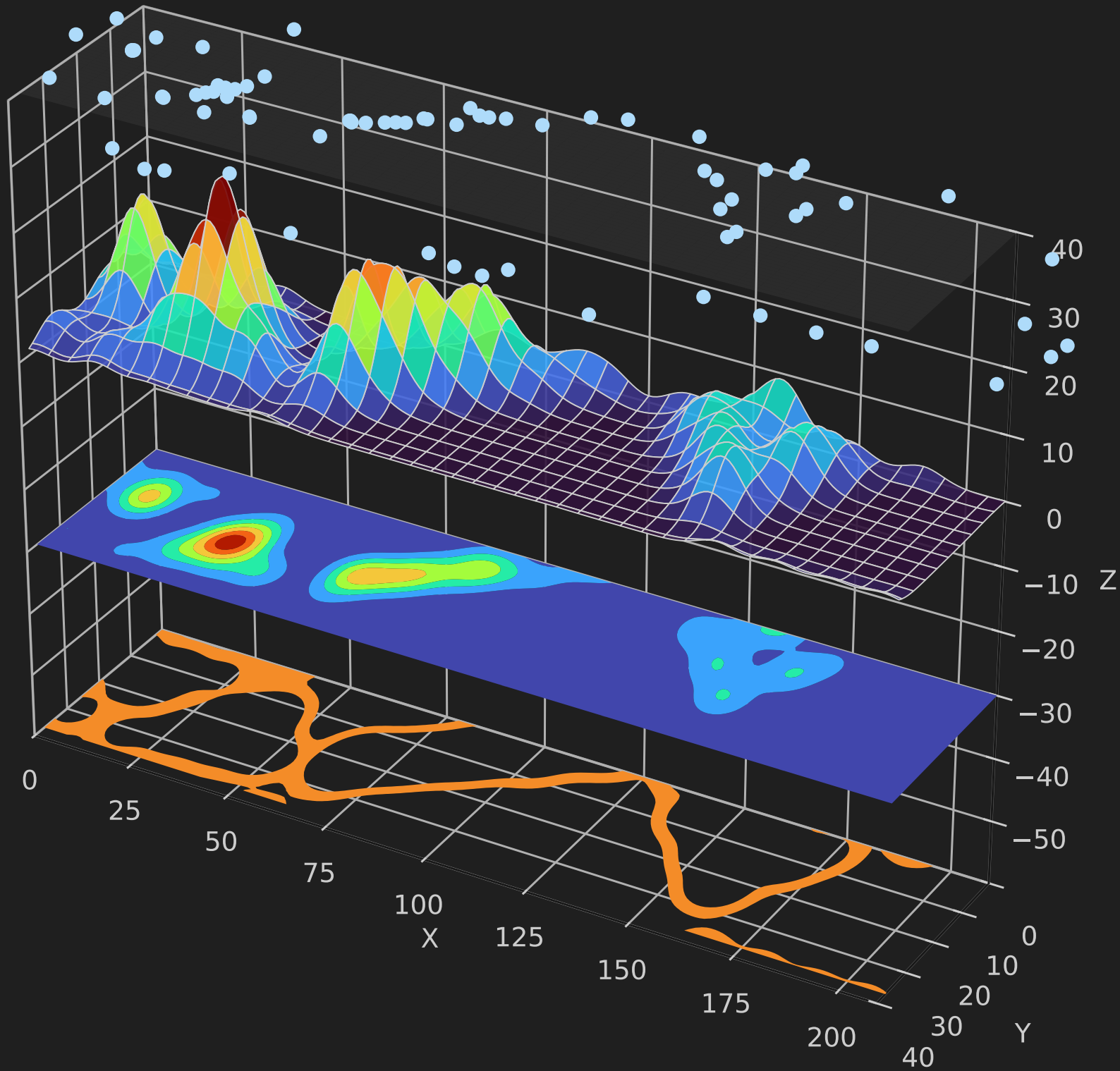
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.30 Shift = 1.79 Iteration = 255



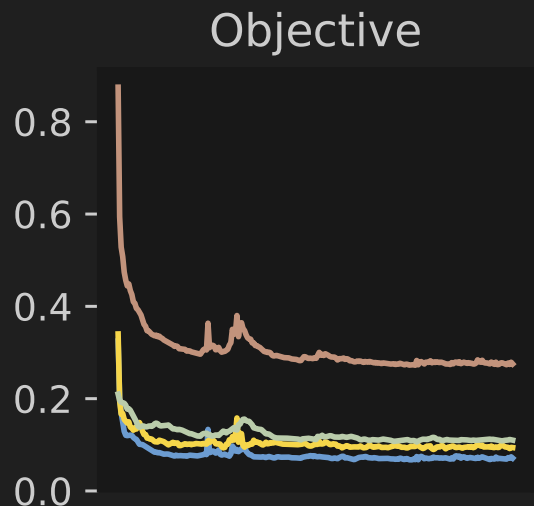
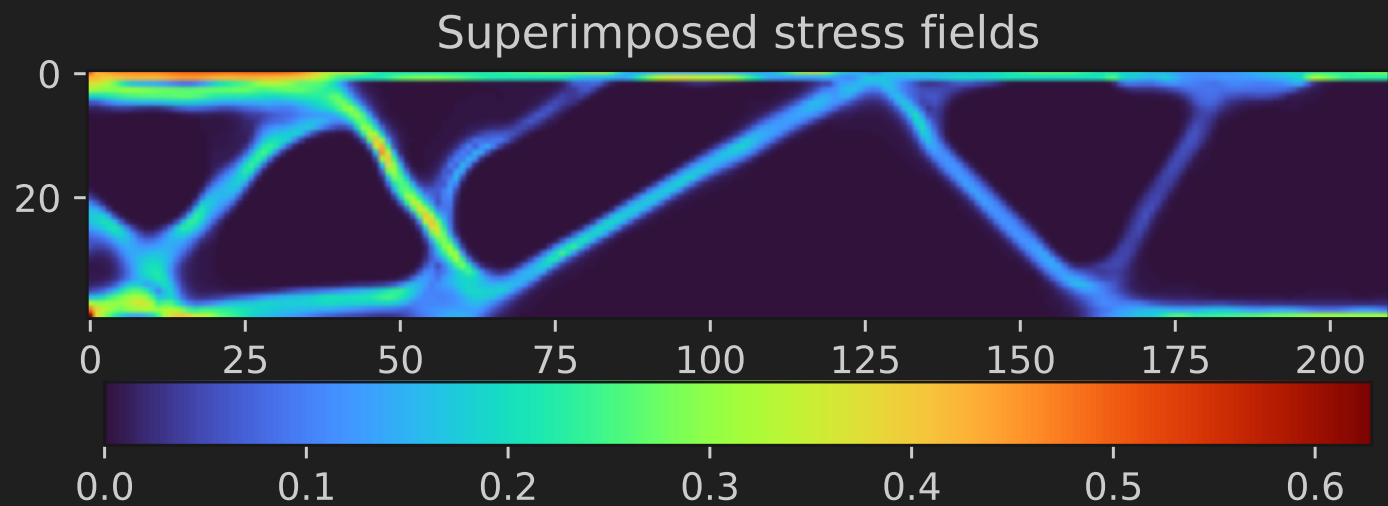
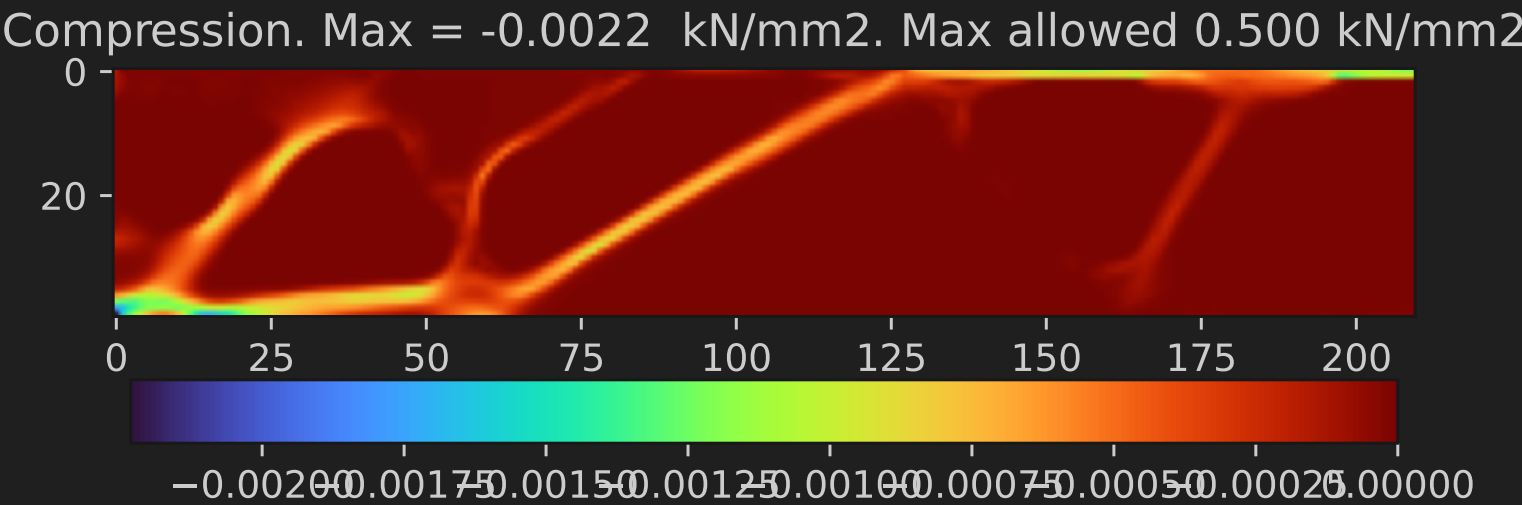
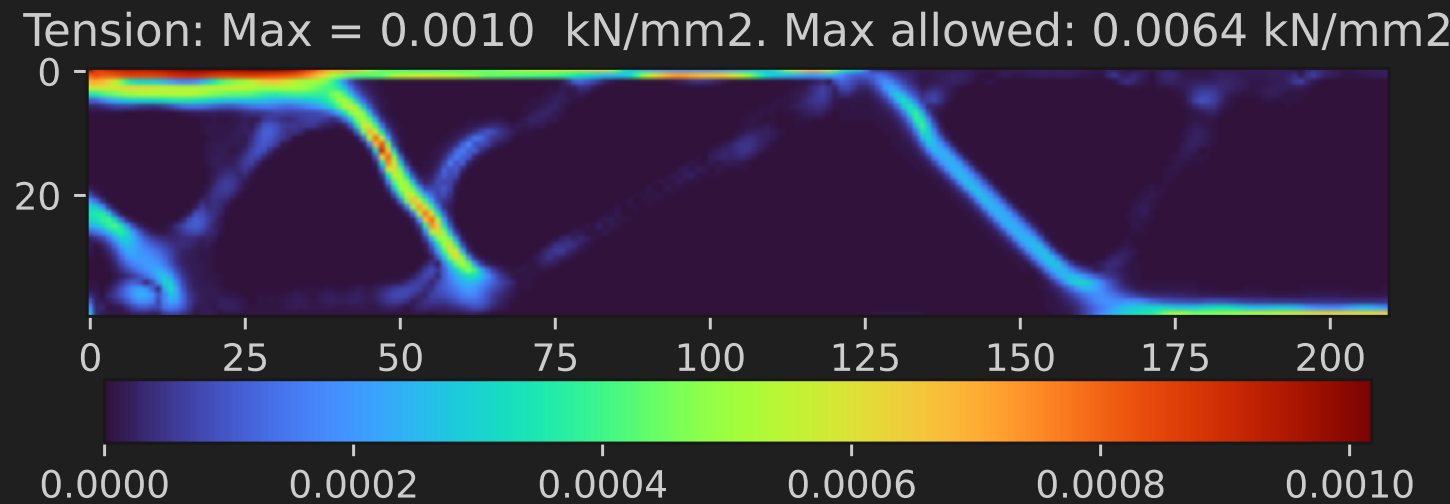
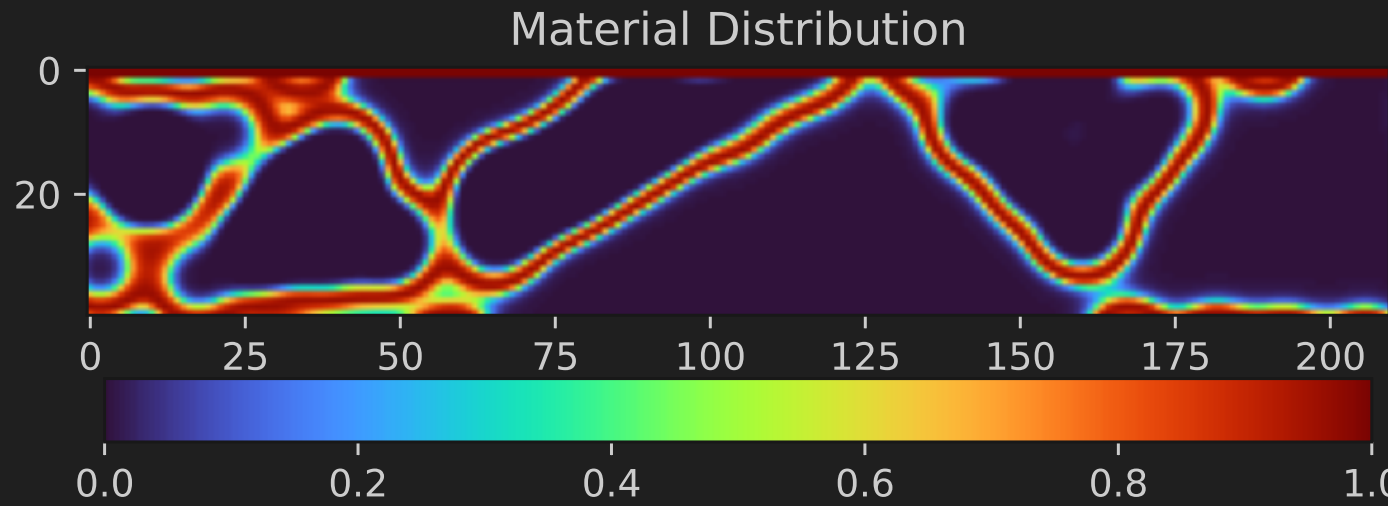
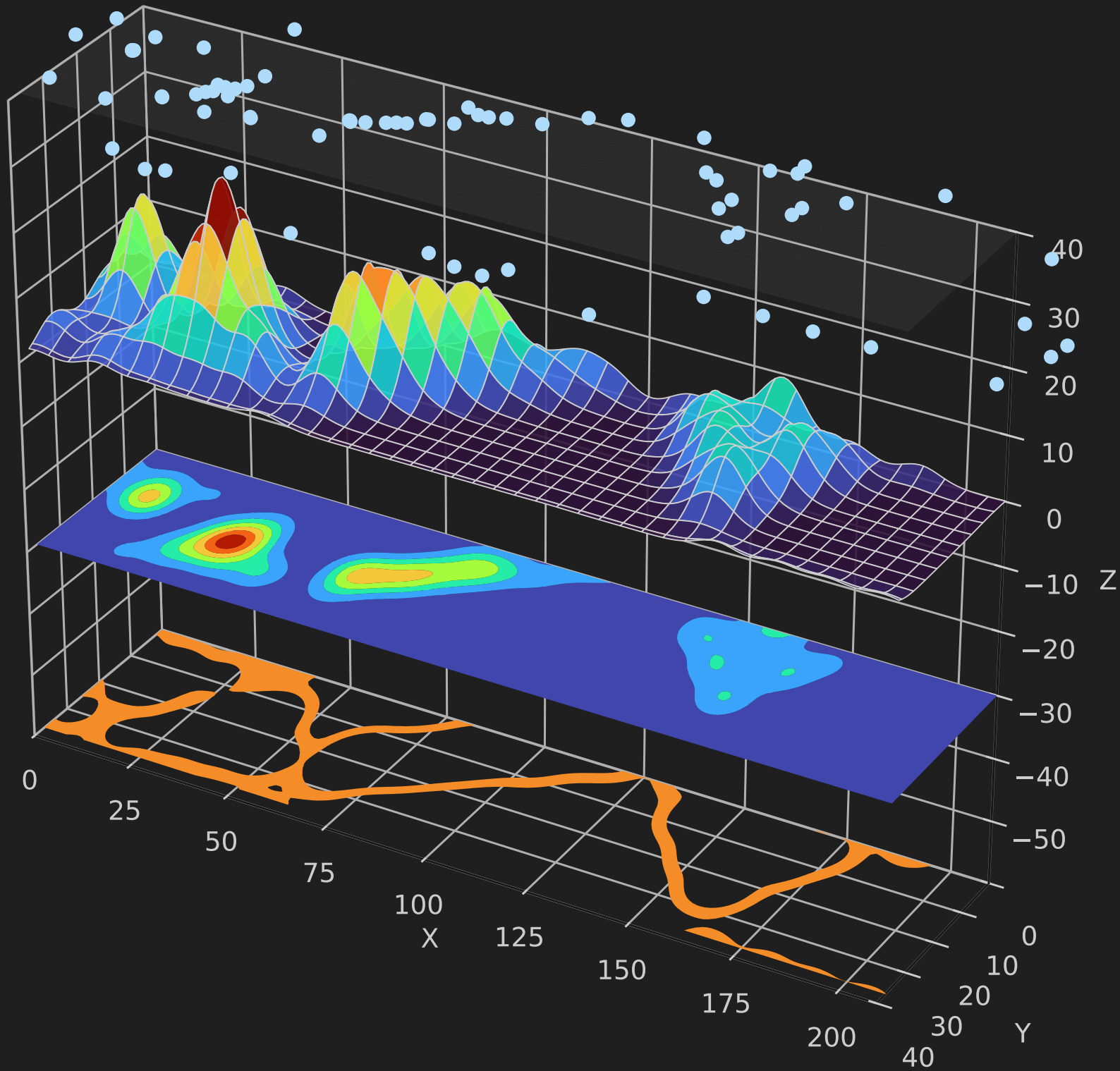
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.34 Shift = 1.81 Iteration = 257



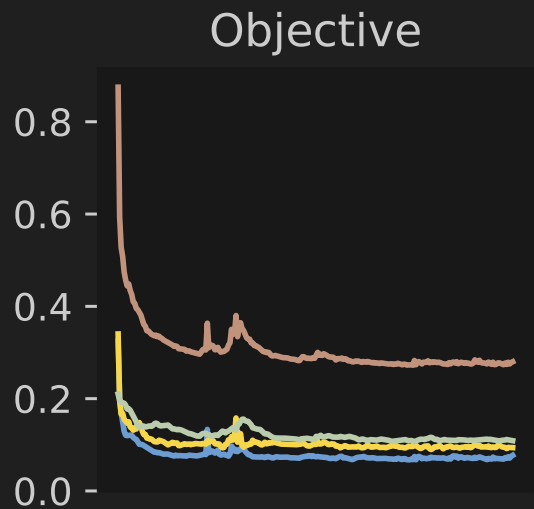
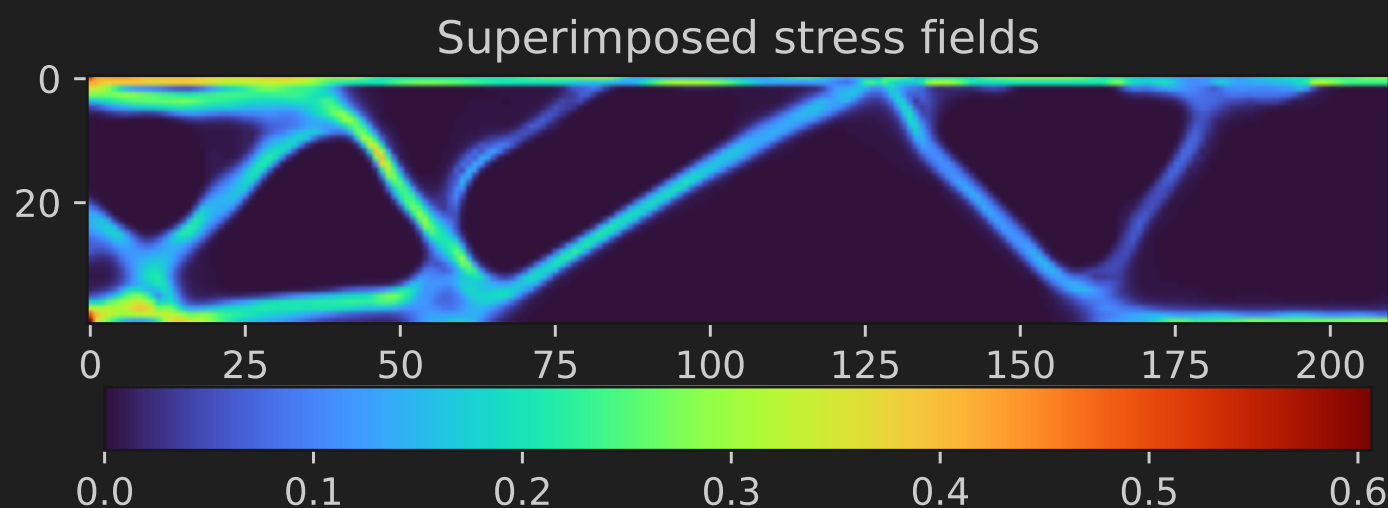
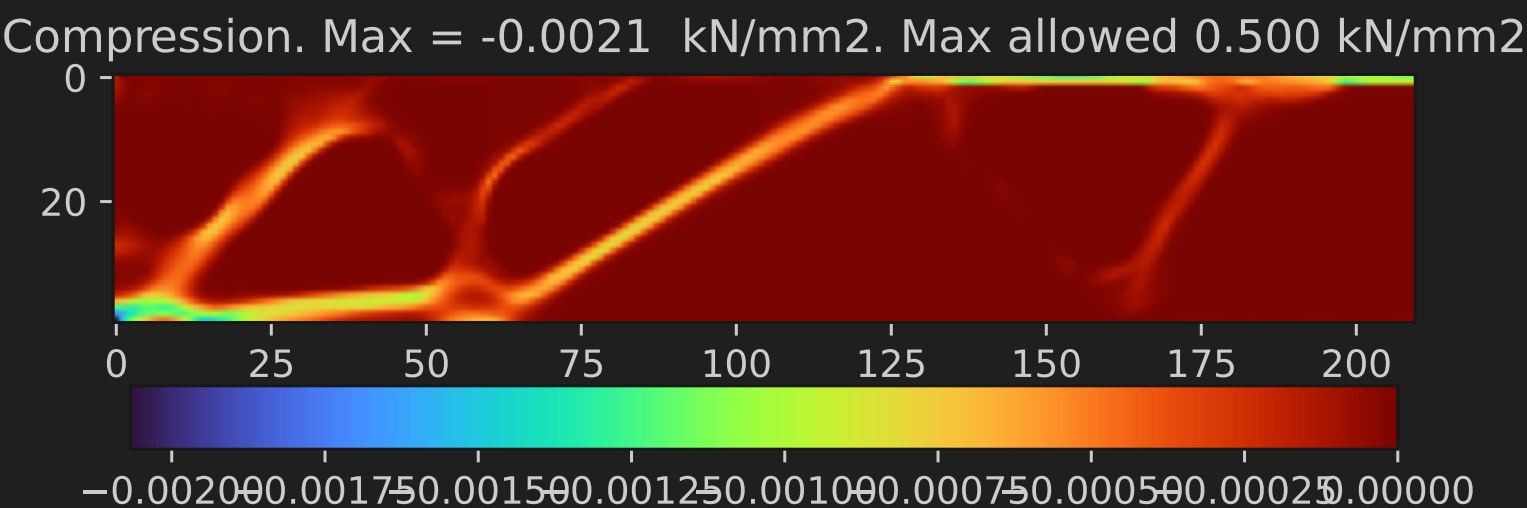
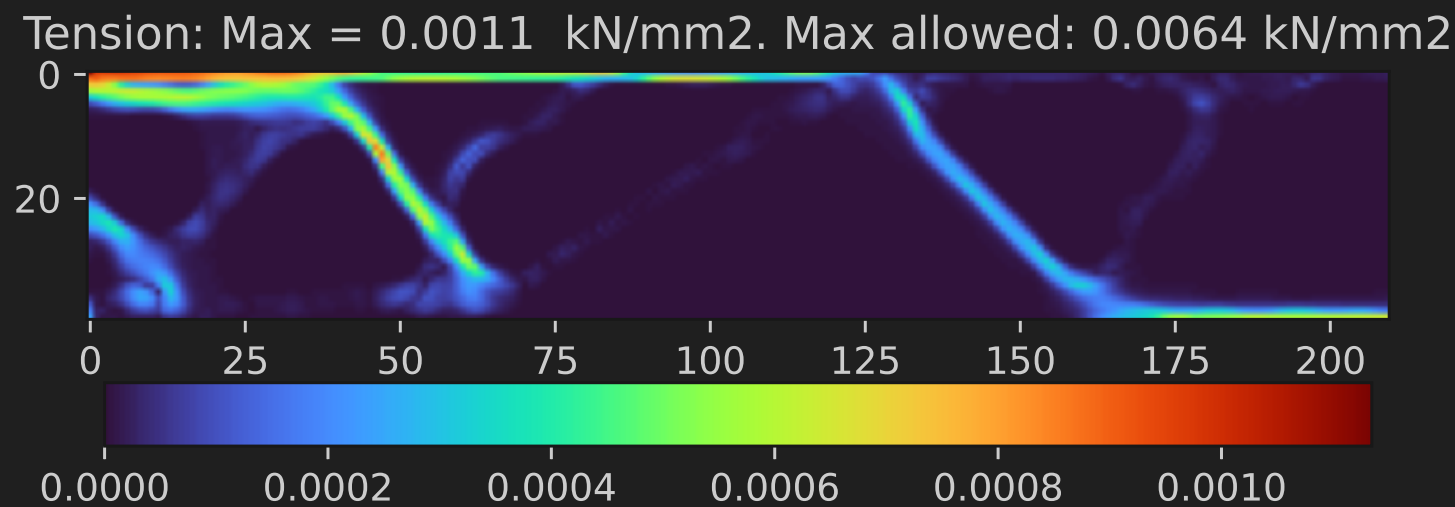
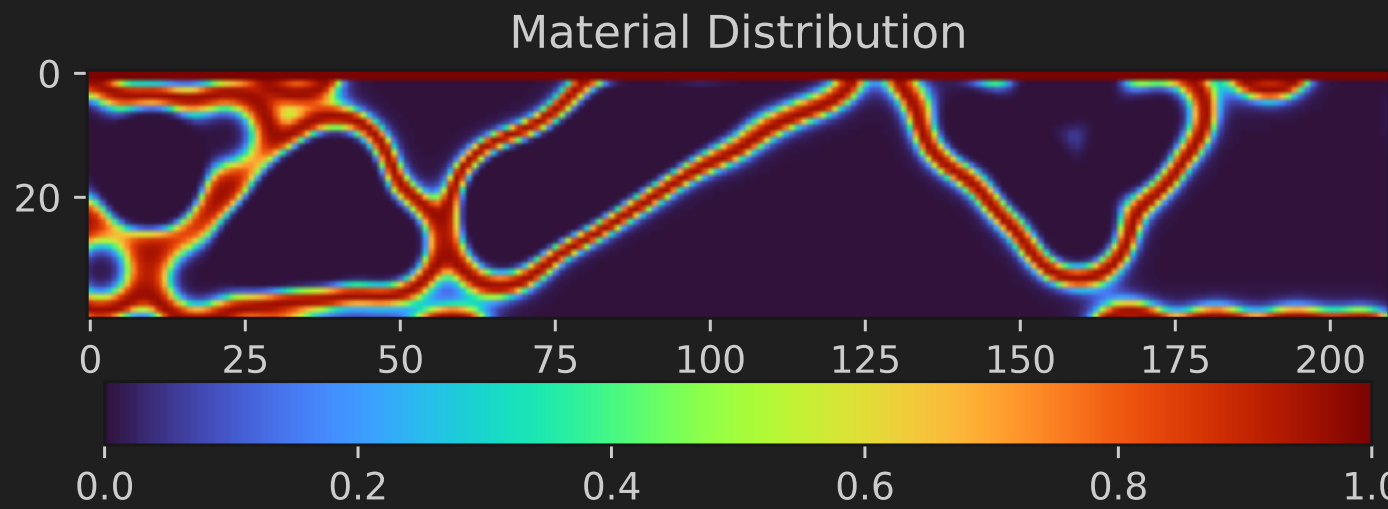
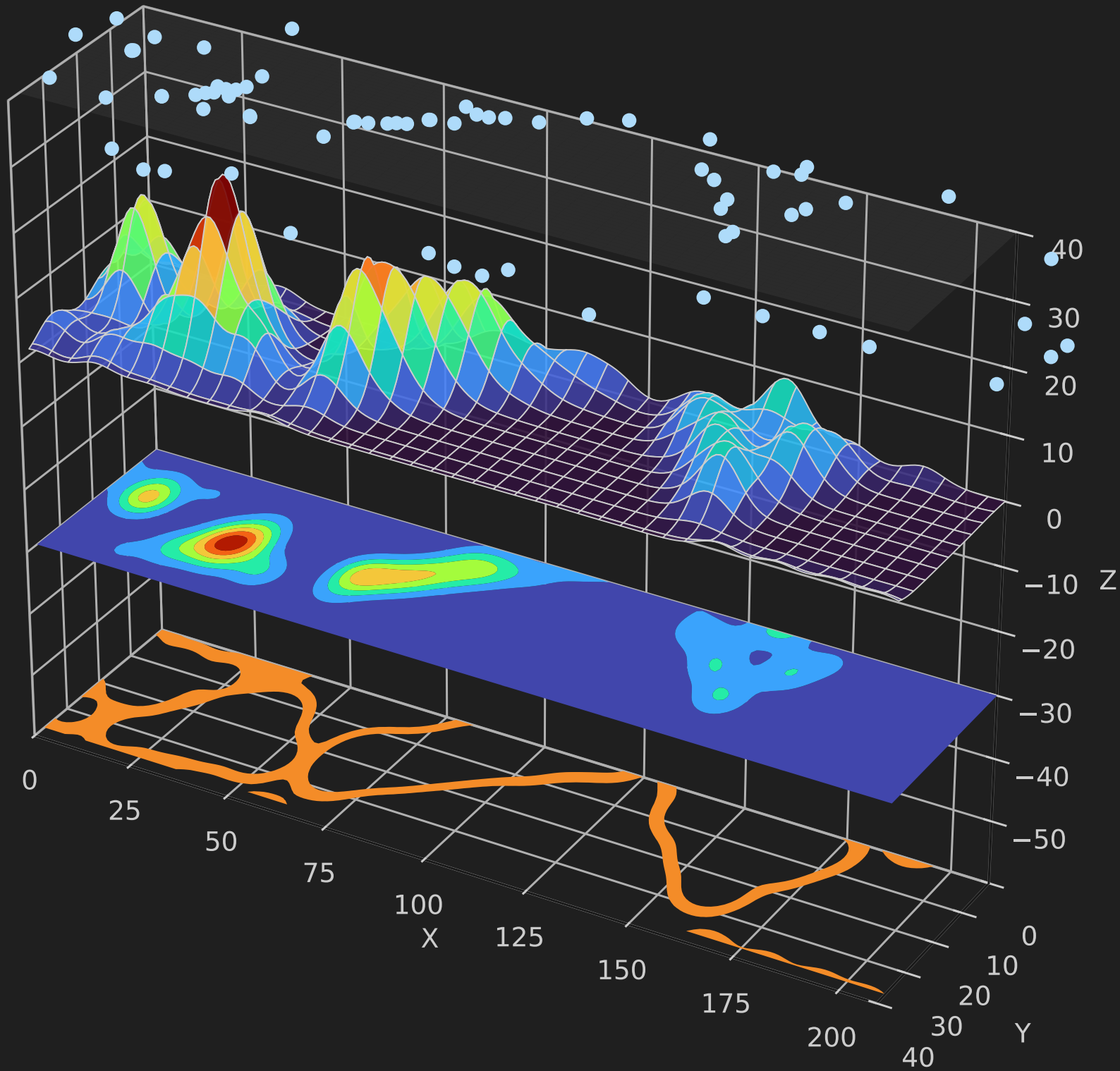
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.35 Shift = 1.79 Iteration = 259



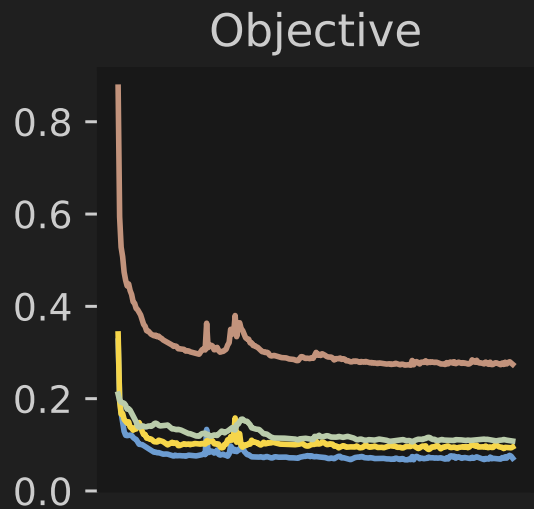
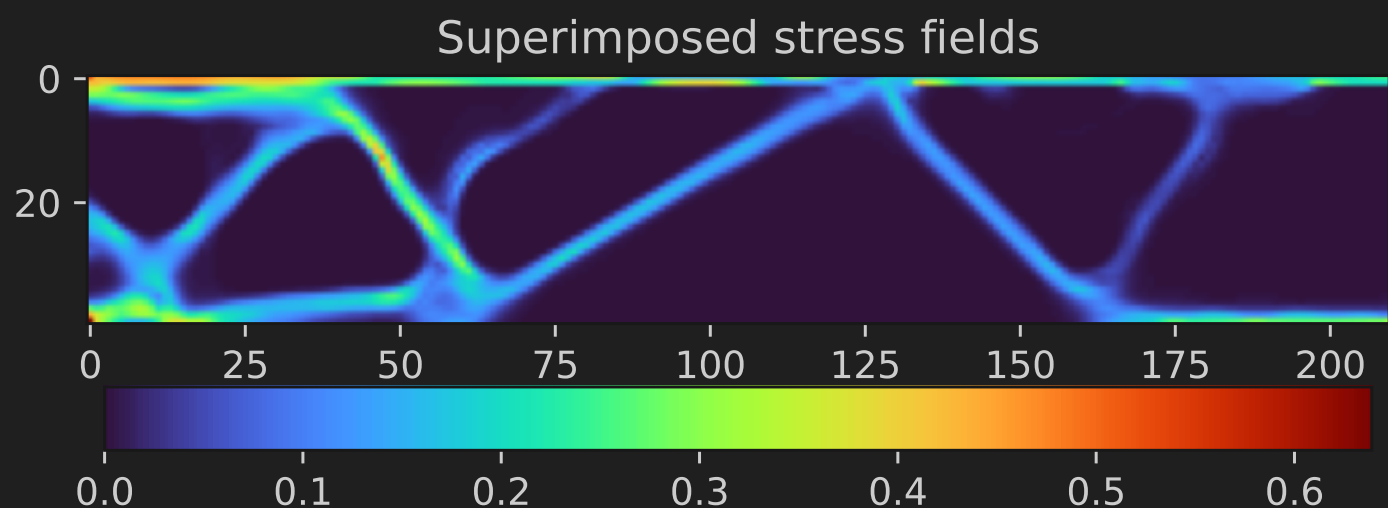
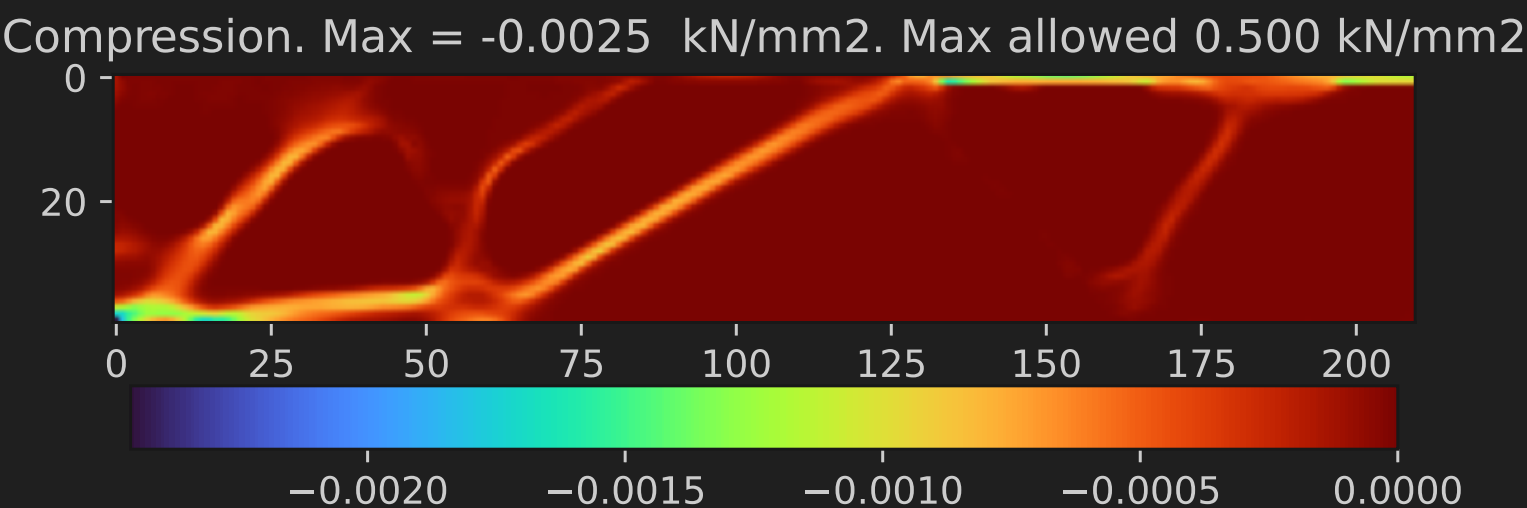
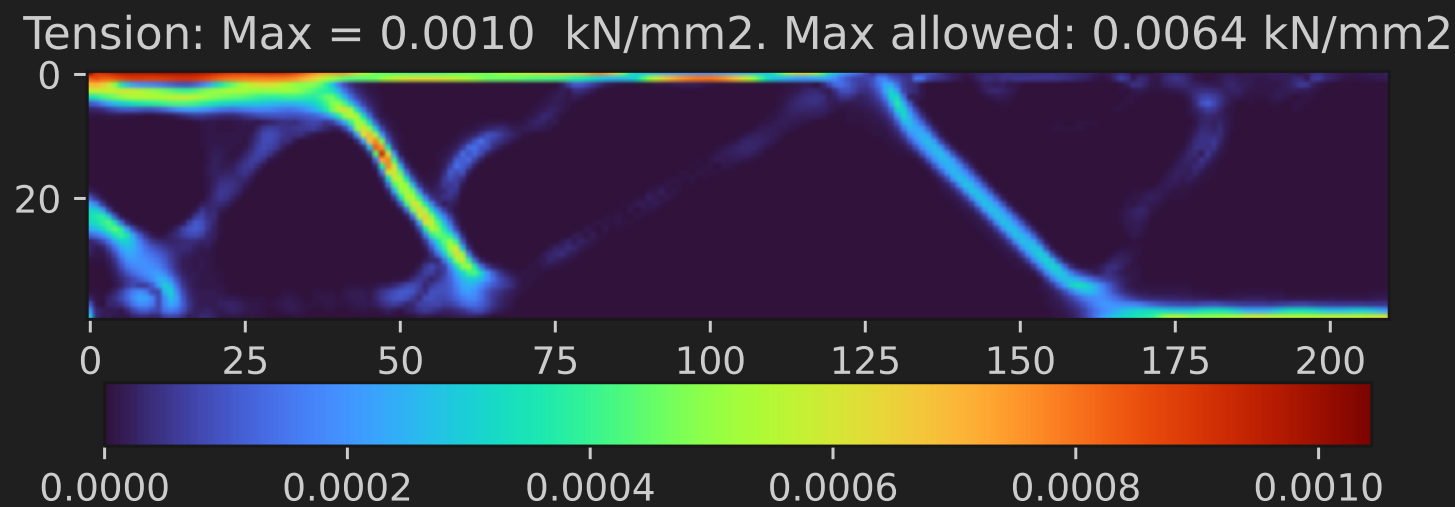
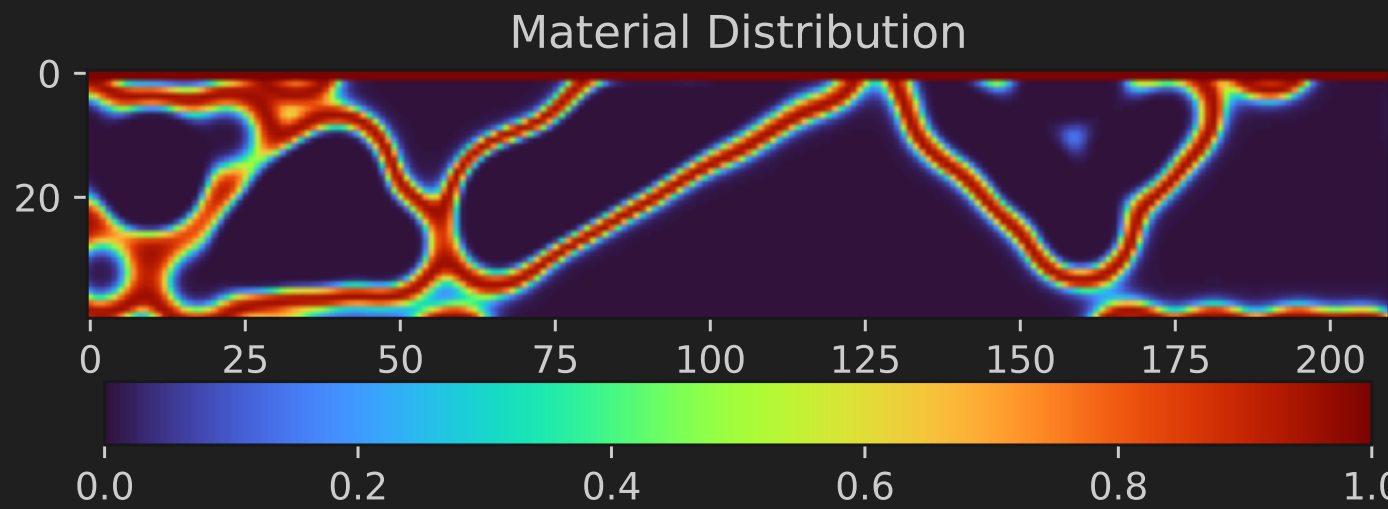
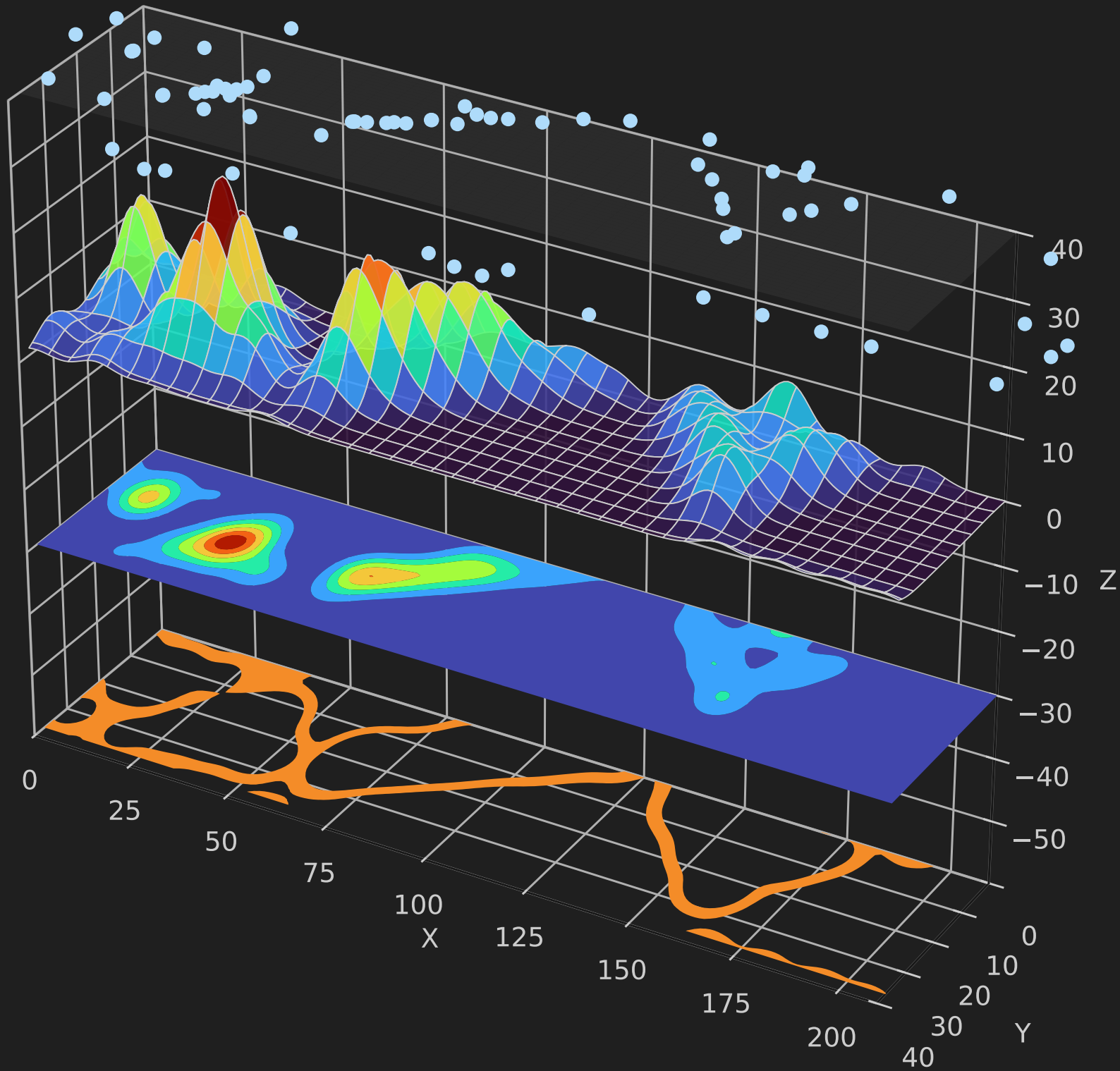
Objective = (Stress: 70 * 0.0011) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.28

Spread Gaussian = 6.27 Shift = 1.79 Iteration = 261



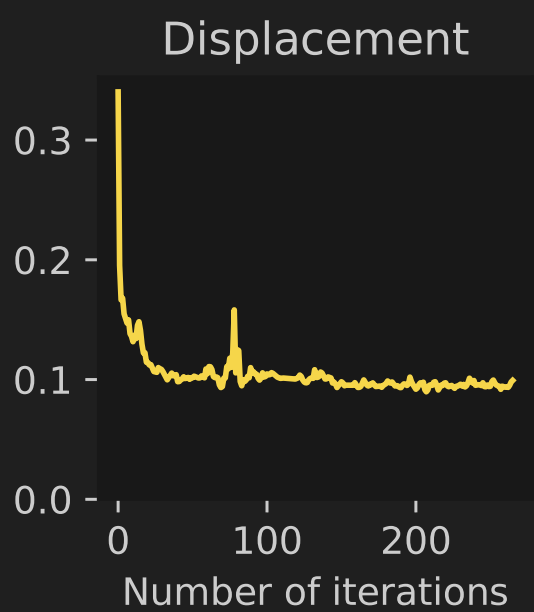
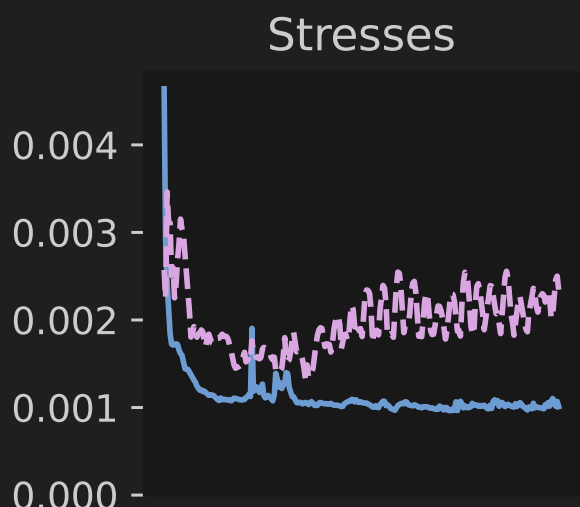
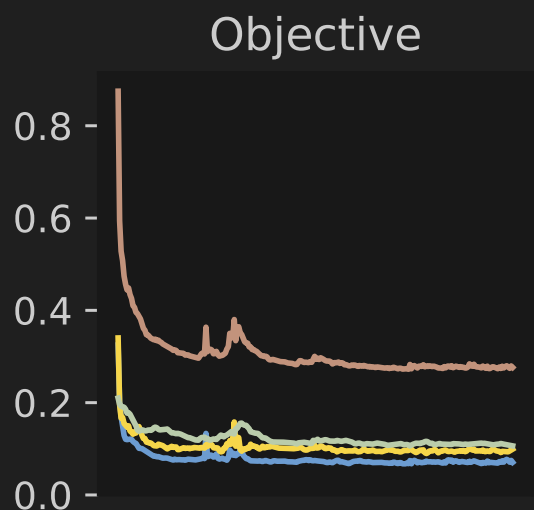
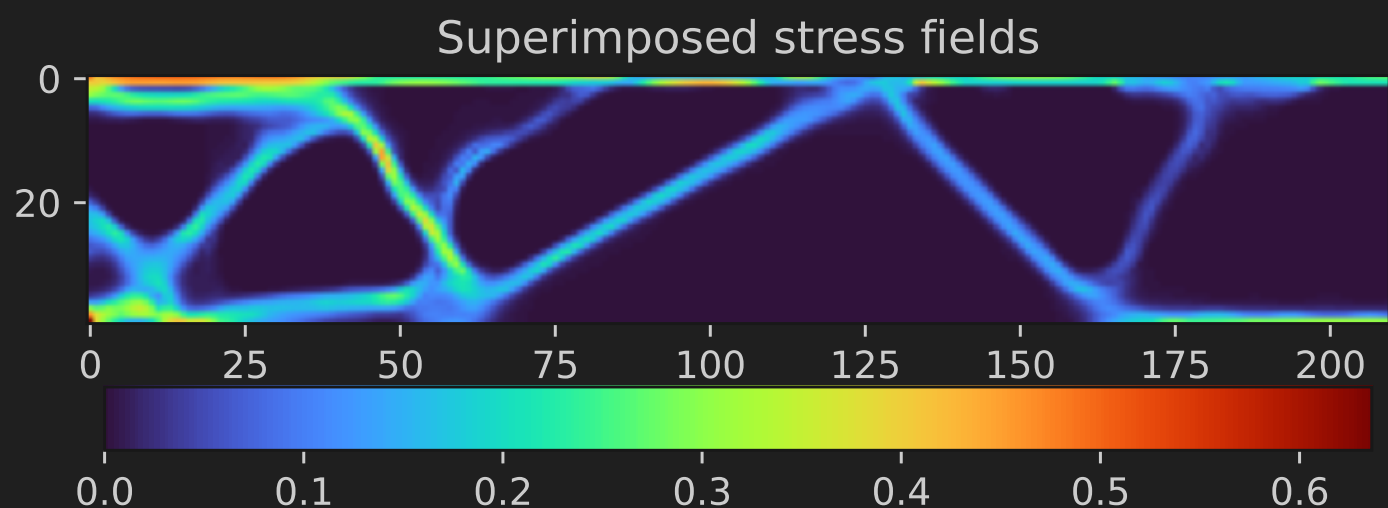
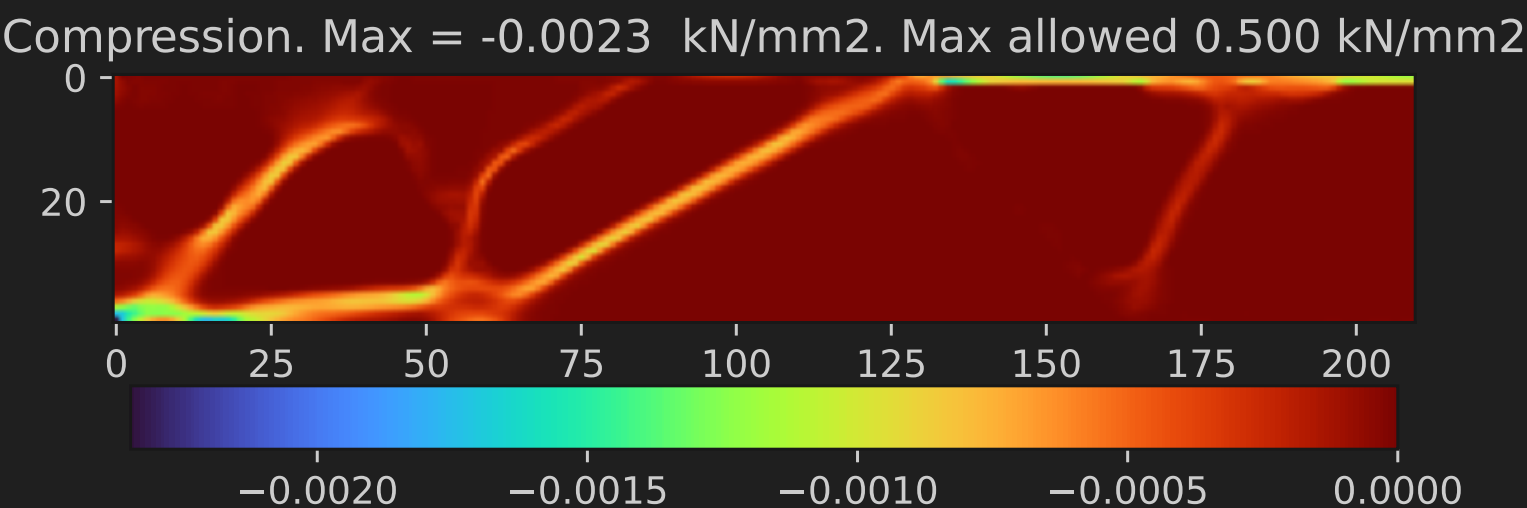
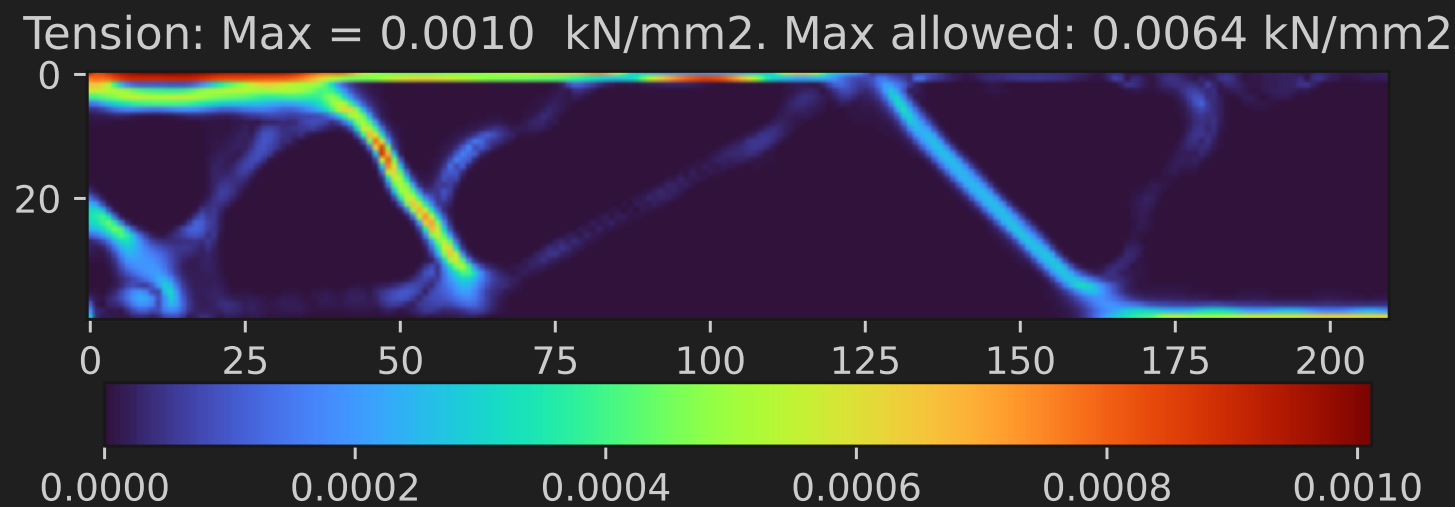
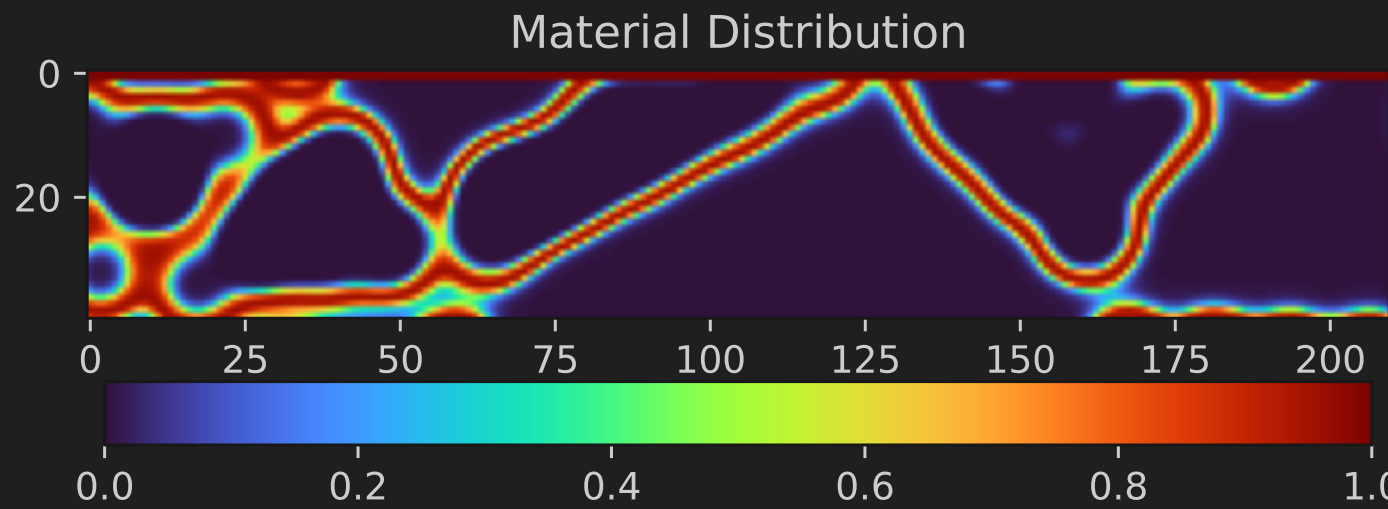
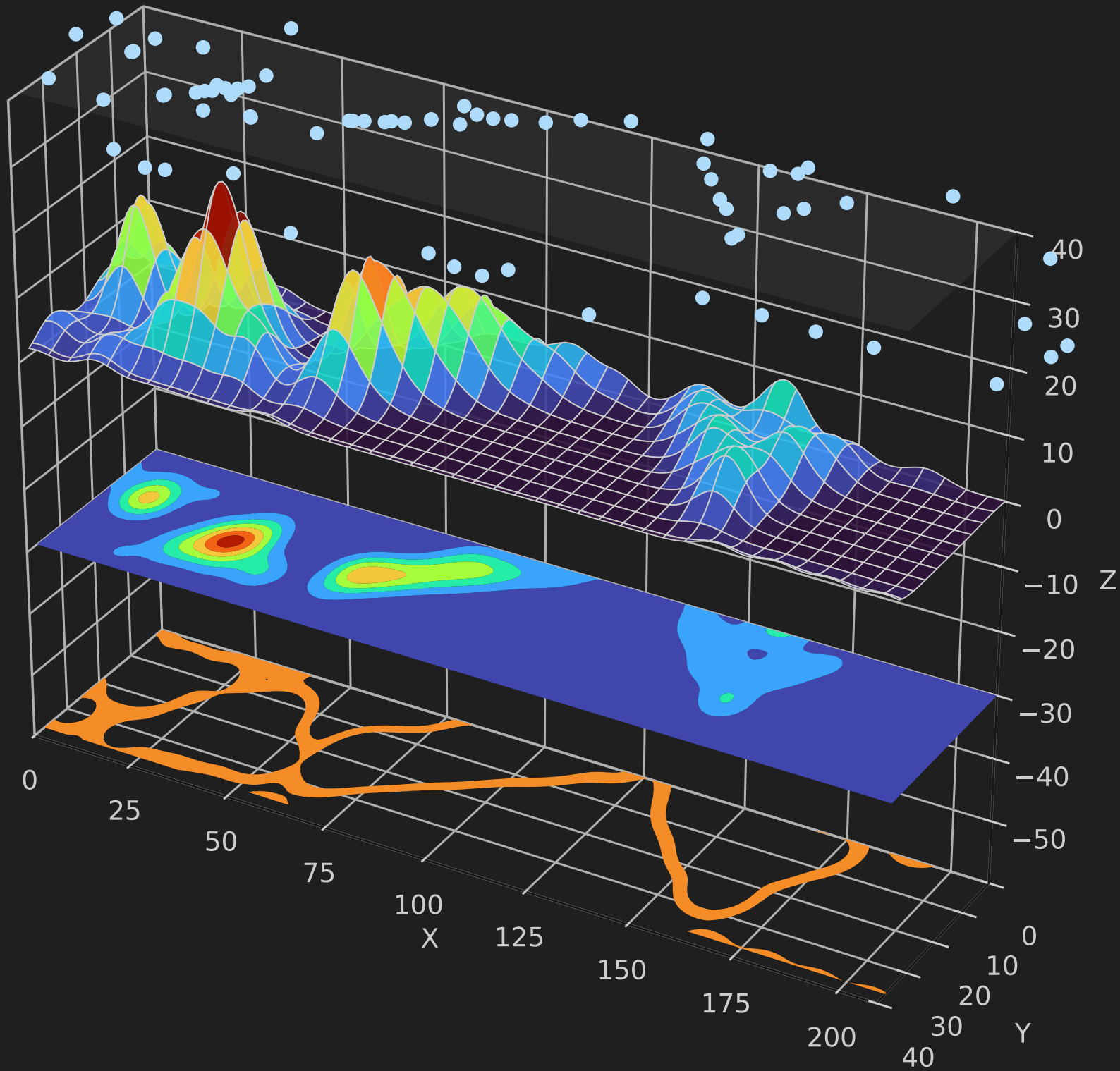
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.28 Shift = 1.75 Iteration = 263



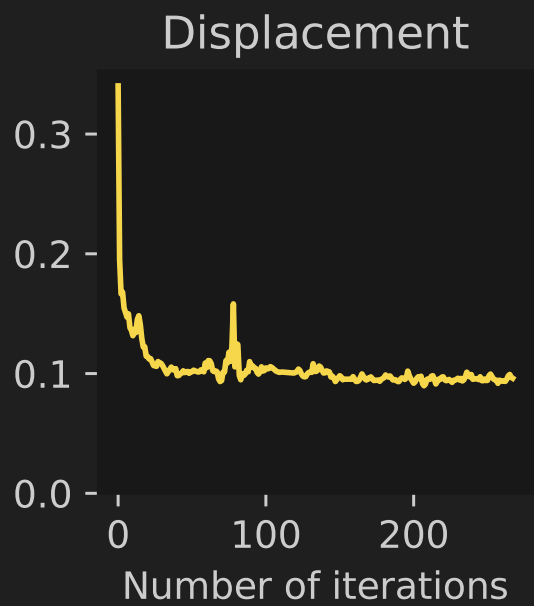
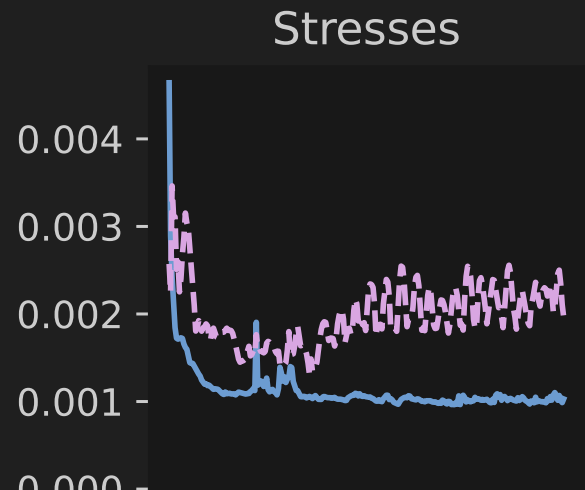
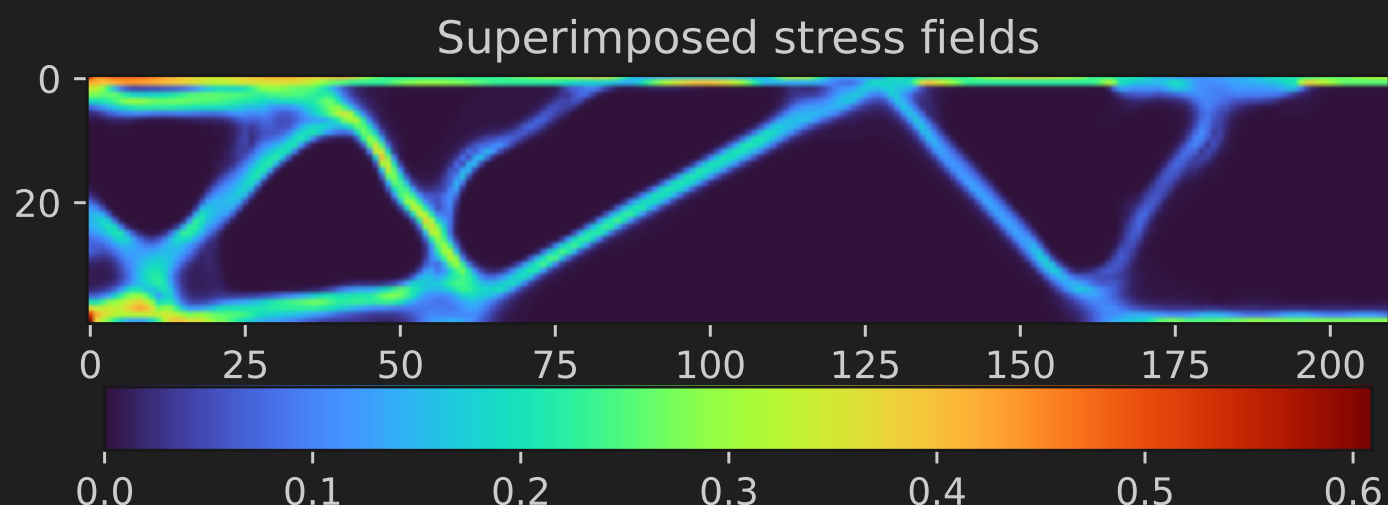
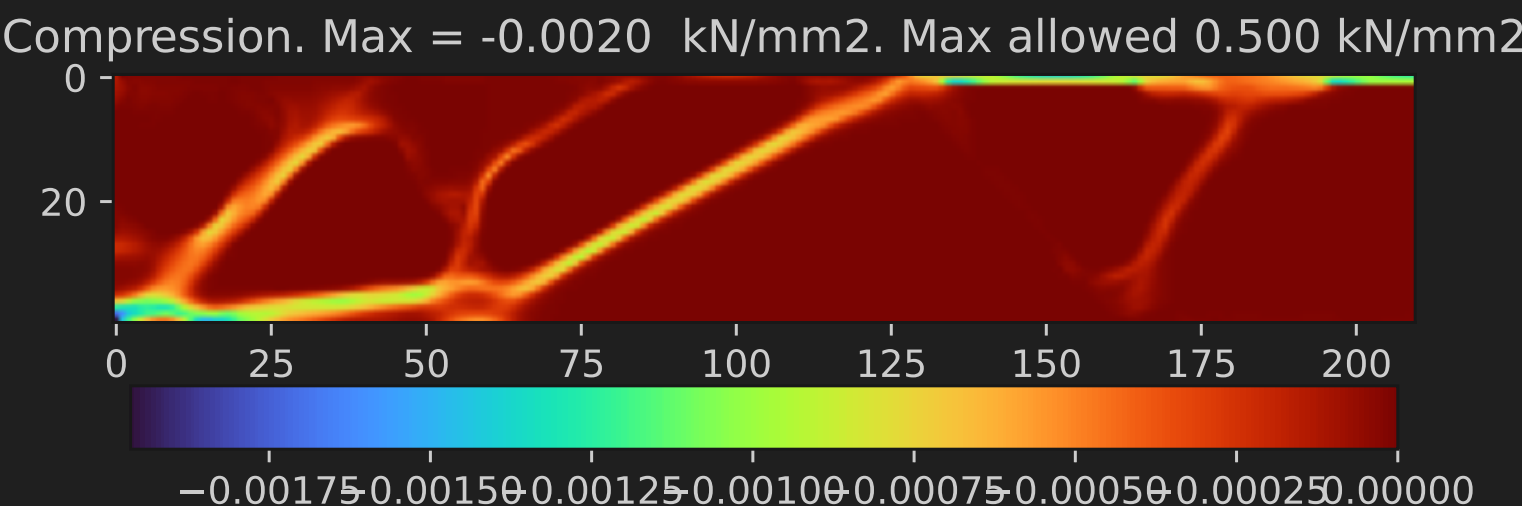
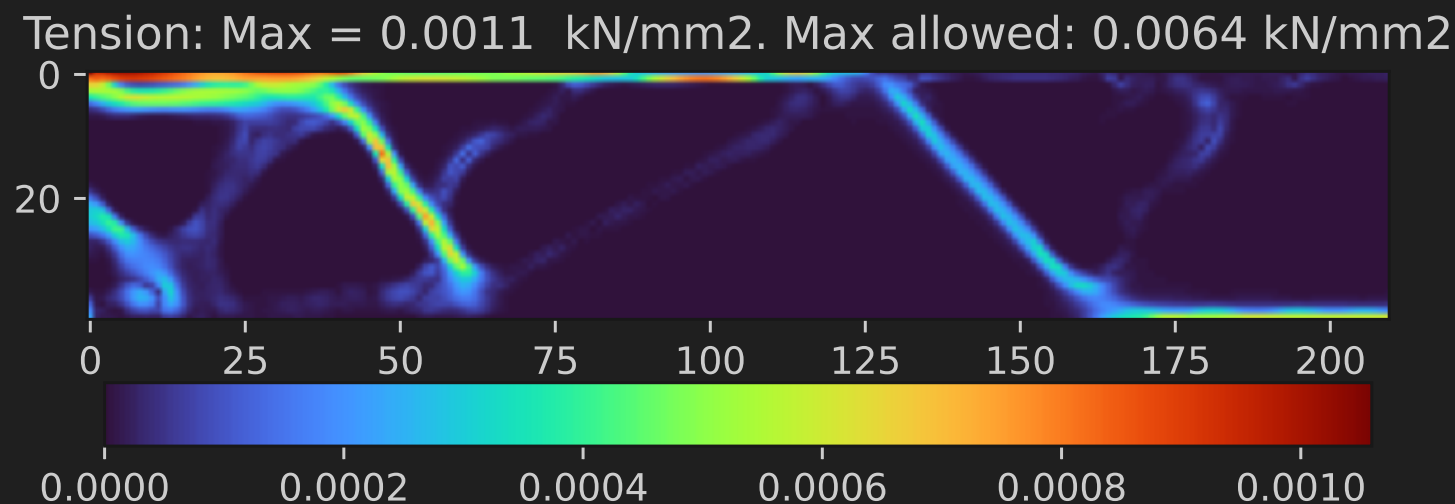
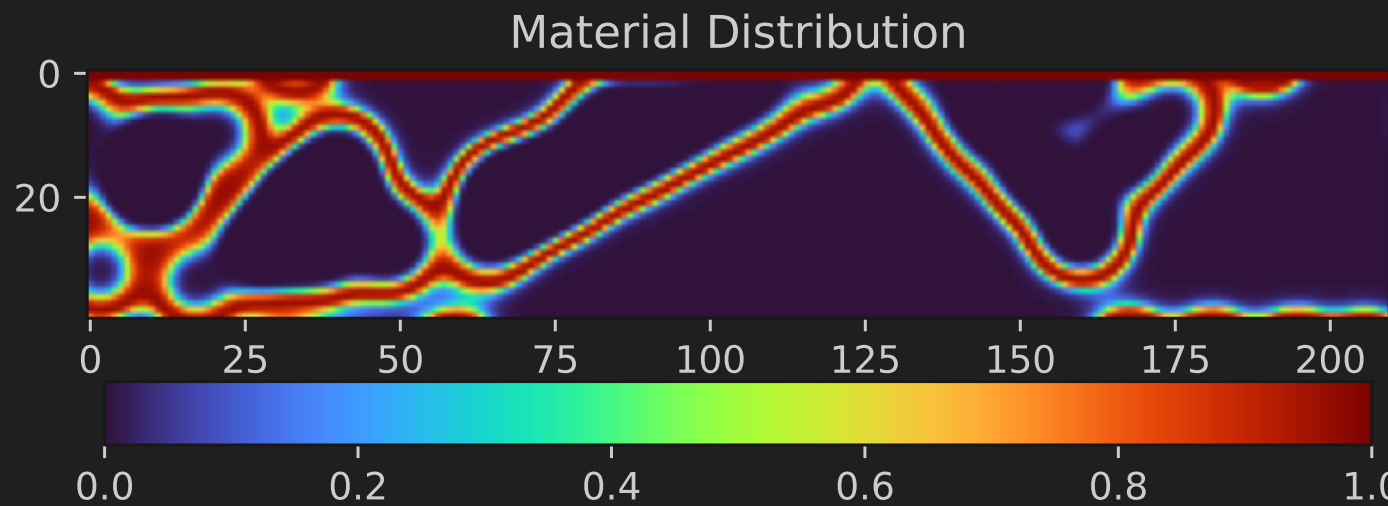
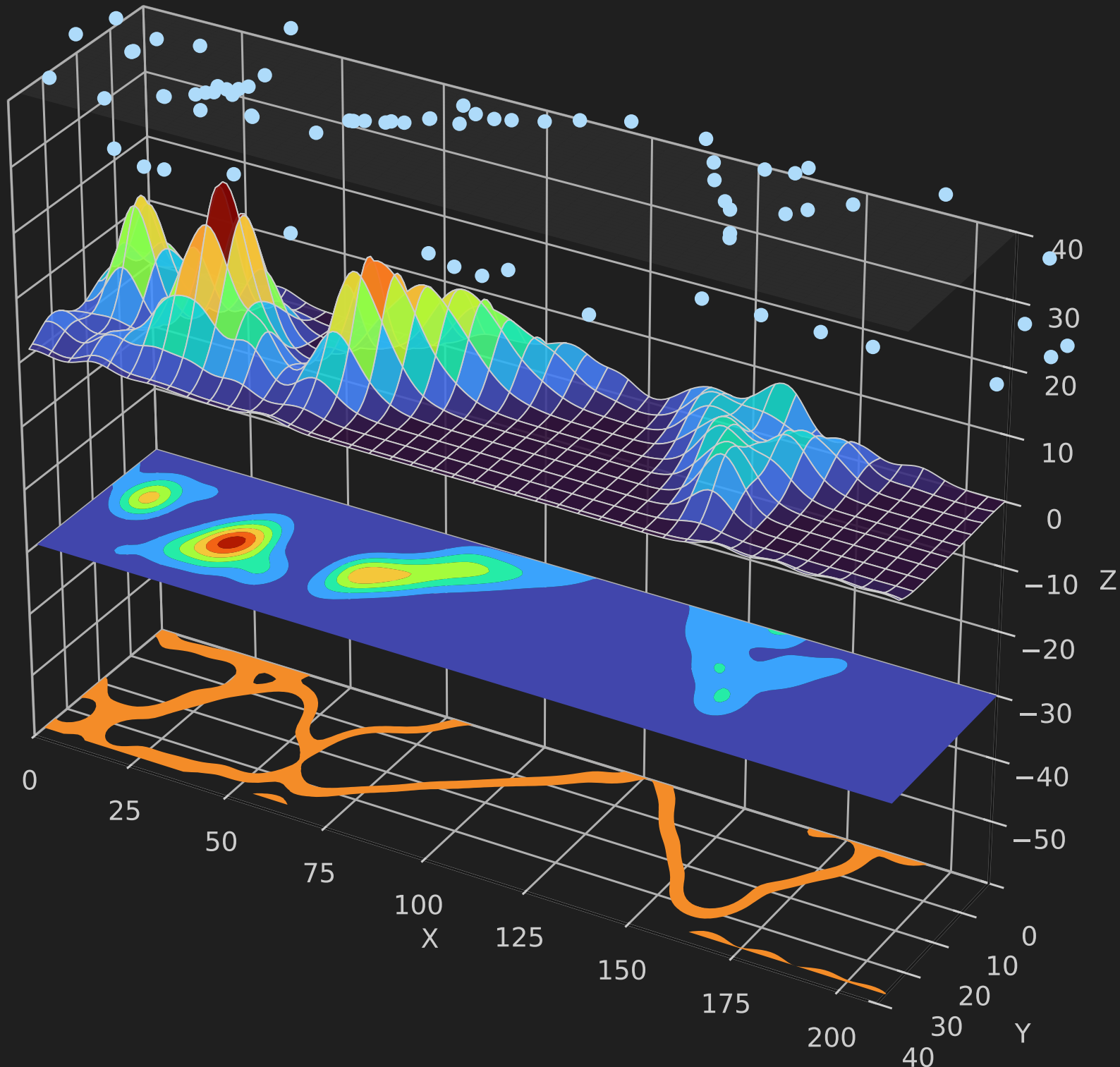
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.21) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.23 Shift = 1.75 Iteration = 265



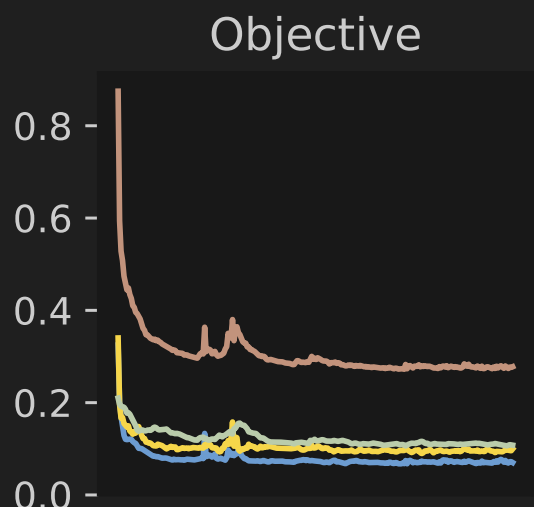
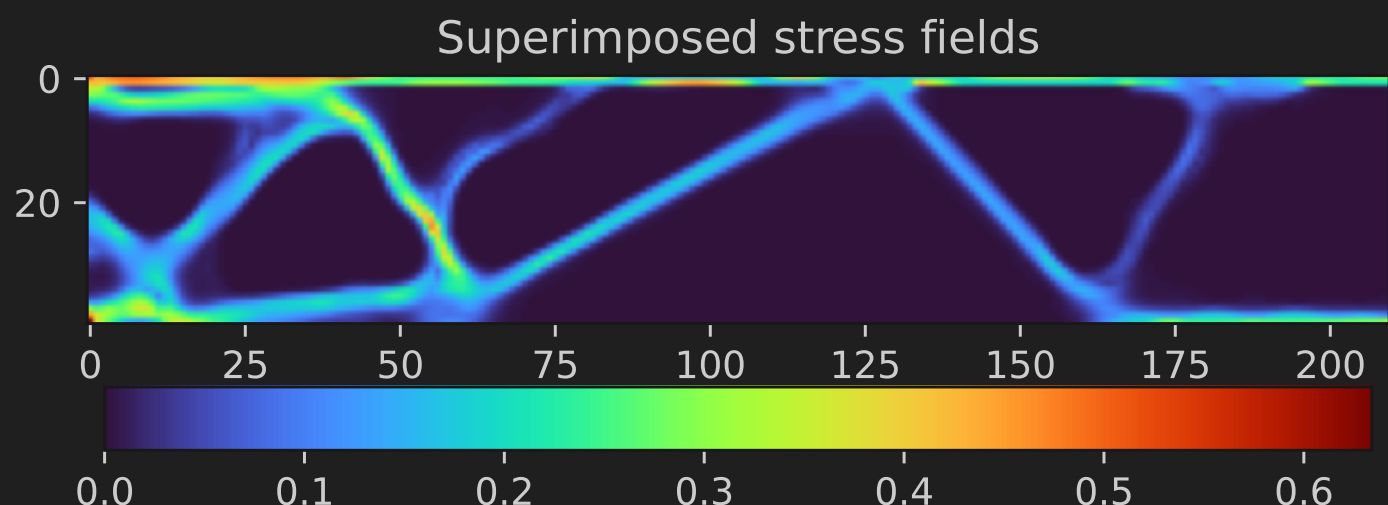
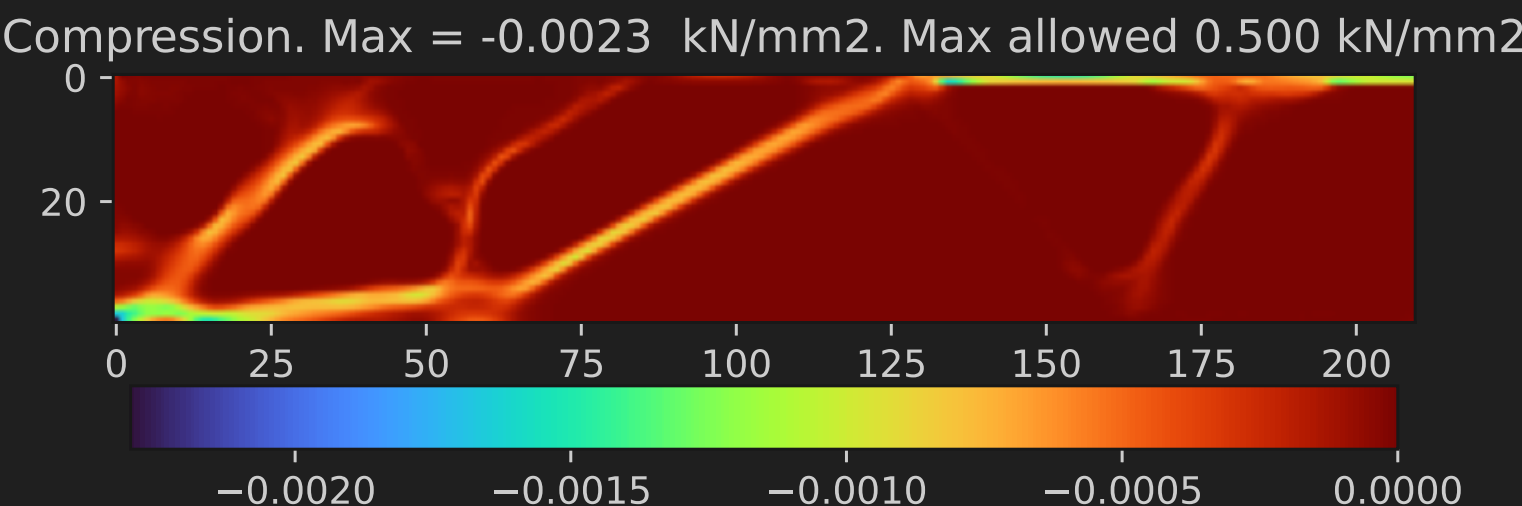
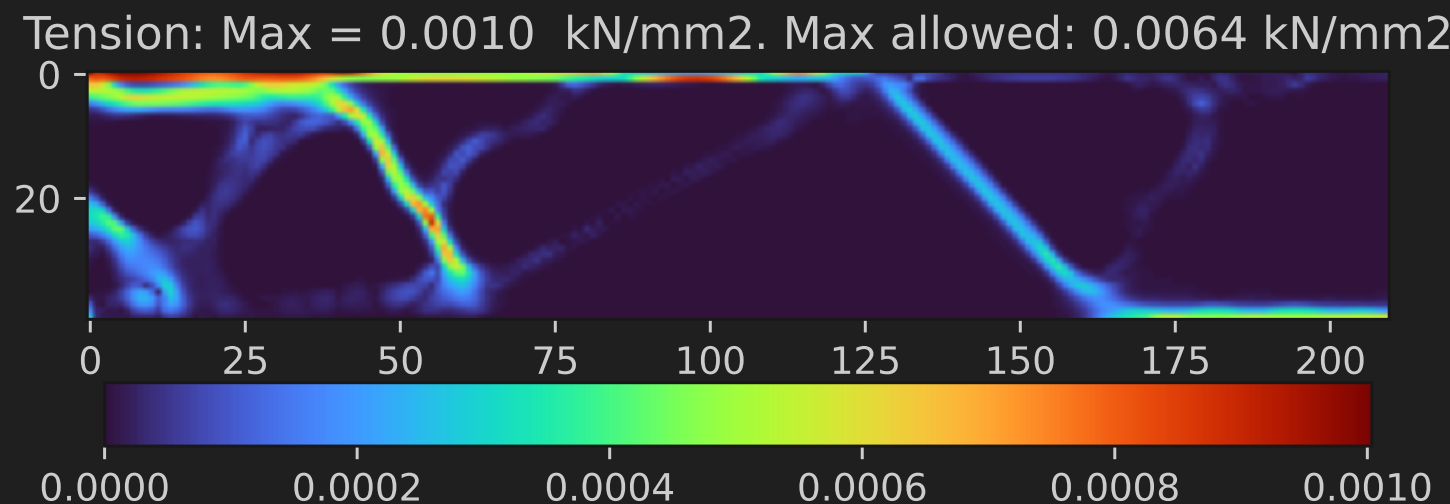
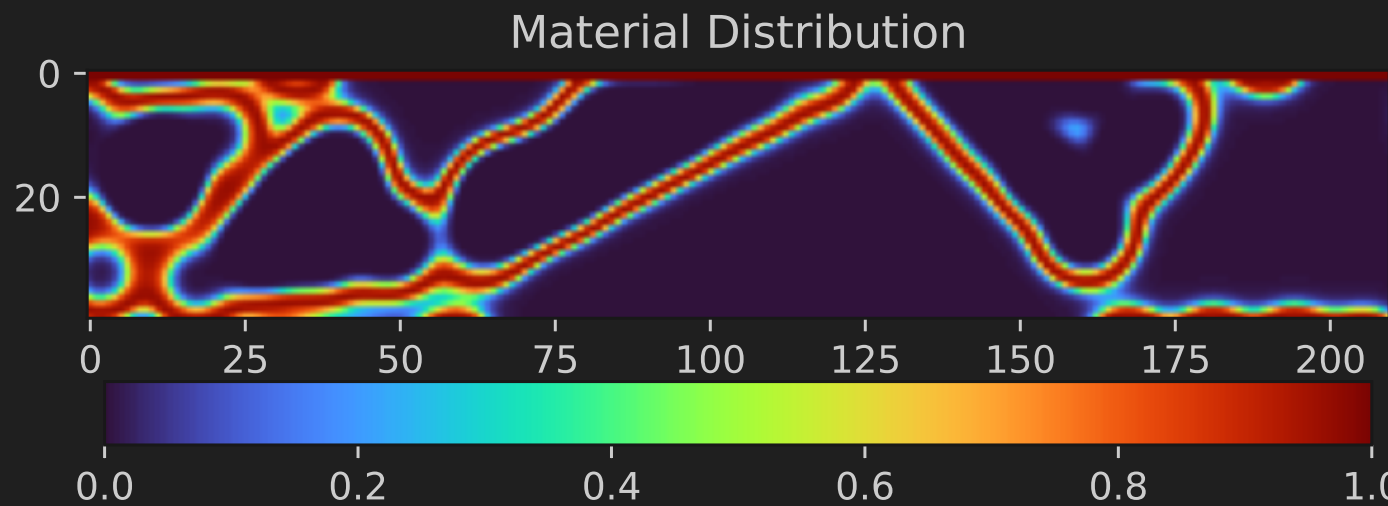
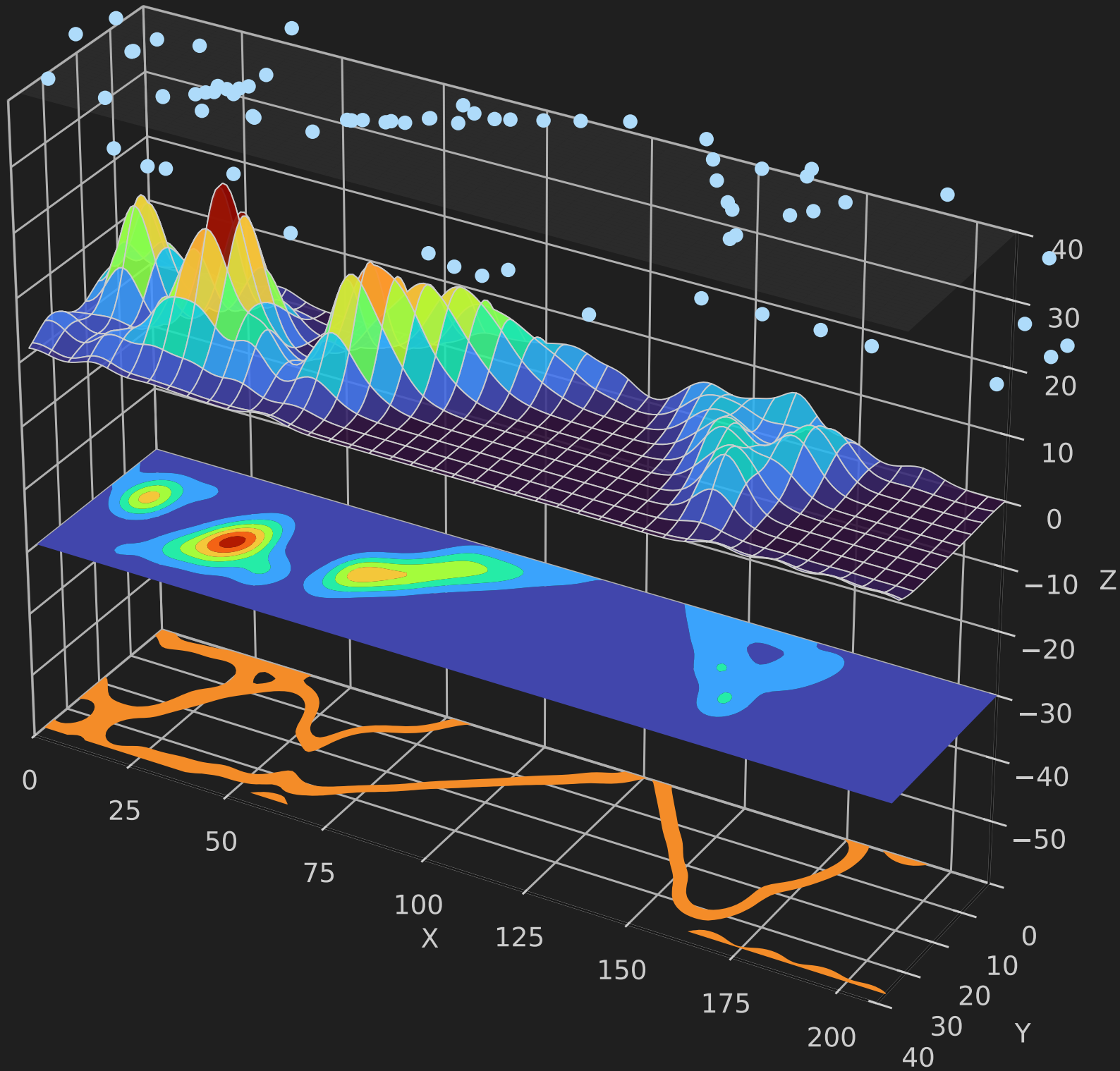
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.16 Shift = 1.80 Iteration = 267



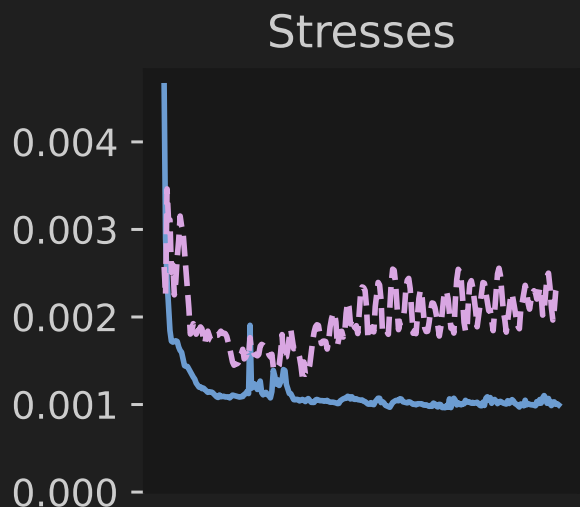
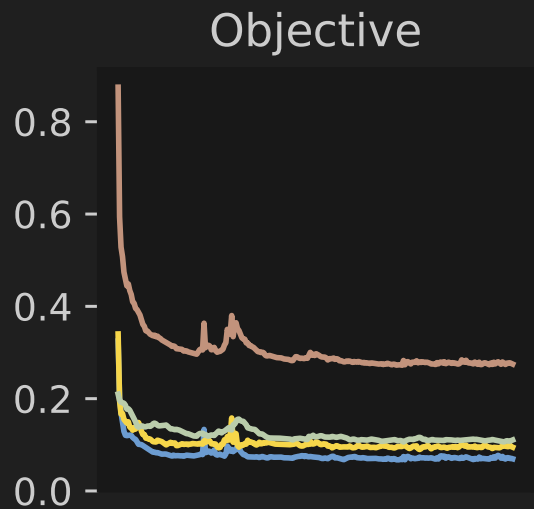
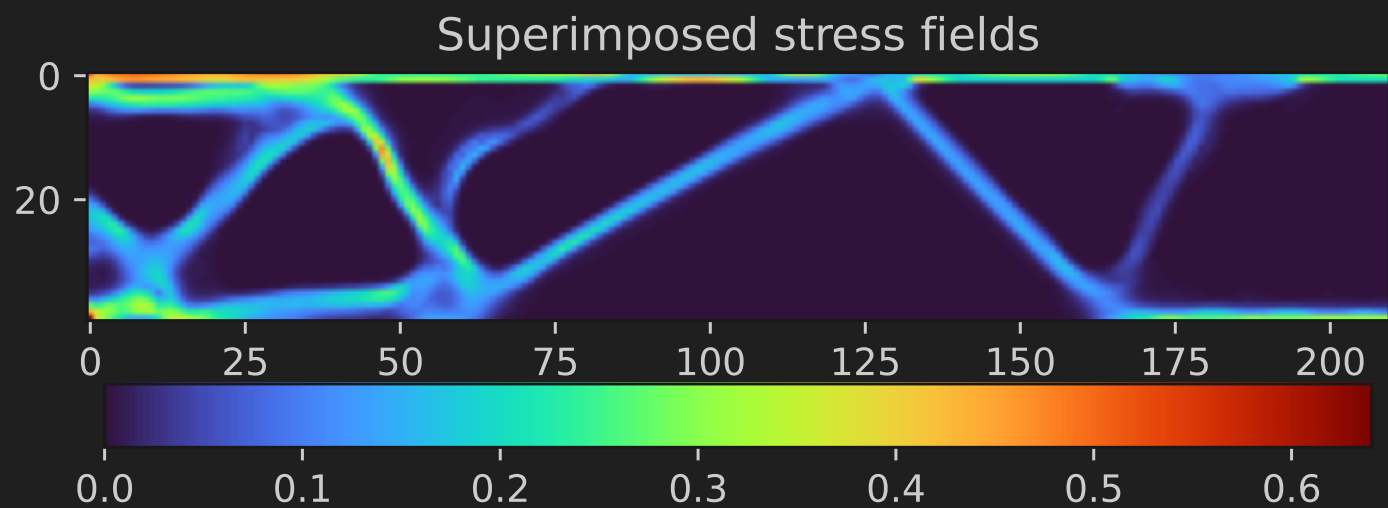
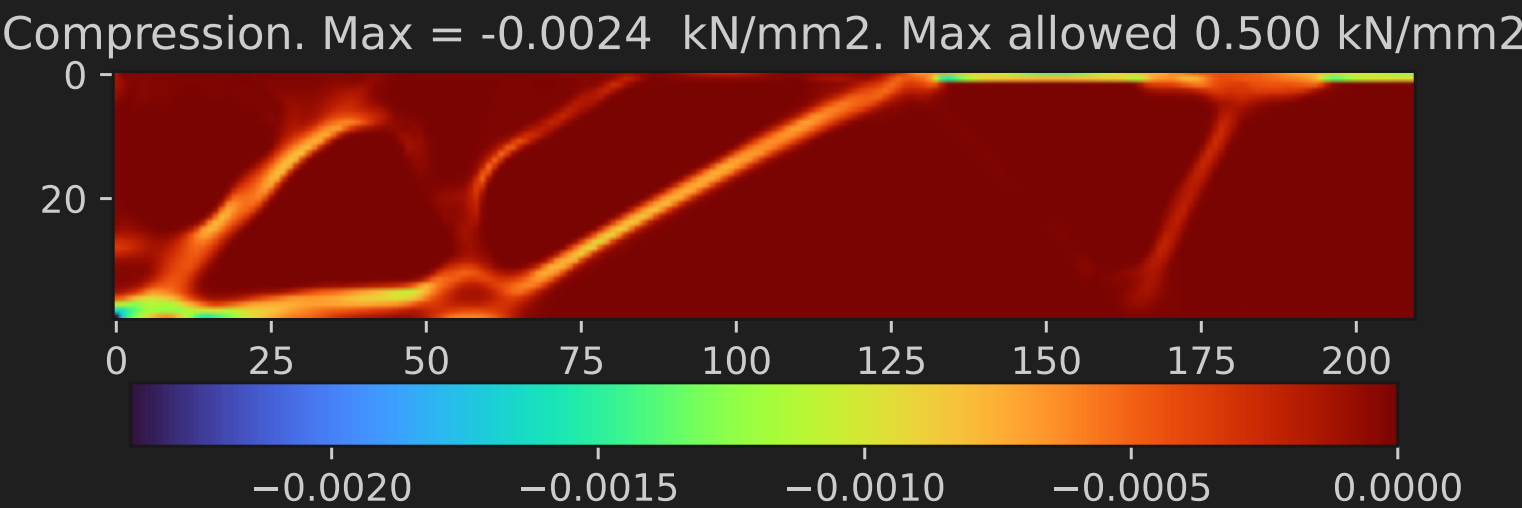
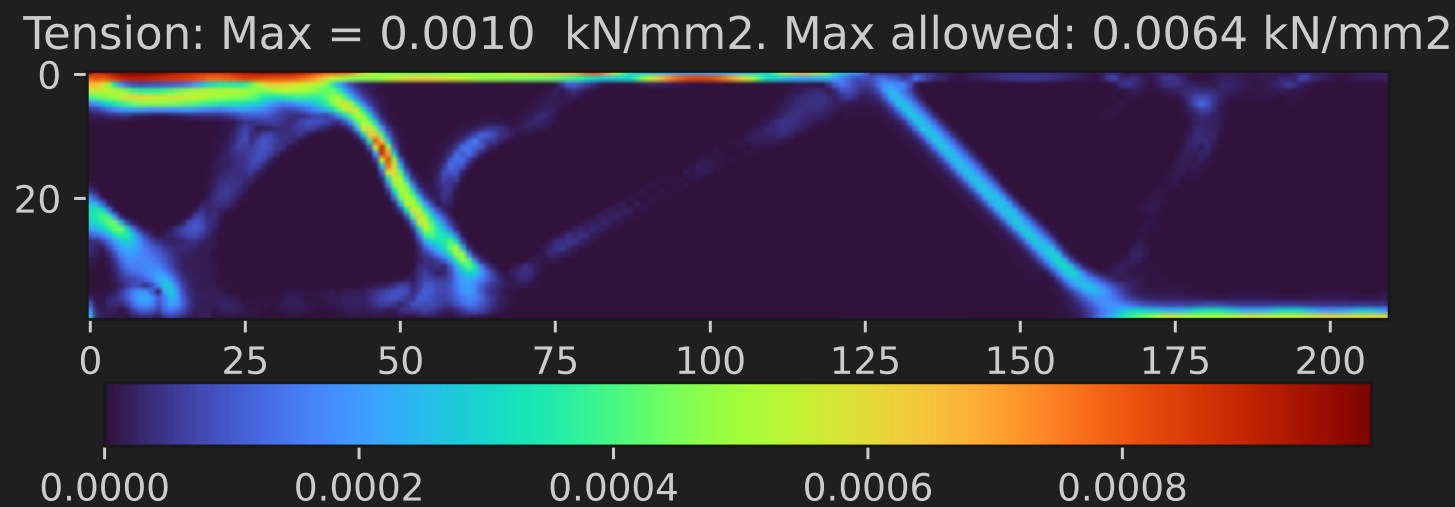
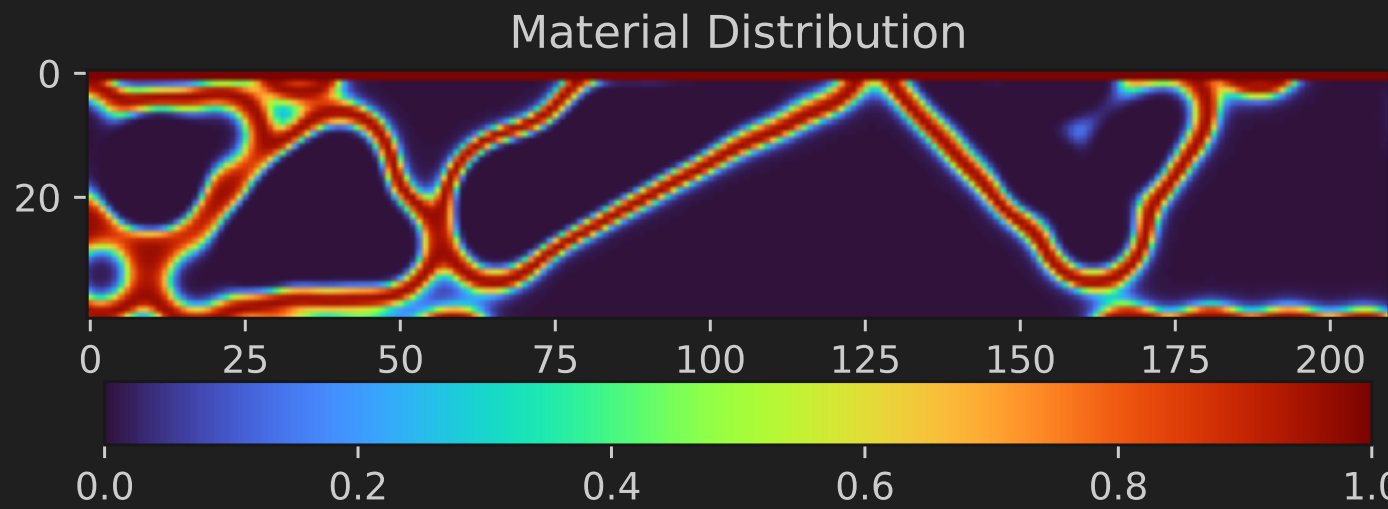
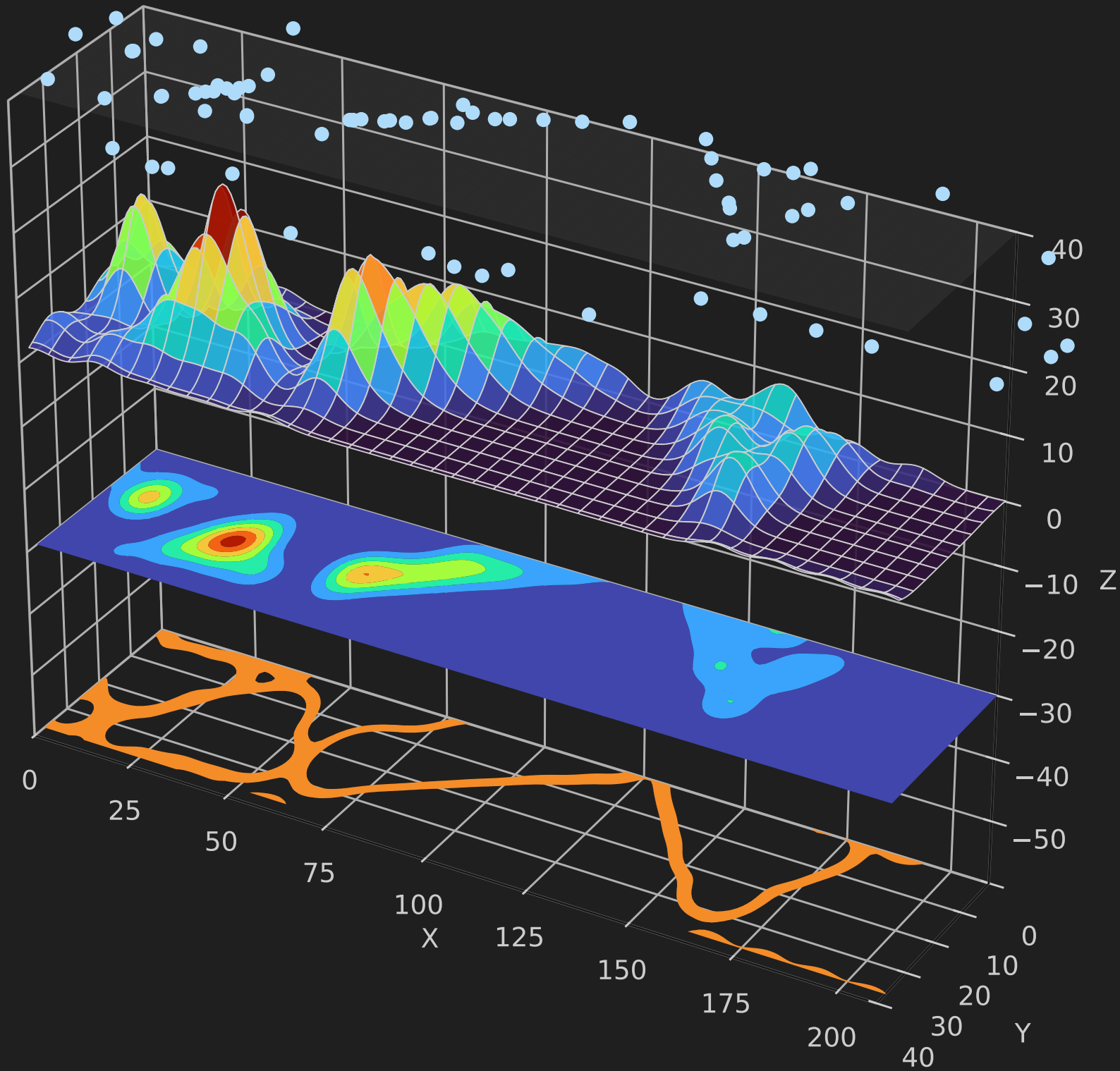
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.28

Spread Gaussian = 6.18 Shift = 1.79 Iteration = 269



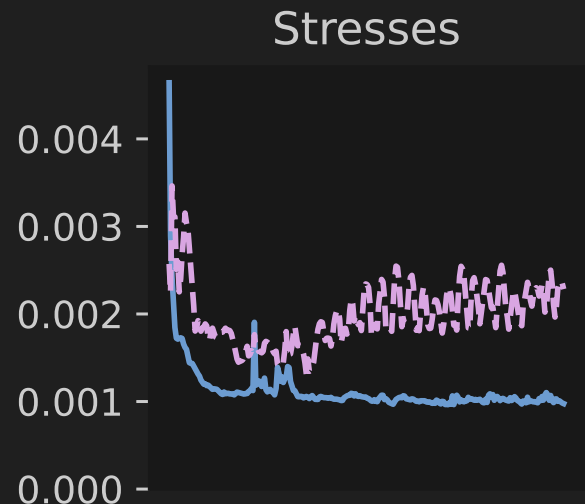
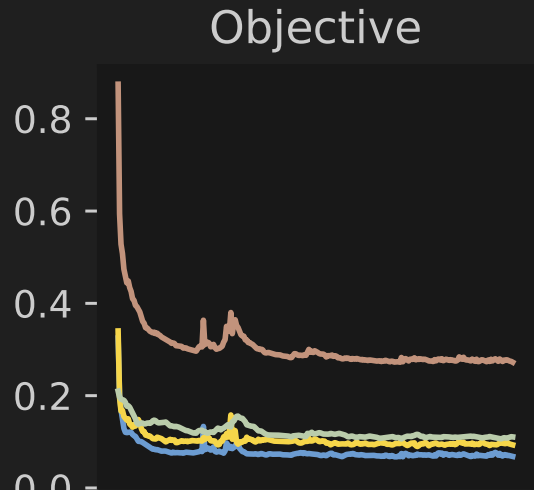
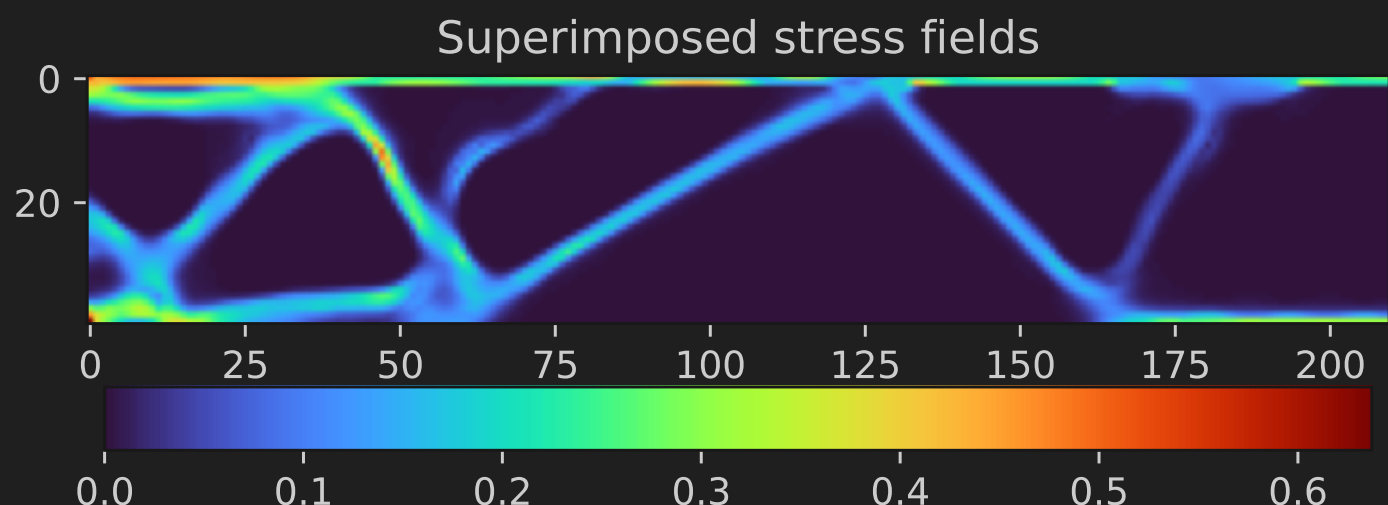
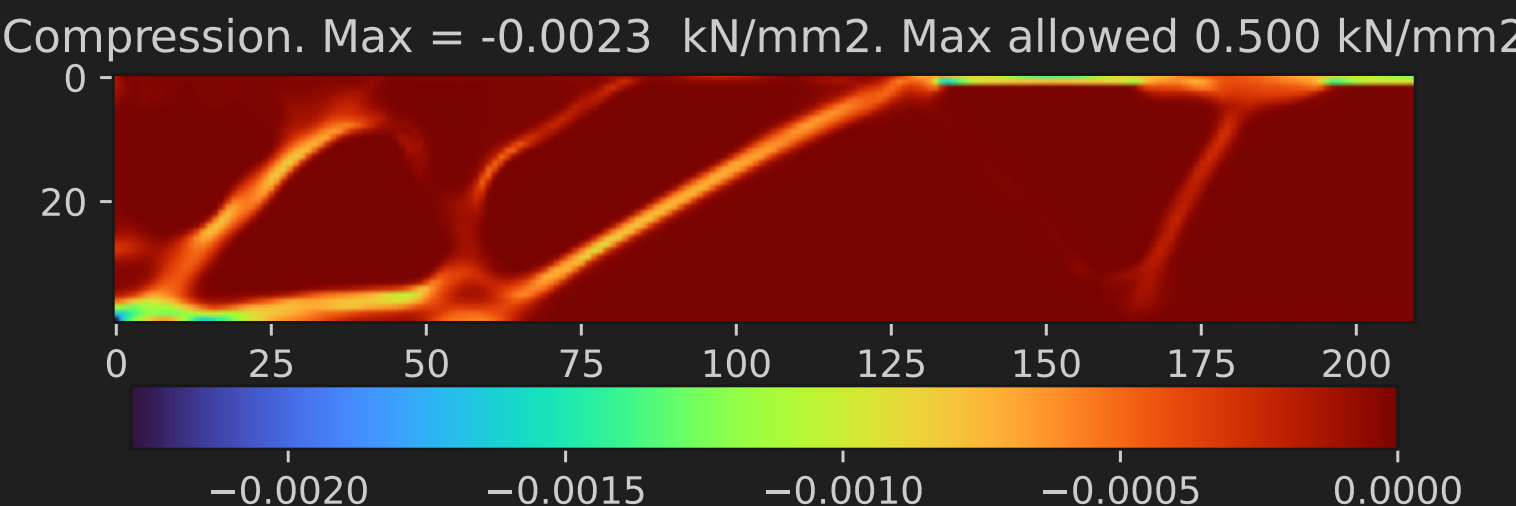
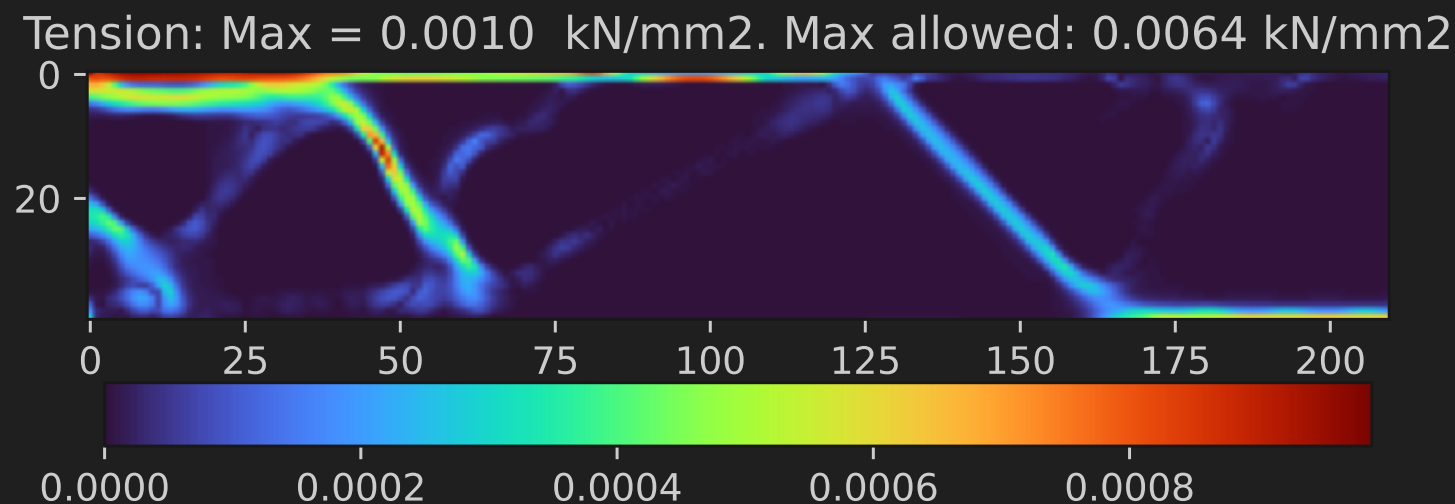
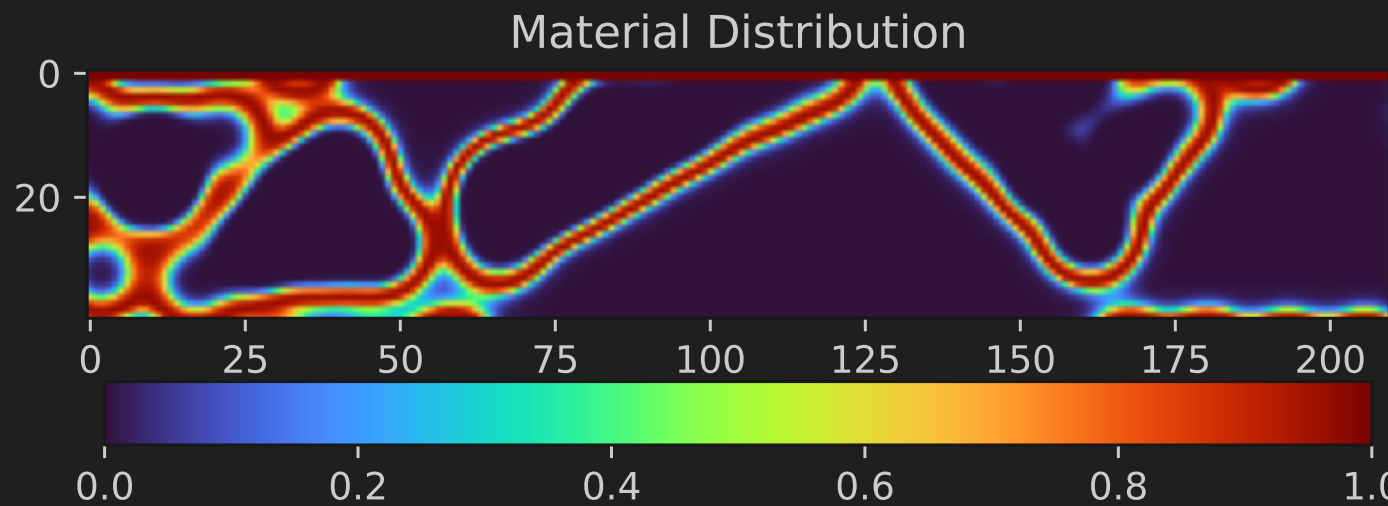
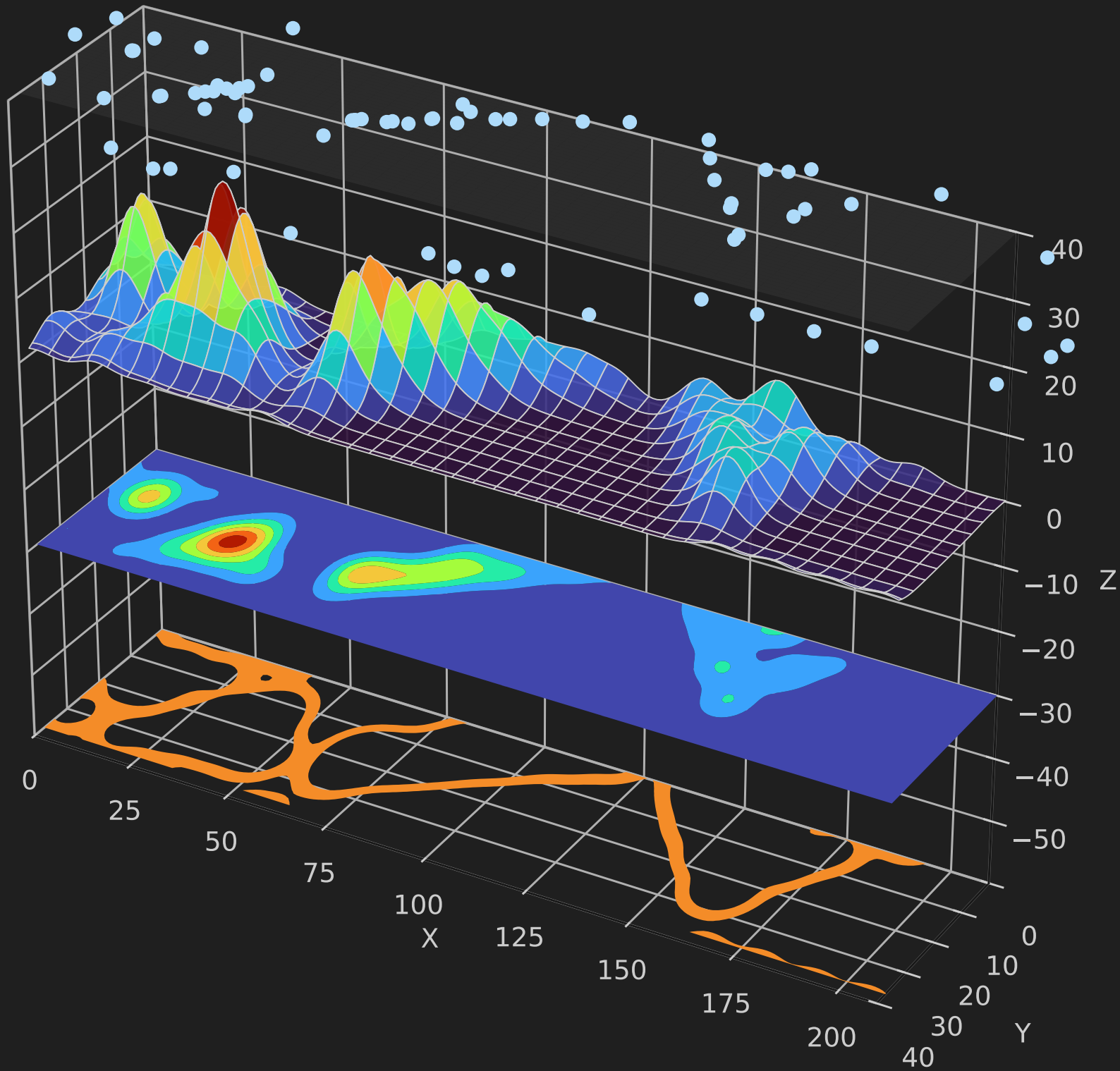
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.19 Shift = 1.82 Iteration = 271



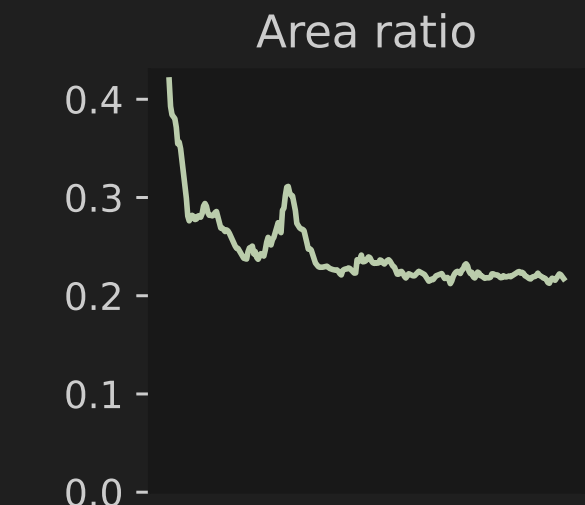
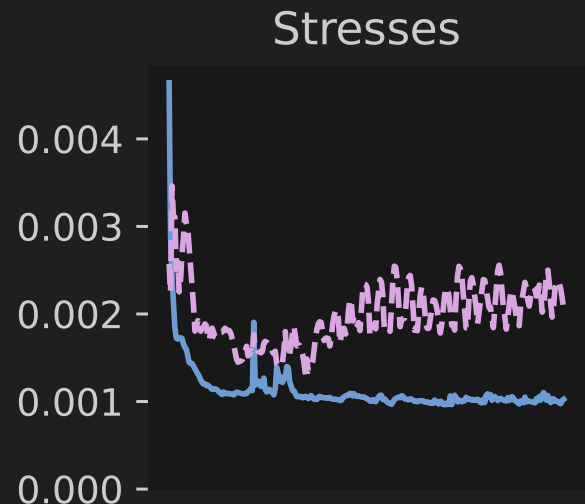
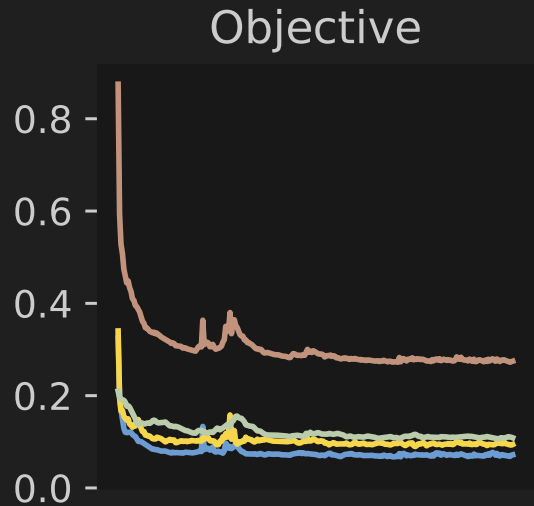
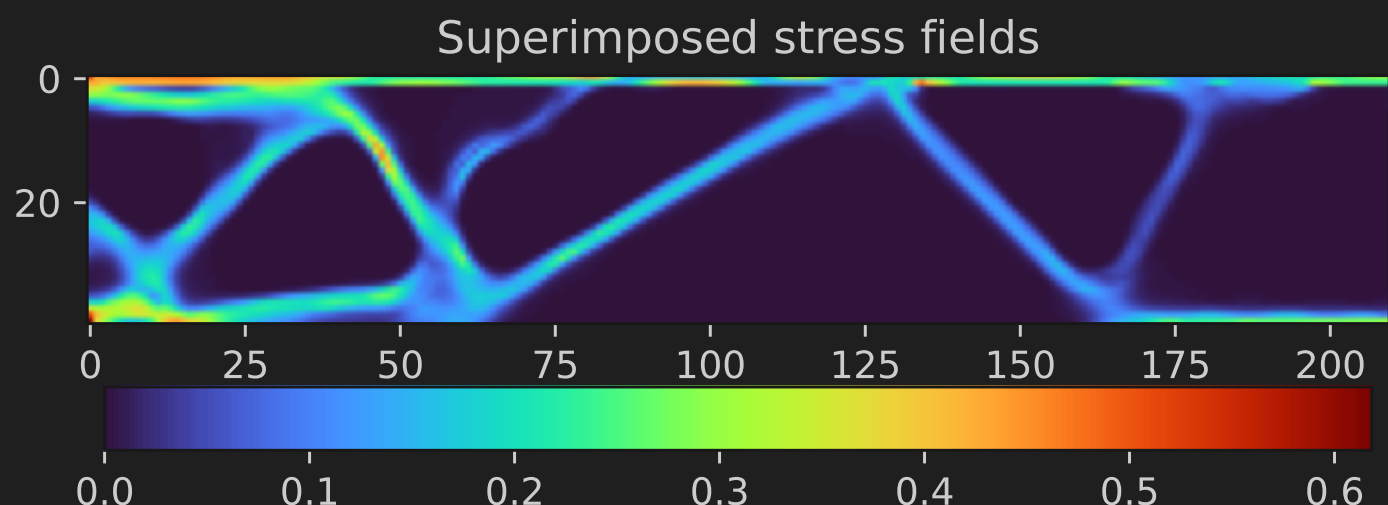
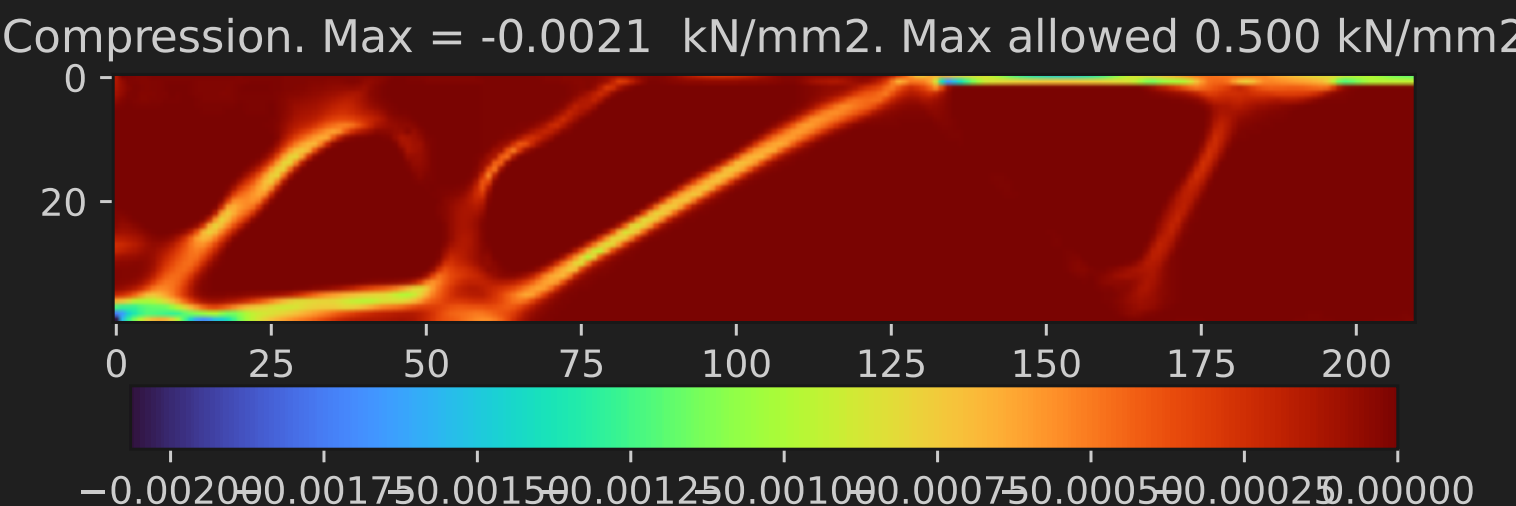
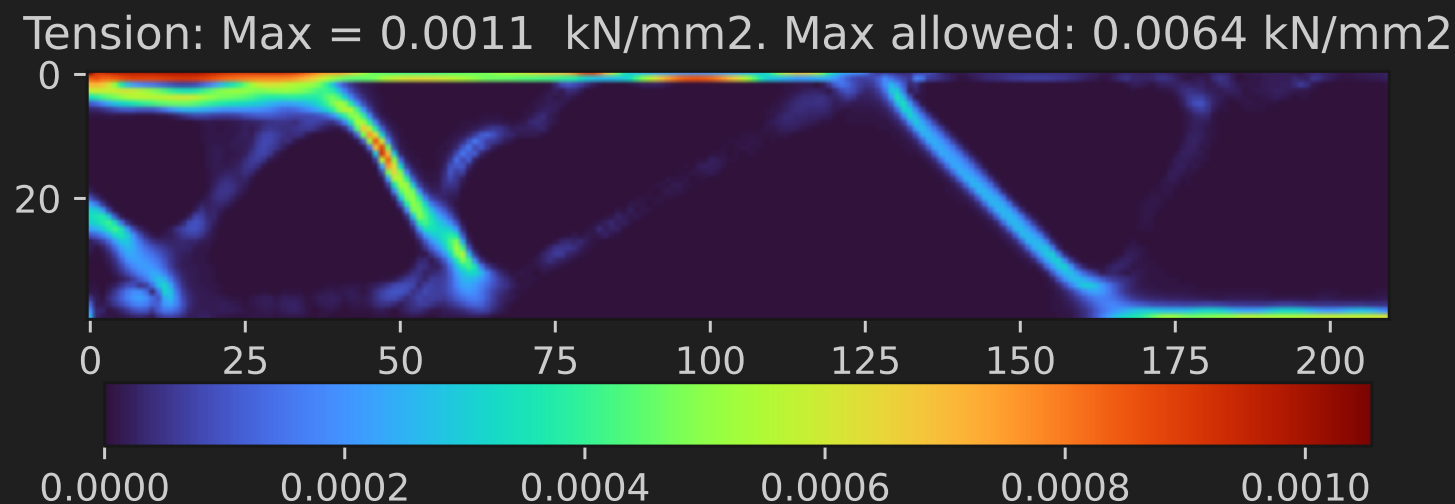
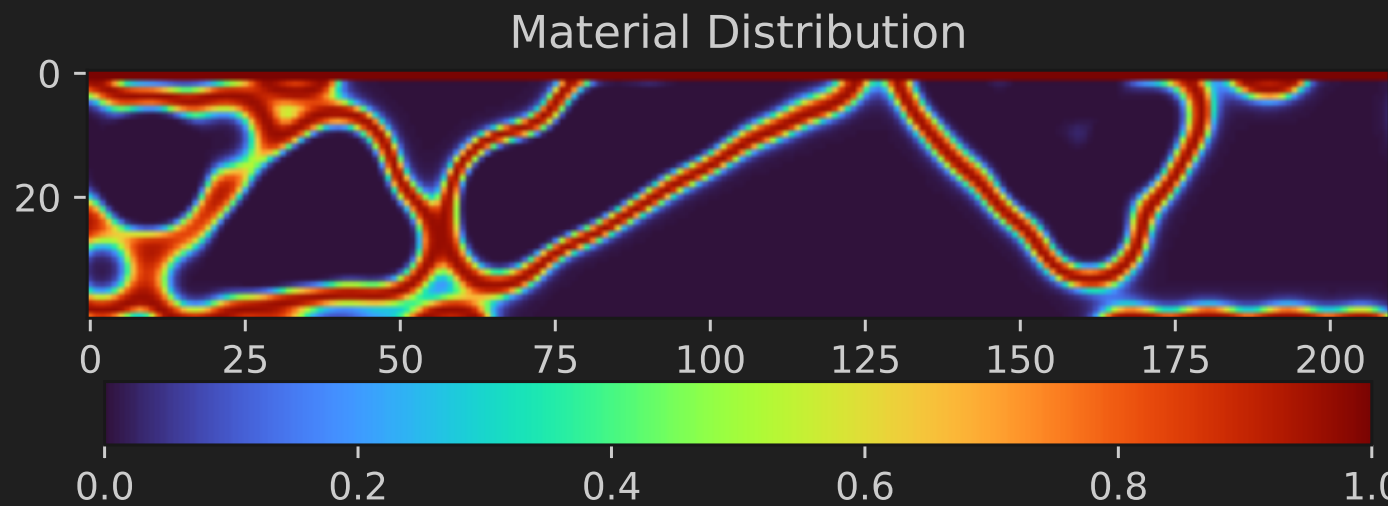
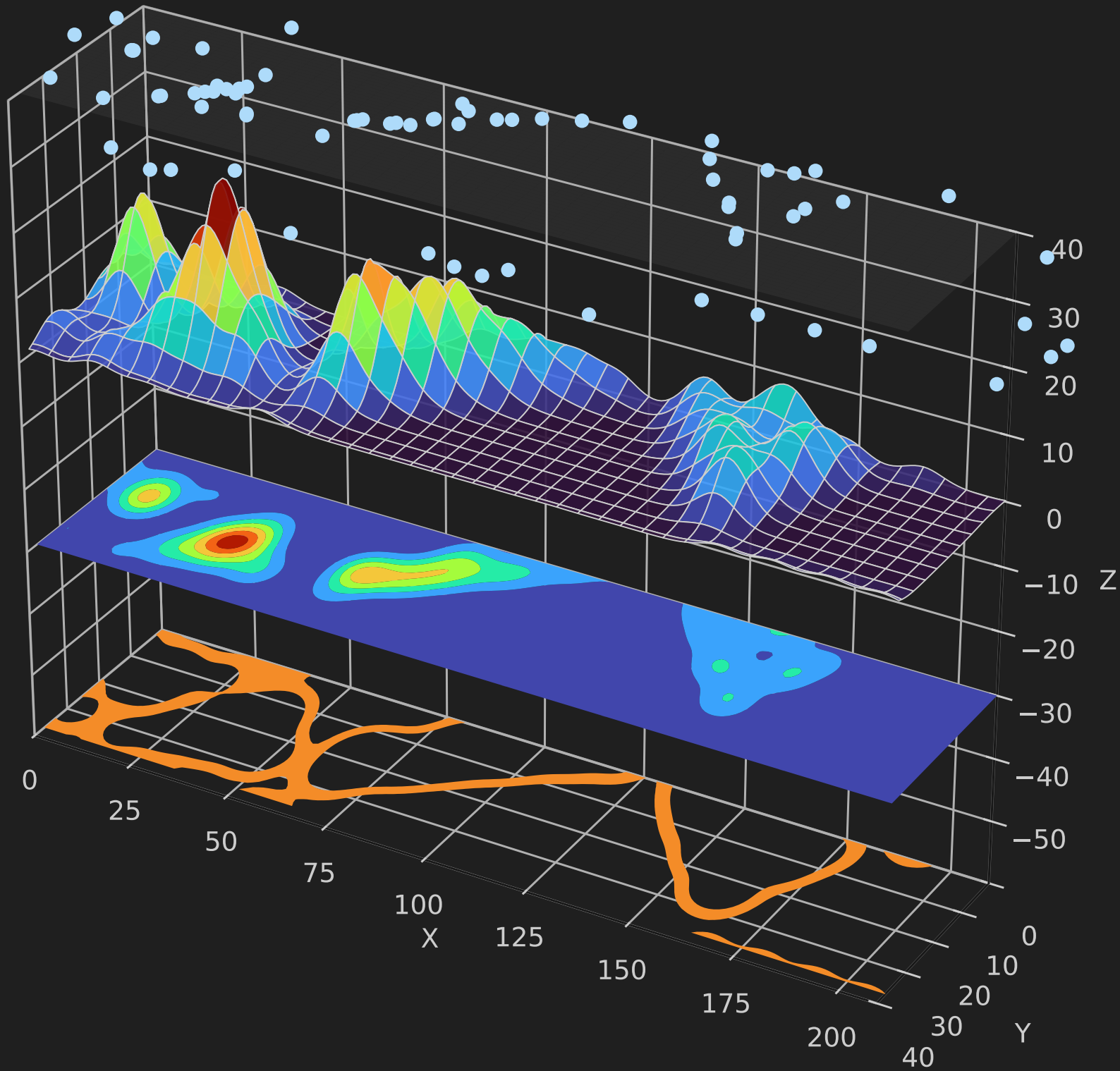
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.24 Shift = 1.82 Iteration = 273



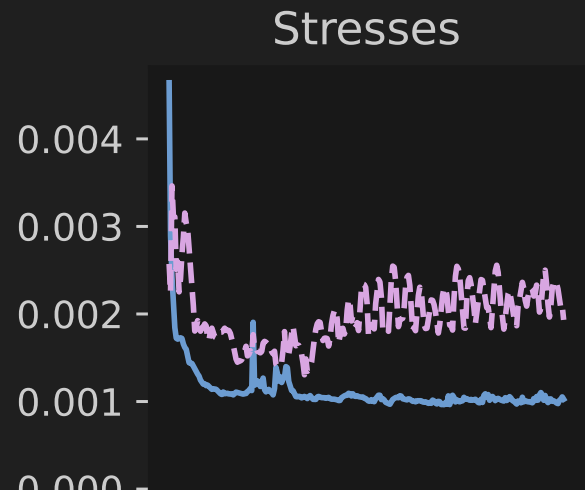
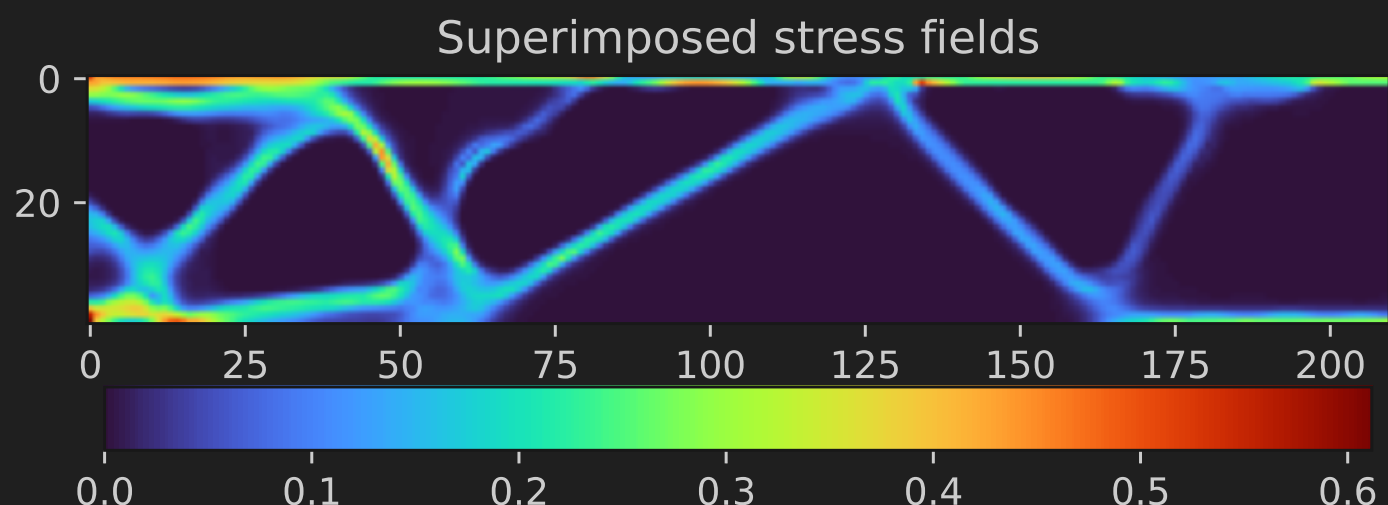
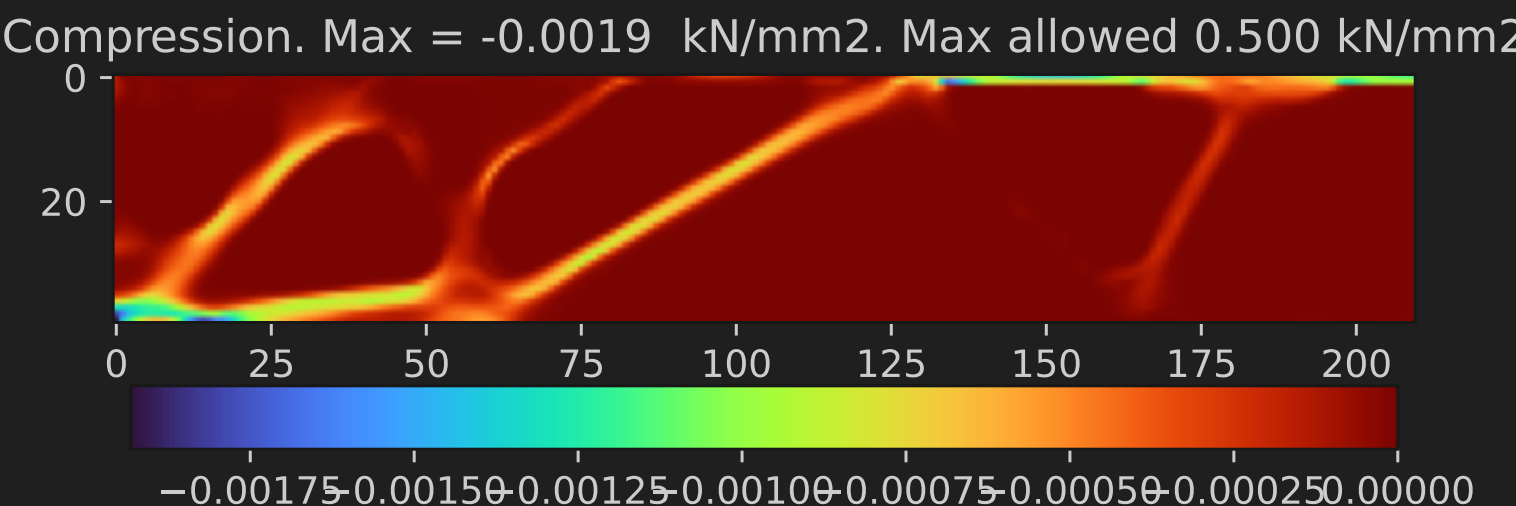
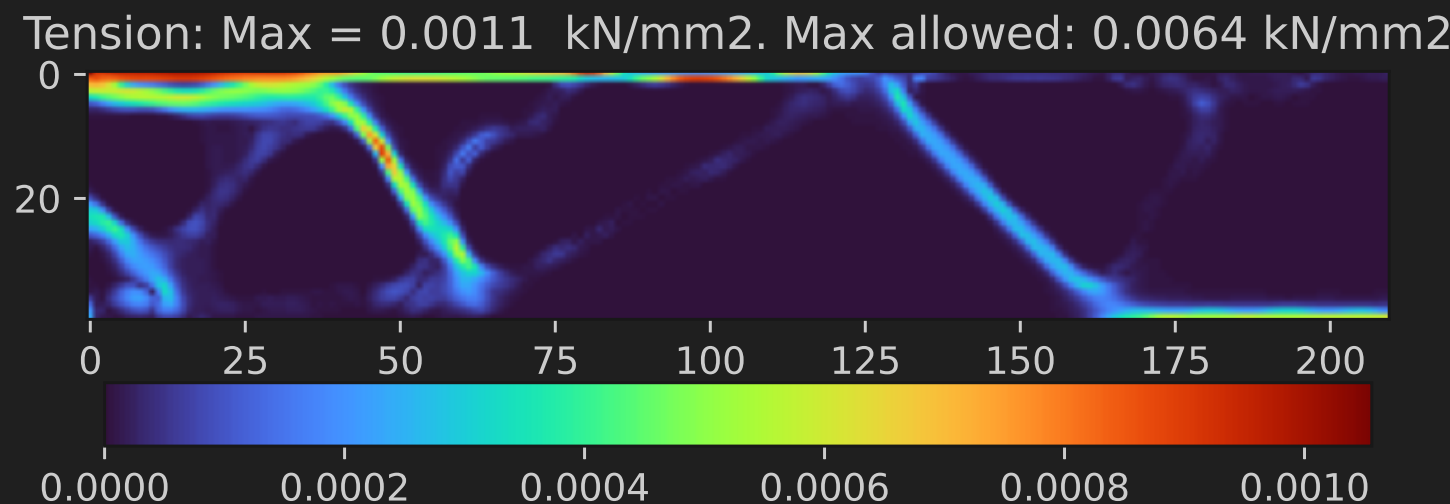
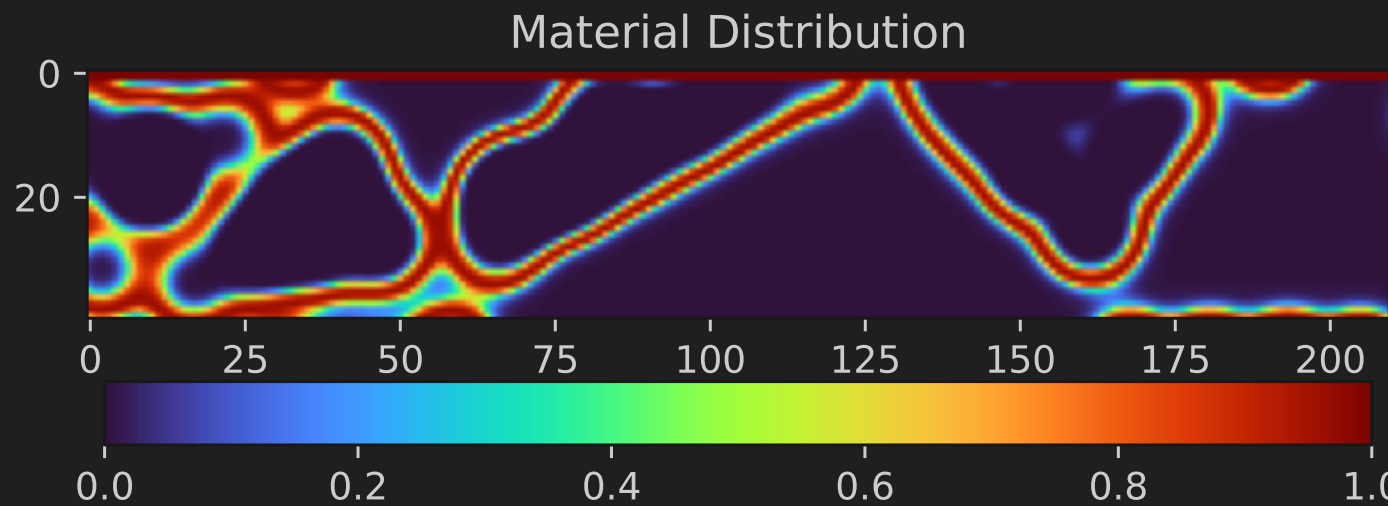
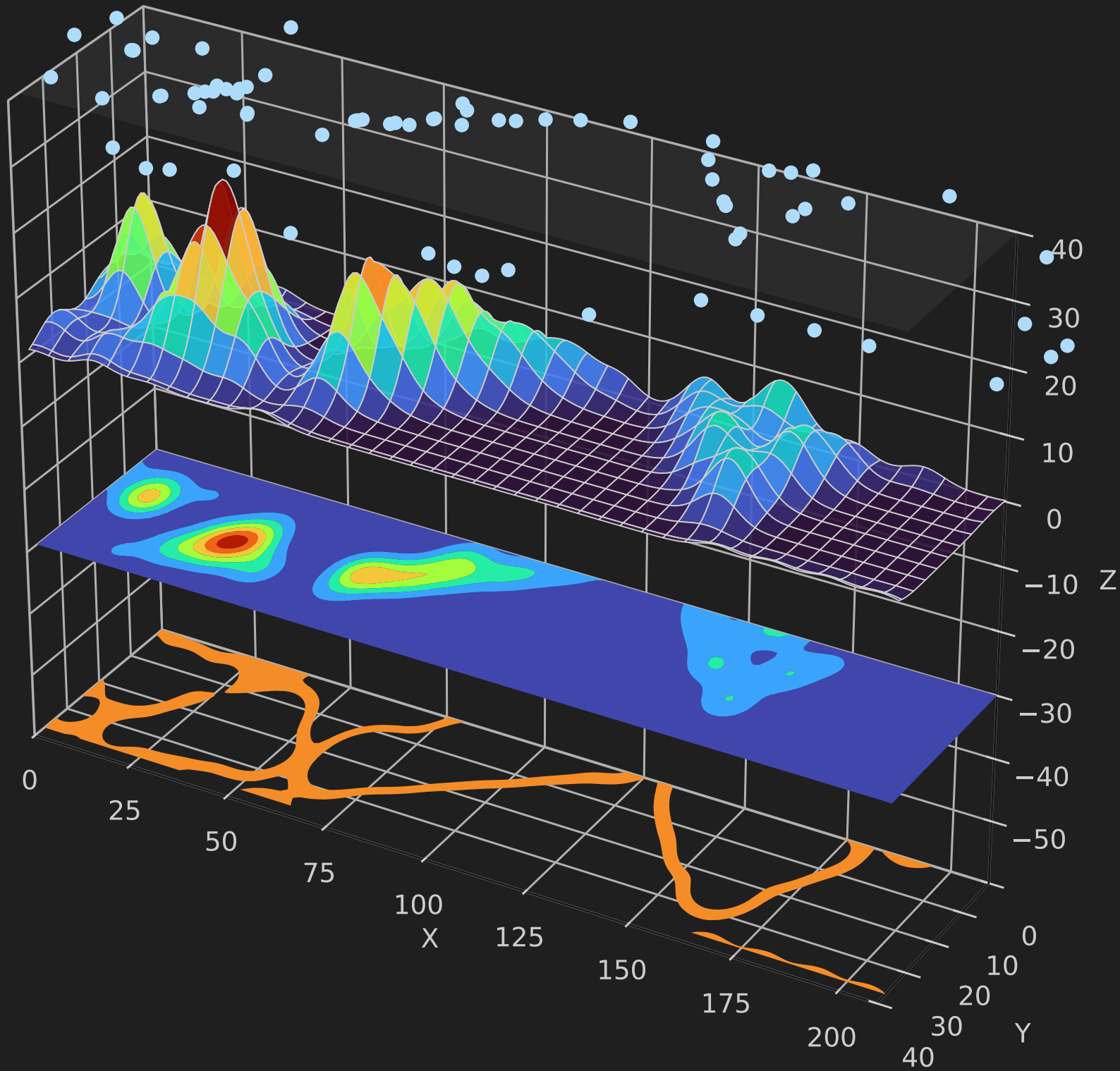
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.29 Shift = 1.80 Iteration = 275



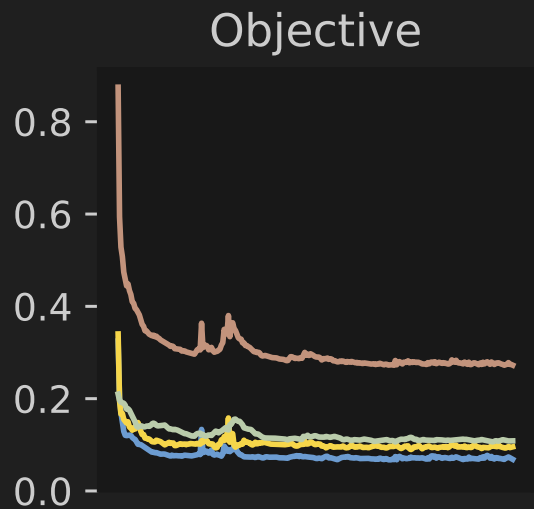
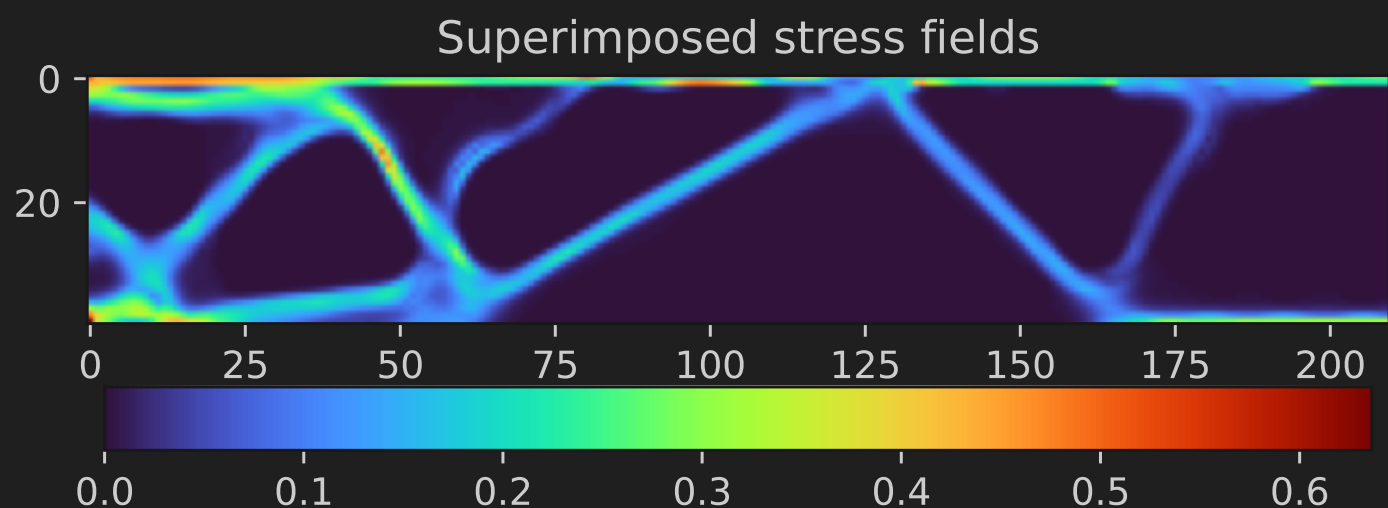
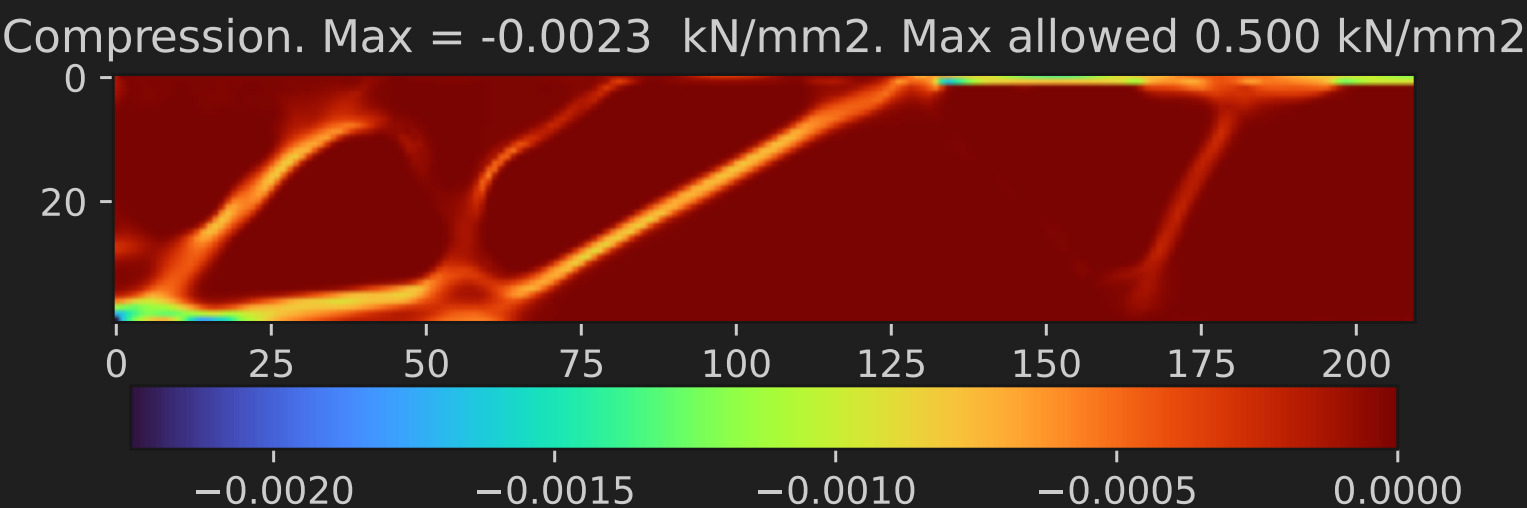
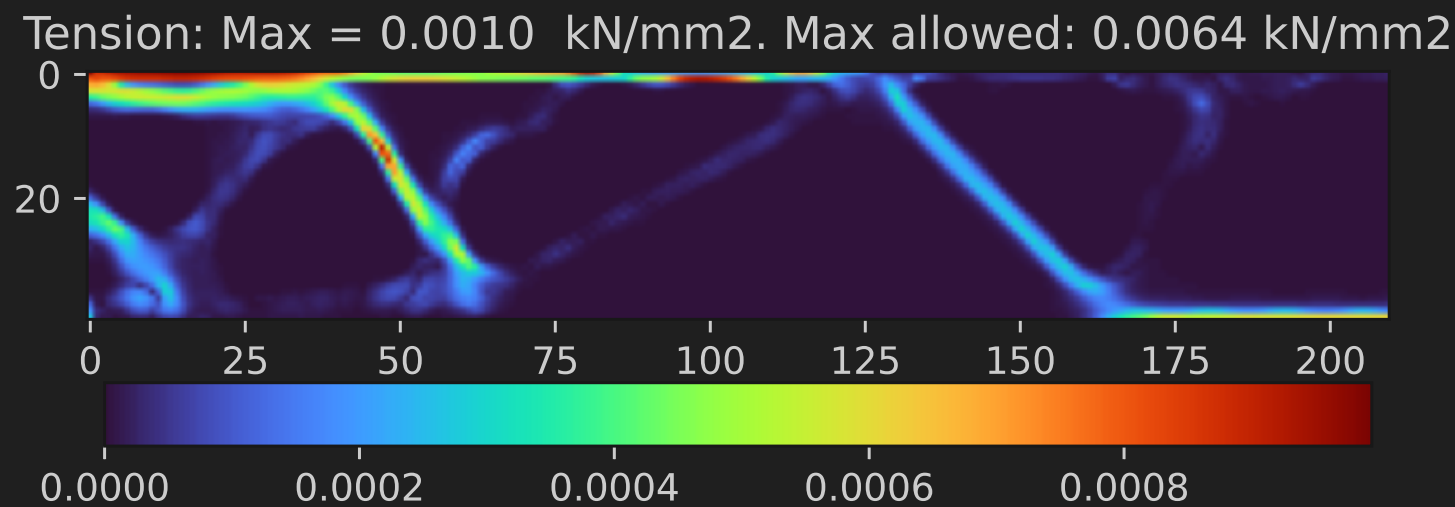
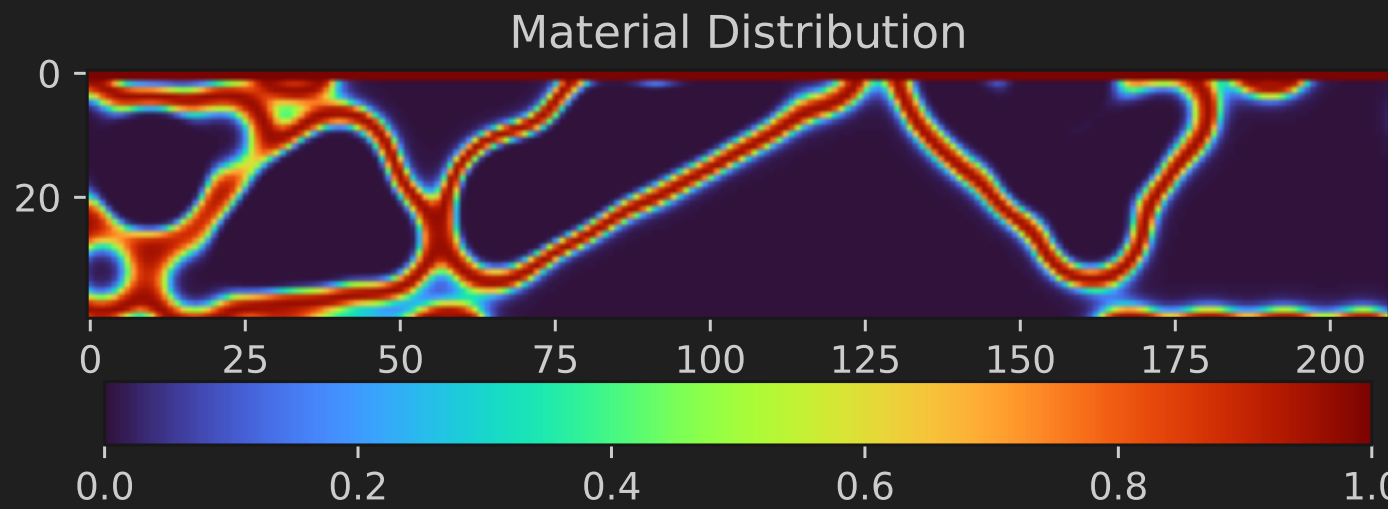
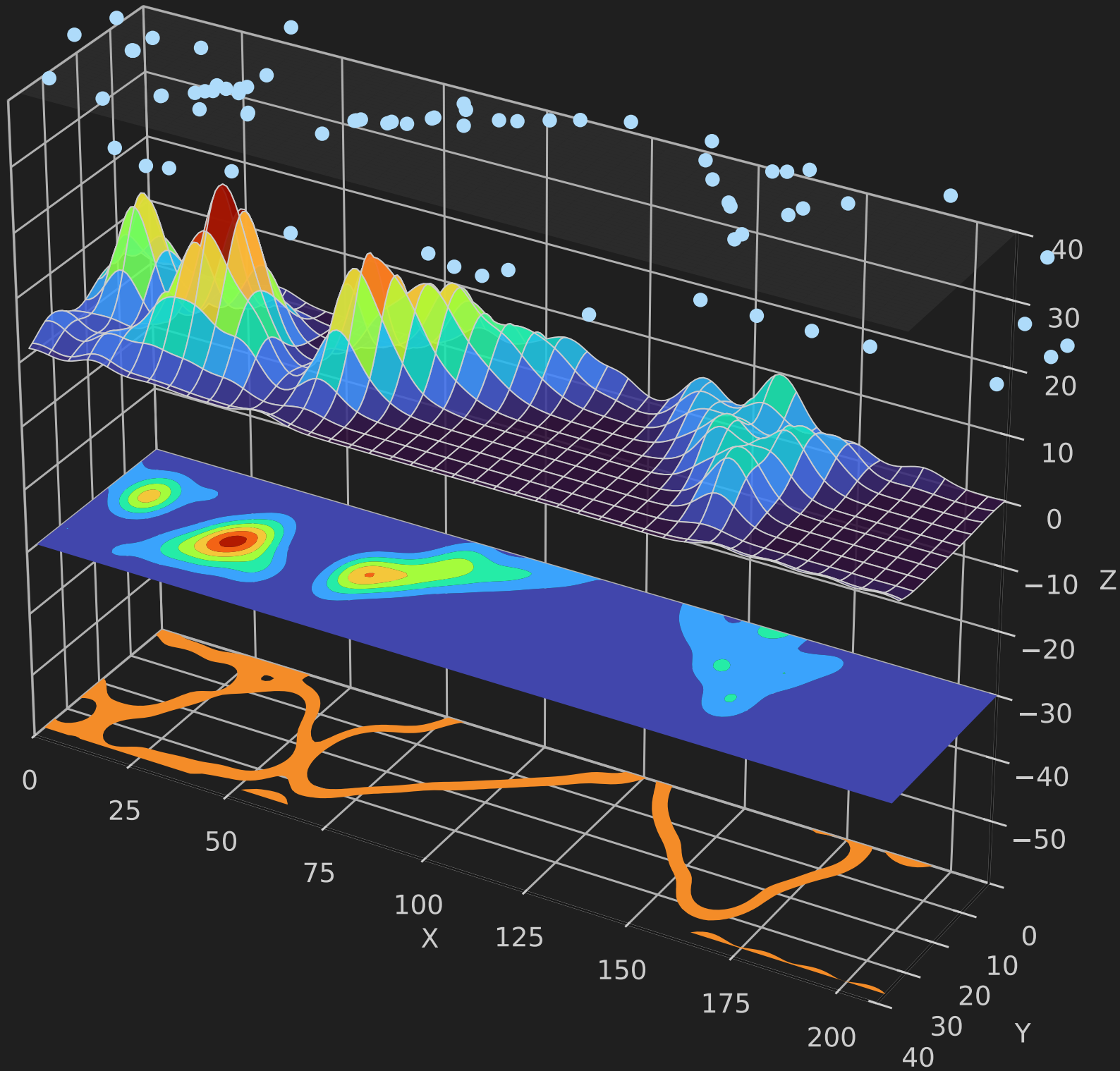
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.30 Shift = 1.80 Iteration = 277



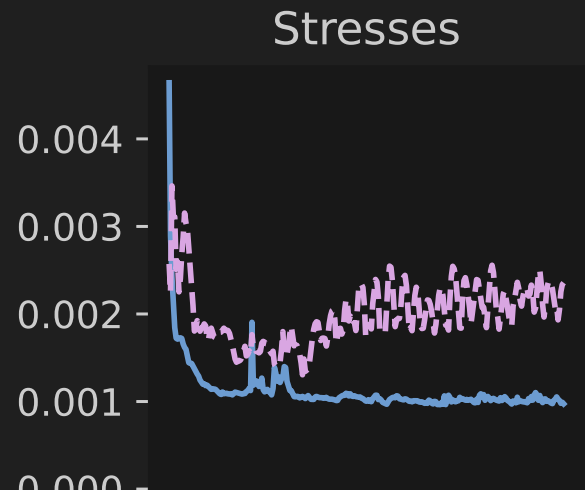
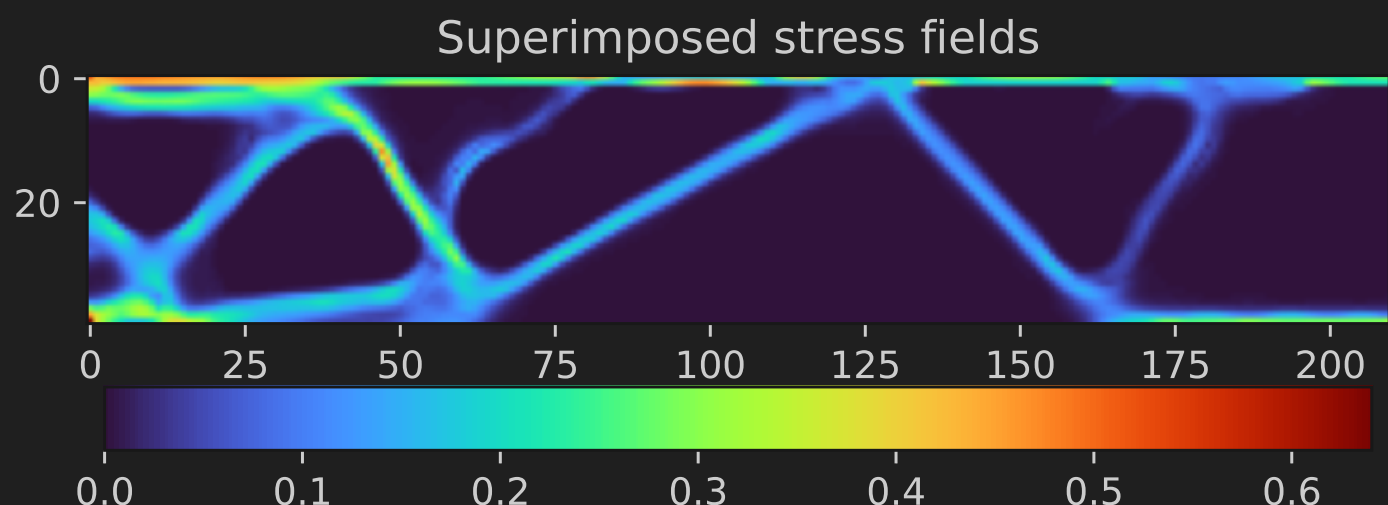
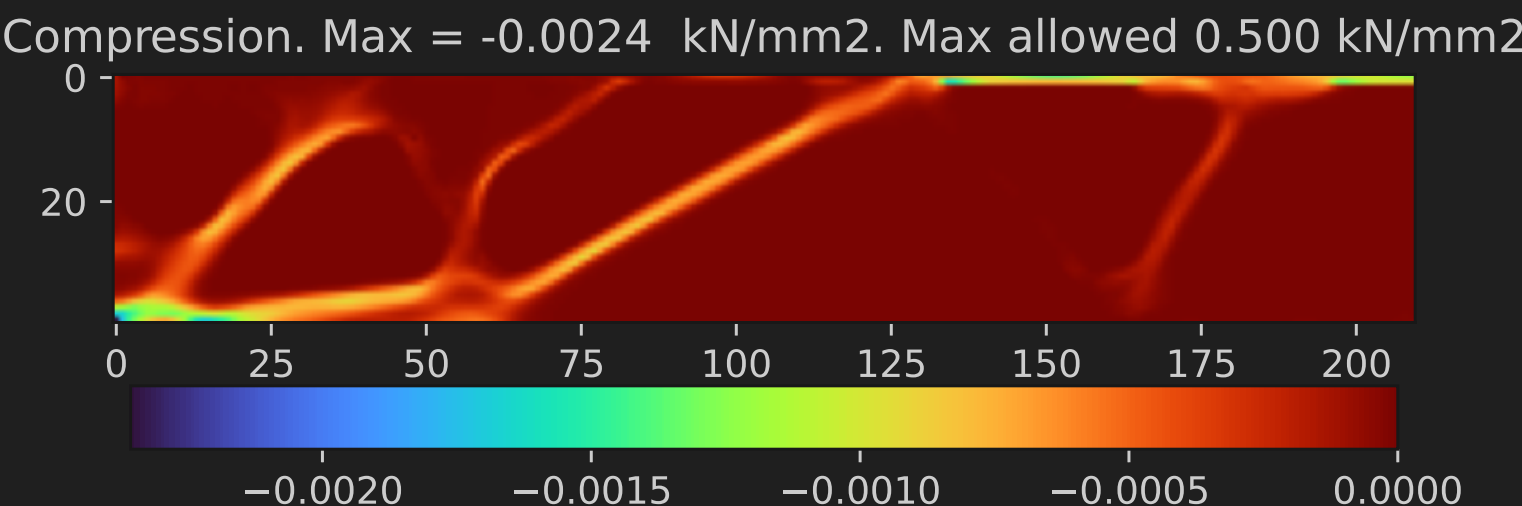
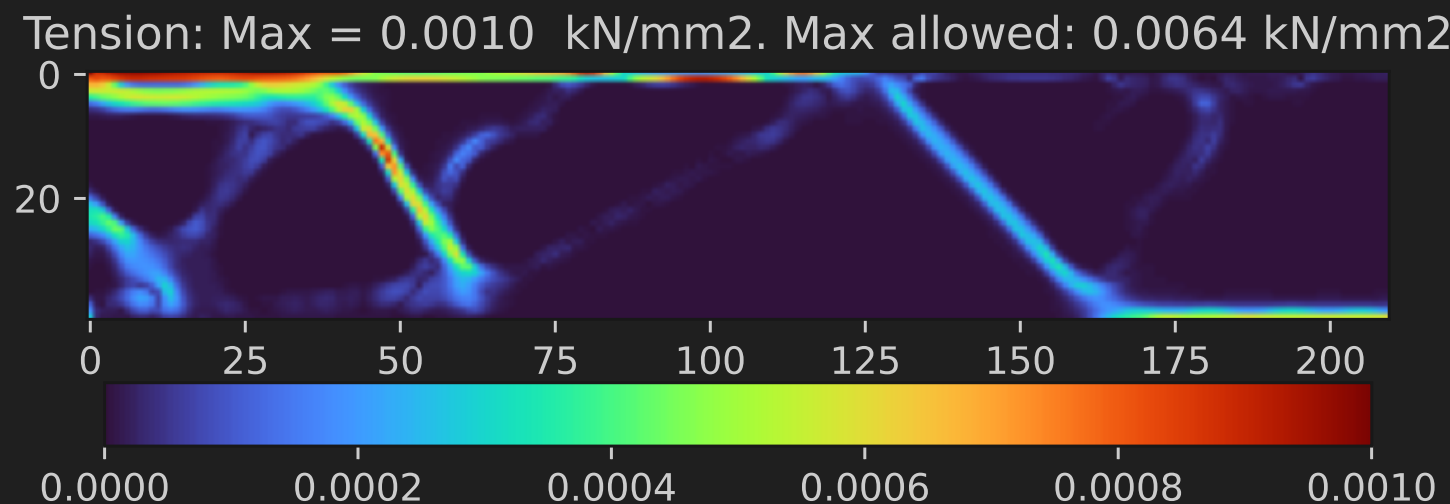
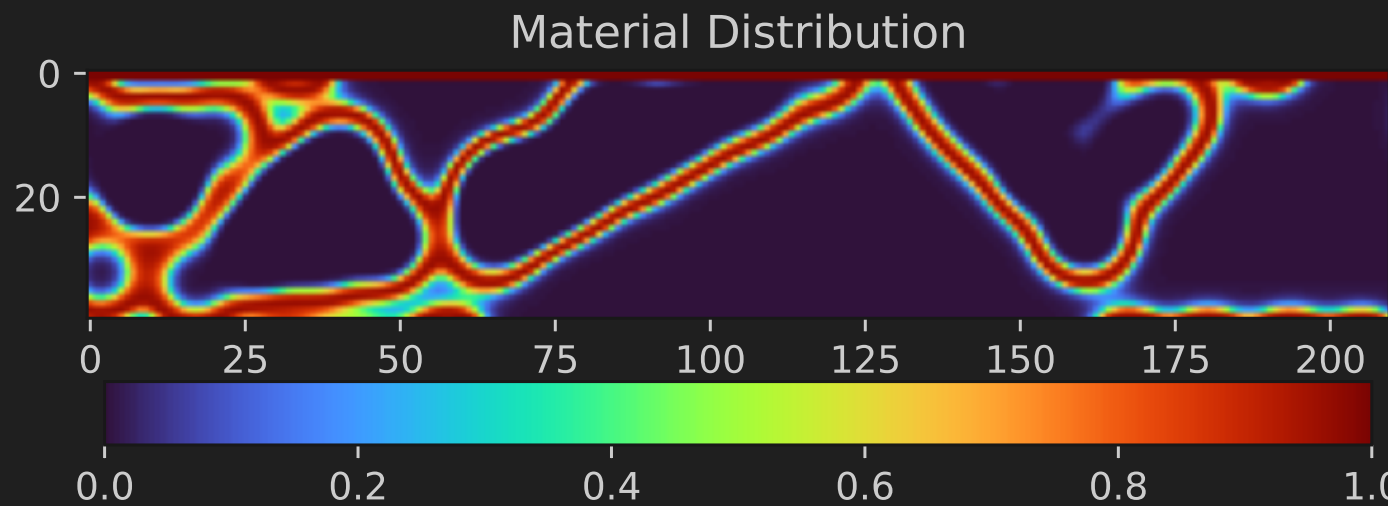
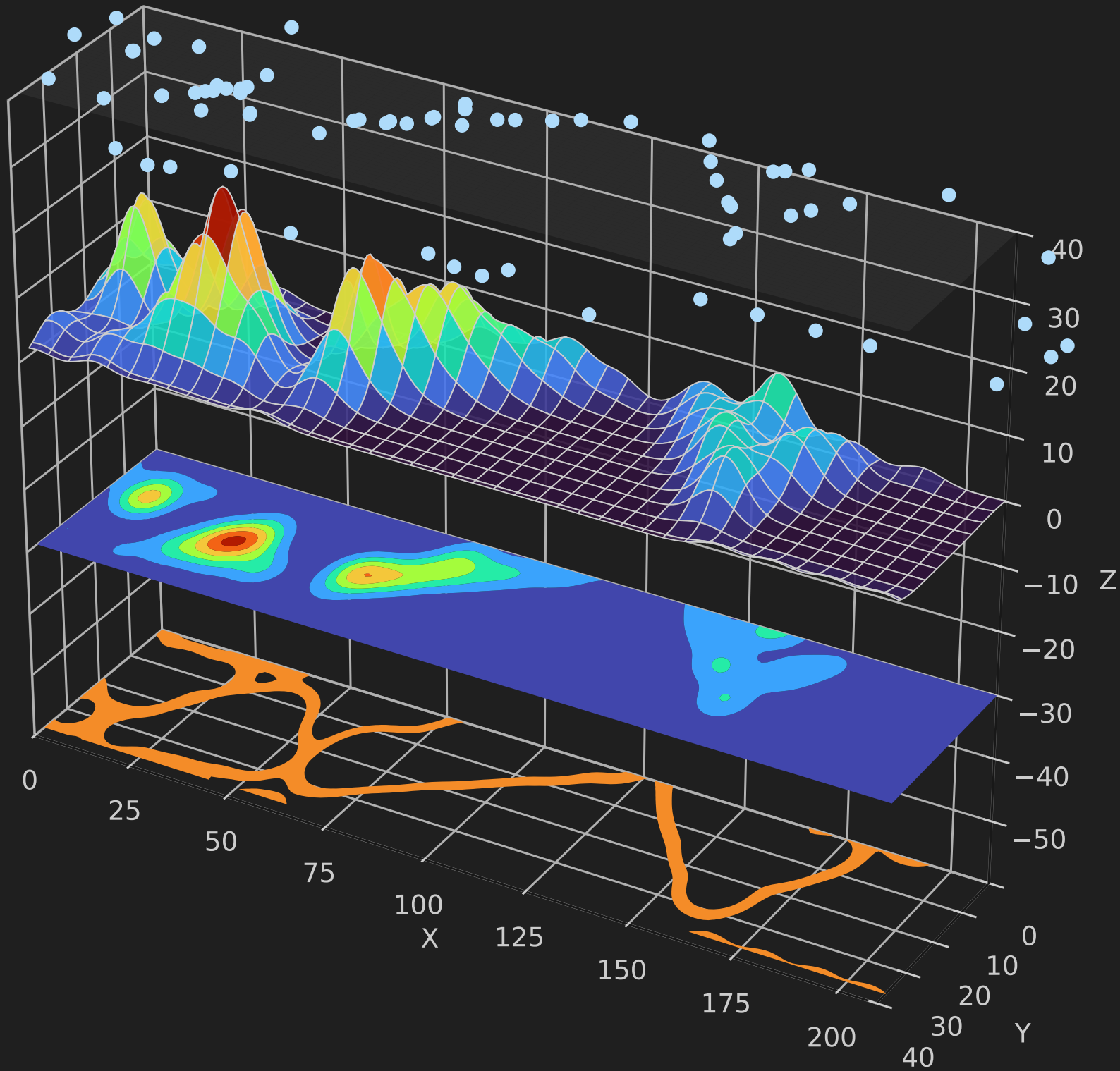
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.27 Shift = 1.81 Iteration = 279



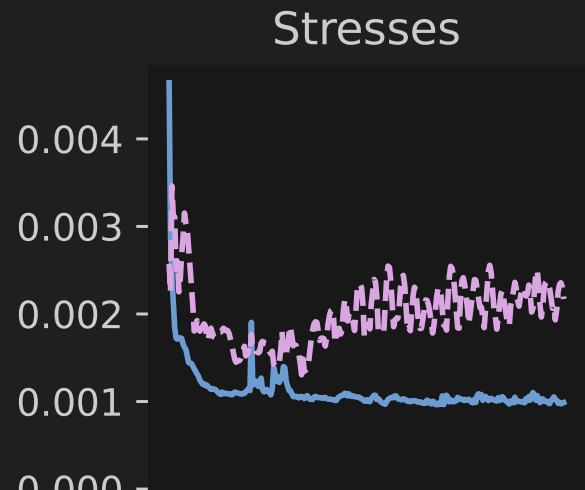
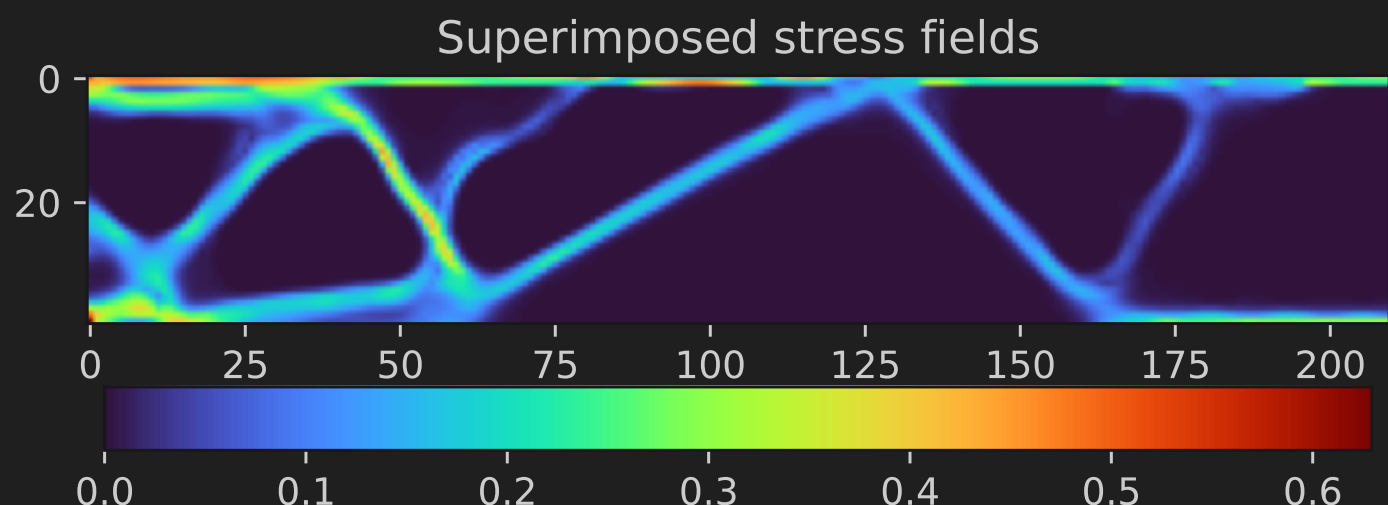
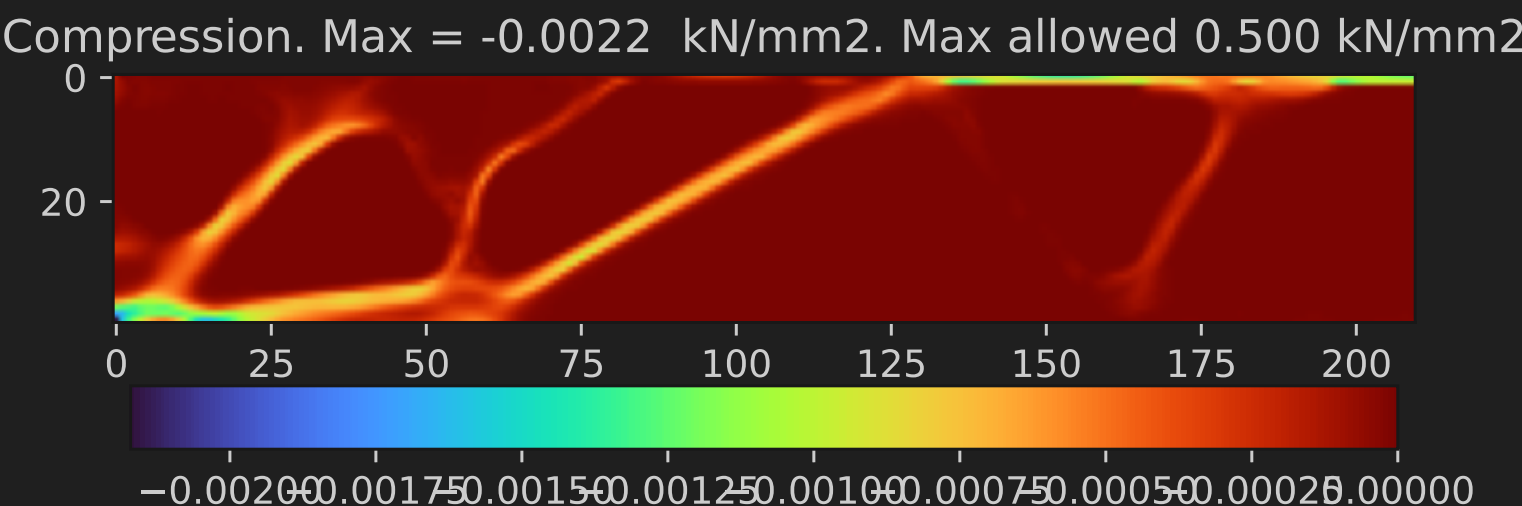
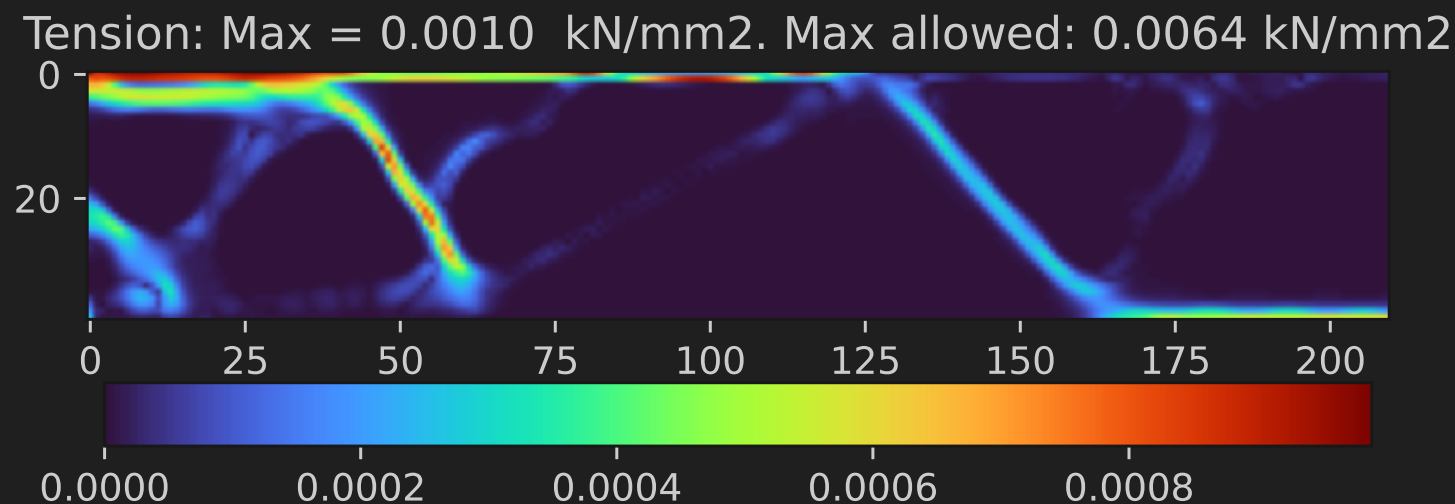
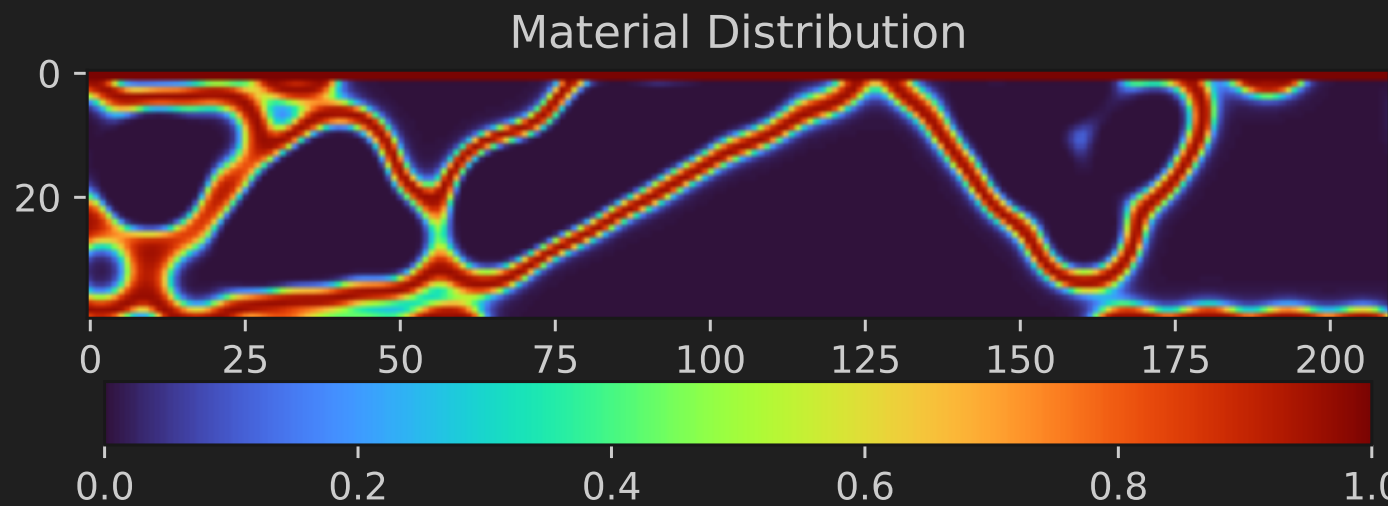
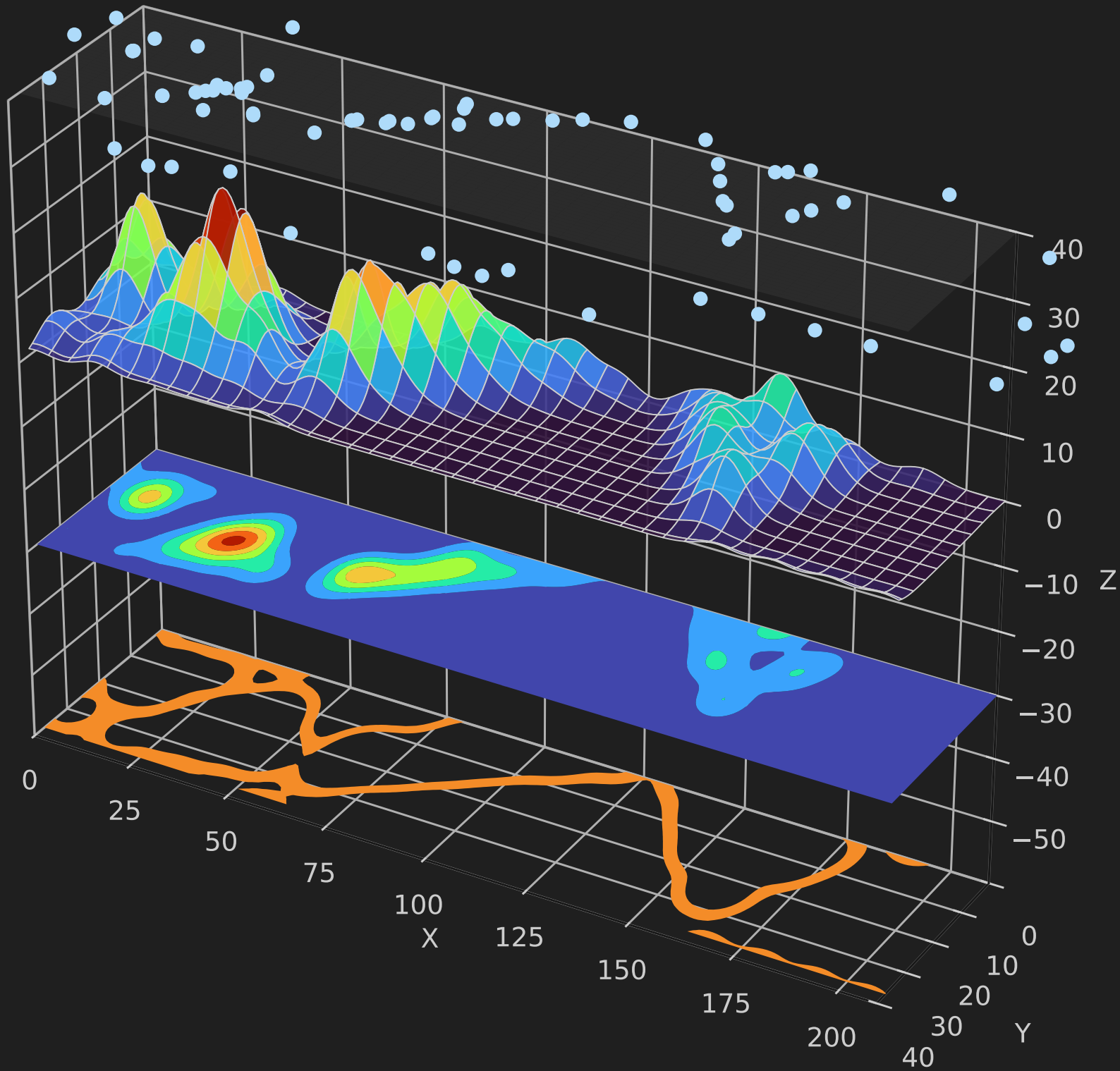
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.26 Shift = 1.81 Iteration = 281



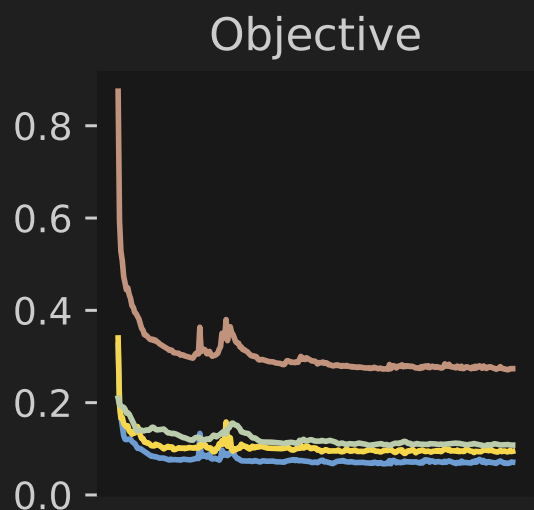
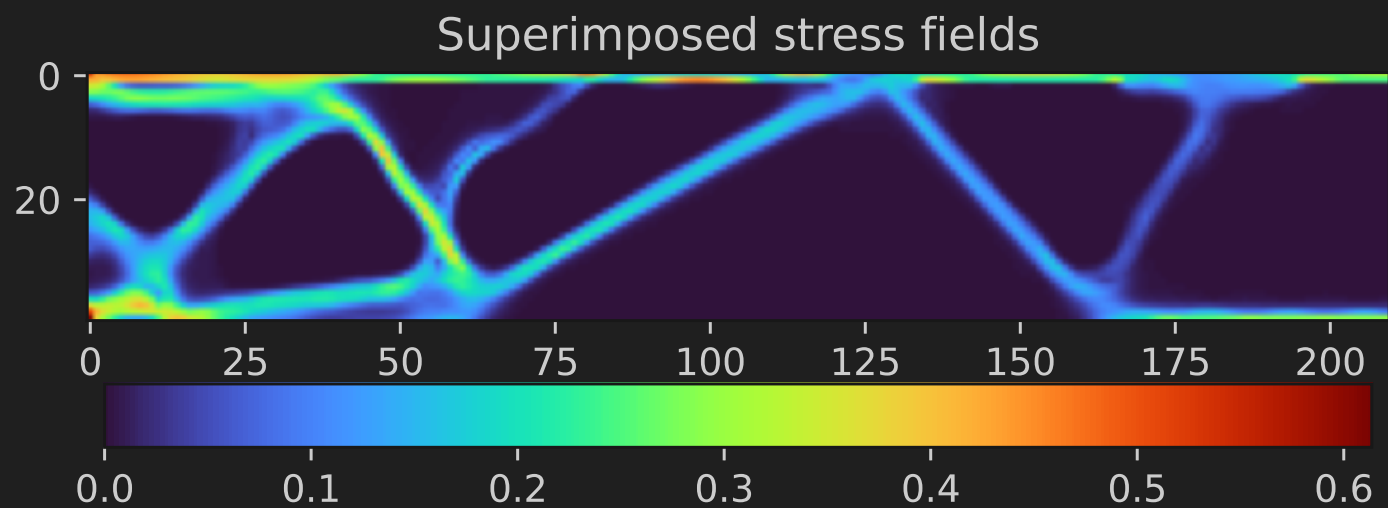
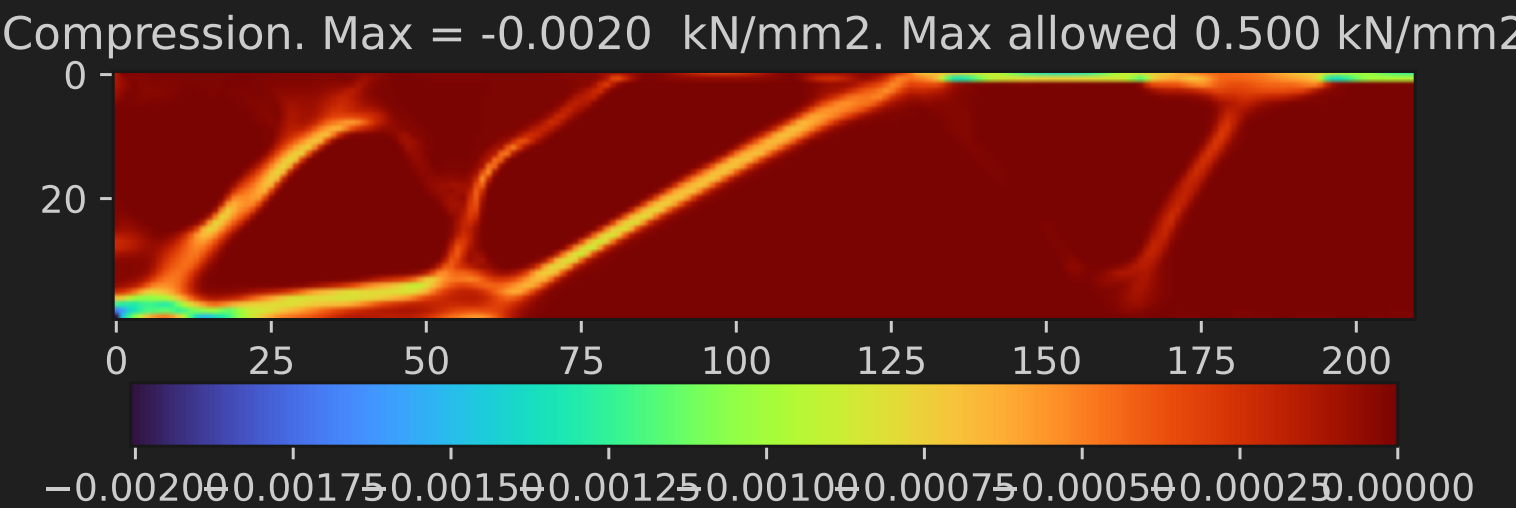
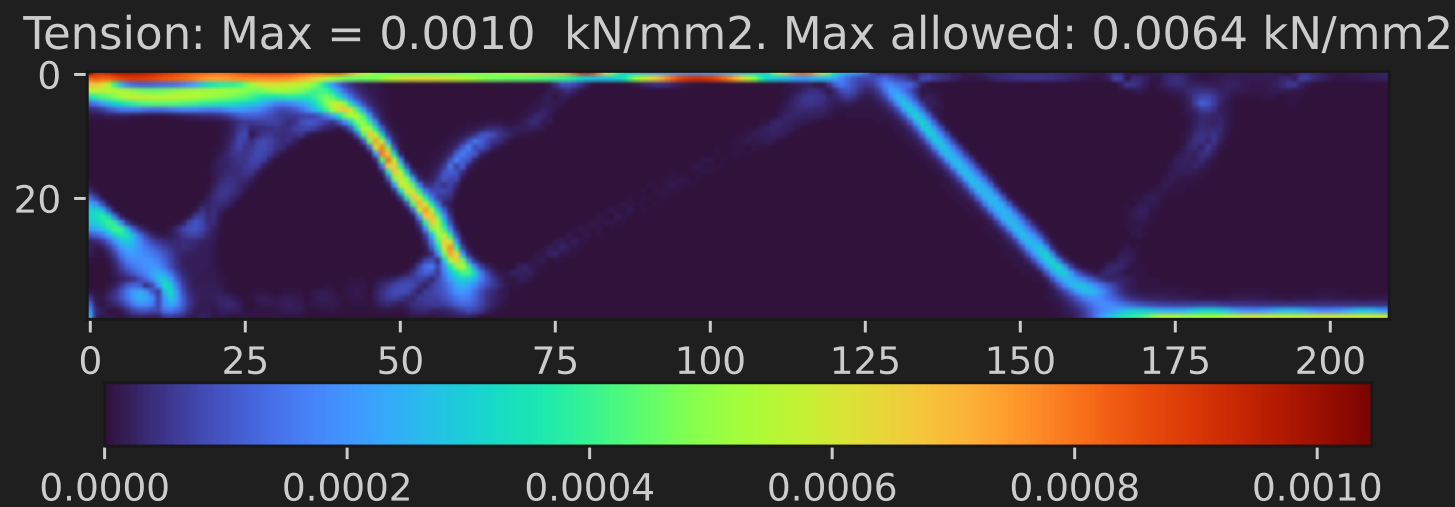
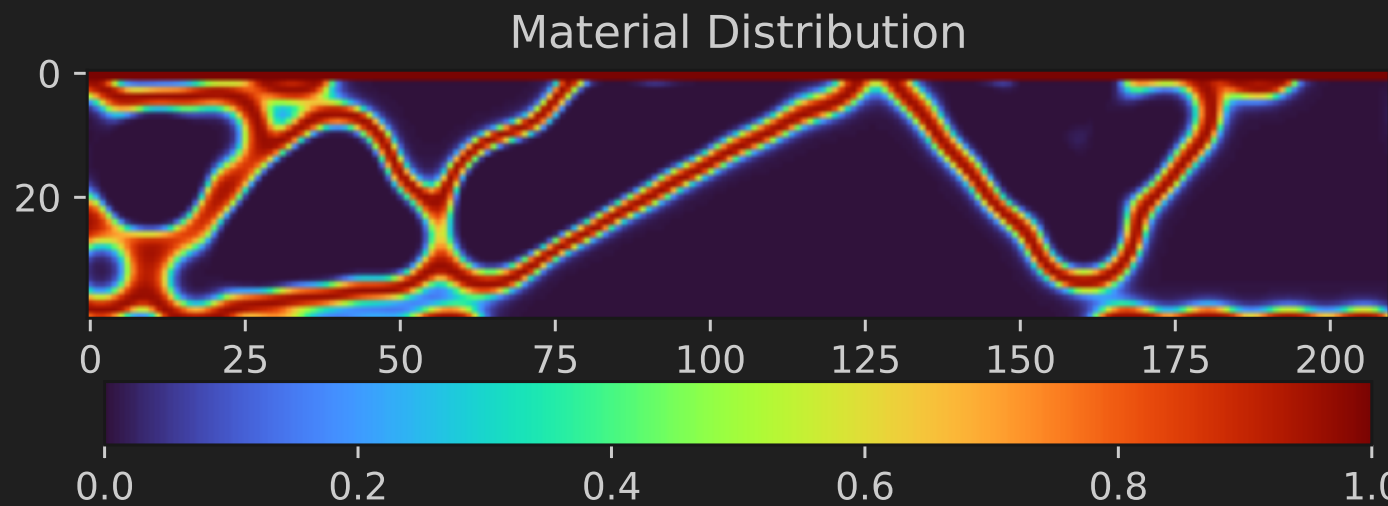
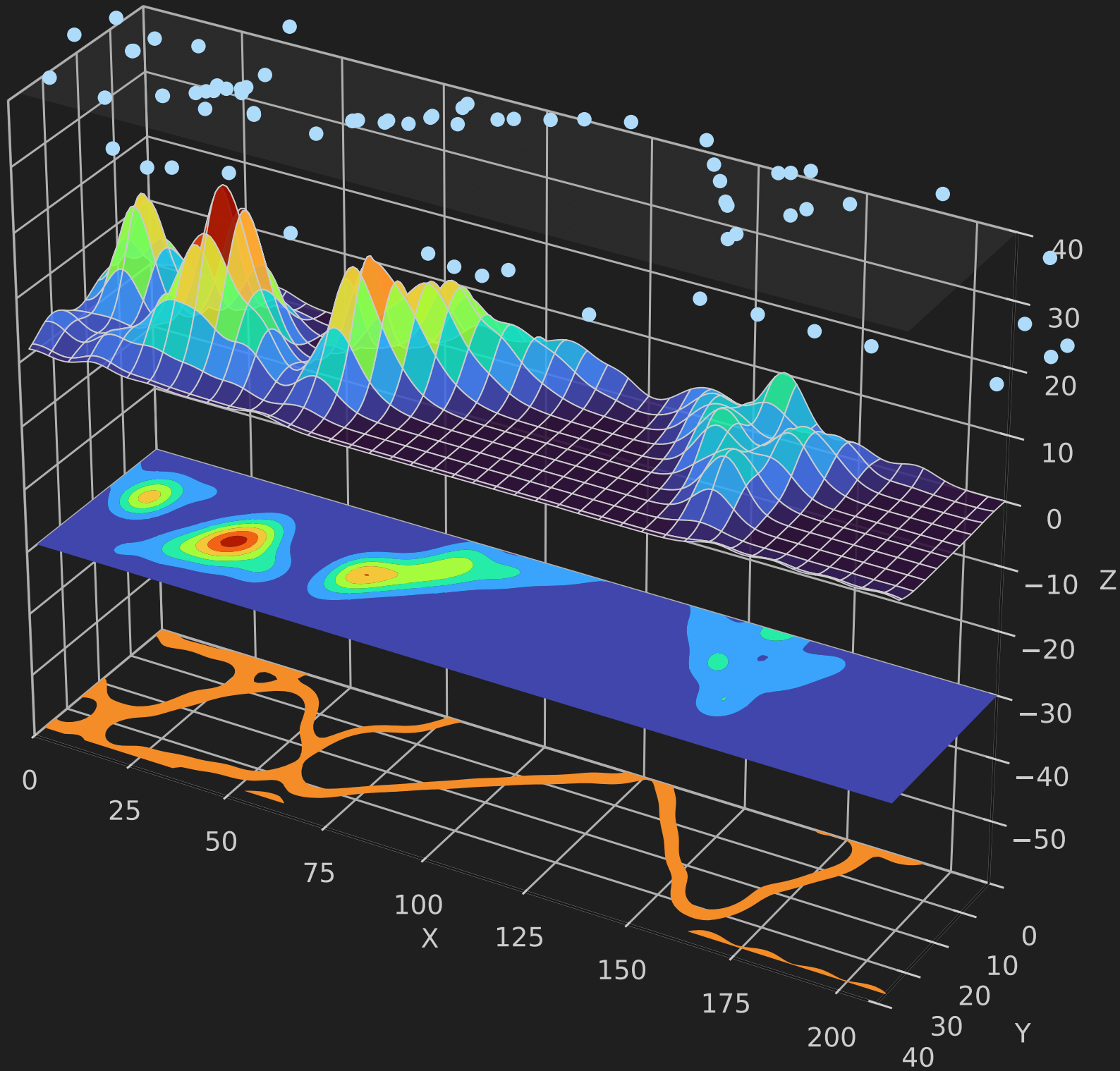
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.25 Shift = 1.81 Iteration = 283



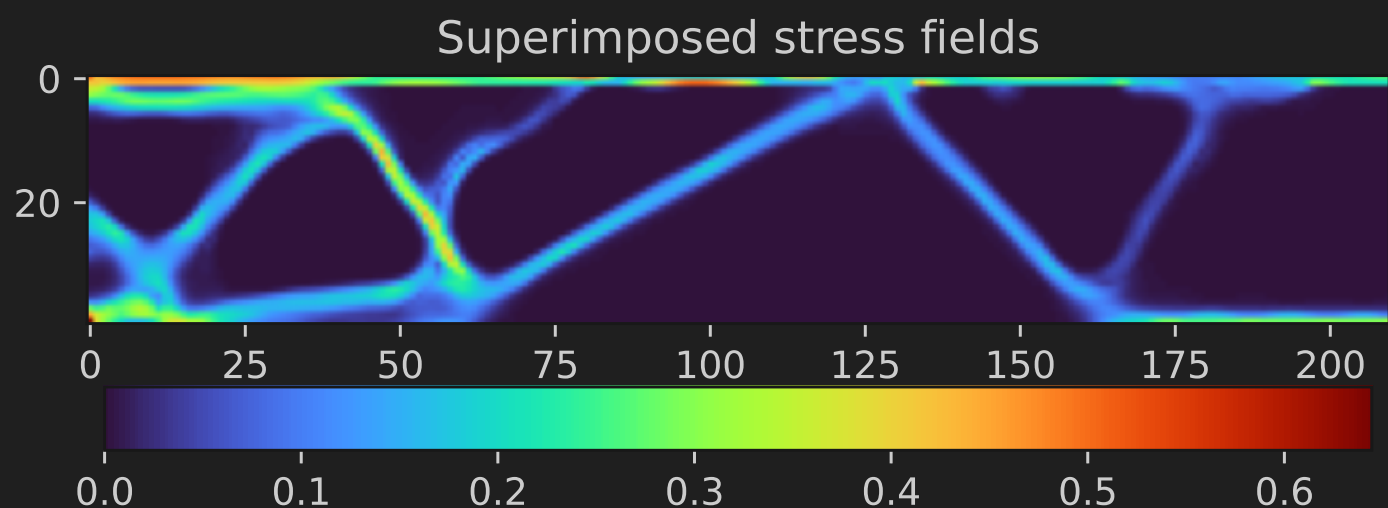
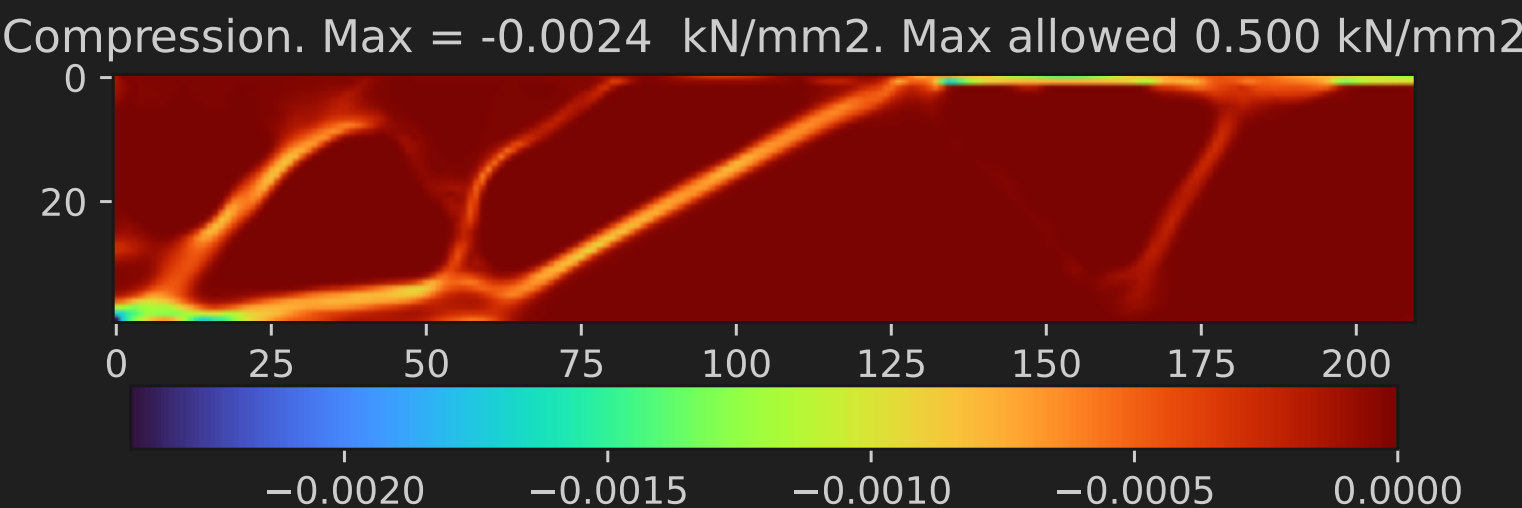
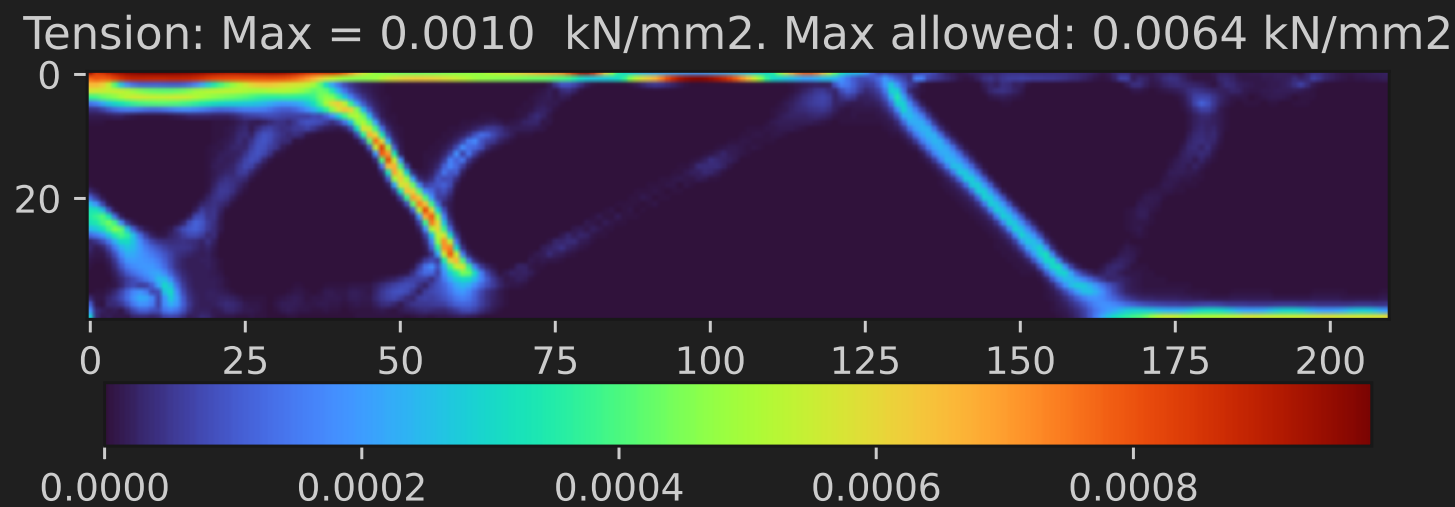
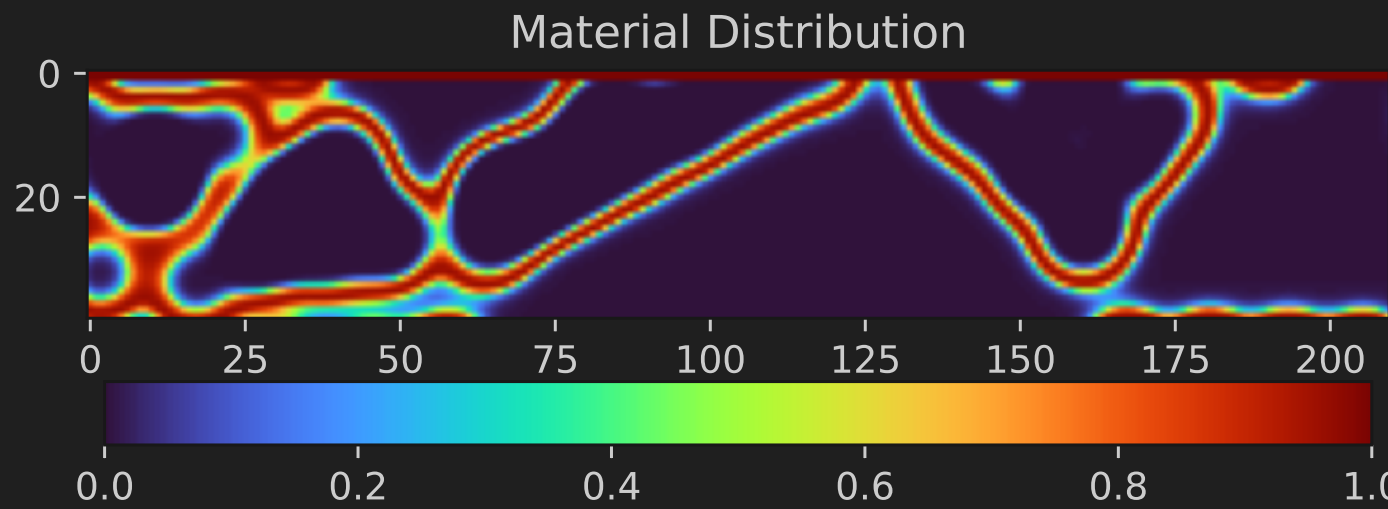
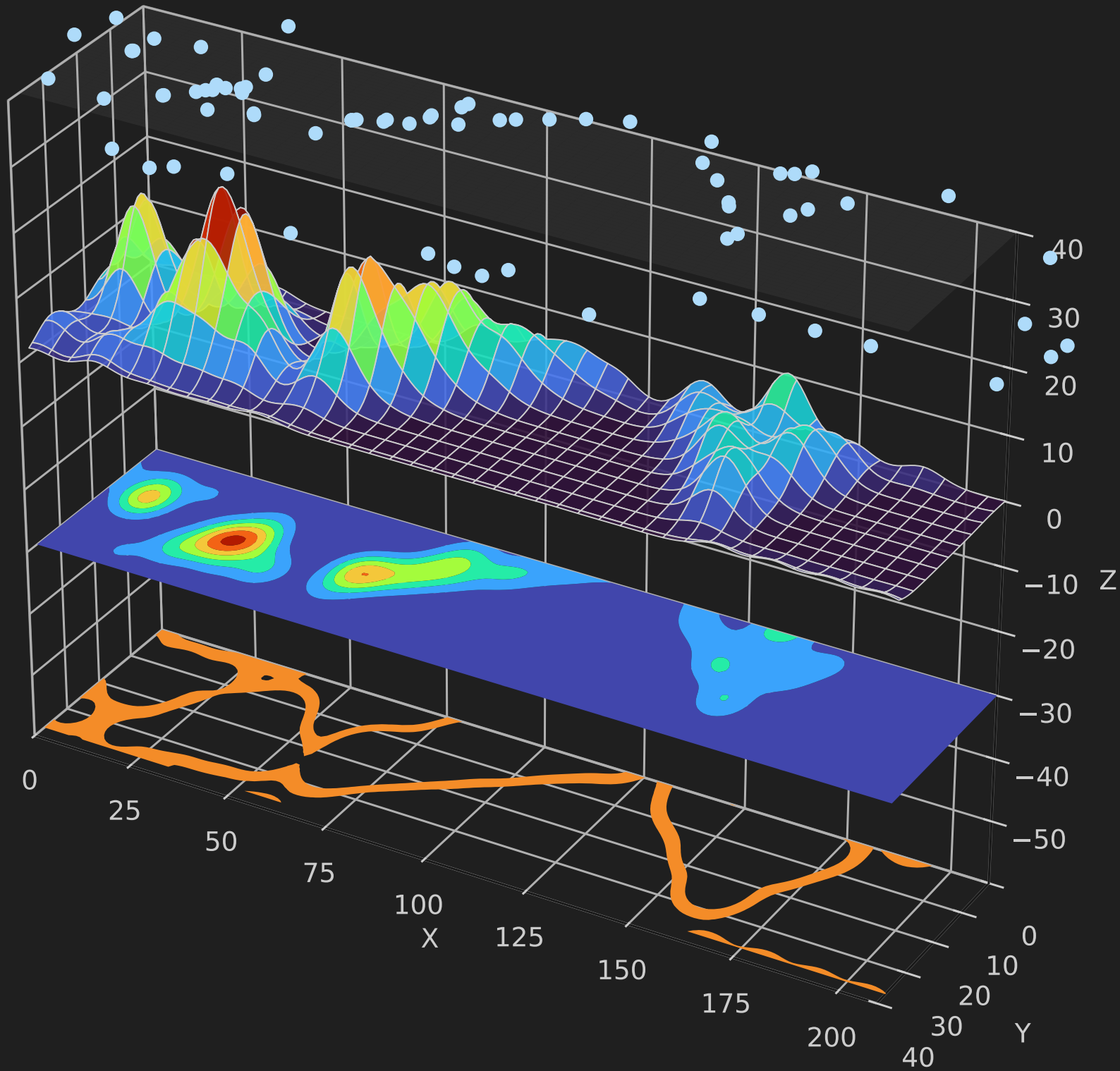
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.09) = 0.27

Spread Gaussian = 6.23 Shift = 1.81 Iteration = 285



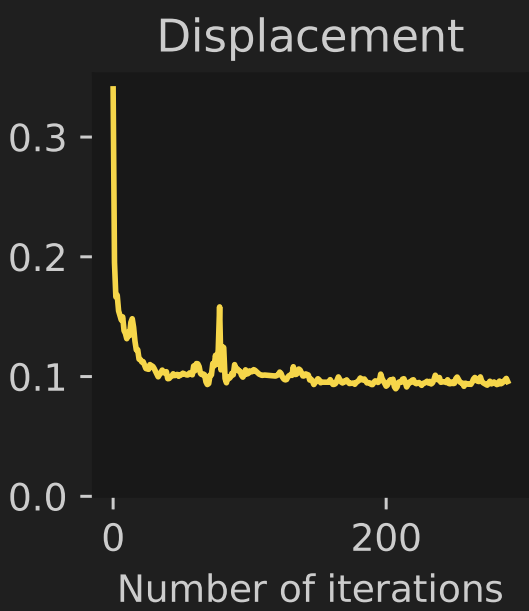
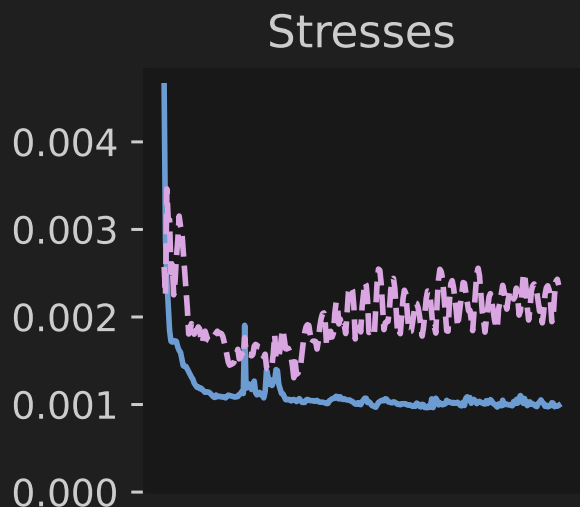
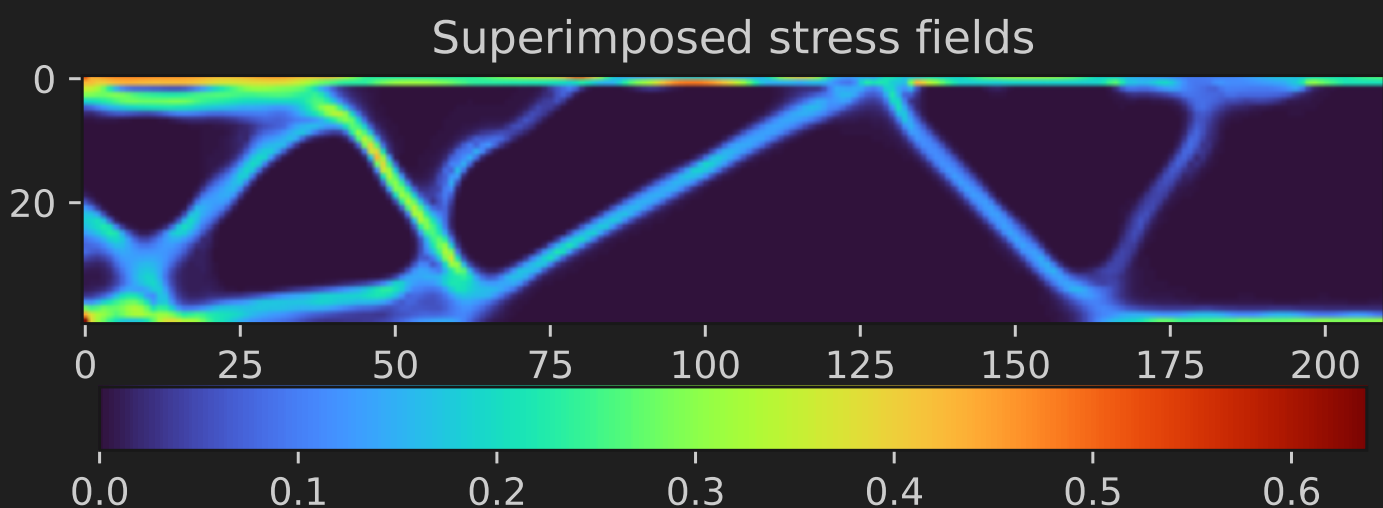
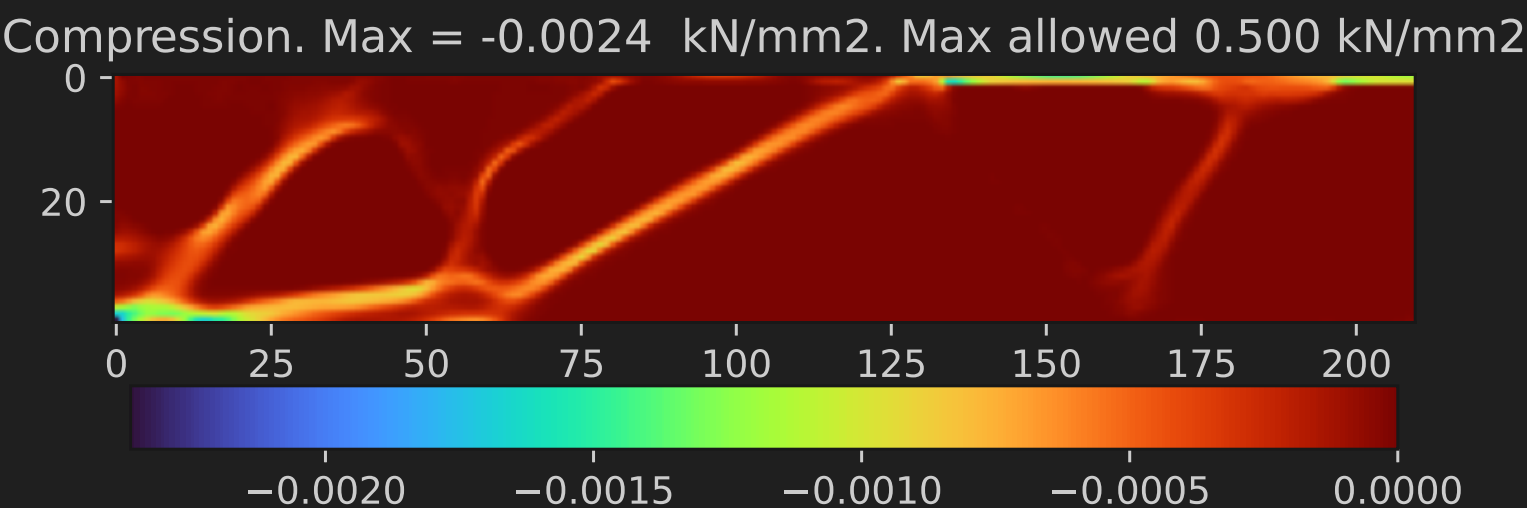
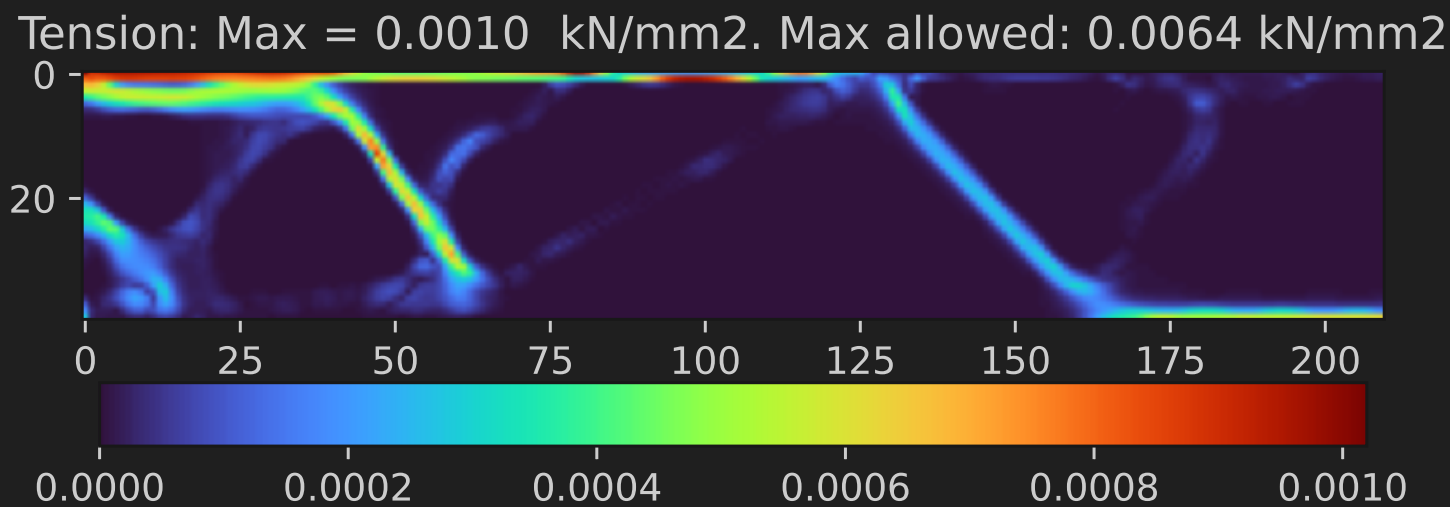
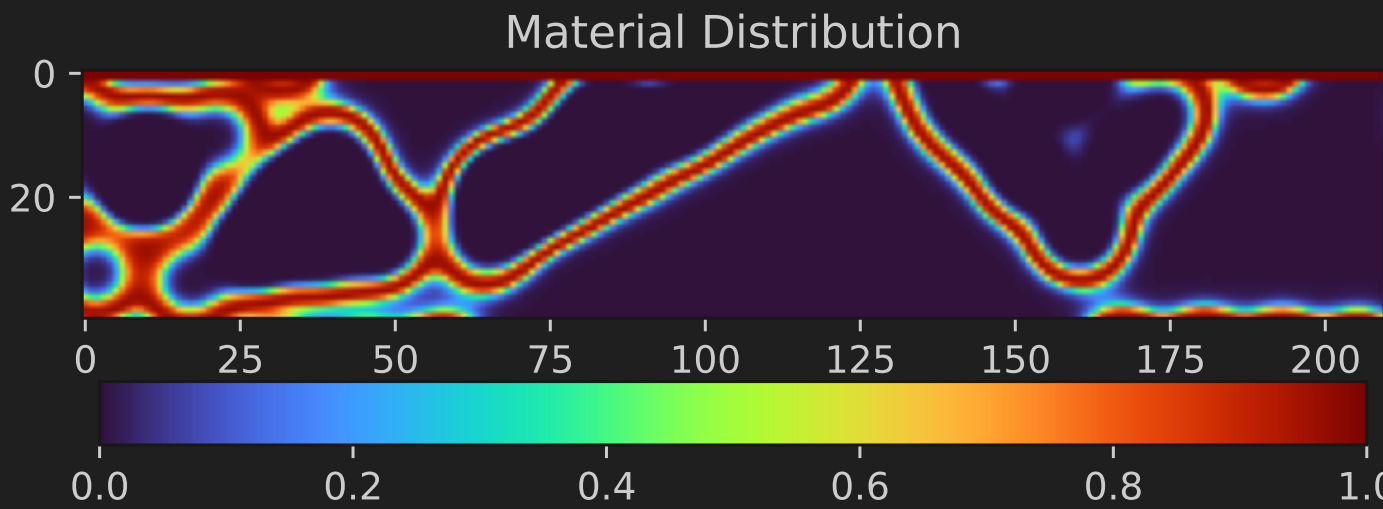
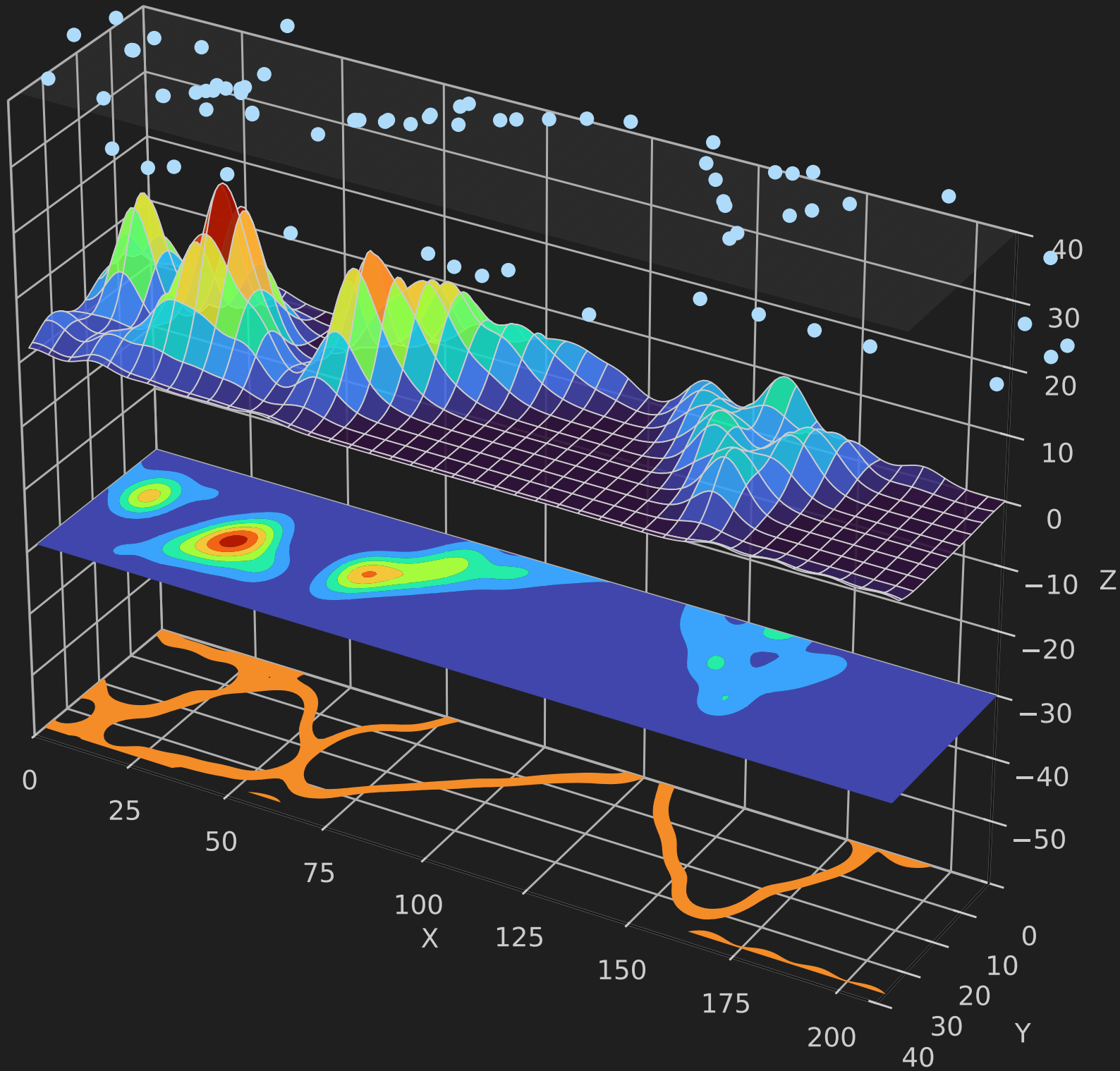
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.21) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.26 Shift = 1.78 Iteration = 287



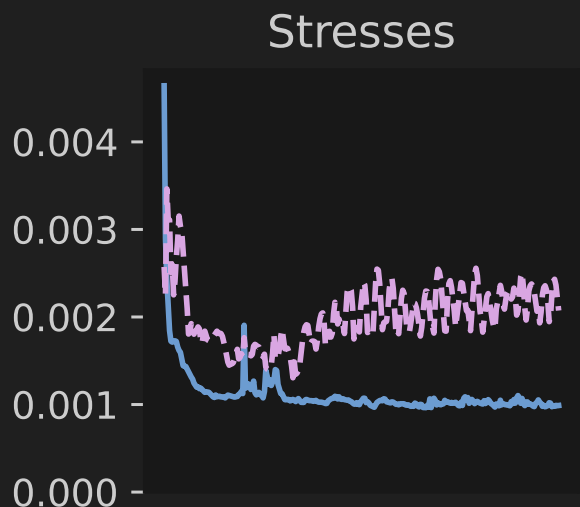
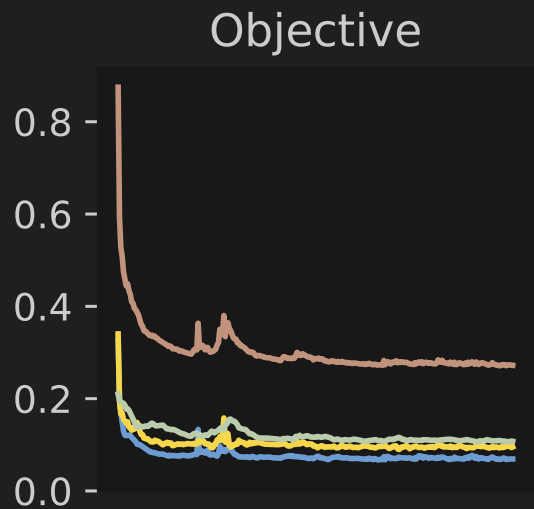
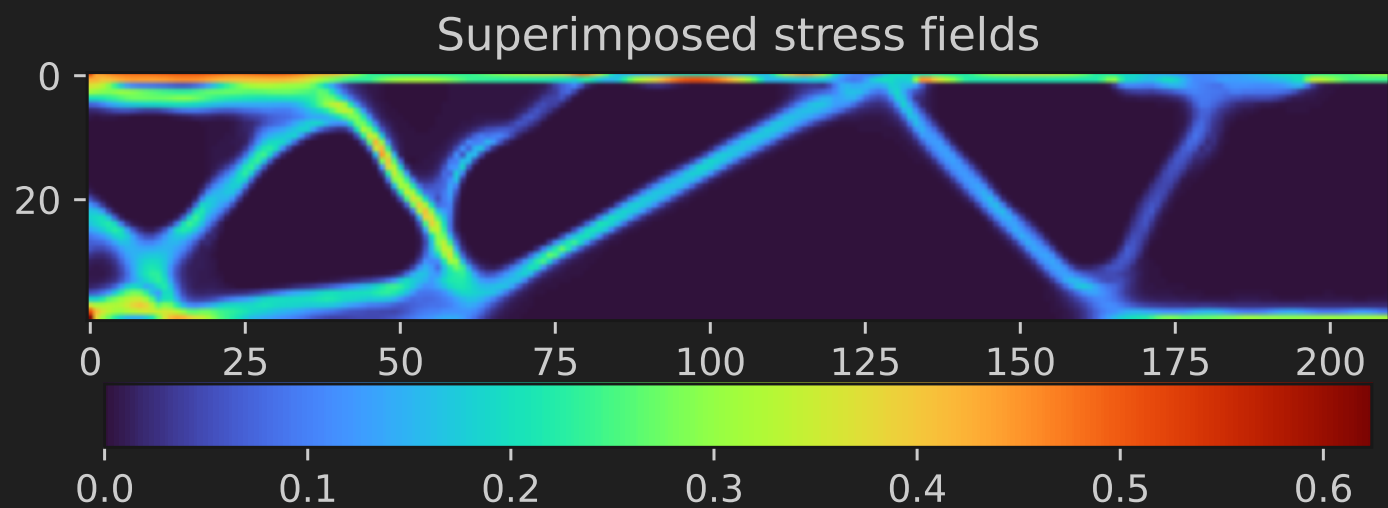
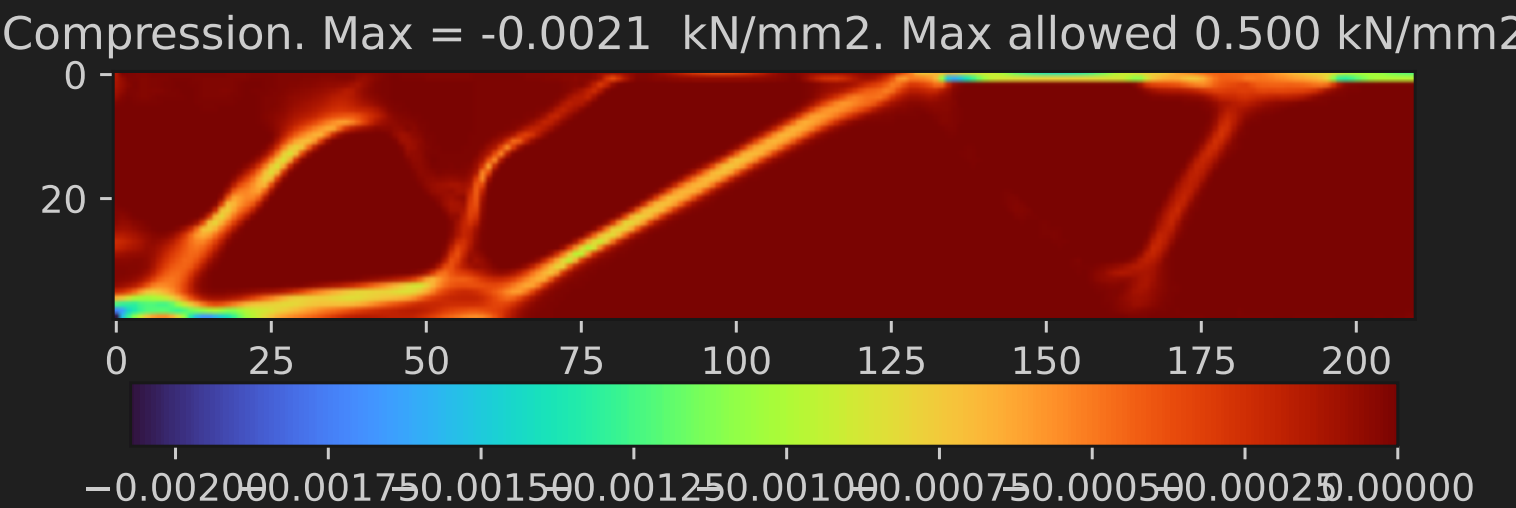
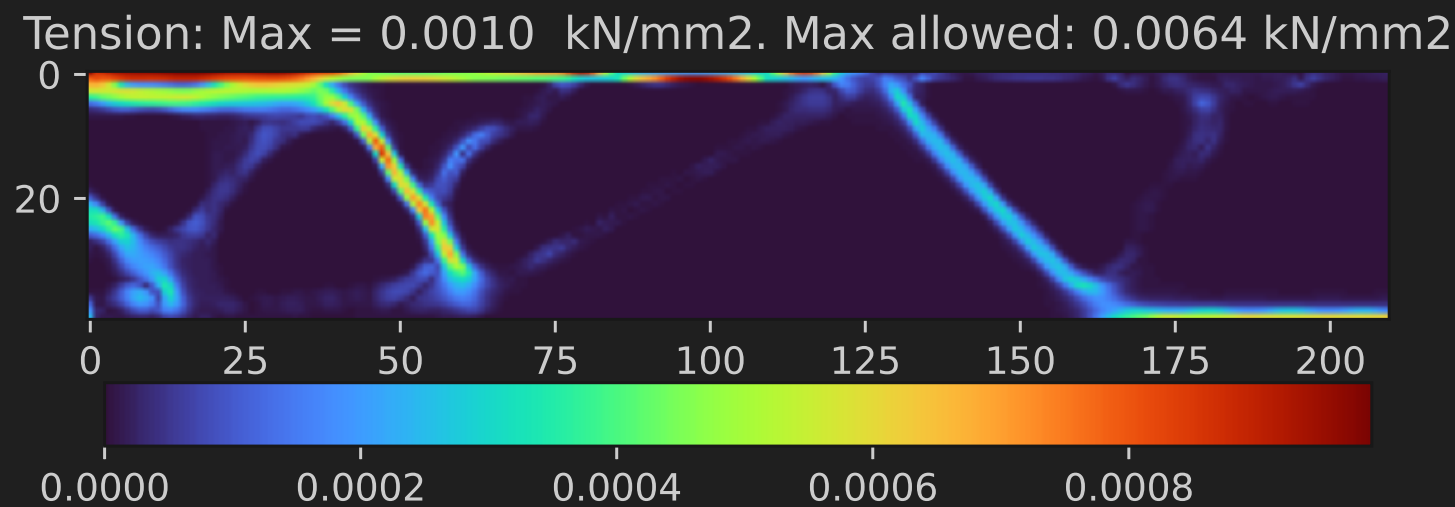
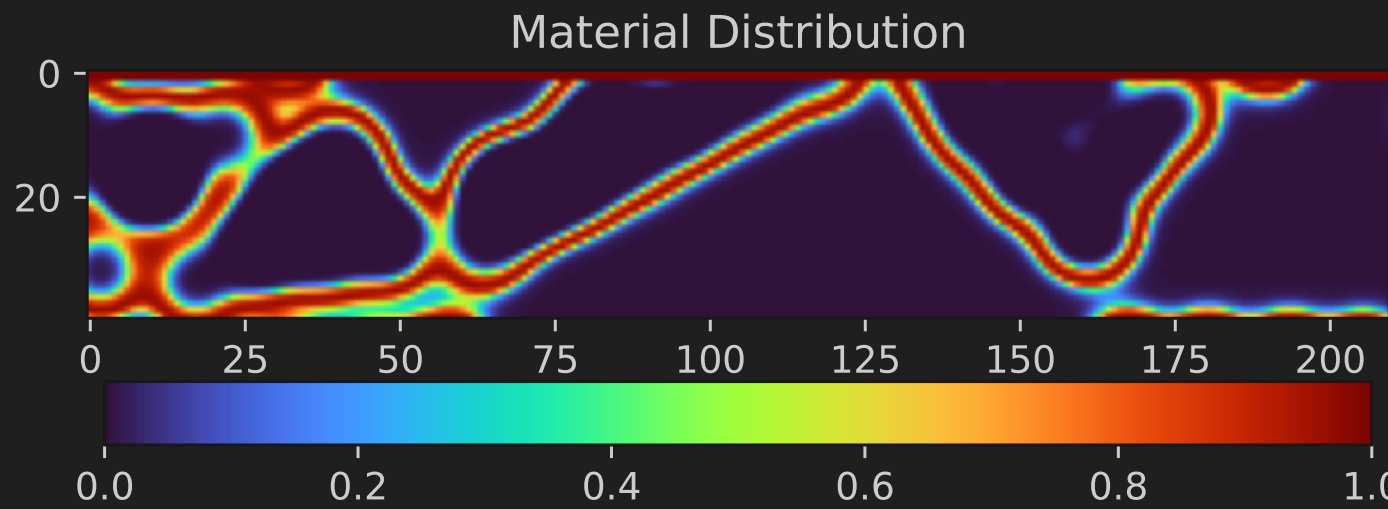
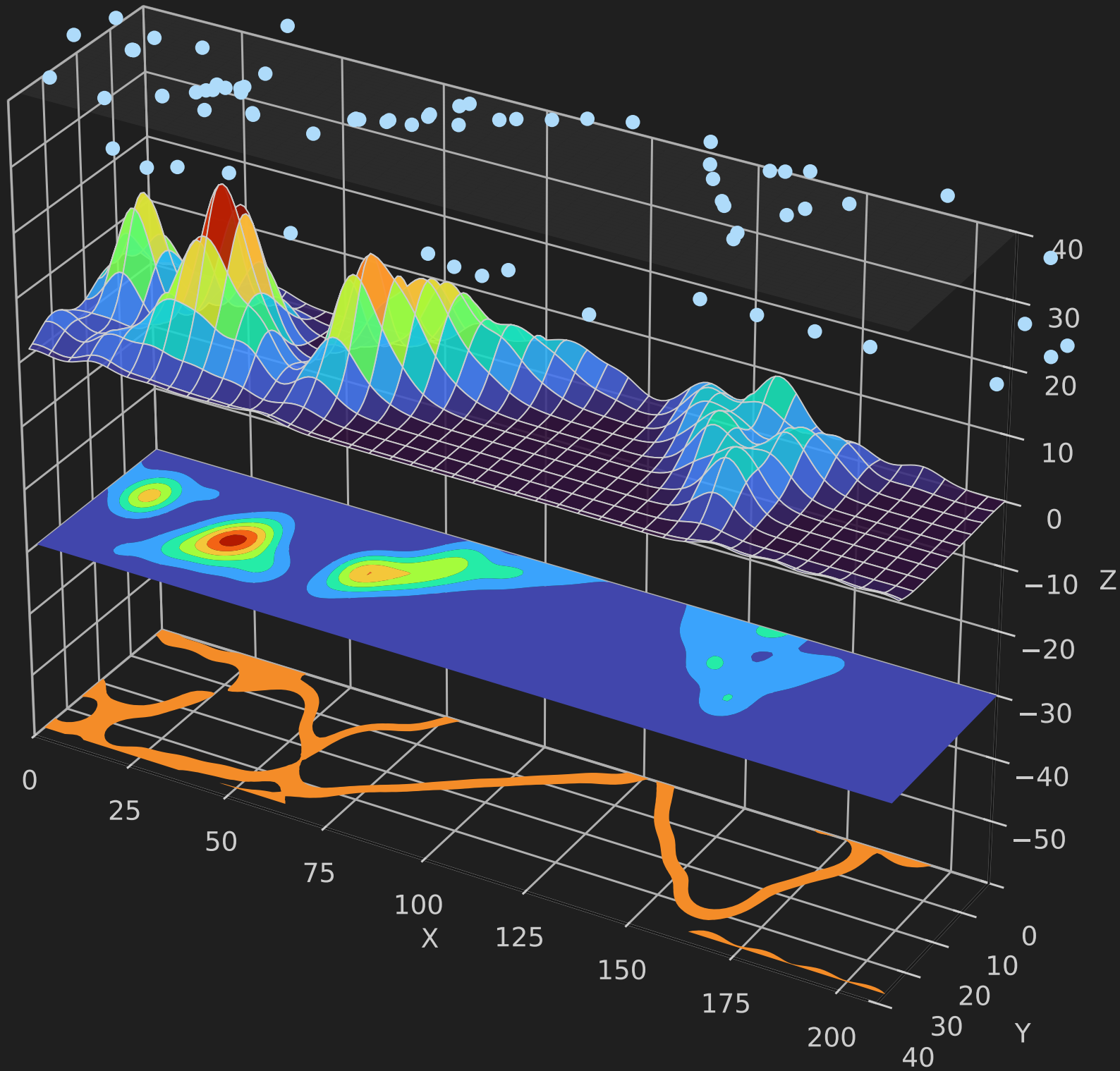
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.26 Shift = 1.79 Iteration = 289



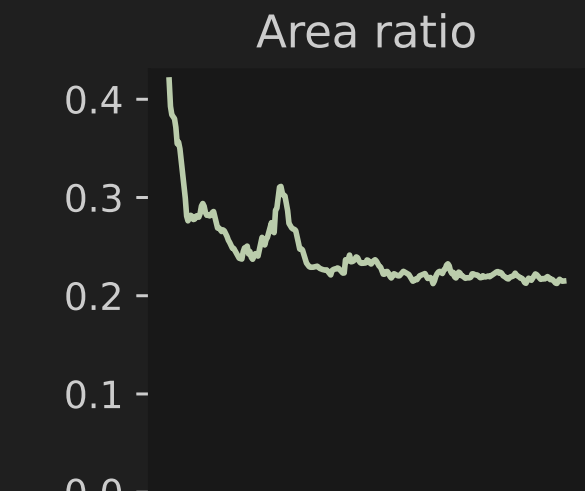
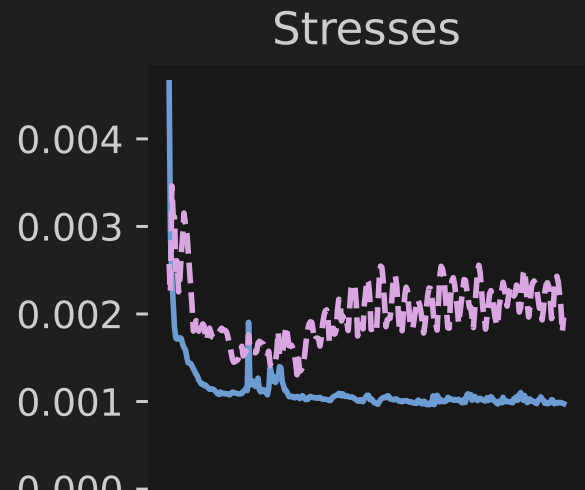
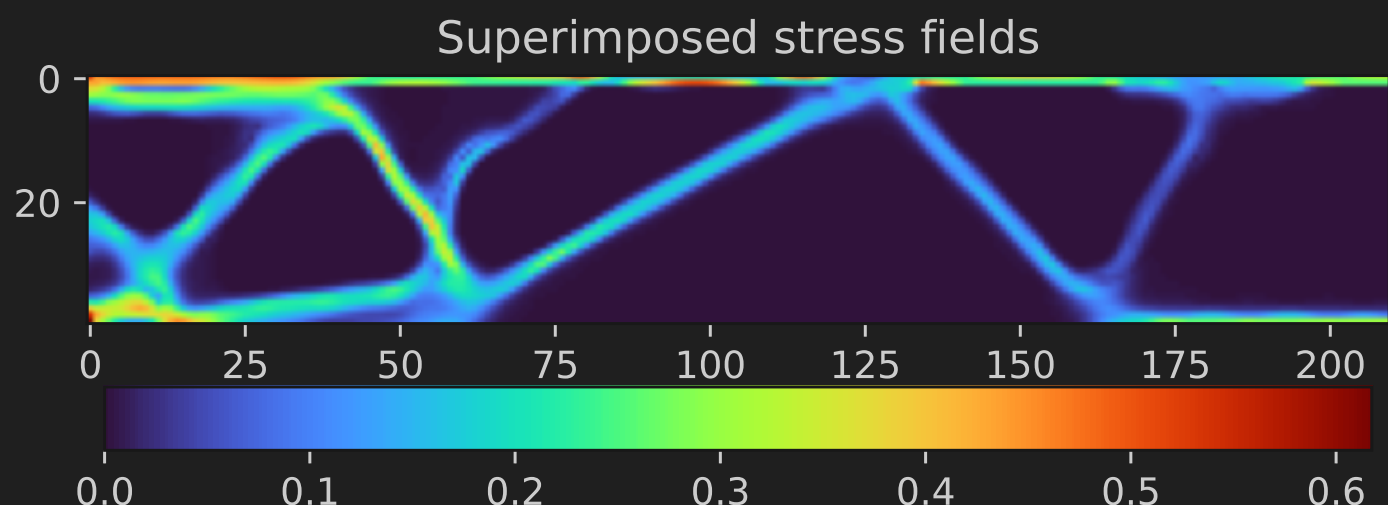
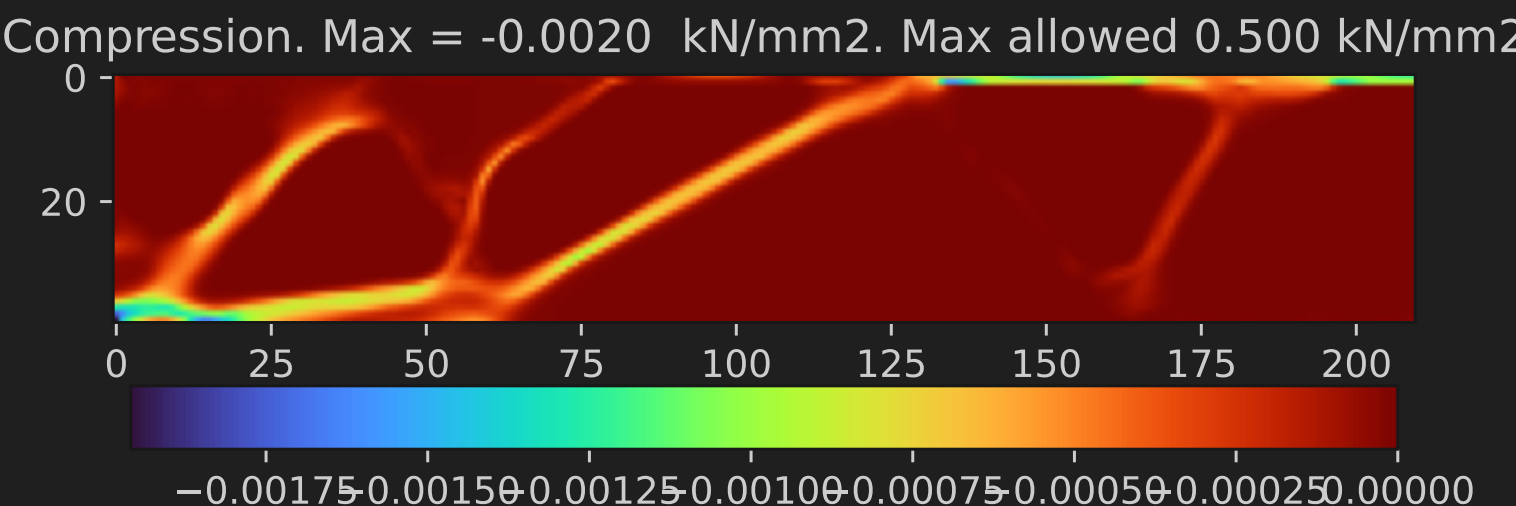
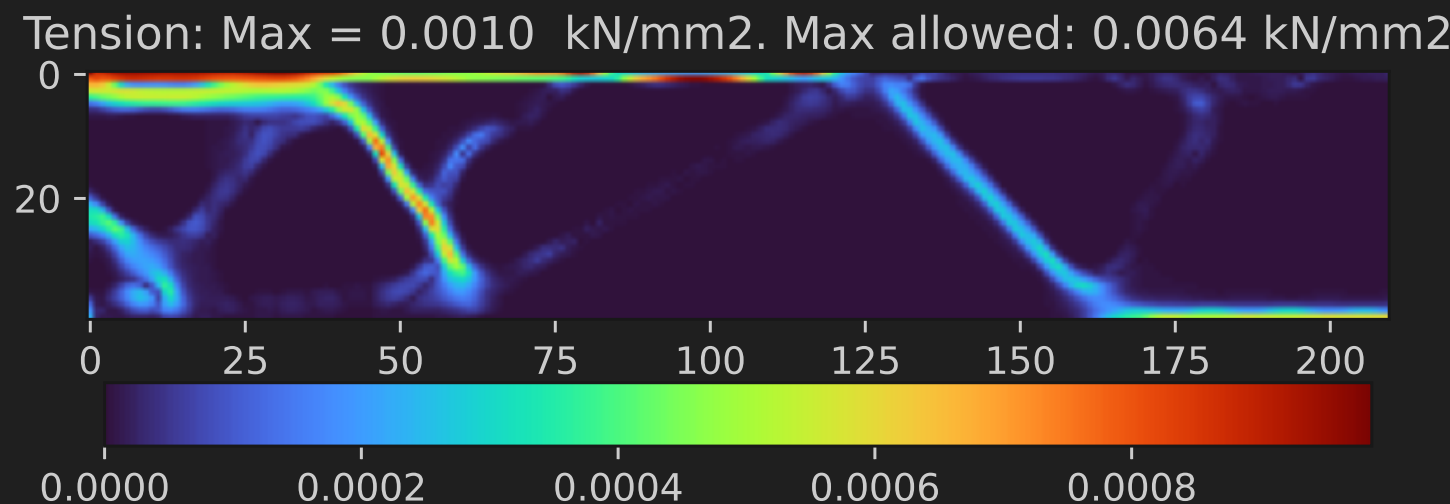
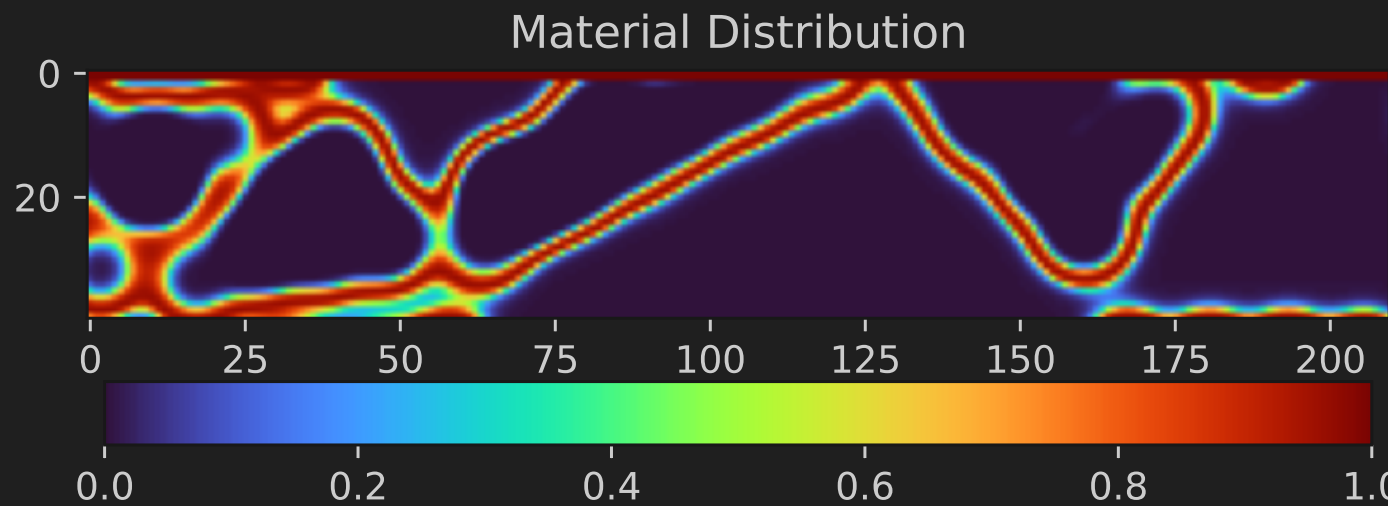
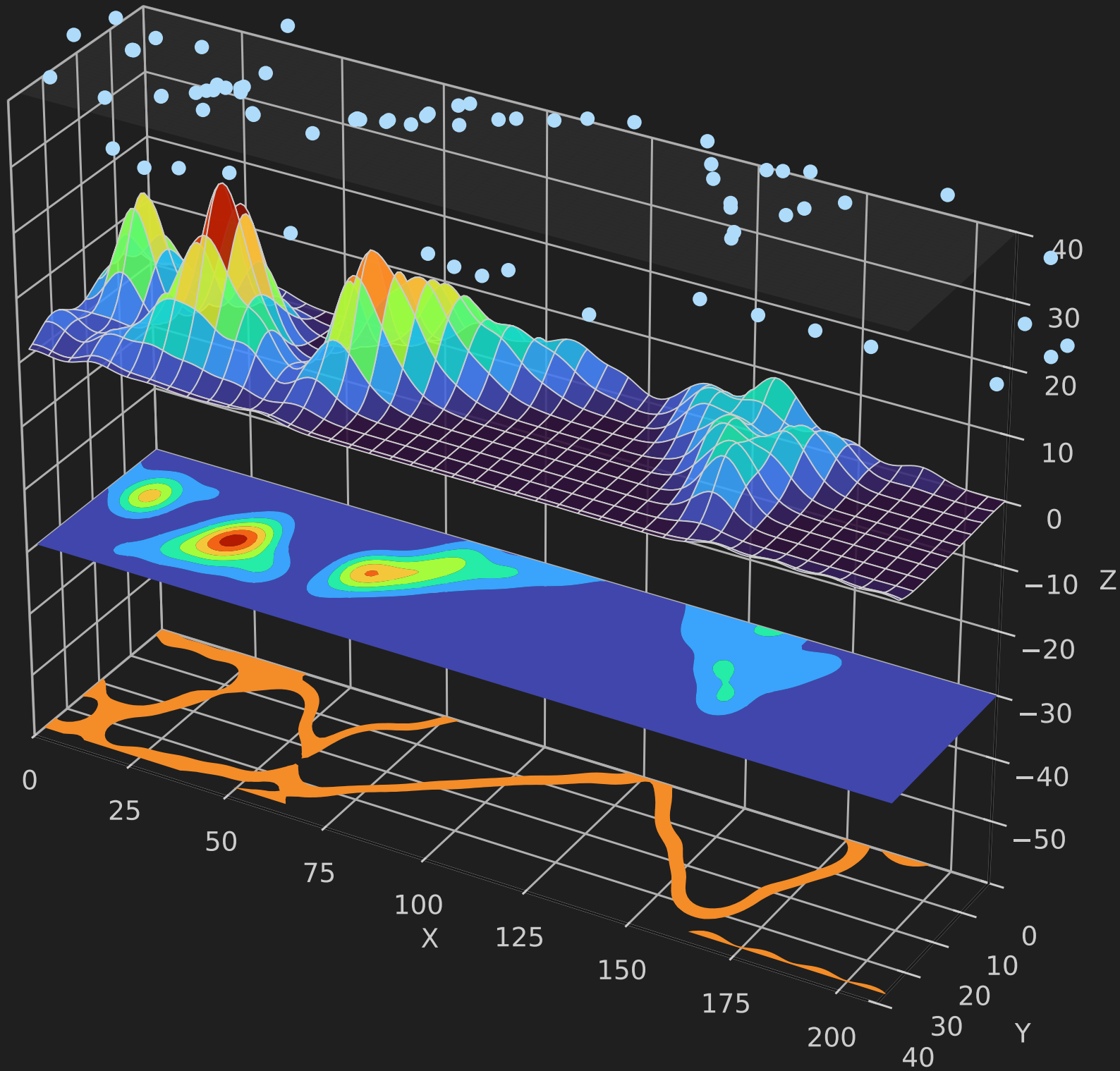
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.22) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.29 Shift = 1.79 Iteration = 291



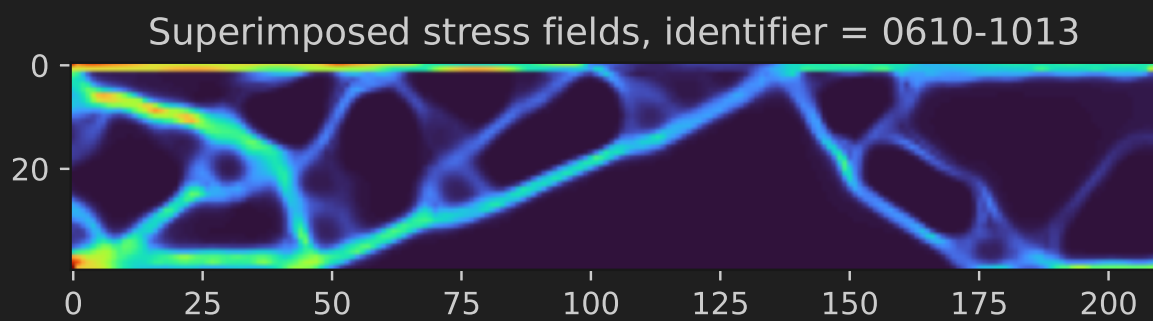
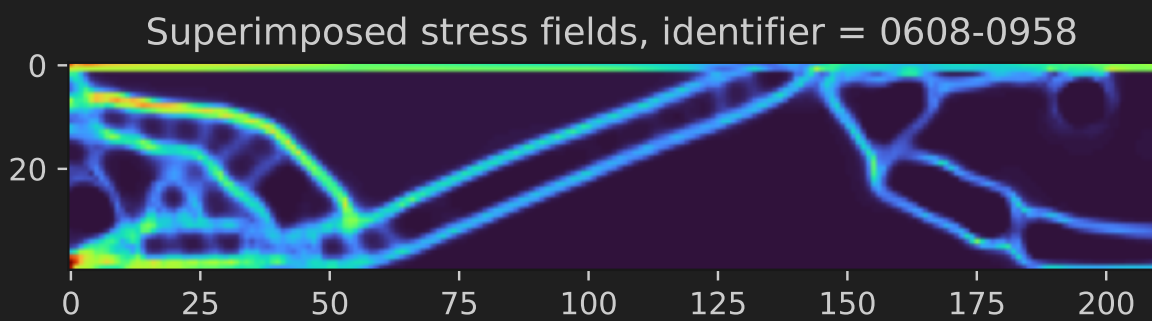
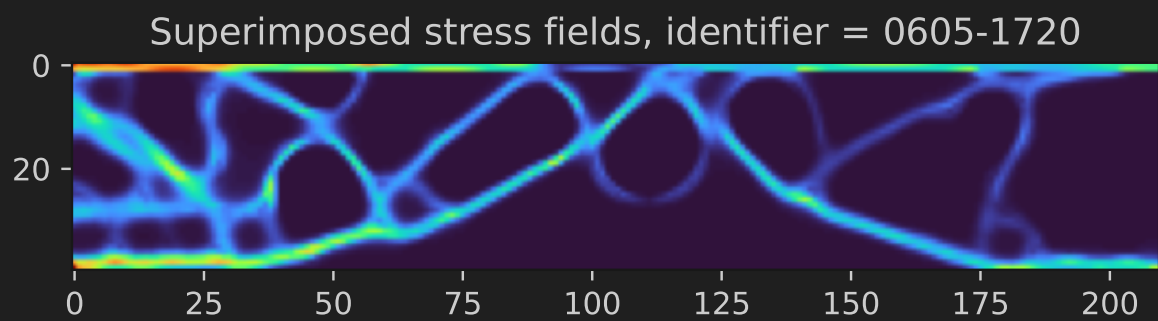
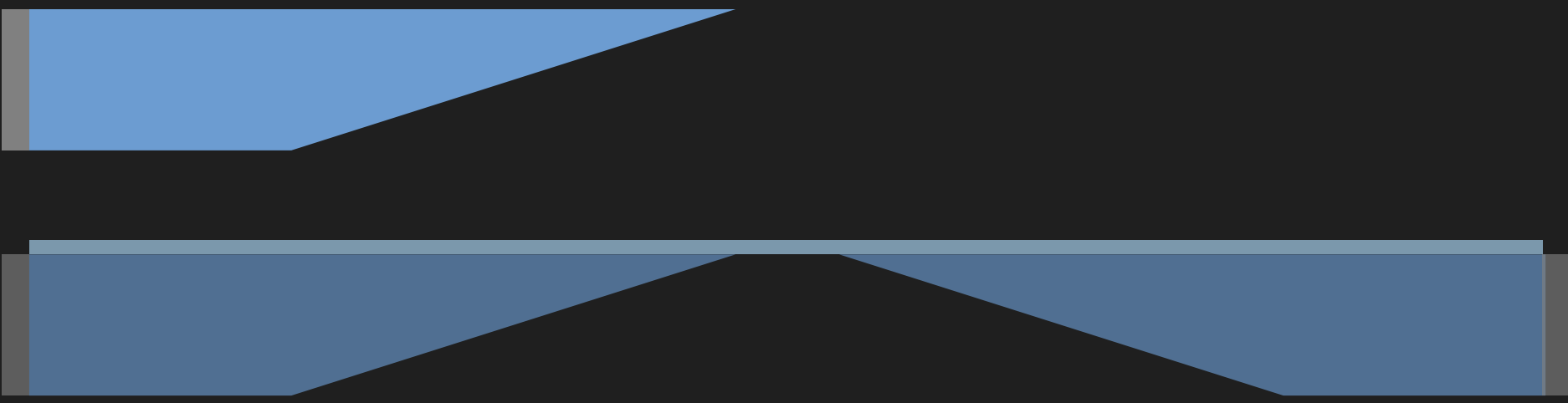
Objective = (Stress: 70 * 0.0010) + (Volume: 0.5 * 0.21) - (Displacement: 1 * -0.10) = 0.27

Spread Gaussian = 6.28 Shift = 1.80 Iteration = 293

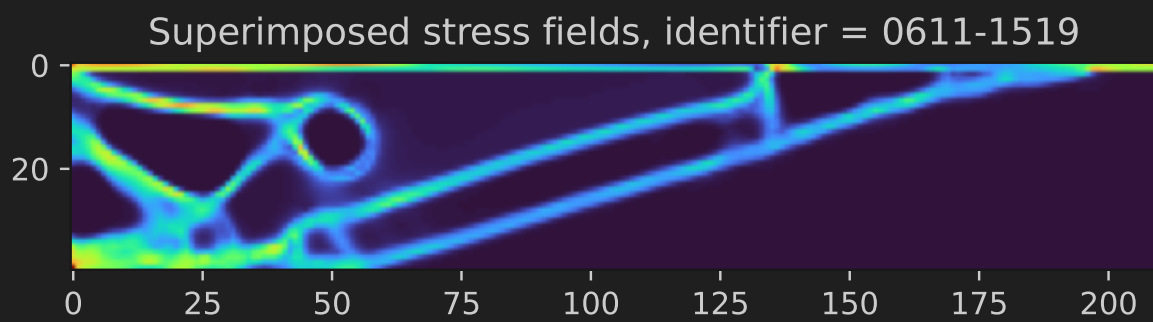
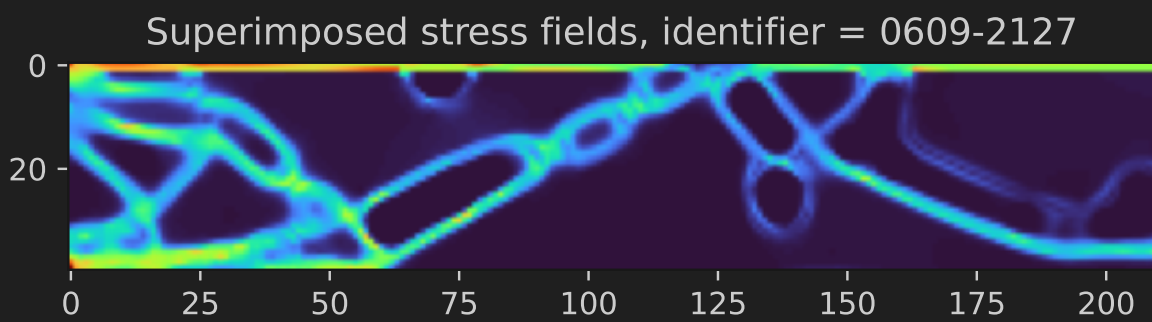
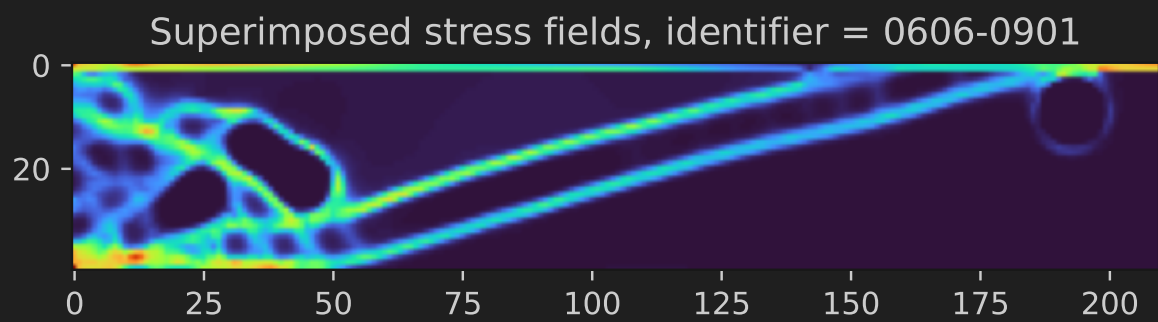
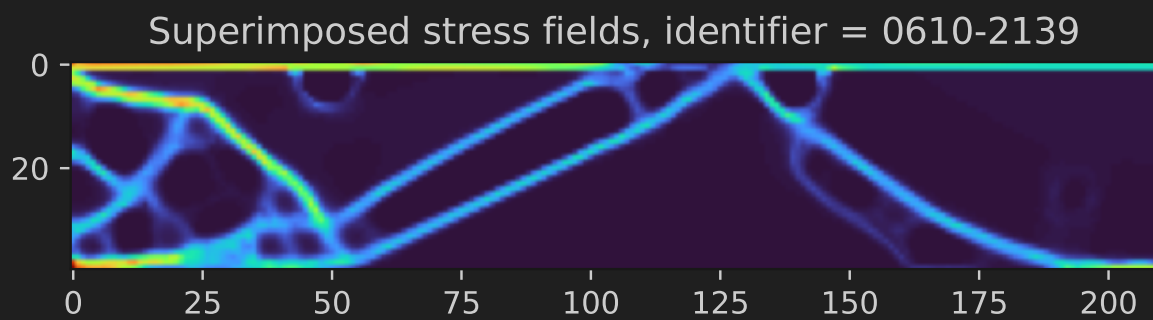
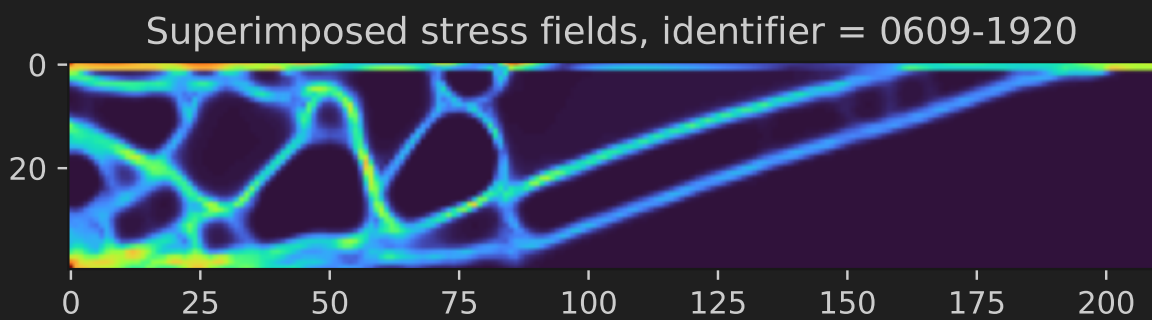
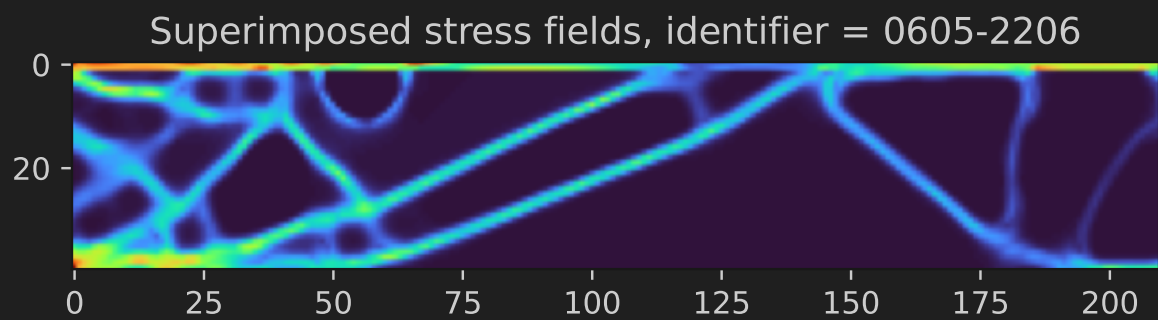
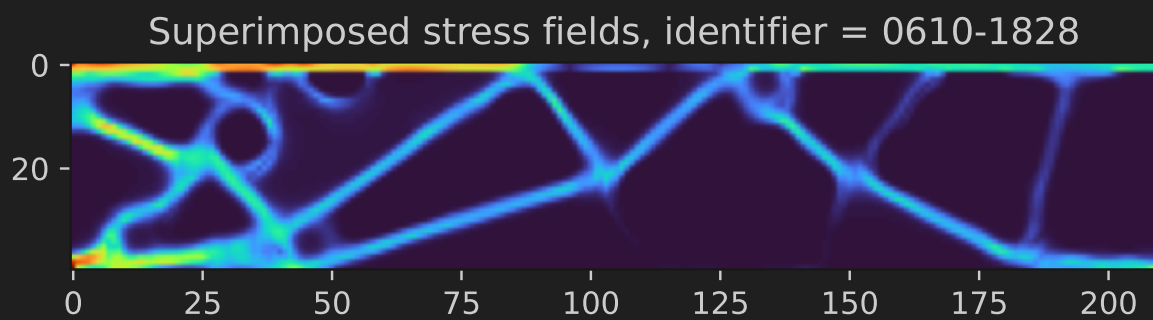
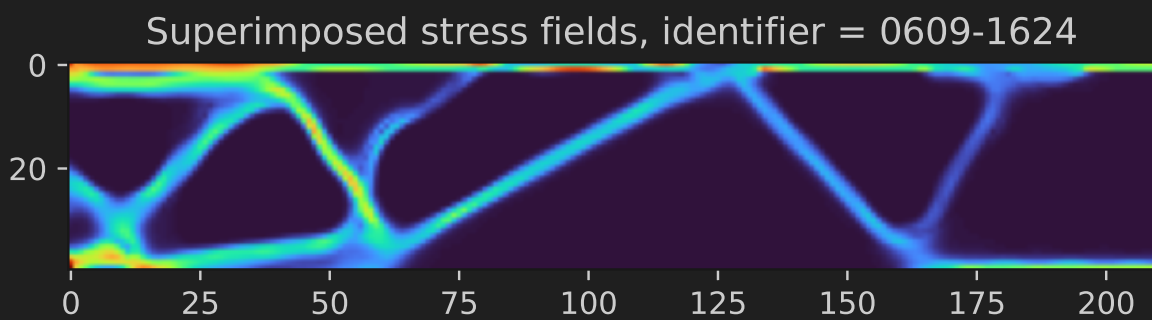
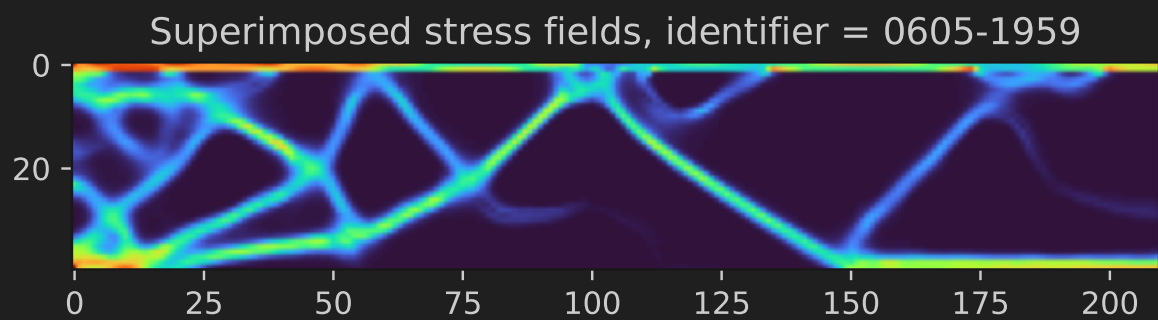


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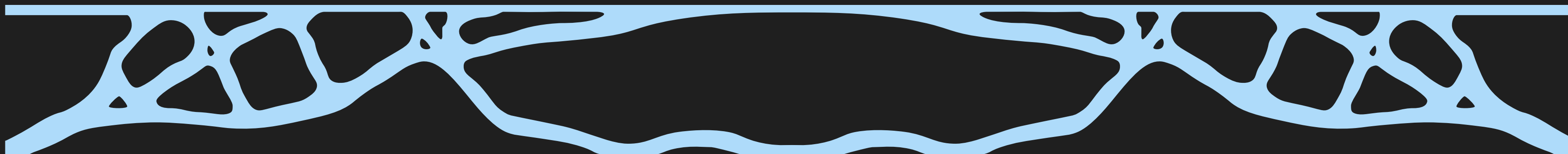
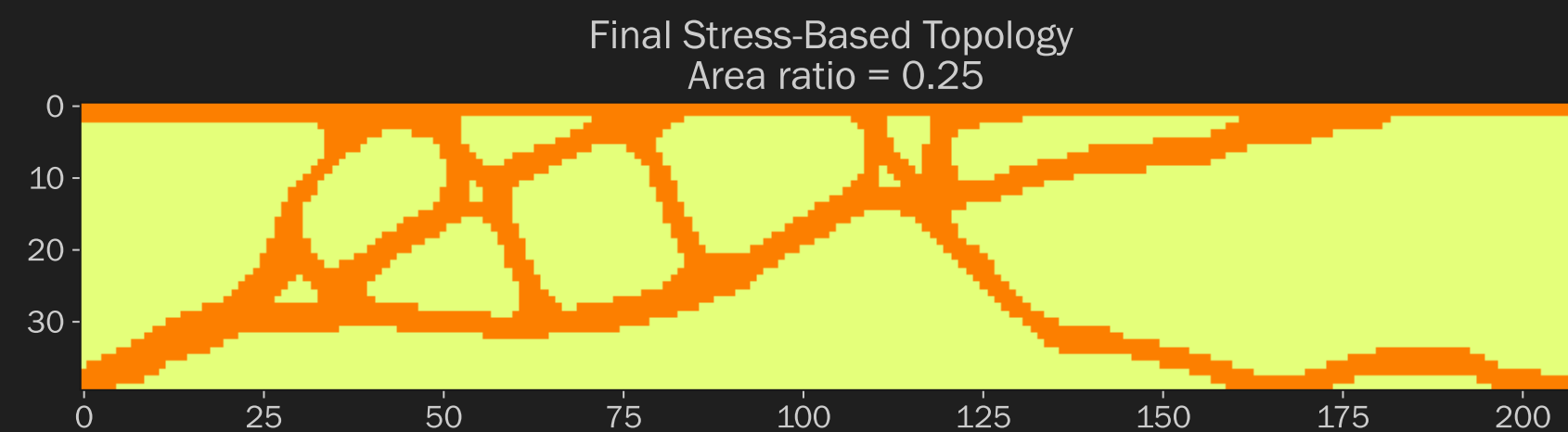
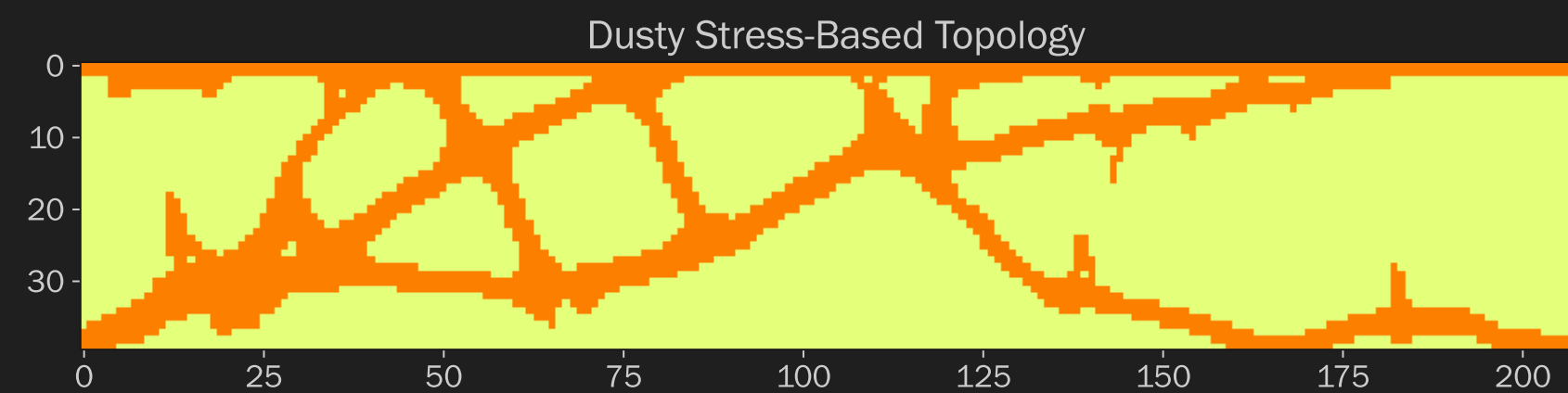
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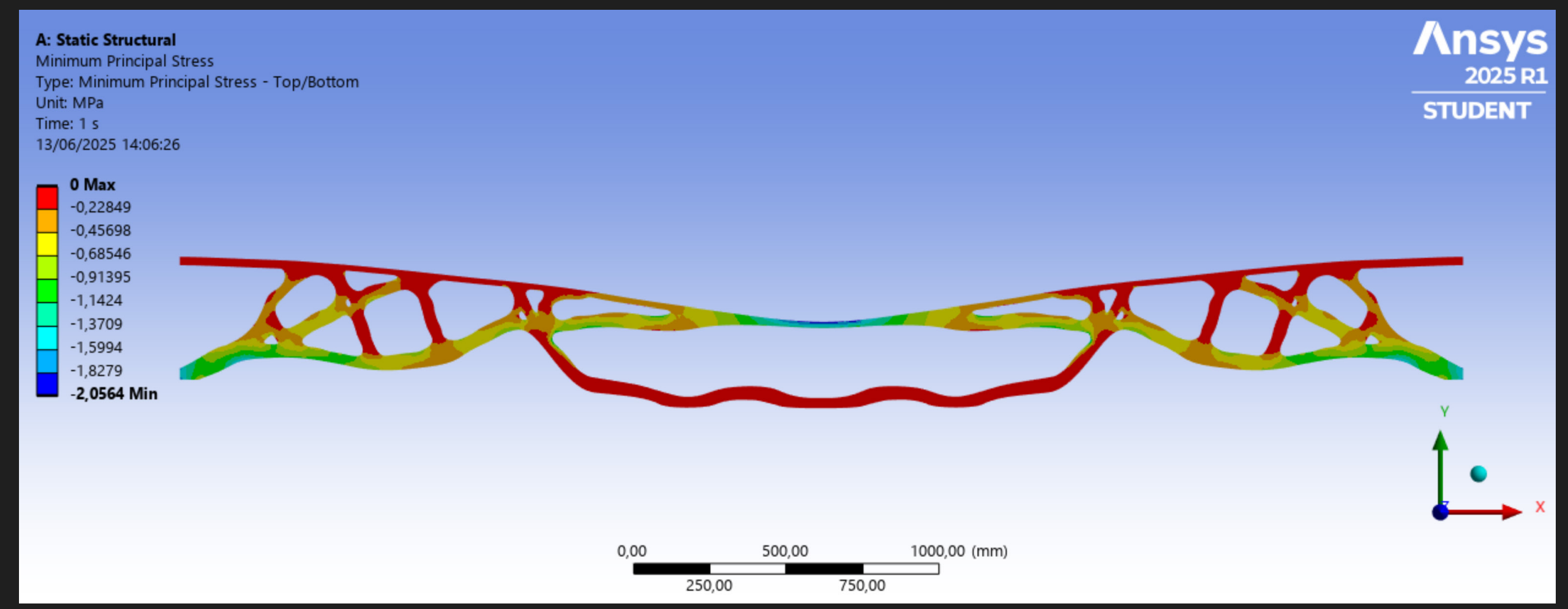
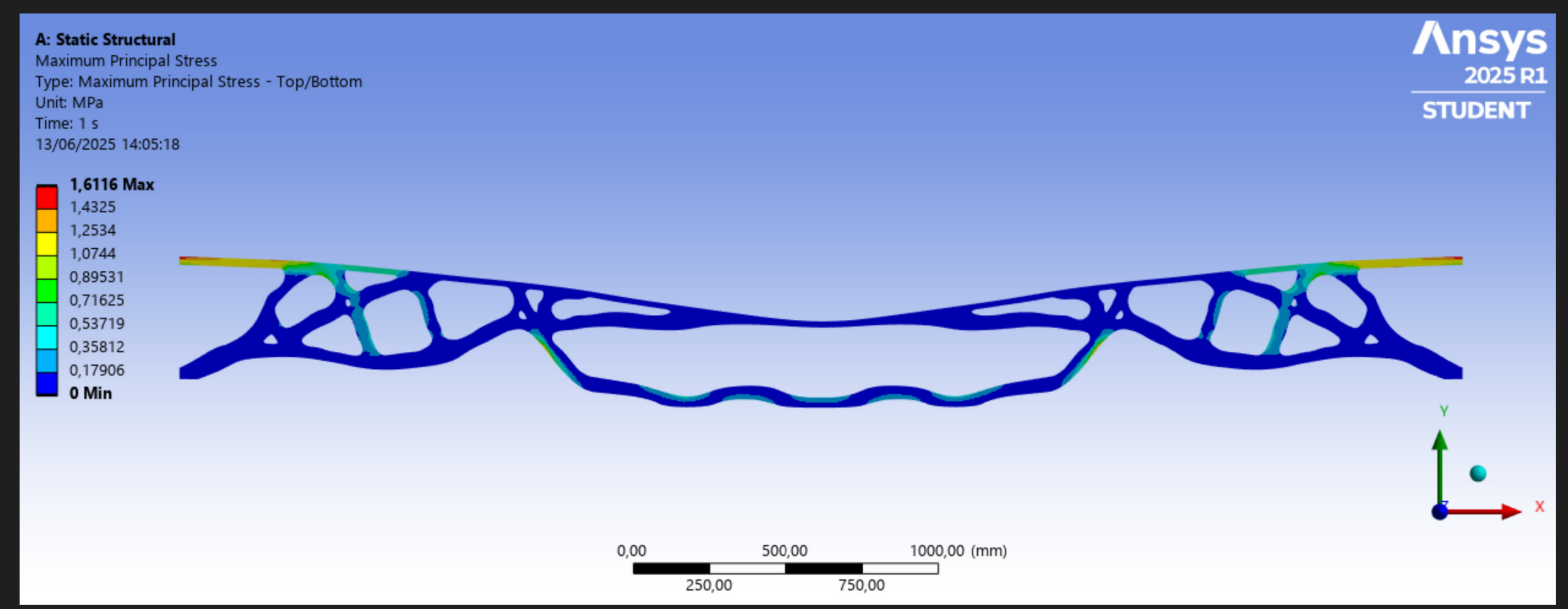
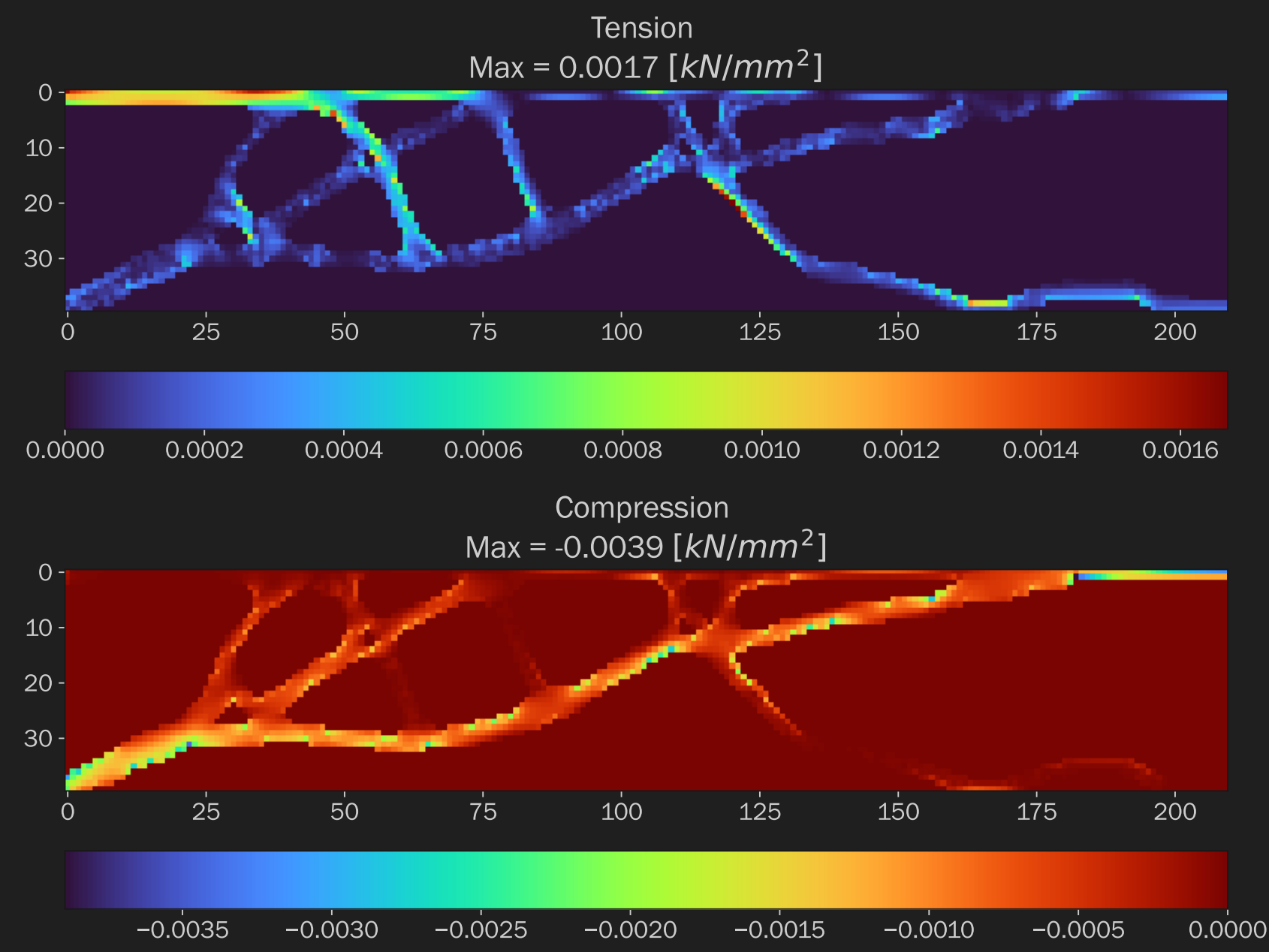
Easiest post-processing for manufacturing

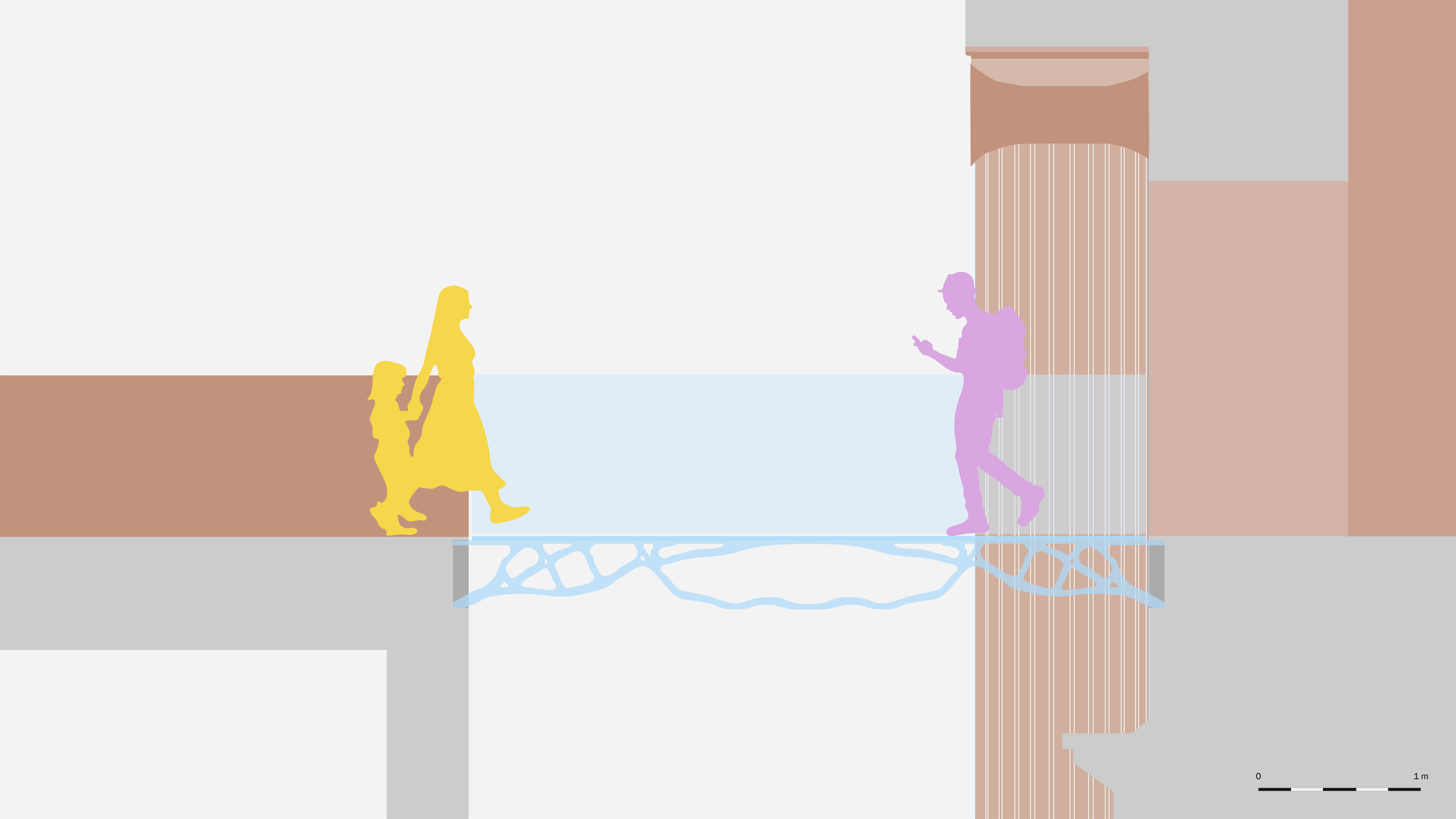


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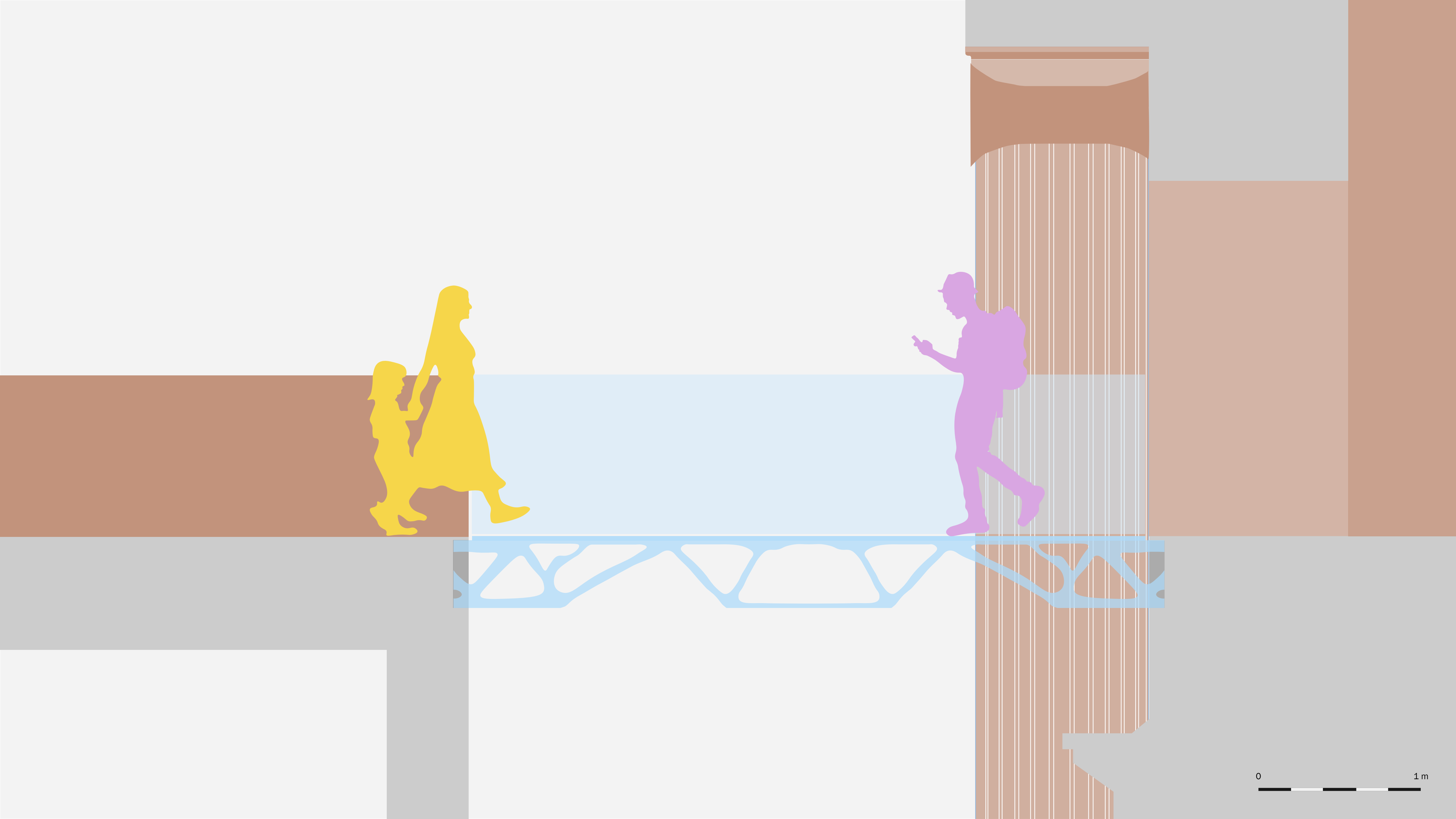




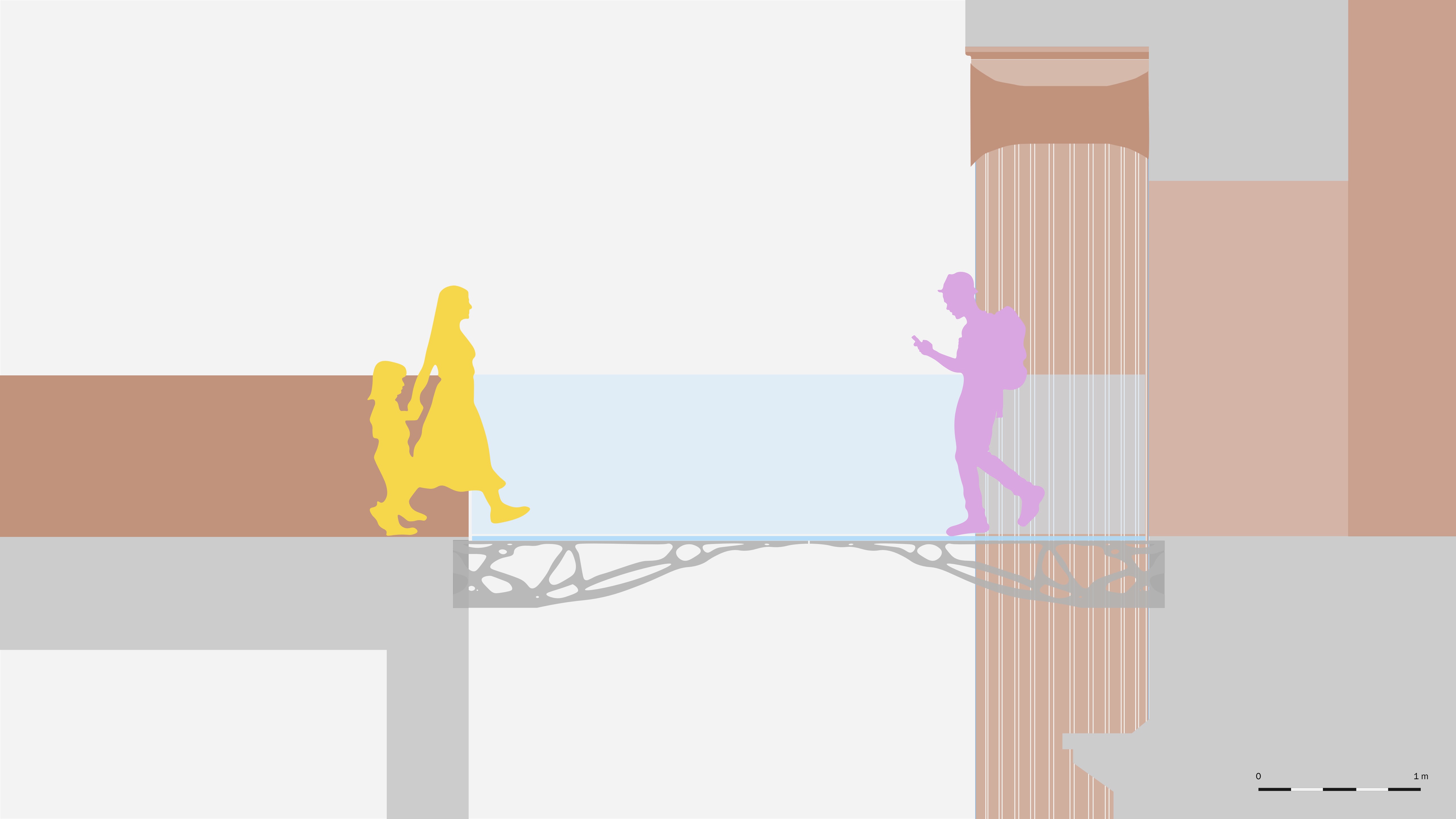
0 1 m



Image by Lara Neuhaus, 2025



0 1 m

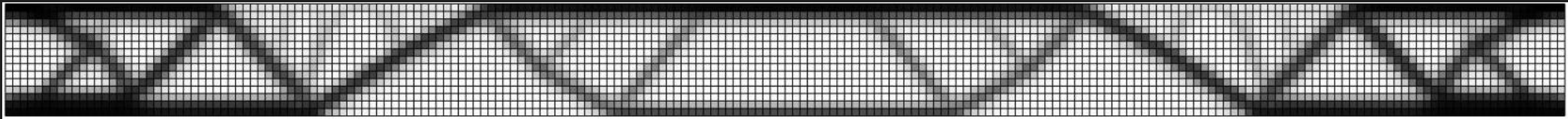


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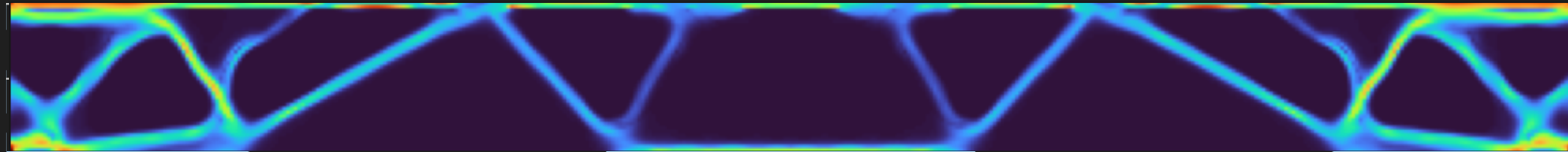
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	Koniari, 2022	Schoenmaker, 2023	Present work
	2D	3D	2D
Structural height [mm]	300	300	400
FE edge [mm]	20	20	10
Design parameters	1,575	31,500	162
Nodes	1,696	35,616	8,651
Degrees of freedom	3,392	106,848	17,302
Code language	MATLAB	MATLAB	Python
Objective	Volume	Volume	Stress + Volume + Displacement
Computer used for optimization	DelftBlue	DelftBlue	Laptop's CPU
Computing time [hours]	46	8	7 (SGD) 2.1 (Adam)

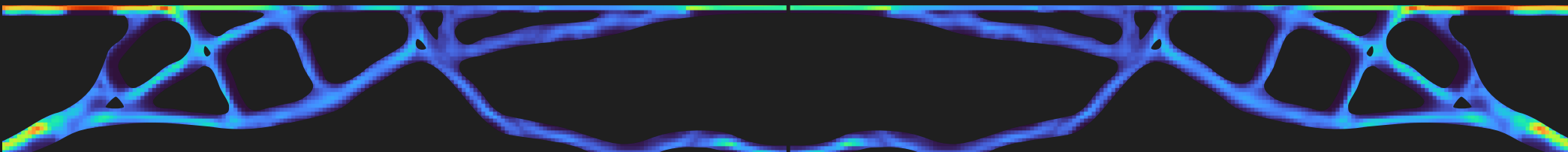
		Koniari, 2002	Schoenmaker, 2023	SGD	Adam	Design constraints
		2D	3D	2D	2D	NA
Volume ratio	[-]	0.30	0.23	0.25	0.29	NA
Maximum principal stress (tension)	MPa	2.96	4.7	1.7	1.3	6.4
Minimum principal stress (compression)	MPa	-5.56	-4.7	-3.9	-1.9	-50
Maximum deflection	mm	0.12	0.24	0.26	0.08	8.4



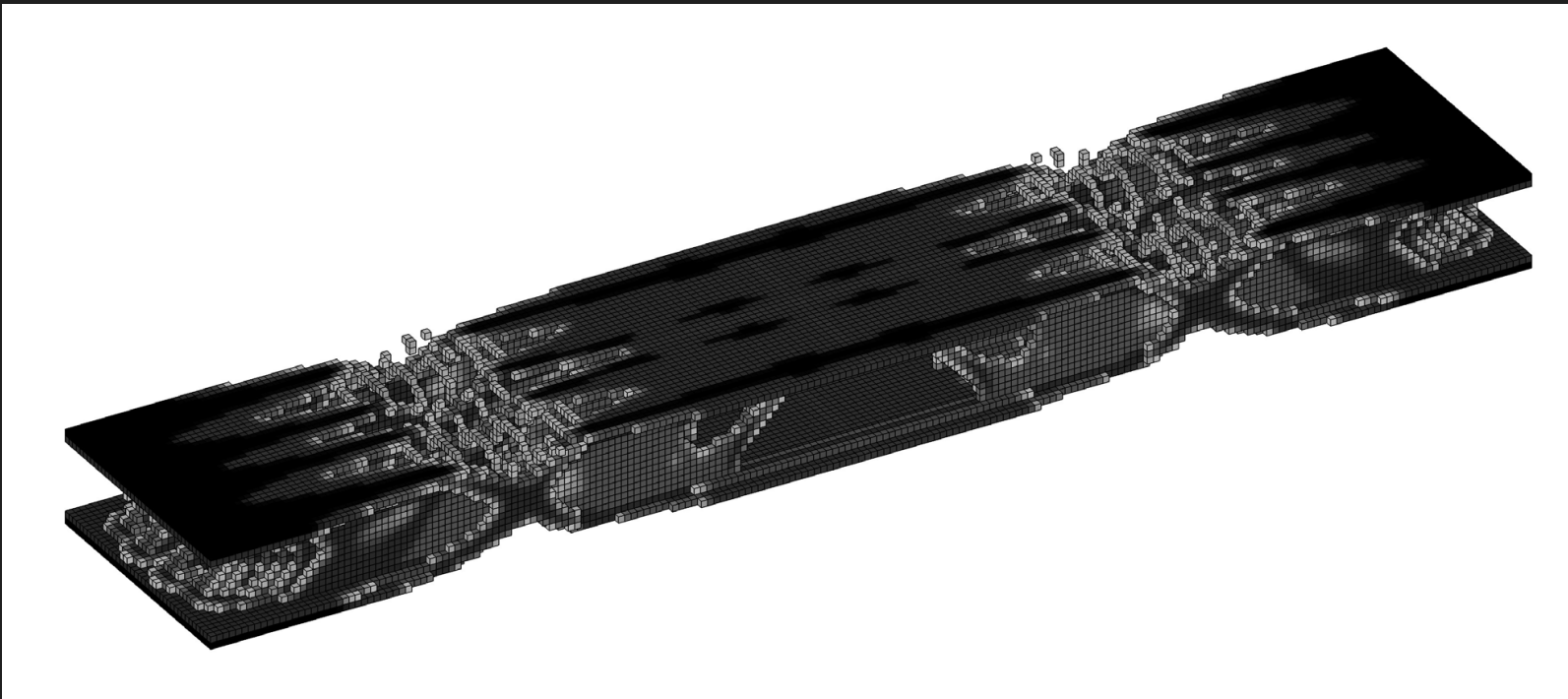
Koniari, 2022



Present work, using Adam optimizer



Present work, using SGD optimizer

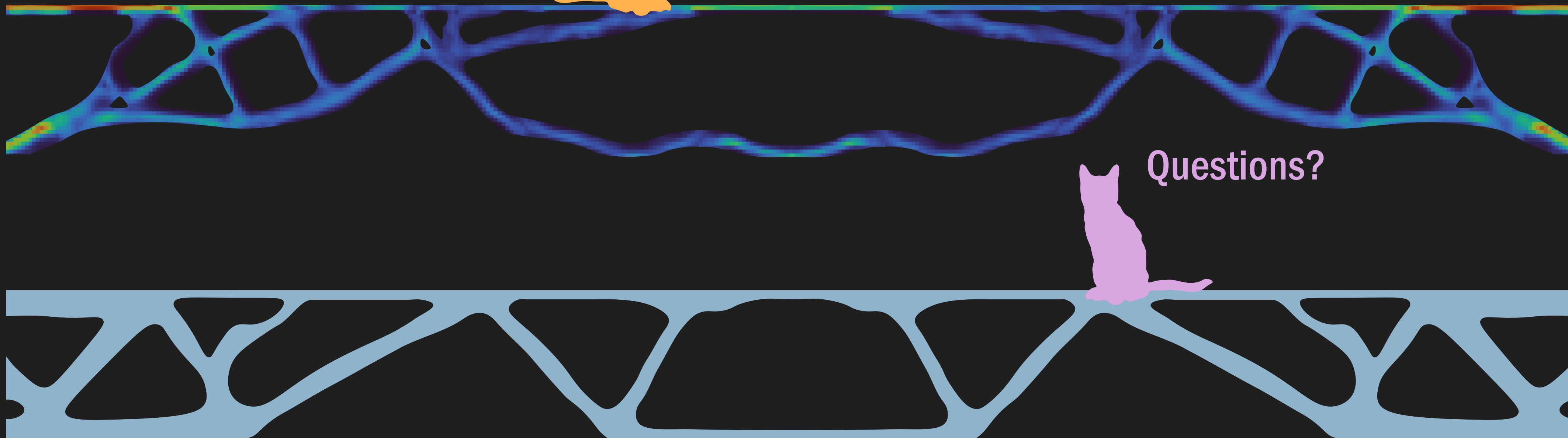


Schoenmaker, 2023

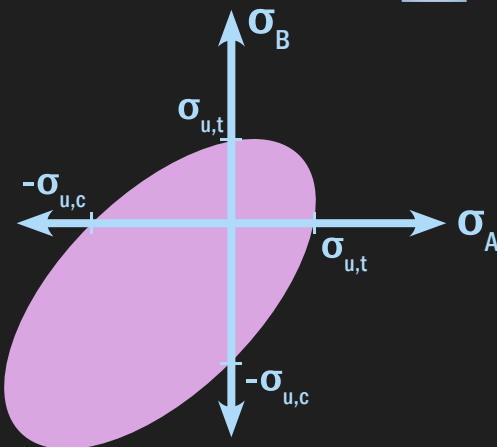
Thank you!



Questions?



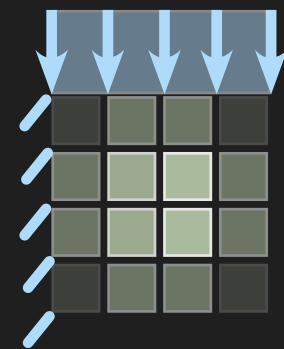
2nd goal:
Optimization algorithm,
specifically tailored to brittle materials.



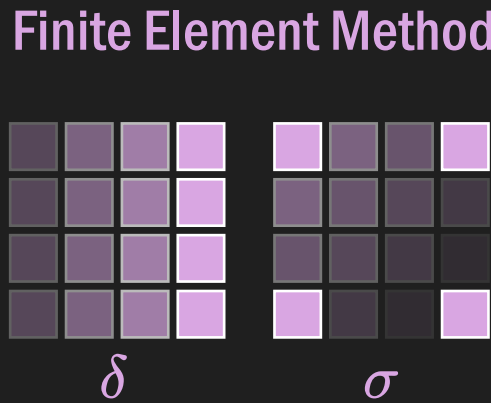
using principal stresses
 $s = \frac{\sigma_{comp,lim}}{\sigma_{tens,lim}}$

$$\sigma_{eq} = \frac{s+1}{2s} \sqrt{\sigma_{11}^2 + \sigma_{22}^2 - \sigma_{11}\sigma_{22}} + \frac{s-1}{2s} (\sigma_{11} + \sigma_{22})$$

Drucker-Prager Criteria



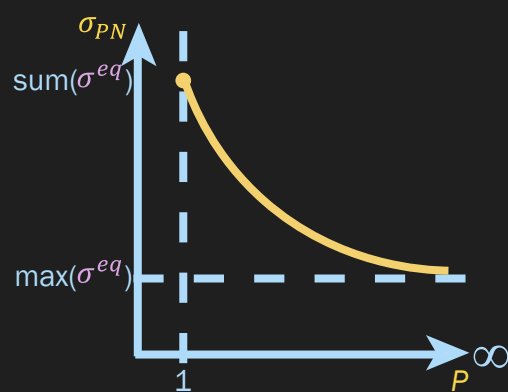
$$F = K U$$



Finite Element Method

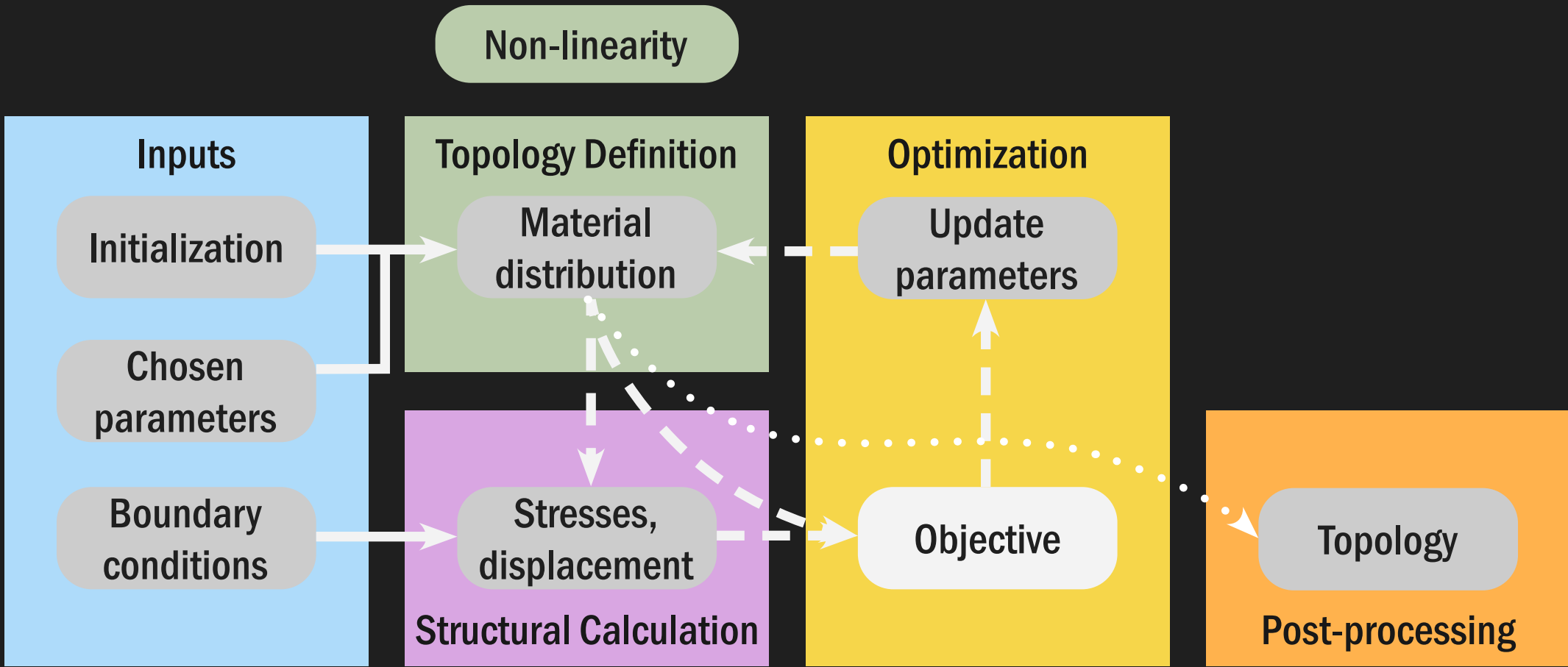
Relaxation

$$\sigma_{ij, e} = \langle \sigma_{ij, e} \rangle \times \rho_e$$



p-norm

$$\left(\sum_{e=1}^N \sigma_{eq}^P \right)^{\frac{1}{P}}$$



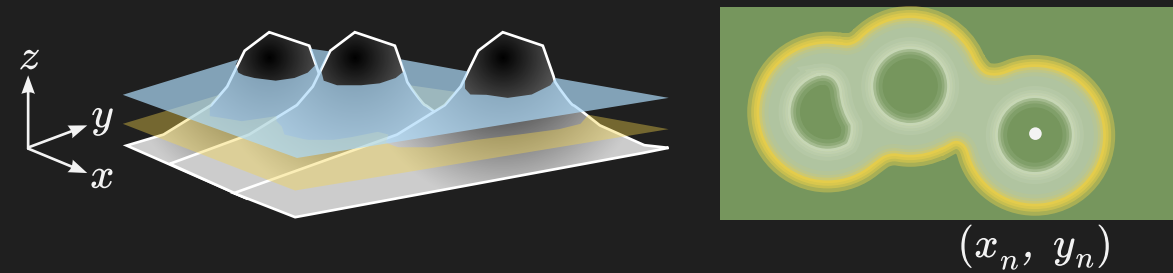
$$f(x) = \alpha \times \sigma + \beta \times A + \gamma \times \delta$$

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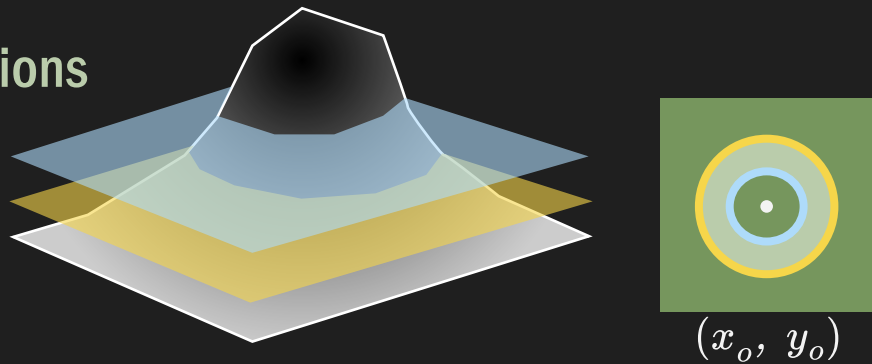
$$z = \sum_{n=1}^N A e^{-\left(\frac{(x-x_n)^2 + (y-y_n)^2}{s^2}\right)}$$

Gaussian Field



Two slicing functions

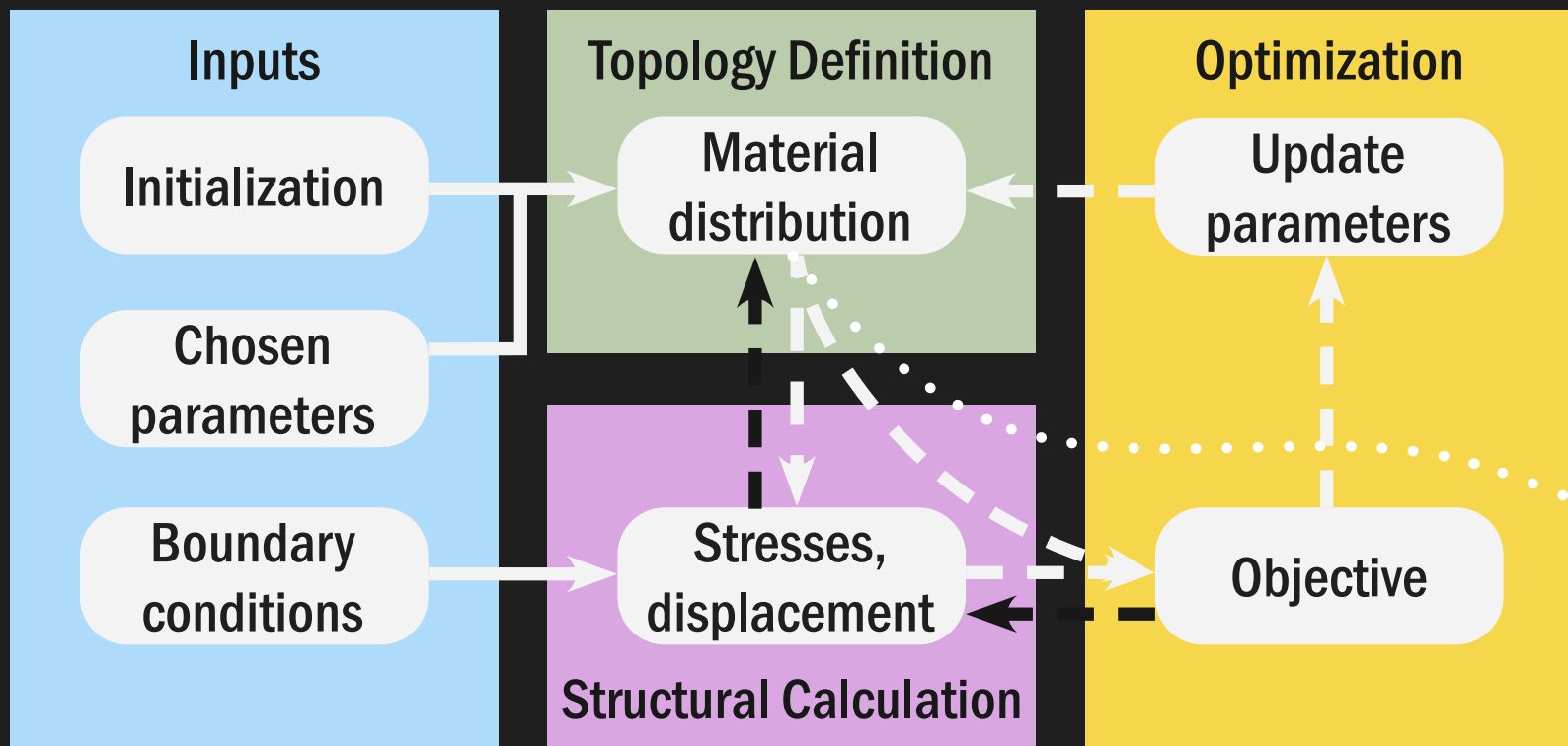
Level Set + Shift
Level Set



Cast Glass

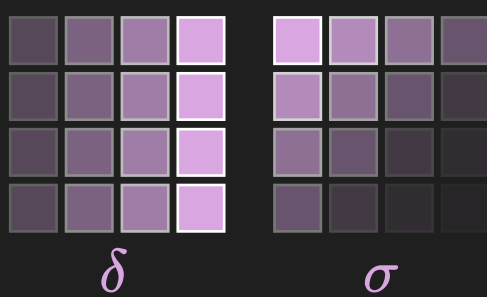
1st goal:
Material distribution definition,
specifically tailored to cast glass.

2nd goal:
Optimization algorithm,
specifically tailored to brittle materials.

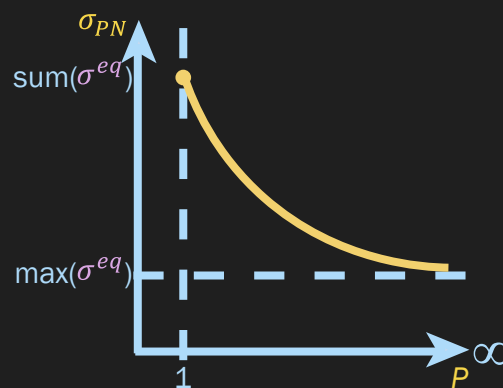


Finite Element Method

$$F = K U$$

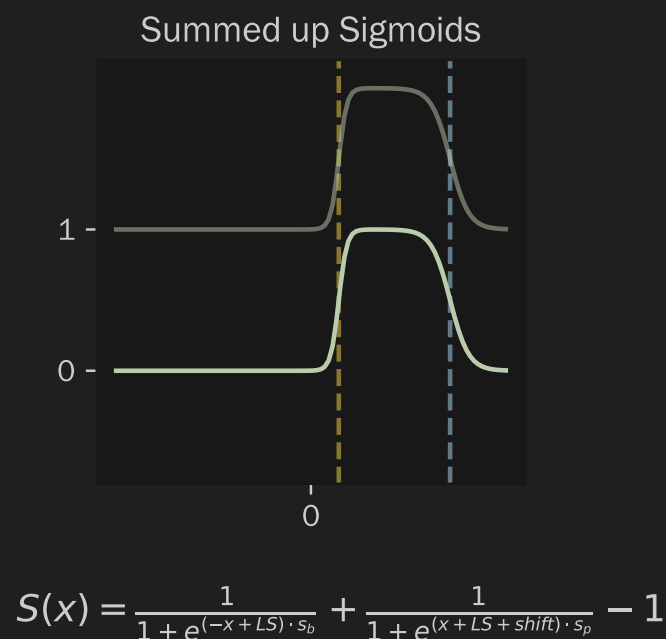


Relaxation

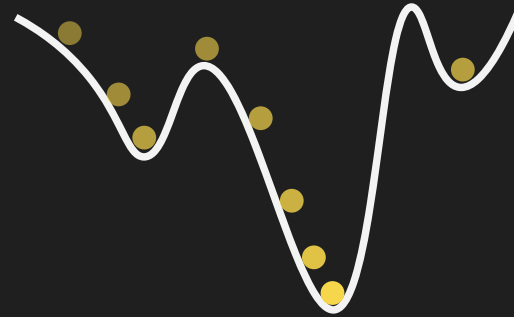


p-norm

$$\left(\sum_{e=1}^N \sigma_{eq}^P \right)^{\frac{1}{P}}$$



Optimizers
SGD or Adam



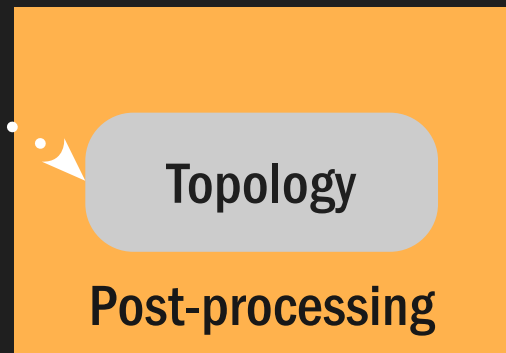
pytorch

Automatic differentiation
autograd()

Chain Rule

$$\frac{dz}{dx} = \frac{dz}{dy} \times \frac{dy}{dx}$$

3rd goal:
A workflow that combines
the material distribution definition,
brittle material properties,
and the optimization algorithm.



$$f(x) = \alpha \times \sigma + \beta \times A + \gamma \times \delta$$

$$\min: \alpha \left(\sum_{e=1}^N \sigma_{eq}^P \right)^{\frac{1}{P}} + \beta \frac{\sum_{e=1}^N \rho_e}{N} + \gamma \left(\sum_{n=1}^N \delta_e^P \right)^{\frac{1}{P}}$$

where $\alpha = 70$, $\beta = 0.5$, and $\gamma = 1$

using principal stresses

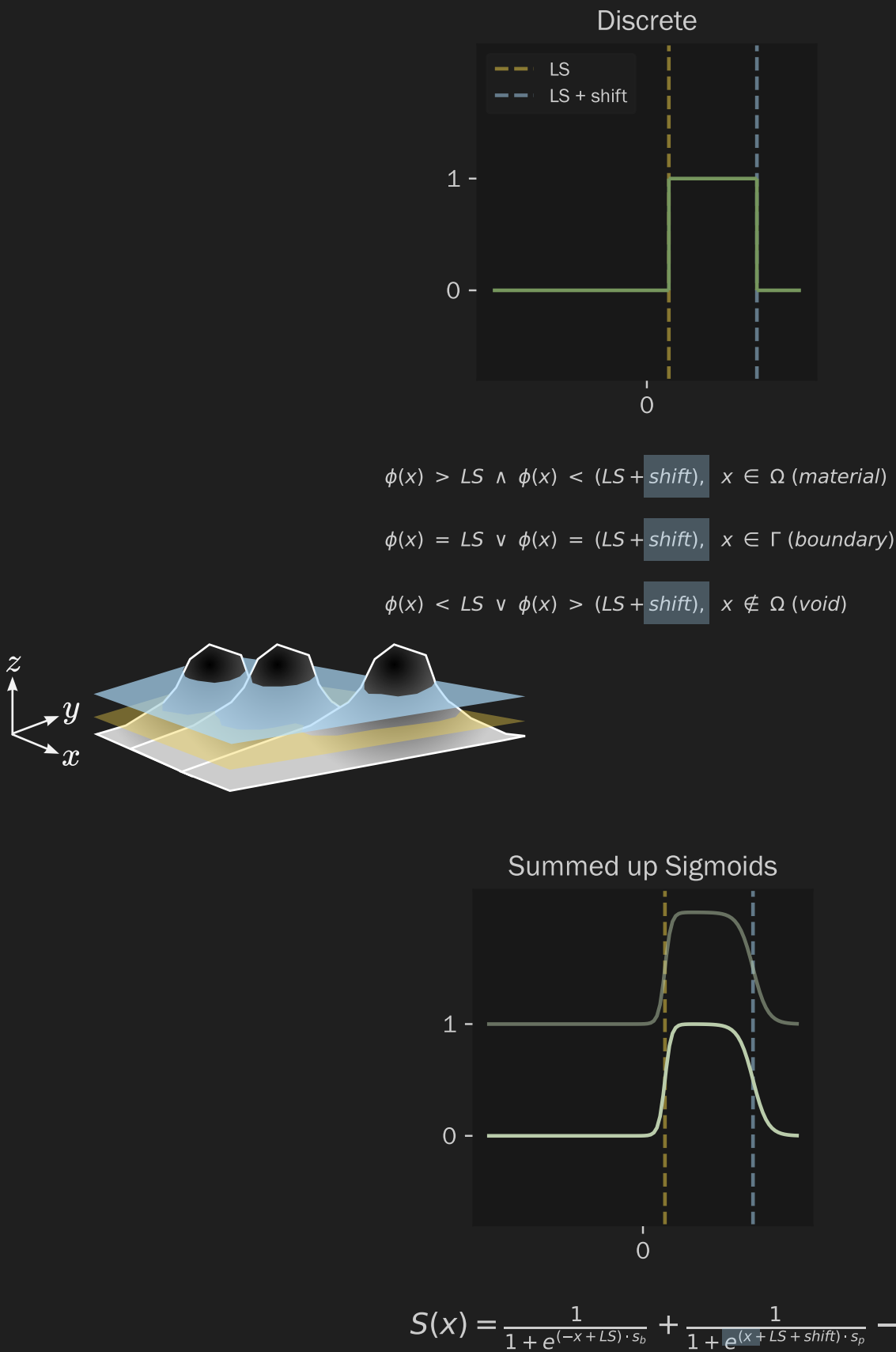
$$s = \frac{\sigma_{comp,lim}}{\sigma_{tens,lim}}$$

Drucker-Prager Criteria

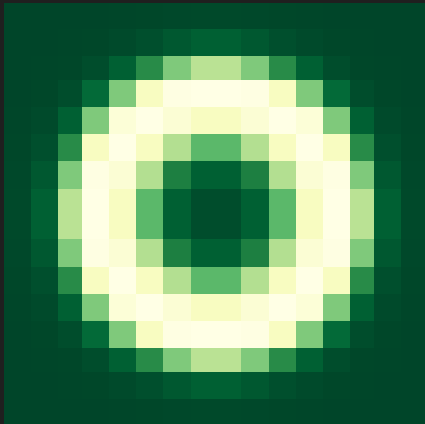
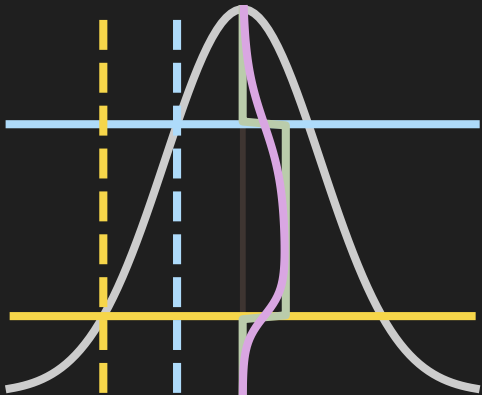
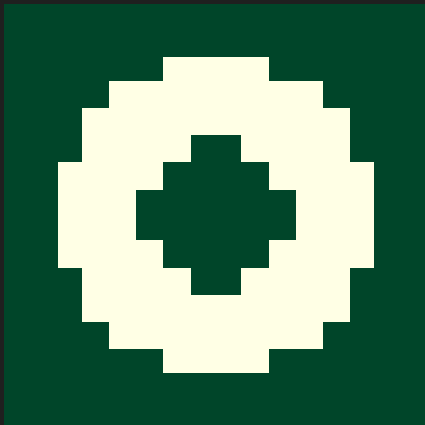
$$\sigma_{eq} = \frac{s+1}{2s} \sqrt{\sigma_{11}^2 + \sigma_{22}^2 - \sigma_{11}\sigma_{22}} + \frac{s-1}{2s} (\sigma_{11} + \sigma_{22})$$

$$\sigma_{ij, e} = \langle \sigma_{ij, e} \rangle \times \rho_e$$

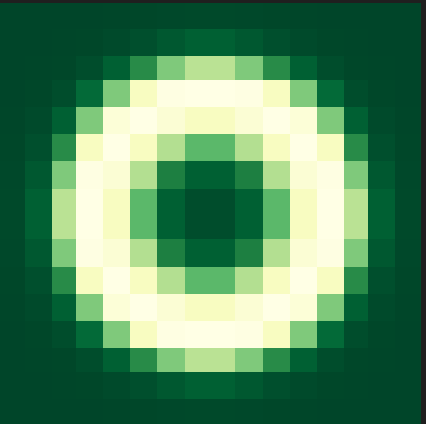
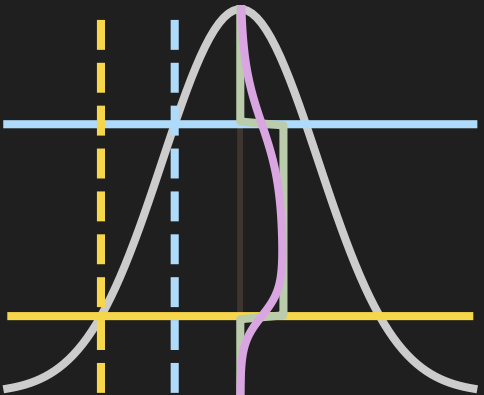
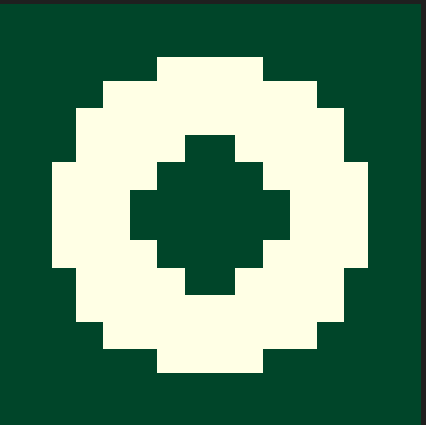
OPTIMIZATION



Shift



Spread



$$z = \sum_{n=1}^N A e^{-\left(\frac{(x-x_n)^2 + (y-y_n)^2}{s^2}\right)}$$

CONSTRAINTS

