

Guest Editorial Special Issue on Sensing and Machine Learning for Automotive Perception

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DOI

[10.1109/JSEN.2023.3267662](https://doi.org/10.1109/JSEN.2023.3267662)

Publication date

2023

Document Version

Final published version

Published in

IEEE Sensors Journal

Citation (APA)

Santra, A., Pandharipande, A., Wang, P. P., Gurbuz, S. Z., Ibanez-Guzman, J., Cheng, C. H., Dauwels, J., & Li, G. (2023). Guest Editorial Special Issue on Sensing and Machine Learning for Automotive Perception. *IEEE Sensors Journal*, 23(11), 11116. <https://doi.org/10.1109/JSEN.2023.3267662>

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Guest Editorial

Special Issue on Sensing and Machine Learning for Automotive Perception

THERE has been tremendous interest in self-driving and advanced driver assistance systems for automobiles over the recent past. According to market predictions, achieving advanced levels of autonomous driving may still be significantly far from large-scale commercial deployment. One of the challenges is to obtain reliable environmental perception from onboard automotive sensors, and possibly external sensors, to support safety-critical driving. Automotive perception includes processed and learned information from multimodality sensors like lidar, camera, ultrasonic, and radar. Conventionally, this sensor information has been supporting functions like emergency braking, adaptive cruise control, and self-parking. This Special Issue explores advances in sensors, sensor system architectures, data processing, and machine learning for automotive perception. This Special Issue also aims to bridge the traditional model-based automotive sensing field with the rapidly emerging data-driven field that uses machine learning methods and focuses on feature representation for high-level semantic understanding. Driven by the efforts on automotive sensor hardware platforms and open datasets, vision-inspired deep learning has shown great potential to achieve state-of-the-art performance and yield better results than traditional signal processing methods in multiobject detection and tracking, simultaneous localization and mapping, multimodal sensor fusion, scene understanding, and interference mitigation. This Special Issue highlights advances in machine learning architectures and methods for automotive perception, alongside performance evaluation methodologies and field test results.

The Guest Editors of this Special Issue accepted 18 manuscripts from a total of 41 received submissions covering the following aspects.

- 1) The first review paper from the guest editors introduces sensors and data processing methods for exterior and interior automotive perception, also highlighting machine learning considerations in automotive perception.
- 2) Six papers focus on object detection and tracking using radar, optical, or Lidar sensors, including fusion among multiple modalities.
- 3) Three papers present collision avoidance and decision-making strategies using reinforcement learning and imitation learning.
- 4) Three papers deal with aspects of odometry, localization, and mapping functionalities of automotive perception.
- 5) Two papers present in-cabin monitoring for people counting and analyzing driver-driving behavior scenes.
- 6) Two papers deal with target estimation/classification and one paper deals with simulation framework in an automotive context.

Finally, the Guest Editors thank the authors and reviewers for their contributions to this Special Issue. They are grateful to the editorial board, administration, and publication staff for their everlasting support in putting together this Special Issue.

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