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# TECHNOLOGICAL MEDIATION OF EMOTIONAL PRACTICES

## The case of AI in healthcare

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**Abstract**

The integration of AI-driven solutions in healthcare is revolutionizing various domains, spanning from pathology and radiology to neonatal intensive care and homecare. This transformative shift not only alters the workflows of healthcare professionals but also reshapes the experience of patients and informal caretakers. Amidst this development, an often-overlooked facet is the impact on emotional relationships among the diverse stakeholders in healthcare. This paper aims to cover this gap by combining insights from the theory of technological mediation and philosophy of emotions: by using the introduction of Artificial Intelligence (AI) in the healthcare field as an example, we showcase how the technological mediation approach has so far overlooked the role of moral emotions in the analysis of how technologies mediate moral life. By building on the concept of emotional attunement, we present an understanding of emotions as practices, where technologies act as mediators of the way in which subjects emotionally attune to each other. We subsequently argue that this mediation is revealed the moment technologies come to create frictions in the attuned emotional practice. These perturbations of emotional attunements are what we call 'emotional glitches'. It is through glitches that moral and emotional mediation of technologies is revealed, thereby also highlighting normative aspects. We argue that studying moral technological mediation through emotional glitches can provide insightful observations on how these technologies should be developed and deployed.

## Plain Language Summary[1]

- This study shows that artificial intelligence in healthcare shapes how care is experienced and how stakeholders relate to one another in everyday practice.
- Rather than treating emotions as private feelings, the article explains how emotions in healthcare develop through shared routines and interactions, and how AI systems increasingly influence these emotional practices by guiding decisions and mediating (health)care work.
- The authors bring together research on technological mediation and moral emotions, offering a new way to understand how technologies shape not only actions and decisions but also emotional and moral practices in care.
- To explain these changes, the study introduces the concept of emotional attunements, describing how both caregivers and care receivers gradually adapt their emotional responses and caring behaviours as AI becomes embedded in healthcare routines.
- The study also identifies emotional glitches—perturbations of emotional attunements determined by the introduction of and interaction with AI tools—as key points where the moral and emotional influence of technology becomes visible.
- Overall, the article shows why understanding the emotional impact of AI is essential for responsible healthcare innovation, helping designers, healthcare workers, and policymakers to reflect on how such technologies shape emotional practices and how these effects may be considered in their design and implementation.

[1] AI-generated; author checked and approved.

# 1 INTRODUCTION

Machine learning and AI algorithms are increasingly pervasive in today's healthcare landscape. From diagnostics, to pathology, radiology and rehabilitative practices, AI powered technologies are starting to set foot in the healthcare world (Secinaro et al., 2021). With AI entering the healthcare field come the promises of precision medicine and more efficient use of increasingly scarce resources (Matheny et al., 2019, p. 113; Stokes & Palmer, 2020). There is a tension between the big promise of AI in healthcare, and the reality of everyday healthcare practice. This practice is situated within a highly mediated and regulated environment, in terms of routines, management, organizational procedures, etc.

Some of the challenges that this implementation could entail have already been addressed in the literature. Matheny et al. (2019) point out how the improper use of AI could hurt patients and the health system, by for instance conflating correlation and causation, exacerbating bias issues, and putting health data at risk of hacker assault and manipulation, consequently endangering patients' rights. De Boer and Kudina (2022) assess qualitative moral impacts of machine learning in medical diagnosis, framing them as uncertainties that need to be evaluated once the technology is introduced. When it comes to evaluating the benefits and disadvantages that AI introduction in healthcare can bring, the debate is typically focused on cost-efficiency, productivity, moral change, and disruption. An overlooked area relates to the emotional and concomitant ethical impact of AI in healthcare. This paper aims to address this gap.

Lots of discussions around technology in healthcare mainly focus on technical effects, trust and costs, time management and efficiency. By doing so, they neglect the deeper impact on emotions and the ethical significance of this impact. Emotions are also a key aspect of healthcare, as highlighted by for example care ethicists, who emphasize the emotional and embodied practice of care (Baur et al., 2017; Frolic, 2011).

Ethicists of technology, as well as postphenomenologists, have investigated how the implementation of robotics, AI and healthcare can have a deep moral impact (de Boer & Kudina, 2022; Li et al., 2020). Some postphenomenologists argue that technologies mediate our being in the world, and this comprises its moral aspects; this is also called technological mediation (Verbeek, 2011). Postphenomenologists and mediation theorists have discussed how technological artifacts interfere not only with human perception of the world but also, and most importantly, mediate the way they live their lives, including moral practices (Kudina, 2018, 2019; Verbeek, 2011). The postphenomenological branch of technological mediation has focused more attentively on the way technologies influence the moral and normative aspects of human lives.[2] However, technological moral mediation seems to be forgetful of the fundamental role that moral emotions play in this. It has been argued that the role of moral emotions is pivotal when it comes to risky technological developments. Emotions can highlight important ethical aspects, such as considerations of fairness and autonomy in the distribution of risks and benefits and in the decision-making procedure (Roeser, 2018). In this paper, we will enrich this understanding with the conceptualization of emotions as practices. We will do so by connecting insights from the philosophy of emotions with postphenomenology. The role of moral emotions seems to have been glossed over by postphenomenologists, while work on emotions and technology has not focused sufficiently on practices. By connecting these two frameworks we can shed new light on the emotional impact of technologies.

We argue that technological implementations such as AI in the field of healthcare are mediating the way humans attune to their emotional environment. To do so, we provide a theoretical

[2] While technological mediation theory emerged from postphenomenology, this paper distinguishes between the two by treating mediation theory as a more targeted approach that extends postphenomenology's descriptive focus with normative analysis. This distinction is further elaborated in Section 3a.

framework that understands moral emotions as sources of moral insight as well as practices, and we draw on work on the concepts of emotional attunements and glitches to point out how breakages in practices can reveal technological mediation of moral emotions. Focusing on emotions as practices, we illustrate how moral emotions are performed both in an embodied and cognitive way. Building on the Heideggerian notion of attunement, more specifically on its reinterpretation by Sareeta Amrute (2019), we will show how humans live and act in a way that is attuned to their emotional environment. Furthermore, we discuss the concept of glitch, arguing that technologically originated frictions within emotional practices reveal moral technological mediation. Considering how fundamental the role of moral emotions is in the field of healthcare itself, we claim that their influence is still confined to the background in the debate on ethics of health technology. There is a need for further investigation when it comes to how moral emotions and emotional attunements are being mediated by the introduction of AI-powered technologies in healthcare. This will help to move the academic debate forward as well as to shed light on urgent societal issues.

The paper is structured as follows: in Section 2, we will present an overview of some significant applications of AI-powered technologies in healthcare and their moral impact on emotions. In Section 3, we will briefly introduce both postphenomenology and approaches in the philosophy of moral emotions that understand emotions as important sources of moral insight, showcasing how both approaches can benefit from each other, specifically in the context of AI in healthcare. We will also introduce the concept of emotional practices. In Section 4, we will develop our new conceptualization of emotional attunements and glitches. In Section 5, we will reflect on how this account can serve as a useful conceptual tool in the realms of philosophy of technology and philosophy of moral emotions in the context of AI in healthcare. We will round off with concluding remarks.

# 2 AI IN HEALTHCARE

The multiple techniques and methodologies that the term ‘artificial intelligence’ comprises generates both a lot of hype and a lot of confusion around the technology. From machine learning to deep learning, from natural language processing to evolutionary computing, all of these different applications get captured under the category of ‘artificial intelligence’ (Matheny et al., 2019; Shaheen, 2021). In the healthcare field, medical specialties that AI applications have touched upon are numerous and growing: from radiology to pathology, from cardiology to mental health, and counting (Topol, 2019). Topol (2019) goes as far as affirming that AI-driven medicine will lay the foundation for high-performance medicine, which will allow for a lower dependency on human resources. Next to these more optimistic forecasts of the role of AI in healthcare, other scholars are raising questions about how this implementation will affect the relationships between multiple actors involved in the healthcare sector (Maiers, 2017; Montemayor et al., 2021). Maiers (2017) stresses the importance of researching how stakeholders make sense of data and algorithmic practices in their daily routines. She articulates two main directions of understanding: the interaction between technology and users; and the cultural and epistemological aspects of this interaction. Focusing only on the technology itself, without highlighting how its implementation influences the daily lives and routines of those affected by it, falls short on providing a comprehensive view of AI implementation in healthcare and its consequences.

Besides modifying how the specific medical disciplines are developed, the introduction of AI-powered technologies also disrupts how the relationships and practices between different stakeholders in the healthcare sector – doctors, nurses, patients, informal caretakers, data scientists – is constituted. Care itself is one of the most fundamental concepts of healthcare, and relationality represents one of its core aspects (Krause & Boldt, 2018, p. 4). While Krause and Boldt (2018) focus on the personal character of care relationality, highlighting the

relationship between caregiver and care-receiver, an analysis of how this relationality is permeated by technological devices is missing in the context of AI.[3] When it comes to AI-powered technologies, the effect of technological implementation becomes fundamentally more disruptive, as the relationality between caretakers and caregivers is being mediated at the level of decision-making processes. Having a doctor telling a patient, based on their own judgment, that they need a biopsy taken to determine whether a carcinoma is benign or malignant, has a different effect than an AI-powered technology taking part in making that same decision (Richardson et al., 2021). More fundamentally, this entails a direct disruption of the care practices of the different healthcare stakeholders. The materiality and practice of the work of professionals needs to adapt to a new tool being introduced. This introduction comes to mediate their relational practices, which comprises their emotional practices as well, as caring practices intended as practical and moral actions are inspired and laden with emotions (Li, 2022; Pulcini, 2016).

Despite the focal position that care plays within the field of healthcare itself, a lot of the literature concerning AI implementation in healthcare still focuses on how to "do work more efficiently and with greater intelligence" (Shimonski, 2021, p. 1). This can often outshine normative and moral effects as compared to technical or risk-benefit analysis issues (de Boer & Kudina, 2022; Kudina, 2018). We would like to highlight that among these are the emotional interactions between actors that are being mediated by technologies. This latter aspect has been glossed over in the literature regarding technological mediation, both in healthcare and in other areas.

The focus of this paper will not be so much on specific types of AI applications in healthcare. There are, indeed, multiple fields of healthcare where AI is being introduced. Rather, these applications will be used as examples to showcase how this technological introduction is mediating and modifying the way different actors interact with each other and how this impacts emotional and concomitant moral practices. The following section will present the theoretical foundations upon which we will base our argument. We will then further finetune our framework in order to showcase how it can serve to understand the important impacts of AI on emotional practices in healthcare.

# 3 THEORETICAL FOUNDATIONS: INTEGRATING EMOTIONS IN TECHNOLOGICAL MEDIATION

Our theoretical argument stems from the conception that technologies are not neutral. As Melvin Kranzberg (1986, p. 545) put it, "technology is neither good nor bad; nor is it neutral". In other words, as postphenomenologists and mediation theorists have pointed out, technologies are always intertwined with the complex world of humans, and the complexity of this sociotechnical entanglement cannot be reduced to either of the two moral poles, nor can it be deemed as impartial (Cressman, 2016; Verbeek, 2011). The philosophy of technological mediation offers an important perspective to analyze how humans, technology, and the world at large co-constitute each other. However, while this perspective can prove to be helpful to interpret the relation between humans and technologies, it falls short on two aspects. First, it struggles to take into account the broader societal and cultural dynamics that contribute to the co-shaping of humans and the world (Rosenberger, 2018). Secondly, as we have mentioned in the introduction, while this approach focuses on mediation of morality and concepts such as values and norms, the role of moral emotions seems to have been neglected within the context of postphenomenology and technological mediation. In the next paragraphs, we will expand on these frameworks and showcase how technological mediation and attention for the role of

[3] However, cf. Li et al., 2020, focus on the triadic relationship human-human-robot interaction. This could be expanded to the context of AI.

emotions in technology can complement and enrich each other to better account for the moral mediation of technologies.

## 3.1 TECHNOLOGICAL MEDIATION THEORY

Technological mediation theory originated within the field of postphenomenology, and it seeks to study the relationships that emerge between users and technologies (de Boer et al., 2018; Verbeek, 2005). Technological mediation stands out from the broader postphenomenological framework by going beyond predominantly descriptive analyses and by also providing normative analyses (de Boer et al., 2018).

Like post-phenomenology, technological mediation theory focuses on the micro-level relations between humans and technologies, originating from the analysis of practical case scenarios (de Boer & Kudina, 2022). It studies the relations between humans and the world, where technologies function as mediators (Verbeek, 2011). This sheds light on how human practices are shaped and adapted by technological artifacts. In Moralizing Technology, Verbeek (2011) extends the postphenomenological approach to include the normative impact that technologies have on the relationship between human beings and reality. Technological artifacts do not only act as mediators of human perception, amplifying or reducing their sensory experiences and their understanding of the world, but they also mediate their 'praxis' (de Boer & Kudina, 2022; Verbeek, 2011). With the term praxis, Verbeek refers to how technological mediation expands to also mediate people's actions. The way humans act in the world is closely connected to how they make decisions in it: it is through this connection that technologies come to mediate the moral realm. The way technological artifacts can open or close new possibilities of actions, subsequently reflects on the practical and moral paths that humans have the potential to take.

Within these potentialities that technologies allow for, human practices are shaped, co-shaped, and re-shaped. While being a useful lens to analyze human relations with technologies, mediation theory – and the tradition of postphenomenology altogether – still focuses more on the individual, micro-level of perception and action (Verbeek, 2005). Shared practices, however, are also shaped by the influence of societal, cultural, and political environments. Cressman (2016) has argued that the approach of postphenomenology does not sufficiently highlight the power and class struggle mediated by technologies. On a similar note, while mediation theory has so far strongly focused on the role of values in technologies (Kudina, 2018; Kudina & Verbeek, 2011; 2018), we would like to point out that it has overlooked how moral emotions and emotional practices are also being mediated by technological use. The field of phenomenology itself is rich in the analysis of the role of emotions on the human perception of the world (Scheler, 1973; Szanto & Landweer, 2020). In the transition to postphenomenology first, and to the theory of technological mediation after, this attention for the importance of emotions got lost. In the next section, we will discuss how the role of moral emotions is relevant when discussing the role of technologies, and how technological mediation itself could benefit from it.

## 3.2 MORAL EMOTIONS AND TECHNOLOGY

In the previous section, we discussed how technologies mediate the moral aspect of people's lives. There has been a long tradition in philosophy which views reason and emotions as opposed. This opposition goes back to approaches in philosophy such as those developed in the past (e.g. Hume, 2003; Kant, 1788/2015; Guyer, 2016), until the recent, highly influential Dual Process theory developed in decision research (e.g. Kahneman, 2011). This distinction separates rational thinking from supposedly irrational, subjective states that are represented by emotions. However, ever since Aristotle in ancient Greek philosophy as well as Mencius in ancient Chinese philosophy, there have been philosophers who have challenged this dichotomy (Roeser & Todd, 2014; Solomon, 2008; Wong, 1991). Moreover, various philosophers and psychologists who

study emotions emphasize the cognitive aspect of emotions (Lazarus & Lazarus, 1996; Nussbaum, 2004; Solomon, 1993). Some scholars of emotions define emotions as affective, cognitive, as well as intentional mental states, also comprising motivational action-tendencies (Frijda, 1987; Scherer, 2009).

Roeser (2011) has developed a theoretical framework that combines such a cognitive theory of emotions with ethical intuitionism. She calls this theory 'affectual intuitionism'. In this theory, moral intuitions are paradigmatically cognitive emotions, which are fundamental moral experiences on which one can base moral reasoning. Emotions can reveal morally salient aspects of a specific event or situation. They do not only act as motivators for actions, but their cognitive component actively informs and shapes moral reasoning. Emotions can serve as perceptions of morally salient features, attuned to the specific circumstances involved. In order to have moral knowledge, and to be able to develop the practical rationality that is needed to act in the world, moral emotions are required (Roeser, 2011). Roeser (2018) has argued that this also holds when it comes to moral evaluations of technologies. While most approaches in ethics of technology emphasize rational argumentation, Roeser argues that moral emotions can highlight important ethical aspects of technologies such as justice, fairness and autonomy. It is important to note that emotional responses to technological developments are not infallible (Steinert & Roeser, 2020), they require reflection and deliberation (Roeser, 2018, chapter 6). Slovic et al. (2004) argue that while emotions can provide us with insights into what we value, we need rationality for an ultimate normative assessment when it comes to risky technologies. However, emotions themselves can play a crucial role in ethical reflection about technologies, which Roeser calls 'emotional deliberation' (Roeser & Pesch, 2015; also cf. Van Norden, 2002; Virág, 2016).

We will build on this framework by Roeser (2011; 2018), as it provides for a cognitive theory of moral emotions that highlights the importance of people's emotional-moral experiences in the context of technological development. Such a theory can be especially helpful in the context of AI in healthcare where emotional experiences and technological developments encounter each other in an especially poignant way. In the next section, we will discuss how we can combine these insights with mediation theory, by investigating how emotions are being mediated by technology, which we can understand as 'emotional practices'.

## 3.3 TECHNOLOGY AND EMOTIONAL PRACTICES

In Subsection 3a, we have explained how postphenomenology and mediation theory show how technologies influence morality. In Subsection 3b, we have discussed how emotions play a role in morality by focusing on a cognitive theory of emotions, and specifically affectual intuitionism. In this subsection, we will discuss how mediation theory and affectual intuitionism can enrich each other. By combining these insights, one can postulate that moral emotions are technologically mediated. Technological mediation theory can benefit from the aforementioned understanding of emotions, i.e. Roeser's affectual intuitionism (Roeser, 2011) and theory of emotional deliberation, as this highlights the important role of moral emotions in the moral knowledge formation and action process. On the other hand, affectual intuitionism and emotional deliberation benefit from technological mediation theory when it comes to shedding light on how moral emotions and emotional practices are mediated by technologies and on the specific cultural and socio-economic circumstances in which a technological practice is embedded (as highlighted by Cressman (2016) as an addition to mediation theory and postphenomenology)[4].

[4] For further insights on the entanglement between technology and culture, see also (Swierstra et al., 2016)

We have already discussed the dominant yet problematic dichotomy between reason and emotion. This relates to the dichotomy between mind and body, between psychological and physiological. From a phenomenological perspective, this distinction is problematic. Humans, while being in the world, do not discriminate between the psychological and the physiological realm. The two are intertwined and constitute something more complex than the simple sum of the two. Emotions play an important role in this intertwinedness. They are constituted by physiological as well as psychological aspects. Feminist scholars as well as neuropsychologists emphasize the embodied, physiological aspects of emotions (Damasio et al., 1996; Liljeström, 2015). The neuropsychologist Antonio Damasio and his colleagues (Damasio et al. 1996) have analyzed emotions as 'somatic markers' that defy the Cartesian dichotomy between physical and mental states. This connects well with the rejection of dualism by phenomenologists. Indeed, earlier phenomenologists such as Scheler (1973) emphasized the important role of emotions. By combining these insights, we can see how affectual intuitionism and emotional deliberation theory on the one hand, and mediation theory on the other can enrich each other: emotions can then be understood as practices, in which the cognitive intentionality of the mental states is merged with the embodied aspect of human agency.

The concept of 'emotional practices' can highlight this further. As Monique Scheer (2012) argues, the body and bodily perception, as well as cognitive aspects, are at the center of emotional practices. In a sense, it is misleading to still talk about psychological and physiological, as under this perspective, the two dimensions merge together, in a "socially and environmentally contextualized body [that] thinks along with the brain" (Scheer, 2012, p. 197). By understanding emotions as practices, the limit between body and mind is superseded by the thinking body, or the bodily-embedded thought. The role of emotions makes itself evident through the practices of human beings. This manifests, for instance, in the practice of healthcare workers. The importance of empathy becomes evident in the care relationship established between nurse and patient. The fear a caregiver feels when a patient is in a situation of danger is not only perceived, but it is shown through their bodily experience: the tension of their shoulders, the stuttering in their movements. The 'inner' side of emotions manifests itself through its bodily component, which are inextricably linked and form a unity (Scheer, 2012, p. 195). Emotions typically involve bodily experiences but go beyond them. Bodily experiences can serve as somatic markers to indicate what is valued by human beings in their moral behaviors (Damasio et al., 1996).

If Scheer's (2012) conceptualization offers an understanding of emotions as practices where embodied subjects emotionally interact with each other, through a postphenomenological perspective one could argue that this interaction can be technologically mediated. How can we then link emotional practices with the role that technologies have on them? The work of Sareeta Amrute (2019) is helpful in understanding the link between affective states and technologies. In her writing, Amrute talks about techno-affects, defining them as how subjects and technologies are aligned and realigned. Techno-affects, similarly to practices, shift the normative focus beyond the general effects of a technical system. It is redirected towards the relationships formed between subjects and technologies, asking who gets to count as a subject, in which circumstances, and what is the weight of the technical influence in the emotional practice developed. Hence, like other types of practice and human interaction, emotional practices also come to be intertwined with technological developments and artifacts. For instance, this becomes quite visible in healthcare practice, as it represents one of the contexts where emotional practices are part of everyday work. When a caregiver and a care-receiver interact with each other, an emotional bond is formed between them. Their interaction, moreover, is mediated by technologies employed in healthcare practices – from the pressure measured through the sphygmomanometer, to the data collected and analyzed about the patients' symptoms, etc. Recently, these technologies have become powered by AI (Jiang et al., 2017; Kerasidou, 2020; Matheny et al., 2019; Stokes & Palmer, 2020), which has impacted the

way they mediate practices. AI-powered tools provide doctors and nurses with information, which has impact on their choices on whether to perform or not perform a certain task. Imagine the case of a nurse in a long-term care facility who has developed a close, intuitive relationship with a patient living with early-stage dementia.[5] Over time, the nurse has learned to read the patient's subtle emotional cues: their restlessness before breakfast, their need for conversation after visiting hours. When the facility introduces an AI system designed to monitor behavior and predict agitation, the nurse begins to consult the system's dashboard at the start of each shift. One morning, the AI flags the patient as 'high-risk' for agitation and recommends preemptive sedation. The nurse, while being uncertain, follows the recommendation, despite having a sense that the patient may simply need a walk outside. The intervention appears to work, and the patient remains calm. Yet the nurse is left questioning whether the AI prevented a crisis or displaced a meaningful moment of emotional bonding and care. In this case, the emotional bond between caregiver and patient is not erased, but subtly rerouted, mediated by the presence of a system that redefines what counts as knowing and caring. The final decision, for now, is typically still up to the healthcare professional. It is nonetheless noticeable how technologies are mediating the relationship between the different stakeholders involved in the healthcare sector. A nurse might need to consult the result from an AI-powered algorithm before deciding whether or not to perform a certain task, such as in the example previously depicted. According to Nancy Robert (2019), nurses will become information integrators for AI systems, on top of their role of health coaches and deliverers of human caring. The way these technologies are entering the healthcare field also shapes emotions understood as practices. Both the bodily and cognitive components of them are mediated, and subsequently altered, by this process. Nevertheless, technological mediation, especially when it comes to emotions, can be subtle. To make this mediation more evident, in the next paragraph we will introduce the concepts of emotional attunements and glitches.

# 4 EMOTIONAL ATTUNEMENTS AND GLITCHES

The lens of emotional practices adds to our understanding of the intertwinement of bodily and cognitive components of emotions. Through this perspective, we want to highlight the role that technologies play in the shaping of emotional practices.

Emotional practices are grounded in the experience that is built over repetition of the same acts, of the same habits, the same interactions with other actors in a certain environment. This description matches what Amrute (2019) describes as attunements. Attunements can be understood as a training of the senses to produce embodied practices, in order to be able to act in a – sociotechnical – environment. Amrute borrows this concept from the definition of Kathleen Stewart (2010), who defines them as "atmospheres of living", where actors feel like some possibilities are opening up, happening, or becoming fixed. The adaptability and malleability of the senses open up to the potential of new ways of living with and through things. This potentiality can align with the creation of new practices – which include emotional practices –, where technologies play a relevant role. The introduction of AI-powered tools in the healthcare domain, for instance, promises the outsourcing of tasks and decisions to machines, so that healthcare professionals can focus on different tasks, namely empathetic care (Kerasidou, 2020). Whether this decisional outsourcing is actually – and successfully – happening, is beyond the scope of this paper. We are here interested in investigating how this narrative tends to leave out the impact this introduction will have on emotional practices themselves. For this reason, we believe that the concept of attunement is useful, as it shifts the focus towards the ever-changing sociotechnical environment, and the interrelation between

[5] The example is inspired by the cases described in the paper "The Cooperation Between Nurses and a New Digital Colleague "AI-Driven Lifestyle Monitoring" in Long-Term Care for Older Adults: Viewpoint", by Groeneveld et al. (2024)

this and emotional practices. Human beings act in an attuned way with their environment, which comprises social relations, cultural practices, environmental and political structures. The body dictates the boundaries of available practices, confined both by its own materiality and its surroundings. Paradigmatically, the way emotions are enacted, therefore, is in attunement with other societal actors and the material world in which this relationship is constituted. This concept is what we propose to call 'emotional attunement'. Emotional attunements define the way emotional practices are enacted in the world in accordance – in attunement – with the external sociotechnical environment. This attunement is built both on the habituation that the body has learned throughout physical repetition, but also through societal, cultural, political, and technical structures that constitute the materiality within which the subject acts.

Within this framework, we want to highlight the role that technologies play in this attunement. As we have argued earlier in the paper, technologies mediate the way humans live in the world, their praxis (Kudina, 2019; Verbeek, 2015; Verbeek, 2011). This mediation, however, can go unnoticed. It is within the nature of human beings – and within the definition of attunement itself – to adapt to new surroundings, environments, and new practices. People tend to attune to new ways of living, and sometimes they fail to acknowledge the change that is being brought about. The reflections of postphenomenology – and of the phenomenological tradition in the first place – draw attention to this mediation. In Being and Time, Heidegger (1927/2010) shows this unnoticeability with the example of the hammer. In the practice of hammering a nail, the hammer-thing is not noticed by the person who's holding it. The practice of hammering happens without questioning what tools are being used, what their aim is, who is performing the action. In the hammering, the hammer and the hammer-er become one in the practice. The practice of hammering goes smoothly, at least until the hammer-thing breaks. When the hammer breaks, the hammer-er is forced to pay attention to the tool they were using. The technological artifact shows its presence only once the practice is interrupted, forcefully, by the fact that it doesn't work anymore. It is when the technical environment breaks that we are made aware of its existence – and more precisely, on the influence that it has on our everyday – emotional practices. A related example can be pictured in an AI-mediated healthcare setting. Imagine a clinician who relies on an AI-based decision support system during routine patient consultations. It processes patient data in the background – such as lab results, vitals, medical history – and suggests potential diagnoses or treatment paths. Over time, the clinician smoothly embraces it in their routine. It's part of the workflow, almost taking the role of an assistant. They don't consciously reflect on the algorithm's logic; they just notice how it helps confirm suspicions or alerts them to patterns they might have missed. The AI tool is ready-to-hand, a trusted help for clinical judgment. But one day, the system flags a rare condition that seems out of place. The suggested diagnosis contradicts the clinician's intuition, knowledge, and experience. They hesitate. They re-run the data. They wonder how the AI reached that conclusion. They first ask for advice from a colleague, then consult the technical documentation and call IT. Now, their attention is no longer on the patient, but on the AI system itself, on its inner workings and limitations. The tool has shifted from ready-to-hand to present-at-hand. It has become a thing, exposed in its objecthood, demanding examination. In this disruption, the invisible infrastructure of technological care becomes visible. What was once a smooth assistant is now a source of uncertainty. The clinician is forced to take a reflective stance: not only about the AI's reliability, but about their own epistemic and caring position.

Building on this framework, we propose an alternative conceptualization of what Amrute (2019, p. 67) calls 'glitchy attunements'. Amrute introduces the concept of glitch as one out of three types of attunements that she analyzes. The author builds on the concept rooted in the tradition of queer and transgender literature, where the theory of the glitch points at those types of identities whose existence is an act of resistance. Amrute combines this understanding together with the political stance that glitchy identities represent a challenge to the status quo. It is through the existence of these glitchy attunements that problematic aspects of the

standard systems – including technological systems – emerge and become noticed. Our alternative reading proposes a conceptualization of glitches as the breaks in the sociotechnical systems that make us aware of their presence.

The term glitch originates from the technical vocabulary, and indicates a break in the digital system. Interestingly, even in the technical sphere, a glitch is differentiated from a bug as the latter generally refers to a problem that causes significant complications and forces the system to pause its work. A glitch, on the other hand, indicates a small inconvenience, a problem that is taken into account from the beginning, which is temporary and won't represent a nuisance in the long run. These definitions can be transferred to the realm of practices, and specifically to emotional practices. When installing a new technology in an environment where a distinct emotional practice is set in place, the changes brought about by this technological introduction manifest themselves as glitches. The actors adapt to the new technological presence, but not without some beginning frictions in their established routines. For instance, introducing a new machine that measures the glucose levels of patients in a hospital ward will, at least in the beginning, cause some glitches in the usual practices between patients and personnel. Nurses will have to learn once again how the data is recorded, elaborated, and stored. They will have to communicate it to the doctors according to how the machine shows it. They will have to explain to patients how the beeping that they hear is normal, and it's nothing to worry about. They will have to learn what the patients are worried about, or scared of – is it the beeping of the new machine? Is it the way that they explained the procedure? Is it the fact that the machine only shows the results twice a day, and that it can't be recalculated as one wants? Nurses will have to earn the patient's trust and build an empathic bond through the mediation of this newly embedded technology. Their emotional and everyday practice will have to accommodate all these small changes. A series of little adjustments, which will, eventually, result in a new normality, a new attuned – emotional – practice. The technological mediation can be explicit, but most times, it reveals itself through imperceptible shifts, the small frictions that redirect practices towards a new emotional attunement. While subjects tend to align their thoughts and behavior – their 'thinking body' – to the novelty of the technical environment, the small glitches that emerge are symptomatic of how that change is not neutral, nor should it go unnoticed.

As we have argued in previous paragraphs, moral emotions are fundamental moral experiences on which people can base their moral reasoning. Emotions shape moral reasoning and therefore influence the moral behaviour of humans in the world. Technologies, on the other side, mediate human moral practices and, consequently, mediate morality. We claim that the frictions which emerge once a technology is introduced in a specific environment, modifying an emotional practice, are symptoms of moral mediation. Emotional practices are constituted by both a cognitive and an embodied aspect or, better said, are the combination of the two. When these moral emotional practices suffer frictions, or glitches, this is a signal that the moral practice itself is being disrupted by the technological implementation. This does not necessarily mean that the technological influence needs to be negative. Imagine the case of a nurse working in a busy rehabilitation unit, responsible for several patients recovering from surgery. One patient, a middle-aged man experiencing prolonged post-operative pain, has trouble expressing discomfort clearly, often downplaying symptoms during morning checks. An AI-assisted monitoring system is used on the ward to track subtle physiological data and behavioral changes, including shifts in sleep quality, facial expressions, vocal tone, etc. One morning, the system flags that the patient has shown signs of disturbed sleep and high stress levels overnight, despite him reporting that he feels 'fine'. Prompted by the alert, the nurse decides to spend a few extra minutes with the patient, gently probing beyond routine questions. This small act leads to a deeper conversation: the patient shares that he has been anxious about the recovery timeline, and that he has been struggling with pain at night but didn't want to be a burden to the already overworked staff. In this case, rather than replacing the nurse's judgment, the AI supported a more attentive, emotionally attuned interaction. The technology functioned here

not as a barrier but as a bridge, pointing out insights that opened up space for emotional and relational depth.

This case and our preceding discussion highlight the pivotal role that moral emotions – and specifically moral emotional practices – have in calling attention to how technologies are mediating morality. Giving prominence to moral emotional practices in the post-phenomenological discourse can therefore represent an innovative way to tackle the discourse on morality and technology.

# 5 EMOTIONAL ATTUNEMENT AND AI IN HEALTHCARE: TOWARDS WHAT TYPE OF HEALTHCARE?

The previous section has highlighted the importance of moral emotional practices in technology. More specifically, the concepts of emotional attunements and glitches provide a useful conceptual tool when it comes to locating and assessing the moral impact of technologies on caring and emotional practices. Observing how agents attune to their technological environment, paying special attention to the frictions that technologies determine on their surroundings, opens up the possibility of witnessing how the moral realm is tangibly being modified through technological interaction.

What consequences does this framework bring about in the field of healthcare? In the beginning of the paper, we mentioned how care itself is one of the most fundamental concepts of the healthcare profession, with relationality being one of its core aspects. Both the taking care of others – typical in caring jobs such as the ones in the healthcare field –, and the caring for others in general – which comprises a broader and emotionally charged dimension – build on a relational understanding (Botti, 2018; Krause & Boldt, 2018). The relations between doctors, nurses, patients, and technological devices allow for space for care to emerge and to be cherished. The emotional bond created between the different actors and stakeholders is an inherent part to the healthcare practice itself. The change brought about by AI-powered technologies in this scenario offers a unique perspective on how healthcare practices are being modified. Kerasidou (2020) calls attention to a pivotal aspect that distinguishes artificial intelligence from other types of technologies employed in the healthcare setting. While devices such as stethoscopes, otoscopes, and ophthalmoscopes are used to enhance the capacities of healthcare professionals, AI-powered technologies add a new layer to the process as they chip into the decision-making process. One could argue that more standard technologies do the same, as the results they deliver influence the decision of the healthcare professional regarding how to proceed. Nevertheless, as Kerasidou explains, the type of information provided by AI-powered tools intervenes at the level of trust-forming bond between caretakers and caregivers . While before it was possible to pinpoint the situated accountability of a certain decision path, with the introduction of AI tools this avenue becomes less easy to track. The emotional connections and practices that develop in sites of vulnerability, such as those of healthcare, have to come to terms with and accommodate for a third actor, whose decisions chip into the affective dimension of these relationships.

The relationship between different stakeholders in the healthcare realm – especially of those who engage with vulnerability, disease, and weakness on a daily basis – is based on constant attunements, where trust and emotional bonds are continuously built and re-shaped. The risky decision taken by a doctor that can be received with fear by a vulnerable patient can be delivered with compassion and can later be rewarded with the trust of the patient once it has proven to be effective. In this same scenario, if an AI algorithm had even partially informed the decision made by the healthcare worker, the compassionate bond would be mediated. The practice that would lead to making and communicating a certain medical decision, and the way this same decision is communicated to the patient, is modified once an AI-generated output

takes part in the decision-making process. The issue of accountability, which would arise in case a certain decision was (or purposefully wasn't) informed by an AI agent, would directly be tied to the development of trust established between different stakeholders. Consequently, the trust relationship developed between caregivers and caretakers in this scenario would impact the way emotions are experienced and performed, due to the addition of an AI-informed decision in the process. In conclusion, because the same decision was informed by an artificial agent, the trust and emotional bond between caregivers and caretakers need to adapt to it.

Whether this adaptation is for good or for bad is beyond the scope of this paper, but it is important to be investigated in further research. Taking a closer look at how these practices are re-shaping, and how the everyday glitches in the emotional system are happening, can provide a more informed picture of the way the moral present is evolving, and can therefore illuminate in which direction to shape the moral future.

# 6 CONCLUSION

This paper aimed at covering the gap between technological moral mediation and the role of moral emotions. We have illustrated our theoretical account through various examples of AI-powered technologies introduced in the healthcare field.

Firstly, we have elucidated the role of artificial intelligence in the field of healthcare, in order to show how the introduction of this technology shapes the moral and emotional practices among healthcare professionals. Here we discussed how current research does not yet take into account the pivotal role that moral emotional practices have in technologically mediated environments.

Secondly, we have proposed a theoretical framework that draws on technological mediation, postphenomenology and philosophy of emotions. The theory of technological mediation offers a valuable perspective in the analysis of the relation between humans and technologies, specifically concerning normativity and moral interactions. However, mediation theory has not yet explored the role of moral emotions. We proposed to complement the theory of technological mediation with an important role for moral emotions. Both perspectives can benefit from each other. On one side, the normative approach of technological mediation has been complemented with a crucial feature of moral action and decision-making, namely moral emotions and emotional practices. On the other side, research on moral emotions in a technological context can benefit from the mediation theory perspective, as we have shed light on how technological artifacts influence moral emotions through practices.

To do so, the paper has lastly introduced the concepts of emotional practices, attunements, and glitches. We have firstly outlined the concept of emotional attunement, defining it as the way emotions are enacted by agents in attunement with other societal actors and the material world. The embodied emotional practices are performed in a manner that is in tune with a specific cultural, historical, and sociotechnical environment. The emotional attunement reveals itself in moments of friction – which we have defined as glitches –, when the attuned emotional practice breaks due to a 'temporary malfunction' of the emotional environment. It is through these glitches that the influence of technologies can be detected within the normative realm. In doing so, this conceptual approach not only brings attention to the emotional dimensions of technological mediation but also responds to an aforementioned shortcoming of existing mediation theory: its tendency to overlook the influence of broader societal, cultural, and political conditions on how technologies are integrated into shared practices. We have used the case of AI-powered technologies in the field of healthcare to explore how agents act in emotional attunement within their technologically mediated environment.

We showed that the influence of technologies on emotional practices can showcase a shift in the emotional and moral human environment. One question, however, remains unanswered: how can emotional glitches be observed and recognized? A potential answer is offered by the emerging field of empirical philosophy (Mol, 2003; 2021). Expanding theoretical, normative, and ethical reflection with empirical research of how attunements are enacted can be highly insightful in exploring how morality is being transformed by technological introduction. As mentioned by Hämäläinen (2016, p. 10), the normative aspect of many of our everyday practices is felt at points of transition. In order to witness this transition, philosophers have based their reasoning on the work of other professionals – such as psychologists, social scientists, or historians. This can make a major contribution to the way philosophical and normative frameworks are subsequently constructed (Hämäläinen, 2016). As the emotional glitches in the moral fabric of society are witnessed at the level of everyday practices, empirical philosophy could represent a fitting approach to open up the world of moral theory to the enactment of emotional and moral practices. This could be a valuable topic of future research, grounded in the theoretical framework developed in this paper.

## Data Access Statement

No new data were generated or analyzed during this study.

## Contributor Statement

Eliana Bergamin: Conceptualization, Writing - Original Draft, Writing - Review & Editing; Sabine Roeser: Conceptualization, Writing - Original Draft, Writing - Review & Editing. Both authors approved the final version.

## Use of AI

N/A

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## Conflict of Interest Statement

There is no conflict of interest.

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