

Full length article

## The evolution of artificial empathy in the hospitality metaverse era

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## ABSTRACT

As hospitality enters the metaverse era, artificial empathy becomes essential for developing of artificial intelligence (AI) agents. Using the empathy cycle model, computational empathy frameworks and interdisciplinary research, this conceptual paper proposes a model explaining how artificial empathy will evolve in the hospitality metaverse era. The paper also addresses customer empathy and responses towards AI agents and other human actors with in the hospitality context. It explores how metaverse characteristics such as immersiveness, sociability, experiential nature, interoperability, blended virtual and physical environments as well as environmental fidelity will shape computational models and evolution of artificial empathy. Findings suggests that metaverse enables AI agents to form a seamless cycle of detection, resonation, and response to consumers' affective states, facilitating the evolution of artificial empathy. Additionally, the paper outlines conditions under which the artificial empathy cycle may be disrupted and proposes future research questions that can advance our understanding of artificial empathy.

### 1. Introduction

Tourism and hospitality are undergoing a digital transformation with artificial intelligence (AI) playing a prominent role (Bulchand-Gidumal et al., 2023; Gursoy et al., 2023a; Gursoy and Cai, 2024). AI solutions are progressively crafted to adhere to societal norms and to exhibit human qualities like empathy (Fan et al., 2024). Artificial empathy refers to an AI agent's capacity to recognise and adapt to humans' emotional states and cognitive needs (Liu-Thompkins et al., 2022). As hospitality is shifting towards a metaverse era (Buhalis et al., 2023; Gursoy et al., 2023b), the opportunities for AI agents to demonstrate artificial empathy are expanding. This raises questions of whether, when and how it should be applied in hospitality metaverse experiences.

Empathy is a critical aspect of tourism and hospitality interactions leading to service quality, satisfaction, loyalty and customers' well-being (Umasuthan et al., 2017; Wieseke et al., 2012; Stoyanova-Bozhkova et al., 2020). Similarly, the empathy of AI agents has positive consequences on customers' responses like satisfaction and usage intention (Fan et al., 2024; De Kerwenael et al., 2020; Lv et al., 2022b; Orden-Mejia and Huertas, 2022). These positive effects can be attributed to a higher perceived agency, trust and lower psychological distance that customers associate with AI agents (see Appendix 1).

Various technologies, such as signal processing, deep learning, and affective computing, are facilitating the development of artificial empathy in chatbots, robots, and virtual agents (Buhalis et al., 2024; Poria et al., 2017; Wang et al., 2022). These opportunities are leveraged by research on computational models of artificial empathy, which aim to replicate mechanisms of human cognitive and affective empathy in AI agents (Paiva et al., 2017; Yalçın and DiPaola, 2020). Building on this foundation, Liu-Thompkins et al. (2022), propose a framework for artificial empathy consisting of perspective-taking, empathic concern and emotional contagion. This adopts a developmental approach to artificial empathy that combines both cognitive and affective empathy.

Hospitality servicescapes are becoming more intelligent through the application of AI. The metaverse is expected to significantly impact them by creating highly realistic, immersive, and interconnected physical and digital environments (Buhalis et al., 2022; Deng et al., 2024; Gursoy et al., 2023b; Gursoy et al., 2025; Yin et al., 2023; Zhang, et al., 2024; Zhong et al., 2024). This creates additional opportunities for hospitality organisations to introduce virtually embodied AI agents that offer personalised, empathic interactions with customers in metaverse servicescapes (Hennig-Thurau et al., 2023). AI agents have already been adopted in the form of robots by hotels like Hilton (Saputra et al., 2025). Hotel chains such as CitizenM and Marriott create metaverse virtual

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hotels and experiences (Hospitalitydesign, 2023). Research on artificial empathy focuses on chatbots and service robots (see Appendix 1), without yet discussing the role of empathic AI agents in the service-scapes of the metaverse. Given that user interaction with AI agents will increasingly determine customer usage intentions (Hadi et al., 2024), researching empathic virtual AI agents in the metaverse is critical.

This paper adopts a model-based research design for conceptual papers (Jaakkola, 2020) to investigate the opportunities and challenges of advancing computational models for artificial empathy in the metaverse era. Building on the empathy cycle framework, computational empathy and interdisciplinary research, it proposes a model to explain the evolution of artificial empathy in the emerging hospitality metaverse servicescapes. It also examines customers' empathy and responses towards hospitality AI agents. By using deductive reasoning, the paper examines how artificial empathy evolves in the hospitality industry context.

The study responds to calls for exploring the roles of AI agents in the metaverse (Huynh-The et al., 2023), particularly within the hospitality industry (Gursoy et al., 2023b; Gursoy et al., 2025). It contributes to the artificial empathy literature by synthesising discussions on the metaverse and explores empathic interactions between hospitality consumers and service providers. This contributes to our understanding of both artificial and human empathy, whilst proposing future research topics on artificial empathy in the hospitality metaverse.

## 2. AI agents in the hospitality industry: from human empathy to artificial empathy

Human employees play a crucial role in fostering authentic and emotional interactions as well as in building relationships to enhance the social value of hospitality experiences (Stoyanova-Bozhkova et al., 2020; Kim et al., 2021; Wu et al., 2022). AI raises opportunities for high-tech guest-AI agent interactions (Gursoy and Cai, 2024). AI provides a set of autonomous computer systems capable of human-like thinking and problem-solving (Bulchand-Gidumal et al., 2023; Chi et al., 2020; Gursoy et al., 2023a). AI agents can appear as physically embodied robots, disembodied chatbots and voice assistants as well as virtual characters (Saputra et al., 2025; Chi et al., 2020). Virtual AI agents can be equipped with a virtual face and body which resembles humans to various degrees and enables them to show not only verbal but also visual, auditory or invisible social cues (Chi et al., 2020; Zhang et al., 2021).

AI can handle repetitive tasks efficiently, consistently, as well as cost-effectively (Chi et al., 2020; Gursoy et al., 2019). AI agents are increasingly capable of providing uninterrupted customer service, addressing not only simple and common queries but also more personalised and complex situations (Bulchand-Gidumal et al., 2023; Chi et al., 2020; Buhalis and Moldavska, 2022). The labour shortage in the hospitality industry means that increasingly AI-enabled robots will handle more customer-related tasks (Saputra et al., 2025). However, interaction with AI agents can be considered less comfortable for customers (Fan et al., 2024), raising questions about the replacement of human employees in intelligent servicescapes (Yin et al., 2023). Privacy concerns and ethical concerns have also been raised (Bozkurt and Gursoy, 2023). AI agents often lack the emotional intelligence required to navigate emotionally charged situations and contexts, which results in experiences that may feel inauthentic (Gursoy et al., 2019; Kim et al., 2024). With the increasing importance of the feeling economy, demonstrating empathy is critical not only for humans but also for AI agents, particularly in services requiring empathic intelligence, such as hospitality (Huang and Rust, 2018; Lee and Madera, 2021; Stoyanova-Bozhkova et al., 2020).

Human empathy is the unconscious and conscious capacity to recognise, understand and respond to feelings and thoughts of another person (Wieseke et al., 2012). Affective and cognitive empathy are crucial requirements for achieving successful service encounters

(Umasuthan et al., 2017). The development of an artificial form of empathy is emerging as a breakthrough, facilitating the development of AI agents capable of handling tasks involving subjectivity, intuition, and affect (Liu-Thompkins et al., 2022; De Kervenoael et al., 2020; Wieseke et al., 2012). Technological developments elevate AI agents' capabilities in detecting, interpreting and responding to humans' emotions and thoughts in real-time (Chi et al., 2020; Poria et al., 2017). Artificial empathy is therefore the codified capability to mimic human empathy by simulating pseudo-mental features of empathy (Asada, 2015).

Studies investigating empathic AI agents (see Appendix 1) highlight that artificial empathy increases usage intention and customer satisfaction (De Kervenoael et al., 2020; Orden-Mejia and Huertas, 2022). Increased perceived agency, lower psychological distance, higher trustworthiness and perceived experience explain the positive effects of artificial empathy (Lv et al., 2022b; Pelau et al., 2021; Xu et al., 2023). Anthropomorphizing AI agents can yield positive outcomes, mainly when a strong empathy capacity is exhibited (Chi et al., 2020; Pelau et al., 2021; Xu et al., 2023; Saputra, et al., 2025). AI empathy is particularly effective when it is combined with human employee empathy (Fan et al., 2024), making the adoption of a joint service provision approach critical for firms. AI can help employees recognise and interpret customers' emotions, yet stimulate employees' fear of replacement and negative feelings (Chi et al., 2020; Huang and Gursoy, 2024).

Existing research examines the positive impact of artificial empathy on customer reactions, as well as its limitations, by exploring its application in chatbots and other smart devices. However, the emerging metaverse offers highly realistic, immersive, and interconnected physical and digital environments for customer-computer interactions (Buhalis et al., 2022; Gursoy et al., 2023b; Yin et al., 2023). How these developments in the metaverse will facilitate or hinder the evolution of empathic virtual AI agents and their roles in hospitality services remains largely unexplored.

## 3. Methodological approach

This paper adopts a model research design approach for designing conceptual articles (Jaakkola, 2020). It aims to predict relationships between metaverse characteristics and the development of AI agents' artificial empathy. It also explores customers' empathy towards AI agents and human actors in hospitality. Huang and Rust (2018) adopted this approach to explain how AI can perform service tasks. The literature analysis focused on studies related to artificial empathy, extended reality, affective computing, human empathy, and the metaverse, not only within the tourism and hospitality industry but also in services and information management. The purpose was to identify the characteristics of the metaverse and current computational models of artificial empathy and to synthesize this information in order to develop our propositions. As suggested by MacInnis (2011), deductive reasoning is used to ground the proposed relationships of the conceptual model.

## 4. Artificial empathy in the metaverse era

### 4.1. The emerging metaverse era and its characteristics

Metaverse has been defined as "a network of digitally mediated spaces that immerse users in shared, real-time experiences" (Hadi et al., 2024, p.2). The metaverse is emerging through the convergence of multiple technological building blocks, including: extended reality, AI, edge computing, spatial computing, 3D modelling, interface devices, the Internet of Things and blockchain (Barrera and Shah, 2023). The development and convergence of these technologies offer unprecedented opportunities to design digital customer experiences across various dimensions such as immersiveness, experiential engagement, environmental fidelity, sociability, convergence of physical and digital worlds, and interoperability (Barrera and Shah, 2023; Buhalis et al.,

2022; Gursoy et al., 2023b; Hadi et al., 2024). These characteristics of the metaverse can create new intelligent servicescapes that significantly influence the development of AI agents and their capabilities for artificial empathy (Hennig-Thurau et al., 2023; Yin et al., 2023).

Immersiveness is expected to be greatly enhanced by advanced extended reality and technological embodiment in the metaverse. This leads to higher levels of presence for metaverse users (Barrera and Shah, 2023; Gursoy et al., 2023b). Real-time, easier and safer multisensory social interactions will be the epicentre of the metaverse era, leading to increasing levels of sociability and presence (Barrera and Shah, 2022; Gursoy et al., 2022; Hennig-Thurau et al., 2023). The convergence of physical and digital worlds results in blended experiencescapes that will eventually make it difficult to distinguish virtual from physical content (Buhalis et al., 2022). Metaverse will be intrinsically experiential, enabling first-hand engagement and interaction (Hadi et al., 2024). It will offer opportunities not only to replicate physical reality and self-representation but also to transcend them, making the decisions around environmental fidelity critical (Barrera and Shah, 2023). Interoperability will enable data exchange and integrated applications between systems, devices and platforms (Buhalis et al., 2022). This will facilitate users to traverse and network with other users across different virtual worlds (Buhalis et al., 2023; Gursoy et al., 2023b).

The metaverse offers significant service potential for tourism and hospitality by creating immersive digital-twin (or not) platforms that enhance virtual tourism experiences and influence physical travel intentions (Choubey et al., 2024; Kılıçarslan et al., 2024). By designing effective metaverse experiences through advanced digital-twin (or not) elements, tourism and hospitality organisations can extend their services before, during and after the actual service encounter, enriching user engagement and experience (Buhalis, et al., 2022). Tailored metaverse experiences to meet users' characteristics, preferences and abilities can revolutionise virtual-physical travel interconnections (Chakraborty et al., 2024).

#### 4.2. Development of artificial empathy in the metaverse era

AI agents' artificial empathy capabilities are increasing with the development of computational models based on theory-driven and data-driven approaches (Fan et al., 2023; Yalçın and DiPaola, 2020). Data-driven approaches start from observed data, aiming to extract patterns and check them against theoretical models of empathy (Yalçın and DiPaola, 2020). Theory-driven approaches explain how empathy is developed in humans and replicate it in computational models (Poria et al., 2017). Computational models for affective empathy are based on theoretical models such as the perception-action mechanism (PAM). Empathy is generated by neurological mechanisms that lead to instinctively matching another person's affective state. Models replicating cognitive empathy are usually grounded in perspective-taking (Yalçın and DiPaola, 2020); a deliberate attempt to imagine the internal state of another person such as emotions and thoughts (Cuff et al., 2016). Computational models use dimensions of empathy and replicate the hierarchical development of human empathy, starting with affective mechanisms and progressing to cognitive ones; as in de Waal's (2008) three-layer structure of emotional contagion, empathic concern, and perspective-taking. However, artificial empathy follows a reverse developmental approach, as AI agents cannot truly experience and share feelings like humans (Asada, 2015). This study adopts the framework of artificial empathy consisting of perspective taking, empathic concern and emotional contagion proposed by Liu-Thompkins et al. (2022). By integrating this framework with Barrett-Lennard (1981) cyclical empathy process, the study encompasses empathic resonance, empathic response, and feedback-driven interactions.

According to Liu-Thompkins et al. (2022, p. 1202), in the context of artificial empathy, perspective-taking refers to "the computational learning and modelling of individuals' thoughts and inference processes in a given situation". Perspective taking is grounded on three capabilities of

progressing difficulty, namely: preference construction, personality assessment, and goal inference. Preference construction is based on broad customer habits; personality assessment refers to individual personality traits; and goal inference focuses on influences of situation-specific goals and motivations on decision making. With effective perspective taking, AI agents can understand customers' thoughts enabling them to demonstrate the necessary personalisation during their interaction with them.

Empathic concern is another dimension of human empathy which in the context of AI involves "algorithmically recognizing an individual's distress and creating the impression of caring and concern from an AI agent to the individual" (Liu-Thompkins et al., 2022, p. 1203). AI agents can demonstrate empathic concern by empathic listening and probing, acknowledgement and proactive adaptation of their conversation to indicate recognition, understanding, caring and helping (Liu-Thompkins et al., 2022). An AI agent can demonstrate empathic concern by explaining to customers that it is completely understandable to feel that way, given their situation, or by providing suggestions to help them regulate or further enjoy their emotions.

Emotional contagion in humans involves the emotional state-matching with another person (De Waal, 2008). Emotional contagion is automatic for humans but not possible for AI with the existing technology (Asada, 2015). Nevertheless, AI agents can create an illusion that they experience "the same emotions as the interacting party through emotion mirroring and mimicry" (Liu-Thompkins et al., 2022, p.1204). An AI agent can therefore mirror a customer's emotions by adjusting its facial expressions to reflect similar emotional states. Emotional contagion requires not only the successful recognition of consumer's emotion but also the evaluations of whether to mirror the emotion or not is appropriate (Paiva et al., 2017).

Artificial empathy models can adopt the cyclical process of human empathic interactions as proposed by Barrett-Lennard (1981), involving three distinct stages: a) empathic resonance by an observer to a target's emotional situation, expressed from the target either consciously or unconsciously, b) observer's attempt to express empathy by responding to the target, and c) the target's reception of the observer's empathic communication which can lead to feedback and new empathic or not interactions. Converging technologies in the metaverse era can enable the transformation of various automated technologies into empathic AI agents (Poria et al., 2017; Wang et al., 2022). Fig. 1 illustrates how metaverse characteristics can facilitate or hinder empathic resonance and expression of empathy AI agents through effective perspective taking, empathic concern and emotional contagion. It highlights the potential influence of artificial empathy on customer empathy and reactions towards hospitality AI and human agents.

Customers' experiences in the metaverse are characterised by increased immersiveness, sociability, environmental fidelity and interoperability. They can lead to an unprecedented quantity and quality of multimodal data related to consumer feelings and thoughts in different situations. That can facilitate the development of empathy resonance of AI agents. In the metaverse, virtual AI agents can express affective empathy through highly effective empathic listening, acknowledgement and dialogue by taking the form of human-like avatars. However, the unlimited opportunities around the environmental fidelity of avatars, AI agents, objects and the environment can create significant artificial empathy challenges to computational models. Low levels of interoperability can be an additional obstacle. A successful demonstration of artificial empathy by AI agents can lead to customers' empathy towards not only AI agents but also other actors of hospitality services. Higher customer empathy towards AI agents can lead to higher intentions to use them, leading to a new cycle of empathy learning and interactions. The metaverse can also hinder the development of artificial and human empathy, particularly in the hospitality and tourism context. The following sections develop propositions to elaborate on how the metaverse influences AI agents' capacity to recognise, interpret and respond to customers' emotions by analysing customers' reactions towards

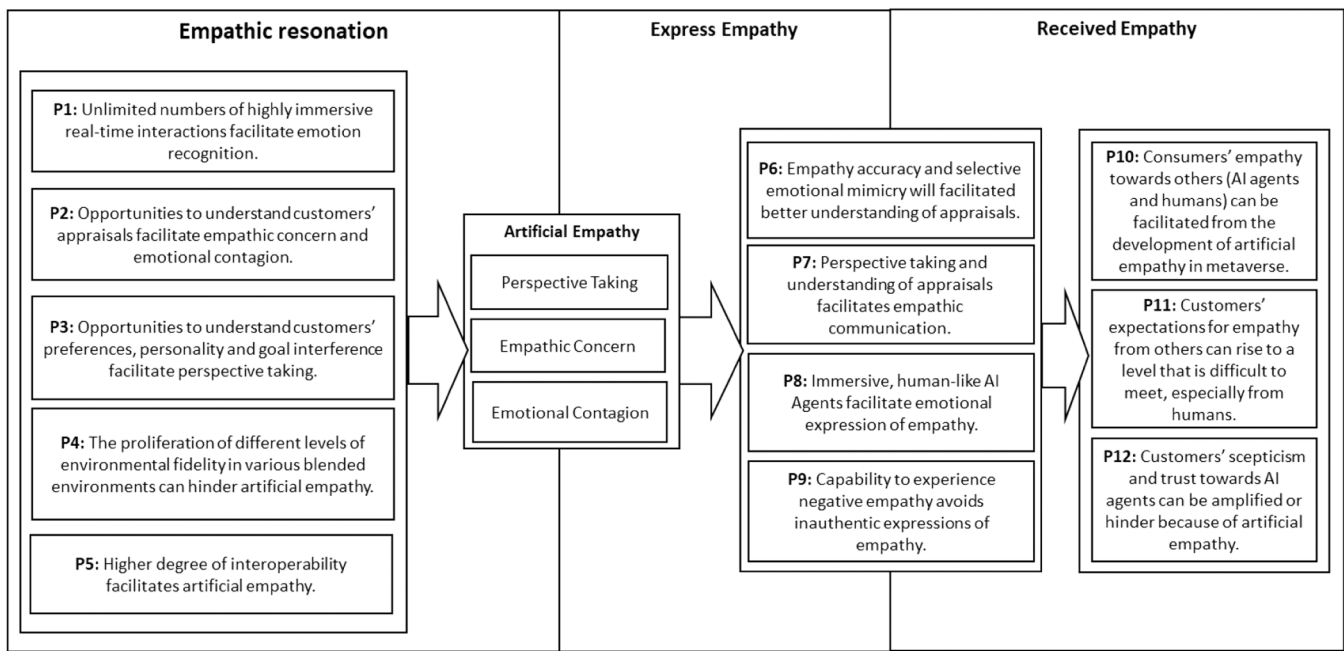


Fig. 1. Artificial empathy cycle in the Metaverse hospitality era.

increasingly empathic AI agents.

4.2.1. AI Agents’ capacity to recognise and resonate with human emotions and thoughts in the metaverse era

Like in human empathy, the cycle of artificial empathy begins when someone expresses feelings and thoughts. To equip AI agents with artificial empathy, affect recognition capabilities and high-quality affective cues are crucial (Liu-Thompkins et al., 2022). Automated affect recognition can be more accurate when multimodal data is used (Poria et al., 2017; Wang et al., 2022; Zhang et al., 2020). In the metaverse era, with the use of diverse technologies such as 3D modelling, digital sensors, wearables and edge computing, users will expressively communicate high-quality affective facial, body and vocal cues in real lifelike or imaginary environments and experiences (Buhalis et al., 2022). Customers can use highly expressive 3D design avatars to visit hotels and restaurants while looking for inspiration. Physiological information such as respiration, heart rate and skin condition can be collected with various wearable technologies, facilitating embodied interactions (Buhalis et al., 2023). Customers can use haptic gloves or other wearables while virtually experiencing casinos or outdoor activities in natural or theme parks. The increased sociability will create an unlimited number of synchronous and immersive interactions in the blended intelligent servicescapes of the metaverse. This can facilitate the capturing of temporal, relational and spatial dynamics of each situation, enhancing AI agents’ capacities for emotion recognition.

**P1.** : In the metaverse, AI Agents’ capacity for emotion recognition will be fostered due to the multimodal data captured from the unprecedented number of highly immersive and synchronous social interactions.

Appraisal theory posits that empathy arises from shared perceptions of a situation (Wondra and Ellsworth, 2015). AI agents can develop empathy by interpreting situations similarly to customers (Paiva et al., 2017). AI agents should have similar perceptions of relevance, expectancy, and coping regarding the situations that customers encounter. By sharing the same appraisals, AI agents will interpret and resonate with customers’ affective states more effectively. This is despite the fact that they will not authentically feel the same emotions as customers. Particularly in the metaverse, AI agents will capture and analyse high-quality multimodal data, enhancing their ability to align with

customers’ emotions and situational context. For example, an AI agent can suggest a dining experience that resonates emotionally with the specific situation by providing a virtual tour, describing the ambience, highlighting menu items, and sharing the chef’s philosophy. The unlimited opportunities for sociability in the metaverse will provide more possibilities for AI learning based on situational and contextual information that can be tracked and stored (Poria et al., 2017; Zhang et al., 2020). Combining physical and virtual servicescapes generates more data on customer appraisals, leading to higher empathy accuracy, which is crucial for responding empathically (Cuff et al., 2016).

**P2.** : In the metaverse, AI agents’ capacity to interpret customers’ affective states will be expanded because of the more effective identification and sharing of customers’ appraisals, leading to more effective empathic concern and emotional contagion.

Perspective taking is a critical component of artificial empathy. Metaverse can significantly influence AI agents’ capacity for perspective taking due to the increasing quality of stored data related to preferences, personality and situation-specific motivations (Dwivedi et al., 2022). Metaverse can proliferate applications capturing users’ multimodal data from previous virtual or physical experiences, further facilitating an AI agent’s capacity for perspective taking, especially regarding customers’ personality assessment. AI agents will be able to create personalised hospitality experiences like wedding ceremonies converging physical and virtual servicescapes, utilising a deeper understanding of customers’ emotions and thoughts. Personality traits and individual characteristics may support personalisation and contextualisation of services and interactions (Chakraborty et al., 2023). High levels of sociability in different contexts of high or low environmental fidelity will improve AI learning, offering unprecedented opportunities to assess personality and predict motivations in various situations. The more AI agents interact with users, the more they learn how to respond to rather nuanced questions (Huynh-The et al., 2023); particularly when devices and platforms adopt some level of interoperability. For example, AI agents will be able to successfully handle complex customer requests and complaints regardless of the virtual, physical or blended environments of the metaverse.

**P3.** : In the metaverse, AI agents’ capacity for perspective taking will be expanded due to high-quality data about customers’ preferences,



personalities and situation-specific motivations (e.g. mental models and user profiles) in highly socialised contexts of varying degrees of environmental fidelity.

The primarily experiential metaverse offers users endless opportunities to select avatars, ranging from digital twins resembling their real appearance to any imaginable form (Hadi et al., 2024). Avatars can deviate from human-like forms, which might hinder the authentic expression and recognition of emotions. Metaverse users can control how much their avatars display real emotional valence and intensity. This allows them to engage in social masking by deliberately or spontaneously modifying or concealing their feelings (Paiva et al., 2017; Zhang et al., 2020). When customers decide to hide their true emotions, often observed during service failures, AI agents can face difficulties in demonstrating empathy. As virtual and physical experiences converge, further challenges emerge. The generalisation of AI models can be complicated by hospitality customers' varying preferences and expectations across environments (Buhalis et al., 2022). The experiential nature of the metaverse increases the complexity of data, making it harder for AI to learn customers' preferences, motivations, and goals (Hadi et al., 2024; Liu-Thompkins et al., 2022). AI agents may struggle to accurately perceive and interpret emotions, leading to empathy failure. This complexity in understanding customer behaviour across virtual, physical, and blended environments can undermine AI agents' perspective-taking and emotional recognition abilities.

**P4.** : The experimental nature of the metaverse can offer unlimited opportunities for various levels of environmental fidelity in various blended environments. However, it may hinder AI agents' capacity to recognise consumers' emotions and interpret customers' affective states as well as their perspective-taking capabilities.

Real-time multisensory social interactions generate the necessary multimodal data to improve the empathic intelligence of AI agents; particularly if interoperability of technologies and platforms is achieved (Poría et al., 2017). Customers should have the option to share and/or integrate their profiles across various metaverse applications to enhance their personalised and empathic hospitality experiences. In a metaverse of high interoperability, conscious empathic AI agents can be developed. They will possess unique traits and develop a personality over time, based on learning from previous experiences (Dwivedi et al., 2022). Different AI agents will be present in the same environment, facilitating the development of a shared understanding of their internal states, based on exchanging the meaning of signals (Esmailzadeh and Vaezi, 2022). However, firms' lower interest in integrating their platforms and users' increasing privacy concerns establish significant barriers. The resulting low capacity to recognise customers' emotions will influence AI agents' capacity to reliably interpret customers' affective states. This can lead to less effective perspective taking, empathic concern and emotional contagion.

**P5.** : In the metaverse, high interoperability will enable the creation of rich multimodal data about consumers' emotions, preferences, personality and goal interferences facilitating the development of artificial empathy mechanisms of emotion recognition, appraisal sharing and perspective taking. A low degree of interoperability in the metaverse will hinder the development of artificial empathy, leading to AI agents' low empathy accuracy or empathy failure.

#### 4.2.2. AI agents' capacity to express empathy in the metaverse era

Following the recognition and resonance of an affective state, AI agents have to demonstrate an appropriate response by expressing empathy in a way that resembles human emotional contagion and emotional concern (Liu-Thompkins et al., 2022; Paiva et al., 2017). Artificial emotional contagion is induced based on an implemented appraisal routine to determine if and how an affective state should be mirrored to meet the goal of an interaction (Paiva et al., 2015; Liu-Thompkins et al., 2022). In the context of human empathy, unsuccessful

emotion mirroring and mimicry are referred to as low empathy accuracy or empathy failure (Cuff et al., 2016; Wondra and Ellsworth, 2015). Two aspects are important for an AI agent's appraisal routine: valence and expressiveness. Positive feelings should be mirrored rather than negative ones and feelings shown more expressively should be mirrored more expressively (Liu-Thompkins et al., 2022). For instance, an AI agent concierge can decide to mirror feelings to a lesser extent when interacting with a guest who is feeling stressed and overwhelmed after a long flight. Contextual aspects such as preferences, personality and goal interference need to be included in affect analyses. Hence an AI agent appraisal routine should determine to what extent an affective state should be mirrored or not (Paiva et al., 2017, Liu-Thompkins et al., 2022); as empathy might not always be favourable or desirable (Bove, 2019).

**P6.** : In the metaverse, AI agents' capacity for imitating emotional contagion will be expanded by better accuracy of emotions to determine if, how and when customers' emotions should be mirrored or not.

In the metaverse, AI agents empowered with generative AI (Gursoy et al., 2023a) will better adapt their conversations with customers, based on identified customers' affective states. They can demonstrate thereby empathic concern and that replicate human behaviour or characteristics. Caring and acknowledgement of AI agents might be perceived as more genuine due to high environmental fidelity. AI agents can further demonstrate empathic concern by proactively adapting messages and communication interfaces (Liu-Thompkins et al., 2022), and prevent the escalation of stressful situations. For example, when an AI agent encounters an angry hospitality customer, verbally demonstrating genuine empathic concern or adapting music and lighting to a more relaxing atmosphere might prevent the escalation of this situation.

**P7.** : In the metaverse, AI agents' capacity for empathic concern, demonstrated through acknowledgement, proactive adaptation, empathic listening and dialogue can be enhanced. This is due to AI agents' appraisal routines and effective perspective-taking, mimicking the respective mechanisms of humans.

In the metaverse, AI agents will be able to express emotional contagion and empathic concern in human-like ways. As in human empathic interaction, the expression of empathy should integrate multiple modalities and adapt within the context (Lv et al., 2022b). Embodied AI agents can adopt the physical appearance of human-controlled avatars, leveraging the higher immersiveness and environmental fidelity (Barrera and Shah, 2023; Hadi et al., 2024). The importance of AI agents' non-verbal cues is emphasised (Huang et al., 2021). However, so far only a limited set of AI agents' emotional expressions has been implemented, which is considered a major shortcoming for marketing interactions (Liu-Thompkins et al., 2022). In the metaverse, AI agents can simulate realistic facial expressions, and mimic gestures and nonverbal cues, making it harder to realise the difference between human and artificial emotions (Buhalis et al., 2022; Huynh-The et al. 2023). For example, a highly expressive and human-like AI agent can demonstrate empathic concern with customers deciding to book a table through the metaverse. This can create a sense of connection and a memorable experience. AI agents' capacity for empathic concern will be facilitated due to AI agents' human-like appearance

**P8.** : In the metaverse, AI agents' human-like appearance and behaviour (including non-verbal cues) will be strengthened. This will expand their capacity to respond to human emotions by expressing human-like emotional contagion and facilitating also the demonstration of empathic concern.

Hospitality encounters can entail negative empathy if employees instinctively share a customer's pain, anger or sadness (Cuff et al., 2016). The risk of negative empathy is high among individuals, heightening the need for emotional labour to avoid a cycle of negative emotions or the lack of empathic concern (Huang and Rust, 2018; Shani

et al., 2014). AI agents are not emotionally affected by customers' negative emotions, enabling effective emotional contagion, empathic concern and perspective taking even in emotionally challenging circumstances. However, empathy is a complex human capability that can cause negative consequences if it seems not authentic or is demonstrated inappropriately in a specific context (Bove, 2019; Liu-Thompkins et al., 2022). Immoderate or inauthentic empathy can make employees be perceived as biased, unprofessional or manipulative (Bove, 2019). This can be replicated by empathic AI agents, particularly in the highly immersive and experiential metaverse context. Receiving empathy benefits from others in embarrassing situations may lead receivers to feel discomfort and threatened in their social integrity (Bove, 2019). Therefore, to be viewed as authentic in their role, AI agents should demonstrate empathy and adjust to a situation.

**P9.** : In the metaverse, AI agents should be trained to understand when and how they should demonstrate empathic concern and emotional contagion, to avoid immoderate or inauthentic expressions of empathy.

#### 4.2.3. Customers' reactions after receiving AI agents' empathy in the metaverse era

Humans can also demonstrate empathy towards AI agents (Pelau et al., 2021), something that can be intensified in the metaverse. The high immersiveness and the human-likeness of AI agents can foster customers' social presence and willingness to interact. The more empathic and conscious AI agents will be in the metaverse, the more authentic the display of AI agents' feelings will be perceived by users, leading to increased customers' empathy towards AI agents (Esmailzadeh and Vaezi, 2022). Similarly, the unlimited number of AI empathic interactions due to metaverse sociability can further amplify customers' abilities related to empathy. Particularly, immersive life-like simulations of perspective taking scenarios will be facilitated in the metaverse, leading to more opportunities for customers' empathy development. AI agents can also provide personalised support and feedback to human users, enabling them to improve their skills related to empathy (Zhang et al., 2023). Empathic AI agents can educate and train customers in advance for various tasks related to their experience, leveraging the crucial role of empathy in learning.

**P10.** : In the metaverse, successful applications of artificial empathy will increase customers' opportunities to develop their capacities related to empathy towards AI agents and other human actors of hospitality services.

The development of AI agents with an expanded capacity to identify customers' affective situations will enhance the customer experience for various hospitality encounters where employees may lack the appropriate empathy (Robinson et al., 2020). Empathic failure, characterised by lower or no empathy towards outgroup members due to low familiarity or similarity, can often be observed in humans (Zaki and Cikara, 2015). This challenge may be difficult to avoid when customers interact with human employees and locals from diverse social and cultural backgrounds. However, AI agents, if trained appropriately without bias in their training data, can equally treat all people with empathy no matter their origin, background or appearance. In fact, through personalisation, AI agents can adapt language, style and service protocols to reflect customers' culture and preferences. Yet, increased interactions with AI agents possessing high artificial empathy can magnify customers' expectations when they interact with humans, whether in real-life situations or within the metaverse. Extended use of technology, especially in the highly immersive metaverse, can also decrease the opportunities for authentic face-to-face interactions and cultural exchanges, which are important ways to develop human empathy (Vallor, 2016). Singh et al., (2025) also explain that metaverse (darkverse) can be a virtual hell for hospitality and tourism customers.

**P11.** : In the metaverse, the heightened frequency of interactions with highly empathic AI agents can enhance customers' experiences but also

poses the risk of amplifying customers' empathy expectations while interacting with AI agents and particularly human employees.

The proliferation of anthropomorphic AI agents in the metaverse will blur the distinction between human and AI agents (Hadi et al., 2024). This further raises the issue of customers' awareness regarding the identity of their interaction partner, resulting in counterfeit service encounters if non-human agents cannot be identified as such (Robinson et al., 2020). Customers' responses towards AI agents' demonstration of emotions and empathy are positively influenced by the awareness of their interaction partners' identity (Fan et al., 2023; Liu-Thompkins et al., 2022; Park et al., 2023). Given the ethical concerns raised with counterfeit service encounters, regulations on the identity disclosure of AI agents need to be established in the metaverse (Robinson et al., 2020). Failing to do so will foster scepticism towards technologies, decreasing the positive effects of artificial empathy on amplifying customers' reactions such as trustworthiness, satisfaction and intention to use (De Kervenoael et al., 2020; Lv et al., 2022b).

**P12.** : In the metaverse, AI agents with enhanced artificial empathy can create counterfeit service encounters, leading to increased scepticism toward technology if their identity is not properly disclosed.

## 5. Discussion

### 5.1. Theoretical implications

This study contributes to the literature on artificial empathy, particularly by integrating insights from the emerging body of work on the metaverse. Research on artificial empathy has predominantly focused on chatbots and service robots (see Appendix 1), with little attention to the role of AI agents within the metaverse (Gursoy et al., 2023b). The metaverse can accelerate the adoption of virtual AI agents (Hadi et al., 2024; Huynh-The et al., 2023). This research argues that the metaverse will not only enhance the human-like appearance of AI agents but will also advance human-like empathic intelligence. Key characteristics of the metaverse, such as immersiveness, sociability, and the convergence of virtual and physical worlds will generate unprecedented multimodal data related to customer experiences. This will aid in developing computational models aiming to replicate both, affective and cognitive empathy as the role of data-driven approaches will be expanded. However, challenges such as the vast range of environmental fidelity and limited interoperability may hinder the progress of artificial empathy in this context. Research on computational models of artificial empathy should take into consideration these developments, adapting the mechanism to the new forms of data that will be available in the metaverse.

Existing research on customers' acceptance of AI agents highlights the influence of demographics, familiarity with the technology, and social influence (Chi et al., 2022; Chi et al., 2023; Lin et al., 2020). In the metaverse, users embody avatars, which can increase their sense of similarity with AI agents, as both are digitally mediated (Hadi et al., 2024), leading to greater acceptance and intention to use. The metaverse's experiential nature and heightened immersiveness in blended servicescapes, especially with AI agents exhibiting high environmental fidelity, are likely to encourage user engagement. Existing literature emphasises the positive impact of human-like appearances and behaviours (e.g., humour) of hospitality AI agents on customers' emotions, trust, and attitudes towards them (Chi et al., 2021; Gursoy et al., 2019; Zhang et al., 2021). This research proposes that in the metaverse, virtual AI agents with more anthropomorphic features and amplified artificial empathy can affect consumers' empathy towards both hospitality AI and human agents. However, excessive reliance on AI, may negatively impact the development of human empathy and increase the expectation for empathic interactions.

5.2. Managerial implications

In the metaverse era, AI agents' empathy capabilities can be strengthened, leading to important managerial and ethical challenges. AI agents can build relationships with customers, amplifying loyalty and intention to visit and revisit a place not only physically but also virtually. The existence of empathic human-like AI agents in the metaverse will foster the creation of new virtual experiences, generating further opportunities for empathic interactions in virtual, physical and blended servicescapes. Further opportunities to replace human employees will emerge, raising challenges of how to keep creating authentic experiences for hospitality firms and the tourism industry.

The need for collaboration between different stakeholders will be intensified, particularly if hospitality firms aim to create AI agents with high artificial empathy, respecting ethics and fostering customer experience (Gursoy et al., 2023a). Collaboration can increase interoperability, enabling the development of artificial empathy without posing privacy and ethical problems. AI can be considered a double-edged sword for hospitality firms, tourists and society leading to unprecedented challenges related to fake big data, privacy concerns and the increasingly smaller role humans assume in a high-touch industry (Singh et al., 2025; Bozkurt and Gursoy, 2023; Bulchand-Gidumal et al., 2023; Lv et al., 2022a). Technology is not a holy grail; therefore, hospitality firms should develop AI agents using a human-centred approach grounded in empathy and moral character, which is essential for ethical human-technology interactions (Vallor, 2016).

In the metaverse, customers' reactions towards AI agents can be improved due to increased artificial empathy and the experiential nature of this servicescape. The type of hotel impacts customers' willingness to accept AI devices; making them more acceptable in limited-service hotels that primarily offer utilitarian types of services (Chi et al., 2022; Lin et al., 2020). With the development of artificial empathy in the experiential metaverse servicescapes, empathic AI agents can play roles in rather utilitarian hospitality tasks, transforming them into hedonic hospitality encounters. For example, the check-in process can be delivered by an AI agent in the metaverse context, offering tailored recommendations, or even providing a virtual tour of the hotel. The hedonic motivation and innovativeness of customers significantly influence the adoption of AI agents (Della Corte et al., 2023). In this context, empathic AI agents can use nudging incentives more efficiently by influencing the behaviour of hospitality customers (Tussyadiah and Miller, 2019). These nudging techniques can be useful in the promotion of sustainable customer behaviours.

5.3. Limitations and further research questions

This study comes with limitations. This paper focuses mainly on the replacement of employees with AI agents and customers' reactions in this respect. However, the augmentation of employees' roles through AI has been broadly discussed, particularly for tasks involving empathy (Fan et al., 2023, Huang and Rust, 2018). In the metaverse, hospitality human employees will inevitably collaborate with empathic AI agents in joint service provisions, raising the need to establish the right balance (Bulchand-Gidumal et al., 2023; Chi et al., 2020). Further investigation of how metaverse will influence interactions between hospitality employees and AI agents is necessary (Jung et al., 2023), given that replacing humans with AI may lead to job losses and is not always appreciated by customers (Chi et al., 2020; Gursoy and Cai, 2024; Huang and Rust, 2018).

This paper investigates artificial empathy demonstrated by AI agents acting in the role of hospitality employees. However, in the metaverse era, numerous further roles will arise for AI agents to take, especially in a tourism and hospitality context. Among others, AI agents can represent other customers, tourist guides or local residents whose demonstration of artificial empathy might furthermore be considered a crucial aspect for customer interactions and successful service encounters. For

instance, virtual AI influencers pose an emerging phenomenon which can be of importance to the hospitality industry (Polat et al., 2024). Therefore, it requires further research to explore the application, perception and impact of AI agents acting in various other roles and their demonstration of empathy in the virtual environment of the metaverse.

Table 1 proposes future research questions that can advance our understanding of artificial empathy. It is organised based on key conclusions for each stage of the empathy cycle: empathic resonance, expressed empathy, and received empathy.

5.4. Conclusion

Hospitality is moving towards a metaverse era, intensifying the evolution and the roles of empathic AI agents in hospitality and tourism experiences. While artificial empathy is a crucial aspect of AI development, the hospitality industry can greatly leverage AI agents in metaverse servicescapes, particularly within the context of the ongoing shortage of hospitality workers.

**Table 1**  
Future research questions to advance the artificial empathy understanding.

Major Conclusion	Research Questions for Future Studies
In the metaverse, empathic resonance will be facilitated due to better emotion recognition, identification and understanding of customer appraisals and more effective perspective taking. The experiential nature of the metaverse can proliferate various levels of environmental fidelity in various blended environments, hindering the development of artificial empathy, particularly in the metaverse characterised by low interoperability.	<ul style="list-style-type: none"> <li>• What kind of multimodal data can be generated from different technologies in different hospitality experiences that can improve the computational models of artificial empathy?</li> <li>• What type of roles should be attributed to more empathic AI agents in the metaverse servicescapes?</li> <li>• When and why will hospitality customers create avatars of low environmental fidelity?</li> <li>• When will hospitality customers decide to apply social masking, hiding their emotions while they are in the metaverse?</li> <li>• How can interoperability be achieved?</li> </ul>
In the metaverse, the expression of empathy from AI agents will be facilitated with more appropriate emotional mimicry and empathic concern through empathic listening, dialogue, proactive messaging and acknowledgement. Highly immersive and human-like AI Agents will facilitate the expression of empathy.	<ul style="list-style-type: none"> <li>• When should a human-like appearance of AI agents be avoided in hospitality metaverse experiences?</li> <li>• Does the experiential nature of the metaverse change consumer appraisals of hospitality experiences compared to real-world experiences?</li> <li>• What is an appropriate empathic concern and emotional contagion in blended hospitality servicescapes of the metaverse?</li> <li>• When should AI agents avoid the demonstration of empathic concern and emotional contagion in hospitality metaverse experiences?</li> </ul>
In the metaverse, customers' empathy can be amplified when they receive higher artificial empathy from AI agents, raising empathy expectations while interacting with humans and other AI agents. The risk of counterfeit service encounters is high, leading to increased scepticism toward technology.	<ul style="list-style-type: none"> <li>• To what extent do blended hospitality servicescapes influence consumer empathy towards AI agents, other customers and human employees?</li> <li>• How can collaboration between empathic employees and AI agents be arranged in the blended hospitality servicescapes to generate more authentic encounters and higher customer empathy?</li> <li>• What are appropriate ways to reveal an AI agent's identity in the metaverse without hindering its experiential nature?</li> <li>• What are the long-term implications of heightening artificial empathy on customers' relationships with AI agents and hospitality employees?</li> </ul>

**CRedit authorship contribution statement**

**Dimitrios Buhalis:** Writing – review & editing. **Cornelia Laserer:** Writing – review & editing, Writing – original draft, Conceptualization. **Ioannis Assiouras:** Writing – review & editing, Writing – original draft,

Conceptualization.

**Declaration of Competing Interest**

None.

**Appendix 1**

**Table**  
Selected literature related to artificial empathy

Authors	Context	Method	Main Findings
Fan et al. (2024)	Chatbot- employee collaboration in service recovery (Hospitality)	Survey, experiments	Increased congruence between chatbot and human empathic responses enhances customer retention, with chatbot identity, employee acceptance, and ambidexterity affecting (in-) congruence effects.
De Kervenoael et al. (2020)	Usage intention of social robots (Hospitality)	Interviews, survey	As a dimension of human robot interaction, the demonstration of empathy by social robots was found to significantly increase the usage intention of visitors.
Lv et al. (2022b)	AI service failures and service recovery (Tourism, Hospitality, Restaurants)	Experiments	A more empathic AI response boosts reuse intention, mediated by psychological distance and trust, with multisensory interactions enhancing recovery effectiveness.
Xu et al. (2024)	Empathic accuracy in AI service failures and service recovery (Hospitality)	Experiments	Higher AI empathic accuracy in AI service recovery efforts increases customer satisfaction. This effect is mediated by the perceived agency and experience and moderated by anthropomorphism.
Orden-Mejia and Huertas (2022)	Smart tourism technologies (STTs) attributes of chatbots (Tourism)	Experiment, survey	Besides informativeness and interactivity, empathy was identified as one of the main STT attributes of destination chatbots to foster tourist satisfaction.
Pelau et al. (2021)	Trust and acceptance towards AI (Restaurants)	Survey	Customers' trust and acceptance towards AI are increased by the perceived demonstrated empathy as well as by the interaction quality, and not solely by its anthropomorphic characteristics.
Agnihotri and Bhattacharya (2024)	Impact of chatbot traits on service recovery (Online retail)	Experiments	Perceived empathy from a chatbot enhances its trustworthiness. Increased perceived empathy, and consequently trustworthiness, positively impacts consumer forgiveness and reduces negative word-of-mouth.
Yang et al. (2023)	Customer resistance to use AI-based chatbots (Customer service)	Survey	The lack of empathy is identified as a defective AI feature, which leads to distrust and resistance to use AI-based chatbots in customer service.
Park et al. (2023)	Effect of chatbot empathy on willingness to donate (WTD) Fundraising	Experiment	Empathy and identity disclosure had no significant individual effect on WTD. However, a highly empathic chatbot revealing its identity increases human likeness, social presence, and WTD.

**Data availability**

No data was used for the research described in the article.

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