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Short Communication

The Influence of Artificial Intelligence on the Stimulation of the Five Human Senses: An Integrated Approach with Multiple Intelligences

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Summary

This research proposes a critical and interdisciplinary analysis of the influence of Artificial Intelligence (AI) on the five human senses: sight, hearing, touch, smell, and taste, based on the foundations of neuropsychology, neurobiology, and neuroeducation. With the exponential growth of AI and its incorporation into various domains of daily life, it is imperative to understand its impacts on human sensory systems and cognitive processes. AI, as an algorithmic and pervasive technology, simulates cognitive and sensory functions through artificial neural networks, pattern recognition, and interactive interfaces. Despite technological advances, AI lacks consciousness, ethical judgment, creativity, or intentionality, and is distinct from and inferior to Human Intelligence (HI) in terms of complexity and cognitive depth. Human senses, in turn, are responsible for receiving and interpreting environmental stimuli, constituting the basis for perception, memory, and knowledge construction. With the advent of pervasive computing, sensory technologies such as tactile sensors, auditory interfaces, augmented reality, and artificial olfactory devices are being developed to replicate or expand these human capabilities. The study highlights the importance of a balanced integration between AI and HI, considering the psychogenetic, sensory, and affective-motivational uniqueness of individuals. The research concludes that AI should be understood as a complementary tool to human intelligence, not as its replacement. An ethical, critical, and educationally oriented approach to the use of AI is advocated, emphasizing the role of neuroscience and neuroeducation in technological mediation. The study also recommends the development of public policies and pedagogical practices that consider the limits and potential of AI, as well as the promotion of critical digital literacy. Future research is suggested to delve deeper into the sensory and cognitive effects of AI, especially on learning, emotion, attention, and memory.

Keywords: Artificial intelligence, Human senses, Neuroeducation, Human intelligence, Cognition, Technological ethics

Introduction

Artificial Intelligence (AI) has established itself as one of the most disruptive approaches today, promoting significant transformations in the global technological landscape. Its exponential growth has sparked both enthusiasm and apprehension, particularly regarding the ethical, cognitive, and social implications arising from its incorporation into the various contexts of everyday human life [4,21]. Therefore, it is essential to critically reflect on the advantages and limitations of this technological advancement, recognizing the need for conscious action by users, researchers, and public policymakers.

The development of AI, characterized by its ability to simulate human cognitive processes through algorithms, artificial neural networks, and interactive, transparent, and pervasive infrastructures, has a direct impact on how individuals perceive, interact, and process sensory information [13]. In this context, the analysis of the interface between AI and the five human senses: sight, hearing, touch, smell, and taste, gains relevance, considering the theoretical bases of neuropsychology, neurobiology, and neuroeducation.

Each of the human senses plays a crucial role in receiving and interpreting environmental stimuli, contributing to the construction of perceptual experience and cognition. Vision, for example, is associated with the decoding of visual stimuli, such as images, symbols, and patterns, while hearing enables the processing of language and environmental sounds. Touch enables tactile and kinesthetic perception and is essential for motor learning and physical interaction with the environment. Smell and taste, although often underestimated in technological approaches, are significantly important in triggering emotional responses and building sensory memory [17]. Pervasive computing, technologies such as tactile sensors, speech recognition, brain-machine interfaces, and kinesthetic systems have been implemented to replicate or expand these sensory capabilities, promoting increasingly natural and immersive interaction experiences [23]. Such advances also align with connectionist theory, according to which cognition emerges from the interconnection of procedural units, similar to human neural networks. In this sense, artificial neural networks, also called connectionist networks, model complex behaviours and mental processes, representing an essential paradigm for understanding AI from the perspective of computational neuroscience [19].

Furthermore, the application of AI in education and adaptive learning environments requires consideration of each individual's psychogenetic, sensory, and cognitive characteristics, as postulated by neuroeducation. This emphasizes the importance of integrating the affective-motivational, self-regulatory, and cognitive systems for the full development of learning [1]. In this scenario, AI can both enhance personalized learning experiences and compromise subjective dimensions of cognition if a balance between technological innovation and biopsychological principles is not maintained.

Therefore, the central objective of this research is to critically analyse the influence of artificial intelligence on the five human senses, considering the interfaces between technology and neuroscience. This analysis is based on the premise that valuing individual differences, as well as a deep understanding of sensory and cognitive mechanisms, is fundamental to building ethically responsible and cognitively sustainable educational and social technologies.

Method

This research adopts a qualitative, interpretative approach, complemented by quantitative instruments, in accordance with the assumptions of mixed methods [5]. This methodological choice aims to respond to the complexity of the object of study, which involves both subjective aspects, such as beliefs, attitudes, and perceptions, and empirical data that allow for stratification and preliminary statistical analysis.

Data collection was conducted through bibliographic and documentary research, based on materials extracted from scientific journals, indexed articles, technical manuals, specialized books, and doctoral theses. These documents provided theoretical and empirical support for the comparative analysis of topics related to Artificial Intelligence (AI), the five human senses, multiple intelligences, and the connectivist and connectionist paradigms.

In this process, document analysis was adopted as the research technique, as defined by [13], who describes it as "[...] a scientific research methodology that adopts certain technical and scientific procedures to examine and understand the content of documents of various types [...]." This approach allowed us to identify patterns, categories, and conceptual relationships relevant to furthering the discussion. Secondary data from surveys and preliminary studies on the five senses and their relationship to AI were used, particularly considering tools such as ChatGPT, launched in 2022, whose application in scientific research is debated. The analysis of these data involved both human and artificial characterization of the senses, in light of neuroscience, cognition, and technology.

The exploratory, descriptive, and explanatory nature of the research favoured the use of various methodological procedures, including comparative analysis, thematic analysis, data stratification, and indirect observation. At times, case study and action research approaches were used, always considering the variables involved and the specific contexts.

Finally, the methodological choice was guided by the research objectives, the complexity of the topic, the scientific context, and the available resources. This methodological plurality ensures greater depth, comprehensiveness, and rigor in the proposed analysis.

Theoretical and Clinical Foundation

In an interdisciplinary approach, this analysis incorporates the principles of neuroscience applied to education, associating them with the study of human temperaments, understood as genetically based structural traits that directly influence learning styles, sensory processing, and emotional responses. In this sense, the sanguine, choleric, melancholic, and phlegmatic temperaments are correlated with dominant sensory styles, creating an innovative bridge between the theory of multisensory stimuli, multiple intelligences (Gardner), and the strategic use of emerging cognitive technologies, such as AI [24,22].

From a clinical-cognitive perspective, the five senses are understood not only as physiological mechanisms, but also as neurosensory portals that shape an individual's perception, cognition, and behaviour. Thus, any technology that interferes with or amplifies sensory stimuli, such as Artificial Intelligence, can also mediate, regulate, or redirect neural processes essential to learning and emotional self-regulation [2,9].

Artificial Intelligence as a Tool for Sensory and Cognitive Modulation

Artificial intelligence, known as AI, belongs to the branch of science linked to Information and Communication Technology (ICT), of computer engineers. Through technological means, it is capable of simulating human intelligence, allowing greater integration and interaction in various domains and sectors. In other words, it is present in almost all areas: military, aviation, transportation, health, especially telemedicine, education, specifically in the education system, among other productive and non-productive sectors. Several companies are using AI for Economics and Management, Human Resources, Recruitment and Selection, business as well as for data processing and management software, for projects such as Project Management. Management, Dashboard many online games, Visual Mind, and best known ChatGPT.

ChatGPT has monopolized the term AI, as it is the best known when it comes to it, it seems to be the only one or artificial intelligence itself, but AI is much more than one imagines, with several interactive and functional resources to respond to whether it is cognitive or 3D image resolution, pervasive, ubiquitous or mobile computing, the internet of things IoT, metaverse, augmented reality and robotics (Figure 1).

Note*: Source: Futurelearn [10].

Figure 1: Artificial and human interaction.

AI, in this context, is not just a technological tool, but a catalyst for educational and neurobehavioral transformation. Through predictive algorithms, artificial neural networks, and adaptive systems, AI has the ability to accurately analyze behavioural patterns, temperamental traits, and sensory responses, thus enabling the customization of learning experiences in real time [18].

Furthermore, its application in the educational and clinical fields allows for the identification of sensory asymmetries, aiding in the early intervention of sensory processing disorders and adjusting stimuli according to the neuropsychological profile of each student, respecting their limits and enhancing their latent abilities.

Integrating the five senses as mediating channels for multiple intelligences exponentially expands the possibilities for personalized educational interventions. Below are applied examples of how AI can modulate sensory stimuli in line with temperamental traits, optimizing cognitive and emotional performance:

a) Hearing: Auditory stimuli, such as music, rhythms and sound narratives, are especially effective for melancholic (reflective) and sanguine (communicative) types, promoting focus, empathy and information retention.

b) Vision: Visuals, such as interactive infographics and dynamic videos, stimulate Cholerics (analytical and results-oriented) and Sanguines (creative), facilitating symbolic decoding and visual thinking.

c) Synesthetic learning.

d) Taste and Smell: Although traditionally less explored, these senses have high affective and mnemonic value. In controlled environments, such as culinary or sensory laboratories, they are effective in anchoring positive emotions to content, strengthening long-term memory.

Neuroplasticity and Personalized Learning

The clinical basis for this proposal is supported by brain neuroplasticity, which demonstrates that sensory experiences physically shape the brain, especially in adapted learning contexts. By providing multisensory stimuli aligned with the individual's neurocognitive profile, it is possible to strengthen synapses, increase retention, and promote the construction of knowledge in an active, emotionally meaningful, and sustainable way [12,9].

In view of the above, this research proposes a new educational and therapeutic paradigm, based on the convergence between:

a. Temperamental science;

b. The foundations of neuroeducation and neuroplasticity;

c. Sensory-cognitive integration based on multiple intelligences;

d. And the strategic use of advanced cognitive technologies, such as AI.

The model not only respects the individual's biopsychosocial complexity, but also provides more inclusive, effective and humanized interventions, promoting equitable, integrated and truly subject-centred learning.

Virtual Reality (VR) and Augmented Reality

Virtual reality has a foundation in the world of technology and uses intelligent 3D technology. Artificial intelligence and deep learning, are augmented reality technologies, which can be reproduced and augmented anywhere with the use of appropriate devices. This technology is gaining momentum, and we can use it for other perspectives in the teaching and learning process, such as pervasive computing, which transmits information interactively and transparently. It has both a logical and physical infrastructure. While virtual reality deals with digital immersion, augmented reality deals with the interaction of digital and physical realms (Figure 2).

Note*: Source: Futurelearn [10].

Figure 2: Virtual Reality and Augmented Reality.

About the five senses emerge [3]:

a. Vision is the sense capable of perceiving light and the formation of images (light stimuli), through photoreceptors located in the eyes, more precisely in the retina.

b. Hearing is the sense capable of capturing and perceiving sound waves, through photoreceptor's located in a region of the ear called the cochlea.

c. Smell is the sense capable of capturing the Odor of chemical particles present in the air, through chemoreceptors located in the olfactory epithelium, located at the top of the nasal cavity.

d. Taste is the sense capable of perceiving the flavours of food, through chemoreceptors located in the taste buds, distributed throughout the tongue, palate, pharynx, epiglottis, and larynx. Smell also helps us perceive flavour.

e. Touch is the sense capable of perceiving textures, pain, temperature and pressure, through mechanoreceptors present throughout the skin, mucous membranes and some viscera (Table 1).

Table 1: Systematic Learning.

Order	Function	Factor	Cognitive response (Yes, No and Maybe)	Learning theory
Virtual object	Allows you to impress the student	Interactive	Yes	Connectivist
Videos	Interactive, produces logical reasoning, critical sense, sometimes a sense of humor, can stimulate the cognitive process	Interactive, tactile and sensitive	Yes	Connectivist
Images	Produces logical reasoning	Static and tactile, sometimes interactive	Yes	Connectivist

Sounds	Improves understanding, can stimulate all senses, critical thinking and memory	Sensitive, creative and integrative	Yes	Multiple intelligences
Sensors and LED Light	Pervasive environment and tactile communication	Interactive and pervasive	Perhaps	Connectivist
Database	Access and storage of the collection during classes	Access and insertion into the digital library	Perhaps	Connectivist

Note*: Source: Quissanga [18].

Table 1 demonstrates how the five senses intervene in artificial intelligence through technological convergence with various learning theories. In other words, the senses play a fundamental role in neuroscience. Our brain has an extraordinary function, enabling it to perform tasks and generate neural responses interconnected by synapses. The brain cannot distinguish between reality and imagination, but it does trigger a stimulus in human regulation and the process of cognition.

Results and Discussion

This research proposes an innovative approach to the influence of Artificial Intelligence (AI) on the stimulation of the five human senses, combining concepts from multiple intelligences, neuroeducation, and emerging cognitive technologies. This represents a new educational and therapeutic paradigm, anchored in the convergence of neuroscience, sensory cognition, and intelligent technologies, with the potential to significantly transform teaching, learning, and human development.

It has been found that, although AI, especially tools such as ChatGPT, has gained great prominence in the contemporary educational and scientific scenario, there is still distrust and resistance regarding its ethical and methodological use, especially with regard to its reliability as a scientific research tool [8]. Despite this, it is evident that the strategic use of AI can favour meaningful learning, personalized teaching and adaptive cognitive development [15].

The analyzed data reveal ten fundamental axes that emerge from the correlation between AI, the five human senses and multiple intelligences, [11]:

i. Temperamentology and cognition: The recognition of temperamental profiles, in combination with AI, can help adapt sensory and cognitive content to the individual's neuropsychological profile;

ii. Neuroeducation and neuroplasticity: AI can Favor the stimulation of neural networks through multimodal sensory experiences, reinforcing;

iii. Sensory-cognitive integration: The five senses act as primary channels in the construction of perception, memory, and behaviour. AI can model and simulate these experiences, promoting embodied learning. learning);

iv. Cognitive technologies: AI tools such as ChatGPT represent adaptive systems with the potential to support writing, reasoning and the organization of ideas, activating neural circuits associated with language, [6];

v. Educational transformation: AI acts as a catalyst for a paradigm shift in education by enabling personalized teaching based on predictive data and self-adjusting systems, [15];

vi. Knowledge reinforcement: Effective learning requires repetition and sensory stimulation, aspects that can be reinforced through interactions with AI systems programmed to provide continuous feedback;

vii. Therapeutic potential: AI can be explored in sensory therapeutic practices, such as in cases of neurocognitive rehabilitation, taking advantage of multisensory stimulation and real-time progress monitoring;

viii. Synapses and neural functions: Neuroscience supports that frequent sensory stimulation strengthens synaptic connections, and AI is a tool that can promote such stimulation, [17];

ix. Wisdom and repetition: Wisdom, according to [11], is built through the internalization and practice of knowledge, and AI can support this process by organizing content and creating meaningful learning paths;

x. Sensory and cognitive education: The integration of the five senses in the educational process enhances experiential learning. AI can facilitate immersive environments, including with technologies such as augmented reality and metaverse, [16].

Thus, the results suggest that AI, when ethically applied and aligned with the principles of neuroeducation and multiple intelligences, can not only facilitate learning but also contribute to the integral development of the human being, promoting cognitively enriching sensory experiences.

Conclusion

i. It is unequivocally clear that Artificial Intelligence (AI) has already established itself as a structuring technological resource of our time, constituting a true heritage of humanity. Its presence is irreversible and increasingly integrated into social, educational, professional, and cognitive practices, making it unrealistic to consider its influence merely transitory or episodic;

ii. It is essential to recognize that AI, despite its increasing sophistication, should primarily act as a tool to support human performance, complementing the capabilities of Human Intelligence (HI), not replacing it. AI remains superior in fundamental domains such as ethical judgment, critical decision-making,

creativity, and empathy; attributes these are innate to human beings and, to date, unattainable by artificial systems;

iii. AI operates through programmed algorithms based on data and probabilistic patterns, and is therefore limited to its inferential and non-conscious nature. In contrast, human intelligence is characterized by its neural plasticity, reflective consciousness, intentionality, and capacity for self-transcendence;

iv. Although Artificial Intelligence will play a central role in scientific and technological development in the coming decades, current knowledge does not suggest it will surpass the complexity, depth, and uniqueness of human intelligence. Therefore, it is imperative that technological advances are always aligned with ethical, educational, and humanistic principles to ensure that AI is used as an extension of human capabilities, not as a replacement.

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Conflict of Interest

None.

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