

ARTIFICIAL INTELLIGENCE AND HUMAN COGNITIVE PROCESSES: FUNDAMENTAL APPROACHES

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Abstract

This article examines the similarities and differences between artificial intelligence and human cognitive processes from a fundamental perspective. In particular, attention, memory, and decision-making are analysed in both human and artificial systems. The study highlights the capabilities and limitations of artificial intelligence in modelling these cognitive processes based on contemporary scientific literature. The findings suggest that while artificial intelligence can successfully simulate certain aspects of human cognition, it cannot fully replicate consciousness, emotions, and subjective experience. The paper also discusses future prospects for collaboration of human and AI.

Keywords: artificial intelligence, cognitive processes, attention, memory, decision-making, human cognition, cognitive modelling.

Abstrakt

Ushbu maqola sun'iy intellekt va insonning kognitiv jarayonlari o'rtasidagi o'xshashlik va farqlarni fundamental nuqtai nazardan ko'rib chiqadi. Xususan, diqqat, xotira va qaror qabul qilish ham inson, ham sun'iy tizimlarda tahlil qilinadi. Tadqiqot zamonaviy ilmiy adabiyotlar asosida ushbu kognitiv jarayonlarni modellashtirishda sun'iy intellektning imkoniyatlari va cheklovlarini ta'kidlaydi. Topilmalar shuni ko'rsatadiki, sun'iy intellekt inson idrokining ba'zi jihatlarini muvaffaqiyatli taqlid qilishi mumkin bo'lsa-da, u ong, his-tuyg'ular va sub'ektiv tajribani to'liq takrorlay olmaydi. Maqolada shuningdek, inson va AI hamkorligining kelajakdagi istiqbollari muhokama qilinadi.

Kalit so'zlar: sun'iy intellekt, kognitiv jarayonlar, diqqat, xotira, qaror qabul qilish, inson bilishi, kognitiv modellashtirish.

Аннотация

В данной статье рассматриваются сходства и различия между искусственным интеллектом и когнитивными процессами человека с фундаментальной точки зрения. В частности, анализируются внимание, память и принятие решений как в человеческих, так и в искусственных системах. В исследовании освещаются возможности и ограничения искусственного интеллекта в моделировании этих когнитивных процессов на основе современной научной литературы. Результаты показывают, что, хотя искусственный интеллект может успешно имитировать определенные аспекты человеческого познания, он не может полностью воспроизвести сознание, эмоции и субъективный опыт. В статье также обсуждаются перспективы сотрудничества человека и ИИ.

Ключевые слова: искусственный интеллект, когнитивные процессы, внимание, память, принятие решений, человеческое познание, когнитивное моделирование.

Introduction

In recent years, the rapid development of artificial intelligence (AI) technologies has contributed to the emergence of new scientific directions within fundamental disciplines, particularly cognitive psychology and neuroscience. Understanding human cognitive processes serves as an essential theoretical foundation for the development of AI systems. At the same time, AI provides new opportunities to model certain aspects of human cognition.

Cognitive processes, such as attention, memory, and decision-making, play a crucial role in enabling individuals to interact with their environment. These processes are shaped by biological, psychological, and social factors. In contrast, artificial intelligence attempts to replicate these processes through algorithmic and mathematical models. Therefore, examining the similarities and differences between human cognition and AI is a significant and timely research problem.

The main objective of this paper is to identify key similarities and differences between artificial intelligence and human cognitive processes. Specifically, the paper addresses the following questions:

1. To what extent can artificial intelligence model human attention, memory, and decision-making?
2. Which aspects of human cognition remain beyond the capabilities of artificial systems?

Addressing these questions can contribute to improving AI systems and clarifying their limitations in replicating human cognition. From a theoretical perspective, human cognition is often explained through frameworks such as information processing theory and dual-process models of thinking. These frameworks emphasize the role of both automatic and controlled processes in shaping human behaviour. In contrast, artificial intelligence systems are primarily based on computational architectures, including machine learning and neural networks, which rely on pattern recognition and statistical optimisation. This fundamental difference highlights the distinction between biologically grounded cognition and algorithm-driven processing.

Methods

This study employs a theoretical and comparative approach. A review of contemporary scientific literature in cognitive psychology and artificial intelligence was conducted. Relevant theories of human cognition and AI models, including machine learning and neural networks, were analysed. A comparative framework was used to examine the cognitive characteristics of human and artificial systems. In addition, an interdisciplinary perspective was adopted by integrating insights from psychology, neuroscience, and computer science. This approach allows for a more comprehensive understanding of both biological cognition and artificial systems, highlighting their conceptual overlaps as well as structural differences.

Results and Discussion

Attention

Human attention is selective and flexible, and it is strongly influenced by emotions, motivation, and context. Humans can only process a limited amount of information at a given time.

In artificial intelligence, attention is implemented through computational mechanisms, particularly “attention mechanisms” used in modern models such as transformers. These systems can process large volumes of data efficiently. However, AI does not possess conscious awareness; its “attention” is purely computational rather than experiential. These findings suggest that while

artificial intelligence can efficiently prioritise and process information, it lacks the subjective awareness and intentionality that characterise human attention. As a result, AI attention mechanisms should be understood as functional analogues rather than true cognitive equivalents.

Memory

Human memory consists of short-term and long-term systems and is inherently dynamic and reconstructive. Humans may forget, distort, or reinterpret information over time.

In contrast, AI systems store information in a stable and precise manner. They do not forget unless explicitly programmed or affected by technical limitations. However, AI lacks the ability to reinterpret information in a meaningful or context-sensitive way, as humans do. This distinction demonstrates that human memory is not merely a storage system but an active and interpretative process. In contrast, artificial systems prioritise accuracy and consistency over meaning, which limits their ability to adapt information in complex or ambiguous contexts.

Decision-Making

Human decision-making is influenced by emotions, past experiences, and intuitive thinking. It is often subjective and may involve biases and heuristics.

Artificial intelligence, on the other hand, relies on data-driven and algorithmic processes. AI systems can make decisions quickly and objectively based on available data. However, they may fail to incorporate emotional, ethical, and contextual factors that are essential in human decision-making. Therefore, although AI systems may outperform humans in speed and accuracy under structured conditions, human decision-making remains superior in situations requiring ethical judgement, contextual sensitivity, and emotional understanding.

A critical implication of these findings is that artificial intelligence should not be viewed as a replacement for human cognition, but rather as a complementary tool. While AI excels in data processing and pattern recognition, it lacks the experiential and interpretative dimensions of human thinking. This suggests that the most effective applications of AI lie in collaborative systems, where human cognitive flexibility and AI computational efficiency are integrated.

Conclusion

The findings of this study demonstrate that artificial intelligence can model certain aspects of human cognitive processes, particularly in relation to attention, memory, and decision-making. However, it cannot fully replicate the complexity of human cognition, which is deeply rooted in consciousness, emotions, and subjective experience.

These results highlight the importance of adopting a complementary perspective, where artificial intelligence is used to enhance rather than replace human cognitive abilities. Future research should focus on developing hybrid systems that integrate human and artificial intelligence, enabling more adaptive, context-aware, and ethically informed decision-making processes.

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