
Research Article

**Neurons and algorithms:
AI Interference into human brain work**

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*«The more brilliant the lighting,
the quicker it disappears»*

Ibn Sina

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Abstract:

This article is aimed to explore how Artificial Intelligence (AI) is reshaping our cognitive landscape through the lens of neural networks and their similarities to human cognition. Additionally, it explores the distinctions and parallels between these two modes of processing, pursuing to attain a deeper understanding of the subtleties in decision-making influenced by AI systems.

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Furthermore, the article analyzes investigation for AI's transformative effects on memory retention and learning processes, positing that, although machines may enhance cognitive functions, they are aligning challenges to traditional methods of knowledge acquisition. Historical insights from Oriental philosophies, often focusing on holistic and integrative understandings of the mind-body relationship, have catalyzed novel inquiries into brain function and consciousness.

Keywords: AI, cognitive process, neural network, neurobiology

The interplay between artificial intelligence (AI) and human cognition has emerged as a crucial area of investigation, unveiling profound implications for our understanding of the mind. As AI technologies evolve, they increasingly mirror the neural mechanisms that underpin human thought and behavior. On the brink of a new era defined by algorithms that not only augment human capabilities, but also possess the potential to fundamentally reshape thought processes, it is essential to critically evaluate both the advantages and disadvantages that are inherent in this technological revolution (Grabowska, A., & Gunia, A., 2024).

Neural Networks VS. Human Cognition: Neural networks and human cognition although fundamentally distinct in their structures and functions exhibit fascinating similarities that merit closer scrutiny. Neural networks, which draw inspiration from the brain's biological frameworks, are composed of layers of interconnected nodes (commonly referred to as «neurons») that process information via weighted connections. A neuron is a structure consisting of a nucleus, a cell body and dendrites. All cells in organisms communicate with each other through cell-to-cell



contacts. In the case of nerve tissue, these are axons. The regions of the axon end section – the terminals – are not linear structures, branching to form networks, chains of nerve branches interacting with nerve, muscle, glandular cells. A nerve is a set of axons. Remarkable that electric signals inside the brain structures are converted into thoughts by means of quantum interactions between neurons. This configuration enables brain cells to learn from extensive datasets by modifying weights of physico-chemical reactions to input patterns — a mechanism reminiscent of how humans acquire knowledge through experience. However, the intricacies of human cognition are significantly more complex and nuanced compared to those found in artificial neural networks. Human thought is shaped not just by logical reasoning, but also emotions, social contexts, a lifetime of experiences (Krishna, V. V., 2023).

Nevertheless, while neural networks outplay in pattern recognition and data-driven tasks — such as image classification and natural language processing — they lack the contextual understanding that is fundamental to human cognition. Humans possess the ability to draw upon abstract concepts and engage in creative problem-solving, which transcends mere data correlation. This distinction raises critical questions about high reliance on AI systems for cognitive functions typically performed by humans. By employing statistical methods, AI can detect patterns, correlations, and anomalies within data at unparalleled speeds. In contrast, human learning is a more comprehensive process that encompasses cognitive functions such as reasoning, intuition, and emotional intelligence. Another significant difference lies in adaptability; AI systems excel in specific tasks yet often falter when it comes to generalization beyond their programming (Rudolph, J., Tan, S., &



Tan, S., 2023). Once trained on a dataset, an AI model may struggle when confronted with new or unstructured information that falls outside its training scope. In contrast, humans are inherently adaptable learners who can apply knowledge across a wide range of situations and leverage creativity to solve problems that have never been encountered before. The potential for neural networks to enhance human capabilities is significant; however, it is essential to acknowledge their limitations. As AI integrates into our cognitive processes, individuals must remain vigilant in preserving those qualities that define human thought — qualities such as empathy, acquittance, cognization and ethical reasoning — that algorithms currently cannot replicate (Jongsma, K. R., & Bredenoord, A. L., 2020). The integration of artificial intelligence (AI) into decision-making processes carries profound implications for both individual and collective cognition. AI systems — particularly those utilizing machine learning algorithms — are capable of analyzing vast data sets at speeds far beyond human capability. This proficiency allows them to identify patterns and produce predictions that can inform decisions across various domains, including healthcare and finance (Dwivedi, Y. K. et al., 2019). Despite this, reliance on AI for decision-making raises concerns regarding autonomy and accountability. While individuals are increasingly inclined to trust algorithmic recommendations, this trend risks eroding personal agency within the common view process.

«Now You See Me»: How Fast Does the Brain «Work»? The brain's memory capacity is about 2.5-6 petabytes (with a memory of this size, you can watch movies on DVD continuously for over 350 years). The brain transmits information at a speed of about 120



meters per second, or 432 kilometers per hour (Williams, T. J. et al., 2018).

Unlike the computer program storage, there is always «free space» in our brains. Unhealthy lifestyle and chronic sleep deprivation can affect the brain's ability to memorize and acquire information. Thus, the important role of hormones in the processes of cognitive activity, and especially «the basic foundation of cognitive components of memory» has been established and confirmed. The content of hormones such as angiotensin, melatonin, leptin, testosterone, estrogen, prolactin, progesterone affects brain function. Dopamine causes feelings of well-being, on which the processes of motivation and learning depend. Norepinephrine is the main mediator of the sympathetic nervous system, controls human muscle activity – it makes it difficult for us to sit still during stress, participates in the processes of learning and memorizing information, reduces anxiety and increases the level of aggressiveness, affects the positive emotions that arise in stressful conditions: excitement, pride of victory, pleasure from risk.

The brain contains a network of neurons known as the default mode network (DMN), which is activated at the state of rest and is involved in the processes of remembering, fantasizing, and self-reflection. Due to the work of this «network» the brain can recall from the «depths' of memory» events of the past, make plans for the future and the present, thus drawing new horizons out in front of the conscious mind.

In addition, it should be mentioned that the human thought process is not limited by a «basic set of commands», as in the case of artificial intelligence systems. AI system software acts strictly



within the written code, is not «flexible», selects only the «correct» (from the point of view of the algorithm) answer to a conceptual question. In the functioning of the human brain, in addition to memory, intellectual ability, level of education, there is also an aspect of «random» solution to the problem posed. Because in the case of human approach of considering any question, abstract, figurative thinking, formed due to the conditions of the surrounding world, the individual's world outlook, and religious affiliation, plays a major role.

In this case, let's take a look at the example of a blitz game of chess. Artificial intelligence during the game will use the most beneficial tactics, follow all «typewritten» recommendations that suggest the most favorable outcome for the win. On the other side of the scale will be the chess player who acts inconsistently, will wag, try to trap his opponent, look for ways to knock his partner out of the rut – to make a «useless» move in time, to give in, to miss the opponent's obvious attack (Krishna, V. V., 2023).

However, it is worth remembering that the computer's comprehensive capabilities are several hundred times greater than the brain's information processing. At the same time, when AI follows a clearly defined script, a human can step back from the original work plan, choose a new strategy, and come to the right decision faster.

Stress, exhaustion, poor health, the need for sleep, and leisure severely limit the brain's cognitive abilities. Artificial intelligence is not burdened by physical shell, aging processes, diseases. But still AI depends on the speed of «Internet», needs electricity, operator, moderator of the actions, code devoid of errors, absence



of «viruses» (blocking programs), which can undermine the activity of the server (Dhar, P., 2020).

AI's role in memory and learning is intricate; it profoundly transforms how individuals acquire, retain, and recall information. By leveraging advanced algorithms and machine learning techniques, AI systems can «upgrade» human memory through personalized learning experiences tailored to individual cognitive styles (Rudolph, J., Tan, S., & Tan, S., 2023). These systems employ data analytics to identify patterns in a learner's behavior, enabling customized educational content that aligns with their unique needs. This adaptability not only fosters engagement but also encourages a deeper understanding by presenting material in various formats — such as visual aids or interactive simulations — thereby accommodating diverse learning preferences. They include: 1) translation technologies; 2) faster memorization of complex topics; 3) methods of formulating questions for students suffering from anxiety or communication disorders; 4) targeted explanations and feedback; 5) generation of personalized sources, materials that will suit individual's learning preferences; 6) quick access to variety of educational programs; 7) individual pacing and former control of learners' engagement. While these innovations hold significant promise, they also raise important questions about the implications for traditional educational methods, particularly as they challenge established norms (Park, P. S. et al., 2024).

A «Computer with a Human Brain» or a Human with a «Robotic Brain»? The development and differentiation of mammalian brain structures, in particular human beings, was more a necessity than a coincidence. It is no wonder that the neocortex became so important in shaping the modern appearance of the



human brain – it is responsible for subtle cognitive processes such as complex language processing – auditory type of information perception, dreams with various images, stages, phases of sleep, memorization, transmission of sensory information to the basal nuclei.

«Blue Brain Project» committed to the creation of a model of the neocortex to show how and what structures allow humans to perceive the world around them better than other mammals – columns of neurons, which are the basic structure of the neocortex, were visualized on a 3D model in order to demonstrate how large volumes of information are processed in 1 second (Williams, T. J. et al., 2018). But the researchers in this project do not aim to accurately «copy» and «reproduce» human consciousness.

Artificial intelligence is a mechanized compilation of human intellectual activities – from solving mathematical problems to writing symphonies. But still AI, when performing «human» tasks, acts according to variants of compound solutions, prescribed and coordinated in the original program code. And humans by nature are very inquisitive creatures – the patterns of human thought extend much further than the set of symbols operated by a computer (Mariani, M. M., Hashemi, N. and Wirtz, J., 2023).

The perspectives of using artificial intelligence cannot be neglected not only in education, but also in medical diagnostics, clinical research, economic forecasting, and meteorology (Pagallo, U. et al., 2023). In clinical practice, specifically in trials with vaccines, AI can become an indispensable tester and approver, as artificial intelligence can form a study plan, samples, build graphical displays of the results obtained, parse large data sets, analyze and interpret the obtained figures. Thus, the workload on



medical personnel who manually need to deal with «paper» work will be reduced. Forecasting, analytics – all this is also a part of the list of competencies possessed by AI. Assuming that all these computer systems will be trained by qualified specialists from different fields of science.

The influence of historical figures such as Abu-L-Qasim Az-Zahrawi (Abulcasis), Ibn Rushd (Averroes), and Avicenna (Ibn Sina) is undeniably impactful when considering their relevance to contemporary neurobiology. Az-Zahrawi's contributions to medicine established foundational principles for understanding bodily functions, which subsequently informed neurological studies. His emphasis on empirical observation aligns seamlessly with the modern scientific methodologies employed in today's neuroscience research. Ibn Rushd's philosophical texts advanced rational discourse regarding the essence of knowledge and perception — this discourse is essential to our understanding of cognitive processes in both humans and machines. Withal, Averroes's exploration of the connection between mind and body offers valuable enlightenment into how mental states may influence physical health; this concept is becoming increasingly relevant as researchers investigate psychosomatic effects within neurobiology (Jongsma, K. R. and Bredenoord, A. L., 2020). Avicenna's influential work synthesized various strands of knowledge from diverse cultures while proposing theories about consciousness that anticipated modern discussions regarding cognition. His concept of a «floating man» argument related to self-awareness not only foreshadows contemporary inquiries into consciousness as a product of neural activity, but also raises questions about whether it is an emergent property influenced by



external environments — this represents a critical debate within both philosophy and neuroscience today (Ahmadi, N. T., 2024).

These early thinkers recognized that human behavior is not solely a byproduct of rational thought; it is also profoundly shaped by emotional states and social contexts. This perspective resonates with contemporary discussions about AI's role in decision-making processes, where emotional intelligence remains a critical factor often overlooked by data-driven algorithms. The historical exploration of the relationship between mind and environment has established a foundation for modern studies investigating how AI can extend or replicate these interactions. Moreover, as scientists continue to develop advanced AI systems capable of analyzing vast datasets for pattern recognition — akin to ancient observational methods — it is crucial to draw on these historical insights (Ahmadi, N. T., 2024). Understanding how past scholars conceptualized cognitive functions can inform current strategies for integrating AI into our behavioral frameworks. Thus, recognizing the contributions of Oriental neuroscientists enriches our discourse on AI's impact on human cognition today.

In conclusion, the convergence of artificial intelligence and human cognition presents a compelling narrative that invites deep reflection on the nature of thought and behavior in our technologically advanced society. The contrast between neural networks and human cognition highlights both AI's potential to enforce cognitive abilities and the inherent limitations of algorithmic processing. As AI systems increasingly influence decision-making, it is crucial to recognize the risks associated with diminishing personal agency and the ethical implications often overlooked by algorithms. The use of artificial intelligence in



medicine, economics, analytics mechanisms will allow people to perform various tasks faster, choose the right answers, approaches to solve complex problems. But there may then be a retirement problem that will overwhelm all work clusters (Krishna, V. V., 2023). This will occur because human resources are slower than AI, may not be at the right level of competence, and are susceptible to environmental factors. While AI offers innovative approaches for improving memory retention and enabling personalized learning, reliance on such technology raises legitimate concerns about the erosion of intrinsic cognitive skills. In addition to everything else, the historical contributions of early neuroscientists from Oriental countries remind us that our understanding of cognition is not a recent phenomenon; rather, it has evolved over centuries through extensive inquiry into human behavior. Their insights underscore the importance of integrating emotional intelligence into decision-making processes — a critical element frequently excluded from contemporary AI frameworks. As people navigate this intricate (and often daunting) landscape where artificial intelligence increasingly influences our cognitive frameworks, it is essential to strike a balance between harnessing technological advancements and preserving vital human qualities: empathy, intuition, and ethical reasoning (Jongsma, K. R. and Bredenoord, A. L., 2020). Ultimately, nurturing an ongoing dialogue about these dynamics will be crucial to ensure that technology serves humanity's best interests. However, it's necessary to pursue this goal without compromising what fundamentally defines our humanity. While the advancements are remarkable, the potential risks cannot be overlooked.



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