Theoretical Perspectives on Pedagogic and Application-Oriented Use of AI: Metacognition and Dynamic Capabilities

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Abstract

The rapid advancement of "cognitive" AI is reshaping human-AI dynamics, shifting from human oversight to increasingly independent AI-human collaboration. This requires balanced skill development to bridge workforce capability gaps. LLMs (ChatGPT, Claude, etc..) and other such developments such as Agentic AI, increase workplace dynamics. This evolution raises a central question: How can we develop theoretical and practical frameworks to guide human-AI collaboration across educational and industrial contexts? To address this, we explore two complementary theoretical perspectives—metacognition and dynamic capabilities (DC) – that together provide a foundation for understanding and optimizing AI-human integration. From a pedagogic perspective, adapting to this new AI environment requires metacognitive awareness – understanding AI's capabilities, limitations, and ethical considerations that will allow humans to work alongside, enhancing its integration across disciplines. A metacognition strategy will require an awareness of our own cognitive capabilities and how it aligns with AI capabilities and resource availability. Hence, we understand "hallucinations" and ongoing needs to increase reliability of responses. Developments in "Agentic AI" allow AI integration within industrial workflows and processes, changing the way companies conduct business. This necessitates the need for the second theoretical perspective, Dynamic Capabilities (DC), that enables firms to "sense and seize" opportunities while navigating threats. DC governance mechanisms characterize firms' ability to assess risk and ethical concerns while accessing resources to create competitive advantage. Overall, the paper presents the integration of metacognitive and dynamic capabilities frameworks to conceptualize how individuals and organizations can strategically and ethically engage with AI technologies in both pedagogical and industrial environments.