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### **Title**

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# Advancing the (Elite) Grandmasters: AI's Role in Enhancing Chess Expertise

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## Abstract

Recent advancements in Artificial Intelligence (AI) have arguably enhanced human performance instead of supplanting it. Here we analyse 2.8 million decisions by elite chess players, a field emblematic of AI's application due to its complexity and objective measurability. We identify two AI milestones that correspond with substantial enhancements in top chess players' performance quality over the past four decades: the introduction of personal computers (PCs) and internet access in the late 1990s, and the advent of deep neural networks for chess in the late 2010s. The impact of these technologies, however, varied by age group; adult elite players derived considerable benefits from neural network-based chess computers, whereas younger top players were more influenced by the widespread availability of knowledge and PCs. Our findings underscore AI's potential to amplify human proficiency in complex tasks, highlighting the importance of tailored technological integration among elite performers.