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Learning in online chess increases with more time spent thinking and diversity of experience

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Abstract

What factors of our learning experiences enable us to best acquire complex skills? Recent ideas from artificial intelligence point to two such factors: (1) a balance of real experience with simulated experience acquired during planning itself, and (2) appropriate diversity in training examples. To test whether these factors influence the development of human expertise, we analyzed data from 1,873 chess players on the online platform Lichess, each of whom played hundreds to thousands of games over months to years. We found that both the time spent planning before moves and the diversity of opening positions encountered predict skill improvement over time. These findings suggest that principles shaping the development of expertise in artificial intelligence systems may also apply to human learning.