Simulation-Based AI with LLMs

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Abstract

Despite remarkable progress in generative AI, even the largest and most capable large language models have serious and arguably fundamental limitations in their reasoning abilities.Simulation-based AI (SBAI) agents, by contrast, make intelligent decisions using models of their problem domains, providing a complementary form of intelligence. SBAI algorithms have several attractive properties, including rapid adaptation to new problems, scalable decision quality through adjustable computational budgets and heuristics, and a degree of explainability. In this talk, He will outlines some of the main algorithms in the area and discuss how they can be combined with the strengths of LLMs, including their coding ability. In the context of the current surge of interest in tool-using LLMs, this combination represents a particularly interesting form of agentic AI, in which simulation and domain models provide powerful tools for reasoning, planning and testing possible actions. He will illustrates this approach with results on challenging games and the sample-efficient learning of code-based world models. Finally, He will describes a new project that combines agentic AI, simulation tools and domain models for network fault diagnosis.

Simon Lucas is a full professor of AI in the School of Electronic Engineering and Computer Science at Queen Mary University of London where he leads the Game AI Research Group. He was previously Head of School of EECS at QMUL. He recently spent two years as a research scientist / software engineer in the Simulation-Based Testing team at Meta, applying simulation-based AI to automated testing. Simon was the founding Editor-in-Chief of the IEEE Transactions on Games and co-founded the IEEE Conference on Games, was VP-Education for the IEEE Computational Intelligence Society and has served in many conference chair roles. His research is focused on simulation-based AI (e.g. Monte Carlo Tree Search, Rolling Horizon Evolution), bandit-based optimisation, and LLMs.