

Rethinking Multi-agent Systems in the Era of LLMs

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ABSTRACT

The original metaphor for the field of multi-agent systems was that of a team of experts, each with distinct expertise, cooperating to solve a problem that was beyond the capabilities of any individual expert. “Cooperative distributed problem solving”, as it was originally called, eventually broadened to consider all issues that arise when multiple AI systems interact. The emergence and dramatic success of Large Language Models (LLMs) has given new life to our old dream, and “agentic AI” is currently one of the most hyped areas in the most hyped technology of the century to date. A raft of LLM-powered agent frameworks have become available, and standards for LLM-agents such as MCP and A2A are rapidly gaining traction. A range of promising applications of multi-agent LLMs have been reported, such as DeepMind’s co-Scientist, where a complex problem solving system is structured in exactly the way that was envisaged decades ago. So, what lessons can we take from the three decades of research into multi-agent systems in the new era of LLM agents? In this talk, we’ll survey the main approaches, opportunities, and challenges for multi-agent systems in new world of LLM-based AI.



BIOGRAPHY

Michael Wooldridge is the Ashall Professor of the Foundations of Artificial Intelligence at the University of Oxford. He has been an AI researcher for more than 30 years, and has published more than 450 scientific articles on the subject, including nine books, translated into eight languages. He is a Fellow of the Royal Academy of Engineering, the Association for Computing Machinery (ACM), the Association for the Advancement of AI (AAAI), and the European Association for AI (EurAI), and is a member of Academia Europaea. He is President Elect of the Association for Advancement of AI (AAAI); from 2014-16, he was President of the European Association for AI, and from 2015-17 he was President of the International Joint Conference on AI (IJCAI); he is currently co-editor in chief of Artificial Intelligence journal. He has received the Faraday Prize from the Royal Society (2025), the Lovelace Medal from the British Computer Society (2020), the Patrick Henry Winston Outstanding Educator Award from the Association for Advancement of AI (2021), the Autonomous Agents Research Award from ACM (2006), and the Distinguished Service Award from the European Association for AI (2023). In 2023 he was appointed specialist advisor to the House of Lords inquiry on Large Language Models. He has published two popular science introductions to AI: the Ladybird Expert Guide to AI (2018), and The Road to Conscious Machines (2020). He presented the 2023 Royal Institution Christmas Lectures, broadcast by BBC TV over December 2023, in the 198th year of the series.

ACM Reference Format:

Michael Wooldridge. 2026. Rethinking Multi-agent Systems in the Era of LLMs. In *Proc. of the 25th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2026), Paphos, Cyprus, May 25 – 29, 2026*, IFAAMAS, 1 page. <https://doi.org/10.65109/KTWN2820>



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Proc. of the 25th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2026), C. Amato, L. Dennis, V. Mascardi, J. Thangarajah (eds.), May 25 – 29, 2026, Paphos, Cyprus. © 2026 International Foundation for Autonomous Agents and Multiagent Systems (www.ifaamas.org). <https://doi.org/10.65109/KTWN2820>