Peer response 2 (Yemi)

In his initial post, Yemi provides a detailed and well-structured description of agent-based systems (ABS), including a discussion of some of the trends that have marked the evolution of these systems over time, such as ubiquity, interconnection, intelligence, delegation, and human centricity. Other important drivers of wider ABS adoption not mentioned include the increased availability of large data sources, improved computation power, as well as advances both in technical algorithm implementations and theoretical agent architecture frameworks (Maes, 1991; Woolridge, 2009; Russel and Norvig, 2021). He also discusses how ABS can support organisations by improving productivity, quickly adapting to dynamic environments, and reducing human-error, while retaining a human-centric view.

Yemi briefly mentions the potential usefulness of AGBs in industries including healthcare and logistics, but his argument could be strengthened by providing specific use-cases. For example, AGBs have been used in healthcare to plan and optimise patient flow during hospital admissions, facilitating capacity planning and helping to reduce waiting times (Jones and Evans, 2008). In logistics, similar systems can be used to optimise warehouse operations by modelling interactions between robots, personnel, and goods, or streamlining complex supply chain operations with multiple players (Mathlouthi, Bellamine Ben Saoud and Sboui, 2015; Sadat Hosseini Khajouei *et al.*, 2021). At the same time, AGBs have also been incorporated in other industries, including algorithmic trading and risk management in finance (Farmer and Foley, 2009; Axtell and Farmer, 2022), smart grid management and renewal source integration in energy networks (Ringler, Keles and Fichtner, 2016; Deissenroth-Uhrig *et al.*, 2017), and adaptive traffic flow and congestion management in transportation systems (Bastarianto *et al.*, 2023).

In sum, AGBs are becoming increasingly common across a myriad fields, and fulfilling ever more complex and important roles. As such, it's crucial that their development is performed using robust methodologies and adhering to strict ethical standards to ensure they keep contributing rather than hindering human wellbeing.

References:

Axtell, R. and Farmer, J.D. (2022) 'Agent-Based Modeling in Economics and Finance: Past, Present, and Future'. Oxford. Available at: https://www.inet.ox.ac.uk/publications/no-2022-10-agent-based-modeling-in-economics-and-finance-past-present-and-future (Accessed: 19 February 2025).

Bastarianto, F.F. *et al.* (2023) 'Agent-based models in urban transportation: review, challenges, and opportunities', *European Transport Research Review*, 15(1), p. 19. Available at: https://doi.org/10.1186/s12544-023-00590-5.

Deissenroth-Uhrig, M. *et al.* (2017) 'Assessing the Plurality of Actors and Policy Interactions: Agent-Based Modelling of Renewable Energy Market Integration', *Complexity*, 2017, pp. 1–24. Available at: https://doi.org/10.1155/2017/7494313.

Farmer, J.D. and Foley, D. (2009) 'The economy needs agent-based modelling', *Nature*, 460(7256), pp. 685–686. Available at: https://doi.org/10.1038/460685a.

Jones, S.S. and Evans, R.S. (2008) 'An Agent Based Simulation Tool for Scheduling Emergency Department Physicians', *AMIA Annual Symposium Proceedings*, 2008, pp. 338–342.

Maes, P. (1991) 'The agent network architecture (ANA)', *SIGART Bull.*, 2(4), pp. 115–120. Available at: https://doi.org/10.1145/122344.122367.

Mathlouthi, W., Bellamine Ben Saoud, N. and Sboui, S. (2015) 'Agent-based modeling and simulation of pooled warehouse intelligent management', in.

Ringler, P., Keles, D. and Fichtner, W. (2016) 'Agent-based modelling and simulation of smart electricity grids and markets - A literature review', *Renewable and Sustainable Energy Reviews*, 57, pp. 205–215. Available at: https://doi.org/10.1016/j.rser.2015.12.169.

Russel, S. and Norvig, P. (2021) *Artificial intelligence: a modern approach*. 4th edn. Upper Saddle River, NJ : Prentice Hall: Pearson. Available at: https://doi.org/10.1109/MSP.2017.2765202.

Sadat Hosseini Khajouei, M.H. *et al.* (2021) 'Complex adaptive systems, agent-based modeling and supply chain network management: A systematic literature review', *Journal of Industrial Engineering and Management Studies*, 8(2), pp. 54–92. Available at: https://doi.org/10.22116/jiems.2021.251146.1388.

Woolridge, M. (2009) *An Introduction to MultiAgent Systems, 2nd Edition | Wiley*. 2nd edn. Chichester: John Wiley & Sons. Available at: https://www.wiley.com/en-us/An+Introduction+to+MultiAgent+Systems%2C+2nd+Edition-p-9780470519462 (Accessed: 11 February 2025).