Collaborative Discussion 1: Agent Based Systems

by Maria Ingold

Peer Response (to Dominic's initial post)

Thank you, Dominic, for your post on the rise and benefits of agent-based systems. We both identified non-intelligent agents and intelligent agents (IA), raised the thermostat example, and noted that they interact in an environment (Wooldridge, 2009).

You observe that intelligent agents have beliefs and objectives which enable its autonomy. However, it is my understanding from Wooldridge (2009) that autonomy is characteristic of all agents, whether intelligent or not.

I am unsure that the microservices comparison relates to the rise of agents, as Kravari & Bassillades (2019) combine the social aspect of intelligent agents with microservice architecture to create a trust model for Internet of Things (IoT) and suggest that intelligent agents may instead evolve or augment microservices.

You note there is debate about agents being Artificial Intelligence (AI), however Winkoff et al. (2001) refer to them as "powerful Artificial Intelligence technology", albeit "scarce" at the time, and twenty years later, AI is defined by Russell & Norvig (2021) as "the study of agents…" with intelligent agents as the primary theme of the book. Furthermore, Bill Gates (2023) just posited that AI agents (as opposed to bots) will be key to proactively transforming our lives and democratising services.

In summary, you raise interesting points, however, recent sources would enhance your discussion. In the case of IA obsolescence and its dangers, references would strengthen your arguments. Thank you for your thought-provoking points in this collaborative discussion.

References:

Gates, B. (2023) *AI is about to completely change how you use computers*, *Gates Notes: The Blog of Bill Gates*. Available from: https://www.gatesnotes.com/AI-agents [Accessed 18 November 2023].

Kravari, K. & Bassiliades, N. (2019) StoRM: A social agent-based trust model for the internet of things adopting microservice architecture, *Simulation Modelling Practice and Theory* 94: 286–302. DOI: https://doi.org/10.1016/J.SIMPAT.2019.03.008.

Russell, S. & Norvig, P. (2021) *Artificial Intelligence: A Modern Approach, Global Edition*. 4th ed. Pearson Education, Limited.

Winikoff, M., Padgham, L. and Harland, J. (2001) Simplifying the development of intelligent agents, *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* 2256: 557–568. DOI: https://doi.org/10.1007/3-540-45656-2_48/COVER.

Wooldridge, M. (2009) *An Introduction to MultiAgent Systems*. Chichester, UK: John Wiley & Sons.

Peer Responses (to Dominic's response to my Initial Post)

Thank you for your response, Dominic. As you also mention "social interaction" in your initial post, I appreciate you clarifying your position (Lambert, 2023).

Wooldridge (2009) defines "social ability" as the interacting of multi-agent systems—composed of multiple agents—with other agents (and people) by cooperating, coordinating, and negotiating to meet goals. Russell & Norvig (2021) describe agents as interacting with an environment by receiving information in through sensors and acting through actuators.

A vacuum cleaner can use its sensor to interact with its environment to determine if its current position is clean or dirty or interact with a person to indicate it needs charging (Russell & Norvig, 2021).

You raise an interesting philosophical point. While intelligence does not necessitate communication, if Stephen Hawking had not been able to communicate using Augmentative and Alternative Communication (AAC) we would not have had the benefit of receiving his intelligence (Pickering, 2020).

While I agree technologies like cloud computing drove scalability, the ability to scale was at least partly driven by the reduction in cost of processing power (Russell & Norvig, 2021; Sunyaev, 2020; Wooldridge, 2009).

Could you clarify Baumers et al. (2016) connection from additive manufacturing to reducing Moore's Law's impact and driving economies of scale on the rise of Intelligent Agents? That would help me understand your position better. Thank you for an engaging discussion.

References:

Baumers, M. et al. (2016) The cost of additive manufacturing: machine productivity, economies of scale and technology-push, *Technological Forecasting and Social Change* 102: 193–201. DOI: https://doi.org/10.1016/J.TECHFORE.2015.02.015.

Lambert, D. (2023) *Initial Post: Collaborative Discussion 1: Agent Based Systems*. Available from: https://www.my-course.co.uk/mod/forum/discuss.php?d=196658 [Accessed 18 November 2023].

Pickering, L. (2020) 'Applications of Applied Linguistics to Augmentative and Alternative Communication Device Users in the Workplace', in: Hartig, A., Santelmann, L., and Conrad, S. (eds) *The Cambridge Introduction to Applied Linguistics*. Cambridge University Press 187–203.

Russell, S. & Norvig, P. (2021) *Artificial Intelligence: A Modern Approach, Global Edition*. 4th ed. Pearson Education, Limited.

Sunyaev, A. (2020) Cloud Computing, *Internet Computing* 195–236. DOI: https://doi.org/10.1007/978-3-030-34957-8_7.

Wooldridge, M. (2009) *An Introduction to MultiAgent Systems*. Chichester, UK: John Wiley & Sons.

Peer Response Addendum (to Dominic's response to my Initial Post)

My apologies for missing your point on environmental impact, Dominic. I concur wholeheartedly that sustainability is a key consideration. On a personal note, I entered into artificial intelligence (AI) as a board advisor for iSIZE, who will be acquired by Sony Interactive Entertainment (Gallizzi, 2023). iSIZE use machine learning to reduce video bit rate prior to encoding, while maintaining visual perceptual quality, which reduces energy used in encoding, storage and delivery. I discuss sustainability and iSIZE further in my article (Ingold, 2020). Thank you for raising such a meaningful consideration.

References:

Gallizzi, U. (2023) Sony Interactive Entertainment to Acquire iSIZE. Available from: https://sonyinteractive.com/en/sony-interactive-entertainment-to-acquire-isize-a-uk-based-company-specializing-in-deep-learning-for-video-delivery/ [Accessed 19 November 2023].

Ingold, M. (2020) Learnings from Lockdown: Sustainable Streaming. Available from: https://www.linkedin.com/pulse/learnings-from-lockdown-sustainable-streaming-maria-ingold/ [Accessed 19 November 2023].