Panel Discussion Summary: AI, Ontologies, and the Next Generation of Researchers

Olga Mashkova[1,*], Anthony Huffman[2]

[1]Computer Science Program, Computer, Electrical, and Mathematical Sciences & Engineering Division, King Abdullah University of Science and Technology, Thuwal 23955, Saudi Arabia
[2]Department of Computational Medicine & Bioinformatics, University of Michigan, Ann Arbor, MI, 48109, USA

Abstract

This mini-report summarizes the ICBO 2025 panel discussion bringing together senior researchers to share insights and advice with early-career colleagues working in biomedical ontologies and knowledge representation. The panel also focused on the effects that AI and LLMs have on both ontology development and ontology usage. Currently, early career researchers should anticipate working with LLMs as assistants or tools instead as trustworthy agents.

Keywords

ontologies, panel discussion, AI systems, career advice

1. Introduction

The rapid advancement of artificial intelligence, particularly large language models (LLMs) and LLM-based agents, has created both unprecedented opportunities and significant challenges for the biomedical ontology community. As these technologies reshape knowledge representation and computational biology, there is an urgent need to examine their implications for ontology development, application, and governance. This panel discussion at the International Conference on Biomedical Ontology (ICBO) 2025 brought together senior researchers to address these critical issues and provide guidance for early-career scientists navigating this evolving landscape.

The panel featured four distinguished researchers who have made substantial contributions to biomedical ontology development and application: Prof. Catia Pesquita (University of Lisbon), Prof. Oliver He (University of Michigan), Prof. Paul Schofield (University of Cambridge), and Dr. Chris Mungall (Lawrence Berkeley National Laboratory). The discussion was moderated by Anthony Huffman (University of Michigan) and Olga Mashkova (King Abdullah University of Science and Technology).

2. Discussion scope

The panel started with the panelists reflecting on their entry into ontology research, emphasizing the interdisciplinary nature of the field. They recommended that new ontologists should identify and develop ontologies that address meaningful issues that align with both personal interests and societal needs to guide their career. Of equal importance is that ontologists should prioritize moving beyond their comfort zones and prioritize cross-disciplinary collaboration.The discussion highlighted that successful ontology research requires not only technical skills in knowledge representation and computational methods, but also the ability to communicate and translate domain expertise. Ontology design is fundamentally a dialogue between formal representation and domain understanding. Researchers should deeply learn about the application domains they serve and remain curious about emerging

16th International Conference on Biological and Biomedical Ontology (ICBO 2025), November 9—11, 2025, Virtual Event, Bethesda, USA

*Corresponding author.
olga.mashkova@kaust.edu.sa (O. Mashkova); huffmaar@umich.edu (A. Huffman)
0000-0002-4916-1660 (O. Mashkova); 0000-0002-0576-550X (A. Huffman)

© 2025 Copyright for this paper by its authors. Use permitted under Creative Commons License Attribution 4.0 International (CC BY 4.0).

CEUR Workshop Proceedings ceur-ws.org ISSN 1613-0073
published 2026-04-17

CEUR-WS.org/Vol-4194/ws_panel_report.pdf

technologies and methodologies. As such, the next generation of ontology researchers should actively engage in domains outside their immediate specialization.

In that vein, the panelists discussed the role of ontologists in community governance, sustainability, and ethical responsibility. Key considerations included establishing transparent decision-making processes for community-maintained resources, ensuring diverse representation in ontology governance structures, addressing potential biases in ontological categorizations, and considering the social and ethical implications of how knowledge is structured and applied. The discussion acknowledged ongoing challenges in maintaining long-term funding for ontology infrastructure and the need for institutional recognition of ontology curation as valuable scholarly work.

The next subject was on how ontologies drive impact in domains including precision medicine, public health, rare disease diagnosis, drug discovery, public health surveillance. Panelists shared examples of ontology applications that have influenced clinical decision-making, accelerated biomedical discovery, and enabled integration of heterogeneous data sources. The importance of working closely with domain experts and end users was repeatedly emphasized to ensure that ontology design decisions reflect actual requirements rather than theoretical ideals.

Following introductions, the bulk of the discussion addressed the role of AI and LLMs in contemporary ontology work. The panelists presented a balanced perspective: these tools offer significant productivity gains for tasks such as candidate term generation, definition drafting, ontology alignment, and quality assurance. However, they also identified critical limitations and flaws in current LLMs. LLMs struggle to capture complex or diverse viewpoints, may reinforce biases present in their training data, and can generate plausible but incorrect or inconsistent ontological assertions. Dr. Schofield specified that this is especially true with diseases, which uses similar words to describe distinct phenotypes or ignore rare diseases which are described in one or two locations. The consensus was that LLMs should be treated as assistants rather than autonomous agents, with human-in-the-loop validation, clear provenance tracking, and rigorous benchmarking essential to ensure reliability. This naturally raised questions on how LLM-using agents could be used in this role.

The panel noted that as AI systems become more prevalent in data analysis and decision support, ontologies may become increasingly relevant to provide these systems with constraints, guidance, and structured world knowledge. Ontologies can support explainability by making the semantic foundations of AI reasoning transparent and verifiable. However, realizing this potential requires ontology researchers to deeply understand both the capabilities and limitations of contemporary AI technologies. As an example, Dr. Mungall showed their efforts in using AI agents to update an older version of NCI Thesaurus to align with U.S. Executive Order 14168 to define sex and gender. The code of conduct for this ontology had previously stated that the ontology would respect and define sexual and gender-based differences. The AI agent, when prompted to deprecate gender related terms in accordance to the executive order, did so. This continued even after additional prompting for the AI to recall the code of conduct. When the AI agent was explicitly told to make sure that the update aligns with the code of conduct, it updated the code of conduct to justify its changes.

This naturally led to discussion on how current AI agents fail. We had the panelists discuss anecdotes of AI failing to act in an appropriate and responsible way. Dr. Schofield followed with an anecdote on the use of AI agents used for warfare. Here, the AI agents, in simulation, would target their own controllers. While Dr. Schofield suggested this was due to AI agents prioritizing their own capacity to act, this may also have been the caused by improper definitions regarding valid targets or failure to recognize the role of a controller. This issue of AI agents not having clear definitions for other ethical situations, especially relating to safety or potential deaths. Dr. Pesquita brought up that situations where we lack a consistent definition for a term (such as in death), would mean that any AI agents would not be able to reason or recognize if their actions would cause death or other types of harm. Altogether, AI agents should be viewed with caution due to unintended actions, especially when not properly grounded by ontology.

3. Conclusion

Altogether, the panel provided a grounding in the importance of ontologies and their current active research projects. The current AI boom in LLMs and agents provide an active, and clear use case for ontologists. Moreover, the attempt to integrate these tools everywhere provide ample opportunities to justify ontology and ontology-based research. The future for early ontologists is looking bright.

Declaration on Generative AI

We used Claude Sonnet 4.5 for grammar check and partially for summarization of the transcribed discussion recording. All content was reviewed by the authors, who take full responsibility.