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Editorial

Applied ontology: Where are we now and where are we going?

Janna Hastings [a,b] and John A. Bateman [c]
[a] *Institute for Implementation Science in Health Care, Faculty of Medicine, University of Zurich, Switzerland*
E-mail: janna.hastings@uzh.ch
[b] *School of Medicine, University of St. Gallen, Switzerland*
[c] *Faculty of Linguistics and Literary Studies, University of Bremen, Germany*
E-mail: bateman@uni-bremen.de

It is our great pleasure to welcome readers to the journal as the incoming new Editors-in-Chief, at the same time thanking Roberta Ferrario and Michael Grüninger for their sterling work over the past five years in maintaining and extending the journal to solidify its position at the forefront of ontology-focused publication venues. Our thanks go also to Isabella Distinto as outgoing assistant editor, with whom many of you will have corresponded directly over the years, and to Mihai Pomarlan as our new assistant editor. We will be building directly on the solid foundation that the previous team has handed on to us. Over these past five years we have seen not only a substantial increase in ontology-related publications, events, and applications, but also an enormous diversification in the topics covered and the areas in which ontology research is being applied. This raises important challenges for the future of the journal concerning how we can best do justice to this diversity and continue to grow the journal's relevance and appeal, serving the applied ontology community as a central hub for information distribution and discussion.

We see several significant trends currently unfolding in applied ontology broadly construed, and we aim to have these reflected fully in upcoming issues expanding the journal's already diverse portfolio.[1] We warmly invite all to participate and to actively encourage submissions to the journal in these and all related areas.

To begin, as mentioned, there is evidently a widening adoption of ontologies in new fields and so it will be of considerable benefit to the community to be aware of these developments and the challenges (and solutions) that they bring. To encourage documentation of this fast-moving state of the art, we are planning to include a new type of article in the journal: the brief new ontology report. Our incorporation of this form of article is motivated partly by a particular kind of submission that we have seen coming into the journal over the years, in which quite specific ontology development efforts that are potentially useful to the broader community are presented in their own right, rather than necessarily addressing open

[1] https://www.iospress.com/catalog/journals/applied-ontology

research issues: in that sense, the existence of the ontology itself is the contribution. Previously, papers of this type were stretched between not being able to present enough detail to make the ontology clear and demonstrating the need for the ontology on practical grounds in the first place.

Brief ontology reports will now provide a home for publications that describe ontologies where the main focus of the contribution is not a substantive research question, but rather a resource which is being made available for the community. As a precondition for consideration, the ontology should be publicly available and shared with a permissive license for re-use. The ontology should be formally correct and well-formed in OWL or in another ontology language, and good supporting documentation and metadata should be available online. The brief report should include a strong motivation for the use case, a descriptive evaluation of how the ontology is suitable for this use case, and evidence of how the ontology adds value over the state of the art. This takes further the proposals made in a previous editorial (Ferrario and Grüninger, 2020) where attention was drawn to the need not only to make information about ontologies available but also to provide sufficient information to make those ontologies usable – for example by applying the FAIR (Wilkinson et al., 2016) principles for data management to ontologies. Brief reports should also follow these general guidelines, but are encouraged to be maximally succinct. Graphics and diagrams should be of a high quality and closely supportive of the points the report wishes to make, never merely 'illustrative'. These reports will therefore be analogous to the Software or Resource reports that have been introduced in other journals for e.g. in bioinformatics or other scientific disciplines.

Second, the ecosystems in which ontologies are developed have also changed dramatically in the past few years. Most dramatically, we have seen the explosion of 'deep learning' approaches to address a wider and wider range of tasks, including systems capable of apparently 'intelligent' behavior – at least if the statements of some of their creators are believed! Systems based on deep learning are now addressing traditional application areas of knowledge representation technologies such as question answering and classification as well as providing new opportunities for visual processing, music generation, summarisation, and so on. For some researchers and developers, these capabilities may raise doubts concerning the extent to which ontologies, as well engineered and solidly motivated structurings of knowledge, are necessary at all. We see this as a particular challenge that now faces the knowledge representation community as a whole, and particularly the *applied* ontology community, and which needs to be taken up enthusiastically. It is now critical, as perhaps never before, to *demonstrate* the benefits and added capabilities of ontology-based solutions, and to articulate further the specific roles of ontologies within a broader rapidly evolving ecosystem of collaborative human-machine engineering.

The unique strengths of applied ontologies include their ability to rigorously specify clear distinctions, and their ability to enable high-quality and guaranteed inferences. These capabilities are complementary to the capabilities of systems based on deep learning, and are still absolutely essential in all of the areas where advanced machine learning systems are now finding application, such as in visual processing, both static and dynamic, object recognition tasks, mode fusions and the like. But applied ontologies cannot afford to ignore the potential efficiencies and enhancements to workflows that can be enabled by data-driven learning and large pretrained models. We are seeing increasing use of ontologies together with data and learning in 'neuro-symbolic' combination approaches, as well as the potential leverage offered by large-scale knowledge sources in the form of knowledge graphs and similar approaches with ontological underpinnings. This gives rise to an opportunity and a need to reduce and remove the historical barriers between approaches: it will be increasingly relevant in the coming years to explore well-motivated and well-theorized combinations of approaches. For all of these areas, we will need better logics and algorithms to keep abreast of the new challenges raised by heterogeneous models, heteroge-

neous approaches, heterogeneous representation systems, and heterogeneous demands. We hope to see strong contributions in all of these areas in future pages of the journal.

At the same time as these evolutions unfold, we have seen a perennial grand challenge for the field of applied ontology become ever more acute: there is a continuing shortage in ontologists with the prerequisite key interdisciplinary skills needed for jobs both in industry and in academia. Expanding the training of ontologists with a balanced background with both the formal, theoretical and the human skills (cf. Neuhaus and Hastings, 2022) to capture and formalise knowledge is a pressing need. Here we will need to broaden significantly educational and training materials (textbooks, online materials, etc.), encouraging good ontological engineering practice and methods along the way. We would like therefore also to see the journal as a further component of this broad strategy of field-building, placed alongside emerging textbooks (cf. Keet, 2020) and the active and growing array of satellite workshops and training events we now see accompanying the Formal Ontology and Information Systems (FOIS) conferences in such configurations as the Bolzano 'Summer of Knowledge' events and the recurring 'Joint Ontology Workshops' (JOWO) active since 2015,[2] as well as the webinars and educational materials of the Educational Series on Applied Ontology (ESAO) active since 2021.[3] A particular event to look out for will be a panel discussion around the theme "What are good Applied Ontology papers" that is being organized for this year's Interdisciplinary School on Applied Ontology (ISAO).[4] This event will precede this year's FOIS conference and is aimed at all working on applied ontology, including PhD students, PostDocs and researchers, as well as ontologists from business and industry.

Many of the core tasks of ontology and ontology engineering, such as shareability, integration, development, and reuse, remain as challenging as they have always been, even though we now have both a broader palette of potential methods and more experience with the kinds of difficulties that occur. Providing ready access to reports of those experiences and solutions thus remains one of the primary goals of the journal, so that it is easier to build on what has gone before. And the old chestnut of ontology evaluation will keep us occupied for the foreseeable future as well.

Finally, to conclude on a more practical note, we would like to draw your attention to the fact that the journal will imminently be changing its electronic submission platform. We hope that this will lead both to an easier submission process for authors as well as to a smoother reviewing procedure. Details of the change are appearing on the journal website and submission pages. To help contribute to this, we would *strongly* recommend that your submitted manuscripts conform to the style guides given on the journal website; in particular, there are excellent LaTeX style files that make submission in the correct format really very easy as well as speeding even further the path from submission to final publication. Taken together, we hope that the developments and continuities we have outlined here will all help contribute to another successful period for the journal and the community it serves.

Biotexts

Editor-in-Chief **John A. Bateman** received his PhD in AI from Edinburgh University in 1986 and has been a full professor at the University of Bremen since 1999. He has been involved with ontology research since developing ontologies for natural language processing in the early 1990s; subsequently he

[2] https://www.iaoa.org/jowo/
[3] https://wiki.iaoa.org/index.php/Edu:ESAO
[4] https://fois2023.griis.ca/isao-2023/

has worked in a variety of ontology-related projects, particularly including treatments of spatial semantics and natural language. He was a member of the IAOA executive council during the first years of the association following its founding in 2009 and was vice-president of the association from 2010–2015.

Editor-in-Chief **Janna Hastings** has been working with applied ontologies since 2006, most notably in the domains of chemistry and psychology. She obtained a PhD in computational biology from the University of Cambridge in 2019 and is now Assistant Professor of Medical Knowledge and Decision Support at the Universities of Zurich and St. Gallen in Switzerland. Her main research interests are the use of knowledge resources such as applied ontologies for the development of human-centred medical artificial intelligence.

We are now also joined by Assistant Editor **Mihai Pomarlan**, who is a research fellow at the University of Bremen; his principal research interest is knowledge representation for autonomous robotics, including such aspects as the ontological modelling of activities and affordances.

References

Ferrario, R. & Grüninger, M. (2020). Proposed guidelines for publishing ontology papers. *Applied Ontology*, *15*(1), 1–5. doi:10.3233/AO-200227.

Keet, C.M. (2020). An Introduction to Ontology Engineering, online, https://people.cs.uct.ac.za/~mkeet/files/OEbook.pdf.

Neuhaus, F. & Hastings, J. (2022). Ontology development is consensus creation, not (merely) representation. *Applied Ontology*, *17*(4), 495–513. https://content.iospress.com/articles/applied-ontology/ao220273. Publisher: IOS Press. doi:10.3233/AO-220273.

Wilkinson, M.D., Dumontier, M., Aalbersberg, I.J., Appelton, G., et al. The FAIR guiding principles for scientific data management and stewardship, *Scientific Data 3* (2016), 160018. doi:10.1038/sdata.2016.18.