

Modelling Multi-Perspective Knowledge on the Semantic Web

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This proposal is to do an M2 internship with me, Lucía Gómez Álvarez, and in collaboration with a second advisor, depending on the chosen topic. First, I will discuss the technical content of the internship and later some details about me and our potential collaboration.

1 Research context

Human knowledge is diverse, contextual, and often shaped by perspective. For instance, the meaning of concepts like “forest” or “tumour” can vary widely across disciplines or institutions. Integrating such heterogeneous knowledge sources without losing meaning or creating inconsistencies remains a central challenge in AI and the Semantic Web.

Standpoint Logic (SL) is a recently developed framework for modelling and reasoning about knowledge that depends on multiple points of view. It allows explicit representation of perspectives and systematic ways to relate, compare, or merge them. This makes it particularly suited for *knowledge modelling* across heterogeneous or partially conflicting sources. You can find an introduction in [Gómez Álvarez and Rudolph, 2021, Gómez Álvarez et al., 2022].

2 Internship topic: Modelling Multi-Perspective Knowledge on the Semantic Web

This internship invites you to explore how Standpoint Logic can serve as a unifying framework for representing and connecting complex knowledge sources in the Semantic Web. The goal is to develop methods that allow us to *model, integrate, and reason* over information coming from different viewpoints while maintaining coherence and interpretability.

Possible directions include:

- Developing standpoint-based models to *link and align heterogeneous ontologies* or datasets while avoiding inconsistencies; For this, you may explore the connections to existing techniques and methods such as ontology alignment techniques [Euzenat et al., 2008] and link keys [Atencia et al., 2021] between sources.
- Exploring *reasoning over large-scale knowledge graphs* (e.g., Wikidata), where diverse communities contribute with different modelling choices and implicit perspectives.

Depending on your interests, the project can take a *theoretical, modelling, or experimental* orientation. You could, for instance, design a proof-of-concept demonstrating standpoint-aware reasoning over a subset of Wikidata, or formalise standpoint-based ontology alignments.

This internship is an excellent opportunity for someone passionate about *knowledge representation, semantic interoperability*, and the challenge of *making large, multi-source data meaningful*. It also offers a clear path toward a *PhD within the SPaRK project*, which focuses on advancing Standpoint Logic for knowledge representation.

3 About me

I did my PhD at the University of Leeds under the supervision of Dr. Brandon Bennett. After my PhD, I worked as a postdoc at TU Dresden in the research group led by Prof. Sebastian Rudolph. Since the beginning of 2024, I am a CRCN Inria researcher at the mOeX team, at the Inria Centre of the University Grenoble Alpes.

Broadly speaking, I work on the representation of interesting features of knowledge via logical languages (e.g., using modal and description logics), on the study of their theoretical properties, and on the implementation of reasoning algorithms for these languages.

I recently obtained a JCJC grant for the project SPaRK (Integrating Perspectives: Standpoint Logic for Knowledge Representation), which covers the topics proposed here and will start soon. As part of this project, we will be looking for a PhD student, a postdoc and a research engineer to join the team.

4 About the candidate

I am looking for a student who is intrinsically motivated to work on some research topic that I also find interesting, so that we can collaborate. I propose some topics in this document, but if you are interested in working on something else, feel free to contact me about it. I offer flexible supervision (either close and active or more autonomous on your side) to help you solve some interesting research questions. On top of that, if the collaboration works well and you are interested, we would be very happy if this internship could lead to a PhD position within the SPaRK project.

Prerequisite knowledge. I assume that you are somewhat familiar with the syntax and semantics of first-order logic (FOL) or description logic (DL). On top of that, it will be useful if you have an interest in algorithms, reasoning systems, and software development.

References

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- [Euzenat et al., 2008] Euzenat, J., Mocan, A., and Scharffe, F. (2008). Ontology Alignments. In Hepp, M., De Leenheer, P., De Moor, A., and Sure, Y., editors, *Ontology Management. Computing for Human Experience*, volume 7, pages 177–206. Springer, Boston, MA.
- [Gómez Álvarez and Rudolph, 2021] Gómez Álvarez, L. and Rudolph, S. (2021). Standpoint logic: Multi-perspective knowledge representation. In Neuhaus, F. and Brodaric, B., editors, *Procs. of the 12th Int. Conf. on Formal Ontology in Information Systems*, volume 344 of *FAIA*, pages 3–17. IOS Press.
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