

Designing Defeasible Ontologies

Victoria Chama

University of Cape Town
Artificial Intelligence Research Unit

March 10, 2025



- ① Background
- ② Motivation
- ③ Research Objectives
- ④ Methodology
- ⑤ References

1 Background

2 Motivation

3 Research Objectives

4 Methodology

5 References

Introduction

Ontologies have solidified their role as a knowledge representation for enabling machine understanding on the web.

- Specifically, ontologies act as an enabler of good knowledge management as they focus on establishing well defined domain concepts in terms of terminologies, definitions, and relationships.

Successful application areas include:

- Data integration of heterogeneous data sources
- Facilitating communication and collaboration between different stakeholders to structure and classify knowledge
- Improved natural language processing as ontologies can provide semantic context
- Enabling automated reasoning in artificial intelligence through the use of declared logical axioms in the ontology

1 Background

2 Motivation

3 Research Objectives

4 Methodology

5 References

Motivation

While ontologies have demonstrated significant value in various domains, several challenges remain in their development and deployment:

- Complexity of ontology engineering activities
- The need for robust reasoning support mechanisms

Problem Statement

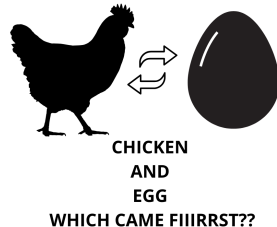
The lack of naturally occurring ontologies that express defeasible knowledge

Issues with automatically generated ontologies

- ① Lack of Realism and Artificial Scenarios
- ② Difficulty in Evaluation and scalability of reasoners
- ③ Bias and Unintended Properties

**Defeasible
Ontologies**

**Defeasible
Reasoners**



- 1 Background
- 2 Motivation
- 3 Research Objectives
- 4 Methodology
- 5 References

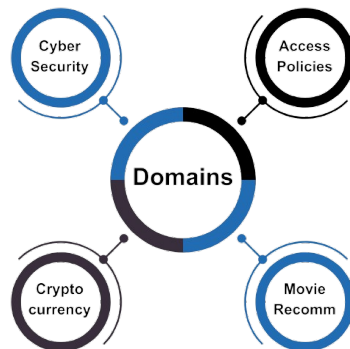
Objectives

- 1 Create a real-world ontology that has defeasible features to address the 'chicken and egg' situation of not having standardized defeasible ontologies to test and evaluate defeasible implementations.
- 2 Develop a framework for defeasible ontology design. This objective focuses on creating a reusable methodology that guides the process of building ontologies that incorporate defeasible reasoning.

- ① Background
- ② Motivation
- ③ Research Objectives
- ④ Methodology
- ⑤ References

Research Approach

- 1 Requirements Specification
- 2 Ontology Design
- 3 Implementation
- 4 Evaluation and Refinement



- 1 Background
- 2 Motivation
- 3 Research Objectives
- 4 Methodology
- 5 References**

- [1] G. Casini, T. Meyer, K. Moodley, U. Sattler, and I. Varzinczak, “Introducing defeasibility into owl ontologies,” in *The Semantic Web-ISWC 2015: 14th International Semantic Web Conference, Bethlehem, PA, USA, October 11-15, 2015, Proceedings, Part II 14*, pp. 409–426, Springer, 2015.
- [2] G. Sacco, L. Bozzato, and O. Kutz, “Know your exceptions: Towards an ontology of exceptions in knowledge representation,” *arXiv preprint arXiv:2403.00685*, 2024.
- [3] R. Iqbal, M. A. A. Murad, A. Mustapha, N. M. Sharef, *et al.*, “An analysis of ontology engineering methodologies: A literature review,” *Research journal of applied sciences, engineering and technology*, vol. 6, no. 16, pp. 2993–3000, 2013.