

Syntactic embeddings in mOWL

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Introduction

- Ontologies contain axioms, not triples (as in a graph)
- Ontology syntactic information can be represented as text

Learning objectives

- Learn about syntactic representation of ontologies as text.
- Learn how to use mOWL on this type of methods.

Axioms as sentences

- Ontologies are constructed over a defined syntax

Syntax

Symbols, formulas, systems, theorems, proofs, and interpretations expressed in formal languages are syntactic entities whose properties may be studied **without regard to any meaning** they may be given, and, in fact, need not be given any. (Wikipedia)

OWL syntaxes

OWL Constructor	DL Syntax	Manchester Syntax
intersectionOf	$C \sqcap D$	C and D
unionOf	$C \sqcup D$	C or D
complementOf	$\neg C$	not C
someValuesFrom	$\exists R.C$	R some C
allValuesFrom	$\forall R.C$	R only C

Axioms as sentences

Ontologies contain axioms Representation as sentences

- $Parent \sqsubseteq Person$

Axioms as sentences

Ontologies contain axioms

- $Parent \sqsubseteq Person$

Representation as sentences

- Parent SubClassOf Person

Axioms as sentences

Ontologies contain axioms

- $Parent \sqsubseteq Person$
- $Female \sqcap Parent \sqsubseteq Mother$

Representation as sentences

- Parent SubClassOf Person

Axioms as sentences

Ontologies contain axioms

- $Parent \sqsubseteq Person$
- $Female \sqcap Parent \sqsubseteq Mother$

Representation as sentences

- Parent SubClassOf Person
- Female and Parent SubClassOf Mother

- Syntactic information of ontologies as sentences
- Use of *reasoning* for data augmentation
- Application to protein-protein interaction

Onto2Vec: method

Input: an OWL ontology Output: numerical representations in \mathbb{R}^n of ontology entities

- 1 Reasoning over the ontology to generate more axioms
- 2 Generation of sentences from the ontology axioms
- 3 Process the sentences using Word2Vec
- 4 Output Word2Vec representations

- Ontologies contain axioms and textual annotations

Example

- Class: GO:0034399
- Label: rdfs:label nuclear periphery
- Comment: rdfs:comment The portion of the nuclear lumen proximal to the inner nuclear membrane

- OPA2Vec extends Onto2Vec by adding annotations to entities.
- Annotations can come from several sources
 - Annotations in the ontology
 - Text corpora from other sources