



# Ontological Relation Classification Using WordNet, Word Embeddings and Deep Neural Networks

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**Abstract.** Learning ontological relations is an important step on the way to automatically developing ontologies. This paper introduces a novel way to exploit WordNet [16], the combination of pre-trained word embeddings and deep neural networks for the task of ontological relation classification. The data from WordNet and the knowledge encapsulated in the pre-trained word vectors are combined into an enriched dataset. In this dataset a pair of terms that are linked in WordNet through some ontological relation are represented by their word embeddings. A Deep Neural Network uses this dataset to learn the classification of ontological relations based on the word embeddings. The implementation of this approach has yielded encouraging results, which should help the ontology learning research community develop tools for ontological relation extraction.

**Keywords:** Semantic relation classification · Word embeddings · Deep learning · Ontologies · WordNet

## 1 Introduction

Semantic relation classification is an important task in the area of natural language processing. The state-of-the-art solutions for this problem are often based on patterns and traditional machine learning techniques (Support Vector Machines, Bayesian Networks, Decision Trees, etc.). The performances of these approaches strongly depend on the quality of the used patterns (mainly based on Hearst lexico-syntactic patterns [10]) and the extracted features (Part-Of-Speech tags, frequencies, distance measures, etc.). The latter are often obtained from existing Natural Language Processing (NLP) systems, which leads to the