

# Interactive relational reinforcement learning of concept semantics

Matthias Nickles · Achim Rettinger

Received: 16 May 2012 / Accepted: 27 March 2013  
© The Author(s) 2013

**Abstract** We present a framework for the machine learning of denotational concept semantics using a simple form of symbolic interaction of machines with human users. The capability of software agents and robots to learn how to communicate verbally with human users would obviously be highly useful in several real-world applications, and our framework is meant to provide a further step towards this goal. Whereas the large majority of existing approaches to the machine learning of word sense and other language aspects focuses on learning using text corpora, our framework allows for the interactive learning of concepts in a dialog of human and agent, using an approach in the area of Relational Reinforcement Learning. Such an approach has a wide range of possible applications, e.g., the interactive acquisition of semantic categories for the Semantic Web, Human-Computer Interaction, (interactive) Information Retrieval, and Natural Language Processing.

**Keywords** Reinforcement learning · Concept learning · Symbol grounding · Statistical relational learning · Interactive learning · Meaning disambiguation

## 1 Introduction

The large majority of existing approaches to the machine learning of aspects of language and communication focuses on how to learn the semantics of words and other language constructs in a textual context, typically from large text corpora. These approaches can neither take into account the dynamic behavioral context of the word use

---

Editors: Antoine Bordes, Léon Bottou, Ronan Collobert, Dan Roth, Jason Weston, and Luke Zettlemoyer

---

M. Nickles (✉)  
Department of Computer Science, Technical University of Munich, Munich, Germany  
e-mail: [nickles@cs.tum.edu](mailto:nickles@cs.tum.edu)

A. Rettinger  
Institute AIFB, Karlsruhe Institute of Technology, Karlsruhe, Germany  
e-mail: [rettinger@kit.edu](mailto:rettinger@kit.edu)