

Semantic Parsing: The Task, the State-of-the-Art and the Future

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1 Introduction

Semantic parsing is the task of mapping natural language sentences into complete formal meaning representations which a computer can execute for some domain-specific application. This is a challenging task and is critical for developing computing systems that can understand and process natural language input, for example, a computing system that answers natural language queries about a database, or a robot that takes commands in natural language. While the importance of semantic parsing was realized a long time ago, it is only in the past few years that the state-of-the-art in semantic parsing has been significantly advanced with more accurate and robust semantic parser learners that use a variety of statistical learning methods. Semantic parsers have also been extended to work beyond a single sentence, for example, to use discourse contexts and to learn domain-specific language from perceptual contexts. Some of the future research directions of semantic parsing with potentially large impacts include mapping entire natural language documents into machine processable form to enable automated reasoning about them and to convert natural language web pages into machine processable representations for the Semantic Web to support automated high-end web applications.

This tutorial will introduce the semantic parsing task and will bring the audience up-to-date with the current research and state-of-the-art in semantic parsing. It will also provide insights about semantic parsing and how it relates to and differs from other natural language processing tasks. It will point out research challenges and some promising future directions for semantic parsing.

2 Content Overview

The proposed tutorial on semantic parsing will start with an introduction to the task, giving ex-

amples of some application domains and meaning representation languages. It will also point out its distinctions from and relations to other NLP tasks. Next, it will talk in depth about various semantic parsers that have been built, starting with earlier hand-built systems to the current state-of-the-art statistical semantic parser learners. It will point out the underlying commonalities and differences between the learners. The next section of the tutorial will talk about the recent advances in extending semantic parsing to work beyond parsing a single sentence. Finally, the tutorial will point out the current research challenges and some promising future directions for semantic parsing.

3 Outline

1. Introduction to the task of semantic parsing
 - (a) Definition of the task
 - (b) Examples of application domains and meaning representation languages
 - (c) Distinctions from and relations to other NLP tasks
2. Semantic parsers
 - (a) Earlier hand-built systems
 - (b) Learning for semantic parsing
 - i. Semantic parsing learning task
 - ii. Non-statistical semantic parser learners
 - iii. Statistical semantic parser learners
 - iv. Exploiting syntax for semantic parsing
 - v. Various forms of supervision: semi-supervision, ambiguous supervision
 - (c) Underlying commonality and differences between different semantic parser learners
3. Semantic parsing beyond a sentence
 - (a) Using discourse contexts for semantic parsing
 - (b) Learning language from perceptual contexts
4. Research challenges and future directions
 - (a) Machine reading of documents: Connecting with knowledge representation
 - (b) Applying semantic parsing techniques to the Semantic Web
 - (c) Future research directions
5. Conclusions