Computational Semantics

Ling 684.03, 2008
TR 9:30–11:18, 201 Oxley
Instructor: Michael White
http://www.ling.ohio-state.edu/~mwhite/

Description

In this course, students will learn how to use Prolog to construct semantic representations for fragments of natural language and perform inference with these representations. At the end of the course, students should be in a good position to appreciate ongoing developments in computational semantics.

The course will be based primarily on **two books** by Patrick Blackburn & Johan Bos, *Representation and Inference for Natural Language: A First Course in Computational Semantics* and *Working with Discourse Representation Theory: An Advanced Course in Computational Semantics*.

Objectives

Student in the course will have an opportunity to:

- Become familiar with the principal terminology, concepts and techniques of computational semantics.
- Learn how to automatically construct and reason with semantic representations of natural language.
- Discover the properties of natural language most relevant to logical reasoning.
- Gain experience in Prolog programming and problem solving.

Topics

Topics will include:

- Weeks 1–2: first-order logic as a tool for computational semantics
- Weeks 2–3: using the lambda calculus to construct semantic representations, compared to unification-based approaches

- Weeks 4–6: handling scope ambiguities with Cooper storage and underspecified representations
- Weeks 6–7: first-order inference with theorem provers and model builders
- Weeks 7–8: constructing Discoure Representation Theory's DRSs (Discourse Representation Structures) and translating them to first-order logic
- Weeks 8–9: resolving pronouns to accessible antecedents and using ontologies in inference
- Weeks 9–10: implementing van der Sandt's algorithm for presupposition projection and accommodation

Prerequisites

Ling 684.01 or equivalent. The course is open to advanced undergraduate and graduate students.

Requirements

Letter grades will be assigned using the standard OSU scale based on class participation and homework assignments.

- Class participation (25%):

You will be expected to keep up with the readings and **actively participate** (ask questions, offer comments, listen, respond, and have all electronic equipment turned off during class lectures) in class discussions and activities.

- Homework assignments (75%):

There will be six homework assignments each worth an equal number of points. The lowest score will be dropped in calculating the grade. Homework assignments are generally due by the beginning of class, in the Carmen dropbox.

No late homework will be accepted **without prior notice** of a justifiable delay.

I encourage group work on the homework assignments, but each of you must write out your own answers. Note that group work means that everyone in the group contributes and **fully understands** what you turn in.

Carmen

We'll be using the **Carmen** system for the schedule and for homework and reading assignments. There will also be discussion forums for posting questions and providing feedback (comments, complaints or ideas) during the course, anonymously if desired.

Readings

The *first* **Blackburn & Bos book** is out in paperback and available from various booksellers. Their second book is only available in a **draft form** that is somewhat out-of-date with respect to the accompanying slides.

There will also be additional readings of primary sources assigned periodically, and listed below.

Semantic composition via unification

- Robert C. Moore. 1989. **Unification-Based Semantic Interpretation**. In *Proc. ACL-89.*
- Ann Copestake, Alex Lascarides and Dan Flickinger. 2001. **An Algebra for Semantic Construction in Constraint-based Grammars**. In *Proc. ACL-01*.

Underspecified semantic representations

- Ann Copestake, Dan Flickinger, Carl Pollard and Ivan Sag. 2005. **Minimal Recursion Semantics: An Introduction**. *Research on Language and Computation*, 3:281–332.
- Alexander Koller, Joachim Niehren and Stefan Thater. 2003. **Bridging the Gap Between Underspecification Formalisms: Hole Semantics as Dominance Constraints**. In *Proc. EACL-03*.
- Jason Baldridge and Geert-Jan Kruijff. **Coupling CCG and Hybrid Logic Dependency Semantics**. In *Proc. ACL-02*.

Rethinking existential quantifiers

- Mark Steedman. 2007. **Surface-Compositional Scope-Alternation Without Existential Quantifiers**. Draft 5.2.

Resources

Slides

- **Helsinki Slides**
- **Gothenburg Slides**
- Malaga Slides (**day 2**, **day 3**, **day 4**, **day 5**)

Code for Books

- **Book 1 Code**
- **Book 2 Code**

Prolog Help

- **Learn Prolog Now!**

Software Requirements

- **Overview**
- **SWI Prolog**
- **Otter (theorem prover) & Mace (model builder)**

Students with Disabilities

Students who need an accommodation based on the impact of a disability should contact me to arrange an appointment as soon as possible to discuss the course format, to anticipate needs, and to explore potential accommodations. I rely on the Office of Disability Services for assistance in verifying the need for accommodations and developing accommodation strategies. Students who have not previously contacted the Office for Disability Services are encouraged to do so (292-3307; **http://www.ods.ohio-state.edu**).

Policy on Academic Misconduct

As with any class at this university, students are required to follow the Ohio State **Code of Student Conduct**. In particular, note that students are not allowed to, among other things, submit plagiarized (copied but unacknowledged) work

for credit. If any violation occurs, I am required to report the violation to the Council on Academic Misconduct.

Disclaimer

This syllabus is subject to change. All important changes will be made in writing (email), with ample time for adjustment.