Linguistics 575:
MRS in Applications

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Overview

- Course goals
- DELPH-IN context
- ERG demo

- Course requirements
- Course expectations
- Why use semantics?
- Target tasks

But first...

- https://www.ehs.washington.edu/fsoemerprep/evacinfo.shtm

Course goals

- Explore NLP tasks which can be improved with semantic features
- Understand what information is captured by the ERG's MRS output that is relevant to those tasks
- Experience with feature design
- Add MRS features to an existing baseline system, and measure the result
- Experience with error analysis
- Experience with academic writing in CL/NLP

DELPH-IN

The DELPH-IN ecology

www.delph-in.net

- Head-drive Phrase Structure Grammar (Pollard & Sag 1994)
- Joint reference formalism (Copestake 2002a)
- Shared semantic representation formalism (MRS; Copestake et al 2005)
- Grammars: ERG (Flickinger 2000, 2011), Jacy (Siegel & Bender 2002), NorSource (Hellan & Haugereid 2003), ...
- Grammar generator: Grammar Matrix (Bender et al 2002, 2010)
- Parser generators: LKB (Copestake 2002b), PET (Callmeier 2002), agree, ACE

The DELPH-IN ecology

www.delph-in.net

- Parse and realization ranking: (e.g., Toutanova et al 2005, Velldal 2008)
- Robustness measures: (e.g., Zhang & Kordoni 2006, Zhang & Krieger 2011)
- Regression testing: [incr tsdb()] (Oepen 2001)
- Applications: e.g., MT (Oepen et al 2007), QA from structured knowledge sources (Frank et al 2007), Textual entailment (Bergmair 2008), ontology construction (Nichols et al 2006) and grammar checking (Suppes et al 2012)

Multilingual grammar engineering: Other approaches

- The DELPH-IN consortium specializes in large HPSG grammars
- Other broad-coverage precision grammars have been built by/in/with
    - LFG (ParGram: Butt et al 2002)
    - F/XTAG (Doran et al 1994)
    - HPSG: ALE/Controll (Götz & Meurers 1997)
    - SFG (Bateman 1997)
- Proprietary formalisms and Microsoft and Boeing and IBM

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Course requirements

- http://faculty.washington.edu/ebender/2014_575/

Term papers v. theses

- Less thorough literature review
- Null results are ok (and don't need to be made "interesting")
  - If you get a null result, the paper still has to be well-written :)
- May nonetheless be worth submitting as a conference/workshop paper:
  - *SEM 2014 (Dublin 8/23-24): http://gmb.let.rug.nl/starsem/wp/ (due: 4/11/14)
  - Coling 2014 (Dublin 8/23-29): http://www.coling-2014.org/ (due: 3/21/14)

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- Course expectations: Why are *you* here?
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Why use semantics?

- “Parsing is a problem in search of a solution” -- Jeremy G. Kahn
- Maybe an overstatement, but it does seem like for many tasks a parsing-based solution doesn’t (easily) improve on a bag-of-words approach
- Why?

Syntax-semantics mismatches (Bender 2013, Ch 9)

- Valence alternations: passive, dative alternation, middle voice
- Semantically empty elements
- Mediated dependencies: raising/control
- Unrealized arguments
- Coordination and one-to-many/many-to-one dependencies
- Long-distance dependencies

Valence alternations: Passive

- The dog chase the cat./The cat was chased by the dog.
- The cat got chased by the dog.
- The cat chased by the dog ran up the tree.
- Precision and recall were measured using the formulas given above.
- Anyone handed a note will be watched closely.

Valence alternations:
Dative alternation, middle voice, causative/inchoative

- Kim gave Sandy the book./Kim gave the book to Sandy.
- Kim threw Sandy a party./Kim threw a party for Sandy.
- This truck loads easily.
- *This truck loads easily by movers.
- The vase broke.
- They broke the vase.

Semantically empty elements

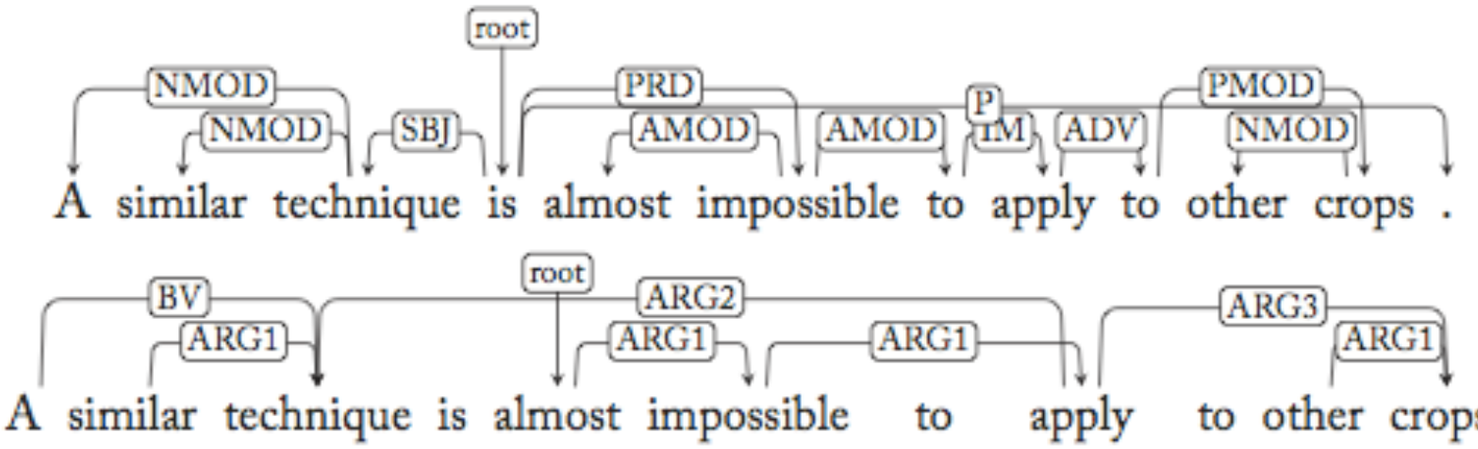

Figure 8.1: Syntactic (CoNLL 2008, top) and semantic (ERG, bottom) dependency structures

- Adapted from Ivanova et al 2012

Mediated dependencies: raising/control

- Kim seems to continue to appear to like sushi.
- Kim tries to like sushi.
- Kim persuaded Sandy to leave.
- Kim appealed to Sandy to leave.
- Kim refrained from laughing.
- Kim will try and find it.
- Kim is anxious to leave.
- It is easy for Kim to leave.

Unrealized arguments

- Mistakes were made.
- Fix those mistakes!
- I ate.
- I watched.
- I’m finished.
- I already told them.

Long-distance dependencies

- What did Sandy claim everyone hoped Lee would believe Kim saw?

- This is the library in which no one believes anyone could imagine Kim read the book.

- I don’t think Kim likes eggs. **Bagels**, I seem to recall Sandy saying that Pat had mentioned Kim likes to eat.

Collectively frequent enough to matter

Phenomenon	Frequency	Candidates
barerel	2.12%	546
tough	0.07%	175
rnr	0.69%	1263
itexpl	0.13%	402
vpart	4.07%	765
ned	1.18%	349
absol	0.51%	963
vger	5.16%	679
argadj	3.60%	1346
control	3.78%	124

Table 1: Relative frequencies of phenomena matches in Wikipedia, and number of candidate strings vetted.

(Bender et al 2011)

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Target tasks

- At least two ways to use MRS:
    - As an interface representation (transfer based MT, ‘deep’ NLU/dialog systems, MRS based abstractive summarization)
    - As an additional source of features for a machine-learner, together with n-grams, syntactic features, etc.
- We’ll focus on the second one this quarter
- What tasks interest people?