

Seminar

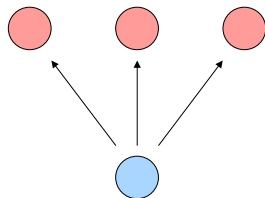
Recent Developments in Computational Semantics

Introduction 1

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Problem 1: One Word – Several Senses



Entailment and Word Overlap



P: *William H. Seward served as Secretary of State under President Abraham Lincoln.*

H: *William H. Seward was Lincoln's Secretary of State*

Approximative entailment measure:

$$\frac{\text{\# of words in H occurring in P}}{\text{length of H}}$$

Word–Sense Disambiguation



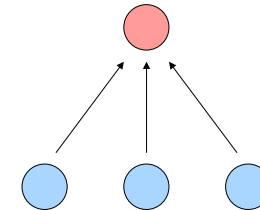
- Knowledge-based WSD approaches:
 - Selectional Constraints
- Statistical approaches
 - Supervised WSD approaches
 - Semi-supervised WSD: Yarowsky 1995, Mihalcea&Moldovan 1999
 - Unsupervised word-sense discrimination: Schütze 1998
 - Graded sense distinctions: Erk&McCarthy 2009, Erk et al. 2009

Word–Sense Disambiguation



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Problem 2: Different words – Same or related senses



Concept Overlap



P: *Aki Kaurismäki directed his first full-time feature*

H: *Aki Kaurismäki directed a film*

P: *Several airlines polled saw costs grow more than expected, even after adjusting for inflation*

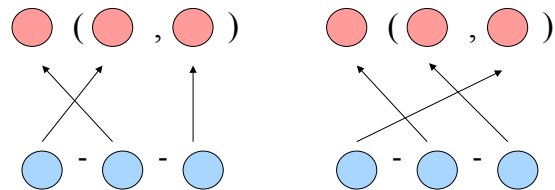
H: *Some companies reported cost increases*

Semantic Similarity



- Lexical-semantic resources (WordNet)
- Resource-based measures
 - e.g.: Jiang&Conrath 1997
- Distributional measures
 - e.g.: Lin 1998, Weeds&Weir 2003

Problem 3: Semantic Structure



Predicate–argument structure



- Word-order, syntactic structure is semantically relevant:
Man bites dog - Dog bites man
- Semantic structure need not co-incide with syntactic structure:
Man pleases dog - Dog likes man
The window broke - The rock broke the window -
John broke the window with the rock
- Thematic roles

Semantic Role Labelling



- The PropBank Framework: Palmer et al. 2005
- Robust Semantic Role Labelling: Pradhan et al. 2008
- *FrameNet and frame-based semantic analysis*

Acquisition of Paraphrases and Inference Patterns



Table 3. The top-20 most similar paths to “X solves Y”.

| | |
|---------------------------------------|-------------------------------------|
| <i>Y</i> is solved by <i>X</i> | <i>Y</i> is resolved in <i>X</i> |
| <i>X</i> resolves <i>Y</i> | <i>Y</i> is solved through <i>X</i> |
| <i>X</i> finds a solution to <i>Y</i> | <i>X</i> rectifies <i>Y</i> |
| <i>X</i> tries to solve <i>Y</i> | <i>X</i> copes with <i>Y</i> |
| <i>X</i> deals with <i>Y</i> | <i>X</i> overcomes <i>Y</i> |
| <i>Y</i> is resolved by <i>X</i> | <i>X</i> ceases <i>Y</i> |
| <i>X</i> addresses <i>Y</i> | <i>X</i> tackles <i>Y</i> |
| <i>X</i> seeks a solution to <i>Y</i> | <i>X</i> alleviates <i>Y</i> |
| <i>X</i> do something about <i>Y</i> | <i>X</i> corrects <i>Y</i> |
| <i>X</i> solution to <i>Y</i> | <i>X</i> is a solution to <i>Y</i> |

Acquisition of Paraphrases and Inference Patterns



- Automatic Acquisition of Paraphrase patterns: Lin&Pantel 2001, Szpektor et al. 2004
- Inference as Directional Similarity: Bhagat et al. 2007, Pantel et al. 2007, Geffet&Dagan 2005, Geffet&Dagan 2004
- *Paraphrase acquisition for textual entailment*

Acquiring Script Information



Acquiring Script Information



- Acquiring script information from texts: Chambers&Jurafsky 2008, Chambers&Jurafsky 2009, Chklovski&Pantel 2004
- *Acquiring script information from web experiments*

The logical context



P: *John bought a new convertible.*

H: *John bought a new car.*

P: *John didn't buy a new convertible.*

H: *John didn't buy a new car.*

Natural Logic for Inference



- Natural logic and entailment relations: B. MacCartney 2009, Ch.5
- Compositional entailment - General aspects: B. MacCartney 2009, Ch.6, except 6.3
- Compositional entailment - Factives and Implicatives: B. MacCartney 2009, Ch. 6.3, Nairn et al. 2006

Distributional Semantics and Compositionality



- Distributional semantics and compositionality: Mitchell&Lapata 2008, Erk&Pado 2008
- *Syntax-sensitive contextualisation of meaning*