Relation Extraction
Lecture 18: November 8, 2013

CS886-2 Natural Language Understanding
University of Waterloo

Distributional Assumption

- Word similarity: words that occur in similar contexts are semantically related
  - Cosine based on term frequency or TF-IDF
  - Latent semantic indexing
  - Latent Dirichlet allocation

- Relation similarity: relations that occur in similar contexts are semantically related
  - Unsupervised relation extraction

Templates

- Template: surface realization of a relation
  - E.g., text denoting a relation between some entities

- Examples:
  - X was born in Y
  - X is native of Y
  - X grew up in Y

Context

- Context: word/entity tuples in a corpus that fill a template

- Example: the context of "X was born in Y" may be
  - <Shakespeare, Stratford-Upon-Avon>
  - <Lady Gaga, New York City>
  - <Gauss, Braunschweig>
  - Etc.

Template Clustering

- Extract relations by clustering templates

- Cluster templates that are filled by similar sets of entity tuples

- Need similarity/distance measure between templates
  - E.g., cosine of some vector representation of two templates

Templates as vectors

- Consider all tuples of entities in a corpus as features
- Vector representations
  - Binary features: presence/absence of tuple with template
  - Frequencies: # of occurrences of tuple with template
  - TF-IDF: tuple frequency – inverse template frequency

Relation Extraction

- Analogies
  - Document : Entity tuple
  - Topic : Relation
  - Word: Template

- Estimate latent variables that correspond to relations
  - Probabilistic latent semantic indexing
  - Latent Dirichlet allocation

Relation Extraction by pLSA

- Probabilistic latent semantic indexing

Relation Extraction by LDA

- Latent Dirichlet Allocation

Template Analysis

- Don't treat a template as a single unit
- Extract features from template

- Idea: parse template
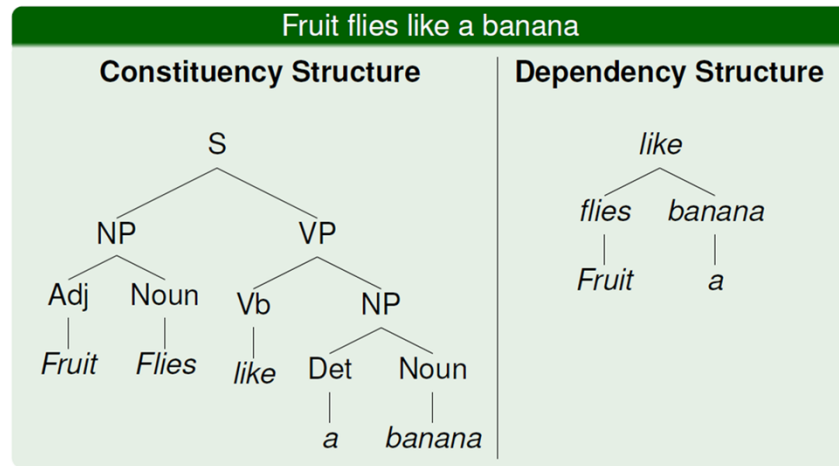 - Extract syntactic and semantic features

Parsing

- Constituency Parsing
  - Hierarchical phrase based parsing

- Shallow parsing/syntactic chunking
  - Flat phrase based parsing

- Dependency Parsing
  - Identify dependencies/relations between words

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Constituent vs Dependency Tree

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Dependency Relations

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