Computational Lexical Semantics

Lecture 9: Learning Narrative Frames

Linguistic Institute 2005
University of Chicago
Unsupervised Semantic Role Labeling

• Could we learn frames from text?
  
  Inducing Semantic Roles:
  

• We’ll see how to learn something similar:
  
  • Narrative frames
  
  • The work of Nate Chambers:
Something in the air around 1975 about “background knowledge”

Framing (Goffman 1974)
Frames (Minsky 1974)
Interactional frames (Hymes 1974)
Schemata (Norman 1975)
Scripts (Shank and Abelson 1975)
Frames (Fillmore 1976)

With influences dating back to Bartlett 1932 and Bateson 1955...
Background models, like frames, focused on sequences of events and participants

**Restaurant Script**

- enters
- looks at
- thinks about
- moves to
- sits at
- gives
- moves to
Learning Scripts/Frames: Nate’s Two Joint Tasks

1. Events in the Narrative
   - prosecute
   - deny
   - plead
   - convict
   - sentence
   - jail

2. Semantic Roles of the Participants
   - suspect, criminal, client, immigrant, journalist, government, …
   - police, agent, officer, authorities, troops, official, investigator, …
1. Learning Narrative Event Chains

Chambers and Jurafsky. *Unsupervised Learning of Narrative Event Chains*. ACL-08

**Narrative Event Chain:**

A partially ordered set of narrative events that share a common actor (the protagonist)
Intuition for learning meaning from text

**Narrative Coherence Assumption**

*Narratives are about protagonists. Events with shared arguments are connected.*

- Centering (Grosz, Joshi, Weinstein 1983)
- Cohesion (Halliday and Hasan 1976)

...blizzard dumped snow...
...They’ve been shoveling it...

Dumping is-related-to shoveling
protagonist:
(noun)
1. the principal character in a drama or other literary work
2. a leading actor, character, or participant in a literary work or real event
The oil stopped gushing from BP’s ruptured well in the Gulf of Mexico when it was capped on July 15 and engineers have since been working to permanently plug it. The damaged Macondo well has spewed about 4.9m barrels of oil into the gulf after an explosion on April 20 aboard the Deepwater Horizon rig which killed 11 people. BP said on Monday that its costs for stopping and cleaning up the spill had risen to $6.1bn.
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Pointwise Mutual Information

\[ \text{pmi}(x, y) = \log \frac{p(x, y)}{p(x)p(y)} \]
Resulting Chain Example
Goal: A Schema with its Arguments

- Police, Agent, Authorities
  - arrest
  - elude
  - surrender

- Prosecutor, Attorney
  - prosecute
  - deny
  - plead

- Plea, Guilty, Innocent
  - convict
  - sentence
  - jail

- Judge, Official
  - Suspect, Criminal, Terrorist, …
Two Joint Tasks


Events in a Narrative

- prosecute
- deny
- plead
- convict
- sentence
- jail

Semantic Roles

- suspect, criminal…
- judge, official, …
Narrative Schemas

- police, agent
  - arrest
  - charge

- criminal, suspect
  - arrest
  - charge
  - plead
  - convict
  - sentence

- judge, jury
  - convict
  - sentence

- police
  - arrest
  - charge

- suspect
  - please
  - convict
  - sentence

judge, jury
Second cue for learning meaning from text: Distributional context

hurricane was downgraded
typhoon was downgraded

hurricane is-related-to typhoon

hurricane struck
typhoon devastated...

strike is-related-to devastate
Joint Learning of Events and Roles

- Use **verb relations** to induce **semantic roles**.
  - Link head nouns of coreferring arguments.

- Use **semantic roles** to learn **verb relations**.
  - Include argument-role-type counts in relation scores.

\[
sim(e_i, e_j) \rightarrow \sim(e_i, e_j, a)
\]
Training Data

• NYT portion of the Gigaword Corpus
  • 1.2 million documents
Learned Examples

NYT portion of the Gigaword Corpus
1.2 million documents

- uphold
- challenge
- rule
- enforce
- overturn
- strike_down

- court, judge, justice, panel, Osteen, circuit, nicolau, sporkin, majority
- law, ban, rule, constitutionality, conviction, ruling, lawmaker,
Learned Examples

distribute
produce
sell
market
develop
manufacture

company, inc, corp, microsoft, iraq, co, unit, maker,

drug, product, system, test, software, funds, movie,
Comparison to FrameNet

• Narrative Schemas
  • Focuses on events that occur together in a narrative.

• FrameNet
  • Focuses on events that share core roles.
Comparison to FrameNet

• Narrative Schemas
  • Focuses on events that occur together in a narrative.
  • Schemas represent larger situations.

• FrameNet
  • Focuses on events that share core roles.
  • Frames typically represent single events.
Conclusion

• Semantic roles are really only a piece of larger knowledge structures
• This background knowledge (scripts, frames, schemata) can be learned from text
• Lots of fun open problems in this line of work!