

Multigraph Clustering for *Unsupervised* Coreference Resolution

Sebastian Martschat
Heidelberg Institute for Theoretical Studies gGmbH

Heidelberg Institute for
Theoretical Studies



Relations

9 negative relations: indicate that mentions are not coreferent.

14 positive relations: clues for coreference between mentions.

Some example relations:

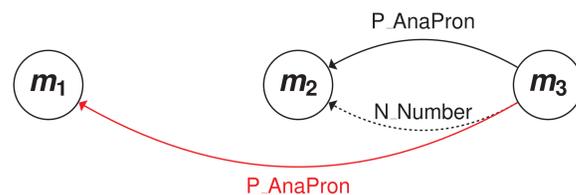
- ▶ N_Number: two mentions do not agree in number
- ▶ P_HeadMatch: heads of mentions match, anaphor definite or proper name
- ▶ P_AnaPron: anaphor is a pronoun, none of the mentions is first/second person pronoun
- ▶ P_Subject: anaphor is third person pronoun, both mentions are subjects, sentence distance ≤ 1

Graph Construction

- ▶ each mention is a node
- ▶ relation r holds for pair (m, n) : add edge from m to n with label r
- ▶ if r is a negative relation, edge gets weight $w(m, n, r) = -\infty$, otherwise $w(m, n, r) = 1$

Clustering

- ▶ employ **1-nearest-neighbor clustering**
- ▶ for every mention m : choose as antecedent mention n such that sum of edge weights maximal and positive



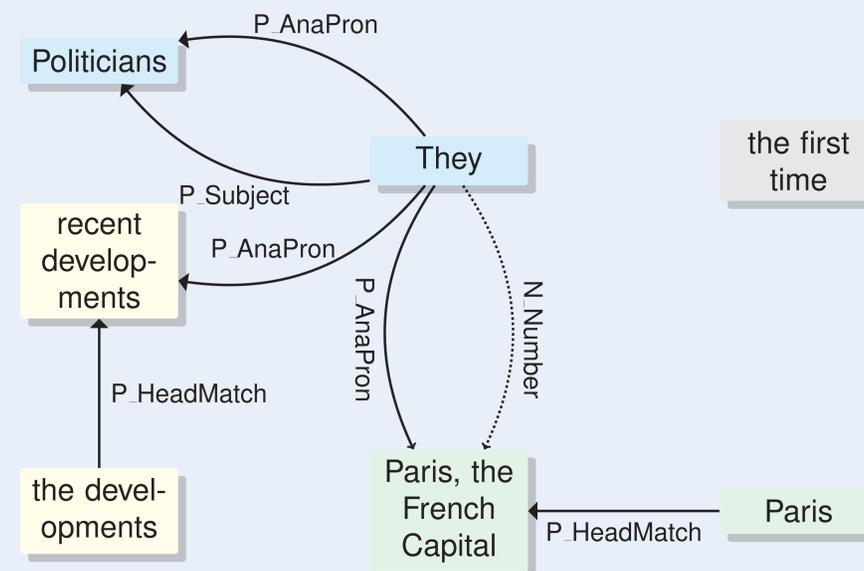
input text

Politicians met in Paris, the French capital, to discuss recent developments. They met for the first time in Paris. The developments are alarming.

mention extraction

[Politicians] met in [Paris, the French capital], to discuss [recent developments]. [They] met for [the first time] in [Paris]. [The developments] are alarming.

graph construction and clustering



Results

Official CoNLL scores on CoNLL'12 shared task English data:

	dev	test
best	63.35	63.37
median	58.9	58.68
this work	62.05	61.10

- ▶ would have ranked fourth on English data in CoNLL'12 shared task (only 0.2 difference to second ranked system)
- ▶ difference to *best* mainly due to MUC metric

Error Analysis

Precision Errors

- ▶ lots of mention detection errors for nominals/names
- ▶ of 8000 clustering decisions when anaphor is pronoun, **1/3** wrong: performance good for *I/he/she*, mediocre for *they*, bad for *you/it* (many expletive cases)
- ▶ many difficult cases which require world knowledge or more complex features:

*Mr. Clinton praised Al Gore's campaign manager, Bill Daley, for the way **he** handled the election.*

Recall Errors

- ▶ count missing links between entities: many due to pairs of nominals
- ▶ often missing world knowledge:

*Barnetts says Kostunica should cooperate with **the Hague Tribunal**. **This particular UN Institution** has in its power to give instant legitimacy to Kostunica.*

Acknowledgments

This work has been funded by the Klaus Tschira Foundation, Heidelberg, Germany. The author has been supported by a HITS PhD scholarship.

Competitive Performance with a Simple, Fast and *Unsupervised* Model