

Multiple Alternative Sentence Compressions and Word-Pair Antonymy for Automatic Text Summarization and Recognizing Textual Entailment

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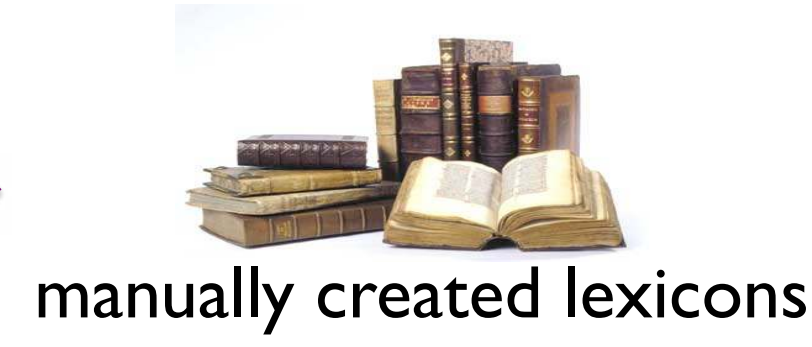
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Antonymy

Kinds

Clear opposites:

- wet – dry
- hard – soft
- promoted – demoted



manually created lexicons

Contrasting word pairs:

- promoted – censured
- hard – fluid
- flinch – advance



largely unrecorded

Why be antonymy-aware

• **Recognizing Textual Entailment and Contradictions:** Antonyms and polarity can preserve or contradict meaning.

- paraphrases:**
Sirius Black could not evade the dementors.
The dementors caught Sirius Black.
- disagreement, contention, and contradiction:**
Giuliani's 9/11 emergency management was prompt.
Slow response was one of his biggest criticisms.

• **Summarization:** Presence of antonyms is an indicator of summary-worthy information.

- contrast:**
Gregory Peck can play both strong and sensitive roles.
Peck can only play simple roles, not complex ones.
- identifying entailments and contradictions

• Sentiment detection, detecting humor, improving distributional thesauri.

Computing word-pair antonymy: Mohammad et al. 2008

Method:

- Identify contrasting word pairs
 - using seed antonym pairs and thesaurus categories.
- Determine degree of antonymy
 - using distributional distance and tendency to co-occur.

Evaluation:

950 GRE-style closest-opposite questions.

Results:

F score = .70 (baselines: .20 and .22).

Recognizing Textual Entailment and Contradictions

Entailment and contradiction

A practical definition of **entailment**:

A text (or source) T entails a hypothesis H if a normal reader would be happy to accept T as strong evidence that H is true (assuming that T is reliable).

A practical definition of **contradiction**:

T contradicts H if it is very unlikely that both T and H can be true at the same time.

Example:

T1 Internet media company Yahoo Inc. announced Monday it is buying Overture Services Inc. in a \$1.63-billion (U.S.) cash-and-stock deal that will bolster its on-line search capabilities.

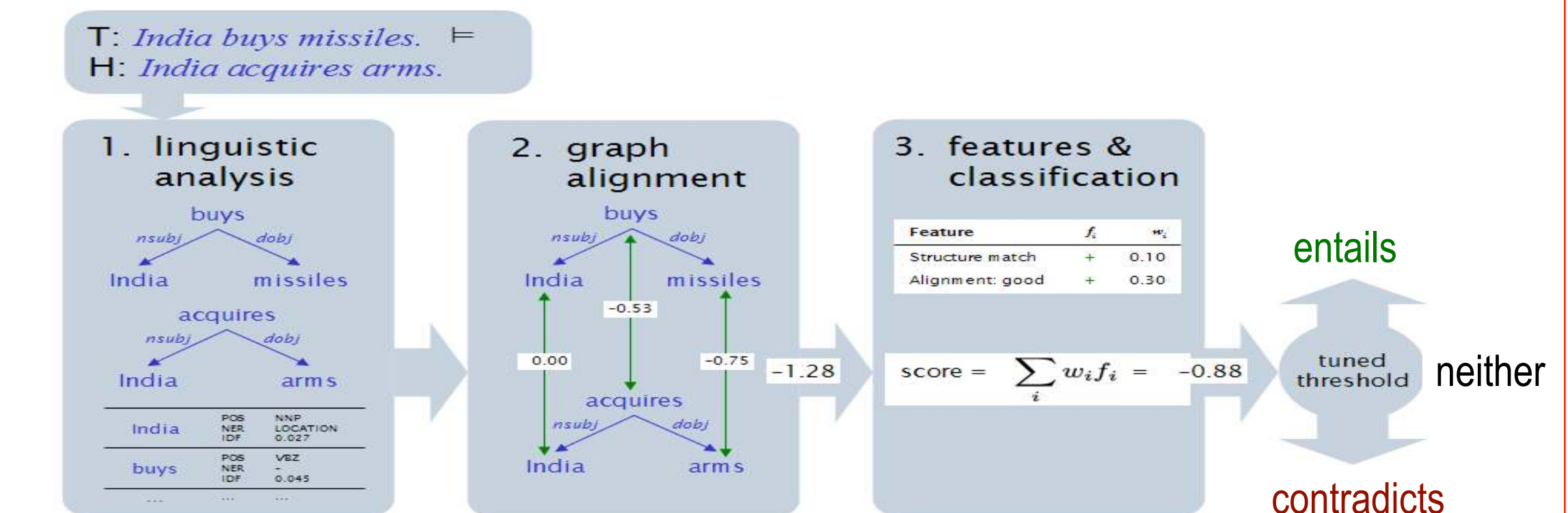
Entails:

- H1.1 Yahoo bought Overture
- H1.2 Overture was acquired by Yahoo
- H1.3 Overture was bought
- H1.4 Yahoo is an internet company

Contradicts:

- H1.5 Overture bought Yahoo
- H1.6 Yahoo sold Overture

Stanford three-stage RTE system



Antonym features

- Check if an aligned pair of words (across T and H) are antonyms.
- If yes, then boolean features generated:
 - Antonyms appear in contexts of matching polarity
Hitler survived the plane crash.
Hitler died in a plane crash
 - Only the hypothesis (or source) word appears in negative polarity context
Hitler survived the plane crash.
Hitler did not die in a plane crash.

Summarization

UMD three-stage architecture for summarization:

1. Tagging: the Stanford Parser (Klein and Manning 2003).

- Sentences are part-of-speech tagged and parsed.
- Named entities in the sentences are identified.

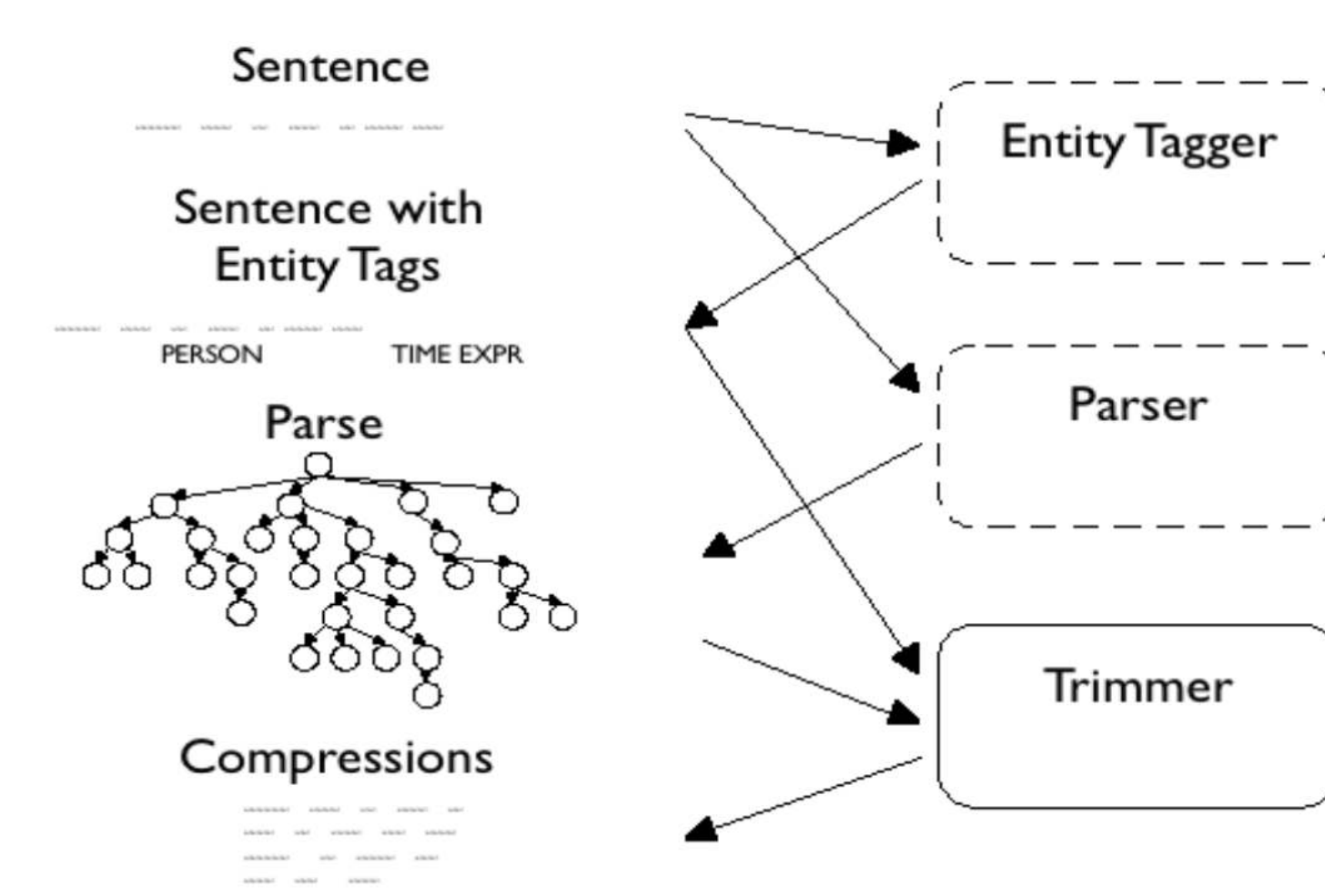
2. Sentence compression: Trimmer (Zajic 2007)

- Linguistically motivated rules to mask syntactic components of the parse of a source sentence.
- Rules are applied iteratively, and in many combinations
- Compression-specific feature values are assigned:
 - number of rule applications
 - parse tree depth of various rule applications.

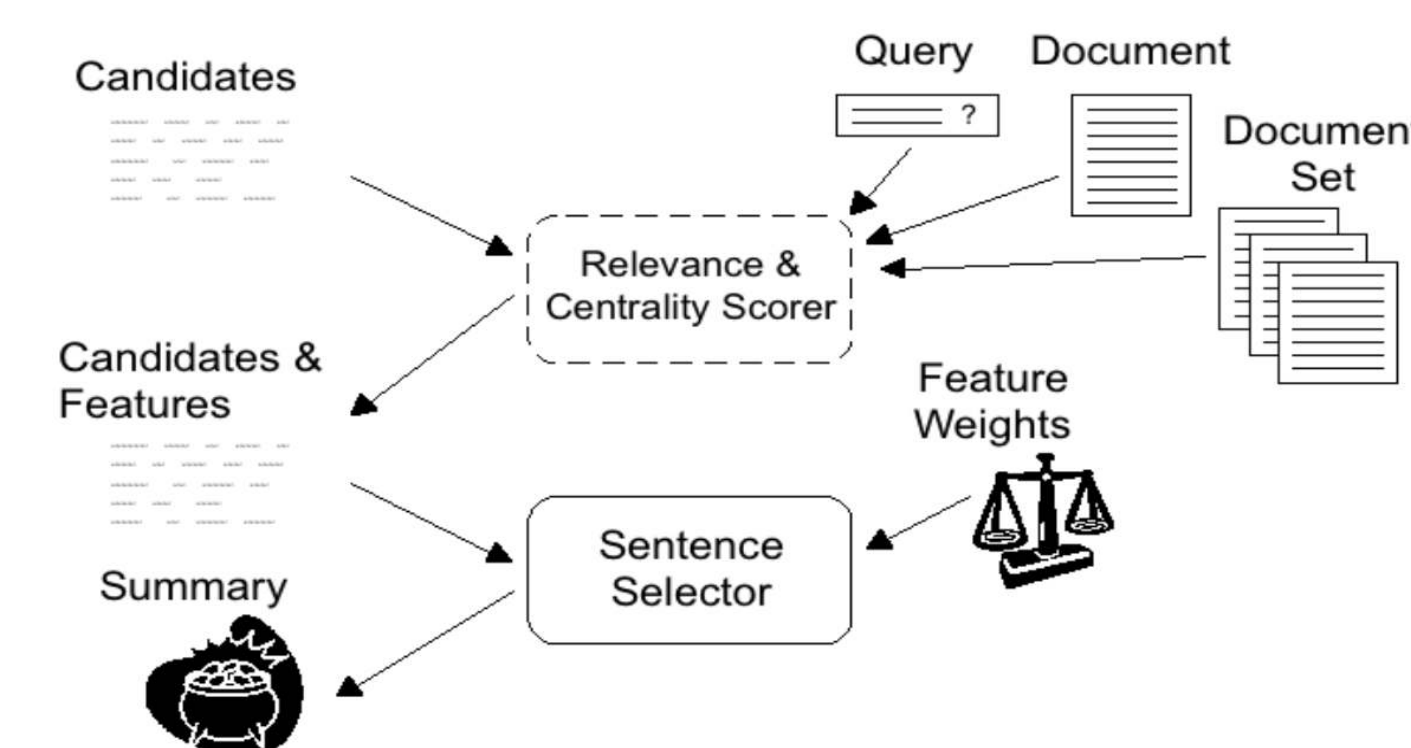
3. Candidate selection

- Static features:
 - position of sentence in the document; length; compression-specific features; relevance scores
- Dynamic features include:
 - redundancy with current summary state; number of candidates from the same source document already in the summary
 - Candidates are selected for inclusion until the summary reaches prescribed word limit or the pool is exhausted.

Stages 1 and 2: tagging and sentence compression.



Stage 3: candidate selection.



Trimmer + Antonymy Features

- Examine each of the words in a sentence to determine whether it has an antonym within the same within the same document.
 - If not, then the antonymy score contributed by this word is 0.
 - If yes, then the antonymy score contributed by this word is its degree of antonymy with the word it is most antonymous to.
- The antonymy score of a sentence is the sum of scores of constituent words.

Document fragment:

...
 For a long time, physicists thought that the Universe will eventually contract.
 New calculations show that in fact the Universe will continue to expand.
 ...

TAC 2008: RTE task

Data

1000 source and hypothesis pairs

Three submissions by Stanford--UMD

- WordNet** : used only WordNet antonyms
- Automatic**: used antonyms determined from our automatic method
- All** : used both manually and automatically determined antonyms

Results

	WordNet	Automatic	All
2-way accuracy	61.7	61.7	61.7
3-way accuracy	55.4	55.6	55.6
Avg. precision	44.08	44.26	44.27

Conclusions

- Our system stood 7th among the 33 participating systems.
- Performance using automatically generated antonyms and those compiled from a manually created resource such as WordNet is comparable.
 - Appealing method for resource-poor languages.
- Using the manually generated antonyms in addition to the automatically generated antonyms did not improve performance by much.

Future work

- Apply the method to data richer in contradictions.
- Analyze the manifestation of antonyms in contradictory source–hypothesis pairs.
- Use sophisticated antonymy features that take into account syntactic dependencies.

TAC 2008: Opinion Summarization Task

Blog data

- 609 documents covering 25 topics
- Writing style is informal
- Natural language text is enmeshed in metadata.

Extracting text to be summarized

- Extract content from HTML <BODY> ... </BODY> tags
- Decode HTML-encoded characters
 - e.g., " " for space, "&" for ampersand
- Convert HTML separator tags into newlines
 - e.g.,
, <HR>, <TD>, <P>
- Remove remaining HTML tags
- Remove common non-content phrases
 - e.g., "Posted by...", "Published by...", "Related Stories", "Track-Back", "Blog This", "Copyright"
- Filter out any line of text containing fewer than $n = 6$ words.

Results

	Trimmer		Trimmer + Antonymy	
	Rank	Score	Rank	Score
Pyramid	11/19	.14/1	13/19	0.130/1
Grammaticality	16/19	4.4/10	17/19	4.318/10
Non-redundancy	3/19	6.7/10	6/19	6.364/10
Coherence	13/19	2.4/5	11/19	2.409/5
Fluency	9/19	3.6/10	15/19	3.318/10

Conclusions

- The performance of the UMD summarizer was roughly middle-of-the-pack.
- It was particularly strong in non-redundancy (rank 3).
- Adding antonymy features:
 - improved coherence
 - negatively affected other aspects.

Future Work

- Use antonymy features more extensively
 - focus on antonyms in adjacent sentences;
 - include syntactic dependency information.

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