

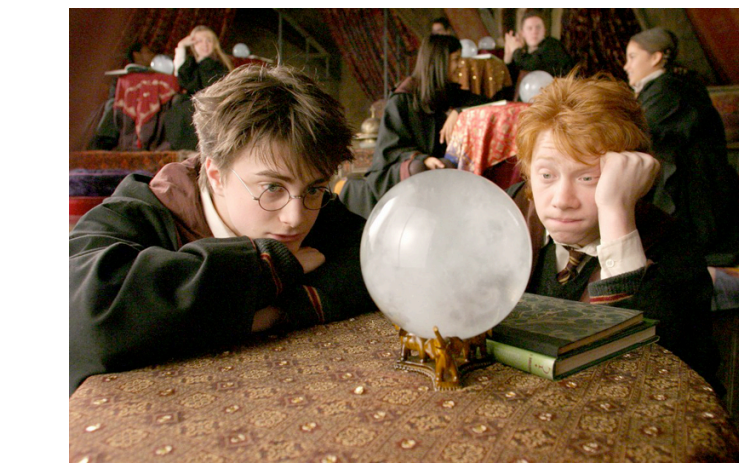
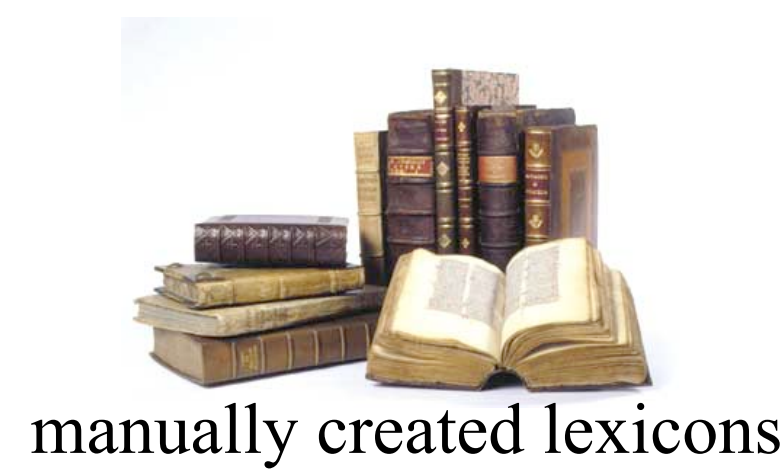
Towards Antonymy-Aware Natural Language Applications

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Antonyms

Kinds

- Clear opposites:
 - create-destroy*
 - hard-soft*
 - promoted-demoted*
 - wet-dry*
- Contrasting word pairs:
 - fired-employed*
 - promoted-censured*
 - hard-fluid*
 - large-small-scale*
 - flinch-advance*
 - cogent-unconvincing*

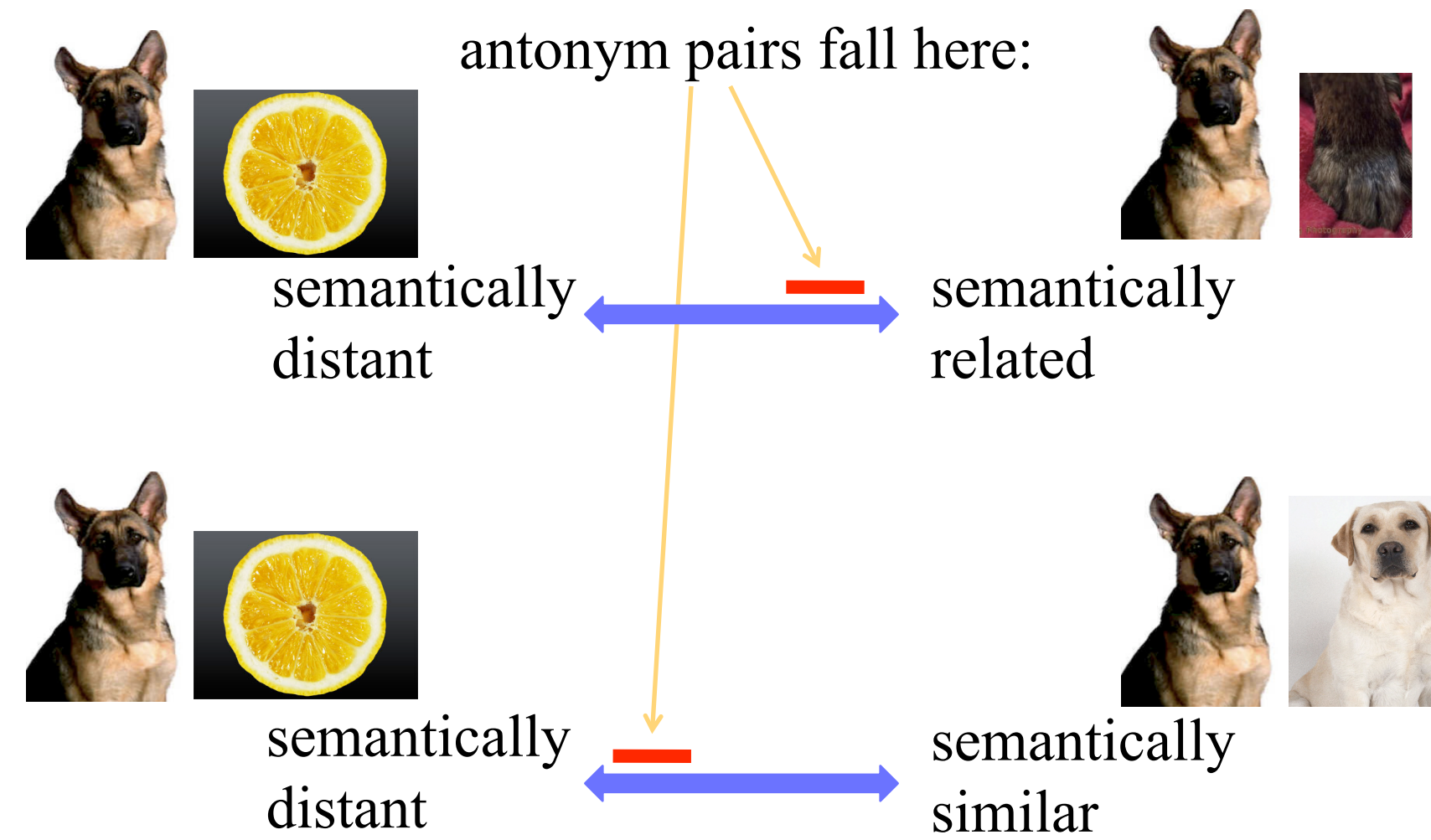


largely unrecorded

Domain

- In the strictest sense:
 - pairs of gradable adjectives
 - *hot-cold, tall-short*
- In a broader sense:
 - pairs of nouns, pairs of verbs, pairs of adjectives
 - *life-death, ascend-descend*
- In the broadest sense:
 - any two words that express a contrast in meaning
 - *city-farm, lifeless-life*

Relation with semantic distance



Antonym pairs simultaneously convey a sense of both distance and closeness:

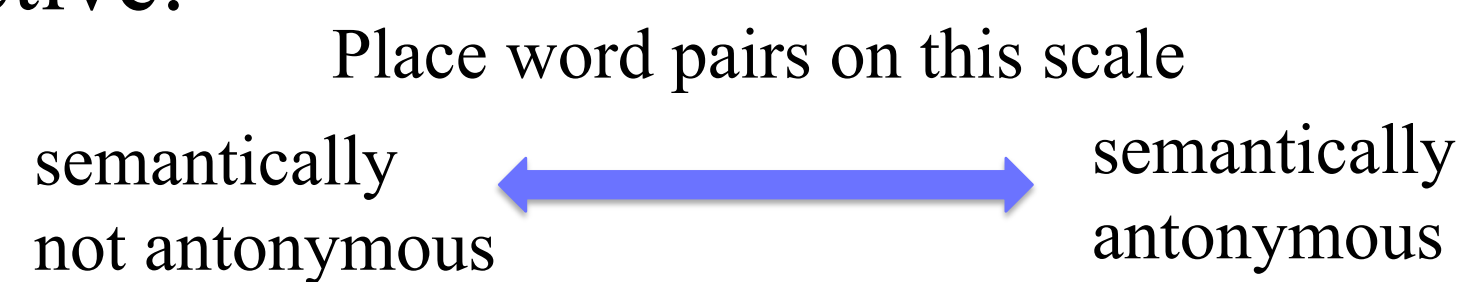
- semantically related;
- but not semantically similar.

Why be Antonymy-Aware

- Detecting incompatibles:
 - contradictions
 - Mad-Eye Moody finds the dementors charming.*
 - Mad-Eye Moody detests the dementors.*
 - differing sentiment/opinion
 - Cornelius Fudge is an incompetent minister of magic.*
 - Fudge is one of the finest ministers of magic ever.*
 - non-coreferent entities
 - Viktor is short and shy.*
 - Viktor is an imposing quidditch player from Romania.*
- Detecting paraphrases
 - Sirius Black could not evade the dementors.*
 - The dementors caught Sirius Black.*
- Detecting humor
 - I don't suffer from insanity; I enjoy every minute of it.*
 - Procrastinate now!*
- Separating antonymous words from those that are semantically similar, as in a distributional thesaurus (Lin, 1998).

Computing Word-Pair Antonymy

Objective:



Hypotheses:

Co-occurrence hypothesis of Antonyms

Antonym pairs co-occur more often than random.

Distributional Hypothesis of Antonyms

Antonym pairs occur in similar contexts.

Central idea (Mohammad et al., 2008):

1. Identify whether two words have a contrast relation.
 - a. generate seed antonym pairs:
 - (i) using antonym generating affix rules
 - (ii) from WordNet
 mark corresponding thesaurus categories as contrasting.
 - b. consider adjacent thesaurus categories to be contrasting.
2. Determine degree of antonymy.
 - a. The degree of antonymy between two contrasting categories is proportional to their semantic closeness: [distributional hypothesis for antonyms](#).
 - b. The degree of antonymy between two words across a contrasting category pair is proportional to their tendency to co-occur: [co-occurrence hypothesis for antonyms](#).

Example:

All word pairs across categories HIDING and REVEALING are marked to have a contrast relation because of seed antonym pair *cover* and *uncover*.

cover and *uncover*: strong tendency to co-occur suggests high degree of antonymy.

unnoticed and *uncover*: moderate tendency to co-occur suggests medium degree of antonymy.

curtain and *spill*: weak tendency to co-occur suggests low degree of antonymy.

Manually create list of affixes that tend to generate antonyms:

<i>x-abx</i>	<i>normal-abnormal</i>
<i>x-disx</i>	<i>trust-distrust</i>
<i>x-unx</i>	<i>classified-unclassified</i>
<i>x-inx</i>	<i>consistent-inconsistent</i>
<i>x-antix</i>	<i>clockwise-anticlockwise</i>
<i>x-nonx</i>	<i>aligned-nonaligned</i>
<i>x-imx</i>	<i>mobile-immobile</i>
<i>x-malx</i>	<i>practice-malpractice</i>
<i>x-misx</i>	<i>fortune-misfortune</i>
<i>lx-illx</i>	<i>legitimate-illegitimate</i>
<i>rx-irx</i>	<i>regular-irregular</i>
<i>imx-exx</i>	<i>implicit-explicit</i>
<i>inx-exx</i>	<i>introvert-extrovert</i>
<i>upx-downx</i>	<i>upstream-downstream</i>
<i>overx-underx</i>	<i>overdone-underdone</i>
<i>xless-xful</i>	<i>harmless-harmful</i>

False positives such as *part-depart* and *tone-intone* did not effect results much.



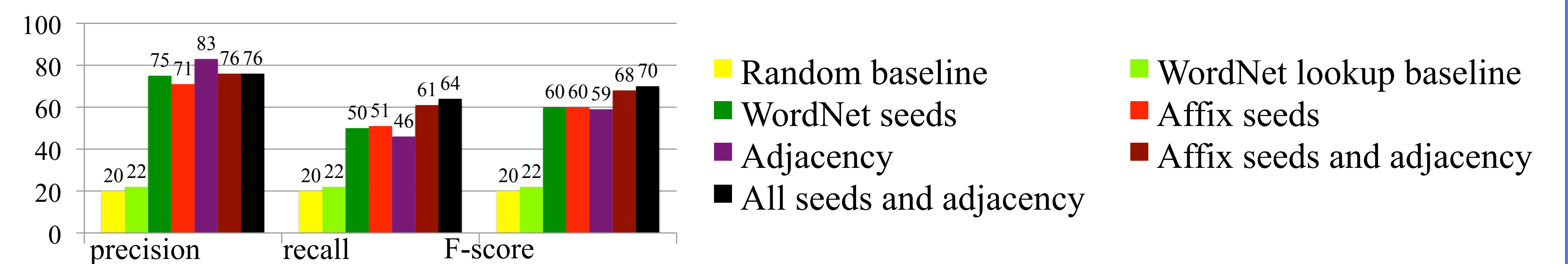
Evaluation: Solve 950 GRE closest-opposite questions

Examples

- Astute*
- shrewd* ← near-synonym
 - foolish* ← answer
 - callow* ← another close opposite
 - winning*
 - debating*

- Obdurate* (hardened in feelings)
- meager*
 - unsusceptible*
 - right*
 - tender* ← answer
 - intelligent*
- Obdurate* (resistant to persuasion)
- yielding* ← answer
 - motivated*
 - moribund*
 - azure*
 - hard*

Results



Conclusions

- Proposed a computational measure of antonymy. Geared towards natural language applications. Captures semantic contrast.
- Used the structure of a thesaurus and distributional hypothesis. Small set of affix rules found to be potent. WordNet helped, but can be done without.

Future Work

- Compute word-pair antonymy in a resource-poor language by combining its text and an English thesaurus.
- Using affix-rule information from different languages to improve performance in a target language.
- Creating a wide coverage polarity lexicon.
- Using word-pair antonymy for text summarization.

References

- Dekang Lin. 1998. Automatic retrieval and clustering of similar words. In *Proceedings of the 17th International Conference on Computational Linguistics*, pages 768–773, Montreal, Canada.
- Saif Mohammad, Bonnie Dorr, and Graeme Hirst. October 2008. Computing Word-Pair Antonymy. In *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP-2008)*, Waikiki, Hawaii.

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