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) 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 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.

Objective: Place word pairs on this scale
semantically not antonymous  semantically not antonymous

Antonyms
- Clear opposites: create-destroy hard-soft promote-demotioned wet-dry
- Contrasting word pairs: fired-employed promised-censured high-hard large-small-scale fine-blend-advance cogent-unconvincing

Distributional Hypothesis of Antonyms

Manual creation of affix rules helps.

WordNet seeds

Manually create list of affixes that tend to generate antonyms:
- x-abx normal- abnormal
- x-dlx trust-distrust
- x-mnx classified-unclassified
- x-mnx consistent-inconsistent
- x-mnx aligned- misaligned
- x-mnx mobile-immobile
- x-mux practice-malpractice
- x-mux fortunate-misfortune
- x-dlx legitimate-illegitimate
- r-xix regular- irregular
- imx-exx implicit-explicit
- imx-exx introvert-extrovert
- upx-dlx upstream-downstream
- ovex-oxerx overdone-underdone
- xless-ful harmless-harmful

False positives such as part-depart and tone-tone did not affect results much.

Relation with semantic distance
- Antonym pairs fall here:
  - semantically distant
  - semantically related
  - semantically similar

Antonym pairs simultaneously convey a sense of both distance and closeness:
- semantically related;
- but not semantically similar.

Evaluation: Solve 950 GRE closest-opposite questions

Examples
- Obdurate (hardened in feelings)
  Meager (answer)
- Obdurate (resistant to persuasion)
  Yielding (answer)

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.

Why be Antonymy-Aware
- Detect 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-coherent 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).

References
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Towards Antonymy-Aware Natural Language Applications
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