



Automatically identifying changes in the semantic orientation of words

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Amelioration and pejoration



- Changes in a word's meaning to have a more positive or negative evaluation
- Historical examples
 - Amelioration: *Urbane*
 - Pejoration: *Hussy*
- Contemporary examples
 - Amelioration: *Pimp*
 - Pejoration: *Gay*

Challenges



- Natural language processing
 - Many systems for sentiment analysis require appropriate and up-to-date polarity lexicons
- Lexicography
 - Identify new word senses and changes in established senses to keep dictionaries current

Inferring semantic orientation



- Semantic orientation from association with known positive and negative words
 - Turney and Littman's (2003) SO-PMI

$$SO-PMI(t) = PMI(t, POS) - PMI(t, NEG)$$

$$PMI(t, S) \approx \log \left(\frac{N \sum_{s \in S} freq(t, s)}{freq(t) \sum_{s \in S} freq(s)} \right)$$

- A difference in polarity between corpora of differing time periods indicates amelioration or pejoration

General Inquirer Dictionary



- Lexicon intended for text analysis
 - Some entries mark positive or negative outlook
- Seed words: All words labelled positive or negative (but not both)
- 1621 positive seeds, 1989 negative seeds
 - Turney and Littman: 7 positive seeds, 7 negative seeds

Corpora



- Three corpora of British English from differing time periods.

Corpus	Size (millions of words)	Time period
Lampeter	1	1640-1740
CLMETEV	15	1710-1920
BNC	100	Late 20 th c.



Inferring polarity

- Verify that our method for inferring polarity works well on small corpora
- Leave-one-out experiment
 - Classify each seed word with frequency greater than 5 using all others as seeds
 - Performance metric: Accuracy over all words, and only words with calculated polarity in top 25%

Inferring polarity: Results



Corpus	Accuracy: All	Accuracy: top-25%
Lampeter	75	88
CLMETEV	80	92
BNC	82	94

- Most frequent class baseline: 55%



Historical data

- Small dataset of ameliorations and pejorations
 - Taken from texts on semantic change, dictionaries, and Shakespearean plays
 - Underwent change in (roughly) 18th c.
 - 6 ameliorations, 2 pejorations
- Compare calculated change in polarity (Lampeter to CLMETEV) to change indicated by resources

Historical data: Results



Expression	Change identified from resources	Calculated change in polarity
ambition	amelioration	0.52
eager	amelioration	0.97
fond	amelioration	0.07
luxury	amelioration	1.49
nice	amelioration	2.84
succeed	amelioration	-0.75
artful	pejoration	-1.71
plainness	pejoration	-0.61



Artificial data

- Suppose *good* in one corpus and *bad* in another were in fact the same word
 - Similar to WSD evaluations using artificial words
 - Requires choosing pairs of words
- Instead compare average polarity of all positive words in one corpus to that of all negative words in another

Artificial data: Results



Polarity in lexicon	Average polarity in corpus		
	Lampeter	CLMETEV	BNC
Positive	0.58	0.50	0.40
Negative	-0.74	-0.67	-0.76

Hunting new senses



- **Hypothesis:** Words with largest change in polarity between two corpora have undergone amelioration or pejoration
- Identify candidate ameliorations and pejorations
 - 10 largest increases/decreases in polarity from CLMETEV to BNC

Usage extraction



- For each candidate extract 10 random usages (or as many as are available) from each corpus
 - Extract the sentence containing each usage
- Randomly pair each usage from CLMETEV with a usage from BNC



Usage annotation

- Use [Amazon Mechanical Turk](#) to obtain judgements
- Present [turkers](#) with pairs of usages
- Turkers judge which usage is more positive/negative (or if usages are equally positive)
- 10 independent judgements per pair

Hunting new senses: Results



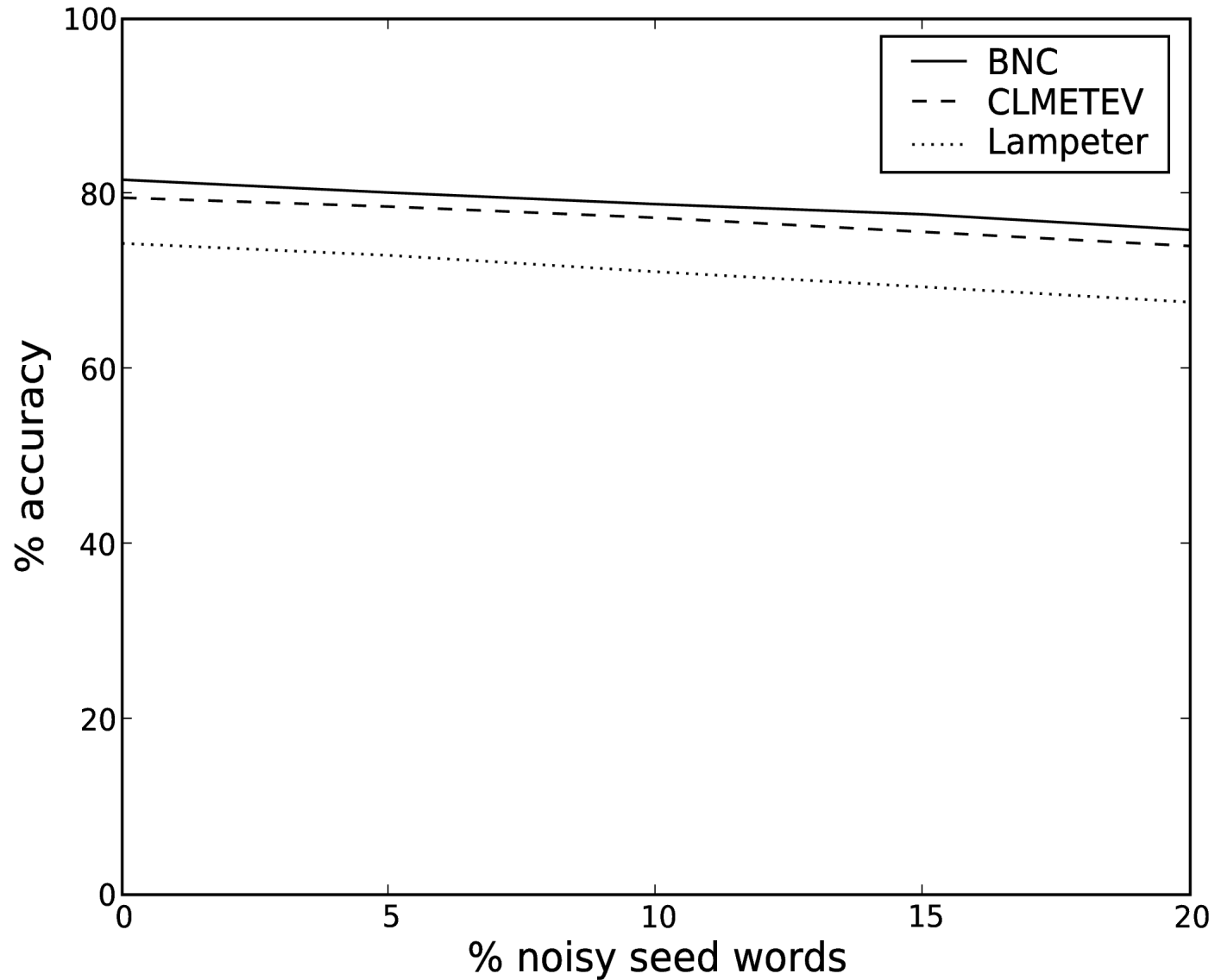
Candidate type	Proportion of judgements for corpus of more positive usage		
	CLMETEV (earlier)	BNC (later)	Neither
Ameliorations	0.28	0.34	0.37
Pejorations	0.36	0.27	0.36



Noisy seed words

- Seed words may undergo amelioration and pejoration!
- Randomly change polarity of $n\%$ of positive and negative seeds
 - E.g., *good* is negative, *bad* is positive
- Repeat experiment on inferring synchronic polarity

Noisy seed words: Results



Conclusions



- First computational study focusing on amelioration and pejoration
 - Encouraging results identifying historical and artificial ameliorations and pejorations
- Future work:
 - More extensive evaluation
 - Methods for identifying semantic change and dialectal variation in word usage

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