Leveraging Sentiment to Compute Word Similarity

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- Introduce Sentiment as another feature in the Semantic Similarity Measure
  - "*Among a set of a similar word pairs, a pair is more similar if their sentiment content is the same*"
  - Is "*enchant*" (hold spellbound) more similar to "*endear*" (make endearing or lovable) than to "*delight* "(give pleasure to or be pleasing to) ?

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- Given a **word** in a sentence, create its *Similarity Vector*
  - Use Word Sense Disambiguation on context to find its **Synset-id**
  - Create a **Gloss Vector** (*sparse*) using its gloss
  - Extend gloss using *relevant* **WordNet Relations**
    - **Learn the relations to use for different POS tags and the depth in WordNet hierarchy**
  - Incorporate SentiWordNet Scores in the Expanded Vector using Different Scoring

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Sentiment-Semantic Correlation

Annotation Strategy	Overall	NOUN	VERB	ADJECTIVES	ADVERBS
Meaning	0.768	0.803	0.750	0.527	0.759
Meaning + Sentiment	0.799	0.750	0.889	0.720	0.844

WordNet Relations used for Expansion

POS	WordNet relations used for expansion
Nouns	*hypernym, hyponym, nominalization*
Verbs	*nominalization, hypernym, hyponym*
Adjectives	*also see, nominalization, attribute*
Adverbs	*derived*

Scoring Formula

- $Score_{SD}(A) = SWN_{pos}(A) - SWN_{neg}(A)$
- $Score_{SM}(A) = \max(SWN_{pos}(A), SWN_{neg}(A))$
- $Score_{TM}(A) =$

  $sign(\max(SWN_{pos}(A), SWN_{neg}(A))) * (1+abs(\max(SWN_{pos}(A), SWN_{neg}(A)))$

$$SenSim_x(A, B) = cosine\ (gloss_{vec}(sense(A)),\ gloss_{vec}(sense(B)))$$

Where,

$gloss_{vec}$ $= 1{:}score_x(1)\ 2{:}score_x(2) \ldots\ n{:}score_x(n)$

$score_x(Y)$ = Sentiment score of word Y using scoring function x

x = Scoring function of type SD/SM/TD/TM

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- A set of 50 word pairs (with given context) manually marked
- Each word pair is given 3 scores in the form of ratings (1-5):
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  - Similarity based on sentiment
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Metric Used	Overall	NOUN	VERB	ADJECTIVES	ADVERBS
LESK (Banerjee *et al.*, 2003)	0.22	0.51	-0.91	0.19	0.37
LIN (Lin, 1998)	0.27	0.24	0.00	NA	Na
LCH (Leacock *et al.*, 1998)	0.36	0.34	0.44	NA	NA
SenSim (SD)	0.46	0.73	0.55	0.08	0.76
SenSim (SM)	**0.50**	0.62	0.48	0.06	0.54
SenSim (TD)	0.45	0.73	0.55	0.08	0.59
SenSim (TM)	0.48	0.62	0.48	0.06	0.78

Evaluation on Travel Review Data: Feature Replacement

Metric Used	**Accuracy (%)**	**PP**	**NP**	**PR**	**NR**
Baseline	89.10	91.50	87.07	85.18	91.24
LESK (Banerjee *et al.*, 2003)	89.36	91.57	87.46	85.68	91.25
LIN (Lin, 1998)	89.27	91.24	87.61	85.85	90.90
LCH (Leacock *et al.*, 1998)	89.64	90.48	88.86	86.47	89.63
SenSim (SD)	89.95	91.39	88.65	87.11	90.93
SenSim (SM)	90.06	92.01	88.38	86.67	91.58
SenSim (TD)	90.11	91.68	88.69	86.97	91.23