



## *ANTUSD: A Large Chinese Sentiment Dictionary*

Shih-Ming Wang and Lun-Wei Ku

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## SENTIMENT DICTIONARY

- ▶ A building block of sentiment analysis & opinion mining
- ▶ Applied as markers or machine learning features

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## AUGMENTED NTU SENTIMENT DICTIONARY (ANTUSD)

- ▶ Lack of Chinese resource
- ▶ Big & complete
- ▶ Expert labeled sentiment & machine predicted sentiment scores

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- ▶ Words and labels were collected from several sentiment corpora (2006~2010)



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  - ▶ Labels: **POS** and **NEG** (2812/8276)
- ▶ ACIBiMA

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  - ▶ Chinese morphological structure on sentiment analysis
  - ▶ Labels: **POS**, **NEU**, **NEG**, **NONOP**, and **NOT**



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  - ▶ Labels: **POS**, **NEU**, **NEG**, **NONOP**, and **NOT**
  - ▶ **NONOP** indicates a non-emotion word
  - ▶ **NOT** indicates an incorrectly segmented word

# RELATED CORPORA II

## SENTENCE-BASED, CONTEXT DEPENDENT

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## PROPERTIES

- ▶ Labels: **POS**, **NEU**, and **NEG**
- ▶ Label process: sentence → sentiment words
- ▶ Each word might belong to conflicting labels
- ▶ Context information not included in ANTUSD

## MACHINE PREDICTED SENTIMENT SCORE

- ▶ CopeOpi: A Chinese opinion-analysis system
- ▶ Sentiment scores of documents, sentences, words, and characters
- ▶ Polarity score of each character is calculated statistically
- ▶ Word by summing up characters; sentence by summing up words...

# EXTENDED-HOWNET (E-HOWNET)

## E-HOWNET

- ▶ A frame-based entity-relation model extended from HowNet
- ▶ Define lexical senses (concepts) in a hierarchical manner
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詞彙:	致勝	Word			
詞性:	VH11	Pos Tag			
英文意涵:	win victory	English Meaning			
概念式:	{win 獲勝}	Concept Frame			
展開式:					
WordNet 自動連結:	{gain.v.05, succeed.v.01, acquire.v.05, win.v.01}	WordNet Linkage			
Sentiment					
score	positive	neutral	negative	non_opinion	non_word
0.5772	1	0	0	0	0



# DEMONSTRATIVE EXPERIMENT

## EXPERIMENT SETTING

- ▶ Dataset: ANTUSD  $\cap$  E-hownet, a total 12995 words
- ▶ Classifier: support vector machine (SVM) with linear kernel
- ▶ Average over 10-fold validation scores

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## THREE SENTIMENT ANALYSIS TASKS

- ▶ Opinion extraction: identify opinion words  
({**POS**,**NEG**} v.s. **NONOP**)
- ▶ Polarity classification: classify opinion words (**POS** v.s. **NEG**)
- ▶ Combined tasks (**POS**, **NEG**, **NONOP**)
  - ▶  $P = \frac{\text{correct}(\text{opinion}) \cap \text{correct}(\text{polarity})}{\text{proposed}(\text{opinion})}$
  - ▶  $R = \frac{\text{correct}(\text{opinion}) \cap \text{correct}(\text{polarity})}{\text{gold}(\text{opinion})}$
  - ▶  $F\_score = \frac{2PR}{P+R}$

# PREPROCESSING

## EXTRACT SINGLE LABEL FOR EACH WORD

1. **NOT**:  $\text{Count}(\text{Not}) > 0$
2. **NONOP**:  $\text{Count}(\text{Non}) > 0$
3. **POS**:  $\text{Count}(\text{Pos}) > 0$  and  $\text{Count}(\text{Neg}) = 0$
4. **NEG**:  $\text{Count}(\text{Neg}) > 0$  and  $\text{Count}(\text{Pos}) = 0$
5. **NEU**:  $\text{Count}(\text{Pos}) = 0$ ,  $\text{Count}(\text{Neg}) = 0$  and  $\text{Count}(\text{Neu}) > 0$

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5. **NEU**:  $\text{Count}(\text{Pos}) = 0$ ,  $\text{Count}(\text{Neg}) = 0$  and  $\text{Count}(\text{Neu}) > 0$

- ▶ **NOT** words are not used
- ▶ **NEU** words are dropped since there are only 16 of them

# FEATURES

## ANTUSD & E-HOWNET

- ▶ CopeOpi score in ANTUSD
- ▶ Synonym-Set index (SSI)
  - ▶ Concept frame index of a word
  - ▶ Each word might belong to many concepts
  - ▶ Represented as a binary vector



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## WORD EMBEDDING

- ▶ Corpus: LDC2009T14 (Chinese news)
- ▶ Word vectors
- ▶ Summation of char vectors
  - ▶ Very high coverage rate

# OPINION EXTRACTION

- ▶ COP, SSI has lower precision
  - ▶ opinion extraction is more semantic-oriented
  - ▶ Many concept frame contain only one word

Feature(s)	Precision	Recall	f-score
COP	0.686	1.000	0.814
SSI	0.693	0.993	0.816
WV	0.784	0.936	0.854
CV	0.765	0.919	0.835
COP+SSI	0.740	0.914	0.818
COP+WV	0.785	0.933	0.853
COP+CV	0.764	0.917	0.833
SSI+WV	0.789	0.937	0.856
SSI+CV	0.772	0.920	0.840
WV+CV	0.808	0.921	0.861

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- ▶ Features are complemented; combined features leads to improvement

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# POLARITY CLASSIFICATION

- ▶ COP leads to a significant better result, reflecting its sentiment-oriented nature

Feature(s)	POS f1	NEG f1	Average f1
COP	0.973	0.976	0.974
SSI	0.792	0.842	0.817
WV	0.870	0.895	0.882
CV	0.829	0.851	0.840
COP+SSI	0.979	0.982	0.980
COP+WV	0.981	0.984	0.982
COP+CV	0.967	0.972	0.970
SSI+WV	0.898	0.915	0.907
SSI+CV	0.868	0.886	0.877
WV+CV	0.899	0.916	0.908

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# POLARITY CLASSIFICATION

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- ▶ Combining word vectors and SSI also leads to improvement

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## COMBINED TASK

- ▶ COP outperforms the others

Feature(s)	Precision	Recall	f-score
COP	0.912	0.927	<b>0.920</b>
SSI	0.706	0.679	0.692
WV	0.737	0.767	0.752
CV	0.689	0.721	0.705
COP+SSI	0.864	0.945	0.903
COP+WV	0.850	0.902	0.875
COP+CV	0.840	0.869	0.854
SSI+WV	0.764	0.796	0.779
SSI+CV	0.732	0.755	0.743
WV+CV	0.764	0.813	0.787

# COMBINED TASK

- ▶ COP outperforms the others
- ▶ Both the numerator of precision and recall are affected by COP's better polarity classification ability
- ▶ Only the denominator of precision is affected by COP's worse opinion extraction ability

## PRECISION & RECALL

$$P = \frac{\text{correct}(\text{opinion}) \cap \text{correct}(\text{polarity})}{\text{proposed}(\text{opinion})}$$

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- ▶ WV+CV outperforms WV due to coverage issue

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# CONCLUSION

- ▶ A so far the largest Chinese sentiment dictionary
- ▶ Manually sentiment labels & machine estimated sentiment scores
- ▶ Three experiments were conducted to demonstrate the usage of ANTUSD



# EMOTIONPUSH (PROMOTION)

- ▶ Personal sentiment analysis
- ▶ Recruiting people for experiment
- ▶ Sign up: <http://tinyurl.com/EmotionPush>



# Thank You

Download ANTUSD @NLPLab

