Microblog Sentiment Analysis with Emoticon Space Model

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Outline

- Background
- Previous Works & Limitations
- Our Model
- Experiments
- Conclusion

Background

- NLP&CC 2014 emotion analysis task
  - document level emotion classification
  - sentence level emotion identification and classification
  - emotion expression extraction

Background

- Related classification tasks
  - **subjectivity classification**: whether a post is subjective
  - **emotion classification**: which emotion does a post have, happiness, anger, or sadness, etc.

Background

- Fully Supervised Methods
  - text classification problems …
  - Naive Bayes

$$p(c = positive|w_1, w_2, ..., w_n) \sim p(c = positive) \prod_i p(w = w_i|c = positive)$$

  - VSM (vector space model)

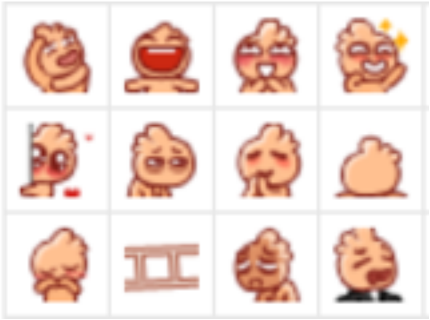
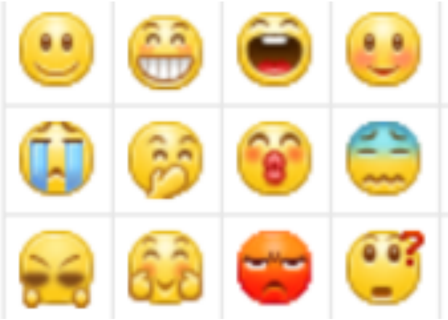
$$vector(post) = [\ 0, 0, ..., 0, 1, 0, ..., 0, 0, 1, 0\ ]$$

Background

- Fully Supervised Methods
  - topics are wide
  - require large amounts of manually labeled data
  - labor intensive
- Emoticons are adopted to alleviate this problem

The Popularity of Graphical Emoticons

- All kinds Emoticons on various platforms

- Emoticons are widely adopted
  - over 25% of posts on Sina Weibo contain emoticons

Previous Works on Microblog Sentiment Analysis

- Noisy (distant) supervised Methods
  - Use some emoticons as sentiment label of posts.
  - positive samples:

    真是萝卜白菜各有所爱，我就笑笑不说话

    雨天最适合窝在家里 抱着手机 听着音乐 吃着零食~嘻嘻

    KTV最新玩法！！！一群女蛇精病啊，哈哈哈哈哈看得我也是醉了......

    中午吃蒸河粉，秋葵炒牛肉。
  - negative samples:

    高音上不去，低音下不来

    宁波现虐猫事件

    这9部电影看完之后~整个人都不好了....

Limitations

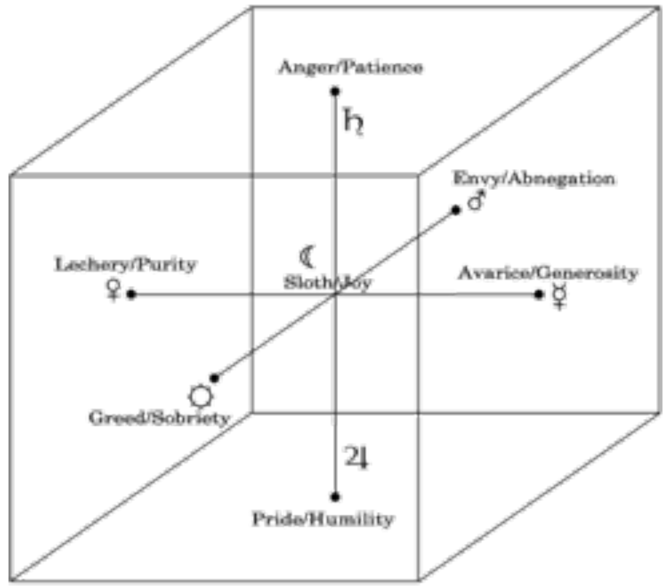
- Noisy labels
  - words in posts may not express the same sentiment with emoticons.
  - hard to tell which emoticon expresses a certain emotion (fear, surprise, etc.).
- Difference among emoticons
  - throw several happy emoticons into the same set, thus ignoring the difference among them
  - different emoticons have different emotions and strengths
  - is  equal to ?

Limitations

- Can not leverage sentiment-ambiguous emoticons
  -  seldom occurs in angry posts.
  - …

Our idea

- Emotion model
  - emotion can be represented in a 3D space
  - different emotions (happiness, sadness, etc.) lie in some special places in the emotion space
  - can emoticons serve as the basis of a similar space ?



Our idea

- Emoticon space
  - projecting words into emoticon space, based on their similarity with the emoticons.
  - coordinates of words can be used as features for supervised classification (fewer data).

Our idea

- For example
  - emoticons = [   …]
  - happy = [0.8, -0.7, 0.1, …]
  - sad = [-0.7, 0.4, -0.1, …]
  - document = [0.1, -0.1, -0.2, …]

Our idea

- Learn Similarity Between Words and Emoticons
  - use word embeddings to define similarity between word i and emoticon j

$$similarity(\boldsymbol{w_i}, \boldsymbol{e_j}) = \frac{\boldsymbol{w_i} \cdot \boldsymbol{e_j}}{|\boldsymbol{w_i}|\,|\boldsymbol{e_j}|}$$

  - use word2vec [1] to estimate word embeddings

Our idea

- Representation of Microblog Posts
  - average, min, max pooling at each dimension.
- SVM for classification

Experiments-1

- Dataset
  - NLP&CC 2013 Chinese microblog corpus
  - 14,000 labeled posts in total
  - labels of subjectivity, emotion
  - balanced classes in experiment-1

The original dataset

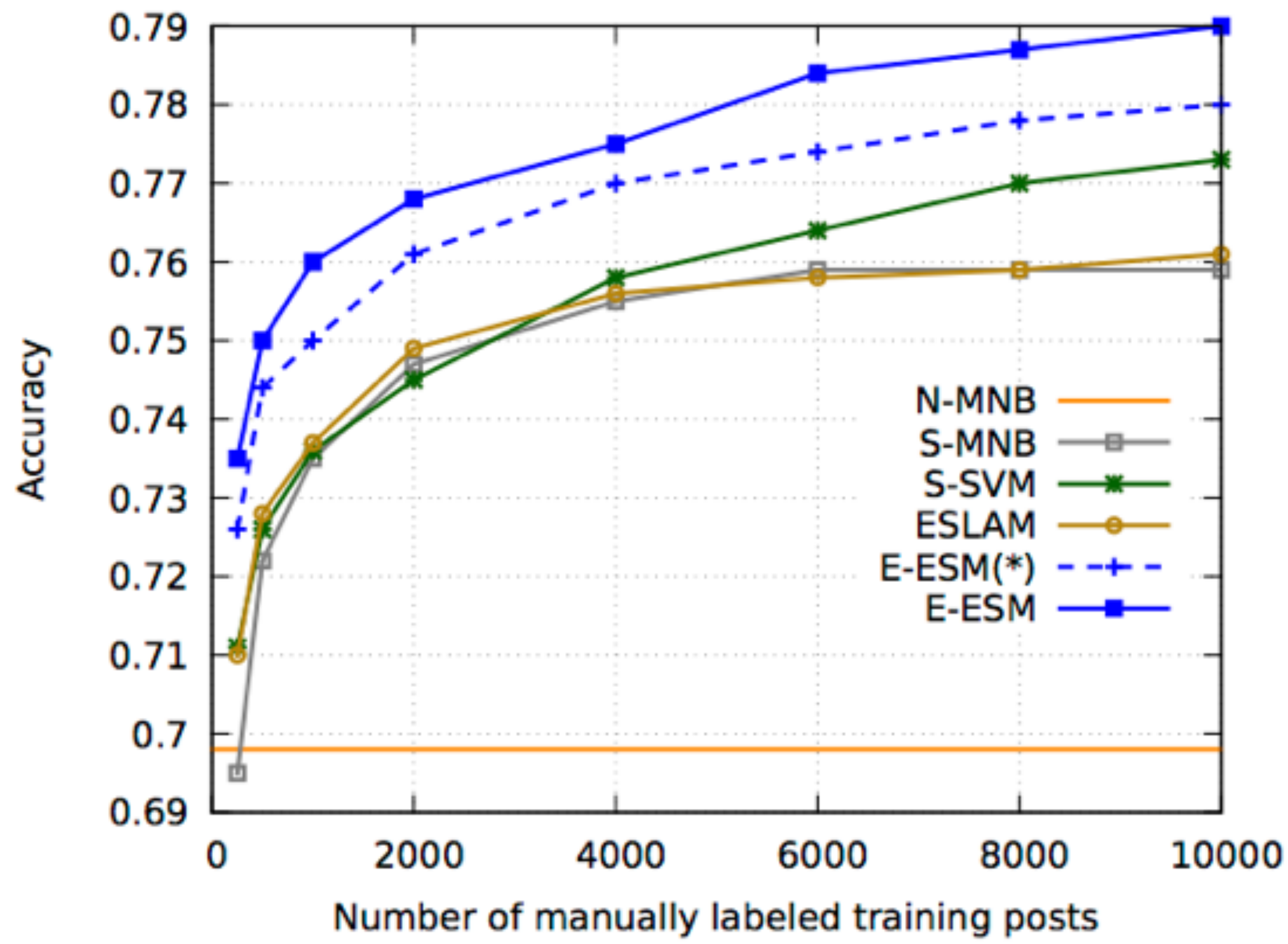
neural	like	happiness	sadness	disgust	anger	surprise	fear
6748	2122	1477	1147	1394	640	333	139

Experiments-1

- Baselines
  - fully supervised methods (S-SVM, S-MNB) [2]
  - noisy supervised methods (N-MNB) [3]
  - combination of above two (ESLAM) [4]
- Our model
  - with ambiguous emoticons (E-ESM)
  - without ambiguous emoticons (E-ESM(*))

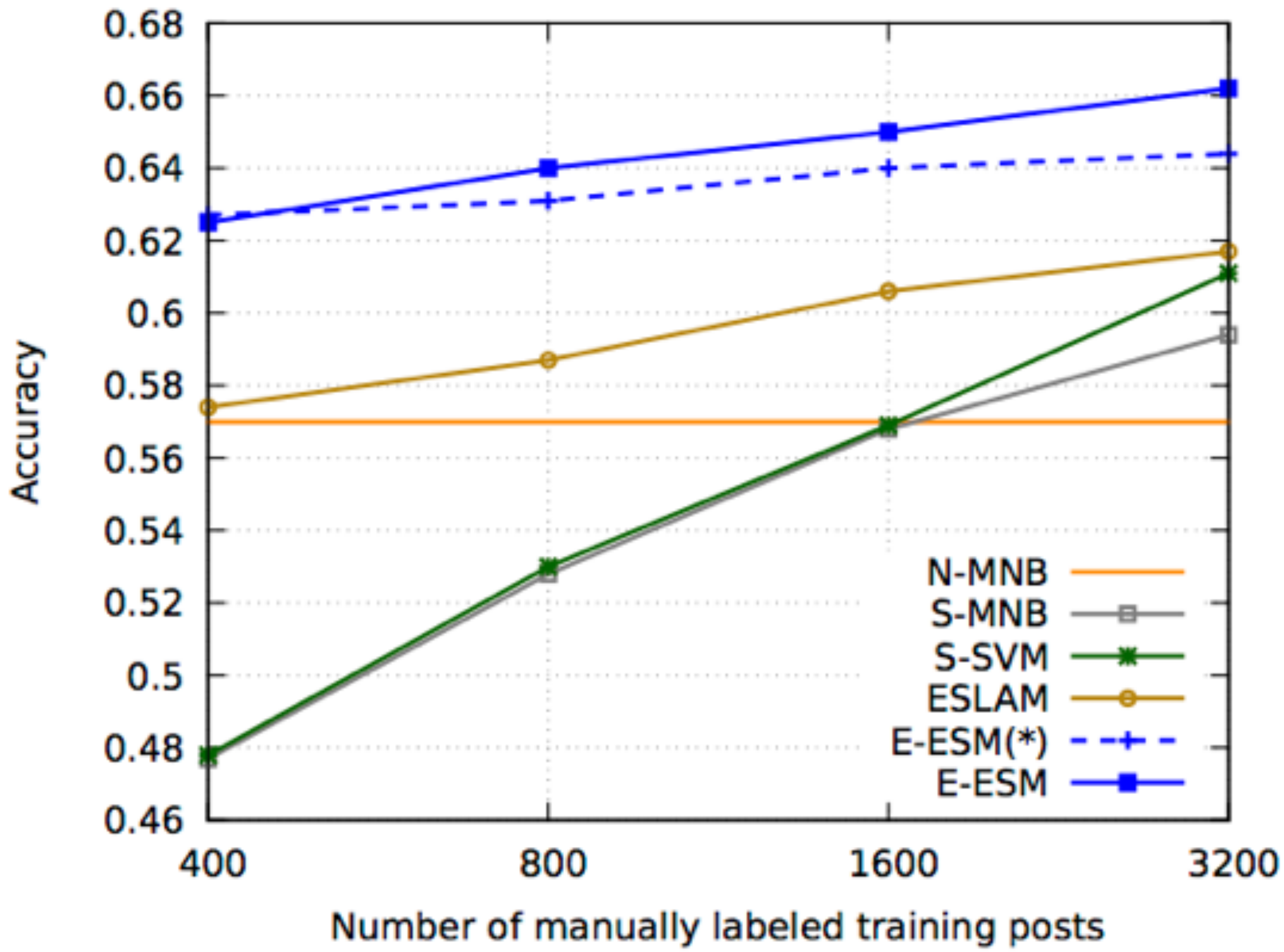
Experiments-1

- Subjectivity Classification



Experiments-1

- Emotion Classification



four emotions (happiness, like, sadness, disgust)

Experiments-2

- NLP&CC 2014 emotion analysis task
  - eight classes (seven emotions + neutral)
  - first emotion + second emotion
  - evaluation metric: average precision
  - 14,000 posts for training & validation, 6000 posts for testing

neural	like	happiness	sadness	disgust	anger	surprise	fear
6748	2122	1477	1147	1394	640	333	139

Experiments-2

- Technical details in NLP&CC 2014 emotion classification task
  - cross validation with 14,000 posts
  - a hierarchical classifier for first emotion: binary subjectivity classifier + seven-class emotion classifier
  - second emotion: conditional probability matrix

    p(second emotion | first emotion)

Experiments-2

- Performance in NLP&CC 2014 Emotion classification task

	loose measure	**strict measure**
document level	0.5309	0.4668
sentence level	0.5489	0.5175

Conclusion

- A richer sentiment representation compared to previous works.
- Need more strategies to recognize the second emotion

Thank you

References

- [1] Mikolov, T., Sutskever, I., Chen, K., Corrado, G., Dean, J.: Distributed rep- resentations of words and phrases and their compositionality. arXiv preprint arXiv:1310.4546 (2013)

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- [4] Liu, K.L., Li, W.J., Guo, M.: Emoticon smoothed language models for twitter sentiment analysis. In: AAAI (2012)