



Summarizing Public Opinions in Tweets

Sentiment Analysis using Twitter corpus

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Introduction

- *Sentiment Analysis* or *Opinion Mining*, the study of computationally determining whether a piece of text is indicative of positive or negative sentiment, is one way of aggregating the overwhelming amount of user generated content available on the internet today.
- **Applications:**
 - Knowing how users feel about a product or service can help in business decisions for corporates.
 - Political parties and social organizations can collect feedback about their programs and legislation.
 - Artists, musicians and other entertainment icons can reach out to their fans and assess the quality of their work.Broadly, it can serve as an automatic polling system, relieving any manual intervention.
- Machine Learning techniques are often applied to sentiment classification, which require a labeled training set of considerable size. Manually labeling large datasets is a tedious and expensive task.
- We introduce a novel automatic labeling (*noisy label*) technique, *sentiment suggestive words*, using which we created an annotated dataset of 1.5 million tweets. A Naive Bayes Classifier is trained using this training set.
- We also study a combination of *minimum word frequency threshold* and *categorical proportional difference* as the feature selection method.

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Background

Noisy Label:

A noisy label is an element within the piece of text which provides information about the class to which the text belongs. e.g. the emoticon “:-)” in the sentence “*Saw it for the first time, it was a great show, can't wait for next week :-)*” gives a hint that the sentence might contain a positive sentiment.

Table 1: Previous studies and concerned noisy label methods.

NAME	NOISY LABEL	DOMAIN
Pang et al. (2002)	Author ratings	Movie review
Read (2005)	Emoticons	News posts
Mishne and de Rijke (2006)	Author tagged moods	Blog posts
Go et al. (2009)	Emoticons	Twitter
Yessenov and Misailovi (2009)	Manually labeled	Movie review
Duurkoop (2010)	Hashtags	Twitter
Pak & Paroubek (2010)	Emoticons	Twitter

Feature Selection:

Feature selection, used in order to improve the performance of the classifier, is a method to select a portion of the feature set, generated by the trainer, which is most likely to serve in classification.

Minimum Word Frequency Threshold: All features with frequency below a minimum threshold frequency (calculated as a percentage on the maximum frequency of any feature) are removed from the feature set.

Categorical Proportional Difference: It is a measure of how equal two numbers are. If a feature is prevalent in either positive tweets or in negative tweets then it's CPD will be close to one whereas if it occurs almost evenly in both positive and negative tweets then its CPD will be close to zero.

References

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5. Lake, T.: Twitter Sentiment Analysis. Technical Report, Western Michigan University, Kalamazoo (2011)
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Experimental Setup

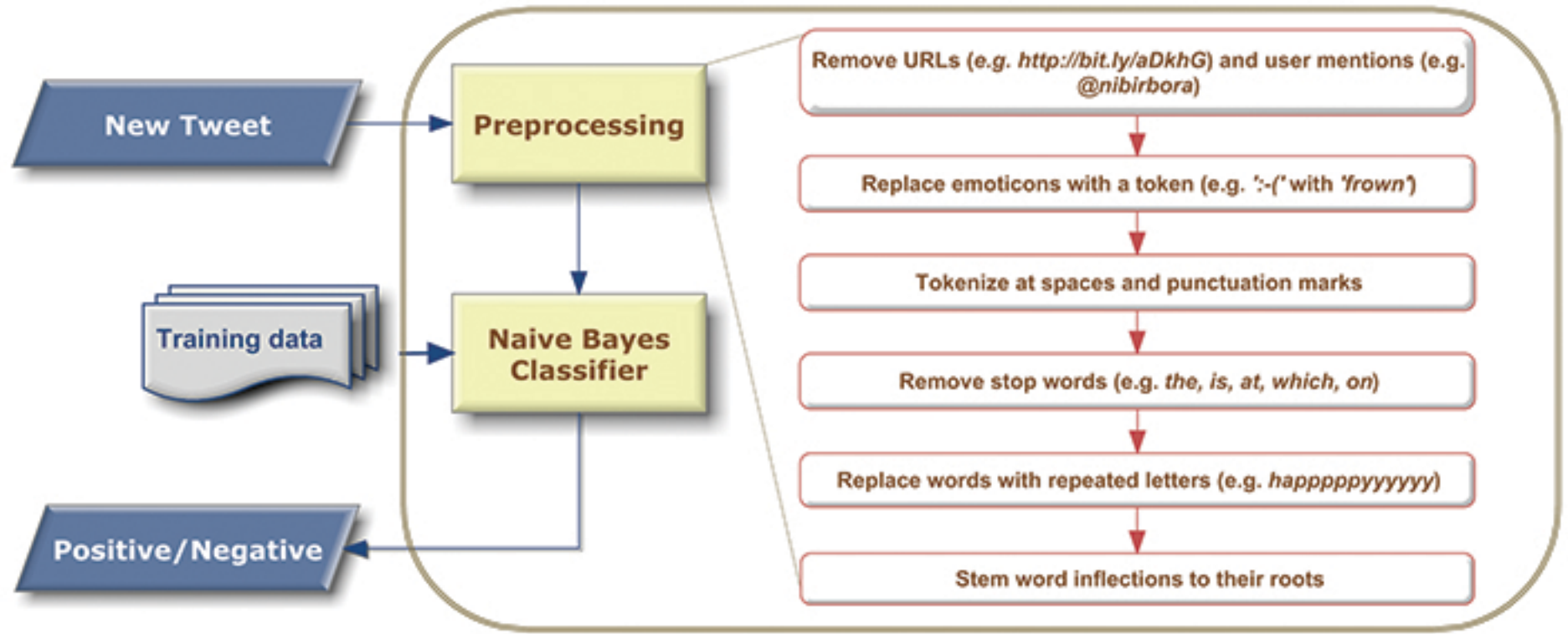


Figure 1: Overview of the experimental setup

The training set:

- A set of 40 words was prepared, each indicating certain sentiment value, and were manually categorized as being positive or negative.
- A tweet is labeled as positive if it contained any of the positive sentiment words, or negative if it contained any of the negative sentiment word.

Table 2: List of positive and negative sentiment words

Positive sentiment words	Negative sentiment words
amazed, amused, attracted, cheerful, delighted, elated, excited, festive, funny, hilarious, joyful, lively, loving, overjoyed, passion, pleasant, pleased, pleasure, thrilled, wonderful	annoyed, ashamed, awful, defeated, depressed, disappointed, discouraged, displeased, embarrassed, furious, gloomy, greedy, guilty, hurt, lonely, mad, miserable, shocked, unhappy, upset

The test set:

A hand labeled test set of 198 positive sentiment tweets and 204 negative sentiment tweets was used to check the accuracy of the classifier.

Results

- The maximum accuracy achieved was **83.33%**.
- Maximum accuracy with CPD alone as the feature selection method was **83.08%**.
- Using Categorical Proportional Difference (CPD) as a feature selection method increased the accuracy of the classifier, showing a peak at CPD value 0.25.
- Minimum word frequency (MWF) threshold did not contribute as a feature selection method. The accuracy decreased gradually with an increase in the MWF threshold.

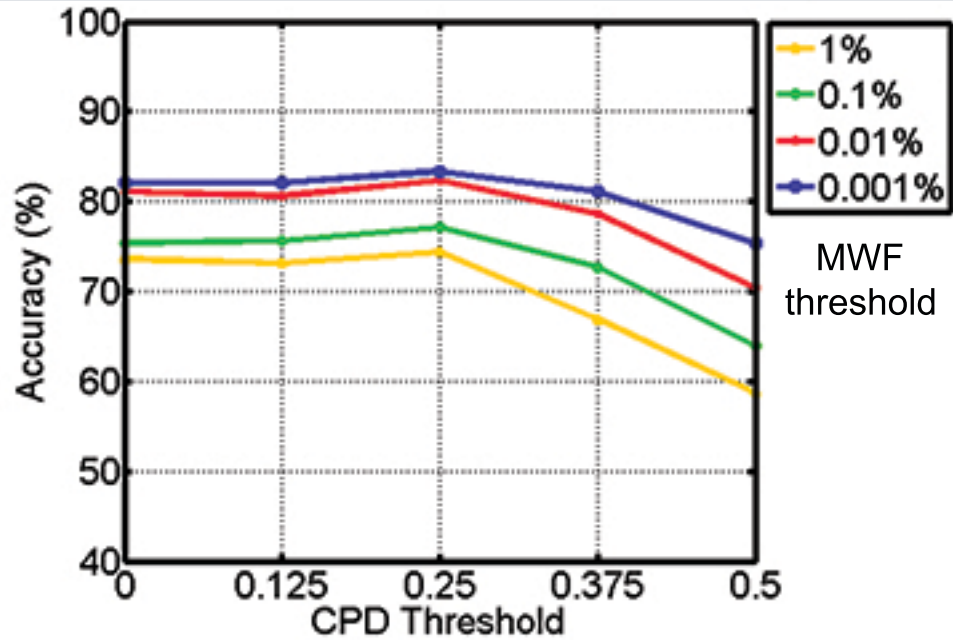


Figure 2: Accuracy of the classifier at different MWF thresholds and CPD thresholds.

Conclusion

- Sentiment suggestive words can be effectively used as noisy label for a Twitter corpus. A training set labeled using sentiment suggestive words is as good as an emoticons annotated dataset.
- Categorical Proportional Difference (CPD) performs well as a feature selection method with Twitter corpus (CPD value 0.25 being a descent choice).
- Setting a minimum word frequency threshold does not perform well as a feature selection method with Twitter corpus.

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