Supervised Sentiment Extraction from Greek tweets

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What is Twitter sentiment analysis?

The task of classifying tweets into categories depending on the sentiment they express.

3 categories (classes):

- ➢Positive: if the tweet conveys a positive sentiment
- ➢Negative: if the tweet conveys a negative sentiment
- ➢Neutral: if the tweet encloses no sentiment at all

Focus on tweets in Greek language, but compare also with English and Chinese methods, and English datasets.

Preprocessing and Features

Training set:

- ➢Removal of url links, mentions (@user), hashtags (#hashtag), abbreviation RT, stop words.
- ➢Repetitive characters at the end of words reduced to one.
- ➢Replacement of positive/negative emoticons and hashtags with the emoticons ☺/☹ respectively.
- ➢Capitalization
- ➢Stemming

Test set:

- ➢Same steps as above.
- ➢Part-of-speech tagging as an auxiliary step for negation identification that follows.

Feature engineering:

1.Bag-of-Words representation, unigrams.

2.Feature selection, experiments with Mutual Information and Chi Squared.

Negation Identification

Based on patterns of part-of-speech tags combined with negation words. Identify these patterns and store the token that is negated.

"I don't like tv"
Word "don't" followed by a verb ⟶ negation pattern
Word "like" ⟶ negated token

Following classification, if the negated token, e.g. the word "like", is one of the classification features, the polarity is reversed.

- ➢Positive to Negative
- ➢Negative to Positive
- ➢Neutral no change

Experiments

Data Sets:

- ➢GR-train: 3191 Greek tweets, 973 positive, 1450 negative, 768 neutral
- ➢GR-test: 598 Greek tweets, 155 positive, 186 negative, 255 neutral
- ➢GRNEG-test: 17% more Greek tweets containing negation

For experiments in English, the corpus of SemEval 2013* is used.

- ➢EN-train: 9070 English tweets, 3280 positive, 1629 negative, 4161 neutral.
- ➢EN-test: 3813 English tweets, 1572 positive, 601 negative, 1640 neutral

*SemEval 2013, task of Sentiment Analysis in Twitter, subtask of Message Polarity Classification.

Algorithms:

- ➢Support Vector Machines
- ➢Logistic Regression

Results:

Metric/Class	Positive	Negative	Neutral
Precision	0.783 / 0.77	0.783 / 0.759	0.723 / 0.724
Recall	0.793 / 0.78	0.623 / 0.629	0.831 / 0.815
F1	0.788 / 0.775	0.694 / 0.688	0.773 / 0.767
Accuracy			75.4% / 74.5%

SVMs / Logistic Regression for GR-test

Metric/Class	Positive	Negative	Neutral
Precision	0.791 / 0.784	0.709 / 0.618	0.61 / 0.594
Recall	0.597 / 0.561	0.329 / 0.331	0.873 / 0.857
F1	0.68 / 0.654	0.45 / 0.431	0.718 / 0.701
Accuracy			67.4% / 65.2%

SVMs / Logistic Regression for EN-test

Also the methods by Go et al. and by Zhao et al. for two classes (positive, negative) were applied to GR-test and achieved 66.2% and 53.7% accuracy respectively.

Step	Accuracy on Greek	Accuracy on English
No step ommited	75.4%	67.4%
Without feature selection	54.3%	62.1%
Without stemming	62.3%	66%
Without negation identification	73%	67.3%

Sensitivity analysis

Feedback Loop

Correction of mistaken predictions by users to improve overall performance. A feedback loop is performed in two ways.

First way: the user provides the correct class and select one word from the tweet that indicates best its sentiment.

Second way: as stemming is applied to tweets, if two unigrams have the same stem, but different part-of-speech tags and different polarities, they will be handled incorrectly. The user provides the right polarity for a particular stem and part-of-speech tag.

After 82 feedback loops ⟶ 4% improvement in accuracy for GR-test.

Conclusion and Future Work

Conclusion:

1.Performance close to other methods proposed for English.

2.Specific characteristics of Greek language, such as tense, genus, intonation, affect the task of sentiment analysis.

Future Work:

1.Collection of a larger training set in Greek. Examine if the differences in performance with English and Chinese methods are due to this.

2.Dictionaries of subjective terms, antonyms/ synonyms.

3.Examination of other approaches for negation identification.

4.Assignment of sentiment to an entity and recognition of specific feeling concerning a person or a nation.