

# Supervised Sentiment Extraction from Greek tweets

## 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.

## 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

## 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.

## 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 omitted                 | 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.