Natural Language Processing
SoSe 2016

HPI Hasso Plattner Institut
IT Systems Engineering | Universität Potsdam

Sentiment Analysis

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June 20th, 2016

Outline

- Sentiment Analysis
  - Motivation
  - Task
  - Machine Learning Approach
  - Rule-based Approach

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Product reviews

Customer Reviews

Speech and Language Processing, 2nd Edition

15 Reviews

5 star: (8)
4 star: (3)
3 star: (3)
2 star: (0)
1 star: (1)

Average Customer Review

★★★★☆ (15 customer reviews)

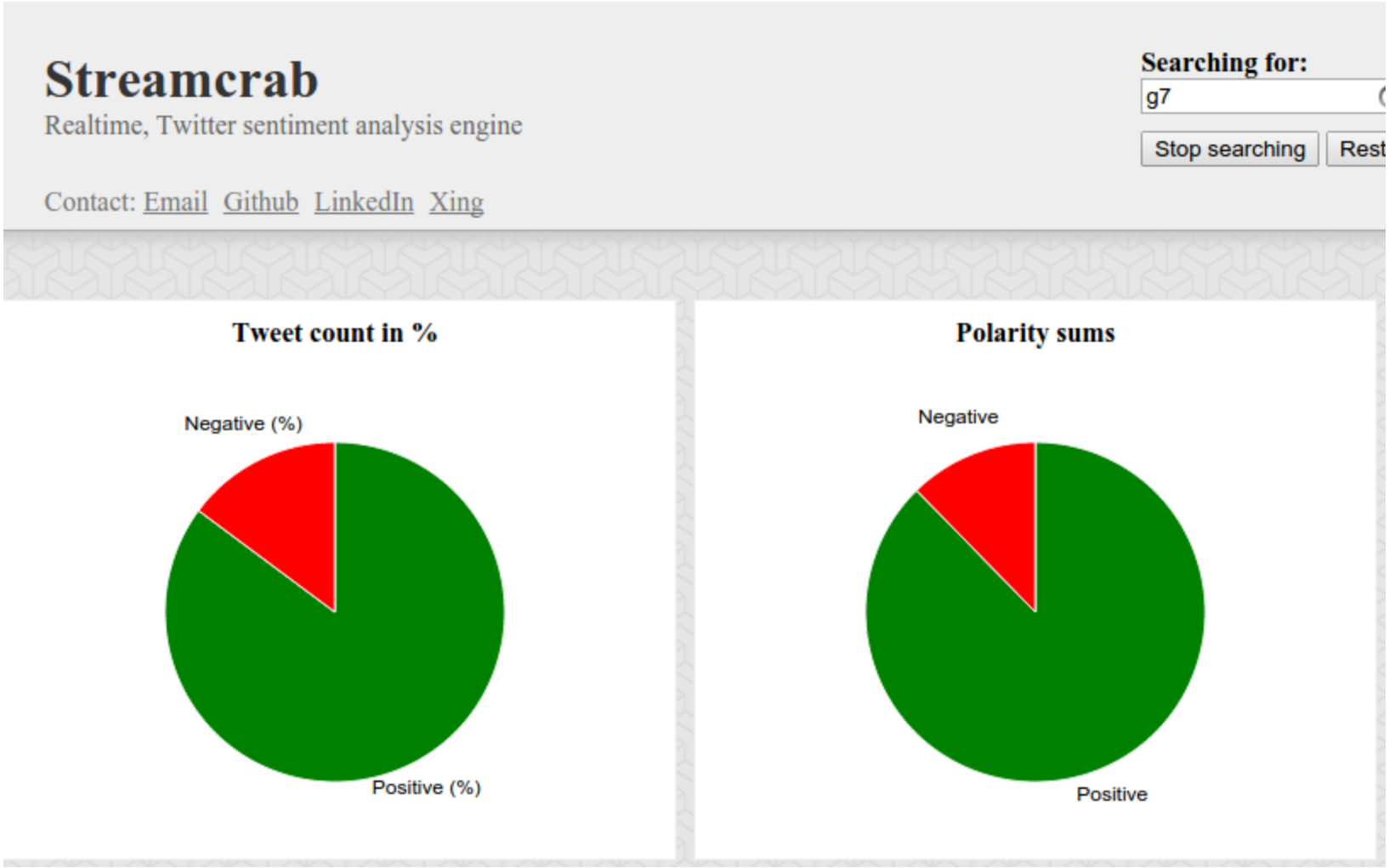
Share your thoughts with other customers

Create your own review

The most helpful favorable review	The most helpful critical review
4 of 4 people found the following review helpful	37 of 37 people found the following review helpful
★★★★★ **Great introductions and reference book**	★★★☆☆ **Good description of the problems in the field, but look elsewhere for practical solutions**
I read the first edition of that book and it is terrific. The second edition is much more adapted to current research. Statistical methods in NLP are more detailed and some syntax-based approaches are presented. My specific interest is in machine translation and dialogue systems. Both chapters are extensively rewritten and much more elaborated. I believe this book is...	The authors have the challenge of covering a vast area, and they do a good job of highlighting the hard problems within individual sub-fields, such as machine translation. The availability of an accompanying Web site is a strong plus, as is the extensive bibliography, which also includes links to freely available software and resources.
Read the full review ›	Now for the...
Published on August 9, 2008 by carheg	**Read the full review ›**
› See more **5 star**, **4 star** reviews	Published on April 2, 2009 by P. Nadkarni
	› See more **3 star**, 2 star, **1 star** reviews

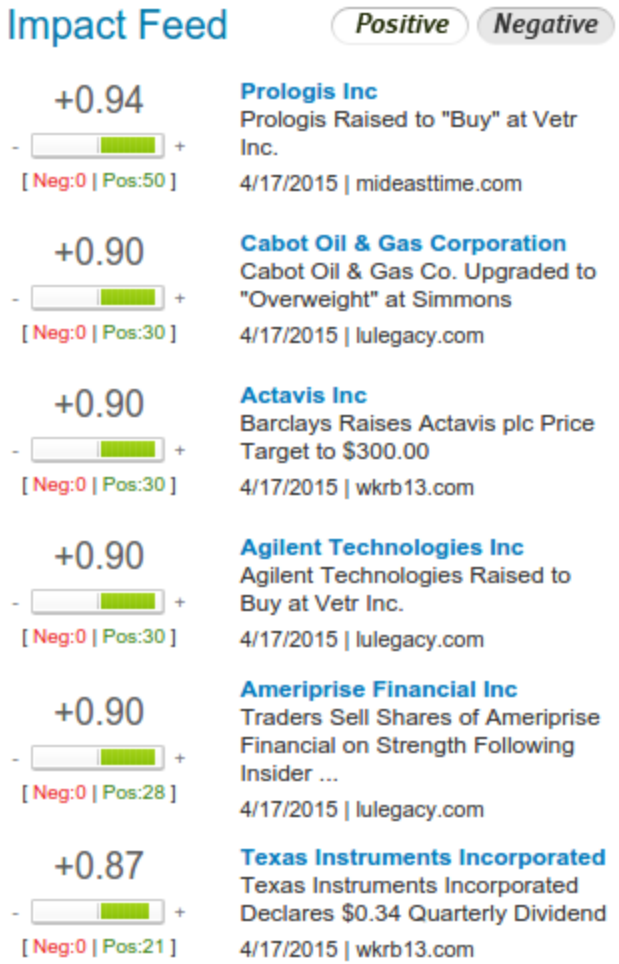
Vs.

Social Media



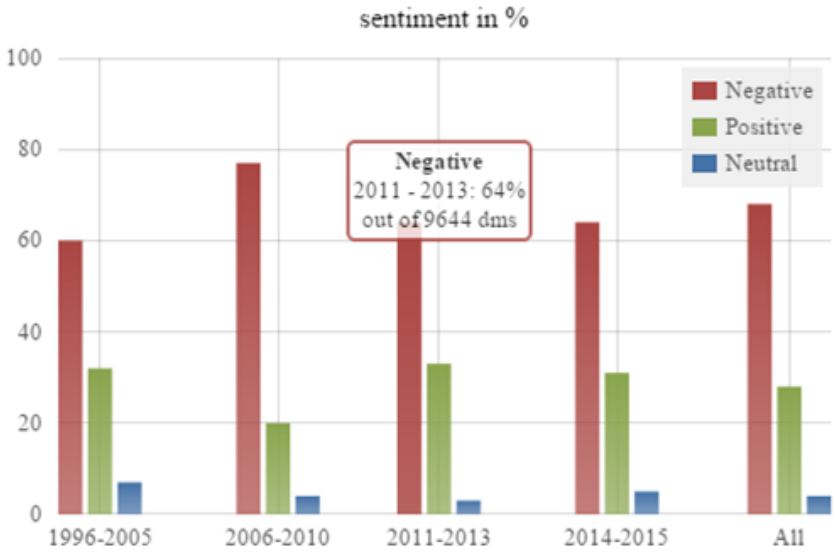
(http://www.streamcrab.com/)

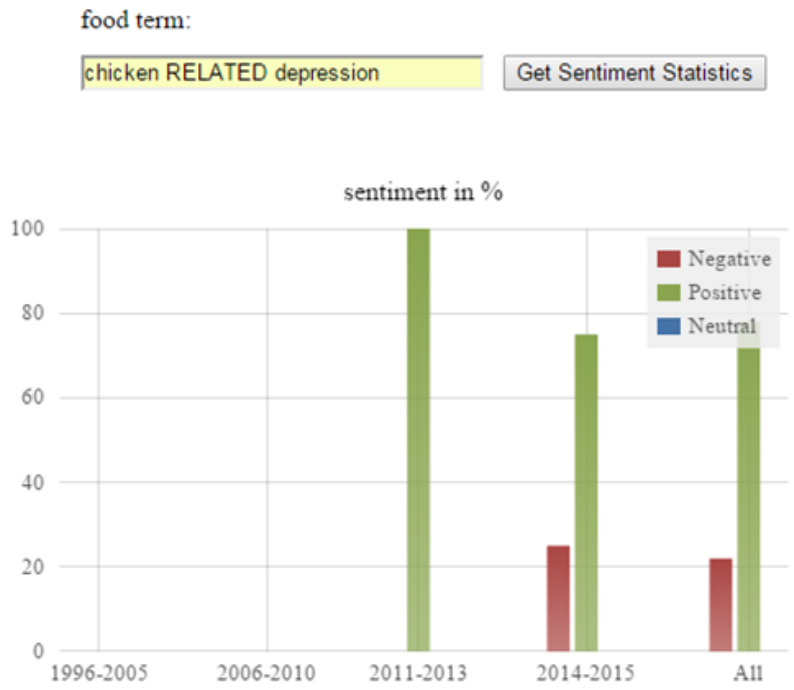
Event Analysis and Prediction



(http://www.thestocksonar.com/Sentiment-Analysis)

Event Analysis and Prediction





(from Fabian Eckert)

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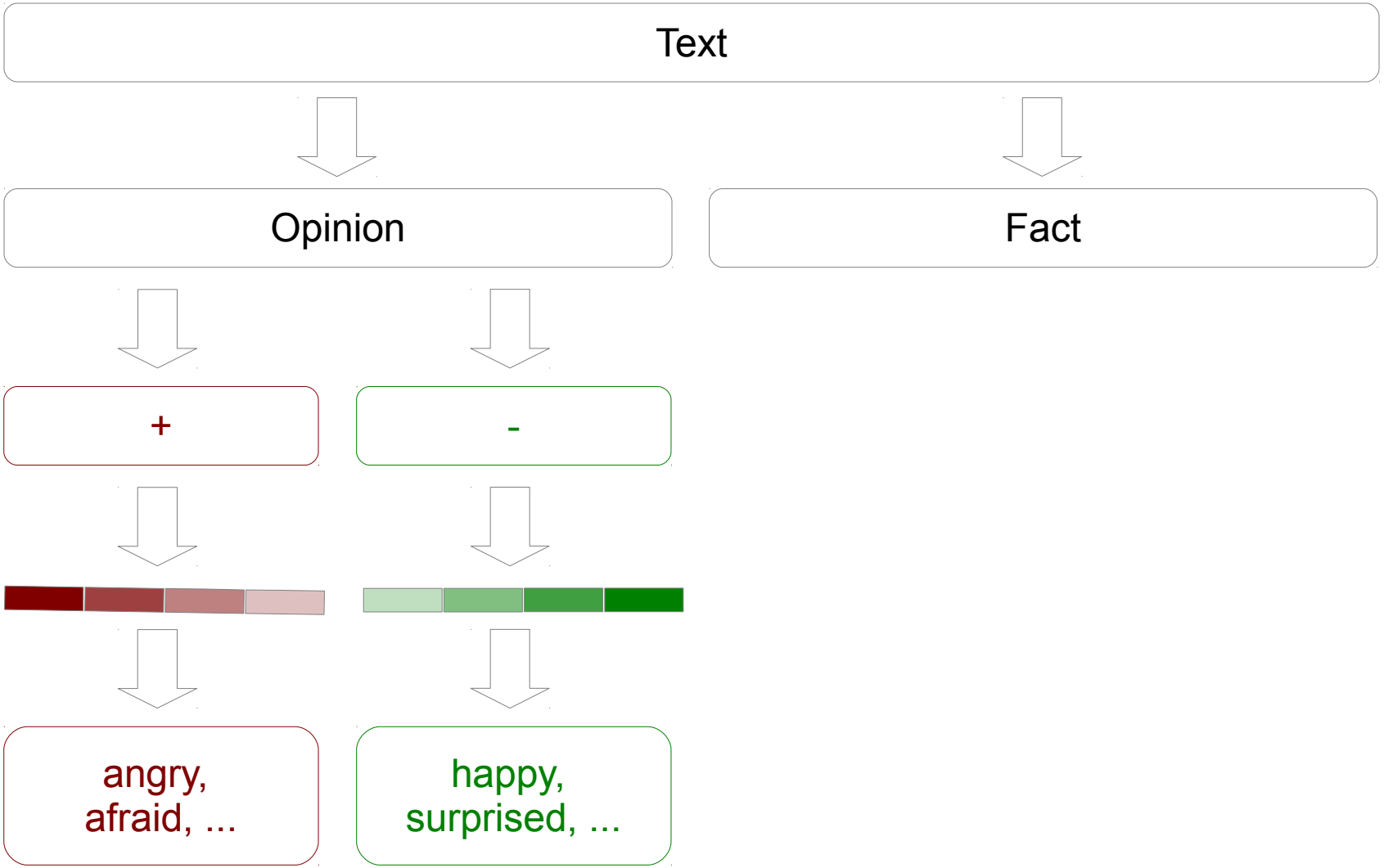
Other names

- Opinion mining
- Opinion extraction
- Sentiment mining
- Subjectivity detection
- Subjectivity analysis

Sentiment Analysis Levels



Advanced Sentiment Analysis

- Opinion holder and Opinion target/aspect
  - Students [OP HOLDER] like Wikipedia [TARGET] because it is easy to use and it sounds authoritative.
  - I had a nice stay in this hotel and the rooms [ASPECT] were very clean.

Advanced Sentiment Analysis

- Mixed opinions
  - The restaurant has an amazing view but it is very dirty.

Sentiment Analysis Approaches

- Machine learning methods

  ⇒ classification

- Rule-based methods

  ⇒ dictionary-oriented

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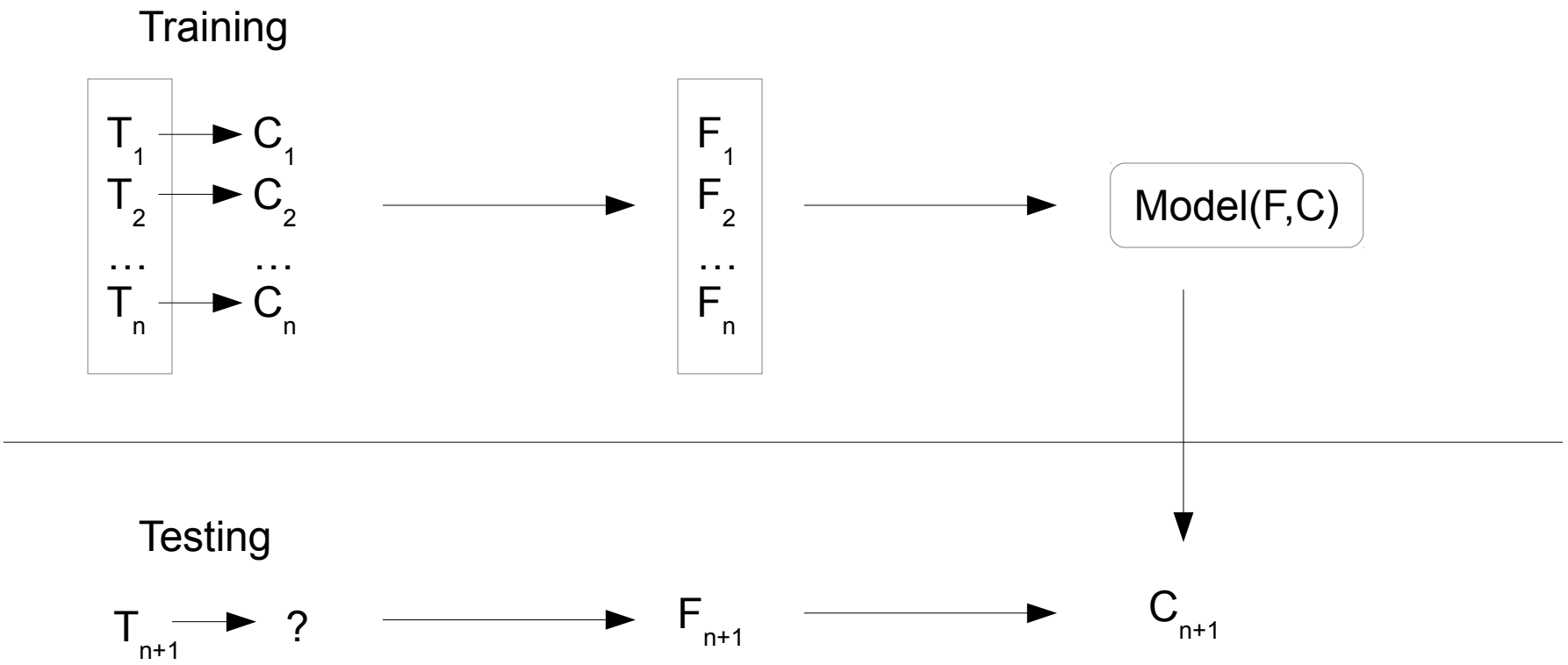
Machine Learning Approach



Sentiment Classification

- Using any kinds of supervised classifiers
  - K Nearest Neighbor
  - Support Vector Machines
  - Naïve Bayes
  - Maximum Entropy
  - Logistic Regression
  - ...

Features

- All words or just adjectives?
  - All words works better than adjectives only

Features

- Word occurrence or frequency?
  - Word occurrence is more useful than frequency
    - Using binary value for words
    - Replace all word counts higher than 0 in each text by 1

Features

- Negation
  - Negation words change the text polarity
    - Adding prefix NOT– to every word between negation and next punctuation

- „I did not like the restaurant location, but the food ...“

- I did not NOT-like NOT-the NOT-restaurant NOT-location, but the food ...

Features

- Other emotions
  - Considering emoticons as additional features
    - :)
    - :(
  - As well as smilies
    - ☺
    - 😐
    - ☹

Fine-grained analysis

- Dealing with finer classes of sentiment

  -3,-2,-1,+1,+2,+3

TA_TOKEN	TA_TYPE
well established	WeakPositiveSentiment
most extensively used drug	StrongPositiveSentiment
capable	WeakPositiveSentiment
most severe	MajorProblem
not develop mature	WeakNegativeSentiment
important	WeakPositiveSentiment
lack	MinorProblem
deadliest	StrongNegativeSentiment
prompted	WeakPositiveSentiment
effort	WeakNegativeSentiment
most severe	MajorProblem
Lack	MinorProblem
most devastating	StrongNegativeSentiment
severe	MajorProblem
malignant	MinorProblem
most severe	MajorProblem
important	WeakPositiveSentiment
neglected	WeakNegativeSentiment
complete a complex	MajorProblem
important	WeakPositiveSentiment
inhibits	MinorProblem

(from SAP HANA database)

Fine-grained Analysis

- Approaches
  - Using multiclass classifier (6 classes in this case)
  - Using two level classifier
    - First level: polarity classifier (positive or negative)
    - Second level: strength classifier (1 or 2 or 3)

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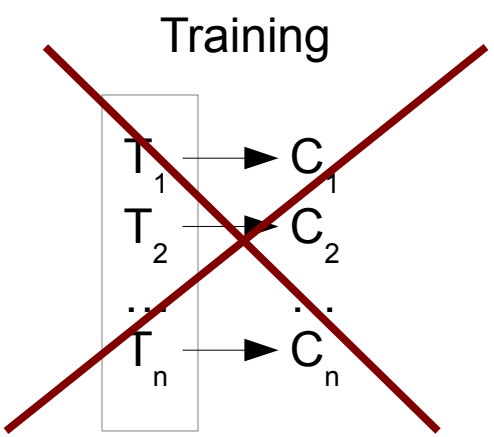
Rule-based Approach



bad
hate
lie
ugly
poor
...

good
love
brave
intelligent
nice
...

Testing

T_{n+1} → ? → C_{n+1}

Rule-based Approach

- Looking for opinionated words in each text
- Classifying the text based on the number of positive and negative words

Rule-based Approach

- Considering different rules for classification
  - Fine-grained dictionary
  - Negation words
  - Booster words
  - Idioms
  - Emoticons
  - Mixed opinions
  - Linguistic features of the language

Rule-based Approach

- Fine-grained Dictionary
  - „It was a good song.“ 
  - „The song was excellent.“ 

Rule-based Approach

- Negation Words
  - „It was a good song.“ 
  - „The song was not good.“ 

Rule-based Approach

- Booster Words
  - „The song was interesting.“ 👍👍
  - „The song was very interesting.“ 👍👍👍
  - „The song was somewhat interesting.“ 👍

Rule-based Approach

- Idioms
  - „shock horror“ 👎👎👎

Rule-based Approach

- Mixed Opinions

„The song was good, but I think its title was strange.“ 

Opinion Dictionary

- English
  - Subjectivity Clues (2005)
  - SentiSpin (2005)
  - SentiWordNet (2006)
  - Polarity Enhancement (2009)
  - SentiStrength (2010)

Opinion Dictionary

- German
  - GermanPolarityClues (2010)
  - SentiWortSchatz (2010)
  - GermanSentiStrength (2012)

Machine Learning
with Opinion Dictionary

- Using opinion words as a feature in the algorithms
- Ignoring other words in the text