RECOGNIZING CONTEXTUAL POLARITY IN PHRASE-LEVEL SENTIMENT ANALYSIS
Outline

◦ Introduction
◦ Methods
◦ Experiments + Results
◦ Conclusion
INTRODUCTION
What is Sentiment Analysis?

“I want Pizza so bad.”

„I just had Pizza. It was so bad.”
Question-Answering System

Google Search Results:

Jamaica-Koalition: Was denken die Bürger? - FOCUS Online
www.focus.de › Politik › Deutschland
vor 2 Tagen - Nach wochenlangen Sondierungen wollten die Jamaika-Partner in der Nacht zum Freitag eine ... Schreiben hier noch Menschen die Artikel?

Machtpoker um Jamaica-Koalition - und was die Deutschen wollen ...
www.focus.de › Politik › Deutschland
14.10.2017 - Und was denken die Menschen im Land über ein Jamaika-Bündnis? Was erhoffen sie sich von dieser Koalition, was sind die Wünsche, was ist ...

Jamaica-Koalition: Was denken die Bürger? - FOCUS Online
www.focus.de › Politik › Deutschland
vor 2 Tagen - Nach wochenlangen Sondierungen wollten die Jamaika-Partner in der Nacht zum Freitag eine Entscheidung fallen. Die gab es nicht.
METHODS
Corpus

- 8,984 sentences
  - 15,991 subjective expressions
- Two Annotators
  - Kappa 0.72

425 documents (MPQA corpus)

Two sets

- Development
  - For data exploration & feature development
- Evaluation
  - 10-fold cross-validation
Prior-Polarity Subjectivity Lexicon

- 8,000 subjectivity clues (unigrams)

- **Neutral:**
  - Good indicators for sentiment expression

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td>good</td>
<td>hate</td>
<td>feel</td>
</tr>
<tr>
<td>nice</td>
<td>repressive</td>
<td>look</td>
</tr>
<tr>
<td>trust</td>
<td>evil</td>
<td>think</td>
</tr>
<tr>
<td>reasonable</td>
<td>grave</td>
<td>deeply</td>
</tr>
<tr>
<td>happy</td>
<td>sad</td>
<td>entirely</td>
</tr>
</tbody>
</table>
(5) Thousands of coup supporters celebrated \(\text{celebrated (positive)}\) overnight, waving flags, blowing whistles …

(6) The criteria set by Rice are the following: the three countries in question are \(\text{repressive (negative)}\) and \(\text{grave human rights violators (negative)}\) …
EXPERIMENTS
Is prior-polarity sufficient for contextual polarity?

- Prior-Polarity Classifier
  - Assumes contextual polarity of clue instance same as clue’s prior polarity

- **Accuracy**: 48%
  - Error results from words with non-neutral prior polarity
  - Non-neutral prior polarity words appear frequently in neutral contexts

→ Prior-polarity alone is insufficient for contextual polarity
Contextual Polarity Disambiguation

Two-step approach:

1. Is the clue instance neutral or polar in the context?

2. Take clue instances classified as polar from Step 1) and identify contextual polarity
1) Step: Neutral-Polar Classification

- **28 Features Classifier**
  - Word Features
  - Modification Features
  - Structure Features
  - Sentence Features
  - Document Features
Word Features

- Distinction between strong- and weak subjective clue

- Example:
  
  “The national Trust Pizza Service...”,  “The CEOs reasonable idea...”

  “trust” = weaksub  
  “reasonable” = strongsub
Modifikation Features

- Considers words before or after clue
- Is the word preceded by e.g. adverbs, adjective, intensifier…

**Example:**

- “The *terrible* mistake led to this!”

![Diagram showing example with words W W W CLUE W W W ...]
Sentence Features

◦ Helps to identify sentence-level subjectivity
◦ Considers pronouns, cardinal numbers and modal

◦ Example:
  ◦ „The Saarland University needs in the year 2017 ...“ neutral
  ◦ „I could eat Pizza and Pasta daily.“ polar
Structure Features

- Identifies sentence-level subjectivity
- Considers passive voice, relationship with subject, copular verbs

Example:

- ["I get the feeling that I've caught a cold." ] polar
- ["It is said that Winter is coming soon.""] neutral
Document Feature

◦ Looks at topic of the document

◦ **Example:**
  ◦ “Report: Annual production rate of coal” — neutral
  ◦ “‘The cake is a lie’ – the whole story behind it” — polar
Results 1) Step: Accuracy

- word token: 73.6
- word + prior polarity: 74.2
- 28 features: 75.9
2) Step: Polarity Classification

- Polarity classification: **positive, negative** or **neutral**
  - Majority of neutral expressions removed but some still remain

- **10 Feature Classifier**
  - Identifies different negation features
    - Determinates polarity
    - Reverses polarity
10 Features

- Word token
- Word prior polarity
- Negated
- Negated subject
- Modifies polarity
- Conjuctional polarity
- General polarity shifter
- Negative polarity shifter
- Positive polarity shifter
Negated

- Looks for local negations

- Example:
  - "This book is not good."  negative
  - "The food is not uneatable."  positive

→ Reverses polarity of polar subjectivity clues
Negated subject

- The subject itself is negated

- Example:
  - 
  - [(No human being) on this planet is happy.] negative
  - The subject „human being“ and the clue „happy“ are negated
In general: Polarity shifters

- Shift the polarity in different direction

- Often reverse previous polarity

- Different kind of polarity shifters
  - General
  - Negative
  - Positive
General polarity shifters

- used on positive and negative polarity clues

**Example:**

- “little truth” negative
- “little threat” positive

→ Reverses polarity of polar subjectivity clue
Negative polarity shifters

- only used on positive polarity clues

Example:

- "lack of understanding" negative
- "lack of damage" ✗

→ Doesn't work on negative subjectivity clues
  - "lack" indicates negative polarity
Positive polarity shifters

- **only** used on **negative polarity clues**

- **Example:**
  - “**abate the damage**” positive
  - “**abate the hope**”

  Doesn't work with positive subjectivity clues
  - “abate” indicates positive polarity
Results 2) Step: Accuracy

Accuracy

- word token: 61.7
- word + prior polarity: 63
- 10 features: 65.7
CONCLUSION
What did we learn?

◦ Word token with or without prior-polarity is insufficient for contextual polarity

◦ Two-step approach:

1. Polar clues needs to be distinguished from neutral clues
   ◦ Uses different linguistic features

2. Polarity of polar expressions needs to be distinguished
   ◦ Uses different negation features
References

- http://bellini-heidelberg.de/images/slider/pizza-1.jpg (picture, slide 4)