Aspect Based Sentiment Analysis

Jared Kramer and Clara Gordon

Overview

- Background
- Our Task
- Our Approach
- Results!

Background

- Entity: The thing being described
- Aspect: A part of the thing being described

`The screen is too small.`

- Entity = laptop
- Aspect = screen

- Aspect detection and sentiment analysis has many downstream applications in automatic review summarization and aggregation

The Whole Task

Dataset

- 2 sets of sentences extracted from reviews, ~3K apiece
- Domains: laptop and restaurant
- Labeled for aspect, aspect polarity, and aspect category

Task breakdown

- Subtask 1: Extract aspects
- **Subtask 2: Classify polarity of aspects**
- Subtask 3: Group aspects into categories
- Subtask 4: Classify polarity of categories

Subtask 2

- Given a sentence with a list of aspects, classify the polarity of each aspect.
  - Not all sentences have aspects
- Two kinds of data: Laptops and Restaurants
- Polarity labels:
  - positive, negative, neutral, conflict

Baseline

- From SemEval-provided script, using random 20% of data as test:
  - 0.4705
  - Pretty easy to beat
  - Based on <aspect term, polarity> tuple frequencies gathered from the training corpus
  - Given 4 different categories, indicates that there are some correlations between aspect and polarity

Our Approach

- Throw tons of features at Mallet!
- Use multiple classifiers
  - Naive Bayes, Max Ent, Decision Tree
- Start with shallow features and move deeper

Shallow Features

- N-grams
  - sentiment backoff using Sentistrength
    - `Screen size is POS for portable use`
  - POS labeling
  - Aspect labeling
    - `ASPECT is perfect for portable use`
  - Punctuation stripping
  - Stopword removal
  - Proximity labeling
  - “Window” around aspect span
  - Wordnet expansion for adjectives

- Metadata
  - Punc, token, POS counts

Preliminary Results (laptops)

Features	Naive Bayes	MaxEnt	Decision Tree
All Unigrams	.6348	.6348	.5132
5 - Window unigrams	.6045	.6045	.4158
All uni+bi-grams	.5943	.6531	.5131
All uni+bi+tri-grams	.5598	**.6551**	.5132
Uni + POS tags	**.6511**	.6409	**.5476**
Bi + Aspect Backoff	.5923	.6227	.5416
Uni + Positions	.6206	.5963	.4787
Bi + Sentiment Backoff	.5930	.6227	.5416
Uni + WordNet	.5223	.5355	.4604

** Official results range between 0.3654 and 0.7049 -- not bad!

Conclusions so far

- Bag-of-words is hard to beat :(
- Similarity of aspect and sentence polarity
  - Sentence level features generally outperform “window”-focused features
  - The more data gathered from the sentence, the better
- Aspect backoff hurts performance
  - There might be trends in which types of aspects are discussed negatively and positively
- Revised focus: focus on identifying and analyzing sentences where aspect polarities differ from overall

Back of the envelope...

- Of 100 manually-examined sentences, 69% had the matching sentence and aspect polarities
- Of those with different aspect polarities, an overwhelming number of the differing aspects were neutral
- Single-aspect sentences more likely to match

Polarity Differences

Negative-Positive:

It's like 9 punds, but if you can look past it, it's GREAT!

Still testing the battery life as i thought it would be better, but am very happy with the upgrade

Everything is so easy to use, Mac software is just so much simpler than Microsoft software.

I love WIndows 7 which is a vast improvment over Vista.

Neutral-Polar (far more common)

I charge it at night and skip taking the cord with me because of the good battery life

I took it back for an Asus and same thing- blue screen which required me to remove the battery to reset.

Data Issues

In the shop, these MacBooks are encased in a soft rubber enclosure - so you will never know about the razor edge until you buy it, get it home, break the seal and use it (very clever con.

I was looking for a mac which is portable and has all the features that I was looking for.

- Are these aspects really positive?

In progress…

- More systematic examination of all possible shallow feature combinations
- Dependendency triples
- Other types of expansion
  - Lin thesaurus, distributional similarity
- Two-part identification: different procedures for single and multiple aspects

Thanks for listening!