

01 – Opinion mining, sentiment analysis

IA161 Advanced Techniques of Natural Language Processing

Z. Nevěřilová

NLP Centre, FI MU, Brno

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Opinion mining, sentiment analysis

So *boring*. I *enjoyed* the first book but this one really *didn't work* for me. The *story*, *characters*, and *relationships* all fell *flat*.

Lair of Dreams like everything else Miss Bray writes is *mind-boggling*. It's *big*. It's *insanely atmospheric* and it's *creeptastic*.

–goodreads.com

this book: boring
first book: enjoyed
this book: did not work
story: flat
characters: flat
relationships: flat

Lair of Dreams: mind-boggling
LoD: big
LoD: insanely atmospheric
LoD: creepstastic

1 Opinion mining, sentiment analysis

2 Applications of opinion mining

3 Problem definition

4 Methods

Opinion mining, sentiment analysis

Opinion mining / sentiment analysis:

*Given a set of **subjective** texts that express opinions about a certain **object**, the purpose is to extract those **attributes** (features) of the object that have been commented on in the given texts and to **determine** whether these texts are positive, negative or neutral. [Dinu and Iuga, 2012]*

Automatic opinion mining: why?

- many subjective texts exist
- mostly because of social media
 - ▶ people express their opinions in texts
 - ▶ one's opinions influence others' opinions
- emotions make part of a decision process (see [Minsky, 2007])

“Opinions” are key influencers of our behaviors. [Liu, 2012]

Opinion mining: applications

The screenshot displays a web application interface for MALL.cz. The main content area is divided into several sections:

- Product Overview:** MALL.cz logo, 91% rating (5 stars), and 4295 reviews.
- Category Ratings:**
 - CENA A TERMÍN DODÁNÍ: 5 stars (4237)
 - KOMUNIKACE ESHOPU: 5 stars (4163)
 - OBSAH ZÁSILKY: 5 stars (4113)
 - ZKUŠENOST S VRÁCENÍM ZBOŽÍ: 4.5 stars (579)
 - ZKUŠENOST S REKLAMACÍ: 4.5 stars (518)
- Payment Information:** Platba: On-line platby (PaySec, Raiffeisen banka), Platba kartou (Euro Card, Maestro, Master Card, VISA).
- Hodnocení (Reviews):**
 - jirichott** (5 stars): *Kritika:* Nakupovat na MALL.cz už nikdy! Jednou jsem to zkusil a byla to katastrofa. NEDOPORUČUJI!!!!
 - Lucie.P** (5 stars, verified customer): *Chvála:* velice spokojená
 - Jerry** (4 stars, verified customer): *Kritika:* Místo objednaného zboží došlo něco zcela jiného, což jsem zjistil po několika týdnech, že zboží vůbec nemají a tudíž jsem musel čekat na nové zboží.
- Table:** A table with columns for Client Name, Language, and Date/Time. It lists 'Clients feed...' in English on 2014-05-13 and 2014-05-10.

Opinion mining: related applications

- document sentiment classification:
This document contains a lot of negative statements.
- sentence subjectivity classification:
This sentence is objective.
- aspect-based opinion summarization:
Most customers of your company think that the communication is not good.
- mining comparative opinions:
Many people think that iPhone is better than SG.
- utility or helpfulness of reviews:
This review is useless.
- cross-lingual opinion mining

Problem definition

What is an opinion?

- an evaluating proposition: *Linux is great.*
- a comparative proposition: *Linux is better than Windows.*

*An opinion is simply a **positive or negative** sentiment, view, attitude, emotion, or appraisal about an **entity** or an **aspect of the entity** from an **opinion holder**. [Liu, 2012]*

entity e is a product, person, event, organization, or topic: iPhone, Madonna, Microsoft ...

aspect a (feature) is a component of e or attribute of e: battery, price, appearance, communication skills ...

Problem definition

opinion = $(e_j, a_{jk}, so_{ijkl}, h_i, t_l)$, where

- e_j is a target entity.
named entity recognition
- a_{jk} is an aspect/feature of the entity e_j .
information extraction
- so_{ijkl} is the sentiment value of the opinion from the opinion holder h_i on feature a_{jk} of entity e_j at time t_l .
sentiment identification
- h_i is an opinion holder.
information extraction
- t_l is the time when the opinion is expressed.
information extraction

not just **one** problem

anaphora resolution + synonym matching

Problem definition

Generally, find structure in **unstructured** data (text)

- document level opinion mining: *The document is negative.*
- sentence level: *The sentence is negative.*
- object/entity and feature/aspect level: *iPhone is expensive.*

Classification task:

- 2-classes: positive/negative
- 3-classes: positive/negative/neutral
- 5-classes ...

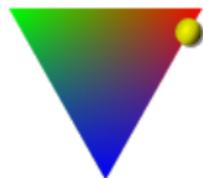
A hard problem (sometimes)

- opinion mining in tweets is relatively easy (short texts, hashtags) usually 3-classes classification for each tweet
- opinion mining in reviews is harder but still the form contains aspects and the reviewer has to mark the review positive/negative usually 2-classes classification for each aspect (e.g. high price)
- opinion mining in discussions, comments, blogs is very hard

sentiment lexicon

evaluative words: nice, cool, shit, bad. . .

SentiWordNet [Baccianella et al., 2010]



Positive: 0 Objective: 0.125 Negative: 0.875

blue = filled with melancholy and despondency

A hard problem (sometimes) II

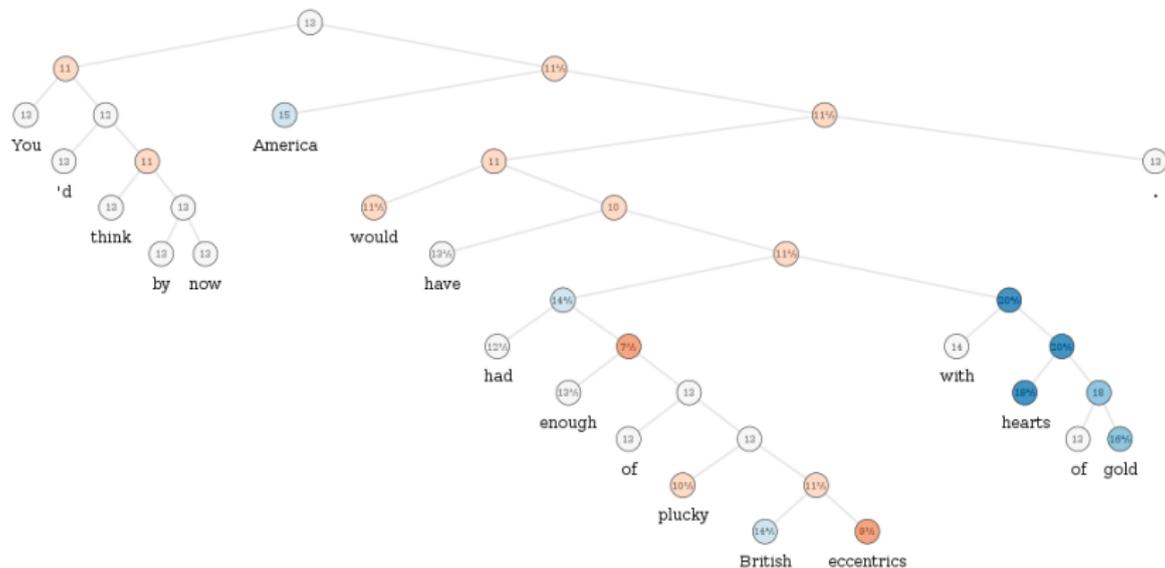
evaluative word	aspect	sentiment
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thin	phone	good
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thin	steak	bad
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high	value	good
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high	price	bad
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Opinion mining methods: supervised machine learning

- 1 get example data with labels
- 2 extract features from the data, i.e. convert the documents to feature vectors
- 3 train the parameters (choose an algorithm: SVM, Naive Bayes, Neural Networks ...)
- 4 test the model

Opinion mining methods: supervised machine learning

[Dinu and Iuga, 2012] report best results on Naive-Bayes with tokens as features and bigrams as features

[Liu, 2012] reports best results with SVM on balanced (English) data
what features, feature extraction methods, training algorithm, parameters of training algorithm to use for Czech data?

let's see during the workshop

Opinion mining methods: state-of-the-art results

- OM on political tweets, [Maynard and Funk, 2012] report **78% precision** and **47% recall**
- on document level OM (movie reviews), [Richa Sharma and Jain, 2014] report **63% accuracy** and **70% recall**

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