Sentiment Analysis

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Announcements

- Friday 25/04: Project update 1
- Friday 09/05: Reading assignment: Bias in word embeddings

Transformers reading assignment: Questions

- The training of these transformer models is performed on GPUs. But, what exactly are GPUs? And how do they work?
  - TPUs
- Is this the only model architecture that can parallelize?
  - RNN, CNN, Word2Vec?
- Is it possible to have different attention functions?
  - Masked attention in decoding to avoid peeking ahead
- Is there any new progress made on self-attention models since this paper was released?

Transformers reading assignment: Questions

- Even though positional might be beneficial in text analysis, what about for example logical derivations, in which the order is crucial for correct understanding but at the same time they can be relatively long.
- If attention-based transformer models are so much more efficient (and also explainable) than RNNs, are there still any advantages or current applications for RNNs?
  - LSTMs
- Why weren't transformers explored earlier?
- How can a model like the Transformers be improved further?

Sentiment Analysis

★★★★★ 6 maanden geleden

This is really a top notch sea and honestly my favorite sea out of all of them. I learned that the water gets saltier the further east you go in the sea which makes people more buoyant when swimming. If I could give it 10 stars, I totally would!

Sentiment Analysis

This review is from: **Black Dragon T-Shirt 100% Cotton Short Sleeve Shirt Pre-Shrunk (Apparel)**

This is, without a doubt, the best black shirt with an angry monochrome dragon perched on two natural pillars on a cliff that I have ever seen. I know that when I get married, this is the undershirt I'll wear. The amount of awesome displayed on your chest canvas while wearing this shirt, obviously a shirt given to man by Zeus himself, is currently impossible to calculate using our current mathematical constructs. We actually need to devise a new form of mathematics which we should call Wurm Theory in order to parse the data.

Demo

https://text2data.com/Demo

Definition

- Sentiment Analysis: The study of **opinions, attitudes and emotions** towards an entity expressed in a text
  - Persons, objects, events, topics
- Text classification of subjective information
- A one-dimensional scale of opinions is often assumed
  - like/dislike
  - for/against
  - positive/negative
  - five stars - one star
- Negative and positive polarity
  - Negative polarity item

Tasks

- Sentiment Classification
  - Classify the opinions expressed in a text or document into categories or on a scale
- Subjectivity Classification
  - Detect to what extent a text contains opinions, evaluations, emotions, beliefs etc.
- Opinion Summarization
  - Summarize the opinions generated by describing a specific entity
- Opinion Retrieval
  - Retrieve documents that express an opinion about an entity of interest
- Emotion Detection
- Sarcasm/Irony Detection
- Opinion Spam Detection
  - Messages/reviews that aim to distort the public perception of an entity

Opinions on entities?

1. I bought an iPhone a few days ago.
   - a fact, not an opinion
2. It was such a nice phone.
   - positive opinion
   - on the phone as a whole
   - from the author of the review
3. The touch screen was really cool.
   - positive opinion
   - on a component of the phone
   - from the author of the review
4. The voice quality was clear too.
   - positive opinion
   - on a characteristic of the phone
   - from the author of the review

Opinions on entities?[1]

5. Although the battery life was not long, that is ok for me.
   - negative opinion?
   - on a characteristic of the phone
   - from the author of the review
6. However, my mother was mad with me as I did not tell her before I bought it.
   - negative emotion/opinion
   - towards the author of the review
   - from the mother of the author of the review
7. She also thought the phone was too expensive, and wanted me to return it to the shop.
   - negative opinion
   - on a characteristic of the phone
   - from the mother of the author of the review

[1] Example from Liu (2010) Sentiment Analysis and Subjectivity. In Indurkhya & Damerau (eds.) Handbook of Natural Language Processing, CRC Press: Chapter 26.

Entities

- Entity of interest can be a product, person, event, organization or topic
- Entities can have components (battery, screen)
- Entities can have attributes (size, weight, price)
- Or just ‘object features’

Opinions

- A view, attitude, emotion, or appraisal on a feature from an opinion holder
- **polarity**: positive, negative or neutral orientation
- **emotion**: subjective feelings and thoughts. Many categorization schemes exist, e.g. VADC, Valence - Arousal - Dominance - Concreteness
- **opinion holder**: a person or organization. Often the author of a post, or sometimes another party that is mentioned (e.g. in a news article)

Unit of analysis

Sentiment of...

- A community
- A specific other person
- The user/author
- Expressed in a document, e.g. a song
- Clause, sentence or paragraph
- Entity or object feature

Applications

- Movies: is this review positive or negative?
- Product: what do people on Twitter think about the new iThingy?
- Advertising: show an ad of our product to people who expressed positive sentiment on a similar product
- Politics: how much do people like this political party currently?
- Economics: is the Twitter stock going to go up or down?
- Users: what other users share similar feelings towards an entity of interest?
- Public sentiment: how is consumer confidence?
- Customer support: is this customer happy or unhappy?
- ...

Characteristics

Sentiment analysis is a type of text classification, but...

- Relatively few categories
- Categories not independent, but e.g. ordinal
- Often not connected to particular domains, topics or users
- Opinions are expressed in complex ways
  - Lexical content may not be enough
- Ordering effects
- Use of rhetorical devices such as sarcasm and irony
- Information often left implicit
- Different sentiments expressed within a text or even sentence
- Relevance of smileys/emoji

Characteristics

- Negation is complicated
- What is the scope?

I do **not** *call this film a comedy movie and it's bad*

- Scope ambiguity

I wasn't watching all the time
= I was watching none of the time, or I was watching some of the time?

- Long distance negation

I really like horror movies, but I do **not** *feel the same about this one*

Methods

- Supervised classification
  - e.g. (binarized) Multinomial Naive Bayes
  - Many datasets available, e.g. movie review polarity datasets, Amazon reviews
  - Plenty of self-annotated data
- Use of lexical resources
  - SentiWordNet
  - WordNet synsets with sentiment scores: positivity, negativity and objectivity
  - Whissell's Dictionary of Affective Language
  - About 9000 words rated in terms of their Pleasantness, Activation, and Imagery (concreteness)

Methods

- Use of lexical resources
  - Regular WordNet (Hu & Liu, 2004)
  - Begin with known adjectives: “great”, “excellent”, “awful” etc
  - For unknown adjectives, measure distance to seed adjectives
  - Use k-nearest neighbour style classification to decide
- Hu & Liu, 2004 developed their own polarity lexicon using this method (2006 positive and 4783 negative words)

Methods

- Supervised classification

Useful features:

- Terms and their (weighted) frequency
- Part-of-speech tags
- Opinion words and phrases (“what a trainwreck!”)
- Negation
- Emoticons/emoji
- Syntactic dependencies

Evaluation issues

- Low inter-rater reliability, hard to get a ground truth
- STS-Gold dataset: Full agreement only on 2/3rd of tweets (for negative/positive/neutral)
- Krippendorff's alpha of 0.765 for tweet-level annotation
- 0.416 for entity-level annotation per tweet

Sentiment is subjective and can be reader-dependent