Comparing Aspect-Based Sentiment Analysis Classification of Discourse Units and Sentences

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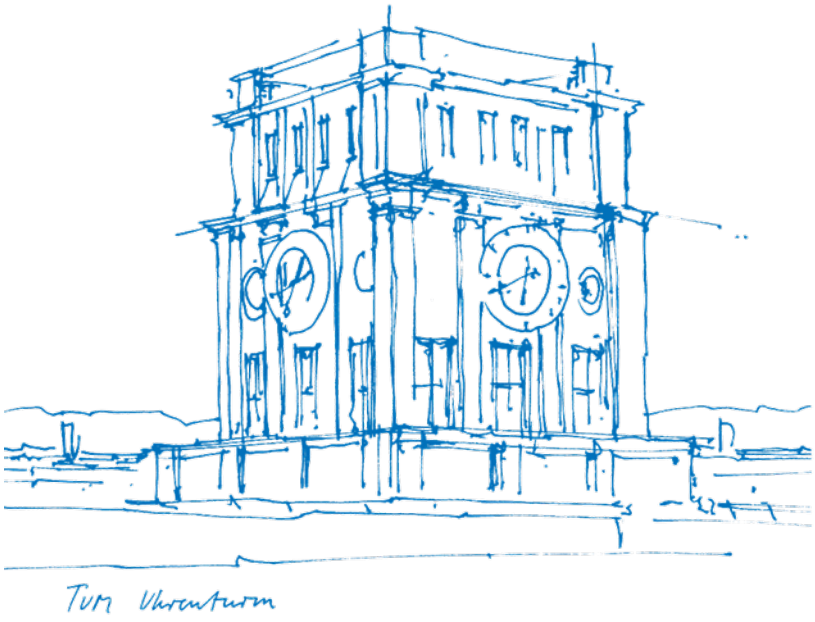
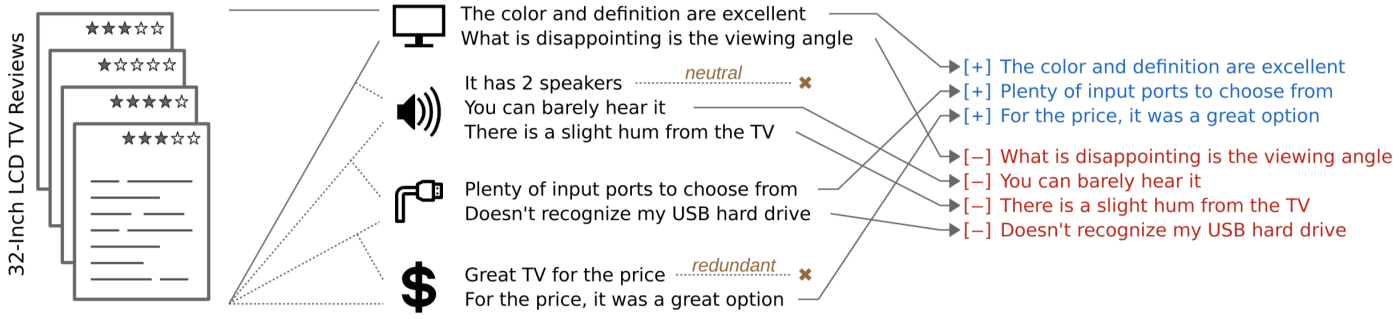


Steps for Sentiment Analysis

1. Segment-Parsing
   a) Sentences
   b) Discourse units **(from RST parser)**
2. Aspect Extraction
   XLING as segment wise features
3. Sentiment Prediction
   Multi-Instance Learning (MILNET [1])
4. Summarization
   Identify aspect-specific and salient units + minimize redundancy



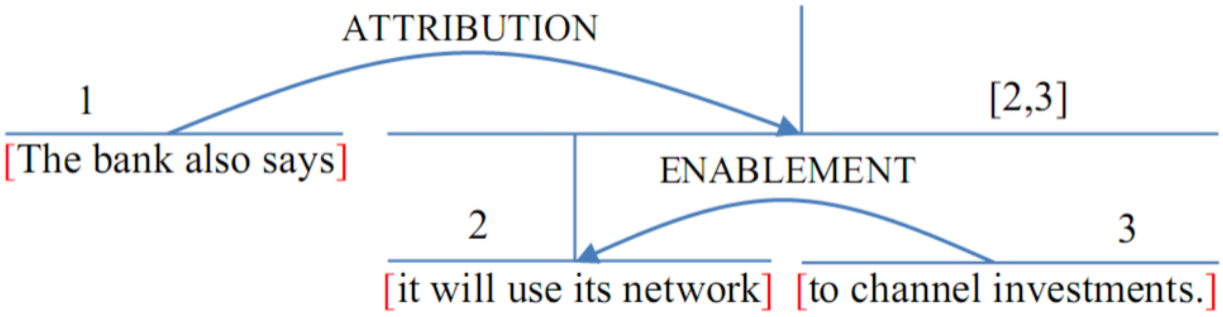
[1] Angelidis, Stefanos. "Multiple Instance Learning Networks for Fine-Grained Sentiment Analysis", 2018

RST Segmentation and EDUs

Goal: split text into elementary discourse units (EDUs) and analyze the rhetorical relationship between them.

Steps:

- **Segmentation** divide text into EDUs. Each EDU has a distinct purpose in its sentence
- **Parsing** Build rhetorical tree with the EDUs. It defines the relationships between the EDUs, thus helps to understand the text in a higher dimension



RST Segmentation Methods: Models

Rule-Based Model

Split the sentence into discourse units with fixed rules, including discourse cue, punctuation, grammar rules, etc.

Statistical Model

Consider the problem as a binary classification problem. For each word N_w, calculate the following probability of the word being a discourse unit boundary:

$$P(b|w,t) = \frac{Cnt\left(N_p \rightarrow ...N_w \uparrow N_r...\right)}{Cnt\left(N_p \rightarrow ...N_w N_r...\right)}$$

N_p is the parent of N_w in lexical syntactic tree, and N_r is the sibling of N_w. Split the sentence at the position of the words which have $p(b|w,t) > 0.5$.

RST Segmentation Methods: Models

Neuronal Network Model

Like the statistical model it approaches the problem as a binary classification and extracts similar features. Models the discourse segmentation with a neuronal network.

Sequential Model

The sequential model approaches the segmentation problem as a sequence labelling task conditioning the probability of a label sequence y on the observed sequence x.

XLING Embeddings

Universal Cross-lingual Sentence Encoder (based on M. Chidambaram et al., 2018)

- **Input:** Text of variable length in arbitrary language (does not have to be specified beforehand)
- **Output:** Embedding vector of length 512

Properties of XLING:

- Optimized for greater-than-word length text
- Trained on different tasks like Conversation Response Prediction or Natural Language Inference
  - Embeddings are useful out-of-the-box for several applications
  - Possibly we can use existing pre-trained XLING embeddings
- Cross-lingual $\rightarrow$ ability to analyze e.g. English and German reviews with the same model

Next Steps & Open Questions

- Input-Data preprocessing
- Comparing the different RST-Parsers
- Determine how close we want to follow the provided paper for the “sentiment analysis classification"[2].

[2] Angelidis, Stefanos. SSummarizing Opinions: Aspect Extraction Meets Sentiment Prediction", 2018