

Amazon Product Reviews

Categorization and Visualization

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Introduction

- Customer reviews in online retailing:
 - Different from traditional brick-and-mortar stores
 - Insights about the product
 - Decide to buy or not
- Problems:
 - Read all reviews: exhausting task
 - Read only top reviews: not complete picture
 - Review sentiment may be not sentence sentiment

Solution

- Visualization system:
 - Extract & Visualize ALL reviews by topics
 - Topics are learn from data
 - Indicate topic-sentence sentiment
 - Feed back to improve the system
 - Deployed as a plugin of browser

Related works

- Opinion space
 - Review as a point in space, good overview of product
 - Our hierarchical solution is for an easier way to browse reviews
- Review summarization
 - Feature-based, e.g. camera = picture quality + screen + battery ...
 - Word counting, e.g. pair of adjective-noun
 - Our topic-based categorization is expanded for out-of-product attributes, e.g. customer service
- Opinion mining
 - Feature-based opinion mining, count +/- keywords for product features
 - Our approach is simpler in the sense that using only +/- ngrams

Work flow

- Review retrieval:
 - Perl scripts to crawl product pages
 - Amazon web service
- Features learning from training dataset:
 - Star rating (review sentiment), helpfulness ratio
 - Learn review topics
 - Learn positive / negative ngrams
- Review computation
 - Infer topics of new review
 - For each topic extract the most representative sentences
 - Compute sentiment score of those sentence

Components

- Visualization
 - Bubble Tree Library (JavaScript, JQuery)
 - Interactive visualization of hierarchical data
- Opinion mining
 - Retrieve 1-2star and 4-5star reviews to build training data
 - Learn positive and negative ngram with sentiment score
- Topic modeling
 - Run LDA on ~500 products to learn 20 topics
 - Record top 100 words of each topic for topic labeling
 - Record word probabilities given topic to compute topic score for sentence

Opinion Mining

- Collect 1, 2, 3-grams from two sets of review
 - 1, 2-star reviews for the set of negative ngrams
 - 4, 5-star reviews for the set of positive ngrams
 - In each set, sort ngrams by frequency
 - For each individual ngram, compute difference of ranks on 2 lists
 - $\text{Sentiment_score} = \text{rank_difference} \times \text{frequency_in_list}$
 - Each individual ngrams has 2 scores
- Aggregating ngrams' sentiment_score for sentiment score of sentence

Topic Modeling

- Run Latent Dirichlet Allocation (LDA) on reviews of 500 products with 20 topics (> 33.5K reviews)
 - Each topic, record top-100 words with their probabilities
 - Each top word is represented by a vector of 20 probabilities
 - Probabilities < mean are set to 0
 - Final list of triples <word, topic, prob.>
- Compute 20 topic-scores for each review sentence
 - Return the topic has the largest score
 - Segment review into topic-sentences

Data and user study

- Camera products on Amazon
- Conduct user study to evaluate
 - Advantage of hierarchical representation over linear method
 - Accuracy of topic modeling and opinion mining
- Compare to Amazon traditional review list
- Different versions of review browsing
 - Categorize on star-rating
 - Categorize on topic then star-rating
- Sentence sentiment
 - Indicate or not
- Measure on user satisfaction

Conclusion

- Product review exploring
 - Learn topics and sentiments from data
 - Infer topic score and sentiment score for each review sentences
 - For HCI course, NLP techniques play supporting role
- Main purpose:
 - Product review summarizing -> an application for product study, and market research,
 - Exploit all possible information
- How to make it a feasible NLP project
 - Topic labeling
 - Standard evaluation for inferred topic/sentiment at sentence level

Thank You!
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Demo