

Contrastive Review Summarization

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1. Introduction

Suppose you want to purchase a product from an e-commerce website, such as Amazon, and want to see how other users who have bought the product feel about the product. To do this, one will have to go through many user reviews and try to find out the frequently occurring user opinions about the product. To cut the chase down our system would be generating two summaries depicting the pros and cons of any product learned from the user reviews corresponding to that product.

2. Description

Presently, for any product on Amazon it displays all the user reviews sorted by helpfulness, which is measured by the number of users rating it as helpful. Consumers reading the reviews usually don't mark every review as helpful or not and so there might be opinions which are expressed frequently across multiple reviews but does not show up the order as they were not marked helpful. Our system will solve this problem by learning the frequent Positive/Negative opinions from the reviews and display it as one coherent summary for each Positive/Negative view.

There are various challenges to be tackled to achieve the goal, such as

- Sentiment Analysis: Every review will need to be categorized as positive or negative. The inherent issues while solving this task is to
 - Identify the subject and the opinion about that subject.
 - Understand little nuances like sarcasm which makes it difficult to categorize as positive or negative view.
- Identify the frequent subject-opinion phrases across multiple reviews because sentences or phrases which convey the same idea can be written in different fashion.
- Generate a summary incorporating the above frequent subject-opinions in a coherent and non-robotic manner.

Sentiment Analysis will be done using an efficient off-the-shelf classifier. The training dataset for sentiment analysis of user reviews will be collected using the Amazon's *Product Advertising API* which will be manually labelled as either positive or negative. Identifying the subject-opinion pair in a sentence will be done using a relevant POS tagging classifier in conjunction with WordNet. Single document summarization of the above opinions will be done by implementing a graph based iterative ranking algorithm.

The system's overall performance will be measured by taking the average of Scores of the three sub-tasks measured in the following manner

- Sentiment Analysis F-Score will be calculated automatically from the development data as specified below:

$$\text{Precision} = \frac{\# \text{ Correct Positive/Negative Reviews}}{\# \text{ Identified Positive/Negative Reviews}}$$

$$\text{Recall} = \frac{\# \text{ Correct Positive/Negative Reviews}}{\# \text{ Actual Positive/Negative Reviews}}$$

- Similarly, F-Score of the frequent subject-opinion phrases can be calculated as

$$\text{Precision} = \frac{\# \text{ Correct Frequent Subject – Opinion Phrases}}{\# \text{ Identified Frequent Subject – Opinion Phrases}}$$

$$\text{Recall} = \frac{\# \text{ Correct Frequent Subject – Opinion Phrases}}{\# \text{ Identified Frequent Subject – Opinion Phrases}}$$

where, Correct and Actual Subject-Opinion Phrases will be annotated manually.

- Summarization Score can be evaluated based on N-point grading scale, in which a summary scoring above certain threshold value will be considered as an Acceptable Summary. Also, the number of Actual Summaries is equivalent to the number of products, assuming that each product will have one comprehensive summary. Moreover, N-point grading scale consists of criteria such as correct grammar, meaningful sentence, coherent paragraph, etc.

$$\text{Score} = \frac{\# \text{ Acceptable Summary}}{\# \text{ Actual Summary}}$$

Research, Planning and Design for the system would be done together along with the evaluation of the system. Subsequent implementation of the task would be divided as follows:

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- Sentiment Analysis
- POS Tagging

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- Identifying frequent Subject-Opinion
- Review Summarization