Project proposal: Unmasking Sarcasm - Enhancing Sentiment Analysis in E-Commerce Reviews and Questions

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1. Problem description

In an increasingly e-commerce driven world, the analysis of review, comments and questions written by consumers online has become a field of interests. Understanding opinions and emotions expressed in product feedback/related questions is essential to enhance the user's experience. One aspect that might be overlooked in this area is sarcastic and humor detection that can lead to a misinterpretation of these texts.

Humor remains a complex human phenomenon that is far from having a clear definition. While humor and sarcastic mechanisms are integral to human interaction, its subjective nature makes it a challenging target for computational analysis. Recent work has been able to open up this area using deep learning and natural language processing advances. With this project, we will attempt to improve e-commerce review processing using deep learning models for humor disambiguation.

2. Brief Survey of Previous Work

Several studies have been conducted over the past years in the ambition of detecting humor and sarcasm:

Jain et al. [3] delved into the complexities of identifying sarcasm in Amazon reviews. Recognizing sarcasm is crucial for accurate sentiment analysis, especially since sarcastic comments can be misinterpreted by traditional opinion mining methods. They utilized the "Sarcasm Corpus" containing labeled ironic and regular Amazon reviews, extracting features like sentiment scores, punctuation patterns, and contextual elements that consider the contrast between review sentiment and product rating. Their experiments designated the Support Vector Machine (SVM) classifier as the most accurate, emphasizing the role of context in sarcasm detection.

Building upon the idea of sarcasm detection, Poria et al. [4] introduced a method using deep convolutional neural networks (CNNs). They critiqued traditional methods that treat sarcasm detection as mere text categorization, arguing that such approaches often miss the deeper understanding of language nuances required for sarcasm. Their method integrates sentiment, emotion, and personality features extracted from pre-trained CNNs. By leveraging Twitter data, they contrasted sarcastic sentences with the ground-truth polarity of events. Their experiments with word embeddings from word2vec and a combined CNN-SVM approach demonstrated superior performance on benchmark datasets.

Yaghoobian et al. [5] further discussed the challenges of sarcasm detection in sentiment analysis. They categorized detection methods into content-based, which focus on lexical indicators, and context-based, which emphasize background knowledge. Their study highlighted the CASCADE model, which uses user embeddings to capture user-specific features, as an example of leveraging context for sarcasm detection.

Shifting the focus to humor detection, Ziser et al. [6] identified product bias in Product Question Answering (PQA) systems, where certain products attract more humorous questions. They proposed a deep-learning framework to detect humor in PQA, focusing on incongruity and subjectivity.

Annamoradnejad and Zoghi [1] proposed the ColBERT model for humor detection. This model leverages BERT embeddings for sentence representation and has achieved state-of-the-art results on various datasets.

Lastly, Gupta et al. [2] explored the potential of Large Language Models (LLMs) in humor detection. Their research emphasized the capability of LLMs to capture the intricacies associated with humor and offense detection.

3. Preliminary Plan and Ideas

Our project focus on how sentiment analysis tools dedicated to sarcasm and humor disambiguation can be used to enhance E-commerce review and Q&A processing. It can be divided in 5 main milestones:

1. First, we implement a basic model able to detect humor/sarcasm in small text reviews. This model would only be capable of saying whether or not a given phrase/text contains humor or sarcasm patterns. To

build the model, we compare different approaches published in the scientific literature.

2. Second, we improve the model to take into account several factors such as the type of product considered, its description, price, etc. (as sarcasm may be related to one aspect of the product). Feeding the model with the context can also help identify if some type of products are more prone to trigger humorous or sarcastic comments.

3. Third, we compare our model to a LLM such as Chat-GPT to assess if our dedicated humor/sarcasm classification model performs significantly better than a state of the art LLM using an appropriate prompt. We analyze the cost of both solutions.

4. Fourth, we improve our model to properly classify a product review considering its sarcastic/humorous sense into meaningful categories such as "consumer thinks the product is overpriced", "consumer thinks the product is good quality", etc. For instance, humor regarding the price of a product may indicate the product is overpriced compared to the customer's expectations.

5. If time allows it, we will use our sarcastic model detection to generate relevent automatic answer that take into account the humorous tone of the comment/question.

References

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