Sentiment Classification in Internet Memes: A Multimodal Study

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Abstract

The internet has given rise to a unique form of expression: memes. These humorous and often satirical images and text combinations have become a significant part of our online culture. Internet memes have the power to convey a wide range of sentiments, from humor to anger to political commentary. Analyzing the sentiments behind these memes is not only a fascinating study in itself but also holds the potential for applications in various fields, including social media analysis, NLP, image/text classification, text mining, machine learning, deep learning, and sentiment analysis. This project aims to explore and understand the sentiments behind internet memes through a comprehensive analysis of a diverse dataset comprising 6992 meme images. The primary objectives of the project include sentiment classification and majority voting, employing six classifiers - three for image analysis and three for text analysis, sourced from the popular scikit-learn (sklearn) library. The project will provide a holistic evaluation of classifier performance by presenting key metrics such as confusion matrices, accuracy, recall, precision, and F1-measure. By analyzing both image and text data in the context of memes, our project adopts a multimodal approach to sentiment analysis, offering a deeper insight into the emotions and messages conveyed through this unique form of online communication. The findings of this study have the potential to enhance our understanding of online sentiment dynamics and the ways in which individuals use humor and satire to express their emotions and opinions in a digital age. Furthermore, the project's outcomes may have applications in content moderation, trend analysis, and brand sentiment monitoring, making it a valuable endeavor with relevance in various domains.

In summary, this project embarks on an exciting journey to uncover the sentiments and emotions behind internet memes, offering a rich dataset for analysis and a toolkit of machine learning techniques to decode the laughter, satire, and underlying messages of online meme culture.

Keywords

Sentiment analysis, memes, data mining, expression, NLP, machine learning.

1 Introduction

Memes are an integral component of internet communication platforms, which has made them an effective means of communicating thoughts, feelings, and responses. Memes are a great resource for learning multimodal sentiment analysis since they combine text, graphics, and occasionally even videos. Memes provide a special chance to investigate the complex interaction between words and visuals in expressing feelings and emotions because of the way that they juxtapose textual information and visual features. This project's main goal is to use social data mining, natural language processing and machine learning to determine sentiment from meme image datasets. We hope to close the sentiment analysis gap that standard textual approaches frequently fall short of by doing this. We seek to identify and comprehend user sentiments, opinions, and humor through meme analysis, which can be useful for a variety of purposes such as content suggestion, social media monitoring, and market research.

Through the advent of this project, we will explain the project's objectives and methods in order to clarify how we intend to create a system that can reliably determine the sentiment contained in memes, as well as the possible advantages and uses of this cutting-edge instrument.

2 Previous work

An overview of the previous work on similar titles of the project brings forth that an approach which uses a combination of Vision transformers, Word based transformers, sentence transformers and Bidirectional LSTM gives a testing accuracy of 62.77[6]. For data preprocessing[1], the images are transformed into equal sizes of $150 \times 150 \times 3$ followed by Keras image preprocessing function to make them suitable before driving into the CNN models. Another way implemented previously[2]uses Machine Learning methods and a process involving text detection and text extraction which is later supplied to a BERT language model along with image segmentation. For the text classification part Pimpalkar et al. use VGG16 convolution neural network model. Furthermore, an optimized LSTM model[5] was effectively used for Sentiment Analysis involving textual data(Amazon reviews, book reviews and tripadvisor dataset) where the text pre-processing was carried out using word tokenization and stemming followed by segregation. If only text data would have been considered for sentiment analysis, a very good model[3] was formed based on the DL method and the GloVe word embedding approach, learns the features using a CNN layer and then coordinating all of them into a Multi-Layered Bi-Directional Long-Short-Term Memory (MBiLSTM) to capture long-range embedded circumstances. After this brief overview, the most impressive method followed a multimodal[4] involving VGG19 and BERT language model which gave an accuracy of 67.12 on a dataset of 10,115 images.

3 Methods

The pipeline of a recommendation system has the following five phases
1)Pre-processing
2)Model Training
3)Hyper Parameter Optimization
4)Post Processing
5)Evaluation

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