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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Mini-Project Synopsis

V – Sem
2024-2025 (Odd)

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MINI-PROJECT DETAILS:

Title:	Emotion Detection and Sentiment Analysis of Text using ML
Domain:	Machine Learning

For office use only:

Group ID:	
Guide:	
Status:	Accepted / To be modified / Rejected

Signature of the Mini Project Co-Ordinator

Title: Emotion Detection and Sentiment Analysis of Text using ML

Abstract

Sentiment analysis is one of most important aspect of today's world. From the fields like traditional business marketing to its modern adaptations like E-commerce and digital marketing, it has been a pivotal element in recognizing the overall likeliness of the product one is going to market and how well it is going to perform. It's importance in today's world can also be estimated in terms of its need in ever growing world of social media where we need to identify the sentiments behind the users' actions like posting some vulgar message, memes, or videos that can be treated harmful and sensitive whose prevention is again a responsibility of the community as whole.

Introduction

Emotion detection and sentiment analysis are two rapidly advancing subfields of Natural Language Processing (NLP) that focus on understanding human emotions and opinions expressed in text or other forms of data. Sentiment analysis traditionally aims to classify textual data into positive, negative, or neutral sentiments, while emotion detection dives deeper by identifying specific emotions such as joy, anger, sadness, or surprise. These technologies have become pivotal in areas such as social media analysis, customer feedback systems, and even mental health monitoring. As the volume of user-generated content continues to increase, the need for systems capable of interpreting and responding to human emotions in real-time has grown substantially.

One of the primary challenges in emotion detection and sentiment analysis is the complexity of human emotions. Unlike straightforward opinions that can be classified as positive or negative, emotions are multifaceted, subtle, and often context-dependent. Sarcasm, irony, or mixed emotions can make it difficult for algorithms to interpret text correctly. Current advancements in NLP, particularly through deep learning models such as transformers, have made it possible to extract deeper layers of meaning from text. Emotion detection models often leverage large datasets annotated with emotions, employing techniques like word embeddings and contextual analysis to enhance their performance in understanding the nuances of human expression.

The applications of emotion detection and sentiment analysis are vast and varied. Businesses use these tools to gauge customer satisfaction by analyzing reviews and feedback, while social media platforms utilize them to monitor public sentiment on a wide range of issues, from product launches to political events. In healthcare, these technologies are being explored for detecting signs of mental health conditions like depression or anxiety by analyzing patients' language patterns. Interactive systems such as chatbots and recommendation engines also benefit from understanding users' emotional states, allowing them to offer personalized and empathetic responses, thus improving user experience. As the technology evolves, the ability to discern not only sentiment but also the underlying emotions will play a crucial role in the future of human-computer interaction.

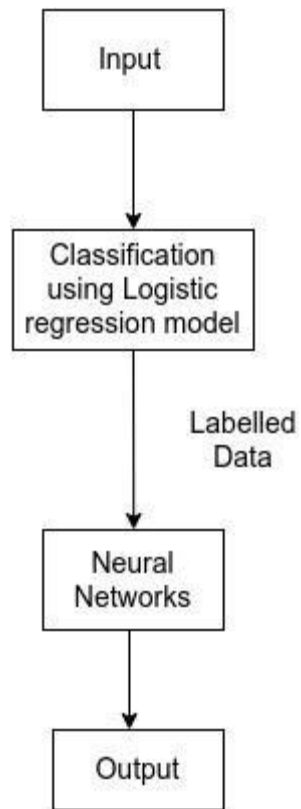
Problem Statement

To develop a machine learning model to perform sentiment analysis and emotion detection on textual data which requires classifying text into three sentiment categories: positive, negative, and simultaneously detecting and classifying emotions expressed in the text into specific emotion categories, such as joy, sadness, fear, anger, surprise, etc. via means of ML techniques like Logistic Regression and Neural Networks.

Objectives

- Develop a machine learning model to classify text into general sentiment categories such as positive, negative, or neutral.
- Ensure that the sentiment analysis model performs well across diverse datasets, including customer reviews, social media comments, and news articles.
- Build a model to detect specific emotions from text, such as joy, anger, sadness, fear, surprise, disgust, etc.
- Accurately identify multiple emotions within a single text if applicable (e.g., mixed emotions in a complex statement).
- Develop a scalable system that can be deployed in real-world applications, such as customer feedback analysis, social media sentiment tracking, or mental health monitoring.
- Identify the differences between biased, un-biased, fake and real sentiments.
- Bifurcate criticisms into sarcastic and genuine criticisms.
- Create an Self-Updating model that updates itself as subtle meaning of words changes according to changing cultures, times or user context.

Block Diagrams/Architecture



SENN Based Model
(Semantic-Emotion Neural Network)

Modules/Component Description

Logistic Regression: Logistic Regression is a statistical method often used in binary classification problems, but it can also be extended to multiclass problems.

Emotion Detection: It classifies emotions into anger, happiness, sadness and many more broad categories.

Sentiment Analysis: These various categories of emotions are categorized as positive, negative or neutral sentiments.

Neural Networks: Neural networks detect the semantic relationships between words and localized features in text to better understand emotions. Neural networks are particularly useful for emotion detection because they can model non-linear patterns, which are common in human language. Unlike logistic regression, which is linear, neural networks can learn intricate patterns and representations from the input data.

Expected Outcomes

Model should be able to:

- Classify sentiments of user based on text into positive, negative or neutral categories with high accuracy across diverse datasets (customer reviews, social media comments, news articles)
- Detect specific emotions and be able to handle multiple emotions in a single text
- Differentiate between sarcastic and genuine comments, particularly for online reviews and social media posts
- Understand differences between biased vs. unbiased and fake vs. real sentiments, especially in domains like product reviews and news articles
- Distinguish between sarcastic criticisms and genuine feedback, especially important for customer service applications
- Adapt to change in language and culture, continuously learning from new data to stay relevant
- Combine sentiment with emotion layers for more nuanced analysis

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