Analyzing Shifts in Reddit User Opinions

A Pre and Post War NLP Sentiment analysis Project

NLP Project Proposal - Team 8

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1 Introduction

In today's interconnected world, online platforms such as Reddit have become critical arenas for public discourse, offering unique insights into societal opinions and behavioral patterns [5]. The diverse range of topics discussed and opinions shared on such platforms provide an invaluable resource for analyzing social dynamics, particularly in the context of significant global events [3].

In this project we would like to explore **How do Reddit users' opinions and sentiments shift pre- and post-war in response to the Israel-Palestine conflict?**

By examining large-scale data from Reddit, we aim to understand how users' expressed sentiments and stances evolve in response to major events [7], with a specific focus on the Israel-Palestine conflict following October 7, 2023.

This research area essential because understanding sentiment dynamics during such events reveals societal impacts and informs moderation strategies for fostering constructive dialogue. By applying advanced NLP techniques and social network analysis, this study bridges computational analysis with social insights.

Through this study, we aim to bridge the gap between computational analysis and social understanding, providing actionable insights into the ways public opinion evolves in digital spaces during times of conflict. This research not only contributes to the fields of **Natural Language Processing (NLP)** and social network analysis but also highlights the broader societal implications of online discourse during significant global events.

2 Data

The success of this project relies on the use of large-scale, structured, and unstructured datasets from Reddit, which provide a comprehensive view of user discourse. Two primary datasets have been selected for analysis.

- **Kaggle Dataset:** A tabular dataset comprising over two million Reddit posts. This dataset primarily includes posts from the `IsraelPalestine` and `worldnews` subreddits, providing a high-level overview of user activity and sentiment trends.
- **Raw Reddit Data:** A JSON-formatted dataset representing the complete tree structure of discussions within the `IsraelPalestine` subreddit. This dataset includes posts and comments dating back to January 2023, enabling a detailed exploration of conversational dynamics.

These datasets cover diverse user perspectives over time, making them ideal for sentiment analysis and trend tracking.

The labeled data and tree-structured format allow fine-tuning of transformer models and construction of dynamic social networks, addressing the nuances of opinion evolution.

3 Methodology

This section describes the techniques used to analyze shifts in Reddit user opinions on the Israel-Palestine war, including data collection, machine learning fine-tuning, social network analysis, and evaluation as illustrated in 1. The goal is to uncover sentiment trends and identify factors influencing changes in user stances.

3.1 Data Collection and Preparation

The first step in our methodology involves collecting large-scale Reddit data related to the `IsraelPalestine` war, with a focus on posts from subreddits such as `IsraelPalestine`. The data is then preprocessed to remove irrelevant metadata and ensure consistency and quality for analysis. Finally, the dataset, including Kaggle-sourced data, is labeled with user stances (*pro-Israel*, *pro-Palestine*, *neutral*) using a combination of automated classification methods and manual verification.

3.2 Fine-Tuning LLM and Evaluation

This stage involves fine-tuning state-of-the-art (SOTA) models to classify sentiment and user stance shifts effectively. Encoder-based models such as BERT[1] and RoBERTa[4] are fine-tuned on labeled Reddit data to enhance sentiment classification accuracy. Furthermore, zero-shot and few-shot learning techniques

using generative models such as GPT [2] or Llama [6] are explored to classify stances without requiring extensive labeled data. Model performance is evaluated using metrics such as accuracy, precision, recall, and F1-score to ensure robustness. Edge cases are included to highlight limitations, such as a naive LLM misclassifying informal language, exemplified by the post: "Bruh, Israel be wildin', but Hamas ain't exactly playin' fair either, ya feel me?" Fine-tuning addresses these gaps, tailoring the model to nuanced dataset contexts.

3.3 Building a Dynamic Social Network

This step involves constructing a dynamic social network from Reddit's tree-structured data, capturing user interactions such as posts, comments, and replies. Classification results from the fine-tuned models are integrated to attribute sentiment and stances to users and their interactions. By tracking changes over time, the network enables analysis of shifts in user engagement and the propagation of opinions within the community.

3.4 Event Correlation and User Timeline Analysis

To identify key dates when shifts in political stances occurred, we adopt a two-pronged approach. First, an event-based analysis cross-references significant dates, sourced from Google, with our dataset to identify correlations between major events and changes in user perspectives. Second, a user timeline analysis tracks individual users' political stances over time, pinpointing turning points and extracting dates of sentiment shifts. By investigating these dates, we aim to uncover whether notable events influenced changes in sentiment.

This dual approach will help us better understand how external events and individual trajectories contribute to shifts in political stances among Reddit users. The fine-tuning enables accurate classification of nuanced sentiments, while social network analysis provides insights into opinion dynamics at a community level.

3.5 Conclusion and Results

The final step involves interpreting the analysis results to identify key findings on how user opinions shift before and after significant events, such as the Israel-Palestine conflict. These findings include the impact of sentiment changes on user engagement, interaction patterns, and overall community dynamics on Reddit. From this analysis, meaningful conclusions are drawn about the factors driving opinion changes, offering valuable insights into sentiment dynamics on digital platforms.

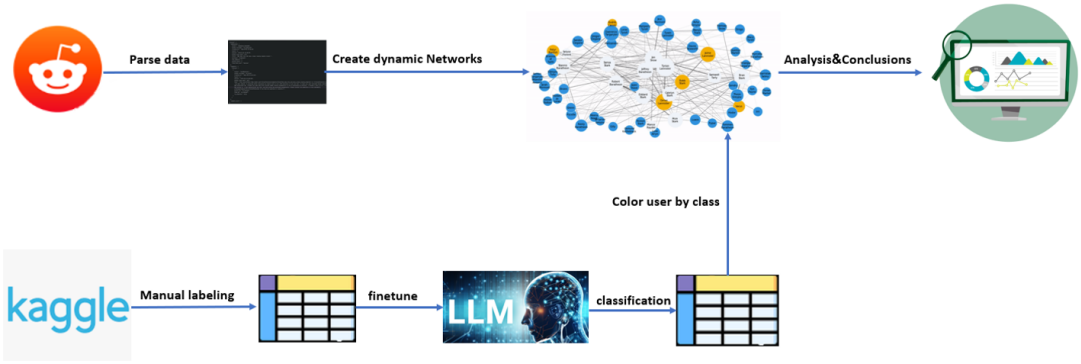

Figure 1: Example of our pipeline.

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