Sentiment Analysis API with LLM Integration

*Demo Images below the text

OBJECTIVE

The objective of this project is to develop a FastAPI-based solution that processes customer reviews, performs sentiment analysis using a Large Language Model (LLM) via the Groq API, and presents structured sentiment results in an HTML format. The API supports file uploads in CSV and XLSX formats and displays sentiment scores and reviews in a table, along with a pie chart visualizing the sentiment distribution.

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1. APPROACH

a. API Design

The **FastAPI** framework is used to implement the API. A user-friendly homepage allows users to upload a CSV or XLSX file containing customer reviews. The API processes these reviews, sends them to the **Groq API** for sentiment analysis, and displays the results on the same page in an HTML table, including sentiment scores, the overall sentiment, and a pie chart visualizing the sentiment breakdown.

b. Input Handling

The API accepts both **CSV** and **XLSX** files. The file is parsed using **Pandas** to extract review text. Based on the file extension, the appropriate Pandas function (read_csv or read_excel) is used to load the data.

c. Sentiment Analysis Integration

The **Groq API** is used to analyze the sentiment of each review. The sentiment results are categorized as:

- **Positive**

- **Negative**

- **Neutral**

The overall sentiment is derived by calculating which category has the highest count. The API sends each review to the Groq API and returns an aggregated sentiment response.

d. Output Display

Once the sentiment analysis is complete, the results are displayed in an HTML format. This includes:

1. **A table** displaying sentiment scores (positive, negative, neutral), overall sentiment, and the list of reviews.

2. **A pie chart** visualizing the proportion of positive, negative, and neutral reviews.

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2. API Implementation

a. File Upload and Parsing

The user uploads the file through the homepage. FastAPI's File and Form methods are used to handle the file upload. The file is processed using Pandas.

b. Sentiment Analysis with Groq API

For each review, a request is sent to the **Groq API** to determine the sentiment. The results are aggregated into positive, negative, and neutral counts.

c. HTML Response

The results are rendered on an HTML page. A table presents the review text along with its sentiment score. The overall sentiment is calculated, and a pie chart is embedded into the page using a base64-encoded image.

3. Example Usage

a. Sample Input

An XLSX or CSV file containing 50 customer reviews.

b. API Request

The user uploads the file through the FastAPI frontend, which then processes the data and returns the analysis results.

c. Sample Output in HTML

The HTML page includes:

- **Table**: Review text, sentiment scores (positive, negative, neutral), and the overall sentiment.

- **Pie Chart**: A pie chart visually representing the sentiment breakdown.

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4. Insights & Analysis

a. Accuracy and Limitations

- The **Groq API** performs well on clear and concise reviews, but sentiment accuracy decreases with ambiguous or mixed sentiment reviews.

- The current model assumes each review belongs to a single sentiment category, which may not always reflect the true sentiment of complex reviews.

b. Potential Improvements

- To improve accuracy, a more granular sentiment scale (e.g., adding mixed sentiment) could be implemented.

- Adding caching mechanisms for frequently analyzed reviews could optimize performance for larger datasets.
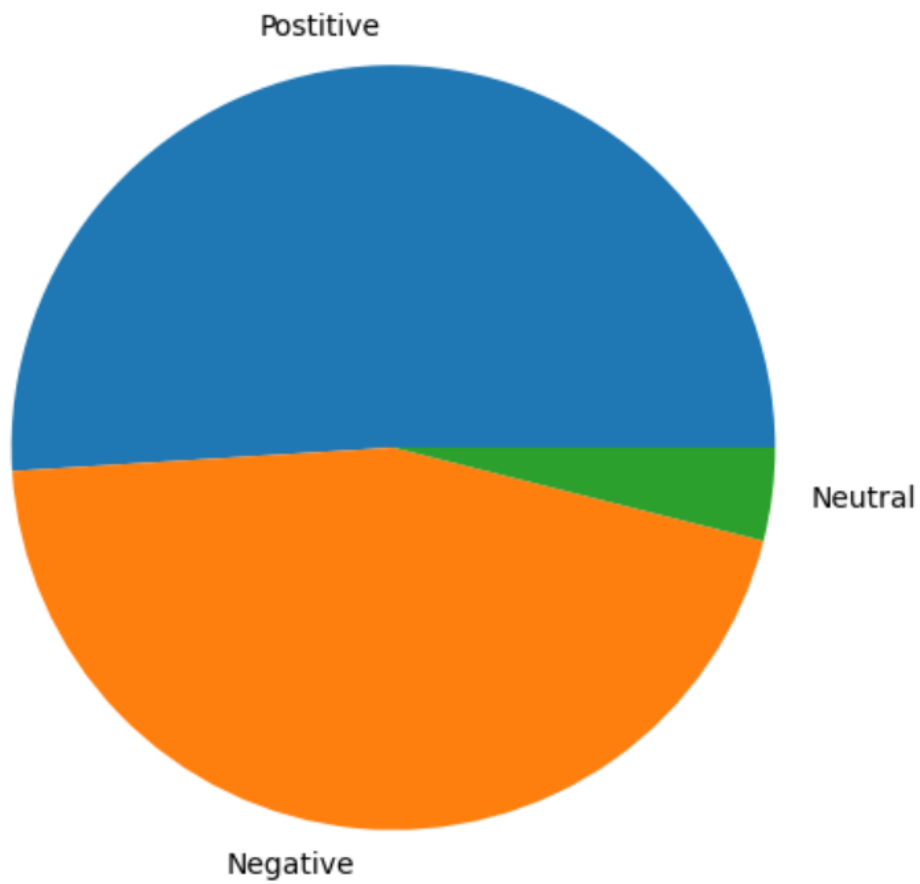
DEMO

Sentiment Analyizer

Select file to upload:

Choose File   No file chosen

Upload File

It might take some time to process your file so please be patient!

Review	Postivie	Negative	Neutral	Overall Sentiment
Great product, very useful!	0.8	0.1	0.1	positive
Poor quality and bad customer service. 😡	0.0	0.8	0.2	negative
Average performance, nothing special.	0.2	0.8	0.0	negative
Exceeded my expectations, fantastic!	0.9	0.1	0.0	positive
Terrible, not worth the money. 😞	0	0.8	0.2	negative
Quite good, but could be improved.	0.4	0.3	0.3	positive
Mediocre at best, not recommended.	0.0	1.0	0.0	negative
Wonderful design, highly recommended!	0.9	0.0	0.1	positive
Awful experience, would not buy again.	0.0	1.0	0.0	negative
Solid product, good value for the price.	0.8571428571428571	0.0	0.14285714285714285	positive

Sentiment Analyizer

File Name: customer_reviews.xlsx
Number of reviews:50

Postitive

Neutral