

Sentiment Analysis Documentation

Overview

The sentiment analysis process aims to classify the sentiment of user reviews related to Amazon Alexa devices into three categories: **Positive**, **Negative**, and **Neutral**. The analysis is performed using the OpenRouter API, which utilizes the Google Gemini model to provide insights into the emotional tone of the text.

Workflow

The workflow involves the following steps:

1. Input Data:

- The dataset consists of Amazon Alexa device reviews stored in an Excel file.
- The file contains a column labeled "Review" that contains user feedback.

2. API Integration:

- OpenRouter API is used to analyze the sentiment of each review.
- The API returns a sentiment analysis result in textual form, which is processed to extract the sentiment polarity (positive, negative, or neutral).

3. Sentiment Classification:

- **Sentiment Polarity:** The overall sentiment of each review is determined based on the text analysis and classified into one of the following categories:
 - **Positive:** Reviews that express favorable feelings or positive emotions about the product.
 - **Negative:** Reviews that express dissatisfaction or negative emotions.
 - **Neutral:** Reviews that do not show strong positive or negative emotions.
- **Sentiment Analysis:** A detailed explanation of the sentiment, including key phrases or words that contributed to the classification, is recorded.

4. Output Data:

- The results are stored in a new Excel file with the following columns:
 - **Review:** The original review text.
 - **Sentiment_Polarity:** The classified sentiment polarity (Positive, Negative, Neutral).
 - **Sentiment:** A detailed breakdown of the sentiment analysis, providing insights into why a specific sentiment was assigned.

API Details

- **API Endpoint:** <https://openrouter.ai/api/v1/chat/completions>
- **Authorization:** Requires an API key to authenticate requests.
- **Payload:**
 - The API expects a POST request with a JSON payload containing the model name (**google/gemini-2.0-flash-exp:free**) and the review text for sentiment analysis.
 - Example payload:

```
{
  "model": "google/gemini-2.0-flash-exp:free",
  "messages": [
    {
      "role": "user",
      "content": "Can you analyze the sentiment of this text: 'I am feeling great about this project!'"
    }
  ]
}
```

Code Explanation

1. **Reading the Excel File:** The reviews are read from an Excel file using the pandas library:
df = pd.read_excel(input_file)
2. **Analyzing Sentiment:** For each review, a request is sent to the OpenRouter API for sentiment analysis. The review text is passed in the payload, and the sentiment result is parsed from the API response:

```
response = requests.post(url, headers=headers, data=json.dumps(data))
sentiment_analysis = result['choices'][0]['message']['content']
```

3. **Classifying Sentiment:** The result is checked for keywords like "positive", "negative", and "neutral", and the corresponding sentiment polarity is assigned:

```
df.at[idx, 'Sentiment'] = (
    "Positive" if "positive" in sentiment_result.lower()
    else "Negative" if "negative" in sentiment_result.lower()
    else "Neutral"
)
```

4. **Saving Results:** After processing all reviews, the results are saved back to a new Excel file:

```
df.to_excel(output_file, index=False)
```

Example

Input Data (Excel):

Review
"The Amazon Alexa device is fantastic, I love the sound!"
"It stopped working after a month, very disappointing."
"It's okay, nothing special about it."

Output Data (Excel):

Review	Sentiment_Polarity	Sentiment
"The Amazon Alexa device is fantastic, I love the sound!"	Positive	The sentiment is positive, expressed through words like "fantastic" and "love."
"It stopped working after a month, very disappointing."	Negative	The sentiment is negative, indicated by "stopped working" and "disappointing."
"It's okay, nothing special about it."	Neutral	The sentiment is neutral, with no strong positive or negative words.

Error Handling

- If the OpenRouter API returns an error (e.g., rate limit exceeded or invalid API key), a detailed error message is displayed.
- Empty reviews are skipped during processing.

Conclusion

The sentiment analysis process provides a structured approach to understanding customer feedback by automatically categorizing reviews based on sentiment. This can be useful for businesses and developers to gain insights into customer satisfaction and identify areas for improvement.