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PRACTICUM-IV

CSL406

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Batch No.	B8	**Semester**	4th Semester
Branch	CSE	**Supervisor(s)**	Dr. Sanjit Ningthoujam

1. Title of the Project

E-Commerce with Sentiment Analyzer: Enhancing Shopping Experience with NLP.

2. Introduction

E-Commerce Sentiment Analyzer: Enhancing Shopping Experience with NLP is an AI-powered project that integrates sentiment analysis into an e-commerce platform. By leveraging Natural Language Processing (NLP), the system analyzes customer reviews to classify them as positive, negative, or neutral. The sentiment analyzer enhances user experience by filtering reviews, highlighting trends, and providing real-time feedback, making online shopping more reliable and efficient.Also integrating a chatbot in the project where user can communicate with the chatbot and get precise suggestions for the interested projects.

3. Problem Definition

Online shoppers often struggle to make informed purchasing decisions due to the overwhelming number of product reviews. Manually analyzing reviews is time-consuming and inefficient. Additionally, businesses lack automated insights into customer sentiment, making it harder to improve products and services. This project aims to integrate sentiment analysis into an e-commerce platform, enabling automated classification of customer reviews as positive, negative, or neutral. Furthermore, a chatbot will assist users by providing concise product recommendations based on sentiment trends, enhancing the overall shopping experience.

4. Objectives

- **Implement Sentiment Analysis** – Develop an NLP-based system to analyze customer reviews and classify them as positive, negative, or neutral.
- **Enhance Customer Decision-Making** – Help shoppers make informed purchase decisions by summarizing sentiment trends from product reviews.
- **Provide Business Insights** – Enable businesses to understand customer feedback and improve products based on sentiment analysis.
- **Integrate an AI Chatbot** – Develop a chatbot that interacts with customers and provides concise product recommendations based on sentiment analysis.
- **Improve User Experience** – Ensure a seamless and intuitive interface that enhances customer satisfaction and engagement with the e-commerce platform.
- **Automate Review Processing** – Reduce the need for manual review filtering by leveraging AI to extract meaningful insights efficiently.

5. Skillset acquired to solve/address the problem

- **Natural Language Processing (NLP)** – Understanding and applying techniques like sentiment analysis using NLP libraries (NLTK, VADER, TextBlob, or Transformers).
- **Machine Learning (ML)** – Training and fine-tuning models for text classification and sentiment analysis using frameworks like Scikit-learn or TensorFlow.
- **Data Processing & Analysis** – Cleaning, preprocessing, and analyzing textual data to extract meaningful insights.
- **Python Programming** – Writing efficient code using Python and leveraging relevant libraries (Pandas, NumPy, NLTK, etc.).
- **Web Development** – Building and integrating the sentiment analysis system into an e-commerce website using technologies like Flask, Django, or React.
- **Chatbot Development** – Implementing AI-driven chatbots with NLP capabilities to provide personalized product recommendations.
- **Database Management** – Storing and retrieving customer reviews and sentiment data using databases like MySQL, PostgreSQL, or Firebase.
- **API Integration** – Connecting sentiment analysis models and chatbots with the e-commerce platform via RESTful APIs.
- **User Experience (UX) Design** – Designing an intuitive and engaging interface for customers to interact with the sentiment-based recommendation system.

- **Cloud Deployment** – Deploying the project on cloud platforms (AWS, GCP, or Heroku) for scalability and accessibility.

6. Timeline to achieve the skillset

Week 1-2: Fundamentals of Web Development

Learn HTML, CSS, and JavaScript basics.

Week 3: React and Vite

Set up a React project using Vite.

Understand project structure and routing with React Router.

Week 4-5: Backend Basics (Node.js & Express)

Learn Node.js fundamentals.

Set up a simple Express server.

Week 6-7: UI Frameworks & Styling

Add Bootstrap and Font Awesome with Vite.

Improve layout using grid/flexbox.

Build a simple cart and checkout flow.

Week 8-9: Introduction to Sentiment Analysis

Understand NLP and sentiment analysis.

Explore Hugging Face transformers and RoBERTa model.

Install necessary Python packages (transformers, torch, etc.).

Create a Python Flask API.

Load and use a pre-trained RoBERTa model.

Accept review text and return sentiment score (positive, neutral, negative).

Week 10: Connect Frontend to Sentiment API

Use fetch or axios in React to send reviews to Flask API.

Display results in UI with styled badges or indicators.

Week 11: Polish & Error Handling

Handle empty inputs, loading states, and API errors.

Show sentiment summaries (e.g., “Overall sentiment: Positive”).

Week 12: Final Integration & Deployment

Deploy frontend (Vercel, Netlify) and backend (Render, Railway).

Test across devices.

7. Detailed description of the project including block schematic/ algorithm/ coding/ testing metrics/ experiments/ result graphs

This project integrates **sentiment analysis** into an **e-commerce website** to enhance customer experience by analyzing product reviews. Additionally, an **AI-powered chatbot** provides personalized product recommendations based on sentiment insights.

Block Schematic

- **User Interaction**

  Users post product reviews and interact with the chatbot.

- **Sentiment Analysis Module**

  Processes and classifies reviews as Positive, Neutral, or Negative.

- **Product Recommendation Chatbot**

  Suggests products based on sentiment-driven insights.

- **Database & API Integration**

  Stores customer reviews, sentiments, and chatbot responses.

- **Frontend UI/UX**

  Displays analysis results and chatbot suggestions in an intuitive interface.

Algorithm

Sentiment Analysis Process:

1. **Data Collection**
    1. Extract product reviews from the database.

2. **Text Preprocessing**
    1. Tokenization, stopword removal, lemmatization.
3. **Sentiment Scoring** (Using **VADER/ BERT** or another NLP model)
    1. Assign sentiment scores (Positive, Negative, Neutral).
4. **Classification**
    1. Categorize reviews based on sentiment polarity.
5. **Store & Display Results**
    1. Store sentiment insights and visualize them on the website.

Chatbot Recommendation Process:

1. **User Query Processing**
    1. Extract keywords and intent from the user's request.
2. **Sentiment Matching**
    1. Retrieve product reviews with similar sentiments.
3. **Recommendation Engine**
    1. Suggest products based on sentiment-based feedback.
4. **User Response Handling**
    1. Provide feedback options for chatbot learning.

8. Weekly Milestones

Week 1	Learned HTML, CSS, JavaScript basics.
Week 2	Created basic static web-pages.
Week 3	Learning about react and vite
Week 4	Backend basics(Nodejs)
Week 5	Backend basics(express)
Week 6	UI frameworks
Week 7	Styling using css
Week 8	Sentimental analysis
Week 9	Sentimental analysis
Week 10	Connect frontend to sentimental analysis using API

Week 11	Polishing and removing error
Week 12	Testing and deployment

9. Completed Milestones

- Learned HTML,CSS,javascript.
- Created UI framework for my website.
- Styling using css.
- Added functionality to various objects of my website.
- Learned about sentimental analysis
- Made a basic sentimental analysis using flask framework.

10.Milestones to be completed

- Adding backend to my website.
- Adding database to my website.
- Integrating sentimental analysis model to my website.
- Deploying my website on the web

11.Expected challenges

Integration of Multiple Technologies

- Combining React (frontend), Express/MongoDB (backend), and Flask (for sentiment analysis) requires careful coordination and API planning.
- Managing CORS issues when communicating between React and Flask servers.

Understanding NLP and Sentiment Analysis

- Training and fine-tuning transformer models like RoBERTa can be complex and resource-intensive.
- Difficulty in accurately interpreting reviews with sarcasm, mixed sentiments, or short text.

Displaying Sentiment Results Meaningfully

- Designing a UI that displays overall product sentiment clearly and intuitively for users.
- Ensuring the analysis doesn't confuse users with too much technical detail.

Performance Optimization

- Running ML models like RoBERTa can be slow, especially on systems without GPU support.
- May need to optimize the Flask API or explore lightweight models for faster inference.

12.References

- **Speech and Language Processing (by Jurafsky & Martin)** – A comprehensive NLP textbook.
- **NLTK Documentation** – Guide to using the NLTK library for NLP tasks.
- **VADER Sentiment Analysis Paper** – The original research paper explaining VADER.
- **JavaScript.info** – A structured tutorial for learning JavaScript.
- **MDN JavaScript Guide** – Official Mozilla docs on JavaScript.
- **MDN HTML Reference** – HTML elements, tags, and best practices.
- **MDN CSS Guide** – CSS properties and styling.

Name and Signature of Student **Name and Signature of Supervisor**