Case Challenge for Senior Data Scientist Position

Use Case: Multi-Agent System for Chatbot and Document Creation Based on Customer Feedback

Introduction:

As part of our hiring process for the Data Scientist position, we have prepared a challenge to evaluate your analytical skills, problem-solving abilities, understanding of data science concepts, and communication skills.

The challenge is the following: You are a consultant, and you were hired by a big product enterprise that aims to use customer feedback to enhance product quality and client satisfaction when having an issue. The Chief Operation Officer shared a list of feedback from 2023 and mentioned that because of the volume, it was too time-consuming to extract all the input and increase the operation efficiency. He is looking to find a way to map the current issues and provide consistent, actionable insights for the team.

Based on this business context, as a consultant, you suggested developing a multi-agent system using LLMs (Large Language Models) combined with Langchain and Langgraph to create an intelligent agentic chatbot for processing customer feedback and generating detailed documents based on the analyzed feedback.

Objectives:

The primary goals of this challenge are to:

1. Assess your ability to design a multi-agent system that efficiently processes customer feedback.
2. Evaluate your proficiency in implementing advanced NLP techniques for sentiment analysis, summarization, and document generation.
3. Test your skills in measuring the model's performance using relevant metrics for accuracy and usability.
4. Examine your capacity to effectively understand the business need and communicate insights derived from the analyzed feedback.

Dataset:

A sample dataset of customer feedback entries is provided, consisting of various fields such as:

- feedback_id: Unique identifier for each feedback entry
- customer_id: Unique identifier for the customer
- feedback_text: Text of the customer feedback
- feedback_category: Category of feedback (e.g., Product Quality, Delivery, Customer Service)
- date: Date of feedback submission
- sentiment: Pre-labeled sentiment of feedback (positive, negative, neutral)
- response_required: Indicator if a response is required (Yes/No)
- response_time: Time taken to respond to feedback (if applicable)
- resolved: Indicator if the feedback was resolved (Yes/No)

Dataset: Customer_Feedback_Dataset.csv

Tasks:

You have been tasked with designing a chatbot system that can handle customer feedback, analyze it, and automatically generate documents summarizing it and suggesting actionable insights. This system should use a multi-agent architecture, where different agents are responsible for various tasks such as NLP processing, sentiment analysis, summarization, and document creation. The following steps outline your next tasks:

1. **Business needs:**
    - **Goal:** Create a document summarizing the sentiments and suggesting actionable insights.
    - **Nice to have:** Mention the operation performance responding to the feedback in the document.
2. **Multi-Agent System Design:**
    - **Task:** Design a multi-agent architecture using Langchain and Langgraph. The architecture should incorporate multiple agents working collaboratively, each assigned distinct roles to enhance the feedback processing workflow.
    - **Goal:** The chosen agents should effectively interpret emotional tone, distill essential insights, and organize these findings into a structured document. You should share the agent strategy defined and why this enhances the final result.
3. **Model Development:**
    - **Task:** Implement LLM/NLP models (using libraries like Transformers, spaCy, NLTK, GPT, LLAMA or others) within the agents to perform tasks such as sentiment analysis, text summarization, and document creation.
    - **Goal:** Ensure the chatbot can accurately classify, analyze, and summarize feedback, generating meaningful documents.
4. **Performance Evaluation:**

- **Task:** Evaluate the performance of the multi-agent system using metrics such as accuracy, F1-score, precision, and recall for classification tasks, and ROUGE scores for summarization.
- **Goal:** Ensure the system meets the desired performance benchmarks.

Business results:

Compiling the business results delivered in the project, you will present them in a 15-minute presentation to the COO, explaining how the system works and how it should be used to achieve the business goals. The COO is a non-tecnical person.

Submission Guidelines:

- Share the slide deck created
- Share a Github repository with your code.

Evaluation Criteria:

Your submission will be evaluated based on:

- Effectiveness of the multi-agent system design.
- Quality of NLP techniques used for sentiment analysis and document generation.
- Performance evaluation using relevant metrics..
- Clarity and relevance of insights and actionable suggestions derived from feedback.
- Overall presentation and communication of findings, particularly in relation to client and sales considerations.