# Artificial Intelligence Chatbot for Online Data Analytics using LLMs

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Abstract

This research aims to develop a tool for analyzing tabular data using a Large Language Model (LLM) to facilitate data summarization, in-depth question answering, and visualization generation based on user prompts. This system enhances the efficiency, speed, and accessibility of data analysis while providing deeper insights. This study incorporates advanced technologies, including AI Agents, LangChain, Typhoon (a Thai-language LLM), and Streamlit, to develop a chatbot for data analysis. The system allows users to select the most appropriate model Typhoon-V2 for processing needs. The evaluation results indicate that the model demonstrates high performance in importing, retrieving, analyzing, and visualizing data. However, certain limitations remain in data analytics and the representation of specific types of visualizations. The system's performance assessment suggests that, while it effectively supports data analysis, further improvements are required to enhance the accuracy of responses to complex queries and to refine in-depth data analysis capabilities. Future developments may include expanding the model's capacity and integrating diverse data sources to better fulfill user demands and improve overall system efficiency.

Introduction
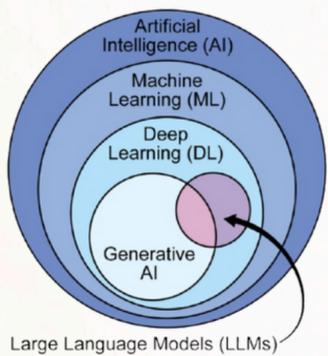
Nowadays, Artificial Intelligence (AI) plays a crucial role in many aspects of daily life and it is widely used in business, education, finance, and various industries. AI helps improve efficiency, reduce errors, and accelerate complex processes with remarkable accuracy.

One of the most powerful AI technologies is Large Language Models (LLMs) — advanced AI systems designed to understand and generate human-like text using Natural Language Processing (NLP). These models are good at summarizing information, answering questions, and analyzing data.

Large Language Models (LLMs) are a part of Generative AI that generates new content, including text, images, and audio. They specialize in language tasks like summarization and text analysis. LLMs are developed using Deep Learning and large neural networks, learning from vast datasets to enhance accuracy in text generation and comprehension.

In this study, we have developed an intelligent chatbot that can summarize tabular data from data file by using descriptive data analysis, and graphical presentations. In addition, this chatbot employed Typhoon V.2 as the LLM model for language-related tasks. This chatbot could help the users to analyze the data by creating a simple prompt.

Architecture
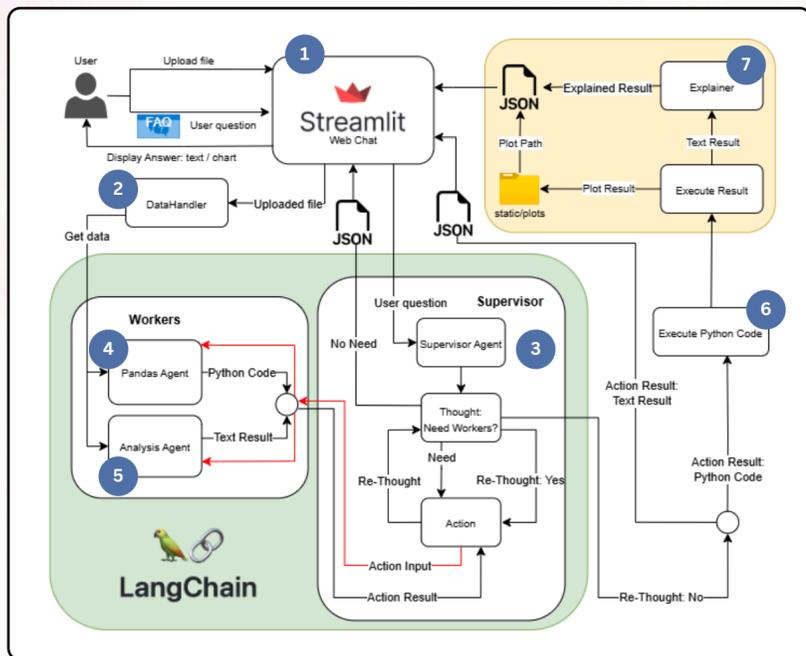
1. **Streamlit Web Chat:** The interface for users to interact with the data analysis system

2. **Data Handler:** Managing and preprocessing the data uploaded by users

3. **Supervisor Agent:** Performing as the coordinator of the system and assigning tasks to the most suitable worker

4. **Pandas Agent:** Managing data, analyzing data, and generating visualizations as Python code to fulfill the user's task

5. **Analysis Agent:** Specializing in data analysis, performing statistical calculations, identifying relationships between variables, and conducting trend analysis

6. **Execute Python Code:** Responsible for executing Python code generated by the Pandas Agent to generate outputs like graphs, tables, or numerical computations

7. **Explainer:** Providing clear, insightful explanations of results generated by the Pandas Agent to enhance user comprehension and support informed decision-making.

Objective

- To develop a chatbot that employed large language model for summarizing tabular data using descriptive data analysis, and graphical presentations.

Technology

LangChain OpenAI TYPHOON Agent AI Streamlit

Methodology

Planning and Creating Program Specification → Web Chatbot designing and System development → Evaluating the System

Evaluation

Evaluation method for Data Input, Retrieval, and Visualization
The model is evaluated using a test dataset, and the questions related to input data, data retrieval, and visualization are used for evaluation. The model's answers the question correctly, the scored will be 1, otherwise will be 0. Finally, the average scores are calculated for each question and then calculated for each aspect.

Evaluation method for Data analysis
The evaluation focuses on assessing the relevance and suitability of the answers provided by the model, given that there is no predetermined answer.
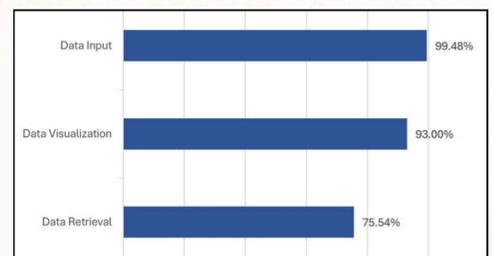
Result

Figure 1: Chatbot Application

Figure 2: Performance Across Different Aspects

From figure 2, the Typhoon Model V.2 performed well in **data input** and **data visualization**, achieving 99.48% and 93.00% accuracy, respectively. It effectively processes initial data and generates visual outputs aligned with user expectations. The slight decrease in data input accuracy can be attributed to data loss, which occurred during the input process. However, the model showed a 75.54% accuracy in **data retrieval**, with errors observed in complex queries, particularly those involving non-exact matches to column names or multi-point questions. As for **data analysis**, it founds that the performance was inconsistent. In some cases, the model provided relevant answers, while in others, the responses were either overly detailed or not related with the questions. Improvements in query clarity and question structure could enhance the model's effectiveness.

Conclusion

In conclusion, the model demonstrates strong performance in data input and visualization, although improvements are needed in data retrieval and analysis. The results show that the system is functional and valuable. However, further development could involve enhancing its in depth data analysis capabilities and and adding more model options to better fulfill user requirements and optimize overall system performance.

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