

Abstract

This poster presents the design and implementation of an agentic AI system that enables non-technical users to analyze structured data through natural language interaction. The system integrates large language models with function calling and modular back-end tools to autonomously perform data cleaning, model training, and result generation. Users can upload CSV files, ask questions in natural language, and receive insights without writing code or understanding data science workflows. The results demonstrate that agentic technology can significantly reduce technical barriers to data analytics while maintaining flexibility, scalability, and interpretability.

Introduction

Non-technical users often face difficulties when trying to analyze structured data because traditional tools require programming or statistical expertise. Agentic AI systems address this problem by combining natural language understanding with autonomous decision-making capabilities. This project explores how an AI agent can interpret user intent, select appropriate analytical tools, and return meaningful insights through a conversational interface.

Background

In today's data-driven world, organizations rely on data for decision making and problem solving. However, accessing and analyzing data often requires technical knowledge that many users do not have. As a result, non-technical users are unable to easily extract information and insights from their own data. At the same time, artificial intelligence has advanced significantly. Large language models can understand natural language and generate meaningful responses. Agentic AI systems go a step further by not only responding to user inputs, but also deciding what actions should be taken to complete a task. This project combines natural language interaction with agentic decision making to reduce technical barriers. Users can ask questions in natural language, and the system decides what tools to use in order to clean data, train models, and generate results automatically.

Problem

Many organizations collect large amounts of data, but analyzing this data requires technical knowledge that many users do not have. Non-technical users are unable to easily extract information and insights from their data. Although there are tools that simplify data analysis, they still require users to understand technical interfaces and workflows. This creates a barrier and forces users to depend on technical teams to obtain information, which slows down decision making.

Methodology

The system follows a modular architecture composed of:

- User Interface Module:** A Streamlit-based chatbot interface where users upload CSV files and ask questions in natural language.
- Agent Module:** A GPT-based agent interprets the user's intent and decides which tools should be executed.
- Tool Calling Module:** Python functions perform data ingestion, cleaning, feature preparation, model training, and prediction.
- Results Module:** The system returns natural language summaries and visualizations to help users understand the output. This approach allows the system to operate end-to-end without requiring the user to interact directly with code or analytics pipelines.

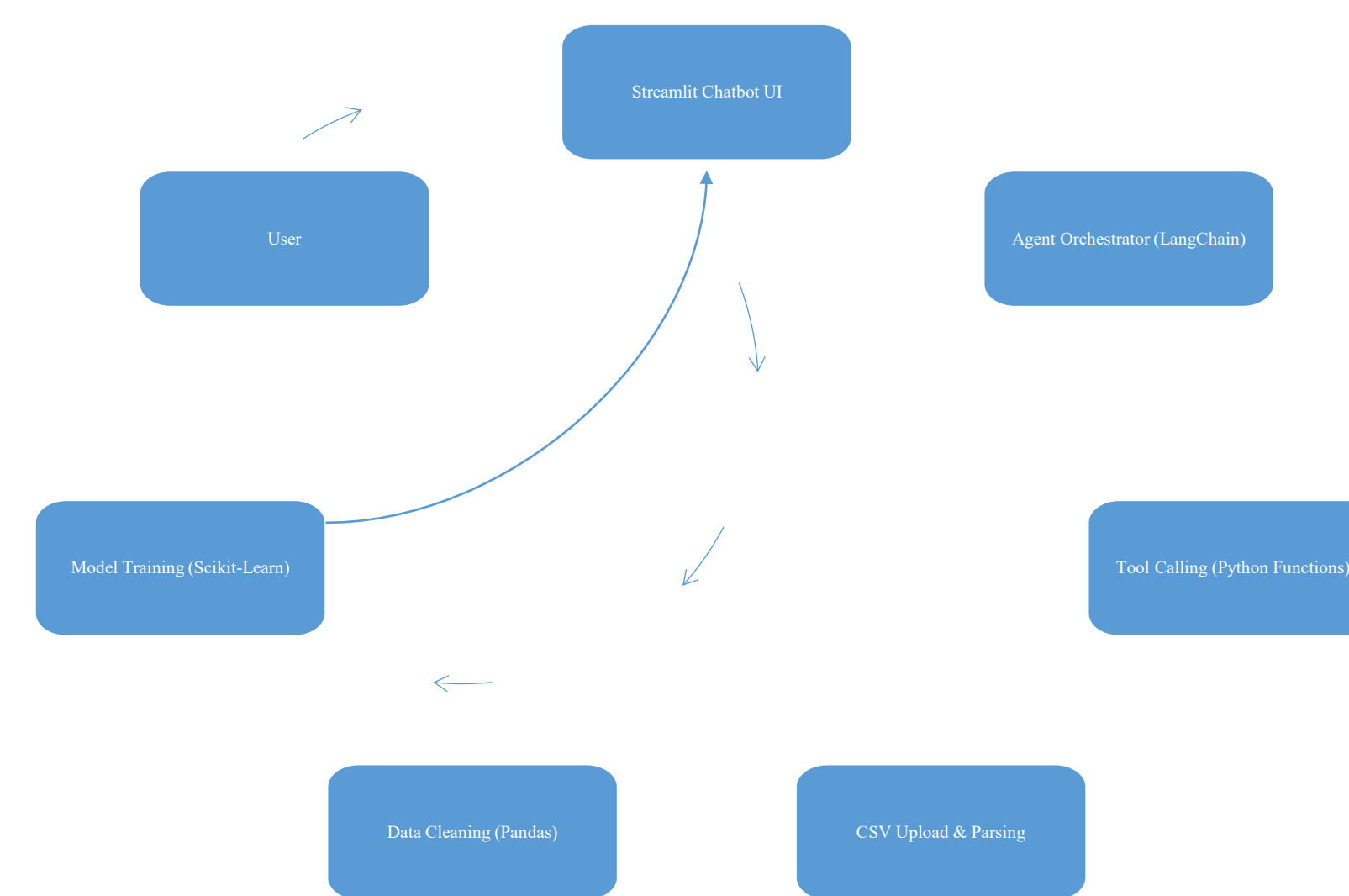


Figure 1
Proposed Architecture

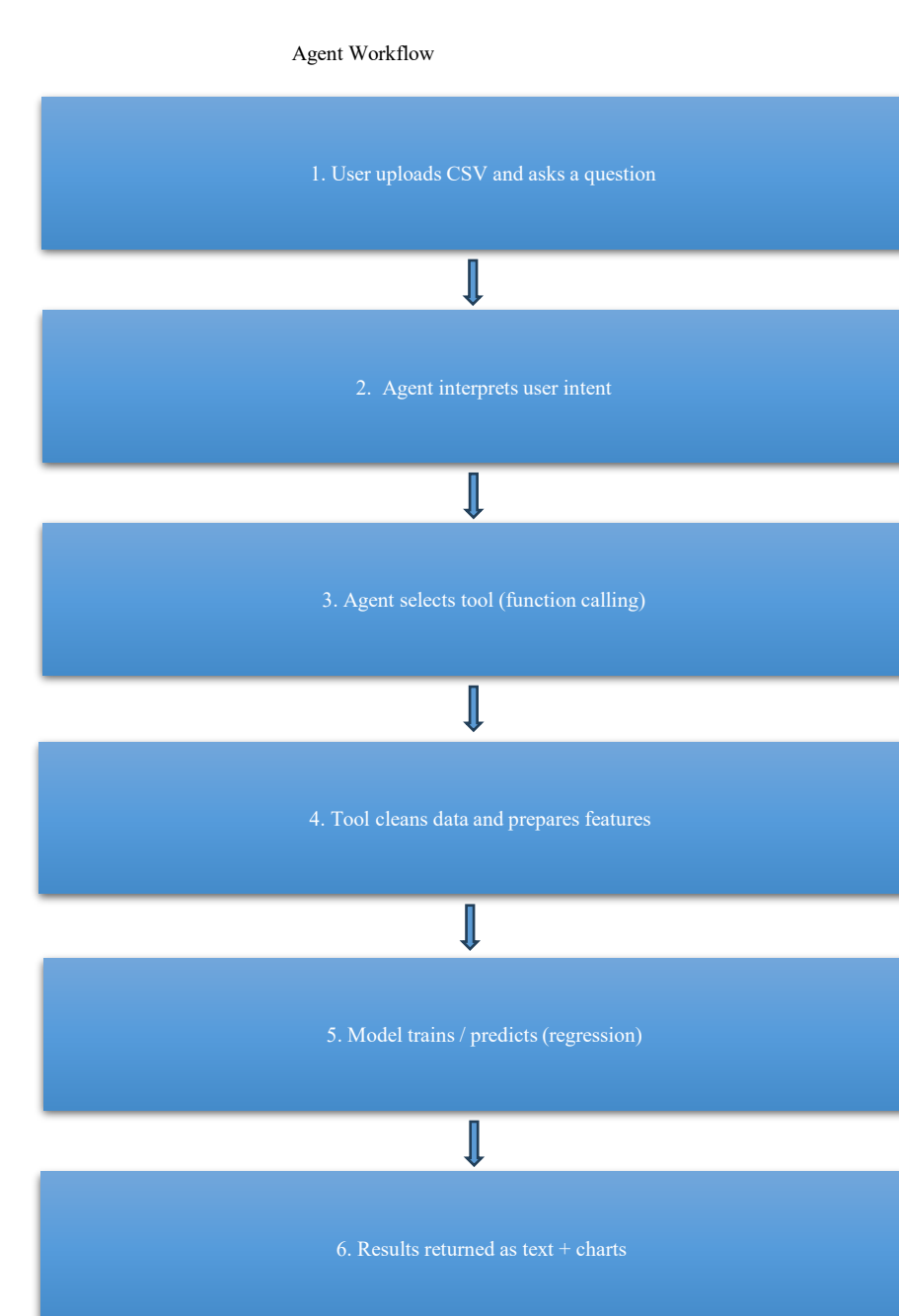


Figure 2
Implementation Workflow

Results and Discussion

The prototype successfully:

- Cleaned and normalized real-world datasets
- Trained regression models automatically
- Generated predictions and descriptive summaries
- Displayed results using visual charts and conversational explanations.

These results show that users with no technical background can obtain insights comparable to traditional data analysis workflows, but with significantly reduced complexity.

The conversational interface simplifies the interaction process and lowers the learning curve for data analytics. The modular architecture allows the system to be easily extended with new tools or integrated with databases beyond CSV files. Limitations include dependency on consistent data structure and the need for improved error handling, which can be addressed in future work.

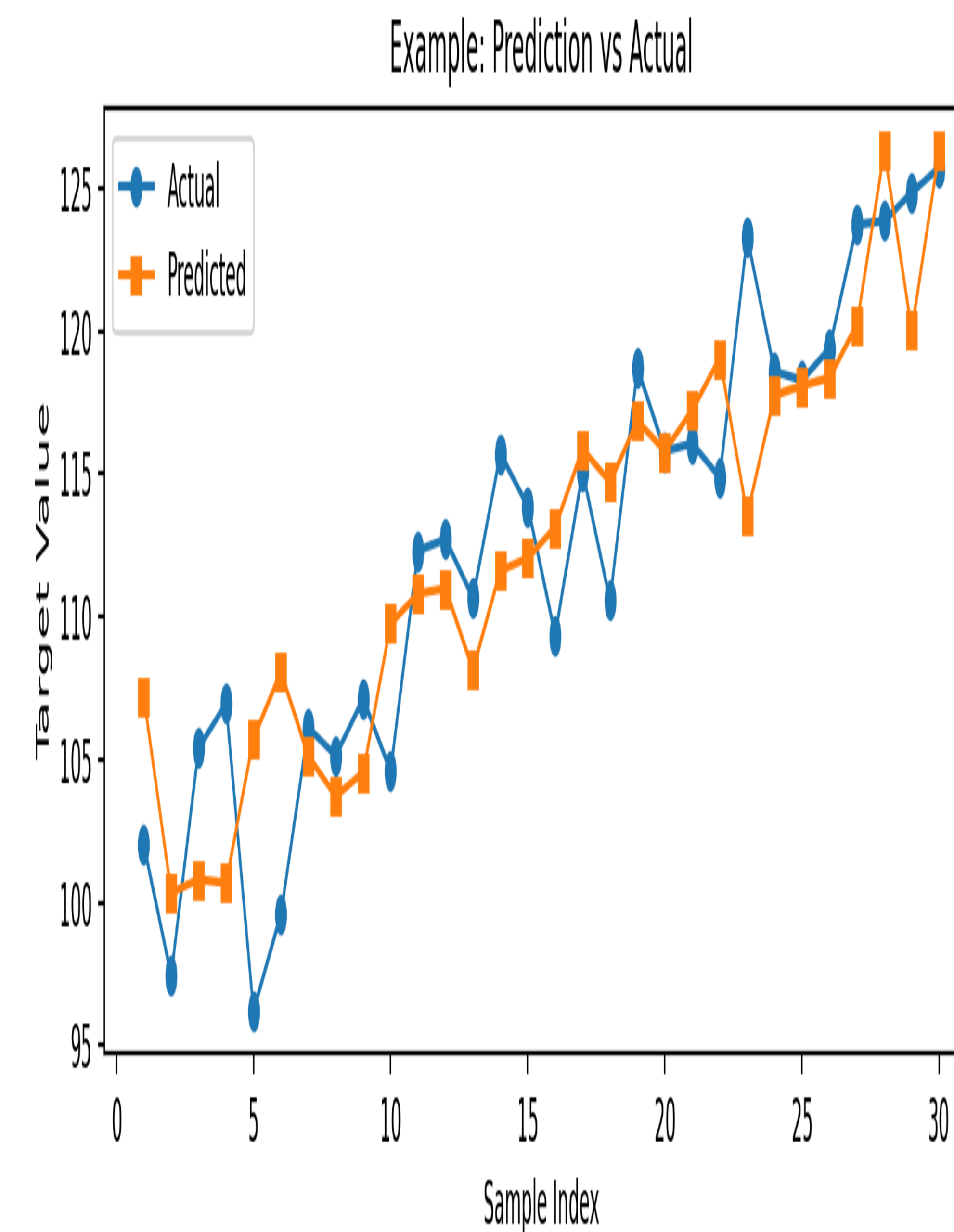


Figure 3
Example Results Visualization

Conclusions

This project demonstrates that agentic AI systems can effectively bridge the gap between non-technical users and complex data analytics processes. By combining large language models with autonomous tool selection, the system enables users to perform advanced analytical tasks through simple natural language interaction. The modular design supports scalability, maintainability, and future expansion, making agentic AI a promising approach for accessible and intelligent data systems.

Future Work

- Future work will include:
- Integration with relational databases (e.g., PostgreSQL, Supabase)
 - Support for more advanced machine learning models
 - Improved validation and error-handling mechanisms
 - Multi-agent collaboration for complex analytics tasks

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