LLM-Powered Data Dashboard

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INTRODUCTION

BACKGROUND

- Caterpillar equipment contains hundreds of sensors, producing large amounts of data
- Currently, engineers need to manually search through directories and then conduct data analysis on their own

PROJECT GOALS

- Create a data dashboard with an integrated chatbot, greatly reducing the time it takes to conduct data analysis tasks
- UI: ensure the dashboard is intuitive and user-friendly
- Ensure that the model can handle the conversion of GH5 files to CSV format

RESEARCH METHODOLOGY

Analyze Machine data

- Worked with Caterpillar machine data by analyzing payloads and familiarizing with time-series data

Explore LAMBDA

- Work with the open-sourced LAMBDA agent, adapt it to Caterpillar data format and features

Design and Integrate UI

- Built a Figma prototype and collected user feedback, created front-end UI with React.js, and combined with back-end

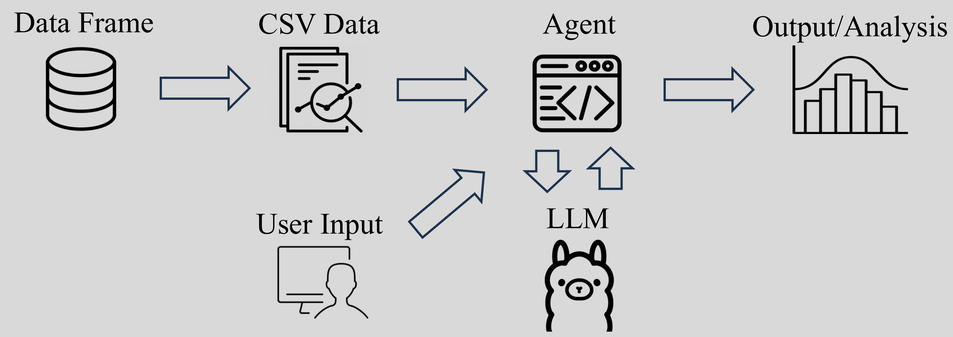
Fine-tune

- Prompt engineer and script the agent to familiarize it with Caterpillar jargon and needs

Testing

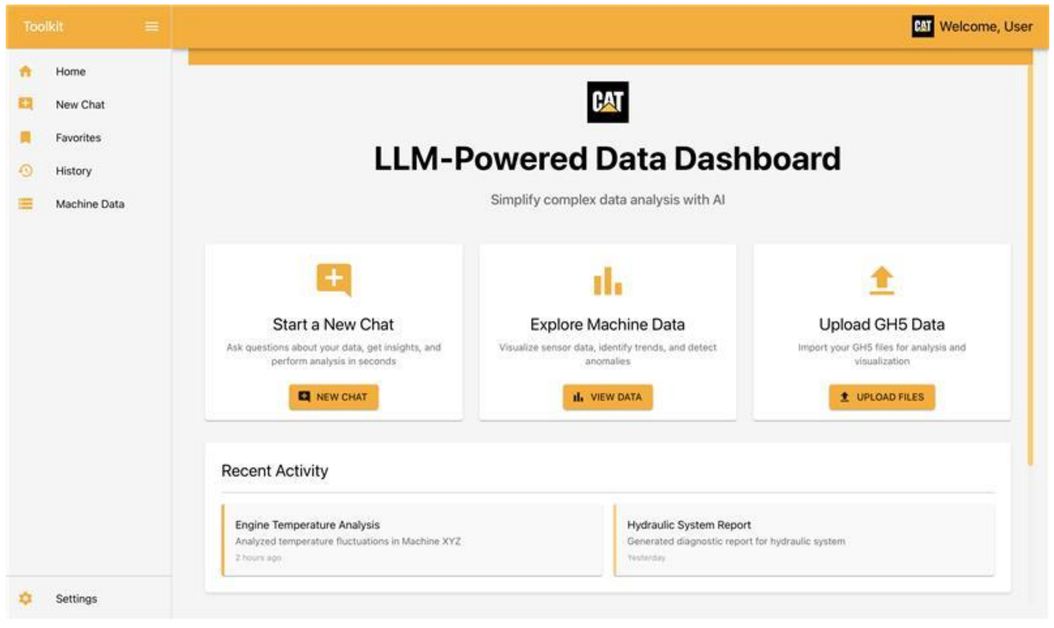
- Perform accuracy testing for LLM hallucinations, add any preventative measures or further prompt engineer to improve accuracy to 90%

WORKFLOW



UI AND FEATURES

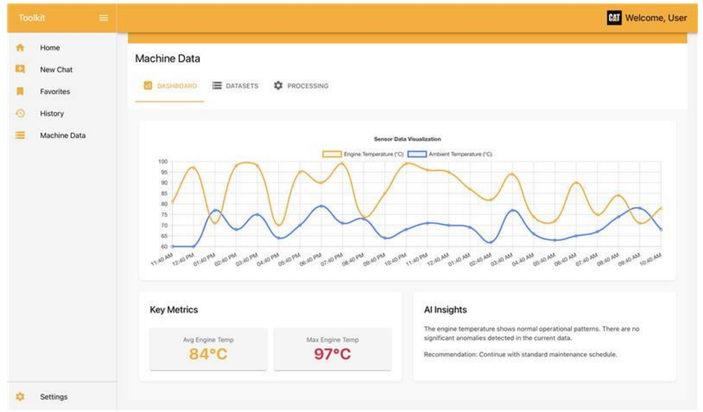
- **User Flexibility**: Ability to switch between LLMs, color themes, show/don't show code snippets, collapsing menus, comprehensive settings
- **Uploading/Accessing Data**: User can upload HDF5 data directly or access machine data through Caterpillar's database system
- **History**: Previous chat history and favorite chats
- **Instant Data Analysis**: Uploading to the agent's data system generates graphs, metrics, and insights



BEHIND THE PROGRAM

Programmer Agent: Generates code based on user input and knowledge base
Inspector Agent: Debugs programmer agent's code
Operational Loop: The two agents enter a feedback loop between each other until code is error-free, it hits the maximum attempts, or the user intervenes.

DATA DASHBOARD



CONCLUSION

- Improved efficiency of data analysis tasks for engineers
- Retrieved, processed, and visualized machine data
- Effectively summarize and answer employees' prompts

FUTURE GOALS

- Refining overall accuracy of the LLM's output
- Scaling data dashboard to other types of machine data

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REFERENCES: LAMBDA — *A Large Model Based Data Agent*, https://www.polyu.edu.hk/ama/cmfai/lambda.html