POWERGPT

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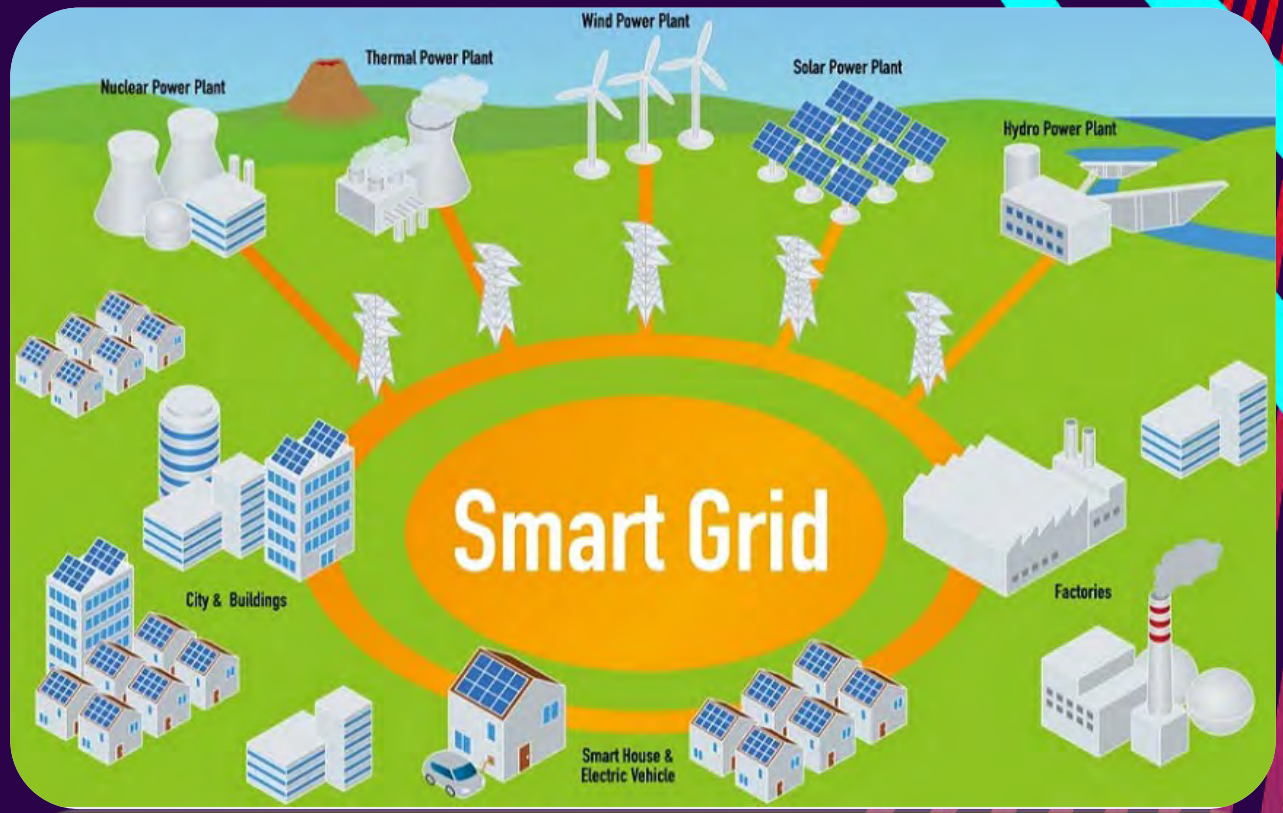
SMART GRID

Electrical Network

Incorporates Advanced Tech

Match supply and demand

Integration of Renewable Energy



[1] Schaller, J. (2020, June 1). Future strategies for data center smart grid integration. Mission Critical Magazine RSS.

BACKGROUND

- Integration of new technologies into the electrical grid has a multitude of benefits, but also creates diverse strains on the system
- Smart grids need more advanced maintenance and management techniques
- Existing strategies:
    - Scheduled -
        - Periodic deployment of teams to oversee machines and perform maintenance
    - Reactive -
        - Relies on highly accurate sensing equipment
        - Prolonged service delays

RESEARCH GAPS

Proactive Strategies

Lack of proactive prognostics strategies

Self-monitoring

Less expensive and time efficient

Ease of use

Need for more organic system-operator interaction

PROPOSED SOLUTION - POWERGPT

Large Scope

National grid map

and wind power prediction

Dynamic Visuals

Transformer graphics, map,

and diagrams

History

PostgreSQL storage

Predictive

Transformer based fault detection

UI

Tkinter to React based

Session Management

Login Page

[2]

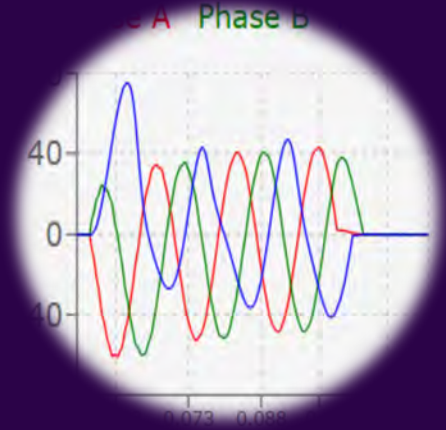
FEATURES

Login

User authentication

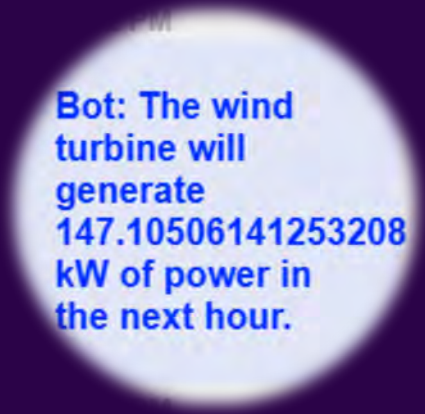
History

Chat retrieval



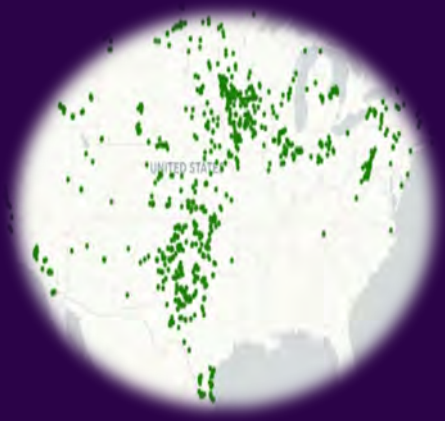
Interactive Features

Graph & diagram



Wind Power

Live generation predictions

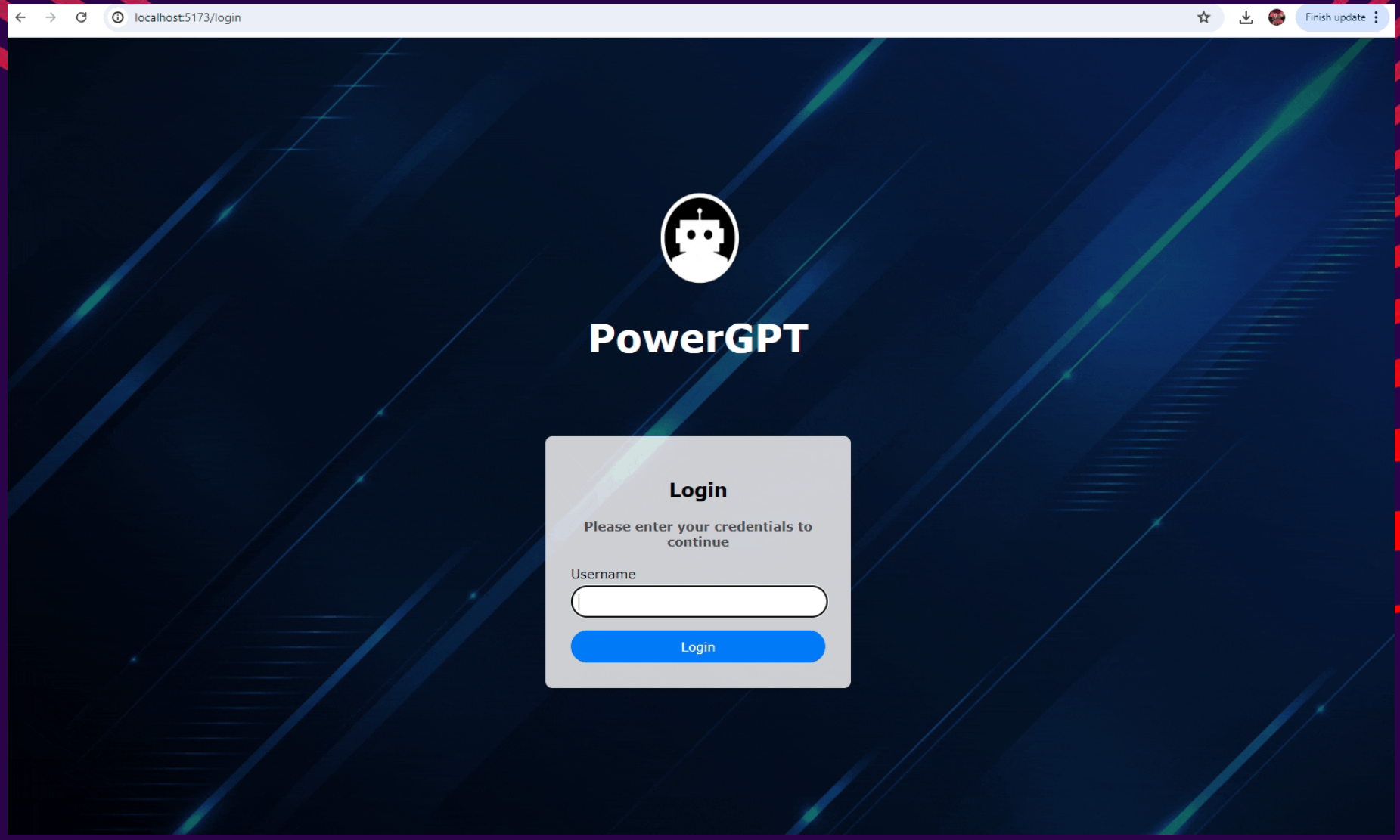


Power Grid

Color-coded plants

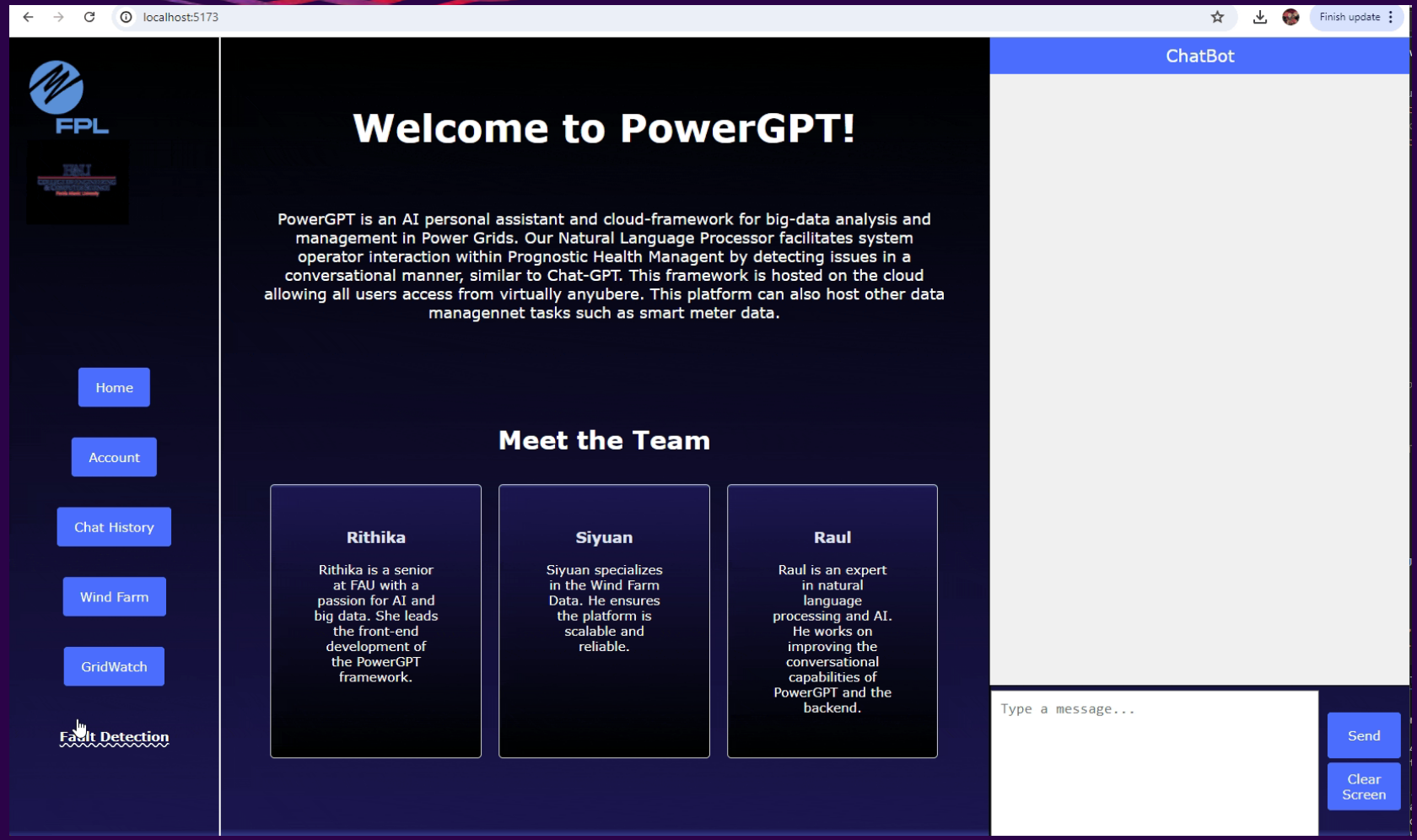
LOGIN/ CHAT HISTORY

- User Query history
- Automatically logs to PostgreSQL dat abase for retrieval
- Login page for session management
- Information stored on database
- Password login planned for future implementation
- Features such as chat history will be per-user based

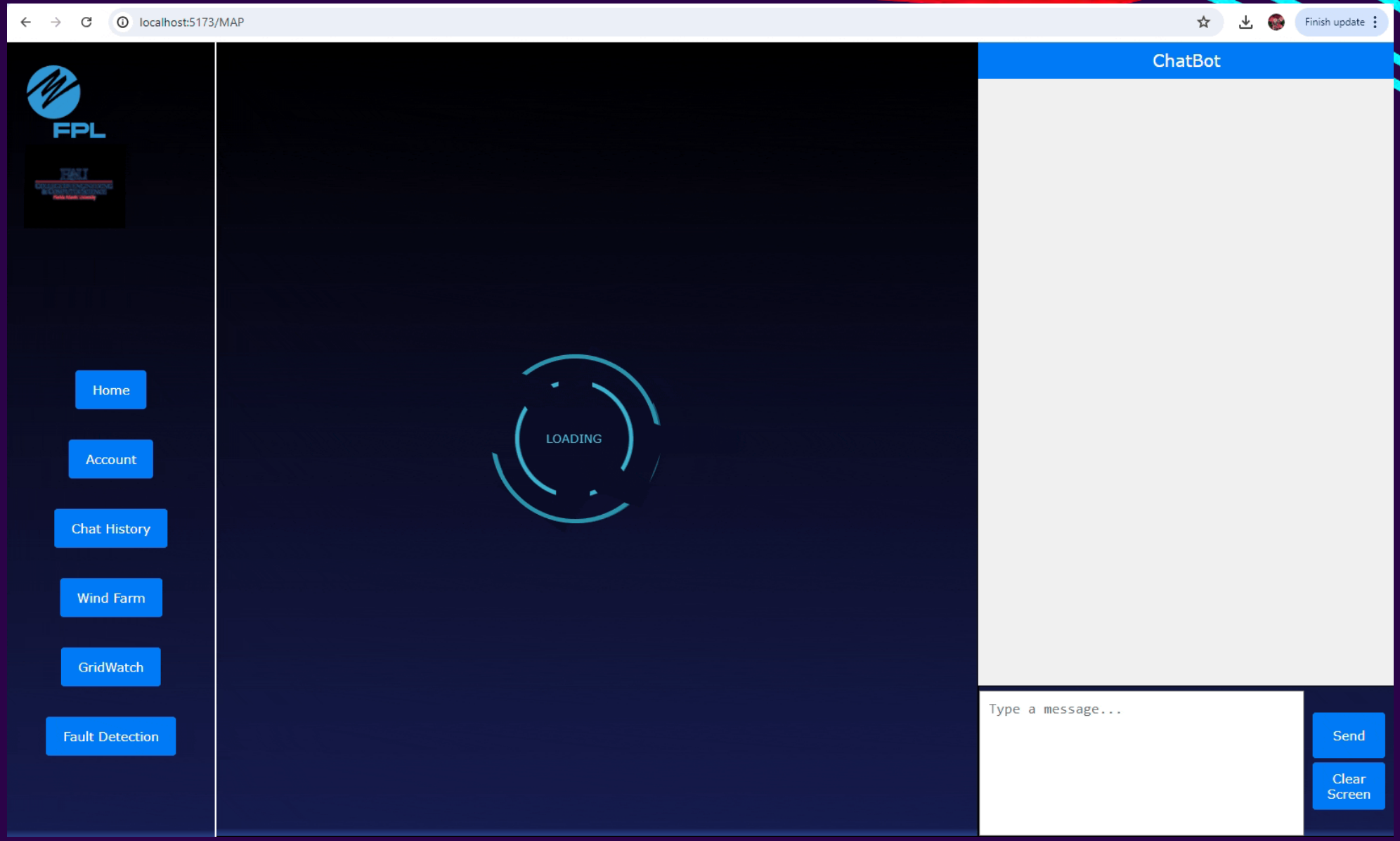


INTERACTIVE FAULT DETECTION

- Uses trained transformer-based model to predict power transformer faults
- When prompted for fault detection, chatbot takes user defined signal and feeds it into the transformer model
- Bot outputs fault prediction
- Highlights faulty parts on a diagram of a power transformer
- Graphs the signal



GRIDWATCH


localhost:5173/MAP
Finish update
FPL
Home
Account
Chat History
Wind Farm
GridWatch
Fault Detection
LOADING
ChatBot
Type a message...
Send
Clear Screen

[3]

WIND POWER

[4] Google. (n.d.). *NWS weather*. Google.

Dataset

- 2017 data of a 2.5 MW Clipper Liberty wind turbine in Minnesota

Integration

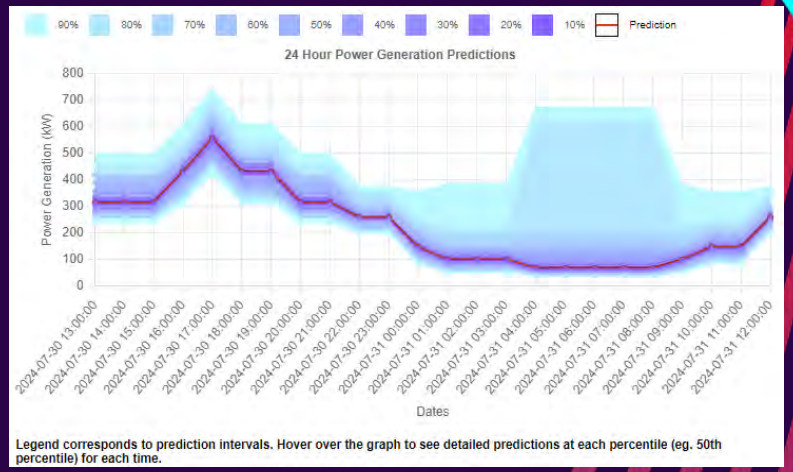
- Accesses live wind speed data for predictions

Training

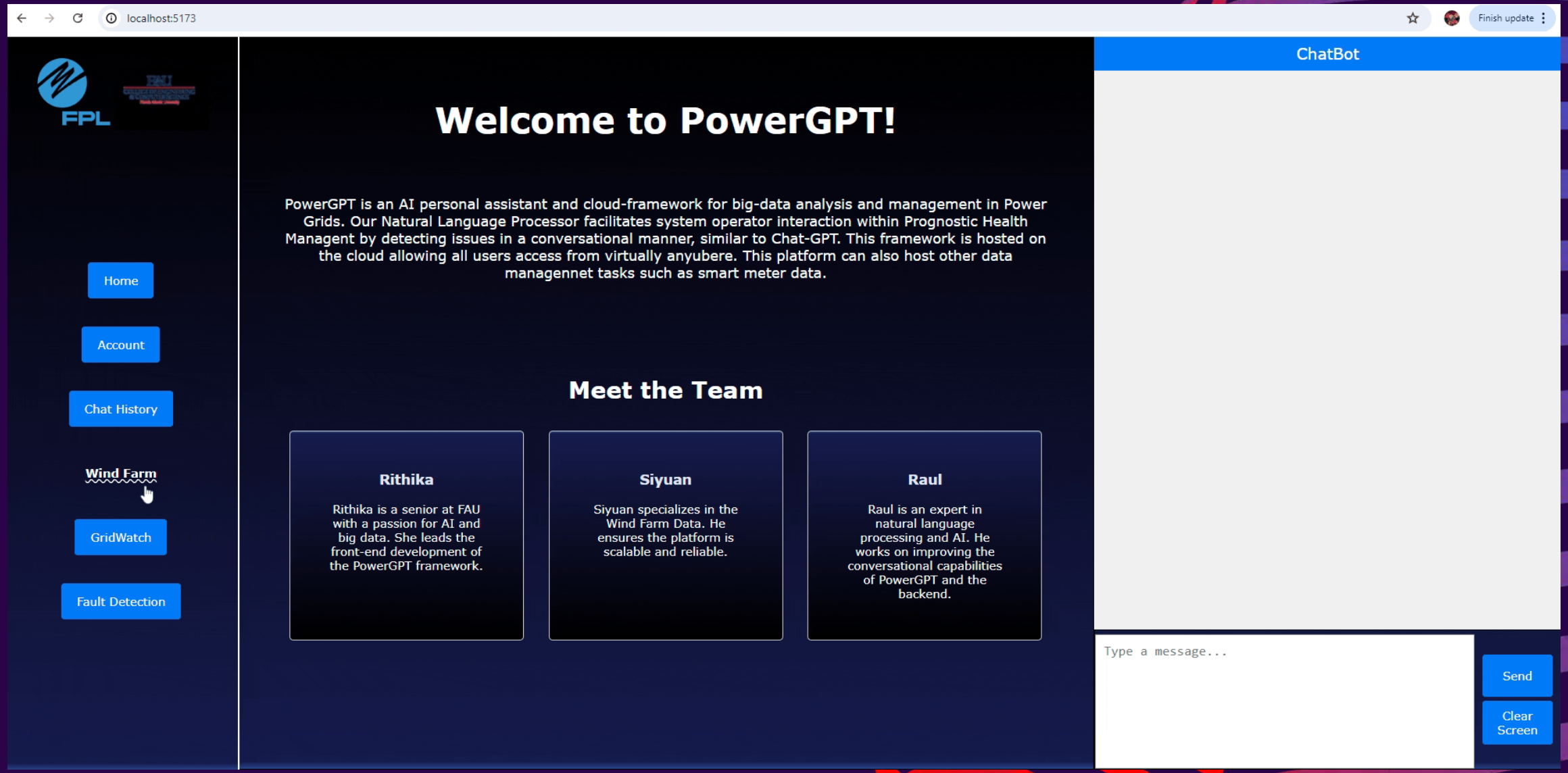
- LightGBM library
- Final RMSE of around 150 kW

Interaction

- User can query and ask for predictions from any city.

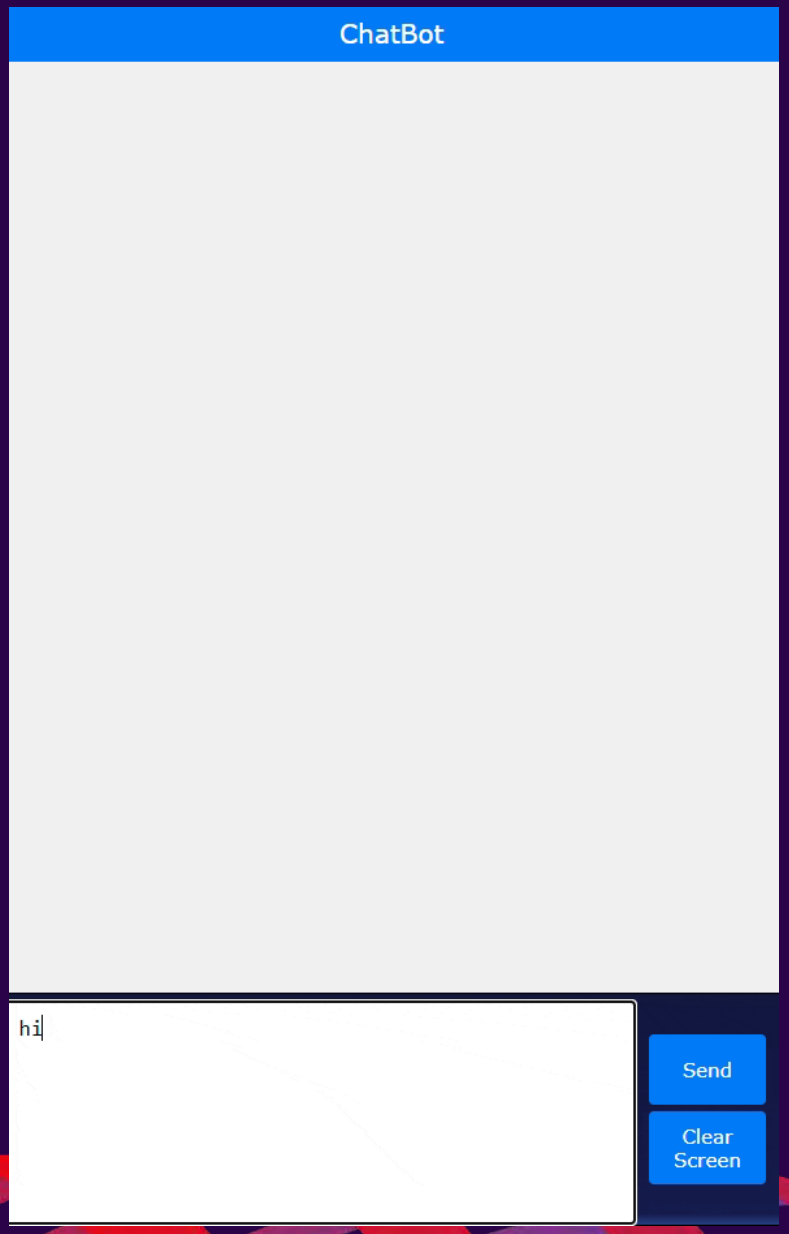


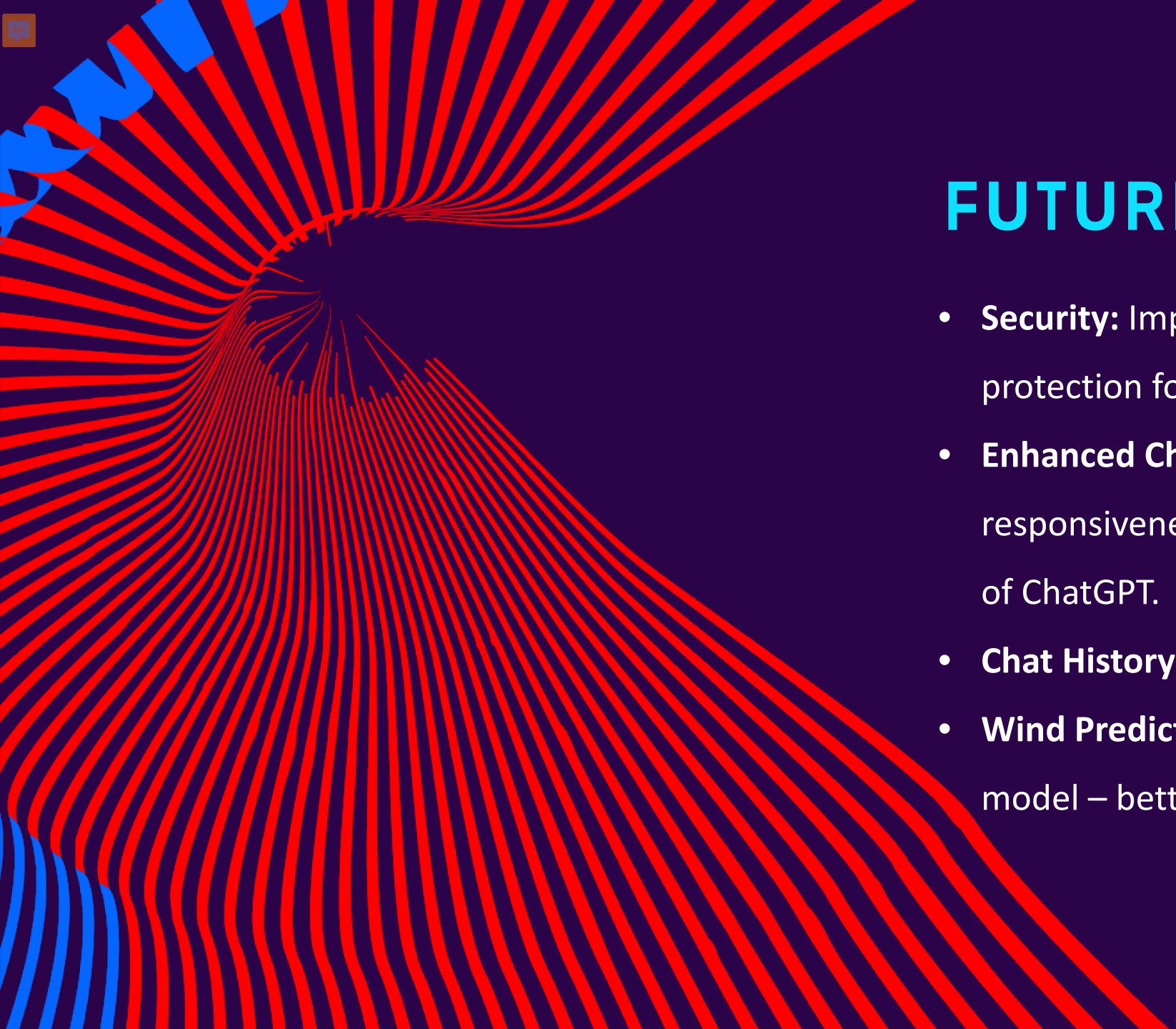
WIND POWER


localhost:5173
Finish update
FPL
Home
Account
Chat History
Wind Farm
GridWatch
Fault Detection
Welcome to PowerGPT!
PowerGPT is an AI personal assistant and cloud-framework for big-data analysis and management in Power Grids. Our Natural Language Processor facilitates system operator interaction within Prognostic Health Managent by detecting issues in a conversational manner, similar to Chat-GPT. This framework is hosted on the cloud allowing all users access from virtually anyubere. This platform can also host other data managennet tasks such as smart meter data.
Meet the Team
Rithika
Rithika is a senior at FAU with a passion for AI and big data. She leads the front-end development of the PowerGPT framework.
Siyuan
Siyuan specializes in the Wind Farm Data. He ensures the platform is scalable and reliable.
Raul
Raul is an expert in natural language processing and AI. He works on improving the conversational capabilities of PowerGPT and the backend.
ChatBot
Type a message...
Send
Clear Screen

CHATBOT

- Makes interaction with the system organic and conversational
- Prompt-based interaction with various features.
- React and Flask Framework for connecting frontend and backend





FUTURE WORKS

- **Security:** Implement secure password protection for user accounts.
- **Enhanced Chatbot:** Improve the chatbot's responsiveness to match the capabilities of ChatGPT.
- **Chat History:** Include diagram and graph
- **Wind Prediction:** Change to transformer model – better long-term dependencies

REFERENCES

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THANK YOU!

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