

EE/CprE/SE 491 WEEKLY REPORT 3

9/27/2024 – 10/2/2024

Group number: 42

Project title: GridGPT 2.0

Client &/Advisor: Gelli Ravikumar

Team Members/Role:

Luke Eitzmann -OpenDSS-Lead

Ian Louis - Power Co-lead

Scott Rininger - Power Co-lead

Aditi Nachnani - Full Stack AI Co-Lead

Ian Bussan - Full Stack AI Co-Lead

- **Weekly Summary**

This week, we met with our advisor Dr. Gelli to present our research from the previous week. The grid team also looked into different models for grouping DERs and predicting DER load and generation. The Grid team also looked into the applications of OpenDSS and how we can use it to integrate with GridAI. The AI team researched how to fine-tune LLM models, this includes both OpenAI and Gemini. We created some fine-tuned data for us to test in the future, as well as learned about RAG for LLM deployment for external data. AI team also learned more about OpenAI from OpenAI documentation.

- **Past week accomplishments**

- **Luke Eitzmann:** I researched the differences between ADMS and DERMS, and then I also researched all the applications for OpenDSS and found examples that we can integrate into our project for the future.
- **Ian Louis:** I researched optimal aggregate DER groupings and aggregate DER forecasting. I specifically researched a method of DER grouping known as disparate DER aggregates (DDA). I also researched applications of machine learning to forecasting load and generation of DERs.
- **Ian Bussan:** This week I learned about fine tuning the GPT 4o model using data that I have

created. I created an example fine tune data with context, questions, and answers for the LLM to fine data. Also Researched RAG, which allows our LLM to get real-time data, and sent our chat bot external data that would be used for question answers.

- **Aditi Nachnani:** We are in contact with ETG and still figuring out how to get the api keys for OpenAI and Gemini API. In the meantime, I logged into the Testbed VM and played around with the windows and ubuntu vms. I also research about fine tuning models and how we can incorporate that to train our model to give the best responses. Specifically, I looked into fine tuning models for OpenAI and GeminiAPI and what their requirements are for their models.

- **Scott Rininger:** I researched more about prosumers. This week I specifically looked into how to include prosumers into DERMS. I also looked into how to stop cyber security threats if we give access to DERMS to more users, specifically prosumers.

- **Pending issues**

- **AI Team (Aditi Nachnani and Ian Bussan):** We emailed ETG to get the API keys for OpenAI and Gemini API. We received an invitation for OpenAI but are still waiting for the key and to get the Gemini API key. We are in constant communication with them to resolve this issue.

- **Individual contributions**

<u>NAME</u>	<u>Individual Contributions</u> <i>(Quick list of contributions. This should be short.)</i>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Luke Eitzmann	Researched differences between ADMS and DERMS, and researched the applications for OpenDSS	6	18
Ian Louis	Researched disparate DER aggregate (DDA) groupings and DER load forecasting through machine learning	6	18
Scott Rininger	Researched prosumers, how to include them and the cyber security threat they present	6	18
Aditi Nachnani	Logged into Testbed VM, researched about fine tuning for OpenAI and Gemini API and looked at the cost, requirements, and limitations	6	18
Ian Bussan	Created fine-tuned data for LLM, Researched finetuning, Researched RAG	6	18

- **Plans for the upcoming week**

- **Scott Rininger:** I am going to learn more about GridAI and how to use it. I am going to figure out how GridAI can help prosumers. Finally, I will consider how to get prosumers onto the software with open opening it up to cyber security threats.
- **Ian Louis:** I am going to research different regression models for DER forecasting. Specifically linear, lasso, and ridge regression. To try and find an application for gridGPT in forecasting. I am also going to look into other DER groupings besides DDA.
- **Luke Eitzmann:** This week I plan to open up OpenDSS with the VM, and play around with some example scripts. I will also try to learn more about ALT DSS - python, and extension for OpenDSS.
- **Ian Bussan:** I am going to research how to connect LLM to DB to data retrieval. This could be connected to RAG as part of the object retrieval. There are multiple different databases that I have to look how to connect to the LLM like Neo4j. As well as deploying and testing a fine tuned model.
- **Aditi Nachnani:** The plan for next week is to research how LLMs connect to DSS. This would allow us to figure out how we can use AI to automate DSS files. If we are able to get the api keys this week, I will experiment with OpenAI and Gemini API. Specifically, I will play around with their apis and compare the two LLMS to see how well they do in terms of accuracy and performance.

- **Summary of weekly advisor meeting**

This week we discussed our individual progress with Dr. Gelli. The Grid team presented the research we did this week about our special topics. Scott researched prosumers, Luke researched OpenDSS, and Ian researched DER grouping models and the use of machine learning in forecasting load and generation from DERs. The AI team explained the research they did regarding the difference between fine tuning OpenAI models and Gemini API. We also looked into RAGS and how we can use that to connect LLM to get real time data. We also shared the issue with retrieving the api keys, and Dr. Gelli advised us what to look into while we wait to get that sorted.

