EE/CprE/SE 491 WEEKLY REPORT 2

9/19/2024 – 9/26/2024

Group number: 42

Project title: GridGPT 2.0

Client &/Advisor: Gelli Ravikumar

Team Members/Role:

Luke Eitzmann - Power Co-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 researched DERs stakeholders and DERMS applications for prosumers, utilities, independent system operators, and regional transmission organizations. Each team member presented on one of the stakeholders and gave possible applications of GridGPT to each stakeholder. The AI team logged into the HPC cluster, and the vSphere client, and logged into the Linux machine to test our environment. Since we are waiting to get access to the API keys, we looked into the documentation for OpenAI to get ourselves familiar with the different requests and endpoints.

- **Past week accomplishments**

  · **Luke Eitzmann**: Worked on researching the applications of DERMS on utility companies, specifically the benefits to work productivity and to revenue enhancement.

  · **Ian Louis**: I researched DER and DERMS applications for ISOs and RTOs. From my research I found two possible applications for gridGPT: forecasting load and generations of aggregate DERS as well as optimal grouping of DERs to from aggregate DERs

  · **Ian Bussan**: I logged into the HPC virtual machine, researched information about the ISU HPC and used commands to see what components are available in the HPC virtual machine.

In addition to running commands to exactly the list of GPUs in the cluster. Also logged into the vSphere client and logged into the Linux machine to test our environment. Also researched more about certain pain points and example of our AI that help with this project

· **Aditi Nachnani**: I emailed the professors and ETG regarding API keys for OpenAI and GeminiAPI. Additionally, I logged into the HPC Cluster and also started learning Go using W3Schools. I also looked at the api documentation for OpenAI and researched about how to create images and make different requests.

· **Scott Rininger**: I researched how DERMs interact with prosumers. I compared and contrasted the three DERMs we had researched previously. I determined the pain points from my research and am working to decrease the pain.

- **Pending issues**

· AI Team (Aditi Nachnani and Ian Bussan): We emailed ETG to get the API keys for OpenAI and Gemini API. We are still waiting for a response. To solve this issue, we will meet ETG in person to ask them about keys and if we need any fundings.

- **Individual contributions**

NAME	Individual Contributions *(Quick list of contributions. This should be short.)*	Hours this week	HOURS cumulative
Luke Eitzmann	Researched the pros and the cons of using DERMS for utility companies	6	12
Ian Louis	Researched DERs effects on ISOs and RTOS. Created a presentation with my finding as well as brainstorming several possible applications of gridGPT to ISOs and RTOs	6	12
Scott Rininger	Researched how DERMs interact with prosumers. Created a presentation to communicate my findings from my research	6	12
Aditi Nachnani	Initiated the HPC cluster; Started learning Go, looked at the docs for OpenAI	6	12
Ian Bussan	Used HPC virtual machine, tested HPC usage, Used vSphere client, and login into Linux machine	6	12

- **Plans for the upcoming week**

· **Scott Rininger**: Going to brainstorm ways to involve prosumers into the DERM process, ways to limit cybersecurity threats. I am also going to research how capacity should be considered when determining the level of access prosumers should be given to the DERM.

· **Ian Louis**: I am going to research my possible applications of gridGPT to ISOs and RTOs. These possible applications are load and generation forecasting of DERs and optimal grouping of DERs to form aggregate DERs. I will make a presentation of my findings.

· **Luke Eitzmann**: I am going to try to use OpenDSS, and experiment with its functionality. And see how it works so we can use it in the future.

· **Ian Bussan**: I am going to use the API keys for Gemini and ChatGPT and test which LLM model is better for smart grid applications. Going to also test the accuracy of simple test cases of electrical grid applications on the pain points problems we discussed last,week. Also discuss with the EE team to get a better understanding of possible pain point problems and correct solutions

· **Aditi Nachnani**: The plan for next week is to expermine with OpenAI and Gemini Api. Specifically, I will compare the two LLMS, and see how well they do in terms of accuracy and performance. Along with that, I will look into how to fine-tune our model to get the best result. After experimenting, the goal is to coordinate with the grid team on challenges we can address with them and decide which LLM to use that will work best for GridAI.

- **<u>Summary of weekly advisor meeting</u>**

  We have had 2 meetings with our advisor since our last report. In our first meeting, the grid team had researched and displayed all that they had learned about the DERMS and their use in society, we discussed the pros and cons of DERMS and who DERMS can affect. It was decided that they affect the prosumers of DERMS, the utility companies, and ISO's. Action Items were made to research the effect that DERMS has on these three potential clients for GridAI In the second meeting, the grid team talked about the effect of DERMS on prosumers, utility companies and ISO's, and the positives and negatives they each face. We decided that our action items would be researching other uses of DERMS such as forecasting loads, optimizing DER aggregates, and potentials starting to experiment on OpenDSS.
  For the AI team we discussed the resources that would be given to us and how to use them: we were given HPC, vSphere Client, and API keys. We discussed how there are multiple use cases for our LLM's to be used for smart grid applications including DERMS related to the local energy market and how LLM's could be used for legal regulatory energy questions. Our focus now is to research fine-tuning for LLM and we would compare performance and accuracy. In addition, research more about Hugging Face with experiments related to fine-tune models.