Group number: **20**

Project title: **GridGPT**

Client &/Advisor: **Gelli Ravikumar**

Team Members/Role:

- **Tin Ngo -> AI Integration Specialist**
- **Jackson Phillips -> AI Integration Specialist**
- **Emma Heithoff -> Power Systems Specialist**
- **Eddy Andrade -> Frontend Lead**
- **Nick Doty -> Backend Lead**

o **Weekly Summary**

As we acquire more information about the project and the goals we want to achieve, we are motivated to do more research and gain a better understanding of the skills required to accomplish our tasks. These skills include React for our front-end, Python Flask for our back-end, a deeper understanding of Hugging Face, AI, and ML, and knowledge of what DSS files are and how to interpret them. This week has been heavily focused on research. Our client plans to provide us with the previous infrastructure, and we are preparing for that.

o **Past week accomplishments**

- Tin Ngo: During a meeting with our client, he instructed us to research and suggest AI models from Hugging Face that could be used in our project. We discussed DSS files and how they related to our users. I found several potential AI models that could be used in our project, including tabular classification and tabular regression models. These models are designed to predict outcomes when given a large dataset, which fits our project's requirements perfectly as we will have data in DSS files that give information about the power grid. Once fine-tuned, these models can interpret the data and provide our users with a better understanding of potential outages and how to make the grid more efficient. We also discussed AI models that could be used in our first use case, which involves a grid copilot generating scripts for us based on a set of DSS files. I found a couple of AI models that could work, although it may be challenging to chain them together. Additionally, I am researching various AI/ML definitions to better understand them. I have also been getting into Hugging Face's documents as they provide lots of information.
- Jackson Phillips: This week, I continued to spend time familiarizing myself with Google Colab. I went through the quick tour of the Transformers library in Google Colab.
- Emma Heithoff: I worked with understanding an example python script for an Induction Motor power analysis. I focused on both the OpenDSS documentation and the script in Colab to fill in my

questions before we design our application to generate the .dss files given the information of the system. My focus is on the script contents in the GitHub dss_python tests for how we will truly solve inquiries of the utility operators.
- Eddy Andrade: This past week, I continued to learn more about React and how it works to make a user interface. In doing so, it has given me ideas on how to create our user interface for GridGPT. I have a rough idea to follow the interface similar to ChatGPT, but I do want to change it to make it our own. I also got more insight alongside with my group on the project from our client.
- Nick Doty: The team met with our client and we further discussed the project. For the backend, we talked about looking into databases such as Influxdb, Graphdb, and Mongodb and how to implement them into the backend. I also have continued to familiarize myself with Flask architecture.

o **Pending issues**

- Tin Ngo: It's difficult to find information that is specifically tailored to our needs. Due to our inexperience, we are struggling to understand what is necessary for the project. Additionally, since we don't have the infrastructure that we will be working on, it is challenging to see the bigger picture and find what we need for it. Moreover, I have to learn a lot to comprehend what I'm researching.
- Jackson Phillips:
- Emma Heithoff: I certainly feel confident in the power system analysis process being done by OpenDSS and simultaneously need more time to understand the intricacies of DSS. I will be able to accomplish this with time in the next few weeks, however. I have the information to formulate more client questions to make this happen.
- Eddy Andrade: Currently, I do not have any pending issues, as I continue to learn more about React. The only thing I need to continue doing is learning more about how React works and how I can implement GridGPT to work and make a user interface that is not cluttered or disorganized.
- Nick Doty: N/A

o **Individual contributions**

NAME	Individual Contributions (Quick list of contributions. This should be short.)	Hours this week	HOURS cumulative
Tin Ngo	Research on AI models and definitions	8	21
Jackson Phillips	Google Colab for Transformers library	6	20
Emma Heithoff	Colab for DSS example/Understanding DSS	6	18
Eddy Andrade	More React/Frontend research	6	18
Nick Doty	Backend/flask/database research	6	18

o **Comments and extended discussion**

o **Plans for the upcoming week**
- Tin Ngo: I did a lot of research on definitions and different types of AI models that we can use. Based

on our upcoming meeting with our client, I will be diving deeper into my research or begin experimenting with these models. I will also be looking into our existing infrastructure that will be given to us this upcoming week.
- Jackson Phillips: I will continue to explore models and work with Google Colab.
- Emma Heithoff: I will continue to work through provided links by client that cover ERPI documentation on OpenDSS, training documentation from past courses, and GitHub resources for past tests with our specified python package. My goal is to begin integrating my understanding of these project aspects into the purpose of our design.
- Eddy Andrade: I continue to plan to work on Researching more about React. I'm hoping to find any tips or tricks I could use to make a better and well-organized user interface.
- Nick Doty: This week I will continue to look into databases and how they can be implemented into the backend.

o **Summary of weekly advisor meeting**

This week's goal revolves around artificial intelligence (AI) advancements for the GridPilot application. The focus is on collecting information about various models that could be utilized within this application, with an emphasis on exploring the Transformers library, specifically in a Colab environment.

A key aspect involves refining or fine-tuning pre-trained GPT models on grid data and Distribution System Simulator (DSS) specifics. While these GPT models are adept at understanding English, the objective is to tailor them for more specialized tasks relevant to grid operations. The term "##Bus" is used to denote individual grid models, which encompass power system components like loads, transformers, and lines.

The overarching goal for the semester is to progress toward training and testing the model. This involves transforming grid models into datasets that are comprehendible by GPT models, necessitating research into various Hugging Face models to understand their capabilities and how they might be applied to this context.

The intended users of this system are utility operators, focusing on both planning and operational aspects of grid management. Planning involves distribution grid modeling, which includes integrating new transformers, lines, and loads, as well as renewable energy resources, ensuring the grid's reliability during these additions. GridPilot aims to automate much of this process, evaluating user input to determine the feasibility of adding new components to the grid, and generating necessary script lines, possibly using tools like Codellama and Copilot for writing Python code and managing multiple files.

On the operations side, the emphasis is on maximizing the inflow of power from renewable sources to reduce energy costs while minimizing the system's impact, providing grid operators with detailed insights into power distribution and timings.

The system is designed to be scalable, with potential references to software like DANCE and blockchain technologies for enhanced functionality. Real-time monitoring of the grid system is a critical feature, catering to the needs of city planners and other stakeholders.