

EE/CprE/SE 491 WEEKLY REPORT 1

Jan 23 - Feb 6

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

- **Weekly Summary** As a team, we came together to brainstorm the design of our application. Subsequently, we scheduled a meeting with our client to ensure mutual understanding. Our main objective was to identify our end users, develop a deployment strategy for our application, and gain a deeper understanding of our project's criteria.
- **Past week accomplishments** *(Please describe/summarize as to what was done, by whom, when and, collectively as a group. This should be about a paragraph or two in length. Bulleted points are acceptable as well. Please keep only your technical details related to your project. Figures, schematics, flow diagrams, pseudocode, and project related results are acceptable, but please ensure that they are legible (clear enough to read) and to provide an explanation. If researching a topic, please add a few details about what was learned and how it is relevant to the project. If two or more people worked on a single task, be sure to distinguish how each member contributed to the task. Specific details relating to the assistance provided to other members may be included here. **Do not include classwork, such as individual reflection assignments, and group meetings as part of your duties.**)*
 - Tin Ngo: I met with the client to discuss the project and find out what was expected of us. We learned that our project would be a continuation of a previous one, and the client suggested we focus on the AI aspect and not worry about setting up specific parts of a full-stack application, such as the database, where it will be hosted on, etc. I did some research on AI, ML, and DL, and we received feedback to look into

Hugging Face. I researched more into Hugging Face, which is a platform where users can submit their AI Models for others to use (open-source). While doing so, I came across OpenOrca, a well-liked AI model capable of interpreting data collected from CSV files. However, it will need some tuning to interpret our grid data and provide useful responses.

- Jackson Phillips: In our meeting with our client, he directed us towards Hugging Face as a resource for many AI models available for use, so we spent some time researching models there this week. We learned our model will need to interact with some existing power grid software and be the bridge between the complex outputs of the existing software and the technicians operating the power grid. I have found that many models using the hugging face transformers library can be used to read CSV and JSON files so we can give the data to the technicians in a readable format. I have found that Microsoft phi-2 and the OpenAI GPT 2 that are on hugging face have the transformers library and seem to be recommended for this use case. I also spent a small amount of time looking at the OpenAI assistant playground.
 - Emma Heithoff: At our initial client meeting, we each presented our understanding of the project and our relevant skills. Dr. Gelli mentioned Hugging Face as a starting point to explore AI models for many applications. I also learned through our discussion about the potential of working with OpenDSS, the open-source distribution system simulator, among a variety of power databases. I researched modifications to openDSS by reading research overviews, watched videos to learn about the base system operation, and looked at Hugging Face to become familiar with the structure we will create to gather information from OpenDSS and similar programs.
 - Nicholas Doty: The entire team met with our client for an introductory meeting and discussed initial questions that we had. I have begun to research possible coding languages that could be used for the backend. Python seems to be a popular choice for backend developers, but Kotlin could also be considered. Especially if we use Android Studio to build the frontend.
 - Eddy Andrade: Me and our team met up with our client to introduce ourselves and get an elaboration on the project that we'll be working on. Our client explained to us an overview of the project, and gave us some information as to what reference points we could use to research on AI, since it is new technology to all of us.
- **Pending issues** *(If applicable: Were there any unexpected complications? Please elaborate.)*
- Tin Ngo: It is hard to find information, and there were a lot of new technologies to learn. Without prior knowledge of certain topics, it is hard to get a grasp on what is needed (skills, preparation, etc) for the project.
 - Jackson Phillips: It is hard to know what we are looking for without knowing exactly what data the files contain and exactly how they need to be relayed to the users.

- Emma Heithoff: What parts of distribution system analysis will the assistant reach in its domain? I am looking for the day to day needs of grid operators to gain an idea of how we can create an assistant that helps them provide improved efficiency. Will we target the entire grid, or specific categories?
- Nicholas Doty: What language will be used specifically for the backend? Is there a specific aspect of the backend that should be emphasized?
- Eddy Andrade: As the frontend lead of the project, what would I be doing to showcase the AI design of the power grids? Would I need to create an interface?

Individual contributions *(Creating this section is optional, but it is **Required to include the “Hours Worked for the Week” and their “Total Cumulative Hours” for the project for each member somewhere relevant in your report. Your individual weekly hours should be at a minimum of 6-8 hours for this course. So please manage your time well. Also, ensure that individual contributions support your claim to the weekly hours. Be honest with the reports.)***

<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>
Tin Ngo	AI model research	6	6
Jackson Phillips	AI model research	6	6
Emma Heithoff	OpenDSS/other grid database research	6	6
Nicholas Doty	AI model research	6	6
Eddy Andrade	AI model/Frontend research	6	6

- **Plans for the upcoming week** *(Please describe duties for the upcoming week for each member. What is(are) the task(s)?, Who will contribute to it? Be as concise as possible.)*
 - Tin Ngo: I am working on integrating AI models into our project. This will require figuring out several components to enable the AI model to work with the application we plan to build. Furthermore, we will be sourcing our data from neo4j, so we need to determine which technology stack will integrate well with neo4j. After getting more information, I plan on developing a diagram to display our architecture.

- Jackson Phillips: I plan on continuing to research AI models and I will get started on figuring out how to train models for specific tasks. I also would like to look into using OpenAI's GPT 4.
- Emma Heithoff: I will find an example DSS simulation to combine with my preliminary research on its capabilities compared to other systems. Similar to Jackson, I will work through ideas on initial model training for use with tasks done in OpenDSS, after asking our client what specific power data analysis is needed by the grid operators. Also, I will continue following the progress of my team listed here to gain knowledge on development and coding.
- Nicholas Doty: I will create a rough outline on what the backend will do in its entirety so that it can be easier to know what needs to be done as well as continue research in potential coding languages that could be used. I will also continue to look into Python and Kotlin and how they could be utilized.
- Eddy Andrade: I plan to discuss with the team as to how we should go around implementing GridGPT in a visual way. Depending on what we decide to do, I will gather research on how to work on the chosen language (and IDE) and come up with a rough draft. On top of that, I will continue to look into the Hugging Face database of AI models.

○ **Summary of weekly advisor meeting** (If applicable/optional)

(Provide a concise summary on the contents and progress made during the advisor meeting.)

Here are some of the notes Eddy Andrade-Robles took while meeting with our client

- How will our application be deployed?
 - We'll be using a lot of web-based platforms
 - Use HCP (or GCP) platform
 - Integrate our project into GCP platform
 - Good support from infrastructure management
 - Don't need to worry about dependability of operating systems
 - Fully focus on the AI
 - In the end, implement on GCP GUI
 - We'll be building a Distributor and Resources Management (complex data)
 - Clean energy resources (don't use fossil fuels)
 - Distributed across the grid
- Will we be working with hardware?
 - No
- What grid data specifically will we be looking at?
 - We'll use multiple power system simulation softwares

- Neoforges?
 - Don't need to worry about it, the infrastructure will be there already
- Most of this data is stored into influx DBs (?)
- Data available in pdfs
- CSV
- How will we get our local environment set up to start coding?
 - Utilize docker to create a containerized environment with the correct dependencies and be ready to start coding.