GridAI: Cloud-based Power Grid Data Analytics

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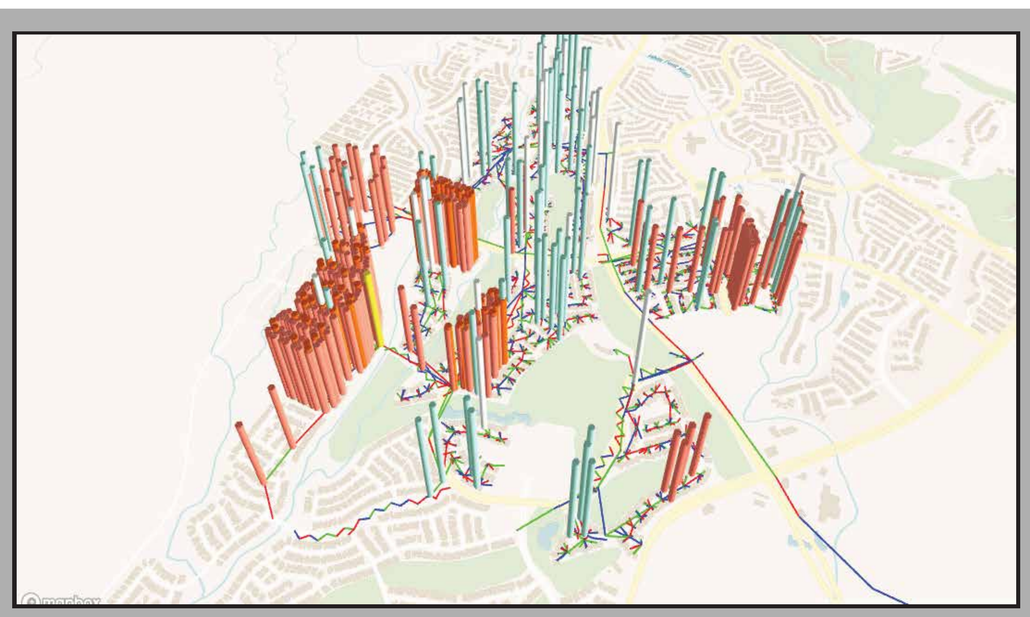
The Power Grid is becoming increasingly complex, requiring better insight to prevent instability and outages.

GridAI seeks to provide a cloud-based web application to host insightful visuals, a virtual assistant, and cutting-edge predictive models to provide insight to the health of the power grid.



APPROACH

By understanding when and where failures will happen, operators can proactively work to prevent problems before they happen. In order to provide an environment to make this method of operation feasible, we take the following approach:

- **Microservice-based, platform independent design**
- **Cloud deployment for stable and consistent service**
- **Data-driven design, intuitive and uncomplicated**
- **Reinforcement Learning for cutting-edge predictive models**
- **Virtual Assistant to provide hands-free support to operators**

REQUIREMENTS

Defining the requirements of the application allows for clear standards of progress and capabilities:

- **100% code test coverage in deployment**
- **Comply with industry data security standards**
- **Real-time data insights**
- **Predictive models retrained with most recent data**
- **Responsive, user-friendly front end**
- **Virtual Assistant to interact with data**
- **Map visualization to provide insight to geographic data**

THE TECHNOLOGY

CLOUD BASED SERVICES

Using Docker to containerize services and managing resources using Google Cloud Compute (GCP), our platform is efficient, reliable, secure.

FULLY INTEGRATED VIRTUAL ASSISTANT

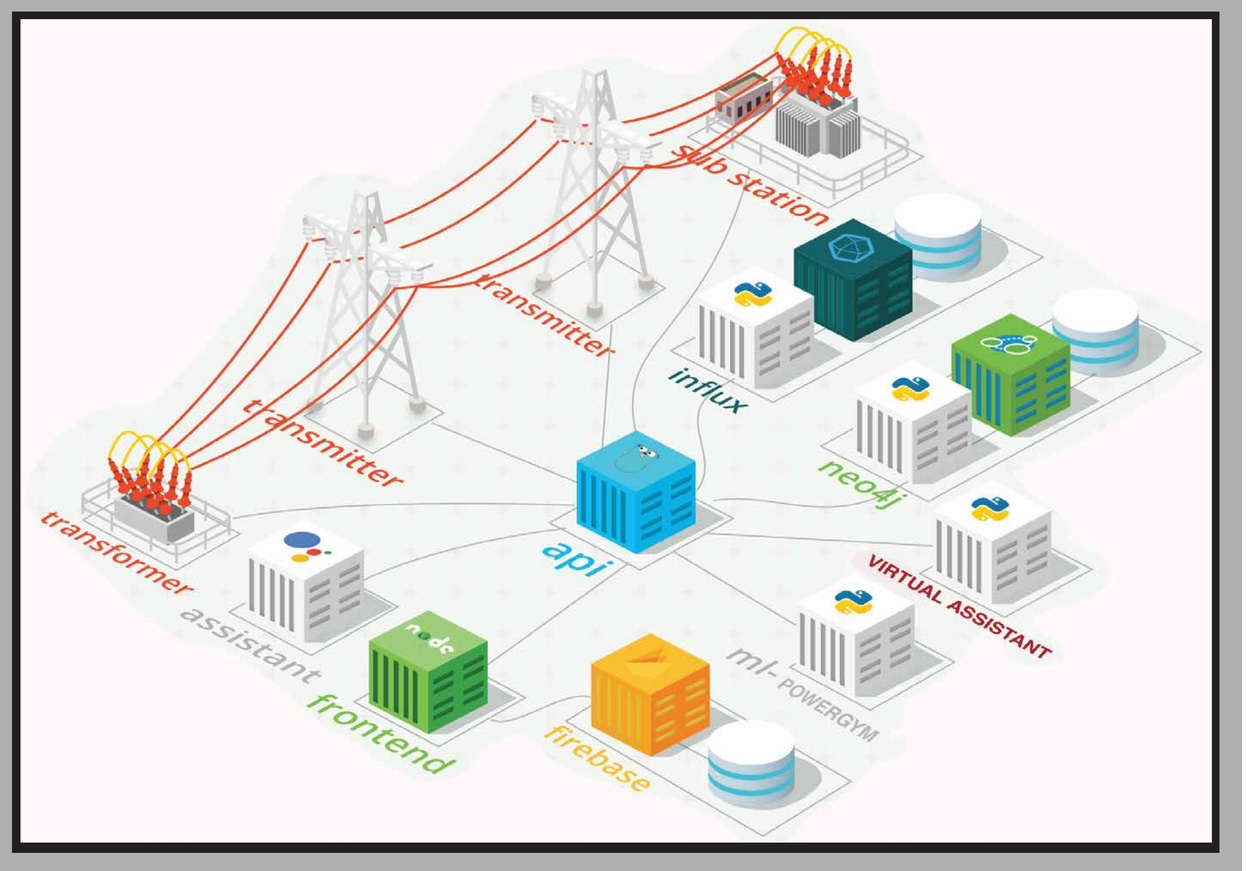
A built-in virtual assistant allows for contractors to access data hands-free, using industry-leading voice recognition and natural language processing models to interact with the platform using only their voice.

ADVANCED MACHINE LEARNING

Using a Gymnasium environment and a cutting edge A2C algorithm, our reinforcement learning models will learn how the power system behaves over time and will able to predict actions to take in order to avoid outages.

INTUITIVE USER INTERFACE

Using data-driven design to specifically enhance the user interface to provide in-depth analytics on the health of the grid without sacrificing ease of use.



THE IMPACT

In today's advanced technological age, there is almost nothing that doesn't rely on the Power Grid. From your office's coffee machine to the ventilators at hospitals, proper electricity is necessary for the continued functionality of society. Where GridAI makes an IMPACT is seen throughout everyday life:

- **Improved analytics to provide insights into the health of the grid**
- **Advanced algorithms to predict where outages occur**
- **Automated intelligent control systems to provide actions to mitigate risk**
- **Tools to assist providers and grid operators in providing efficient solutions**

RESULTS + CONCLUSIONS

We have made significant progress over the course of this project to improve the capabilities of the GridAI platform. Our major milestones include:

- **Redesign and implementation of microservice architecture using Docker and GCP for platformless deployment and service**
- **Implementing a brand new reinforcement learning application to learn and predict how systems behave over time**
- **Build out a first-of-its-kind virtual assistant designed for use by power grid operators and utility providers to enhance their working experience**
- **Improved integration testing and code coverage to ensure proper security and functionality**
- **Provided further emphasis on information security, specifically in regards to data privacy**

The GridAI platform has made large strides since its inception three years ago, and it undoubtably has the capability to turn into an essential tool for power grid operators and utility providers as they continue to perform maintance on the grid, an essential piece of everyday life.

Future Work

In further iterations of the project, there remains much work to be done. There are multiple features, topics, and points of improvement that were beyond the scope of our project due to time constraints.

For further information on future work, please see section 6 in the official GridAI Project Brief.

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