U.S. Natural Gas & Electric Company - Covid Response

Company Profile

This public utility provides natural gas and electricity to 6.7 million of Michigan's ten million residents, serving customers in all sixty-eight of the state's Lower Peninsula counties.

Pacific Data Integrators

Business Challenges

This gas and electric utility needed to determine the following:

The impact of COVID-19 on 2.7 million residential demand response customers. Specifically, the risk of customers defaulting on their utility bills

To what degree COVID-related shutdowns would increase load usage for residential customers in Michigan

The revenue impact of Covid-19 from increased residential customer load usage and higher default rates

Project Methodology

To provide the desired insights, our team developed a unique approach to machine learning validation. First, they built a set of initial predictions using an Unsupervised Learning Technique (KMeans). Then, they validated the results using both Supervised Learning (Gradient Boosting) and Unsupervised Learning (Gaussian Mixture Models) techniques.

Additional Steps:

All python code was extensively documented to improve readability and ensure reusability

Wrote custom-code to optimize the memory usage of datasets, thereby decreasing runtimes and increasing computational efficiency

After the datasets were memory optimized, the required space to store the datasets was reduced by 90%

Streamlined SQL queries utilized in the project

Project Results

First, by leveraging a machine learning algorithm, our team was able to assign a 'risk estimate' for each customer based on recent payment trends, historical payment information, the number of overdue payments, and other factors.

This predictive model estimated a Risk Score for each of the 2.7 residential customers. Furthermore, it divided residential customers into four stability segments: Low Risk, Medium Risk, High Risk, and Extremely High Risk.

Subsequently, our team built a load forecasting model and revenue forecasting model for each customer through the summer months, which traditionally see peak usage.

We were able to forecast electric and gas consumption for relevant customers from July through September of 2020, as well as predict the financial impact that Covid-related load usage increases would have on the company.