Customer Success Story: Demand Response Propensity Model

Build Demand Response Propensity Model Backed by Machine Learning

A Demand Response propensity model presents an opportunity to successfully and economically prevent capacity shortages during critical peak hours, while reducing power supply costs that directly impact customers. Since demand response is “virtual,” the electricity provided is green and renewable.

Company Profile

This public utility provides natural gas and electricity to 6.7 million of Michigan’s 10 million residents, serving customers in all sixty-eight of the state’s Lower Peninsula counties.

Project Goals

The overarching goal of this project was for Pacific Data Integrators' team to build a cohort of 'Demand Response' propensity models backed by machine learning. This model would help the client manage the electric grid efficiently and reduce costs.

Ingest smart meter data under one umbrella from several unorganized, internal and external sources

Develop interactive dashboards driven by advanced analytics, to equip business stakeholders with the ability to understand complex segmentation

Spearhead the successful acquisition of a new customer base via multiple marketing channels (optimized by machine learning methodology)

Profile 1.6 million active residential customers based on their load consumption behavior

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Business Challenges

Unstructured and missing data regarding customer attributes; plus poor data precision for some fields

The need to leverage several databases, both internal and external

Computation of sophisticated ML algorithms is not plausible in local machines for large datasets

Implemented Solution

Under the umbrella of demand response, a cohort of different propensity models were created to support the company's vision of enrolling more customers under the demand response program.

Propensity models were developed for AC Peak Cycling, Summer Time of Use, and Power Michigan Drive (Electric Vehicle program)

Integrated smart meter data (MV-90 for both commercial and industrial customers)

Optimized voltage levels delivered to customers, reduced energy usage, increased efficiency year-round & implemented peak demand reduction on the hottest day(s) of the year

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Project Results

Drove the foundation of a dedicated, high-powered server for computationally expensive algorithms

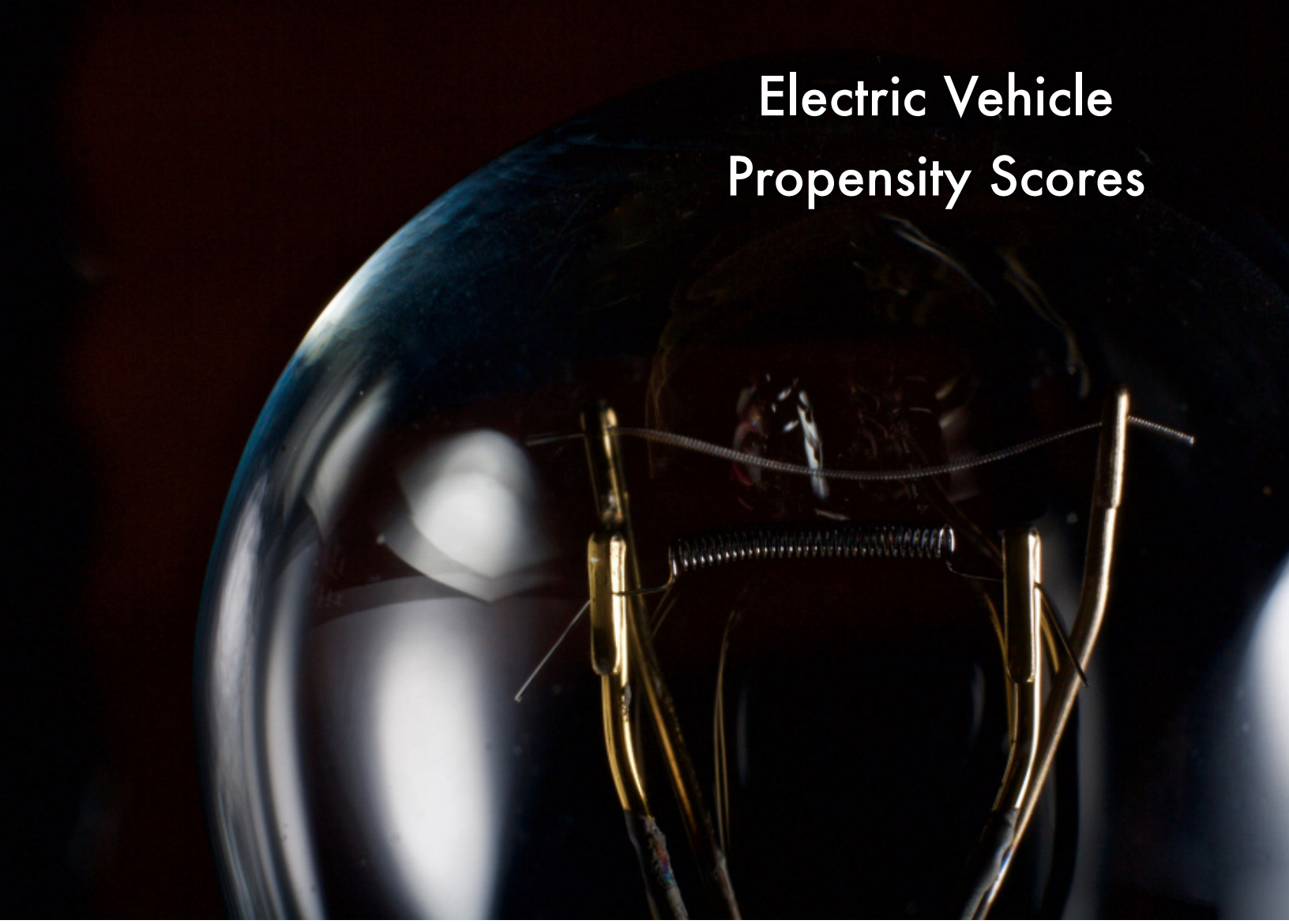
Galvanized a demand response propensity model regarding an energy saving program (AC peak cycling), ensuring profitable marketing enrollments

Work done on AC peak cycling propensity model was well received by the client's SVP and CEO

Successfully profiled 1.6 million residential customers based on their load consumption behavior for the first time in the client's post-modernization 15-year history

Developed an eco-system of in-house demand response programs, where a single pipeline can deliver customized marketing needs; replacing the dependency on several third-party vendors

Revived dormant program enrollments for AC peak cycling, exceeding the sales target by leveraging advanced machine learning-based analytics



Electric Vehicle Propensity Scores

Project Summary

The goal of this project was to take the unlabeled data of1.6M customers and ascertain the propensity scores by determining how likely it is that they will purchase an electric vehicle. PDI prepared the data and developed a machine-learning model using semi-supervised expectation maximization (EM) algorithm on the unlabeled customers.

Company Profile

This public utility provides natural gas and electricity to 6.7 million of Michigan's 10 million residents, serving customers in all sixty-eight of the state's Lower Peninsula counties.

Project Goal

Determine how likely it is that 1.6 million customers will purchase an electric vehicle, based on a training dataset of 1600 customers who already own an electric vehicle. To assign a propensity score accurately, machine-learning algorithms have to be iterated on a combination of hyperparameters.

This project will provide valuable data-driven insights from customer data via machine learning, and will allow the company to share smart analytics with customers related to their usage patterns.

Project Challenges

There is training data for only one label: which customers own an electric vehicle. There is no definite information as to which customers will never own an electric vehicle, necessitating machine learning to extrapolate a solution.

Data scientists spend a significant amount of time cleansing and preprocessing data before actual algorithm work can begin, increasing the delivery time. Additionally, iterating the algorithm using combination of hyperparameters makes this process computationally expensive.