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Utilities

AMI-based EV Detection & Disaggregation

The Oracle Utilities analytics team recently developed and deployed advanced data-science-based EV detection and disaggregation capabilities using 15-minute or hourly advanced metering infrastructure (AMI) data.

With billions of such data points being ingested for our roughly 100 clients worldwide, this is a significant breakthrough that delivers on two promises:

- rolling out intuitive, user-friendly EV adoption customer journeys, and
- planning for and managing the operational impact of EVs as a DER on the grid.

BACKGROUND ON THE R&D

EV detection and disaggregation began with a disciplined effort from our data scientists who reviewed, understood, and built upon a decade or more of state-of-the-art research into time series based end-use disaggregation of aggregate household energy data.

The Oracle data science team built advanced deep learning classification models using neural networks that mimic the human brain's learning processes. Fed with billions of rows of disaggregated energy usage the model learns how to read appliance signatures, and in this case EV signatures, such that it can reliably identify the contribution of EV charging patterns amidst the aggregate household energy use signal. These trained models are then deployed for each specific household's usage to understand whether a customer has an EV, how customers interact with their EV chargers, and where EVs are clustering on the distribution grid. These insights are significant for utilities because EV charging can contribute 20% or more of typical household energy usage. As vehicle electrification increases over time, grid planners will be better equipped to proactively address EV-related load growth.

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DISTINCTIONS AND TESTING RESULTS

Many of the detection and disaggregation products that provide good results in the market today are based on using much higher resolution (sub-minute or sub-second) data which is unsustainable from the perspective of data backhaul for utilities. Our algorithms are generating extremely good results (accuracy hitting > 90% in some cases) for even 15-minute and hourly AMI data. As the availability of hourly AMI data is far greater than the extremely low availability of sub-second AMI data.

Below are some unique examples of consider. Figure 1 shows how well the model is able to predict a customer's EV charging behavior:

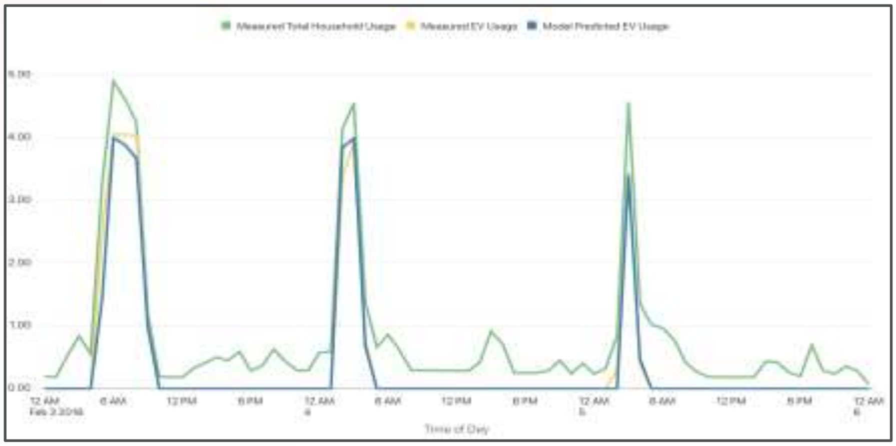

Figure 1. Predicting EV charging with high accuracy

While it is great to be able to predict energy usage when the EV is charging, it is equally important for the model to understand when and if high energy spikes are not from EV charging, but attributable to other appliance usage in the household.

Figure 2 below, demonstrates just such a scenario where the model correctly distinguishes between an EV and non-EV caused usage spike:

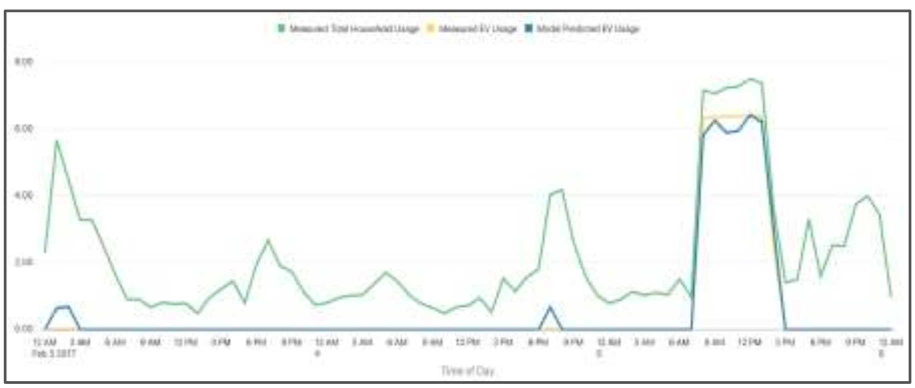

Figure 2. Model's ability to distinguish between EV and non-EV spikes

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