

Analysis of Energy Use Behaviors in Residential Buildings Using Real-World Home Energy Sensors

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ABSTRACT

Numerous studies predict energy consumption using building technology or occupant behavior data, but few focus on occupant behavior through a lens of energy consumption. This study aims to predict occupant behavior using energy use data. We collected actual household energy consumption data for one year, and the sensor-measured data were used to predict the appliances in use that represented associated occupant behaviors. The features used for the prediction included *Frequency*, *Timestamp*, *Cooling Degree Days*, *Heating Degree Days*, *Power*, *Day of the week*, *Appliance* based on the Occupant Behavior Prediction Model. In data analytics, we used classification and clustering with machine learning algorithms. The results showed that the features derived from the model to predict appliances could reach 96% accuracy using the Decision Tree algorithm. The finding implies that daily appliance usage and associated occupant activities in a household are well patterned and predictable using our model. Additional clustering analysis provided further energy consumption characteristics of the household. Also, the minute-level daily energy consumption can be used for detailed energy strategies for households having similar conditions with this testbed.