

## **A Modular Recommender System for Domestic Energy Efficiency**

### **Abstract**

Recommender systems continually impact multiple verticals by introducing automated intelligence to decision making. When applying such Artificial Intelligence (AI) tools to energy efficiency problems, a number of opportunities and challenges present themselves. This paper presents a modular recommender system for improving domestic household energy savings. The recommender relies upon a contextual appliance-level energy dataset from seven appliances in a household. Modularity is incorporated into the system design to create customizable sub-components that adapt to the nature of the data and the end-user's preference, such as modules that recommend based on usage patterns, power consumption, and occupancy. Machine Learning (ML) has been used for automatic appliance profiling and rank-based methods are employed to evaluate the recommender based on relevance scores. Implementation results for generating recommendations for two weeks yield a Root Mean Square Error (RMSE) of 0.652, Normalized Cumulative Discounted Gain (NCDG) of 0.593 for seven appliances. Future work includes evaluation on edge computing platforms and user testing through a mobile application.