

2018 Research Week Proposal

Title - University Energy Demand Forecasting using Machine Learning: A Comparative Study

Program of Study – Industrial and Systems Engineering

Presentation Type – PowerPoint

Mentor – Professor Robert Rich (rkrich@liberty.edu)

Student names and emails

- Nicholas Losee (nlosee@liberty.edu)
- Dean Palmer (dpalmer4@liberty.edu)
- Seth Marselus (sdmarselus@liberty.edu)

Category – Applied

Abstract:

Due to a fluctuating population on a College University Campus, seasonality of energy consumption may be challenging to predict. Energy Demand Forecasting provides an advantage to Facility managers and entities in energy purchasing for the load balancing of the system as well as identifying cost savings opportunity. This study aims to predict the energy demand on a University Campus. Machine Learning approaches were used to compare the forecast accuracy of a University's energy load demand. Through Response Surface Method, relative input factors were identified such as: weather condition, temperature, period of the week (weekend), and campus events. A single month was analyzed to reduce the scope of the forecasting model. Multiple Linear Regression was the first model to be considered for prediction of the data output. The accuracy of each model was determined by the mean absolute percent error (MAPE), the correlation coefficient and the coefficient of determination against the test set. A similar process was then used for testing a Neural Network Model. Each model successfully estimated the campus energy load with less than ten percent error, yet the Neural Network model performed a more accurate prediction with a correlation coefficient of .967. Approximately 93 percent of the variance in historical University energy demand can be predicted by the Neural Network prediction value.

Index Terms—Machine Learning, Multiple Linear Regression, Neural Network, Energy Demands, Response Surface Method, University Energy Demand, Time Series Data