

NM SMART GRID CENTER Spring 2023 Externship

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Externship Report: Working with the City of Albuquerque to develop a predictive model for energy consumption for smart buildings using machine learning techniques.

During spring externship, I worked with Mr. Saif Ismail, Energy, and Sustainability Division Manager and his great team at the City of Albuquerque. We worked on the ongoing Balanced Resource Acquisition and Information Network (BRAIN) project which creates a data repository and computer-based analytics platform that enables real-time interaction with the City's current and historical utility and building performance-related data streams. We studied a comprehensive literature search in the most popular scientific databases about the use of AI-big data analytics for Building Energy Management Systems (BEMS). A Building Energy Management System (BEMS) is an advanced method to screen and control the building's energy needs. In addition to energy management, the system can be used to monitor and control many other building functions, regardless of whether it is a residential or commercial space. Building Energy Management System (BEMS) has been a substantial topic nowadays due to its importance in reducing energy waste. Building Energy Management System can bridge the gap between the automated building management system and the building energy behavior operation using machine learning techniques.

In this research, we tried to provide a thorough and comprehensive understanding of how smart building management systems (SBMS) affect building efficiency and human behaviors, which can serve as a blueprint for the future development of SBMS that are more effective and efficient. By utilizing a suitable predictive algorithm to estimate data for the test area based on smart meter data, the analysis can be conducted to determine the impact of occupant behavior on a building connected to smart metering in comparison to non-smart metering. Over the 10-week course of my program, we conducted research to analyze the impact of occupant behaviors variables, indoor environment variables, and outdoor environment variables on the building's energy consumption. Among different machine learning methods, multiple linear regression (MLR), artificial neural network (ANN), and random forest (RF) were selected to develop a predictive model for the energy consumption of smart buildings. In order to implement machine learning algorithms, the necessary data were collected and the important variables included in the energy consumption prediction models were identified. The results of these analyses will be presented in future reports.

This externship opportunity has been highly beneficial in improving my skills and expertise in data analysis, particularly for practical applications such as smart grid technology. My academic and professional objectives will benefit from the practical experience I have received. I have gained real-world experience that will benefit my academic and professional goals. The externship I took part in has equipped me with skills and knowledge that will prepare me for my future endeavors. I am grateful for the valuable experience I gained through the wonderful opportunity provided by NM EPSCoR. I would want to thank the city of Albuquerque, Prof. Ali Bidram, and Mr. Saif Ismail for their assistance in making my success possible.

