Analyzing Weather Observation History to Improve Building Energy Demand Predictions

Reid Jenkins[1], Ariel Fan[2], Albert Boulanger[3], Roger Anderson[3], Ashish Gagneja[3], Leon Wu[3]

[1]Columbia University, Columbia College [2]Columbia University, Barnard College [3]Columbia University Center for Computational Learning Systems

The Center for Computational Learning Systems (CCLS) has developed Total Property Optimizer (TPO), a suite of machine learning based decision and optimization algorithms for energy usage optimization of buildings. TPO is incorporated in SELEX Elsag's (a subsidiary of Finmeccancia) Di-Boss system that takes in multiple sources of building data including the building's Building Management System (BMS), fire systems data, turnstile data, etc. to offer a web portal and dashboard for a building operator's properties. TPO uses historical datasets of covariates (predictors) such as building occupancy data, electricity and steam demand, and weather data to train the machine learning to predict energy consumption for the upcoming 24 hours based on real-time data for these covariates. Di-Boss is currently deployed in two buildings: 345 Park and 560 Avenue of Americas, both located in midtown Manhattan and owned by Rudin Management Company. As of now, Di-Boss operates on weather covariates collected from the Central Park weather station. We have found that there are key microclimatic differences between Central Park's and Hunter College's weather stations that affect the performance of the machine learning. Our initial study, which tested over the year 2012, yielded smaller errors in electricity demand prediction when using the Hunter College weather station covariates over June, July, and August than when using Central Park data. However, more trials and tests are necessary to conclude that Hunter College is a better weather station to use than Central Park in optimizing energy predictions.