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Machine Learning Models for the Prediction of Heating and Cooling Loads of a Residential Building

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Abstract : Due to the current energy crisis that many countries are battling, energy-efficient buildings are the subject of extensive research in the modern technological era because of growing worries about energy consumption and its effects on the environment. The paper explores 8 factors that help determine energy efficiency for a building: (relative compactness, surface area, wall area, roof area, overall height, orientation, glazing area, and glazing area distribution), with Tsanas and Xifara providing a dataset. The data set employed 768 different residential building models to anticipate heating and cooling loads with a low mean squared error. By optimizing these characteristics, machine learning algorithms may assess and properly forecast a building's heating and cooling loads, lowering energy usage while increasing the quality of people's lives. As a result, the paper studied the magnitude of the correlation between these input factors and the two output variables using various statistical methods of analysis after determining which input variable was most closely associated with the output loads. The most conclusive model was the Decision Tree Regressor, which had a mean squared error of 0.258, whilst the least definitive model was the Isotonic Regressor, which had a mean squared error of 21.68. This paper also investigated the KNN Regressor and the Linear Regression, which had to mean squared errors of 3.349 and 18.141, respectively. In conclusion, the model, given the 8 input variables, was able to predict the heating and cooling loads of a residential building accurately and precisely.

Keywords : energy efficient buildings, heating load, cooling load, machine learning models
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