



# Building Energy Optimization Using ML



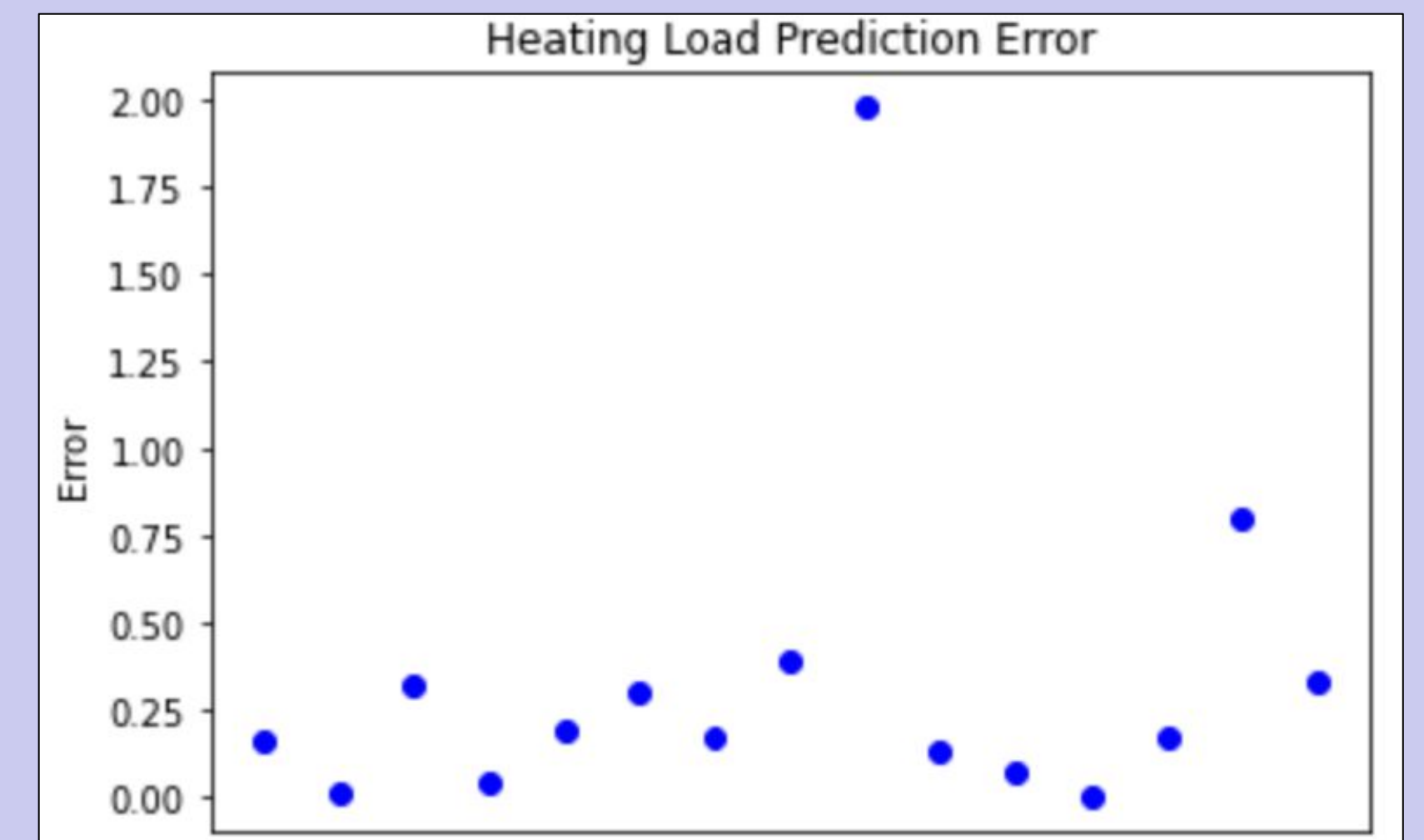
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## Introduction:

Residential and commercial buildings account for around 40% of energy and greenhouse gas emissions, according to the EIA. Under the guidance of Dr. Ohadi and his lab group, I used data science and machine learning to study the factors which drives increased building energy consumption and make buildings use less energy. My research was virtual and consisted of me giving powerpoint presentations on my progress.



Accuracy of my model is pretty good, as error is low

## Materials:

I used Jupyter Notebook and Python for my project. In order to make effective predictions on data using machine learning, I also needed a quality dataset and the right techniques to analyze the data. The dataset I used comes from a quantitative study on the heating and cooling requirements for buildings.

To have the right techniques to analyze data, I examined the top 5 solutions of a machine learning Kaggle competition, to see the best practices they used to analyze and process data.

	Relative Compactness	Surface Area	Wall Area	Roof Area	Overall Height	Orientation	Glazing Area	Glazing Area Distribution	Heating Load	Cooling Load
0	0.98	514.5	294.0	110.25	7.0	2	0.0	0	15.55	21.33
1	0.98	514.5	294.0	110.25	7.0	3	0.0	0	15.55	21.33
2	0.98	514.5	294.0	110.25	7.0	4	0.0	0	15.55	21.33
3	0.98	514.5	294.0	110.25	7.0	5	0.0	0	15.55	21.33
4	0.90	563.5	318.5	122.50	7.0	2	0.0	0	20.84	28.28

## Methods:

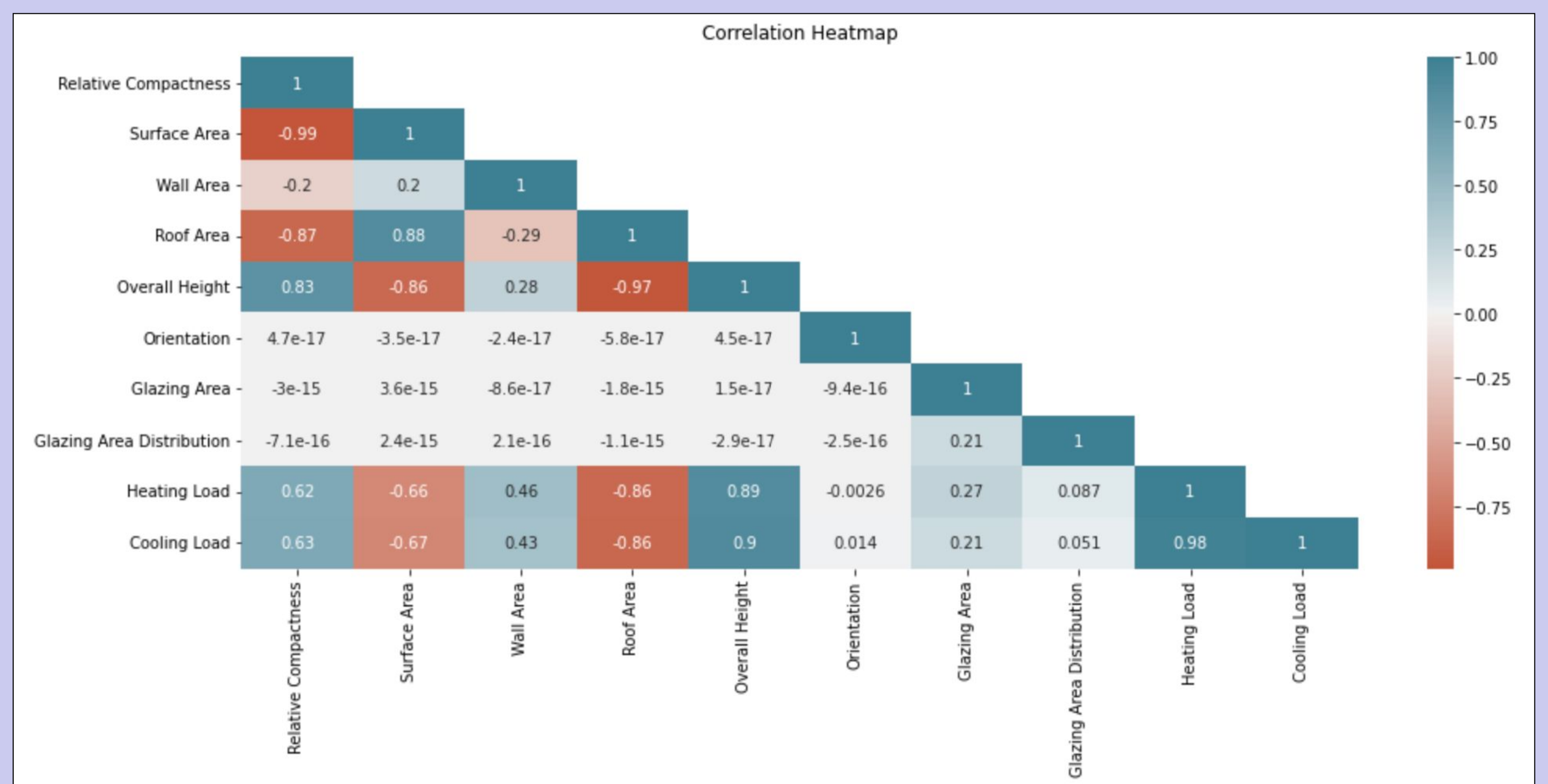
The dataset I used is downloadable from Kaggle.com. In my code, I used various Python libraries to display trends in the data and make predictions on new data using machine learning.

## Results:

I was able successfully produce and communicate trends in the data, and my machine learning algorithm achieved high accuracy in predicting the cooling and heating load of a new building based on its height, wall area, ect.

## Discussion:

Visualizing trends in data allows us to better understand it, and being able to predict certain values before buildings are built/renovated is very useful. This research project showed me how important it is to minimize the energy consumption of buildings and the impact it makes to our global carbon footprint. My work is by no means exhaustive, and I look forward to expanding upon it in the future with new datasets and discoveries.



Correlation heatmap illustrates how different attributes of a building relate to one another

## Site Information:

Name of Site: AHX-PI

Address: Glenn Martin Hall 4298 Campus Dr, College Park, MD 20742

Your supervisor: Dr. Michael Ohadi

The site mission: Engage in cutting edge research in the fields of advanced heat and mass and thermal management systems

The particular goals of the site you were at: Use machine learning to optimize the energy consumption of buildings

## Acknowledgments:

I am very grateful for my lab supervisor, Dr. Michael Ohadi, and my other lab members for giving me the opportunity to research such an interesting topic. I'd also like to thank Dr. Holtz & Dr. Merck for guiding me through SGC and educating me about science, research, and climate change for the past 2 years.

