Modelling and Improving Home Energy Performance

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Background:

With the rise of global warming and continuos hike in electricity bills, Improving home energy efficiency especially in residential sector has become a major task to deal with for government organizations around the world. The process of evaluating a building's energy efficiency requires analyzing the thermal behaviour of the building envelope which usually involves use of destructive ausculation techniques to determine composition of different layers of the envelope.

A paper published by Cambridge Architectural Research presented a model called Cambridge Housing Model which uses English Housing Survey data to estimate energy usage of the domestic residential homes. This serves as motivation for this project.

Technology Stack

jupyter

python™

R

pandas

$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$

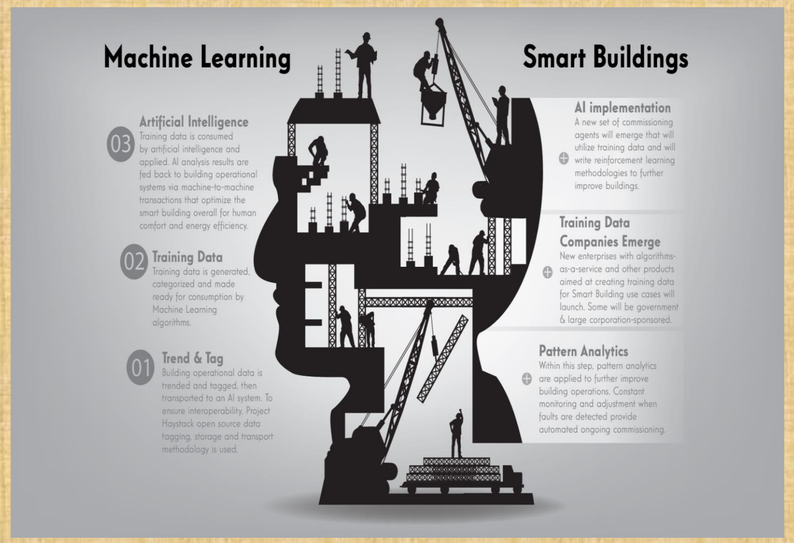
X

This Project:

This dissertation project aims to find a non-destructive and cost-effective way to improve the energy efficiency of houses around UK.
Machine learning Algorithms along with Python will be used to determine what factors affect the rate of energy consumption of buildings and what could be done to improve the overall energy efficiency of residential buildings.

Dataset:

The primary source of input data used in this dissertation is the data from the English Housing Survey(EHS) 2011. The dataset contains physical and demographic data on 16,150 properties, representing 22.4 million dwellings.

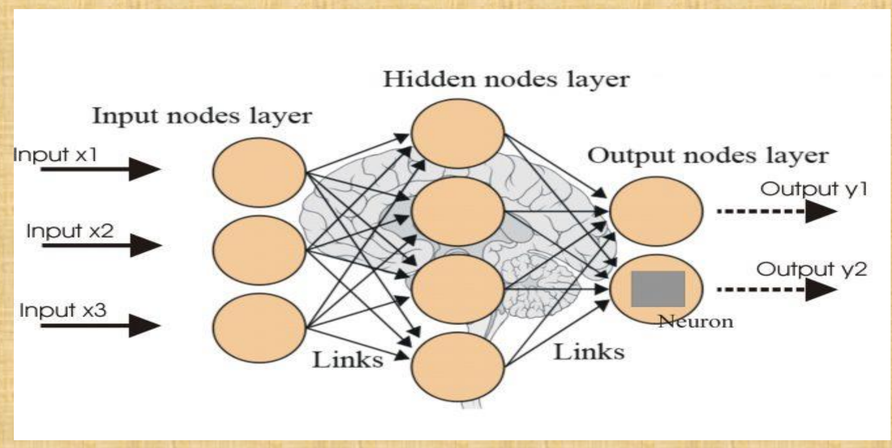


Methodology:

There are several techniques which can be used to evaluate an building's energy efficiency. These techniques can be classified into three general catagories:

a) White box models: Conventional engineering approach
b) Black box models: Machine learning approach
c) Gray box models: Hybrid engineering/Machine learning approach

Artificial Neural Network : is the blackbox model used for performing predictions in this project. They are brain-inspired systems which are meant to replicate the way that humans learn. Neural network consists of input and output layers as well as a hidden layer that transforms the input into something that the output layer can use.



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