**PROBLEM DEFINITION**

Electricity is a national asset and every effort should be made to prevent its wastage. Enough effort is to be put to save power at each building level. The building energy management depends on various design and harvesting factors. Design factors include provision of false ceilings, automated doors and implementation of slab system of charges. Harvesting factors include the provision of additional power sources like solar/Bio Mass power and proper maintenance of electrical appliances. This project aims at analyzing the dataset comprising of the design and harvesting factors of Buildings by using Quadratic Discriminant Analysis, Gaussian Process Classifier, Gradient Boosting and Extra Trees classifications.

**APPLICATIONS AND OUTCOMES**

The project comprises of four modules. The first module deals with adding the buildings design factors and harvesting factors to the database. The second module deals with the implementation of Quadratic Discriminant Analysis, Gaussian Process Analysis. The third module deals with the Gradient Boost Analysis & Extra Trees Classifier Analysis. The fourth module deals with the generation of the comparison plot, comparing the accuracies of the classifiers. Gradient boosting classifiers are a group of machine-learning algorithms that combine many weak learning models together to create a strong predictive model. Decision trees are usually used when doing gradient boosting. Gradient boosting models are becoming popular because of their effectiveness at classifying complex datasets. The objective of Gradient Boosting classifiers is to minimize the loss, or the difference between the actual class value of the training example and the predicted class value. Each Tree in the Extra Trees Forest is constructed from the original training sample. Then, at each test node, each tree is provided with a random sample of k features from the feature-set from which each tree must select the best feature to split the data based on some mathematical criteria (typically the Gini Index). This random sample of features leads to the creation of multiple de-correlated trees.

**Algorithm Used:**

Quadratic Discriminant Analysis, Gaussian Process Classifier, Gradient Boosting and Extra Trees classifications

**Outputs from the project:**

(1) Accuracies Comparison Plot

(2) QDA, Gaussian Process predictions

(3) Extra Trees, GBC predictions

(4) Accuracies of Extra Trees, Gradient Boosting & Gaussian process classifications

**LIMITATIONS**

In the existing system the architects are designing the buildings without using any machine learning techniques towards Energy Harvesting and optimization. The proposed system assists the architects, in designing the buildings by using Gradient Boosting and Extra Trees towards Energy Harvesting and optimization.

**ADVANTAGES**

**Project Advantages:**

1. The project is useful for the Building Architects to understand more about the design and harvesting factors that leads to the low power consumption.

2. Less power consumption reduces the expenses and leads to the low maintenance charges.

3. Less power consumption leads to low pollution, particularly in case of Thermal power.

**Technical Advantages:**

1. Using latest Python’s sklearn tool to implement the QDA, GPC, GBC and Extra Trees classifications. 2. Using Python, which is chosen as the best programming language, by the Programming Community. 3. More Functionality can be implemented with less no. of lines of code in Python.

4. PyQt tool is used to create the Graphical User interfaces.

5. All the Front-end code is generated automatically by PyUIC.