EEE 591
Project 2
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Project 2: Mines vs Rocks

Conclusion & Inference

In this study on the **Mines vs. Rock** dataset, we applied dimensionality reduction technique called **Principal Component Analysis** (PCA) to gain insights into the dataset's structure. The dataset was split into testing and training points with a **30:70** ratio respectively. By performing PCA the optimum components where the code achieved maximum accuracy of **92.063%** is **[7, 10]** which is a significant reduction from 60 features which shows PCA to be very useful for feature engineering. From the plot[1] we noticed that the accuracy reduces as the number of parameters start increasing Subsequently, we applied an MLPClassifier for classification and achieved promising results with a strong emphasis on precision and recall values. This suggests that the model exhibits a high ability to distinguish between mines and rocks. $\begin{bmatrix} 27 & 2 \\ 3 & 31 \end{bmatrix}$ is the confusion matrix obtained. The low number of False Positives and False Negatives shown reinforced this interpretation by highlighting the model's effectiveness in correctly identifying both mines and rocks, thus offering favorable prospects for survival in a real minefield scenario. Our parameter choices for the MLPClassifier were based on **GridSearch** algorithm for fine-tuning, focusing on parameters like the number of hidden layers **hidden_layer_sizes**, hyper-parameter **alpha**, and activation functions to optimize model performance, ultimately leading to the achieved results. Overall, this work underscores the potential for efficient dimensionality reduction techniques and robust classifiers in enhancing the accuracy and reliability of mine vs. rock classification tasks.

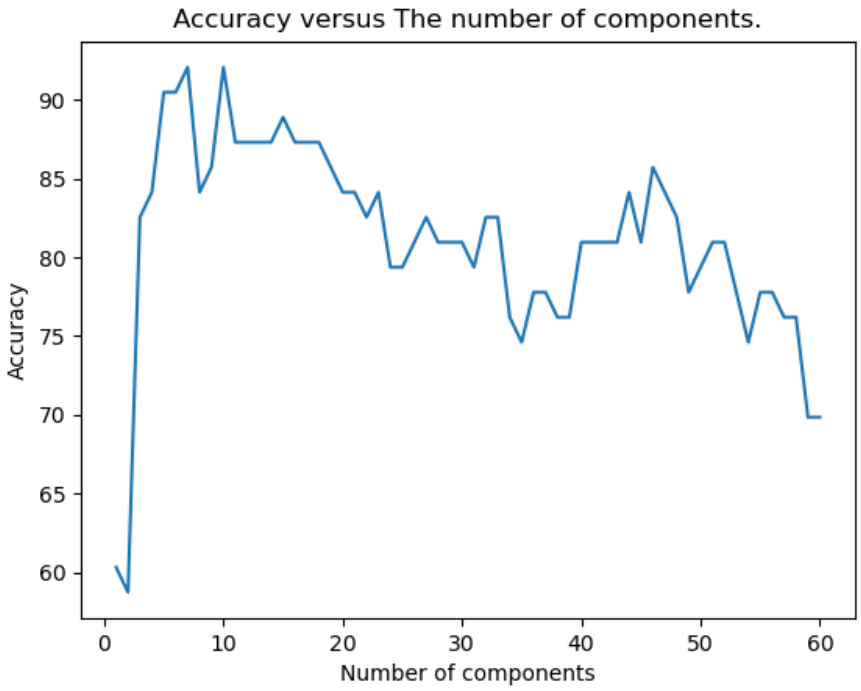

Figure 1: Accuracy v//s Component Count