Executive Summary for Project 1-A:

Recently AMAPE has been having a lot of issues with counterfeit money which is bad for the business. According to a random dataset of 1372 bank notes, 44.46% were fake. In order to solve this problem and identify fake notes on spot, Supervised Machine Learning algorithms can be used. Taking variance of Wavelet Transformed image, skewness of Wavelet Transformed image, curtosis of Wavelet Transformed image and entropy of image as our independent variables (features) we can detect if the notes are genuine or not. As can be seen from the correlation matrix, the authenticity of the note is highly correlated to variance, and reasonably correlated with skewness. Skewness and curtosis are negatively correlated or orthogonal. This helps us in dimensionality reduction and feature selection which means that taking one of them as an input and ignoring the other can improve our model and reduce its complexity.

Executive Summary for Project 1-B:

Applying different ML classification models yields the below summary.

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| --- | --- |
| Algorithm | Combined Accuracy |
| K-Nearest Neighbor | 100% |
| Logistic Regression | 98% |
| Random Forest | 100% |
| Support Vector Machine | 100% |
| Perceptron | 99% |
| Decision Tree | 98% |

Based on the given information solely, I would personally choose SVM. SVM, is more effective in high dimensional spaces compared to the other algorithms .The accuracy of each algorithm is significantly high and that is not always good. One reason is that we cannot visualize the output due to the fact that we need to visualize the data in four diminution and since we cannot visualize it, our model can be overfitting . To improve the model we can do data augmentation, the dataset provided is limited and in order to improve the model and test it rigoursly, we can try data augmentation methods to get the best out of our set. Another improvement that can be done to improve the output is feature selection, this would allow us to visualize the model and reduce noise. Those improvements along with the accuracy would make our model ready for a real world test.