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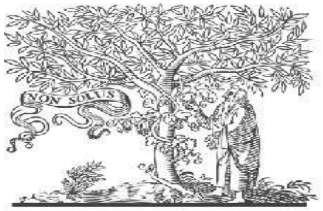

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Title **AN EFFICIENT DETECTION OF COUNTERFEIT CURRENCY USING A HYBRID FRAMEWORK**

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An Efficient Detection of Counterfeit Currency Using a Hybrid Framework

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Abstract –
Imitation currency created without the state's or government's legal approval is recognized as counterfeit money. This currency is a forgery or fraud when it is produced or used. This has led to an upsurge in corruption in our nation, which has an adverse effect on its economic development. We are working on a project called "An Efficient Detection of Counterfeit Currency Using a Hybrid Framework" to combat this fraudulent practice. As soon as the note is scanned by the gadget, the suggested project will identify the counterfeit one. Methods for detection and recognition that go beyond algorithms include elements like colour, form, paper width, and note-specific picture filtering. This research suggests a technique for identifying fake currencies that includes SVM, K-Nearest Neighbour, Decision Tree, AdaBoost, GentleBoost and Bagging with image processing. These datasets for banknote authentication was developed using sophisticated computational and mathematical techniques that provide accurate data and information on the entities and properties associated to cash. Using machine learning algorithms and image processing, data processing and data extraction are carried out to obtain the desired outcome and accuracy.

Keywords - Features extraction, K-Nearest Neighbour, Image processing, Accuracy, Data extraction.

Introduction

In general, counterfeit currency detection involves comparing a specific physical currency notes characteristics to those of the genuine banknote. The world of the digital era is rapidly evolving, and with it, fraudulent activities, notably in the financial sector. Modern technologies are causing the large-scale growth of counterfeit money. As a result, the financial industry is increasingly in need of technologies that can effectively detect fraudulent cash. Once the banknote is exposed through UV light at 365 nm wavelength, it will be easily noticeable. With the use of the computer program MATLAB, programmes for detecting counterfeit currency may be created. The two main processes used in these applications are classification and recognition. It therefore becomes a beneficial method for those who are blind. Also, it is helpful when transacting money on a daily basis in places like banks, hospitals, travel, and institutions run by the government.

Proposed System

This study provides a method for spotting counterfeit money that combines image processing with SVM, K-Nearest Neighbor,

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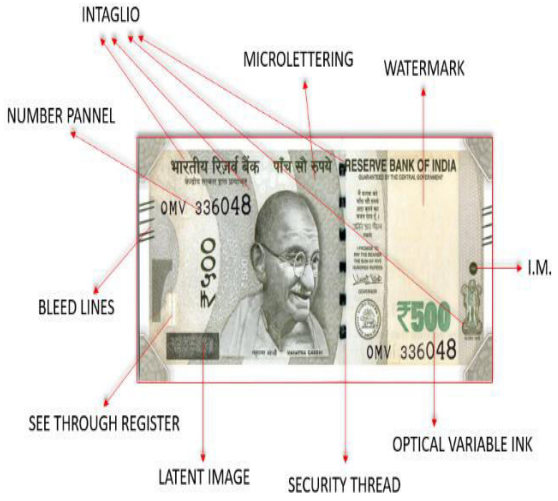
Decision Tree, AdaBoost, GentleBoost, and Bagging.

Features of a Real Note



- The Mahatma Gandhi watermark has a light and shadow appearance and multidirectional lines in the watermark window, is present on banknotes from the Mahatma Gandhi Series.
- The numeral 500 is imprinted with optically variable ink, which is a colour-shifting ink, on the obverse of each Rs.500 note. When the note is held flat, the number 500 looks green, but when it is held at an angle, it appears blue.
- Fluorescent ink is used to create the number panels on the notes. Moreover, the notes contain optical fibres. When the note placed in an ultraviolet light, both may be seen.
- The Rs. 500 notes contain a security thread with the words "RBI" and "Bharat" written in Hindi and similar visible characteristics.
- A unique intaglio element has been added to the left of the watermark window. This feature aids in identifying the denomination for people who are blind and comes in different forms (100-Triangle, Rs. 500-Circle, and Rs. 1000-Diamond).
- The only way to see the latent picture is to hold the note horizontally at eye level.

The camera-captured, real-time image of Rs.500 note is used as the input. The cash can be captured using a camera and hardware configuration. Then, the captured picture is transformed into the appropriate RGB histograms. The primary feature extraction method used for all of the photos are Entropy and Mean, and values are gathered as a result. We will obtain the outcomes needed to construct a graph between the genuine note and the false note using various modes and wavelengths.

SVM - One of the most well-liked supervised learning algorithms, Support Vector Machine, or SVM, is used to solve Classification and Regression issues. Nevertheless, it is largely employed in Machine Learning Classification issues. The SVM algorithm's objective is to establish the optimal line or target variable that can divide n-dimensional space into classes, allowing us to quickly classify fresh data points in the future.

KNN - One of the simple machine learning algorithms, relying on the supervised learning method, is K-Nearest Neighbor. The KNN technique places the new instance in the category that is most similar to the existing categories on the presumption that the new case and the old instances are comparable. A new data point is classified using the K-NN algorithm based on similarity after all the existing data has been stored.

GentleBoost - Using Binning and Parallel Computing, accelerate the training of ECOC classifiers. Address Uneven Misclassification Costs or Unbalanced Data in Classification Ensembles.

Bagging – it is often referred to as Bootstrap aggregating, aids in enhancing the efficiency and precision of machine learning algorithms. It lowers the variance of a prediction model and is used to handle bias-variance trade-offs. Bagging, especially decision tree methods, is used for both regression and classification models to prevent overfitting of the data.

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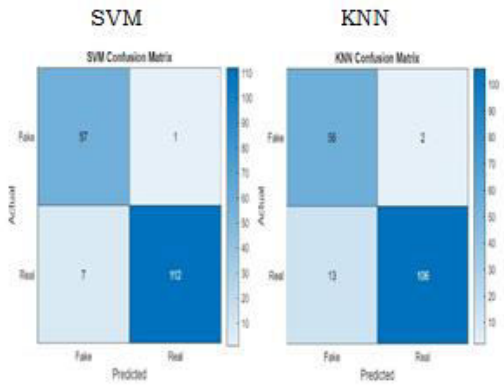
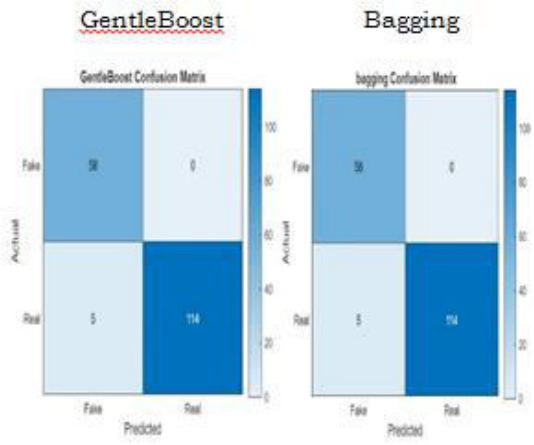
AdaBoost - The first truly successful boosting algorithm created for binary classification was called AdaBoost. AdaBoost is short for Adaptive Boosting and is a very common boosting approach that combines numerous "weak classifiers" into a single "strong classifier".

Decision Tree - One of the supervised machine learning algorithms is the decision tree. Although this approach may be used for classification and regression issues, classification problems are where it is most frequently applied. A decision tree visualises the data and categorises it in accordance with a series of if-then conditions.





Conclusion

We brought our suggested notion into reality in two ways: initially, by employing analysis of hyperspectral imagery, and subsequently, by extracting various traits from both real and counterfeit cash notes and comparing them to one another to determine which is which. In our suggested study, we combined these two methodical methodologies. The many properties contained in the test input note are analyzed and compared to the genuine note in the image processing portion, which determines if the provided note is counterfeit or not. For every feature, entropy is calculated. In order to categorize the provided note, the Aspect Ratio is first determined for the input notes and is 500. Every module in the above was implemented in MATLAB. A counterfeit note detecting system using image processing methods has been established. The testing observations show that the results are approximately correct since the intensity levels of the massively complicated textured backgrounds are comparable.

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