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# Fake Currency Detection using Machine Learning

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## ABSTRACT

***Fake notes are a problem that affects many nations. Among them is Indian. Anyone can print fictitious notes thanks to advancements in technology. The production and distribution of such counterfeit notes makes it impossible for regular people to tell if the money is real or fake because they make their distinctions based on looks. Ordinary people barely have the ability to distinguish between counterfeit cash notes, even with banks and other large companies having automatic devices meant to do so. Numerous processes are involved in identification, including edge detection, feature extraction, picture segmentation, acquisition, grayscale conversion, and image comparison. The detection of counterfeit currency using machine learning has the potential to completely change how we safeguard our financial institutions and currencies against fraud.***

**Keywords:** Fake Currency Detection, Counterfeit Money Detection, Secure Transactions, Anti-Counterfeit Technology, Currency Authentication.

## 1. INTRODUCTION

As fake currency has proliferated in the current digital era, governments, corporations, and individuals all have serious concerns about guaranteeing the legitimacy of paper money.

Ensuring the validity of paper money has become a crucial problem for governments, corporations, and individuals alike in the current digital era, given the widespread use of counterfeit currency. The quick development of these technologies has greatly eased people's lives. However, very few people use these technologies' beauty to further their negative goals. We are surrounded by several examples of this type. The counterfeit note is one of the most important examples among them that came to light. The counterfeit note may allude to the money's creation and distribution without the legal consent of the government. It's a fake. Not only does India face this type of falsification, but most other nations do as well. Being victimized by counterfeit money is not a recent issue. The innovative Fake Currency Detection App. The app scans and analyzes the complex properties of banknotes using advanced image recognition algorithms. It is capable of identifying even the smallest distinctions between real and fake currency. The application utilizes machine learning models in order to enhance its detection accuracy over time. Convolutional Neural Networks (CNNs) are a useful technique for identifying counterfeit money since they have demonstrated remarkable performance in image recognition tasks. Three main steps are involved in employing CNNs to detect fraudulent currency: gathering datasets, training them, and testing them. Gathering a sizable collection of photos of real and counterfeit money is part of the dataset collection stage. The dataset ought to be varied and inclusive of the many forms of currencies that are in use. The collected dataset is pre-processed to get rid of any noise or distortion that can affect CNN's analysis. The program learns from new patterns and keeps up with the tactics used by counterfeiters over time thanks to machine learning. The worldwide currencies are supported by the Fake Currency Detection App. It is a flexible solution that is ideal for enterprises, financial institutions, and international travelers because users can simply choose the currency they wish to authenticate. Because banknotes can be instantly validated, it's perfect for point-of-sale transactions as well as business and daily purchases. Whether the scanned currency is real or fake is immediately indicated by the app. Users can validate banknotes using the app's offline mode even when they aren't online. This characteristic guarantee functionality even in places. The straightforward layout makes it easy to navigate and validate banknotes. Users may confidently confirm the legitimacy of banknotes with the help of the Fake Currency Detection App, encouraging safe financial transactions and aiding in the battle against counterfeit money. This program acts as your trustworthy partner in maintaining the integrity of your financial transactions, whether you are a business owner, cashier, or an individual worried about the money you receive. With the Fake Currency Detection App, embrace the secure transaction of the future.

## 2. RELATED WORK

We divide related work into several key categories that have a direct impact on our research.

J.Refonaa,Ginnu George Sebastian, Dilip Ramanan, M. Lakshmi**:** Eliminating black money has grown to be a significant concern

in India. Even though the government has taken a number of actions to readicate black money, reports on government policy indicate that these actions were not particularly effective. However, with the introduction of new technology, black money can be totally eliminated from the market. This essay outlines a clever strategy that makes use of cutting-edge contemporary technology to effectively and simply get rid of counterfeit money and black money. One of the most widely used technologies, such as NFCs or high frequency RFID tags, can be used to accomplish this. Each paper currency can have these tags embedded into it, allowing for constant tracking and accounting of the currency at all times and locations. This study offers a financially sensible answer to the persistent issue of black money.[1]

Kuppala Lavanya, Kurapati Lakshmi, Lingolu Satya Surya Praveen, Gadi Lokesh: The assessment focuses on six supervised machine learning methods that are used to detect bank cash authenticity on a dataset that is available in the UCI machine learning repository. Using three train test ratios—80:20, 70:30, and 60:40—we applied Support Vector Machine, Random Forest, Logistic Regression, Naive Bayes, Decision Tree, and K-Nearest Neighbor to implement this. Their performance was assessed using a variety of quantitative analysis parameters, including Precision, Accuracy, Recall, MCC, F1-Score, and others. Additionally, certain SML algorithms offer 100 percent accuracy for a given train-test ratio.[2]

Adiba Zarin, Jia Uddin**:** With the development of printing and scanning technologies, currency duplication is still a growing worry for countries. Banks have a lot of note detecting devices, but they are expensive and frequently unreliable. This problem could be greatly solved by the domains of machine vision, neural networks, and image processing. We have created a module that helps blind individuals recognize and match scanned objects to a list of objects, including cash notes, persons, bottles, and the camera's detected object's angle and distance. The approach is based on object recognition from images stored in a database. In this paper, a model combining the Hough transformation technique, face recognition, and optical character recognition (OCR) is proposed. To verify if Bangladeshi notes are authentic, the watermark, ultraviolet lines, and microprinting are removed.[3]

Shamika Desai, Atharva Raja**:** This survey's primary goal is to identify Indian paper money utilizing a novel, methodical technique that makes use of Generative Adversarial Networks (GAN). In this system, Convolutional Neural Networks (CNNs) would be largely used to extract information from Indian rupee notes. Following processing, the image data are sent into a Generative Adversarial Network, which aids in identifying if the cash is real or false. The two primary modules of a GAN are the Generator and the Discriminator, which distinguish between real and counterfeit money.[4]

K Kambale, A Bhansali and P Satalgaonkar: In order to identify a counterfeit note on portable devices like smartphones and tablets, a convolution neural network (CNN) model is constructed as part of the Deep Learning process covered in this survey. A self-generated dataset was used to train and evaluate the developed model. The CNN network receives images that are captured with the camera on a smartphone. The outcomes are promising and can be enhanced with additional investigation and enhancements to the Deep CNN model's architecture. The results show that the testing accuracy was approximately 85.6%, while the training and validation accuracy were 96.55% and 98.57%, respectively.[5]

Aman Bhatia and Aryan Mhatre: In the advanced age of computer science and high computational methods, various machine learning algorithms are proposed by image processing that give 99.9percent accuracy for the fake identity of the currency. Detection and recognition methods over the algorithms include entities like color, shape, paper width, and image filtering on the note. This survey deals with the matter of identifying the currency that if the given sample of currency is fake. Various traditional strategies and methods are available for fake currency identification based on the colors, width, and serial numbers mentioned.[6]

Rencita Maria Colaco and Rieona Fernandes: This document provides the full methodology for a phony note detector system that is even within the reach of the average person. Through the application of image processing techniques, it is possible to determine the authenticity of money notes. Image segmentation, edge detection, grayscale conversion, and other operations are among the many operations that can be carried out on an image as part of an image processing technique. The suggested system will be more affordable, dependable, and simple.[7]

Kanchi Reddy**,** Challa Yashwanth, SreeHarsha KVS, Pavan Sai: The main goal of this survey was to provide a model for visually impaired people to employ when detecting items. We have created a module that helps blind individuals recognize and match scanned objects to a list of objects, including cash notes, persons, bottles, and the camera's detected object's angle and distance. The approach is based on object recognition from images stored in a database. The system auditory feedback will notify the user of the image recognition findings.[8]

Md Ferdousur Rahman, Md Israfil Mahmud Raju, Munim Protik: A real-time solution for visually challenged people to recognize Bangladeshi cash is shown in this survey. The suggested approach makes use of image processing algorithms to help those who are blind or visually handicapped recognize banknotes with prosperity. Blind embossing or blind dots on Bangladesh's most recent banknotes may make it easier for hands-on observers to determine the bill's worth. The challenge of accurately identifying the value of a banknote with image processing algorithms can be difficult because embossing wears off over time.[9]

Megha Jadhav, Yogesh Sharma, Gayatri Bhandari: The most crucial part is to use neural networks to identify additional key traits. Deep learning is a superior technique in the big data era, where processing enormous amounts of data is necessary for every real-world application. In this study, we examined bank notes from several nations by carefully removing their attributes and utilizing deep learning to analyze them. In order to protect individuals from suffering financial harm due to counterfeit bank notes, our system suggested a deep learning-based algorithm that can identify counterfeit bank notes using standard scanners.[10]

## 3. ALGORITHMIC SURVEY

The common algorithms and techniques used in fake currency detection to determine if a currency is real or false are listed below. The algorithmic survey aims to create a reliable and precise system for identifying counterfeit money using cutting-edge machine learning techniques:

1. Image Recognition Algorithms:

- Features: Robustness against changes in lighting and angle, high accuracy in differentiating between objects.

- Accuracy: Very accurate at identifying minute details Consistently train the model using a variety of datasets to increase accuracy.

2. Machine Learning Models Detection::

- Features: Constantly picking up new patterns, adapting to changing counterfeiting methods, and increasing accuracy with time.
- Accuracy: Accuracy is continuously improved by learning. detection criteria are dynamically adjusted based on empirical data.

3. Real-time Validation:

- Features: Perfect for daily purchases, quick validation in business transactions, and point-of-sale transactions.
- Accuracy: Perfect for daily purchases, quick validation in business transactions, and point-of-sale transactions.

4. Security Enhancement Algorithms:

- Features: Secure connection between the application and servers is ensured via encryption methods. encryption protocols that are updated often to fend against attackers.
- Accuracy: Guaranteeing the encryption methods' accuracy for safe communication. encryption protocols that are updated frequently to thwart potential threats.

5. Feedback Mechanism:

- Features: User input is categorized using algorithms for sentiment analysis. Constantly taking input into account to enhance the functioning of the app. Rank order of feature improvements according on user feedback.
- Accuracy: User feedback is correctly categorized by sentiment analysis algorithms. For precise feature upgrade prioritizing, ongoing learning and development are necessary.

6. Security Update Algorithms

- Features: Algorithms to identify unusual app behavior that may point to security risks. updates that are automatically carried out when possible vulnerabilities are found.
- Accuracy: Algorithms that correctly identify anomalies that point to potential security risks. System security is enhanced by automated updates that are brought about by precise threat monitoring. High-precision, ongoing surveillance for new methods of counterfeiting.

7. Cross - Platform Compatibility Algorithms:

- Features: Codebase optimized for Android and iOS performance consistency. Frequent testing on both systems to guarantee equal performance
- Accuracy: The codebase is tuned for uniform performance on both the iOS and Android operating systems. Frequent testing guarantees functionality and feature parity accuracy. cross-platform deployment with excellent compatibility accuracy for a larger user base.

The accuracy values are estimates that are subject to significant variation based on the specific dataset, image quality, pre-processing, and implementation details. Depending on what is needed for the work at hand, selecting the optimal algorithm frequently requires trial and error and fine-tuning.

## 3. CONCLUSION

Since paper money is used far more frequently in India, a mechanism to identify counterfeit money is required. keeping up with its uniqueness. The suggested method appears to be helpful in determining whether the new currencies being utilized in the market are authentic or not. Compared to previous suggested approaches, this one compares a greater number of features for feature extraction. It does more than just present the outcome; it also illustrates the locations of the currency discrepancies. Because of its user-friendly interface, this program is suitable for users of all ages and backgrounds. The straightforward layout makes it easy to navigate and validate banknotes. By enabling users to reliably confirm the legitimacy of banknotes, the Fake Currency Detection App promotes safe financial transactions and aids in the battle against counterfeit money. As a future development, this system can be extended to support foreign currencies such as dollars, euros, taka, etc.

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