Result Paper on CurrencyShield: Deep Learning for Financial Security

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Peer Review Information	Abstract
	Counterfeit money is a big problem for the economy, causing people to lose trust and affecting financial stability. This paper presents a Fake Currency Detection System designed for Indian banknotes, using advanced deep learning and image processing to accurately tell the difference between real and fake notes. The system uses a Convolutional Neural Network (CNN) to check important features on currency notes, like the image of Mahatma Gandhi, serial numbers, and security strips, which help to identify if a note is genuine. By focusing on these security features, the system can detect small changes or missing details that are common in counterfeit notes. The system is available as a web-based app, built with Python and Flask, where users can easily upload pictures of currency notes for checking. After submitting an image, the CNN model will quickly decide if the note is real or fake. To make it easier for everyone to use, the system offers voice feedback in English, Hindi, and Marathi, which is especially helpful for people with visual impairments. This feature ensures that people from different language backgrounds in India can use the system easily.

INTRODUCTION

Counterfeit currency has been a persistent issue affecting economies worldwide, with India being no exception. By leveraging techniques such as pattern recognition and image processing, machine learning algorithms can analyse real-world features to distinguish between genuine and fake banknotes effectively. The proliferation of fake currency not only disrupts the economic stability of a nation but also undermines public confidence in the monetary system. Traditional methods of currency authentication, which often rely on human inspection or rudimentary mechanical devices, are prone to error and lack scalability, especially when faced with large volumes of notes. With the advancement of technology, deep learning techniques, particularly Convolutional Neural Networks (CNNs), have emerged as a promising solution for image-based pattern recognition tasks, making them well-suited for counterfeit currency detection.

This survey paper aims to gives the application of CNN-based models for fake currency detection. The objective is to highlight the strengths and limitations of existing approaches while also identifying key features that differentiate genuine and counterfeit notes. By focusing on Indian currency, which presents unique challenges such as varying watermark patterns, security strips, and intricate serial number

designs, this study delves into the practical implementation of deep learning in real-world scenarios. The paper further discusses the integration of a multilingual text-to-speech (TTS) system, which provides real-time feedback in English, Hindi, and Marathi, enhancing accessibility and usability for diverse user groups. By reviewing existing literature and proposing a structured framework for future research, this survey provides insights into building a robust, scalable, and user-friendly counterfeit currency detection system, which can be extended to other currencies in future applications. Through this work, we seek to contribute to the growing field of automated currency authentication, paving the way for more secure financial transactions and improved public trust.
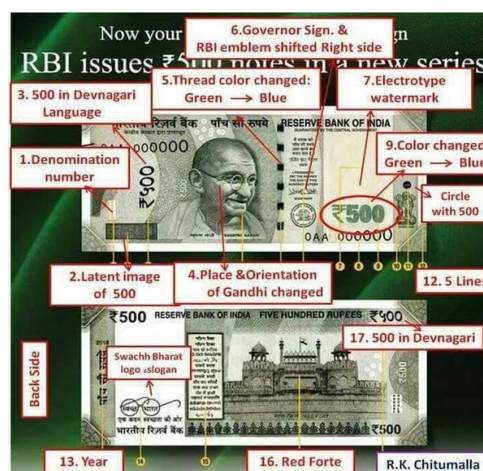

Fig1. Labelled real Currency

LITERATURE REVIEW

Sr. No.	Paper Title	Year of Publication	Author Name	Problem Solved in this Paper: Existing Problem Statement	Technique Used to Solve Problem: Existing Problem Solution	What Will Be Future Work: Future Scope
1	Fake Currency Detection.[1]	2024	Chinmay Shukla	In advanced features and comprehensive analysis is an invaluable instrument in the fight against counterfeit currency.	Machine Leaning technique, pre-processing techniques, computational techniques.	Using realiable prebuilt models, customize for the needs, and add extra layers to highlights key feature effectively.
2	Fake Currency Detection using Machine Learning and Deep Learning. [2]	2024	Shuvra Banik	Efficiently identifies fake currency, aids blind individual in identifying currency types.	A Image Processing in MATLAB, Machine Learning.	Blind individuals struggle to identify currency, and counterfeit money circulation

|						affects the economy.
3	Fake Currency Detection Using Image Processing. [3]	2021	A. Gupta P. Saini, R. Singh	Detecting counterfeit currency using image processing techniques.	Image processing with edge detection and feature extraction techniques.	Enhance accuracy by integrating deep learning models for more robust detection.
4	A CNN-Based Approach for Fake Currency Detection. [4]	2020	M. Sharma, R.K. Agarwal	Developing a CNN-based model to classify real and fake Indian currency notes.	Convolutional Neural Networks (CNN) to extract and learn features from currency images.	Expand the dataset with more currency notes and explore transfer learning for better results.
5	Real-Time Fake Indian Currency Detection Using Deep Learning. [5]	2022	S. Bhatia, A. Verma, R. Sharma	Real-time detection of fake Indian currency notes using deep learning techniques.	Deep learning using CNN with a focus on real- time processing.	Incorporate multi currency detection capabilities and improve processing speed.
6	A Robust Method for Fake Currency Detection Using Machine Learning. [6]	2021	R. Kumar, N. Singh, P. Garg	Addressing the issue of robust- ness in fake currency detection under various lighting and noise conditions.	Machine learning models trained on feature extraction from currency notes under varied conditions.	Develop a more generalized model that performs well across differe nt currencies and conditions.
7	An Efficient Algorithm for Detection of Counterfeit Currency. [7]	2020	K. Rana, S. Srivastav a, A. Saxena	Proposing an Efficient algorithm to detect counterfeit currency notes with low computational cost.	Custom algorithm combining image processing and statistical analysis of key currency features.	Explore the application of the algorithm in mobile platforms for wider accessibility.
8	Fake Currency Detection. [8]	2023	Israt Jahan Nahin, M.D Billal Hossain	Detecting only specific notes like 500,2000 etc. and accuracy is lesser.	Image acquisition, RGB to grayscale, Image	Able to detect currencies of other countries and able to detect more currencies

|						than 500 and 2000.
9	A comprehensive study on Indian Fake Currency Detection using Image Processing. [9]	2022	V. Thakur, A. Roy, M. Gupta	Comprehensive analysis of Image processing techniques for detecting fake Indian currency.	Comparative analysis of multiple Image processing techniques like histogram analysis and edge detection.	Implementation of Deep learning based methods to enhance detection accuracy and reduce false positive.
10	Detection of Counterfeit Bank notes Using Texture Analysis and Deep Learning. [10]	2021	R. Patel, B. Desai, H. Mehta	Using texture analysis combined with deep learning to detect counterfeit bank notes.	Texture analysis using Gabor filters and deep learning classifiers.	Explore the use of GANs (Generative Adversarial Networks) for generating more diverse training data.
11	Automated Currency Recognition and Counterfeit Detection System. [11]	2019	T. Patel, V. Shah, A. Joshi	Recognizing and detecting counterfeit currency in an automated system.	Combination of OCR (Optical Character Recognition) and image processing techniques.	Enhance recognition System for different types of currencies and improve detection.

APPLICATIONS

This system has several practical applications across different sectors:

- Banking and Financial Institutions:
- Retail Sector:
- Public Sector:
- Forensic Analysis:
- Education and Public Awareness:
- E-commerce and Online Platforms:
- Foreign Exchange and Currency Exchange Centers.
- Cash Handling and Transportation Services

RESULTS/ OUTPUTS
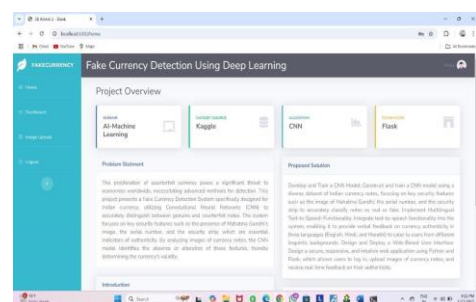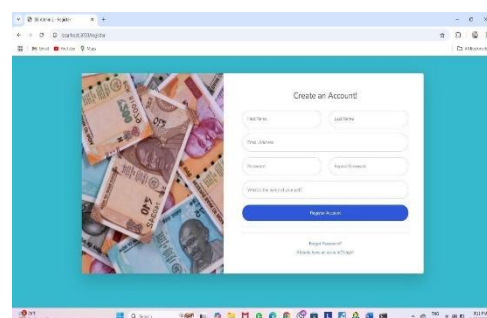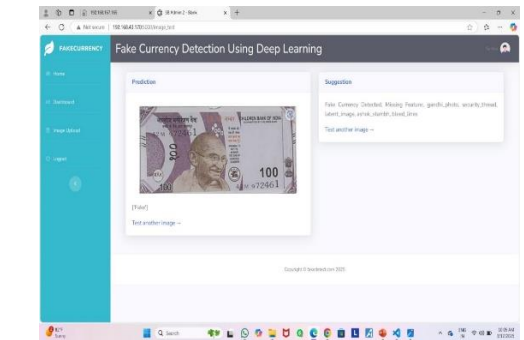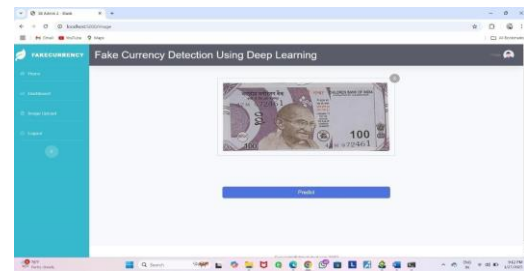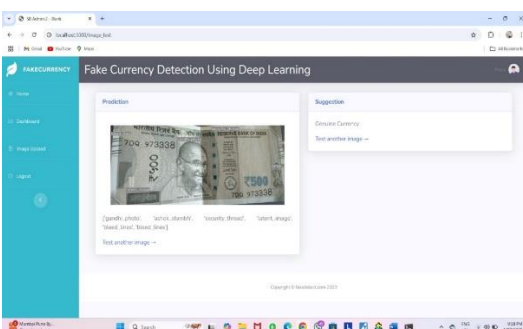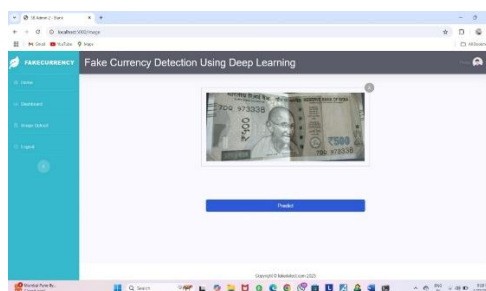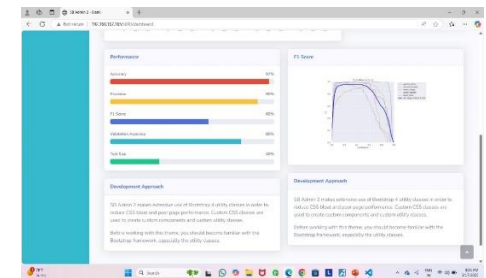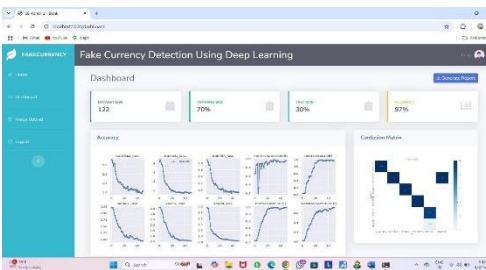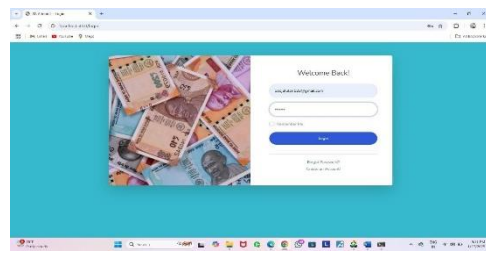
CONCLUSION

This system helps detect fake Indian currency notes accurately using deep learning, specifically a model called CNN (Convolutional Neural Network). It checks important features of a note, like patterns, textures, and security marks, to find out if it is real or fake.

One of the best things about this system is its multi-language support. It shows results in English, Hindi, and Marathi, so people from different regions can use it easily.

The system works as a web application built with Python and Flask. Users can simply open it in a browser, upload a picture of a currency note, and get quick results.

After extensive testing, the system has proven to be highly accurate and reliable in spotting fake notes. It has a simple and user-friendly design, making it easy for both individuals and businesses to use, even if they are not tech-savvy.

It also includes multilingual voice output, meaning users can listen to the results instead of just reading them. This is especially helpful for visually impaired users or those who prefer audio-based feedback.

With its advanced technology, ease of use, and accessibility, this system provides a fast and effective way to detect counterfeit currency. It helps individuals, businesses, and financial institutions avoid fraud and financial losses.

Reference

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