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Detecting Counterfeit Indian Currency using Convolutional Neural Networks

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ABSTRACT: The aim of this project is to develop an efficient and reliable counterfeit currency detection system using deep learning technique. This project aims to provide an automated solution that can accurately classify currency notes as real or fake. The system is implemented using the Spyder development environment and utilizes deep learning algorithms for image-based currency classification. By using deep learning, the system can achieve higher accuracy compared to traditional manual verification methods. The proposed framework reduces human effort and minimizes the chances of error in counterfeit detection. It also helps banks, shops, and financial institutions verify currency quickly and efficiently. The framework can be further enhanced by including additional security features and advanced preprocessing techniques for noise reduction. The project also demonstrates the practical application of artificial intelligence in financial security systems. Overall, the main objective is to create a smart, fast, and accurate counterfeit currency detection system for Indian banknotes.

KEYWORDS: Software-Based Currency Detection ,Convolutional Neural Network (CNN), Machine Learning Model, Image Processing, Fake Currency Identification.

I. INTRODUCTION

Counterfeit currency is a major global issue that negatively impacts the economy and financial security of many countries. In India, only the Reserve Bank of India is authorized to issue currency, yet fake notes continue to circulate, affecting workers, farmers, and uneducated individuals who often cannot identify counterfeit money. Traditional methods rely on features such as color, size, texture, shape, edge detection, watermarking, segmentation, and feature extraction. However, these approaches often provide lower accuracy and face challenges in extracting reliable features. To overcome these limitations, deep learning techniques using Convolutional Neural Networks (CNNs) such as AlexNet, ResNet50, Darknet53, GoogLeNet, and Xception networks are used for accurate fake currency detection. These models require a large dataset of Indian currency images captured under different angles and lighting conditions for effective training and classification

II. LITERATURE SURVEY

Several researchers have contributed to the development of Detecting Counterfeit Indian Currency using Convolutional Neural network.

Ankush Singh and Prashant Mankani (2020) developed a fake currency detection system using image processing methods for identifying counterfeit Indian banknotes.

Gaurav Singal (2020) introduced a deep convolutional neural network approach for counterfeit Indian currency note detection with improved accuracy and automated feature extraction

Singh and Verma (2022) implemented deep learning models such as ResNet50 and AlexNet for Indian currency recognition under different lighting and image conditions.

Dr. K. Sailaja and Hima Bindu (2023) implemented a Convolutional Neural Network (CNN) model for identifying fake Indian currency using deep learning technique

Patel and Chandra (2023) analyzed the use of pretrained CNN architectures including GoogLeNet and Darknet53 for counterfeit currency classification and feature extraction

III. METHODOLOGY

The proposed system is designed to develop an intelligent counterfeit Indian currency detection system using Deep Learning and Convolutional Neural Networks (CNN). The architecture includes six major modules: Image Acquisition Module, Preprocessing Module, Feature Extraction Module, CNN Classification Module, Currency Verification Module, and Result Display Module.

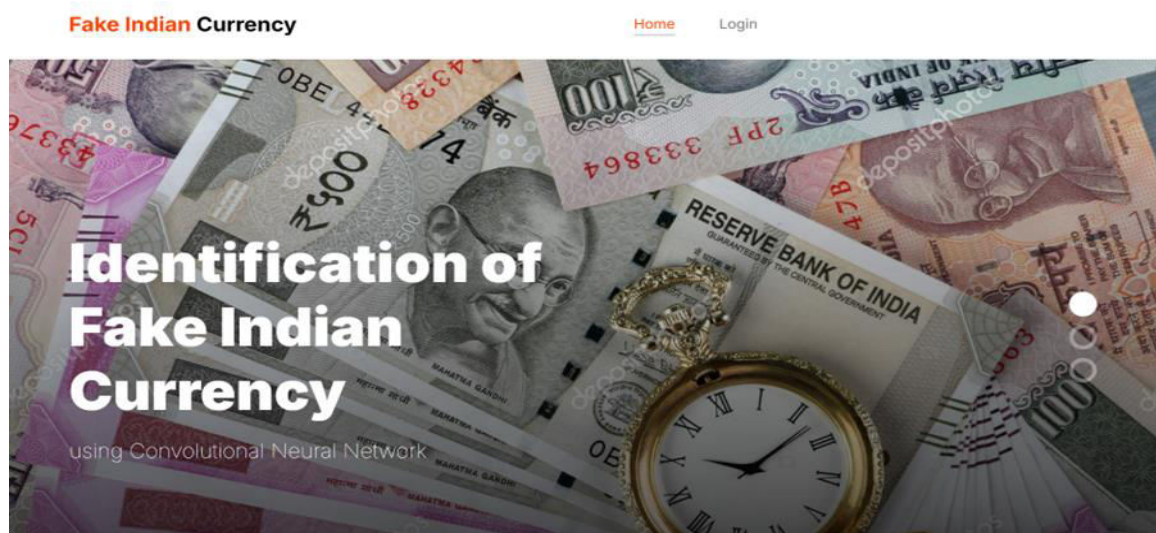
The Image Acquisition Module is responsible for collecting Indian currency note images of different denominations under various lighting conditions and angles. These images are used to create a dataset for training and testing the deep learning model. The Preprocessing Module enhances the quality of the input images through resizing, grayscale conversion, noise removal, normalization, and segmentation techniques to improve detection accuracy.

The Feature Extraction Module extracts important currency characteristics such as watermark patterns, security threads, serial numbers, texture, symbols, and note dimensions. This module helps the system identify distinguishing features between genuine and counterfeit currency notes.

The CNN Classification Module uses Convolutional Neural Networks and pretrained deep learning models such as AlexNet, ResNet50, GoogLeNet, Darknet53, and Xception for training and classification. The model automatically learns complex image features and classifies the currency as real or fake with high accuracy.

IV. RESULTS

The implemented counterfeit Indian currency detection system produced accurate and efficient classification results using the Xception deep learning model. During training and testing, the model effectively distinguished genuine currency notes from counterfeit notes by analyzing important security features and image patterns. The system achieved 93.34% training accuracy and 97.00% validation accuracy, demonstrating strong learning capability and reliable performance. The obtained results indicate that the proposed CNN-based approach can support fast, secure, and automated counterfeit currency detection in real-world financial applications.



Fake Indian currency *detection* using CNN



Fake currency prediction : *Real*

V. CONCLUSION

The counterfeit Indian currency detection system demonstrates the effectiveness of the Xception Architecture in identifying genuine and fake currency notes. Experimental analysis showed that the deep learning model achieved a training accuracy of 93.34% and a validation accuracy of 97.00%, indicating high performance and reliability in counterfeit detection. The system successfully extracted important currency features such as watermarks, security threads, textures, and serial numbers to accurately classify notes as real or fake. The Xception-based CNN model provides better accuracy and efficient performance compared to traditional image processing techniques. It can be effectively used in banks, shops, ATMs, and financial institutions for quick and secure counterfeit currency detection. Furthermore, the framework can be enhanced in the future by including additional security features and real-time detection capabilities for improved financial security.

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