Fake currency detection by using Machine Learning

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ABSTRACT:

The one important asset of our country is bank currency, and in order to create discrepancies in money, miscreants introduce fake notes in the financial market that resemble the original note. During the demonetization period, there is a lot of fake currency floating around. In general, a human being finds it difficult to distinguish a forged note from a genuine one because many features of the forged note are similar to those of the genuine one. It is difficult to distinguish between genuine and counterfeit bank notes. As a result, there must be an automated system available in banks or ATM machines. To design such an automated system, an efficient algorithm that can predict whether a banknote is genuine or forged bank currency is required, as fake notes are designed with high precision.

1.INTRODUCTION

In recent years, the proliferation of counterfeit currency has posed significant challenges to financial institutions, businesses, and individuals worldwide. Detecting counterfeit banknotes manually is a time-consuming and error-prone process, prompting the need for automated solutions leveraging advancements in technology.

The advent of deep learning, particularly Convolutional Neural Networks (CNNs), has revolutionized various fields, including image recognition and classification tasks. CNNs have demonstrated remarkable capabilities in analyzing and extracting features from complex visual data, making them an ideal candidate for counterfeit currency detection.

This project focuses on developing a robust counterfeit currency detection system using CNNs. By harnessing the power of deep learning algorithms, the aim is to create a highly accurate and efficient solution capable of distinguishing between genuine and fake banknotes.

The implementation of such a system has the potential to streamline currency authentication processes, mitigate financial losses due to counterfeit currency circulation, and enhance overall security measures in the banking and retail sectors.

In this paper, we present a detailed exploration of the methodology, dataset acquisition, model architecture, training process, and evaluation metrics employed in building the CNN-based counterfeit currency detection system. Furthermore, we discuss the practical implications, challenges, and future directions of utilizing deep learning techniques for combating counterfeit currency.

Through this project, we aspire to contribute to the advancement of security technologies and facilitate the development of innovative solutions for safeguarding financial integrity in an increasingly digitized world

2.LITERATURE SURVEY

2.1 Tushar Agasti, Gajanan Burand, Pratik Wade and P Chitra, —Fake currency detection using image processing‖ 14th ICSET-2017

Fake Currency has always been an issue which has created a lot ofproblems in the market. The increasing technological advancements have made the possibility for creating more counterfeit currency which are circulated in the market which reduces the overall economy of the country. There are machines present at banks and other commercial areas to check the authenticity of the currencies. But a common man does not have access to such systems and hence a need for a software to detect fake currency arises, which can be used by common people. This proposed system uses Image Processing to detect whether the currency is genuine or counterfeit. The system is designed completely using Python programming language. It consists of the steps such as gray scale conversion, edge detection, segmentation, etc. which are performed using suitable methods

2.2 Eshita Pilania, Bhavika Arora, —Recognition of Fake Currency Based onSecurity Thread Feature of Currency‖ International Journal Of EngineeringAnd Computer Science, ISSN: 2319-7242

In the last few years a great technological advances in color printing, duplicating and scanning, counterfeiting problems have become more serious. In past only authorized printing house has the ability to make currency paper, but now a days it is possible for anyone to print fake bank note with the help of modern technology such as computer, laser printer. Fake notes are burning questions in almost every country. Counterfeit notes are a problem of almost every country but India has been hit really hard and has become a very acute problem. Fake Indian currency of 100, 500 and 1000 rupees seems to have flooded the whole

system and there is no proper way to deal with them for a common person. There is a need to design a system that is helpful in recognition of paper currency notes with fast speed and in less time. Our system describes an approach for verification of Indian and other countries currency banknotes. The currency will be verified by using image processing techniques

2.3 Nayana Susan Jose, Shermin Siby, Juby Mathew, Mrudula Das,Android Based Currency Recognition System for Blind,International Journal of Engineering Research in Computer Scienceand Engineering (IJERCSE) Vol 2, Issue 4, April 2015.

in recent years, a lot of illegal counterfeiting rings manufacture and sell fake coins and at the same time fake note currency is printed as well which have caused great loss and damage to the society. Thus it is imperative to be able to detect fake currency We propose a new approach to detect fake Indian notes using their images. Currency image is represented in the dissimilarity space, which is a vector space constructed by comparing the image with a set of prototypes. Each dimension measures the dissimilarity between the image under consideration and a prototype. In order to obtain the dissimilarity between two images, the local key points on each image are detected and described. Based on the characteristics of the currency, the matched key points between the two images can be identified in an efficient manner. A post processing procedure is further proposed to remove mismatched key points. Due to the limited number of fake currency in real life, SVM is conducted for fake currency detection, so only genuine currency are needed to train the classifier

3.PROPOSED WORK

Fake currency is a serious problem all over the world, affecting the economies of almost every country, including India. Counterfeit currency is one of the most serious issues confronting the world today. Because of their use of cutting-edge technology, counterfeiters are becoming more difficult to track. The use of readily available and efficient counterfeit detection software is one of the most effective methods of preventing counterfeiting. The background of our topic is image processing technology, which we use to verify valid currency notes. The software will detect counterfeit money by extracting features from notes. The software's success rate can be measured in terms of accuracy and speed. So our goal is to work on parameters that will be impossible to implement on counterfeit notes, so we began working on

parameters that will be sufficient to distinguish between fake and original notes.

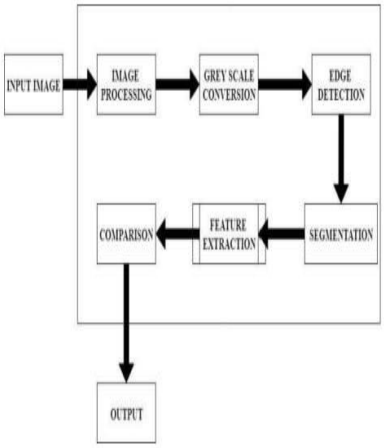

Fig 1:Architecture

3.1 IMPLEMENTATION

Data Preprocessing Module:

Data Collection: Gather a diverse dataset of images containing both genuine and counterfeit currency notes.

Data Augmentation: Apply transformations such as rotation, scaling, and flipping to increase dataset diversity and improve model generalization.

Normalization: Scale pixel values to a range suitable for neural network training (e.g., [0, 1] or [-1, 1]).

Splitting Dataset: Divide the dataset into training, validation, and testing sets to evaluate the model's performance.

Model Architecture Module:

CNN Architecture Selection: Choose a suitable CNN architecture (e.g., VGG, ResNet, or custom architecture) known for its effectiveness in image classification tasks.

Feature Extraction Layers: Define the layers responsible for extracting relevant features from input images.

Classification Layers: Design the classification layers to predict whether an input image contains genuine or counterfeit currency.

Training Module:

Initialization: Initialize the CNN model with random weights or pre-trained weights (transfer learning).

Loss Function Selection: Choose an appropriate loss function (e.g., binary cross-entropy) to measure the model's performance during training.

Optimizer Selection: Select an optimization algorithm (e.g., Adam or SGD) to minimize the loss function and update the model parameters.

Training Loop: Iterate over batches of training data, feed them into the model, calculate the loss, and update the model parameters using backpropagation.

Validation: Evaluate the model's performance on a separate validation set to

monitor for overfitting and adjust hyperparameters accordingly.

Training Visualization: Visualize training metrics such as loss and accuracy over epochs to assess the model's convergence and performance.

Testing Module:

Evaluation Metrics: Calculate evaluation metrics such as accuracy, precision, recall, and F1-score on the test set to assess the model's performance.

Confusion Matrix: Generate a confusion matrix to analyze the model's predictions and identify any misclassifications.

Deployment Module:

Integration: Integrate the trained model into a user-friendly application or system for real-world deployment.

Inference Pipeline: Develop an inference pipeline to preprocess input images, feed them into the model, and interpret the model's predictions.

User Interface: Design a user interface for interacting with the fake currency detection system, allowing users to upload images and view the model's predictions.

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4.RESULTS AND DISCUSSION

Fig 2:Home screen

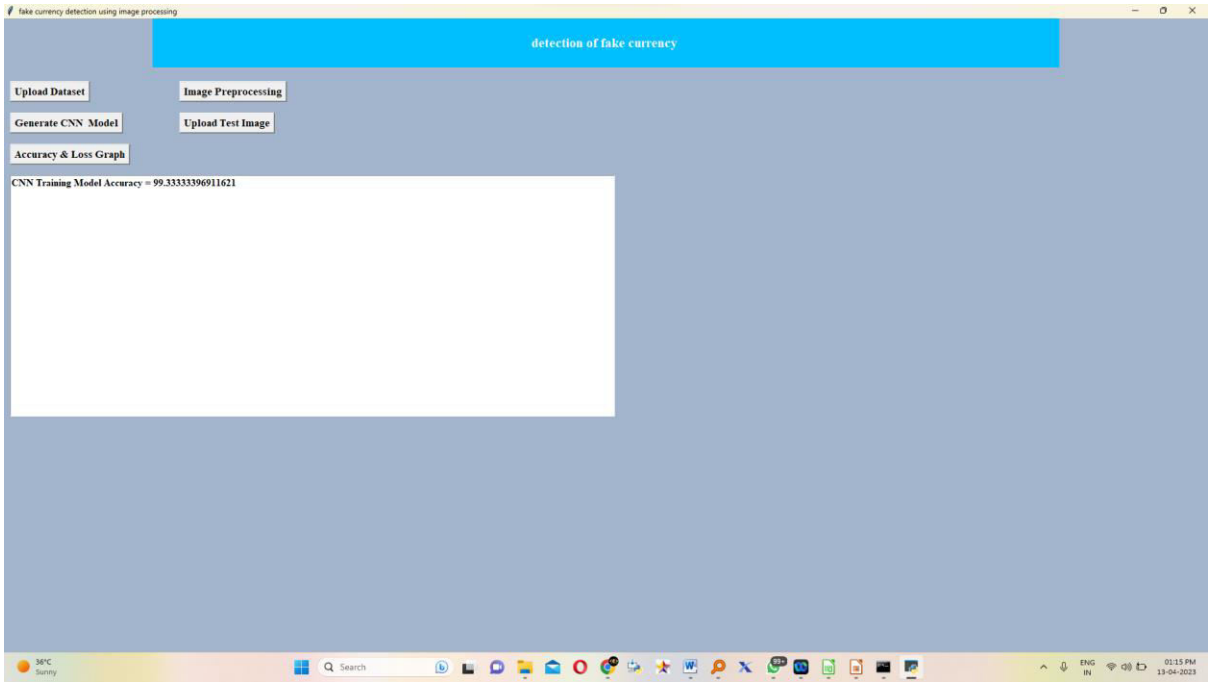

Fig 3:Accuracy Screen

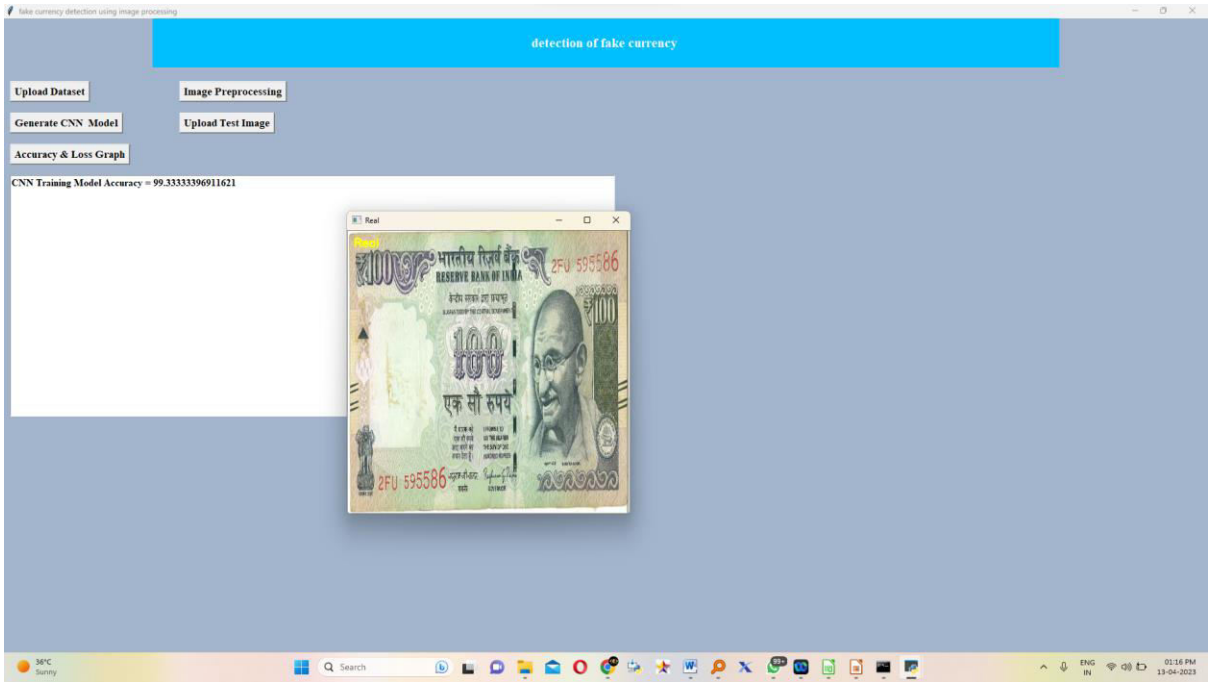

Fig 4:Predicted Note As Real

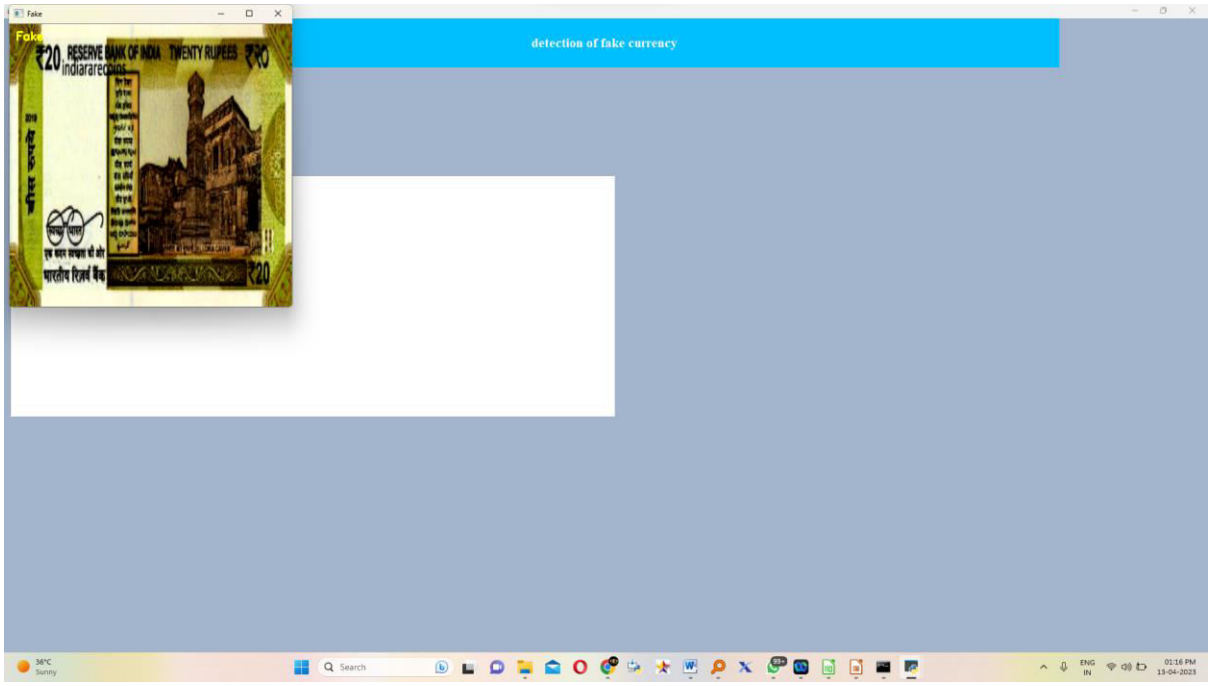

Fig 5:Predicted Note As Fake

5.CONCLUSION

Several conclusions can be drawn from the results of machine learning using Error Level Analysis [6] and Convolutional Neural Network in this study.

1. A convolutional neural network employs two convolutional layers, one MaxPooling layer, one fully connected layer, and one output layer with softmax to achieve superior accuracy.

2. The use of error level analysis can improve training efficiency and reduce computational costs. The reduction in the number of layers and epochs required from the previous method [7] demonstrate this. The proposed model requires only one epoch to achieve convergence.

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