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Fake Money Detection using Machine Learning

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Abstract: Our nation's most valuable asset is bank currency, and in order to cause financial inconsistencies, counterfeit notes that seem like the real thing are introduced into the financial market. A significant amount of counterfeit money was observed to be floating on the market during the demonetization period. Because many characteristics of a forged note are identical to those of an original, it is generally exceedingly difficult for a human to distinguish a forged note from a genuine one using the numerous factors intended for identification. It is difficult to distinguish between authentic and counterfeit banknotes. Therefore, an automated system must be provided in ATMs or banks. An effective algorithm that can determine if a banknote is authentic or counterfeit must be created in order to create such an automated system, since counterfeit notes are quite precisely manufactured. In order to detect bank cash authenticity, we use the CNN method in this research on datasets that are accessible through the UCI machine learning repository. We have used machine learning methods to accomplish this, and their performance is evaluated using a variety of quantitative analysis parameters.

Keywords: counterfeit currency, fake money detection, machine learning, image processing, Convolutional Neural Networks, Support Vector Machines, automated systems.

Introduction:

Fake money is defined as counterfeit money that has not been authorised by the government. Duplicating money is the illegal duplication of unique money. The RBI is the primary organisation in charge of printing currency in India. Once separated and circulated in the market, counterfeit currency is a persistent problem for the RBI. The purpose of the counterfeit note discovery framework is to identify counterfeit notes from the certified. The main arrangement that is by and by accessible for the basic man to recognize fake cash is the Fake Note Detector Machine. This machine is, for the most part, accessible only in banks which aren't reachable each time by normal resident. Every one of these situations needs a sort of answer for average folks to pass judgment on a fashionable monetary certificate and to prevent our money from losing its worth. Pictures are prepared by utilizing different procedures for picture preparation and assisting. Different highlights are extricated from the pictures. he processes is divided into several sections, such as handling images, extracting trademarks, and examining images. The key component of the strategy is that we extract the highlights, which serve as the basis for organizing the phone note. Money security features are essential for distinguishing

between real and counterfeit currency. Watermarks, security string, idle images, and optically factor ink are examples of standard security highlights. The study uses an approach for detecting counterfeit money that distinguishes between the image of money and the general features of dormant photos and ID marks. Since it involves identifying some of the most noticeable and indiscernible features of Indian currency, extracting characteristics from images of banknotes can be extremely challenging. Since the 500 and 2000 are the most valuable currency notes that have been issued since demonetisation, there is a very high chance that they would be counterfeited. To combat this, we are using programming to identify counterfeit notes using a photo handling system.

Convolutional Neural Network:

One of the primary types of neural networks used for image categorization and recognition is the convolutional neural network. Convolutional neural networks are widely utilized in a variety of applications, including face recognition, object identification, and scene labelling.

CNN receives an image as input, classifies it, and processes it under a particular category, such as tiger, lion, dog, or cat. The computer relies on the image's resolution and interprets it as a collection of pixels. It will appear as h * w * d, where his height, w is width, and d is dimension, depending on the image resolution. For instance, a greyscale image is 4 * 4 * 1 array of the matrix, while an RGB image is 6 * 6 * 3 arrays.

Convolution Layer:

The first layer to extract features from an input image is the convolution layer. The convolutional layer maintains pixel relationships by learning visual properties from a small square of input data. It is a mathematical process that requires two inputs, such as a kernel or filter and an image matrix.

o the dimension of the image matrix is h×w×d.

o the dimension of the filter is fh×fw×d.

o The dimension of the output is (h-fh+1)×(w-fw+1)×1.

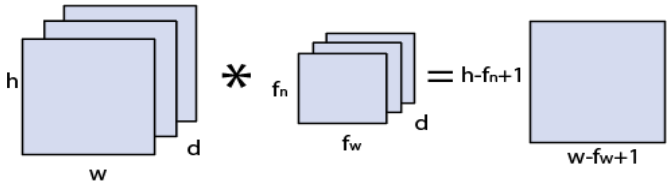

Image matrix multiplies kernl or filter matrix

Let's start with consideration a 5*5 image whose pixel values are 0, 1, and filter matrix 3*3 as:

$$\begin{bmatrix} 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 \end{bmatrix} \times \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

5 × 5 — Image Matrix 3 × 3 — Filter Matrix

The convolution of 5*5 image matrix multiplies with 3*3 filter matrix is called "Features Map" and show as an output.

$$\begin{bmatrix} 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 \end{bmatrix} \times \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 4 & 3 & 4 \\ 2 & 4 & 3 \\ 2 & 3 & 4 \end{bmatrix}$$

Convolved Feature

By applying various filters to a picture, convolution can carry out operations like edge detection, sharping, and blur.

Proposed System:

The identification of counterfeit cash is a significant global problem that affects the economies of almost every country, including India. One of the major topics being examined globally these days is the use of counterfeit money. This essay addresses the issue of determining whether the provided sample of bank cash is counterfeit. There are several conventional techniques and procedures for identifying counterfeit bank cash. Since many characteristics of a forged note are identical to those of the original, it is generally exceedingly difficult for a human to distinguish a forged note from a genuine one using the different identification parameters. It might be difficult to tell the difference between authentic and counterfeit banknotes.

Data Flow Diagram:

1. Another name for the DFD is a bubble chart. A system can be represented using this straightforward graphical formalism by showing the input data, the several processing operations performed on the data, and the output data that the system generates.
2. The system components are modelled using it. The system process, the data that the process uses, an outside party that communicates with the system, and the information flows within the system are all examples of these components.
3. Another name for DFD is a bubble chart. DFD can be divided into levels that correspond to increasing functional detail and information flow. For example, figure 5.3.1.

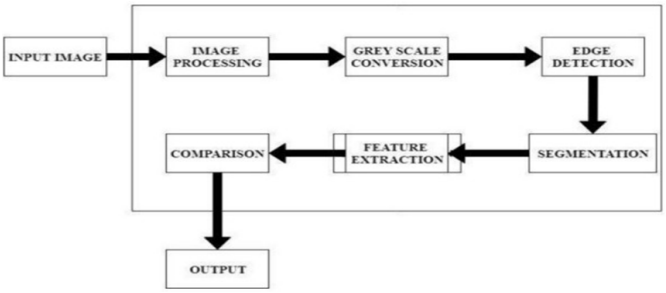

Figure 5.3.1 Data Flow Diagram

Use Case Diagram:

A use case diagram is a particular kind of behavioural diagram that is designed and produced from use-case research, according to the Unified Modelling Language (UML). It graphically depicts the actors, their goals (shown as use cases), and the connections or dependencies between those use cases to show the functionality that a system offers.

A use case diagram's main objective is to show which actors communicate with the system and make use of its features. It can also be used to illustrate the roles that the actors in the system play. An example of this idea is shown in Figure 5.3.2.

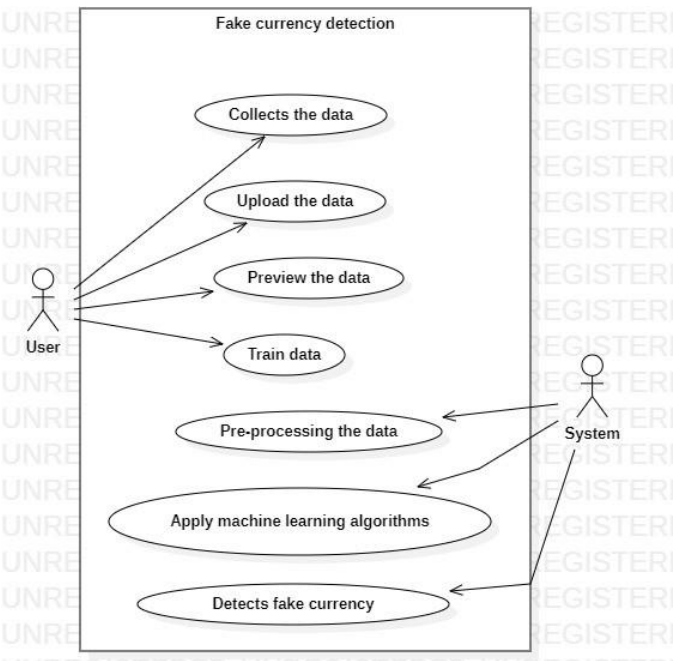

Figure 5.3.2 Use Case Diagram

Sequence Diagram:

In UML, a sequence diagram is an interaction diagram that shows the order and manner of interactions between processes. As seen in Figure 5.3.3, it is a component of a Message Sequence Chart and is also referred to as an event diagram or timing diagram.

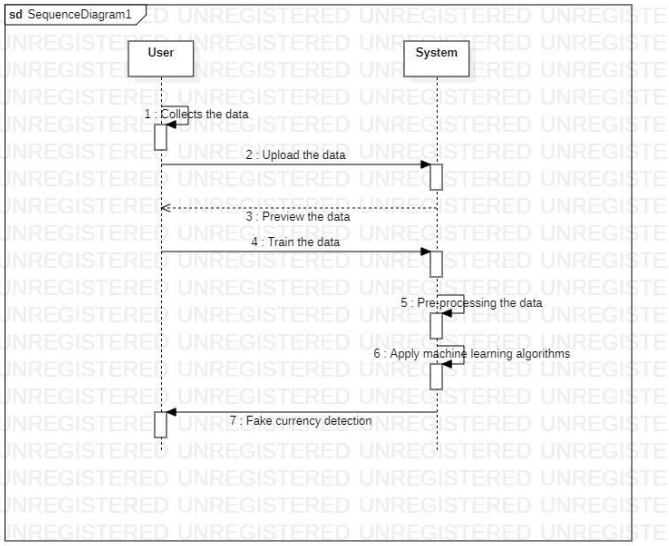

Figure 5.3.3 Sequence Diagram

Data Collection Module:

Aside from the printing quality, material, and other factors that make for easy visual differentiation, the various Indian currency categories vary in how they estimate value and use colour. In any event, the colour and content won't help the visually impaired person at all, and the similar measurements of the various coins sometimes cause confusion.

Pre-Processing Module:

Pre-processing procedures often start with data analysis and information extraction. This reduces undesired distortion and improves some aspects of the image that are crucial for additional processing. Both picture smoothing and image adjustment are included. Following these two pre-processing stages, the currency photos were used for feature extraction.

Detect Fack Currency Module:

Six supervised machine learning methods are used in this work to detect bank cash authentication using datasets from the UCI machine learning library. We have used machine learning methods to accomplish this, and their performance is evaluated using a variety of quantitative analysis parameters. Additionally, some machine learning algorithms provide higher accuracy for specific train-test ratios.

Conclusion:

In this paper, we have described how machine learning techniques are used in our suggested approach to identify counterfeit banknotes. Additionally, the suggested system can be scaled to use image processing to determine whether or not the coin is counterfeit. Unlike the current system, the system does not have a complicated procedure to determine whether the data contains counterfeit bank cash. The proposed approach outperforms the current system in terms of speed and accuracy. The CNN algorithm is used in this system to determine whether or not the cash is counterfeit.

References:

1. Vidhate, Y. Shah, R. Biyani, H. Keshri, R. Nikhare, Fake currency detection application. Int. Res. J. Eng. Technol. (IRJET) 08(05) (2021). e-ISSN: 2395-0056.

2. A.A. Mandankandy, K.E. Kannammal, Fake currency detection: a survey. Gedrag en Organisatie 33(4), 622–638 (2020).

3. A.A. Mandankandy, K.E.

Kannammal, Fake currency detection: a survey. Gedrag en Organisatie 33(4), 622–638 (2020).

4. A.Singh, K. Bhoyar, A. Pandey, P. Mankani, A. Tekriwal, Detection of fake currency using image processing. Int. J. Eng. Res. Technol. (IJERT) 8(12) (2019).

5. G.Navya Krishna, G. Sai Pooja, B. Naga Sri Ram, V. Yamini Radha, P. Rajarajeswari, Recognition of fake currency note using convolutional neural networks. Int. J. Innov. Technol. Exploring Eng. 8(5), 58–63 (2019).

6. K.D. Sudha, P. Kilaru, M.S.R. Chetty, Currency note verification and denomination recognition on Indian currency system. Int. J. Recent Technol. Eng. 7(6S) (2019). ISSN: 2277-3878

7. M.Laavanya, V. Vijayaraghavan, Real time fake currency note detection using deep learning. Int. J. Eng. Adv. Technol. (IJEAT) 9(1S5) (2019). ISSN: 2249-8958.

8. T.Kumar, T. Subhash, D. Regan, Fake currency recognition system for Indian notes using image processing techniques (2019).

9. A.Upadhyaya, V. Shokeen, G. Srivastava, Analysis of counterfeit currency detection techniques for classification model (2018).

10. S.Gothe, K. Naik, V. Joshi, Fake currency detection using image processing and machine learning (2018).

11. S.Shaker, M.G. Alawan, Paper currency detection based image processing techniques: a review paper (2018).

12. V.Lalithendra Nadh, G. Syam Prasad, Support vector machine in the anticipation of currency markets. Int. J. Eng. Technol. (UAE) 7(2), 66–68 (2018).

13. T.Agasti, G. Burand, P. Wade, P. Chitra, Fake currency detection using image processing, ICSET-2017. IOP Conf. Ser. Mater. Sci. Eng. 263, 052047 (2017).