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Fake Currency Detection Using Machine Learning and Image Processing Techniques

Prof. Nutan Patil*[1], Prof. Sarika B. Patil[2], Prof. Harsha Sarode[3], Prof. Sonu Khapekar[4]

*[1,2,3] Assistant Professor, Department of Electronics and Telecommunication, and

[4]Assistant Professor, Department of Computer Engg., Nutan Maharashtra Institute of Engineering and Technology, Pune, Maharashtra, India.

ABSTRACT

In today's digital era, technology has transformed the way people live and work, making life more convenient and efficient. However, with the rapid advancement of technology, some individuals are misusing it for malicious purposes. Despite the benefits, technology has also created new opportunities for unethical behavior and criminal activities. One of the major challenges faced by the global economy is counterfeit currency. The emergence of advanced printing and scanning technologies has made it easy for counterfeiters to produce fake currency, which can be hard to detect. This poses a serious threat to individuals and businesses alike. To tackle this issue, various traditional methods and approaches have been employed, which involve analyzing colors, widths, and serial numbers of banknotes. However, these methods have their limitations, and thus, new techniques are needed. This paper explores the use of image processing for detecting counterfeit currency. By leveraging advanced image processing algorithms, it is possible to identify fake banknotes that are almost identical to genuine currency. Such methods have the potential to revolutionize the way we detect and prevent counterfeit currency.

Keywords : Image Processing, KNN Algorithm, CNN Algorithm, Canny Edge Detector, Image Segmentation, Android Development, Graphical User Interface.

I. INTRODUCTION

Counterfeit currency refers to fake money that has not been authorized by the government. This is a serious issue that many countries face, including India. To address this problem, machine learning methodologies can be used to extract the specifications of Indian notes. This involves processing images using various techniques of image processing and extracting features from the images. The process includes image segmentation, characteristics extraction, and image classification. While commercial areas can afford machines that use UV light and other techniques to detect the authenticity of currency, common people find it difficult to detect whether their currency is real or fake, and they may suffer losses as a result. To address this, a user-friendly system has been designed to enable anyone to detect the genuineness of their currency easily. This system can also be converted into a mobile app for wider accessibility.

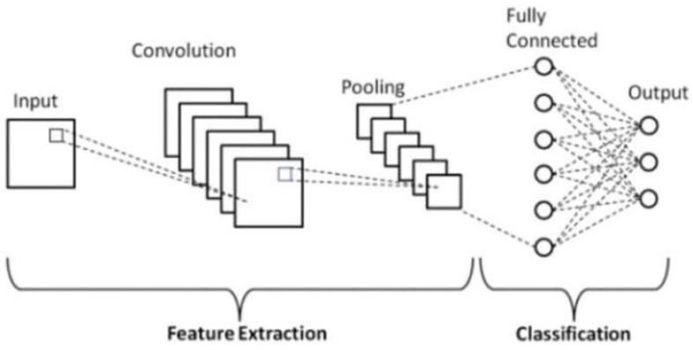
II.METHODOLOGY

A Convolutional Neural Network (CNN) is a type of neural network architecture that is often used in

Computer Vision, a field of Artificial Intelligence that enables computers to interpret visual data such as images. Neural Networks, including CNNs, are known for their strong performance in Machine Learning tasks across various datasets such as images, audio, and text. For example, Recurrent Neural Networks, specifically LSTM, are used for predicting sequences of words, while Convolutional Neural Networks are used for image classification.

In this blog, we will explore the basic building blocks of a CNN. A typical Neural Network has three types of layers: Input Layers, Hidden Layers, and Output Layers. The Input Layer is where the model receives its input, and the number of neurons in this layer corresponds to the number of features in the data, such as the number of pixels in an image. The input from the Input Layer is then fed into the Hidden Layers, which can have varying numbers of neurons depending on the model and data size. Each Hidden Layer computes its output by multiplying the output of the previous layer with learnable weights and adding learnable biases, followed by an activation function that makes the network non-linear. The output from the Hidden Layers is then fed into the Output Layer, which converts the output of each class into a probability score using a logistic function like sigmoid or softmax.

To train the model, the data is fed into the network, and the output from each layer is obtained through a process called feedforward. The network's performance is evaluated by calculating the error using an error function, such as cross-entropy or square loss error. Backpropagation is then used to calculate the derivatives of the error function with respect to the weights and biases of the network, which are used to update these parameters in order to minimize the loss.



III.MODELING AND ANALYSIS

3.1 Hardware Requirements

RAM : 8 GB

As we are using Machine Learning Algorithm and Various High Level Libraries Laptop RAM minimum required is 8 GB.

Hard Disk : 500 GB

Data Set of CT Scan images is to be used hence minimum 40 GB Hard Disk memois required. Processor : Intel i5 Processor IDE

Android studio

3.2 Software Requirements

Kotlin is a cross-platform, statically typed, general-purpose programming language with type inference. Kotlin is designed to interoperate fully with Java, and the JVM version of Kotlin's standard library depends on the Java Class Library, but type inference allows its syntax to be more concise. Kotlin is a modern statically typed programming language used by over 60 of professional Android developers that helps boost productivity, developer satisfaction, and code safety. Kotlin is a cross-platform, statically typed, general-purpose programming language with type inference. Kotlin is designed to interoperate fully with Java.

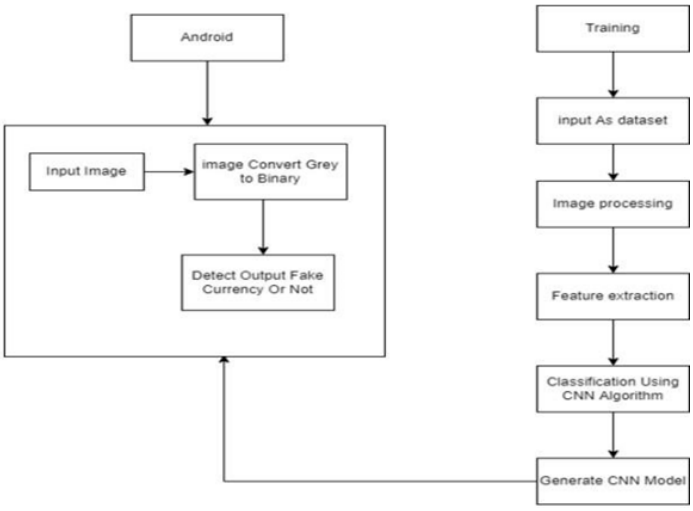
Android Visual studio: Android Studio is the official integrated development environment for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems. Android Studio provides a unified environment where you can build apps for Android phones, tablets, Android Wear,

Android TV, and Android Auto. Structured code modules allow you to divide your project into units of functionality that you can independently build, test, and debug.

3.3 ANALYSIS MODELS: SDLC MODEL TO BE APPLIED

SDLC Models stands for Software Development Life Cycle Models. In this article, we explore the most widely used SDLC methodologies such as Agile . Each software development life cycle model starts with the analysis, in which the Also, here are defined the technologies used in the project, team load. One of the basic notions of the software development process is SDLC models which stands for Software Development Life Cycle models. SDLC– is a continuous process, which starts from the moment, when it's made a decision to launch the project, and it ends at the moment of its full remove from the exploitation. There is no one single SDLC model. They are divided into main groups, each with its features and weaknesses.

1. Requirement Analysis - Requirement Analysis is the most important and necessary stage in SDLC. The senior members of the team perform it with inputs from all the stakeholders and domain experts or SMEs in the industry. Planning for the quality assurance requirements and identifications of the risks associated with the projects is also done at this stage. Business analyst and Project organizer set up a meeting with the client to gather all the data like what the customer wants to build, College Short Form Name, Department of Computer Engineering 2021 21 who will be the end user, what is the objective of the product. Before creating a product, a core understanding or knowledge of the product is very necessary.
2. System Design - The next phase is about to bring down all the knowledge of requirements, analysis, and design of the software project.
3. This phase is the product of the last two, like inputs from the customer and requirement gathering.
4. Implementation - In this phase of SDLC, the actual development begins, and the programming is built. The implementation of design begins concerning writing code. Developers have to follow the coding guidelines described by their management and programming tools like compilers, interpreters, debuggers, etc. are used to develop and implement the code.
5. Testing - After the code is generated, it is tested against the requirements to make sure that the products are solving the needs addressed and gathered during the requirements stage. During this stage, unit testing, integration testing, system testing, acceptance testing are done.
6. Deployment - Once the software is certified, and no bugs or errors are stated, then it is deployed. Then based on the assessment, the software may be released as it is or with suggested enhancement in the object segment. After the software is deployed, then its maintenance begins.
7. Maintenance - Once when the client starts using the developed systems, then the real issues come up and requirements to be solved from time to time. This procedure where the care is taken for the developed product is known as maintenance.

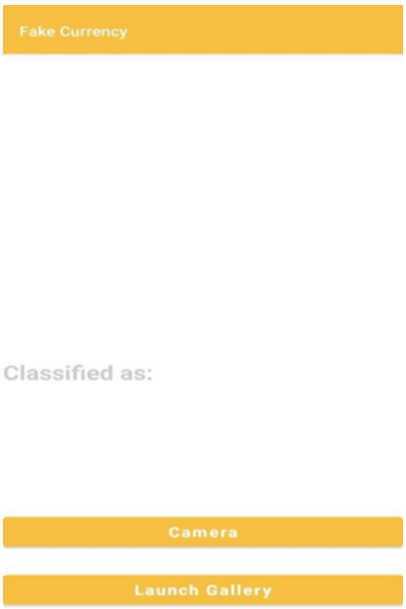


IV. RESULTS AND DISCUSSION

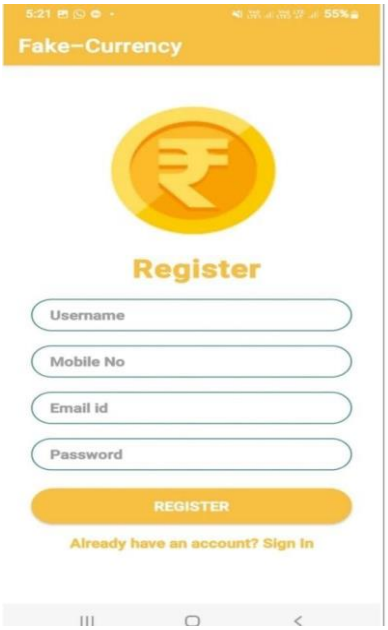
We have tested the input given by camera and by image upload option as well. We found that on most fake notes

the model is working and identifying whether it is fake. Also on the quality of image the accuracy is depend

Registration Page

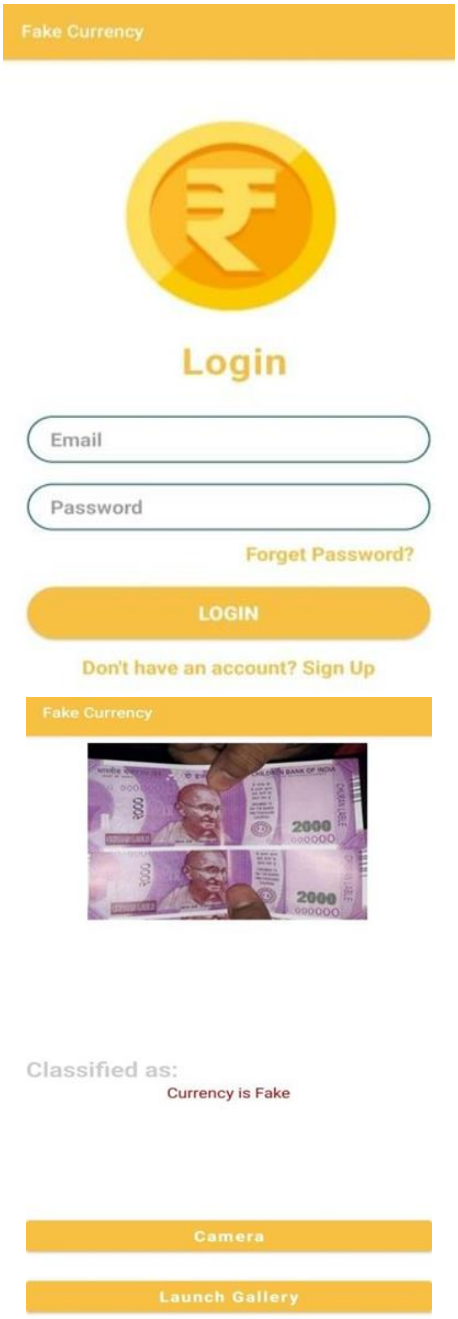


Login Page



Upload currency image using gallery or camera

Result – fake or real



V. CONCLUSION

In track of originality. Paper currencies are used much more in India and hence a system to detect the fake currency is needed. As the new currencies are used in the market, the proposed system seems to be useful to detect the currency to be genuine or not. This system compares more features for feature extraction than other proposed systems. It also shows where the differences are in the currencies instead of simply displaying the result. This system can be further

implemented for foreign currencies like Dollars, Euros, Taka etc.

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