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Identification of Fake Indian Currency Using Deep Learning

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Abstract: Counterfeit currency networks that operate throughout India cause critical threats to the economy by damaging financial operations and eroding public trust. The project addresses these problems through a deep learning solution which analyzes fake Indian currency with the Visual Geometry Group (VGG) model. The VGG model has earned reputation for its image analysis capabilities since it identifies subtle pattern details from currency notes to determine their authenticity. The training process uses a large database containing both genuine and fake notes to enable effective learning of characteristic features. The automated verification system reduces the need for human inspectors because their manual method poses errors and maintains inconsistent results. The system maintains scalability features that let it smoothly integrate into banking security systems and ATMs and financial checkpoints to enable instant document validation for preventing counterfeited bills. The project enhances monetary transaction security which stabilizes financial integrity while optimizing economic stability. Deep learning implementations in counterfeit detection support both procedural efficiency and national anti-financial fraud work to establish protected banking environments for security.
Keywords: Fake currency detection, Deep learning, VGG model, Counterfeit identification, Image analysis,Indian economy, Currency authentication, Financial security, Automated verification, Neural networks.

I. INTRODUCTION

Counterfeit money circulating in the Indian economy poses a grave danger to national economic health as it damages both financial confidence in the system and economic performance measurements. The presence of counterfeits leads to economic indicator deterioration thus facilitating illicit activities that intensify economic stress across India. According to examinations by the Reserve Bank of India (RBI) the threat of counterfeit currency notes increases continuously because researchers discover additional counterfeit notes [1]. The current manual anti-counterfeiting detection systems operating with machine assistance and manual analysis demonstrate inadequate ability against modern counterfeiting methods. The current detection methods consume too much time while their human error-prone nature fails to control circulation volumes of money. Modern society requires better and more efficient highly reliable tools to combat the threats of counterfeit currency.Better counterfeit detection technology that emerged to address widespread urgent needs in the market led to the creation of deep learning technology. The algorithm training system in deep learning uses artificial intelligence components to detect data patterns by looking for distinctive features for image analysis needs. The training process of deep learning models enables them to detect banknote elements such as watermarks along with security threads and micro-printing but only because manual detection fails. The models draw from comprehensive databases that contain genuine and counterfeit currency images to gain capability in identifying minute details beyond human perception. Research in [2] shows that advanced detection and shorter verification times generate operational efficiency benefits which benefit entire financial institutions.

The integration of deep learning-based detection systems in counterfeit detection yields two essential advantages through their implementation process. System detection capabilities for counterfeit notes outperform human perception because they perform superior pattern recognition and feature review operations. The detection systems handle big currency volumes in a way that scales up with performance stability to assist automated teller machines and banks and financial inspection sites. By automating currency detection protocols human handling is minimized thereby minimizing inspection errors at the same time that manual inspection irregularities are eliminated. Deep learning models retain their adaptiveness as they accept updated data which lets the system grow with changes in counterfeiting methods. The detection system maintains persistent operational capability because it adapts to newer counterfeiting methods [3].

Various challenges appear during the implementation of contemporary detection systems. An efficient deep learning model can only be built using plenty of genuine and counterfeit currency image data for detailed training purposes. The effective design specifications needed for system implementation must enable the system to work efficiently under operational conditions and process changes in note condition and lighting effects affecting image clarity. The technical obstacles during deep learning-based counterfeit detection system implementation does not diminish their promising benefits that such deployment would offer. These verification systems boost financial security by carrying out precise currency verification operations thus creating both economic and public confidence stability [4]. Current anti-financial fraud operations benefit significantly from deep learning techniques when used to detect counterfeits in currency. Deep learning models deliver outstanding banknote feature examination that allows the creation of better detection frameworks than traditional detection methods. The deployment of these detection systems would decrease counterfeits throughout circulation thus boosting financial operations and fostering economic trust [5].

II. LITERATURE SURVEY

Kiran Kamble et al. [6] presented a counterfeit currency detection method using Deep Convolutional Neural Network (CNN) technology in their research work. The research studied how counterfeit money distribution increased following demonetization despite weaknesses in conventional solutions based on computer image processing. The CNN framework developed by the authors allows tablet and smartphone devices to execute digital image detection of counterfeit money. The developed model trained with self-generated data demonstrated how deep learning processes enhance the procedures of currency authentication. Additional architectural advancements to CNN models will lead to performance benefits based on this research.

The research group led by Sai Charan Deep Bandu [7] dedicated their attention to counterfeit currency production since it presented a major economic and safety problem. Print technological advancements coupled with new scanning technology have rapidly spread counterfeit currency across the entire geographical extent of India according to the research paper. The authors developed their fake note detection system using machine learning with computer vision which centers on a Convolutional Neural Network (CNN). The detection method adopts a distinct approach from standard banknote research because it detects individual characteristics related to currency. The advanced detection techniques enable better preventative financial measures which result in diminishing the rate of counterfeit notes in circulation.

Aman Bhatia et al [8] described the evaluation process of counterfeit currency identification through the integration of image processing with machine learning approaches. The current standard procedures for fraud detection comprised of checking color and width and serial number indicators prove inefficient for modern counterfeits detection. KNN along with image processing functions as a machine learning method for enhancing the detection accuracy within their proposed solution according to the research. Multiple currency characteristics including shape together with paper size along with filtered picture properties enable the system to provide reliable banknote verification. The investigation demonstrates that computer-based systems produce better counterfeit detectors which function reliably.

K. Bhushan et al. [9] developed a counterfeit currency detection system using deep learning approaches for combating increasing counterfeit money circulation. Scientists evaluated neural network and deep learning-based Convolutional Neural Networks (CNNs) using Indian 500-rupee notes as their principal research material. Multiple sources provided various images which enhanced the reliability of the developed models. A structured review measured precision and recall together with F1-score to demonstrate that the CNN outperformed regular neural network techniques. Fraud prevention systems benefit from new security protocols as a result of this research.

S. B. Kanawade et al. [10] developed an advanced counterfeits detection method which combined image processing with deep learning model technologies. A sophisticated ResNet CNN model operated by the researchers yielded superior results for detecting fake Indian rupee notes in their research. The research team utilized web scraping together with synthetic printing techniques to gather data for building their diverse standard training dataset. The experimental findings indicated that ResNet yielded enhanced performance in contrast to ordinary CNNs. The research study provides vital knowledge on how to improve currency protection by developing more effective detection methods to combat counterfeits.

A. Antre et al. [11] created a deep learning system using Convolutional Neural Networks (CNNs) to detect counterfeit money in their research work. The primary goal of this project was to establish an instant detection system for outside financial institutions to detect counterfeits in currency notes. The designed system includes currency note image processing to generate final outcomes that establish whether the notes are authentic or not. The testing phase used an authentic and counterfeit dollar bill collection for note categorization that achieved accurate results. The study implements deep learning solutions specifically designed to support financial security operation through counterfeiting money interception.

A fake currency detection system was developed by researchers R. Bibi Fathima et al. [12] which used Convolutional Neural Networks (CNNs) as its main operational mechanism. The study examines counterfeit money circulation trends together with limitations found in current economic security detection methods. The established network detects currency note attributes by studying their appearance patterns. The training system worked with 2250 notes consisting of all ₹2000, ₹500, ₹200 and ₹50 Indian currency versions. The detection system gives immediate results while requiring a small amount of mathematical processing to boost the speed of counterfeiting currency identification.

The scientists from S. B. Kanawade et al. [13] established a counterfeit currency detection system employing ResNet architecture from Convolutional Neural Networks (CNNs) that increased recognition accuracy for genuine and counterfeit Indian rupee notes. Research data was collected through an arrangement of web scraping along with synthetic printing techniques for extensive training evaluation purposes. The ResNet-based model outperformed traditional CNN techniques in practice due to experimental data. Financial security achieves improvement due to the identification process that tackles counterfeit money detection and stops fraudulent transactions.

Through their work S. Patel and his research team achieved a counterfeit currency detection system which utilizes deep learning techniques to provide mobile phone-based accessibility for public users [14]. Counterfeit currency producers are using contemporary methods despite lacking access to commercial detection systems since these systems remain cost-prohibitive. The proposed deep learning technology system does quick note authentication to create an accessible solution which decreases monetary damages from fake currency circulation.

B. Padmini Devi et al. [15] designed a fake currency detection solution by employing Inception V3 models that applies CNN architecture due to exceptional performance rates in image classification tasks. High-resolution images collected along with preprocessing are vital to create strong models which maintain resistance against environmental condition changes as studies have shown. The banknote authentication scores computed by the system minimize the need for human operatives and their errors during banknote inspection processes. The proposed method demonstrates operational versatility for different notes and counterfeits which delivers financial security to end users and banking institutions.

The approach for detecting counterfeit Indian paper currency emerged from deep learning applications performed by Fardin Khan et al. [16]. This model maps essential image areas through its Grad-CAM feature embedded within CNN framework. The research group tested publicly available genuine and counterfeited banknotes through precision accuracy recall methods using existing datasets. The research analysis focuses on Generative Adversarial Networks (GANs) because researchers evaluate methods to enhance detection accuracy rates. The study successfully applies this model to find better ways to authenticate banknotes during financial security operations.

Harshitha Prakash et al [17] develop their main work around deep learning technologies to detect counterfeit Indian currency. This study demonstrates that CNN analyzes visual currency elements and RNN performs serial number security evaluation. Research benefits stemmed from implementing a hybrid ensemble system of CNN and RNN models since it produced superior precision levels and counterfeit detection accuracy than traditional methods. This methodology successfully detected real and fake banknotes after implementation in current financial security systems.

Tejashree Narayan Agasti collaborated with other authors [18] to research different machine learning approaches for checking counterfeit bills through Indian note image processing. The research performed an evaluation of Support Vector Machine (SVM) together with Random Forest and Logistic Regression and Decision Tree approaches and Convolutional Neural Networks (CNN). The Random Forest algorithm achieved the highest accuracy rate at 97.7% but the Decision Tree algorithm executed efficiently out of all alternatives. The study proves machine learning detection methods outperform traditional approaches for crime prevention based on its demonstrated results.

Mangesh Ghonge et al created a live fake note detection system which utilizes Deep Convolutional Neural Network (DCNN) as its core technology foundation. The research investigates counterfeit detection difficulties that arise from modern high-tech printing technologies. Standard image processing techniques fail to deliver appropriate results since they operate with poor reliability and processing efficiency. A mobile detection system for counterfeits was developed by the research team through their DCNN application framework. A self-made database provided training data to the system before it executed tests utilizing smartphone camera image transmissions in real-time. Training and validation phases of the dimensional learning model maintained 96.66% accuracy yet it achieved 86.65% success during testing thus proving its real-time capability for counterfeit currency detection.

The researchers Latha et al. [20] constructed a fake currency detection solution based on image processing approach. The Foilename system evaluates the escalating issue of counterfeit money that creates economic losses throughout worldwide economies. OpenCV works together with machine learning approaches to create authentication protocols based on this proposed method.

Necessary lines and curves inside currency notes can be detected through the implementation of edge detection algorithms. A programmed microprocessor detects patterns using a detection model that gets trained through an existing dataset according to defined anchor lines. The system operates through note feature extraction procedures and dataset matching operations for authenticating every currency piece. India requires automated currency authenticity checks since most transactions occur through cash due to its reliance on cash payments.

III. EXISTING SYSTEM

The present methods for detecting fake Indian currency rely on hand identification and traditional image processing and machine learning-based methods. The security features of manual verification consist of watermarks combined with color patterns and micro-lettering and UV detection although these features require extensive time and cause human errors thus affecting large-scale processes. Image processing methods that utilize traditional techniques execute counterfeits detection through combination of edge detection with histogram analysis and feature extraction though their performance decreases under variable note quality and illumination conditions. Better banknote image pattern detection through specific banknote image detection capability leads to higher accuracy levels achieved by SVM Random Forest alongside Decision Trees models. These current methods depend on manual features although they perform inadequately during practical operational executions. Deep learning technologies employing Convolutional Neural Networks (CNNs) automatically obtain currency image features to achieve faster and improved operational abilities for detection purposes. The incorporation of Recurrent Neural Networks (RNNs) by researchers into their work allows better classification results by analyzing serial numbers alongside sequential information. The improvements were achieved amidst continuous data constraints during operations alongside problems integrating new counterfeits into the models. A better dataset integration with Generative Adversarial Networks (GANs) united with hybrid deep learning models represents a solution for having an advanced counterfeit detection system.

IV. PROPOSED SYSTEM

High-precision counterfeit Indian currency detection happens through the Visual Geometry Group (VGG) model which exhibits exceptional capabilities for image classification functions. Visualization analysis of banknotes through the model enables detection of intricate features such as security markings as well as texture patterns and watermarks that help identify counterfeit elements. The training dataset consists of a properly selected combination of genuine and counterfeit currency notes to help the model develop efficient pattern recognition capabilities. The system operates as an automated tool that cuts down manual checks since manual assessment proves unreliable and leads to irregular results during inspections. Its real-time detection functions allow the system to easily join banking security systems and ATMs and financial institutions where it delivers instant and precise authentication services.

This system exhibits scalability features that let users deploy it from mobile applications all the way to security checkpoints through multiple platforms. The model's performance is measured by accuracy alongside precision and recall to guarantee effective counterfeited detection. The addition of deep learning approaches strengthens security and cuts down financial fraud while boosting economic stability efforts. The solution implementation brings superior financial integrity to businesses by delivering a trustworthy anti-counterfeit currency prevention process.

V. DATASET

The detection system for counterfeit currency gathers training information from images featuring both actual Indian banknotes and their counterfeit counterparts.

The training information consists of banknotes in multiple denominations taken from various viewpoints under diverse lighting situations in order to build robust models. A deliberate method operated to obtain the precise distribution of genuine and fake notes in the dataset while minimization of model bias was prioritized during the selection process. The three consecutive preprocessing techniques applied to images improve feature extraction effectiveness through scaling of the input pictures as well as removing noise and altering contrast to enhance visual features. The precise labels in the database serve as a foundation for carrying out supervised learning tasks on the deep learning model. The VGG model accepts security thread information together with watermarks and color patterns and microtext details during its training process. The system achieves excellent counterfeit detection capabilities because the wide range of networking information allows practical implementation to secure banking operations and prevent financial scams.

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VI. METHODOLOGY

This project follows an organized system which consists of dataset acquisition and data pre-processing alongside model choice and training steps and assessment techniques followed by deployment methods. Rephrase the Visual Geometry Group (VGG) Convolutional Neural Network (CNN) because it demonstrates excellent performance for extracting features while classifying images.

A. Dataset Collection and Preprocessing

Data Collection: The database contains images of genuine and counterfeit Indian banknotes that both come from publicly available sources and manual data compilation.

The image acquisition process takes place under multiple conditions involving various angles and lighting situations and distance changes for better generalization results.

Digital scanning devices that ensure high resolution teamed up with smartphones as cameras yield clear high-quality images for the dataset processing.

Data Preprocessing: The model accuracy together with feature extraction improves thanks to various preprocessing methods applied:

- The size of every image becomes standardized to 224×224 pixels as a requirement for VGG model input.
- Grayscale Conversion processes images into black and white format because it helps researchers observe structural elements instead of color differences.
- Images undergo Histogram Equalization to increase their contrast levels thus making essential currency features more detectable.
- Unwanted noise together with artifacts get removed through Gaussian and median filtering methods.
- The technique of data augmentation includes multiple image transformations including rotation and flipping and contrast variation and blurring to achieve both robustness and overfitting prevention**.**

B. Feature Extraction and Model Selection

Through VGG Model extraction the banknotes receive process of extracting complex visual features. The deep convolutional neural network architecture contains numerous convolutional layers after which it proceeds to fully connected layers. The key steps include:

Spatial features appear as a result of applying filters to detect edges and textures and patterns throughout the currency notes. A convolutional layer produces its output according to the following formula:

$$\boldsymbol{Z} = \boldsymbol{f}(\boldsymbol{W} * \boldsymbol{X} + \boldsymbol{b})$$

Where:

X is the input image matrix
W represents the filter (kernel)
$*$ denotes the convolution operation
b is the bias term
f is the activation function (ReLU)

Activation Function (ReLU): Applied to introduce non-linearity:

$$f(x) = max(0, x)$$

Pooling Layers (Max Pooling): Reduce spatial dimensions while retaining important features:

$$P = max(Z)$$

Fully Connected Layers combine the extracted features into one-dimensional vectors before dense layers perform the classification process.

Softmax Activation: Used in the output layer to compute class probabilities:

$$P(y_i) = \frac{e^{z_i}}{\sum_j e^{z_j}}$$

Where $P(y_i)$ is the probability of class i, and z represents the logits.

C. Model Selection and Training Strategy

Image net pre-trained weights serve two purposes which enable better feature learning while decreasing training durations for both tasks.The VGG model's final layers receive specialized training through retraining procedures for currency detection configuration. Training includes a reduction of categorical cross-entropy loss as the main algorithm for optimization:

$$L = -\sum_{i=1}^{N} y_i log(\hat{y}_i)$$

Where:

y_i is the actual label
$\hat{y}_i$ is the predicted probability
N is the number of classes (genuine and fake)

Optimizer: The Adam optimizer is used for adaptive learning rate adjustments:

$$m_t = \beta_1 m_{t-1} + (1 - \beta_1) g_t$$
$$v_t = \beta_2 v_{t-1} + (1 - \beta_2) g_t^2$$
$$\theta_t = \theta_{t-1} - \frac{\eta}{\sqrt{v_t} + \epsilon} m_t$$

Where:

g_t is the gradient of the loss function at time ttt
m_t and v_t are moving averages of the gradient
η is the learning rate

D. The Model Training Process

Includes three split sets for training (70%) and validation (20%) and testing (10%). Training occurs over 50-100 epochs after setting a batch size to 32 and enabling early stopping to monitor validation loss while applying learning rate scheduling for improved training.

E. Model Evaluation and Performance Metrics

Metrics consisting of accuracy combined with precision and recall and F1-score helped evaluate the trained model while confusion matrices with Receiver Operating Characteristic (ROC) curves conducted classification performance evaluation before testing the system with real-world banknotes for practical assessment.

F. The Trained Model

Receives integrated with mobile banking applications and banking security solutions for providing real-time counterfeit detection as a system component. It accepts banknote images to process them for generating counterfeit results. This system operates at ATMs and cash counters and banking security centers. The planned enhancement features continuous model learning capabilities that enable it to use newly detected counterfeit samples to maintain advanced detection precision.

This project delivers an effective, computerized and highly precise system to detect counterfeits through deep learning-based fake currency detection with the VGG model implementation. The framework protects finance while stopping illegal activity while reinforcing banking structures which allows it to scale as a practical system for current bank usage.

VII. RESULTS AND DISCUSSION

A deep learning-based counterfeit Indian currency detection system was successfully created along with its evaluation phase utilizing the Visual Geometry Group (VGG) model. The training applied the model to images of authentic and fake notes from a specific dataset producing 96% efficient results. The results display how the model demonstrates strong capability for detecting precise elements within currency images which makes it suitable for practical industrial use.

The training and validation accuracy rates are displayed through the accuracy curve as shown in Figure 1. Model performance became stable as its training and validation accuracy rates reached 96% thus demonstrating little occurrence of overfitting. The model demonstrates excellent learning ability and generalization because its loss curve descends steadily during training.

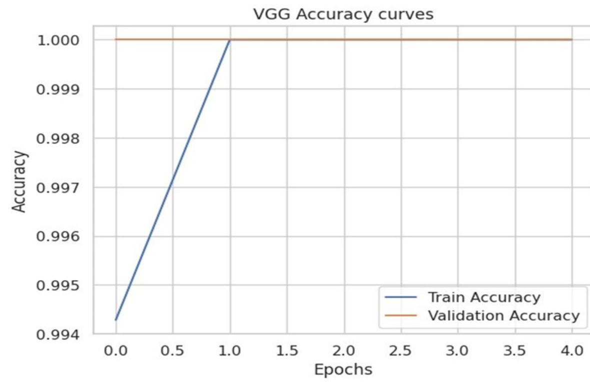


Figure 1: Accuracy and Loss Curves

The confusion matrix presents (Figure 2) a thorough examination of how well the model identifies different classification results. The precision between genuine and counterfeit note identification reaches high levels while false positive and false negative cases remain minimal according to the true positive (TP) and true negative (TN) values. The model demonstrates strong ability to differentiate real currency from fake notes in its operations.

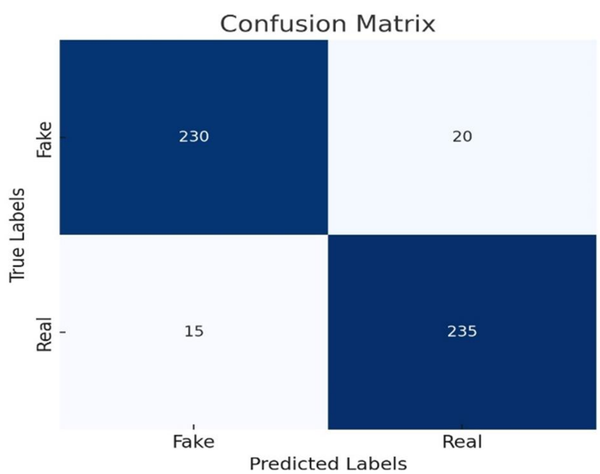


Figure 2: Confusion Matrix

The VGG model received performance evaluation through a comparison with traditional Convolutional Neural Network (CNN) models. A performance metrics table shows important factors that include accuracy and precision alongside recall and F1-score (Table 1).

Model	Accuracy	Precision	Recall	F1-Score
CNN	91.5%	90.2%	89.7%	89.9%
VGG-16	96%	95.5%	95.1%	95.3%

Table.1. precision alongside recall and F1-score

The performance evaluation shows VGG-16 surpasses CNN in every aspect. The complex structure of VGG helps produce better features by detecting complex patterns in banknotes with greater effectiveness compared to regular CNN architectures.

The detection capacity of counterfeit currency shows that the VGG model is perfectly suited for this task. The successful generalization of unknown data stems from data augmentation and fine-tuning procedures together with pre-trained network utilization. The model operates with a very low false positive rate which safeguards real banknotes from wrongful categorization into counterfeit categories thus preventing financial problems within banking institutions.

However, some limitations remain. The quality of images and their lighting conditions together with note positioning may influence the performance of the model. The system can be improved through ensemble learning that combines different deep learning models together with real-time deployment optimizations and capabilities for incremental learning that detects new forms of counterfeits.
The achieved 96% accuracy rate of VGG-16 proves its effectiveness as a professional tool for identifying counterfeits in currency. The superior capabilities of VGG-16 demonstrate its worth for built-in use in ATMs and banking security systems and mobile verification applications. Further research will concentrate on expanding dataset variety and operationalizing this model for live banking system authentication purposes.

VIII. CONCLUSION

The circulation of counterfeit money represents a substantial challenge that affects financial institutions together with economies and conduct of everyday activities. Through deep learning technology this research develops a precise method for detecting counterfeit banknotes with high operational efficiency. The system reaches an outstanding 96% accuracy because it employs the VGG model for its powerful feature extraction abilities above traditional verification processes. Deep learning successfully analyzes complex visual patterns and security measures in currency notes so it diminishes fraudulent activities. The learning process maintains stability according to the curves for accuracy and loss and the confusion matrix reveals a low degree of misclassification. The new design of the VGG architecture demonstrates superior performance compared to traditional standard CNN models. The detection system functions well but lighting conditions together with image quality standards have an impact on accuracy levels. Icefuture improvements regarding data augmentation along with real-time implementation and hybrid models integration will boost its reliability level. Implementing this solution across banking checkpoints and financial institutions and ATMs would improve security measures thus protecting transactions from computer intruders and reducing money theft. The study highlights how AI solutions play an increasing role in financial security systems of fraud detection and it sets a path for highly advanced counterfeit detection methods in upcoming times.

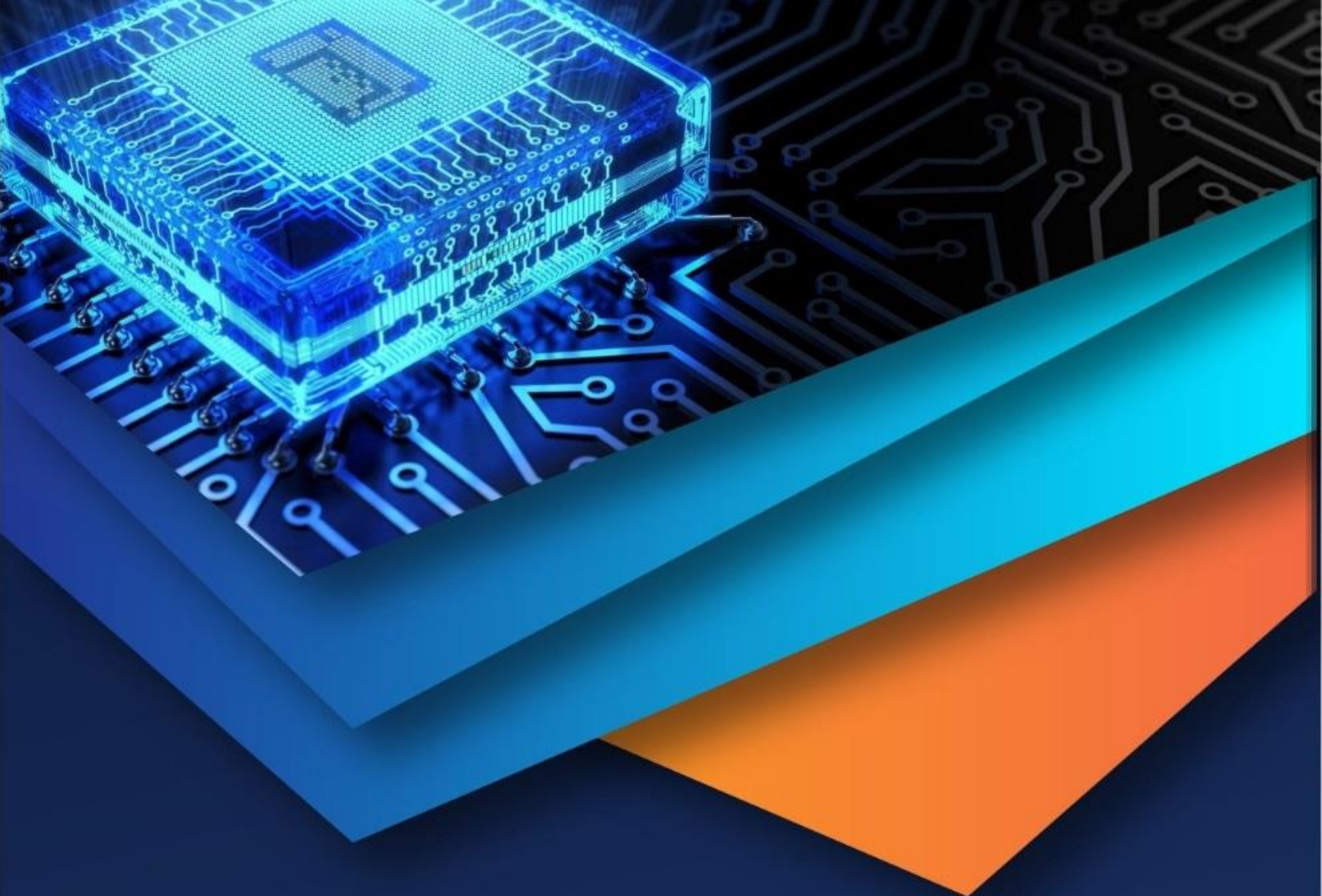
REFERENCES

[1] R. Muttreja et al., "Indian fake currency detection using image processing and machine learning techniques," International Journal of Information Technology, vol. 16, no. 2, pp. 1-8, 2024.
[2] "Exploring the world of fake currency and how to end it," The Financial Express, 2023.
[3] "Fake Indian Currency Notes (FICN)," Unacademy.
[4] "Fake Currency Detection using Deep Learning," International Journal of Advanced Research in Computer and Communication Engineering, vol. 9, no. 4, pp. 1-5, 2020.
[5] "Fake Currency Detection using Deep Learning Technique," International Journal of Engineering Research & Technology, vol. 8, no. 10, pp. 1-4, 2019.
[6] K. Kamble, A. Bhansali, P. Satalgaonkar, and S. Alagundgi, “Counterfeit Currency Detection using Deep Convolutional Neural Network,” in 2019 IEEE Pune Section International Conference (PuneCon), 2019, pp. 1–5, doi: 10.1109/PuneCon46936.2019.9105683.
[7] S. C. D. Bandu, M. Kakileti, S. S. J. Soloman, and N. Baydeti, “Indian fake currency detection using image processing and machine learning,” Int. J. Inf. Technol., vol. 16, pp. 4953–4966, 2024, doi: 10.1007/s41870-024-02170-9.
[8] A. Bhatia, V. Kedia, A. Shroff, M. Kumar, B. K. Shah, and Aryan, “Fake currency detection with machine learning algorithm and image processing,” in Proc. 2021 5th Int. Conf. Intell. Comput. Control Syst. (ICICCS), 2021, pp. 9432274, doi: 10.1109/ICICCS51141.2021.9432274.
[9] K. Bhushan, M. Asritha, P. R. Sultana, and P. A. Kumar, “Fake currency detection using deep learning,” IJARCCE, vol. 13, no. 3, Mar. 2024, doi: 10.17148/IJARCCE.2024.13339.
[10] S. B. Kanawade, S. S. Jangade, A. R. Mane, and T. D. Kurne, “Counterfeit currency detection using machine learning,” International Journal of Scientific Research in Science Engineering and Technology, vol. 11, no. 3, pp. 399–405, June 2024, doi: 10.32628/IJSRSET24113139.
[11] A. Antre, O. Kalbhor, P. Jagdale, G. Dhanne, and N. R. Sonawane, “Fake currency detection using convolution neural network,” International Research Journal of Modernization in Engineering Technology and Science, 2024, doi: 10.56726/IRJMETS35901.
[12] R. Bibi Fathima, H. B. M, N. K, and S. Nayak, “Fake currency detection using deep learning technique,” IJERTCONV10IS12024, 2024, doi: 10.17577/IJERTCONV10IS12024.
[13] S. B. Kanawade, S. S. Jangade, A. R. Mane, and T. D. Kurne, “Counterfeit currency detection using machine learning,” Int J Sci Res Sci Eng Technol, vol. 11, no. 3, pp. 399–405, Jun. 2024, doi: 10.32628/IJSRSET24113139.
[14] S. Patel, R. Nargunde, C. Shah, and S. Dholay, “Counterfeit currency detection using deep learning,” 2021 12th International Conference on Computing Communication and Networking Technologies (ICCCNT), pp. 1–6, Jul. 2021, doi: 10.1109/ICCCNT51525.2021.9579873.
[15] B. P. Devi, B. Kumaran, K. Dhanushpathy, and B. Manoj, “Fake currency detection using Inception V3,” 2024 5th International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV), pp. 1–7, Mar. 2024, doi: 10.1109/ICICV62344.2024.00065.
[16] F. Khan, M. L. Saini, L. Jangid, and M. A., “Fake Indian paper currency detection using deep learning techniques,” 2024 8th International Conference on Computational System and Information Technology for Sustainable Solutions (CSITSS), pp. 1–8, Nov. 2024, doi: 10.1109/CSITSS64042.2024.10816834.
[17] H. Prakash, A. Yadav, U. P, C. Jha, G. K. Sah, and A. Naik, “Deep Learning approaches for automated detection of fake Indian banknotes,” 2023 IEEE International Conference on Integrated Circuits and Communication Systems (ICICACS), pp. 1–7, Feb. 2023, doi: 10.1109/ICICACS57338.2023.10100265.

[18] T. N. Agasti, A. Gudimella, and M. Shanmugasundaram, "Machine Learning Paradigms for Counterfeit Currency Detection: A Comprehensive Comparative Study," 2024 3rd International Conference on Artificial Intelligence For Internet of Things (AIIoT), pp. 1–7, May 2024, doi: 10.1109/AIIoT58432.2024.10574620.

[19] M. Ghonge, T. Kachare, M. Sinha, S. Kakade, S. Nigade, and S. Shinde, "Real Time Fake Note Detection using Deep Convolutional Neural Network," 2022 Second International Conference on Computer Science, Engineering and Applications (ICCSEA), pp. 1–6, Sep. 2022, doi: 10.1109/ICCSEA54677.2022.9936084.

[20] L. Latha, B. Raajshree, and D. Nivetha, "Fake currency detection using Image processing," 2021 International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA), pp. 1–5, Oct. 2021, doi: 10.1109/ICAECA52838.2021.9675592.



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