Indian Currency Classification Using Deep Learning

V Karthick, Associate Professor
Department of CSE
Rajalakshmi Engineering College
Chennai, India
vkarthick86@gmail.com

Surendhar S, UG Student
Department of CSE
Rajalakshmi Engineering College
Chennai, India
210701271@rajalakshmi.edu.in

Tarunvishaal L, UG Student
Department of CSE
Rajalakshmi Engineering College
Chennai, India
210701285@rajalakshmi.edu.in

Abstract-Indian currency plays a major role in Indian economics. However this paper proposes a deep learning method for image processing to identify the currency. This model is trained with the help of currency image dataset for accurate prediction. This system reduces the need for manual intervention which leads to increased efficiency and cost savings. The dataset comprise of Indian currency images plays a key role in training the model with the help of Deep learning algorithm. This is mainly useful in the Banks and ATM for recognizing the currency where speed plays a crucial role. The main objective of this system is to provide a user-friendly interface for currency classification using Deep learning algorithm.

Keywords: Currency classification , Deep learning, Image processing

I. INTRODUCTION

India, as one of the developing country occupies a pivotal position in the financial level across the globe. The main aim of this project is to develop the Indian currency classifier[1] using the neural networks algorithm which comes under Deep learning technique to accurately identify the different denominations of Indian currency notes. To achieve this first we need to gather the images of Indian currency which consist of different denominations. After collecting the dataset Data Preprocessing[2] technique must be done for resizing, augmentation to enhance the model robustness. Next we need to split the dataset into training, testing and validation in the appropriate ratio to avoid overfitting and underfitting issue. By using convolutional Neural network [3]algorithm the corresponding model can be trained with the help of the training dataset. Finally the model can be evaluated by giving the input as currency image.

Currency Recognition System using Image Processing and Artificial Neural Networks" by Mohd. Shabri Abd. Majid, Fakhrul Anas Yusof, Nor Ariati Anuar, 2019 presents an artificial neural network and image processing technique-based system for currency recognition is presented. The study focuses on feature extraction techniques that train a neural network to recognize various money notes, such as edge detection and histogram analysis.

Automatic Recognition of Indian Currency Note Based on HSV Parameter" by Jitendra D. Kanade, U. P. Khot, P. M. Patil, 2015 proposes a extracting features based on color information, and classifying the notes using a support vector machine (SVM), this research suggests an automated approach for recognizing Indian currency notes using HSV (Hue, Saturation, Value) color space characteristics.

Banknote Authentication using Deep Learning" by Gregory B. Huang, Chen-Wei Tan, 2018 The authors used convolutional neural networks (CNNs) to create a deep learning model for banknote authentication.

Currency Recognition Using Deep Convolutional Networks" by Nishant Mehta, Prateek Bansal, 2017. This research describes a deep convolutional neural network based cash recognition system

Indian Currency Recognition System Based on Deep Learning" by S. Saranya, P. S. Sathya, 2020. The study's main objective is to create a deep learning-based system for recognizing Indian cash. Through intensive testing and model tuning, the authors were able to achieve good performance when using a CNN architecture to categorize various Indian money denominations.

II.   MATERIALS AND METHODS

The dataset serves as a foundation for building the Machine Learning[3] model.The dataset which is used for training this model contains 195 images of 5 categories of Indian currency, this images are collected from the google The images in this dataset are not reduced to any single size and it may have different proportions. After collecting the dataset perform augmentation

Techniques like flipping ,rotation to improve the model generalization[4]. Divide this dataset into training, testing and validation sets.70%of images in the dataset is used for training,15% of images are used for testing,15% of indian currency images are used for validating . Convolutional Neural Network algorithm is used for training and prediction.

Hardware Requirements
- Secondary storage
- 4 GB RAM
- QUAD CORE PROCESSOR

SOFTWARE REQUIREMENTS
- Jupyter Notebook
- Python External libraries
- Python package

III.   EXISTING SYSTEM

Indian currency denomination recognition based on ANN[5] algorithm proposed that different Indian currencies are classified based on the set of features like color and dimensions. The classification of shapes is achieved with the help of ANN algorithm[6]. Also after the extraction of features, recognizing the denominations is done with the help of the developed algorithm. This paper discuss the drawbacks involved in currency recognition which includes lighting conditions and the quality of the images. Recognition[7] is done with the help of

intrinsic features of the currency. One of the main limitation of this paper is that the background of the image is contrasting with the object. Another limitation is luminescent conditions over the object must be uniform.

IV. PROPOSED SOLUTION

Our proposed solution provides a easy method which reduces the need for manual intervention that leads to increased efficiency and cost savings. This system used CNN algorithm[8] to predict the images of Indian currency. Our solution is employed in various applications like ATM's ,currency sorting machines. It proves to be a reliable solution with high user desirability and at the same time ensures feasibility. Our model could predict all the denominations of Indian currency with good accuracy. The main purpose of using CNN algorithm is as it includes pooling layer[9] which reduces the spatial dimensions so that our model can predict the image regardless of the location of the images.

V. METHODOLOGY

The methodology involved in our proposed system is described in the diagram depicted below which involves data collection, image preprocessing, segmentation, Training, Classification techniques. Dataset plays a major role in our model. By using this methodology in our system may leads to good prediction with high accuracy.
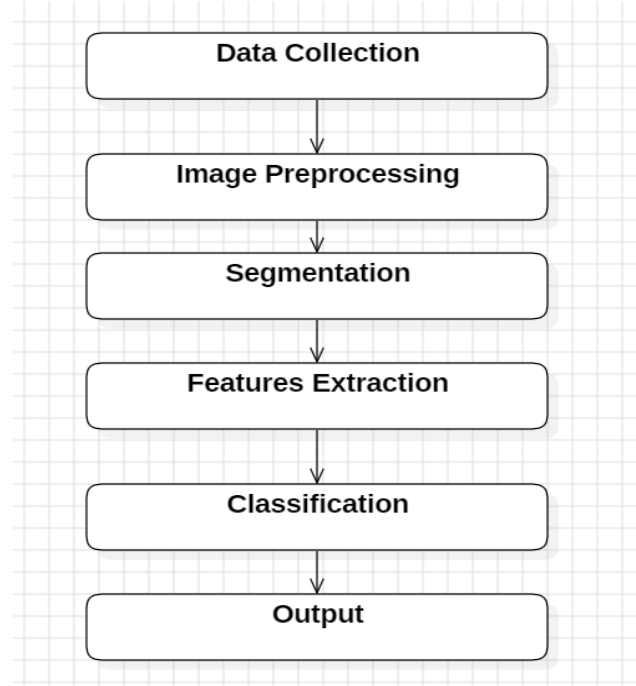
Data collection
Data collection is the first step in the currency recognition system .It is the process of collecting the images of Rs 10,50,100,200,500,2000 from the google and stored in the respective categories.

Image preprocessing
Only the image of the currency[4] is extracted from the collected image.Background of the image is removed .Finally we get only the currency of the image with no background image so that it is easy for the model to predict the image.

Segmentation
First the image of the Indian currency is converted into grayscale[10] . The images of grayscale contains only the sensitive information.The mathematical function is used to acquire the gray value of the pixel.Finally we get the segmented[11] image of Indian currency.

Classification

Currency classification technique is done with the help of CNN algorithm with the help of the dataset where the dataset is split into training,testing,validation set. 70% of the images are used for training,15% for testing,15% for validation. Thus our model predict[12] the images of Indian currency.

VI. RESULT

Thus our model predicts[13] the different denominations of Indian currency with good accuracy. It saves the manpower and our efficient time and cost. We also compared the accuracy of Training and Validation set which is depicted below
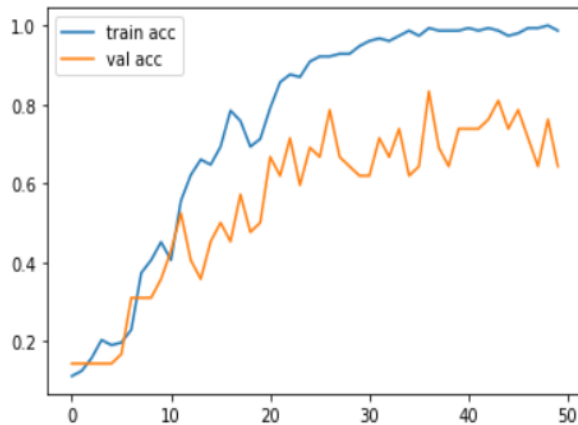
VII. DISCUSSION

The previous paper had a limitation in luminescence property of the image which leads to reducing the accuracy of the predicted image. But our model overcomes this problem and recognize the different denominations of Indian currency with good accuracy. Our solution can also be equipped with storing and saving functionalities as a future work so that it can be even more helpful for people while used on a daily basis.

VIII. CONCLUSION

Our model Indian currency classifier achieves a significant milestone in identifying the different denominations of Indian currency with very good accuracy. Moreover this will continuously evolve and make a valuable contributions in the field of Computer vision and recognizing the currency. In the future it can be integrated into web and mobile application for real time prediction.

IX. REFERENCES

[1] N. E. Caytuiro-Silva, J. M. Peña-Alejandro, E. G. Castro-Gutierrez, J. Sulla-Torres, and B. Maraza-Quispe, "Annotated Peruvian banknote dataset for currency recognition and classification," *Data Brief*, vol. 51, p. 109715, Dec. 2023.

[2] R. Jafari, *Hands-On Data Preprocessing in Python: Learn how to effectively prepare data for successful data analytics*. Packt Publishing Ltd, 2022.

[3] M. Sewak, M. R. Karim, and P. Pujari, *Practical Convolutional Neural Networks: Implement advanced deep learning models using Python*. Packt Publishing Ltd, 2018.

[4] J. Chaki and N. Dey, *A Beginner's Guide to Image Preprocessing Techniques*. CRC Press, 2018.

[5] S. Shanmuganathan and S. Samarasinghe, *Artificial Neural*

Network Modelling. Springer, 2016.

[6]   S. S. and M. Paulraj, *Introduction to Artificial Neural Networks*. Vikas Publishing House, 2009.

[7]   D. Ghai, S. L. Tripathi, S. Saxena, M. Chanda, and M. Alazab, *Machine Learning Algorithms for Signal and Image Processing*. John Wiley & Sons, 2022.

[8]   K. Saravanan, O. Nethaji, M. V. Suganthi, S. Rajendran, and P. Murugabharathi, *Neural Networks and Deep Learning*. Leilani Katie Publication, 2024.

[9]   Y. Tsukamoto, "Corrigendum: Electrical synapses for a pooling layer of the convolutional neural network in retinas," *Front. Cell. Neurosci.*, vol. 18, p. 1404440, Apr. 2024.

[10]   P. K. Sree, M. P. J. Shalem Raju, M. P. Archana, and R. R. Pbv, *Fundamentals Of Deep Learning: Theory And Applications*. Academic Guru Publishing House, 2023.

[11]   J. Brownlee, *Better Deep Learning: Train Faster, Reduce Overfitting, and Make Better Predictions*. Machine Learning Mastery, 2018.

[12]   S. Bhattacharyya, V. Snasel, A. E. Hassanien, S. Saha, and B. K. Tripathy, *Deep Learning: Research and Applications*. Walter de Gruyter GmbH & Co KG, 2020.

[13]   S. Manikandan, G. L. V. Prasad, and M. V. VijayaRangan, *Deep Learning and its Applications*. Quing Publications, 2022.