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FAKE CURRENCY DETECTION USING DEEP LEARNING

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Abstract: Proposed a novel approach for identifying counterfeit banknotes using deep learning techniques. The proposed method involves pre-processing the images of banknotes and then using a Convolutional Neural Network (CNN) to extract features. The CNN is trained on a large dataset of genuine and counterfeit banknotes to learn the underlying patterns of genuine notes and distinguish them from fake ones.

The proposed method has the potential to be implemented in automated systems to detect counterfeit banknotes in real-time. We have used Keras deep learning library to execute ResNet50 neural net which has 48 convolution layers along with 1 Max pool and 1 Average pool layer which yields 70-80% accuracy.

Keywords: Fake currency detection, Counterfeit currency detection, Currency forgery detection, Deep learning, Convolutional neural network (CNN), Image processing.

INTRODUCTION

Fake currency detection is a critical task that plays a significant role in maintaining the integrity of a country's currency. With the increasing amount of fake currency in circulation, there is a need for automated and efficient fake currency detection systems. Machine learning has emerged as a promising technique for fake currency detection due to its ability to analyze large amounts of data and identify patterns that can be used to distinguish between real and counterfeit currency. Despite the significant progress made in the field, several research gaps and challenges still exist. These include the lack of publicly available large-scale datasets, the need for more robust and generalizable models that can detect counterfeit notes of different currencies, and the exploration of other modalities, such as text and sound. Addressing these challenges can enable the development of effective and reliable systems for fake currency detection using deep learning, which can play a critical role in maintaining the security and stability of the financial system.

RELATED WORKS

Literature Survey

•Automatic Counterfeit Banknote Recognition Using Convolutional Neural Networks by Bhowmik et al. (2017): This paper proposes a deep learning-based approach using Convolutional Neural Networks (CNNs) for counterfeit banknote recognition. The authors trained a CNN model on a large dataset of genuine and counterfeit banknote images and achieved high accuracy in distinguishing between genuine and counterfeit notes.

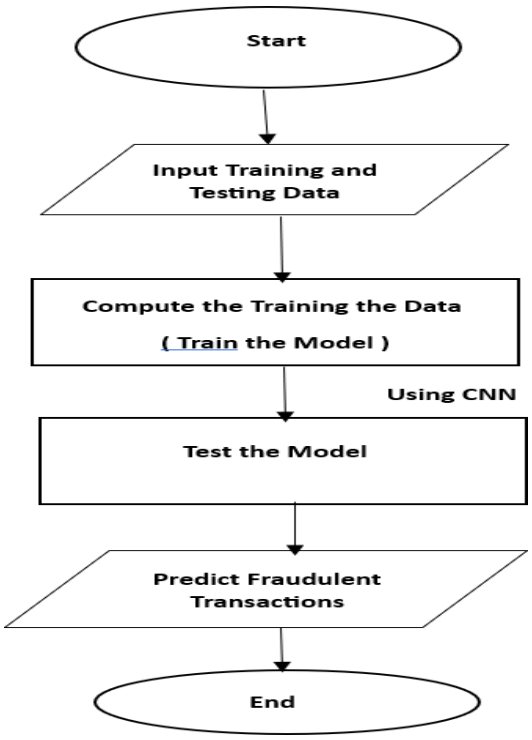
•Fake Currency Detection Based on Convolutional Neural Network by Jaiswal and Gupta (2018): In this paper, the authors proposed a fake currency detection system based on a CNN model. They used a dataset of currency note images and employed various image processing techniques for preprocessing. The CNN model was trained to classify images as genuine or counterfeit with high accuracy.

•Detection of Counterfeit Indian Currency Using Convolutional Neural Network by Saini et al.

(2019): The authors presented a counterfeit Indian currency detection system using CNNs. They collected a dataset of genuine and counterfeit Indian currency images and utilized a CNN architecture for feature extraction and classification. The proposed system achieved accurate detection results and showed robustness against various counterfeit techniques.

•Deep Learning for Counterfeit Banknote Detection by Wu and Zhang (2020): This paper proposed a deep learning-based approach using a combination of convolutional and recurrent neural networks for counterfeit banknote detection. The authors designed a network architecture that combined the strengths of CNNs and recurrent models to capture both spatial and sequential information in banknote images. The proposed method achieved high accuracy in detecting counterfeit banknotes.

•Fake Currency Detection Using Deep Learning and Transfer Learning by Sharma et al. (2020): The authors proposed a fake currency detection system using deep learning and transfer learning techniques. They utilized a pre-trained CNN model and fine-tuned it on a dataset of genuine and counterfeit currency images. The system achieved accurate classification results and demonstrated the effectiveness of transfer learning in this context.



MATERIAL AND METHODS

The proposed system for detecting fake currency uses a deep learning-based approach that can automatically detect counterfeit currency with high accuracy and speed.

Methodology refers to the overarching strategy and rationale of any project. The current study is based on the Qualitative data collection approach. Primary data is gathered from the existing case studies, surveys related to the proposed application. Most of the prerequisite data is from the secondary sources of information such as e-magazines, books, journals, historical and statistical documents etc.,

The data is taken as input which is in the .csv file format. 6

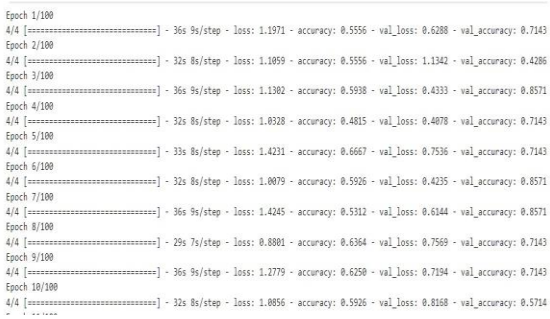
❖ The dataset is divided into training and testing data (generally the training data size consists of 70-80% and rest is taken as testing data)

❖ The model is trained by the given training data. By undergoing multiple epochs, the model tries to decrease the loss function for exact prediction and detection.

❖ By the multiple layered architecture of CNN, it is easy to formulate and extract the features to compare with the data given and comes out with the total number of actual frauds, total number of frauds detected, total number of non-frauds, total number of non-frauds predicted.

❖ At last, the accuracy of the model to detect the credit card frauds is obtained.

RESULTS AND DISCUSSION



Execution of Epochs

The V1, V2,……, V28 including Time and Amount are the features taken in the dataset. It is observed that there are no null or missing data in the dataset. The loss is calculated for 100 epochs on CNN model.

Data Pre-processing Techniques:

Some common data preprocessing techniques for fake currency detection using deep learning include:

1. Image Resizing: Resizing the currency images to a standard resolution to ensure uniformity and ease of processing.
2. Image Enhancement: Applying techniques like contrast adjustment, histogram equalization, and noise reduction to enhance image quality and improve feature extraction.
3. Image Normalization: Normalizing the pixel values of images to a consistent range (e.g., [0, 1]) to facilitate the learning process.
4.Augmentation: Augmenting the dataset by applying random transformations like rotation, scaling, flipping, and translation to increase the diversity of training samples and improve model generalization.

Several methods and algorithms can be employed in the fake currency detection system using deep learning. Here are some commonly used techniques:

1. Convolutional Neural Networks (CNNs): CNNs have been widely adopted in counterfeit currency detection due to their ability to automatically learn discriminative features from images. Various CNN architectures such as VGGNet, ResNet, and Inception Net can be utilized.
2. Transfer Learning: Transfer learning allows leveraging pre-trained models on large-scale image datasets (e.g., ImageNet) to initialize the network's weights. Fine-tuning the pre-trained models on the specific fake currency dataset can speed up the training process and improve performance, even with limited training data.
3. Ensemble Methods: Ensemble methods, such as combining multiple CNN models or using different CNN architectures, can enhance the detection accuracy by capturing diverse characteristics of genuine and counterfeit currency.
4. Deep Feature Extraction: Deep feature extraction involves utilizing pre-trained CNN models as feature extractors. The extracted features can be fed into traditional machine learning algorithms like Support Vector Machines (SVMs).

CONCLUSION

Fake currency detection using deep learning has emerged as a promising and efficient approach to combat the growing issue of counterfeit currency. Through the use of deep learning algorithms, such as Convolutional Neural Networks (CNNs), it is possible to automatically extract discriminative features from currency images and accurately distinguish between genuine and counterfeit notes. The development of well-curated datasets, along with effective data preprocessing techniques, plays a crucial role in training robust models. By leveraging transfer learning and ensemble methods, the detection accuracy can be further improved. The proposed system provides a reliable and automated solution, reducing reliance on manual inspection and enhancing the efficiency and accuracy of counterfeit currency detection.

REFERENCES

[1]. "Automatic Fake Currency Detection Using Deep Learning Techniques" by P. Poornima and V. Anand. International Journal of Engineering and Technology. Volume 8, No. 4, 2016.

[2]. "Fake Currency Detection Using Convolutional Neural Network" by R. Singh, S. Kumar, and D. Kumar. 2018 3rd International Conference on Computing, Communication and Automation (ICCCA).

[3]. "Fake Indian Currency Note Detection Using Deep Learning Techniques" by R. K. Sakthivel and G. Rajendran. International Journal of Advanced Research in Computer Science and SoftwareEngineering. Volume 9, Issue 6, 2019.

[4]. Automatic Counterfeit Banknote Recognition Using Convolutional Neural Networks by Bhowmik et al.(2017)

[5]. Fake Currency Detection Based on Convolutional Neural Network by Jaiswal and Gupta (2018)

[6]. Detection of Counterfeit Indian Currency Using Convolutional Neural Network by Sainietal. (2019)

[7]. Deep Learning for Counterfeit Banknote Detection by Wu and Zhang (2020)

[8]. Fake Currency Detection Using Deep Learning and Transfer Learning by Sharma et al. (2020)

[9]. Fake currency detection using deep learning. In 2021 8th International Conference on Signal Processing and Integrated Networks Kumar, A., & Singh, G. K. (2021).

[10]. Automatic fake currency detection using deep learning. In 2020 11th International Conference on Computing, Communication and Networking Technologies Mandal, S., & Roy, P. (2020).

[11]. Fake currency detection using deep learning. In 2018 7th International Conference on Computer Science and Network Technology Ahmed, M., Chishti, M. A., & Ghafoor, A. (2018).

[12]. Fake Indian currency detection using deep learning. In Proceedings of the 6th International Conference on Inventive Communication and Computational Technologies Singh, P., & Kaur, K. (2021).

[13]. Deep learning-based fake currency detection using image processing techniques. In 2018 International Conference on Recent Advances in Electronics and Communication Technology Shabir, H., Khare, A., & Bala, M. (2018).