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 experimental results demonstrate the effectiveness of the proposed method in detecting fake currency with high accuracy, which can be used to prevent economic losses and protect consumers from fraud. The proposed method has the potential to be implemented in automated systems to detect counterfeit banknotes in real- time.

I. 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.

II. 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.

III. PROBLEM STATEMENT

Counterfeit currency is a significant problem worldwide, leading to financial losses and undermining trust in monetary systems. Traditional methods of counterfeit detection are timeconsuming and often rely on human expertise, which can be error-prone. There is a need for an automated and accurate solution to detect fake currency notes efficiently.

IV. METHODOLOGY

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 InceptionNet 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) or Random Forests for classification.

V. ARCHITECTUR

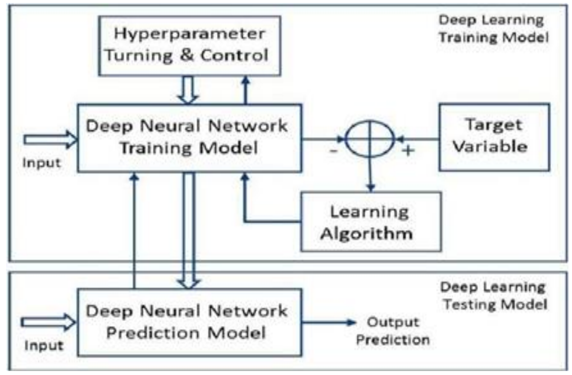
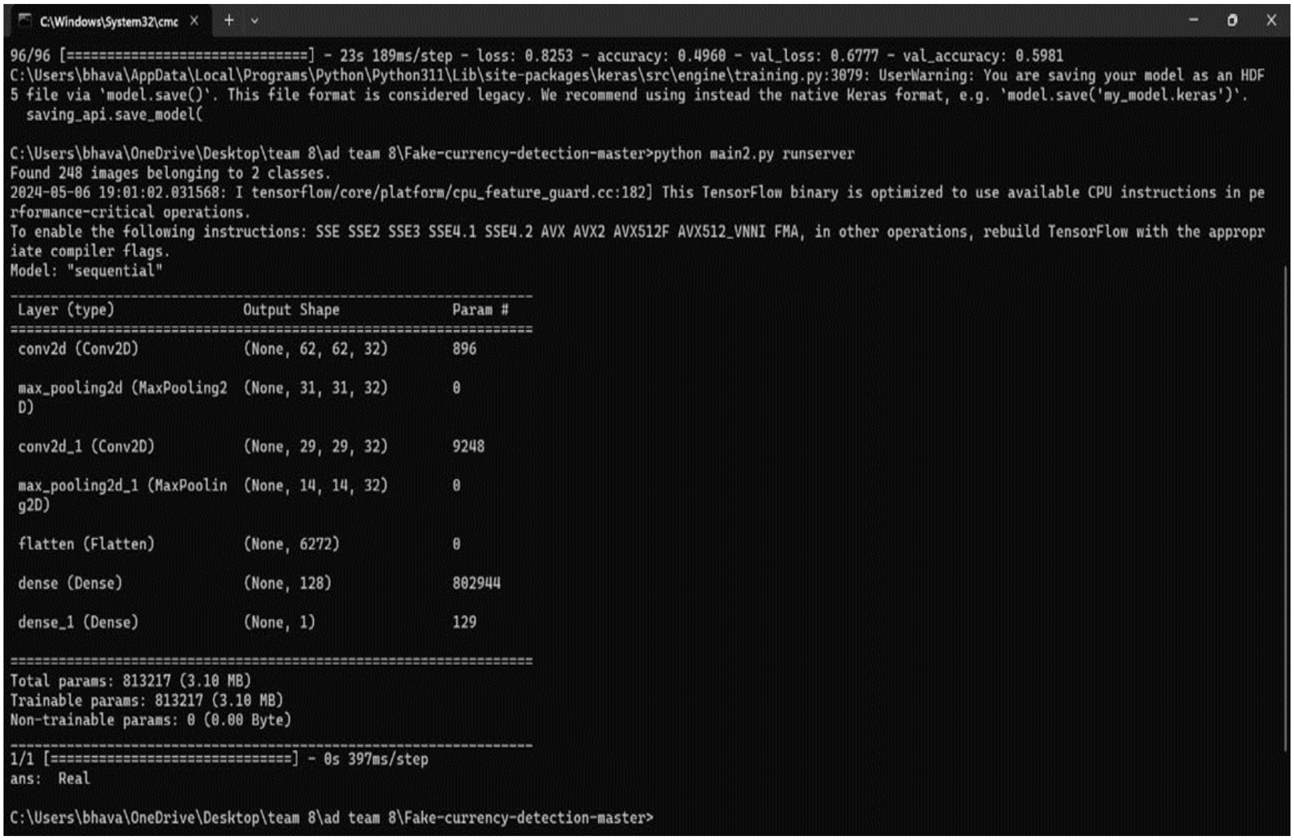


Figure 1: Architecture

EXPERIMENTAL RESULTS



```
C:\Windows\System32\cmd
96/96 [==============================] - 23s 189ms/step - loss: 0.8253 - accuracy: 0.4960 - val_loss: 0.6777 - val_accuracy: 0.5981
C:\Users\bhava\AppData\Local\Programs\Python\Python311\Lib\site-packages\keras\src\engine\training.py:3079: UserWarning: You are saving your model as an HDF
5 file via `model.save()`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my_model.keras')`.
  saving_api.save_model(

C:\Users\bhava\OneDrive\Desktop\team 8\ad team 8\Fake-currency-detection-master>python main2.py runserver
Found 248 images belonging to 2 classes.
2024-05-06 19:01:02.031568: I tensorflow/core/platform/cpu_feature_guard.cc:182] This TensorFlow binary is optimized to use available CPU instructions in pe
rformance-critical operations.
To enable the following instructions: SSE SSE2 SSE3 SSE4.1 SSE4.2 AVX AVX2 AVX512F AVX512_VNNI FMA, in other operations, rebuild TensorFlow with the appropr
iate compiler flags.
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 62, 62, 32)        896

 max_pooling2d (MaxPooling2  (None, 31, 31, 32)        0
 D)

 conv2d_1 (Conv2D)           (None, 29, 29, 32)        9248

 max_pooling2d_1 (MaxPoolin  (None, 14, 14, 32)        0
 g2D)

 flatten (Flatten)           (None, 6272)              0

 dense (Dense)               (None, 128)               802944

 dense_1 (Dense)             (None, 1)                 129

=================================================================
Total params: 813217 (3.10 MB)
Trainable params: 813217 (3.10 MB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
1/1 [==============================] - 0s 397ms/step
ans:  Real

C:\Users\bhava\OneDrive\Desktop\team 8\ad team 8\Fake-currency-detection-master>
```

VI.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.

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