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Currency Detection using TensorFlow

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Abstract: Advances in technology have replaced people in almost every field with machines. Thanks to the introduction of machines, banking automation has reduced the burden on humans. Banking automation requires more attention to declining currency handling. When the banknote is blurred or defaced, it is difficult to identify its currency value. A sophisticated design is included to increase the security of the call. This makes the call recognition task very difficult. For correct currency recognition, it is very important to choose a good function and an appropriate algorithm. One of the main problems that blind people face is the recognition of money, especially cash. In a way, the seemingly weakened people do not think about cash settlement and run into problems related to cash transactions in their daily life. It is a useful treatment for those who are externally weakened. studies and trialswere conducted according to key points, such as watermarks, images printed on money, the value of words and numbers, and the total amount of information gathering that stimulated CNN .This paper focuses on the study of solving social problems using Convolutional Neural Networks (CNNs) and validating and evaluating different CNN models. Here, the Alexnet, Googlenet and Vgg16 models were considered for the study .All models were adjusted during preparation and testing of individual data sets. Among these three models, Alexnet had the best performance, Vgg16 model showed 100% performance, and Google net showed performance with 88%.

Keywords- banknote recognition; convolutional neural networks; computer vision; deep learning;VGG16; transfer learning.

I. INTRODUCTION

Currency is notes and coins issued by the government for circulation in the economy. Service and product exchange facility. Banknotes are an important medium for trading. The banknote is characterized by simplicity, durability, full control and affordability. This made him well known. Compared to all other alternative forms of currency, paper is the most preferred form of currency. This has one downside to banknotes: it cannot be reused, but the issue is less serious compared to other methods. As part of the technological advancements introduced to the financial sector, financial institutions and banks have embarked on financial self-service. An automated banking system is implemented that processes currencies using, machines with ATM counters and coin dispensers. In this situation, the uses a currency recognizer to classify the banknotes. Call has two types of features i.e. internal features and external features. External characteristics include physical aspects of the currency, such as width and size. However, these physical features are unreliable as circulation can damage the currency. This compromised call system can cause the system to not recognize the call. Internal features include unreliable color features because calls go through different hands and this can get dirty and give incorrect results. For currencies of each denomination there is a specific color and size that is followed by Reserve bank of India. It is a very simple for human to identify them denomination of currency note because our human brain is extremely skillful in learning new matters and discovering them later without much trouble. But this currency recognition task turns very difficult and challenging in computer vision, in cases when currencies becomes damaged, old, and faded due to wear and tear of currencies. Security features are included in every Indian Currency which dispenses help in recognition and identification of the currency value. Various Security features are identification mark (shape), Center value, Ashoka, Latent image, See through register, Security thread, Micro letter, Watermark and RBI seal.

1.1 Deep Learning: Deep Learning is a new machine learning environment, introduced with the aim of bringing Machine Learning closer to one of its original motive: Artificial Intelligence ”(p.6). In-depth reading refers to the study of multiple categories of illustrations and concepts that assist researchers in analyzing data, including images, sounds, and texts

In-depth reading is often associated with a neural network with a few layers that can learn from a large amount of data, which includes a series of labeled images. In addition it has been widely used in the field of vision and voice (processing natural language). The weights of any layer are learned through the spread of back propagation in an in-depth learning process. All layers have different effects on data analysis. Despite its difficulties, the method has been successfully extended to a variety of classification and identification problems.

1.2 Deep learning techniques:

Classic-Neural-Networks: A multilayer perceptron, inwhich neurons are associated with a continuous layer,and is often used to identify Neural Connected Networks. There are 3 functions involved in the launch system: Line function: Properly called, this indicates only the line that repeats the input with a continuous repetition. Non-line work: This is categorized into three categories: A- “Sigmoid Curve: A function that is translated as anS- shaped curve with its width starting from 0 to 1.

B- Hyperbolic tangent (tanh) refers to an S-shaped curve with a distance of 1 to 1.

C-Rectified Linear Unit (ReLU): A single point function that returns 0 when the input value is below the set value and the line multiplication if the input value is high. **Convolutional-Neural-Networks**: CNN is a continuous version of the highly developed neural- network-model model. It is designed to handle high levels of complexity, as well as pre-processing and data integration.

CNN is divided into four stages after the input data was presented in the conversion program: Convolution: a process that generates feature maps from input databases and uses function in these maps.

Max Pooling: Assists C-NN in image acquisition based on imaginary modification.

Plans: At this stage, the data that has been generated is thenpressed for CNN to check.

Complete Connection: This is sometimes described as a hidden layer that collects system loss function.

Recurrent-Neural-Networks (RNNs): initially, RNN was developed to assist in sequencing prediction; for example, the Long-Short-Term-Memory (LSTM) algorithm is widely knownfor its versatility. These networks are based solely on datatracking with variable input lengths.

Generative-Adversarial-Networks: Using an efficient production system for counterfeit production models and detecting real-time data from producers, known as(GANs). In their research, they used GANs and could distinguish between fake and real banknotes with a high degree of accuracy. GAN.s is a two-dimensional and highly complex neural network. The generative- network is the first, and the racist network is the second. After using GANs in the database and using them to separate real and fake notes, promising results were obtained.

1. Single-shot-multibox-detector: It is a comprehensive mathematical model in finding objects. It creates connecting boxes using working maps from a variety of layers. It will builddifferent boundary boxes based on different categories; after that, one can find out what the object was. This system can also be used for real-time detection, and has faster capabilities than R_C-NN and Res Net.

2. Multilayer perception: This is one of a kind of neural-network built into a layer of input and a node that works togetherto produce one or more hidden layers and effects. To calculate output, indirect activity is required, and a back-propagation- algorithm can be used to train MLP isolation and reduction. In addition, MLPs were a feed forward neural network composed of a number of nodes connected by a single connection and trained using back-propagation.

II.EXISTING SYSTEM

The authors of [1] proposed a method of recognizing money using monetary features such as central number, latent image, RBI, form, and micro letter. It contains a training data set for preparing the training model. PCA analysis accounts for banknote recognition. In [2], the authors proposed a method for recognizing banknotes using features such as color, texture, and size. Dirty banknote detection method activated. Author [3] proposed a banknote recognition system using MATLAB tools. PCA analysis according to with a description of Euclidean distance. Describes the LBP method for matching purposes In [4], the authors first determine the country and then propose a method for determining the country name. The author of [5] gave a brief introduction to the features of the Indian currency. Shape filtering process according to with other analysis and segmentation descriptions. A banknote detection recognition technology is implemented using a neural network. [6] is a book on CNNs which includes various processing of layers with mathematical demonstrations. Once an image is captured, it is transformed to matrix form prior to detection and then matched with a trained model to demonstrate all processing between matrix generation and recognition using mathematical calculation. Effect of various convolution kernels on horizontal and vertical edges. In [7], the authors described all aspects of CNNs. In [8], the author proposed a method for recognizing currency using a neural network. Classification using weighted

Euclidean distance with various steps required for data collection and processing. In [9], [10], the authors proposed a call recognition technique, and is a learning machine used to train data and obtain accuracy.

III. METHODOLOGY

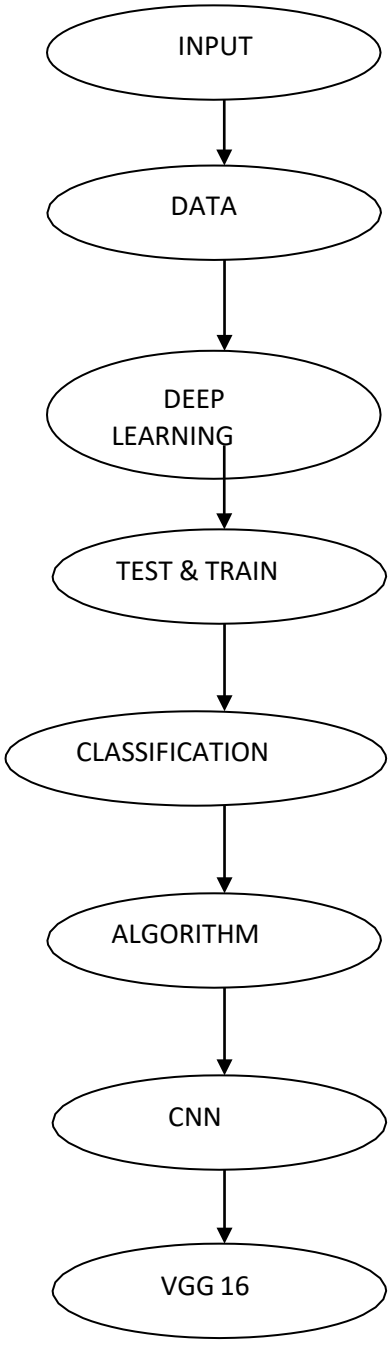


Figure 1: Methodology of the system

In the coding section, we will use the in-depth reading of Keras library on python to build our CNN (Convolutional Neural Network). We have to include TensorFlow and Theano working at the end of the Cameras. TensorFlow isan organization. An open source software for data flow system across the entire job list. It is a symbolic mathematical library, and it is and is used in machine learning applications such as neural networks. Theano is a Python library and is doing well mathematician to convertand evaluate statistics expressions, especially those with amatrix value. In Theano, the figures are expressed using a NumPy-square syntax was also compiled for optimal performance it can be CPU or GPU architecture. After installing the required libraries, we train our model as discussed above. After training and model testing, we set the amount of time that increases the accuracy of AFCRS in addition to increasingthe number of periods

Data pre-processing- An easy way to get data without overloading once under the pre-processing of the data set. The main purpose after pre-processing the data that adding value base value which is a set of data generated. Main the advantage ofpre-processing data is that it is better training-set. For these purposes, we use the Keras library to pre-process images. The VGG-16 model we use is ours experiments require input image format 64x 64 x 3, where 3 refers to R, G, B (red, green, blue) parts of the colored picture and the image should be 64 x 64 pixels in size. We then use the following three types of pre-image processing in the original databases, too select our first filter that starts at 64.

a. Image Rescaling - We need to resize the image to make the model data into a common format for training to be developed, accurate, and fast. Sine re-scaling feature on the cameras. To usethis feature, we need to import a certain library from keras pre- processing as "ImageDataGenerator". If the re-rating feature is missing or 0, no resume is used, otherwise we duplicate the data about it given number. This is done after installing all the others changes. In our model, we use re-scaling feature like:

rescale = 1. / 255 in both training and testing data sets.

b. Image Shearing - We need to cut the image to make the training data better, more accurate. We also have shear range factor in the cameras. This will be incorporated into the camera'spre-processing library. In our model, we use a clipboard as shear_range = 0.2. Shear range is usually the Shear angle in the middle anti-clockwise direction by degrees, also known as the shear intensity.

c. Perspective Transformations: Applied perspective transformations on training data to zoom in the range of zoom_range=0.2 to get the accurate results by learning in an accurate manner. Zoom range is a float or lower, upper range forrandom zoom. This is also done by importing a library from keras pre-processing.

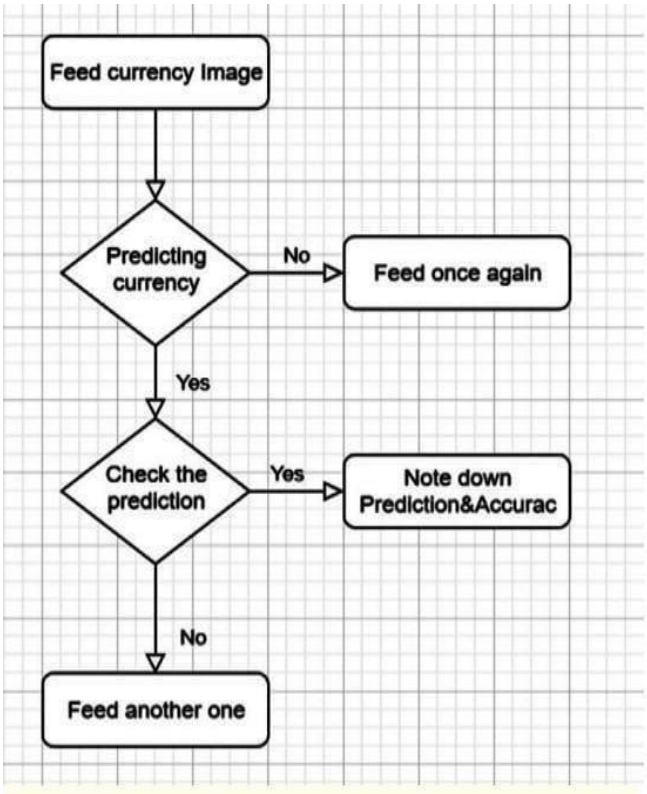
2. Training the CNN: Here, after choosing VGGNet for our model, we optimized VGGNet [4], which is a pre-trained network. This speeds up the training process, as they are few and far between really training layers. Training the neural network, of course it is actually better to start with a malfunctioning neural network and expose the neural network with high accuracy. As terms of job loss, we want our job loss to be the same very low atthe end of training. This shows that

The neural network has a high level of learning and accuracy. The problem of network training equals productivity as loss function with a small error rate. It is also

important effective even reduces losses because, it turns out loss is an easy task to improve. Even though there are many algorithms that make it work and for better performance, we select ReLU (linear Rectifier unit) as our activation function, and we can select 'adam' as our development work because, it develops neural networks with faster training. And also computational

The ReLU step is simple. To see a note of a given currency as fake or real, we should see the accuracy of VGG-16 a well-configured model with a set of generated data. It was about 55% on the corresponding test set, though ours the data set was very small and limited to 200 images, the result is still very encouraging. When we enlarge our image data set with real- world samples that can make the model even higher accurately trained which may result in our results being higher 80% accuracy is a good indicator of results. Without full points, the result may be considered to invest heavily in the database, a was the training and test sets very similar. Therefore, after careful consideration, we must evaluate the loss and accuracy of our model, by changing the size of the collection and epoch. Basically there are 2 cases in deep learning about loss and accuracy prices.

Figure 2. Testing procedure of the model



IV. RESULTS

The three-layer CNN model used to classify monetary notes based on systems has yielded 98.50% accurate results and 15 times. The training database is divided by an 8: 2 rating for opposite validation. Multi-measurement templates are used to determine security features in a currency note. To test the model, a scanned image of the currency note will be uploaded via the Jupyter File UploadSystem and its variability is predicted by model. The use of CNN has several advantages, which include, for example, CNN is well known for its architecture, and the best part is that no feature is required. The great advantageof C-NN over its predecessor is that it can identify an important factor without the need to interact with people.

Some of CNN's obstacles are, Images in different positions are separated; due to operations such as max pool, the Convolutional neural network is very slow, If CNN has multiple layers, the training phase can take longer, if the machine does not have a powerful GPU and CNN requires a large Data-set to process trained neural network

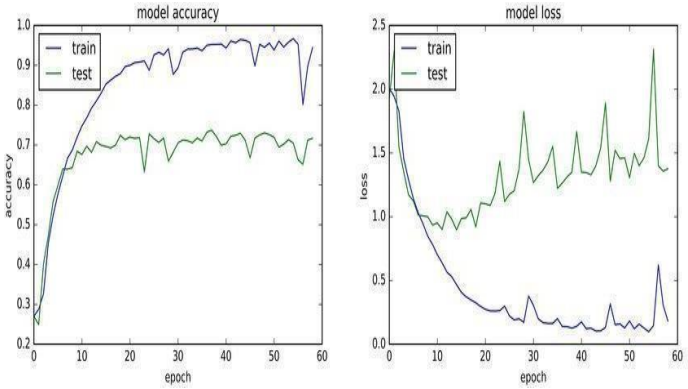


Figure 3. Accuracy of CNN

V. CONCLUSION

Today, technology is advancing on a massive scale. The proposed system can be extended to detect coins as well as detect counterfeit currency. You can add the names of countries other than India, you can also compare between them. It does not give 100% accuracy when image is loaded externally into practicefolder. You can solve this problem by optimizing the system. Therefore, the various methods proposed in this article were successfully implemented and validated by running experiments on the model. CNN turns out to be the best feature to do this technique using tflite and flutter_tts modules. 95% accuracy is achieved with model classifications. Also, detection of coins works well in this method.

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