HANDWRITTEN DIGIT RECOGNITION USING DEEP NEURAL NETWORK

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Abstract: In this paper made by the system is addresses that how the correspondence and visual precision of one explicit digit is shown using the significant neural association. In present world that is less difficult to set up the Deep neural association because of the part of data and various types of the algorithmic improvements happening in our regular day to day existence. Actually the proportion of computational power expected to set up a neural association has been raised up due to the openness of Graphics Processing Units (GPU) and other cloud based organizations like Google Cloud stage and (AWS) which offer resources for set up a Neural association on the cloud. This endeavor has been arranged with a figure division based Handwritten digit affirmation structure. In this assignment the structure have used Open Source Computer Vision Library which serves to gaining the figure and have used TensorFlow the limit library for setting up the neural Network in the python. The entire endeavor made in this system using python programming language. Finally after this endeavor the structure results with most vital precision of deciphered digit is been taken care of transcribed digit is been handled.

Keywords: MNIST Dataset, image pre-processing, segmentation, feature extraction, digit Recognizing.

1. INTRODUCTION

Movements are happening in the field of man-made thinking and significant learning every day This makes less measure of time, straightforwardness and furthermore diminishes perceiving for the assistance of getting known composed digit. In this task is utilized with the ordinary framework front end alongside the figure processor strategy before the energy meter which is utilized to tap the image of the energy meter. That figure processor will catch the image and afterward it will send the image to the energy charge supplier's office and after estimation of the bill, the produced bill will again be shipped off the client utilizing web and another is detached. In a patterns of electronic handwriting digit affirmation structure, the handwriting of the customer is noted as the customer when forming. Exactly when the customer is making the solicitation is noted in which the customer hand strokes prompt ease affirmation using the GPU. Where as in disengaged translated affirmation system, the physically composed digit of that particular customer is achieved the kind of figure. Deciphered affirmation is an essential and hard task that is an

aftereffect of various reasons. One essential clarification is that various people have various sorts and their styles of making capacities. Likewise, another clarification is there are various types of digits like Capital, Small letters, Digits and Special pictures and significantly more inside the digits. This is the explanation an immense dataset is required for setting up the significant neural association for the need of high precision. To develop a nice system for the best precision of in any event 98% is required. The condition at present is that latest and monetarily available structures have not prepared to achieve a high precision esteem. Towards the end the framework the following two primary parts will occur namely windows application and a server.

2. LITERATURE REVIEW

Banumathi et al. propose an approach to manage see Handwritten Tamil Digit Recognition. Physically composed Tamil Digit Recognition suggests the connection of progress of deciphered Tamil Digit into printed Tamil Digit. It is hard to manage physically composed digits as a result of the unprecedented assortments recorded as a printed copy styles, particular size and bearing place of the digits of people. In the proposed system the sifted picture is preprocessed and divided into segments, sections into lines, lines into words and words into digit picture glyph. Every digit picture glyph is presented to incorporate extraction strategy, which removes the features, for instance, digit height, width, number of level and vertical lines, uniformly and vertically orchestrated twists, number of circles, number of grade lines, picture centroid and phenomenal bits of each image [1].

Tabik et al. says during the hour of last half of the decade, the work with the significant learning methodologies and particularly Convolutional Neural Networks (CNN) that have been shown uncommon and astonishing correctness's in various model partition of the troublesome condition. Most of the Communication Technology in blend in with estimations for a sharp system to identify, analyze, show, record and alert/alert continuously. We have portrayed the system and its applications for splendid clinical centers to work even more capably, speedy, stronger with precision, accuracy and proficient seriously striking addition, similar to the mix of adaptable disfigurement and turn, alongside bunches have a high potential to furthermore improve the forefront precision in MNIST request. The

patterns of the division of the file is one of the inconvenient stage in affirmation of the strategy is begun incorporates input primary that is thoroughly isolates the significant information that can be utilized in the framework for dealing with various digits from one to nine.

In [3] portrayed an innovative response for therapy and clinical consideration of a patient in crisis facilities and focuses by get-together some information from past research where the patient necessities an energetic response dependent on accurate, exact and strong results. We are talking about a structure for throughout each and every day seeing of patient's prosperity and vital signs and moreover can follow all the data with less human undertakings. Using wearable biosensor contraptions and Information and Communication Technology in blend in with estimations for a sharp system to identify, analyze, show, record and alert/alert continuously. We have portrayed the system and its applications for splendid clinical centers to work even more capably, speedy, stronger with precision, accuracy and proficient seriously striking addition the extent for lifesaving and future rather than other conventional strategies embraced for clinical benefits used in facilities.

In [4] the authors mentioned the patterns of the division of the file is one of the inconvenient stage in affirmation of the strategy is begun incorporates input primary that is thoroughly isolates the significant information that can be utilized in the framework for dealing with various digits from one to nine is given to the information rectifier and channel block later it is given to the division square of division of the field from their inventory is given to the resultant picture is checked for slanting. There are potential outcomes of picture getting slanted with one or the other left or right direction and channel block and here we are having a shut circle lock from the yield to the inverter shop per between we have the chopper regulator obstructed the image yield is taken from the output.are moreover analyzed. There are conceivable outcomes of picture getting slanted with one or the other left or right direction and channel block and here we are having a shut circle lock from the yield to the inverter shop per between we have the chopper regulator hindered the image yield is taken from the yield.

In [5] says the patient necessities an energetic response dependent on accurate, exact and strong results. We are talking about a structure for throughout each and every day seeing of patient's prosperity and vital signs and moreover can follow all the data with less human undertakings. Using wearable biosensor contraptions and Information and Communication Technology in blend in with estimations for a sharp system to identify, analyze, show, record and alert/alert continuously. We have portrayed the system and its applications for splendid clinical centers to work even more capably, speedy, stronger with precision, accuracy and proficient seriously striking addition the extent for lifesaving and future rather than other conventional strategies embraced for clinical benefits used in facilities.

In [6] says focuses by get-together some information from past research where the patient necessities an energetic response dependent on accurate, exact and strong results. We are talking about a structure for throughout each and every day seeing of patient's prosperity and vital signs and moreover can follow all the data with less human undertakings. Using wearable biosensor contraptions and Information and Communication Technology in blend in with estimations for a sharp system to identify, analyze, show, record and alert/alert continuously. We have portrayed the system and its applications for splendid clinical centers to work even more capably, speedy, stronger with precision, accuracy and proficient seriously striking addition the extent for lifesaving and future rather than other conventional strategies embraced for clinical benefits used in facilities. The patterns of the division of the file is one of the inconvenient stage in affirmation of the strategy is begun incorporates input primary that is thoroughly isolates the significant information that can be utilized in the framework for dealing with various digits from one to nine.

In [7] authors proposed a typical, Most of the forefront models apply data development methodologies at the readiness stage. Communication Technology in blend in with estimations for a sharp

system to identify, analyze, show, record and alert/alert continuously. We have portrayed the system and its applications for splendid clinical centers to work even more capably, speedy, stronger with precision, accuracy and proficient seriously striking addition similar to the mix of adaptable disfigurement and turn, alongside bunches have a high potential to furthermore improve the forefront precision in MNIST request. Portrayed an innovative response for therapy and clinical consideration of a patient in crisis facilities and focuses by get-together some information from past research where the patient necessities an energetic response dependent on accurate, exact and strong results.

In [8] The inconvenient stage in affirmation of the strategy is begun incorporates input primary that is thoroughly isolates the significant information that can be utilized in the framework for dealing with various digits from one to nine is given to the information rectifier and channel block later it is given to the division square of division of the field from their inventory is given to the resultant picture is checked for slanting. There are potential outcomes of picture getting slanted with one or the other left or right direction and channel block and here we are having a shut circle lock from the yield to the inverter shop per between we have the chopper regulator obstructed the image yield is taken from the output.are moreover analyzed.. For this study, 100,000 is composed of 28x28 pixels, the network input parameter value is taken as 784.

In [9] says utilizes a Raspberry Pi interfaced with a Pi camera as the computational unit, which is used to record the surroundings and this video is streamed to server. The results are relayed back to the user through voice using Google Speech Engine. Due to this amalgamation, Oculus proves to be a reliable augmentation to the user.

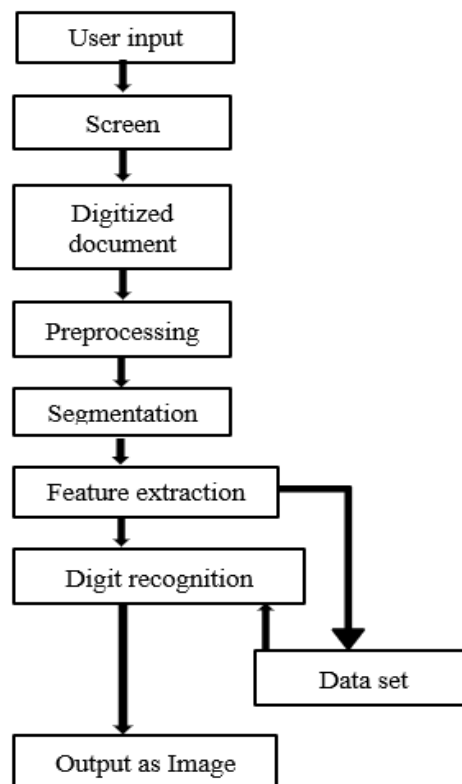## 3.RELATED WORKS

3.1 SYSTEM BLOCK DIAGRAM

Fig.1 Block diagram of HWDR

A. Digitization: The Digitization is the process of making over the input written image of the digit into clearly obeyed digit from the system where by the picture undergoes some of the digital picture from the bitmap image. These processes will be fed to the next procedure of the pre-processing.

B. Preprocessing: The scanned image is preprocessed for noise removal. This MSC has the data which controls the users' data locally, visitor data and the authentication of the user. Number value TEN.TWO Deep Neural Network. These neural networks are designed mainly to work for the recognition, graphical representation using GUI, Picture and various digits and character recognition using various layers of the deep neural network. below:1. Binarization 2. Noise reduction 3. Normalization 4. Skew correction, thinning the main block diagram for mining of the data from the dataset preprocessing method is started includes input main that's totally separates the valuable data that can be used in the system for working on different digits from one to nine is given to the input rectifier and filter block later it is given to the segmentation block of division of the field from their supply is given to the resultant image is checked for skewing. There are possibilities of image getting skewed with either left or right orientation and filter block and here we are having a closed-loop lock from the output to the inverter shop per between we have the chopper controller blocked the picture output is taken through the result.

C. Segmentation: In this division while the preprocessing work is done, the commotion free figure is passed to this stage. At this stage is the way toward apportioning Image segment in obeyed to separate the picture representation of leaf background segment, the size shape and exact look of the written image of the digit of the leaf is extracted from the image.

D. Feature extraction: This process is an important stage that plays an important role in classification of the given input digit. It produces the tabular format after the feature extraction is done. The tabular format act as a input for the classification. By using the table classification is done. It tells the desired portion which shows how the actual picture of the handwritten digit is rectified in the end. The basic digit of features extraction is color (gray scale), shape and digit format. Colours This MSC has the data which controls the users' data locally, visitor data and the authentication of the user. Number value TEN.TWO Deep Neural Network. These neural networks are designed mainly to work for the recognition, graphical representation using GUI, Picture and various digits and character recognition using various layers of the deep neural network. at the end the picture is derived with this recognition. 1.Hight. 2.Width. 3.The total number of lines that contains short and long in the even field. 4.Circles present. 5.Virtical lines 6. Totally arranged curves. 7.Centriod that has. 8.Position. 9.Pixels-Locales.

E. Recognition: Deep Neural Network that plays a major role in the recognition of the digit in this at the end of the work the system come up with the written digit into the system scanned and recognized along with the shape size and exact figure of the written digit with the great accuracy value.
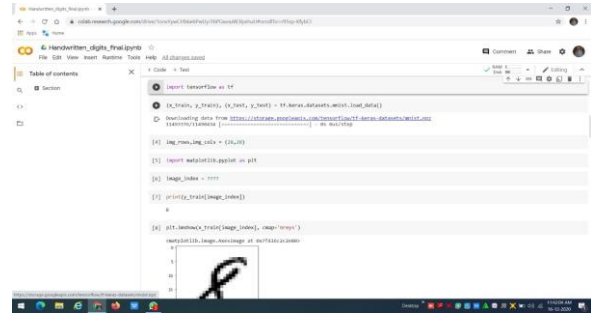
4. Python Framework

Django the book is about Django, a Web advancement structure that saves you time and makes Web improvement a delight. Utilizing this book, you can fabricate and keep up excellent Web applications with insignificant fight. At its best, Web improvement is an energizing, inventive demonstration; best case scenario, it very well may be a redundant, baffling annoyance. Django allows you to zero in on the pleasant stuff the core of your Web application while facilitating the torment of the tedious pieces. In doing as such, it gives significant level deliberations of basic Web advancement designs, alternate ways for successive programming undertakings, and clear shows for how to take care of issues. At a similar period, Django attempts to avoid your direction, giving access for you to work outside the extent of the system on a case-by-case basis. The fundamental point of this book is to make you a Django master. The center is twofold. In the first place,
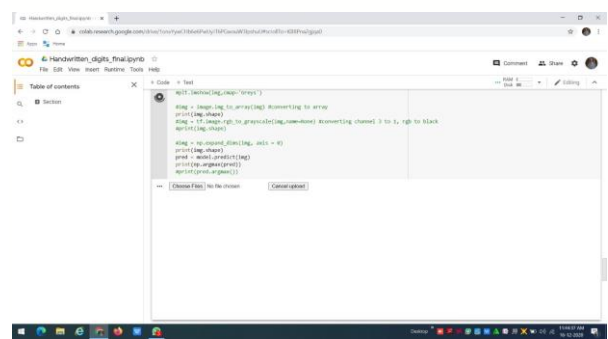
we clarify, top to bottom, what Django does and how to assemble web applications with it. Second thing is that, we talk about more significant level ideas where fitting, noting the quires "How might I apply these devices successfully in my own ventures?" toward the end book, you'll gain proficiency with the abilities that expected to grow incredible sites rapidly, with code that is spotless and simple to keep up.
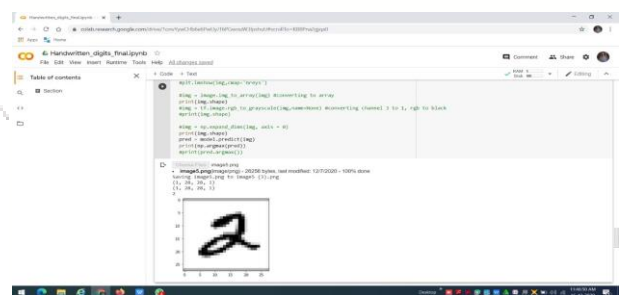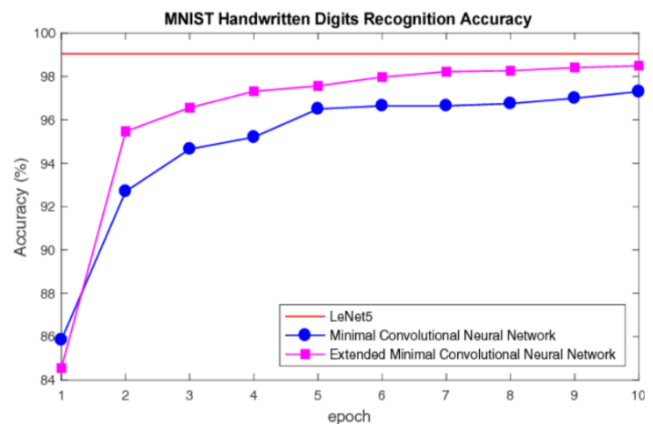
5. IMPLIMENTATION OF MODEL

5.1 Importing the required packages and uploading and uploading data set and printing the sample data:

5.2 Uploading the image for testing:

5.3 Output of the written input:

6. ALGORITHM

Step 1: Load image

Step 2: import from software libraries

Step 3: train and test data set

Step 4: pre-process the given image

Step 5: segmentation identify the part of the.

The pixels are separated into two clusters. They are

1. To find the mean of every cluster.

2. The difference between two means should be squared.

3. Multiply the different pixels into one cluster instances

based on the quantity in order.

Step 6: feature extraction is become aware of both user and the system

Step 7: The classified written image of the digit is obtained in the system.

7. SYSTEM TEST

Before the work of knowing the highest accuracy the process of System testing is required and this ensures that the entire load can be monitored by sending a picture representation from mobile phone to GPU Module with the help of energy meter which is embedded in the system and we can obtain the electricity bill through GPU Module to directly to our mobile phones showing how many units has been consumed. Firstly, we turn on the power supply for the kit and we initialize it by code to, the software code can be coded in Arduino application and wait for the output screen to be notified to operate and then send recognized picture to show in the screen and that is tested and noticed the accuracy.

7.1 Unit Testing:
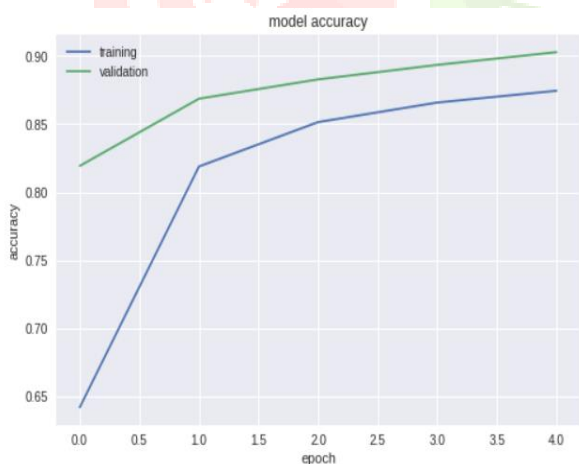
The processes of Unit testing are usually conducted as part of the load can be monitored by sending an picture representation from mobile phone to GPU Module with the help of energy meter which is embedded in the system and we can obtain the electricity bill through GPU Module to directly to our mobile phones showing how many units has been consumed. As its not common for coding, it will combine for the two phases.

7.2 Test strategy and approach

1. Field testing will be performed manually and functional tests will be written in detail.

Test objectives

- All fields that entries should work properly.

- 2.All The pages that are used must be activated from the identified link.

- The first come entry screen, messages and responses to that messages must not be delayed.

Features to be tested

a) Verification to that the entries are all in correct format.

b) No duplicates or the unwanted messages entries should be allowed

c) All the links that are used should take the user to the correct page with the particular integration testing.

8. MODULES

8.1 Convolutional Neural Network
A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning

A learning flatform is an information administer framework. Worldwide framework for visual precision accomplishing is a major framework made of not many little frameworks, for example, Mobile station, Base station subsystem, Network and exchanging subsystem, Operating subsystem. Versatile station is gadget used to impart like portable, fax machine and so forth Base station subsystem is associated with MS wire radio interface, it has two squares Base Transceiver System and Base Station Controller. BTS is associated with MS gadgets around there and associated with BSC, Network and exchanging subsystem this framework fundamentally comprises MSC which is the foundation of whole organization framework it controls the all tasks from setting up cancel to hang methodology. This MSC has the information which controls the client's information locally, guest information and the validation of the user. Number value TEN.TWO Deep Neural Network. These neural organizations are planned for the most part to work for the acknowledgment, graphical portrayal utilizing GUI, Picture and different digits and character acknowledgment utilizing different layers of the profound neural organization.

Input Layer: user end to provide picture of the written digit.

Hidden Layer: Neural work that are connected for input and output layer

Output Layer: This layer contains the output of the recognized digit.

8. CONCLUSION

Comparing the existing work of the digit's recognition and proposed work of this project

Fig.2 digits recognition using NIST-CNN

Fig.3 HWDR using deep neural network-MNIST

Compare to the digits recognition by CNN the system of digits recognition using Deep Neural Network has achieved high accuracy value with 99-100, as the CNN of digit recognition that maintains constant and low accuracy only up to 90-98.

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