

HANDWRITTEN NUMBERS ANALYSIS

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Abstract - Text recognition from natural scene images is very tough task now these days compare than videos. Application of image processing called pattern recognition make easy to recognize text from multimedia documents. A pattern can be fingerprint image, handwritten word sample, human face images, speech signal and DNA sequence etc. or we can say that all pattern are in machine editable form. Text can be recognized with and without segmentation of character. Segmentation can be line, word or character level and without segmentation character is recognized from whole text image.

Key Words: - Convolution Neural Network (CNN), Artificial Neural Network (ANN)

1. INTRODUCTION

Recognition is identifying or distinguishing a thing or an individual from the past experiences or learning. Similarly, Digit Recognition is nothing but recognizing or identifying the digits in any document. Digit recognition framework is simply the working of a machine to prepare itself or interpret the digits. Handwritten Digit Recognition is the capacity of a computer to interpret the manually written digits from various sources like messages, bank cheques, papers, pictures, and so forth and in various situations for web-based handwriting recognition on PC tablets, identifying number plates of vehicles, handling bank cheques, digits entered in any forms etc.

Machine Learning provides various methods through which human efforts can be reduced in recognizing the manually written digits. Deep Learning is a machine learning method that trains computers to do what easily falls into place for people: learning through examples. With the utilization of deep learning methods, human attempts can be diminished in perceiving, learning, recognizing and in a lot more regions. Using deep learning, the computer learns to carry out classification works from pictures or contents from any document. Deep Learning models can accomplish state-of-art accuracy, beyond the human level performance. The digit recognition model uses large datasets in order to recognize digits from distinctive sources.

2. LITERATURE SURVEY

Anuj Dutt in his paper demonstrated that utilizing Deep Learning systems, he had the capacity to get an extremely high measure of accuracy. By utilizing the convolutional Neural Network with Keras and Theano as backend, he was

getting an accuracy of 98.72%. In addition, execution of CNN utilizing TensorFlow gives a stunningly better consequence of 99.70%. Despite the fact that the complication of the procedure and codes appears to be more when contrasted with typical Machine Learning algorithms yet the accuracy he got is increasingly obvious.

In a paper published by Saeed AL-Mansoori, Multilayer Perceptron (MLP) Neural Network was implemented to recognize and predict handwritten digits from 0 to 9. The proposed neural system was trained and tested on a dataset achieved from MNIST.

These days, an ever-increasing number of individuals use pictures to transmit data. It is additionally main stream to separate critical data from pictures. Image Recognition is an imperative research area for its generally used applications. In general, the field of pattern recognition, one of the difficult undertakings is the precise computerized recognition of human handwriting. Without a doubt, this is a very difficult issue because there is an extensive diversity in handwriting from an individual to another individual. In spite of the fact that difference does not make any issues to people, yet, anyway it is increasingly hard to instruct computers to interpret general handwriting. For the image recognition issue, for example, handwritten classification, it is essential to make out how information is depicted onto images.

3. ARCHITECTURE

The reason behind this document is to look into the design possibilities of the proposed system, such as architecture design, block diagram, sequence diagram, data flow diagram and user interface design of the system in order HANDWRITTEN NUMBER ANALYSIS to define the steps such as pre-processing, feature extraction, segmentation, classification and recognition of digits.

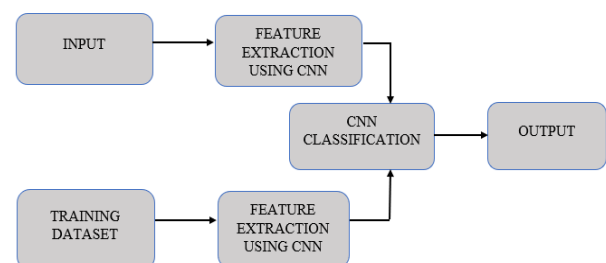


Fig 1: Block Diagram

The above Figure 1 illustrates the block diagram of the proposed system. The proposed model contains the three stages in order to classify and detect the digits:

- A. Feature Extraction
- B. CNN Classification
- C. Training dataset

3.1 Feature Extraction

It is a process of dimension reduction of initial raw dataset to more manageable groups for processing. In the feature extraction stage redundancy from the data is removed.

3.1 CNN Classification

It is a specific type of Artificial Neural Network (ANN) which uses Perceptron, a machine learning unit algorithm for supervised learning to analyze data.

3.3 Training Dataset

It is initial set of data used to help a program understand how to apply neural networks and produce results. It is then complimented by validation and testing dataset. The initial approach to the training set images that are to be processed in order to reduce the data, by thresholding them into a binary image.

4. METHODOLOGY

Each research work needs some estimation, to measure the accuracy and performance of handwritten digits, MNIST dataset is being used for such reasons. MNIST is the most broadly utilized standard for handwritten digit recognition. MNIST is a huge and a standard database of handwritten digits. MNIST dataset has been commonly used as a standard for testing classification algorithms in handwritten digit recognition frameworks. The initial step to be carried out is to place the dataset, which can be effectively done through the Keras programming interface. The images in the MNIST dataset are available in type of a cluster comprising of 28x28 values constituting to an image along with their labels. This is equivalent if there could be an occurrence of the testing images.

5. IMPLEMENTATION

5.1 SOFTWARE PLATFORM

1. TensorFlow

TensorFlow is an amazing information stream in machine learning library made by the Brain Team of Google and made open source in 2015. It is intended to ease the use and broadly relevant to both numeric and neural system issues just as different spaces. Fundamentally, TensorFlow is a low-level tool for doing entangled math and it targets specialists who recognize what they're doing to construct exploratory learning structures, to play around with them and to transform them into running programs. For the most, it can

be considered as a programming framework in which one can entitle to calculations as graphs. Nodes in the graph speak the math activities, and the edges contain the multi-dimensional information clusters (tensors) related between them.

2. Python 3.7

Python is broadly utilized universally and is a high-level programming language. It was primarily introduced for prominence on code, and its language structure enables software engineers to express ideas in fewer lines of code. Python is a programming language that gives you a chance to work rapidly and coordinate frameworks more effectively.

3. Anaconda

5.3.1 Anaconda is a free and open-source appropriation of the Python and R programming for logical figuring like information science, AI applications, large-scale information preparing, prescient investigation, and so forth. Anaconda accompanies in excess of 1,400 packages just as the conda package and virtual environment director, called Anaconda Navigator, so it takes out the need to figure out how to introduce every library freely. Anaconda Navigator is a graphical UI (GUI) incorporated into Anaconda appropriation that enables clients to dispatch applications and oversee conda packages, conditions and channels without utilizing command line directions.

5.2 HARDWARE PLATFORM

1. NVIDIA GeForce Graphic Card

Nvidia Corporation more regularly specified to as Nvidia (adapted as NVIDIA), is an American innovation organization. It structures graphical processing units (GPUs) for the gaming and expert markets, just as a framework, system on a chip units (SoCs) for the versatile figuring and car showcase. It's essential GPU product is named as "GeForce". With outstanding GPU fabricating, Nvidia gives parallel processing capacities to analysts and researchers that enable them to effectively run superior applications.

5.3 RESULTS

The Figure 2 shows the GUI created after running code in python.

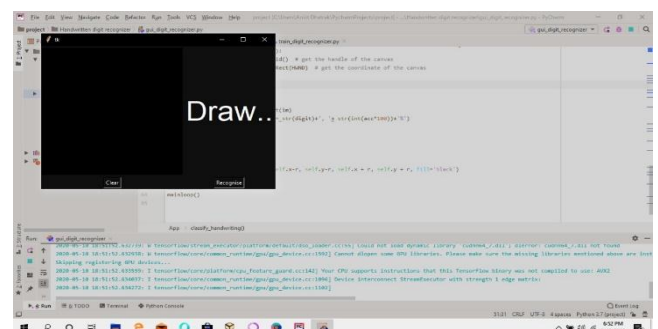


Fig 2: GUI

The Figure 3 shows the trained data after running the code in python.

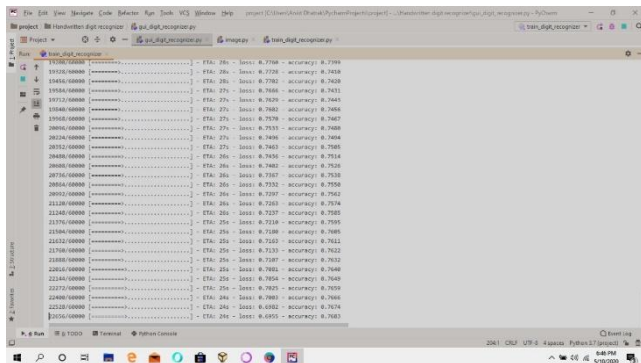


Fig 3: Training Data

The figure 4 shows the output generated by training CNN.

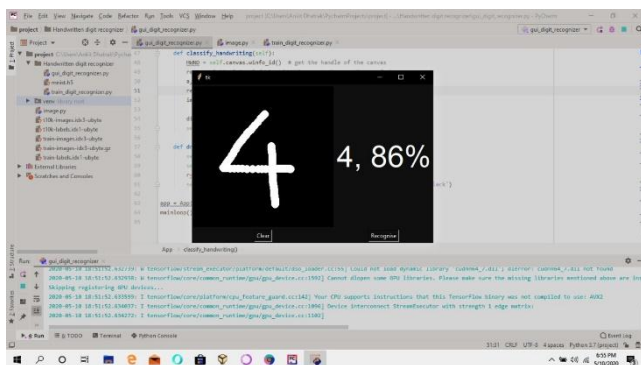


Fig 4: CNN Output

6. CONCLUSION

The Handwritten Recognition using Deep learning methods has been implemented. The most widely used Machine learning algorithms. Thus, by concluding we would like to mention that we have successfully completed our mini project on “Handwritten Number Analysis”. This is based on what has been learned during the degree, expanding the knowledge in different aspects to obtain a final project. And also, we could gain knowledge in machine learning. The overall project works well with its implementation and, thus we obtain the desired results.

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