



Internship Project

report on

**Intelligent HandWritten digit Identification System for Compute Application Using IBM Watson
Studio**

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**INTELLIGENT HANDWRITTEN DIGIT IDENTIFICATION SYSTEM FOR COMPUTER APPLICATION
USING IBM WATSON STUDIO**

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CHAPTER 1

INTRODUCTION

1.1 Overview

Handwriting recognition is one of the compelling research works going on because every individual in this world has their own style of writing. It is the capability of the computer to identify and understand handwritten digits or characters automatically. Because of the progress in the field of science and technology, everything is being digitalized to reduce human effort. Hence, there comes a need for handwritten digit recognition in many real-time applications. MNIST data set is widely used for this recognition process and it has 70000 handwritten digits. We use Artificial neural networks to train these images and build a deep learning model. Web application is created where the user can upload an image of a handwritten digit. this image is analyzed by the model and the detected result is returned on to UI

Project Objectives

By the end of this project you will:

- know fundamental concepts and techniques of the Artificial Neural Network and Convolution Neural Networks
- Gain a broad understanding of image data.
- Work with Sequential type of modeling
- Work with Keras capabilities
- Work with image processing techniques
- know how to build a web application using the Flask framework.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING SYSTEM

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, this 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 image.

2.2 PROPOSED SYSTEM

The proposed handwritten digit recognition system follows the standard model of feature based classification systems consisting of the digit image database, an essential feature extraction sub-block and a main classification sub-block. The MNIST Benchmark database of handwritten digits has been considered in this work. The Histogram of Oriented Gradient technique has been extended in this work by using a new Multiple-Cell Size HOG approach to extract features from the database images and the classification sub-block is based on the Support Vector Machine (SVM) classification methodology .

CHAPTER 3

THEORETICAL ANALYSIS

3.1 BLOCK DIAGRAM

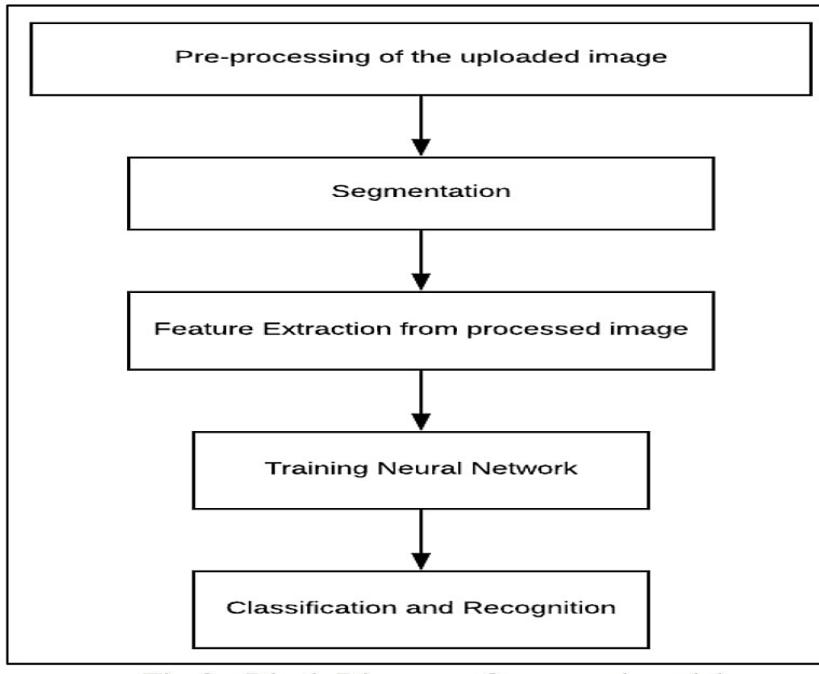


Figure 3.1.1: Block Diagram of Project

3.2 HARDWARE AND SOFTWARE DESIGNING

HARDWARE DESIGNING:

The hardware required for the development of this project is:

- Processor : Intel® Core™ i5-9300H
- Processor speed : 2.4GHz
- RAM Size : 8 GB DDR
- System Type : X64-based processor

SOFTWARE DESIGNING:

The software required for the development of this project is:

- Desktop GUI : Anaconda Navigator
- Operating System : Windows 10(and other higher version)
- Front end : HTML,CSS,JAVASCRIPT
- Programming Language : PYTHON
- Cloud Computing Service : IBM Cloud Services

CHAPTER 4

EXPERIMENTAL ANALYSIS

4.1 UNDERSTANDING THE DATA :

ML depends heavily on data, without data, it is impossible for a machine to learn. It is the most crucial aspect that makes algorithm training possible. In Machine Learning projects, we need a training data set. It is the actual data set used to train the model for performing various actions. TensorFlow already has MNist Data set so there is no need to explicitly download or create Dataset

The MNSIT dataset contains ten classes: Digits from 0-9. Each digit is taken as a class

Python Flask:

Flask is a micro web framework written in Python. Extensions exist for object-relational mappers, form validation, upload handling, various open authentication technologies and several common framework related tools. Flask is used for the backend, but it makes use of a templating language called Jinja2 which is used to create HTML, XML or other markup formats that are returned to the user via an HTTP request. Flask offers a diversified working style while Django offers a Monolithic working style. It is designed as a web framework for restful API development

CHAPTER 5

FLOWCHART

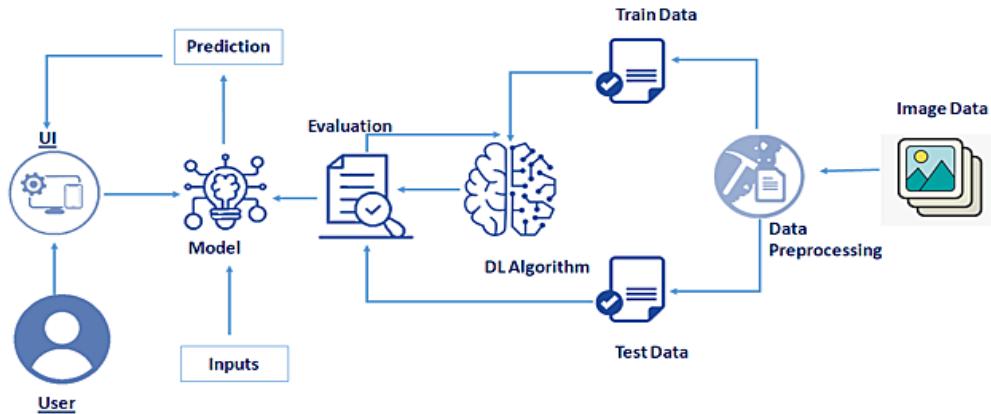


Figure 5.1: Flowchart of the Project

Project Flow:

- The user interacts with the UI (User Interface) to upload the image as input
- The uploaded image is analyzed by the model which is integrated
- Once the model analyses the uploaded image, the prediction is showcased on the UI

To accomplish this, we have to complete all the activities and tasks listed below

- Understanding the data.
 - Importing the required libraries
 - Loading the data
 - Analyzing the data
 - Reshaping the data.
 - Applying One Hot Encoding
- Model Building
 - Creating the model and adding the input, hidden and output layers to it
 - Compiling the model
 - Training the model
 - Predicting the result
 - Testing the model by taking image inputs
 - Saving the model
- Application Building

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- Create an HTML file
- Build Python Code

Results

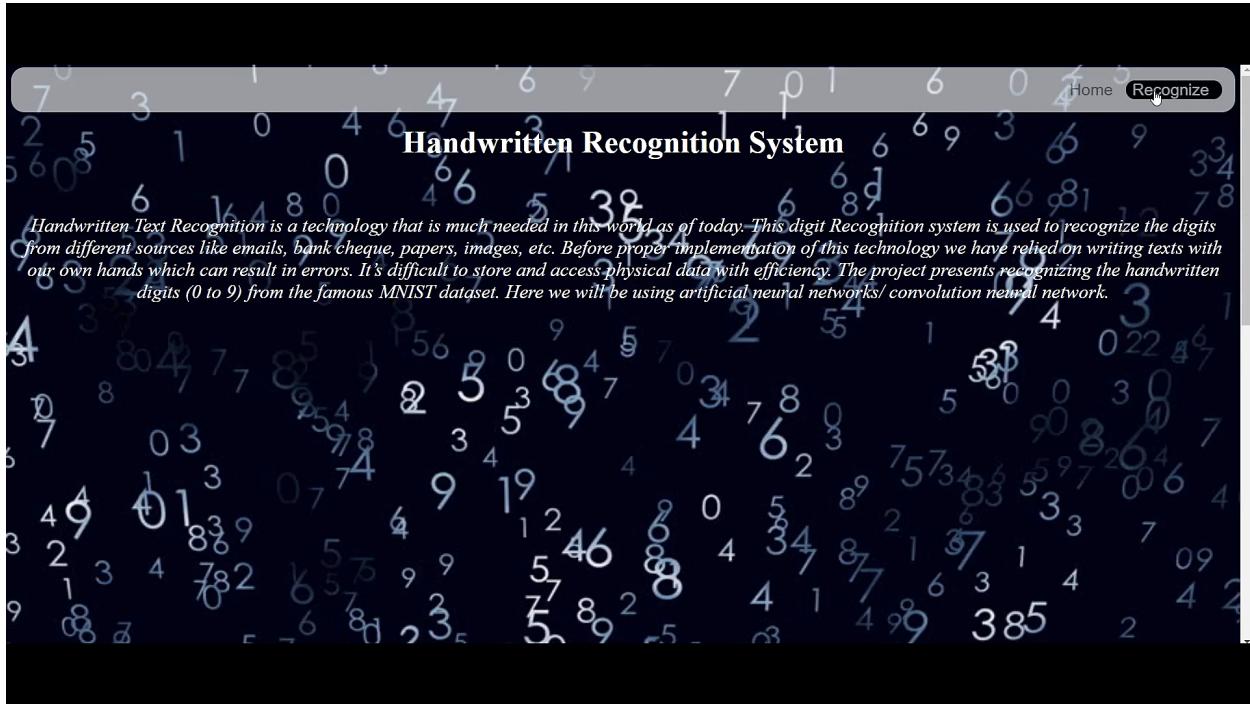


Fig 1: home page of project

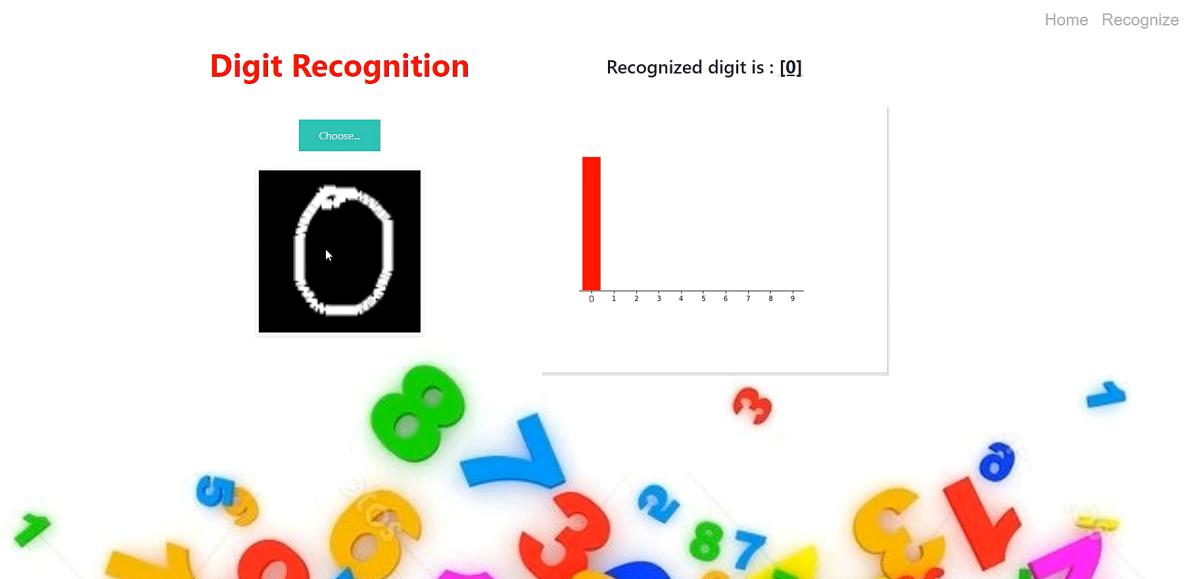


Fig 2: output image of zeroth value and graph

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Home Recognize

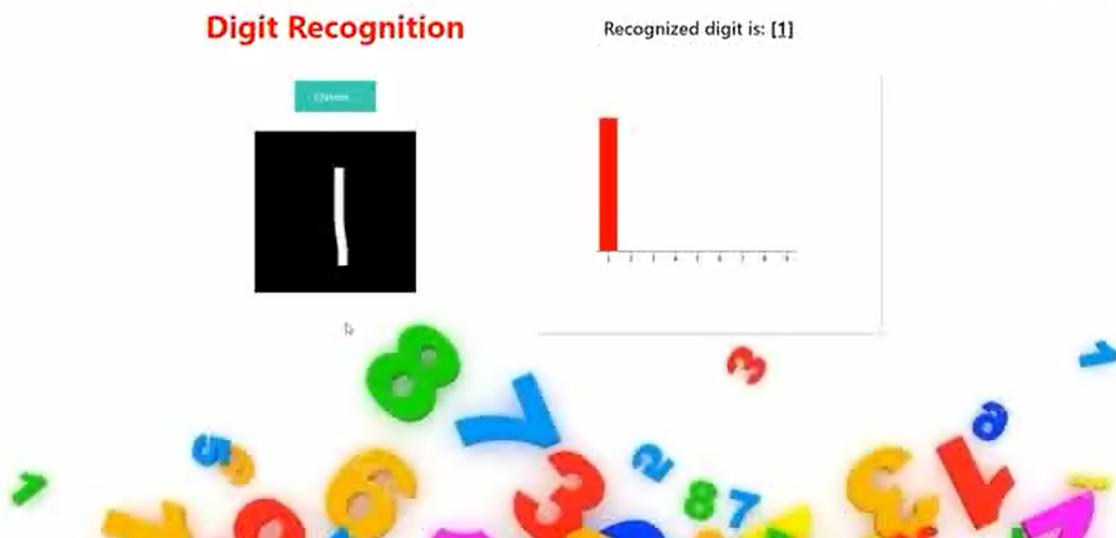


Fig 3: output image of first value and graph

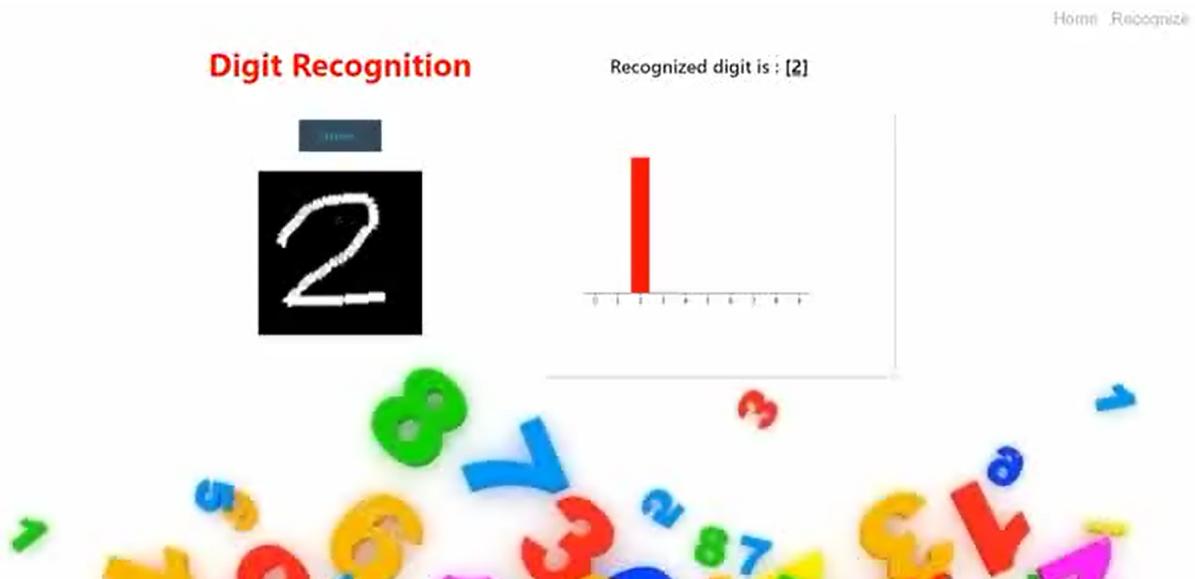


Fig 4: output image of second value and graph

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Home Recognize

Digit Recognition

Recognized digit is : [3]

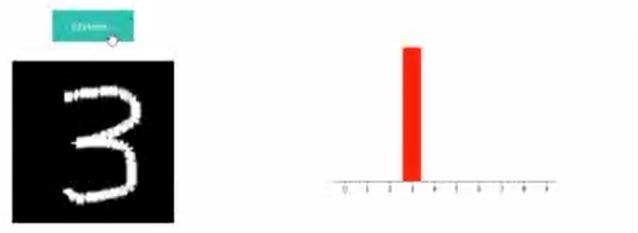


Fig 5:output image of third value and graph

Digit Recognition

Recognized digit is : [4]

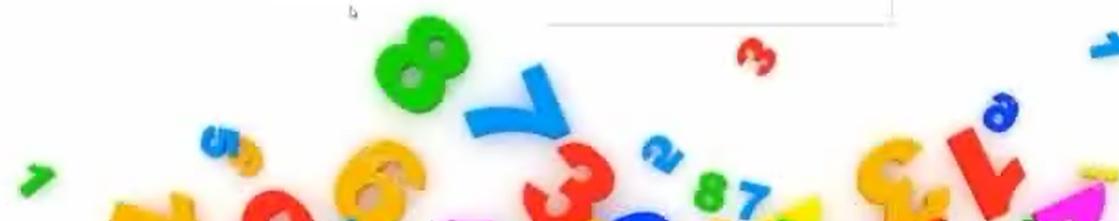
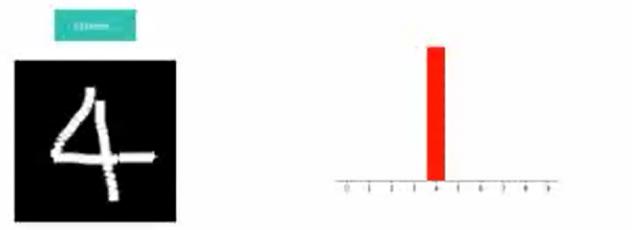


Fig 6: output image of fouth value and graph

Advantages and disadvantages

Advantages: Through the training phase, the system can adapt to the writing style of the user.

Disadvantages: The user needs patience because the learning process can take longer in some circumstances.

Applications

Applications of handwriting recognition are numerous: reading postal addresses, bank check amounts, and forms. Furthermore, OCR plays an important role for digital libraries, allowing the entry of image textual information into computers by digitization, image restoration, and recognition methods.

Conclusion

Handwritten digit recognition is the first step to the vast field of Artificial Intelligence and Computer Vision. As seen from the results of the experiment, CNN proves to be far better than other classifiers. The results can be made more accurate with more convolution layers and more number of hidden neurons.

In the present study, we have given an overview of the scope of offline and online handwriting recognition in context of Indic scripts especially. Though, a lot of work has been done for Chinese, Japanese, Korean and Latin scripts, but there is great need to work in the direction of handwriting recognition in Indic scripts. Yet, the progress and expansion of Indian language technologies such as online and offline handwriting recognition has a long way to go. So, in order to survival of Indic scripts in the technological and internet era, a great work is to be done yet. The present work is a motivation for future readers and researchers to work and carrying out research in the area of online and offline handwriting recognition in Indic scripts.

Future scope

Scope of Handwriting Recognition

- a) Electronic form filling One of the applications of online handwriting recognition is electronic form filling. Internationally, the expenditure for entry of data from handwritten forms, notes and records is trillions of dollars. If we look at 2010 census of our country, more than fifty thousand enumerators were employed to collect data using handwritten forms, where they took six months to do this job. Further, it took two more years to feed this data into servers. So, in such applications, an immediate and direct conversion of handwritten data to typed data will result in reducing the huge cost and it will also increase the productivity. In this way, all government application forms can be completed and filled using handwriting recognition and the data will be directly entered to structured databases. It will be only possible, when the handwriting recognition is standardized, perfected and it is available to all computing devices. Further the writer dependent and independent systems could be developed as per the requirement.
- b) Writing electronic applications in one's own handwriting and nativescript There are a number of native language/script speakers/writers who want to exchange information with the computer system.
- c) Automated music symbol notation reader One of the applications of handwriting recognition is the development of automated music symbol notation reader. In this way, a composer can write his composition using all the notations directly. Then it is converted to the standard format to display/print for a book or for his symphony group. Further, the Vedic Sanskrit is identical, with the symbols for udata, anudata, svaritha, deerghasvaritha and plutha, and the engine which is capable of recognizing handwritten Grantha or Devanagari with all such symbols will be in great use.
- d) Alternative to hardware and software keyboards Online handwriting recognition is also an alternative to keyboards. In this way, an input to a computing device can be made using handwriting recognition