DAYANANDA SAGAR UNIVERSITY

KUDLU GATE, BANGALORE – 560068

Bachelor of Technology
in
COMPUTER SCIENCE AND ENGINEERING

Major Project Phase-II Report

(IDENTIFYING HANDWRITTEN NUMERICALS USING DL METHODS)

By

Chandana A S - ENG18CS0068
Chethana A S - ENG18CS0074
Shubha Shree N- ENG18CS0271
Thanushree D K- ENG18CS0299

Under the supervision of

Prof. Rashmi Mothkur
Assistant Professor,Department of CSE

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING,
SCHOOL OF ENGINEERING
DAYANANDA SAGAR UNIVERSITY,
BANGALORE

(2021-2022)

DAYANANDA SAGAR UNIVERSITY

School of Engineering
Department of Computer Science & Engineering
Kudlu Gate, Bangalore – 560068
Karnataka, India

CERTIFICATE

This is to certify that the Phase-II project work titled **"IDENTIFYING HANDWRITTEN NUMERICALS USING DL METHODS"** is carried out by **Chandana A S (ENG18CS0068), Chethana A S (ENG18CS0074), Shubha Shree N (ENG18CS0271), Thanushree D K (ENG18CS0299),** bonafide students of Bachelor of Technology in Computer Science and Engineering at the School of Engineering, Dayananda Sagar University, Bangalore in partial fulfillment for the award of degree in Bachelor of Technology in Computer Science and Engineering, during the year **2021-2022**.

Prof Rashmi Mothkur	**Dr Girisha G S**	**Dr. A Srinivas**
Assistant Professor Dept. of CS&E, School of Engineering Dayananda Sagar University	Chairman, CSE School of Engineering Dayananda Sagar University	Dean School of Engineering Dayananda Sagar University
Date:	Date:	Date:

Name of the Examiner **Signature of Examiner**

1.

2.

DECLARATION

We,**Chandana A S (ENG18CS0068), Chethana A S (ENG18CS0074), Shubha Shree N (ENG18CS0271), Thanushree D K (ENG18CS0299),** are students of the Eighth semester B.Tech in **Computer Science and Engineering**, at School of Engineering, **Dayananda Sagar University**, hereby declare that the phase-II project titled **"IDENTIFYING HANDWRITTEN NUMERICALS USING DL METHODS"** has been carried out by us and submitted in partial fulfillment for the award of degree in **Bachelor of Technology in Computer Science and Engineering** during the academic year **2021-2022**.

Student **Signature**

Name1: Chandana A S

USN : ENG18CS0068

Name2: Chethana A S

USN : ENG18CS0074

Name3: Shubha Shree N

USN : ENG18CS0271

Name4: Thanushree D K

USN : ENG18CS0299

Place : Bangalore

Date :

ACKNOWLEDGEMENT

It is a great pleasure for us to acknowledge the assistance and support of many individuals who have been responsible for the successful completion of this project work.

First, we take this opportunity to express our sincere gratitude to the School of Engineering & Technology, Dayananda Sagar University for providing us with a great opportunity to pursue our Bachelor's degree in this institution.

We would like to thank ***Dr. A Srinivas. Dean***, ***School of Engineering & Technology***, ***Dayananda Sagar University*** *for his constant encouragement and expert advice.It is a matter of immense pleasure to express our sincere thanks to* ***Dr. Girisha G S, Department Chairman***, ***Computer Science, and Engineering***, ***Dayananda Sagar University,*** *for providing the right academic guidance that made our task possible.*

We would like to thank our guide ***Rashmi Mothkur, Assistant Professor***, ***Dept. of Computer Science and Engineering***, ***Dayananda Sagar University***, *for sparing his/her valuable time to extend help in every step of our project work, which paved the way for smooth progress and the fruitful culmination of the project.*

We would like to thank our Project Coordinator ***Dr. Meenakshi Malhotra and Dr.Bharanidharan N,*** *and all the staff members of Computer Science and Engineering for their support.*

We are also grateful to our family and friends who provided us with every requirement throughout the course. We would like to thank one and all who directly or indirectly helped us in the Project work.

signature of Students
ENG18CS0068
ENG18CS0074
ENG18CS0271
ENG18CS0299

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

OCR	Optical Character Recognition
MNIST	Modified National Institute of Standards and Technology
ANN	Artificial Neural Network
ReLU	Rectified Linear Unit
CNN	Convolutional Neural Network
SVM	Support Vector Machine
SIFT	Scale Invariant Feature Transform
LSTM	Long Short Term Memory
RNN	Recurrent Neural Network
ROI	Region Of Interest
R-CNN	Region Based Convolutional Neural Network

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

"**IDENTIFYING HANDWRITTEN NUMERICALS**" is a project implemented using the concept of neural networks.It is an ability of a computer to recognize and understand intelligible handwritten input from sources such as paper documents.

The purpose of this project is to create a neural net which can understand and predict the handwritten digits and text of different languages from the image. By training this neural network we can help users provide any image in any shape or form such that this neural network will be able to predict the digit written in the given image.

This project is a basic step towards understanding neural networks and computer vision.

The aim of a handwriting recognition system is to convert handwritten digits and text into machine readable formats. The main objective of this work is to ensure effective and reliable approaches for recognition of handwritten digits, text and make banking operations easier and error free.

CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

The aim of a handwriting recognition system is to convert handwritten digits and text into machine readable formats. The main objective of this work is to ensure effective and reliable approaches for recognition of handwritten digits,text and make banking operations easier and error free.

1.1 DIGIT RECOGNITION:

Handwritten digit recognition is the ability of computers to recognize human handwritten digits. It is a hard task for the machine because handwritten digits are not perfect and can be made with many different flavors. The handwritten digit recognition is the solution to this problem which uses the image of a digit and recognizes the digit present in the image.Digit recognition is an application of the image recognition and though considered as the first step towards pattern recognition and image recognition it is a major leap towards using Artificial Neural Networks to recognize the image. This project uses CNN to classify the given image of digits and text. Though considered as a solved problem in this field, using CNN to predict is much more efficient and accurate to predict the image and first steps towards accurate image recognition. In this project, there are various layers, which can also be called as Regular Nets which will be trained given the data i.e. images. These neural networks are trained on more than 60,000 images. And tested on more than 10,000 images of digits and text in different languages. The MNIST dataset is maintained by MNIST which contains more than 60,000 images. Various techniques are used to make the image into desirable form and shape. Then the images are given as the training set. After including the layers, we can test the output by giving the images to the model to predict.

1.2 ARTIFICIAL NEURAL NETWORK:

An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurons) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a specific application, such as pattern recognition or data classification, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurons.

1.2.1 CONVOLUTIONAL NEURAL NETWORK

In deep learning, a convolutional neural network (CNN, or ConvNet) is a class of deep neural networks, most commonly applied to analyzing visual imagery. CNNs use a variation of multilayer perceptron designed to require minimal pre-processing. Convolutional networks were inspired by biological processes in that the connectivity pattern between neurons resembles the organization of the animal visual cortex. Individual cortical neurons respond to stimuli only in a restricted region of the visual field known as the receptive field. The receptive fields of different neurons partially overlap such that they cover the entire visual field.

CNNs use relatively little pre-processing compared to other image classification algorithms. This means that the network learns the filters that in traditional algorithms were hand-engineered. This independence from prior knowledge and human effort in feature design is a major advantage. They have applications in image and video recognition, recommender systems, image classification, medical image analysis, and natural language processing.

1.2.2 EASYOCR

EasyOCR is a python package that allows the image to be converted to text. EasyOCR, as the name suggests, is a Python package that allows computer vision developers to effortlessly perform Optical Character Recognition.

EasyOCR is an open-source and ready-to-use OCR with almost 80 supported languages. You can choose to train the model with your own data (you can follow their example dataset to format your own dataset) or use the existing models to serve your own application.It is by far the easiest way to implement OCR and it has access over many languages including English, Hindi , kannada and many more languages.EasyOCR doesn't have many software dependencies, it can directly be used with its API.

OCR tools analyze the handwritten or typed text in images and convert it into editable text.It can process multiple languages at the same time provided they are compatible with each other.

1.3 FIGURES AND TABLES

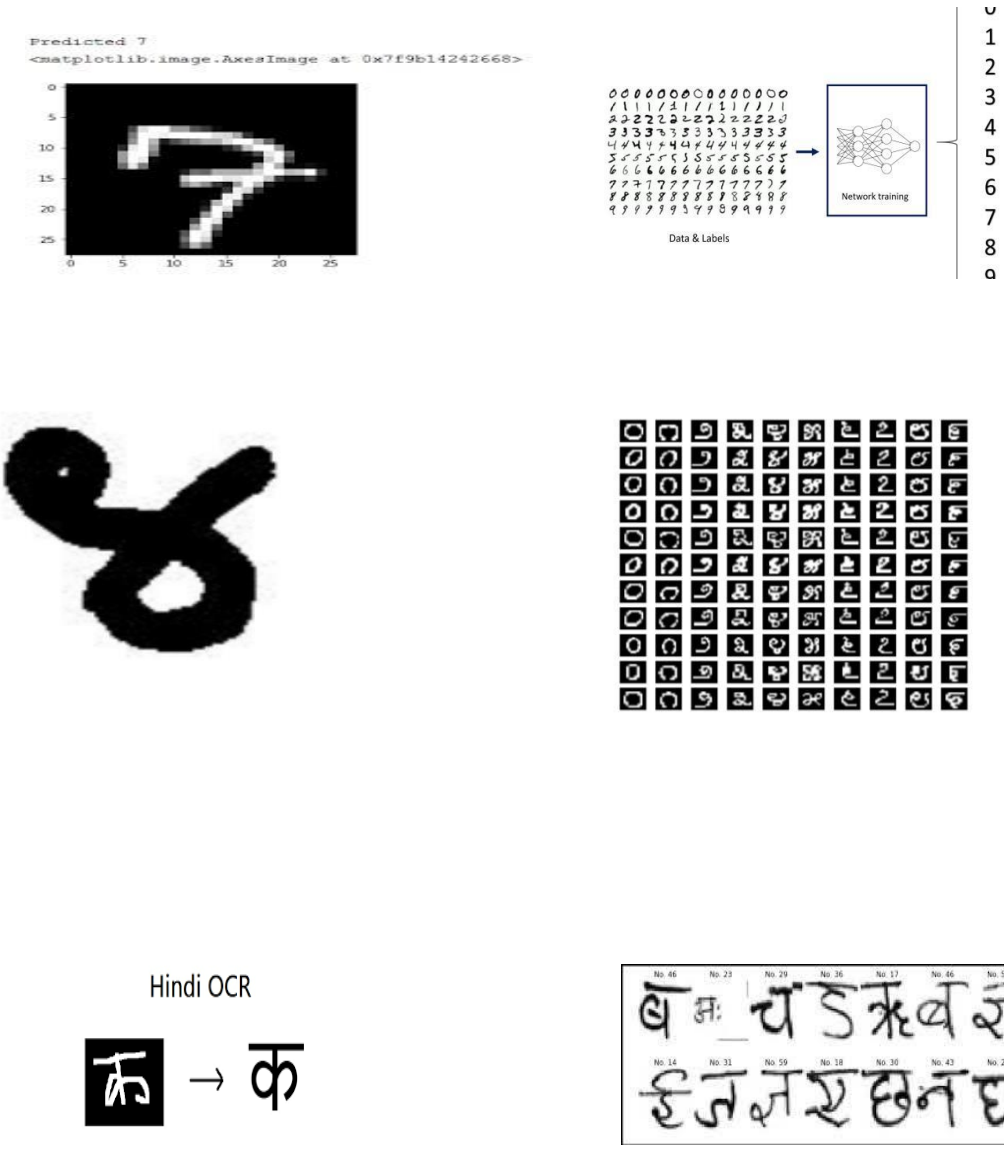


Fig 1.3 Sample data and labels

1.4 SCOPE

The scope of this project is handwritten recognition regarding the application of deep learning algorithms based on CNN. Additionally, the purposes are not only to improve the current recognition performance, but also to seek the highest reliability in the applications of handwritten digits and text.

CHAPTER 2
PROBLEM DEFINITION

CHAPTER 2 PROBLEM DEFINITION

Handwritten recognition is the ability of computers to recognize human handwritten digits and text. Here,we use a data set for predicting different languages by training the model.

This digit recognition is the solution to this problem which uses the image of a digit and recognizes the digit present in the image. If the system incorrectly recognizes a digit, it can lead to major damage which is not desirable. That's why an algorithm with high accuracy is required in these real world applications.

The handwritten recognition is the ability of computers to recognize human handwritten digits and text. This is the solution to the problem which uses the image of a digit and recognizes the digit present in the image.

CHAPTER 3
LITERATURE REVIEW

CHAPTER 3 LITERATURE REVIEW

Literature review in the immense research is going on in the field of handwritten recognition. Many people have developed systems for handwritten digit recognition and handwritten character recognition. We have studied some of the systems:

Md.Anwar Hossain, Md.Mohon Ali [1]. Recognition of handwritten digit recognition using convolutional neural networks",It shows that neural network classifiers with single-layer training can be applied efficiently to complex real-world classification such as the recognition of handwritten digits. The paper shows how MatConvNet is used.

Vijayalakshmi R Rudraswamimath, Bhavani Shankar [2]. Handwritten digit recognition using CNN, It trains and tests a set of classifiers for handwritten digit recognition using MNIST database. Most widely used ML algorithms, KNN,SVM,RFC,CNN.

Muzamil Nawaz,Sandesh Gangwani,Isma Farah Siddiqui [3].A keras based implementation for efficient handwritten digit Recognition using convolutional neural network.This paper defines process of handwritten Kannada digit recognition with high accuracy back-propagation of Kannada language

R. Vijaya Kumar Reddy,Dr. B. Srinivasa Rao,K. Prudvi Raju [4].Handwritten Hindi Digits Recognition Using Convolutional Neural Network with RMSprop Optimization,It is an efficient handwritten Hindi numeral digit recognition structure based on Convolutional Neural Network (CNN) with RMSprop optimization technique

S Ahlawat,A Choudhary [5].Hybrid CNN-SVM classifier for handwritten digit recognition,The aim of this paper is to develop a hybrid model of a powerful Convolutional Neural Networks (CNN) and Support Vector Machine (SVM) for recognition of handwritten digit from MNIST dataset. The receptive field of CNN helps in automatically extracting the most distinguishable features from these handwritten digits.

Feiyang Chen,Nan Chen,Hanyang Mao,Hanlin Hu [6]. Assessing Four Neural Networks on Handwritten Digit Recognition Dataset (MNIST),In this paper, we compare four neural networks on MNIST dataset with different divisions. Among them, three are Convolutional Neural Networks (CNN), Deep Residual Network (ResNet) and Dense Convolutional Network (DenseNet) respectively, and the other is our improvement on CNN baseline through introducing Capsule Network (CapsNet)to the image recognition area.

CHAPTER 4
PROJECT DESCRIPTION

CHAPTER 4 PROJECT DESCRIPTION

4.1. PROPOSED DESIGN

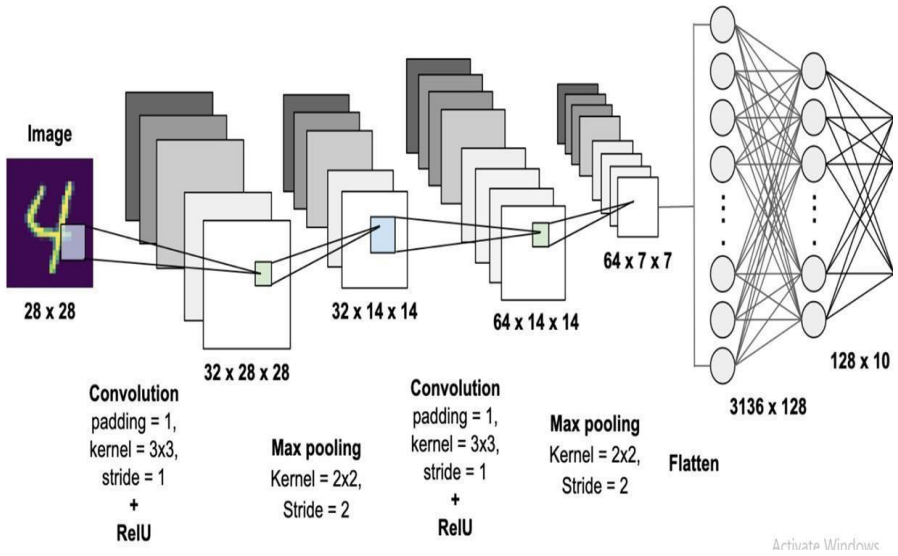


Fig 4.1 System Design

4.1.1 Sequential

This class configures the model for the training. This is the main class that is used to initialize the model. This is the first step to make an ANN (Artificial Neural Network). This class return an object that is used to build the model layer after layer

4.1.2 3 Conv2D

This layer creates a convolution kernel that is convoluted with the layer input over a single spatial (or temporal) dimension to produce a tensor of outputs. We use this layer as the first layer in a model. Convolutional layer is the very first layer where we extract features from the images in our datasets.

4.1.3 MaxPooling2D

Max pooling is a sample-based discretization process. The objective is to down-sample an input representation (image, hidden-layer output matrix, etc.), reducing its dimensionality and allowing for assumptions to be made about features contained in the sub-regions binned. Max pooling operation is done on temporal data.

4.1.4 Flatten

Flattening a tensor means to remove all of the dimensions except for one.

4.1.5 Dense

This class is used to make regular densely-connected NN layers. A dense layer is just a regular layer of neurons in a neural network. Each neuron receives input from all the neurons in the previous layer, thus densely connected.

4.1.6 ReLU

A Rectified Linear Unit(ReLU) is a non-linear activation function that performs on multilayer neural networksIn this layer we remove every negative value from the filtered image and replace it with zero. This function only activates when the node input is above a certain quantity.ReLU helps to prevent the exponential growth in the computation required to operate the neural network

4.2. ASSUMPTIONS AND DEPENDENCIES

The framework must be prepared completely before use ,when framework is prepared before leaving you are required to spare the framework for further use

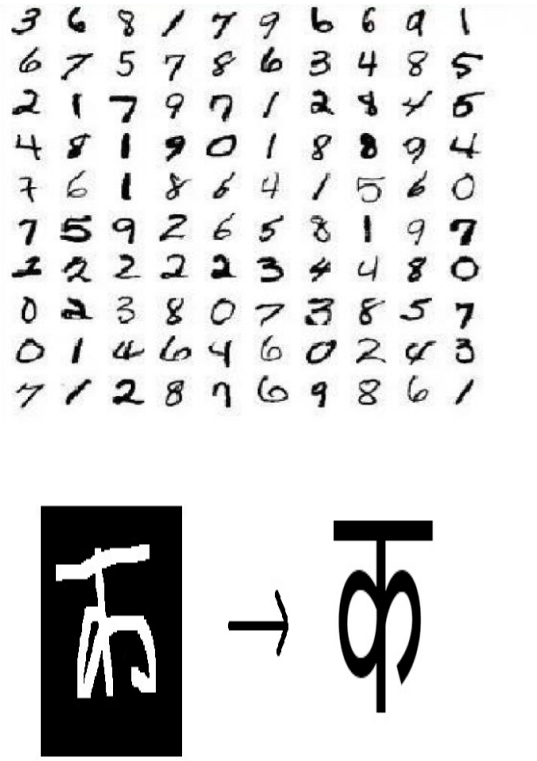


fig 4.2 Sample predictions

CHAPTER 5
REQUIREMENTS

CHAPTER 5 REQUIREMENTS

5.1 FUNCTIONAL REQUIREMENTS:

5.1.1 The Dataset: Getting the dataset is the first and foremost work in training the dataset. The dataset used in this project is MNIST Handwritten Dataset.

5.1.2 Python Distribution: Pycharm.

5.1.3 Libraries Used: Keras is the main library used for the execution of the Artificial Neural Network (ANN). This project uses TensorFlow Backend.

5.2 HARDWARE REQUIREMENTS:

- Processor – Min. Intel Core i3 processor, 1.2Ghz
- RAM – Min. 4 GB
- GPU – Min. 2 GB Integrated (For TensorFlow)

5.3 SOFTWARE REQUIREMENTS :

- Operating System - Windows 10
- Programming Language - Python
- Tool Used - Anaconda, Pycharm
- Library Used - Keras with TensorFlow Backend, OpenCV, TensorFlow and Numpy

CHAPTER 6
METHODOLOGY

CHAPTER 6 METHODOLOGY

"Identifying handwritten numericals using MNIST Dataset" is a project implemented using the concept of neural networks. To implement this project various components and methodologies are used.

6.1 Python Distribution:

Anaconda was used as the python distribution. Anaconda was used to install in the libraries and execute the python scripts.

6.2 Libraries Used:

Keras is the main library used for the execution of the Artificial Neural Network
This project uses Keras with TensorFlow Backend.
The classes used from the keras Libraries are :

1. Sequential
2. Conv2D
3. MaxPooling2D
4. Flatten
5. Dense

6.3 The Dataset:

Getting the dataset is the first and foremost work in training the dataset. The dataset used in this project is MNIST Handwritten Dataset. This dataset contains a training set of 60,000 examples, and a test set of 10,000 examples.

6.4 EasyOCR:

Python package that allows the image to be converted to text. It is by far the easiest way to implement OCR and it has access over many languages including English, Hindi , kannada and many more languages.EasyOCR doesn't have many software dependencies, it can directly be used with its API.It can process multiple languages at the same time provided they are compatible with each other.

6.5 FLOW CHART

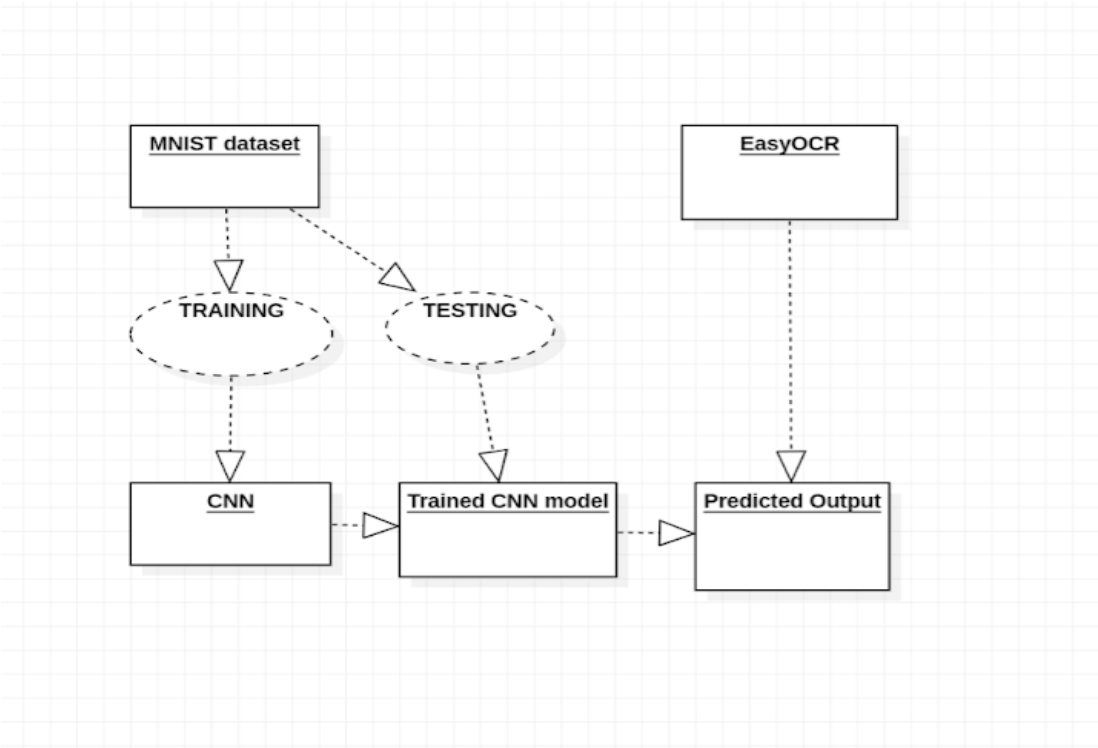


fig 6.1 flow chart

CHAPTER 7
EXPERIMENTATION

CHAPTER 7 EXPERIMENTATION

Algorithm :

Step 1: Get the Dataset
Step 2: Assign the images to respective directories where the directories work as labels
Step 3: Train the model Using CNN
Step 4: Perform number of epochs and end the train after accuracy>95%
Step 5: Evaluate the model
Step 6: Save the model using save() method
Step 7: Get input from the user and predict the image using predict() method.

def predict_using_trained():

In this module it takes the images that are present in the trained folder and uses the mnist training to predict the numbers and text.

def easy_ocr():

This module takes the images present in the directory and apply OCR techniques and does the prediction of the output.
reader = easyocr.Reader(['en','hi']) Here, we can add as many languages required.

def minist_traning():

This module is used for Training purpose.it takes a mnist dataset to train the model and training data will be created and it will be stored in the same directory.
model = minist_traning() Here, the model is trained , and all the training data is stored in the folder mnist.hi .

CHAPTER 8
TESTING AND RESULTS

CHAPTER 8 TESTING AND RESULTS

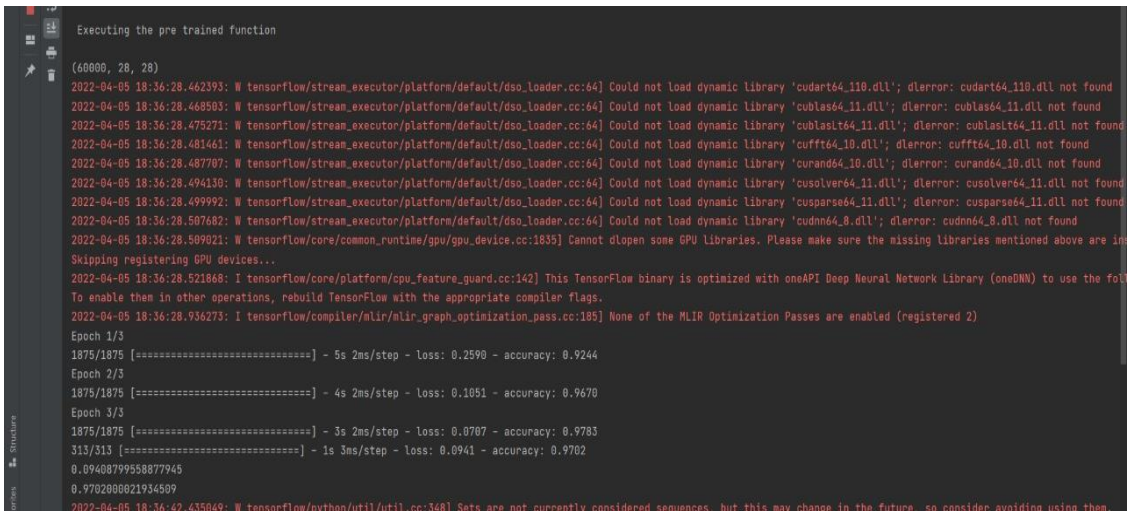


fig 8.1 Executing the Model and Training the model

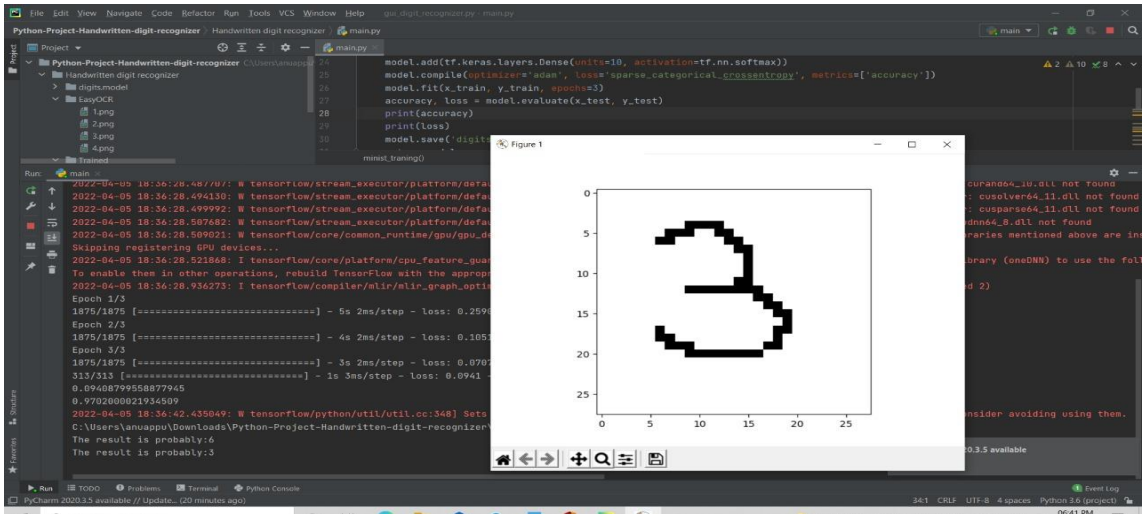


fig 8.2 predicting the digit

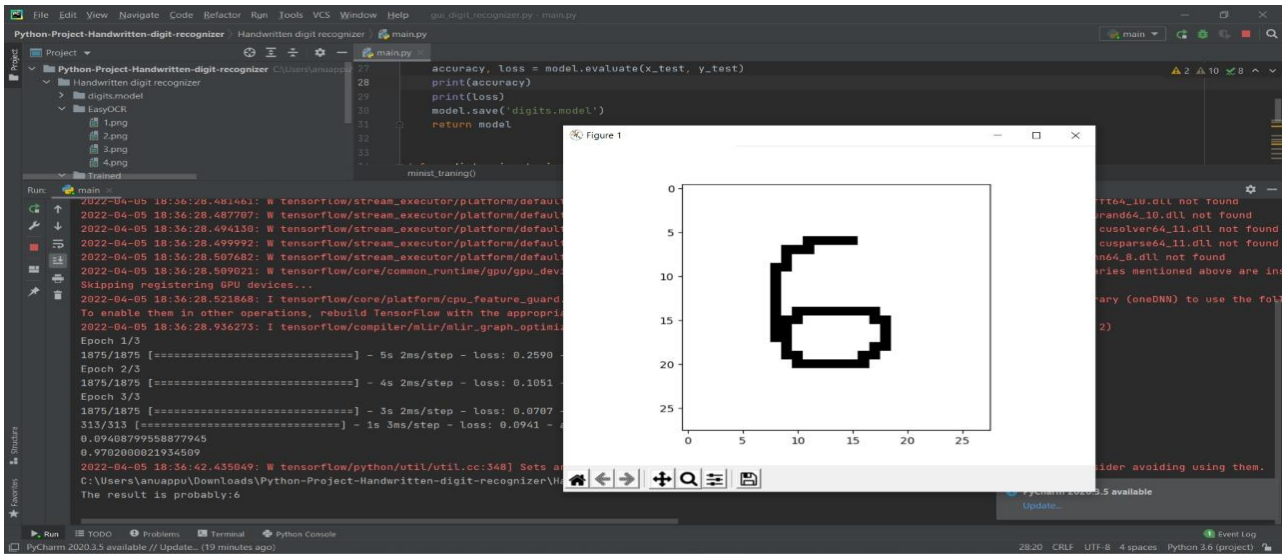


fig 8.3 predicting the digit

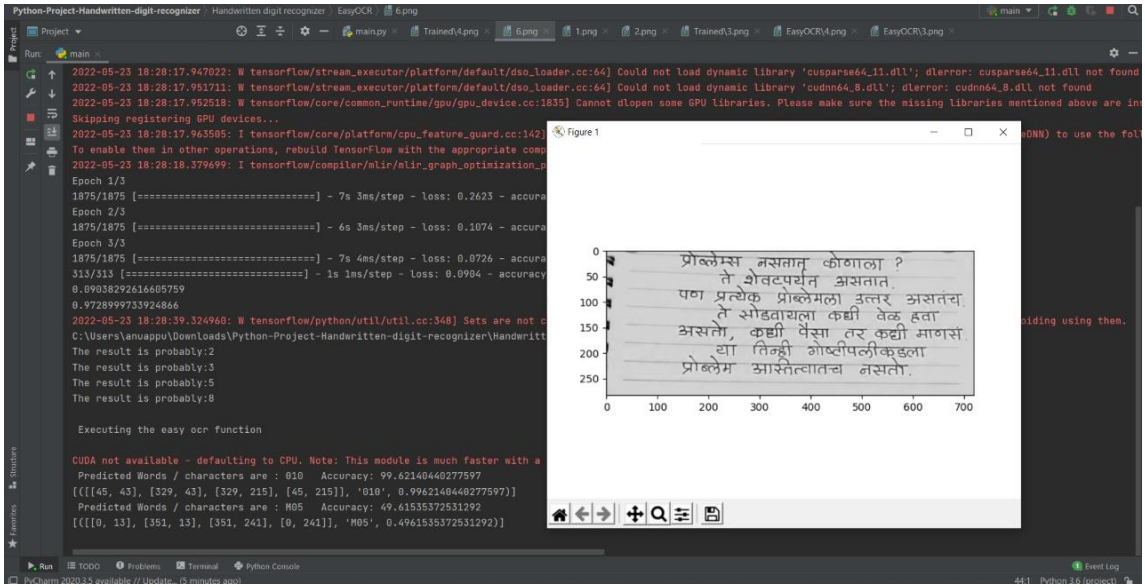


fig 8.4 predicting the text in hindi

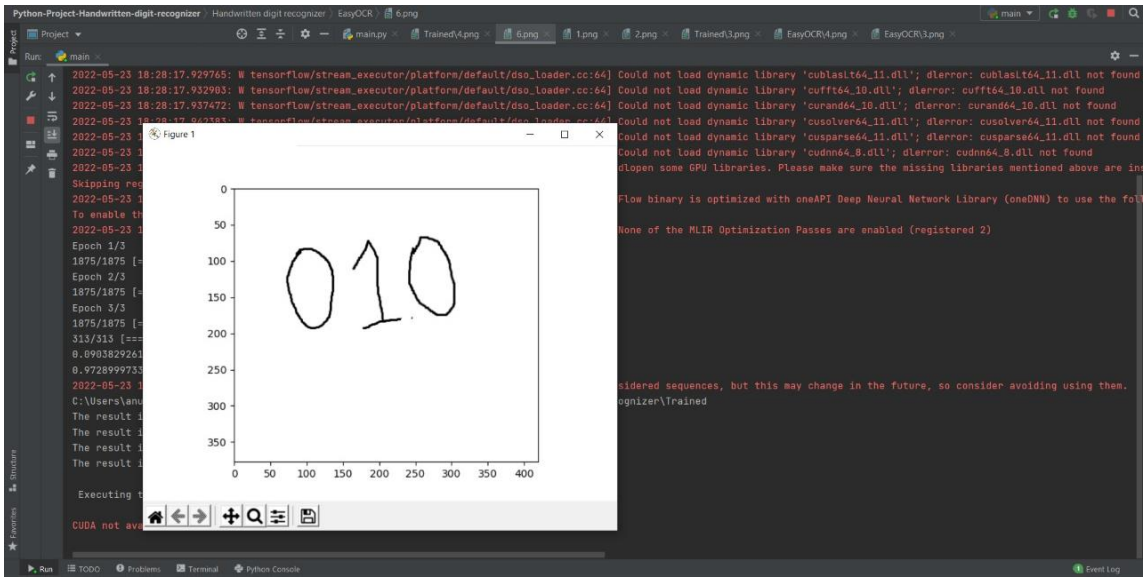


fig 8.5 predicting triple digits

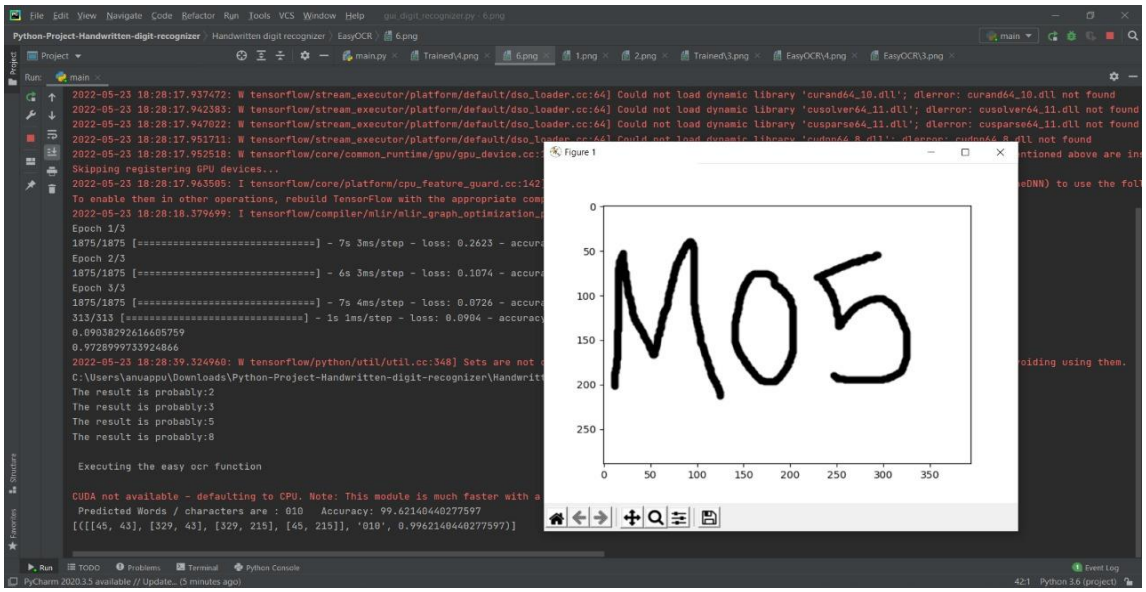


fig 8.6 predicting the Alphanumeric text

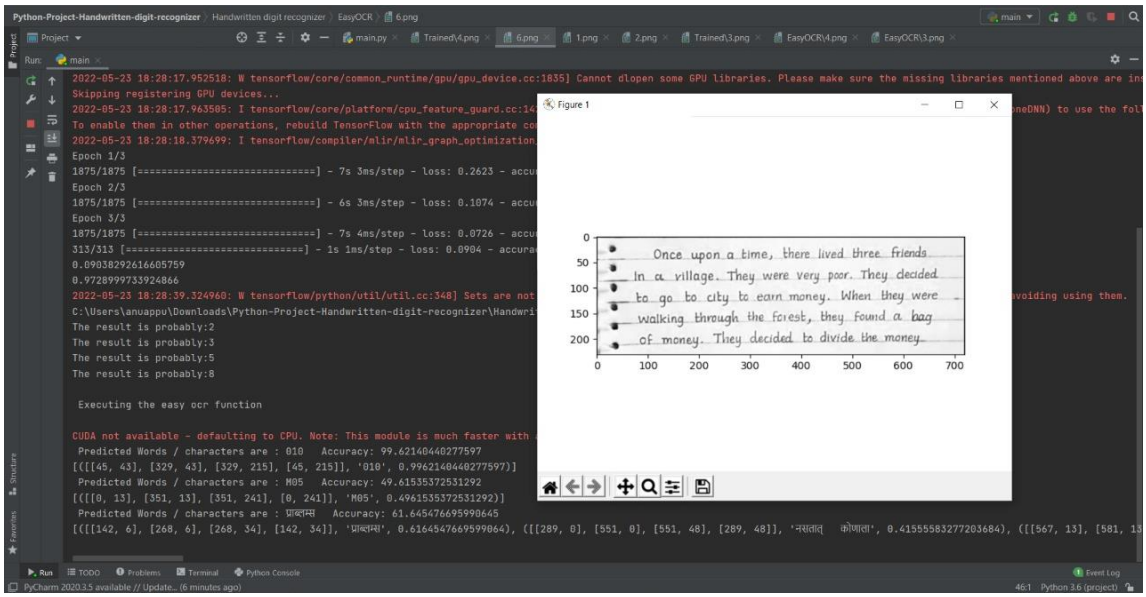


fig 8.7 predicting the text in english

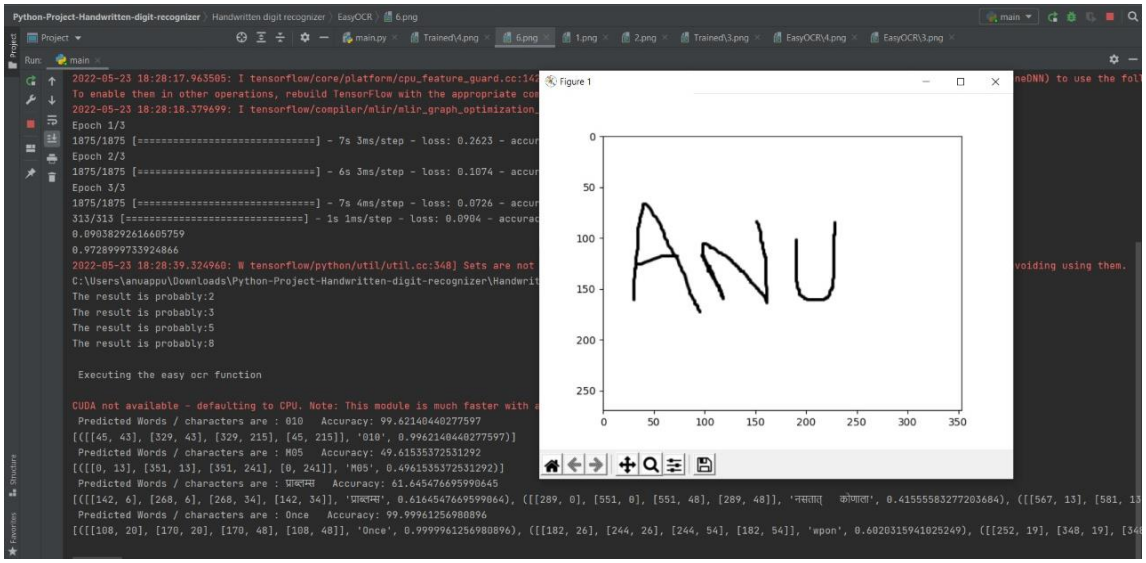


fig 8.8 predicting the text

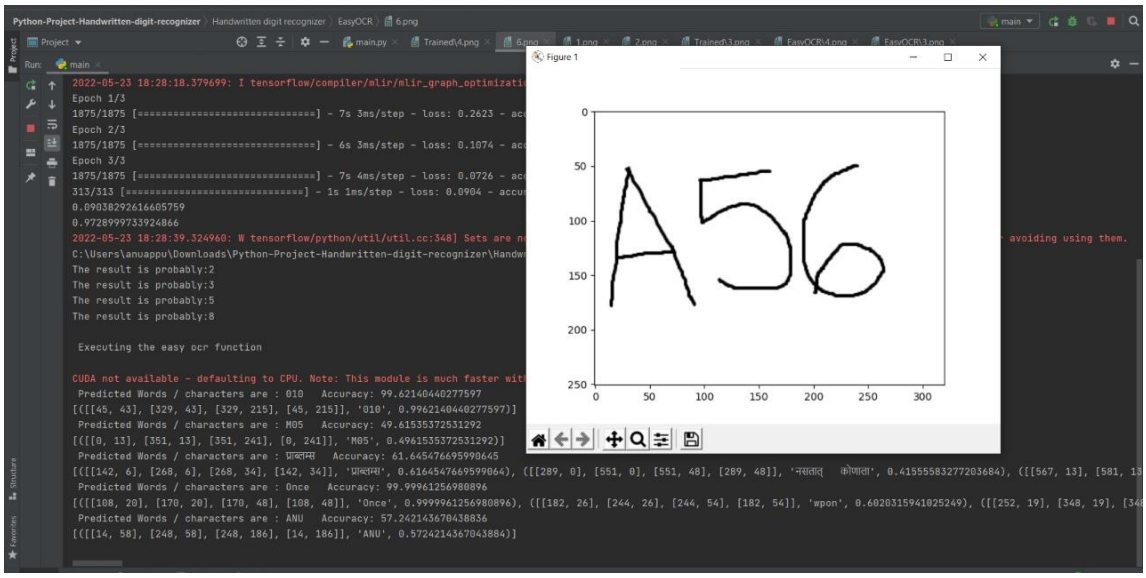


fig 8.9 predicting the Alphanumeric text

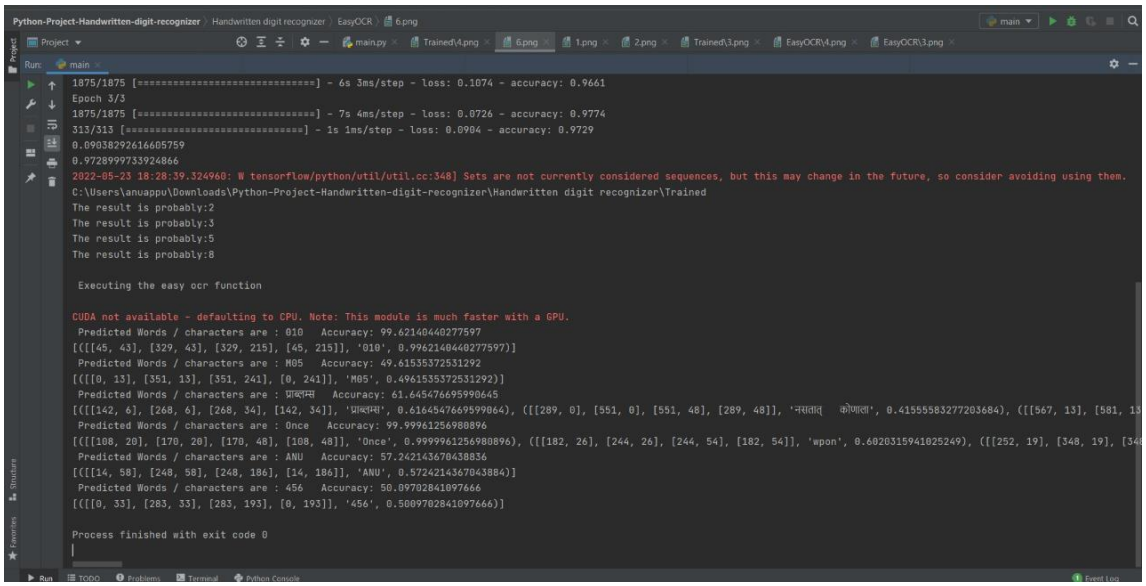


fig 8.10 Results of all the easyocr images

CHAPTER 9
CONCLUSION

CHAPTER 9 CONCLUSION

The Handwritten recognition using deep learning models identifies the digits, text in different languages such as English and Hindi .Project implemented using the concept of neural networks.It is an ability of a computer to recognize and understand intelligible handwritten input from sources such as paper documents.We have implemented our project using the data source called MNIST Dataset. The main objective of this work is to ensure effective and reliable approaches for recognition of handwritten digits, text and make banking operations easier and error free.Our algorithm successfully detects the text and the digit and text up to a 80% of accurate results are observed.This project is helpful for banking , postal address , check number and many other purpose

CHAPTER 10
FUTURE SCOPE

CHAPTER 10 FUTURE SCOPE

Future research and work should be devoted to:

- addition of many more languages to predict the handwritten languages.
- addition of more training and testing models.
- work on accuracy to predict the exact handwritten text or digit.
- addition of voice recognition

REFERENCES

[1] Md.Anwar Hossain, Md.Mohon Ali,"Recognition of Handwritten digit recognition using convolutional neural networks", Global journal of computer Science and Technology ,Volume 19 Issue 2 Version 1.0,2019

[2] Vijayalaxmi R Rudraswamimath,Bhavanishankar, "Handwritten digit recognition using CNN"International Journal of Innovative Science and research Technology,2019

[3] Muzamil Nawaz,Sandesh Gangwani,Isma Farah Siddiqui"A keras based implementation for efficient handwritten digit Recognition using convolutional neural network ",Asia Pacific conference on information science and technology, 2020

[4] Feiyang Chen,Nan Chen,Hanyang Mao,Hanlin Hu"Assessing Four Neural Networks on Handwritten Digit Recognition Dataset (MNIST)",CHUANG XINBAN JOURNAL OF COMPUTING,20 Jul 2019

[5] S Ahlawat,A Choudhary,"Hybrid CNN-SVM classifier for handwritten digit recognition",International conference on computational intelligence and data science, 2019

[6] R. Vijaya Kumar Reddy,Dr. B. Srinivasa Rao,K. Prudvi Raju "Handwritten Hindi Digits Recognition Using Convolutional Neural Network with RMSprop Optimization" "Second International Conference on Intelligent Computing and Control Systems ,2018".

GITHUB LINK : https://github.com/shubhashreen/major-project.git

APPENDIX

```
import cv2 as cv
import numpy as np
import matplotlib.pyplot as plt
import tensorflow as tf
import os
# from IPython.display import Image
import easyocr


def minist_traning():
    """
    Does the traning from the MNIST dataset
    :return: None
    """
    mnist = tf.keras.datasets.mnist
    (x_train, y_train), (x_test, y_test) = mnist.load_data()
    print(x_train.shape)
    x_train = tf.keras.utils.normalize(x_train, axis=1)
    x_test = tf.keras.utils.normalize(x_test, axis=1)
    model = tf.keras.models.Sequential()
    model.add(tf.keras.layers.Flatten(input_shape=(28, 28)))
    model.add(tf.keras.layers.Dense(units=128, activation=tf.nn.relu))
    model.add(tf.keras.layers.Dense(units=128, activation=tf.nn.relu))
    model.add(tf.keras.layers.Dense(units=10, activation=tf.nn.softmax))
    model.compile(optimizer='adam',                loss='sparse_categorical_crossentropy',
metrics=['accuracy'])
    model.fit(x_train, y_train, epochs=3)
    accuracy, loss = model.evaluate(x_test, y_test)
    print(accuracy)
    print(loss)
    model.save('digits.model')
    return model
def predict_using_trained():
    """
    Takes the images that are present in the trained folder and uses the mnist traning to
predict the numbers
    :return: None
    """
```

```
    model = minist_traning()
    cur_wd = os.getcwd()
    path = cur_wd + "\\" + "Trained"
    print(path)
    imgs = os.listdir(path)
    for cur_img in range(1,len(imgs)+1):
        os.chdir(path)
        img = cv.imread(f'{cur_img}.png')[:,:,0]
        img = np.invert(np.array([img]))
        prediction = model.predict(img)
        print(f'The result is probably:{np.argmax(prediction)}')
        plt.imshow(img[0], cmap=plt.cm.binary)
        plt.show()
    os.chdir('..')

def easy_ocr():
    """
    This module uses the easy ocr library to predict the output
    :return: None
    """
    reader = easyocr.Reader(['en','hi'])
    cur_wd = os.getcwd()
    path = cur_wd + "\\" + "EasyOCR"
    imgs = os.listdir(path)
    for cur_img in range(1,len(imgs)+1):
        os.chdir(path)
        pre_img = cur_img
        img = cv.imread(f'{cur_img}.png')[:, :, 0]
        img = np.invert(np.array([img]))
        plt.imshow(img[0], cmap=plt.cm.binary)
        plt.show()
        output = reader.readtext(f'{cur_img}.png')
        tup1 = output[0]
        print(f" Predicted Words / characters are : {tup1[1]} ", end=" ")
        print(f" Accuracy: {tup1[2]*100} ",end= "\n")
        print(output)
    os.chdir('..')

if __name__=="__main__":
    print("\n Executing the pre trained function \n")
    predict_using_trained()
    print("\n Executing the easy ocr function \n")
    easy_ocr();
```

FUNDING AND PAPER PUBLICATION DETAILS

Paper Title	Identifying Handwritten Numericals and Text Using Dl Method**s**
Journal	International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET) . Volume 11, Issue 5, May 2022
Year of Publishing	2022
Abstract	Handwritten recognition is an application based on the concept of an interconnected system. It is an ability of a system to recognise as well as understand intelligible handwritten input from sources, likely paper documents. The motive of identifying handwritten numerical is to create an interconnected net which can appreciate and predict the manuscript digits and texts of copious languages by the depiction. By training this network we can help users provide any image in any shape or form in which this will be able to recognise the given image. This is a basic step towards analyzing networks and cv.The aim of a handwritten prediction system is a conversion of manuscript digits and text into a system readable format. The main intent of this work is to ensure effective and reliable approaches for identification of the manuscript digits, text and make banking operations easier and error free.
Author	Chandana A S Chethana A S Shubha Shree N Thanushree D K Prof. Rashmi Mothkur


CERTIFICATION
OF PUBLICATION
IJIRSET
International Journal of Innovative
Research in Science, Engineering and Technology
(A Monthly Peer Reviewed Journal)
Website: www.ijirset.com Email: ijirset@gmail.com
Impact Factor 8.118
This is hereby Awarding this Certificate to
CHANDANA A S
U.G. Student, Department of Computer Engineering, Dayananda Sagar University, Kudlu Gate, Bangalore, India
Published a paper entitled
Identifying Handwritten Numericals and Text using DL Methods
in IJIRSET, Volume 11, Issue 5, May 2022
e-ISSN : 2319-8753
p-ISSN : 2347-6710
ISSN
INNO SPACE
SJIF Scientific Journal Impact Factor
Editor-in-Chief


CERTIFICATION
OF PUBLICATION
IJIRSET
International Journal of Innovative
Research in Science, Engineering and Technology
(A Monthly Peer Reviewed Journal)
Website: www.ijirset.com Email: ijirset@gmail.com
Impact Factor 8.118
This is hereby Awarding this Certificate to
CHETHANA A S
U.G. Student, Department of Computer Engineering, Dayananda Sagar University, Kudlu Gate, Bangalore, India
Published a paper entitled
Identifying Handwritten Numericals and Text using DL Methods
in IJIRSET, Volume 11, Issue 5, May 2022
e-ISSN : 2319-8753
p-ISSN : 2347-6710
ISSN
INNO SPACE
SJIF Scientific Journal Impact Factor
Editor-in-Chief


CERTIFICATION
OF PUBLICATION
IJIRSET
International Journal of Innovative
Research in Science, Engineering and Technology
(A Monthly Peer Reviewed Journal)
Website: www.ijirset.com Email: ijirset@gmail.com
Impact Factor 8.118
This is hereby Awarding this Certificate to
SHUBHA SHREE N
U.G. Student, Department of Computer Engineering, Dayananda Sagar University, Kudlu Gate, Bangalore, India
Published a paper entitled
Identifying Handwritten Numericals and Text using DL Methods
in IJIRSET, Volume 11, Issue 5, May 2022
e-ISSN : 2319-8753
p-ISSN : 2347-6710
ISSN
INNO SPACE
SJIF Scientific Journal Impact Factor
Editor-in-Chief


CERTIFICATION
OF PUBLICATION
IJIRSET
International Journal of Innovative
Research in Science, Engineering and Technology
(A Monthly Peer Reviewed Journal)
Website: www.ijirset.com Email: ijirset@gmail.com
Impact Factor 8.118
This is hereby Awarding this Certificate to
THANUSHREE D K
U.G. Student, Department of Computer Engineering, Dayananda Sagar University, Kudlu Gate, Bangalore, India
Published a paper entitled
Identifying Handwritten Numericals and Text using DL Methods
in IJIRSET, Volume 11, Issue 5, May 2022
e-ISSN : 2319-8753
p-ISSN : 2347-6710
ISSN
INNO SPACE
SJIF Scientific Journal Impact Factor
Editor-in-Chief

IJIRSET
International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

e-ISSN: 2319-8753 | p-ISSN: 2347-6710

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 5, May 2022

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.118

9940 572 462 | 6381 907 438 | ijirset@gmail.com | www.ijirset.com

International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)

| e-ISSN: 2319-8753, p-ISSN: 2320-6710| www.ijirset.com | Impact Factor: 8.118|

||Volume 11, Issue 5, May 2022||

| DOI:10.15680/IJIRSET.2022.1105296 |

Identifying Handwritten Numericals and Text Using Dl Methods

Chandana A S[1], Chethana A S [2], Shubha Shree N [3],Thanushree D K[4], Rashmi Mothkur[5]

U.G. Student, Department of Computer Engineering, Dayananda Sagar University, Kudlu Gate, Bangalore, India[1]

U.G. Student, Department of Computer Engineering, Dayananda Sagar University, Kudlu Gate, Bangalore, India[2]

U.G. Student, Department of Computer Engineering, Dayananda Sagar University, Kudlu Gate, Bangalore, India[3]

U.G. Student, Department of Computer Engineering, Dayananda Sagar University, Kudlu Gate, Bangalore, India[4]

Assistant Professor, Department of Computer Engineering, Dayananda Sagar University, Kudlu Gate, Bangalore, India[5]

ABSTRACT: Handwritten recognition is aapplication based on the concept of interconnected system. It is an ability of a system to recognise as well as understand intelligible handwritten input from sources, likely paper documents. The motive of identifying handwritten numerical is to create an interconnected net which can appreciate and predict the manuscript digits and texts of copious languages by the depiction. By training this network we can help users provide any image in any shape or form in which this will be able to recognise the given image. This is a basic step towards analysing networks and cv.The aim of a handwritten prediction system is a conversion of manuscript digits and text into a system readable format. The main intent of this work is to ensure effective and reliable approaches for identification of the manuscript digits, text and make banking operations easier and error free.

KEYWORDS: CNN, ANN, MNIST, RE-LU, EasyOCR, TENSOE-FLOW, KERAS, PYTHON.

I. INTRODUCTION

This project helps texts,numerical which are in the manuscript form transform into computer readable form. The intention of this project is to find an effective and reliable way for recognising the manuscript numerical, text and make bank performance easy and also make it error-free.

Digit recognition is an application of imagerecognition, though considered as the first step to pattern identification and image identification it's a major leap towards utilising Artificial Neural Networks toward acknowledgingthe image. The Present project uses CNN for classifying given image of digits and text. Though considered as a solution in this field, utilising CNN to predict is much more efficient and accurate to predict the given text and digits and first steps towards accurate image identification. In this project, there are various layers, which can also be called as Regular Nets which will be trained with the information i.e., images.

An Artificial Neural Network (ANN) is data distillationideal whatever stimulate the procedureof biotic nervous structure, like the cerebrum, action data. Essential technique for novel structure of details distillation system. Assured a lot of most associated clarified parts running in accord to investigate. ANNs, Individuals acquire knowledge at samples An ANN is constructed for particular appeal, including pattern identification or data categorization, along erudition. erudition in biological systems presumes accustoming to synaptic linkage a certain be betwixt the axon.

CNN is mostly engaged in analysing visual-representation. CNN uses various layers for perceptions designed to enable minimal pre-processing. CNN was motivated by their design which was a connection of neurons that relate the organisation of the mammal striated layer. Single cortical neurons respond to stimuli only in an obstructed place of the peripheral vision which is called the perceptive vision. These fields slightly overlap in such a way that they cover the complete peripheral vision. CNN uses proportionally few initialisation images as contrast to analysing algorithms. This tells us that the network finds out the filters that were used in the customary algorithm.They have applications of pictures and tape spotting, recommendation technique, picture classification, medical picture analysis, and NLP.

EasyOCR is a raft in python that permits the conversion of image to text. It is by far the easiest way to execute OCR and it has access to many languages including English, Hindi, kannada and many more languages.EasyOCR doesn't have many software dependencies, it can directly be used with its API.It can operate numerous languages synchronously and it is agreeable with others as well.

| e-ISSN: 2319-8753, p-ISSN: 2320-6710| www.ijirset.com | Impact Factor: 8.118|

||Volume 11, Issue 5, May 2022||

| DOI:10.15680/IJIRSET.2022.1105296 |

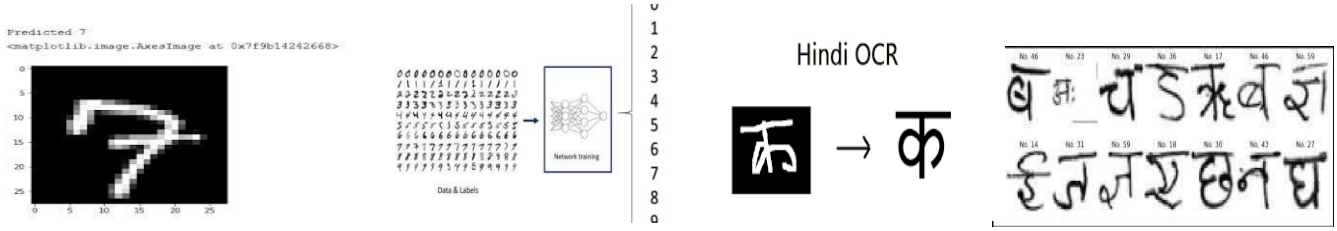


Fig. a. sample data

II. RELATED WORK

Immense research is going on in the field of handwritten recognition. Many people have developed systems for handwritten digit recognition and handwritten character recognition. We have studied some of the systems:[1]. Recognition of Handwritten digit recognition using convolutional neural networks. Itshows that neural network classifiers with single-layer training can be applied efficiently to complex real-world, classification such as the recognition of handwritten digits.[2]. Handwritten digit recognition usingCNN. It trains and tests a set of classifiers for handwritten digit recognition using MNIST database.[3]. Akeras based implementation for efficient handwritten digit Recognition using convolutional neural network. This paper defines process of handwritten digit recognition.[4] Handwritten Hindi Digits Recognition Using Convolutional Neural Network with RMSprop Optimization. It is an efficient handwritten Hindi numeral digit recognition structure based on Convolutional Neural Network (CNN) with RMSprop optimization technique.[5]. MNIST Kannada Digit Recognition. This paper presents an efficient handwritten Kannada digit recognition approach based on comparing the prediction accuracy of the CNN model and various machine learning algorithms.[6]. Handwritten Hindi Digits Recognition Using Convolutional Neural Network with RMSprop Optimization. It is an efficient handwritten Hindi numeral digit recognition structure based on Convolutional Neural Network (CNN) with RMSprop optimization technique.

III. METHODOLOGY

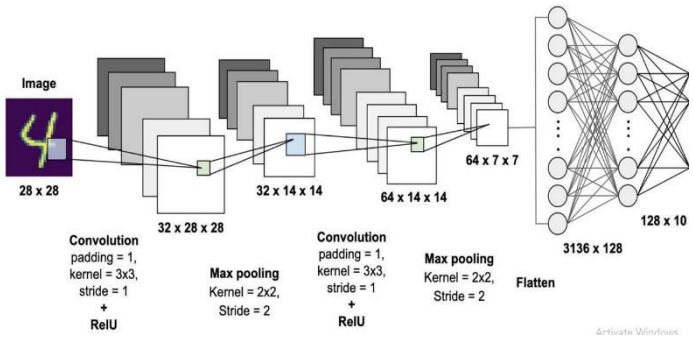


Fig. b. Proposed model architecture

The proposed model in the fig. b. consists of different layers; Sequential layer–This constructs the model for training, The most important class acclimated to configure the plan.Beginning is to construct ANN. This category gets back an item which is used to build the design layer after layer.3 Conv2D-This layer generates a complexity core that is convoluted with the layer put in above an isolated spatial extent to construct a tensor of turnout,this is the very first layer used in a model. Here attributes are being drowned out from our datasets.MaxPooling2D-A layer in CNN which helps in load identification,which reduces the measurements and allows for expectation about characteristics present in the sub-regions binnedthis operation is done on temporal details.Flatten-Flattening a tensor means to remove all of the

| e-ISSN: 2319-8753, p-ISSN: 2320-6710| www.ijirset.com | Impact Factor: 8.118|

||Volume 11, Issue 5, May 2022||

| DOI:10.15680/IJIRSET.2022.1105296 |

dimensions except for one. Dense-This is used to make well-regulated dimly-connected NN layers.This is purely a frequent film of axone in a NN. Individual axon is given for each axone in the preceding fill, thus closely linked. The activation function used in CNN; ReLU-This refers to an estimated strenuous role that accomplishes on multilayers of neural networks.In this layer we detach each of the pessimistic merits from the absolute image and supplant it with zero, ReLU helps to avert the steady growth to utilize the neural network.

Anaconda is applied as the python distribution and helps to set-up the libraries and apply them in all python scripts. The libraries used are Keras , Tensor-Flow , EasyOCR python package. The dataset used is MNIST manuscript data-set. The fig. c. flow chart shows how the output is predicted undergoing various process.

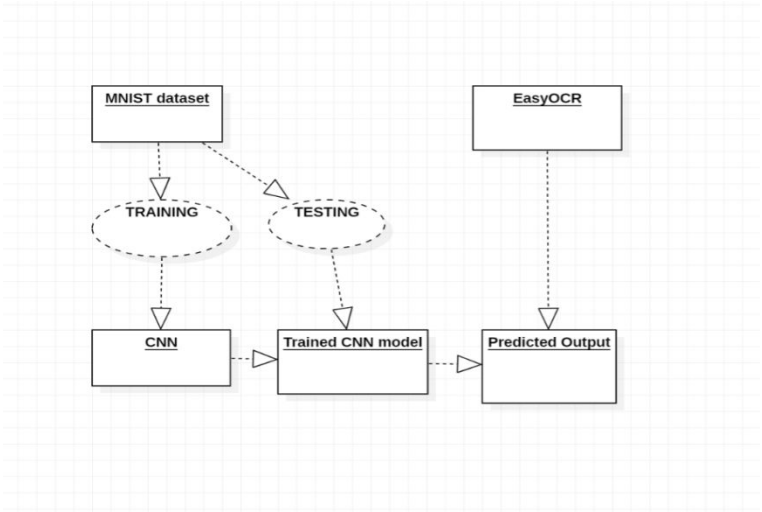
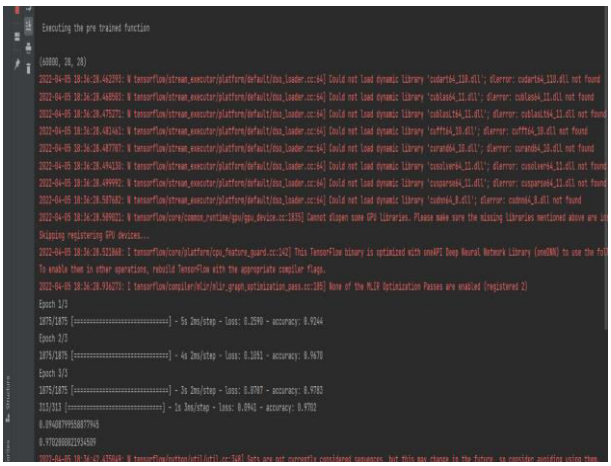


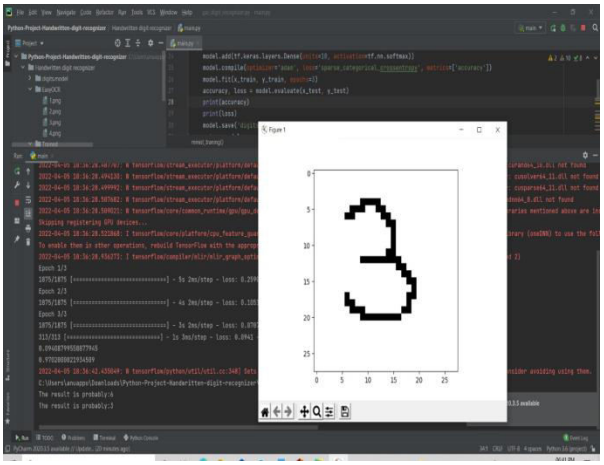
Fig. c. flow-chart

IV. EXPERIMENTAL RESULTS

Dataset-MNIST dataset is maintained by MNIST which holds more than 70,000 images. Various techniques are used to make the image into desirable form and shape. Then the images are given as the training set. After including the layers, we can test the output by giving the images to the model to predict. These neural networks are trained on more than 60,000 images. And tested on more than 10,000 images of digits and text in different languages.



(d)



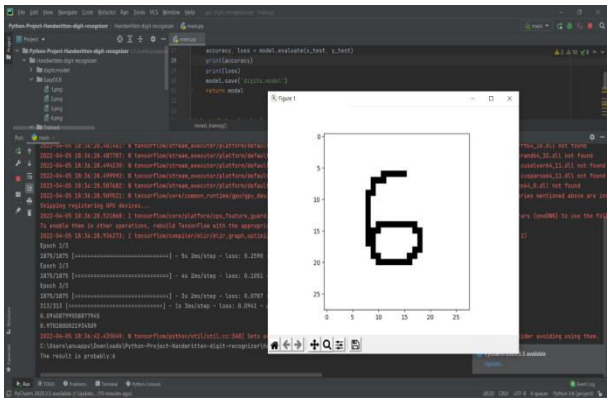
(e)

International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)

| e-ISSN: 2319-8753, p-ISSN: 2320-6710| www.ijirset.com | Impact Factor: 8.118|

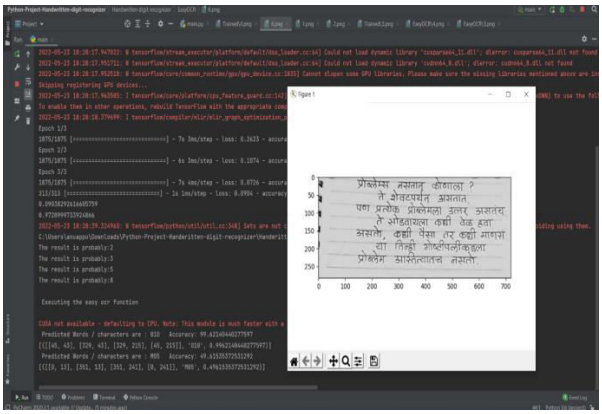
||Volume 11, Issue 5, May 2022||

| DOI:10.15680/IJIRSET.2022.1105296 |

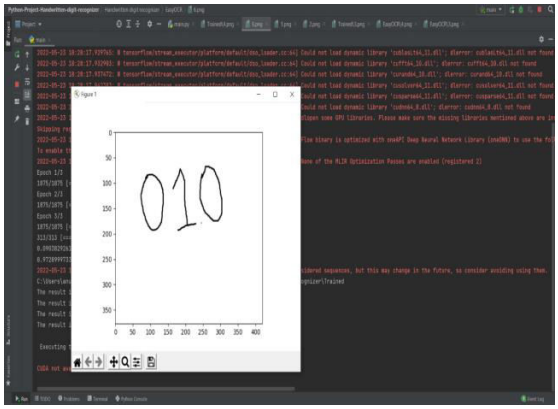


(f)

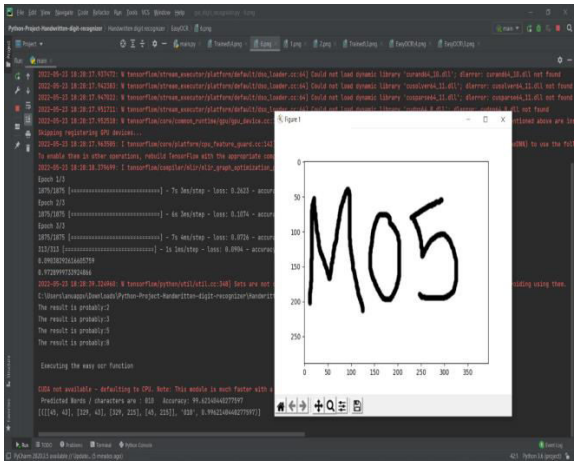
Fig.1 Trained function (d). shows executing the model and training the model. (e). shows 3 which is the predicted output for input 3. (f). predicting the handwritten digit 6.



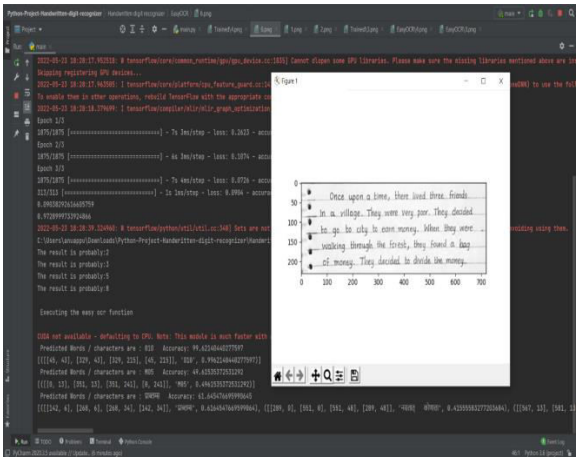
(g)



(h)



(i)

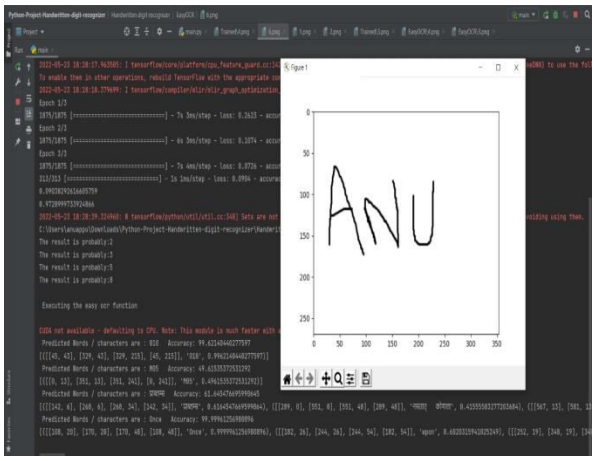


(j)

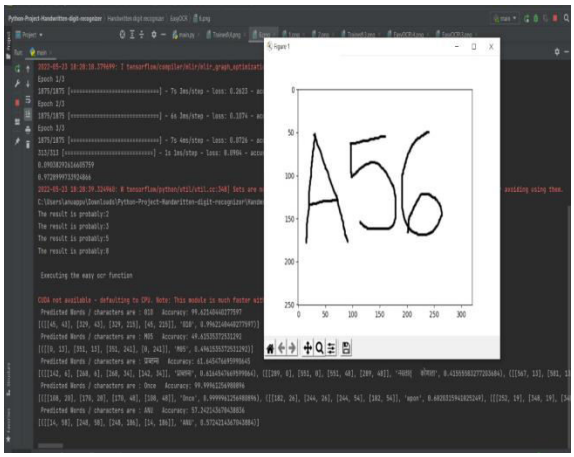
| e-ISSN: 2319-8753, p-ISSN: 2320-6710| www.ijirset.com | Impact Factor: 8.118|

||Volume 11, Issue 5, May 2022||

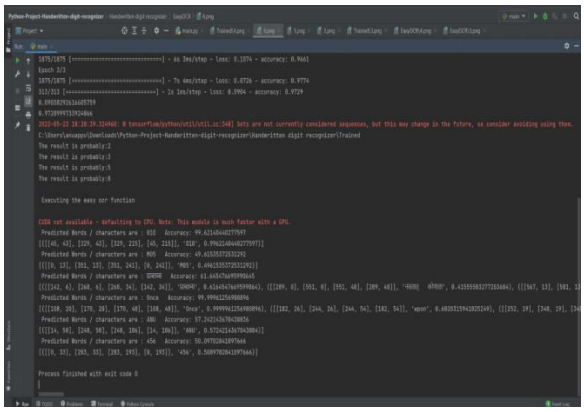
| DOI:10.15680/IJIRSET.2022.1105296 |



(k)



(l)



(m)

Fig.2 Easyocr function (g) predicting the handwritten text image of an Hindi language.(h). predicting handwritten triple digits.(i). predicting the handwritten alphanumeric.(j). predicting the handwritten text image of an English language.(k). predicting the handwritten text.(l). predicting the handwritten Alphanumeric. (m). Results of the handwritten images under easyocr.

V. CONCLUSION

We have implemented a handwritten digit and text recognition system. Our algorithm successfully detects the text and the digit up to80% of the accurate results are observed. We have applied our algorithm on many images handwritten in various languages such as Hindi, Englishand found that we get accurate results.

REFERENCES

1. Md.Anwar Hossain, Md.MohonAli, “Recognition of Handwritten digit recognition using convolutional neural networks", Global journal of computer Science and Technology ,Volume 19 Issue 2 Version 1.0,2019
2. Vijayalaxmi R Rudraswamimath,Bhavanishankar, “Handwritten digit recognition using CNN”International Journal of Innovative Science and research Technology,2019
3. MuzamilNawaz,SandeshGangwani,Isma Farah Siddiqui“Akeras based implementation for efficient handwritten digit Recognition using convolutional neural network ”,Asia Pacific conference on information science and technology, 2020

| e-ISSN: 2319-8753, p-ISSN: 2320-6710| www.ijirset.com | Impact Factor: 8.118|

||Volume 11, Issue 5, May 2022||

| DOI:10.15680/IJIRSET.2022.1105296 |

4. FeiyangChen,NanChen,HanyangMao,HanlinHu"Assessing Four Neural Networks on Handwritten Digit Recognition Dataset (MNIST)",CHUANG XINBAN JOURNAL OF COMPUTING,20 Jul 2019
5. S Ahlawat,AChoudhary,"Hybrid CNN-SVM classifier for handwritten digit recognition",International conference on computational intelligence and data science, 2019
6. R. Vijaya Kumar Reddy,Dr. B. Srinivasa Rao,K. Prudvi Raju "Handwritten Hindi Digits Recognition Using Convolutional Neural Network with RMSprop Optimization" "Second International Conference on Intelligent Computing and Control Systems ,2018".

INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.118

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

9940 572 462 6381 907 438 ijirset@gmail.com

Scan to save the contact details