

Project Development PhaseSprint-1

Date	3 November 2022
Team ID	PNT2022TMID39478
Project Name	A Novel Method for Handwritten Digit Recognition System

The screenshot shows a Google Colab notebook interface. The browser tabs at the top include 'Settings', 'Welcome to Colab', 'Handwritten...', '(10) Whats...', 'QMNIST - 1', 'Sent Mail', 'archive.zip', 'Google Dri...', 'IBM', 'Python PIL', and a plus sign for more tabs. The address bar shows the URL: colab.research.google.com/drive/1huptOJ_r6Iy4wertUbqSxVhbaj9n5X#scrollTo=LwYfVkyWoeB6. The notebook title is 'Handwritten Digit Recognition.ipynb'. The menu bar includes 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help'. The left sidebar has icons for 'Code', 'Text', 'Find', 'List', and 'Load Data'. The main code cell is titled 'Importing Necessary Libraries' and contains the following Python code:

```
[1] import numpy
import tensorflow
from tensorflow.keras.datasets import mnist
from tensorflow.keras.models import Sequential
from tensorflow.keras import layers
from tensorflow.keras.layers import Dense, Flatten
from tensorflow.keras.layers import Conv2D
from keras.optimizers import Adam
from keras.utils import np_utils
```

The bottom of the screen shows a Windows taskbar with various application icons and a system tray displaying '24°C Cloudy', 'ENG IN', and the date '23:25 03-11-2022'.

Dataset Link:

https://drive.google.com/file/d/1rH45JOMn2Gqme4ymXGQD8qtpFEgT2LL2/view?usp=share_link

The screenshot shows a Google Colab notebook interface. The browser tabs at the top include 'Settings', 'Welcome to Colab', 'Handwritten...', '(10) Whats...', 'QMNIST - T...', 'Sent Mail', 'archive.zip', 'Google Dri...', 'IBM', 'Python PIL', and a plus sign for more tabs. The address bar shows the URL: `colab.research.google.com/drive/1huptOJ_rj6lyv4wertUbqSxVhbaj9n5X#scrollTo=LwYfVkyWoeB6`. The notebook title is 'Handwritten Digit Recognition.ipynb' with a star icon. Below the title are links for 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', 'Help', and 'Saving...'. On the right, there are icons for 'Comment', 'Share', and a settings gear. The notebook content is divided into two sections: 'Code' and 'Text'. The 'Code' section contains three code cells. The first cell has the code `from keras.utils import np_utils` and shows a green checkmark icon. The second cell is titled 'Load Data' and contains the code `(x_train, y_train), (x_test, y_test)=mnist.load_data()`, also with a green checkmark. The third cell contains the code `print(x_train.shape)#shape is used for give the dimension values #60000-rows 28x28-pixels paint` and shows the output: `(60000, 28, 28)` and `(10000, 28, 28)`. The bottom of the screen shows a Windows taskbar with a temperature of 24°C, a search bar, and various application icons. The system clock shows 23:25 on 03-11-2022.

```
[1] from keras.utils import np_utils
```

Load Data

```
[2] (x_train, y_train), (x_test, y_test)=mnist.load_data()
```

```
[3] print(x_train.shape)#shape is used for give the dimension values #60000-rows 28x28-pixels paint
(60000, 28, 28)
(10000, 28, 28)
```

```
(60000, 28, 28)
(10000, 28, 28)
```

Settings - C xWelcome T xHandwritte x(10) Whats xQMNI... xSent Mail - xarchive.zip xGoogle Dri xIBM xPython P... x

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Handwritten Digit Recognition.ipynb

File Edit View Insert Runtime Tools HelpAll changes saved

+ Code + Text

RAMDiskEditing

Understanding the data

[x] [4] x_train[0]

```
0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 80, 156, 107, 253, 253,
 205, 11, 0, 43, 154, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 14, 1, 154, 253,
 90, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 139, 253,
 190, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 11, 190,
 253, 70, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 35,
 241, 225, 160, 108, 1, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 81, 240, 253, 253, 119, 25, 0, 0, 0, 0, 0, 0,
 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 45, 186, 253, 253, 150, 27, 0, 0, 0, 0, 0,
 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 16, 93, 252, 253, 187, 0, 0, 0, 0, 0, 0,
 0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 249, 253, 249, 64, 0, 0, 0, 0, 0,
 0, 0],
0, 0],
```

10.png ^ archive (1).zip ^ Handwritten_Dig...ipynb ^ Show all x

24°C Cloudy 23:25 03-11-2022

Settings - C xWelcome T xHandwritte x(10) Whats/ xQMNIST - T xSent Mail - xarchive.zip xGoogle Dri xIBM xPython PIL x+ x

colab.research.google.com/drive/1huptOJ_rj6lyv4wertUbqSxVhbaj9n5X#scrollTo=LwYTVkYWoeB6

Handwritten Digit Recognition.ipynb

CommentShareSettingsProfile

+ Code + TextRAMDiskEditing

[4]

```
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0],
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0]], dtype=uint8)
```

{x}

[5]

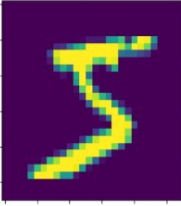
```
y_train[0]

5
```

[6]

```
import matplotlib.pyplot as plt #used for data visualization
plt.imshow(x_train[0]) #ploting the index=0 image
```

```
<matplotlib.image.AxesImage at 0x7fc68af2c950>
```



10.pngarchive (1).zipHandwritten_Dig...ipynbShow all x

24°C Cloudy23:26 03-11-2022

Settings - C xWelcome.Ti xHandwrite: x(10) Whats: xQMNIST - T xSent Mail - xarchive.zip xGoogle Dri: xIBM xPython PIL: x+

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Handwritten Digit Recognition.ipynb

File Edit View Insert Runtime Tools Help All changes saved

Comment Share

RAM Disk

Editing

Reshaping Dataset

[7]

```
#Reshaping to format which CNN expects (batch, height, width, channels)
x_train=x_train.reshape(60000, 28, 28, 1).astype('float32')
X_test= X_test.reshape(10000, 28, 28, 1).astype('float32')
```

One-Hot Encoding

[8]

```
#one hot encode
number_of_classes = 10 #storing the no. classes in a variable
y_train= np_utils.to_categorical (y_train, number_of_classes) #converts the output in binary format
y_test= np_utils.to_categorical (y_test, number_of_classes)
```

[9]

```
y_train[0]

array([0., 0., 0., 0., 0., 1., 0., 0., 0., 0.], dtype=float32)
```

Creating the Model

[10]

```
#create model
model=Sequential()
#adding model Layer
```

10.png

archive (1).zip

Handwritten_Dig...ipynb

Show all

24°C Cloudy

ENG IN 23:27 03-11-2022