Project Development Phase
Sprint-1

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

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

colab.research.google.com/drive/1huptOJ_rJ6Iyv4wertUbqSxVhbaj9n5X#scrollTo=LwYfVkYWoeB6

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```
[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)#shope is used for give the dimension values #60000-rows 28x28-pixels paint
    (68000, 28, 28)
    (10000, 28, 28)

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

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Understanding the data

```
[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, 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,   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,   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,
         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,   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,    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],
```

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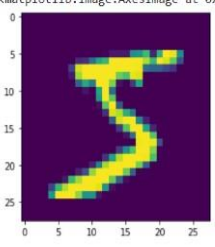
```
[5]  y_train[0]

     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>
```

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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
```

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