

#Understanding the Data (Sprint-1) TEAM

ID:PNT2022TMID10395

```
#Import all Necessary Libraries import pandas as pd
import numpy as np import matplotlib.pyplot as plt
from tensorflow.keras.datasets import mnist
(x_train,y_train),(x_test,y_test)=mnist.load_data()
x_train
```

```
array([[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, 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, 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, ..., 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, 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, 0]]], dtype=uint8)

x_train.shape (60000, 28, 28) one_img =
x_train[0] one_img.shape (28, 28) one_img
array([[ 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,  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,  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,  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,
3,
        18, 18, 18, 126, 136, 175, 26, 166, 255, 247, 127,  0,
0,
        0,  0],
 [ 0,  0,  0,  0,  0,  0,  0,  0, 30, 36, 94, 154,
170,
        253, 253, 253, 253, 253, 225, 172, 253, 242, 195, 64,  0,
0,

```

[illegible]


```

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

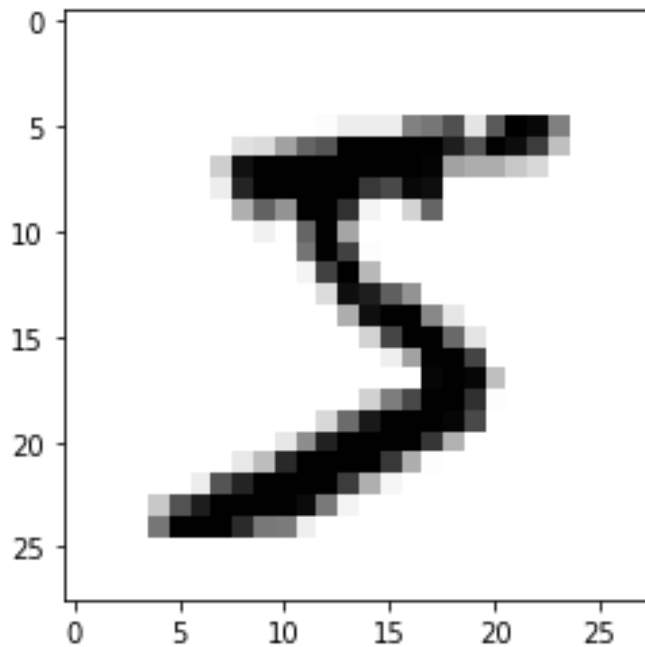
```

```

#plot the single image
plt.imshow(one_img,cmap='binary')

```

<matplotlib.image.AxesImage at 0x7f36882992d0>



```

y_train
array([5, 0, 4, ..., 5, 6, 8], dtype=uint8)

#categories the data
from tensorflow.keras.utils import to_categorical

y_train.shape

(60000,)
y_example = to_categorical(y_train)
print(y_example,y_example.shape)

[[0. 0. 0. ... 0. 0. 0.]
 [1. 0. 0. ... 0. 0. 0.]
 [0. 0. 0. ... 0. 0. 0.]

```

[illegible]

```

[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.01176471, 0.07058824, 0.07058824,
0.07058824, 0.49411765, 0.53333333, 0.68627451, 0.10196078,
0.65098039, 1.      , 0.96862745, 0.49803922, 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.11764706, 0.14117647,
0.36862745, 0.60392157, 0.66666667, 0.99215686, 0.99215686,
0.99215686, 0.99215686, 0.99215686, 0.88235294, 0.6745098 ,
0.99215686, 0.94901961, 0.76470588, 0.25098039, 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.19215686, 0.93333333, 0.99215686,
0.99215686, 0.99215686, 0.99215686, 0.99215686, 0.99215686,
0.99215686, 0.99215686, 0.98431373, 0.36470588, 0.32156863,
0.32156863, 0.21960784, 0.15294118, 0.      , 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.07058824, 0.85882353, 0.99215686,
0.99215686, 0.99215686, 0.99215686, 0.99215686, 0.77647059,
0.71372549, 0.96862745, 0.94509804, 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.31372549, 0.61176471,
0.41960784, 0.99215686, 0.99215686, 0.80392157, 0.04313725,
0.      , 0.16862745, 0.60392157, 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.05490196,
0.00392157, 0.60392157, 0.99215686, 0.35294118, 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.      , 0.54509804, 0.99215686, 0.74509804, 0.00784314,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.04313725, 0.74509804, 0.99215686, 0.2745098 ,
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.      , 0.1372549 , 0.94509804, 0.88235294,
0.62745098, 0.42352941, 0.00392157, 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.31764706, 0.94117647,
0.99215686, 0.99215686, 0.46666667, 0.09803922, 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.17647059,
0.72941176, 0.99215686, 0.99215686, 0.58823529, 0.10588235,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.0627451 , 0.36470588, 0.98823529, 0.99215686, 0.73333333,
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.      , 0.97647059, 0.99215686, 0.97647059,
0.25098039, 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.18039216,
0.50980392, 0.71764706, 0.99215686, 0.99215686, 0.81176471,
0.00784314, 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.15294118, 0.58039216, 0.89803922,
0.99215686, 0.99215686, 0.99215686, 0.98039216, 0.71372549,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      ],
[0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.09411765, 0.44705882, 0.86666667, 0.99215686, 0.99215686,
0.99215686, 0.99215686, 0.78823529, 0.30588235, 0.      ,
0.      , 0.      , 0.      , 0.      , 0.      ,
0.      , 0.      , 0.      ],
```



```

[0.          , 0.          , 0.          , 0.          , 0.          ,
 0.          , 0.          , 0.          , 0.09019608, 0.25882353,
 0.83529412, 0.99215686, 0.99215686, 0.99215686, 0.99215686,
 0.77647059, 0.31764706, 0.00784314, 0.          , 0.          ,
 0.          , 0.          , 0.          , 0.          , 0.          ,
 0.          , 0.          , 0.          ],
[0.          , 0.          , 0.          , 0.          , 0.          ,
 0.          , 0.07058824, 0.67058824, 0.85882353, 0.99215686,
 0.99215686, 0.99215686, 0.99215686, 0.76470588, 0.31372549,
 0.03529412, 0.          , 0.          , 0.          , 0.          ,
 0.          , 0.          , 0.          , 0.          , 0.          ,
 0.          , 0.          , 0.          ],
[0.          , 0.          , 0.          , 0.          , 0.21568627,
0.6745098 , 0.88627451, 0.99215686, 0.99215686, 0.99215686,
 0.99215686, 0.95686275, 0.52156863, 0.04313725, 0.          ,
 0.          , 0.          , 0.          , 0.          , 0.          ,
 0.          , 0.          , 0.          , 0.          , 0.          ,
 0.          , 0.          , 0.          ],
[0.          , 0.          , 0.          , 0.          , 0.53333333,
0.99215686, 0.99215686, 0.99215686, 0.83137255, 0.52941176,
0.51764706, 0.0627451 , 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.          , 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.          , 0.          , 0.          ]])

```

#reshape the scaled data

```
x_train = x_train.reshape(60000,28,28,1)
```

```
x_test = x_test.reshape(10000,28,28,1)
```

```
x_train.shape,x_test.shape
```

```
((60000, 28, 28, 1), (10000, 28, 28, 1))
```