#Understanding the Data (Sprint-1)

TEAM ID:PNT2022TMID26748

*#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

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| [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,

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| 126, | 136, | 175, | 26, | 166, | 255, | 247, | 127, | 0, |
| 0, | 0, | 0, | 0, | 0, | 30, | 36, | 94, | 154, |
| 253, | 253, | 225, | 172, | 253, | 242, | 195, | 64, | 0, |
| 0, | 0, | 0, | 0, | 49, | 238, | 253, | 253, | 253, |
| 253, | 251, | 93, | 82, | 82, | 56, | 39, | 0, | 0, |
| 0, | 0, | 0, | 0, | 18, | 219, | 253, | 253, | 253, |
| 247, | 241, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 0, | 0, | 0, | 0, | 0, | 80, | 156, | 107, | 253, |
| 43, | 154, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 0, | 0, | 0, | 0, | 0, | 0, | 14, | 1, | 154, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 139, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 11, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 108, | 1, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 253, | 119, | 25, | 0, | 0, | 0, | 0, | 0, | 0, |
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253, 198, 182,

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205, 11, 0,

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90, 0, 0,

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[ 0, 0, 0,

190, 2, 0,

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[ 0, 0, 0,

253, 70, 0,

0, 0],

[ 0, 0, 0,

241, 225, 160,

0, 0],

[ 0, 0, 0,

81, 240, 253,

0, 0],

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| 253, | 253, | 150, | 27, | 0, | 0, | 0, | 0, | 0, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 93, | 252, | 253, | 187, | 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, | 0, | 0, | 0, | 0, |
| 183, | 253, | 253, | 207, | 2, | 0, | 0, | 0, | 0, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 253, | 253, | 250, | 182, | 0, | 0, | 0, | 0, | 0, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 24, | 114, |
| 253, | 201, | 78, | 0, | 0, | 0, | 0, | 0, | 0, |
| 0, | 0, | 0, | 0, | 0, | 23, | 66, | 213, | 253, |
| 81, | 2, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 0, | 0, | 0, | 18, | 171, | 219, | 253, | 253, | 253, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 0, | 55, | 172, | 226, | 253, | 253, | 253, | 253, | 244, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 0, | 136, | 253, | 253, | 253, | 212, | 135, | 132, | 16, |
| 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
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148, 229, 253,

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253, 253, 253,

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253, 253, 198,

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195, 80, 9,

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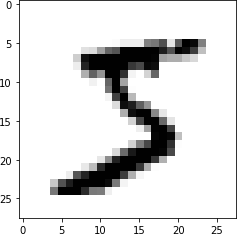
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| 0, |  |  |  |  |  |  |  |  |  |  |  |  |  |

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.] |
| ... |  |
| [0. 0. 0. ... | 0. 0. 0.] |
| [0. 0. 0. ... | 0. 0. 0.] |
| [0. 0. 0. ... | 0. 1. 0.]] (60000, 10) |
| y\_example[0]  array([0., 0., | 0., 0., 0., 1., 0., 0., 0., 0.], dtype=float32) |

y\_cat\_test = to\_categorical(y\_test,num\_classes=10) y\_cat\_train = to\_categorical(y\_train,10) one\_img.max(),one\_img.min()

(255, 0)

x\_train = x\_train/255 x\_test = x\_test/255

scaled\_img = x\_train[0] scaled\_img

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| 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. ], | | | | | |
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| 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. | , |
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| 0. | , | 0. | , 0.19215686, 0.93333333, 0.99215686, | | | | | | |
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| 0.99215686, | | 0.99215686, | | 0.98431373, | | 0.36470588, | | 0.32156863, | |
| 0.3215  0. | 6863,  , | 0.2196  0. | 0784,  , | 0.15294118, 0. , 0. ,  0. ], | | | | | |
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| 0.07058824, | 0.85882353, | | 0.99215686, | |
| 0.99215686, | 0.99215686, | | 0.77647059, | |
| 0.94509804, 0. | | , | 0. | , |
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0.71372549, 0.96862745,

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| 0.80392157, | | 0.04313725, | |
| 0. | , | 0. | , |
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0.41960784, 0.99215686, 0.99215686,

0. , 0.16862745, 0.60392157,

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| 0. | , | 0. | , | 0. | , | 0. | , 0.05490196, | | |
| 0.00392157, | | 0.60392157, | | 0.99215686, | | 0.35294118, | | 0. | , |
| 0. | , | 0. | , | 0. | , | 0. | , | 0. | , |
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| 0. | , | 0.54509804, | | 0.99215686, | | 0.74509804, | | 0.00784314, | |
| 0. | , | 0. | , | 0. | , | 0. | , | 0. | , |
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| 0. | , | 0. | , | 0. | , | 0. | , | 0. | , |
| 0. | , | 0. | , 0.1372549 , 0.94509804, 0.88235294, | | | | | | |

0.62745098, 0.42352941, 0.00392157,

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| 0. | , | 0. | , | 0. | , | 0. | , | 0. | , |
| 0. | , | 0. | , | 0. | , 0.31764706, 0.94117647, | | | | |
| 0.99215686, | | 0.99215686, | | 0.46666667, 0.09803922, 0. , | | | | | |
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| 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. | , |
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| 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, |
| 0.77647059, | | 0.31764706, | | 0.00784314, |
| 0. | , | 0. | , | 0. , |
| 0. | , | 0. | , | 0. ] |
| [0. | , | 0. | , | 0. , |

0.99215686, 0.99215686,

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. ,

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0. , 0. , 0. ],

[0. , 0. , 0. , 0. , 0. ,

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0. , 0. , 0. , 0. , 0. ,

0. , 0. , 0. , 0. , 0. ,

0. , 0. , 0. , 0. , 0. ,

0. , 0. , 0. ],

[0. , 0. , 0. , 0. , 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))