ASSIGNMENT 2:-

Output:-

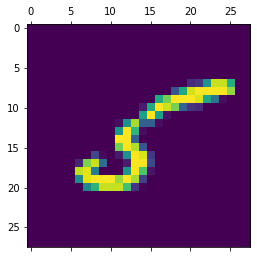
Downloading data from <https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz> 11490434/11490434 [==============================] - 0s 0us/step

60000

10000

(10000, 28, 28)

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, 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, 0, 0], [ 0, 0, 0, 0, 0, 0, 0, 49, 238, 253, 253, 253, 253, 253, 253, 253, 253, 251, 93, 82, 82, 56, 39, 0, 0, 0, 0, 0], [ 0, 0, 0, 0, 0, 0, 0, 18, 219, 253, 253, 253, 253, 253, 198, 182, 247, 241, 0, 0, 0, 0, 0, 0, 0, 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, 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, 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, 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, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 46, 130, 183, 253, 253, 207, 2, 0, 0, 0, 0, 0, 0, 0], [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 39, 148, 229, 253, 253, 253, 250, 182, 0, 0, 0, 0, 0, 0, 0, 0], [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 24, 114, 221, 253, 253, 253, 253, 201, 78, 0, 0, 0, 0, 0, 0, 0, 0, 0], [ 0, 0, 0, 0, 0, 0, 0, 0, 23, 66, 213, 253, 253, 253, 253, 198, 81, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [ 0, 0, 0, 0, 0, 0, 18, 171, 219, 253, 253, 253, 253, 195, 80, 9, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [ 0, 0, 0, 0, 55, 172, 226, 253, 253, 253, 253, 244, 133, 11, 0, 0, 0, 0, 0, 0, 0, 0, 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, 0, 0, 0, 0, 0, 0, 0], [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [ 0, 0, 0, 0, 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)

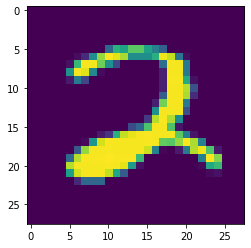


array([[0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 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. , 0.12156863, 0.15686275, 0.50588235, 0.91764706, 0.91764706, 0.62352941, 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0.26666667, 0.58823529, 0.9372549 , 0.99607843, 0.99215686, 0.99215686, 0.99215686, 0.84313725, 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0.61176471, 0.78823529, 0.99607843, 0.99607843, 0.99607843, 0.94509804, 0.58823529, 0.38431373, 0.03137255, 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0.0745098 , 0.60392157, 0.99607843, 0.9254902 , 0.79607843, 0.3254902 , 0.15294118, 0.11764706, 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0.56470588, 0.99215686, 0.56862745, 0.04705882, 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0.03921569, 0.50588235, 0.87058824, 0.30588235, 0.30980392, 0.03137255, 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0.5254902 , 0.99215686, 0.65490196, 0.03137255, 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. , 0.99607843, 0.30588235, 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0.78823529, 0.99215686, 0.88627451, 0.27058824, 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0.21568627, 0.02352941, 0. , 0.07058824, 0.50196078, 0.99215686, 0.94509804, 0.16078431, 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0.09803922, 0.80392157, 0.92156863, 0.36078431, 0. , 0. , 0.07843137, 0.99215686, 0.99215686, 0.22745098, 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0.90588235, 0.96078431, 0.42352941, 0. , 0. , 0. , 0.51764706, 0.99215686, 0.7254902 , 0.05490196, 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0.4745098 , 0.96078431, 0.99607843, 0.99607843, 0.99607843, 0.85098039, 0.99607843, 0.8745098 , 0.19607843, 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0.45490196, 0.64705882, 0.91372549, 0.91372549, 0.91764706, 0.70588235, 0.15294118, 0.01176471, 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ], [0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ]])

Model: "sequential" \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Layer (type) Output Shape Param # ================================================================= flatten (Flatten) (None, 784) 0 dense (Dense) (None, 128) 100480 dense\_1 (Dense) (None, 10) 1290 ================================================================= Total params: 101,770 Trainable params: 101,770 Non-trainable params: 0

Epoch 1/10 1875/1875 [==============================] - 6s 3ms/step - loss: 0.6578 - accuracy: 0.8348 - val\_loss: 0.3575 - val\_accuracy: 0.9051 Epoch 2/10 1875/1875 [==============================] - 5s 3ms/step - loss: 0.3340 - accuracy: 0.9067 - val\_loss: 0.2884 - val\_accuracy: 0.9181 Epoch 3/10 1875/1875 [==============================] - 9s 5ms/step - loss: 0.2846 - accuracy: 0.9198 - val\_loss: 0.2567 - val\_accuracy: 0.9263 Epoch 4/10 1875/1875 [==============================] - 8s 4ms/step - loss: 0.2545 - accuracy: 0.9284 - val\_loss: 0.2334 - val\_accuracy: 0.9351 Epoch 5/10 1875/1875 [==============================] - 5s 3ms/step - loss: 0.2328 - accuracy: 0.9343 - val\_loss: 0.2164 - val\_accuracy: 0.9389 Epoch 6/10 1875/1875 [==============================] - 5s 2ms/step - loss: 0.2155 - accuracy: 0.9386 - val\_loss: 0.2025 - val\_accuracy: 0.9428 Epoch 7/10 1875/1875 [==============================] - 5s 2ms/step - loss: 0.2006 - accuracy: 0.9435 - val\_loss: 0.1908 - val\_accuracy: 0.9460 Epoch 8/10 1875/1875 [==============================] - 5s 2ms/step - loss: 0.1874 - accuracy: 0.9476 - val\_loss: 0.1815 - val\_accuracy: 0.9490 Epoch 9/10 1875/1875 [==============================] - 5s 2ms/step - loss: 0.1760 - accuracy: 0.9506 - val\_loss: 0.1741 - val\_accuracy: 0.9497 Epoch 10/10 1875/1875 [==============================] - 4s 2ms/step - loss: 0.1662 - accuracy: 0.9529 - val\_loss: 0.1632 - val\_accuracy: 0.9523

313/313 [==============================] - 1s 2ms/step - loss: 0.1632 - accuracy: 0.9523 Loss=0.163 Accuracy=0.952



313/313 [==============================] - 1s 2ms/step Handwritten nuber in the image is= 90520

dict\_keys(['loss', 'accuracy', 'val\_loss', 'val\_accuracy'])

