**CHAPTER 11- IMPLEMENTATION**

**import** tensorflow **as** tf

mnist**=**tf**.**keras**.**datasets**.**mnist

(x\_train, y\_train),(x\_test, y\_test) **=**mnist**.**load\_data()

x\_train**=**tf**.**keras**.**utils**.**normalize(x\_train,axis**=**1)

x\_test**=**tf**.**keras**.**utils**.**normalize(x\_test,axis**=**1)

model**=**tf**.**keras**.**models**.**Sequential([

tf**.**keras**.**layers**.**Flatten(input\_shape**=**(28,28)),

tf**.**keras**.**layers**.**Dense(128, activation**=**tf**.**nn**.**relu),

tf**.**keras**.**layers**.**Dense(128, activation**=**tf**.**nn**.**relu),

tf**.**keras**.**layers**.**Dense(10, activation**=**tf**.**nn**.**softmax)])

model**.**compile(optimizer**=**'adam', loss**=**'sparse\_categorical\_crossentropy', metrics**=**['accuracy'])

model**.**fit(x\_train,y\_train, epochs**=**3)

Epoch 1/3

1875/1875 [==============================] - 3s 1ms/step - loss: 0.2602 - accuracy: 0.9245

Epoch 2/3

1875/1875 [==============================] - 3s 1ms/step - loss: 0.1045 - accuracy: 0.9675

Epoch 3/3

1875/1875 [==============================] - 3s 1ms/step - loss: 0.0713 - accuracy: 0.9775

Out[1]:

<tensorflow.python.keras.callbacks.History at 0x1f22baa8d60>

In [2]:

val\_loss, val\_acc**=**model**.**evaluate(x\_test, y\_test)

print(val\_loss, val\_acc)

313/313 [==============================] - 0s 1ms/step - loss: 0.0835 - accuracy: 0.9733

0.083494171500206 0.9732999801635742

In [3]:

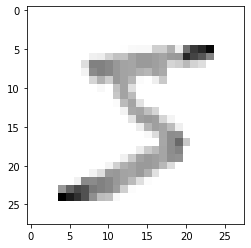
**import**matplotlib.pyplot**as**plt

plt**.**imshow(x\_train[0], cmap**=**plt**.**cm**.**binary)

plt**.**show()

print(x\_train[0])

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In [4]:

model**.**save('epic\_num\_reader.model')

WARNING:tensorflow:From C:\Users\prncc\anaconda3\lib\site-packages\tensorflow\python\training\tracking\tracking.py:111: Model.state\_updates (from tensorflow.python.keras.engine.training) is deprecated and will be removed in a future version.

Instructions for updating:

This property should not be used in TensorFlow 2.0, as updates are applied automatically.

WARNING:tensorflow:From C:\Users\prncc\anaconda3\lib\site-packages\tensorflow\python\training\tracking\tracking.py:111: Layer.updates (from tensorflow.python.keras.engine.base\_layer) is deprecated and will be removed in a future version.

Instructions for updating:

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This property should not be used in TensorFlow 2.0, as updates are applied automatically.

INFO:tensorflow:Assets written to: epic\_num\_reader.model\assets

new\_model**=**tf**.**keras**.**models**.**load\_model('epic\_num\_reader.model') In [5]

In [6]:

predictions**=**new\_model**.**predict([x\_test])

In [7]:

print(predictions)

[[2.2446521e-08 1.6073621e-07 2.8700836e-06 ... 9.9999142e-01

1.5195930e-08 1.7568410e-06]

[1.1745748e-06 4.7907233e-03 9.9495029e-01 ... 4.4733167e-08

1.2370440e-07 1.7251296e-09]

[3.8843245e-07 9.9988365e-01 4.0777624e-05 ... 2.3151975e-05

1.0285361e-05 1.1934999e-06]

...

[7.7898370e-08 6.1385371e-08 1.5636862e-08 ... 9.1768434e-06

3.7060865e-06 6.4659375e-04]

[8.4857013e-05 6.2228230e-07 2.7413894e-06 ... 6.4985511e-06

1.8824053e-04 5.6882758e-08]

[7.2184214e-08 1.9933077e-07 1.2579572e-07 ... 2.7098190e-10

1.5022833e-07 1.2045092e-09]]

In [8]:

**import**numpy**as** np

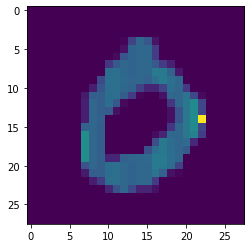
print(np**.**argmax(predictions[3]))

0

In [9]:

plt**.**imshow(x\_test[3])

plt**.**show()



In [10]:

**import**numpy**as** np

print(np**.**argmax(predictions[4]))

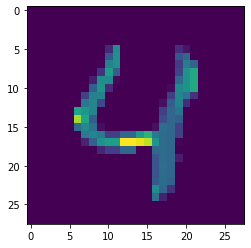
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In [11]:

plt**.**imshow(x\_test[4])

plt**.**show()



In [12]:

**import**numpy**as** np

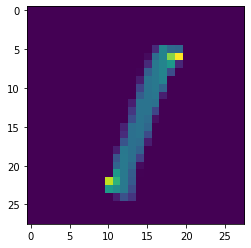
print(np**.**argmax(predictions[5]))

1

In [13]:

plt**.**imshow(x\_test[5])

plt**.**show()



In [14]:

**import**numpy**as** np

print(np**.**argmax(predictions[6]))

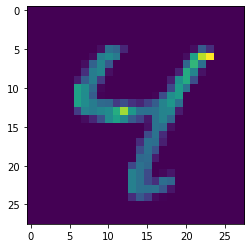
4

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In [15]:

plt**.**imshow(x\_test[6])

plt**.**show()



In [16]:

**import**numpy**as** np

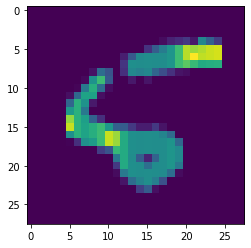
print(np**.**argmax(predictions[8]))

5

In [17]:

plt**.**imshow(x\_test[8])

plt**.**show()



In [18]:

**import**numpy**as** np

print(np**.**argmax(predictions[7]))

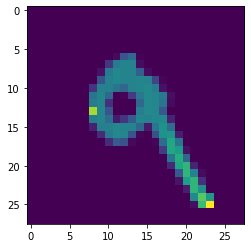
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In [19]:

plt**.**imshow(x\_test[7])

plt**.**show()



In [ ]: