Fashion_MNIST1

March 10, 2024

Name :Ilhe Uddhav Sampat | Batch : B3 | Roll no. : 4159

[1]:
```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

[21]:
```
import tensorflow as tf
# Helper libraries
import numpy as np
import matplotlib.pyplot as plt
print(tf.__version__)
```

```
2.15.0
```

[23]:
```
train_images.shape
```

[23]:
```
(60000, 28, 28)
```

[22]:
```
fashion_mnist = tf.keras.datasets.fashion_mnist
(train_images, train_labels), (test_images, test_labels) = fashion_mnist.
 ↪load_data()
```

[38]:
```
class_names = ['T-shirt/top', 'Trouser', 'Pullover', 'Dress', 'Coat',
'Sandal', 'Shirt', 'Sneaker', 'Bag', 'Ankle boot']
```

[24]:
```
len(train_labels)
```

[24]:
```
60000
```

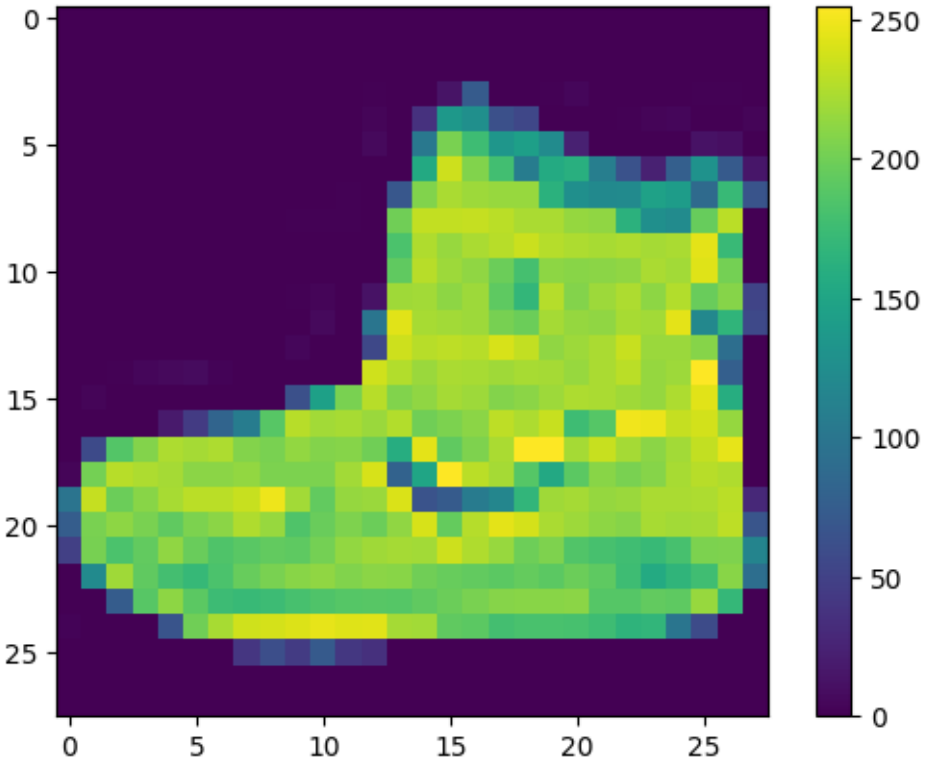
[29]:
```
train_labels
```

[29]:
```
array([9, 0, 0, …, 3, 0, 5], dtype=uint8)
```

[31]:
```
len(test_labels)
```

[31]:
```
10000
```

[32]:
```
plt.figure()
plt.imshow(train_images[0])
plt.colorbar()
plt.grid(False)
plt.show()
```



[33]:
```
train_images = train_images / 255.0
test_images = test_images / 255.0
```

[39]:
```
plt.figure(figsize=(10,10))
for i in range(25):
    plt.subplot(5,5,i+1)
    plt.xticks([])
    plt.yticks([])
    plt.grid(False)
    plt.imshow(train_images[i], cmap=plt.cm.binary)
    plt.xlabel(class_names[train_labels[i]])
plt.show()
```

[40]:
```
import tensorflow as tf
model = tf.keras.Sequential([
tf.keras.layers.Flatten(input_shape=(28, 28)),
tf.keras.layers.Dense(128, activation='relu'),
tf.keras.layers.Dense(10)
])
```

[41]:
```
model.compile(optimizer='adam',
loss=tf.keras.losses.
SparseCategoricalCrossentropy(from_logits=True),
metrics=['accuracy'])
```

[42]:
```
model.fit(train_images, train_labels, epochs=30)
```

```
Epoch 1/30
1875/1875 [==============================] - 6s 3ms/step - loss: 0.4975 -
accuracy: 0.8238
Epoch 2/30
1875/1875 [==============================] - 5s 2ms/step - loss: 0.3739 -
accuracy: 0.8639
Epoch 3/30
1875/1875 [==============================] - 5s 2ms/step - loss: 0.3361 -
accuracy: 0.8771
Epoch 4/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.3113 -
accuracy: 0.8850
Epoch 5/30
1875/1875 [==============================] - 5s 2ms/step - loss: 0.2933 -
accuracy: 0.8914
Epoch 6/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.2784 -
accuracy: 0.8963
Epoch 7/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.2664 -
accuracy: 0.9015
Epoch 8/30
1875/1875 [==============================] - 5s 2ms/step - loss: 0.2583 -
accuracy: 0.9032
Epoch 9/30
1875/1875 [==============================] - 7s 4ms/step - loss: 0.2461 -
accuracy: 0.9081
Epoch 10/30
1875/1875 [==============================] - 6s 3ms/step - loss: 0.2390 -
accuracy: 0.9113
Epoch 11/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.2297 -
accuracy: 0.9135
Epoch 12/30
1875/1875 [==============================] - 6s 3ms/step - loss: 0.2224 -
accuracy: 0.9164
Epoch 13/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.2176 -
accuracy: 0.9186
Epoch 14/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.2096 -
accuracy: 0.9215
Epoch 15/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.2039 -
accuracy: 0.9236
```

```
Epoch 16/30
1875/1875 [==============================] - 5s 2ms/step - loss: 0.1989 -
accuracy: 0.9245
Epoch 17/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.1926 -
accuracy: 0.9275
Epoch 18/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.1858 -
accuracy: 0.9301
Epoch 19/30
1875/1875 [==============================] - 6s 3ms/step - loss: 0.1843 -
accuracy: 0.9305
Epoch 20/30
1875/1875 [==============================] - 7s 4ms/step - loss: 0.1760 -
accuracy: 0.9332
Epoch 21/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.1715 -
accuracy: 0.9349
Epoch 22/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.1671 -
accuracy: 0.9372
Epoch 23/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.1650 -
accuracy: 0.9371
Epoch 24/30
1875/1875 [==============================] - 6s 3ms/step - loss: 0.1614 -
accuracy: 0.9391
Epoch 25/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.1564 -
accuracy: 0.9415
Epoch 26/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.1536 -
accuracy: 0.9421
Epoch 27/30
1875/1875 [==============================] - 7s 4ms/step - loss: 0.1500 -
accuracy: 0.9441
Epoch 28/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.1463 -
accuracy: 0.9442
Epoch 29/30
1875/1875 [==============================] - 6s 3ms/step - loss: 0.1439 -
accuracy: 0.9466
Epoch 30/30
1875/1875 [==============================] - 5s 3ms/step - loss: 0.1416 -
accuracy: 0.9468
```

[42]: <keras.src.callbacks.History at 0x7b5baf9516c0>

[43]:
```
test_loss, test_acc = model.evaluate(test_images, test_labels, verbose=2)
print('\nTest accuracy:', test_acc)
```

```
313/313 - 1s - loss: 0.4120 - accuracy: 0.8847 - 622ms/epoch - 2ms/step

Test accuracy: 0.8847000002861023
```

[44]:
```
probability_model = tf.keras.Sequential([model,
tf.keras.layers.Softmax()])
```

[45]:
```
predictions = probability_model.predict(test_images)
```

```
313/313 [==============================] - 0s 1ms/step
```

[46]:
```
predictions[0]
```

[46]:
```
array([2.1964429e-12, 4.0216148e-17, 6.1392609e-14, 3.7199290e-15,
       5.7292461e-18, 2.1006183e-05, 9.3537848e-16, 6.7640467e-05,
       5.1644106e-12, 9.9991131e-01], dtype=float32)
```

[47]:
```
np.argmax(predictions[0])
```

[47]:
```
9
```

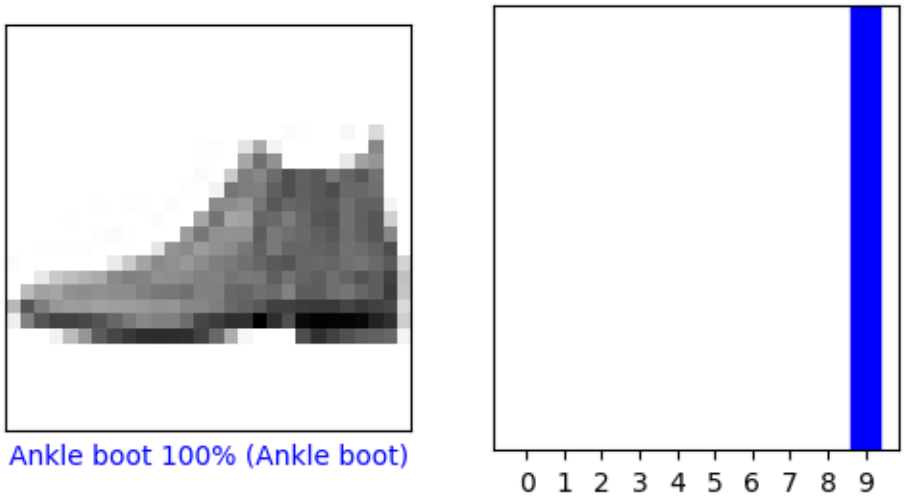
[48]:
```
test_labels[0]
```

[48]:
```
9
```

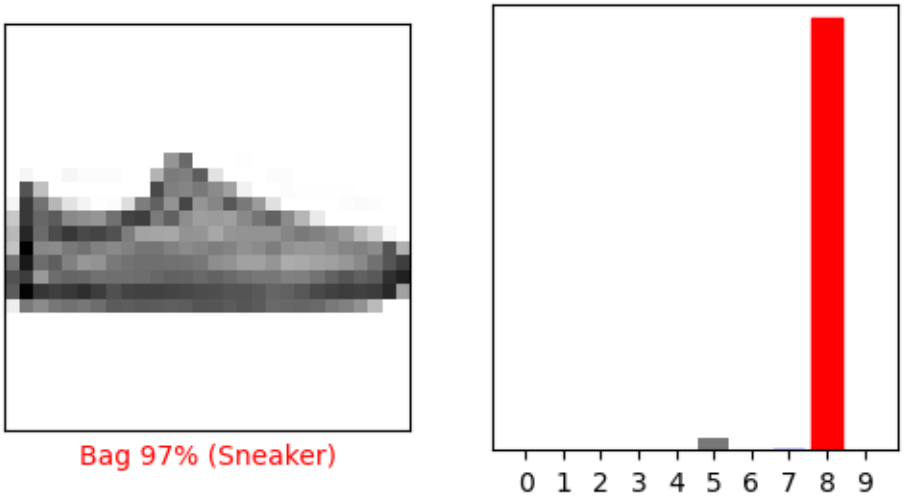
[52]:
```
def plot_image(i, predictions_array, true_label, img):
  true_label, img = true_label[i], img[i]
  plt.grid(False)
  plt.xticks([])
  plt.yticks([])
  plt.imshow(img, cmap=plt.cm.binary)
  predicted_label = np.argmax(predictions_array)

  if predicted_label == true_label:
    color = 'blue'
  else:
    color = 'red'
  plt.xlabel("{} {:2.0f}% ({})".format(class_names[predicted_label],
100*np.max(predictions_array),
class_names[true_label]),
color=color)
def plot_value_array(i, predictions_array, true_label):
  true_label = true_label[i]
  plt.grid(False)
```

```
  plt.xticks(range(10))
  plt.yticks([])
  thisplot = plt.bar(range(10), predictions_array, color="#777777")
  plt.ylim([0, 1])
  predicted_label = np.argmax(predictions_array)
  thisplot[predicted_label].set_color('red')
  thisplot[true_label].set_color('blue')
```

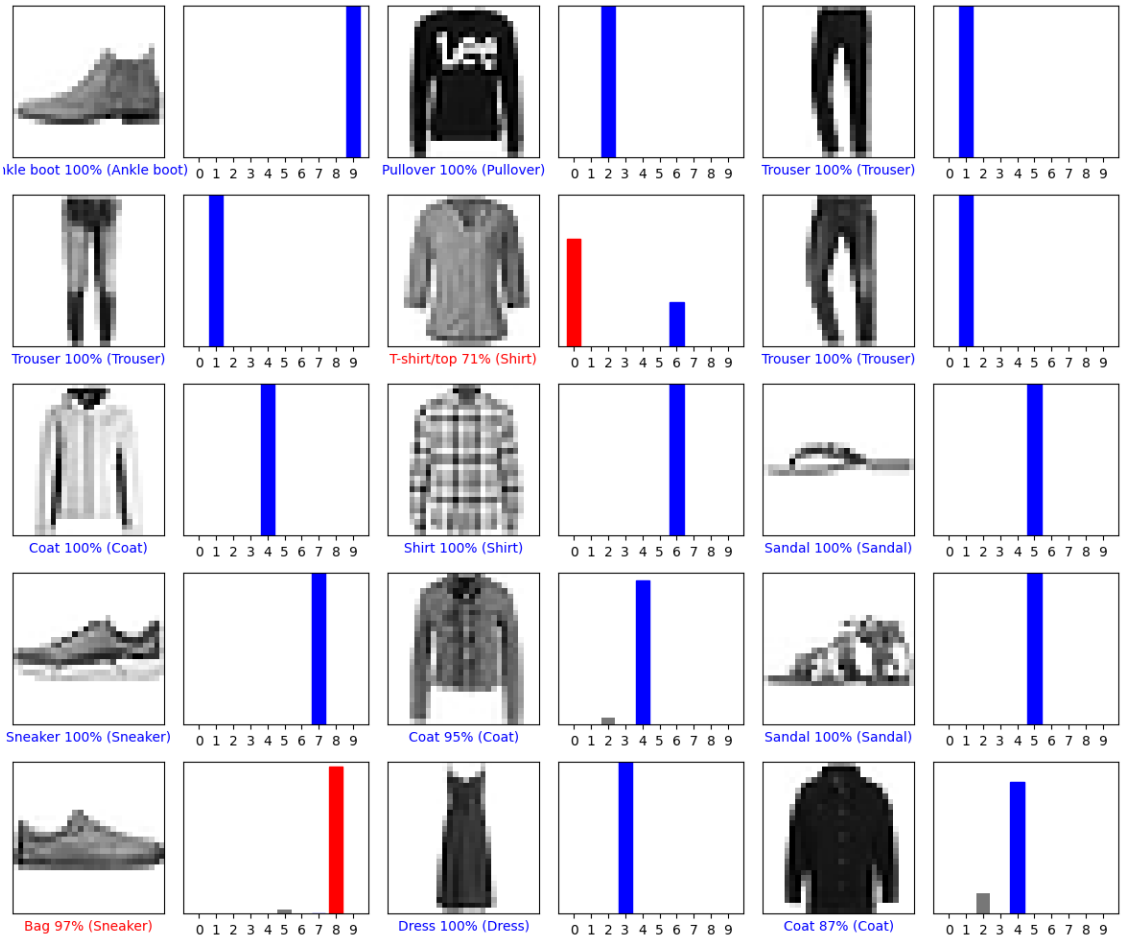
[53]:
```
i = 0
plt.figure(figsize=(6,3))
plt.subplot(1,2,1)
plot_image(i, predictions[i], test_labels, test_images)
plt.subplot(1,2,2)
plot_value_array(i, predictions[i], test_labels)
plt.show()
```



[54]:
```
i = 12
plt.figure(figsize=(6,3))
plt.subplot(1,2,1)
plot_image(i, predictions[i], test_labels, test_images)
plt.subplot(1,2,2)
plot_value_array(i, predictions[i], test_labels)
plt.show()
```



[55]:
```
# Plot the first X test images, their predicted labels, and the true labels.
# Color correct predictions in blue and incorrect predictions in red.
num_rows = 5
num_cols = 3
num_images = num_rows*num_cols
plt.figure(figsize=(2*2*num_cols, 2*num_rows))
for i in range(num_images):
  plt.subplot(num_rows, 2*num_cols, 2*i+1)
  plot_image(i, predictions[i], test_labels, test_images)
  plt.subplot(num_rows, 2*num_cols, 2*i+2)
  plot_value_array(i, predictions[i], test_labels)
  plt.tight_layout()
plt.show()
```
2.6



[55]:
```
2.6
```

[57]:
```
#Grab an image from the test dataset.
img = test_images[1]
print(img.shape)
```

```
(28, 28)
```

[58]:
```
# Add the image to a batch where it's the only member.
img = (np.expand_dims(img,0))
print(img.shape)
```

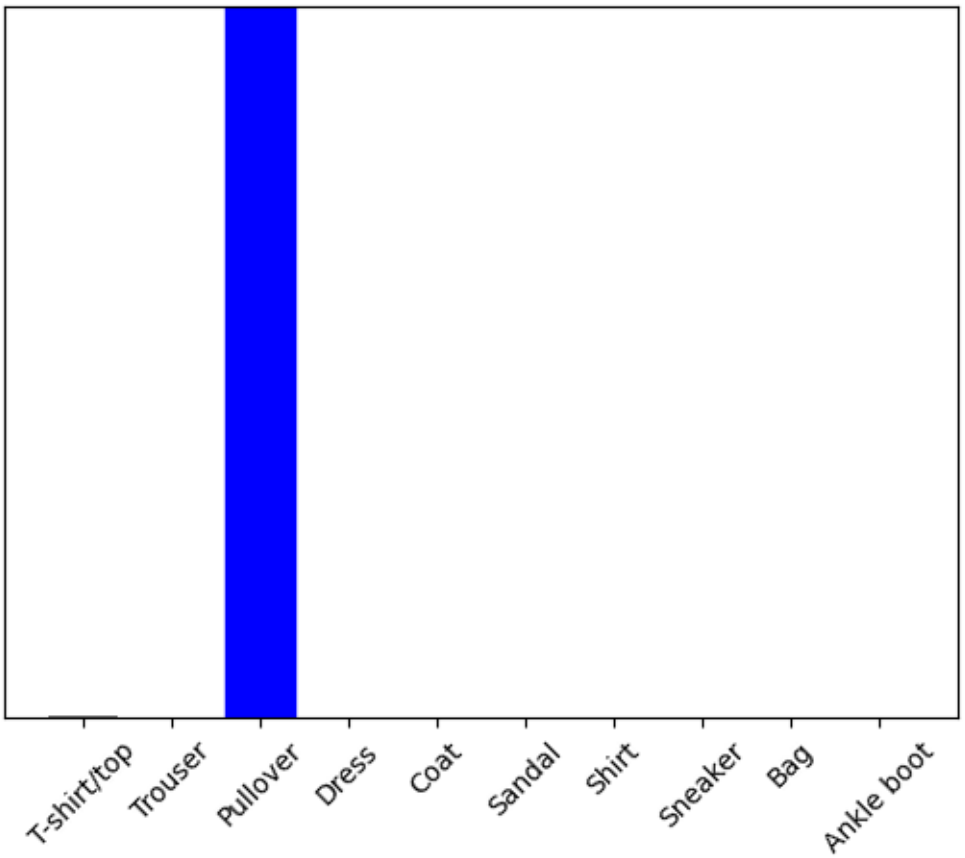
```
(1, 28, 28)
```

[59]:
```
predictions_single = probability_model.predict(img)
print(predictions_single)
```

```
1/1 [==============================] - 0s 26ms/step
```

```
[[6.0373795e-04 1.7264191e-17 9.9938548e-01 5.8309847e-17 8.4143803e-06
  1.0190069e-08 2.3110567e-06 3.4952586e-22 8.2321563e-13 7.7461522e-20]]
```

[60]:
```
plot_value_array(1, predictions_single[0], test_labels)
_ = plt.xticks(range(10), class_names, rotation=45)
plt.show()
```



[61]:
```
np.argmax(predictions_single[0])
```

[61]:
```
2
```