Fashion_ComputerVision

September 1, 2021

1 Training on the Fashion MNIST dataset

1.1 Importing required modules

[1]:

```
from __future__ import absolute_import, division, print_function

# import TensforFlow and TensorFlow Datasets
import tensorflow as tf
import tensorflow_datasets as tfds

# Helper libs
import math
import numpy as np
import matplotlib.pyplot as plt

# Improve progress bar display
import tqdm
import tqdm.auto
tqdm.tqdm = tqdm.auto.tqdm

print(tf.__version__)
```

```
2.5.0
```

[2]:

```
from jupyterthemes import jtplot
jtplot.style(theme='onedork')
```

1.2 Loading the fashion MNIST dataset

[3]:

```
dataset, metadata = tfds.load('fashion_mnist', as_supervised=True,␣
 ↪with_info=True)
train_dataset, test_dataset = dataset['train'], dataset['test']
```

1.2.1 Mapping class names

Label	Class
0	T-shirt/top
1	Trouser

Label	Class
2	Pullover
3	Dress
4	Coat
5	Sandal
6	Shirt
7	Sneaker
8	Bag
9	Ankle boot

[4]:

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

1.3 Exploratory data analysis

[5]:

```
num_train_examples = metadata.splits['train'].num_examples
num_test_examples = metadata.splits['test'].num_examples
print("Number of training examples: {}".format(num_train_examples))
print("Number of test examples:     {}".format(num_test_examples))
```

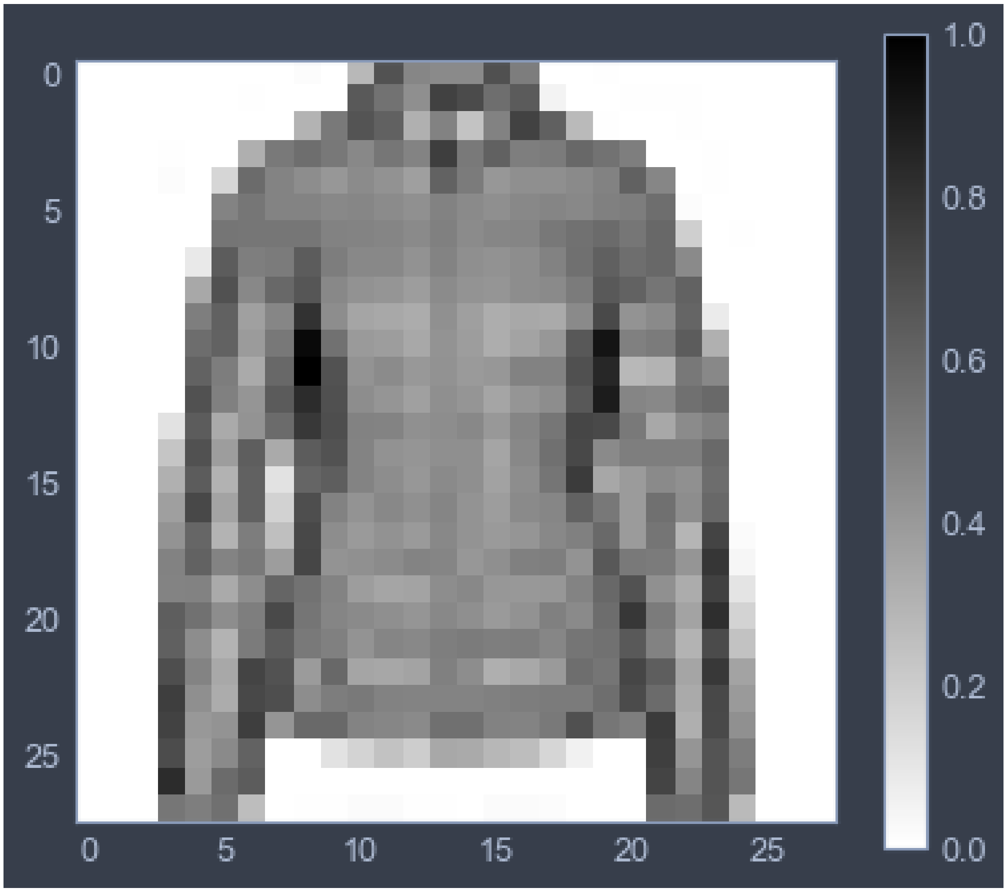
```
Number of training examples: 60000
Number of test examples:     10000
```

[6]:

```
def normalize(images, labels):
    images = tf.cast(images, tf.float32)
    images /= 255
    return images, labels

train_dataset = train_dataset.map(normalize)
test_dataset = test_dataset.map(normalize)
```

[7]:

```
for image, label in test_dataset.take(1):
    break
image = image.numpy().reshape((28, 28))

plt.figure()
plt.imshow(image, cmap=plt.cm.binary)
plt.colorbar()
plt.grid(False)
plt.show()
```



[8]:

```
plt.figure(figsize=(10, 10))
i = 0
for (image, label) in test_dataset.take(25):
    image = image.numpy().reshape((28, 28))
    plt.subplot(5, 5, i+1)
    plt.xticks([])
    plt.yticks([])
    plt.grid(False)
    plt.imshow(image, cmap=plt.cm.binary)
    plt.xlabel(class_names[label])
    i += 1

plt.show()
```

1.4 Building the model

The model consists of 1 input layer with flattened image data, 1 hidden layer with ReLU activation and 1 softmax output layer

[9]:
```
model = tf.keras.Sequential([
    tf.keras.layers.Flatten(input_shape=(28, 28, 1)),
    tf.keras.layers.Dense(128, activation=tf.nn.relu),
    tf.keras.layers.Dense(10, activation=tf.nn.softmax)
])
```

[10]:

```
model.compile(optimizer='adam',
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])
```

1.5 Training the model

[11]:

```
BATCH_SIZE = 32
train_dataset = train_dataset.repeat().shuffle(num_train_examples).
 ↪batch(BATCH_SIZE)
test_dataset = test_dataset.batch(BATCH_SIZE)
```

[12]:

```
model.fit(train_dataset, epochs=5, steps_per_epoch=math.ceil(num_train_examples/
 ↪BATCH_SIZE))
```

```
Epoch 1/5
1875/1875 [==============================] - 11s 4ms/step - loss: 0.4921 -
accuracy: 0.8256
Epoch 2/5
1875/1875 [==============================] - 8s 4ms/step - loss: 0.3719 -
accuracy: 0.8644
Epoch 3/5
1875/1875 [==============================] - 8s 5ms/step - loss: 0.3337 -
accuracy: 0.8785
Epoch 4/5
1875/1875 [==============================] - 13s 7ms/step - loss: 0.3112 -
accuracy: 0.8863
Epoch 5/5
1875/1875 [==============================] - 13s 7ms/step - loss: 0.2883 -
accuracy: 0.8945
```

[12]:

```
<tensorflow.python.keras.callbacks.History at 0x177ac109af0>
```

[13]:

```
test_loss, test_accuracy = model.evaluate(test_dataset, steps=math.
 ↪ceil(num_test_examples/32))
print('Accuracy on test dataset:', test_accuracy)
```

```
313/313 [==============================] - 1s 3ms/step - loss: 0.3606 -
accuracy: 0.8726
Accuracy on test dataset: 0.8726000189781189
```

2 Make predictions

[14]:

```
for test_images, test_labels in test_dataset.take(1):
    test_images = test_images.numpy()
    test_labels = test_labels.numpy()
    predictions = model.predict(test_images)
```

[15]:

```
predictions.shape
```

[15]:

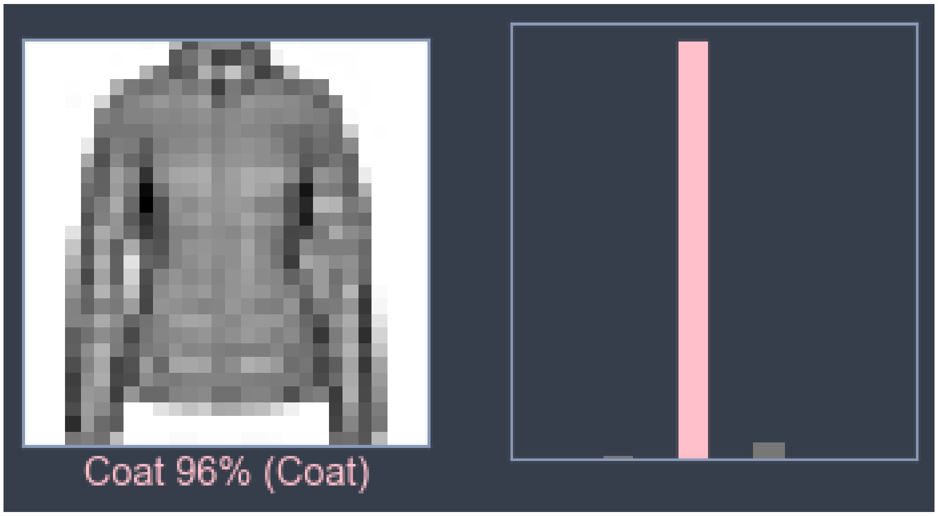
```
(32, 10)
```

[16]:

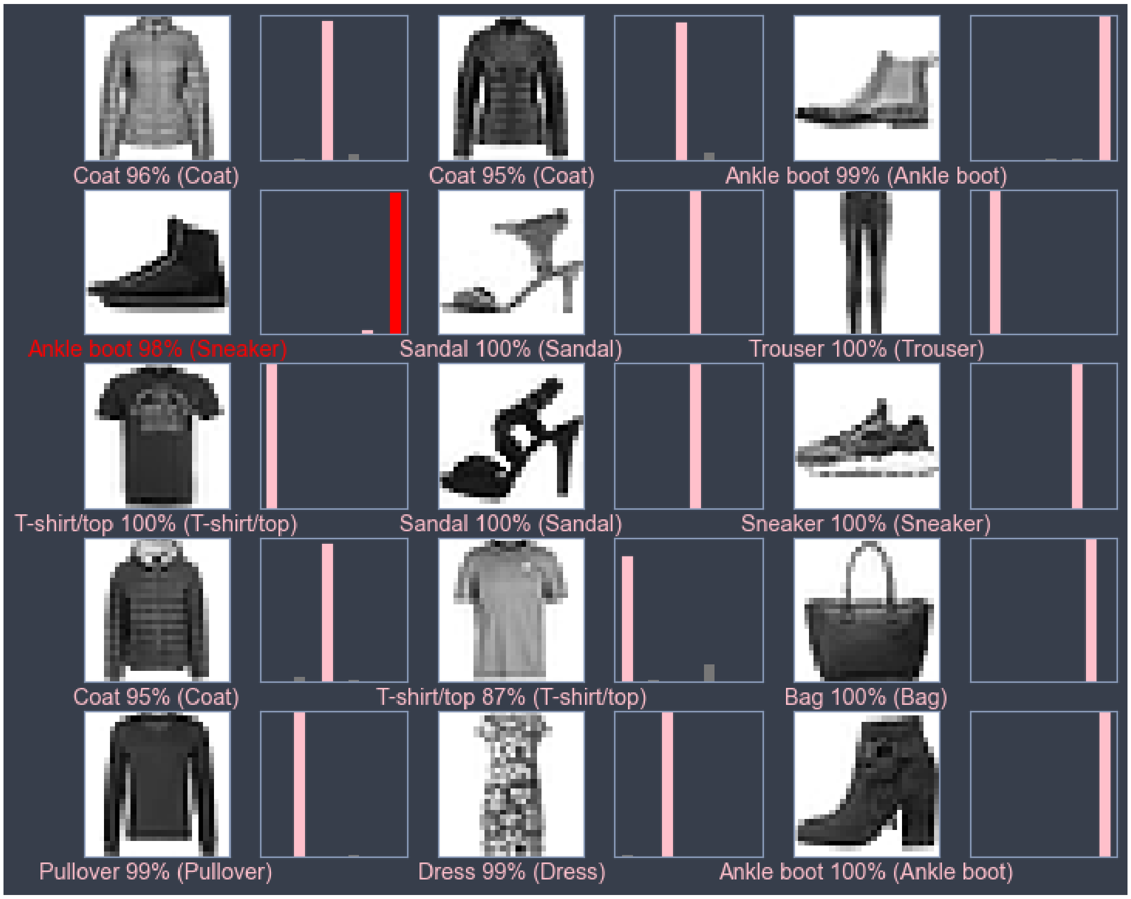
```
def plot_image(i, predictions_array, true_labels, images):
    predictions_array, true_label, img = predictions_array[i], true_labels[i],␣
 ↪images[i]
    plt.grid(False)
    plt.xticks([])
    plt.yticks([])
    plt.imshow(img[..., 0], cmap=plt.cm.binary)

    predicted_label = np.argmax(predictions_array)
    if predicted_label == true_label:
        color = 'pink'
    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):
    predictions_array, true_label = predictions_array[i], true_label[i]
    plt.grid(False)
    plt.xticks([])
    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('pink')
```

[17]:

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



```
[18]: 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, test_labels, test_images)
    plt.subplot(num_rows, 2*num_cols, 2*i+2)
    plot_value_array(i, predictions, test_labels)
```



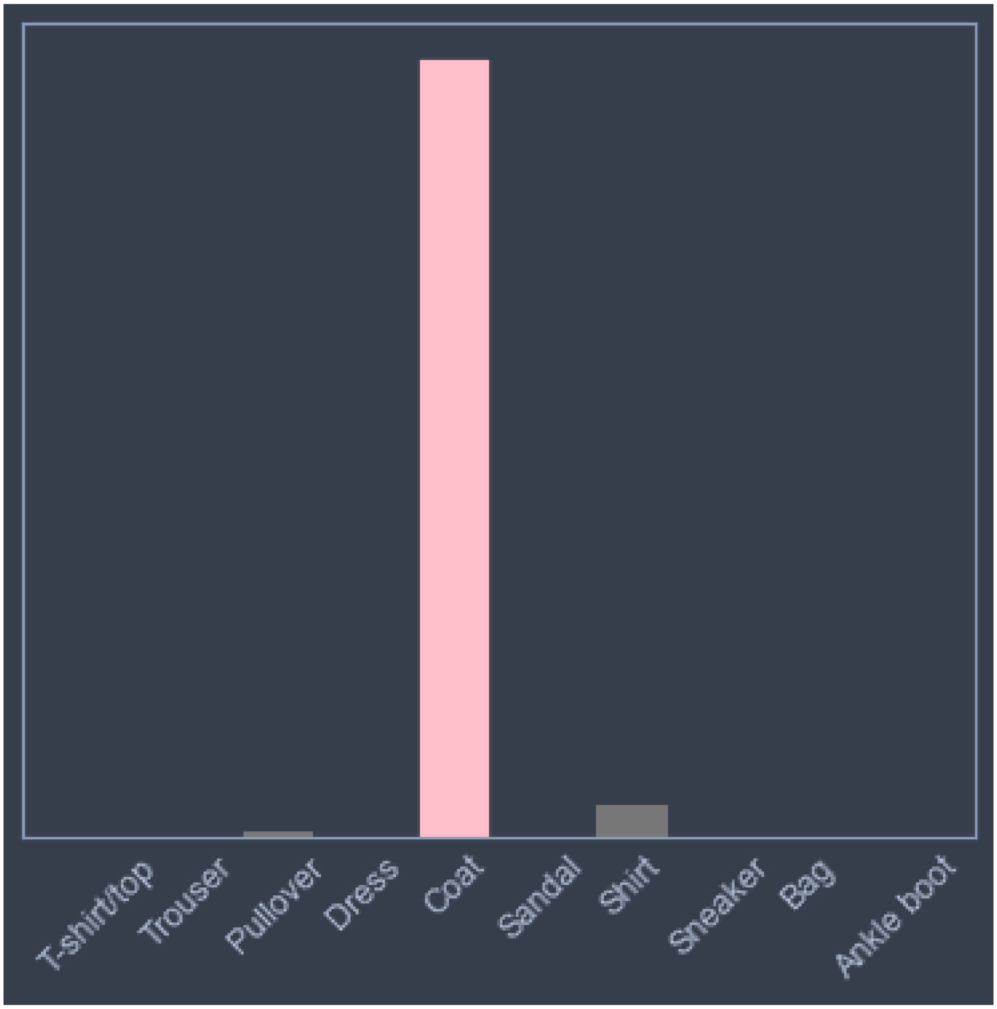
[19]:

```
img = test_images[0]
img = np.array([img])

predictions_single = model.predict(img)
print(predictions_single)
```

```
[[8.6477494e-06 9.4196047e-08 5.8491817e-03 1.3625237e-06 9.5572501e-01
  1.9251620e-10 3.8415466e-02 4.6543602e-12 1.9791722e-07 5.0144400e-10]]
```

[20]:

```
plot_value_array(0, predictions_single, test_labels)
_ = plt.xticks(range(10), class_names, rotation=45)
```


T-shirt/top
Trouser
Pullover
Dress
Coat
Sandal
Shirt
Sneaker
Bag
Ankle boot