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#Roll N.o :- 4107

#Div :- A

#Practical N.o 3 :- Use MNIST Fashion Dataset and create a classifier to classify fashion clothing into categories.

In [1]:

```
import tensorflow as tf
import matplotlib.pyplot as plt
from tensorflow import keras
import numpy as np

(x_train, y_train), (x_test, y_test) = keras.datasets.fashion_mnist.load_data()
```

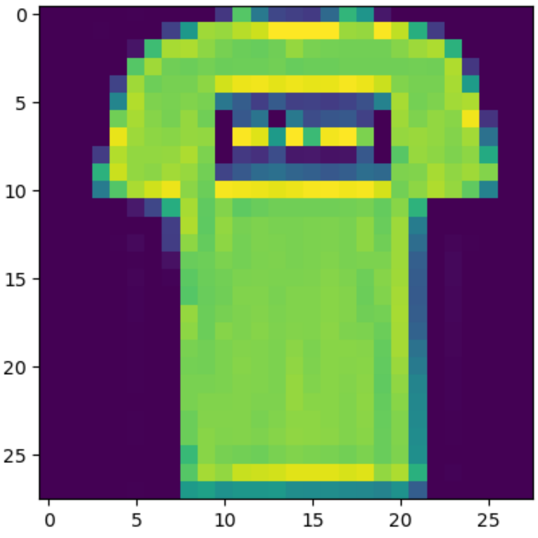
```
WARNING:tensorflow:From C:\Users\Omkar\AppData\Local\anaconda3\Lib\site-packages\keras\src\losses.py:2976: The name tf.losses.sparse_softmax_cross_e

Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-labels-idx1-ubyte.gz
29515/29515 [==============================] - 0s 17us/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-images-idx3-ubyte.gz
26421880/26421880 [==============================] - 8s 0us/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/t10k-labels-idx1-ubyte.gz
5148/5148 [==============================] - 0s 0s/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/t10k-images-idx3-ubyte.gz
4422102/4422102 [==============================] - 0s 0us/step
```

In [2]:

```
plt.imshow(x_train[1])
```

Out [2]:

```
<matplotlib.image.AxesImage at 0x20d4b645b90>
```

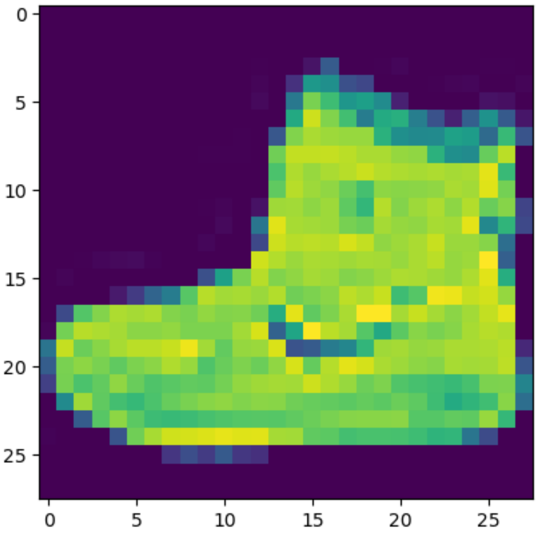


In [3]:

```
plt.imshow(x_train[0])
```

Out [3]:

```
<matplotlib.image.AxesImage at 0x20d51fb7010>
```



In [4]:

```
x_train = x_train.astype('float32') / 255.0
x_test = x_test.astype('float32') / 255.0
```

In [5]:

```
x_train = x_train.reshape(-1, 28, 28, 1)
x_test = x_test.reshape(-1, 28, 28, 1)
```

In [6]:

```
model = keras.Sequential([
    keras.layers.Conv2D(32, (3,3), activation='relu', input_shape=(28,28,1)),
    keras.layers.MaxPooling2D((2,2)),
    keras.layers.Dropout(0.25),
    keras.layers.Conv2D(64, (3,3), activation='relu'),
    keras.layers.MaxPooling2D((2,2)),
    keras.layers.Dropout(0.25),
    keras.layers.Conv2D(128, (3,3), activation='relu'),
    keras.layers.Flatten(),
    keras.layers.Dense(128, activation='relu'),
    keras.layers.Dropout(0.25),
    keras.layers.Dense(10, activation='softmax')
])
```

```
WARNING:tensorflow:From C:\Users\Omkar\AppData\Local\anaconda3\Lib\site-packages\keras\src\backend.py:873: The name tf.get_default_graph is deprecat

WARNING:tensorflow:From C:\Users\Omkar\AppData\Local\anaconda3\Lib\site-packages\keras\src\layers\pooling\max_pooling2d.py:161: The name tf.nn.max_p
```

In [7]:

```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 26, 26, 32)        320

 max_pooling2d (MaxPooling2  (None, 13, 13, 32)        0
 D)

 dropout (Dropout)           (None, 13, 13, 32)        0

 conv2d_1 (Conv2D)           (None, 11, 11, 64)        18496

 max_pooling2d_1 (MaxPoolin  (None, 5, 5, 64)          0
 g2D)

 dropout_1 (Dropout)         (None, 5, 5, 64)          0

 conv2d_2 (Conv2D)           (None, 3, 3, 128)         73856

 flatten (Flatten)           (None, 1152)              0

 dense (Dense)               (None, 128)               147584

 dropout_2 (Dropout)         (None, 128)               0

 dense_1 (Dense)             (None, 10)                1290

=================================================================
Total params: 241546 (943.54 KB)
Trainable params: 241546 (943.54 KB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

In [8]:

```
model.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy'])
history = model.fit(x_train, y_train, epochs=10, validation_data=(x_test, y_test))
```

```
WARNING:tensorflow:From C:\Users\Omkar\AppData\Local\anaconda3\Lib\site-packages\keras\src\optimizers\__init__.py:309: The name tf.train.Optimizer i

Epoch 1/10
WARNING:tensorflow:From C:\Users\Omkar\AppData\Local\anaconda3\Lib\site-packages\keras\src\utils\tf_utils.py:492: The name tf.ragged.RaggedTensorVal

WARNING:tensorflow:From C:\Users\Omkar\AppData\Local\anaconda3\Lib\site-packages\keras\src\engine\base_layer_utils.py:384: The name tf.executing_eag

1875/1875 [==============================] - 53s 27ms/step - loss: 0.5682 - accuracy: 0.7863 - val_loss: 0.3773 - val_accuracy: 0.8608
Epoch 2/10
1875/1875 [==============================] - 48s 26ms/step - loss: 0.3745 - accuracy: 0.8629 - val_loss: 0.3166 - val_accuracy: 0.8855
Epoch 3/10
1875/1875 [==============================] - 48s 25ms/step - loss: 0.3226 - accuracy: 0.8813 - val_loss: 0.2926 - val_accuracy: 0.8933
Epoch 4/10
1875/1875 [==============================] - 51s 27ms/step - loss: 0.2987 - accuracy: 0.8904 - val_loss: 0.2813 - val_accuracy: 0.8984
Epoch 5/10
1875/1875 [==============================] - 50s 26ms/step - loss: 0.2798 - accuracy: 0.8967 - val_loss: 0.2705 - val_accuracy: 0.9028
Epoch 6/10
1875/1875 [==============================] - 50s 27ms/step - loss: 0.2661 - accuracy: 0.9015 - val_loss: 0.2616 - val_accuracy: 0.9064
Epoch 7/10
1875/1875 [==============================] - 50s 27ms/step - loss: 0.2573 - accuracy: 0.9036 - val_loss: 0.2633 - val_accuracy: 0.9039
Epoch 8/10
1875/1875 [==============================] - 51s 27ms/step - loss: 0.2454 - accuracy: 0.9076 - val_loss: 0.2655 - val_accuracy: 0.9045
Epoch 9/10
1875/1875 [==============================] - 54s 29ms/step - loss: 0.2385 - accuracy: 0.9115 - val_loss: 0.2564 - val_accuracy: 0.9085
Epoch 10/10
1875/1875 [==============================] - 51s 27ms/step - loss: 0.2309 - accuracy: 0.9140 - val_loss: 0.2503 - val_accuracy: 0.9079
```

In [9]:

```
test_loss, test_acc = model.evaluate(x_test, y_test)
print('Test accuracy:', test_acc)
```

```
313/313 [==============================] - 2s 7ms/step - loss: 0.2503 - accuracy: 0.9079
Test accuracy: 0.9078999757766724
```

In [ ]: