DL Pac 3B

In [2]:

```
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()
```

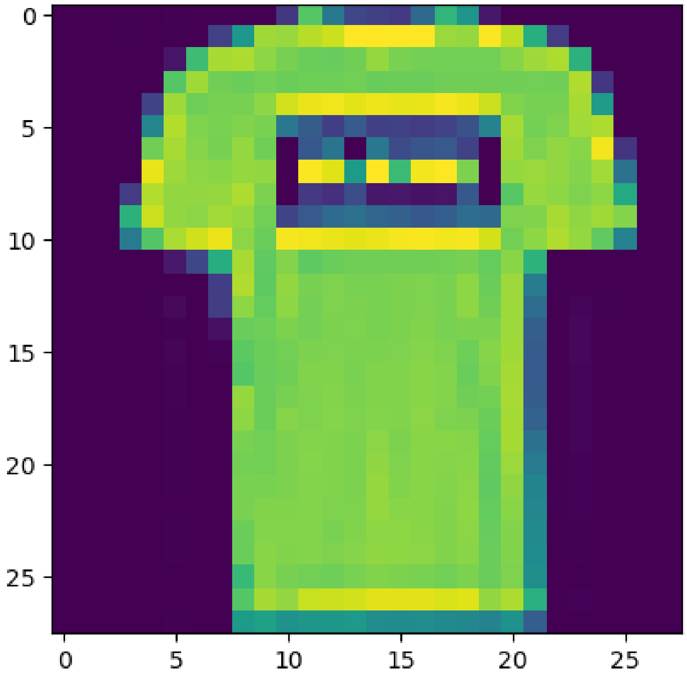
```
WARNING:tensorflow:From C:\Users\rushi\anaconda3\lib\site-packages\keras\src\losses.py:2976:
The name tf.losses.sparse_softmax_cross_entropy is deprecated. Please use tf.compat.v1.losse
s.sparse_softmax_cross_entropy instead.

Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-label
s-idx1-ubyte.gz (https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-labels-idx
1-ubyte.gz)
29515/29515 [==============================] - 0s 0s/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-image
s-idx3-ubyte.gz (https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-images-idx
3-ubyte.gz)
26421880/26421880 [==============================] - 8s 0us/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/t10k-labels
-idx1-ubyte.gz (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 (https://storage.googleapis.com/tensorflow/tf-keras-datasets/t10k-images-idx3-
ubyte.gz)
4422102/4422102 [==============================] - 1s 0us/step
```

In [3]:

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

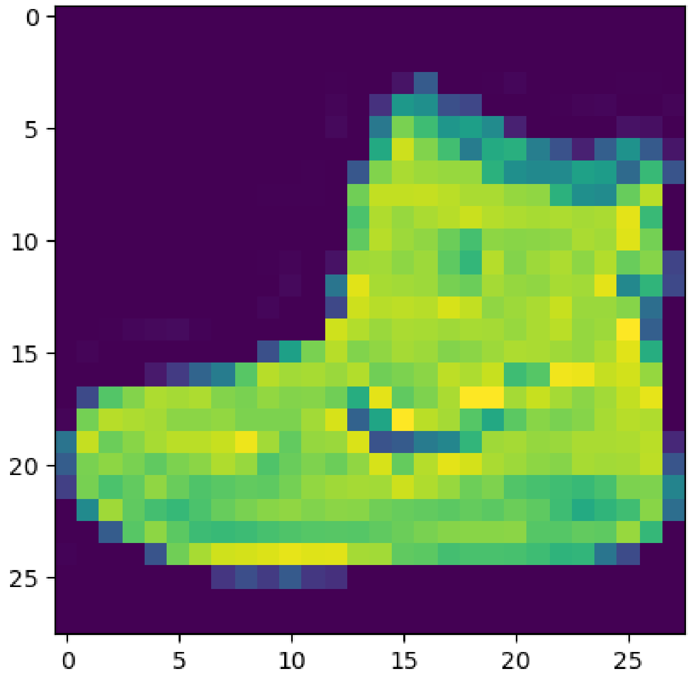
Out[3]:

```
<matplotlib.image.AxesImage at 0x27b68d9e820>
```



In [4]:
```
plt.imshow(x_train[0])
```

Out[4]:
```
<matplotlib.image.AxesImage at 0x27b68e1f850>
```



In [6]:
```
# Next, we will preprocess the data by scaling the pixel values to be between 0 and 1, and then
x_train = x_train.astype('float32') / 255.0
x_test = x_test.astype('float32') / 255.0
x_train = x_train.reshape(-1, 28, 28, 1)
x_test = x_test.reshape(-1, 28, 28, 1)
```

In [8]:
```
x_train.shape
```

Out[8]:
```
(60000, 28, 28, 1)
```

In [9]:
```
x_test.shape
```

Out[9]:
```
(10000, 28, 28, 1)
```

In [10]:
```
y_train.shape
```

Out[10]:
```
(60000,)
```

In [11]:
```
y_test.shape
```

Out[11]:
```
(10000,)
```

In [14]:

```python
model = keras.Sequential([
    keras.layers.Conv2D(32, (3, 3), activation='relu', input_shape=(28, 28, 1)),
    keras.layers.MaxPooling2D((2, 2)),
    # It shows a 13 * 13 size image with 32 channels or filters or depth.
    keras.layers.Dropout(0.25),
    # Reduce Overfitting of Training sample drop out 25% Neuron
    keras.layers.Conv2D(64, (3, 3), activation='relu'),
    # 64 * 3 * 3 = 576 + 1 = 577 * 32 + 32(bias) = 18496
    keras.layers.MaxPooling2D((2, 2)),
    # It shows a 5 * 5 size image with 64 channels or filters or depth.
    keras.layers.Dropout(0.25),
    keras.layers.Conv2D(128, (3, 3), activation='relu'),
    # We need to flatten the 3x3x128 feature map to a vector of size 1152
    keras.layers.Flatten(),
    keras.layers.Dense(128, activation='relu'),
    keras.layers.Dropout(0.25),
    keras.layers.Dense(10, activation='softmax')
])

model.summary()
```

```
WARNING:tensorflow:From C:\Users\rushi\anaconda3\lib\site-packages\keras\src\backend.py:873:
The name tf.get_default_graph is deprecated. Please use tf.compat.v1.get_default_graph instea
d.

WARNING:tensorflow:From C:\Users\rushi\anaconda3\lib\site-packages\keras\src\layers\pooling\m
ax_pooling2d.py:161: The name tf.nn.max_pool is deprecated. Please use tf.nn.max_pool2d inste
ad.

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 [ ]:

```
# Compile and Train the Model
# After defining the model, we will compile it and train it on the training data.
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))
```

In [18]:

```
test_loss, test_acc = model.evaluate(x_test, y_test, verbose=2)
print('Test accuracy:', test_acc)
```

```
313/313 - 1s - loss: 0.2541 - accuracy: 0.9101 - 1s/epoch - 5ms/step
Test accuracy: 0.910099983215332
```