# Import the necessary packages

```
In [10]:
```

```
import matplotlib.pyplot as plt
from keras.utils import np_utils
from tensorflow.keras.datasets import mnist
```

# Load the data

```
In [2]:
```

```
(X_train, y_train), (X_test, y_test) = mnist.load_data()
```

# **Data Analysis**

```
In [3]:
```

```
print(X_train.shape)
print(X_test.shape)

(60000, 28, 28)
(10000, 28, 28)
```

## In [4]:

```
X train[0]
```

#### Out[4]:

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```

## In [5]:

y train[0]

#### Out[5]:

5

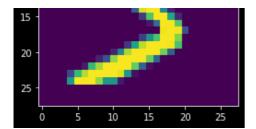
## In [7]:

```
plt.imshow(X train[0])
```

#### Out[7]:

<matplotlib.image.AxesImage at 0x299039b90f0>





# **Data Pre-Processing**

## In [8]:

```
X_train = X_train.reshape(60000, 28, 28, 1).astype('float32')
X_test = X_test.reshape(10000, 28, 28, 1).astype('float32')
```

## In [11]:

```
number_of_classes = 10
Y_train = np_utils.to_categorical(y_train, number_of_classes)
Y_test = np_utils.to_categorical(y_test, number_of_classes)
```

## In [12]:

```
Y train[0]
```

## Out[12]:

array([0., 0., 0., 0., 0., 1., 0., 0., 0., 0.], dtype=float32)