```
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Dropout, LSTM
```

```
mnist = tf.keras.datasets.mnist  # mnist is a dataset of 28x28 images of handwritten digits and their labels
(x_train, y_train),(x_test, y_test) = mnist.load_data()  # unpacks images to x_train/x_test and labels to y_train/y_test

x_train = x_train/255.0
x_test = x_test/255.0

print(x_train.shape)
print(x_train[0].shape)
```

```
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11490434/11490434 [==============================] - 0s 0us/step
(60000, 28, 28)
(28, 28)
```

```
model = Sequential()
model.add(LSTM(128, input_shape=(x_train.shape[1:]), activation='relu', return_sequences=True))
model.add(Dropout(0.2))

model.add(LSTM(128, activation='relu'))
model.add(Dropout(0.1))

model.add(Dense(32, activation='relu'))
model.add(Dropout(0.2))

model.add(Dense(10, activation='softmax'))


opt = tf.keras.optimizers.Adam(lr=0.001) #, decay=1e-6)

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

model.fit(x_train,
          y_train,
          epochs=3,
          validation_data=(x_test, y_test))
```

```
WARNING:absl:`lr` is deprecated in Keras optimizer, please use `learning_rate` or use the legacy optimizer, e.g.,tf.keras.optimizers.legacy.Adam.
Epoch 1/3
1875/1875 [==============================] - 175s 92ms/step - loss: 0.6887 - accuracy: 0.7706 - val_loss: 0.1512 - val_accuracy: 0.9571
Epoch 2/3
1875/1875 [==============================] - 174s 93ms/step - loss: 0.1633 - accuracy: 0.9559 - val_loss: 0.0866 - val_accuracy: 0.9752
Epoch 3/3
1875/1875 [==============================] - 172s 92ms/step - loss: 0.1169 - accuracy: 0.9694 - val_loss: 0.0958 - val_accuracy: 0.9720
<keras.src.callbacks.History at 0x7afdec0f9a20>
```