```
import tensorflow as tf

# Load the data
(train_data, train_labels), (test_data, test_labels) = tf.keras.datasets.mnist.load_data()

# Preprocess the data
train_data = train_data.reshape((60000, 784)) / 255.0
test_data = test_data.reshape((10000, 784)) / 255.0
train_labels = tf.keras.utils.to_categorical(train_labels)
test_labels = tf.keras.utils.to_categorical(test_labels)

# Define the model architecture
model = tf.keras.models.Sequential([
    tf.keras.layers.Dense(128, activation='relu', input_shape=(784,), kernel_regularizer=tf.keras.regularizers.l2(0.01)),
    tf.keras.layers.Dense(64, activation='relu', kernel_regularizer=tf.keras.regularizers.l2(0.01)),
    tf.keras.layers.Dense(10, activation='softmax')
])

# Compile the model
model.compile(optimizer=tf.keras.optimizers.Adam(learning_rate=0.001),
              loss='categorical_crossentropy',
              metrics=['accuracy'])

# Train the model
history = model.fit(train_data, train_labels,
                    epochs=10,
                    batch_size=128,
                    validation_data=(test_data, test_labels))
```

```
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11490434/11490434 [==============================] - 1s 0us/step
Epoch 1/10
469/469 [==============================] - 4s 7ms/step - loss: 1.1297 - accuracy: 0.8826 - val_loss: 0.5958 - val_accuracy: 0.9244
Epoch 2/10
469/469 [==============================] - 4s 8ms/step - loss: 0.5593 - accuracy: 0.9208 - val_loss: 0.4954 - val_accuracy: 0.9313
Epoch 3/10
469/469 [==============================] - 5s 11ms/step - loss: 0.4877 - accuracy: 0.9307 - val_loss: 0.4528 - val_accuracy: 0.9392
Epoch 4/10
469/469 [==============================] - 5s 11ms/step - loss: 0.4497 - accuracy: 0.9367 - val_loss: 0.4324 - val_accuracy: 0.9417
Epoch 5/10
469/469 [==============================] - 6s 13ms/step - loss: 0.4229 - accuracy: 0.9401 - val_loss: 0.3885 - val_accuracy: 0.9497
Epoch 6/10
469/469 [==============================] - 3s 6ms/step - loss: 0.3990 - accuracy: 0.9449 - val_loss: 0.4030 - val_accuracy: 0.9416
Epoch 7/10
469/469 [==============================] - 3s 6ms/step - loss: 0.3829 - accuracy: 0.9462 - val_loss: 0.3648 - val_accuracy: 0.9547
Epoch 8/10
469/469 [==============================] - 3s 6ms/step - loss: 0.3647 - accuracy: 0.9505 - val_loss: 0.3445 - val_accuracy: 0.9516
Epoch 9/10
469/469 [==============================] - 4s 8ms/step - loss: 0.3527 - accuracy: 0.9511 - val_loss: 0.3315 - val_accuracy: 0.9564
Epoch 10/10
469/469 [==============================] - 3s 6ms/step - loss: 0.3405 - accuracy: 0.9530 - val_loss: 0.3282 - val_accuracy: 0.9536
```