Testing the Network on a Subset

Now that we have trained the network, at least on a small subset of $100$ records, we want to test how well that works.

We do this against the second data set, the test dataset. We first need to get at the test records, and the Python code is very similar to that used to get the training data.

```
# load the mnist test data CSV file into a list
test_data_file = open("mnist_test_10.csv", 'r')
test_data_list = test_data_file.readlines()
test_data_file.close()
```

We unpack this data in the same way as before, because it has the same structure.

```
# load the mnist test data CSV file into a list
test_data_file = open("mnist_test_10.csv", 'r')
test_data_list = test_data_file.readlines()
test_data_file.close()

#get the first test record
all_values = test_data_list[0].split(',')
#print the label
print(all_values[0])
```

Before we create a loop to go through all the test records, let’s just see what happens if we manually run one test. The following shows the second record from the test dataset being used to query the now trained neural network.

```
image_array = numpy.asfarray(all_values[1:]).reshape((28,28))
matplotlib.pyplot.imshow(image_array, cmap = 'Greys', interpolation = 'None')
matplotlib.pyplot.savefig("output/samplePlot2.png")
matplotlib.pyplot.savefig('output/samplePlot3.png')
```

You can see that the label for the second record from the test data set is "9”. That’s what we hope the neural network will answer when we query it. Plotting the pixel values as an image confirms the handwritten number is indeed a “9”. Now query the trained network to see what is shows:

```
#Querying the trained network
print (n.query((numpy.asfarray(all_values[1:]) / 255.0 * 0.99) + 0.01))
```

Querying the trained network produces a list of numbers, the outputs from each of the output nodes. You can quickly see that one output value is much larger than the others, and is the one corresponding to the label “9”. That’s the *tenth* element because the first one corresponds to the label “0”.

It worked! This is the real moment to savor. All our hard work throughout this guide was worth it! We trained our neural network, and we just got it to tell is what it thinks is the number represented by that picture. Remember that it hasn’t seen that picture before, it wasn’t part of the training dataset. So the neural network was able to correctly classify a handwritten character that it had not seen before. That is massive!

With just a few lines of simple Python, we have created a neural network that learns to do something that many people would consider artificial intelligence — it learns to recognize images of human handwriting. This is even more impressive given that we only trained on a tiny subset of the full training data set. Remember that training data set has $60,000$ records, and we only trained on 100. I personally didn’t think it would work!