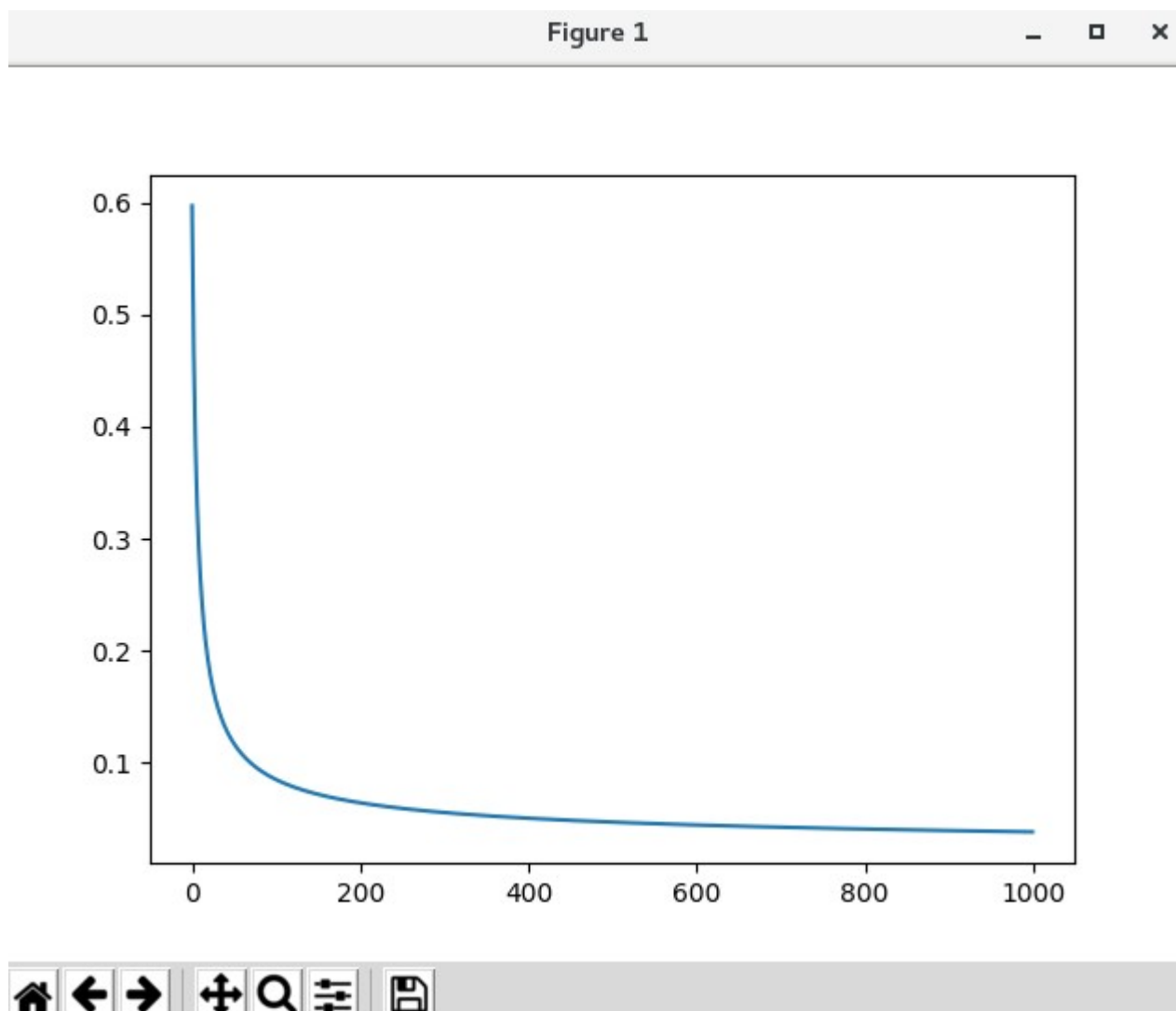


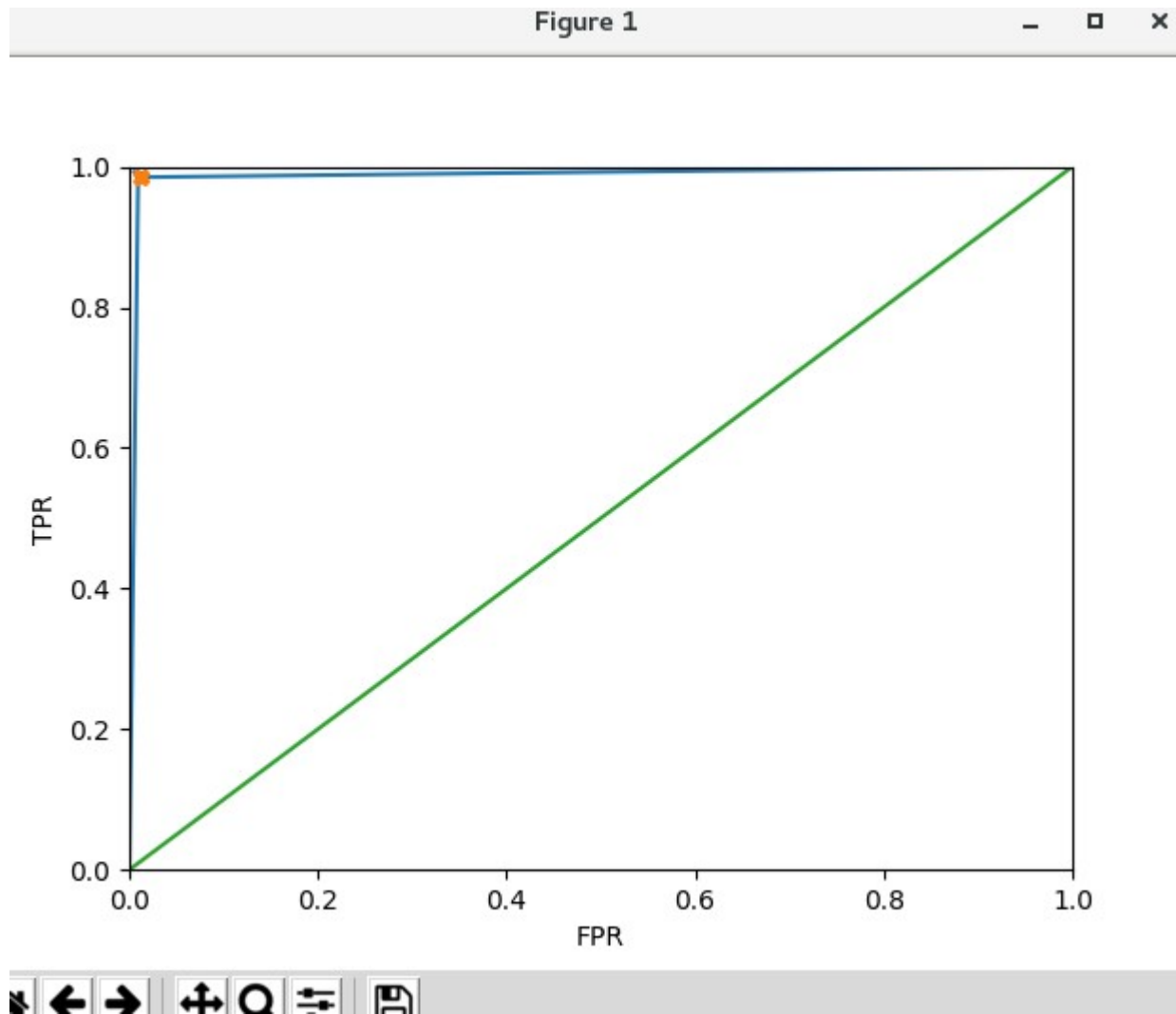
For this assignment I imported the MNIST data set which consisted of pixel data with a label of 6 & 8. I used the sklearn to implement k-folding. The library provided an array of values that acted as pointers.

For each fold I created test data and training data arrays and separated the labels. Data and labels were normalized to treat the data for the gradient ascent algorithm. The gradient was calculated by $\text{dot}(X.T, y - \text{prediction})$. Predictions were calculated using dot product of weights and features, that were fed into the sigmoid functions. A cost curve was calculated using an equation which calculated the cost of labels 0 and 1 independently. The results were then added together, this assured that the equation produced a convex cost function.

The TPR and FPR were then calculated using the results and determining if the algorithms prediction was a true positive, false positive, true negative, false negative. The array was then mapped to produce a ROC curve. TPR and FPR were averaged and marked with an 'X' on the ROC curve.
Cost Curve



ROC Curve



TPR: [0.9898734177215189, 0.9875930521091811, 0.9848866498740554, 0.9879227053140096, 0.9803439803439803, 0.980440097799511, 0.9776674937965261, 0.9906976744186047, 0.9926108374384236, 0.9849624060150376]

FPR: [0.009411764705882352, 0.016786570743405275, 0.01182033096926714, 0.007389162561576354, 0.012106537530266344, 0.014598540145985401, 0.011990407673860911, 0.01282051282051282, 0.004830917874396135, 0.009501187648456057]

Avg TPR: 0.9856998314830848

Avg FPR: 0.011125593267360878