Results

Part 1

Initial Weight Vectors:

wj1=[0.707 1 1]
wj2=[-1.63 1 1]
wk=[-1 0.4 -0.6]

Number of epochs: r = 58

Final Weight Vectors:

wj1=[1.0741 1.2538 1.2538]
wj2=[-1.4063 1.4171 1.4171]
wk=[-1.33 1.5676 -1.5814]

Accuracy: 100%
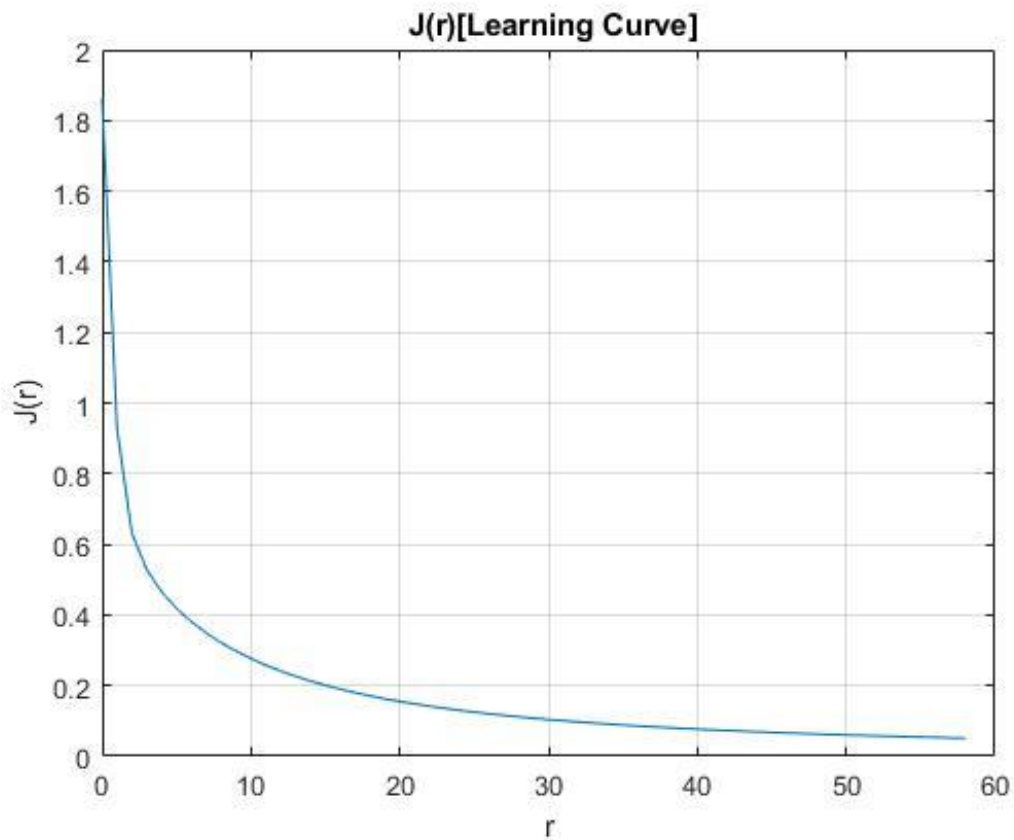

Figure 1: Learning Curve
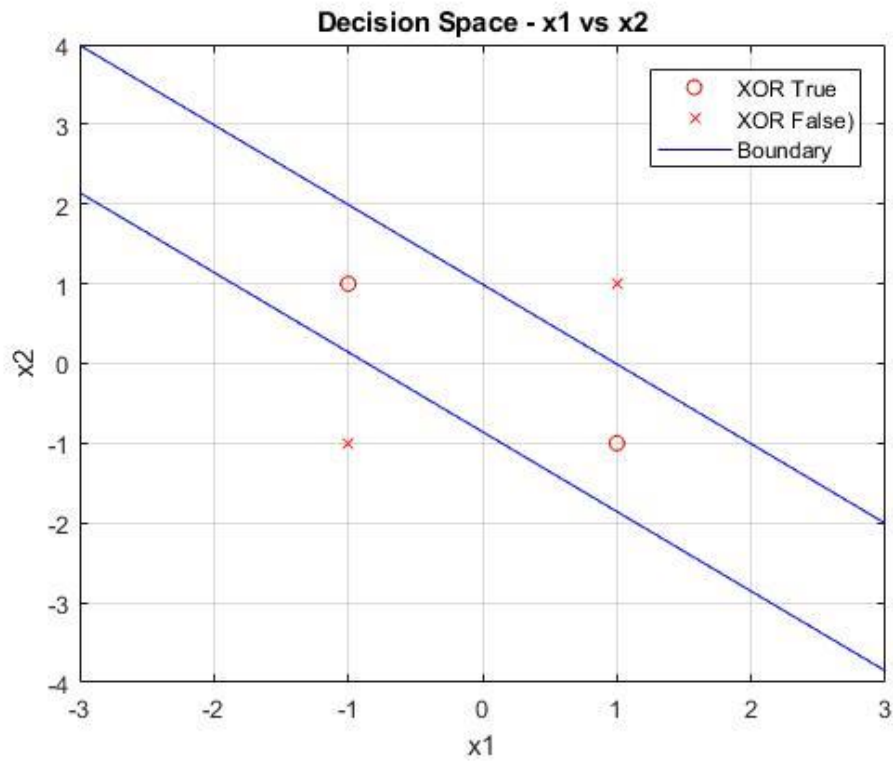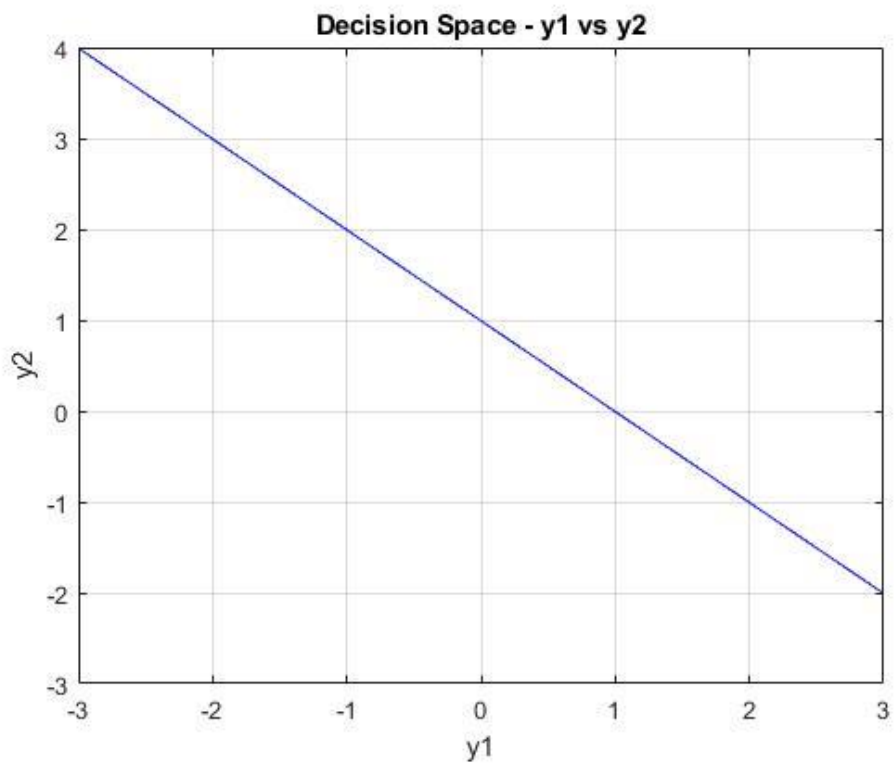
Figure 2: Decision Surface in x1-x2 Space

Figure 3: Decision Surface in y1-y2 Space

Part 2

Initial Weight Vectors:

wj1=[1.0741 1.2538 1.2538]
wj2=[-1.4063 1.4171 1.4171]
wk=[-1.33 1.5676 -1.5814]

Number of epochs: r = 212

Final Weight Vectors:

wj1=[3.3236 4.6189 -5.5750]
wj2=[2.5972 0.6030 5.8517]
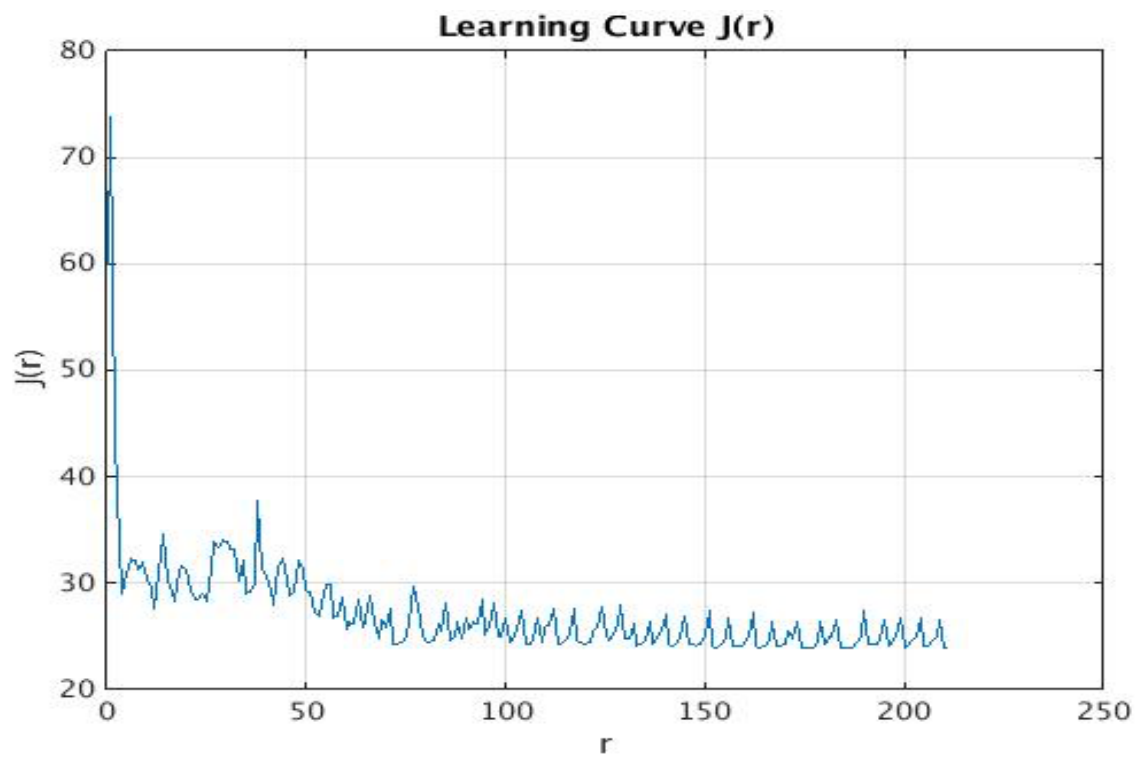wk=[2.4170 4.1393 -6.8983]

Accuracy: 86.9159%

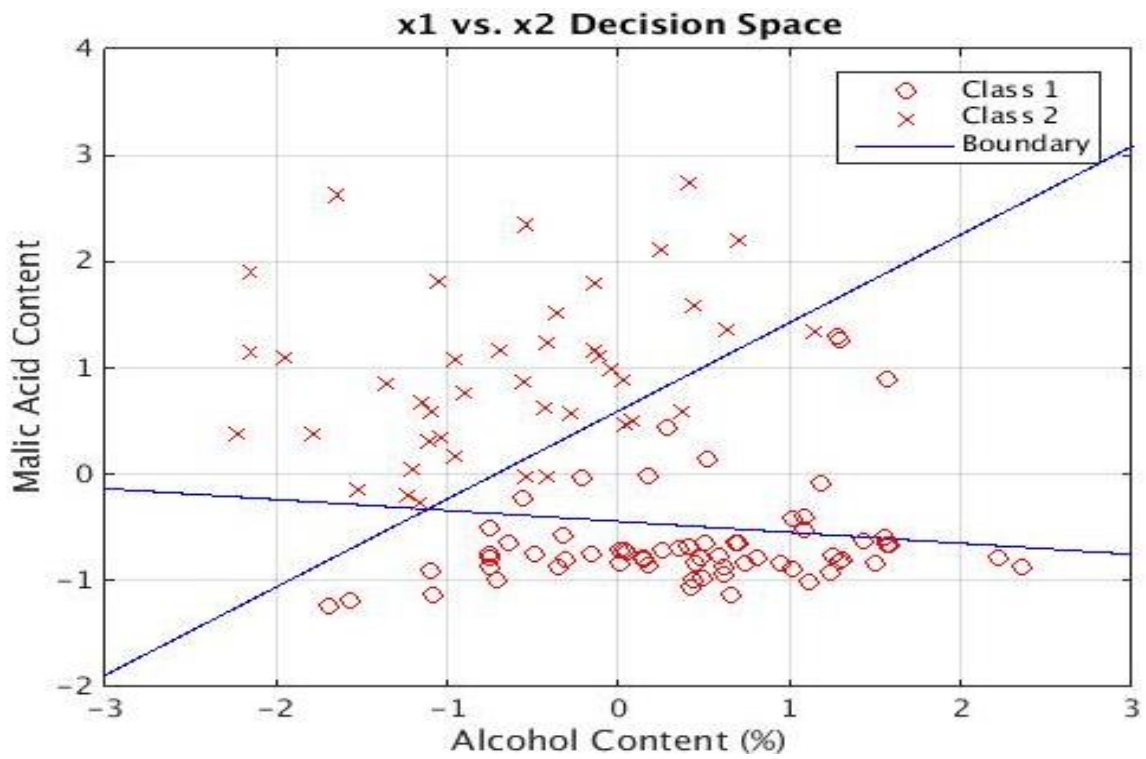Figure 4: Learning Curve (epochs for convergence = 212)
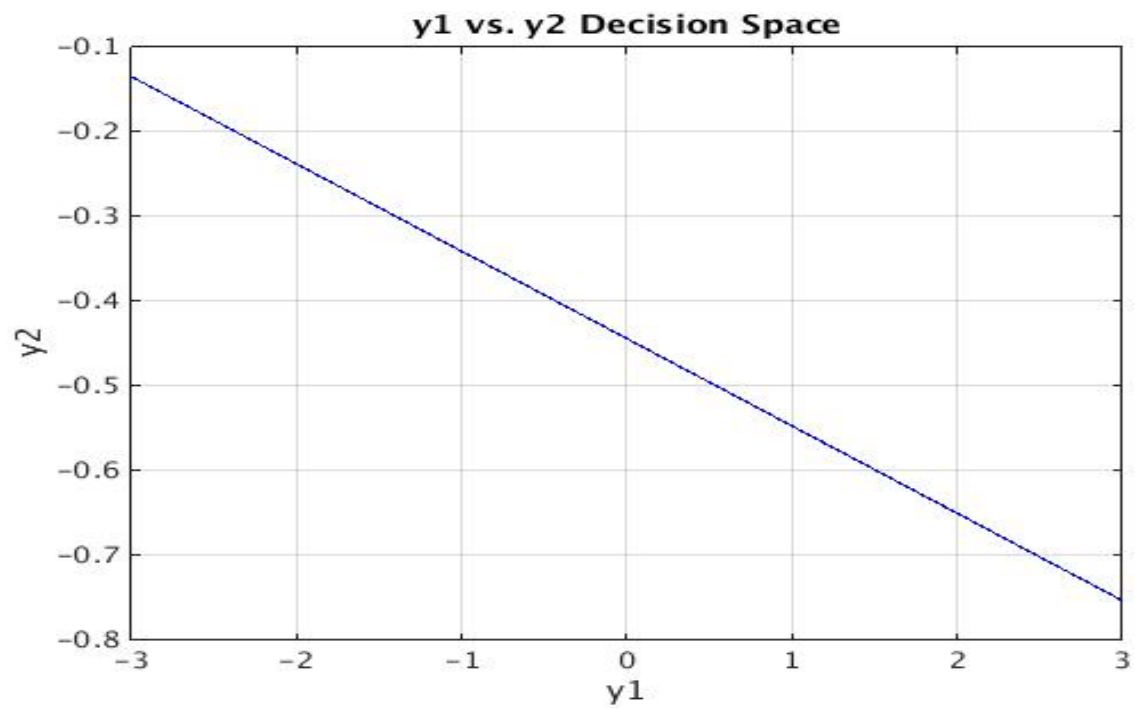
Figure 5: Decision Surface in x1-x2 Space

Figure 6: Decision Surface in y1-y2 Space

<u>Conclusion</u>

In this lab, our team implemented a multi-layer neural network that uses a back propagation algorithm that classifiers non-separable data. The first part of this lab consisted of creating a 2-2-1 neural network that solves the classical XOR problem. We operated with a learning threshold of 0.001 and a weight vector of 0.1. The two inputs that were used were two 4x1 vectors. Our team was able to reach an accuracy of 100% after converging on 59 epochs.

The second part of this lab also consisted of constructing a 2-2-1 neural network. However, it was applied to a Wine Data Set in order classify non-separable data. Our team used 2 classes as required, which were classes 1 and 3. The features used where **Alcohol** and **Malic-Acid**. The computed classification accuracy was 87%, and that was reached after converging at 212 epochs. The classifications were made via the lines demonstrated in figure 5. However, y1-y2 decision space was used to categorize the data points that did not belong to either category.

5 <u>References</u>

[1] N. Zhang, "ELE888/EE8209 – Intelligent Systems (2014) – Student Lab Manual," Department of Electrical and Computer Engineering, Ryerson University, Toronto, Ontario, March 15. 2015.