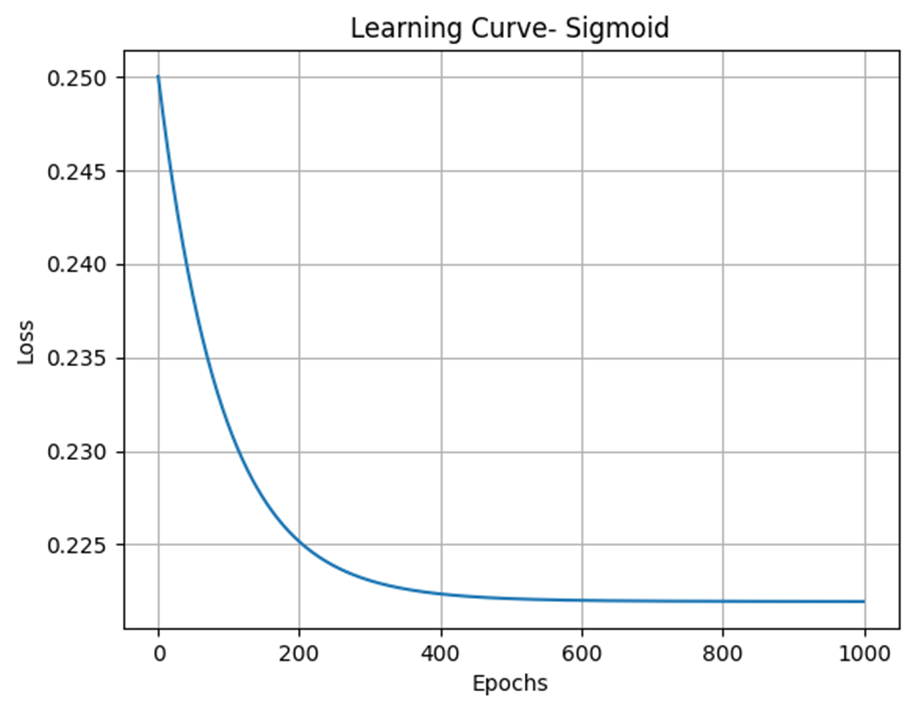
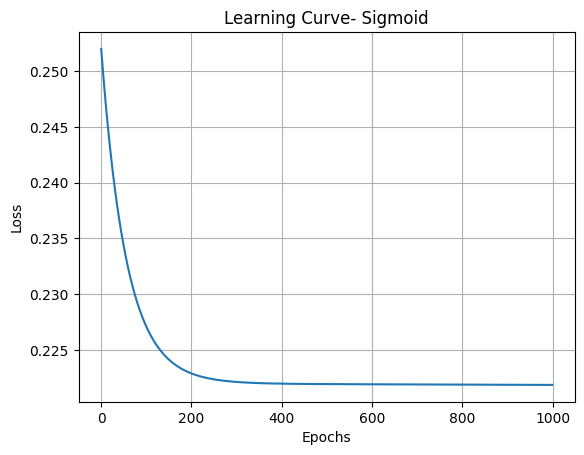
**Neural Network Graphs-**

**From Scratch:**

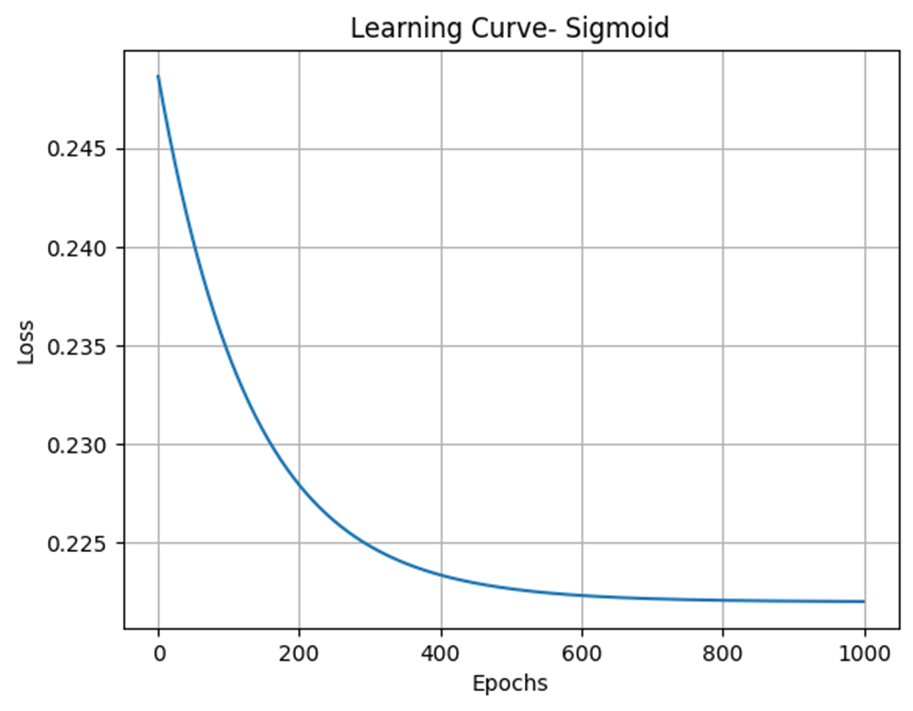
Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.01



Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.01

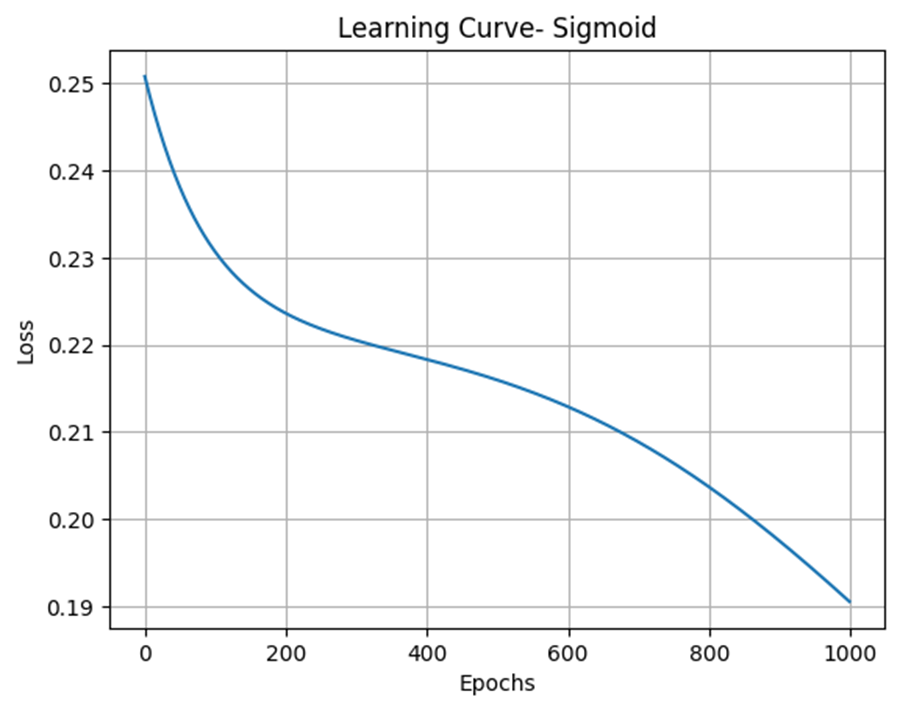


Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.01

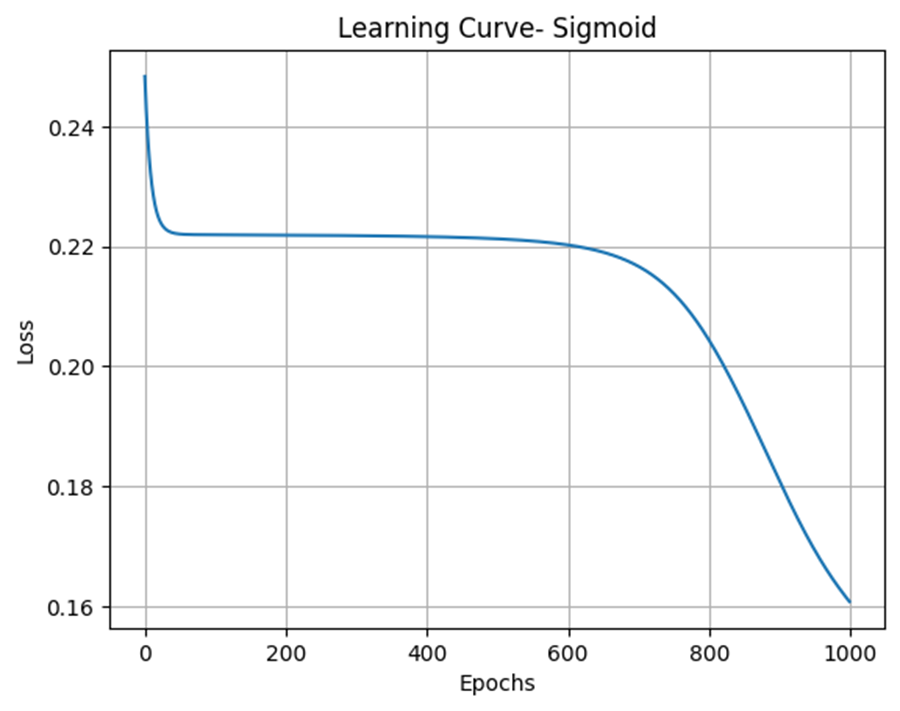


\*Reducing Number of Hidden Layers since increasing them did not have much of an impact

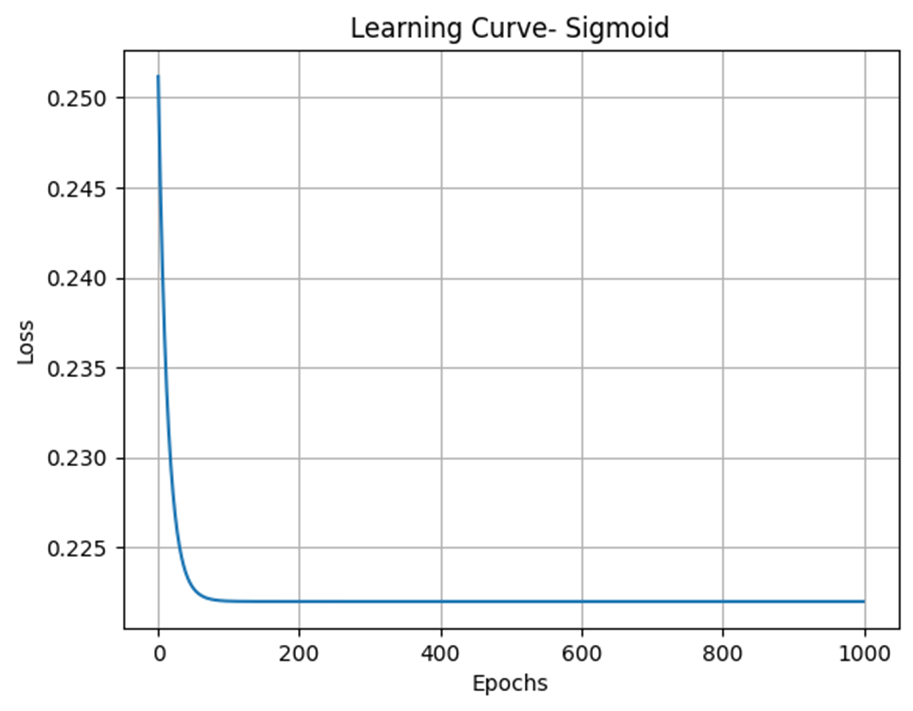
Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.01



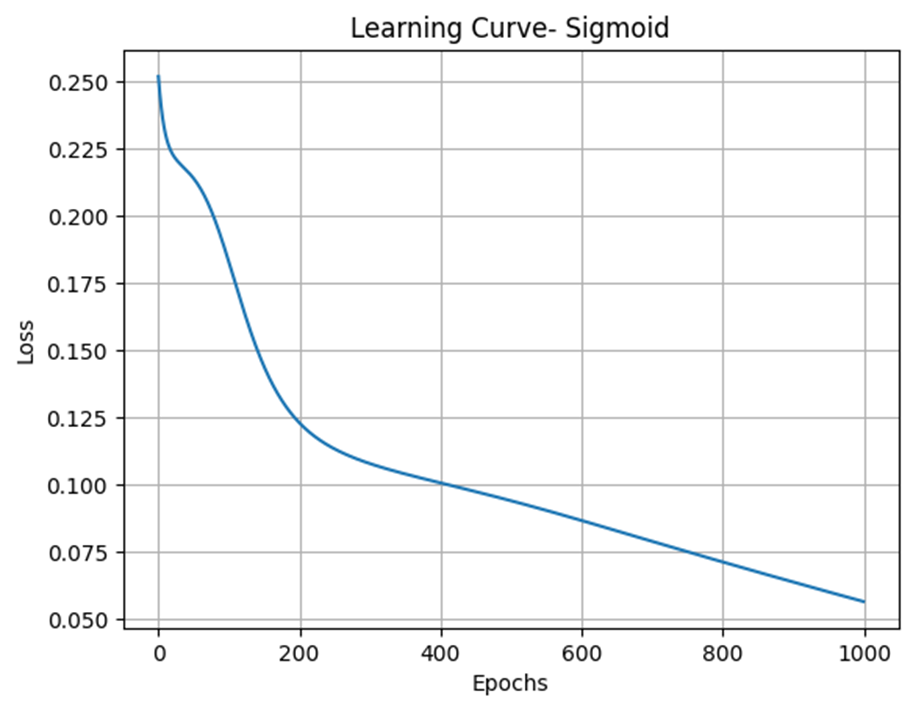
Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.1



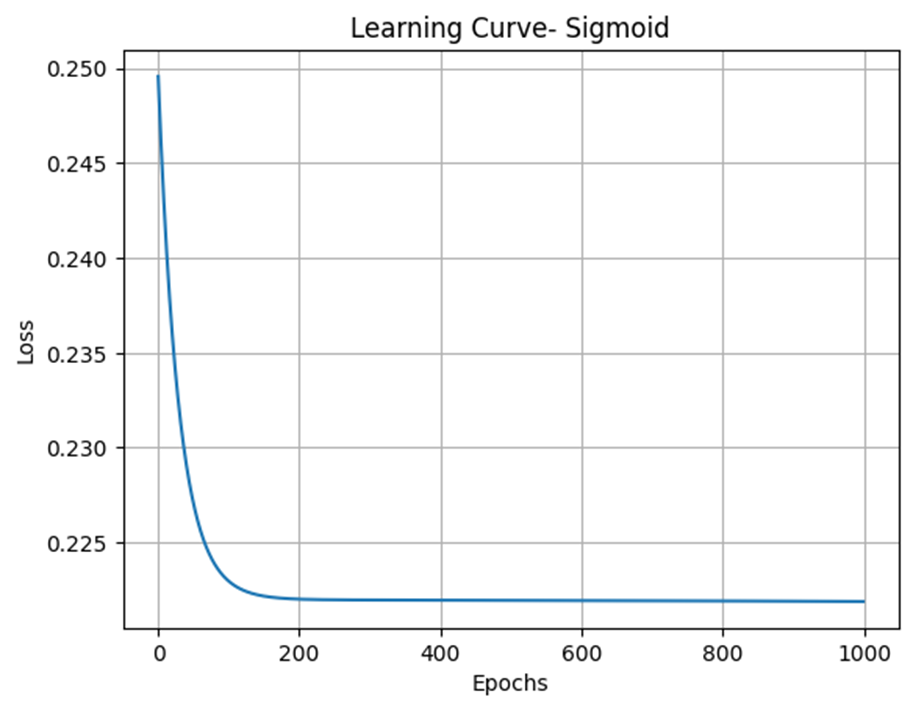
Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.1



Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.1

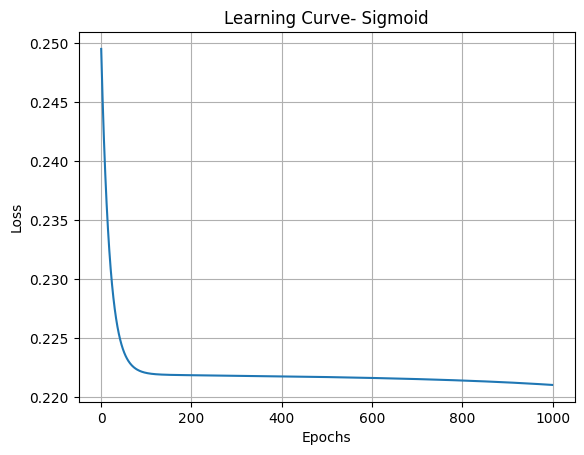


Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.03

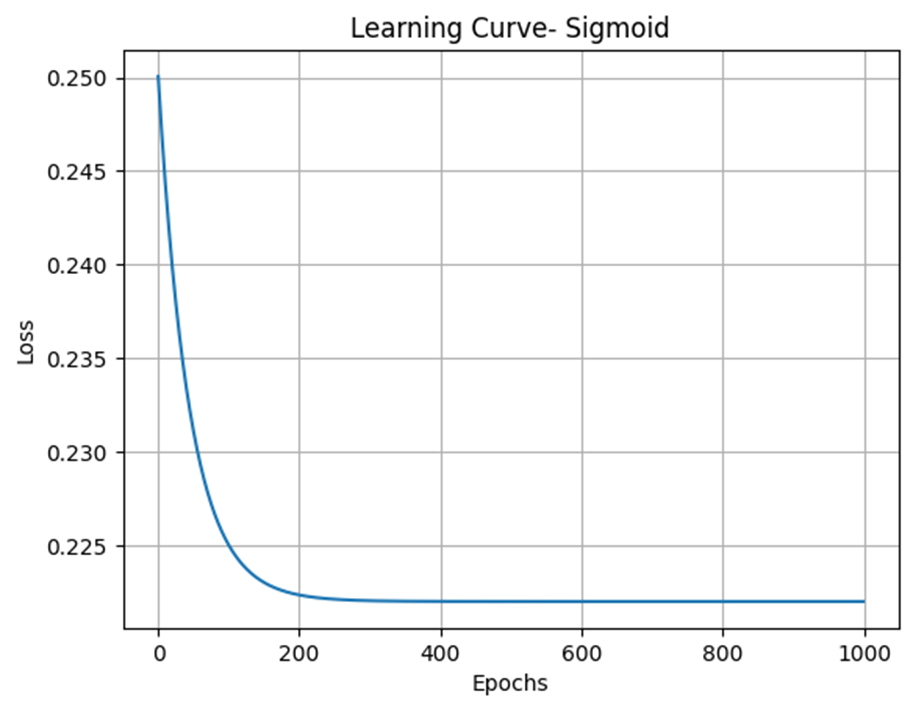


Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.03

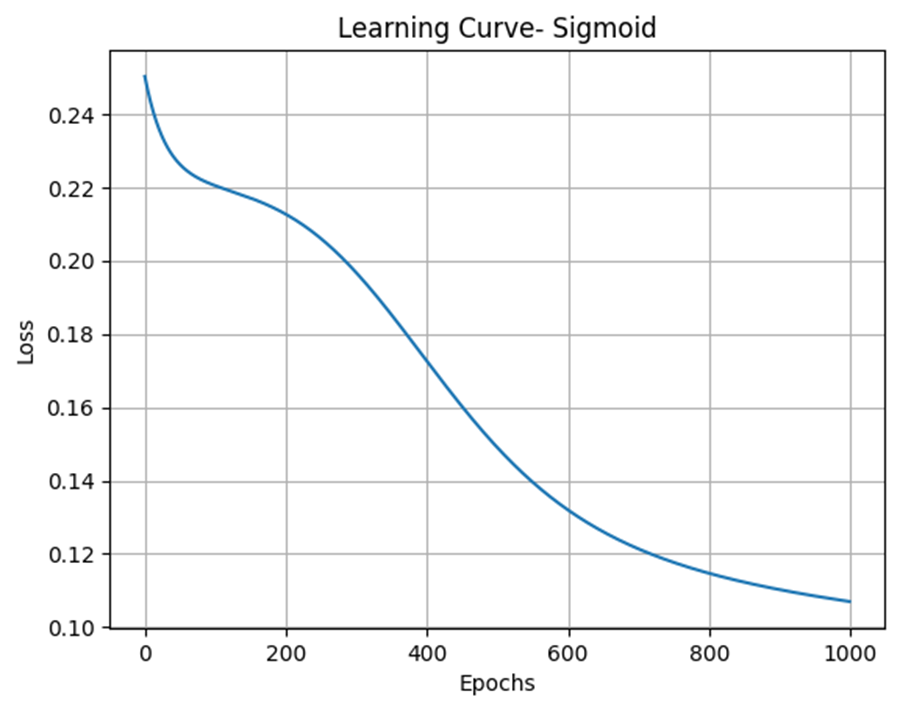
(Same number of hidden layers but different number of neurons per layer did not really have an impact either time)



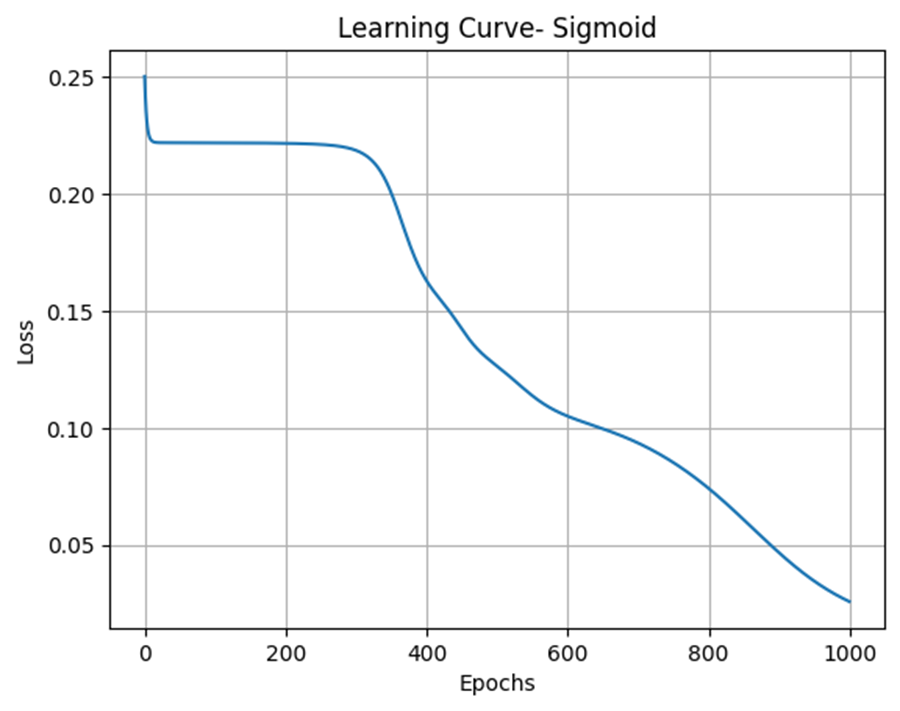
Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.03



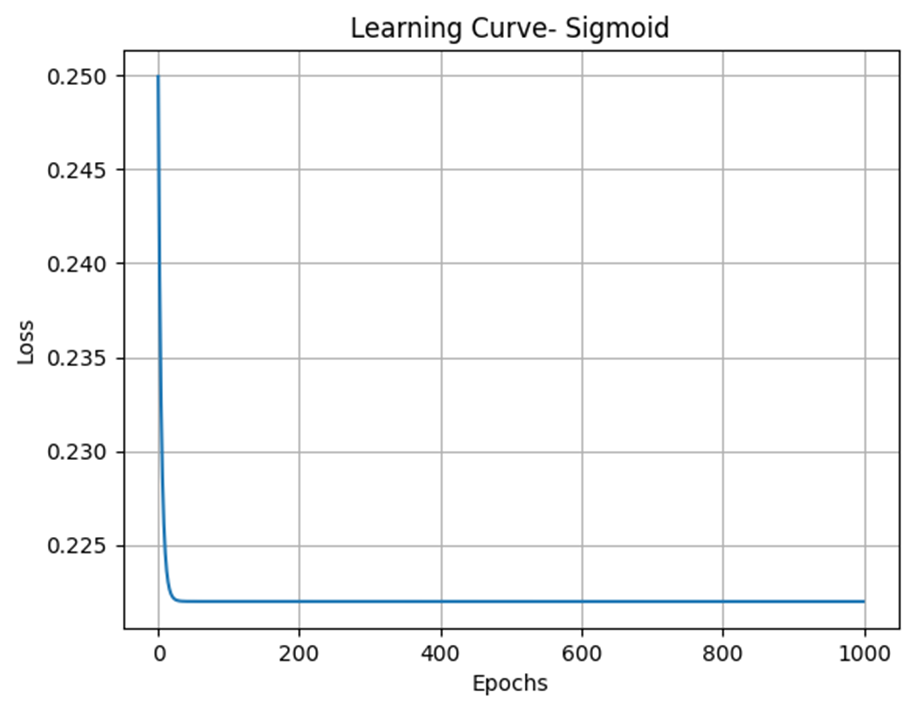
Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.03



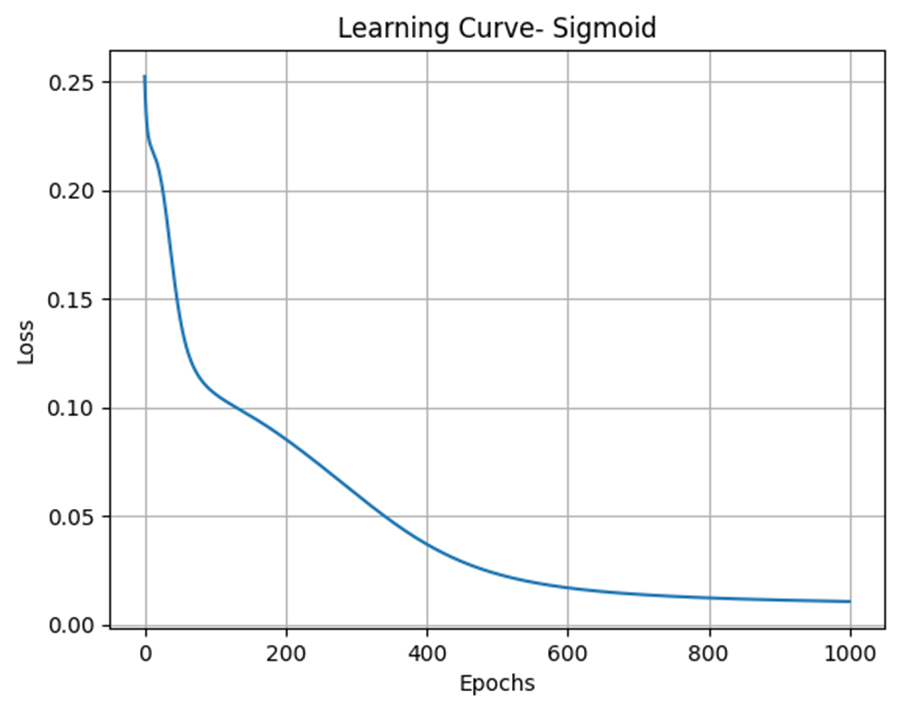
Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.3



Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.3



Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.3

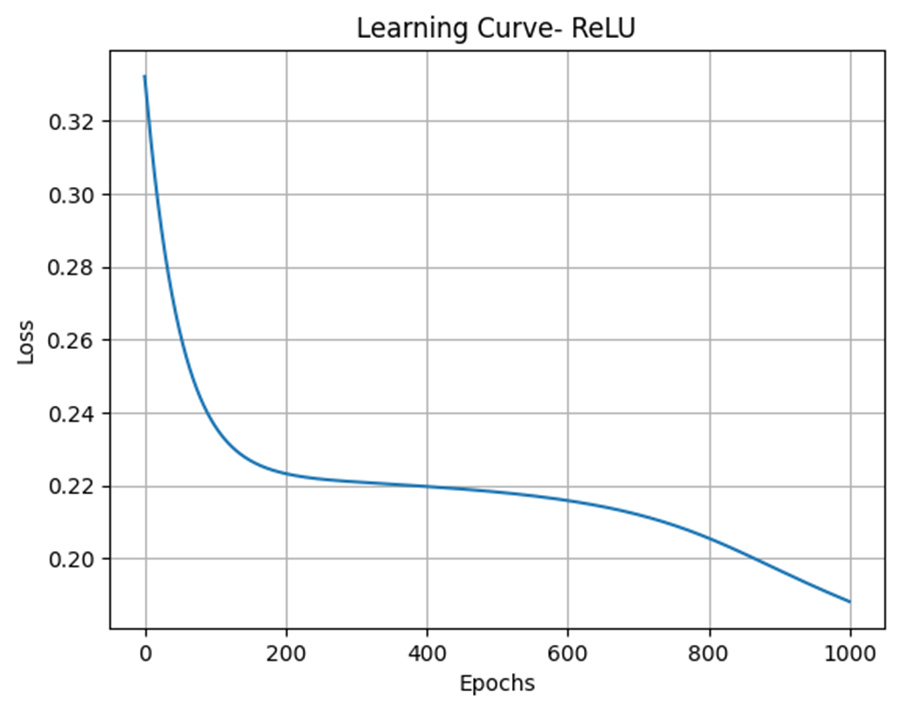


\*\*MUCH BIGGER IMPACT!

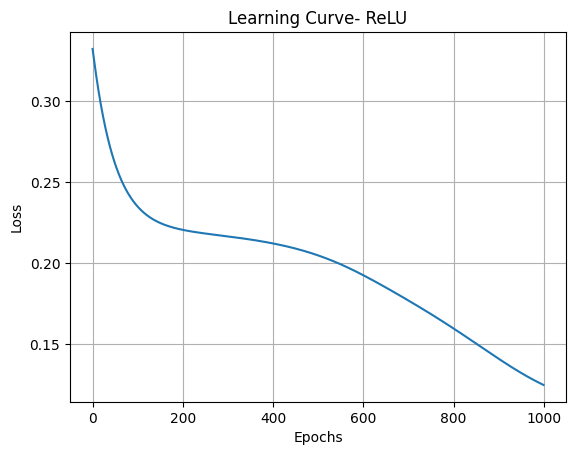
-Now to do this all with another activation function for comparison

ReLU-

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.01

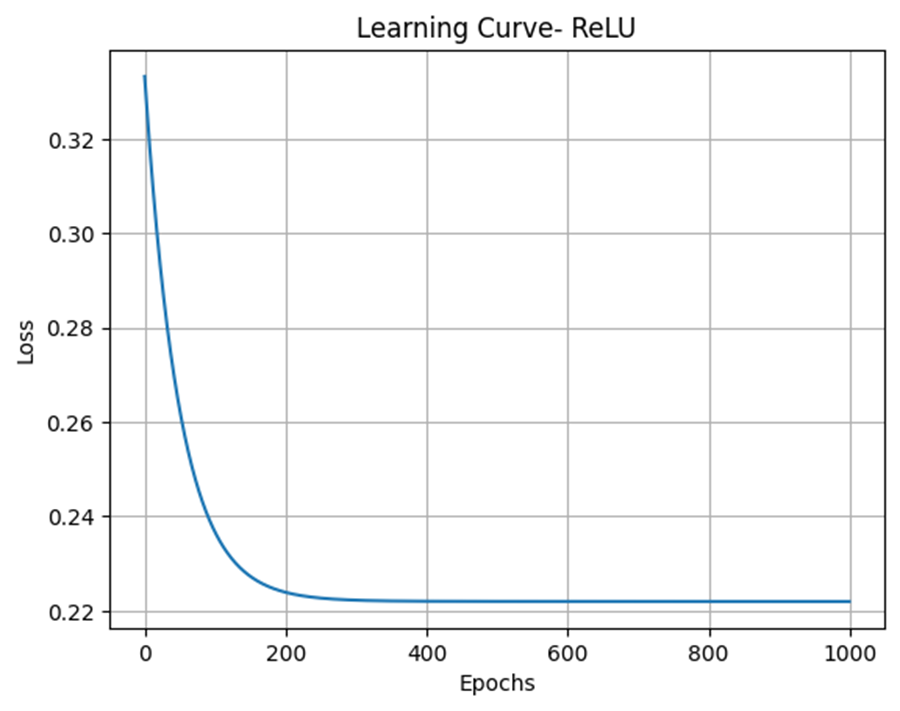


Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.01



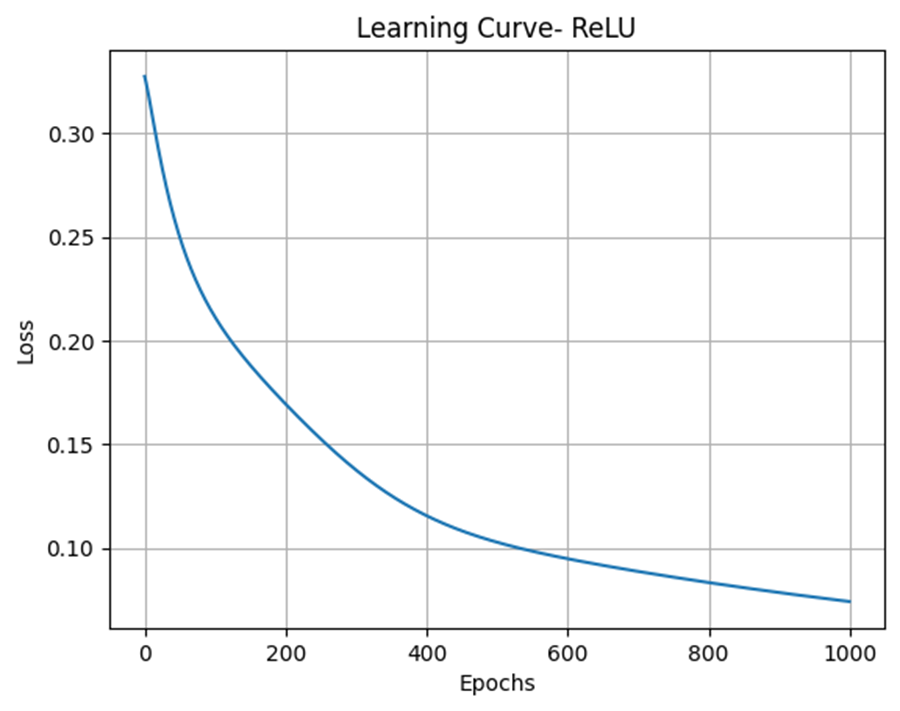
Changing Number of Hidden Layers and Neurons Per Layer-

Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.01

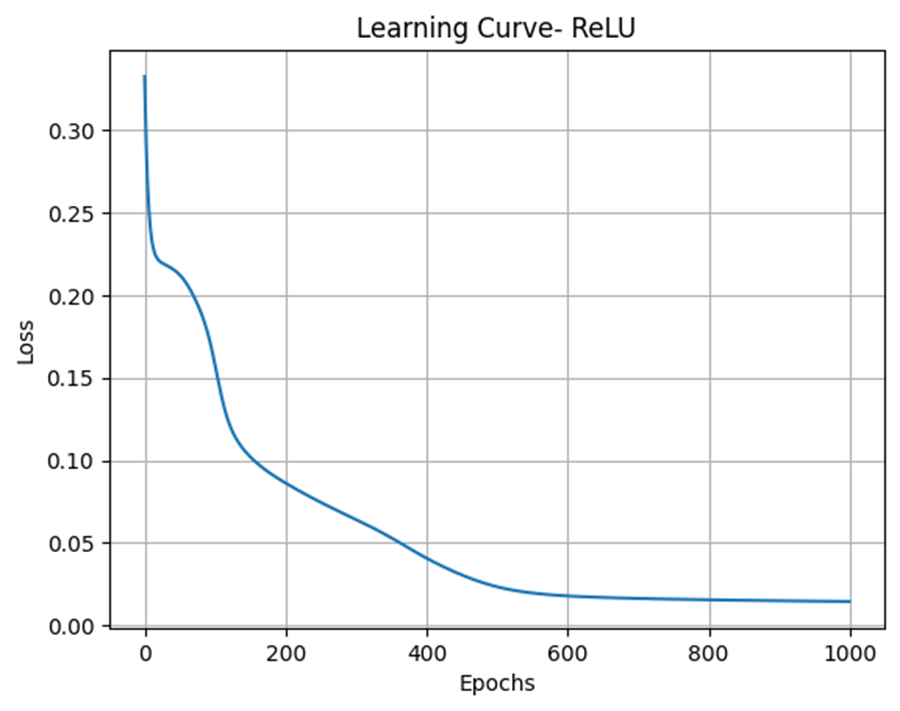


\*Let’s reduce the number of layers here too for comparison

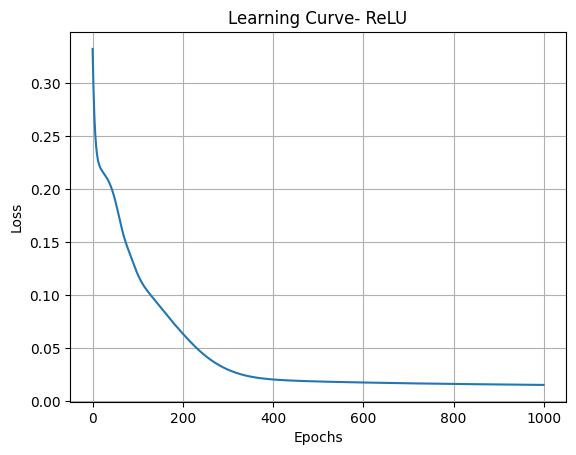
Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.01



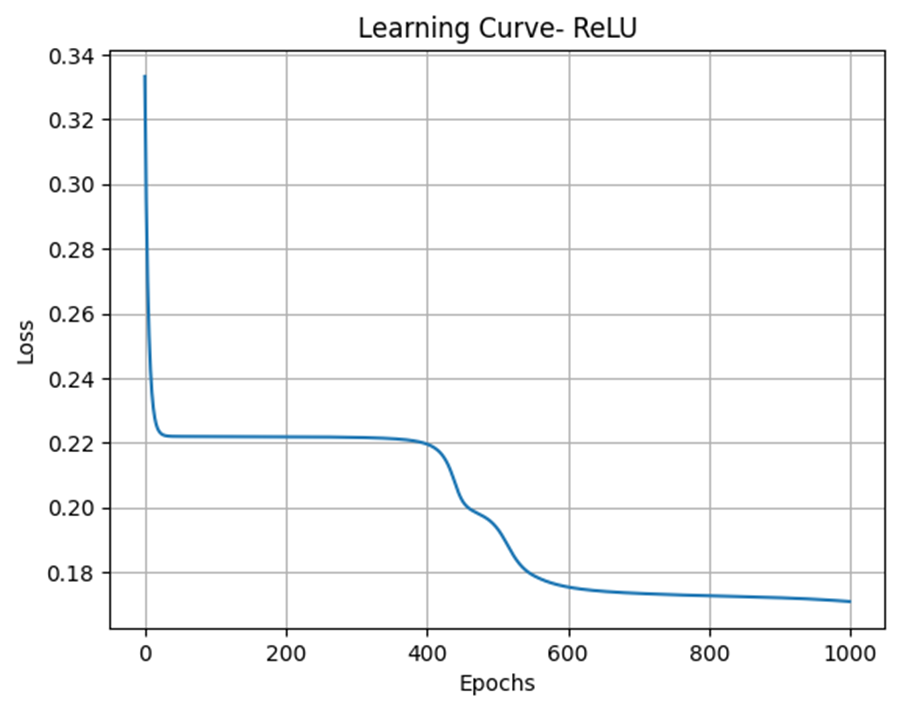
Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.1



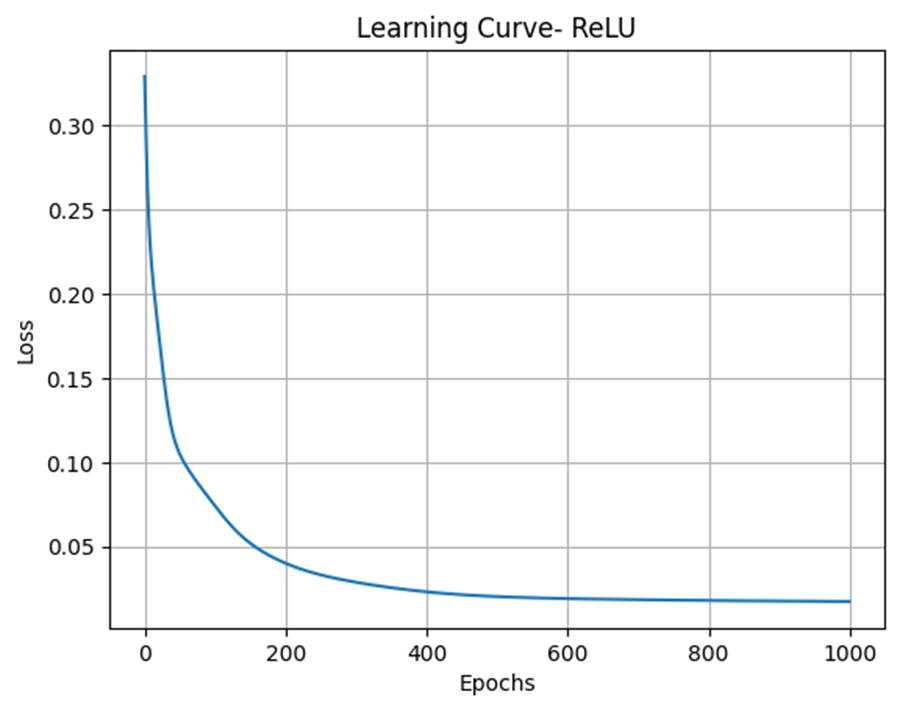
Number of Hidden Layers: 2, Neurons per Layer: 10, 10 Learning Rate: 0.1



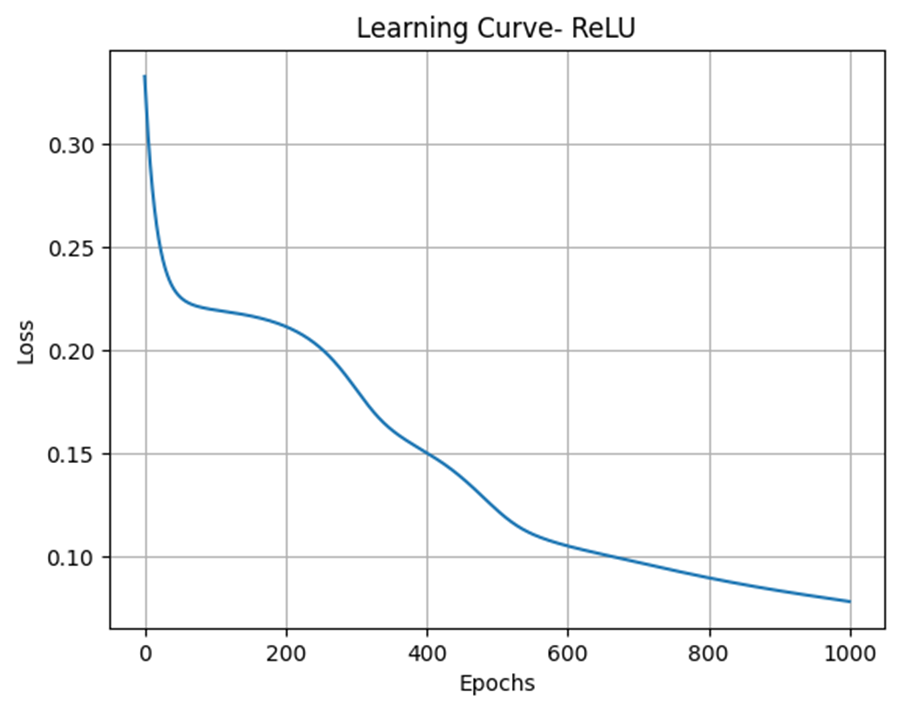
Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.1



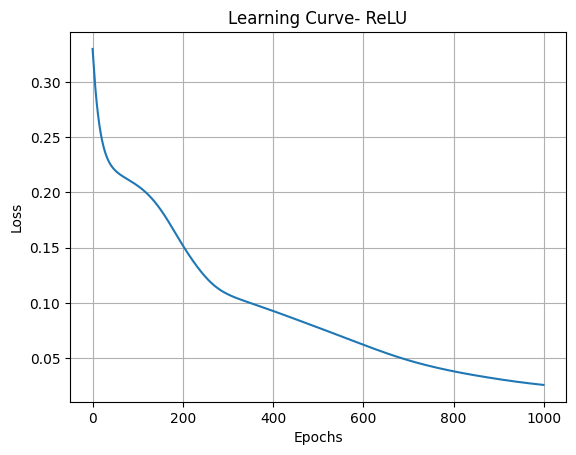
Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.1



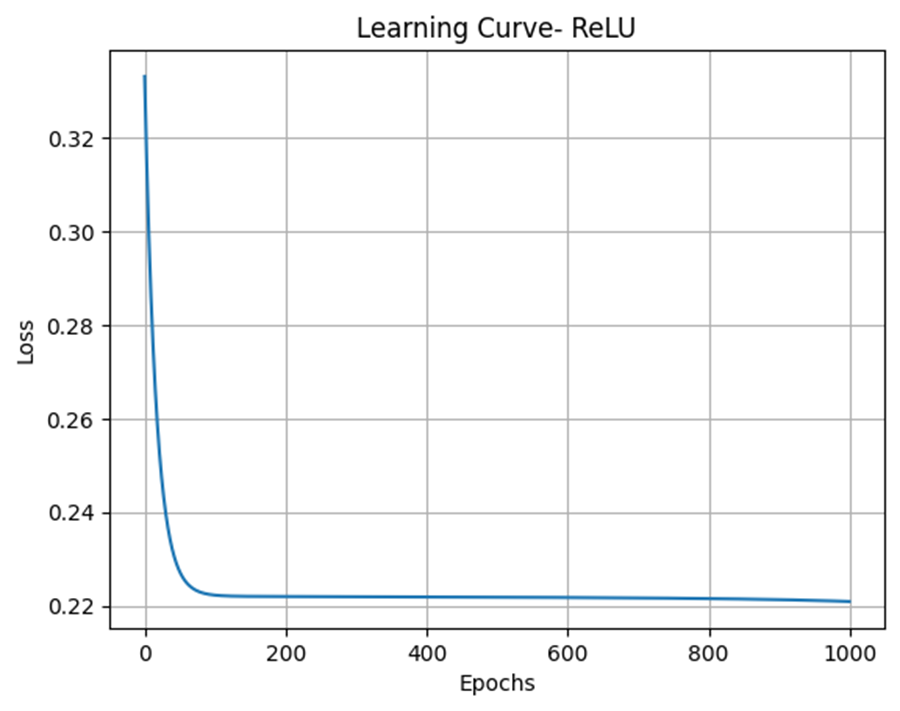
Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.03 (cross validation accuracy was high here!)



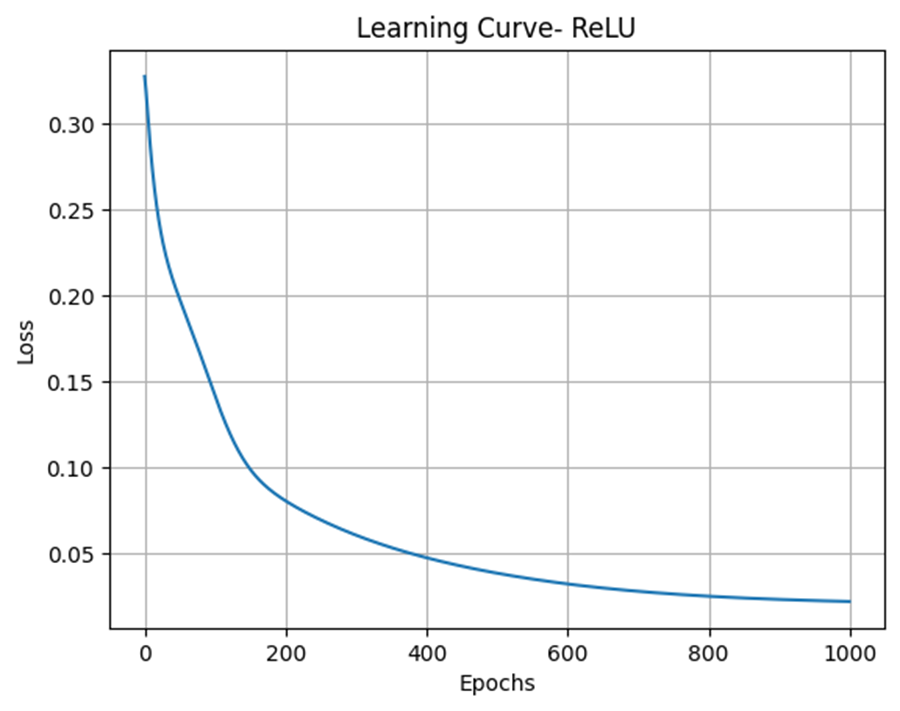
Number of Hidden Layers: 2, Neurons per Layer: 10, 10 Learning Rate: 0.03



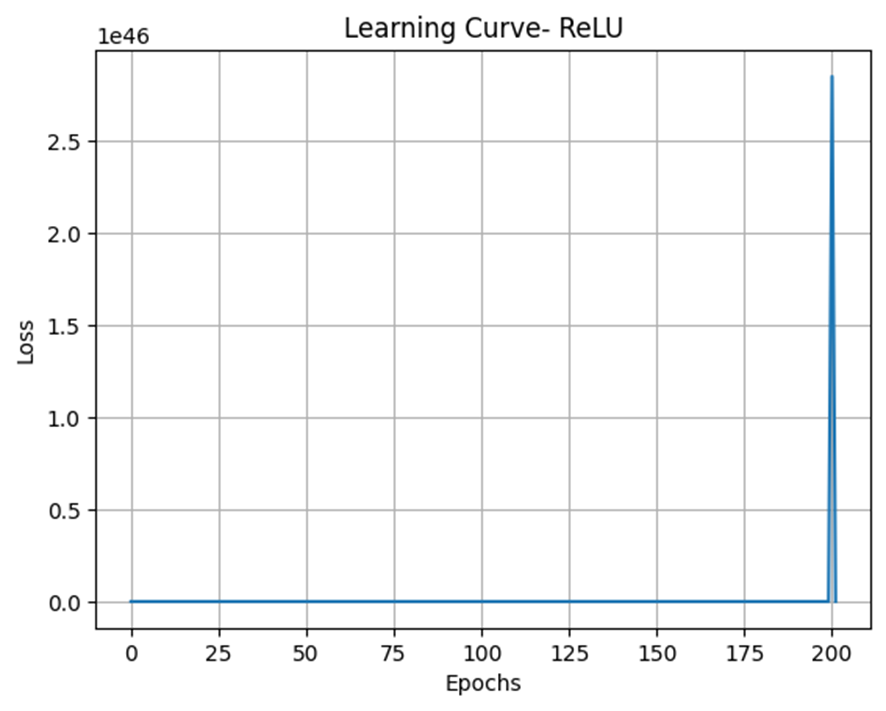
Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.03



Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.03

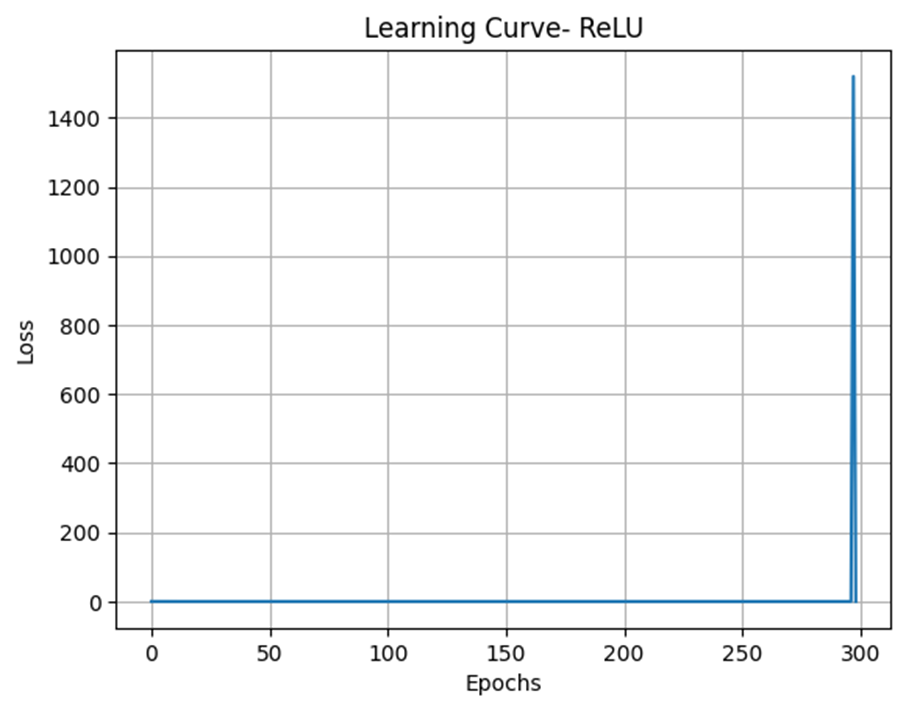


Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.3

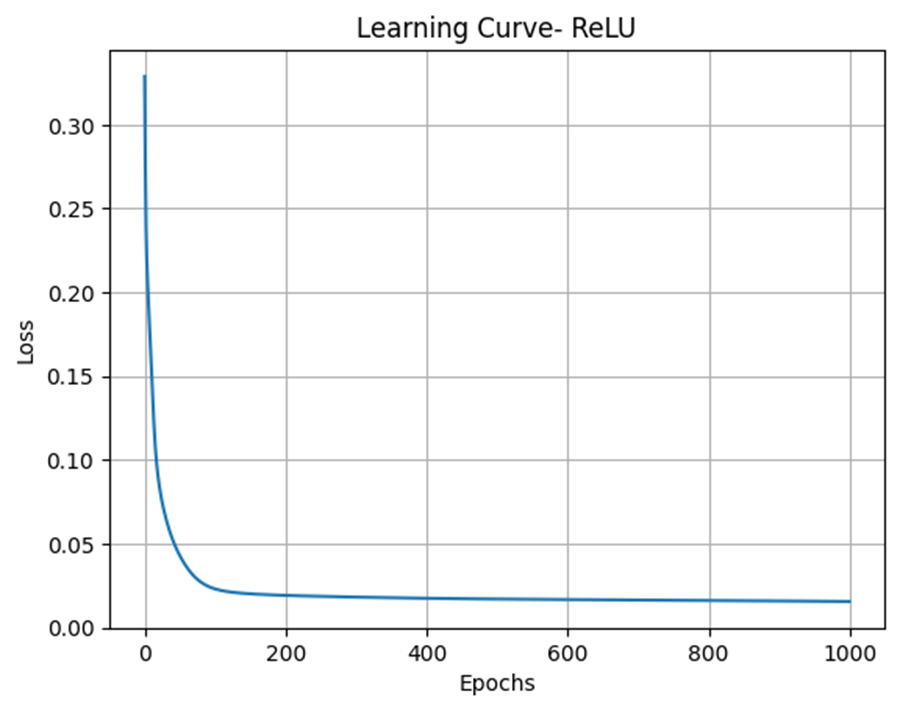


(Cross validation accuracy here plummeting. Increased layers give less accurate results here too)

Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.3



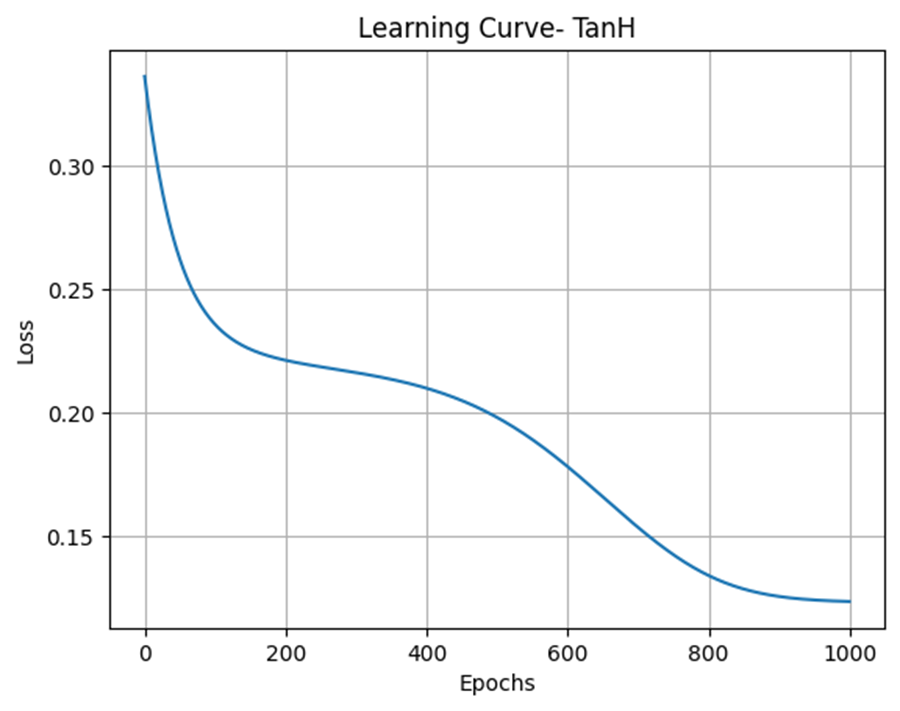
Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.3



\*\*By reducing the number of hidden layers, the learning rate did not have nearly as much of an affect on the learning curve as previous ones did.

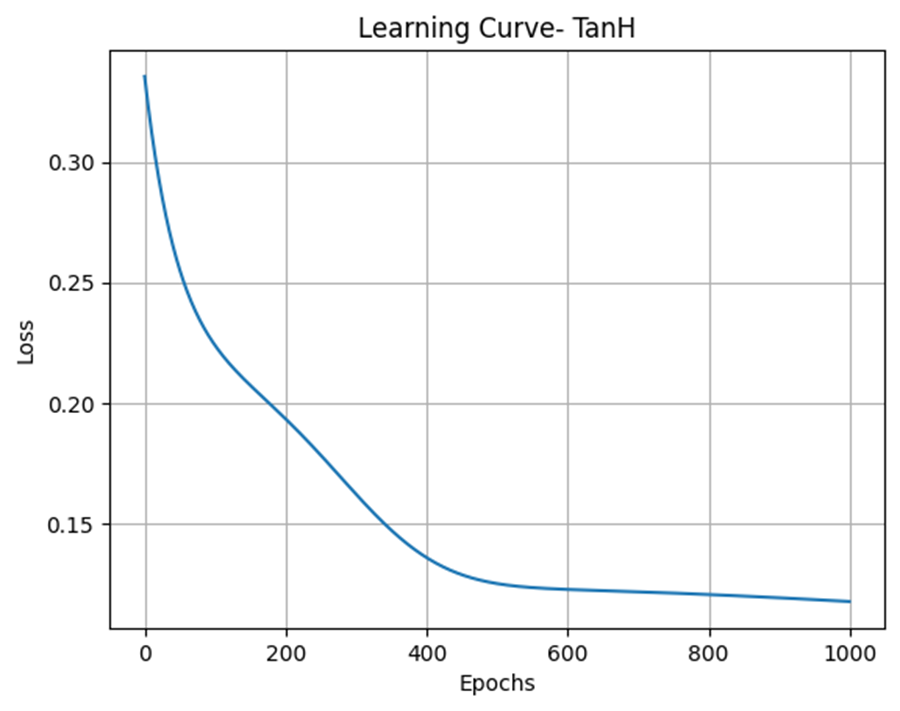
TanH-

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.01

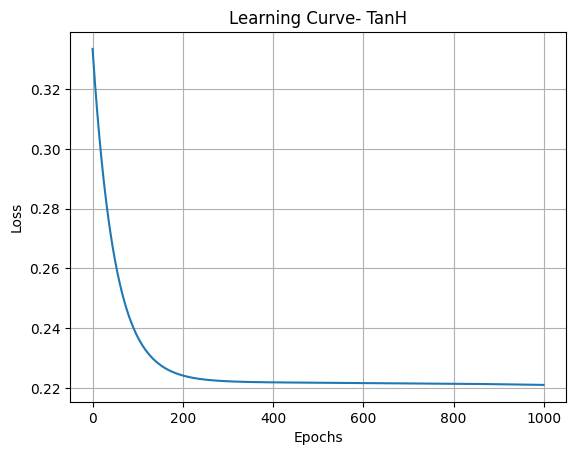


Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.01

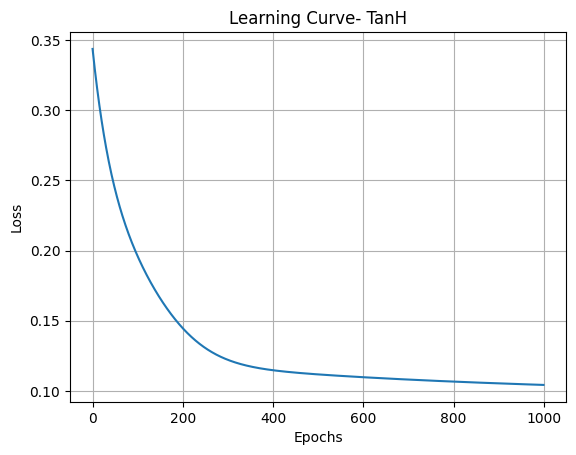
(Increased number of neurons but kept just 2 layers)



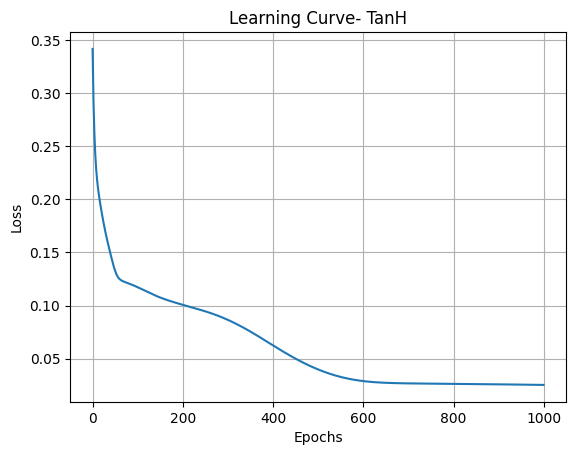
Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.01



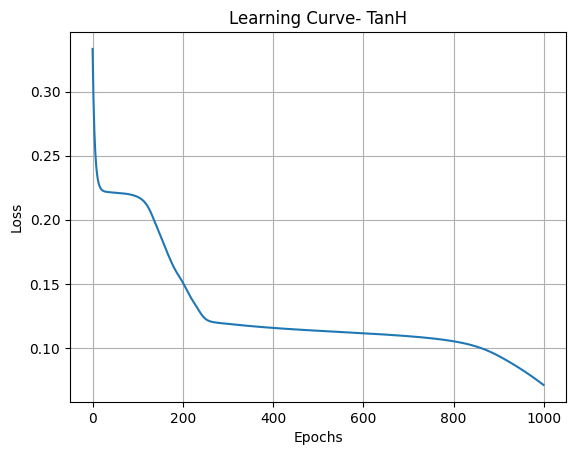
Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.01



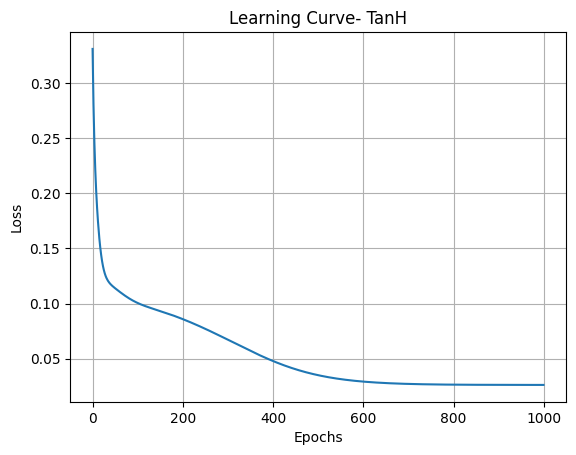
Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.1



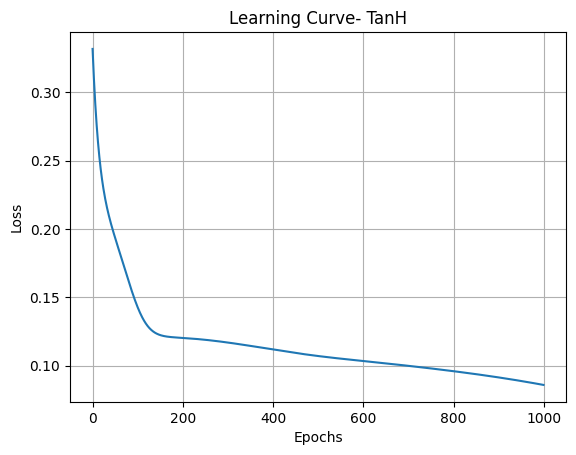
Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.1



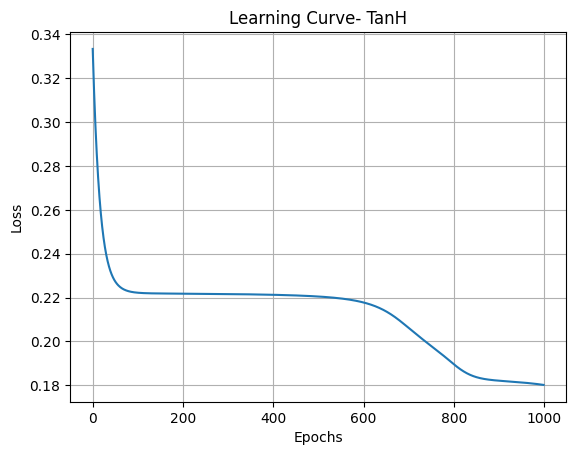
Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.1



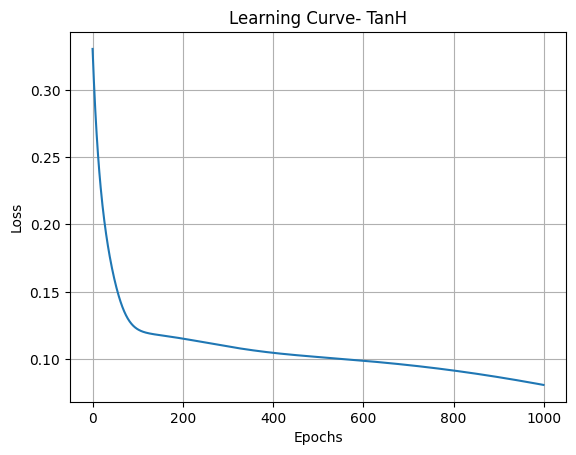
Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.03



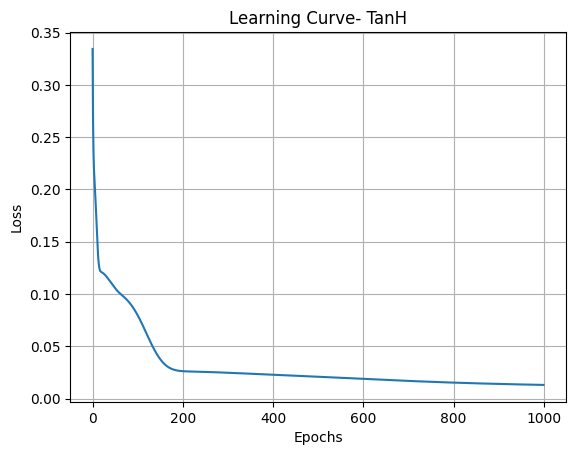
Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.03



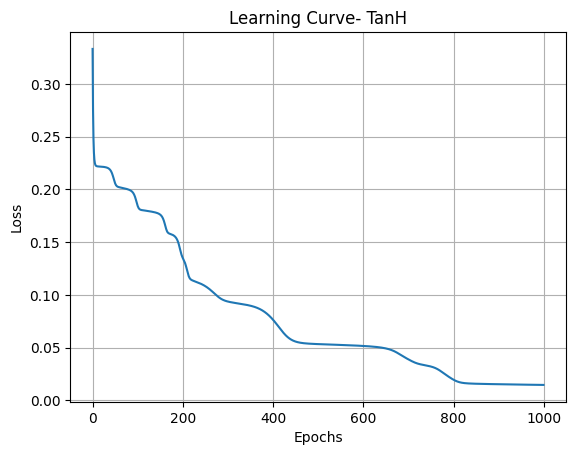
Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.03



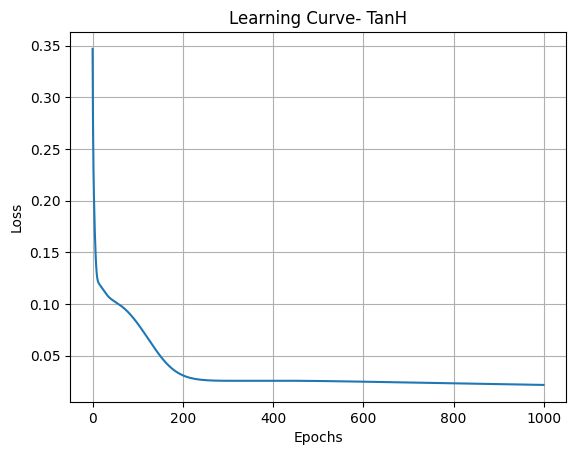
Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.3



Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.3

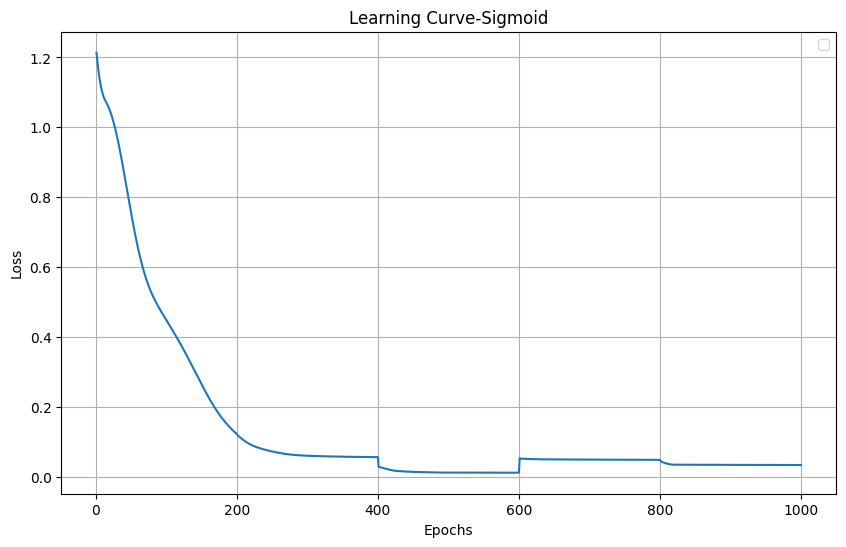


Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.3

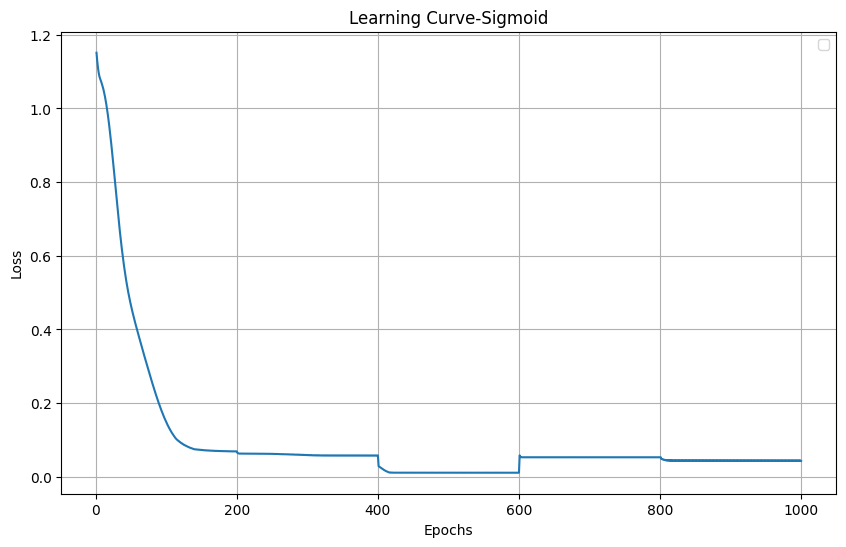


SKLEARN-

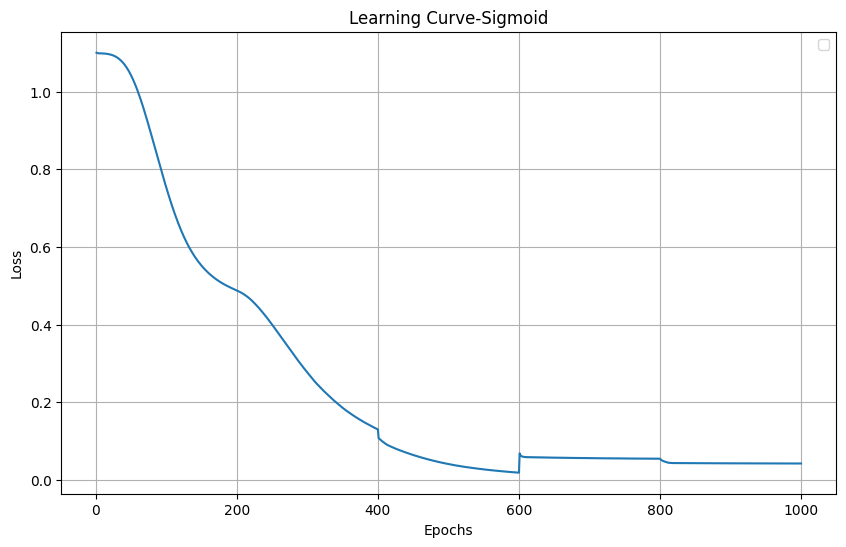
Number of Hidden Layers: 2, Neurons Per Layer: 5, 5, Learning Rate: 0.01



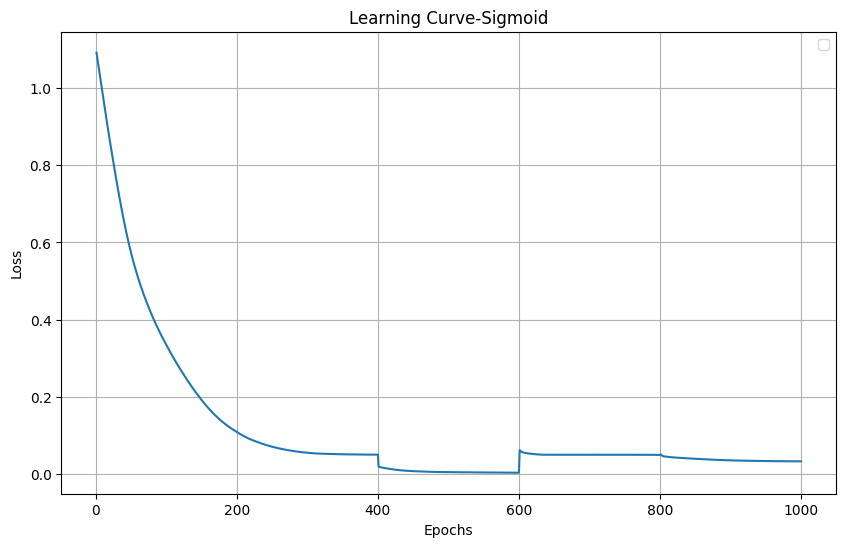
Number of Hidden Layers: 2, Neurons Per Layer: 10, 10, Learning Rate: 0.01



Number of Hidden Layers: 3, Neurons Per Layer: 4, 4, 2, Learning Rate: 0.01



Number of Hidden Layers: 1, Neurons Per Layer: 5, Learning Rate: 0.01



0.1,

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.1

A graph with a blue line

Description automatically generated

Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.1

A graph with a blue line

Description automatically generated

Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.1

A graph with a blue line

Description automatically generated

Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.1

A graph with a line graph

Description automatically generated

0.03

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.03

A graph with a line

Description automatically generated

Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.03

A graph with a line

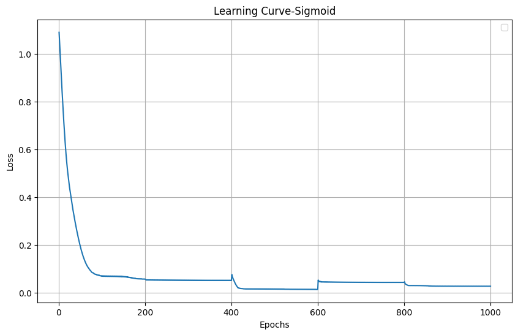
Description automatically generated

Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.03

A graph with a line

Description automatically generated

Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.03



ReLU

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.01

A graph showing a graph

Description automatically generated

Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.01

A graph showing a graph

Description automatically generated

Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.01

A graph with a line

Description automatically generated

Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.01

A graph with a line

Description automatically generated

0.1,

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.1

A graph with blue lines

Description automatically generated

Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.1

A graph showing a graph

Description automatically generated

Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.1

A graph with blue lines

Description automatically generated

Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.1

A graph with blue lines

Description automatically generated

0.03

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.03

A graph with a line graph

Description automatically generated

Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.03

A graph with blue lines

Description automatically generated

Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.03

A graph with a line

Description automatically generated

Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.03

A graph showing a graph

Description automatically generated

0.3

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.3

A graph with a blue line

Description automatically generated

Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.3

A graph showing a graph

Description automatically generated

Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.3

A graph with a line

Description automatically generated

Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.3

A graph with blue squares

Description automatically generated

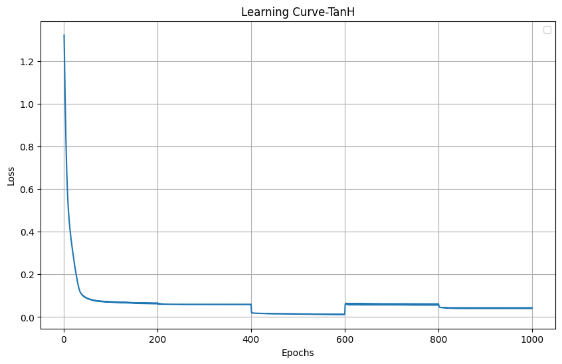
TanH

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.01

A graph with a line

Description automatically generated

Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.01



Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.01

A graph with a line

Description automatically generatedCross-validation accuracy: 0.6000

Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.01

A graph with a line

Description automatically generated C. V 0.3333

0.1,

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.1

A graph with a line graph

Description automatically generated

Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.1

A graph showing a number of blue lines

Description automatically generated with medium confidence

Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.1

A graph showing a graph

Description automatically generated with medium confidenceC V 0.3333

Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.1

A graph with blue lines

Description automatically generatedC. V 0.3333

0.03

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.03

A graph with a line graph

Description automatically generated

Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.03

A graph with blue lines

Description automatically generated

Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.03

A graph with blue lines

Description automatically generatedC V 0.4000

Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.03

A graph with a line

Description automatically generated C. V 0.333

0.3

Number of Hidden Layers: 2, Neurons per Layer: 5, 5. Learning Rate: 0.3

A graph with blue lines

Description automatically generated

Number of Hidden Layers: 2, Neurons per Layer: 10, 10. Learning Rate: 0.3

A graph showing a number of blue lines

Description automatically generated Cross-Validation Accuracy: 0.3533

Number of Hidden Layers: 3, Neurons per Layer: 4, 4, 2. Learning Rate: 0.3

A graph showing a number of numbers

Description automatically generated with medium confidence C. V 0.333

Number of Hidden Layers: 1, Neurons per Layer: 5. Learning Rate: 0.3

A graph with blue squares

Description automatically generated C. V 0.333