CS156 Module 5 Week 13 Homework Assignment #4 (10pts)

1. In this HW assignment, you will write your own transfer/activation function for the ANN that recognizes hand written digits.
2. Download the Python file named cs156\_ann\_examp\_2.py from the Week 13 section on Canvas.
3. The \_sigmoid and \_sigmoid\_gradient functions are on line numbers 207 & 216 respectively. The \_sigmoid functions gets called on lines 267 & 270.
4. Pick a transfer/activation function from slides 17 or 18. Implement the selected function as a member function of the NeuralNetMLP class, then change the calls on lines 267 & 270 to your new member function.
5. For HW 4, report, below, if your transfer/activation function performs better after 50 epochs, than the sigmoid function.

Solution:

4. Changes done as part of Hw:

1. # comment out the following line and replace with sigma2 = w2.T.dot(sigma3) \* self.\_linear\_gradient(z2)  
   # sigma2 = w2.T.dot(sigma3) \* self.\_sigmoid\_gradient(z2)  
   sigma2 = w2.T.dot(sigma3) \* self.\_linear\_gradient(z2)
2. def \_tanh(self, z):  
    return expit(z)
3. def \_linear\_gradient(self, z):  
    sg = self.\_tanh(z)  
    return sg \* (1 - sg)  
   """Implement the hyperbolic tangent sigmoid activation function"""

The function tanh is tanh(*x*)= (e^n - e^(-n))/ (e^n + e^(-n)),

Internally we need to smooth the graph hence calling the ufucntion for spl.expit

5.Log Sigmoid result data is below:

A group of numbers in squares

Description automatically generatedA screenshot of a computer

Description automatically generatedA graph with blue lines

Description automatically generatedA graph with red lines

Description automatically generated

A number in squares with numbers

Description automatically generated with medium confidence

Another transfer/activation function done is : hyperbolic tangent sigmoid function

Result data is :

A screenshot of a computer

Description automatically generated

A graph with blue lines

Description automatically generatedA graph with red lines

Description automatically generatedA number in squares with numbers

Description automatically generated with medium confidence

Both the functions performed equally well.