DATA 527 – Predictive Modeling
Assignment 3
40 points

The problem assignment (70%)

The purpose of this exercise is to implement a feed forward neural network to solve the problem of the XOR logic function. It is a simple exercise to get started with neural networks concept. The below table defines the truth table of the XOR function, which is technically, the dataset for this problem.

A	B	Output
0	0	0
1	0	1
0	1	1
1	1	0

The lecture note provides the algorithm and the equations needed for the program implementation.

Implement the algorithm following the requirements described below and report your results in the writeup.

Requirements:

- Define the neural network structure that fits the problem to solve
- Test the use of a bias node on the performance of the neural network
- Compare both stochastic and batch gradient descent and report their performance results in the writeup.
- Save the model parameters obtained from the training process in a log file *NNModelParameters*. Save the following parameters in the file: The Learning rate, the number of iterations, the final error, the structure of the neural network (layers, nodes, links), and the final weights.
- Plot the cost error per iteration and save the plot in the current directory.
- Add a function that takes inputs from the table data and make predictions using the implemented neural network.

The problem report (30%)

Possible outline for the report might be:

- Overview/ Description
- Methodology/Strategy

- Implementation
- Results
- Discussion
- Conclusion
- References

Instructions

You must complete this assignment individually; you are not allowed to collaborate with anyone else. You may discuss the homework to understand the problems and the mathematics behind the various learning algorithms, but you are not allowed to share problem solutions or your code with any other students. Using the discussion board on Blackboard for this topic is encouraged to post any questions you may have while working on the assignment and get back to any of your colleagues' questions that you might know the answer of.

Any sources of help that you use while completing this assignment (other students, textbooks, websites, etc.) must be cited in your PDF report.

This assignment consists of two parts: a problem report and a program exercise.

- For the problem report, you write up your solutions electronically and submit it as a single PDF document.
- Your solution to the programming exercise must be implemented in python. Any plots created in the program or results generated from the program should be reported in the PDF report.

You will be submitting the following files, including the log files:

• hw3-yourFullName.pdf (a PDF writeup)
• FFNNImplementation.py

Please follow the naming conventions exactly, and do not submit additional files including data sets. The files should be submitted as a zipped folder. Your name, class name, deadline, and term should be included in each file you submit (except the log files). In the program as a comment section on the top and in the report before your start the document.