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ECE 472: Deep Learning
Professor Curro

Assignment 2: Binary Classification

Remarks:

Attempts to implement ReLU, Leaky-ReLU, and Sigmoid activation functions were made and unsuccessful; the functions themselves have been fully and properly implemented, however an unnecessary amount time was wasted on integrating the "handmade" activation functions into Tensorflow. The realization that "handmade" activation functions require integration was realizing that this very reason of no integration was causing my model to be unable to train due to failure of gradient computation. The quick solution that has been used instead was to utilize the built in functions instead.

MultiPerceptron Design Considerations:

One thing to note is that I don't include the input layer within my discussion of design considerations (only hidden layers and output layer).

Initially, I decided on testing 8->4->2->1 setup, however my loss didn't converge. I ramped the widths up by about 4 times, and it didn't converge. I then ramped the widths by 10 fold about and then I noticed convergence over 1500 iterations given a batch size of 32. This "funnel" design yielded losses to as low as 0.003 or possibly even lower. I tested out my final design, which is the "hourglass" configuration:

100->75->50->25->50->75->100->1

This design yielded optimal convergence compared to all permutations I have tested out thus far, yielding losses as low as 0.000002.

Citations

"Archimedean Spiral." *Wikipedia*, 20 Aug. 2021. *Wikipedia*, https://en.wikipedia.org/w/index.php?title=Archimedean_spiral&oldid=1039754847.

Brownlee, Jason. "Plot a Decision Surface for Machine Learning Algorithms in Python." *Machine Learning Mastery*, 13 Aug. 2020, https://machinelearningmastery.com/plot-a-decision-surface-for-machine-learning/.

"Python - Pandas & MatPlotLib: Plot a Bar Graph on Existing Scatter Plot or Vice Versa." *Stack Overflow*, https://stackoverflow.com/questions/49991227/pandas-matplotlib-plot-a-bar-graph-on-existing-scatter-plot-or-vice-versa Accessed 19 Sept. 2021.