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Neural Networks and Deep Learning Report

**Part 1**

Settings:

Summary:

The neural network almost perfectly learned the training set. The sum squared error for training cases was 0.0002, making it quite accurate. 100% of it met the training criteria! The neural network took 5,126,356 iterations to train on the training set, but did not generalize well enough for the test criteria since only 60% of the testing cases met the test criteria. Although it learned how to calculate the mean with minimal error, it had trouble learning how to determine the median of the three floats.

**Part 2**

Settings:

* Mean
* Median

Summary:

When the tasks were separated, the neural networks were better able to learn their respective tasks. In fact, the neural network that calculated the mean of the three inputs was essentially perfect. 100% of test cases met the criteria with a sum squared error of 0.0002. Also, 100% of the test cases met the test criteria with a sum squared error of a mere 0.0001. It was able to accomplish this in 1,962,642 iterations. Between the mean and the median, the median was significantly more difficult to calculate. During training, 100% of the cases met the criteria with a sum squared error of 0.0000. Unfortunately, testing was the biggest issue as only 50% of test cases met the criteria. The sum squared error was 0.0728 for testing. This is likely due to the fact that it was significantly overfitted. Another factor that could have attributed to poor median calculations is the nature of the output. The output is not discrete which leads the neural network to assume that there is at least some sort of computation required to produce the desired output. The output in this case does not necessarily need to be computed, but rather selected from the list of inputs via comparison.

**Part 3**

Image Classification Problem:

Classify whether the animal pictured is either a giraffe or an elephant.

Development of Training and Testing Data Sets:

In order to develop both the training and testing data sets, I searched google for images of both giraffes and elephants. I selectively chose each image to train and test the neural networks on a variety of different pictures. These pictures include obscured vision of each animal, each animal facing left, right, and toward the camera, animals in motion, stationary animals, standing animals, and even sitting animals. Some of these pictures features were not trained on, yet managed passed testing with a degree of certainty.