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CSSE490

HW5

Fruit Image Recognition using NEAT

Milestone 1: Trying to recognize distinctly shaped fruit images (Apples vs Bananas)

Initial Parameters and Setup:
I had initially planned to use 100 by 100 images and use neat-python to try to recognize the images. This caused my computer to freeze and pycharm quit responding.
I initially had a population of 50, 300 generations, and 30000 inputs (which were the 10000 pixels and the 3 rgb values at each pixel). I added 3 hidden layers as well.
This didn't run at all.

Current parameters:
I reduced my dataset down to 48 images per fruit, as well as resizing the images down to 16 by 16. I also had a population of 10 now instead. For the first shape tests I converted the images to grayscale, which further reduced the inputs by a third. With a generation runtime of about 5 seconds, I ran about 50 generations, and even got 100% accuracy on some tests.

Visualization and experiments:
I wasn't able to generate experiment reports like I had said, due to the challenge of getting neat to work with images, but by using the visualize.py file from the neat-python library I was able to graph the best and average fitness as well as the average accuracy.

Milestone 2: Adding color back into the mix

I continued with the previous parameters, and the .py file was pretty much the same, but with the added RGB values. This multiplied the inputs by 3, which significantly increased the runtime. It also wasn't as accurate in finding a really good neural net, most likely due to the similar spherical shape of Apples and Oranges. Again the results of the most recent experiment were graphed and added to the viz folder.

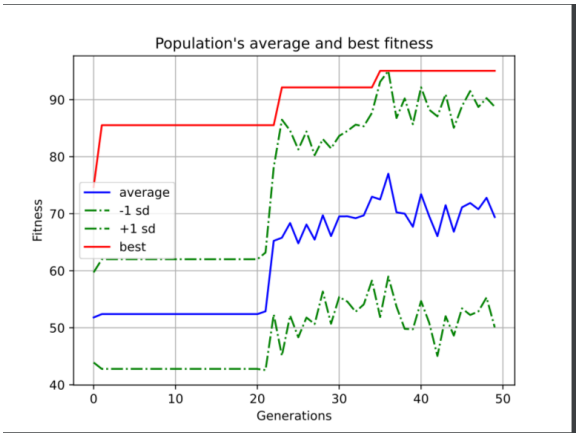
Milestone 3: Adding more fruits and more possible outputs.

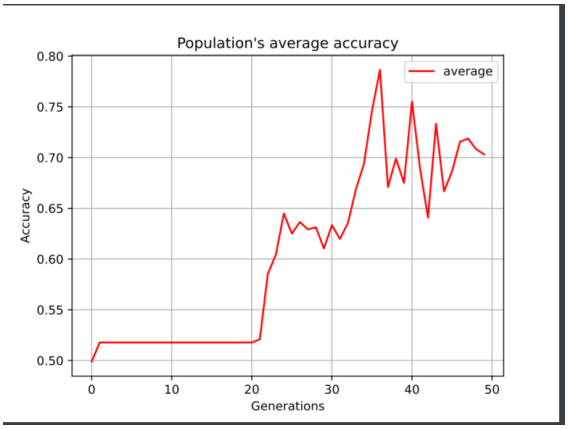
This milestone was really the most challenging part of the project. I now had 4 possible outputs, and was using color values. That means there were 192 images, each with 768 inputs. I also changed the Neural net parameters to have 4 outputs, and selected the output with the largest value as the guess. The fitness of each genome was also changed to be four times the previous amount, and the fitness adjustment happened 4 times, once for each output. Overall it performed very poorly, the best test I saw having less than 50% accuracy for the best genome. The runtime averaged at 12-15 seconds

per generation, and with 50 generations this meant that best case it would take 10 minutes to complete.

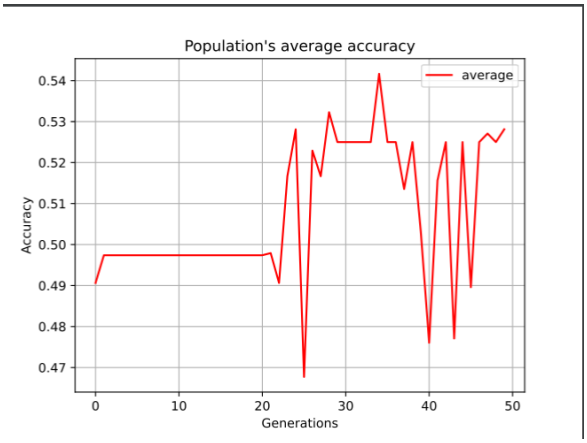
Milestone 4:
I will attach graphs below for each previous Milestone.

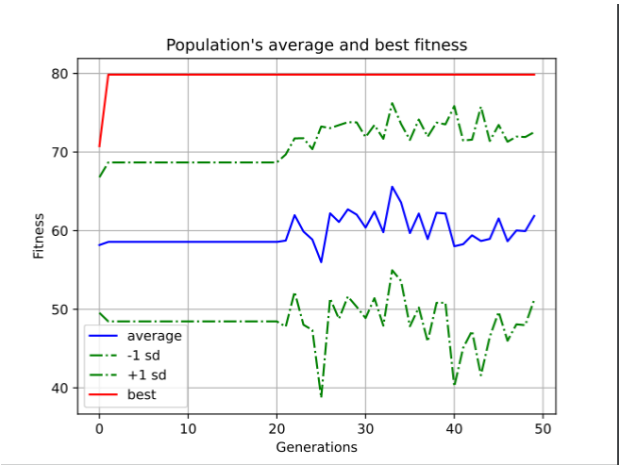
Graphs for part 1:



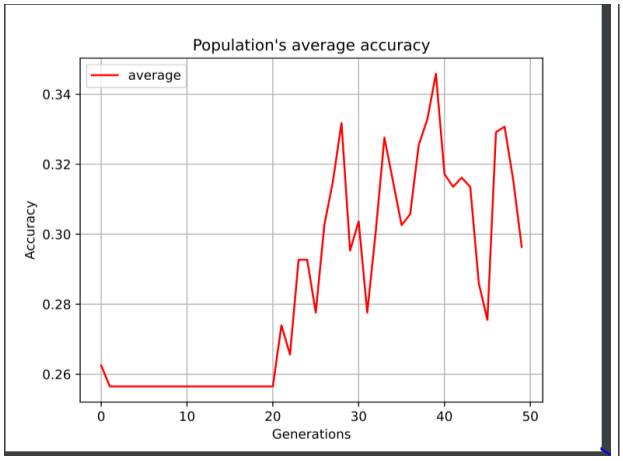


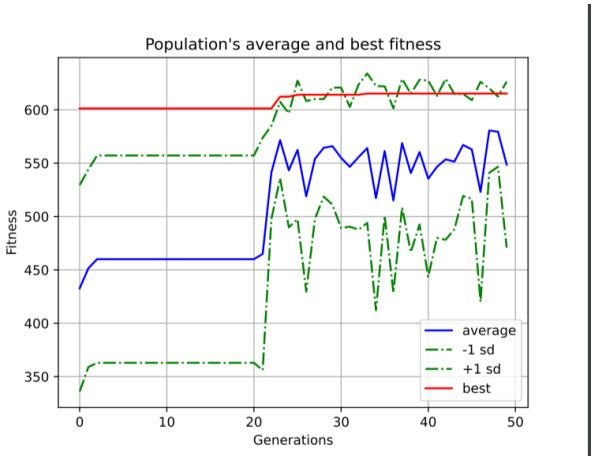
Graphs for part 2:





Graphs for part 3:





Milestone 5: Test different parameters

This milestone is incomplete mainly because of the challenge in trying to get neat to recognize images. With most tests taking 5 or more minutes to complete, and the actual algorithms themselves not being completed until late tuesday, testing and going into depth with different parameter combinations wasn't possible.

Conclusions:

Overall I would consider this project both a success and a failure. I failed in completing what I had aimed to do, but now I realize that maybe I set too high of a goal with such a challenging topic. However I was very successful in achieving my learning goals, and the experience from attempting image recognition with NEAT was great. It was very fun and in the future I plan to take on this challenge of recognizing images, but hopefully am able to pull it off better.