Marked Tutorial 2: Genetic Algorithm

The goal of this algorithm is to maximize the equation: Y = w1x1 + w2x2 + w3x3. The genetic algorithm does this by ‘evolving’ its solutions by using a calculation of fitness. The fitness function for my solution is defined aptly as the “fitness\_function” in my submitted code. This function takes in the input values of 4, -2 and 7 (in that order) and 3 weights to determine a fitness value. This fitness is used to determine if that individual is good enough to be used to reproduce a “new population” to support in finding the optimal solution.

My results showed the genetic algorithm, when starting with random values between 10 and -10 for the weights, it identifies the greatest fitness and evolves those individuals to become more optimized with each generation. The output below shows the optimization occurring:

Generation 1: Best Fitness = 111.93783404407955, Best Weights = [9.440761770062137, -4.295869085882067, 9.369006970295267]

Generation 2: Best Fitness = 124.4266221443975, Best Weights = [7.904855767121955, -9.872577898636795, 10.43743475409087]

Generation 3: Best Fitness = 131.48555846303708, Best Weights = [9.669589846781854, -9.872577898636795, 10.43743475409087]

Generation 4: Best Fitness = 133.11424683478907, Best Weights = [8.763067252657997, -9.170169639763266, 11.388805506375794]

Generation 5: Best Fitness = 137.48139484876063, Best Weights = [9.854854256150881, -9.170169639763266, 11.388805506375794]

Generation 6: Best Fitness = 142.4279466211188, Best Weights = [10.74028806980366, -9.872577898636795, 11.388805506375794]

Generation 7: Best Fitness = 144.93829939013239, Best Weights = [10.47399454748648, -9.872577898636795, 11.899595057558981]

Generation 8: Best Fitness = 152.07472569955308, Best Weights = [11.938790644523932, -10.699438424693975, 11.845812324581345]

Generation 9: Best Fitness = 154.51891177125424, Best Weights = [10.802157663987554, -10.094825617200101, 13.017232840129116]

Generation 10: Best Fitness = 158.0464497099798, Best Weights = [12.698573925208525, -9.872577898636795, 12.500999744553159]

Final Solution:

Best Fitness = 158.0464497099798

Best Weights = [12.698573925208525, -9.872577898636795, 12.500999744553159]

The code I have produced performs this functionality well, by utilizing the genetics algorithm to determine the optimal output for the equation in the given number of generations. Due to the nature of this equation, and the optimized solution being maximization of the output, increasing the generations only results in better results. However, for this assignment it has been limited to 10 for simplicity.