

SET10107 Coursework

40056761@live.napier.ac.uk
 SET10107 - Computational Intelligence
 School of Computing, Edinburgh Napier University, Edinburgh

Index Terms—Neural Network, Evolutionary Algorithm, Multi-Layer Perceptron

I. INTRODUCTION

THE aim of this project was to investigate how the diversity of an Evolutionary Algorithm's population effects the performance of Multi-Layer Perception Neural Network trained by said algorithm. A substantial amount of research has already been conducted into how the effectiveness of Hyper-heuristic's can be improved by encouraging diversity in the individual sub-heuristics - this investigation was designed to assess if a similar approach to Hyper-heuristic diversity could be applied to an Evolutionary algorithm to improve its fitness

II. APPROACH

Investigation was conducted by exploring how different types of Parent Selection, Child Crossover, Mutation, and Immigrant Injection can alter the overall diversity of an Evolutionary Algorithm's population - and how in turn that effects the overall fitness of the Algorithm.

A. Background

Stuff about hyper-heuristics goes here. Get those references, son.

B. Algorithm Operators

1) Selection

While the provided `selectRandom` function was a perfectly valid solution to increasing the diversity of selected parents - alternative selection functions had to be designed to allow for comparison.

`selectRandom`: The provided selection method operates by simply choosing two random individuals from the population. This selection function should be considered the most diverse, as every individual in the population has an equal chance of being selected to become a parent - regardless of their fitness

`selectElite`: This selection method operates by choosing the two individuals with the best and second-best fitness. From an ignorant approach, this may seem to be a valid selection tactic, in reality however this method is likely to cause the population to reach a local maxima within a relatively small number of generations. `selectElite` was included in this investigation to provide evidence that a lack of diversity in the population may be detrimental to its potential fitness.

`selectTournament`: This function was designed to randomly choose a designated number of individuals - and the individual in the group with the best fitness goes forward as a parent. The number of individuals in the tournament directly alters the selection pressure - larger tournaments have a smaller chance of a weaker individual being chosen for crossover. This selection method should prove adequate in diversifying the population - however it is unlikely to be as pronounced as the `selectRandom` function.

`selectRoulette`: A roulette selection has the potential to pick any individual in the population, proportional to its fitness - e.g. an individual with a fitness of 10 is twice as likely to be picked over an individual with a fitness of 5. While individuals with high fitness are more likely to be selected by this function, it is not guaranteed - ensuring this function is suitable for the diversification of the population.

C. Crossover

III. EXPERIMENTS & ANALYSIS

IV. RESULTS

V. CONCLUSION

VI. FUTURE WORK