**CSE 5693 Machine Learning**

**HW4 Genetic Algorithm**

Josias Moukpe

Written Assignment

1. **9.4**

**Consider applying GAS to the task of finding an appropriate set of weights for an artificial neural network (in particular, a feedforward network identical to those trained by BACKPROPAGATION. Consider a 3 x 2 x 1 layered, feedforward network. Describe an encoding of network weights as a bit string, and describe an appropriate set of crossover operators. Hint: Do not allow all possible crossover operations on bit strings. State one advantage and one disadvantage of using GAs in contrast to BACKPROPAGATION to train network weights**

1. **10.1**

**Consider a sequential covering algorithm such as CN2 and a simultaneous covering algorithm such as ID3. Both algorithms are to be used to learn a target concept defined over instances represented by conjunctions of n boolean attributes. If ID3 learns a balanced decision tree of depth d, it will contain 2d - 1 distinct decision nodes, and therefore will have made 2d - 1 distinct choices while constructing its output hypothesis. How many rules will be formed if this tree is re-expressed as t a disjunctive set of rules? How many preconditions will each ru?e possess? How many distinct choices would a sequential covering algorithm have to make to learn this same set of rules? Which system do you suspect would be more prone to overfitting if both were given the same training data?**

1. **10.3**

**Refine the LEARN-ONE-RULE algorithm of Table 10.2 so that it can learn rules whose preconditions include constraints such as nationality belong to set {Canadian, Brazilian}, where a discrete-valued attribute is allowed to take on any value in some specified set. Your modified program should explore the hypothesis space containing all such subsets. Specify your new algorithm as a set of editing changes to the algorithm of Table 10.2.**

1. **10.6**

**Apply inverse resolution to the clauses C = R(B, x) v P(x, A) and CI = S(B, y) v R(z, x). Give at least four possible results for C2. Here A and B are constants, x and y are variables.**

1. **From testIrisSelection in the programming assignment, compare the three selection strategies. Plot test set accuracy against number of generations and discuss your observations.**
2. **From testIrisReplacement in the programming assignment, plot test set accuracy against replcaement rate (r) and discuss/explain your observations.**