TEI OF CRETE
DEPARTMENT OF INFORMATICS ENGINEERING
Msc in Informatics & Multimedia

COMPUTATIONAL INTELLIGENCE

October 24, 2016

Professor: Giorgos Papadourakis, Ph.D.

ASSIGNMENT 1: Evolutionary Computation

1. How do you think adaptation and self-organization are interrelated?

2. What is the difference between fuzziness and probability? Provide an example to illustrate the difference.

3. What is the definition of artificial intelligence? List some differences between computational intelligence and artificial intelligence.

4. Give a real-world example of each type of adaptation: supervised, reinforcement, and unsupervised.

5. Convert the following binary coded strings to Gray coding: 10111010, 10010100, 01101110.

6. Calculate two generations for the simple problem max $\{x^2\}$ over x {0,.. 63}
   a) Starting with random numbers {0.3, 0.6, 0.1, 0.7} calculate the binary representation of the code to be used with initial population of 4.
   b) For each member of the initial population calculate x, f(x), f_{norm}, cumulative f_{norm},
   c) Using roulette wheel selection with random numbers {0.3, 0.8, 0,2, 0.5} form the population after reproduction with 4 spins.
   d) Perform a two point crossover between individuals 1,2 {crossover 3,5 bits} and individuals 3,4 {crossover 5,2 bits}
   e) Perform bitwise mutation on 3rd bit from left of 2nd individual and 5th bit from left on 4th individual.
   f) Repeat step b,
   g) Repeat step c with random numbers {0.1, 0.3, 0,9, 0.7}
   h) Perform a one point crossover between individuals 1,3 {crossover 3rd bit} and individuals 2,4 {crossover 4th bit}
   i) Repeat step b
   j) Using modified roulette wheel selection (Baker) with random number {0.4} form the third generation population after reproduction with 1 spin.

7. After running a genetic algorithm for a fairly long time, the fitness values tend to cluster at the high end of the scale. For example, on a scale of 0 to 1, they might cluster from 0.90 to 0.98. What is the main problem with this? How can it be alleviated?

8. What is the main difference between evolutionary programming and evolution strategies?

9. What are the main difference between genetic algorithms and genetic programming ?

10. For each of the schemata 0**1**11, 001***1*, *1*10*1* and **1**01* give the order o(H) and the defining length δ(H).