

## Assignment #9

ECE449, Intelligent Systems Engineering  
Department of Electrical and Computer Engineering, University of Alberta

**No late assignments accepted!**

Fall 2019  
Dr. Petr Musilek

### Points: 10

**Due:** Thursday, November 28, 2019, 3:30 PM,  
in the assignment box in the ETLC atrium

**Note:** Show your work! Marks are allocated  
for technique and not just the answer.

Student Name:

ID Number:

1. [4 points] Compare the following pairs of concepts:

a) *Individual* and *Population*:

b) *Chromosome* and *Gene*:

c) *Genotype* and *Phenotype*:

d) *Crossover* and *Mutation*:

2. [6 points] Selection

Consider the following population of 10 individuals in GA:

[100001, 100011, 011100, 011000, 010000, 110010, 001010, 000101, 111101, 000010]

That encode value of single variable  $x$  using binary code. The fitness function  $f(x) = 1/[1 + (x - 32)^2]$  should be maximized. Further, assume that random number generator provided the following sequence of numbers

[0.2319, 0.2393, 0.0498, 0.0784, 0.6408, 0.1909, 0.8439, 0.1739, 0.1708, 0.9943]

used to select 10 individual for the intermediate population (i.e. population of individuals to undergo crossover and mutation). Determine the intermediate population using

a) fitness proportional selection, and

b) ranked selection;

Compare the two intermediate populations

Note: Prior to applying selection, sort the individuals in the population ascending according to their fitness.