**COEN 432/6321**

**Assignment #1**

**Due Date , Feb 07 , 2020, at 11:55 PM, via Moodle**

This project is intended to be a gentle introduction to Genetic Algorithms (GAs). Your task is to design your own GA to evolve a solution **x** = {*x*1*, x*2} that maximizes the function

*f(x*1*, x*2*)* = 21.5 + *x*1 \* sin(4π*x*1) + *x*2 \* sin(20π*x*2)

subject to constraints

-12.0 ≤ *x*1 ≤ 12.0 and 6.0 ≤ *x*2 ≤ 6.0

As suggested by Eiben & Smith (the textbook), include some of the GA parameters in the representation of each individual (and perhaps, test different selection schemes). I suggest that you first build and test a first version that is simple and straight-forward, but later on include parameters in the representation (version 2) and perhaps, even make it more potent (faster or/and more efficient) in a third version using selection/diversification ideas that you’ve learned from Eiben & Smith, external sources, or from own imagination.

Run each GA version 10 times (at least) using a different random seed for each run. For each GA version, record the *progress of evolution* over time, by calculating the mean and standard deviation of both *average* and *maximum* fitness of a 1000-individual population, over time (call this PE). Also, for each GA version (and for all 10 runs), record the coordinates of the *fittest* individual (**x)** with its *fitness* value f(**x**) (call this FF).

Each student should write a brief report that includes each of the following items:

1. Algorithm: *clear* high-level pseudo-code for each and every of GA version;
2. Results: for each GA version, a *figure* showing PE and a *table* containing FF;

propose explanatory *hypotheses* for why different GA versions behaved differently.

1. Conclusion (1 paragraph): critical *lessons* about GA design and operation.

Submit your short report and software project via moodle. The marker will read your report, examine your source code, run your program, and return commented and graded reports to you via email.

# Submission Instructions

* Assignments in **Python, Java, C, C++ and Javascript** are accepted.
* Along with programs and report, the assignments should also have a **Readme** file, explaining **how to compile and run** your program.
* All **the code and necessary files** includingthe **brief report and readme file** should be **placed in a single folder** andnamed **COEN431\_6321\_ASN#1\_YOURID**.

**NOTE: The GA should be written from scratch, do not make use of any packages to generate the GA.**