CS 5320/4320

Project #2

Points 100, Due: 11:59 pm, Mar 1

Empirically establish whether or not (a) stochastic universal sampling and (b) deterministic sampling perform (statistically) significantly better than roulette wheel sampling in GAs. Use only one problem for this purpose, namely the one studied in Project 1. Use all the configurations from Project 1; specifically, use proportional selection (no other selection). Use the metrics discussed in the lectures to substantiate your claims. Statistical tests of significance are not needed; however, means and standard deviations are a must for any meaningful comparison to be made. Make suitable choices on the number of runs, etc.

The specific optimization problem is the same as the one in Project1:

Minimize $f(X_1, X_2, X_3) = X_1^2 + X_2^2 + X_3^2$ for $-1.0 <= X_i <= 5.0$, i = 1, 2, 3.

All the information needed to complete this project can be found in the lectures/notes/books/reading material posted on Canvas. It is up to you to determine, judiciously, how you will go about establishing the improvement in performance (or lack thereof).

Use Python/Java/C/C++ as the implementation language. Please do not use an off-the-shelf implementation of GA from a package (such as Octave or Matlab). The goal is for students to develop a sound understanding of the working of the GA heuristic. Please ensure that your program's output is exactly reproducible (by recording, maybe in a file, the initial seed(s) of your random number generator). Do not use the system time or something similar as the initial seed.

This is a group project, with three students per group. There will be only one submission from a group (it doesn't matter which member submits it; the submissions of the other members will remain blank on Canvas.) Please write the names of the group members at the top of the very first page (or cell) of the submission. Form your own groups by interacting amongst yourselves but please do NOT use Canvas's features to store group compositions. A student may choose to be in different groups for different projects. Working in groups is highly recommended but not mandatory; a student may choose to work independently.

Please submit on Canvas a single doc/docx/pdf/ipynb file (no other file type, please, with the following exception: if you are submitting an ipynb file, please ALSO submit the corresponding html) containing the source code and all output. Submission of multiple files is discouraged but may be resorted to only if you absolutely cannot manage to produce a single file. Physical files are to be uploaded – not a link to some web site. At the beginning of your report, you may add notes for any other special issues/techniques that you think might be important in your implementation.