COSC 4P82 Genetic Programming Project

Instructor: Brian Ross
Due date: End of term (exact date TBA).
Note for undergrads: Projects can be done individually or in groups of 2.
Note for graduate students: Projects must be done individually.

Evaluation: An 8-12-page paper, and relevant code and data listings. Please submit a hard-copy of the report with signed department cover page, and electronic copy of your report, files and data. Upload it all to BrightSpace.

NOTE: Major mark deduction if ChatGPT or other AI LLM used to write any part of the report.

Topics: Two types of topics are possible:

1. <u>Application</u>: Use GP to solve some application problem of your choosing. You might try using a new variation of GP towards a known problem, or even an improvement of some other researcher's approach as described in the literature. The course lectures and seminars will introduce a lot of new ideas and method that you might consider using for the project. You might even think of a novel problem in which GP has yet to be applied. Lots of data for different real-world problems is available at the UCI Machine Learning Repository (www.ics.uci.edu/~mlearn/MLRepository.html).

The results of your experiment should be described in a suitable report, which lists all the relevant parameters and results. Attention should be given to experimental methodology and analyses. Your assignments will give you practice in writing formal reports.

2. <u>System</u>: Create a new GP system with some interesting features, for example:

- Koza's tree-based GP system in a language of your choice (other than Lisp). You might embellish it with some new features.
- Extend an existing GP system (ECJ, DEAP, ...) in a useful and nontrivial way.
- Create a visualization tool for a GP system. Many papers exist on techniques for visualizing runs, populations, progress, etc.
- Accelerate GP with a GPU (e.g. using CUDA).
- A new GP representation, using grammars, linear chromosomes, ...

System projects will require testing on experimental data. Therefore, such projects will still require a formal report of experimental evidence that tests the implemented system. There will be less emphasis on experimental methodology and analysis compared to application-oriented projects. The report should also describe the system design and implementation of the implemented system.

Comments:

Please pass your topic idea to me for approval before you start work on it.

Be sure to research relevant background research to your topic. See online citation indices, journals, conferences, technical reports, etc.

The intention of the project is to give you an opportunity to be creative with ideas you have been exposed to during the course. Please keep your project idea focused and within reasonable limits. Many might use very interesting ideas and obtain impressive research results, which could be potentially published at a research conference (although this is not an expected criteria for the project).

Grading will focus on the scientific maturity of your report. Experiment methodology should be sound and rigorous. New systems should be tested using appropriate experimental test cases. Empirical results should be analyzed using appropriate statistical methods. These requirements will be discussed during the course.