Module	Artificial Intelligence Methods (20 Cr)
Module Code	COMP2024 (G52AIM)
Convenor	Tissa Chandesa, Siang Yew Chong
Deadline	29th April 2022
Percentage	50%
Length	Maximum 8 A4-pages for Group Report Maximum 2 A4-pages for Individual Reflection
Type	Group Coursework with Individual Reflections

Instructions:

1. **Submission of Coursework**
   Completed **(i) group technical report in *PDF*, (ii) individual reflections in *PDF*, and (iii) all competition source and generated files, archived in a Zip file** must be submitted online via ***Moodle***. **Full instructions in page 4**. For example, the leader of Group 1 should submit the file as Group01.zip.

2. **Deadlines**
   Submission deadline is by **29th April 2022**, **15:30**. A penalty for late submission applies. The penalty used in this School is a reduction of 5% for each working day that the work is received late.

3. **Layout**
   Coursework must be word-processed with all pages numbered. It should include
   (i) **Cover page** that lists all members of the group - **names** and **full student ID number** (the ***group leader*** must be ***clearly indicated***). This is completed with the following statement:
   We declare that we have read and understood the University's Academic Integrity and Misconduct statements and policies.

   (ii) **Written group technical report** including any figure, table, and citations at maximum of 8 pages. The page limit is to ensure that you focus on explaining how you work out your solutions clearly.

4. **Plagiarism Academic Integrity and Misconduct**
To complete the report, it is essential that you make clear that the work in question is your own since submission of another person's work as if it was your own constitutes an act of plagiarism, which is a very serious academic offence. Provide appropriate academic references if you need to make use of specific results/methodologies produced by others. You may be asked to explain your work orally. It is **your own responsibility** to **familiarize** yourself with the Academic Integrity and Misconduct statements and policies:

https://www.nottingham.ac.uk/qualitymanual/assessment-awards-and-deg-classification/pol-academic-misconduct.aspx

https://www.nottingham.ac.uk/studyingeffectively/studying/integrity/index.aspx

School of Computer Science
University of Nottingham Malaysia

Single-Objective Continuous Optimization Problems

The following coursework is about producing a technical report of your selected stochastic optimizers for the single-objective continuous optimization problems.

Note that there are both Group and Individual Components. Together they contribute to your own final individual mark at 100 in total for assessment. All members will share the same mark for the Group Component part.

1. **[Group Component]** Produce a **group technical report of stochastic optimizers** of your choice for the **single-objective continuous optimization problems**. You are allowed to use libraries of optimizers (if they are made open-source) but you must cite them.

    Assessment breakdown is as follows:

    (i)   **Literature review of the optimizers of your choice**. Here, you will be assessed on both the breadth and depth of your review. For example, in selecting specific optimizers, the review should be focused on why they are chosen (e.g. reported advantages) against the backdrop of general state-of-the-art algorithms available. Also, a novel, clear, succinct (algorithmic, mathematical, or graphical) presentation of the optimizers will be considered. **[10 marks]**

    (ii)   **Controlled experimentation of optimizers**. Here, the main choice must be the BBOB-2010 set of benchmarks (as indicated in the lab sheets). You must return the standard technical reporting results, for example, repeated runs of your optimizers against specific benchmark problems and statistical analysis if you compare optimizers. This can be in a general table summary, and figures of your runs. **[20 marks]**

    (iii)   **Detailed explanation of your results**. This must be done based on the controlled experiments you performed. For example, you can choose to highlight specific and more details in your results (e.g. benchmark problem types) and offer explanation for your numerical results. If you include some new variations to the standard optimizers in the literature, then you must qualitatively explain the improvements (if any) that are backed with quantitative results. **[20 marks]**

2. **[Individual Component]** Assessment breakdown is as follows:

    (i)   **Individual reflection**. Each member must produce a single piece of reflection essay on their contribution. The group leader will focus on the competition coordination and subsequent group technical report writing. All other members will focus on their own individual research culminating in their own final submission of optimizer for the competition. **[30 marks]**

    (ii)   **Competition**. Each group will run their own internal competition coordinated by the group leader. Each of the remaining members must submit one's own optimizer for this internal BBOB-2010 competition. A scaled down version will be used. Each member will be scored based on a weighted, within-benchmark ranks. This score will then be used to rank-sort the members. Marks will be assigned in five tiers (4, 8, 12, 16, 20). The group leader will be assigned a 20. The remaining members are assigned 20, 16, 12, …, according to their ranks. Average marks used for tie breaks (e.g., 18, 18 for first, second ties). **[20 marks]**

Competition specifications:

*a. Complete **BBOB-2010 benchmarks** will be used (**f1** to **f24**), at **5-Dimensions**, across **15-instances** each.*

*b. Optimizer is initialized (with the same, fixed random seed), and then run once to search for each benchmark problem instance, at maximum of **5000 fitness evaluations**.*

c. Download the modified fgeneric.m file and replace inside your installation directory (note: line 127 has been changed to "DeltaFtarget = 1e-16;").

Submission reporting:

*a. Download the provided FSMap.xlsx file. There are **24 x 15 cell** (orange-colored) entries (from B2 to P25).*

b. Fill each entry with your optimizer's Δftarget output. This entry must be in the range of [1.00E-14,1.00E+03]. Values above 1.00E+03 must be modified back to 1.00E+03. Values below 1.00E-14 must be modified back to 1.00E-14.

c. Each member submit your completed FSMapYYYYYYYY.xlsx and source files to the group leader.

d. The group leader to verify the submission of FSMap files by compiling and running the submitted optimizers. Then, the group leader is to complete the RankCXX.xlsx file.

Note: XX is your group number, e.g., for Group 1, XX = 01. YYYYYYYY is your 8-digit student ID.

What to Submit

The group leader is required to submit online via Moodle:

1. A maximum 8-page written report (**PDF document**) with brief explanations of your results and discussion.

2. Individual reflection essays of each group members (**PDF documents**).

3. Matlab codes of your final optimizer and all associated generated files following BBOB-2010 competition instruction to run the benchmarks. **Ensure that your M-codes outputs the files in the same root directory of your main source file**.

4. Label your files and folder structures:

   (i) groupXX-report.pdf for the report.

   (ii) groupXX-YYYYYYYY.pdf for individual reflection.

   (iii) FSMapYYYYYYYY.xlsx and RankCXX.xlsx files for the competition results.

   Note: XX is your group number, e.g., for Group 1, XX = 01. YYYYYYYY is your 8-digit student ID.

   (iv) All source files + generated competition files with results from running the benchmarks must be submitted. Suggested folder structure is source->groupc for files associated and used to produce the group technical report, and then source->compc->YYYYYYYY for files associated with individual competition submission.

   (v) Archive all your files and ensure you retain your folder structures in a single BBOB2010GXX.zip for Moodle submission.

Further Competition and Assessment Notes

Non-competition participation by any member will be assessed at zero mark (out of 20), and would significantly impact the assessment of individual reflection essay (out of 30).

Your completed FSMapYYYYYYYY.xlsx file will give you the overall score of your optimizer. **Note that your submitted optimizer and generated files can be further verified by the module convenor**. In the event of any discrepancy, your submission might be disqualified and marks be reduced accordingly. One such example relates to technical inconsistencies in your submission, e.g., Δftarget values must now range only within [1.00E-14,1.00E+03].