

## GA Homework

- Develop a genetic algorithm for the test case assigned to you.
- Write a program to test your algorithm, you may use any programming language.
- Include the program code in your report. You may discuss with each other, but **do not share your code**.
- Upload your report (in **one WORD file**) to the Moodle system before **11:00 pm on April 2 Tuesday**; Grade will be deducted 50% per day for late homework.
- If you have difficulty to start from scratch, please refer to the MATLAB code offered by Haupt and Haupt (2003) “Practical Genetic Algorithms”:  
<https://onlinelibrary.wiley.com/doi/pdf/10.1002/0471671746.app2>.  
The code **does not** consider the constraint, so you have to modify it.

Your report should include the following parts (those shown in **bold** must be highlighted in your report).

1. The **optimization problem** assigned to you
2. Given the precision being  $10^{-4}$ , show **the composition of chromosomes** (e.g., 20-bit chromosomes: 11 bits for variable X and 9 bits for Y)
3. **Number of chromosomes and number of generations** (e.g., 100 chromosomes and 1000 generations)
4. **Mechanisms of selection, crossover and mutation** (e.g., roulette wheel, two-point crossover and one-bit mutation)
5. **Constraint handling** (e.g., pre-censoring or penalty)
6. **Setting of tuning parameters** (e.g., crossover rate=0.9 and mutation rate=0.1).
7. **The final optimization results and evolution history**
  - The final result includes the optimal solution (X,Y) and the associated objective function value.
  - The evolution history should be a two-dimensional chart with the X-axis showing generations and the Y-axis showing the record of the best objective function up to the current generation.
  - The evolution history shall be a **monotonically increasing curve**.
8. Program code
  - Define important variables and arrays in the beginning of the code
  - Mark the following 6 parts in your code:
    1. initialization, 2. fitness evaluation, 3. selection, 4. crossover, 5. mutation, and 6. constraint handling.
  - Explain your code using comments (preferably in different colors).