

**Indian Institute of Technology, Indore**  
**Computer Science & Engineering**  
**CS 354N: Assignment VIII - GA**

**Date- 25-03-2025**

**Some general instructions:**

- Name your file in "Assignment8\_yourRollno.zip" format.
- You are not allowed to use any built-in libraries related to the topic. Code from scratch is preferably advised.
- Submission of the assignment should be made using the Google Classroom platform only.
- Plagiarism in any form will not be tolerated.
- You are allowed to submit only once before the deadline. Avoid multiple submissions. In such a case, only the last submitted file will be considered for evaluation.
- Last date for submission of the assignment: 01-04-2025
- Submit a single file (report in zip format) containing the procedure (screenshot of main procedures/code/Results).

**Lab Assignment**

1. Implement a program with basic genetic algorithm that solves the following problem:

Find the maximum value of the function  $f(x)=x^2 + x^3$  , where  $x$  is an integer in the range  $[0, 31]$ .

By performing the following:

- i) Represent  $x$  as a 5-bit binary string.
- ii) Initialize a random population of 8 individuals.
- iii) Perform roulette wheel selection to select parents.
- iv) Apply single-point crossover at a random position.
- v) Introduce mutation by flipping a random bit in the offspring.
- vi) Repeat for 10 generations and print the best solution at every iteration in tabular format.

Extend your program to read the following:

1. any function from the user, and
2. range of integer(according to range string conversion must take place)

3. size of binary string
4. an option to maximize or minimize
5. an option for number of generations required for computation
6. choice to choose single point or two point crossover
7. choice for number of bits for mutation

Demonstrate computation of results in tabular format showing all iterations

2. Implement the following with a language of your choice

Program that uses a genetic algorithm to obfuscate a given text string.

Objective: Modify the text so that it remains readable but appears obfuscated.

Perform the following:

- i) Represent each individual in the population as a variation of the original text (e.g., replacing characters with similar-looking ones like  $A \rightarrow @$  or  $O \rightarrow \text{Ø}$ ).
- ii) Define fitness as the inverse of the number of recognizable characters (penalizing completely unreadable text).
- iii) Use roulette wheel selection to pick parents.
- iv) Apply single-point crossover to combine parent obfuscations.
- v) Introduce mutation by randomly replacing characters with their obfuscated equivalents.
- vi) Evolve for 5 generations and output the most obfuscated text.

**Hint:**

Create a mapping of characters and their "obfuscated" equivalents, categorizing which variations are still recognizable.

Tolerable obfuscation: Characters are replaced with recognizable equivalents, retaining the original context.

Example: "HELLO"  $\rightarrow$  "H3LL0" (completely tolerable)

Intolerable obfuscation: Characters are randomly replaced, breaking the original context.

Example: "HELLO"  $\rightarrow$  "X7@!9" (completely unreadable).

You may use NLP techniques for automation and recognizability