CENG463 – MACHINE LEARNING

HOMEWORK I

Due Date: 17.11.2024 – 23:59

In this homework, you will create a genetic algorithm to solve an image puzzle. A genetic algorithm consists of:

- Population
- Individuals
- Selection
- Crossover
- Mutation
- Fitness Function

Since there is no exact solution, solving the image puzzle requires you to define the logic for each step mentioned above. Figure 1 provides a basic outline of the steps in a genetic algorithm.

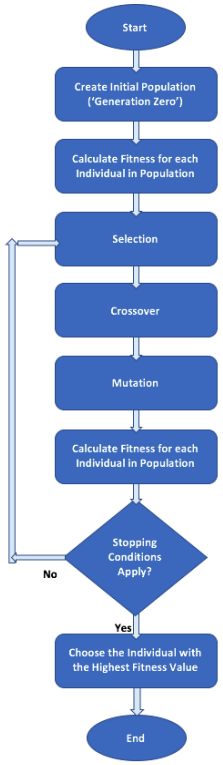

Figure 1 - Logic of Genetic Algorithm

An example solution is shown in Figure 2, with its parameters listed in Table I. Note that this is just an example; your solution may vary in terms of image size, generation number, population size, fitness function, etc.

Image you want to achieve

Shuffled Image

Generation (1), Best Individual

…… ……

…… ……

…… ……

Generation (n-1), Best Individual

Generation(n), Best Individual (Solution)
(You can find each generation's best individual in Generations.rar file)

Figure 2 - An Example Solution

Table 1 - Parameters of Example Solution

Parameters of Example Solution	
Image Size	128X64
Image Channel	(0) Grayscale (**Important**)
Population	20
Generations	1000
Generation Number for Solution	24
Patch Size	8

WHAT YOU SHOULD DELIVER:

- You must write a detailed report of your solution, including:
  - Specification of your patch size.
  - Explanation of how you constructed the crossover, fitness, mutation, and selection functions (graphics are encouraged).
  - An image of the best individual from each generation.
  - Code upload.
  - Python as the required programming language for your solution.