WIX3001 Soft Computing Assignment 3: Evolutionary Computing

1. Group Assignment: 3-5 members per group.

2. Using Jupyter-Notebook and/or Google Colaboratory, develop a multi-objective evolutionary algorithm to design a fuzzy rule base based a dataset with at least 10+ continuous-valued features.

3. Include the following:
   a) Initialize a random population of chromosomes, where each chromosome represents one fuzzy rule base.
   b) Design and compare at least two fitness functions to optimize more than one objective. For example: function A is used to maximize the fuzzy rule base accuracy and minimize the number of fuzzy rules, while function B is used to maximize the fuzzy rule base coverage with the minimum number of features.
   c) Design and compare at least two strategies for selection, crossover, and mutation.
   d) Run the evolutionary algorithm for at least 50 generations, regardless of whether stopping criteria is used or not.

4. Write a report. It should include:
   a) Details of your dataset.
   b) Describe how you implement the above steps.
   c) Describe the pros and cons of your fitness functions and evolutionary strategy.
   d) Describe what results are obtained. Show the progression of the evolutionary process using graphs (i.e. plot average/maximum fitness score vs generations).
   e) Analyze the chromosomes using techniques such as unsupervised clustering or feature importance. Explain how the evolutionary process identifies which features are important.

5. Submit the assignment report and the Notebook file to Spectrum by 1st June 2024. Only one representative needs to submit the report for the whole group.

Marking scheme:

Explained methodology used	2%
Compared at least 2 different multi-objective fitness functions.	2%
Compared at least 2 different evolutionary strategies	2%
Visualized results and fitness score over time	2%
Results and Discussion	2%
Total	10%