MCTA 3371 Computational Intelligence & MCTE 4322 Intelligent Control: Mini Project
Intelligent Heart Risk Prediction using Computational Intelligence [20 marks]

1) This project is group work of max 5 persons, and the total mark is 20.
2) You can use any programming software (e.g. Python, Matlab, Unity3D(C#), Scilab, Octave, FreeMat, etc).
3) Submission due date of the report, and presentation: 15th February 2024, 9am at Advanced Multi-Agent System Lab, E0 Building, Level 2.
4) Upload your code and simulation file to your own Github Repository and share your Github link together with your report to the One-Drive link (link will be given later).

Problem Statement

Cardiovascular diseases are a leading cause of mortality worldwide. Predicting the risk of heart problems can be crucial for early intervention and preventive measures. In this mini project, you are tasked with developing a predictive model using computational intelligence techniques to assess the likelihood of an individual experiencing heart problems.

Objectives

The objective of this mini project is to employ computational intelligence methods to predict the risk of heart problems in individuals based on relevant health data. Students will utilize soft computing techniques, specifically Fuzzy Logic, Genetic Algorithms (GA), and Artificial Neural Networks (ANN), individually or in combination (hybrid approaches: Fuzzy-GA, GA-NN, Neuro-fuzzy).

Instructions

By using your knowledge and intuition, design an intelligent controller for realizing this intelligent system. You need to do the followings:

1) Data Collection:
   - Access the data from any one of the following provided sources:
     - ScienceDirect Heart Disease Prediction Dataset (Table 1) (https://www.sciencedirect.com/science/article/pii/S2352914819301996).
     - Kaggle Heart Attack Prediction Dataset (https://www.kaggle.com/datasets/iamsouravbanerjee/heart-attack-prediction-dataset).
   - Explore the dataset to understand the features and their distributions.
   - Normalize or standardize the data as needed.
2) Soft-Computing Modeling and Simulation:
   - Choose and implement suitable soft-computing methods, such as fuzzy logic, neural networks, genetic algorithm, or hybrid approaches.
   - **Attain excellent marks by incorporating hybrid approaches into your solution**.

- Develop a Graphical User Interface to embed the simulation process (**optional – BONUS Marks**)

3) Evaluation and Validation:
   - Validate the model's predictions by comparing them with the actual heart attack data from https://www.kaggle.com/datasets/iamsouravbanerjee/heart-attack-prediction-dataset .
   - Optimize parameters and fine-tune your model for better performance.
   - Analyze and interpret the results to evaluate the effectiveness of the soft-computing approach.
4) Documentation and Presentation:
   - Prepare a comprehensive report documenting the project methodology, implementation details, and findings.
   - Create an engaging presentation to showcase the project's objectives, methodology, and results.

Deliverables

1) Final Project Report:
   - Present a comprehensive report documenting the project implementation, including introduction, soft-computing modeling, simulation, and analysis of results.
2) Presentation:
   - Deliver an engaging presentation summarizing the project, highlighting the key aspects, methodology, and findings.
3) Code and Documentation:
   - Submit well-documented code that demonstrates the implementation of the soft-computing methods and simulation techniques used in the project.
4) Individual Contributions:
   - Each team member should submit a summary of their individual contributions to the project.