MSc AI Lab: Second Assignement

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Genetics Algorithms for the De Jong functions optimisation

Grade

The project grade, corresponding to 30% of your final grade, is given by a weighted average of your performance in the homeworks (10%, **25%**, 30% and 35%).

Deadline

This assignment must be submitted by **23:59** (Lugano's time) on **8th November 2023**. The solution will be presented during the TA session following the assignment due.

Instructions

The goal of this assignment is to implement a Genetic Algorithm (GA) that finds the global minimum of specific De Jong functions. The implementation will be based on a provided notebook and should be tested following the rules below.

1. **Starting Point**: Use the notebook available at `GAforF0.ipynb` as your base.
2. **Target Functions**: Implement the GA to search for the global minimum of De Jong functions: n.1, n.2, n.3, and n.5. Refer to the paper "Optimization of Dejong Function using GA" for deeper insights.
3. **GA Settings**: Configure your GA using the following settings:
   - Population size: 20
   - Crossover method: Single-Point
   - Mutation type: Bit string with a rate of 1%
   - Iterations: 600
   - Random: Three different starting seeds
4. **Encoding and Decoding**: Use the `gray_encode` and `gray_decode` functions from the given class for encoding and decoding tasks. Use the `evaluate` function for evaluation.
5. **Parameter Combinations**: Test the GA with the following selection rules:
   - Rank
   - Roulette
   - Rank with Elitism
   - Roulette with Elitism
6. **Output Requirements**: For each combination (parameter, function, seed), provide:
   - A graphical representation of the minimum, average, and standard deviation values across iterations.
   - The best result and solution obtained.

Submission Guidelines

1. **File Type**: Submit as a Python Jupyter notebook.
2. **Content**: Discuss your findings briefly and provide evidence for each of the tasks completed.
3. **Exclusions**: Do not include plot images or files from the `AI2022MA` directory.
4. **File Naming**:
    - For a single file: <Name Surname>_MScAI23_hw2.ipynb
    - For multiple files: Compress them into a folder named <Name Surname>_MScAI23_hw2.zip