Search Based Software Engineering

Exercise 02 - Genetic Algorithms

2019-05-14

Deadline: 2019-05-27 23:59

Submit to: andre.karge@uni-weimar.de

Submission details: compress your files (.zip or .tar.gz or .rar)
Include a text file with the names, matrikel numbers and degree program for each group member!
Submit a .py file for your solution (no .ipynb files!)
Submit a .pdf file for theory tasks.

Name your compressed file: <lastname>_<firstname>_<matrikelnummer>-ex<exercise-number>(.tar.gz or .rar or .zip)
or for more than one student: please use this format for all group members
example: norris_chuck_123456-schwarzenegger_arnold_121212-ex01.tar.gz

Groups: submit your solved assignment in **groups of 2**

Language: Python 3

Hint: Use the bdbc and h264 datasets for your algorithms (*feature + interaction*)
The slides of the lab class and the datasets can be found at: link

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Problem Description
Model configurations

Task 1. Theory (6 points)

a) What are $(1+1)$, $(1+\lambda)$, $(1,\lambda)$, (μ,λ) and $(\mu+\lambda)$?

b) Explain differences between them.

Task 2. Line Recombination (6 points)

a) How does Line Recombination work? Explain in detail.

b) How can Line Recombination be extended to get Intermediate Line Recombination?

c) Implement Intermediate Line Recombination as a python function.

Task 3. Selection Procedures (7 points)

a) What is Fitness-Proportionate Selection (FPS) and how does it work?

b) What is Stochastic Universal Sampling (SUS) and how does it work?

c) Implement SUS as a python function.

Task 4. Programming (17 points)
Implement a genetic algorithm to find an optimal configuration for the given datasets *bdbc* and *h264*. Make sure that I can execute your program with this command:

python3 run_genetic_alg.py model_feature.txt model_interactions.txt

The script has to consist of the following components:

a) Initialization procedure (5 points)

b) Copy procedure (1 point)

c) Tweak / mutation procedure (5 points)

d) Selection procedure (use SUS from task 3) (1 point)

e) Crossover / breeding procedure (5 points)

You can extend the given *run_genetic_alg.py* script.
Hint: This is a maximization problem - the higher the fitness values, the better.