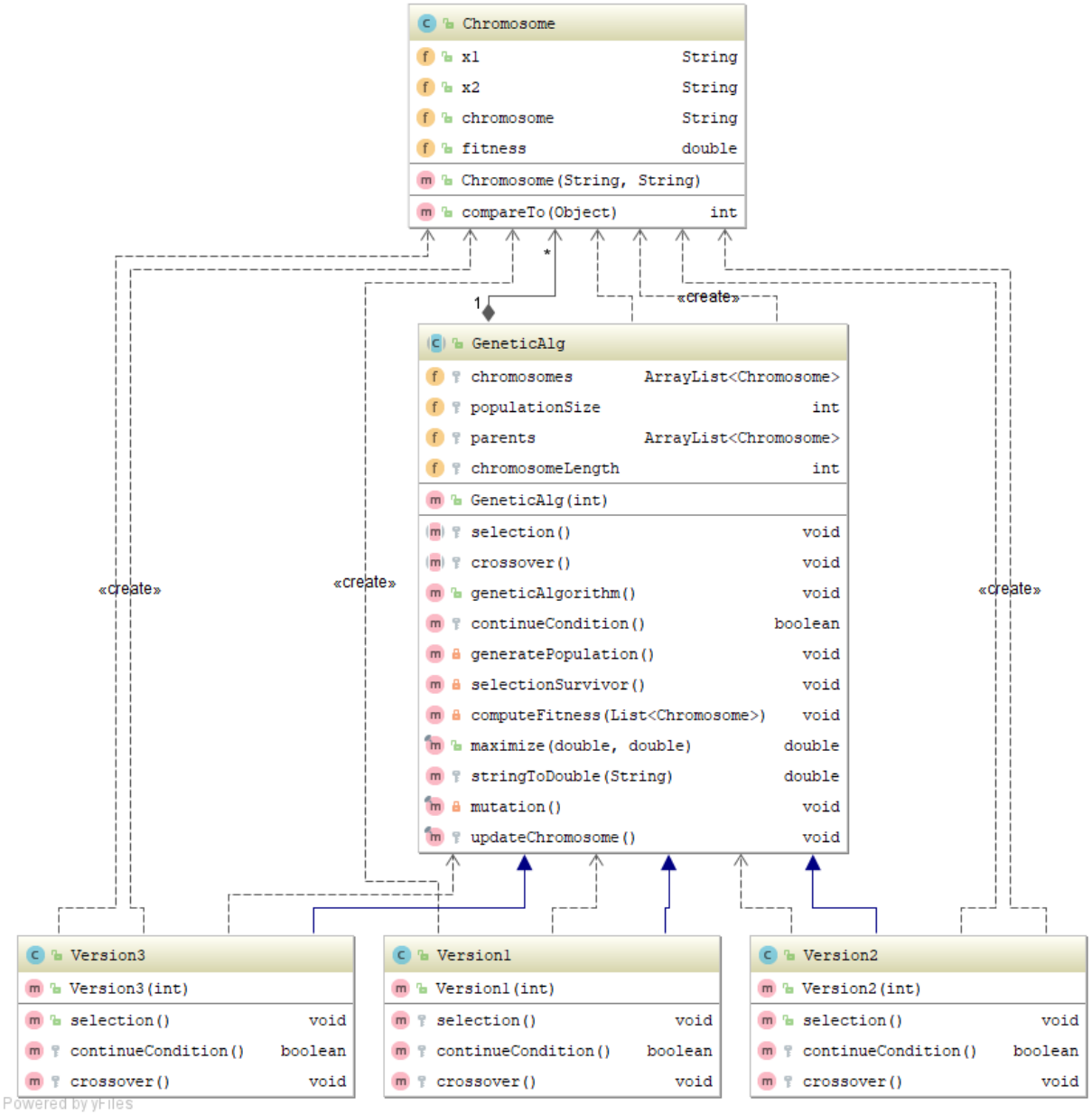
Gebze Technical University
Computer Engineering

CSE443- 2019 Fall

HOMEWORK 2 REPORT

SİMGE SARIÇAYIR
151044035

Part1



In this part, template method is implemented. According to method there is an abstract class which includes primitive methods and maybe hook methods. In this project geneticAlgorithm method is represents template method and it has some steps. These steps are some abstract method that subclass is decided how it will be implemented but template is precise.

Chromosomes are represented with a class that has fitness value and x1,x2 values.

GeneticAlg class has 2 abstract method. Crossover and Selection methos are abstract because subclasses can have their own manner for it. For example, version1 will use “roulette wheel selection” and 1 point crossover but version 2 will use “rank selection” and 2 point crossover.

```
Generate the initial population
Compute fitness
REPEAT
    Selection
    Crossover
    Mutation
    Compute fitness
UNTIL population has converged
```

According to genetic algorithm, initial population is initialized with random double values then their fitness values are calculated. When fitness values are calculated maximize function is used. Also, initial population is initialized with random values but there some constraints about it so they are considered too.

The function to optimize is:

Maximize: $f(x_1, x_2) = 20x_1x_2 + 16x_2 - 2x_1^2 - x_2^2 - (x_1 + x_2)^2, x_1, x_2 \in \mathbb{R}$

Subject to: $x_1 + x_2 \leqslant 5; 0 \leqslant x_1 \leqslant 5; 0 \leqslant x_2 \leqslant 5$

After these operations abstract selection method is implement in the subclasses. There are three types selection methods; roulette wheel selection, rank selection, tournament selection. According to which version has this type they are implemented.

Crossover operation is two type in this project , one point and two point so abstract method is initialized in the subclasses.

Mutation is same for all versions so it is implemented final in the abstract base class. All versions can use that method directly.

These methods are called with order. Then fitness is computed for parent chromosomes which are selected in the selection method previously. These operations are repeated until population is converged.

Loop is repeated with 100 iterations but there is also a termination condition. When a parent could not found 35 times in the selection method while loop is ended.

Results

fitness values for version1	fitness values for version2
90.13593196370107	123.65214585566153
111.45401420154315	104.43375513326687
123.92198278368812	116.47071586502258
112.68440217109423	113.61544815489435
111.57739125405222	44.89087920292603
115.1387481602698	113.65710054531911
122.54157934886514	117.78598067784823
16.685576585965496	106.96565448377413
117.53029395647722	107.72000008529949
114.17491984373777	107.59911817127494

fitness values for version3
122.21829053869848
123.22518887664333
122.1450992268428
122.15042435897672
122.21819386162242
121.9388031090579
121.93350463641352
122.16273441348949
124.27211464456681
122.22683698247516