Task Assignment

Each student is requested implementing a command-line application in Java to solve a given Knapsack using Genetic Algorithms (GA), Simulated Annealing (SA), Ant Colony Optimization (ACO) and Particle Swarm Optimization (PSO).

Given **IntelliJ-project** with base structure must be used.

After finishing the project/implementation a complete **archive [student_id]_[student_name].zip** must be created and **uploaded to Vula latest until October 15th 2019**.

Specification

Programming language and IDE	
Programming language	Oracle JDK/JRE 12.0.2
Knapsack data instance [knapsack_instance.csv]	
Number of items	150
Search space	2^{150} = 1427247692705960000000000000000000000000
Maximum capacity	822
Maximum number of iterations	10000
Best-known optimum	1013
Command-line	
General	Command-line arguments in any arrangements
-algorithm [ga | sa | aco | pso | best-algorithm]	Select *Genetic Algorithm* or *Simulated Annealing* or Ant Colony Optimization or Particle Swarm Optimization or the best suitable from the four given algorithms.
-configuration [default | best]	**Configuration** for each algorithm is stored in an **XML-file**, e.g. ga_default.xml. Parameter can **only** be used **with -algorithm [ga | sa | aco | pso]**. default | solution quality: minimum 75% best | solution quality: minimum 80%
-search_best_configuration	Search for the best configuration. Parameter can **only** be used **with -algorithm [ga | sa | aco | pso]**. Best configuration – with minimum 80% solution quality – is stored in an **XML-file**, e.g. ga_best.xml.

Scores (maximum 50 points)

Genetic Algorithm (1st week) [12 points]	**Base** [2 points]; **One-point Crossover** (1PX) [1 point]; **Two-point Crossover** (2PX) [1.5 points]; **Roulette-Wheel Selection** (RWS) [2 points]; **Tournament-Selection (TS)** [1 point]; **Bit-Flip Mutation** (BFM) [0.5 point]; **Exchange Mutation** (EXM) [0.5 point]; **Inversion Mutation** (IVM) [0.5 point]; **Insertion Mutation** (ISM) [0.5 point]; **Displacement Mutation** (DPM) [0.5 point]; **Parameter Recommender*** [2 points]
Simulated Annealing (2nd week) [12 points]	**Algorithm** [10 points]; **Parameter Recommender*** [2 points]
Ant Colony Optimization (3rd week) [12 points]	**Algorithm** [10 points]; **Parameter Recommender*** [2 points]
Particle Swarm Optimization (4th week) [12 points]	**Algorithm** [10 points]; **Parameter Recommender*** [2 points]
Best suitable algorithm selection **and** solution quality minimum 90% **(4th week)** [2 points]	-

*** Parameter recommender ensures configuration with solution quality of minimum 80%.**

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