LOG 734 Heuristics in Analytics

Assignment 1

Handed out: December 18, 2019
Due date: February 21, 2020

Description

In this assignment, you should design and implement a construction heuristic for the *multidimensional knapsack problem* (MKP). The heuristic must be able to produce feasible solutions to any instance of the MKP. The heuristic is to be evaluated based on two main criteria: 1) the speed of execution and 2) the quality of the solutions obtained.

The construction heuristic can be implemented in a programming language of your own choice. The resulting program should be able to read an instance of the MKP from file, execute the construction heuristic, and output the result (including the running time of the heuristic).

The material handed in must include a written report describing:

- the heuristic implemented
- the reasoning for any choices made when designing the heuristic
- results for the set of test instances that are available through Canvas

The code for the heuristic must also be handed in, in the form of a .zip-file.

You may work in a group of up to three students.

The implementation of the heuristic can be based on any C++ code shared on Canvas by the lecturer, or the heuristic can be implemented from scratch.

Note that the work performed in this assignment will form the starting point for assignment 2.

NB!

- Describe your implementation well: use pseudocode and correct terminology
- Be sure to include a good discussion about choices made when designing the heuristic – describe why something was implemented, not just what was implemented
- Include additional analysis/insight whenever possible
- Present results in a way that is easy to read and evaluate

Benchmark

To give you an indication of how good solutions can be obtained using only a construction heuristic, here are the best results produced by solutions of assignment 1 in 2018 and 2019:

Instance	Best-18	Best-19
100-5-01	23474	24148
100-5-02	23970	24274
100-5-03	22691	23317
100-5-04	22608	23102
100-5-05	23390	23826
250-10-01	58393	58697
250-10-02	57548	58145
250-10-03	56942	57613
250-10-04	60296	60425
250-10-05	56552	57643
500-30-01	113290	114878
500-30-02	113570	113760
500-30-03	113811	115625
500-30-04	112809	113807
500-30-05	114730	115226