IMPROVEMET heuristic for the SCP

Implementation, deadline: 17/10/24

Implement first-improvement (FI) and best-improvement (BI) algorithms for the SCP. In these two algorithms, consider one neighborhoods of your choice. Apply redundancy elimination after each step.

Apply each of these algorithms once to an initial solution generated by CH1, CH2, CH3, and CH1+RE. Hence, in total eight algorithms should be tested obtained by the combinations of the four constructive heuristics with the two iterative improvement algorithms. As variance reduction technique for the experiments make sure that the FI and BI algorithms start from the same initial solution. This can be ensured by using for each of the executions on a same instance the same random number seed. As the experimental results report for each of the experiments

* the average percentage deviation from best known solutions;
* the total computation time across all instances;
* the fraction of instances that profit from the additional local search phase.

Determine by means of statistical tests (in this case, the Student t-test or the Wilcoxon test), whether there is a statistically significant difference between the solutions generated by the various algorithms. Consider the data for the Set Covering Problem (SCP) available in Moodle.

Note: send (i) a report in pdf format that concisely explains the implementation, reports the above requested results in appropriate form, and gives an interpretation of the overall results (e.g. impact of constructive heuristic or redundancy elimination on results (in dependence of constructive heuristic?), impact of initial solution on quality of local optima, computation times of first- vs. best-improvement; results of statistical tests, etc.); (ii) the source code of the implementation; and (iii) a spreadsheet or textfile of the raw data that were used for statistical testing.