Constructive heuristicS for the SCP

Exercise 1.1 Implementation, deadline: 09/10/24

Consider the data for the Set Covering Problem (SCP) available in Moodle.

1. Implement three different constructive algorithms that generate a solution: CH1, CH2 and CH3 (e.g. of CH1 - picking in each constructive step first a still un-covered element and then, second, a random set that covers this element).

Note that in the construction no redundant set should be added, that is, at each construction step check first whether a set contains at least one element that is not yet covered.

1. Implement a procedure to eliminate redundant sets from complete covers (RE). Note that such a procedure can improve the cost as in a complete cover elements may be covered by more than one set and, thus, it may be possible to remove some sets that have become redundant during the solution construction.

For each of these constructive heuristics implement incremental updates of the evaluation function value and the status of the current partial solution (elements covered, the number of sets that cover an element, columns to be considered as candidates to be added, etc.).

1. Apply the three constructive methods CH1-CH3 once to each instance (using same random number seed) with and without post-processing by redundancy elimination.
2. Report for each of the experiments

* the average percentage deviation from best known solutions;
* the fraction of instances that profit from the redundancy elimination;