

Exercise 1 (not mandatory)

Consider the following linear program:

Maximise $30X_1 + 10X_2$

Subject to:

$$3X_1 + X_2 \leq 300$$

$$X_1 + X_2 \leq 200$$

$$X_1 \leq 100$$

$$X_1 \geq 50$$

$$X_1 - X_2 \leq 0$$

$$X_1, X_2 \geq 0$$

1. Solve the problem graphically. Is there more than one optimal solution? Explain.
2. Are there any redundant constraints?

Exercise 2 (mandatory)

Refer to the attached python code.

1. The code reads an instance of the knapsack problem from a file and stores data into memory for use to implement a solution approach.
2. The folder “dataset” contains 5 instances of the knapsack problem of different sizes.
3. A solution is coded as a binary vector (e.g. [0 1 1 0 1 1 1 0 0 0]).
4. Further guidelines are given in comments.

Questions:

1. Implement the hill climbing algorithm to find a solution to the problem.
2. Implement the stochastic hill climbing algorithm.
3. Extend the hill climbing algorithm to implement a metaheuristic of your choice - parameters can be tuned manually.
4. Compare the three approaches in terms of the objective value.