Problem solving methods

Objectives

Using Python to solve complex problems

- Develop abstract data types
- Develop layered applications
- Implement problem solving algorithms (backtracking, greedy)

Requirements

1. Consider a list of persons identified by name and age.

    a. Form groups of *k* persons having a different name

    b. Form groups of *k* persons with the same name but different age

2. Consider a knapsack problem: we have a list of objects, each with a value (v) and a weight (w). The objective is to place objects in a knapsack of capacity W such that the total value of objects is maximum and the total weight does not exceed W.

$$\text{maximize} \sum_{i=1}^{n} v_i x_i$$

$$\text{subject to} \sum_{i=1}^{n} w_i x_i \leq W \text{ and } x_i \in \{0,1\}.$$

Develop a greedy algorithm for the 0-1 knapsack problem. The solution should include:

- A class to model the problem - backpack (capacity, items)
- A class to model the solution - selected items
- A class to model the algorithm