

Bin packing & Facility location

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Contents

1	Bin packing	1
1.1	One container: the knapsack problem	1
1.2	Several containers	1
2	Facility location	1

1 Bin packing

1.1 One container: the knapsack problem

- We already saw a dynamic programming approach last week
- There is also an ILP formulation
- The continuous relaxation can be solved analytically: just sort the objects by decreasing price per kilogram
- Using this relaxation, we can deduce a simple 2-approximation algorithm

1.2 Several containers

- The objective is to minimize the number of containers used
- Easy lower bound
- Online heuristics: NEXT-FIT (2-approx) & FIRST-FIT (17/10-approx)
- Offline heuristic: FIRST-FIT-DECREASING (3/2-approx, cannot do better)
- ILP formulation: need to assume we have K boxes available
- Strengthen the relaxation with valid inequalities: Ex 13.3 (reminder on cuts and B&B)
- Solve a simple case polynomially: Ex 13.4

2 Facility location

- ILP formulation
- Local search algorithm: drop, add or swap facilities and assign each client to the cheapest facility