

3. Greedy

Wednesday, February 17, 2021

12:05 PM

0/1 knapsack

Item	6	3	1	4	5	2	7
Profit	18	15	10	7	6	5	3
Weight	4	5	2	7	1	3	1

M = 15 (weight)

Item Chosen	Weight of bag (weight added)	Remaining Weight	Profit
6	4 (4)	11	18
3	9 (5)	6	18+15
1	11 (2)	4	18+15+10
5	12 (1)	3	18+5+10+6
2	15 (3)	1	54

N possible ways to fill the bag

- $O(N)$
- Greedy approach
- Only 1 combination with maximal profit

Dynamic programming gives n^2 solutions
-feasible and optimal

Fractional knapsack

Item	Profit	Weight	p/w
6	18	4	4.5
3	15	5	3
1	10	2	5
4	7	7	1
5	6	1	6
2	5	3	1.6
7	3	1	3

Arranging in order of p/w

Item	Profit	Weight	p/w
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5	6	1	6
1	10	2	5
6	18	4	4.5
3	15	5	3
7	3	1	3
2	5	3	1.6
4	7	7	1

Vector

Item number	Fraction chosen
1	1
2	0.66
3	1
4	0
5	1
6	1
7	1

Item	Weight of the bag	Remaining weight	Profit
5	1	14	6
1	3	12	6+10
6	7	8	16+18
3	12	3	34+15
7	13	2	49+3
2	15	0	52+(1.6*2)=55.2

N feasible solutions

1 optimal solution

- Any exponential algorithm can be reduced to a polynomial algorithm using greedy approach