

CS 254 Design and Analysis of Algorithms Lab
Spring Semester, 2023-24, IIT Indore

Assignment 7

1. You are given a set of items, each with a weight and a value. You need to determine which items to include in the collection so that the total weight is less than or equal to a given limit while maximizing the total cost.

Example:

Input: item = $[i_1, i_2, i_3, i_4, i_5]$;

weights = [2, 5, 7, 3, 1];

values = [10, 20, 15, 7, 5];

Weight Limit = 10

Output: $[i_1, i_2, i_4]$, with total cost 37

- (a) Design a solution using a greedy approach.
 - (b) Check if your greedy algorithm can always provide the optimal solution.
 - (c) If not, design an optimal solution strategy.
2. Given an array of jobs where every job has a deadline and associated profit if the job is finished before the deadline. It is also given that every job takes a single unit of time, so the minimum possible deadline for any job is 1. Maximize the total profit if jobs are scheduled sequentially.

Example:

Input: Four Jobs with the following deadlines and profits

JobID	Deadline	Profit
a	4	20
b	1	10
c	1	40
d	1	30

Output: Following is the maximum profit sequence of jobs: [c, a], Total profit = 60

- (a) Design a solution using a greedy approach.
- (b) Check if your greedy algorithm can always provide the optimal solution.
- (c) If not, design an optimal solution strategy.