



ASSIGNMENT D4 (EXTRA)

Combinatorial Algorithms for CS4B

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Assignment Code: After implementing all the assignment I pushed my code on my [Github](#) link.

Answer to the question no. 2

The implementation is done in Qustion1.py file.

Dynamic solution of scrum task:

1. Get the benefit and cost of each tasks and assume value is benefit and weight is cost.
2. Initialize a 2D array for memoisation.
3. For each cell of the memo, apply:

$$m(i, w) = \begin{cases} m(i-1, w), & w_i > w \\ \max(m(i-1, w), (m(i-1, w - w_i) + v_i)), & \text{otherwise} \end{cases}$$

And the output is following:

```
C:\Users\DELL\Desktop\Winter 2021-2022\Computer Science for Big data\csfb-wise2122\assignment_8>
cost_constraint: 9, b/c: 0/0, solution: []
cost_constraint: 10, b/c: 50/10, solution: [0]
cost_constraint: 20, b/c: 80/20, solution: [0, 2]
cost_constraint: 30, b/c: 120/30, solution: [7]
cost_constraint: 40, b/c: 170/40, solution: [0, 7]
cost_constraint: 50, b/c: 200/50, solution: [0, 2, 7]
cost_constraint: 60, b/c: 230/60, solution: [0, 2, 7, 8]
cost_constraint: 100, b/c: 290/100, solution: [0, 2, 5, 6, 7, 8]
cost_constraint: 150, b/c: 350/150, solution: [0, 2, 5, 6, 7, 8, 9, 10]
cost_constraint: 200, b/c: 375/170, solution: [0, 1, 2, 5, 6, 7, 8, 9, 10]
cost_constraint: 1000, b/c: 420/310, solution: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
```

Complexity Analysis: As the algorithm need to memoize the all possible solution. So, we have to fill all cell of the memo. As a result, the **time complexity** become **O(n x w)** and the **space complexity** become same as time complexity. Here, **n** is number of tasks and **w** is the cost.

Answer to the question no. 3

If we added more data to the original list, n of the previous question will incese. So, the time and space compexity will increase but not in a polynolial fassion. If we added 4 x 9 = 36 more tasks to the list, the complexity will increase 36 times cost.