# Algorithm Analysis Homework 4

## Due by 5/5(Fri.)

### [1] Programming part

You are to write a program to solve a 0-1 knapsack problem with following approach.

a. Brute force
b. Greedy
c. Dynamic Programming
d. Branch and bound

As you know, Greedy approach does not provide a solution to the 0-1 knapsack problem solution. Therefore, when using greedy approach, it is assumed to be a fractional knapsack problem.

For dynamic Programming & branch bound, and fractional knapsack approach, you should use the algorithm descriptions discussed in the class to implement them

You may refer to any blog or hyperscale AI service for trouble shooting in this homework. But, before you using it, at least think ahead about the logic and implementation details. And you should understand the codes you submit for your own benefit.

Generate benefit value and weight – that are all integer - using random number generator function (sees value is 100). The range of benefit value is between $1 and $500 and that of weight is between 1 and 100. And maximum capacity if knapsack $W$ is

$W$ = (number of items) X 25.

For an output, build a table as follows.

[1] Brute force

| Number of Items | Processing time in milliseconds / Maximum benefit value |
|---|---|
| 11 | .23 / 230 |
| 21 | XXX / XXX |
| 31 | XXX / XXX |

[2] Greedy / D.P. / B.&B.

| Number of Items | Processing time in milliseconds / Maximum benefit value | | |
|---|---|---|---|
| | Greedy | D. P. | B. & B. |
| 10 | XXX / XXX | XXX / XXX | XXX / XXX |
| 100 | XXX / XXX | XXX / XXX | XXX / XXX |
| 1000 | XXX / XXX | XXX / XXX | XXX / XXX |
| 10000 | XXX / XXX | XXX / XXX | XXX / XXX |

Note

1) Write your program in C++.
2) If the program does not compile, you will get no point. Make sure that your program runs in g++.
3) Submit one program file only, not multiple files.
4) Follow the output format suggested above.
5) Total running time of program should not exceed one hour. If your program does not produce output in time, you will get no point.
6) You may use any features in C++ including STL, etc.
7) In header part of the comment, list all the references when doing this homework.

For ex)

(1) 강의 slide chapter 6. page3-5

(2) Blog: ** URL here **

(3) book: "Algorithm analysis in C++" by Someone, chapter 5

(4) Hyperscale AI ChatGPT

8) Also comment put the case you failed to implement it in header part.

For example,

// did not implement data size=40 case of brute force approach

// did not implemet data size greater than or equal to 1000

* If your program does not run on certain data size, think of a reason and try to fix it.

[2] Writing part

Answer the following question in Korean. (If you are more comfortable with English, you ca write in English, but my standards is Korean.)

a. Describe any difficulties you experienced while doing this assignment.

b. What are the notable differences between your code (at least the one you had in you mind) and the one you referenced on the internet?

c. Describe what you had learned from this homework.

Note

1) Submit this part with pdf format.

2) Number of pages should be more than half page, but should not exceed 2 pages.

3) Don't ask me about the font size and/or spacing. We all have intelligence the Lord has given us.