Assignment7 : Set Cover

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- Scene Reconstruction
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Task 8-1

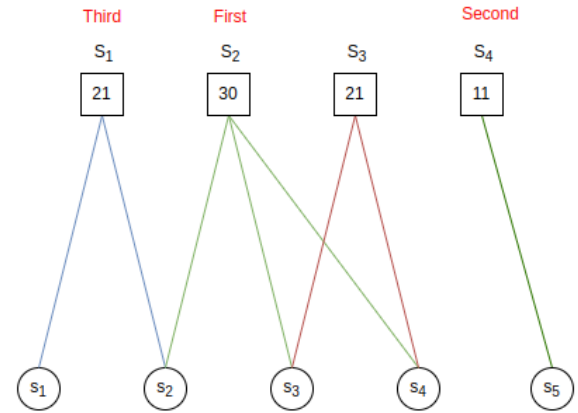
For case shown in upper graph, Greedy algorithm will choose **first S_2, then S_4, and finally S_1**. The total cost is $w_{S_1} + w_{S_2} + w_{S_4} = 62$.

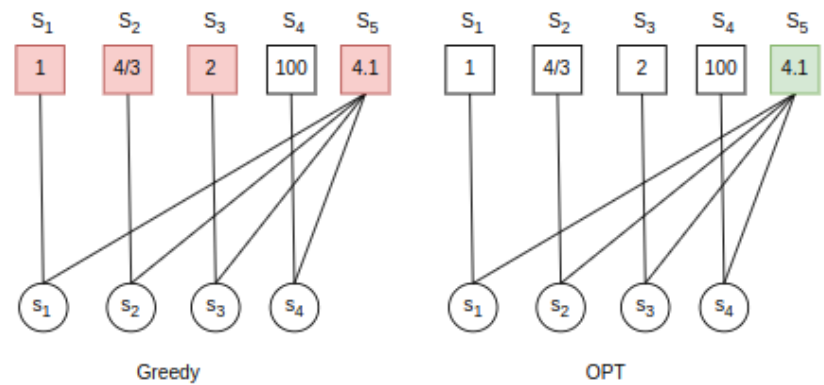
However, the best solution is

$$w(C) = \sum_{i \in \{1,3,4\}} w_{S_i} = 53$$

As for lower graph, greedy algorithm will choose $\{S_1, S_2, S_3, S_5\}$, with $w(C) = 8.4$ However, the OPT solution is $\{S_5\}$, with $w(C^*) = 4.1$

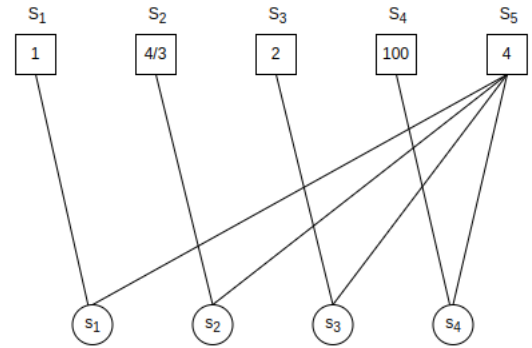
$$\frac{w(C)}{w(C^*)} = \frac{8.4}{4.1} \approx 2.05$$





Task 8-2 (Example 1)

Consider right example. For the first, and each step , greedy algorithm will choose S_1(First step), S_2(Second Step), S_3(Third Step) or S by an averge weight.



Final weight will be

$$w(C^*) = 4$$

When algorithm choose S_5 in first step

And

$$w(C) = \sum\{1, \frac{4}{3}, 2, 4\} = 8.33$$

When algorithm choose S_5 at last

Equals to $w(C^*)H(d^*) = 4 * H(4^*)$

Middle Solution

When S_5 is choosen neight first nor last, a middle solution $w(C) \vDash W(C^*) < w(C) < w(C^*)H(d^*)$ occurs.

Task 8-2 (Example 2)

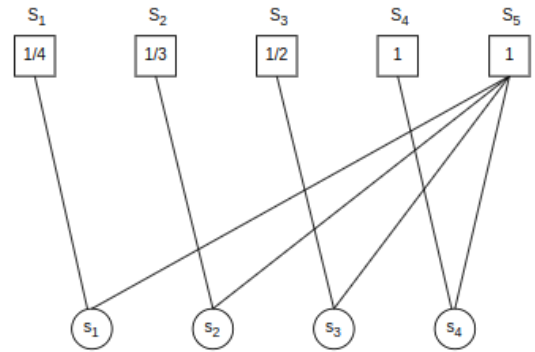
Consider upper example. This example directly explain how $w(C)_{worst} = H(d)$ comes.

Best weight will be directly choose S_5, the result will be

$$w(C^*) = 1$$

Similar with example before, for each step algorithm will choose S_1(First step), S_2(Second Step), S_3(Third Step) or S by an averge weight.

when S_5 is choosen as the last one, algorithm will comes for its worst case, and result will be



$$w(C) = \sum S_1, S_2, S_3, S_4$$
$$= \sum \{\frac{1}{4}, \frac{1}{3}, \frac{1}{2}, 1\} = H(4*)$$