

CS 310 Algorithms

Assignment -1

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Q5.

[5 marks]

You are given the following two $n \times n$ -dimensional matrices. The first matrix called "Intern Preference Matrix" stores information about n interns that want to apply for jobs at n different companies. Each row corresponds to one intern and indicates his/her order of preference for the employers. For example: Intern-1's first preference is Employer-3, second preference is for Employer-1, third preference is Employer-5 and so-on.

How would you restructure/re-store the above information so that we can answer such queries in $O(1)$ time? You are only allowed to use arrays. You cannot use other data structures such as hash tables, etc. **Clearly** explain your answer and the **space** required by your solution.

Sol:

We will make two 2D arrays each of size $n \times n$ where n is number of Employees/Interns.

In Interns Array, we will rewrite their preferences for Employees such that:

- Every Row corresponds to that Intern Preferences i.e. Row 0 shows Intern 1 preferences
- Every Columns represents corresponding Employee i.e. Column 0 shows Employee 1.
- In this way, we will store their Employees J preference number by Intern I at $\text{Array}[I][J]$.

Now, we can answer each query in $O(1)$.

The overall space required is $2 \times (N \times N) = O(N^2)$

For Example, consider the conversion of following intern array:

Intern Preference Matrix

I_1	E3	E2	E1
I_2	E1	E3	E2
I_3	E1	E2	E3



	E1	E2	E3
I_1	3	2	1
I_2	1	3	2
I_3	1	2	3

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