CE100 Algorithms and Programming II

Matrix Chain Order / LCS

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0.2.0.1 Spring Semester, 2021-2022

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0.3 Matrix Chain Order / Longest Common Subsequence

0.4 Outline

- Elements of Dynamic Programming
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  - Overlapping Subproblems

- Recursive Matrix Chain Order Memoization
  - Top-Down Approach
  - RMC
  - MemoizedMatrixChain
    - LookupC
  - Dynamic Programming vs Memoization Summary

- Dynamic Programming
  - Problem-2 : Longest Common Subsequence
    - Definitions
    - LCS Problem

[1] ce100-week-6-lcs.md_doc.pdf
[2] ce100-week-6-lcs.md_slide.pdf
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    - Notations
    - Optimal Substructure of LCS
        - Proof Case-1
        - Proof Case-2
        - Proof Case-3

    - A recursive solution to subproblems (inefficient)
    - Computing the length of and LCS
        - LCS Data Structure for DP
        - Bottom-Up Computation
    - Constructing and LCS
        - PRINT-LCS
        - Back-pointer space optimization for LCS length

- Most Common Dynamic Programming Interview Questions
    - Problem-1: Longest Increasing Subsequence
        - https://www.geeksforgeeks.org/longest-increasing-subsequence-dp-3/
        - https://en.wikipedia.org/wiki/Longest_increasing_subsequence#:~:text=In%20computer%20science%2C%2
        - https://www.youtube.com/watch?v=22s1xxRvy28&ab_channel=StableSort

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- Problem-2: Edit Distance
    - https://www.geeksforgeeks.org/edit-distance-dp-5/
    - https://www.youtube.com/watch?v=tU2f2JwHmfQ&feature=youtu.be&ab_channel=PrepForTech
    - Recursive
        - https://www.youtube.com/watch?v=8Q2IEIY2pDU&ab_channel=BenLangmead
    - DP
        - https://www.youtube.com/watch?v=0KzWq118UNI&ab_channel=BenLangmead
        - https://www.youtube.com/watch?v=eAVGRWSryGo&ab_channel=BenLangmead

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- Problem-3: Partition a set into two subsets such that the difference of subset sums is minimum
    - https://www.geeksforgeeks.org/partition-a-set-into-two-subsets-such-that-the-difference-of-subset-sums-is-minimum/
- Problem-4: Count number of ways to cover a distance
    - https://www.geeksforgeeks.org/count-number-of-ways-to-cover-a-distance/
- Problem-5: Find the longest path in a matrix with given constraints
    - https://www.geeksforgeeks.org/find-the-longest-path-in-a-matrix-with-given-constraints/

- Problem-6: Subset Sum Problem
    - https://www.geeksforgeeks.org/subset-sum-problem-dp-25/
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    - https://www.geeksforgeeks.org/optimal-strategy-for-a-game-dp-31/
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    - https://www.geeksforgeeks.org/0-1-knapsack-problem-dp-10/

- Problem-9: Boolean Parenthesization Problem
    - https://www.geeksforgeeks.org/boolean-parenthesization-problem-dp-37/
- Problem-10: Shortest Common Supersequence
    - https://www.geeksforgeeks.org/shortest-common-supersequence/
    - https://en.wikipedia.org/wiki/Shortest_common_supersequence_problem
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    - https://www.geeksforgeeks.org/partition-problem-dp-18/
- Problem-12: Cutting a Rod

  - https://www.geeksforgeeks.org/cutting-a-rod-dp-13/

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  - https://www.geeksforgeeks.org/coin-change-dp-7/
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  - https://www.geeksforgeeks.org/egg-dropping-puzzle-dp-11/

0.5 References

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