南方科技大学
SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

Lab 12 - Practice
Dynamic Programming (p3)

CS208 Algorithm Design and Analysis

Instructor: Yang Xu, xuyang@sustech.edu.cn

Practice: Longest common subsequence

- Given two sequences $X = \langle x_1, x_2, \dots, x_m \rangle$ and $Y = \langle y_1, y_2, \dots, y_n \rangle$, we wish to find their common subsequence that has a maximum length.

- **Optimal structure**

  To find LCS(X, Y)

  If $x_m = y_n$, we must find the LCS of $\langle x_1, x_2, \dots, x_{m-1} \rangle$ and $\langle y_1, y_2, \dots, y_{n-1} \rangle$

  X_{m-1} Y_{n-1}

  $$\text{LCS}(X, Y) = \text{LCS}(X_{m-1}, Y_{n-1}) + 1$$

  If $x_m \neq y_n$, we compare LCS(X, Y_{n-1}) and LCS(X_{m-1}, Y), and choose the longer one

  $$\text{LCS}(X, Y) = \max(\text{LCS}(X, Y_{n-1}), \text{LCS}(X_{m-1}, Y))$$

LCS Examples

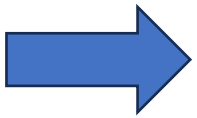
S_1 = ACCGGTCGAGTGCGCGGAAGCCGGCCGAA

S_2 = GTCGTTCGGAATGCCGTTGCTCTGTAAA

LCS(S_1, S_2) = GTCGTCGGAAGCCGGCCGAA

Sample Input:

ABCBDAB
BDCABA



Sample Input:

BCBA

Grading

- To be graded in a week
- Total point: 1