

Thursday, December 25, 2025 9:00 PM

LCS → Longest Common Subsequence

$$S1 = " \underline{ab} c \underline{x} \underline{y} " \\ S2 = " \underline{x} \underline{b} \underline{y} "$$

$$CS \Rightarrow \underline{\underline{xy}}, \quad \underline{\underline{x,y,b}}, \quad \textcircled{b} \textcircled{y}$$

\uparrow

LCS

Definition

$\text{fun}(i, j) = \boxed{\text{max length of LCS}}$

10

$s_2 = "xby"$

012

Transitum

$$\text{fun}(i, j) = \frac{1 + \text{fun}(i+1, j+1)}{\max \left\{ \begin{array}{l} \text{fun}(i, j+1) \\ \text{fun}(i+1, j) \end{array} \right\}} \quad \xrightarrow{s1[i] == s2[j]} \text{fun}(i, j+1) \quad \text{if } s1[i] == s2[j] \quad \text{else } \text{fun}(i+1, j)$$

$S1 = \boxed{a|a|b|x|w|y}$

Diagram illustrating a stack $S2$ with elements b , y , x , a at indices 0 , 1 , 2 , 3 respectively. An arrow points from index 3 to element a .

Base Case

$$\text{fun}(|S_1|, \cdot) = \text{fun}(i, |S_2|) = 0$$

T.C: O(N.M)

$S.P: 0(N \cdot m)$

$$\frac{T.C}{S.C} \geq 1$$

Time = $\frac{[1s], [2s], 3s}{}$, 5s

LIS \rightarrow Longest Increasing Sequence

4
v

3, 6, 9, 11

五〇九

5, 6, 9, 11

5, 6, 8, 11

Defination $\text{fun}(3) = 3 / \text{fun}(4) = 2$

$f_{\text{LIS}}(i)$ = max LIS length starting at index i

Definition $\text{fun}(j) = \text{fun}(j) \leftarrow$

$\text{fun}(i) = \max \text{ LIS length starting at index } i$

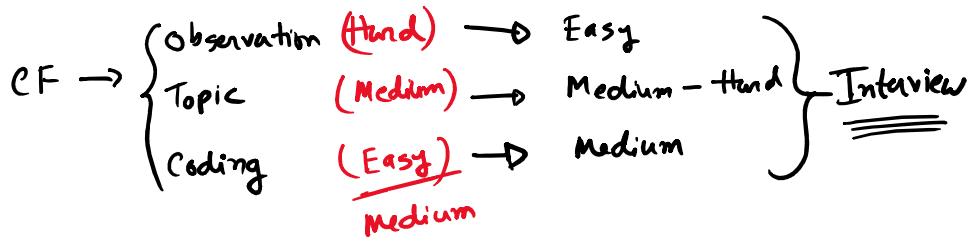
Transition

$$\text{fun}(i) = \max \begin{cases} \text{value}[i] < \text{value}[j] \\ j = i+1, \quad 1 + \text{fun}(i+1) \rightarrow \underline{i+1} \\ j = i+2, \quad 1 + \text{fun}(i+2) \rightarrow \underline{i+2} \\ \vdots \\ j = N-1, \quad 1 + \text{fun}(N-1) \end{cases}$$

Base Case

$N \geq \text{size of Array} \rightarrow \text{return } 0$

$$\text{fun}(N) = 0$$



$$10 \rightarrow 8$$

$$10 \rightarrow 8/9$$

nums = [5, 3, 2, 6, 9, 8, 11]						
0	1	2	3	4	5	6
5	3	2	6	9	8	11

