Exam 3 Review

P vs. NP: definitions

P
NP
NP-hard
NP-complete

examples
given a problem, which does it fall into?

Reductions

2D dynamic programming

hint: make sure you understand 1D dynamic programming

① English subproblem def.

"Let MaxFoo(i,j) be ..."

What subproblem gives final answer? what vals of i, j?

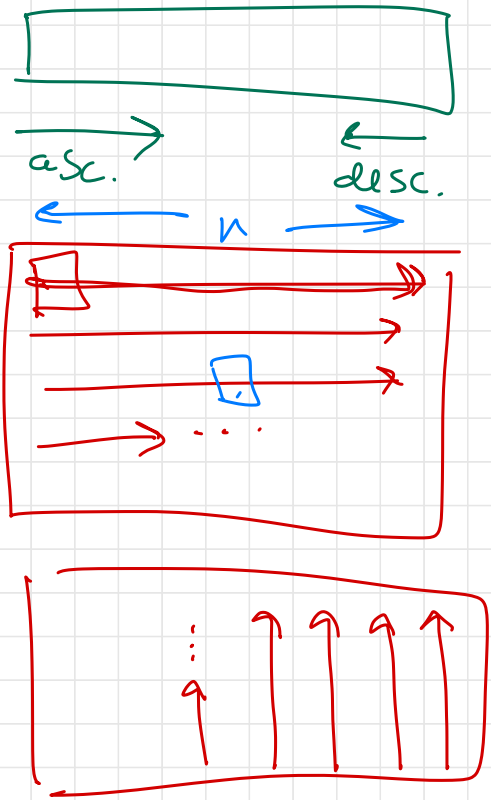
② Recursive subproblem def.

$$MaxFoo(i,j) = \begin{cases} \text{base cases} \\ \text{recursive case} \\ MaxFoo(i,j+1) \\ MaxFoo(i-1,j+1) \end{cases}$$

What are choices to be made at (i,j)? How to encode recursively (by calling MaxFoo)?

③ Memoization structure (2D array) and how to fill

"fill row by row, rows in a scending order, columns in ascending order"



MaxFoo(m, n)

what do I need to have computed already in order to compute A[i, j]?

④ write iterative alg
- for loops
- filling an array
- returning correct array element

YOU SHOULD NOT HAVE TO THINK!

Edit Distance

given two strings $A[1..m]$ and $B[1..n]$, what is the min. # of letter insertions, letter deletions, and letter substitutions to transform A into B.

A = CAT

B = CASE

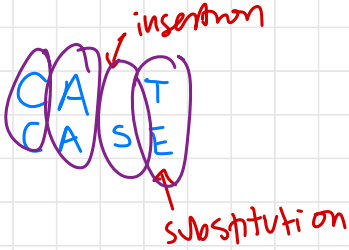
CAT

CAST insertion

CASE substitution

CASE 2

edit(CAT, CASE) = 2



edit(FOOD, MONEY) = 4

F O U D
M O N E Y
↑ ↑↑↑

If we have already aligned prefixes A[1..i] and B[1..j] optimally, we only need to align the remaining parts of A and B optimally.

① Let Edit(i,j) be the edit distance between A[1..i] and B[1..j].

what is our final answer?

Edit(m,n) : edit dist btwn A[1..m] and B[1..n]

②

$$Edit(i,j) = \begin{cases} \\ \\ \\ \end{cases}$$

What choices do I need to make at (i,j)?

align A[1..i] with B[1..j].

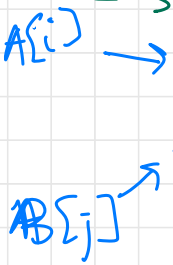
- insertion

$Edit(i, j-1) + 1$

- deletion

$Edit(i-1, j) + 1$

- substitution



$$Edit(i,j) = Edit(i-1, j-1) + (A[i] \neq A[j])$$