

Sequence alignment.

Given two strings

$$X = x_1 x_2 \dots x_m$$

$$|\Sigma|$$

$$Y = y_1 y_2 \dots y_n$$

Find the non-crossing matching between letters
of the two strings, whose size is maximized

Find the fewest number of edit operations that convert X into Y
("modify", "insert", "delete")

"hello"

h ————— ✓ h (h, h)
e ————— e l (l, l)
l ————— l l
()
o ————— o

"hello"



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Matching:

a set of ordered pairs
that each element of X occurs
in at most one pair

"modify"

"insert"

"delete"

hwlllo

hello

hel-0

he llo

he llo

hell-0

hiwe ll o

h-e ll o

$X = x_1 x_2 \dots x_m$

"penalty"

penalty: "the cost of conversion"

$Y = y_1 y_2 \dots y_n$

hello

hello



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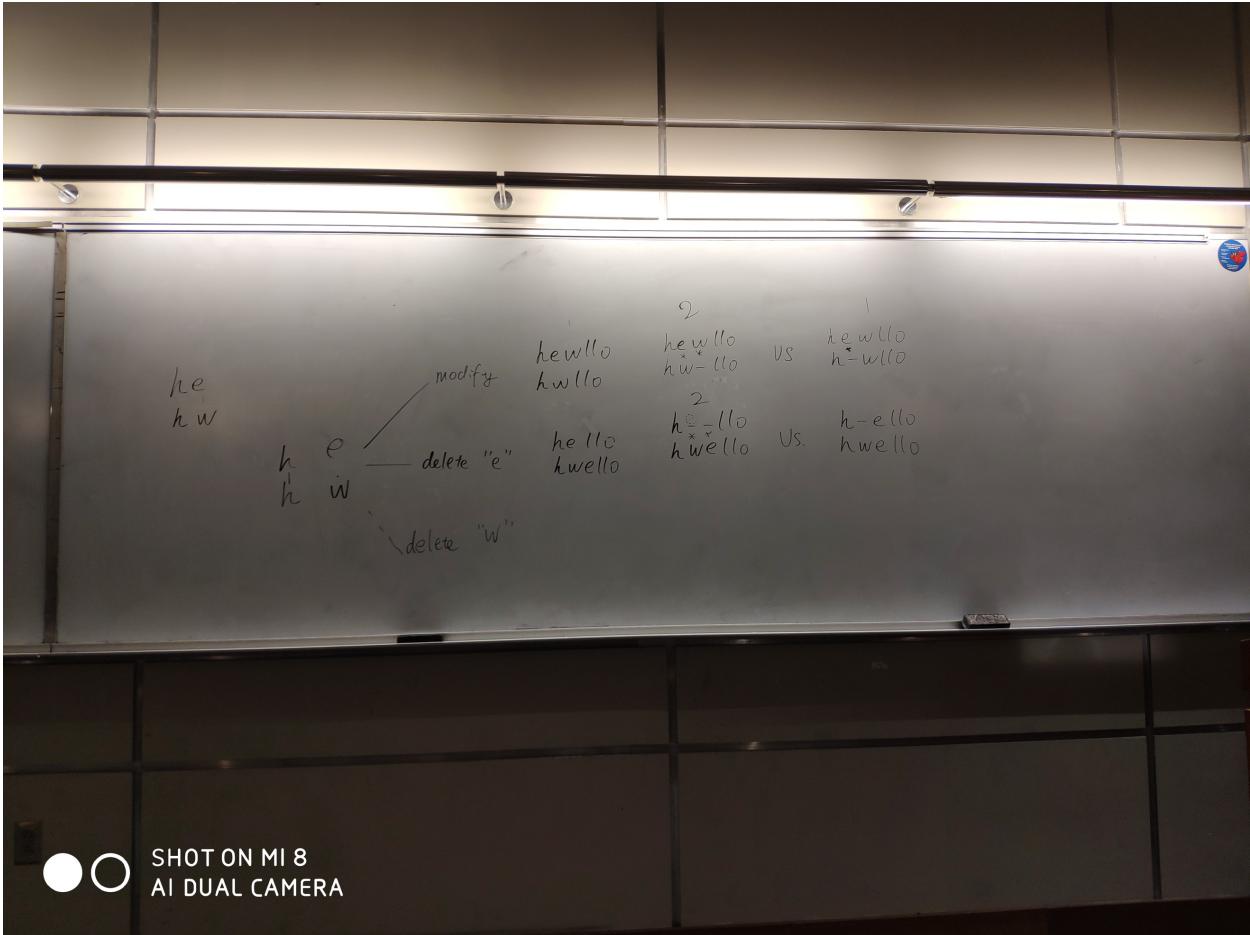
"prefix alignment"

$O(i,j)$: subproblem of finding π_k
smaller number of operations
that converts $x_1 x_2 \dots x_i + 0$
 $y_1 y_2 \dots y_j$ where $i \leq m$ and $j \leq n$

X $x_1 \underline{\dots} x_i \dots x_m$
Y $y_1 \underline{\dots} y_j \dots y_n$



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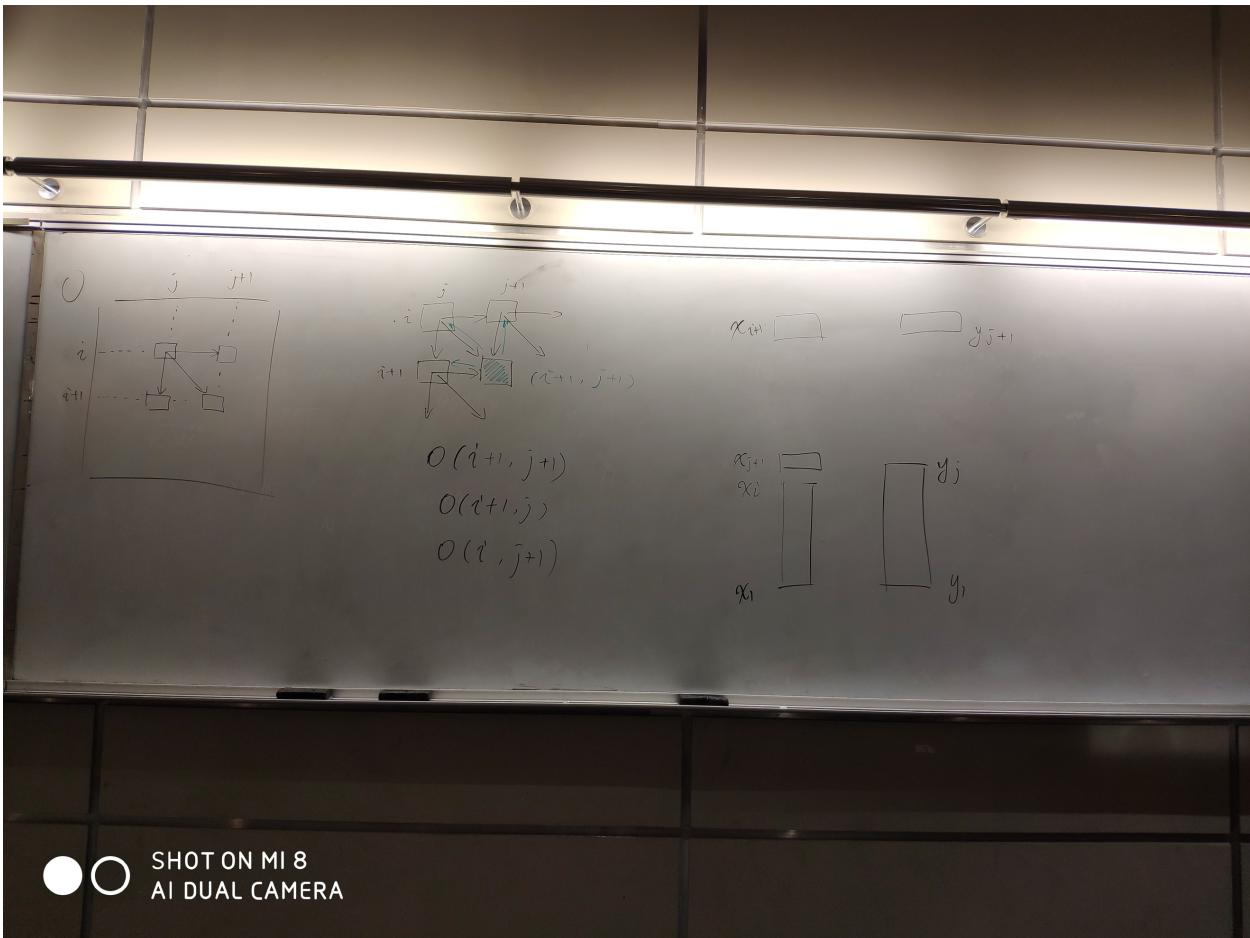
$$O(i+1, j+1) = \min \begin{cases} O(i, j-1) + S(y_j) \\ O(i-1, j) + S(x_i) \\ O(i-1, j-1) + M(x_i, y_j) \end{cases}$$

$O(i+1, j+1) = \min \begin{cases} O(i, j) + S(x_{i+1}) \\ O(i, j-1) + S(y_{j+1}) \\ O(i-1, j) + M(x_i, y_{j+1}) \end{cases}$

$O(i+1, j+1) = \min \begin{cases} O(i+1, j) + S(y_{j+1}) \\ O(i, j+1) + S(x_{i+1}) \\ O(i, j) + M(x_{i+1}, y_{j+1}) \end{cases}$



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