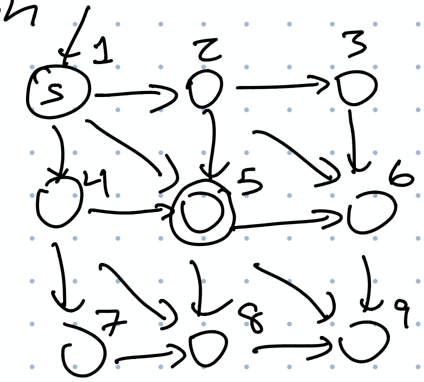
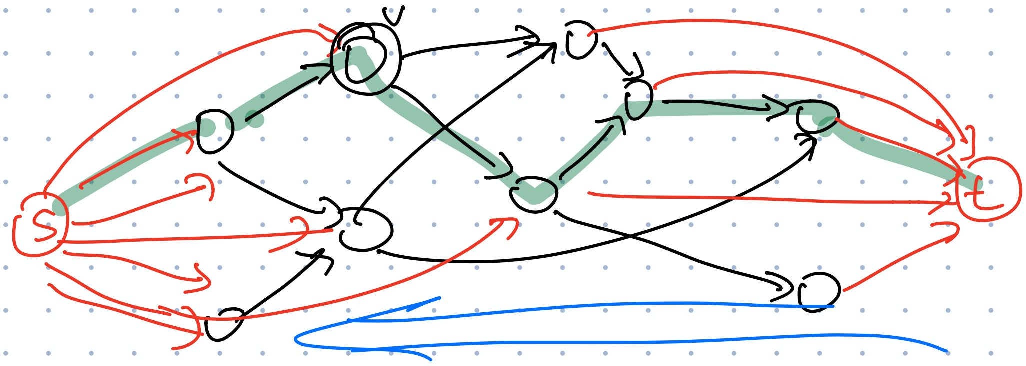
Dependency graph



DFS = memoization

scan in reverse topological order = DP

Longest path in a dag



LLP(v) = length of longest path from v to t

$$LLP(v) = \begin{cases} 0 & \text{if } v = t \\ \max\{1 + LLP(w) \mid v \to w\} & \\ [\max \emptyset = 0] & \end{cases}$$

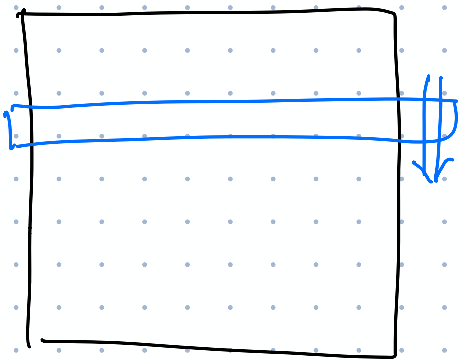
Memoize LLP(v) into new field v.LLP

Evaluate in rev. top. order
= postorder

O(V+E) time

We need $\boxed{LLP(s) - 2}$

Edit distance — Actual edit sequence in $O(n^2)$ time and $O(n)$ space



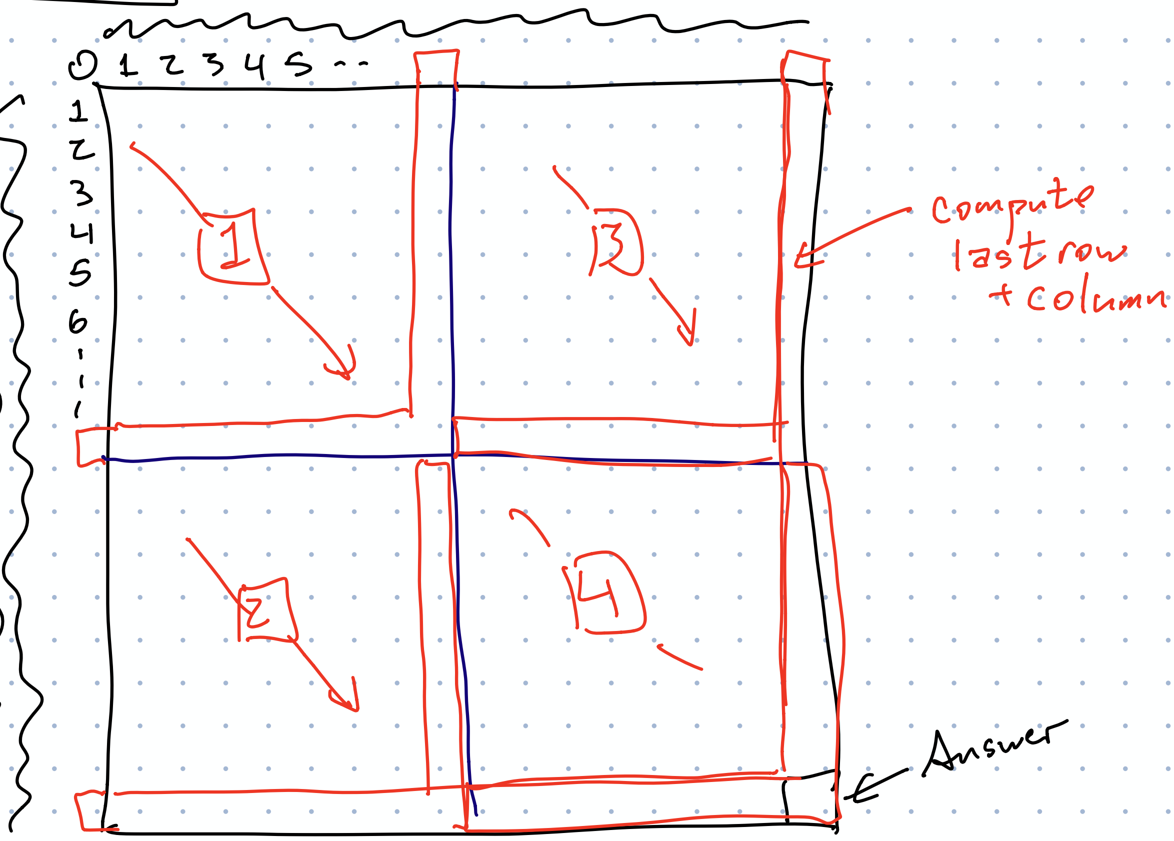
Chowdury + Ramachandran '05

$Edit(0, j) = j$
$Edit(i, 0) = i$

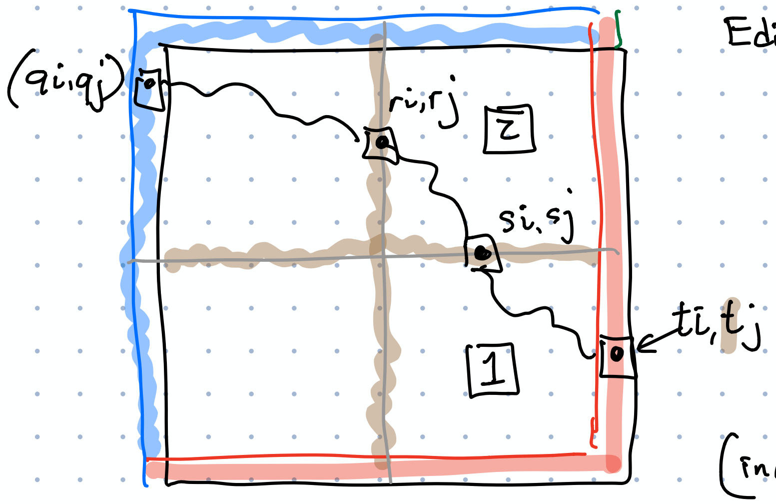
	A	X
O	5	4
X	6	$\boxed{5}$

$T(n) = 4T(\frac{n}{2}) + O(1)$
$= O(n^2)$ time

$S(n) = S(\frac{n}{2}) + O(n)$
$= O(n)$ space



Construct the path



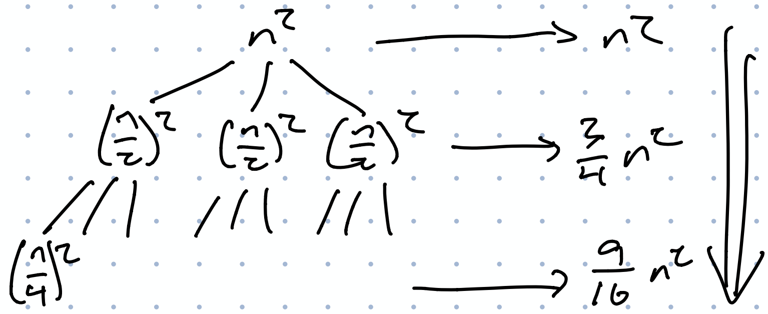
EditPath(i, j, w ← block
T[0...w], ← input fringe
L[0...w],
ti, tj) ← target cell on output fringe

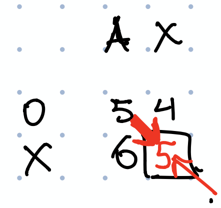
returns is

path from input fringe to ti, tj
(incl. starting cell of that path)

Time: $T(n) \leq O(n^2) + 3T(\frac{n}{2}) = O(n^2)$

Space: $S(n) \leq O(n) + S(\frac{n}{2}) = O(n)$





"Four Russians" [1970]

$O(n^2/\log^2 n)$ time

$(\log n)^2$