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Sep 6, 2018

Dynamic Programming

Sep 6-2:01 PM

- EDIT Distance
- Optimal triangulation
- Independent set tree
- Longest increasing sequence
- Connection to DAGs

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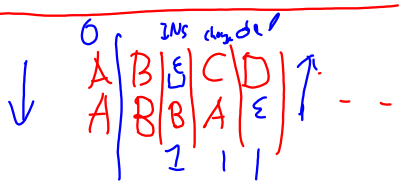
EDIT DIST

A B C D E F R
A B B A F E Q R



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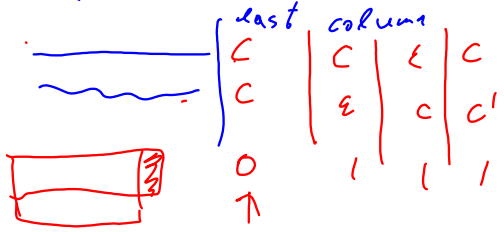
ED

optimal alignment



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B[1...n]
C[1...m]

$f(n,m) = \min \begin{cases} f(n-1,m-1) + [B[n] \neq C[m]] \\ f(n-1,m)+1 \\ f(n,m-1)+1 \end{cases}$

$f(0,m) = m$
$f(n,0) = n$

$O(nm)$ distinct calls | $O(nm)$

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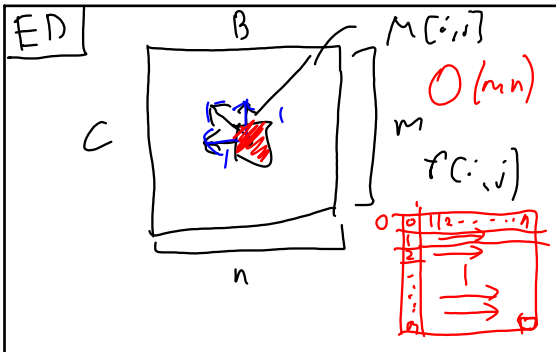
ED



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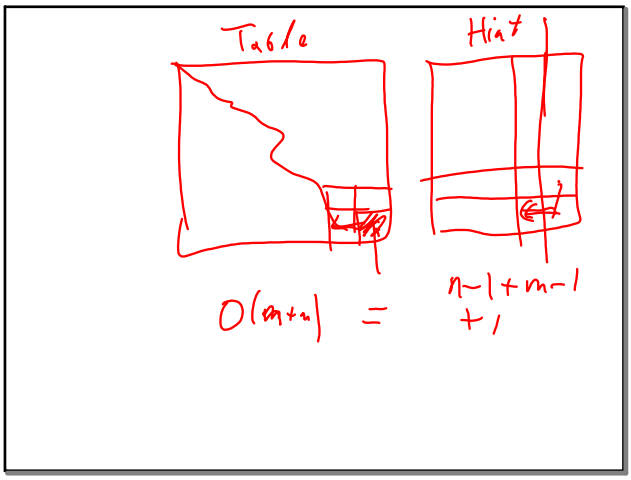

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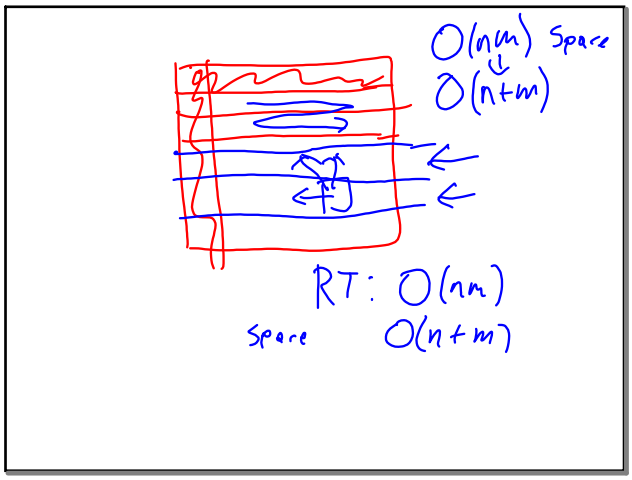

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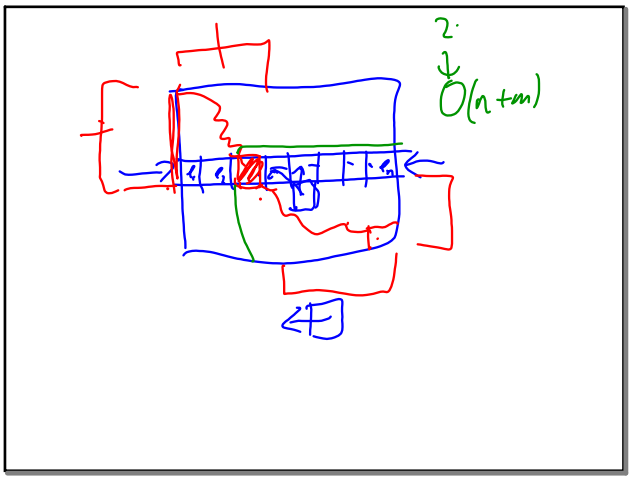

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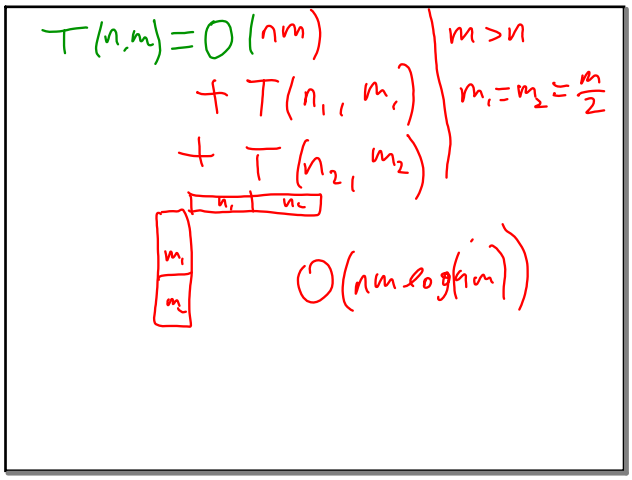

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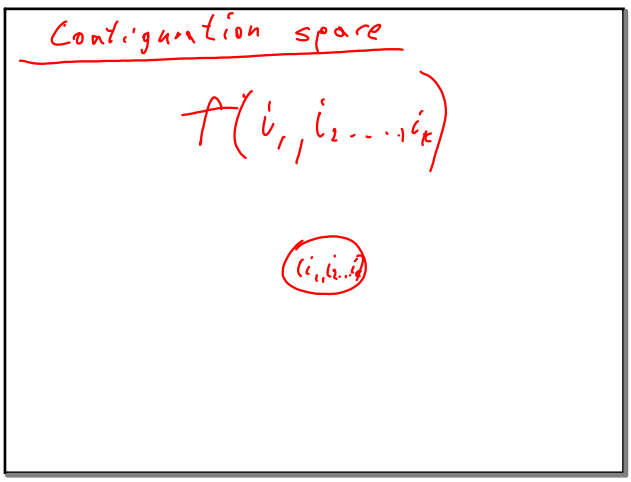

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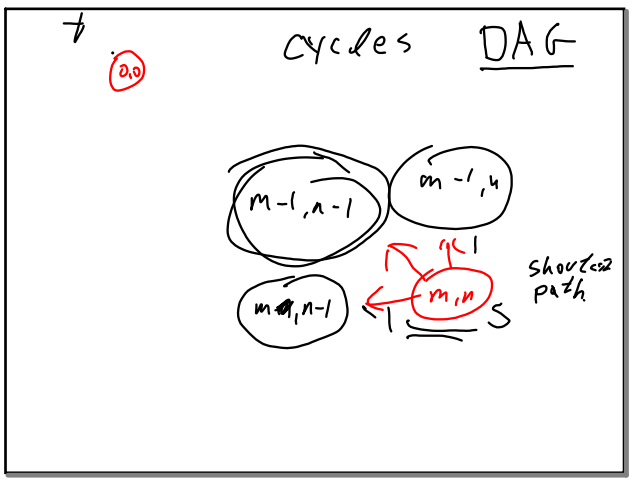

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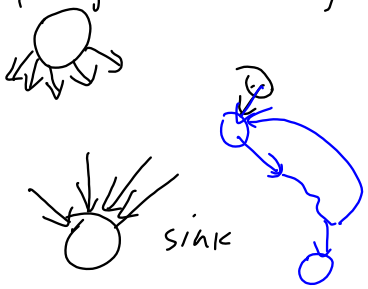
DAG Topological sorting



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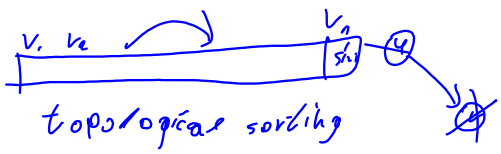
DAG $O(n+m)$

v_i

$deg^{out}(v_i)$

0 1 2



v_1 v_2 v_n

topological sorting

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DAG

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Longest Increasing Sequence

$x_1, x_2, \ldots, x_n$

7, 13, -5, 3, 16, 473, 374

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Dilworth Theorem

Given a sequence of n numbers there is always a subseq of length $\lceil \sqrt{n} \rceil$ that is either increasing or decreasing

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$x_1, x_2, \ldots, x_n$

$f(i) \equiv$ length of longest inc sequence that has x_i as last element.

$\max_{i=1}^{n} f(i)$ $O(n)$

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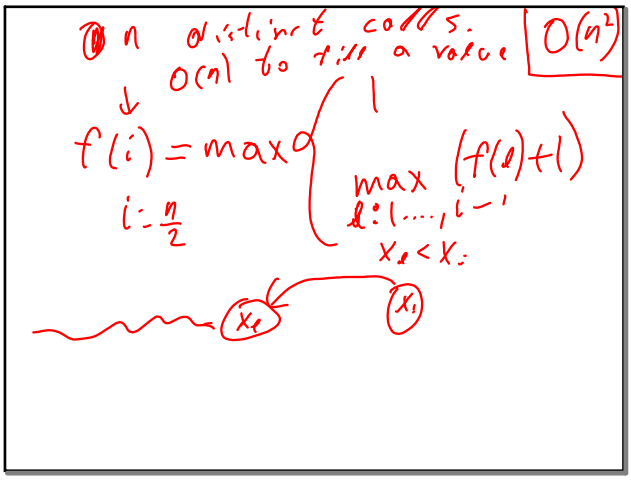

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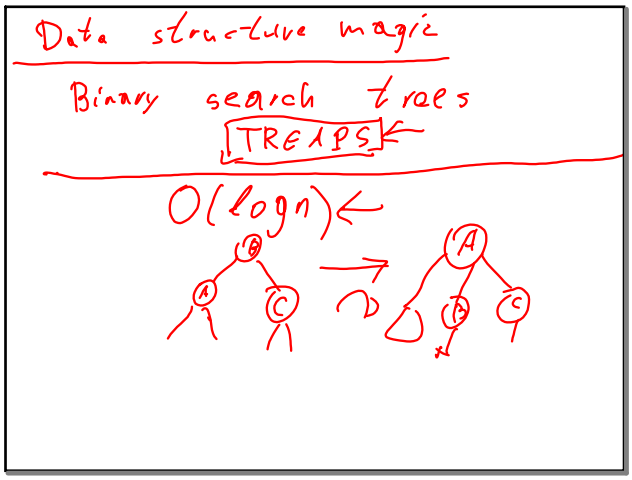

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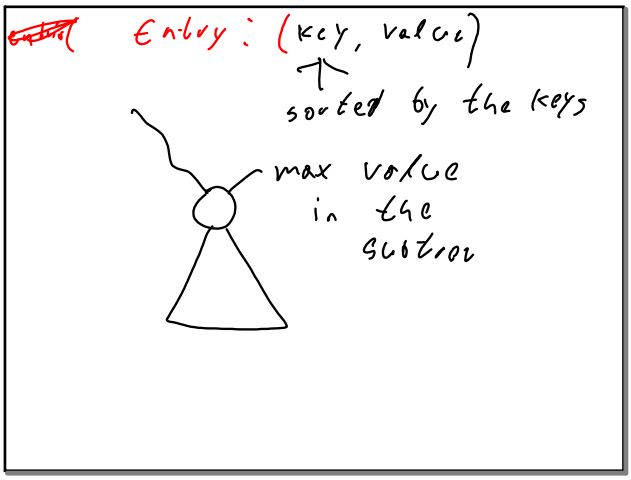

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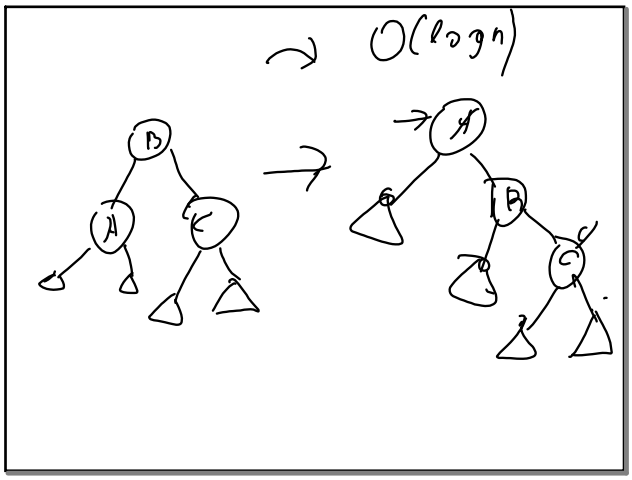

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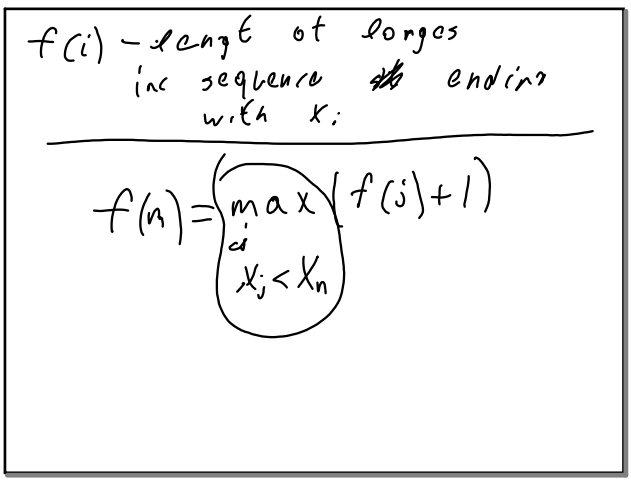

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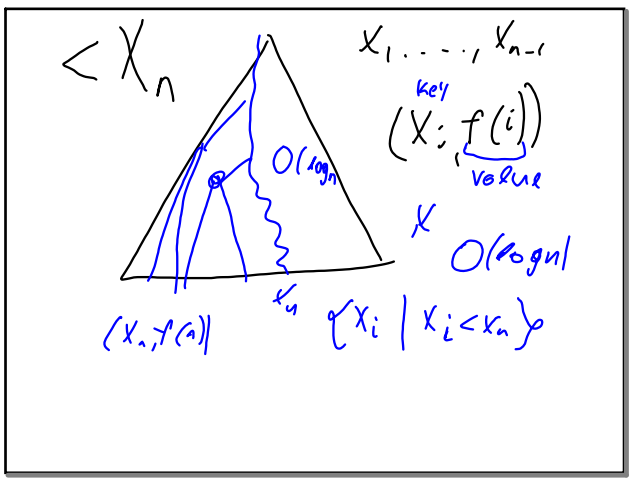

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$O(\log n)$
$O(n \log n) \leftarrow O(n^2)$

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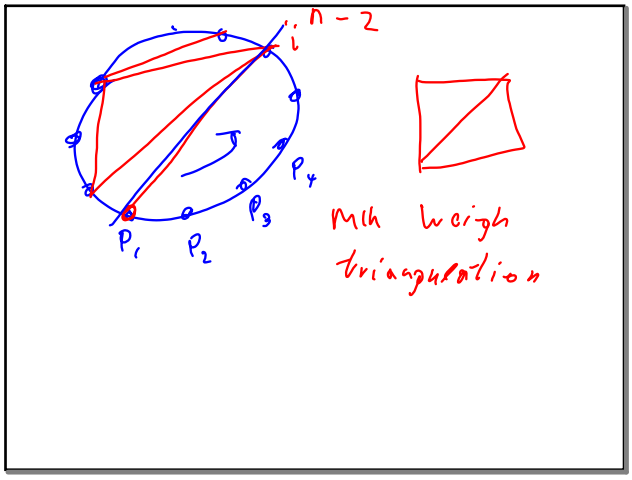

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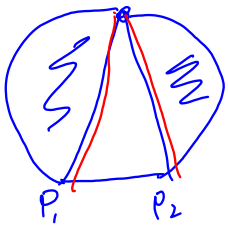

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