CS 124 Lecture 10

February 26, 2020

Matrix Mult

$$\overset{X}{\begin{bmatrix} A & B \\ C & D \end{bmatrix}}\overset{Y}{\begin{bmatrix} E & F \\ G & H \end{bmatrix}} = \begin{bmatrix} AE+BG & AF+BH \\ CE+DG & CF+DH \end{bmatrix}$$

$$T(n) = 8T(n/2) + \Theta(n^2) = \Theta(n^3)$$

↳ $\log_2 8 = 3$

if 7: $\Theta(n^{\log_2 7})$

Strassen's Algorithm

$P_1 = A(F-H)$

$P_2 = (A+B)H$

$P_3 = (C+D)E$

$P_4 = D(G-E)$

$P_5 = (A+D)(E+H)$

$P_6 = (B-D)(G+H)$

$P_7 = (A-C)(E+F)$

$$AE+BG = P_5 + P_4 - P_2 + P_6$$

Can we get matrix mult down to $O(n^{2+\varepsilon})$ for any $\varepsilon > 0$

Dynamic Programming

String reconstruction

dict of words → break up string of words w/o spaces thesearethereasons

✓ ✓ ?

+ backtracking → exponential time, no guarantee

Greedy

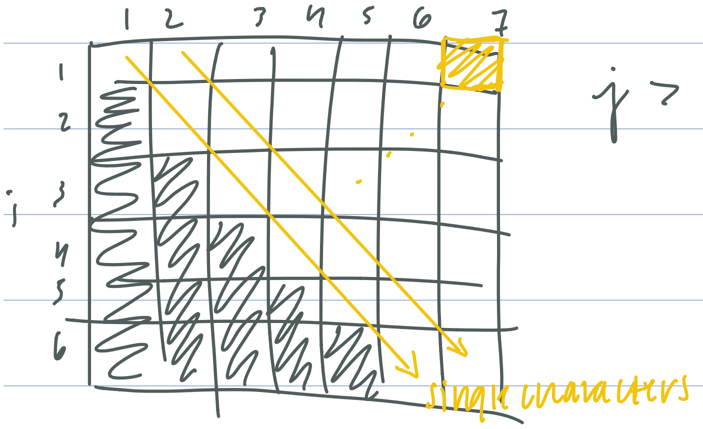
DP : recursive definition of the problem

$s[1 \ldots n]$

Dictionary: lookup cost of 1

$$D(i,j) = \begin{cases} \text{TRUE if } s[i \ldots j] \text{ can be broken into DICT words} \\ \text{FALSE} \quad \text{o/w} \end{cases}$$

$$D(i,j) = \text{True if } s[i \ldots j] \in \text{DICT} \text{ or if } \exists k,\ i \leq k < j \quad D(i,k) \wedge D(k+1,j)$$



$j > i$ so lower half is out

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d= length
for d := 1 to n:
    for i := 1 to n-d+1
        j := i+d-1
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