Greed Algorithm

Scheduling Problem

Jobs

\( a \rightarrow t \rightarrow time \)

Job \((\text{start, finish})\) Times

Optimize: \text{NUMBER of jobs}

1)

2)

3)

\vdots

n)

Sort \( O(n \log n) \)
Greatly Analyze

Where did we make our first mistake?

Omission vs. Commission - **First Error**

No mistake (yet)

Could be computed to give Opt Sched

No mistake

OOPS!

Works
Matching - optimally $\Theta(n^3)$

$N = 2^n$ points

$2^1 \cdot 1 = 2$

$2^2 \cdot 3 = 6$

$2^3 \cdot 9 = 18$

$N = 2^n$ points

$\text{OPT}_n = 2^{n-1}$

$\text{Greedy}_n = 2 \cdot \text{OPT}_{n-1} + L_n + L_{n-1} - 2 \cdot L_{n-1}$
\[ \text{OPT}_n = 2^{n-1} \]
\[ \text{CASEOXY}_n = 2 \text{CASEOXY}_{n-1} + 3^{n-1} - 2^{n-2} \]
\[ (2-2)(6-3) \]
\[ \Rightarrow \text{CASEOXY}_n = a2^n + b3^n \]
\[ = \Theta(3^n) \]
\[ \text{OPT}_n = \Theta(2^n) \]

\[ N = 2^n \text{ points} \]
\[ n = \log N \]
\[ \frac{\text{CASEOXY}_n}{\text{OPT}_n} = \Theta \left( \frac{3^n}{2^n} \right) \]
\[ = \Theta \left( (\frac{3}{2})^n \right) \]

Ratio of \( \frac{\text{CASEOXY}_n}{\text{OPT}_n} \) for \( N \) points:
\[ = \Theta \left( (\frac{3}{2})^n \right) \]
\[ = \Theta \left( N^{\frac{\log 3}{\log 2}} \right) \]
\[ = \Theta \left( N^{\frac{1}{2}} \right) \]
\[ = \Theta \left( \sqrt{N} \right) \]