Greedy Algorithms

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Interval Scheduling

Input

- n tasks;
- a start time s_i for each task i;
- a finish time f_i for each task i;

Desired output

A set $S \subseteq [n]$ of non-overlapping tasks maximizing $|S|$.

Examples

Different Greedy Approaches

- Smallest Interval

Different Greedy Approaches

- Smallest Interval
- Earliest Start Time

Earliest Finish Time Greedy Algorithm

1. Sort all jobs by non-decreasing f_i
2. Let $A = \{\}$;
3. Check all jobs by non-decreasing f_i
   If (Job i does not overlap jobs in A) Then $A \leftarrow A \cup \{i\}$
4. Output A

Examples

Running Time Analysis

Correctness

- Greedy outputs a valid solution;
- Greedy outputs an optimal solution among all valid solutions.

High Level Intuition

Formal Proof by Induction

Formal Proof by Induction

Variants

- Different values for different jobs.
- Multiple machines.
- Online setting.

Homework 1 comments.

Thanks!