

# Fundamental Algorithmic Techniques V

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# Outline

The greedy algorithm paradigm

Characteristics of greedy algorithms

Correctness proof techniques

# The greedy algorithm paradigm

Best possible (greedy) choice right now, for immediate best outcome!

Requirements:

- 1 **greedy-choice property:**  
globally optimal solution  $\Leftrightarrow$  local optimal (greedy) choices
- 2 **optimal substructure**

Examples where Greedy Algorithm is suboptimal

- life!?
- road...
- 0-1 knapsack problem

# Examples where Greedy is optimal

Course allocation, Cache, Huffman coding and Shannon Entropy

## Characteristics of greedy algorithms

Greedy stays ahead!

- $A = \{a_0, a_1, \dots, a_n\}$  algo. sequence and  $O = \{o_0, o_1, \dots, o_n\}$  optimal sequence
- choose a measure  $\mu(\cdot)$
- show stay ahead:  
 $\mu(a_0, a_1, \dots, a_n) \leq \mu(o_0, o_1, \dots, o_n)$  by induction!
- Prove optimality: use greedy stays ahead to generate contradiction

## Correctness proof techniques

Induction example: classes Scheduling

