LEC1 Introduction   3.13   wenhao zhang

~~Gumi=It~~

Goal: 1. solve compational problems

2. Prove correctiness

3. argue afficiency

4. communication

Algorithm $f: I \to O$

for Birthday problem: maintain record, Interview students in some order

- cheek f birthday in record — if so returnpair

   - add student to record

   - return none

Correctness

Inductive Hypothesis: if first k students contain match alg returns a match before interviewing student k+1

Base case: $0 = k$, ✓

Assume Inductive Hyphothesis true for $k = k'$

$$\begin{cases} \text{if } k' \text{ contains match} \rightarrow \text{already returned} \\ \text{if } k'+1 \text{ contains match} \end{cases}$$

Efficiency

(operations)

Don't measure time insteal count ops

expect performance to depend on size of

our input

(n)

$$\begin{cases} - O (\circ) \text{ upper bounds} \\ - \Omega (\circ) \text{ lower bounds} \\ - \Theta \quad \text{both} \end{cases}$$

Ex. $\rightarrow O(n \lg n) \quad O(n^2) \quad O(n^c)$ ← efficiency

$O(1) \rightarrow O(n), O(\lg n)$

$O(1), O(\lg n), O(n), O(n \lg n), O(n^2), O(n^c)$

Mo	Tu	We	Th	Fr	Sa	Su

Model of computation

→ Memory

CPU ☐   64 bit

Word-RAM

integer arithmetic

logic ops

Data Structures

How to solve on Algorithms Problem

↳ Reduce to a problem you already know (use datastruct
or algorithm)   Overview of 6.006
                                      ↓
Search Problem (Data Structures)

Static Array (L01)   Linked Lists (L02)

Dynamic Array (L02)   Sorted Array (L03)

Directed ~~Array~~ - Access Array (L04)   Hash Table (L04)

Balanced Binary Tree (L06-L07)   Binary Heap (L08)

Sort Algorithms

☒   See in the note ☐