Algorithms!

CS3000
5/5 (M)

Admin

- Laney Strange (she/her)
- 11:40-1:20 MTWR (lecture)
- Tues Recitation 1:30, 3:25
- Thurs Recitation 1:30
- OH M 1:30-3 ME 313
  R 9:30-11
- l.laney@northeastern.edu

- please say your name!

Agenda

1. Algorithms overview
2. Structure and setup
3. CS3000

1. Algorithms Overview

↳ what are we getting ourselves into?

1. What is an algorithm?
   - characteristics, def, components, when to use
   - introduce self, name
2. What is a good algorithm?
   - swap info / contact

"Good" Algorithm

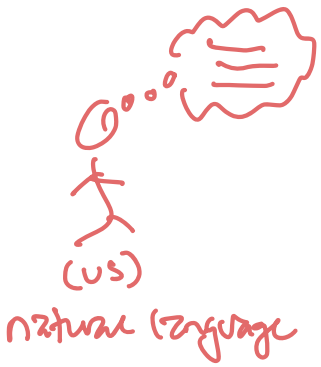
- efficiently achieves a desirable result
- something that works
- clarity
- handles edge cases

Algorithm

- set of instructions
- step by step
- solves a problem
- deps on inputs, might solve a diff way
- solve problems in an organized way
- different algos, same result
- might optimize different things
- generalized

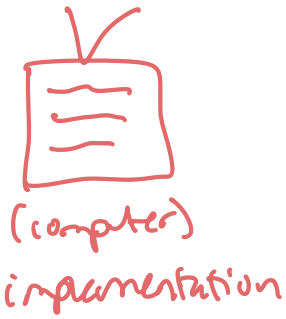
- scalable for any size of input
- generalized for similar problems
- deterministic, predictable
- relevant
- efficiency
  - good worst-case scenario
  - time
  - space
  - don't do unnecessary work
  - consistent for inputs
- executed until you reach goal
- takes an input, produces an output

2. Structure and Setup



Pseudocode

- more structured than NL
- less specific than code
- language agnostic
- C/C++ ish



Pseudocode Style: CLRS

- no ; or : or {} to show code blocks
- instead, just indentation
- define functions before calling
- assume basic math: +, -, *, /, ⌈⌉, ⌊⌋, log, exp, mod
- if/else if/else, for, while, return, print

Arrays!

- like a list - one variable, many values
- index from 1
- A, with length n (separate)

(ex) A [, , , ... ,] values
1 2 3 ... n positions

A[3] ~ value at position 2

for i = 1 to n
  A[i] = ϕ ↳ every value set to ϕ

i = 1
i = 2
...
i = n

// comment!

(ex) A real algorithm

A = the cards
n = 8
~~key = 5~~
key = 11

best case: find on first try!
worst case: never find!

Algo #1: Linear Search
- what do if find key? → position where found
- what do if never find key? → return NIL

```
LINEAR SEARCH (A, n, key)
  for i = 1 to n
    if A[i] == key
      return i
  return NIL
```

(ex) n = 4

i = 1	is $i \leq n$?	yes!
i = 2	is $i \leq n$?	yes!
i = 3	is $i \leq n$?	yes!
i = 4	is $i \leq n$?	yes!
i = 5	is $i \leq n$?	no!

↳ How many times do we check the loop condition?

$n+1$

How many times do we execute the loop body?

n

3. CS3000

↳ Course website: notes
pseudocode
Hw, APPs, Recitation

Homework
- th → th 9pm
- 48 hour grace period
- Second chance HW

Typeset!

Exams
- 5/22
- 6/12
- XC exam Q (6/18)

APPs
- due 11:30 next day
- can't be late
- drop 3 of 8

Recitations
- tues "real"
- thurs "vibes" any 1:30