COT 5407: Introduction to Algorithms

Giri NARASIMHAN

www.cs.fiu.edu/~giri/teach/5407S19.html

Momentos

- Slides and Audio online
- Need to register
  - Go to https://fiu.momentos.life
  - If you don't already have an account
    - Click on "Sign up"
    - Follow instructions & use referral code: XLY6FD
  - If you have an account, "Add Course" with code XLYF6D
  - Verify account using link sent to email

Why?

I am here because …

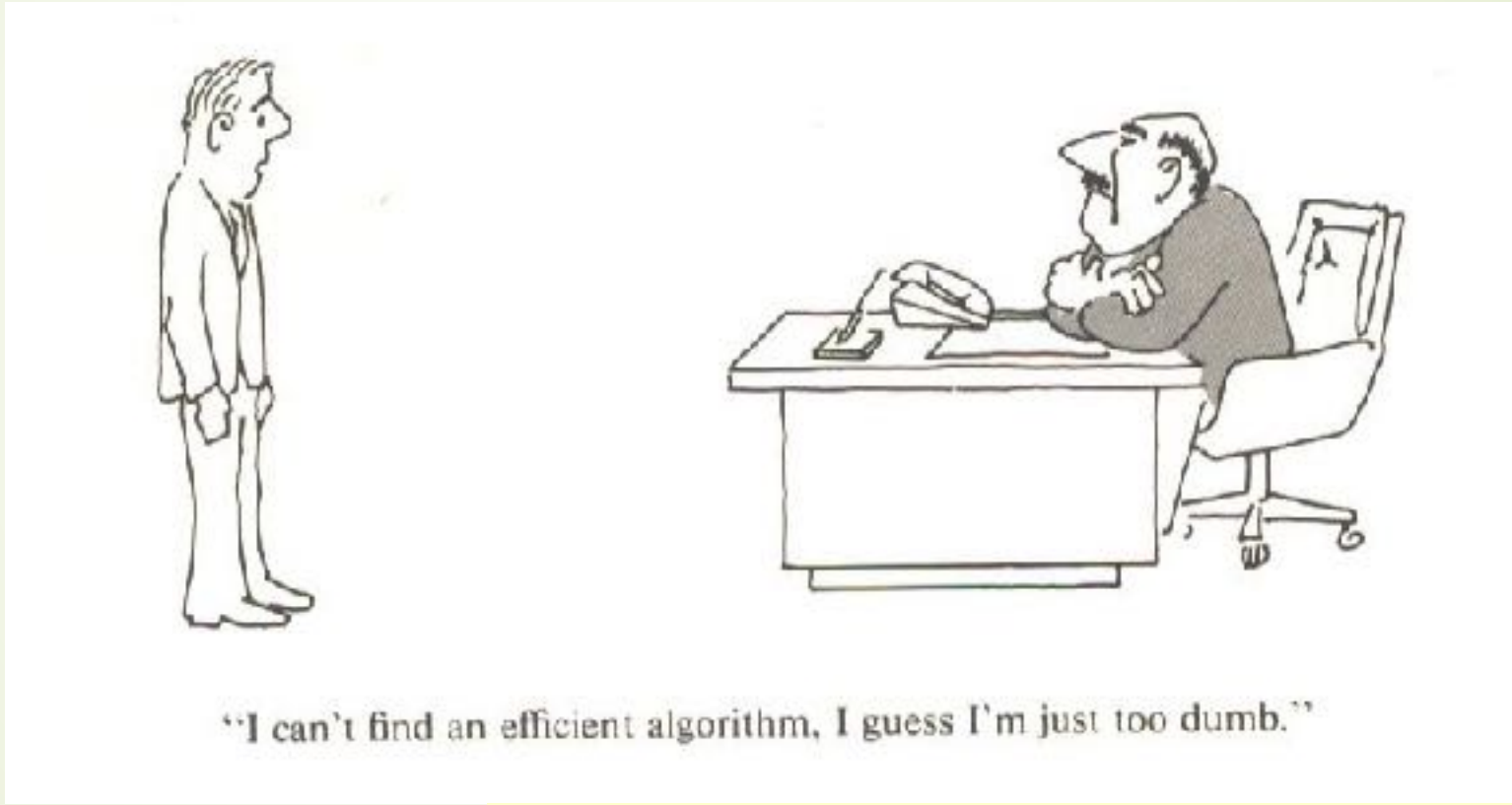
- It's required

Hate being here because …

- It's required

What do you expect to learn?

Why should I care about Algorithms?

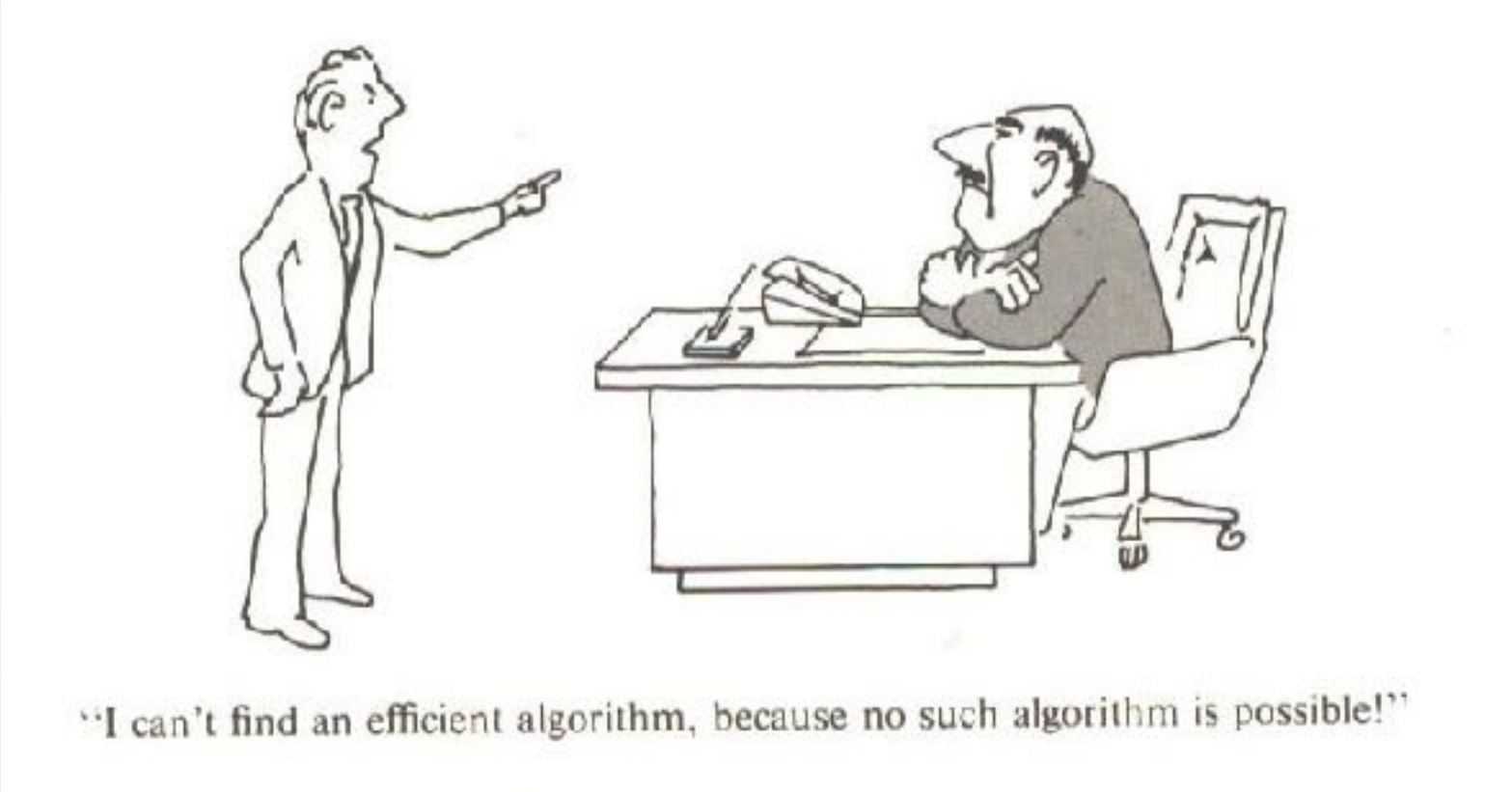


Cartoon from *Intractability* by Garey and Johnson

More questions you should ask

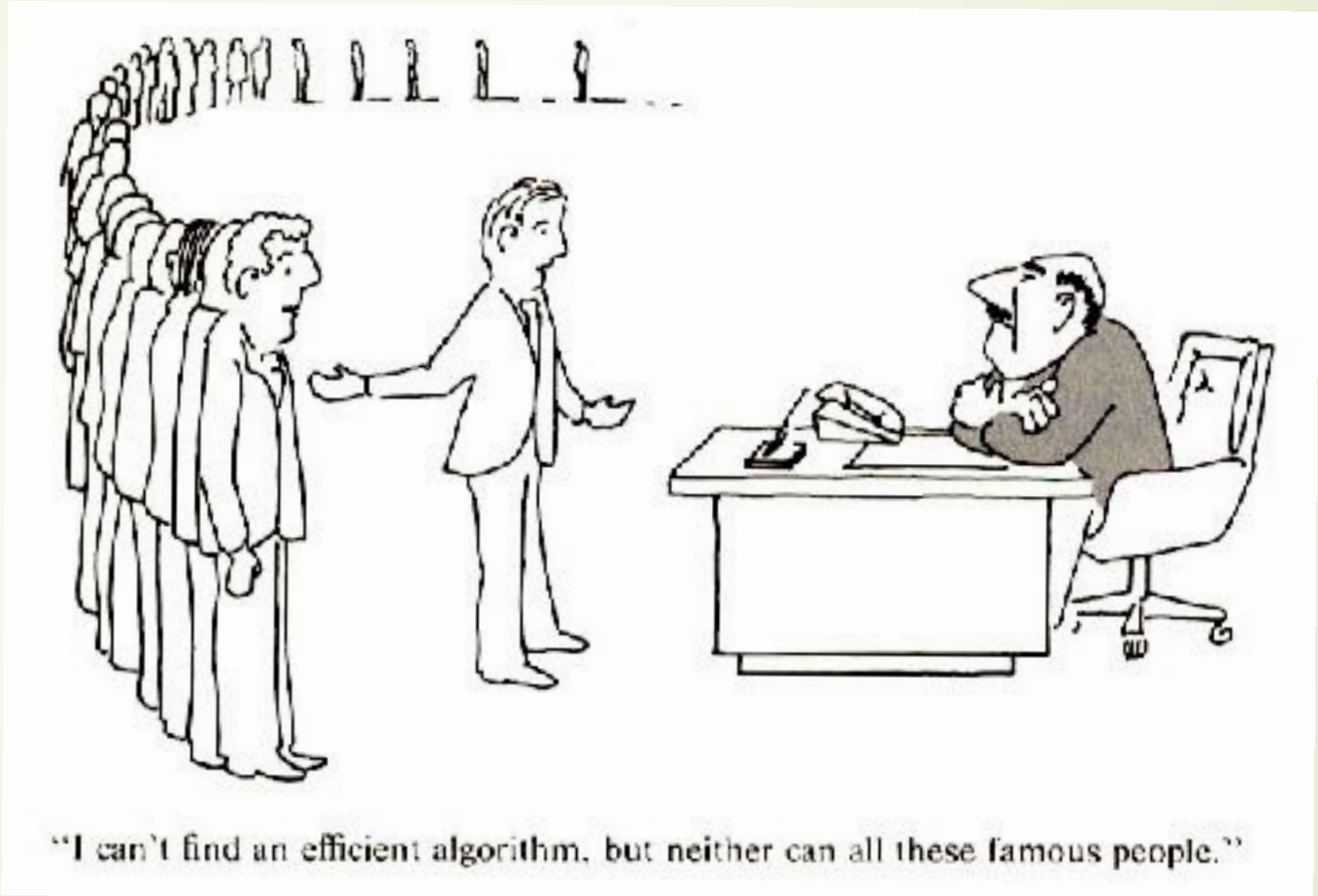
- Who should know about **Algorithms**?
- Is there a future in this field?
- Would I ever need it if I want to be a software engineer or work with databases?

Why are theoretical results useful?



Cartoon from *Intractability* by Garey and Johnson

Why are theoretical results useful?



Cartoon from *Intractability* by Garey and Johnson

Person of the Year …

Time's Person of the Year

2018

2017

The first hundred votes …

Who won a majority?

48	12	9	12	23	12	22	12	12	12
48	93	93	93	12	12	93	12	93	12
12	93	48	48	12	12	12	33	79	12
12	12	93	12	12	9	12	23	12	12
12	12	12	33	93	93	93	12	12	12
12	9	12	23	93	48	48	12	12	44
93	93	93	12	12	9	12	23	12	55
12	12	48	12	48	48	12	48	88	12
12	12	93	12	12	9	12	23	12	12
12	12	12	33	93	93	93	12	12	12

Standard Approaches

- Keep a list of candidates and their counts
  - Every vote needs to be compared against every candidate in the worst case
- Sort the list and count
  - Sorting is the bottleneck
  - Can we avoid sorting?

48	93	93	93	12	12	93	12	93	12	93	12	12	9	12	23	12	93	93	93	12	9	12	23
12	93	48	48	12	12	12	33	79	12	12	33	93	93	93	12	12	93	48	48	93	93	93	12
12	12	93	12	12	9	12	23	12	12	12	23	93	48	48	12	12	12	93	12	93	48	48	12
12	12	12	33	93	93	93	12	12	12	93	12	12	9	12	23	12	12	12	33	12	9	12	23
12	9	12	23	93	48	48	12	12	44	48	48	12	48	88	12	12	9	12	23	48	48	12	48
93	93	93	12	12	9	12	23	12	55	12	9	12	23	12	12	93	93	93	12	12	9	12	23
12	12	48	12	48	48	12	48	88	12	93	93	93	12	12	12	93	12	48	12	93	93	93	12
12	12	93	12	12	9	12	23	12	12	12	9	12	23	12	55	12	12	93	12	12	33	79	12
12	12	12	33	93	93	93	12	12	12	12	12	12	33	93	93	93	12	12	12	12	23	12	12
48	48	12	12	12	33	79	12	12	33	93	93	93	12	12	93	48	12	33	79	93	12	12	12
93	12	12	9	12	23	12	12	12	23	93	48	48	12	12	12	93	12	23	12	48	12	12	44
12	33	93	93	93	12	12	12	93	12	12	9	12	23	12	12	12	93	12	12	12	23	12	55
12	23	93	48	48	12	12	44	48	48	12	48	88	12	12	9	12	48	12	12	12	48	88	12
93	12	12	9	12	23	12	55	12	9	12	23	12	12	93	93	93	12	23	12	12	23	12	12
48	12	48	48	12	48	88	12	93	93	93	12	12	12	93	12	48	12	48	88	12	23	12	12
93	12	12	9	12	23	12	12	12	9	12	23	12	55	12	12	93	12	23	12	93	12	12	12
93	12	12	9	12	23	12	12	12	23	93	48	48	12	12	12	93	12	23	12	48	12	12	44
12	33	93	93	93	12	12	12	93	12	12	9	12	23	12	12	12	93	12	12	12	23	12	55
12	23	93	48	48	12	12	44	48	48	12	48	88	12	12	9	12	48	12	12	12	48	88	12
93	12	12	9	12	23	12	55	12	9	12	23	12	12	93	93	93	12	23	12	12	23	12	12
48	12	48	48	12	48	88	12	93	93	93	12	12	12	93	12	48	12	48	88	12	23	12	12
48	48	12	12	12	33	79	12	12	33	93	93	93	12	12	93	48	12	33	79	93	12	12	12
93	12	12	9	12	23	12	12	12	23	93	48	48	12	12	12	93	12	23	12	48	12	12	44
12	33	93	93	93	12	12	12	93	12	12	9	12	23	12	12	12	93	12	12	12	23	12	55
12	23	93	48	48	12	12	44	48	48	12	48	88	12	12	9	12	48	12	12	12	48	88	12
93	12	12	9	12	23	12	55	12	9	12	23	12	12	93	93	93	12	23	12	12	23	12	12
48	12	48	48	12	48	88	12	93	93	93	12	12	12	93	12	48	12	48	88	12	23	12	12
48	48	12	12	12	33	79	12	12	33	93	93	93	12	12	93	48	12	33	79	93	12	12	12
93	12	12	9	12	23	12	12	12	23	93	48	48	12	12	12	93	12	23	12	48	12	12	44
12	33	93	93	93	12	12	12	93	12	12	9	12	23	12	12	12	93	12	12	12	23	12	55
12	23	93	48	48	12	12	44	48	48	12	48	88	12	12	9	12	48	12	12	12	48	88	12
93	12	12	9	12	23	12	55	12	9	12	23	12	12	93	93	93	12	23	12	12	23	12	12
48	12	48	48	12	48	88	12	93	93	93	12	12	12	93	12	48	12	48	88	93	93	12	12
93	12	12	9	12	23	12	12	12	9	12	23	12	55	12	12	93	12	23	12	9	12	23	12
12	23	93	48	48	12	12	44	48	48	12	48	88	12	12	9	12	48	12	12	12	48	88	12
93	12	12	9	12	23	12	55	12	9	12	23	12	12	93	93	93	12	23	12	12	23	12	12
48	12	48	48	12	48	88	12	93	93	93	12	12	12	93	12	48	12	48	88	12	23	12	12
93	12	12	9	12	23	12	12	12	9	12	23	12	55	12	12	93	12	23	12	93	12	12	12

Wacky Ideas, anyone?

- What if I pick two random votes and they turn out to be different?

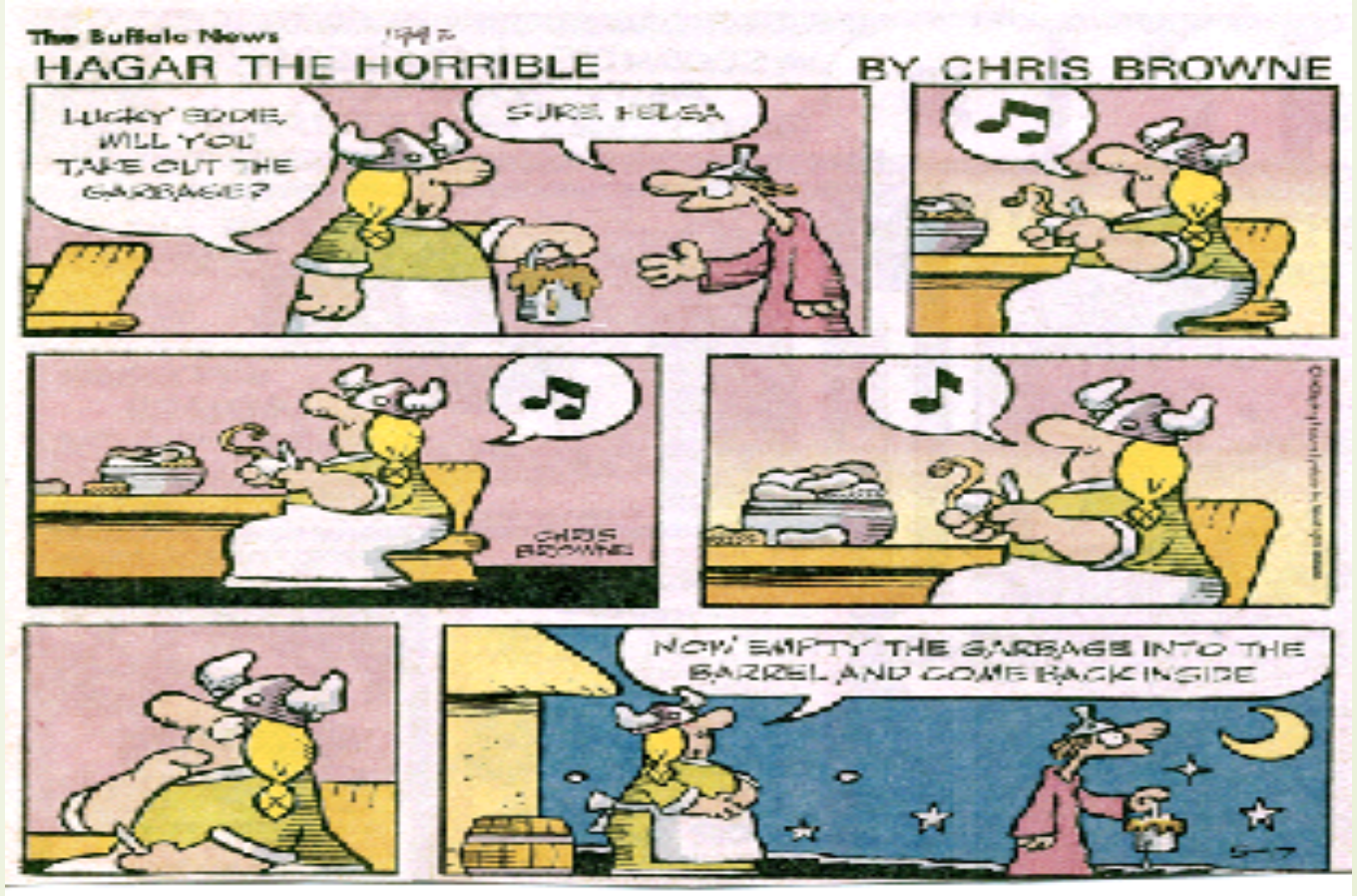
Evaluation

Exams (2)	45%
Quizzes	10%
HW Assignments	30%
Kattis Submissions	5%
Semester Project	5%
Class Participation	5%

What you should already know …

- Array Lists
- Linked Lists
- Sorted Lists
- Stacks and Queues
- Basic Sorting Algorithms
- Trees
- Binary Search Trees
- Heaps and Priority Queues
- Graphs
  - Adjacency Lists
  - Adjacency Matrices

Algorithms are "recipes"!



Algorithms can be simple