Algorithm definition

“An algorithm is a finite, definite, effective procedure, with some input and some output.”
—Donald Knuth

COS 226 vs. COS 423

COS 226. Implementation and consumption of classic algorithms.
- Stacks and queues.
- Sorting.
- Searching.
- Graph algorithms.
- String processing.

COS 423. Design and analysis of algorithms.
- Greed.
- Divide-and-conquer.
- Dynamic programming.
- Duality.
- Data structures.
- Intractability.

Emphasizes critical thinking, problem-solving, and code.

private static void sort(double[] a, int lo, int hi) {
    if (hi <= lo) return;
    int lt = lo, gt = hi;
    int i = lo;
    while (i <= gt) {
        if (a[i] < a[lo]) swap(a, lt++, i);
        else if (a[i] > a[lo]) swap(a, i, gt--);
        else i++;
    }
    sort(a, lo, lt - 1);
    sort(a, gt + 1, hi);
}

\[
\sum_{i=1}^{n} \sum_{j=i+1}^{n} \frac{2}{j-i-1} = 2 \sum_{i=1}^{n} \sum_{j=2}^{n-i+1} \frac{1}{j} \leq 2n \sum_{j=1}^{n} \frac{1}{j} \\
\approx 2n \int_{x=1}^{n} \frac{1}{x} \, dx = 2n \ln n
\]
Why study algorithms?

"Algorithms are the life-blood of computer science... the common denominator that underlies and unifies the different branches." — Donald Knuth

Internet. Web search, packet routing, distributed file sharing, ...
Biology. Human genome project, protein folding, ...
Computers. Circuit layout, databases, caching, networking, compilers, ...
Computer graphics. Movies, video games, virtual reality, ...
Security. Cell phones, e-commerce, voting machines, ...
Multimedia. MP3, JPG, DivX, HDTV, face recognition, ...
Social networks. Recommendations, news feeds, advertisements, ...
Physics. Particle collision simulation, n-body simulation, ...

We emphasize algorithms and techniques that are useful in practice.

Lectures

- Monday and Wednesday 11–12:20pm in Green 0-S-6.
- Attendance is required.
- No electronic devices except to aid in learning.

iClicker

Student response system (required).

- Register your iClicker in Blackboard.
- Available at Labyrinth Books ($30).
- Use only one device per lecture.

Which model of iClicker are you using?

A. iClicker.
B. iClicker+.
C. iClicker 2.
D. iClicker Reef.
**Precepts**

- Friday 11–11:50am in Friend 004 or Monday 7:30–8:20pm in Friend 006.
- Preceptor solves problems and answers questions.
- Attendance is strongly recommended.

**Textbook**

Grades

Problem sets.
• “Weekly” problem sets, due via electronic submission.
• Graded for correctness, efficiency, rigor, clarity, and conciseness.
• Use \texttt{LaTeX} template for writing solutions.

Course grades.
• Primarily based on problem sets.
• iClicker participation.
• Staff discretion used to adjust borderline cases.

Collaboration

Collaboration policy. [see course website for full details; ask if unsure]
• Course materials (textbook and lecture slides) are always permitted.
• No external resources, e.g., can’t Google for solutions.

“Collaboration permitted” problem sets.
• You may discuss ideas with classmates.
• You must write up solutions on your own, in your own words.

“No collaboration” problem sets.
• You may discuss ideas with course staff only.

Where to get help?

Textbook. Read the textbook—it's good!

Piazza. Online discussion forum.
• Low latency, low bandwidth.
• Mark as private any solution-revealing questions.

Office hours.
• High bandwidth, high latency.
• See course website for schedule.

Questions?

Not registered? Get registered.
Haven’t taken COS 226 and COS 340? See me.