Algorithm definitions

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

— Donald Knuth

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

— webster.com

Algorithm etymology

Etymology. [Knuth, TAOC]  

• *Algorism* = process of doing arithmetic using Arabic numerals.

• A misperception: *algiros* [painful] + *arithmos* [number].

• True origin: Abu 'Abd Allah Muhammad ibn Musa al-Khwarizm was a famous 9th century Persian textbook author who wrote *Kitāb al-jabr wa'l-muqābala*, which evolved into today's high school algebra text.

COS 226 vs. COS 423

COS 226. Implementation and consumption of classic algorithms.  

• Stacks and queues.  

• Searching.  

• Graph algorithms.  

• String processing.

```java
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]) exch(a, lt++, i);
        else if (a[i] > a[lo]) exch(a, i, gt--);
        else i++;
    }
    sort(a, lo, lt - 1);
    sort(a, gt + 1, hi);
}
```

Emphasizes critical thinking, problem-solving, and code.
COS 226 vs. COS 423

**COS 423.** Design and analysis of algorithms.
- Greedy.
- Divide-and-conquer.
- Dynamic programming.
- Network flow.
- Randomized algorithms.
- Intractability.
- Coping with intractability.
- Data structures.

Emphasizes critical thinking, problem-solving, and rigorous analysis.

**Why study algorithms?**

**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.** N-body simulation, particle collision simulation, ...

We emphasize algorithms and techniques that are useful in practice.

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**Administrative stuff**

**Lectures.** [Kevin Wayne]
- Monday and Wednesday 11–12:20pm in Friend 006.
- Attendance is required.
- No electronic devices except to aid in learning.

**Precept.** [Dan Larkin and Sachin Ravi]
- Thursday 4:30–5:20pm or Friday 11–11:50am in COS 105.
- Preceptor works out problems.
- Attendance is recommended.

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**Course website**

- Syllabus.
- Office hours.
- Problem sets.
- Lecture slides.
- Electronic submission.
- ...

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**Prerequisites.** COS 226 and COS 340, or instructor's permission.
Textbook


Grades

Problem sets.
- "Weekly" problem sets, due via electronic submission.
- Graded for correctness, clarity, conciseness, rigor, and efficiency.
- Use LaTeX template for writing solutions.

Course grades.
- Primarily based on problem sets.
- Staff discretion used to adjust borderline cases.
- Undergrads: determined without considering grad students.
- Grads: determined using undergrad scale.

Collaboration

Collaboration policy. [see syllabus for full details; ask if unsure]
- Course materials (textbook, slides, handouts) 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.

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 web for schedule.

Where to get help?

www.piazza.com/class#spring2013/cos423
www.cs.princeton.edu/courses/archive/spring13/cos423