HONR 278J: Under the Hood: Algorithms and their Applications

Spring 2004

Course Information: *http://www.cs.umd.edu/users/samir/278J/*

Instructors:

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Class Time:

Tu Th, 3:30-4:45. CSIC 3118.

Course Overview: Ever wondered, how does google do such a remarkable job as a search engine? How does mapquest give directions? How do we compress large amounts of data? How do we sequence DNA using computers? How do companies mine data and learn about you?

The main point of this course is to study a few topics, and to explore the algorithmic methods and technology behind these methods. For the first few weeks we will review the history of algorithms, study many diverse (and easy) to understand algorithms. Finally we will pick a few topics and study the required graph theory and algorithmic tools required to understand the principles behind these software tools and packages.

Text: Algorithmics: The spirit of computing by David Harel. Other readings and online resources will be distributed during the semester.

Course Work: Course work will consist of a few homework assignments, one small project, and 2 exams (one midterm and a comprehensive final). Homework problems will generally be mathematically oriented. All class work is to be done independently. Plagiarism will be treated very seriously. Assignments are to be written up NEATLY. Badly written assignments will not be graded. Please staple your homework.

It is your responsibility to make sure that you pick up all homeworks and handouts. All course information and homeworks will be available on the web page. Solutions to homeworks will be given out in class.

Grading: Final grades will be based on homework assignments, the midterm exams, and the comprehensive final exam. The relative weights of these will be 20% for the homework total, 10% for a project, 30% for the midterm, and 40% for the final exam.

Syllabus: The topics and order listed below are tentative and subject to change.

1. Analysis of Algorithms: Basics about analysis of algorithms, worst case behavior, Order notation, Asymptotics.
2. Some simple algorithms, stable marriages, gcd, primality, binary search.
3. Sorting and Selection: Sorting techniques, Selection.
4. Heaps and other Data Structures.
5. Elementary Graph Theory.
6. Graphs and search techniques: Depth first search, Breadth first search, Shortest Paths.
7. Applications of Algorithms: DNA sequencing, Google, Mapquest.
8. NP-completeness: What does it mean for a problem to be NP-complete? Examples of NP-complete problems.