CS 787
Advanced Algorithms and Data Structures
Fall 2010

Course description.

The concept of an algorithm, a step-by-step procedure for accomplishing some task, is as old as mathematics. With the invention of the computer, however, came an increased focus on the efficiency of these procedures. This is true in part because increased processing power widens the gap between what a fast algorithm can do the accomplishments attainable via the application of a substantially slower one. More recently, researchers have re-evaluated the very notion of an algorithm, to include randomization and the exploitation of quantum effects.

To avoid excessive concern with the details of particular problem domains, we will focus on the algorithms themselves, viewed as mathematical objects. We will emphasize algorithms for discrete (combinatorial and algebraic) problems, often choosing them for esthetic and didactic qualities rather than mere utility.

We will begin with a review of analysis methods and common design techniques (induction, dynamic programming, etc.). After that, topics will be chosen to illustrate some of the major algorithm ideas of the past few decades.

Intructor.

Eric Bach (4391 CS, 262-7997, `bach@cs.wisc.edu`). Office hours MWF 11-12 and by appt.

Time/place.

MWF 9:55-10:45, 1257 CS.

Prerequisites.

No particular results from CS 577 will be assumed. You should, however, be familiar with data structures and big-O style algorithm analysis. Some facility with with combinatorial mathematics (discrete probability, finite sets, number theory, etc.) is also required.

Readings.

We will mainly use papers from the literature. These will be made available either as handouts or via the web.

Several books on algorithms will be put on reserve at Wendt library.

There will be a course web page, accessible from the "Undergraduate and Graduate Programs" box on `cs.wisc.edu` as follows:

Courses → Current CS Classes → CS 787 Lecture 1

We will keep a log of lecture topics and readings on this web page.

Grading.

Based on occasional homework (3-5 problems per assignment), plus a term project.

Along with written work, class participation is required. This includes contribution to class discussions, and manifest intellectual engagement with the course material. I would also like each of you to come to office hours at least once during the term.