Algorithmic Aspects of Computer Networks

CAS CS-591 – Spring 2002

http://www.cs.bu.edu/fac/byers/courses/591/S02/cs591.html

M 3:00 - 6:00 PM, STH B20

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Course Overview: Today's complete networking researcher must carry a large toolkit. Expertise in network measurement, network modeling, protocol design and systems engineering are perforce. But while many researchers bring these skills to the table, far fewer have deep insight when it comes to questions of algorithms and analysis. This is all the more surprising given the wealth of elegant and essentially algorithmic constructs which have been applied to networking and Web-related problem domains in recent years. This graduate seminar will study 1) fundamental algorithmic principles as relate to networking, 2) how algorithmic methods have been applied to specific networking applications, and 3) the limits of algorithmic practicability, i.e. if and when heuristics should be employed.

Prerequisites: The course is geared primarily toward PhD students who are interested in pursuing a career in either networking research or algorithms. CS 555 or equivalent is a required prerequisite for this course, as is CS 530 (co-requisite). Masters students and undergrads who did excellent work in CS 555 are also encouraged to attend. Most of the papers will delve deeply into algorithmic, statistical or information-theoretic techniques, so a graduate level of mathematical sophistication is expected. Please see the instructor if you are at all uncertain about your level of preparation.

Course Expectations and Grading: For class, students will be expected to read and digest approximately two research papers per week (prior to lecture). For the majority of the course, the instructor, along with specialists (see below) will lead discussions on the current set of papers and will lecture on background material needed to understand the next set of papers. For each subsection of the course, a group of students chosen in advance will serve as **specialists**, i.e. will be experts on the papers we are discussing, and will be expected to help facilitate the discussion, brainstorm about research directions, and help with the presentation of the material

(or with supplemental material). These students will also generate scribe notes reflecting the technical material and the class discussion which are to be distributed to the class.

Grades will break down as follows. The primary output in this class is a semester-long research project, conducted individually or in teams of two with the instructor's permission, and culminating in a presentation to the class and a writeup in the style of a conference paper. The project and presentations will constitute 50% of the overall grade. Suggested project topics and project deadlines will be announced after the first few weeks of the course. Information about style guidelines for both the paper and presentation will also be given through the course. I will expect students in this class to take the project very seriously and there will be regular interaction with the instructor outside of class to work on the projects — ideally, several/many of the projects in the class will eventually lead to publishable papers.

Class participation will constitute 25% of a student's overall grade – this grade will be based both on the student's work as a specialist and contributions to the class discussion throughout the course. For the remaining 25% of the grade, I will pose a few challenging problems as homework questions, and if I feel like students are not reading the papers closely enough, I reserve the right to have in-class quizzes testing the main concepts in the papers and class discussions, which would also factor in here.

Reading List and Textbooks: The weekly readings will be maintained on the course webpage and a preliminary reading list and topics we plan to cover is attached.

The course will primarily draw from recent and not-so-recent research papers in the field, so there is no required text. However, there are recommended texts which cover networking fundamentals and elementary aspects of randomized algorithms, respectively.

The networking text I recommend is: Larry Peterson and Bruce Davie, *Computer Networks: A Systems Approach*, Morgan Kaufmann, 1996. This text is excellent, and I use it to teach CS 555. The randomized algorithms text I recommend having on your bookshelf is Rajeev Motwani and Prabhakar Raghavan, *Randomized Algorithms*, Cambridge University Press, 1995.

Academic Conduct: Your work in this class falls under the purview of the College of Arts and Sciences Code of Academic Conduct. Any incidence of cheating or plagiarism in this class will be passed on to the CAS Academic Conduct Committee.