Department of Computer Science
University of Illinois at Urbana Champaign

CS598JH: Advanced Topics in Wireless Networks

COURSE DESCRIPTION (Spring 2006)

INSTRUCTOR: Jennifer Hou, 4104 Siebel Center
Tel. (217) 265 6329
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Office hours: 11:00am-12:00pm Wednesdays and Fridays

CREDITS: 4 hours, graduate standing

PREREQ: CS 423 Operating Systems Design
CS 438 Communication Networks for Computers

GOALS: In this course, we will discuss issues that better define and characterize wireless links and their implications for higher-layer protocol design and optimization. Specifically, we will study the following issues: (T1) Channel behavior understanding and modeling based on real-life measurement results, (T2) control knobs for improving network capacity, including power control, physical carrier sense turning, rate control, interference mitigation, and channel diversity, (T3) multi-radio and mult-path multicast routing, (T4) fundamental analysis of the achievable transport capacity of wireless networks, (T5) cross-layer design and optimization that can achieve substantial gains in overall network performance, and (T6) systems prototyping and experimentation issues.

TOPICS:
1. Technical motivation (1 week).
2. interference impact and mitigation (1 week).
3. Power control (1 week).
4. Physical carrier sense (1 week).
5. Rate control (1 week).
6. Channel diversity (1/2 week).
7. QoS provisioning (1/2 week).
8. Routing (2 weeks).
9. Modeling of MAC (2 weeks).
10. Channel behavior modeling (1 week).
11. Capacity analysis (2 weeks).
12. Cross layer design and optimization (1 week).

REFERENCES: Papers and book chapters from the literature will be distributed and posted on-line during the semester.

HOMEWORK: Each student is required to turn in a one-page summary for each of the 24 papers (out of 48 presented in class). The summary should clearly state the problem addressed, the technical approaches taken, the major contribution made, and most importantly your critics. The summaries will be graded, and counted toward 20% of the grades.

PRESENTATION: Each student is required to make at least 4 presentations throughout the semester. Students have to thoroughly digest the paper assigned to him/her, prepare adequate handouts, and deliver the lecture as if he/she were the instructor. The PowerPoint/postscript/PDF file for the handout should be given to the instructor at least two days before the presentation, so that she can post on-line and students can download the material prior to the class presentation. The length of each presentation should be kept to approximately 40 minutes (2 presentations per class), unless otherwise specified.

PROJECT: Students are required to either (1) conduct in-depth research on an advanced topic, or (2) develop a network software system (individually or as a team). A 3-page term project proposal will be due on March 8, Wednesday. To help students to formulate the project topic and proceed with project research, the instructor will be available during her office hours or by appointment throughout the semester. Students are encouraged to discuss their potential topics with the instructor early in the semester (preferably in February-March). A poster session will be scheduled in the week of May 1 (likely on May 5 subject to room availability), with all the networking faculty invited to participate the session. A term paper that documents the research findings or the design/implementation is due on May 5, Friday.

EXAM: No midterm or final exams.

WEB PAGE: http://www.cs.uiuc.edu/~jhou/cs598jh/

GRADING: Paper summaries 20%
Class presentation 20% (5% for each presentation)
Project 60% (project proposal: 10%, capability of following the proposed schedule and demonstrating milestones: 10%, significance and completeness of results: 30%, poster presentation: 10%)