

UNDERGRADUATE MATHEMATICS SEMINAR

This week's seminar is jointly sponsored by the Math Department and the Computer Science Department. The speaker, **Tuomas Sandholm**, is a professor in the Computer Science Department at **Carnegie Mellon University**. A bio of Professor Sandholm follows his abstract.

DATE: **THURSDAY, MAY 7th**

Time & **3:45pm** – Refreshments in the Math Common Room, **Bailey 204**

Location: **4:00pm** – Seminar in **Bailey 207**

TITLE: Design and Algorithms for Modern Kidney Exchanges

ABSTRACT: In *kidney exchanges*, patients with kidney disease can obtain compatible donors by swapping their own willing but incompatible donors. The clearing problem involves finding a social welfare maximizing set of non-overlapping short cycles. We proved this NP-hard. It was one of the main obstacles to a national kidney exchange. We presented the first algorithm capable of clearing these exchanges optimally on a nationwide scale. Furthermore, clearing is an online problem where patient-donor pairs and altruistic donors appear and expire over time. Recently we developed trajectory-based online stochastic optimization algorithms (that use our optimal offline solver as a subroutine) for this. They outperform the current practice of solving each batch separately. I will share my experiences from using our algorithms in real kidney exchanges, and the generalizations we introduced. For one, we used them to launch the first never-ending altruistic donor chains. I am also involved with UNOS in designing the nationwide kidney exchange. I will discuss design considerations in modern kidney exchanges.

The talk will cover the following papers:

- [A Nonsimultaneous, Extended, Altruistic-Donor Chain](#). *New England Journal of Medicine* 360(11), March 2009. (With Rees, M., Kopke, J., Pelletier, R., Segev, D., Rutter, M., Fabrega, A., Rogers, J., Pankewycz, O., Hiller, J., Roth, A., Ünver, U., and Montgomery, R.)
- Online Stochastic Optimization in the Large: Application to Kidney Exchange. In Proceedings of the *International Joint Conference on Artificial Intelligence (IJCAI)*, 2009. (With Awasthi, P.)
- [Clearing Algorithms for Barter Exchange Markets: Enabling Nationwide Kidney Exchanges](#). In Proceedings of the *ACM Conference on Electronic Commerce*, 2007. (With Blum, A. and Abraham, D.)

Tuomas Sandholm is Professor in the Computer Science Department at Carnegie Mellon University. He has published over 350 papers on electronic commerce; game theory; artificial intelligence; multiagent systems; auctions and exchanges; automated negotiation and contracting; coalition formation; voting; safe exchange; normative models of bounded rationality; resource-bounded reasoning; machine learning; networks; and combinatorial optimization. He has 19 years of experience building optimization-based electronic marketplaces, and has fielded several of his systems. He is also Founder, Chairman, and Chief Scientist of CombineNet, Inc., which has commercialized over 600 large-scale generalized combinatorial auctions, with over \$40 billion in total spend and over \$5 billion in generated savings. He received the Ph.D. and M.S. degrees in computer science from the University of Massachusetts at Amherst in 1996 and 1994. He earned an M.S. (B.S. included) with distinction in Industrial Engineering and Management Science from the Helsinki University of Technology, Finland, in 1991. He is recipient of the National Science Foundation Career Award, the inaugural ACM Autonomous Agents Research Award, the Alfred P. Sloan Foundation Fellowship, and the Computers and Thought Award. He is Fellow of the ACM and AAAI.

Fall '09 Preregistration Process Begins this Weekend

The Timeline

- **Advising: Monday, May 4th – Friday, May 8th.** Pick –up your preregistration material from the Registrar's office. Then meet with your academic advisor and discuss fall term math course options.
- **Petition course signup: Saturday, May 9th- Tuesday, May 12th.** Log into webadvising.union.edu to request a slot in a petition course. For math courses, you will be asked to follow a link to a math specific course petition page and asked to provide details about your request.
 - With the exception of honors projects, independent studies, and theses, all upper division math courses in the fall term are petition courses.
- **Acceptance period: Tuesday, May 19th – Wednesday, May 20th.** Log into webadvising.union.edu and select "Petition Management". Change the courses marked "Faculty Approved" to "Accepted by Student" or "Not Needed" based on your interests. **REMEMBER: Accepting a petition does not enroll you in a course!**
 - Based on the petition acceptances, students will be taken from the waitlist on the 21st and 22nd.
- **Registration Period via the Web at Hale House: Monday, May 25th – Friday, May 29th.** Refer to your prescheduling sheet for your specific appointment time.
- **Post-Petition Requests:** If you need to get into a math course after the petition period is over, **do not contact the professor or the department chair.** Rather, make your request online at <http://www.math.union.edu/courses/requests>.

The Courses

Next fall, the Math Department is offering several interesting courses beyond the calculus sequence that are suitable for math majors and minors.

Math 199 is the department's "bridge course," intended to help students make the transition from computationally oriented courses to more theoretical proof-writing courses. It is a **required** course for all math majors and minors that is *usually* taken after a student has taken Math 115.

Beyond Math 199: Three courses having Math 199 as a prerequisite are being offered in the fall.

Math 219 (Topics in Discrete Mathematics): As a 200-level course, Math 219 is appropriate for students coming from Math 199. Topics may include graph theory, partially ordered sets, algebraic coding theory, and more.

Math 336 (Real Variable Theory): Math 336 is **required** for math majors. In this course, you will learn some of the theoretical underpinnings of the calculus of functions whose domain lies within the set of *real* numbers.

Math 330 (Complex Analysis): This is a good choice for more advanced students, especially those thinking about graduate school in math. In this course, you will learn about the calculus of functions whose domain lies within the set of *complex* numbers.

Problem of the Newsletter: May 6, 2009

Since the most recent problem was issued just a few days ago, readers will be given more time to work on that one. Here it is again:

The problem: Find all solutions (x,y) of the equation $x^y=y^x$ for **real** numbers $x,y >0$.

Professor Friedman will accept solutions to this problem until 12:00 noon, **Tuesday, May 12th**. Email your solution to him (friedmap@union.edu) or put it in his mailbox in the Math Department's office on the second floor of Bailey Hall.