MSCS Mess

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This Week's Colloquium

Title:	Consulting to Improve Colonoscopy
Speaker:	Felicity Enders, PhD, MPH
Date:	Monday, March 17th
Time:	3:30 PM
Location:	RNS 410

About the talk: Colorectal cancer (CRC) is the second leading cause of cancer deaths in the United States, yet colonoscopy, the primary tool for preventing CRC, has poor success rates. This talk will explore a multi-year collaboration between a clinician investigator and a biostatistician on a series of projects to improve the quality of colonoscopy. A number of statistical methods have been used to date, so this talk will briefly introduce assessing agreement, diagnostic testing, and receiver operating characteristic curves. There is no expectation that the audience will have prior expertise with these methods.

About the speaker: Felicity T. Enders, PhD, MPH, is an Associate Professor of Biostatistics at Mayo Clinic in Rochester, MN. She leverages her statistical consulting expertise to teach statistics to doctoral and master's students in Mayo Clinic's clinical and translational sciences program. Dr. Enders' personal research focuses on statistics education for non-statisticians. Her most recent efforts include developing and evaluating instruments to assess understanding of biostatistics among students in the health sciences. Dr. Enders holds a Ph. D. from Yale University, MPH and Ph. D. from Johns Hopkins Bloomberg School of Public Health.

This Week's Seminar

There will not be an MSCS Seminar next week.

REU: Smithsonian Tropical Research Institute

Do you want to spend your summer in Panama? Then apply for the STRI-REU! This is a 10-week program for life science programs as well as students in mathematics and computer science. The REU will pay for airfare, housing, food allowance, and a $5000 stipend. If you would like to apply, youshould first browse through the list of potential mentors and project descriptions and identify up to three distinct projects/mentors that align with your own scientific interests (http://bit.ly/1go3Qfe). All application materials, with the exception of the recommendation letters, must be compiled into a single electronic pdf file. The file should be named as follows: SURNAME_FIRST INITIAL_REU.pdf and sent to `strireu@si.edu`. If you have any questions, please see http://www.stri.si.edu/reu/english/.

Save the Date for MSCS Recital

The Annual MSCS Recital, an evening of food and performances provided by MSCS students, faculty and staff, will be held on Wednesday, April 23, at 7:00pm in Ytterboe Lounge. Please make plans to attend this very relaxed and pleasant evening.

In addition to musical performances, past recitals have included mathematical jokes, juggling, poetry reading, mathematical parodies of famous literature, and unicycle riding. If you are interested in performing, contact Kay Smith (`smithk@stolaf.edu`).

Math Across the Cannon

Remember that Prof. Joseph Silverman of Brown University will be delivering this year's Math Across the Cannon lectures on April 3rd. That is the Thursday after spring break, so mark your calendars. Prof.

Silverman is a renowned number theorist whose interests also include cryptography and arithmetic dynamics. He has written several textbooks on these topics and is known for giving excellent lectures. More information on the talks he will be giving in Northfield is available at http://pages.stolaf.edu/diveris/?p=339.

Do you want to teach mathematics?

Are you interested in becoming a math teacher? Have you thought about it, but are unsure if it's the right career path for you? Or are you looking for a fun class to take and satisfy a GE at the same time? If you've answered "yes" to any of these questions, consider taking EDUC 290: Educational Psychology (course description later in this issue). It offers a nice introduction to our Education Department and to the world of education in general. You'll also get some "field experience," where you'll spend some time in actual schools. And you'll come out of each course with a GE credit (HBS) – so you really can't go wrong. In fact, convince a couple of friends (or more) into taking these courses with you! If you have any questions, contact Prof. Matsuura (matsuura@stolaf.edu).

Course Descriptions

Don't know what to take next semester, or are you looking for an interim abroad? Read the following descriptions of the many MSCS courses being offered. Note that this is *not* an exhaustive list. More courses can be found online.

Fall Semester

- CSCI 125: Tools for Data
- CSCI 315: Bioinformatics
- CSCI 336: Logic Programming
- EDUC 290: Educational Psychology
- MATH 282: Introduction to Abstract Mathematics
- MATH 384: The Mathematics of Finance
- STAT 302: Biostatistics: Design and Analysis

Interim

- MATH 218: Geometry and Decorative Art in Morocco

Fall Semester

CSCI 125: Tools for Data

CS125 introduces popular tools for handling data, including 1) obtaining data from web sources, 2) visualizing the data, 3) searching for important patterns in multidimensional data, and 4) sharing results on the web. The emphasis in this course is not just a particular set of tools, but also a broad perspective on computing that applies to many different application areas over time. The approach is hands-on, working with real world datasets. Students in biology, chemistry, mathematics, psychology and statistics are especially encouraged to consider this course. No prior experience with statistics or programming is required.

CSCI 315: Bioinformatics

Students study computational problems arising from the need to store, access, transform, and utilize DNA-related data. Topics from computer science include: exhaustive search; algorithms (including dynamic programming, divide-and-conquer, graph and greedy algorithms) for fragment reassembly, sequence alignment, phylogenetic trees; combinatorial pattern matching; clustering and trees; and hidden Markov models. Prerequisites: Computer Science 253, or one of Computer Science 125 or 251 and one of Biology 125 or Mathematics 220, or permission of instructor. Counts toward neuroscience concentration. Carries IST GE credit.

CSCI 336: Logic Programming

Students learn a widely-used style of programming based on first order predicate logic. Topics include declarative programming, Horn clauses, declarative and procedural semantics of logic programs, clauses as relations, goals, backtracking, and resolution. Programming projects and exercises use Prolog, the most significant logic programming language. Additional topics include the relationship of Prolog to logic and applications to artificial intelligence. Prerequisite: Computer Science 251 or permission of instructor.

EDUC 290: Educational Psychology

Students study theories of and research into human behavior, growth, and development. Through lectures, discussions, case studies and field experiences, students analyze the impact of applied psychology upon schools, teachers, and students. Students also examine the interaction between individual characteristics and needs and political, economic and philosophical issues confronting contemporary American

students. Required 20-hour field experience. Carries the HBS GE.

MATH 282: Introduction to Abstract Mathematics

This course will introduce students to abstract mathematical thinking, emphasizing mathematical reasoning and writing. Using a variety of topics as the backdrop, students will learn to conjecture and prove theorems in a setting that is not quite as rigorous as in Math 244 (Real Analysis I) or Math 252 (Abstract Algebra I). Topics may include number theory, graph theory, game theory, combinatorics, and more. The course is intended for students who want to learn about mathematics beyond calculus and linear algebra without necessarily committing to a mathematics major, and for students who want or need to learn how to express themselves in a precise, logical manner. Pre-requisite: Math 220.

MATH 384: The Mathematics of Finance

Can mathematics be behind a social catastrophe? Some say the current economic downturn, exemplified by the turmoil in the housing and financial markets, is an example of just this phenomenon. One version of the story is that huge investment banks and other institutions hired mathematicians to define and model the behavior of exotic financial instruments, things like futures contracts, put and call options (both naked and married), credit default swaps, mortgage backed securities, etc. Simple versions of these instruments have been around for a long time, but new ways of packaging and marketing them sprang up in the 90's and 00's. The modelers based their work on certain assumptions, but their models ended up being applied to situations in which the assumptions didn't hold. We've all seen the consequences.

A key challenge for financial institutions is to determine the "fair price" for these complicated investments. The mathematics behind this determination is tricky and fascinating. The goal of this 300-level seminar is to understand both these exotic financial instruments and the mathematics behind their valuation. This course is NOT about accounting, determining monthly loan payments, determining how to meet retirement, home down payments or other personal goals, or setting financial reserves for banks, insurance companies or other financial institutions.

Students enrolling in this class should have two 200-level math courses under their belts. Calculus is essential, some experience with probability will be helpful but not required. No formal background in corporate finance or investing is expected.

Non-negotiable currency will be minted for "cash" transactions and other investments created for and traded in the course's faux financial market. This currency will be backed by homemade chocolate chip cookies. Contact Prof. McKelvey with any questions about the course, or the cookies.

STAT 302: Biostatistics: Design and Analysis

Biostatistics: Design and Analysis investigates issues in health-related settings using a quantitative, research-oriented perspective. Course material focuses on global and public health issues, study design, methods for analyzing health data, and communication of research findings. Design topics include controlled trials, case-control, cohort and other observational studies. Methods include survival analysis and casual inference for observational studies. Communication emphasizes writing up findings and interpreting published research. Prerequisite: completion of Statistical Modeling (Stat 272) or permission of the instructor. Counts toward statistics and mathematical biology concentrations. Contact the instructor Julie Legler or Katie Zielger-Graham for more information.

Interim

MATH 218: Geometry and Decorative Art in Morocco

Islamic art is decorative and based on geometry. Students study this art, its origins, and its significance, along with cultural topics related to Moroccan life, in the imperial city of Fes. Field work includes identification and analysis of distinct geometrical patterns found on buildings, monuments, and artifacts. Students also use geometry to create their own art. Mosaic designs are still created in Fes, a center for Islamic geometric patterns. Students stay with Moroccan families while in Fes. Field trips visit sites in and around Fes, with day-long visits to Mekns, Moulay Idriss, and Volubilis, and a longer excursion to Marrakech and Casablanca. Offered in interim 2015. Satisfies the Multicultural Global and AQR GE requirements.

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If you would like to submit an article or event to be published in the Math Mess, e-mail jacobsoj@stolaf.edu