MSCS Mess

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Science Symposium

There will be no MSCS Seminar nor Colloquium this week. However, the science symposium will be fantastic so please attend!

Title:	Wasn't Geographic Information Always Big?
Speaker:	Francis Harvey, University of Minnesota
Date:	Friday, October 25th
Time:	3:30
Location:	RNS 150

About the talk:
Does the current rage for "big data" really brings us anything new, given the long history of cartographers and geographers dealing with massive amounts of data and large differences of scale? Prof. Harvey will explore this question in the context of fascinating applications of GIS with excellent visualizations.

About the speaker:
Francis Harvey is an Associate Professor at the University of Minnesota in the department of Geography, with a specialty in Geographic Infromation Systems (GIS). His research interests include location privacy, spatial data infrastructures, geographic information and sharing, semantic interoperability, and critical GIS. He serves on the editorial boards of the International Journal of Geographical Information Systems, Cartographica, GeoJournal, and the URISA Journal. He published A GIS Primer with Guildford Press in 2008. He is currently finishing work on a long-term research project in Poland considering discrepancies between cadastre data and actual land use. He continues to work on spatial data infrastructure research. He has also contributed to the development of a model curriculum and resources for GIS ethics teaching (see http://www.gisprofessionalethics.org).

MSCS Jokes!

Since so many people were upset that the jokes were missing from last week's issue, here are some more compiled from the Internet!

Math: Why did the chicken cross the road? The answer is trivial and is left as an exercise to the reader.

Statistics: Two random variables were talking in a bar. They thought they were being discrete but I heard their chatter continuously.

Computer **S**cience: What's the object-oriented way of becoming wealthy? Inheritance.

Course Descriptions

Don't know what to take this interim or next semester? 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.

Interim

- Math 382: Graph Theory
- Math 390: Practicum

Spring Semester

- CS 121: Principles of Computer Science
- CS 276: Programming Languages
- Math 236: Mathematics of Biology
- Math 384: Topics in Applied Math: Numerical Simulation
- Stat 214: Honors Statistics for the Sciences

Interim Classes

Graph Theory

What's the shortest way from point A to point B on a given set of roads? How many colors does it take to make a map of the United States so that no adjacent states get the same color? These questions and more can be stated (and sometimes proved) using graph theory. Simply put, graph theory is a mathematical game of "connect the dots." The study of graph theory dates all the way back to Euler in 1736 when he wrote a paper about the Seven Bridges of Knigsburg. Since then, graph theory has become an incredibly interesting major area of mathematics with important applications in other areas of mathematics as well as computer science, engineering, physics, biology, and sociology. In this course we'll study properties of certain classes of graphs (such as complete graphs, bipartite graphs, and trees) and algorithms used to find graphs with certain properties or check if a graph has a desired property. Time permitting, we may also see how linear algebra and matrices can be used to understand graphs even though the two concepts are seemingly unrelated. Prerequisite: Math 244 or Math 252.

Practicum

Interested in mathematics in the corporate world? The Math Practicum (Math 390), offered during interim, should be on your mind. The course offers the opportunity to work on real-world problems from Minnesota businesses, non-profits and government agencies. Small teams (4-6) of students are assigned to work on a single high-level problem for the entire course. The course faculty will support student efforts through daily meetings about team progress, but will not be actively engaged in the research. At the end the term, the team results are presented to the sponsors at the company offices.

Generally limited to juniors and seniors, admission to the course is granted after an application process. You may apply to participate in the Math Practicum online by using the link below (which will be emailed to majors and concentrators). Applications are due by Friday, Oct. 25 and students will be notified regarding admission by Nov. 1. For any questions, about the course, applications, or other practicum matters, please contact Katie Ziegler-Graham (`kziegler@stolaf.edu`, x3415) or Tina Garrett (`garrettk@stolaf.edu`, x3419).

Apply online at `bit.ly/1aTaTHi`.

Spring Classes

Principles of Computer Science

CS 121 (also known as CS1) introduces the essential concepts of computer science (CS) that are at the foundation of the information age. Those principles remain current and provide useful insight in practice, even as hardware and software systems come and go. CS121 is a hands-on course, with regular homework exercises for learning those concepts by doing them, using the versatile and popular Python programming language. The combination of savvy concepts and valuable programming skills make CS121 both an effective one-course taste of computer science and an ample preparation for the option of continuing in CS.

The universal applications of computing make it important, and the Spring 2014 sections of CS 121 will feature a newly expanded set of applications to many disciplines all across the campus, including humanities, social sciences, the arts, natural sciences and mathematics. For example, when exploring techniques for handling huge unstructured data sets, we will analyze literary texts; when learning about programming with strings of characters, we will work with DNA sequences. No specialized background is needed for the numerous liberal-arts applications.

No prerequisites; in particular, no prior background in CS or programming is needed. See Dick Brown (`rab@stolaf.edu`) or Richard Allen (`allen@stolaf.edu`) for more information.

Programming Languages

This course provides an implementation-oriented examination of features commonly found in programming languages. Students construct their own interpreters for an example programming language incorporating the various language features they study throughout the course. Major themes are: programming language semantics, programming language translation, implementation of control structures and memory structures, abstraction mechanisms, language translation systems, types. Prerequisites: HD and SD, or consent of instructor (`allen@stolaf.edu`).

Mathematics of Biology

The interdisciplinary field of mathematical biology combines experiment, mathematical theory, statistics and computation to better understand biological systems. In this course you will engage in all of these areas by collecting data and implementing the essential modeling techniques of formulation, implementation, validation, and analysis. The course is taught

by a mathematician with a wet-lab taught by a biologist. The labs use discrete and continuous models to study population growth, enzyme kinetics, random walks and glucose homeostasis. No prior laboratory experience is required. Prerequisites: Math 126 or 128, and Math 220. If you have questions, please contact Becky Vandiver (`vandiver@stolaf.edu`).

Numerical Simulation

If you took Differential Equations 1, you probably learned about the Forward Euler method and used NDSolve in Mathematica to solve ODEs numerically. We will spend about half of this course learning about these and other numerical methods for ODEs. We will discuss the theory and implementation, including algorithms that adapt their step size to maximize efficiency and accuracy. The second half of the course will cover discrete stochastic simulation. ODEs assume the system's behavior is continuous and deterministic. However, in many settings (e.g. biochemistry, ecology), interactions between small populations leads to behavior that is random (stochastic) and discrete. We will learn Gillespie's Stochastic Simulation Algorithm, a Monte Carlo method for simulating these systems, and discuss techniques for speeding up these simulations. The course will include a group research project. Contact Prof. Kevin Sanft (`sanft@stolaf.edu`) with questions.

Prerequisites: Differential Equations 1 (Math 230), some prior programming experience recommended but not required.

Honors Statistics for the Sciences

The Honors sections of Statistics for the Sciences were developed to serve two distinct audiences: first, mathematically-inclined students who can handle an accelerated course, which will facilitate exposure to more topics and greater depth in the topics covered; second, students who have had some exposure to statistics (e.g., AP Statistics) but have not used modern statistical software and have not analyzed large, messy data sets. Stat 214 will delve into the mathematics that underlie the statistical methods being studied in greater depth, will expose students to new, computationally-intensive methods not covered in Stat 212, and will introduce students to a modern statistical software package. Stat 214 should be a great course to prepare students for the statistics concentration, plus it counts as an elective for the Mathematics major. Two sections of Stat 214 will be offered in Spring 2014.

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