Comps Gala!

Thursday, March 4 in Olin 141 there will be another Comps Gala. Come to any or all of the presentations and support your peers in their great work. The schedule is as follows:

Using occupancy theory and hierarchical models to estimate otter population in southeastern Minnesota
Chrisna Aing, Sarah Halls, Kiva Oken
3:30 pm

Ecologists often conduct surveys to find out what proportion of an area is inhabited by a target species (the occupancy rate). However, sometimes the species is not observed because it is absent while at other times it is not observed because it went undetected during the survey. Occupancy theory attempts to discern between these two processes in order to estimate the occupancy rate. Under a hierarchical model framework, we used occupancy theory to analyze aerial survey data from the Minnesota Department of Natural Resources on otter tracks on three southeastern Minnesota rivers during the winter. We developed Bayesian and spatial models that both incorporate the possibility of false detection—sometimes observers claimed to see tracks when perhaps they were not there—as well as allow for site-to-site correlation. Extensive simulations show that these models are surprisingly good at estimating occupancy rate given the limitations of our data.

Differences Between Single and Several Complex Variables
Tomoki Isogai
4:30 pm

Most of the things we learned in Calculus I and II (single real variable calculus) can be extended to multivariable calculus in a natural manner. We take a look at two examples from several complex variable theory that behave quite differently from single variable complex analysis. Namely, zero sets for analytic functions, and domains with a function that cannot be extended analytically to a larger domain (called domain of holomorphy.)

Demand Forecasting for 3M
Robert Carlton, Gorkem Celebioglu, Daniel O’Connell, Eric Tiede
6:00 pm

Demand forecasting is a powerful tool for manufacturers. If a manufacturing company can forecast accurately even just one month into the future, it will reduce costs and improve customer satisfaction. For our comps project, we attempted to use macroeconomic indicators to improve the present forecasting system at 3M.
The University of Wisconsin is sponsoring a 6 week program in biostatistics. This is open to U.S. citizens. Deadline is March 5. For more information, visit:
http://www.biostat.wisc.edu/Educational_Resources/SIBS/

The Tour This Week

This week's Tour of Math speaker is Jonathan Hibbard, and his talk (3:30 pm, February 26, CMC 206) is on "Simple Traffic Flow, And Why It Might Be A Good Idea To Close 42nd Street". As always, all are welcome!

Reminder: Apply to PREP!

Each summer for over a dozen years, Carleton has sent a student to the San Antonio Pre-Freshman Engineering Program (PREP) to serve as a mentor. PREP consists of about 1300 middle- and high-school students from the greater San Antonio area. PREP stresses the development of abstract reasoning, problem solving skills, and their application. Carleton pays for the travel expenses and a generous stipend, PREP pays for room. The dates for this summer are June 14 to July 30. To apply, send Gail Nelson a statement of interest which includes a description your qualifications by Friday, March 5.

PROBLEMS OF THE WEEK

1. It's not hard to show that any positive integer is either a square, or one can get it by adding and/or subtracting distinct squares (of integers). For one thing, any odd integer is a difference of consecutive squares (for example, $13 = 49 - 36$), and any even integer can be found from the odd one just before it by adding the square 1 (for example, $14 = 49 - 36 + 1$). This leaves two awkward cases in which we've used the square 1 twice ($2 = 1 - 0 + 1$ and $4 = 4 - 1 + 1$), but we also have $2 = 16 - 9 - 4 - 1$, and 4 is itself a square. Now for the problem: Can one get any positive integer that is not itself a cube by adding and/or subtracting distinct cubes (of integers)?

2. Let $n$ be an even integer. Two people travel along the grid lines of a rectangular grid with $n + 1$ vertical lines and three horizontal lines, as follows: At $t = 0$, they start at opposite corners of the grid, say at the upper left corner (0,2) and the lower right corner $(n,0)$, and during each unit of time they each traverse one unit of time to an adjoining grid point. The person starting at (0,2) always moves to the right or down, while the other person always moves to the left or up, so that the two people will change places in $n + 2$ units of time. At each grid point where there is a choice, each person decides at random which of the two possible directions to pursue. (Note that, for example, once the person starting at (0,2) reaches the bottom edge of the grid, she no longer has a choice.) What is the probability, as a function of $n$, that the two people will meet somewhere along the way?

Solutions to last week's second problem arrived from Henry Luo, Shunji Li, and Gabe Davis; Henry should stop by CMC 217 to pick up a B.B.O.P. item. No word on the first problem yet; as always, I'll be happy to acknowledge solutions until I post my own. Solutions to the problems posted January 29 have now been posted.

- Mark Krusemeyer

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Problems of the Week:
Mark Krusemeyer

Subscriptions & Web:
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