

Goodsell Gazette

Carleton College

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The newsletter for the Carleton mathematics and statistics community

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Mathematics and Statistics Colloquium

The next Math/Stats Colloquium Series will be held on Tuesday, April 20 from 4:00 pm - 5:00 pm, with an informal "tea" held before the talk at 3:30 pm where you can drop by and connect with others in the Math/Stats Department. The Zoom details will be sent out via the mast-interest mailing list, so be sure you are on the list!

Title: An MCMC Convergence Diagnostic: Are We There Yet?

Speaker: Christina Knudson ('09); University of St. Thomas

Abstract: Gelman and Rubin's (1992) convergence diagnostic is one of the most popular methods for terminating a Markov chain Monte Carlo (MCMC) sampler. Since the seminal paper, researchers have developed sophisticated methods for estimating variance of Monte Carlo averages. We show that these estimators find immediate use in the Gelman-Rubin statistic, a connection not previously established in the literature. We incorporate these estimators to upgrade both the univariate and multivariate Gelman-Rubin statistics, leading to improved stability in MCMC termination time. An immediate advantage is that our new Gelman-Rubin statistic can be calculated for a single chain. In addition, we establish a one-to-one relationship between the Gelman-Rubin statistic and effective sample size. Leveraging this relationship, we develop a principled termination criterion for the Gelman-Rubin statistic. Finally, we demonstrate the utility of our improved diagnostic via examples (including a Titanic survival model with Jack and Rose).

About the speaker: Christina Knudson graduated from Carleton College in 2009 with a degree in mathematics. She earned her PhD in statistics from the University of Minnesota in 2016. She is currently an assistant professor of statistics at the University of St. Thomas in St. Paul, MN.



Work in the Math and Stats Department Next Year!

Are you interested in working for the Mathematics and Statistics Department next year? Are you looking for a flexible job on campus and an opportunity to work with and for your professors? Do you want to help other students learn mathematics and statistics with the added benefit of learning the material *better* for

yourself?!

We are looking for students to work in a variety of positions, including math and stat course **graders**, **teaching assistants**, and **prefects**. Teaching assistant's duties may vary depending on the course and instructor preferences, but they could include some combination of office hours, grading, and one-on-one help for students in a specific course. Prefects will be working for Kathy Evertz (Academic Support Center) and will need to meet the criteria for that program. We ask that graders and TAs received at least a B+ in the class you would like to grade (or have had an AP score that tested you out of the course). If you took a class last spring and you did well in the class, let us know that in the comment section of the application.

We also need students who would like to help students with **mathematics software** questions (like Mathematica), to work in our "**stats lab**" to assist students from a variety of stats courses on HW, project and R questions, and to work in the QRC as a **comps stats consultant** to assist with data analysis questions from comps students in other departments. We ask that students interested in working in the stats lab be comfortable with R and R Markdown, have a B+ or higher in Stat 120 (Math 215) or 250 (Math 275) and Stat 230 (Math 245), and we highly recommend taking Stat 220 (Math 285) though this isn't a requirement. Students interested in the consultant position should have taken Stat 220 and 230 and one or more of Stat 260, 320, or 330.

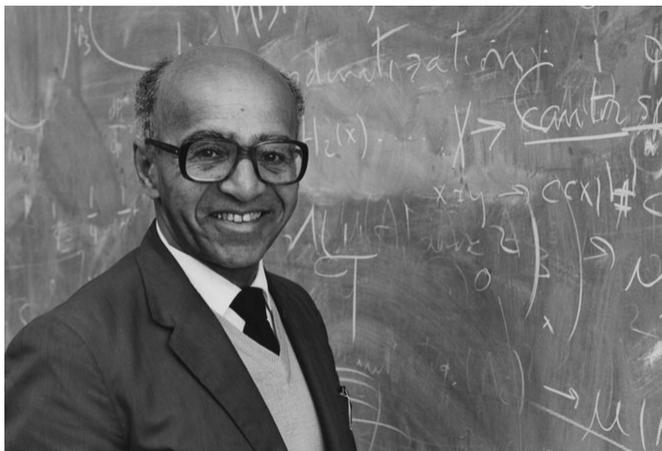
The application for these positions is now available and due on Monday, April 19.

The Math Skills Center will also be hiring tutors for next year and you can apply here.

If you have questions about the math and stats positions outlined here please contact Sue Jandro. If you have questions about tutoring in the Math Skills Center please contact Russ Petricka.

Notable this Month

David Blackwell was born on 24 April 1919 in the small town of Centralia, Illinois. He entered the University of Illinois in 1935 at age 16 to study mathematics, earning his bachelor's in 1938, masters in 1939 and his PhD in 1941. He was named a Rosenwald Postdoctoral Fellow at the Institute of Advanced Study (IAS) at Princeton, becoming the first African American to be a fellow at the IAS. However, he was denied the right to attend faculty lectures at



Princeton University because of his race (the university and the institute are separate entities). After his post-doc, he held positions at Southern University, Clark College and Howard University during which time he began research in statistics.

In 1954 he was a visiting professor at the University of California Berkeley and the following year, was hired as a full professor in the Statistics Department that had just been created. He retired in 1988. Blackwell made significant contributions to mathematics, statistics and game theory, including the Rao-Blackwell Theorem and one of the first textbooks on Bayesian statistics (Basic Statistics (1969)).

He held many leadership positions throughout his career, including vice president of the American Mathematical Society, vice president of the American Statistical Association and president of the Institute

of Mathematical Statistics. Blackwell died in 2010 at the age of 91. In 2014, he was awarded posthumously the National Medal of Science.

Sources: Wikipedia; A Centennial Year (2019) Reflection o the Life and Contributions of Mathematician David H Blackwell (1919-2010) (www.ams.org/journals/notices/201902/rnoti-p221.pdf); photo from math.illinois.edu/david-blackwell

Carleton Teams Compete in Konhauser Problemfest

On Saturday, April 10, three teams of Carls participated in the 29th annual Konhauser Problemfest, tackling a set of ten challenging (but fun!) problems. The team of Bowen Li, Ton Meesena, and Sebastian Vander Ploeg Fallon took home first place out of 15 teams, meaning that the famed pizza trophy has returned to Carleton after a one-year absence. Check it out in the area near Sue's office the next time you're in the department. The team of John Byun, Alejandro Gonzalez, and Erin Watson nabbed a tie for second place. Also making a strong showing was the team of Shira Julie, Marcella Manivel, and Michaela Polley. Congratulations to all who participated!

Upcoming Events

Week 4

Tuesday, April 20, 3:30 - 5:00pm
Christina Knudson Colloquium Talk - Zoom

Problems of the Fortnight

To be acknowledged in the next *Gazette*, solutions to the problems below should reach me by noon on Tuesday, April 27.

1. As a function of n , what is the largest number of 90° angles that an n -gon can have? (For example, the number is 1 for $n = 3$ and 4 for $n = 4$. Note that the n -gon doesn't have to be convex; in other words, it can have "indentations". On the other hand, 270° angles *don't* count as 90° . For instance, if you make a 6-gon by drawing the outline of a "fat" letter L, it will have five, but not six, 90° angles.)

2. Let A_n be the $(n + 1) \times (n + 1)$ matrix such that all entries in any northeast-southwest diagonal of A_n are equal to each other and such that the "values" of these diagonals, in order, are $0, 1, \dots, n - 1, n, n - 1, \dots, 1, 0$. For example,

$$A_3 = \begin{pmatrix} 0 & 1 & 2 & 3 \\ 1 & 2 & 3 & 2 \\ 2 & 3 & 2 & 1 \\ 3 & 2 & 1 & 0 \end{pmatrix}.$$

Find $\det(A_n)$ as a function of n .

The first problem posed April 2 was solved both by Sebastian Vander Ploeg Fallon and by "Auplume"; Ben Hafner solved the second problem. Ben and Sebastian should contact Sue Jandro in order to arrange to collect a B.B.O.P. item. Good work, all!

- Mark Krusemeyer



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