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Math Across the Cannon

Every year, the Carleton Department of Mathematics and Statistics and St. Olaf Department of Mathematics, Statistics, and Computer Science jointly host the Math Across the Cannon speaker series. This year, the speaker is Alicia Carriquiry.

Alicia Carriquiry is a professor in the Department of Statistics at Iowa State University. She is currently Distinguished Professor of Liberal Arts and Sciences and President's Chair in Statistics, and is Director of the Center for Statistics and Applications in Forensic Evidence (CSAFE), a National Institute of Standards and Technology (NIST) Center of Excellence. Carriquiry's research interests include measurement error modeling, survey sampling and Bayesian methods. In recent years, she has become interested in machine learning algorithms and their application in various disciplines, including forensic science.

Date: **Tuesday, October 12**

Student seminar at St. Olaf
Reception 3–3:30, RMS Floor 1 Atrium
Talk 3:30–4:30 pm, RMS 150

Quantifying the Similarity Between Images for Forensic Analysis

When a crime is committed, crime scene investigators collect any evidence that might lead to apprehending the criminal. Much of the evidence consist of patterns and include tire tread prints, handwritten notes, microscopic striations on the surface of a bullet, and many others. The forensic analysis of this type of evidence is purely subjective; after visual comparison of the questioned item and a reference item (e.g., a bullet fired using the defendant's gun), forensic examiners reach a categorical conclusion such as "identification".

The subjective approach does not lend itself to rigorous scientific testing and validation, and for most pattern comparison disciplines, critical questions such as the discipline-wide error rates remain unanswered. Today we focus on the question of source: is the defendant the source of the evidence at the crime scene? and describe statistical and algorithmic approaches to begin addressing the question. We use the forensic analysis of shoe prints as an example. Using methods from image analysis, graph theory, machine learning and good old statistics, we develop an approach to quantify the differences between two

outsole images that appears to be promising.

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Public lecture at Carleton
Talk 7–8 pm, Weitz Cinema
Reception 8–8:30 pm

CSI Statistics: How the Principled Use of Quantitative Methods can Contribute to the Fair Administration of Justice

The United States leads the world in terms of the number of its citizens it incarcerates. Black and Brown people are over-represented among jailed individuals and tend to receive harsher sentences than Whites for the same crime. Saddest of all, the Innocence Network estimates that about 20,000 wrongfully convicted individuals are languishing in jail today for crimes they did not commit.

Ad-hoc forensic methods, exaggerated claims and junk science are leading contributors to wrongful convictions. Yet many un-validated, poorly tested forensic technologies continue to be admitted in court proceedings. Today we briefly highlight some of the limitations of forensic practice and propose a principled quantitative framework to address those limitations. We focus on the forensic question of source: how likely is it that the defendant was the source of the evidence at the crime scene? When the evidence is biological, forensic DNA analysis provides science-based answers. When evidence consists of a pattern such as a fingerprint or the markings on a fired bullet, much of the science still needs to be developed.

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These events are sponsored by The St. Olaf Department of Mathematics, Statistics, and Computer Science, The Carleton Department of Mathematics and Statistics, and the Michael Morrill Fund.

Mathematics and Statistics Colloquium

We're pleased welcome algebraist Cory Colbert from Washington and Lee University to speak in our next Math/Stat Colloquium.

When: Tuesday, October 19 (Week 6) at 4:00pm

Where: CMC 306

Title and Abstract: To be Announced. Watch for posters in the CMC!

Please note that masks will be required at the event.

Undergraduate Research and Internship Symposium

The 2021 Undergraduate Research and Internship Symposium will be held on Friday, October 15, 2021 in the Weitz Center for Creativity from 4:30 p.m. to 6:00 p.m.

The Symposium will be part of both Family Weekend and the Inauguration of President Alison Byerly, and will feature the research and internship work of more than 150 students.

GeMMS Crafts and Conversation

GeMMS (Gender Minorities in Math and Stats) is inviting you to our second crafts and conversations of the term! We will be meeting in the CMC 206 next **Tuesday (October 12th) at 6pm** to decorate mugs and talk about math before walking over to the Weitz at 6:45 for Math Across the Cannon. Snacks will be provided, but feel free to bring your dinner with!

Questions? Contact MurphyKate (mmontee@carleton.edu). This event is aimed at those who identify as a gender minority in the math/stats department.

Study Math Education in Budapest

Budapest Semesters in Mathematics Education (BSME) is a study abroad program in Budapest, Hungary, designed for undergraduates, recent graduates, and in-service teachers interested in the learning and teaching of secondary mathematics. BSME is specifically intended for those who are not only passionate about mathematics, but also the teaching of mathematics. To learn more about our summer and semester terms, visit bsmeducation.com.

GeMMS Movie Night

Come one, come all, to the GeMMS movie night! At **7pm on Midterm Monday (10/18)**, join us in CMC 206 to watch **Big Hero 6**, eat snacks, and hang out with other GeMMS members! Questions? Contact MurphyKate (mmontee@carleton.edu). This event is open to all GeMMS members.

Upcoming Events

Week 5

Tuesday October 12, 3:00-4:30pm
Math Across the Cannon Student Seminar — St. Olaf

Tuesday October 12, 6:00-6:45pm
GeMMS Crafts and Conversation — CMC 206

Tuesday October 12, 7:00-8:30pm
Math Across the Cannon Public Lecture — Weitz Cinema

Friday October 15, 4:30-6:00pm
Undergraduate Research and Internship Symposium — Weitz Center for Creativity

Week 6

Monday October 18, 7:00pm
GeMMS Movie Night — CMC 206

Tuesday October 19, 4:00-5:00pm
Cory Colbert Colloquium Talk — CMC 306

Job, Internship, & Other Opportunities

Biostatistics Virtual Prospective Student Experience — University of Michigan

Earn a degree in Biostatistics and learn to develop and use data analysis tools crucial to cutting edge medical, public health, and biological research.

Current students, faculty and alumni will describe the exciting opportunities in this field, the outstanding job prospects post-graduation, and the admissions and financial support opportunities in the Department of Biostatistics at Michigan. Prospective Masters and PhD students are encouraged to attend!

Event details and registration at sph.umich.edu/biostat/prospective-student-experience.html.

Economic Consultant (DC) — Edgeworth Economics

Edgeworth Economics is an economic and quantitative consulting firm that provides economic analysis and expert testimony for clients facing complex litigation, regulatory, and other challenges involving antitrust, class certification, intellectual property, and labor and employment. Edgeworth's expert economists, statisticians, data analysts, and other professionals assist clients with innovative solutions rooted in the rigorous application of economic principles and hard data. Organizations including leading law firms, Fortune 500 companies, and government agencies rely on Edgeworth Economics to help them navigate through their most critical legal disputes and other challenges.

Seeking graduates in Economics, Statistics, Mathematics, or similar discipline. All interested candidates must apply online through Edgeworth's Careers website, www.edgewortheconomics.com/careers by Feb. 1st, applications rolling!

See full job description on Handshake at carleton.joinhandshake.com/jobs/5426160.

Problems of the Fortnight

To be acknowledged in the next *Gazette*, solutions to the problems below should reach me by noon on October 19.

1. Given a parabola in the plane, describe the locus (set) of all points P in the plane such that there are two perpendicular lines through P that are tangent to the parabola:

    a) in the particular case of the parabola $y = x^2$;
    b) for a general parabola.

2. Evaluate the sum of the infinite series $\sum_{n=1}^{\infty} \dfrac{\sin(n\pi/7)}{3^n}$. (If you use technology to get the answer, which is not necessary, do explain why the answer comes out the way it does.)

A correct solution to the first problem posed September 24 arrived from "Auplume". Alas, as of press time, no student solutions have come in yet. I would still be happy to get some, as well as (of course) solutions to the new problems above. As the days shorten and the forecast features more clouds and perhaps showers, why not settle in a comfortable spot and ponder a problem or two?

                     - Mark Krusemeyer

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