

MSCS MESS

Department of Mathematics, Statistics, and Computer Science
St. Olaf College, Northfield, MN 55057
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Masks Required at MSCS Events

As a reminder, the MSCS department will continue to require masks at all indoor public events, including colloquia and seminars. If you plan to attend any of the department-sponsored events listed in this issue, come prepared with a mask!

Today's Research Seminar

Title: Local Data of Elliptic Curves
and Applications
Speaker: Alex Barrios
Date: **Friday, October 8**
Time: 3:40pm
Location: RNS 204

About the talk: Elliptic curves have provided the mathematical bridge for solving intractable problems in number theory such as Fermat's Last Theorem and possibly the *abc* Conjecture. Fermat's Last Theorem, first conjectured by Fermat in 1637, states that the only integer solutions to the equation $x^n + y^n = z^n$ for $n \geq 3$ satisfy $xyz = 0$. This is a stark contrast to the $n = 2$ case, which has infinitely many integer solutions! In this talk, we introduce the *abc* Conjecture and show that Fermat's Last Theorem easily follows from the explicit form of the *abc* Conjecture! We then transition to defining elliptic curves and discuss the Modified Szpiro Conjecture (MSC), which is equivalent to the *abc* Conjecture. To better understand the MSC, we discuss the local data of an elliptic curve and show how recent work in this direction leads to a better understanding of the behavior of the MSC.

About the speaker: Alex Barrios is a visiting assistant professor of mathematics at Carleton College. He received his Ph.D. in mathematics from Purdue University. His research area is in arithmetic geometry, a branch of mathematics whose focus is on solving number-theoretic questions through techniques in algebra and geometry.

Statistics and Data Science Alumni Graduate School Panel

If you're interested in pursuing statistics and data science in the future and want some advice, make some time to attend this year's alumni graduate school panel! On **Monday, October 11** from **6pm till 7:15**, seven alumni will be joining us to talk about their experiences in graduate school related to statistics and data science. Students in all class years are encouraged to attend! This event will take place virtually at **this Zoom link**.

Math Across the Cannon

It's the most wonderful time of the year: Math Across the Cannon! This (mostly) annual event features an outside MSCS expert who gives one talk at St. Olaf and one talk at Carleton. This year's speaker is **Alicia Carriquiry**. Dr. Carriquiry is a Distinguished Professor of Statistics at Iowa State University, having served on the faculty there since 1990. She is originally a native of Uruguay, and earned a PhD in statistics and animal genetics at Iowa State. Dr. Carriquiry is the director of the Center for Statistics and Applications in Forensic

Evidence, a research center committed to improving the accuracy of the analysis and interpretation of forensic evidence. In her own research, she investigates applications of statistics in human nutrition, bioinformatics, forensic sciences, and traffic safety.

**Math Across the Cannon
Afternoon Talk**

Title: Quantifying the Similarity Between Images for Forensic Analysis

Speaker: Alicia Carriquiry

Date: **Tuesday, October 12**

Time: 3:30 PM (reception at 3pm)

Location: RNS 150

About the talk: 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.

**Math Across the Cannon
Evening Talk**

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

Speaker: Alicia Carriquiry

Date: **Tuesday, October 12**

Time: 7pm (reception to follow)

Location: Weitz Cinema at Carleton

About the talk: 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.

Apply to Present at NUMS

The Northfield Undergraduate Mathematics Symposium (NUMS) will occur on October 26 in the afternoon from 3:30-7:20. This will be an online event, featuring math research presentations by St. Olaf and Carleton students. If you are a St. Olaf student who would like to give a presentation at NUMS, please complete **this application form** by October 11. We plan to select up to four students or groups from St. Olaf to give presentations at NUMS.

Actuarial Opportunity

From an Ole alum: Van Iwaarden Associates is looking to either hire an actuarial intern for part-time work during the school year, or provide immediate full-time employment for a recent grad. Most Van Iwaarden employees currently work remotely, but they do have an of-

fice space in Minneapolis if desired. Check out **this job posting** for more details on the position and the firm. If you have any questions about the actuarial internship application process in general, feel free to email any of the Actuarial Club's officers: Emily Noye (noye1@stolaf.edu), Carly Dammann (damman1@stolaf.edu), or Josh Kugel (kugel2@stolaf.edu).

To submit an article, event, or anything else for publication in the Mess, email mcgowa2@stolaf.edu; to receive the Mess digitally each Friday, email habero1@stolaf.edu; visit <http://wp.stolaf.edu/mscs/mscs-mess/> for a digital archive of previous MSCS Mess issues.

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