MSCS Mess

Department of Mathematics, Statistics, and Computer Science
St. Olaf College, Northfield, MN 55057
February 17, 2023 | Volume 51, No. 13

Colloquium

Title: **Applied Mathematics and Bad Intuition: Two Examples**
Speaker: Prof. Steven McKelvey
Date: 2/20/23, 3:30pm
Place: RMS 204

Abstract: One of the fun things about studying applied mathematics is finding examples where mathematics reveals that the real world doesn't behave the way we imagine. Such examples show both the necessity and power of studying applied mathematics. In this talk two important examples will be introduced. The first will come from the world of Wall Street and high finance, where mathematicians known as "quants" have revolutionized the world of investing. Woe be to the investor who lacks mathematical sophistication. The second example involves spending millions or billions of dollars on transportation infrastructure. Sounds boring at first, but maybe not if you're regularly stuck in traffic jams. As this example shows, spending money in the "obvious" way can make matters worse.

Zoom

Title: **Communicating Your Research to the Public**
Speaker: Prof. Sheldon Jacobson
Date: 2/28/23, 3:30pm
Zoom: Link

In collaboration with the chapters at West Texas A&M and West Point, the student chapter for the Society of Industrial and Applied Mathematics (SIAM) at St. Olaf has arranged for Dr. Sheldon Jacobson from the University of Illinois Urbana-Champaign to give a talk over Zoom on Wednesday, February 22nd, from 3:30 to 4:15 pm. We encourage anyone with an interest in data science to attend.

Communicating scientific research to a broad audience has become a prerequisite for success in today's academic environment. This presentation discusses numerous facets of academic communication, with a focus on hands-on application of various techniques and principles to enhance your ability to reach a broad and diverse audience. Examples are provided to illustrate various techniques and principles of communication. By using communication as a branding tool, engineers, mathematicians, and computer scientists can create both a media presence for themselves, but also promulgate the value of data science to the general

population.

Dr. Jacobson is the Founder Professor of Engineering in the Department of Computer Science at UIUC. His work includes applying operations research to aviation security, public health, forecasting presidential elections, and NCAA basketball. Dr. Jacobson is a fellow of the Institute for Operations Research and Management Sciences, the Institute of Industrial and Systems Engineers, and the American Association for the Advancement of Science. He is also the recipient of a Guggenheim Fellowship, two IISE Awards for Technical Innovation in Industrial Engineering, two Awards of Excellence from the Communicator Awards, a Media Relations Award for Communications & Marketing Excellence from the University of Illinois Office of Public Affairs, an IISE David F. Baker Distinguished Research Award, and an INFORMS Impact Prize. More information is available on Dr. Jacobson's homepage and wikipedia page.

Save the Date! *Voting and Linear Algebra: Connections and Questions*

This RNS talk will be delivered by Prof. Michael Orrison on **March 13th** at 3:30pm in RNS 310. Voting is something we do in a variety of settings and in a variety of ways, but it can often be difficult to see nontrivial relationships between the different voting procedures we use. In this talk, I will discuss how simple ideas from linear algebra and discrete mathematics can sometimes be used to unify different voting procedures, and how doing so leads to new insights and new questions in voting theory.

Michael Orrison is a Professor of Mathematics at Harvey Mudd College. He received his A.B. from Wabash College in 1995, and his Ph.D. from Dartmouth College in 2001. His teaching interests include linear algebra, abstract algebra, discrete mathematics, and representation theory. His research interests include voting theory and harmonic analysis on finite groups. He particularly enjoys finding, exploring, and describing novel applications of the representation theory of finite groups with the help of his talented and energetic undergraduate research students.

Sports Analytics Club Speaker

The Sports Analytics Club is hosting a Zoom presentation about the summer program featuring guest speaker Dr. Ron Yurko on February 21st, at 7:00pm. The presentation will be held in TOH 184. Dr. Yurko will present the Summer Undergraduate Research Experience in Statistics 2023 program theme, ***Data Science in Sports Analytics***, as well as some of his own research on sports analytics. **The application deadline is Feb. 26th**. The program will concentrate on statistics and data science methodology with applications in sports. Students do **not** need to have be familiar with sports to participate. Participants will receive a stipend of $4000. This is provided to cover all living expenses during the program. It is expected that participants are not taking on additional summer responsibilities.
Additional information and the application can be found on the Carnegie Mellon University Statistics Website. For more information, please contact Alexander Matoushek at Matous1@stolaf.edu

Dr. Yurko is an Assistant Teaching Professor at Carnegie Mellon University, where his research focuses on statistical genetics and sports analytics. In the sports analytics field, he has developed several R packages to enable easy access of publicly available data. Most of his research is centered on NFL data, where he has developed advanced metrics for player evaluation.

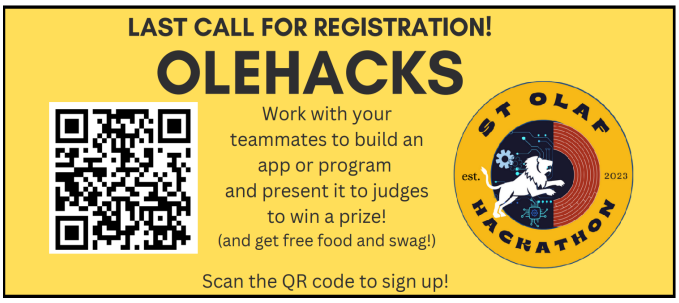
MSCS Students - Additional St. Olaf Hackathon Spots!

The Linux Ladies organization are working tirelessly to organize the OleHacks event. We're excited to announce that we've now

opened up more registration slots for OleHacks! As a result, we are looking for more participants! If you are interested please fill out this form by 11:59pm CDT on **Feb. 21st**.

OleHacks is a 36-hour hackathon taking place from Friday, March 3rd to Sunday, March 5th. During the event, teams will collaborate to design and build innovative functional products. At the end of the 36-hour period, participants will pitch their projects and ideas to a group of peers and company representatives. Additionally, we are also working on bringing some guest speakers and there will be **fun games throughout the event**.
If you have any questions about OleHacks, please reach out to olehacks@stolaf.edu!

Here is one example of a previous hackathon held at St. Olaf! And here is another example of a previous hackathon!



MinneMUDAC 2023: Student Data Science Challenge

Registration has just opened for a Student Data Science Challenge sponsored by a group representing the Twin Cities Data Science and Analytics communities. St. Olaf had won the Undergraduate Division in 2018 and took the Honorable Mention in 2019 (the last time this was held), and we'd like to keep the streak going! **Each team who participated in the past really enjoyed and benefited from the experience, despite the non-trivial time commitment involved**.

Prof. Roith and Prof. Roback are willing to do some of the initial organizing and high-level oversight, including forming teams (as there's a limit on how many teams St. Olaf can sponsor) and setting up a weekly check-in meeting. **But strong student leadership and self-motivation and resourcefulness would be needed**.

Teams of up to 5 students will analyze data from approximately Feb. 20th to Mar. 24th; some data will be provided, while other data you may find on your own. Successful teams require members who are willing to **commit 5 hours or more per week starting Feb. 20th**, with a heavier commitment as the deadline approaches. Teams can be fielded in both the Novice (first years and sophomores with limited experience) and Undergraduate Divisions; Groups will then present their results on Saturday, Mar. 25th to panels of data science and statistics professionals.

Please note that Final Presentations are at Target Field in Minneapolis on the first Saturday of Spring Break! You **must** be able to attend this event to take part. Please note that Prof. Roith and Prof. Roback will ultimately form teams and coordinate registration for the event. So do **not** register yourself.

Please email Prof. Roback [roback@stolaf.edu] or Prof. Roith [roith@stolaf.edu] if you have interest or questions. More details are also available on the MinneMUDAC website. We are hoping to form teams and register by Friday, Feb. 17th.

CURI Project Descriptions

There is still time to apply for this summer's CURI projects, several of which are being led by faculty from the MSCS department! To read more about each project, please see the Elevator Page or the CURI Page. To learn even more about each project you're welcome to email or visit the professor lead! Please note that the application deadline is Feb. 20th at 8:00am. Additionally, the CURI presentation's slides from last week were forwarded to all math majors.

- **Spatial Statistics Analysis of Glacier Loss**

Lead: Prof. Laura Boehm Vock

In this project, we will apply the latest techniques for missing data imputation, propagation of error, and uncertainty estimation (accounting for spatial correlation!) to investigate ice volume loss on a Swedish glacier. If you would like more details about this project, email boehm@stolaf.edu or stop by RMS 400 with questions!

- **Mathematical modeling of mast seeding**

Lead: Prof. Sara Clifton

Trees within a forest coordinate boom-or-bust production of seeds (called "mast") every year. Using mathematical models, we will attempt to understand what the primary drivers of mast seeding are, what determines the masting period and crop, and how climate change may affect mast seeding. If you would like more details about this project, email clifto2@stolaf.edu or stop by RMS 303 with questions!

- **Towards a classification of trialgebras**

Lead: Prof. Erik Mainellis

Any student of abstract algebra knows that you can add and multiply the elements of a ring. But what if there were two different ways to multiply those elements? What if there were three ways? In this project, we set out to describe, or classify, some "trialgebras," which are structures with three multiplications. The first two weeks of the project will be introducing some of the tools we will be using for this project. If you would like more details about this project, email mainel1@stolaf.edu or stop by RMS 406 with questions!

- **Mathematical Models for Transport Networks in Fungi**

Lead: Prof. Paula Mercurio

As they grow, fungi naturally form networks that serve a variety of functions such as absorption and transport of nutrients, and can also interact with the roots of plants, creating an underground network connecting plants and trees. The aim of this project is to use network analysis techniques to improve on existing models of fungal network development. The first two weeks will provide background on networks and any necessary mathematical background. If you would like more details about this project, email mercur1@stolaf.edu or stop by RMS 304 with questions!

- **Goal Operations for Intelligent Autonomous Agents**

Lead: Prof. Sravya Kondrakunta

In this project, our aim is to develop robust autonomous agents for coordinating multiple robots in completing a mission in the real world. These agents should possess the ability to adapt to dynamic environmental situations and manage their goals independently, without human intervention. This will be achieved through the use of a sub-branch of artificial intelligence known as goal reasoning. If you would like more details about this project, email sravya1@stolaf.edu or stop by RMS 409 with questions!

- **Mandelbrot Breadcrumbs**

Lead: Prof. Daniel Stoertz

The Mandelbrot set is one of the most famous fractals ever discovered. It arises from the study of the behavior of iterates of the complex-valued quadratic mapping $f(z;c) = z^2+c$. Recently, identical copies of the Mandelbrot set have been observed while studying certain members of the much more complicated function family $R(z;a,c) = z^n + a/(z^n) + c$. In this

project, we will investigate more members of this family in order to find more copies of the Mandelbrot set, and hopefully we will contribute to the greater understanding of how and why it appears where it does. The first week or two of the project will be a crash course on complex analysis, complex dynamics, and the kinds of visualization algorithms we'll be using. If you would like more details about this project, email stoert1@stolaf.edu or stop by RMS 509 with questions!

Volunteer/Experience Opportunities

REUs: Summer Research in MSCS

If you are interested in being paid to collaborate on a research project with students from around the country off campus this summer, keep reading! To look through the programs available for Research Experiences for Undergraduates (REU's), check out this link! Most of them are done over the course of 8 – 10 weeks during the summer and include stipends around $4,000. Applications will open in November and most will be due between late January and early March.

Read the eligibility for each because many are restricted to certain years in school, certain majors, or US citizenship. The website has a variety of tabs at the top to help you find programs that apply to you! In particular, there are lots available for international as well as domestic students!

Most applications require a personal statement about why you would like to participate in the REU as well as letters of recommendation, so start looking into these sooner rather than later.

Make sure to reach out to us (mercur1@stolaf.edu and mainel1@stolaf.edu) if you have any questions!

CS Undergraduate Research

St. Olaf CS invites applicants for undergraduate research student work during Spring '23, for work on projects involving cloud computing or Raspberry Pi units, as part of the CSinParallel research group. Specifically, the work relates to (1) "Runestone Backend", an automated containerized parallel/cluster computations on Google Cloud using Kubernetes, and (2) the Self-Organizing Cluster system for the Raspberry Pi, including system image development. Qualifications depend on the particular project, as described in the application details. Both are ongoing projects with flexible expectations for hours per week, and strong applicants who may have partial qualifications are encouraged to apply for one or both projects. **Please apply here, applications will be accepted and considered until further notice.**

To submit an article, event, or anything else for publication in the Mess, email hilst1@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.

Jacob Hilst, Editor
Daniel Stoertz, Faculty Adviser
Ellen Haberoth, Mess Czar