MSCS Mess

Department of Mathematics, Statistics, and Computer Science
St. Olaf College, Northfield, MN 55057
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Colloquium

Title: **Fibonacci Numbers, Catalan Numbers and the Super FiboCatalan Numbers**
Speaker: Prof. Kendra Killpatrick
Date: 3/3/23, 3:30pm
Place: RNS 310

If you are a math major, then you have probably heard of the most famous sequence of numbers, the Fibonacci numbers. If you have taken Combinatorics, you have probably heard of the second most famous sequence of numbers, the Catalan numbers. If you are a Combinatorics professor, you may have heard of the FiboCatalan numbers, but in this talk I will define the super Catalan numbers $S(m, n)$ and the super FiboCatalan numbers and explain how they tie all of these famous sequences together in a generalized format. The super Catalan numbers are known to be integers, but only have a nice combinatorial interpretation for $m = 2$ and $m = 3$. I will prove that the super FiboCatalan numbers are integers for m=1 and m=2 and present a number of open conjectures and problems related to these numbers.

Kendra Killpatrick is a Professor of Mathematics at Pepperdine University where she also serves as the Senior Associate Dean for Seaver College. She completed her Ph.D. in Combinatorics at the University of Minnesota in 1998 and even taught for one semester as a Visiting Faculty member at St. Olaf College in 1999! In addition, she served as the Associate Director for the Budapest Semesters in Mathematics program for seven years, working closely with Dr. Garrett. In her non-academic life, she enjoys trail running, climbing and leading her daughter's Girl Scout troop.

Colloquium

Title: **Combining CS and Biology: Algorithms for comparing and summarizing tumor trees**
Speaker: Prof. Layla Oesper
Date: 3/6/23 , pm
Place: RNS 310

Tumors evolve as part of an evolutionary process where distinct sets of genomic mutations accumulate in different cell lineages descending from an original founder cell. A better understanding of how such tumor lineages evolve over time, which mutations occur together or separately, and in what order these mutations were gained may yield important insight into cancer and how to treat it. Thus, in recent years there has been an increased interest in computationally inferring the evolution-

ary history of a tumor – that is, a rooted tree where vertices represent populations of cells that have a unique complement of somatic mutations and edges that represent ancestral relationships between these populations. However, accurately inferring these trees is often a challenging process. In this talk, I will discuss several methods designed in my lab that address issues related to the inference of tumor evolution. This includes methods to compare these trees that take into account the unique structure of tumor evolution and both graph and optimization based methods that are able to create a consensus tree from a set of conflicting tumor evolutionary histories.

Layla Oesper is an Associate Professor of Computer Science at Carleton College. Dr. Oesper received her B.A. in mathematics from Pomona College and her Sc.M. and Ph.D. in Computer Science from Brown University. Dr. Oesper is also the recipient of NSF CRII and CAREER Awards. Her lab focuses on the design of computational methods related to inference and analysis of cancer evolution.

OleHacks Virtual AI Expert Meetings

Olehacks is underway! We will be having two virtual tech talks with AI experts on **March 3rd, 7:30pm**, and **March 4th, 1:00pm**. You are welcome to join in on the Zooms, even if you're not attending the Hackathon!

Tech Talk with Dr. Dustin Dannenhauer
Friday Zoom Link

Tech Talk with Dr Leilani Gilpin
Saturday Zoom Link

Last minute OleHacks registration!

Good news! OleHacks is opening up a few last-minute registrations! So hurry up and fill out this form if you are interested, as we will be accepting participants on a first-come-first-serve basis. We will send you a confirmation of your spot by the end of the day today.

You do not have to be an excellent programmer to participate; you can just come to join the others for the experience. Hackathons are a great way to build projects that you could use for your resume and future interviews!

We also have free food and over $1500 worth of prizes that will be given out during the event, and you could be the lucky one to win them!

If you have any questions, feel free to email olehacks@stolaf.edu

Save the Date! *MSCS Talent Show!*

The MSCS Department is hosting a talent show on April 5th, at 6:30pm in Ytterboe Lounge. If you'd like to sign up, please contact Prof. McKelvey at his email address, mckelvey@stolaf.edu.

Harvey Mudd REU Site: Exploring the Limits of Intelligent Systems

Harvey Mudd College's Department of Computer Science is pleased to continue to offer opportunities for undergraduate research in Summer 2023 as part of our NSF REU site. This year, our projects are themed around exploring the limits of intelligent systems. This REU focuses on understanding the boundaries in what intelligent systems can achieve both theoretically and in complex real-world scenarios with non-expert users. Students will work on cutting-edge subprojects in computer vision,

programming language analysis and synthesis, human-robot interaction, and information-theoretic understanding of machine learning systems. These research topics will give you valuable academic and industry skills that extend beyond current AI models and frameworks towards the broader reaches of what computing may achieve in the future.

Participating students will be housed at Harvey Mudd College, an undergraduate-only institution in Claremont California from May to July 2023. Participants will experience the most compelling aspects of a graduate school environment during a ten-week summer program. You will actively engage with the entire research process, from literature search, to articulating problems of interest, to investigations of specific pieces of these problems, and focusing results for presentation and publication. You'll also have a ton of fun working with other students, participating in social activities, building skills, and enjoying a southern California summer!

The application is due on March 7th. Eligibility for this program is restricted to current undergraduate students in good standing who are 18 years or older and who are a US citizen or permanent resident. Accepted students will receive a stipend, coverage of housing costs, and coverage of travel costs to and from Harvey Mudd at the start and end of the program. For more information and to submit your application, please visit our posting on the NSF ETAP portal.

For details on individual projects and our mentors, visit our departmental page!

Project NExT Fellows and Consultants

You are invited to apply to the Bridge to the Doctorate program at the University of Virginia, which is a two-year long program of courses, mentoring, and research intended for talented and motivated students from underserved communities. The program provides personalized training to help students on their path to pursuing careers in the mathematical sciences.

The application deadline is March 1. More information about the program can be found on the UVA Math Department Page and the general UVA page (general UVA 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.

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.

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