MSCS MESS

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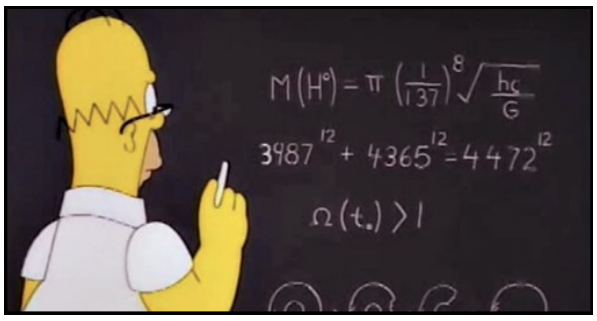
MSCS Colloquium

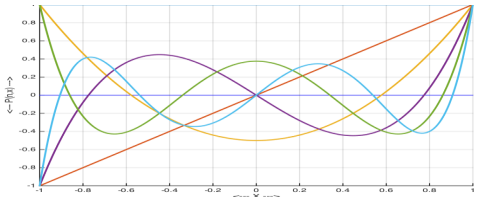
Learning to Teach, and Teaching to Learn
The Rhode to Math Education:
Undergraduate Teaching at Brown
Whom: Lisa Kehe, St. Olaf '19
Where: RNS 310
When: Monday, Feb. 12th | 3:30 p.m.

About the talk: The Brown TEU (Teaching Experience for Undergraduates) in math education is a program that clearly utilizes the hand-in-hand nature of teaching and learning. How can we teach people with unique stories, instead of just students sitting at desks? How can we change the reputation of math class from "boring" and "impossible" to "engaging" and "rewarding"? What can teachers learn from students? Experiences in a diverse classroom, team-teaching, and making math human will all be discussed.



MSCS Colloquium

Orthogonal polynomials in scientific computing
Whom: Reginald McGee
Where: RNS 310
When: Tuesday, Feb. 13th | 3:30 p.m.



About the talk: In this talk we will discuss common challenges encountered when interpolating data with polynomial functions. The interpolation problem will be viewed as finding linear combinations with respect to different polynomial bases on the vector space of continuous functions. Additionally, we will discuss families of polynomial bases with pairwise orthogonality and how to create them by applying the Gram-Schmidt process to the monomial basis and with recurrence relations. A popular orthogonal polynomial family are the Chebyshev polynomials and we will discuss how they can used to minimize approximation error in interpolation problems.

MSCS Research Talk

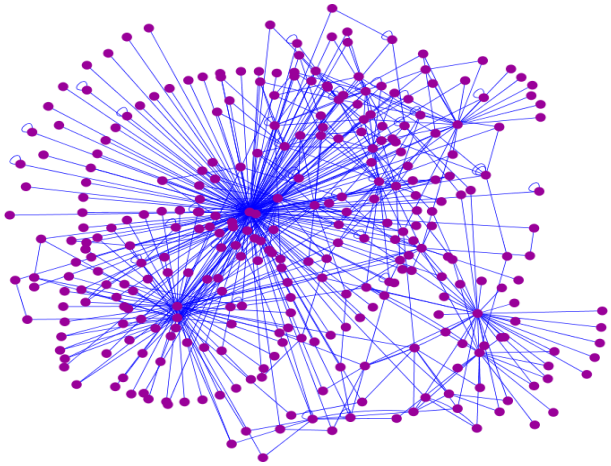
A bundled approach for high-dimensional informatics problems

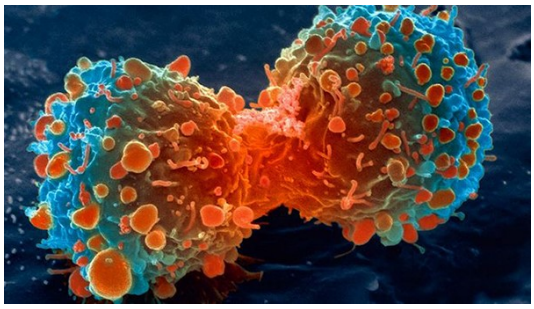
Whom: Reginald McGee

Where: RNS 204

When: Wednesday, Feb. 14th | 3:30 p.m.

About the talk: As biotechnologies for data collection become more efficient and mathematical modeling becomes more ubiquitous in the life sciences, analyzing both high-dimensional experimental measurements and high-dimensional spaces for model parameters is of the utmost importance. We present a perspective inspired by differential geometry that allows for the exploration of complex datasets such as these. In the case of single-cell leukemia data we present a novel statistic for testing differential biomarker correlations across patients and within specific cell phenotypes. A key innovation here is that the statistic is agnostic to the clustering of single cells and can be used in a wide variety of situations. Finally, we consider a case in which the data of interest are parameter sets for a nonlinear model of signal transduction and present an approach for clustering the model dynamics. We motivate how the aforementioned perspective can be used to avoid global bifurcation analysis and consider how parameter sets with distinct dynamic clusters contrast.





MSCS Colloquium

Curing Cancer with Mathematics

Whom: Danika Lindsay

Where: RNS 310

When: Thursday, Feb. 15th | 3:30 p.m.

About the talk: Have you ever wondered why curing cancer is such an impossible task? Join me in discovering how mathematics can be used to help answer this question and many others! In this talk, we will work together to develop and analyze a simple mathematical model of tumor growth and evolution. We will use a computer simulation of a tumor to validate our mathematical results and gain insight into how a tumor evolves during treatment. We will also discuss drug resistance as an obstacle to the successful treatment of cancer. But, most importantly, we will use our model to inform clinical decisions regarding cancer treatment protocols and to discover the optimal treatment strategy to overcome drug resistance.

MSCS Colloquium

Preventing Drug Resistance in Cancer Using Evolutionary Modeling

Whom: Danika Lindsay

Where: RNS 310

When: Friday, Feb. 16th | **2:30 p.m.**

About the talk: Cancer is a leading cause of death worldwide, and many cancer-related deaths can be attributed to the development of resistance to therapy. Mathematical models of tumor growth and evolution contribute to a more complete understanding of the emergence and development of drug resistance. These models may be the key to designing more effective therapeutic regimens capable of preventing or delaying disease progression due to resistance. In this talk, I will focus specifically on improving treatment outcomes for patients with non-small cell lung cancer (NSCLC). The current standard therapy for advanced NSCLC eventually becomes ineffective for every patient, inevitably leading to disease progression, usually within a period of 12-18 moths. I will describe a novel stochastic model of a lung tumor undergoing treatment with a combination of standard therapy and a drug specifically designed to target oxygen-deprived regions in the tumor. I will conclude the talk by outlining some future directions for this work along with several exciting opportunities for undergraduate involvement!

Black History Month

Throughout the long history of mathematics, Black mathematicians have made significant and lasting contributions to the field. During February, as we celebrate Black History Month, take a moment to peruse this article from the AMS chronicling historical and contemporary figures and stories highlighting the experience and importance of Black mathematicians http://www.ams.org/journals/notices/201802/rnoti-p118.pdf. Additionally, the website http://mathematicallygiftedandblack.com/ is a community platform for Black mathematicians, featuring the accomplishments of Black scholars in the mathematical sciences.

Weekly Theorem

Valentine's Theorem– Existence of "The One"

Proof: Let **A** be an n x n matrix of all n people on earth, and **v** be a vector of love of the same length. It follows that Cupid must take the elements of **v** across the rose of **A**, creating a **Â** matrix of love. Clearly Cupid's **Â**-rows of love describe a consistent system of linear equations, as proved by St. Valentine in the 3rd century C.E. Further, each of Cupid's **Â**-rows must be unique, and thus, linearly independent. Therefore Null(**Â**) is trivial and Cupid's **Â** matrix of love describes a one-to-one linear transformation as claimed. ■

To submit an article or event for publication in the mess, email nevilleq@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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