



Sonoma State University Department of Mathematics and Statistics
presents a series of informal talks open to the public

“The book of nature is written in the language of mathematics” - Galileo

Wednesdays at 4:00pm on Zoom

<http://bit.ly/SSU-Math-Colloq-S21>

Phone: (707) 664-2368 www.sonoma.edu/math

Series supported by Instructionally-Related Activities Funds

- February 3** **Animals, Riddles, & Origami: Math Modeling for Young Children** **Kathy Morris, Emerita & Brigitte Lahme, Sonoma State University**
Mathematical modeling has been a focus in high school since the introduction of the Common Core State Standards and is a mathematical practice all students are developing. While it is easy to imagine engaging real-world problems for high schooler given their extensive mathematical background, we will explore what mathematical modeling looks like in the early grades – even in kindergarten! Meaningful and developmentally-appropriate modeling tasks support young students to generate their own questions, act out mathematically rich scenarios, and determine the reasonableness of their approaches and solutions. We will discuss how by using familiar contexts we can all play a role in nurturing the math identity and agency of the children in our own lives.
- February 10** **A Mathematical & Historical Treatment of Timekeeping** **Chris Dugaw, Humboldt State University**
I will describe the history, form, and function of four timekeeping mechanisms: the pendulum, the balance spring, the tuning fork, and the quartz crystal. By the conclusion of the talk you will have a basic understanding of how these mechanisms work, the physics behind them, and the mathematics involved. While some of the models I present will involve differential equations, a student with only a background in trigonometry will be able to understand the majority of the mathematical content. You will get to learn a bit about me personally, my interest in timekeeping, and you will be able to see some unique watches from my personal collection. This should be a fun talk with lots of pictures, videos, and interaction.
- February 17** **A Mathematical Model of Parasite Transmission in Sand Crab Populations Along the California Coast** **James Peirce, University of Wisconsin LaCrosse**
This will be an informal discussion on the mathematical model of a parasite that has caused recent deaths of California sea otters. You may wonder why a mathematician from Wisconsin is concerned about the California sea otter. During this talk I will explain how a mathematically curious mind (like the one you are developing as a math major) can naturally lead to the discovery of new scientific questions that can aid in local conservation efforts. My presentation will focus on the biological system and its mathematical model, data collected by high school and university students, and the (unanswered) mathematical questions that are currently being investigated.
- February 24** **Finding Patterns in Data Using Cluster Analysis** **Cristina Tortora, San Jose State University**
Cluster analysis is a data analysis technique with the goal of grouping a set of objects in such a way that objects in a cluster are more similar to each other than to those in other clusters. For example, using cluster analysis, one can find groups of patients with similar symptoms. In this talk, I'll give an introduction to cluster analysis focusing on model-based clustering, a specific subgroup of cluster analysis techniques. Model-based clustering uses density functions to model each cluster within the data; the entire data set is defined as a convex combination of the clusters. I'll then focus on some challenges and recent advancements in model-based clustering with examples in different fields.
- March 3** **The Joy of Modeling, Programming, and Statistical Consulting!** **Students from Math 180, 467, and 470**
Modeling without clay or glue? Serving as a consulting statistician? Programming mathematics? We'll see them all. Come see amazing student projects from Martha Shott's Mathematical and Statistical Modeling course, Kyle Falbo's Mathematical Programming course, and Rodrigo Gaitan's Statistical Consulting course.
- March 10** **Talking About Identity, Equity and Belonging** **Mary Pilgrim, San Diego State University**
What comes to mind when you think of a mathematician? Do you think all students in your classes have access to the same resources? In this interactive talk I will share two activities intended to raise awareness about identity, equity, and belonging in the mathematics classroom. These activities have been used in professional development for undergraduate tutors and graduate students at multiple institutions and are adaptable for a diversity of audiences. Participants will engage in discussion about these activities, and I will share data gathered from recent uses of each activity.
- March 17** **Cayley Graphs, Cayley Isomorphisms, Kazhdan Constants** **Travis Hayes, Sacramento State University**
In this talk, we will explore a way to construct graphs based on the structure of finite cyclic groups and a corresponding symmetric subgroup. From here, we can discuss the Kazhdan Constant, which is a numerical value for a graph that quantifies how efficiently connected the graph is. We will round off the talk with what was found through my research while at California State University, Los Angeles.
- March 24** **NO TALK—Spring Break**
- March 31** **NO TALK—César Chávez Day**
- April 7** **Building with Boxes and Beads** **Simone Sisneros-Thiry, CSU East Bay**
What does doing math research look like? For me, it involves playing with diagrams and gestures, counting objects by moving them around in different ways. Some of the mathematical objects I study are called partitions: ways of breaking up a positive integer into positive integer parts. For example, the partitions of three are 3 , $2 + 1$, and $1 + 1 + 1$. Partitions can be represented by diagrams, some made of boxes and some made of beads. My work in partitions is the result of a 2+ year collaboration with Dr. Hannah E. Burson and Dr. Armin Straub across several states (and sometimes an ocean). The presentation will include comments on our collaborative process as one example of how mathematicians come together and share ideas.
- April 14** **Machine Learning Methods for Genomic Variation** **Mario Bañuelos, Fresno State**
Genomic anomalies, or variations, are often shared between members of the same species. Although rare, these changes may result in disease or an increase in host fitness. Most approaches for detecting structural variation rely on high quality data and are typically limited to one type of structural variant such as deletions or inversions. These genomic changes are often difficult to detect. Standard approaches for identifying such variation involves comparing fragments of DNA from the genome of interest to a reference genome. This process is usually complicated by errors produced in both the sequencing and mapping process which may result in an increase in false positive detections. In this work, we describe gradient boosting, neural network, and recommendation systems approaches in the context of genomic variants.
- April 21** **MATH FEST: Social Justice, “Citizenship,” Community, and Math Education** **Carrie Diaz Eaton, Bates College**
Information is a form of power, and our students consume and produce more unfiltered information than ever. They need agency as individuals and tools as members of a future workforce to ethically and responsibly process this information. What is the role of mathematics instruction in helping students in their role as digital citizens? I will talk about my information literacy course using Open Educational Resources, including Calling Bull, Figure of the Day, and RStudio. This course serves as a forum to think meaningfully about probability, data analysis, and data visualization; a gentle introduction to programming; and a context to examine the interplay of information, power, and social justice. It also asks students to use these tools to explore and develop their own agency as digital citizens. I close by examining the narrative of citizenship in the context of digital studies, in the context of mathematics, and in the context of Latinx displacement and immigration.
- April 28** **Representations for Mathematical Sense Making** **Topaz Wiscons, Sacramento State University**
Did you know that young learners can discover and explain many interesting mathematical concepts even before they learn formal algebra and common algorithms? We will explore multiple compelling approaches to mathematical sense making and I will highlight a current research project analyzing methods of representation used by pre-service elementary school teachers.
- May 5** **One or Two Things You Can Do With Linear Algebra** **Henry Boateng, San Francisco State University**
Linear Algebra has a a lot of cool applications. However, because of time constraints, a typical Linear Algebra class is not able to cover any meaningful applications. In this talk, we will try to extend and apply our knowledge from MATH 322 to some of these applications. We will look at image compression, image detection and perhaps noise filtering.