The Mathematics Association of America
Louisiana – Mississippi Section
100th Annual Meeting

THE UNIVERSITY of MISSISSIPPI

Oxford, MS
March 2 – 4, 2023

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Invited Speakers:

Association for Women in Mathematics Lecture Series

Dr. Anastasia Chavez is an Assistant Professor of Mathematics at Saint Mary's College of California. Born and raised in California, she transferred from the Santa Rosa Junior College and earned a bachelors in applied mathematics and masters in mathematics from San Francisco State University. After earning her Ph.D. in enumerative and algebraic combinatorics with an emphasis in matroid theory from the University of California, Berkeley, Anastasia was a Huneke Fellow at the Mathematical Sciences Research Institute and Presidents' Postdoctoral Fellow, NSF Mathematical Sciences Research Postdoctoral Fellow, and Krener Assistant professor at the University of California, Davis.

Anderson Distinguished Lecture Series

Dr. Michael Pearson received a bachelor's degree from the University of Mississippi in 1980, a master's degree from Mississippi State University in 1982 and a Ph.D. (Harmonic Analysis) from The University of Texas at Austin in 1989. Prior to joining the MAA (in 2002), he served on the faculty at Florida International University (1989-1992) and Mississippi State University (1992-2002).

As Executive Director, Michael provides leadership to advance the mission of the MAA to further the understanding of mathematics and its impact on our world. As a long-time member of the MAA, he is delighted to have the opportunity to work closely with colleagues who share the sense of community and common purpose that he sees as the fundamental strength of the Association.

MAA Visitor

Dr. Hortensia Soto is a Professor at Colorado State University. She has published in various areas of mathematics education including assessment, mathematical preparation of elementary teachers, outreach efforts for high school girls, and especially in the area of teaching and learning of undergraduate mathematics. Her current research efforts are dedicated to investigating the teaching and learning, complex analysis, where she adopts an embodied cognition perspective and is part of the Embodied Mathematics Imagination and Cognition community. Since her days as an undergraduate student, Hortensia has mentored young women and promoted mathematics via summer outreach programs. She has also been involved with facilitating professional development for K-16 teachers in Nebraska, Colorado, and California. As a result of this work she received the MAA Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics.

Hortensia is a working member of the Mathematical Association of America. She served as the Associate Treasurer, the Associate Secretary, as an editor of the *MAA Instructional Practices Guide*, and currently serves as MAA President.

In her spare time, she enjoys hiking, practicing yoga, meditating, reading, and most of all spending time with her son Miguel.

Schedule of Events

Thursday, March 2nd		**Triplett Alumni Center**
Registration	5:30 – 8:00pm	Ballroom Lobby
Integration Bee	6:30 – 9:00pm	Butler Auditorium
Friday, March 3rd		**The Inn at Ole Miss**
Registration	7:45 – 4:30pm	Ballroom Lobby
Exhibits & Hospitality	8:00 – 4:30pm	Ballroom Lobby
Student Team Competition	8:00 – 10:30am	Ford Ballroom A-B
Section NExT	8:00 – 10:30am	Ford Ballroom D
1st Plenary Session:	10:45 – 11:45am	Ford Ballroom A-B
Association of Women in Mathematics Lecture: Anastasia Chavez		
Student Luncheon	12:00 – 12:45pm	Ford Ballroom A-B
2nd Plenary Session:	1:00 – 2:00pm	Ford Ballroom A-B
MAA Visitor: Tensia Soto		
Student Paper Presentations	2:10 – 4:50pm	Ford Ballroom D
Faculty Presentations I	2:10 – 4:30pm	Ford Ballroom C
Student Jeopardy Session	2:30 – 3:30pm	Ford Ballroom A-B
Student Job Fair	3:30 – 4:30pm	Ford Ballroom A-B
3rd Plenary Session:	5:00 – 6:00pm	Ford Ballroom A-B
Anderson Lecture: Michael Pearson		
Centennial Celebration	**6:30pm**	**The Pavilion**
Saturday, March 4th		**Bryant Hall**
Registration & Hospitality	8:00 – 9:30am	2nd Floor Lobby
Special Sessions	8:30 – 10:30am	Room 207
Faculty Presentations II	9:00 – 10:20am	Room 200
How to Run Math Jeopardy!	9:00 – 10:00am	Room 209
Student Poster Session	10:00 – 10:40am	2nd Floor Lobby
Business Meeting	10:45 – 11:45pm	Room 209
Executive Committee	11:50 – 12:30pm	Room 209

Friday, March 3	
Student Paper Presentations **Ford Ballroom D**	**Faculty Presentations I** **Ford Ballroom C**
2:10pm **Building Thinking Classrooms: A Collaborative Self-Study** Ashley Bailey Delta State University	2:10pm **Teaching College Geometry from a Historical Perspective** Jing Wang Christian Brothers University
2:30pm **Candy Crush Combinatorics** Kelsten Antoine Northwestern State University	2:30pm **Essential Codimension and Lifting Projections** Arindam Sutradhar University of Louisiana at Lafayette
2:50pm **Computations and Observations on Congruence Covering System** Andrew Lott Millsaps College	2:50pm **A Second-Order Accurate Crank-Nicolson Type Scheme for Nonlinear Time-Space Reaction-Diffusion Equations on Time-Graded Meshes** Yusuf Afolabi University of Louisiana at Lafayette
3:10pm **DiseaseNet: a Unified Approach to Disease Detection** Bailey Meche University of Louisiana at Lafayette	3:10pm **The Many Sides of Poncelet Polygon** Taylor Poe Mississippi College
3:30pm **An Algorithm for Knights and Knaves Puzzles** Caroline Tate Mississippi College	3:30pm **Stochastic Simulations of Cell Lineage Model** Steven J. Dabelow McNeese State University
3:50pm **Using SIRF Model to Simulate the Competition among Multiple Strains of COVID-19 in US and Canada** Morgan Wilson University of Southern Mississippi	3:50pm **Application of Two-Parameter Maxwell Distribution** Faysal Ahmed Chowdhury University of Louisiana at Lafayette
4:10pm **Three Colorful Methods for Finding the Chromatic Polynomial** Emerson Statom Louisiana Tech University	4:10pm **Reciprocal Sums and Counting Function** Alex Rice Millsaps College
4:30pm **Regression Analysis of NFL Quarterbacks' Injuries** Julie Weems Louisiana Tech University	

Saturday, March 4	
Special Sessions **Bryant 207**	**Faculty Presentations II** **Bryant 200**
8:30am **Step-By-Step Guided Calculus Problem Solving** Victoria Kelly, Hawkes Learning	9:00am **The Independent Bondage Number of Planar Graphs with Minimum Degree at least 3** Kanchana Madhumali Gamlath Esweda Gamladdalage University of Mississippi
9:10am **Innovations and Resources for Calculus and Advanced Math** Aaron Warnock, Pearson	9:20am **Normally Abundant Groups** Gary L Walls Southeastern Louisiana University
10:00am **Redesigning Your Math Curriculum with Coreqs, Planning, and Practice** Dayna Leaman, Wiley Christy Sue Langley, University of Louisiana Lafayette	9:40am **Reflection Positive Structure of Euclidean Kernel** Shaikh Gohin Samad McNeese State University
	10:00am **Using Mathematical Techniques and Venn Diagrams to Understand Boolean Functions Generated by a Computer Scientist** Vipin Menon McNeese State University

Notes:

Section Next Workshop
Friday, March 3, 8:00 – 10:30
Ford Ballroom D

Section NExT (New Experiences in Teaching) is a professional development program that addresses the full range of faculty responsibilities including teaching, scholarly activities, and service. All faculty in their first five years of a teaching position are invited to attend.

8:00am **Welcome to Section NExT!**
Anne Claire Fandel & Laura Sheppardson
LA-MS Section NExT Co-Coordinators

8:15am **An Introduction to the Mathematical Association of America**
Michael Pearson, Executive Director
Mathematics Association of America

8:30am **Weaving Students into Entry-Level Mathematics Instead of Weeding Them Out**
Jenna Carpenter, President
American Society for Engineering Education

Mathematics courses have historically served as weed-out courses for other disciplines. While some of the more overt weed-out practices are no longer in use, the weed-out philosophy still underpins many of our mindsets, policies, procedures, and approaches in entry-level mathematics courses. With the long decline in the US birthrate impacting college student enrollment for at least the next two decades, we must figure out how to become student-ready colleges instead of insisting on college-ready students. We will look at evidence-based practices that help us weave students from various backgrounds into entry-level mathematics courses instead of weeding them out.

9:30 **Small Group Discussion**
Jenna Carpenter, President
American Society for Engineering Education

Hortensia Soto, President
Mathematical Association of America

Join in small group discussions lead by our speakers, Dr. Jenna Carpenter and Dr. Hortensia Soto, as we explore topics including hybrid/online teaching, co-requisite models, and mitigating fatigue and instructor burnout. Bring your own experiences to share with your peers!

Louisiana-Mississippi Section 2023 Plenary Series

Student Address
Association of Women in Mathematics Lecture
Friday, March 3, 10:45 – 11:45am
Ford Ballroom A-B

Introduction of AWM Lecturer
Frank Serio, Northwestern State University

Matriods, Positroids, and Beyond!
Dr. Anastasia Chavez

Matroids are a fundamental combinatorial object with connections to many areas of mathematics: algebraic geometry, cluster algebra, coding theory, polytopes, physics ... just to name a few. Introduced in the 1930's, Whitney defined matroids with the desire to abstract linear and graphical dependence. In fact, every graph is associated with a matroid (called *graphical*) and from every vector configuration a *realizable (sometimes called representable)* matroid exists. It has been shown that most matroids are neither graphical nor realizable, making these two matroid properties rare and highly desired.
A particularly well-behaved family of representable matroids, called positroids, was introduced by Postnikov and shown to have deep connections to the totally nonnegative Grassmannian and particle physics. Moreover, he described several combinatorial objects in bijection with positroids that compactly encodes matroidal data and have been shown to characterize many matroidal properties. With just a few definitions and examples revealing their connections to a variety of fields, you too can begin searching for the matroids living among us.

Opening Plenary Session
MAA Visitor
Friday, March 3, 1:00 – 2:00pm
Ford Ballroom A-B

Welcome
Donald Cole, Assistant Provost Emeritus

Introduction of MAA Visitor
Judith Covington, LA-MS Section Chair

Embodied Cognition: What is it? How Does it Involve Mathematics?
Dr. Hortensia Soto, MAA President

Embodied cognition is a philosophy that claims that learning is body-based. One might ask how that has anything to do with teaching and learning mathematics. In this talk, I will illustrate ways in which this lens can facilitate learning especially for students whose second language is English. I argue that most faculty probably already adopt aspects of embodied cognition into their courses and my hope is to help make faculty more aware of how they do this. Please bring your fun meters so we can experience some of these ideas together.

R.D. Anderson Lecturer
Friday, March 3, 5:00– 6:00pm
Ford Ballroom A-B

Introduction of Anderson Lecturer
John Travis, Mississippi College

500 Years of Data Science
Dr. Michael Pearson, MAA Executive Director

The current high interest in exploiting the power of data to inform decisions has led to new formal areas of study in data science and analytics, but the underlying ideas are part and parcel of modern science. I'm going to share some vignettes to highlight this history, as well as some current MAA efforts to build capacity in this interdisciplinary and expanding field.

Student Activities

Student Jeopardy!
Friday, March 3, 2:30 – 3:30pm
Ford Ballroom A-B

All students are welcome to join! This contest follows the Jeopardy game show format. Each team consisting of up to four students will compete to answer the problems from the subjects of undergraduate mathematics, such as calculus, differential equations, discrete equations, discrete mathematics, linear algebra, and history of mathematics. Prizes are available for the winning teams!

Student Job Fair
Friday, March 3, 3:30 – 4:30pm
Ford Ballroom A-B

Curious about potential careers for undergraduate and graduate mathematics majors? Join in a speed networking event with experts from the fields of actuarial science, education, and more! In rounds of 10 minutes each, students will meet with a different expert for small group discussion and Q&A.

Special Sessions

How to Run Math Jeopardy!
Saturday, March 4, 9:00 – 10:00am
Bryant 209

Dr. Ron Taylor, Berry College

Join Dr. Ron Taylor as he explains how to host Math Jeopardy at your school!

Step-By-Step Guided Calculus Problem Solving
Saturday, March 4, 8:30 – 9:00am
Bryant Room 207

Victoria Kelly, Hawkes Learning

Explore Calculus through a mastery-based homework & testing software featuring over 43,000 algorithmically generated questions and a powerful LaTex-based Question Builder tool for faculty. Save time grading and receive detailed analytics on question-based performance while the software provides error-specific feedback and guides students through interactive step-by-step problem-solving tutorials. **Win one of three $25 Gift Cards!**

Innovations and Resources for Calculus and Advanced Math
Saturday, March 4, 9:10 – 9:55am
Bryant Room 207

Aaron Warnock, Pearson

We are excited to invite you to this session with Pearson Faculty Advisor Aaron Warnock, to show you innovations and resources for Calculus and Advanced Math courses including Linear Algebra and Differential Equations. These resources can be used both as teaching tools for you as well as learning resources to help your students with conceptual understanding and visualization!

Redesigning Your Math Curriculum with Coreqs, Planning, and Practice
Saturday, March 4, 10:00 – 10:30am
Bryant Room 207

Dayna Leaman
Wiley Senior Digital Learning Executive
Christy Sue Langley, University of Louisiana Lafayette & Peer Advisor for Knewton Alta

Explore the challenges and opportunities of redesigning your math curriculum, the impact of redesign on how you choose course materials, and how adaptive technology such as Knewton Alta supports your redesign goals.

Student Paper Presentations
Friday, March 3, 2:10 – 4:50pm

Building Thinking Classrooms: A Collaborative Self-Study
In this manuscript we, a preservice math teacher (PST) and math teacher educator (MTE), share a self-study investigation into how our experiences as math students compare to the Building Thinking Classrooms pedagogical framework (BTC). A discussion of why and how we plan to implement BTC will follow.

Ashley Bailey
Delta State University

Candy Crush Combinatorics
One of the most popular mobile games, Candy Crush Saga, was developed in 2012 by the video game developer King. The colorful game is played by millions of people across the world, and after 11 years, it remains to be the most played video game in the world. I have played this game for years, and I currently still do. As a math student looking for a research topic, I wanted to focus on something that would not only catch my eye, but also keep me interested enough to continue my research. This paper presents some of the math behind this addicting game.

Kelsten Antoine
Northwestern State University

Computations and Observations on Congruence Covering System
A covering system is a collection of integer congruences such that every integer satisfies at least one congruence in the collection. A covering system is called distinct if all of its moduli are distinct. An expansive literature has developed on covering systems since their introduction by Erdős. Here we present elementary observations on covering systems, including some approaches we believe to be original. We also present substantial new computational results, including a full classification of distinct covering systems with at most ten moduli, which we group together based on two forms of equivalence. In addition, we determine the minimum cardinality of a distinct covering system with all moduli exceeding 2, which is 12.

Andrew Lott
Millsaps College

DiseaseNet: a Unified Approach to Disease Detection
Many diseases are correlated to detectable methylation data biomarkers. Methylation signatures of noninfectious diseases could reveal disease presence before symptoms occur, allowing for earlier disease surveillance and intervention. DiseaseNet seeks to provide a unified approach to disease detection using methylation by training a deep learning model on cancer, schizophrenia, asthma, arthritis, and normal samples. Using transfer learning, we trained an additional variational autoencoder (VAE) classifier onto the CancerNet model to classify the original 33 cancer types, 3 new disease types, and one normal. We will explore why the VAE classifier is mathematically precise for this objective. Training this model resulted in an organized latent space and an average F-measure of approximately 89.2%. This reveals not only that general disease signatures exist in methylation data, but also that these diseases, cancer, and normal samples are distinguishable from one another. This model serves as a proof of concept that many human diseases may be encodable into the same model.

Bailey Meche
University of Louisiana at Lafayette

An Algorithm for Knights and Knaves Puzzles
This talk will present the concept of knights and knaves puzzles, the history behind them, and how they may be solved. In addition to that, it will explore an algorithm for solving such puzzles through the use of Boolean algebra and contradiction. This algorithm will then be applied to a slightly more complex form of the original knights and knaves puzzle.

Caroline Tate
Mississippi College

Using SIRF Model to Simulate the Competition among Multiple Strains of COVID-19 in US and Canada
In this study, we introduce a novel high-dimensional SIR model to examine the competition among multiple strains of COVID-19 in patchy environments, specifically focusing on the statistics of the United States and Canada in 2020. The two countries serve as two distinct patchy environments being analyzed and the model will be modified to generalize the results. The ongoing research aims to understand the effect of limiting migration and enforcing isolation measures on the spread of COVID-19, particularly in situations where multiple strains are present simultaneously. The model will observe how policy changes impact the

behavior of the different strains and the public, in order to better understand the efficacy of isolation as a solution for controlling the pandemic.

Morgan Wilson
University of Southern Mississippi

Three Colorful Methods for Finding the Chromatic Polynomial

Mathematicians apply algebraic graph theory to address and interpret problems arising out of data structures and optimization. For example, graph coloring problems have intrigued mathematicians and computer scientists alike. The chromatic polynomial was created to help solve such problems. This research aims to create a greater understanding of the underlying structures behind chromatic polynomials by analyzing the algebraic, deletion-contraction, and color partition methods. Each method has differing applications, but by viewing them all together, this research hopes to show the depth of this most interesting subject in a condensed manner.

Emerson Statom
Louisiana Tech University

Regression Analysis of NFL Quarterbacks' Injuries

Risk assessment is important in many careers such as first responders and the military. This is no different for people who play sports, especially people who are in contact sports such as football. These players' lives can be changed forever with one bad hit. This research aims to analyze the probability of an injury for the National Football League's (NFL) quarterbacks. It is hard to predict when what, and where an injury will occur, because of this very little work has been done on the subject matter in a general form. This paper aims to determine what variables play a role in factoring into a player being injured. The data was collected using NFL combine data as well as historical injury reports. We performed a binary logistic regression analysis with the variables and whether or not a player was injured in a season. This general model can be used for quarterbacks within the NFL to determine if they should keep playing based on their data during that time or end their careers.

Julie Weems
Louisiana Tech University

Faculty Presentations I
Friday, March 3, 2:10 – 4:30pm

Teaching College Geometry from a Historical Perspective

We offer a geometry/history of mathematics course as an upper-level elective in the mathematics program at Christian Brothers University. This course contains topics such as Euclidean and non-Euclidean geometry, mathematical structures, and the historical development of mathematical concepts. We will share some teaching ideas that we adopt in efforts to engage students in and out of the classroom, promote critical thinking, and help students improve their written and oral communication skills.

Jing Wang
Christian Brothers University

A Second-Order Accurate Crank-Nicolson Type Scheme for Nonlinear Time-Space Reaction-Diffusion Equations on Time-Graded Meshes

In this talk, we present a second-order numerical scheme for nonlinear time-space fractional reaction-diffusion equations over the time-graded meshes. We shall discuss the error and stability analysis, and give some numerical examples to corroborate our theoretical observations.

Yusuf Afolabi
University of Louisiana at Lafayette

Essential Codimension and Lifting Projections

We consider extensions of Brown–Douglas–Fillmore's notion of essential codimension to pairs of projections in the multiplier algebra of a separable stable C*-algebra B whose difference lies in the canonical ideal B. We investigate both a concrete definition akin to the original one given by Brown– Douglas–Fillmore, as well as a KK-theoretic definition, and show that they coincide. We explore the properties as well as an axiomatization of essential codimension. Using essential codimension, we establish K theoretic necessary and sufficient conditions for projection lifting from certain corona algebras (whose canonical ideals need not have real rank zero).

Arindam Sutradhar
University of Louisiana at Lafayette

The Many Sides of Poncelet Polygon
Poncelet Polygons can be characterized equivalently by orthogonal polynomials on the unit circle, finite Blaschke products, numerical ranges of matrices, and through a recursive relation known as Mirman's iterations. Last year, each of these were introduced in the quadrilateral case. These topics will be revisited and further described in the hexagonal and pentagonal cases.

Taylor Poe
Mississippi College

Stochastic Simulations of Cell Lineage Model
Cell lineage models are models that allow us to study population dynamics of stem and transient amplifying cells. While these models are useful, they do employ the use of differential equations, which can result in a number of cells that is not realistic (i.e. not a whole number of cells). Thus, we will construct a "biochemical model" and use the Stochastic Simulation Algorithm (also known as a Gillespie simulation) in order to simulate the lineage and obtain a discrete number of cells. We will compare these simulations to results obtained from the deterministic model and address an interesting development that occurs when we modify the models to remove a spurious steady state.

Steven J. Dabelow
McNeese State University

Application of Two-Parameter Maxwell Distribution
The problem of constructing statistical intervals for two-parameter Maxwell distribution is considered. An appropriate method of finding the maximum likelihood estimators (MLEs) is proposed. Constructions of confidence intervals, prediction intervals and one-sided tolerance limits based on suitable pivotal quantities are described. Pivotal quantities based on the MLEs, and moment estimators are proposed and compared with the statistical intervals based on them in terms of expected widths. Comparison studies indicate that the statistical intervals based on the MLEs offer little improvements over other interval estimates when sample sizes are small, and all intervals are practically the same even for moderate sample sizes. The methods are illustrated using two examples involving real data sets.

Faysal Ahmed Chowdhury
University of Louisiana at Lafayette

Reciprocal Sums and Counting Function
Motivated by the gentle exploration of the distribution of prime numbers typical of an undergraduate number theory course, as well as by a recent breakthrough result in arithmetic combinatorics, we explore connections between the counting function (the number of elements that are at most x) and the reciprocal sum function (the sum of the reciprocals of the elements that are at most x) for subsets of the natural numbers.

Alex Rice
Millsaps College

Faculty Presentations II
Saturday, March 4, 9:00 – 10:20am

The Independent Bondage Number of Planar Graphs with Minimum Degree at least 3

For a finite graph G, a vertex set D of G is said to be a dominating set of G, if every vertex $v \in V(G) - D$ has a neighbor in D. Further, if D is independent as well, we say D is an independent dominating set. Define $\gamma_i(G)$ to be the minimum cardinality among all independent dominating sets of G. The independent bondage number of G denoted by $b_i(G)$, is defined as min $\{|B|: B \subset E(G)$ such that $\gamma_i(G - B) > \gamma_i(G)\}$. We show that $b_i(G) \leq 8$ for planar graphs with minimum degree at least 3. This result improves on upper bounds in a recently published paper of Pham and Wei. We use discharging method to obtain this upper bound.

Kanchana Madhumali Gamlath Esweda Gamladdalage
University of Mississippi

Normally Abundant Groups

We assume that all groups considered in this talk are finite and we use the notation that for all $x, y \in G$, a group, that the commutator $[x, y] = x^{-1}y^{-1}xy$. Further, if χ is an irreducible character of G, we let $Z(\chi) := \{g \in G|\ |\chi(g)| = \chi(1)\}$.
We define for all g in the group G, $K_g := \{[g, x]|\ x \in G\}$. Note that in general K_g is not a subgroup of G. However, it is easy to see that whenever $K_g$is a subgroup of G, it must be a normal subgroup of G. This talk is concerned with finite groups G so that for all $g \in G$, we must have K_g is a normal subgroup of G. We call groups with this property **Normally Abundant Groups** or **NA-groups** for short.
The main result is that if G is an NA-group, then G must be a nilpotent group and that if χ is a nonlinear irreducible character of G, then χ must vanish on $G \backslash Z(\chi)$. Some sufficient conditions for a group to be a NA-group are determined and some examples are given.

Gary L. Walls
Southeastern Louisiana University

Reflection positive structure of Euclidean Kernel

We discuss the structure of reflection positive kernels that define the dynamics in Euclidean formulations of relativistic quantum mechanics with a finite number of degrees of freedom. A relativistic formulation of quantum mechanics should satisfy the following properties: (1) A Hilbert space representation of the theory defining a probability amplitude. (2) Measurements of quantum observables (quantum probabilities, expectation values and ensemble averages) cannot be used to make absolute determinations of inertial frames. This requires a unitary (ray) representation of the Poincaré group on the Hilbert space. (3) It should be possible to perform tests of relativistic invariance on isolated subsystems. This requires that the unitary representation of the Poincaré group on the Hilbert space satisfies space-like cluster properties. (4) The theory should be stable with respect to small perturbations. This requires that the mass Casimir operator of the Poincaré Lie algebra has a spectrum bounded from below. (5) Real experiments detect particles. This means that the mass Casimir operator has discrete one particle eigenstates. While direct interaction approaches to relativistic quantum mechanics have proved to be useful, they have two disadvantages. One is that cluster properties are difficult to realize for systems of more than two particles. The second is that the relation to quantum field theories is indirect. Euclidean formulations of relativistic quantum mechanics provide an alternative representation that does not have these difficulties. More surprising, the theory can be formulated entirely in the Euclidean representation without the need for analytic continuation. The structure of correlations that preserve both the Euclidean covariance and reflection positivity will be discussed.

Shaikh Gohin Samad
McNeese State University

Using mathematical techniques and Venn diagrams to understand Boolean functions generated by a Computer Scientist

Mathematical techniques like Venn Diagrams are very useful for a Computer Scientist. Venn Diagrams have a natural place in Set Theory. In Computer Science, Karnaugh Maps are often used to understand and Boolean expressions, and then to optimize and minimize Boolean expressions. This paper presents a meaningful way to interconnect Venn Diagrams and Boolean Algebra, and thus in teaching students a new way to perform the enumeration of Boolean Functions.

Vipin Menon
McNeese State University

Student Poster Presentations
Saturday, March 4, 10:00 – 10:30am

Calculating Diversity
This presentation walks through calculating diversity using one attribute in three different equations: Shannon's Entropy, Simpson's Index, and Generalized Variance. In addition, diversity is defined, and there is a small glimpse in to how diversity is used. Diversity is explored using different data sets from classroom profiles and university makeup that could be used for measurement and comparing the methods and values

Caylen Harms
Mississippi College

A Surprising Way to Work With The Group of Integers Modulo n
If $n = n_1, \cdots, n_q \in \mathbb{Z}^+$, then it is known that $\mathbb{Z}_n$ is isomorphic to the usual direct product $\mathbb{Z}_{n_1} \times \cdots \times \mathbb{Z}_{n_q}$ if and only if n_i and n_j are relatively prime for $i \neq j$. We will define a new binary operation on this direct product in which $\mathbb{Z}_n \cong \mathbb{Z}_{n_1} \times \cdots \times \mathbb{Z}_{n_q}$ regardless the factorization of n. If n_1 is odd, then we define $H = \langle n_1 \rangle$ and thus H will have exactly n_1 cosets in $\mathbb{Z}_n$. Using the cosets of H, we construct unique order sets of elements in $\mathbb{Z}_n$ where elements are ordered by the coset of H in which they lie. We define summation sets as the set of sums of consecutive elements from our unique ordered sets. It was previously shown that these summation sets are pairwise disjoint, and the union of all the summation sets is $\mathbb{Z}_n - H$, if n is odd. We will show that if n is even, then each summation set is repeated exactly once. We also show that the union of all summation sets recovers all even elements of $\mathbb{Z}_n$ not in H and not in $(n_1 - 2) + H$, and the summation set recovers only the odd elements from $(n_1 - 2) + H$.

Rachel Hill
University of North Alabama

Regular Normal Forms in Coxeter Groups
For my senior undergraduate research project, I investigated regular normal forms for $m - n - \infty$ coxeter groups. These are groups with a presentation of the form $\langle a, b, c \mid a^2 = b^2 = c^2 = e, (ab)^m = (ac)^n = e \rangle$. To find these normal forms, we utilized both Cayley graphs and rewriting systems, and were able to find a general format for regular normal forms in these groups.

Seth Martin
University of North Alabama

Generating Taxicab Conics Through Plane Intersections
We know that in Euclidean geometry we can create circles, ellipses, and parabolas by looking at the intersection of a plane and a cone. The angle and position of the plane will determine which of these shapes is produced. But what if we tried to recreate this phenomenon in a non-Euclidean geometry? We will explore the difference and similarities between these two geometries and how this relates to the construction of conic parabolas.

Jacob Laughlin
University of North Alabama

Molecular Graph Theory: Analysis of Buckminsterfullerene
Buckminsterfullerene is the most complex symmetric molecule found to date, as the icosahedral group is the point group with the largest number of elements. The molecule was named after scientists who proposed similar models to Buckminsterfullerene in the shape of a geodesic dome. In 1985 several scientists repeated the experiment and coined the sixty-carbon molecule Buckminsterfullerene. Graph theory plays an integral part in analyzing the bonds and structure of chemical molecules. This project will explore the interdisciplinary connections between graph theory and theoretical chemistry via analysis of the Buckminsterfullerene.

Benjamin Hemming
Delta State University

Random Walks on Graphs with Absorbing States Using Markov Chains

A Markov Chain is a tool used to determine the probability of complex situations. We employ Markov chains in the context of random walks on graphs. In the example of an ant taking a random walk along the path P_n starting at vertex v_i with an absorbing state at v_n, Eidson showed $t_i(P_n) = (n-1)^2 - (i-1)^2$, where $t_i(G)$ is the average number of steps until absorption starting at vertex v_i in graph G. Here, we calculate $t_i(C_n) = i(n-i)$, where C_n is a cycle on n vertices, through the use of Markov Chains.

Collin Cartwright and Sejin Kim
Belhaven University

Developing Markov Chain Formulas in Wolfram Mathematica

Developing formulas and performing operations on large matrices can be a difficult task by hand. Through use of the popular CAS, Mathematica, we developed tools to analyze matrices related to Markov chains modelling random walks on cycle graphs including coding transition matrices, methods of matrix manipulation, and calculating adjoint matrices. Additionally, we used these models to reinforce our hypotheses and direction of our proofs to prove general results.

Lilly Ates and Emilie Chapple
Belhaven University

Campus Locations

Thursday, March 2 – Triplett Alumni Center

Friday, March 3 – The Inn at Ole Miss

Friday, March 3 – The Pavilion at 6:30pm

Saturday, March 4 – Bryant Hall

Interactive Map:

SCAN ME