
THE • MATHEMATICAL • ASSOCIATION • OF • AMERICA •
MAA - FL
MCMLXVII
FLORIDA SECTION

2022 Joint Meetings

Of The

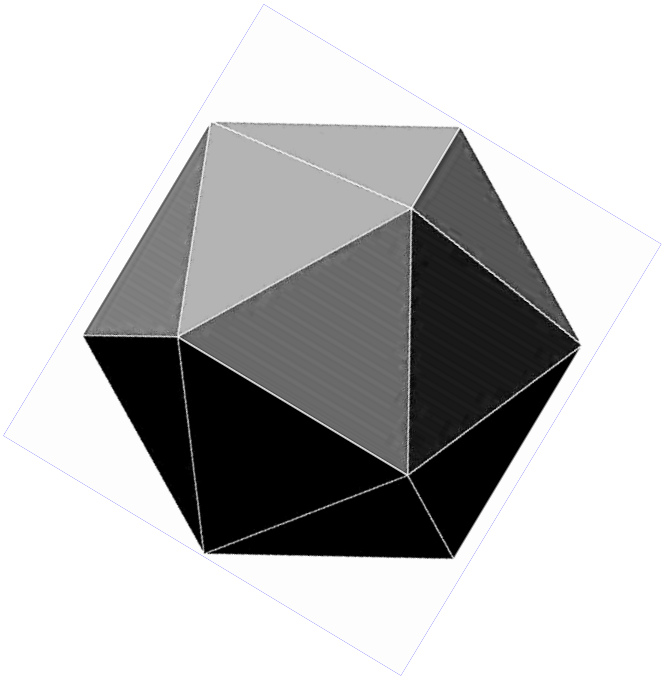
Florida Section

Of The

Mathematical Association of America

And

The Florida Two-Year College Mathematics Association



Virtual Meeting

February 18-19, 2022

Florida Section of the Mathematical Association of America

2021 – 2022

Section Representative	Monika Kiss, Saint Leo University
President	Anthony Okafor, University of West Florida
Past President	Milé Krajčevski, University of South Florida
Vice-President for Programs	Jacob B. Aguilar, Saint Leo University
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Florida Two-Year College Mathematics Association

2021-2022

President	Joni Pirnot, State College of Florida
Past President	Sandra Seifert, Florida SouthWestern State College
Vice-President for Programs	Don Ransford, Florida SouthWestern State College
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Historian	Robert Shollar, State College of Florida

PROGRAM

Friday, February 18, 2022

Committee Meetings and Workshop

FTYCMA

11:00 – 12:30	**FTYCMA Annual Business Meeting**	**Main Room**

FL – MAA

12:30 – 2:00	**Executive Committee Meeting**	**Main Room**

WELCOME

2:45 – 3:00	**Welcoming Remarks**	**Main Room**

Anthony Okafor, President, FL-MAA
Joni Pirnot, President, FTYCMA
Lisa Marano, Chair of the Committee on Sections, MAA

Please note that for the duration of the conference we created *Breakout Room 8* as a room where you can meet up with old friends and make new friends, if you wanted to take a short break. We also created *Breakout Room 9* for students to mingle. Enjoy the Conference!

All times are in Eastern Standard Time (EST)

Friday, February 18, 2022

3:00 – 3:50 **Plenary Session** **Main Room**

Jose Perea, MAA NAM Speaker
Northeastern University

The Underlying Topology of Data

4:00 – 6:30 **Student Events** **B/O Room 7**

In order to be considered for award recognition in the Integration Contest/Problem Solving Contest you will need have your camera on and aimed at your workspace. Your camera must be far enough away that both arms are visible for the duration of the contest. Once you have completed the exam, you will need to use a document scanning app (like CamScanner) to scan your solutions and email your completed submission to Kevin Murphy (Kevin.Murphy@saintleo.edu) within 10 minutes of the closure of the contest. Any submissions received after these 10 minutes have passed will not be deemed eligible.

4:00 - 4:50 **Student Integration Contest**

Put your integration skills to the test! This 50-minute competition will feature integration problems requiring a variety of calculus techniques. Calculators and notes are not allowed. Undergraduate students of any background are welcome to participate and the top three scores will receive Amazon Gift Cards in addition to be being recognized for the achievement.

5:00 – 5:50 **Student Problem Solving Contest**

Put your reasoning skills to the test! This 50-minute competition will feature a variety of fun problems spanning the gamut of the field of mathematics. Calculators and notes are not allowed. Undergraduate students of any background are welcome to participate and the top three scores will receive Amazon Gift Cards in addition to be being recognized for the achievement.

6:00 – 6:30 **Student Kahoot! Challenge**

How can you get any better than combining mathematics and video games? Race against others and the clock to try and quickly and accurately solve some quirky and entertaining mathematical puzzles.

Please note that we are using *Breakout Room 9* as our Student Hospitality "room". Feel free to come and join other students in here.

4:00 – 4:45 Contributed Papers Session I

Full Session

Antony Cheng **B/O Room 1**
University of Tampa

Incorporate Online Graphing Utilities, Desmos, GeoGebra, and Wolfram Alpha in Teaching Business Calculus.

Session A 4:00-4:20

Timothy Corbett (Undergraduate Student) **B/O Room 2**
University of Mary Washington

Einstein's equation, Lagrangians for General Relativity and ADM Formalism

Lina Fajardo Gomez (Undergraduate Student) **B/O Room 3**
University of South Florida

DNA Segment Arrangements and Delannoy Numbers

Monika Kiss and **Jacci White** **B/O Room 4**
Saint Leo University

The new era of teaching mathematics

Gary Marmon and Matthew Kimm (Graduate Students) and Anthony Okafor
University of West Florida **B/O Room 5**

Courses Grade Prediction Using Low-Rank Matrix Factorization

Session B 4:25-4:45

Daniel Jelsovsky and Susan Serrano **B/O Room 2**
Florida Southern College

The Philosophy of Teaching Statistics

Rebecca Williams **B/O Room 3**
State College of Florida

Canvas Cram Session: Using Canvas in Your Math Course

Raelyn White (Undergraduate Student) **B/O Room 4**
Florida State University

Introductory statistics using RStudio

Johnny Cabrera (Graduate Student), Hsin Kuo and Jia Liu **B/O Room 5**
University of West Florida

Preconditioned Iterative Solvers for the 2D Helmholtz Equation Via Radial Basis Functions

5:00 – 5:45 Contributed Papers Session II

Full Session

Guillermo Farfan and Robert Schoen **B/O Room 1**
Florida State University

The meaning of = in school elementary mathematics

Session A 5:00-5:20

Jacob B. Aguilar **B/O Room 2**
Saint Leo University

The Fading Hope of COVID-19 Herd Immunity

Andre Waschka **B/O Room 3**
Mercer University

Estimating Causal Effects of Time-varying Interventions from Observational Data

Yaxuan Wang (Undergraduate Student) **B/O Room 4**
University of Central Florida

Clustering of Diverse Multiplex Networks

Roxanne Back **B/O Room 5**
Florida Southern College

Teaching Mathematics with Origami

Session B 5:25-5:45

Scott H. Demsky **B/O Room 2**
Broward College

Taylor Series for 1/(1+x^2) at x=a

Erika Ward **B/O Room 3**
Jacksonville University

Supplementation and Collaboration: Just in Time Interventions in Mathematics Across Campus

Jason Elsinger **B/O Room 4**

Florida Southern College

Implementing specifications-based grading in mathematics courses across the curriculum

Bariaa Shatila **B/O Room 5**
Flagler College

Proctoring math exams via an online proctoring service

6:00 – 6:45 Section Representative's Session **Main Room**

Monika Kiss
Saint Leo University

What can the MAA do for you and what can you do for the MAA?

7:00 – 7:50 Plenary Session **Main Room**

Lisa Marano, Chair of MAA Committee on Sections
West Chester University

Mathematics and Community Engagement: A story about finding mathematical problems in the community and bringing mathematics into the community.

Saturday, February 19, 2022

8:45 – 9:00 Welcome back **Main Room**

9:00 – 9:50 Hawkes Learning **B/O Room 11**

Taylor Ireland

Math Pathway Prep & Corequisite Support

9:00 – 9:45 Contributed Papers Session III

Full Session

Nancy Eschen and Amber Strickland **B/O Room 1**
Florida State College at Jacksonville

Project-Based Learning in College Algebra

Megan Cavanah and Kimberly Hess **B/O Room 2**
Polk State College

Get Ready MAT 1033! An Initiative to Address Student Preparedness for Intermediate Algebra

Session A 9:00-9:20

Jason Elsinger **B/O Room 3**
Florida Southern College

Representations of Lattice Vertex Algebras, Trace Functions, and Modular Transformations

Puja Pandey B**/O Room 4**
University of Florida

On the Equivalence of Statistical Distances for Isotropic Convex Measures

Bradly Rivera-Muñiz (Graduate Student), and Raid Amin **B/O Room 5**
University of West Florida

A spatial study of quality of life in the USA

Mozhgan Nora Entekhabi **B/O Room 6**
Florida A & M University

Inverse Source Problems for Wave Propagation

Session B 9:25-9:45

Yuanchang Sun **B/O Room 3**
Florida International University

Lorentzian Peak Sharpening and Sparse Blind Source Separation for NMR Spectroscopy

Caroline E. Johnson (Undergraduate Student) **B/O Room 4**
Davis Senior High School and Woodland Community College
Paul Johnson
Biostat Software

Examining the Riemann Hypothesis, and Ratios of Robin and Lagarias Inequalities

Bariaa Shatila **B/O Room 5**
Flagler College

Essential Course for Undergraduate Students

Ryan Farrell (Undergraduate Student) **B/O Room 6**
University of North Florida

Classic Results on the Bounds of Ramsey Numbers

10:00 – 11:15 Workshop **B/O Room 10**

Manisha Ranade
Santa Fe College

Modelling and teaching Mindfulness for Math anxiety

10:00 – 10:45 Contributed Papers Session IV

Full Session

Adebukola Adeyem, Carrie Grant and Kurt Sebastian **B/O Room 1**
Flagler College

Course Coordination in the midst of Covid-19 and thereafter

Session A 10:00-10:20 **B/O Room 2**

Joanne Kiriazes and Sidra Van De Car
Valencia College
Maria Capursi and Lori Dunlop-Pyle
University of Central Florida

Observations on Transfer Student Experience: A Learning Model between Two-Year and University Faculty

Alfred "Ken" Mulzet **B/O Room 3**
Florida State College at Jacksonville

An Extension of D'Alembert's Solution for the One Dimensional Wave Equation

Ala' J. Alnaser, Abigail Bowers, Aaron Bardal and Jared Bunn **B/O Room 4**
Florida Polytechnic University

STEM-Focused and Personalized for First-Term Calculus Students

Lindsey Fox **B/O Room 5**
Eckerd College

Management of Epidemics through Governance

Session B 10:25-10:45

Joseph Ours **B/O Room 2**
State College of Florida

Get Started with LaTeX

Kristina Zogovic, Marcus Green (Graduate Students)
Subhash Bagui, Jossy Uvah and Sikha Bagui
University of West Florida

Robert Lamar **B/O Room 3**
Warner University

Exploratory research of Covid-19 Vaccination Effects on population in Florida

Brian Camp **B/O Room 4**
Suncoast Credit Union

Tales from the Bootstrap

Matthew Kimm and Gary Marmon (Graduate Students), **B/O Room 5**
Jay Kim and Anthony Okafor
University of West Florida

Applications of the Markov Method for Ranking and Recommendation Tasks

11:00 – 11:45 Contributed Papers Session V

Full Session

Michael Brilleslyper **B/O Room 1**
Florida Polytechnic University
Beth Schaubroeck
U.S. Air Force Academy

Palindromic Polynomials, Unimodular Roots, and Trigonometric Equations

Jay Kim, Anthony Okafor and Josaphat Uvah **B/O Room 2**
University of West Florida

First Semester to First Year in College: Factors Predicting Improvements in GPA among At-Risk Students

Session A 11:00-11:20

L. H. Kuo and Niranjan Warnakulasooriya Mahaguruge (Graduate Student)
University of West Florida **B/O Room 3**

Meshfree space-time method for solving two-dimensional wave equation

Kevin Murphy **B/O Room 4**
Saint Leo University

Kahoot! in Calculus vs a General Education Course

Hitakshi Lahrani (Graduate Student) **B/O Room 5**
University of South Florida

Partially ordered sets and quandles.

Benjamin Titera (Undergraduate Student) **B/O Room 6**
University of North Florida

Planar Graphs and Embeddings

Session B 11:25-11:45

Yanhui Zhu, Fang Hu (Graduate Students)
Lei Hsin Kuo and Jia Liu **B/O Room 3**
University of West Florida

SCOREH+: A High-Order Node Proximity Spectral Clustering on Ratios-of-Eigenvectors Algorithm for Community Detection

Channa Navaratna **B/O Room 4**
Indiana University of Pennsylvania
Menaka Navaratna
Florida Gulf Coast University

Wildlife Tracking with Asynchronous Multiple Directional Antenna Readings

Albert Hancock (Undergraduate Student) **B/O Room 5**
University of North Florida

Generating Functions and The Catalan Numbers

12:00 – 12:50 Contributed Posters Session **B/O Room 1**

Karin Ebey and Mariana Olivares-Cely (Undergraduate Students) and Lindsey Fox
Eckerd College

Modeling the Effects of Resistance to Disinfectants on the Transmission of Nosocomial Infections

Isaac Blackburn and Kat Fillman (Undergraduate Students) and Lindsey Fox
Eckerd College

Mathematically Modeling the Role of Healthcare Workers in the Environmental Transmission of C. difficile

Evelyn Smith (Undergraduate Student) and Constance Schober
University of Central Florida
Lane Ellisor (Undergraduate Student) and Annalisa Calini
College of Charleston

Computational and Linear Stability Studies of Damping Effects on Rogue Wave Formation.

Payton Bivens and Kelsey Weeden (Undergraduate Students) and Lindsey Fox
Eckerd College

Mathematically modeling the transmission of Koi herpesvirus in common carp

Brendan Chamberlain (Undergraduate Student)
University of North Florida

Security Systems and Location Numbers of Graphs

1:00 – 1:50 **Plenary Session** **Main Room**

Anastasia Chavez, MAA AWM Speaker
Saint Mary's College of California

Matroids, Positroids, and Beyond!

1:50 – 2:00 **Closing Remarks** **Main Room**

Joni Pirnot, President, FTYCMA
Anthony Okafor, President, FL-MAA

2:00 – 3:00 **Award Ceremony and** **Main Room**
FL-MAA Business Meeting

ABSTRACTS

Contributed Papers Session I

Full Session

Antony Cheng – University of Tampa

Incorporate Online Graphing Utilities, Desmos, GeoGebra, and Wolfram Alpha in Teaching Business Calculus.

Calculus and Its Applications, a course that is often offered by the business department in higher education. It incorporates concepts of calculus that deals with rate of change, derivatives, integrals, and real-life applications relate to business situations. We exam online graphing utilities, Desmos, GeoGebra, and Wolfram Alpha that can be used to teach these complex concepts. This talk provides examples that incorporating different graphing utilities to teach Calculus concepts. The use of online graphing utility can provide learning support and promote student engagement. It will also help student to visualize a given problem and perform better in the class.

Session I-A

Timothy Corbett (Undergraduate Student) – University of Mary Washington

Einstein's equation, Lagrangians for General Relativity and ADM Formalism.

Einstein's equation describes the relation of spacetime curvature and present matter. We will consider the case of a Lorentzian manifold M diffeomorphic to $\mathbb{R}$ x S, where $\mathbb{R}$ is the set of all real numbers, the manifold S represents space and t in $\mathbb{R}$ represents time. A space where a linear map at a point p is proportional to some constant K and a differential expression is called a space of constant curvature. K can either be zero, positive or negative. We will find various models to fit each case. We will derive a simple solution of the Einstein field equations called the Schwarzschild solution, which describes spacetime around a spherical object. We can derive Einstein's equations using the Lagrangian for Einstein's equation from an action principle. We analyze Einstein's equations for how space geometry changes over time using ADM formalism.

Lina Fajardo Gomez (Undergraduate Student) – University of South Florida

DNA Segment Arrangements and Delannoy Numbers

We use combinatorial techniques to study gene rearrangements. During reproduction, the transcriptionally active macronucleus in certain species of ciliates is disintegrated and regenerated from a germline micronucleus where each gene is fragmented and scrambled. Fragments may be out of order or reversed, separated by "junk" DNA segments which may be excised as circular molecules. The alignment of short repeat sequences, called pointers, at the

endpoints of gene fragments guides the recombination process. Analysis of the sequences of cyclic molecules indicates that fragments of one or two genes are involved in cyclization. We propose a combinatorial model to describe each linear arrangement of gene fragments neighboring circular molecule junctions as a sequence of pointers, and we call these sequences legal strings. We describe a bijection between legal strings and lattice paths from (0,0) to (m, n) using only steps (1,0), (0,1) and (1,1), which are counted with the square array of Delannoy numbers.

Monika Kiss and Jacci White - Saint Leo University

The new era of teaching mathematics

If we learned anything from the last two years it is this, teaching as we know it must change. Both the content we engage our students with as well as how we engage our students must change for our programs to be viable. In this talk, first we will discuss the opportunities that our new technologies are affording us, such as teaching our classes in a hybrid format, so that we can reach our students where they are but still maintain the interactions that a formal classroom gives us. Then we will discuss some ideas on how we must rethink our mathematics programs to attract majors from the current generation.

Gary Marmon, Matthew Kimm (Graduate Students) and Anthony Okafor – University of West Florida

Courses Grade Prediction Using Low-Rank Matrix Factorization

Estimating a student's grades in future courses is vital in informing course selection that leads to a greater probability of student success and on time graduation. This study presents the problem of grade prediction in the context of a recommender system that uses low-rank matrix factorization to predict ratings by treating the student-course-grade matrix as a user-item rating matrix. Course vectors represent a set of components associated with a course, and each student vector represents a student's knowledge gained. Undergraduate programs are structured in a way that lower-level courses build up to higher level courses. These lower-level courses provide the necessary knowledge and skills for students to do well in future courses. With this in mind, a sparse linear combination of the grades that the student obtained in past courses is used as the basis to make our predictions.

Session I-B

Daniel Jelsovsky and Susan Serrano - Florida Southern College

The Philosophy of Teaching Statistics

The focus of general-education mathematics courses is often precision and numerical manipulation. Method is considered more critical than result. Exactness is rewarded. Students enrolled in these courses are often there solely due to a general-education requirement. General-education statistics classes, on the other hand, are often populated with students with students who require statistical ability in their majors and/or careers. This means that, to the students at

least, results are critical and precise manipulations far less so. For that reason, we need to make sure that general-education statistics instruction meets the needs of the students enrolled in those courses and is not simply a repackaged mathematics course.

Rebecca Williams - State College of Florida

Canvas Cram Session: Using Canvas in Your Math Course

This is meant for those who haven't utilized Canvas much or are just Canvas-phobic. Topics include submitting written test work in Canvas, formative assessments in Canvas, using Speed Grader, and how to sync with online homework systems.

Raelyn White - Florida State University

Introductory statistics using RStudio

A simple demonstration of the beginner statistical functions in R. As well as a description of the set up and navigation of RStudio. This is an introductory session designed as a demo for someone who is not familiar with R. We will investigate the difference between importing statistical functions verses programming the functions each time. This session will conclude with sharing of basic resources to help get started with R and RStudio.

Johnny Carbreana, Hsin Kuo and Jia Liu - University of West Florida

Preconditioned Iterative Solvers for the 2D Helmholtz Equation Via Radial Basis Functions

In this paper, we consider a linear system of equations arising from the discretization of the 2D Helmholtz equation through radial basis functions. The coefficient matrix A that is generated from the discretization is dense and often ill-conditioned. We apply different preconditioners to improve the conditioning of the problem for computation. Numerical experiments are conducted using the General Minimal Residual method (GMRES) to compare the convergence rates among various preconditioners. Besides, we applied the new discretization strategy to improve the accuracy and we found the best preconditioner with GMRES for the 2D Helmholtz equation based on the radial basis functions.

Contributed Papers Session II

Full Session

Guillermo Farfan and Robert Schoen - Florida State University

The meaning of = in school elementary mathematics

Equality plays a fundamental role in students' development of number sense, and a good understanding of = is key in helping students transition from arithmetic to algebra. Many studies conducted in the last decades report that students often have a poor understanding of the meaning of = in mathematics, starting in elementary school. Using data collected from thousands

of Florida students, we will show how elementary-level students respond to questions about equations and the meaning of =. We will discuss how these findings may relate to mathematics standards in Florida and their implication for students' preparation for secondary- and college-level mathematics.

Session II-A

Jacob B. Aguilar - Saint Leo University

The Fading Hope of COVID-19 Herd Immunity

In this talk, I will discuss the challenges involved in reaching a theoretical COVID-19 herd immunity threshold beyond which transmission will cease.

Andre Waschka– Mercer University

Estimating Causal Effects of Time-varying Interventions from Observational Data

The longitudinal structure of observational data routinely collected in various settings allows researchers to estimate the potential impact of different time–dependent interventions strategies. However, the absence of randomization in observational data poses challenges that require a careful statistical adjustment for confounding in order to obtain unbiased estimates. Our statistical model is semiparametric and is based on causal theory. We focus on estimating the causal effect of an intervention, using a doubly robust longitudinal targeted maximum likelihood estimator together with ensemble-based machine learning (Superlearner). This approach is illustrated by an observational longitudinal study of the effects of an intervention for the ICU hypotensive patients.

Yaxuan Wang (Undergraduate Student) – University of Central Florida

Clustering of Diverse Multiplex Networks

The paper introduces the DIverse MultiPLEx (DIMPLE) network model where all layers of the network have the same collection of nodes and are equipped with the Stochastic Block Models (SBM). In addition, all layers can be partitioned into groups with the same community structures, although the layers in the same group may have different matrices of block connection probabilities. The DIMPLE model generalizes a multitude of papers that study multilayer networks with the same community structures in all layers, as well as the Mixture Multilayer Stochastic Block Model (MMLSBM). We introduce novel algorithms for the between-layer and the within-layer clustering and study the accuracy of those algorithms, both theoretically and via computer simulations. Finally, we show how our between-layer clustering algorithm can be extended to the Heterogeneous Multiplex Random Dot-Product Graph model, which generalizes the COmmon Subspace Independent Edge (COSIE) random graph model.

Roxanne Back – Florida Southern College

Teaching Mathematics with Origami

Origami is a fun and engaging way to teach a wide range of mathematical concepts. I will give examples of activities that can be used in an upper-level survey course for math majors as well as activities for Liberal Arts Mathematics and Geometry courses.

Session II-B

Scott H. Demsky – Broward College

Taylor Series for 1/(1+x^2) at x=a

We determine a formula for all coefficients of the Taylor series for the function 1/(1+x^2) centered at x = a for any real number a along with the radius of convergence of the series. We utilize complex numbers to extend a standard calculus technique involving geometric series, but we write the coefficients using real numbers only.

Erika Ward – Jacksonville University

Supplementation and Collaboration: Just in Time Interventions in Mathematics Across Campus

While we celebrate the benefits that students get from a mathematical education, we also know that students often struggle to recall the particulars of skills they learned when needed in later classes. Inspired by conversations with colleagues in other departments, the JU Mathematics department is developing interventions for courses that rely on students recalling previous mathematical knowledge. These brief modules consist of a video (covering the mathematical skill in the context of the course where it is needed) and interactive practice problems. Students will be encouraged to access these materials to refresh before they encounter the topic in class, or to use the resource to brush-up when they're struggling with homework or other assignments. We hope that these resources will improve student success and confidence in their mathematical skills, and we plan to study their efficacy as they are deployed.

Jason Elsinger – Florida Southern College

Implementing specifications-based grading in mathematics courses across the curriculum

Mastery-based grading, or specifications-based grading, is an alternative grading scheme that often minimizes the effects of partial credit and allows multiple attempts at each of the course learning outcomes. I have been using specifications grading in all my classes, and in this talk I will describe my grading system and my experiences in implementing it. I will show how I track grades (using an excel file that includes a summary of the best attempt for every problem from every student) and handle reassessments. In addition to my own grade book, I also set up an excel grade book for my students to use to help them keep track of their own progress.

Bariaa Shatila – Flagler College

Proctoring math exams via an online proctoring service.

With the increasing demand of online learning, professors and students face academic challenges. As a math educator, I wanted to maintain the integrity of my online math courses, so I required that the midterm and final exam get proctored via an online proctoring service. However, some students were complaining about the usage of the proctoring service. What are the advantages and disadvantages of the online proctoring services in our mathematics classes? Are online proctoring services fair to our students? Is there another alternative that educators can use?

Sponsor

Taylor Ireland – Hawkes Learning

Math Pathway Prep & Corequisite Support

The math pathways initiative created a challenge to implement strategies that support and accelerate developmental-level learning while providing robust curricular content.

Join this presentation to learn about successful corequisite implementation structures, newly enhanced course materials that offer contextualized review, and pre-pathway math literacy courses designed to prepare students for any future math pathway curriculum. Learn how to use data on class and individual student performance, commonly missed questions, and time-on-task activity to identify intervention points for at-risk students. **Attend and be entered to win one of three $25 Amazon Gift Cards!**

Contributed Papers Session III

Full Session

Nancy Eschen and Amber Strickland - Florida State College at Jacksonville

Project-Based Learning in College Algebra

The aim of this presentation/talk is to outline and discuss a term-long project in a College Algebra Honors class at Florida State College at Jacksonville (FSCJ). Mathematics Professor Nancy Eschen and Academic Librarian Professor Amber Strickland collaborated to create a project that combined the curriculum of the class with the requirement of using FSCJ academic student support services. This project required students to select and analyze a dataset relating to a topic of their choice; explore functions models for the data using Excel; write a literary review of their topic; and present a poster of their work. Students met the librarian to learn how to find academic sources for information and research plus consulted with FSCJ tutors in the areas of mathematics, computer (Excel), and writing. Several students were selected to present their posters at the FSCJ Math Mini-Conference.

Megan Cavanah and Kimberly Hess - Polk State College

Get Ready MAT 1033! An Initiative to Address Student Preparedness for Intermediate Algebra

Get Ready MAT 1033! An Initiative to Address Student Preparedness for Intermediate Algebra In response to the learning loss associated with the COVID-19 pandemic, mathematics faculty at Polk State College created a bootcamp course to help students practice essential, prerequisite material before starting Intermediate Algebra. The course, which comes at no cost to students, includes videos, practice and self-assessments to help students work through material prior to starting the credit-bearing course. In this session, the designers and coordinators for Get Ready MAT 1033 will share the course design, the implementation and marketing strategies used to launch the course, as well as lessons learned. In addition to discussing student outcomes, participants will reflect on how this model could be used at their colleges.

Session III-A

Jason Elsinger – Florida Southern College

Representations of Lattice Vertex Algebras, Trace Functions, and Modular Transformations

A lattice vertex algebra is an algebraic structure associated to an even lattice. Any group of automorphisms of the lattice naturally extends to a group of automorphisms of the lattice vertex algebra. An important problem is to classify the representations for the subalgebra of fixed points, known as an orbifold. In this talk I will describe an alternative approach to writing the irreducible orbifold characters using a combination of trace functions. It has been known that the set of irreducible characters for an orbifold is closed under modular transformations and I will discuss our method for calculating these transformations.

Puja Pandey - University of Florida

On the Equivalence of Statistical Distances for Isotropic Convex Measures

In convex geometry and its probabilistic aspects, many fundamental inequalities can be reversed up to universal constants in the presence of geometric properties, for instance reverse isoperimetric inequality for convex bodies. In this talk we will see that distances between probability measures are equivalent for convex measures, which extends a result of Meckes and Meckes (2014). The class of convex measures contains fundamental distributions in probability and statistics. Examples include Gaussian distributions, uniform distributions on a convex set and more general log-concave distributions, as well as heavy tailed distributions such as Cauchy distribution. We will see that the convergence in total variation of an isotropic s-concave probability measures is equivalent to convergence in bounded Lipschitz and is further equivalent to Rényi and Tsallis divergence with respect to Gaussian.

Bradly Rivera-Muñiz and Raid Amin - University of West Florida

A spatial study of quality of life in the USA

This study's main goal was to develop a comprehensive Quality of Life (QoL) Index based on 31 demographic variables for the 3108 counties in the contiguous USA. Counties were ranked worst in QoL to best, and spatial cluster analysis is used to identify counties with significant low/high QoL clusters. GIS-based mapping was used to create informative heat maps with significant clusters shown. The rate of African Americans, diversity in a race within counties, and upward mobility were studied in a regression analysis in which QoL was predicted from these three covariates. The QoL Index was adjusted for the covariates, and a new spatial heat map with clusters is obtained. It was concluded that as the rate of African Americans increases in a county, the QoL decreases, while the QoL increases when diversity or upward mobility increases.

Mozhgan Nora Entekhabi– Florida A & M University

Inverse Source Problems for Wave Propagation

Inverse source scattering problem and uniqueness of the source arises in many areas of science. It has numerous applications to surface vibrations, elasticity and acoustical and bio-medical industries and medical imaging. In particular, inverse source problem seeks the radiating source which produces the measured wave field. The study aims to provide a technique for recovering the source function of the classical elasticity system and the Helmholtz equation from boundary data at multiple wave numbers when the source is compactly supported in an arbitrary bounded C^2 – boundary domain, establish uniqueness for the source from the Cauchy data on any open non-empty part of the boundary for arbitrary positive K, and increasing stability when wave number K is getting large. Various studies showed that the uniqueness can be regained by taking multifrequency boundary measurement in a non-empty frequency interval (0, K) noticing the analyticity of wave-field on the frequency. This type of inverse source problem is also motivated by the wide applications in antenna synthesis, medical imaging and geophysics.

Session III-B

Yuanchang Sun - Florida International University

Lorentzian Peak Sharpening and Sparse Blind Source Separation for NMR Spectroscopy

In this talk, we shall introduce a weighted peak sharping technique for NMR spectra separation. To achieve an optimal sharpening while preserving the data nonnegativity, we prove the existence of an upper bound of the weight parameter and propose a selection criterion. Numerical experiments on NMR spectroscopy data show satisfactory performance of our proposed method

Caroline E. Johnson (Undergraduate Student) – Davis Senior High School and Woodland Community College and **Paul Johnson** – Biostat Software

Examining the Riemann Hypothesis, and Ratios of Robin and Lagarias Inequalities

This presentation examines the Riemann Hypothesis (RH), and the two 'if and only if' inequalities due to Robin (1984) and Lagarias (2002). Robin showed that RH $\Leftrightarrow \sigma(n)/n < e^{\gamma}\log$

log(n) for n > 5040, where σ(n) is the sum of the divisors of the positive integer n; γ is Euler's constant. Lagarias showed that RH $\Leftrightarrow \sigma(n) < H(n) + e^{H(n)} * \log(H(n))$ for all n; where H(n) is the harmonic sum. We examine the ratios of the two inequalities, ratio1 = σ(n)/n/(e^{γ}log log(n)) and ratio2 = $\sigma(n)\{H(n) + e^{H(n)} * \log(H(n))\}$. We examine their linear relationship. We comment on the pattern of the means of the two ratios as n increases. We choose an optimal cutoff point and demonstrate that the percentage of ratios exceeding this cutoff point decreases as we increase n; approaching zero for large n. We discuss the findings in context to Morrill and Platt's (2020) extension of Robin's inequality for 20-free integers.

Bariaa Shatila – Flagler College

Essential Course for Undergraduate Students

Many students think Mathematics is an abstract subject and are afraid from taking a Mathematics course. I believe that the Essentials of Mathematics course that I teach at Flagler College is an essential course for all undergraduate students. This course is relevant for our students and will equip them with the quantitative skills to deal with real-world math problems. This math course helps students practice critical thinking and problem-solving skills. It covers the following independent topics: financial mathematics, systematic counting, probability, geometry, and analyzing statistics. Students who took this class reported that it was the best Mathematics course they ever took.

Ryan Farrell (Undergraduate Student) – University of North Florida

Classic Results on the Bounds of Ramsey Numbers

Abstract. Ramsey's theorem states that a sufficiently large complete graph with each edge colored in one of finitely many colors will always contain a monochromatic subgraph of a certain type. This presentation investigates what "sufficiently large" means in specific cases. We define Ramsey numbers and prove a number of classic results including the well-known party problem which asserts that any party of six or more people where each pair of people are either friends or enemies must have at least three mutual friends or three mutual enemies.

Workshop - Saturday

Manisha Ranade - Santa Fe College

Modelling and teaching Mindfulness for Math anxiety

Among college students, Math anxiety is a major stumbling block to success. It affects learning of new concepts and retention of old material. During the pandemic, anxieties regarding health, family and jobs increased dramatically making it even tougher for students. Anxiety affects physical health via decreased immunity. Besides students, professors and college administrators also suffered from pandemic related stresses. Mindfulness is one way to relieve anxiety and is a secular, accessible and equitable practice. In this workshop, we will introduce practicing mindfulness for wellbeing, followed by resources to take it to the Math classroom. There will be a guided practice as well as an interactive portion with breakouts for small group discussion. At

the end, we will come up with an action plan to implement these practices. The speaker is trained in Yoga therapy and is working on a project, "Mindfulness in the Math classroom".

Contributed Papers Session IV

Full Session

Adebukola Adeyem, Carrie Gran and Kurt Sebastian – Flagler College, St. Augustine, FL

Course Coordination in the midst of Covid-19 and thereafter

Course coordination describes coordination in the design, structure, and teaching of a course, to the extent that multiple instructors within a multi-section course have come to common agreement. COVID-19 has changed numerous things in higher education, it has forced educators to reinvent themselves and their classrooms. Even after being back to face-to-face teaching, things are not necessarily back to "normal." Our goal to coordinate our Introductory Statistics course has become more important. In this presentation, we will share how our Statistics team continue to collaborate to create a learning environment that provides consistency to our students. Changes the global pandemic had on our course coordination model, if any. Based on our experience, we will make recommendations regarding course coordination that will provide those in attendance ideas to use in their own institutions. Our discussion will include our course coordination model and the outcomes experienced over the last four years.

Session IV-A

Joanne Kiriazes, **Sidra Van De Car** - Valencia College and **Maria Capursi, Lori Dunlop-Pyle** – UCF

Observations on Transfer Student Experience: A Learning Model between Two-Year and University Faculty

Valencia College partnered with the University of Central Florida to create a peer observation model between mathematics faculty. Because transfer students typically have lower success rates, faculty at the sister institutions created a program to allow faculty to observe one another's classes, evaluate differences in pedagogy, and identify aspects of classroom culture unique to the sister institution. This presentation will discuss differences in success rates, describe the observation program, and review differences observed between the institutions that may affect transfer student success, as found in the initial offering of the program in Fall 2020. Plans for future observations and actions for student success will be discussed.

Alfred "Ken" Mulzet - Florida State College at Jacksonville

An Extension of D'Alembert's Solution for the One-Dimensional Wave Equation

In this presentation we will use D'Alembert's formula to solve a two-dimensional wave equation/initial value problem, with suitable restrictions on the initial conditions. This method can be generalized to higher dimensions as well. We then use this approach to solve initial value problems of the form

$utt=Auxx+Buxy+Cuyy$ $u(x,y,0)=f(x,y)$ $u\_t(x,y,0)=g(x,y)$

where the functions f(x, y) and g(x, y) are homogeneous polynomial functions of degree n.

Kristina Zogovic[1], Marcus Green[1], Subhash Bagu[1], Jossy Uvah[1,] Sikha Bagui[1] and Robert Lamar[2] - University of West Florida[1], Warner University[2]

Exploratory research of Covid-19 Vaccination Effects on population in Florida

In this paper, we studied longitudinal COVID-19 vaccination data for the State of Florida, from 19th of January 2021 till 2nd of April 2021. For this analysis, the State of Florida was divided into six geographic regions and the whole State of Florida was used as the control group. The project assessed whether there was any detectable reduction in the population prevalence of COVID-19 in the State of Florida, associated with the current early stages of vaccination. We compared the actual number of new COVID-19 cases and deaths as well as the changes in disease prevalence across sex and racial groups between the sub-regions. Analysis showed that the vaccination had different rates. The slope was significantly different in some regions and with respect to some categories. Finally, the analysis showed that the COVID-19 vaccination played an important role in reducing the number of new cases of COVID-19 and new deaths in the state and sub-regions of Florida.

Ala' J. Alnaser, Abigail Bowers, Aaron Bardal and Jared Bunn – Florida Polytechnic University

STEM-Focused and Personalized for First-Term Calculus Students

In this project we seek to improve success and retention of STEM majors by improving student motivation for problem solving in STEM applications. This is done through enhancing first year and second year Calculus courses by not only connecting the learned theory to real-life STEM examples, but moreover relating them to the students' actual areas of interest. Many projects and assignments were designed for this purpose, with a basic structure of (i) watching a video with examples, (ii) choosing an area of interest such as Mechanical or Electrical Engineering, Computer Science or Data Analysis, (iii) solving a real-life application based on this choice, and (iv) filling out a short survey and discussing with peers. We believe that this project is an extension on previous results that show the positive effect of homework on student learning, with the added motivation that comes from the student's personal interest.

Lindsey Fox – Eckerd College

Management of Epidemics through Governance

In this study, we consider a system of ODEs for a two-patch epidemiological model with various management strategies for outbreaks of two diseases: Cholera and Ebola. Optimal control theory is used on both models to minimize the cost of the strategies and the burden of the epidemic. We

analyze whether the difference in disease transmission mechanisms affect the management strategies of two types of governance: one-size-fits-all management for both patches and customized management for each patch.

Session IV-B

Joseph Ours– State College of Florida

Get Started with LaTeX

Learn how to start using LaTeX. LaTeX is a document preparation system used for the communication and publication of scientific documents and is a wonderful tool for typing mathematical documents—especially exams. This presentation will cover the very basics and allow you to begin writing LaTeX exams and documents. This will be a hands-on presentation and you will have the opportunity to create your own LaTeX document. This will be accomplish via Overleaf—an online editor for documents written in the LaTeX markup language. Please sign up for a free Overleaf account at https://www.overleaf.com/signup before attending the presentation.

Kristina Zogovic, Marcus Green (Graduate Students), Subhash Bagui, Jossy Uvah and Sikha Bagui - University of West Florida, **Robert Lamar -** Warner University

Exploratory research of Covid-19 Vaccination Effects on population in Florida

In this paper, we studied longitudinal COVID-19 vaccination data for the State of Florida, from 19th of January 2021 till 2nd of April 2021. For this analysis, the State of Florida was divided into six geographic regions and the whole State of Florida was used as the control group. The project assessed whether there was any detectable reduction in the population prevalence of COVID-19 in the State of Florida, associated with the current early stages of vaccination. We compared the actual number of new COVID-19 cases and deaths as well as the changes in disease prevalence across sex and racial groups between the sub-regions. Analysis showed that the vaccination had different rates. The slope was significantly different in some regions and with respect to some categories. Finally, the analysis showed that the COVID-19 vaccination played an important role in reducing the number of new cases of COVID-19 and new deaths in the state and sub-regions of Florida.

Brian Camp - Suncoast Credit Union

Tales from the Bootstrap

An eclectic mix of stories from a recovering teacher – the job market for math people; bootstrapping, pi and phi; Excel isn't really that bad; some quizzes on data visualization and the square root of two.

Matthew Kimm and Gary Marmon (Graduate Students), Jay Kim and Anthony Okafor - University of West Florida

Applications of the Markov Method for Ranking and Recommendation Tasks

We discuss the Markov rating method, which has found success in ranking sports teams, and describe its application to graph based ranking methods. Then, we describe the application of graph based ranking methods to recommendations problems, and the advantages of additionally using the Markov rating method. Finally, we present an application of the Markov method to a higher educational recommendation task.

Contributed Papers Session V

Full Session

Michael Brilleslyper - Florida Polytechnic University and **Beth Schaubroeck** - U.S. Air Force *Academy*

Palindromic Polynomials, Unimodular Roots, and Trigonometric Equations

A polynomial with all its roots having modulus one in the complex plane is called unimodular. It is well known that a unimodular polynomial must have coefficients that form a palindrome or an anti-palindrome. The converse, however, is false. Here we discuss a one-parameter family of anti-palindromic polynomials of even degree and describe how changing the parameter value increases the number of roots of modulus one until the polynomial is unimodular. The unimodular condition on a polynomial seems very rigid and sensitive to small changes, but this is not the case. Indeed, there is a continuous range of the parameter that preserves this property. Translating the problem to an equivalent trigonometric setting provides a simple explanation for the observed behavior. This talk is accessible to undergraduates and will include numerous graphics and animations created using Mathematica.

Jay Kim, Anthony Okafor and Josaphat Uvah - University of West Florida

First Semester to First Year in College: Factors Predicting Improvements in GPA among At-Risk Students

First semester GPA performance is the most significant predictor for college dropouts. Interventions among at-risk students need to target their efforts to improve first year GPA; i.e. second semester improvements. A small size university in the Southeast US found that 76% of students who underperformed (GPA < 2.0) in their first term went on to drop out in their first year. Improving GPA past the first term is critical to reducing the dropout rate among these students. This study considers which factors best predict improvement in GPA during second and summer terms for at-risk first year students. Factors considered include pre-college factors (high school GPA, test scores, etc.), demographic factors, and type of major (STEM vs. non-STEM). The results will help identify what can be done for at-risk students beyond the first semester as well as which students can benefit the most from targeted improvement efforts.

Session V-A

L. H. Kuo and Niranjan Warnakulasooriya Mahaguruge - University of West Florida

Meshfree space-time method for solving two-dimensional wave equation

In recent years, the time-space technique has demonstrated the potential to solve time-dependent problems such as wave equations to a Poisson-type PDE. In this presentation, we utilize Kansa's method with Radial Basis Functions (RBF) to solve the Wave equation as Poisson's type of equation. To overcome the resultant ill-conditioned matrix, we further apply ghost points as center points for the RBF kernel. The numerical results demonstrate that the accuracy of the solution of the Wave equation can reach up to 1E-10, which is potential to be used for nano-scale simulation.

Kevin Murphy – Saint Leo University

Kahoot! in Calculus vs a General Education Course

This talk will introduce the online quiz tool Kahoot! and how it can be used to stimulate interest and participation in a variety of courses. In the Fall I used Kahoot! for both a general Business Math general education course and for a Calculus 1 course. I will describe what I did including the successes and shortcomings.

Hitakshi Lahrani - University of South Florida

Partially ordered sets and quandles.

We will review the basics of quandles which are algebraic structures coming from knot theory. Given a partially ordered set structure on a quandle, we will discuss compatibility of the order with the binary operations of the quandle. We will present many examples. The talk will be self-contained.

Benjamin Titera (Undergraduate Student) – University of North Florida

Planar Graphs and Embeddings

This presentation discusses planar graphs: graphs which can be drawn in the plane without any two edges crossing. We examine the properties such a graph must possess and consider examples of planar and nonplanar graphs. These observations are generalized to graphs drawn on any closed, connected, orientable surface.

Session V-B

Yanhui Zhu, Fang Hu, Lei Hsin Kuo and Jia Liu - University of West Florida

SCOREH+: A High-Order Node Proximity Spectral Clustering on Ratios-of-Eigenvectors Algorithm for Community Detection

Complex network analysis has brought significant advances to uncover network mesoscopic properties. Community detection is one of the significant features of understanding real complex systems. This paper proposes a High-order node proximity Spectral Clustering on Ratios-of-Eigenvectors (SCOREH+) algorithm for community detection in complex networks. This algorithm preserves high-order transitivity information of the affinity matrix in a network:

1. We construct the high-order proximity matrix from the original affinity matrix using the Radial Basis Functions (RBFs) and Katz index.
2. We obtain the normalized Laplacian matrix and the normalized leading eigenvectors—the ratios of the leading eigenvectors aid in mitigating the effect of degree heterogeneity.
3. We harness a procedure that joins an additional eigenvector (the $(K+1)^{th}$ leading eigenvector) to the spectrum domain for clustering if the network is considered to be a ``weak signal" graph.
4. We apply the K-means algorithm to the spectrum domain for acquiring the node labels.

We compare our SCOREH+ algorithm with the spectral clustering (SC), the Spectral Clustering on Ratios-of-Eigenvectors (SCORE), and SCORE+. To demonstrate the high effectiveness of our algorithm, we conduct comparison experiments on nine real-world networks and several synthetic networks with noises. The experimental results show that our SCOREH+ outperforms SC, SCORE, and SCORE+ on most of these networks. In addition, we find that by tuning the RBFs and their shaping parameters, we can obtain state-of-the-art community structure on all real-world and even on noisy synthetic networks.

Channa Navaratna - Indiana University of Pennsylvania and **Menaka Navaratna** - Florida Gulf Coast University

Wildlife Tracking with Asynchronous Multiple Directional Antenna Readings

While GPS tracking provide a location information with better accuracy, it requires a substantial financial investment. In comparison, VHF radio telemetry is a low-cost option with ease of maintenance. Therefore, it is still popular among scientists. Multiple antennas with triangulating techniques can be deployed to estimate the location of a radio tagged animal. Telemetry data from multiple antennas can significantly improve the accuracy of location. Wildlife telemetry, in most cases, involves collecting data under less than perfect weather/terrain condition. Often data from multiple antennas are not collected at specified times or time intervals. This may create complications in estimation process. Further, obstructions in the field may prevent some antennas from receiving the signal transmitted. We investigate ways to use recursive approximation filtering techniques to accommodate data gathered by at asynchronous time intervals and the use of mobile antennas in data gathering.

Albert Hancock (Undergraduate Student) – University of North Florida

Generating Functions and The Catalan Numbers

Abstract. Generating functions are a type of formal power series used to provide a closed-form solution for recurrence relations. We explore the procedures of using ordinary generating functions and products of generating functions, and in particular, their application in finding a closed-form expression of the Catalan sequence. After the base recursion of triangulations of a

convex (n+2)-gon, further applications of the Catalan numbers are examined in Dyck paths and ballot sequences.

Contributed Posters Session

Karin Ebey and Mariana Olivares-Cely (Undergraduate Students) and Lindsey Fox – Eckerd College

Modeling the Effects of Resistance to Disinfectants on the Transmission of Nosocomial Infections

Antimicrobial resistance is a growing threat, increasing the rate and complications of hospital-acquired infections. This study explores how resistance to disinfectants affects the spread of nosocomial diseases. An ODE compartmental model was created to describe the transmission of two strains of a generalized pathogen, resistant and susceptible to disinfectants, throughout a hospital ward. Transmission occurs directly and through contact with an environmental reservoir of pathogen. Evolution of resistance occurs through mutation and horizontal gene transfer. Different selection pressure magnitudes, and the ratio of disinfectant efficacy on resistant and susceptible strains, were tested. More people become infected overall, and a more significant proportion get the resistant strain, when the selection pressure for resistance is higher. In all simulations, the majority of transmission occurs directly, but as selection pressure increases, a more significant proportion of cases are caused by contact with the environmental reservoir. These results have important implications for infection management.

Isaac Blackburn and Kat Fillman (Undergraduate Students) and Lindsey Fox – Eckerd College

Mathematically Modeling the Role of Healthcare Workers in the Environmental Transmission of C. difficile

Clostridioides difficile is the leading cause of infectious diarrhea and one of the most common healthcare-acquired infections in United States hospitals. C. difficile persists well in healthcare environments because it forms spores that can survive for long periods of time and can be transmitted to susceptible patients through contact with contaminated hands and surfaces that can harbor infectious agents, called fomites. This study explores an alteration of a previous model to include healthcare workers as a transmission vector in conjunction with high-touch and low-touch fomites. The transmission is described by a system of ordinary differential equations representing four patient classes, two pathogen environmental reservoirs, and two healthcare worker groupings. Parameters have a significant effect on the incidence and three different parameter scenarios were explored. The goal of this study was to successfully alter the pre-existing model to encompass the healthcare workers as a transmission vector.

Evelyn Smith (Undergraduate Student), Constance Schober - UCF and **Lane Ellisor (Undergraduate Student), Annalisa Calini -** College of Charleston

Computational and Linear Stability Studies of Damping Effects on Rogue Wave Formation.

Inspired by the work of Schober and Strawn on the effects of damping on the formation and persistence of rogue waves in deep water, modeled by the nonlinear Schrödinger (NS) equation and its higher-order generalizations (HONS), we investigate two interesting scenarios.

1. Counterintuitively to the expected effects of damping, under certain initial conditions, damping may temporarily cause rogue waves solutions to grow in height beyond the maximal height of the initial HONS solution.

2. Small perturbation of unstable single frequency waves (undisturbed sea state) in NS models typically results in waves of greater amplitude that recur in time. When the steepness of the wave is large enough, energy is permanently transferred from the carrier wave to lower ``sidebands" modes. This is known as permanent downshifting, a phenomenon that typically inhibits rogue wave formation.

While Schober and Strawn study the effects of nonlinear damping, our study focuses on the effects of viscous damping. To this end, we present numerical realizations of rogue waves and stability calculations for background states in higher-order Nonlinear Schrödinger models with viscous damping terms.

Payton Bivens and Kelsey Weeden (Undergraduate Students) and Lindsey Fox – Eckerd College

Mathematically modeling the transmission of Koi herpesvirus in common carp

Koi herpesvirus (KHV) is an extremely contagious virus that affects common carp. The virus is transmitted through direct contact with infected fish, contaminated fluids, or other contaminated vectors. In this study, we constructed an epidemiological model that uses a system of ordinary differential equations to describe the dynamics of transmission of KHV. Classes include susceptible, exposed, infectious, ailing, and recovered. Some parameters of the model fluctuate with water temperature. The rate of progression through both compartments exposed (E) and infected (I) are dependent on temperature. Between sixteen degrees celsius and twenty-eight degrees celsius, the progression rates are highest. The goal is to better understand the direct transmission of KHV before adding an environmental component to study transmission via contaminated water.

Brendan Chamberlain (Undergraduate Student) – University of North Florida

Security Systems and Location Numbers of Graphs

We discuss location numbers of graphs and their applications to security systems. Given some number of sensors that output the distance between the room which the sensors are placed in and the room which an intruder is in, the location number of a connected graph can be interpreted as the smallest number of such sensors required in order to uniquely determine which room the intruder is in. More specifically, the locating code of a vertex with respect to some set of vertices in the graph is a vector whose entries are the distances between the vertex and the vertices in the set. A set of vertices in the graph is a locating set if every vertex in the

graph has a unique locating code with respect to that set. The cardinality of a minimum locating set is the location number of the graph.

Plenary Sessions

Jose Perea, MAA NAM Speaker - Northeastern University

Bio: Jose Perea is an associate professor in the department of mathematics and the Khoury college of computer sciences. Prior to Northeastern, he held positions as an assistant professor of CMSE and Mathematics at Michigan State (2015 – 2021), and as a visiting assistant professor of Mathematics at Duke University (2011 – 2015). He holds a PhD in Mathematics from Stanford University (2011) and a BSc in Mathematics from Universidad del Valle, Colombia (Valedictorian, Summa cum laude, 2006). He is the inaugural 2022-2024 lecturer for the Mathematical Association of America and the National Association of Mathematics, a recipient of a 2020 NSF CAREER award, a 2020 honoree of Lathisms (Hispanic heritage month), and a 2018 honoree of Mathematically Gifted and Black (black history month).

The Underlying Topology of Data

Topology, and particularly algebraic topology, seeks to develop computable invariants to quantify the shape of abstract spaces. This talk will be about how such invariants can be used to analyze scientific data sets, in tasks like time series analysis, semi-supervised learning and dimensionality reduction. I will use several examples to illustrate real applications of these ideas.

Lisa Marano, Chair of MAA Committee on Sections - West Chester University

Bio: Dr. Lisa Marano is the Associate Dean for the College of the Sciences and Mathematics at West Chester University. Prior to serving in this role, she served as inaugural co-director of the WCU First Year Experience and taught in the program since its pilot in Fall 2018. As a Professor of Mathematics, she mainly taught Financial Mathematics and Statistics courses while serving as the founding director for the department's Actuarial Science program. Dr. Marano has taught courses combining Mathematics and Social Justice that illustrate how mathematics can be used as a tool to empower. She also serves on the Board of Directors for the Mathematical Association of America as the Chair of the Committee on Sections. In her MAA section, EPaDel, she served as Representative, Chair, Vice-Chair, and Section NExT Coordinator. On a personal note, she enjoys spending time with her partner, Chet, and son, Kyle, and watching Kyle compete as a swimmer and diver.

Mathematics and Community Engagement: A story about finding mathematical problems in the community and bringing mathematics into the community.

First-year seminars, learning communities, service-learning courses, undergraduate research projects, and capstone experiences are among a list of high-impact educational practices compiled by George Kuh (2008), which measurably influence students' success in areas such as student engagement and retention. It is recommended that all college students participate in at least two of these HIPs to deepen their approaches to learning, as well as to increase the

transference of knowledge (Gonyea, Kinzie, Kuh, & Laird, 2008). In Mathematics, if a student participates in service-learning, it is typically in the form of tutoring, in conjunction with a school or with an after-school program, or modeling work or statistical analysis for non-profits. Today, I will discuss a number of service-learning projects developed for mathematics courses, which do not involve these traditional opportunities. I will also describe my current research project which has potential impact on my community and yours.

Anastasia Chavez, MAA AWM Speaker - Saint Mary's College of California

Bio: 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 bachelor's degree in applied mathematics and master's 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.

Matroids, Positroids, and Beyond!

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 arises a representable matroid (over some field F). It has been shown that most matroids are neither graphical or representable, 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 ecodes 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.

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