
2019 Joint Meetings
Florida Section of
the Mathematical Association
of America
Florida Two-Year
College Mathematics
Association
Polk State College
Lakeland Campus
February 15-16, 2019
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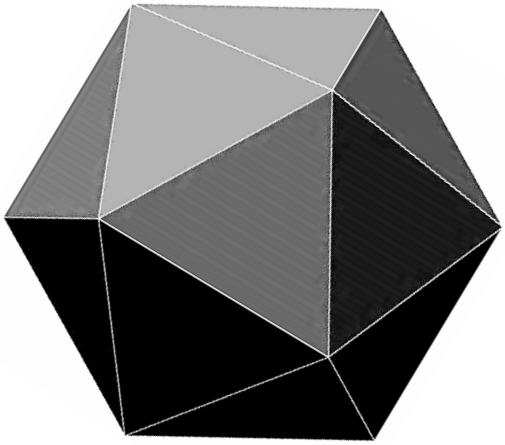
2019 Joint Meetings
Of The
Florida Section
Of The
Mathematical Association of America
And The
Florida Two-Year College Mathematics Association



Polk State College
Lakeland Campus

February 15 - 16, 2019

Florida Section of the Mathematical Association of America

2018 – 2019

Section Representative	Pam Crawford, Jacksonville University
President	Penny Morris, Polk State College
Past President	Brian Camp, Saint Leo University
Vice-President for Programs	Milé Krajcevski, USF
Vice-President for Site Selection	Joy D'Andrea, USF Sarasota-Manatee
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Florida Two-Year College Mathematics Association

2018 - 2019

President	Sandra D. Seifert, Florida SouthWestern State College
Past President	Altay Özgener, State College of Florida
President-elect	Joni Pirnot, State College of Florida
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Historian	Robert M. Shollar, State College of Florida Manatee-Sarasota
Webmaster	Altay Özgener, State College of Florida

PROGRAM

Friday, February 15, 2019

Committee Meetings and Workshops

FL – MAA

10:00 – 11:30	**Executive Committee Meeting**	**LTB 1120**

FTYCMA

10:00 – 11:00	**FTYCMA Officer's Meeting**	**LTB 1121**
11:00 – 12:30	**FTYCMA Annual Business Meeting**	**LTB 1121**

Registration

11:00 –	**Registration & Publishers**	**LTB 1105**

Sign in and browse the displays from several publishing representatives

Welcome

1:40 – 2:00	**Welcoming Remarks**	**LTB 1100**

Angela Falconetti, President, Polk State College
Sandra D. Seifert, President, FTYCMA
Nancy J. Rivers, Southeast Vice-President AMATYC
Penny Morris, President, FL-MAA

Friday, February 15, 2019

2:00 – 2:50 Plenary Session LTB 1100

Deanna Haunsperger – Carleton College, President of MAA

Bright Lights on the Horizon

3:00 – 3:45 Contributed Papers Session I

Full Session

Li Zhou – Polk State College **LTB 1305**

MONTHLY dose of Euler, Gauss, and Riemann

Chuck Lindsey – Florida Gulf Coast University **LTB 1306**

The Introduction of Hindu-Arabic Numerals into Europe

3:00 – 3:20 Session A

Jacci White – Saint Leo University **LTB 1309**

MAA-FL History (Part I)

C. Altay Özgener – State College of Florida **LTB 1310**

How Not to Prove the Riemann Hypothesis

Jenna Harwick (Graduate) – University of North Florida **LTB 1120**

Modeling Macronuclear Assembly of Ciliates

Joseph Ours (Graduate) **-** University of North Florida **LTB 1121**

Maximal Prefix Codes and Automata

3:25 – 3:45 Session B

Monika Kiss – Saint Leo University **LTB 1309**

MAA-FL History (Part II)

Pin Hung Kao – Flagler College **LTB 1310**

Polynomials at Prime Arguments

David House (Graduate) **-** University of North Florida **LTB 1120**

Transition Polynomials of Four-Regular Graphs

Rhys Jones (Graduate) - University of North Florida **LTB 1121**

Maximal Bond Free Languages

3:00 – 4:45 Special Topic Session-Panel **LTB 1122**

Roberta (Bobbi) Parrino Cook – Indian River State College
Panel Participants: Scott Brewer, Lanie Culligan, Eva Allen,
Kris Demarais, Elizabeth Zeiss, Daniel Richardson, Lynne O'Dell, Bobbi Cook

Dramatic Increases in Student Learning and Success in Introductory Mathematics Within the Environment of SB1720

4:00 – 4:45 Contributed Papers Session II

Full Session

Scott Hochwald – University of North Florida **LTB 1305**

Mathematical Potpourri

Anurag Katyal – Palm Beach State College **LTB 1306**

Teaching More By Talking Less: A Radical Experiment with Active Learning

4:00 – 4:20 Session A

Joy D'Andrea – USF Sarasota-Manatee **LTB 1309**

Euler Extension Episode Continued

Rebecca Williams – State College of Florida **LTB 1310**

Ideas for the ~~Lazy~~ Efficient Professor

Ovidiu Nechita (Undergraduate) – Florida Atlantic University **LTB 1120**

Branch Points

Sierra Inks (Graduate) **-** University of North Florida **LTB 1121**

Integer Partitions, Young Tableaux, and (0, 1)-matrices

4:25 – 4:45 **Session B**

Scott H. Demsky – Broward College **LTB 1309**

A Classroom Model for Increasing Learning and Success in Liberal Arts Math

Matthew E. Winters – Stetson University **LTB 1310**

Coloring graphs of fractional power less than one

Jay Kim (Graduate), Anthony Okafor - University of West Florida **LTB 1120**

Female Specific State Level Variables on STI Rates for US Women 20 years and Older

4:25 – 5:50 Student Events LTB 1121

4:25 - 5:05 **Student Integration Contest-**

Come and test your integration abilities!

5:05 - 5:50 **Student Problem Solving Contest-**

Students test their problem solving skills.

4:50 – 5:30 Section Representative's Session LTB 1120

Pam Crawford – Jacksonville University

News and Notes from the MAA

4:50 – 5:30 **Conference Break** **LTB 1105**

Please visit the textbook publishers

5:40 – 6:30 **Plenary Session** **LTB 1100**

Gregory McColm – University of South Florida

The Geometry of Paradise

Saturday, February 16, 2019

9:00 – 9:45 Contributed Papers Session III

Full Session

Christine Potthast, Victor Bague,
Patrick Berry, Phillip Waitkevich, Shane Irons,
Anthony Fontana (Undergraduates) **-** Saint Leo University **LTB 1305**

The Future is Now

Michael Reynolds – Indian River State College **LTB 1306**

Key Points in the History of Algebraic Notation

Ozlem Ugurlu – Palm Beach State College **LTB 1309**

Borel Orbits and Lattice Paths

9:00 – 9:20 Session A

Daniel L Kern, Menaka B Navaratna – Florida Gulf Coast University **LTB 1310**

Diverse Assessments and Consistent Intervention in Calculus

Matt Cuffaro – Independent scholar **LTB 1120**

In the Garden of Gamma Functions

Allynn Burns (Undergraduate), **Anthony Okafor** - University of West Florida **LTB 1121**

Time Series Modeling of Summer Average Precipitation in the Southeastern Region of the United States.

Abigail Foreman (Undergraduate) **-** University of North Florida **LTB 1122**

A Brief Introduction to Quantum Information Theory and Grover's Algorithm

9:25 - 9:45 Session B

James Garrett (Graduate) – University of South Florida **LTB 1310**

Algebraic Systems for DNA Origami Motivated by Jones Monoids

Matt Cuffaro – Independent scholar **LTB 1120**

Braid Theory in Heliophysics

Adebukola Adeyemi – Flagler College **LTB 1121**

On Bayesian-Frequentist Hybrid Inferences in Statistics with Application to the Non-nested Disposition Model for Correlated Binary Outcomes

Joseph Free (Graduate) **-** University of North Florida **LTB 1122**

Communicative Dynamics of Finite Directed Graphs

10:00 – 10:45 Contributed Papers Session IV

Full Session

Julie Phelps, Ryan Kasha – Valencia College **LTB 1305**

IMPACT: Improving Mathematical Prowess and College Teaching Or Making an Impact on Students in the Math Curriculum

Markus Schmidmeier – Florida Atlantic University **LTB 1306**

2:3:4 Harmony within the Tritave

Jossy Uvah - University of West Florida **LTB 1309**

Some issues Affecting Performance in the Calculus. Are There Remedies?

Carrie E.A. Grant – Flagler College **LTB 1122**

Coordinating a Three Phased Final Project for an Introductory Statistics Course

10:00 - 10:20 Session A

Lina Fajardo Gomez (Graduate) – University of South Florida **LTB 1310**

Product-simplicial complexes in a word graph

Robert M. Shollar – State College of Florida, Manatee- Sarasota **LTB 1120**

Elliptic Curves and the Proof of Fermat's Last Theorem

Matthew Kimm (Graduate), **Anthony Okafor** - University of West Florida **LTB 1121**

Machine Learning Techniques and Applications to Higher Education

10:25 - 10:45 Session B

Vincent J. Matsko – Independent Consultant **LTB 1310**

Making Sequences and Series Accessible

Kurt A. Sebastian - Flagler College **LTB 1120**

Building a Mathematics and Technology Program at a Small, Private Liberal Arts College

Sikha Bagui and Regina Eckhardt (Graduate) **LTB 1121**
-University of West Florida

Deep Learning for Phishing Email Classification

11:00 – 11:45 Contributed Papers Session V

Full Session

Debbie Garrison – Valencia College **LTB 1305**

Ways to Incorporate GAISE Recommendations in Your Introductory Statistics Class

11:00 - 11:20 Session A

Shen Zhang (Graduate) **-** University of West Florida **LTB 1309**

Ground state solutions for quasilinear Schrödinger equations with critical growth and lower power subcritical perturbation

Mike Desgrottes (Graduate), **Steven Senger,** **LTB 1120**
David Soukup,Renjun Zhu - University of West Florida

A General Framework for Studying Rainbow Configurations

Daniel McGinnis, Eirini Poimenidou- New College of Florida **LTB 1121**

A Method to Construct 1-Rotational Factorizations of Complete Graphs and Solutions to the Oberwolfach Problem

11:25-11:45 **Session B**

Christlene Aimetee (Undergraduate), **Samantha Seals** – University of West Florida **LTB 1120**

Hypertension and Diabetes in Southern African Americans: Data from the Jackson Heart Study

Naimul Chowdhury (Undergraduate) – New College of Florida **LTB 1121**

The Pumping Lemma and Classification of Natural Languages

12:00 – 12:50 **Plenary Session** **LTB 1100**

Vilmos Totik – University of South Florida

Boring Calculus?

1:00 – 1:10 **Closing Remarks** **LTB 1100**

Sandra D Seifert, President, FTYCMA
Penny Morris, President, FL-MAA

1:20 – 2:40 **Luncheon and Awards** **LTB 1100**
FL-MAA Business Meeting

ABSTRACTS

Plenary Sessions

Deanna Haunsperger – Professor of Mathematics at Carleton College

Bio: Dr. Deanna Haunsperger is a professor of mathematics at Carleton College in Minnesota. Since her own undergraduate days, Deanna has been interested in increasing the number of students who pursue advanced degrees in mathematics That passion has guided her as a former co-editor for Math Horizons (the Mathematical Association of America's magazine for undergraduates) and as co-founder and co-director of Carleton's Summer Mathematics Program for Women (a successful, intensive four-week summer program to encourage talented undergraduate women to pursue advanced degrees in the mathematical sciences). She has chaired the MAA's Strategic Planning Committee on Students and the Council on Outreach. Deanna is a former President of the MAA (2017-2018). She is married to fellow mathematician Steve Kennedy, and together they have two grown children.

Bright Lights on the Horizon

Math Horizons, the MAA undergraduate magazine, is now over twenty years old. In those two decades many fabulous articles have appeared. In this talk we will survey some of the speaker's favorites, that list includes pieces on square-wheeled bicycles, Egyptian arithmetic, non-transitive dice, magic tricks, jokes, and mathematical paintings, theater and sculpture.
Here is an idiosyncratic tour of the best of Math Horizons.

Gregory McColm - Associate Professor of Mathematics at USF

Bio: Gregory McColm has been teaching and doing research in mathematics at USF for 33 years. Originally working in logic and computer science, he turned to geometry during the past decade - especially as applied to crystallography. A history buff, he is now working on mathematical patterns in Arabesque art.

The Geometry of Paradise

For over a thousand years, much of the art and craftwork in the Middle East featured highly symmetric and stylized designs. Such a design was not an ornament framing a primary subject, but was itself the primary subject. Although there is similar work around the world, from ancient China to native America, the arabesque masonry, ceramics, textiles, and even calligraphy, consisting of interwoven foliage, writing, and even abstract curves, are most often associated with medieval and early modern Islam. There and then the most geometrically complex art appeared, and although the motives and methods of the artists and craftspeople is conjectural (and therefore controversial), their work can be examined, described, and analyzed with the machinery of modern geometry.

Vilmos Totik – Professor of Mathematics at University of South Florida

Bio: Vilmos Totik is a professor at USF, a member of the Hungarian Academy of Sciences. He is working in mathematical analysis, in particular in the theory of orthogonal polynomials, approximation theory and potential theory. He has (co)-authored 6 books and a problem book on set theory.
He wrote about 200 research papers and 15 educational articles.

Boring Calculus?

Learning calculus skills requires solving lots of simple, repetitional problems. To cheer up students, in my calculus classes I used to discuss some much more challenging/exciting questions, and the talk will discuss some of them. Seemingly the problems (like "The lion and the tamer" or "The snail and the wicked boy") have nothing to do with calculus, but their solution requires some elementary calculus results (like the divergence of the harmonic series or the growth of the exponential function).

Contributed Papers Session I

Full Session

Li Zhou – Polk State College

MONTHLY dose of Euler, Gauss, and Riemann

The **Problems and Solutions** column of the *American Mathematical MONTHLY* may serve as a bridge from course work to creative and research mathematics, and is therefore a valuable resource for both students and teachers of all levels, from high school to graduate school. In this talk, we present three recent problems from *MONTHLY* involving Euler's product, Gauss' AGM algorithm, and Riemann's zeta function. The talk is accessible to calculus students.

Chuck Lindsey – Florida Gulf Coast University

The Introduction of Hindu-Arabic Numerals into Europe

Many histories on the introduction of Hindu-Arabic numeration into Christian Europe name Gerbert d'Aurillac as the key figure behind this initiative. However, there is still a considerable amount of uncertainty regarding key details, including Gerbert's original purpose for this innovation, and the evidence in many respects is very thin. In this talk we will discuss the mathematical environment in the late 10^{th} century, Gerbert's introduction of the new numeration system, and examine some of the early efforts in the late 10^{th} and 11^{th} centuries to disseminate the new system. Along the way, we will take a closer look at what the existing evidence actually says and at some specific questions that are still very much unresolved.

Session I - A

Jacci White – Saint Leo University

MAA-FL History (Part I)

Can you believe it is that time again? We need more great MAA stories from our Florida section to update our history documents and archives. Come ready to share stories new and old, or just to listen as other people reminisce. You are welcome to share anything related to the MAA (or our members ☺). If you have the writing skills and interest to improve our document then you should also come to the session to take notes and join the history team.

C.Altay Özgener – State College of Florida

How Not to Prove the Riemann Hypothesis

We will talk about the recent hoopla (which never ends) about the Riemann Hypothesis started with Sir Michael Atiyah. We will give a brief history of the problem, and talk about implications.

Jenna Harwick (Graduate) – University of North Florida

Modeling Macronuclear Assembly of Ciliates

Ciliates, an ancient group of organisms, have evolved one of the most intricate DNA processing in living organisms. Ciliated protozoa carry out massive and intricate processing of DNA during conversion of micronuclear genome to a macronuclear genome after cell mating. We will examine three mathematical operations, *ld, dlad,* and *hi,* used in the process of assembling a gene into its macronuclear form. All involve cutting and ligation of the DNA at one or more pairs of identical (direct) or inverted repeated sequences. The rearrangement of these blocks of DNA can be represented by compositions of functions on signed permutations or on strings of ordered pairs, by double-occurrence words, or by graphs.

Joseph Ours (Graduate) – University of North Florida

Maximal Prefix Codes and Automata

This presentation discusses some characteristics of prefix codes. It starts with a brief survey of prefix codes. Then, we demonstrate how to graphically represent prefix codes through the construction of their literal automata and, finally, we construct their minimal automata. The presentation concludes with important properties relating prefix codes with their corresponding minimal automata.

Session I - B

Monika Kiss – Saint Leo University

MAA-FL History (Part II)

Can you believe it is that time again? We need more great MAA stories from our Florida section to update our history documents and archives. Come ready to share stories new and old, or just to listen as other people reminisce. You are welcome to share anything related to the MAA (or our members ☺). If you have the writing skills and interest to improve our document then you should also come to the session to take notes and join the history team.

Pin Hung Kao - Flagler College

Polynomials at Prime Arguments

We adopt A. J. Irving's double-sieve method to study the almost-prime values produced by irreducible polynomials and products of irreducible polynomials evaluated at prime arguments. For the first part of the talk, we will provide a historical background on this classical problem in additive number theory. For the second part of the talk, we will discuss the main idea behind the double-sieve method and the improved results from their classical counterparts.

David House (Graduate) – University of North Florida

Transition Polynomials of Four-Regular Graphs

By visiting edges, half edges, and vertices, we can follow specific pathways throughout a graph. There are several kinds of transitions at a vertex. In this presentation, we specifically look at three possible transitions at a 4-degree vertex. Giving a weight to these transitions allows us to create an equation to represent the pathway through the graph. These equations are formed by the transition polynomials. We will compute the weighted transition polynomial of a four-regular graph by using vertex reduction and recursion.

Rhys Jones (Graduate) – University of North Florida

Maximal Bond Free Languages

Bond free languages are languages consisting of words that adhere to specific restrictions on the subwords. Such conditions were motivated by studying unwanted hybridization of DNA strands and were formulated using involution mappings. Later, they were abstracted to the theory of codes. We investigate the maximality of sets of words conforming to such restrictions and discuss a structural characterization.

Special Topic Session-Panel

Roberta (Bibbi) Parrino Cook - Indian River State College

Panel Participants: Dr. Scott Brewer, Lanie Culligan, Eva Allen, Kris Demarais, Elizabeth Zeiss, Daniel Richardson, Lynne O'Dell, Dr. Bobbi Cook

Dramatic Increases in Student Learning and Success in Introductory Mathematics Within the Environment of SB1720

After four years in the math redesign Action Research Project - MARS (Math At the Root of Success), Indian River State College (IRSC) is dramatically improving student learning and success rates in introductory mathematics with an increase of over 22% which is equivalent to an improvement of over 12 percentage points. Details of the MARS Project will be explained by a panel of instructors and researchers in the project. To help serve the new student population created by the passage of SB1720 in 2013, IRSC expanded the MARS Project into two introductory math courses with multiple deliveries – one for STEM and one for LIBERAL ARTS Pathways. A peer tutoring program and different types of emporium and collaborative learning models have been used along with the use of both quantitative and qualitative data collection. Many aspects of the MARS Project can be replicated at any institution.

Contributed Papers Session II

Full Session

Scott Hochwald - University of North Florida

Mathematical Potpourri

20th and 21st century mathematical anecdotes will be blended with some simple problems with amusing answers. Interspersed throughout this entertaining presentation will be a collection of mathematical results bound by a common connection to the number 2. While the harmonic series will be a starting point for much of the mathematics, uncountable sets also get some coverage. It is hard to give additional details given the nature of the talk. However, at some point almost periodic functions, sieves, GPY, and the power of a definition to reduce a 100-page paper to a single page will be discussed.

Anurag Katyal - Palm Beach State College

Teaching More by Talking Less: A Radical Experiment With Active Learning

Some time ago, I decided to take a radical approach to teaching and stopped lecturing entirely. I had slowly transitioned from lecturing exclusively to flipping my classes where students were supposed to watch lectures prior to coming to class and finally to no lectures at all. Time in and outside of class is spent solving problems individually and in groups accompanied by writing prompts that require students to reflect on their problem solving process. In the talk, I would like to talk about the successes and challenges experienced through this journey. I would also like to share practical and usable techniques that other faculty can implement in their classrooms and courses immediately and how this change in teaching has improved student engagement with the course material and with each other in the classroom.

Session II – A

Joy D'Andrea - USF Sarasota-Manatee

Euler Extension Episode Continued

In this talk we will discuss the conclusion and updates from the Euler extension theorem that we created back in 2014, with updates and results from 2015 – current. Join us for an exciting observation and discussion of where this extension concept is going.

Rebecca Williams - State College of Florida

Ideas for the ~~Lazy~~ Efficient Professor

We all have a lot of great ideas, but who has the time to implement them? This session offers easy ideas to enhance your courses, all of which require minimal

preparation. If you feel overwhelmed by the thought of improving your courses, this talk is for you.

Ovidiu Nechita (Undergraduate) - Florida Atlantic University

Branch Points

One of the many visually stunning topics in Complex Analysis is branch points. Many functions, such as roots, are naturally multi-valued when defined over the complex plane; but we often choose to restrict their outputs to a single branch in the interest of making them bona fide functions. In this talk we will explore the details of this process in greater depth. We will see how a multi-valued function following closed paths in the domain naturally arrives at different values in the codomain, solely based on whether the paths encircle branch points. We will see how to use branch cuts to curtail this erratic behavior and extract single valued branches of a multifunction.

Sierra Inks (Graduate) – University of North Florida

Integer Partitions, Young Tableaux, and (0, 1)-matrices

This presentation focuses on the graphical representations of integer partitions, such as Ferrers shapes, and their applications to finding the number of partitions of an integer n. Then, it concentrates on transforming Ferrers shapes into Young tableaux diagrams. It concludes with establishing a bijection between Young tableaux and the class of $(0,1)$-matrices with prescribed row and column sum vectors.

Session II - B

Scott H. Demsky - Broward College

A Classroom Model for Increasing Learning and Success in Liberal Arts Math

Motivating non-STEM students to participate, learn and succeed in Liberal Arts Math classes (MGF1106/1107) can be a challenge. In this talk, the author will demonstrate a partially flipped classroom model that utilizes pre-class assignments, in-class assignments, outside-of-class formative assessments, and in-class summative assessments. This model was implemented in the Fall 2018 semester at Broward College, and it has already resulted in increased student participation, learning and success. The structure can be adapted to classrooms that use varying degrees of online technology and to most any online homework platform. Finally, this model could also be utilized in many other general education math courses.

Matthew Winters - Stetson University

Coloring graphs of fractional power less than one

For positive integers n and m the graph $G^{1/n}$ is lengthening of the graph, while G^m is a shortening. Specifically, $G^{1/n}$ subdivides the graph edges by replacing every edge with a length n path and G^m connects each vertex to the vertices no more than m edges from it. A natural question to ask is what happens when a graph is modified using both operations. For this talk we discuss the extension of known results regarding the chromatic number of graphs $G^{m/n}$. Namely, that clique number $\omega(G)$ and chromatic number $\chi(G)$ of certain fractional graph powers are equal. We will also present some problems suitable for additional research.

Jay Kim (Graduate), Anthony Okafor - University of West Florida

Female Specific State Level Variables on STI Rates for US Women 20 years and Older

Sexually transmitted infections (STIs) are a growing public health concern, with the epidemic of gonorrhea's increasing antibiotic resistance being labelled a global crisis by the WHO. STIs have serious economic and social impacts that disproportionately affect women and can lock them into poverty. Studies on reducing STI rates have typically looked for the characteristics of high-risk individuals or specific racial groups, and usually in geographically limited comparisons. This study expands research on STIs rates by asking what sociodemographic factors unique to women affect their rates of STI

transmission. The study examines the highest-risk group of women by age (young women, 20-years and older) across the entire United States and DC by looking at how variations in sociodemographic conditions for women between states relate to their different STI rates. Data are drawn from the US Centers for Disease Control and the US Census. A time series analysis was performed based on sex-specific variables observable at the state-level. The implications for social policies based on the results of the model are also discussed.

Contributed Papers Session III

Full Session

Christine Potthast, Victor Bague, Patrick Berry, Phillip Waitkevich, Shane Irons,Anthony Fontana (Undergraduates) - Saint Leo University

The Future is Now

Robots are an integral part of society today. They are used in almost every aspect of our lives whether we realize it or not. Last Summer, a small group of students from Saint Leo University began researching Anki's Cozmo, a robot with some of the most advanced Artificial Intelligence (A.I.) commercially available, as part of the Summer Undergraduate Research Initiative (SURI). This presentation will cover our research, the past, present, and future of robotics, some algorithms used in A.I., and the ethics of robotics. We will also talk more about Cozmo, ongoing research on it, and what it can do. This project was advised by Dr. Monika Kiss, and was funded by the National Science Foundation's Emerging Math and Computer Science (EMACS) Scholarship and Saint Leo's Flagship program of the Math and Science Department. The future is now.

Michael Reynolds - Indian River State College

Key Points in the History of Algebraic Notation

In this talk, we trace the history of algebraic notation starting from the first roots of the development of algebra in Egypt and Babylonia around 1700 BC. We will explore the evolution of algebraic expression from prose to symbolic algebra, viewing examples of different notational systems developed by mathematicians attempting to increase the efficiency of algebraic expression. We also examine the origins of some common modern mathematical symbols.

Ozlem Ugurlu - Palm Beach State College

Borel Orbits and Lattice Paths

In this talk, we present our recent progress on the enumeration problem on the number of Borel orbits in classical symmetric spaces.
After introducing the explicit formulas determining the number of Borel orbits in symmetric spaces of classical types Sp(n, C)/GL(n, C) and SO(2n,C)/GL(n, C), we explain how they are in bijection with the set of lattice paths weighted by appropriate statistics.

Session III - A

Daniel L Kern, Menaka B Navaratna – Florida Gulf Coast University

Diverse Assessment and Consistent Intervention in Calculus

Historically calculus classes seem to be viewed as one of the most challenging classes in STEM disciples. There are many reasons behind this statement; lack of prerequisite knowledge, difficulty of content, poor learning styles, lack of accountability, and absence of support. Like many other universities, our institution is negatively affected by the high DFW rates in calculus classes. As an effort to remediate this problem, we have introduced a series of new testing modules and interventions which are intended to increase student learning while improving retention. Early on we test students' knowledge of prerequisite material and give

multiple assignments to strengthen their understanding of basic concepts. In the event that a student displays a poor performance on assignments or a test, we have introduced a series of interventions to improve student learning. A variety of teaching mechanisms were adopted to maintain students' interest in the subject. The data is statistically compared with control groups.

Matt Cuffaro - Independent Scholar

In the Garden of Gamma Functions

The (Eulerian) Gamma function is a ubiquitous throughout mathematics, but it shows itself the most throughout special functions and combinatorics. This talk is an exposition of two variants--the p-adic and q-analog Gamma functions--and their applications.

Allynn Burns (Undergraduate), Anthony Okafor - University of West Florida

Time Series Modeling of Summer Average Precipitation in the Southeastern Region of the United States.

The North Atlantic Subtropical High (NASH) is a high-pressure system located over the Atlantic. It is known to affect precipitation in the United States, however, the cause of that effect is still a mystery. Understanding the variables that make up the NASH and their contributions to the amount of rainfall in the United States could help officials to take the necessary precautions to reduce the devastating effects of drought and over-saturation. To gain this better understanding, a model was created to explain the variability in the average summer (May-September) precipitation in the Southeastern region of the United States using factors which compound the NASH. Variables were chosen and using a correlation matrix, it was determined that some variables were highly correlated. Principal component analysis (PCA) was employed not only to combat the effect of collinearity, but also to reduce the variable dimension. A multi-variate model was then created incorporating time lag to predict the average summer precipitation. The model was significant and had good predictability.

Abigail Foreman (Undergraduate) – University of North Florida

A Brief Introduction to Quantum Information Theory and Grover's Algorithm

This presentation provides a brief overview of the mathematical differences between classical computing and quantum computing, highlighting some of the unique properties that create challenges and advantages for quantum computers. These properties include the no-cloning principle and entanglement. We will also explore a security protocol known as the BB84 protocol which is exclusive to quantum computers. Finally, we will look at a search algorithm known as Grover's which can find a result in an unstructured data set of N values in √N calls to the oracle function.

Session III - B

James Garrett (Graduate Student) - University of South Florida

Algebraic Systems for DNA Origami Motivated by Jones Monoids

The technique of DNA origami, pioneered by Rothemund in 2006, efficiently creates complex shapes and structures at nanolevel. It is observed that feasible simplifications of strand connections, that arise naturally in DNA origami, resemble the monoid relations of the Jones monoids, which are well studied in physics and knot theory. We identify two types of basic building blocks and describe a DNA origami structure with their concatenations. We create a set of rewriting rules which plausibly reflect the origami structure, and give rise to the *origami monoid*. For an origami monoid with n strands, we investigate typical algebraic properties of monoid structures, such as Green's relations and classes. In particular, the number of elements are computed using computer software GAP for $n \leq 6$. Morphisms between origami and Jones monoids are also defined and studied.

Matt Cuffaro - Independent Scholar

Braid Theory in Heliophysics

Braid theory has been applied to understand the twisting of coronal plasma, a phenomena believed to explain the superheating of the solar coronosphere. This talk will introduce existing work on this application of braid theory.

Adebukola Adeyemi – Flagler College

On Bayesian-Frequentist Hybrid Inferences in Statistics with Application to the Non-nested Disposition Model for Correlated Binary Outcomes

For decades, studies have been done on various groups of people, animals, trees, etc. In such studies, there are outcomes that aggregate in the groups. For many researchers, aggregation (dependence) is one of the main reasons for the study. Bonney's dispositional models were developed to address some of the data difficulties experienced in practice, particularly aggregation. Although there has been numerous frequentist estimation method for the disposition models, there is yet any work done on making simultaneous Bayesian-Frequentist inference about the model parameters.
In this work, we propose a new technique for the estimation of the parameters of the disposition models using Yuan's Bayesian-frequentist Hybrid Inference. Particularly, we discuss a new implementation of the Bayesian-frequentist Hybrid Inference with application to the non-nested disposition model. Our results are applied to data on Esophageal Cancer in Chinese Nuclear families and compared to the results from the frequentist method.

Joseph Free (Graduate) – University of North Florida

Communicative Dynamics of Finite Directed Graphs

In this talk, we show that the adjacency structure of finite directed graphs naturally gives rise to semi-flows on the power set of vertices. Adjacency is defined in terms of a communication relation, which on a restricted set of vertices is shown to be an equivalence relation. Using matrix methods, we show that these semi-flows may be succinctly expressed in terms of the adjacency matrix of the graph, and that the orbits of these semi-flows may be used to obtain the equivalence classes of the communication relation.

Contributed Papers Session IV

Full Session

Julie Phelps, **Ryan Kasha** - Valencia College

IMPACT: Improving Mathematical Prowess and College Teaching Or Making an Impact on Students in the Math Curriculum

Learn about how AMATYC's third standards document came about, how it follows from its predecessor documents, Crossroads and Beyond Crossroads, and how it will help math educators shape the vision and modality of college math courses. In addition, this session will discuss how its contents can directly impact you, your students, state policies, and the teaching and learning of mathematics in the first two years of college. This session will hopefully have you leaving with a different perspective, innovative ideas for teaching mathematics, and will serve as an impetus for further reflection in the way college math teaching is approached and practiced.

Markus Schmidmeier - Florida Atlantic University

2:3:4 Harmony within the Tritave

In the Pythagorean tuning system, the fifth (3:2) is used to generate a scale in which notes are identified modulo the octave (2:1). We exchange the formal role of

the prime numbers 2 and 3 in the construction of the scale: So, the octave is used to generate a scale in which notes are identified modulo the tritave (3:1). We discuss how the elements of composition (dominants and subdominants, first and second inversions, major and minor) behave under this duality. We visualize the progress of harmony in the tonal network and illustrate the above mentioned composition elements in a short sample piece.

Jossy Uvah - University of West Florida

Some Issues Affecting Performance in the Calculus. Are There Remedies?

There is universal agreement about the centrality of the calculus as a foundation block for majors in Science, Technology, Engineering and Mathematics, STEM. However, national data shows lackluster success rates in this important general education for STEM. We identify some issues responsible for this state of affairs to include student readiness and faculty instruction. We suggest two concrete and tested intervention strategies to improve students' performance in the Calculus sequence.

Carrie E. A. Grant - Flagler College

Coordinating a Three Phased Final Project for an Introductory Statistics Course

A semester long comprehensive final project in an introductory statistics course has become a common assessment. One challenge of the project is the fact that it is often due at the end of the semester. Dividing the project into three distinct phases that correspond to the three units of study in a traditional statistics course eases the burden of one large assessment due at the end of the semester.

Session IV - A

Lina Fajardo Gomez (Graduate) - University of South Florida

Product-simplicial complexes in a word graph

Words where each symbol appears exactly twice are called double occurrence words (DOWs). Pattern reduction rules in DOWs can simulate DNA recombination processes. Repeatedly applying these rules to remove subwords from a given word generates words that can be arranged in a partially ordered set. This structure can be represented with a graph whose vertices are DOWs connected by an edge if one word can be obtained from the other through a pattern deletion. On this graph, we consider the cell complex consisting of products of directed simplexes, which preserves information about the relationships between words. We define a new boundary operator and prove that the new family of cells is closed under it. This allows the computation of homology groups, which can shed some light on the underlying geometry of the data set.

Robert M. Shollar - State College of Florida, Manatee-Sarasota

Elliptic Curves and the Proof of Fermat's Last Theorem

In 1637, Pierre de Fermat stated his famous problem known as Fermat's Last Theorem. It took over 350 years before Andrew Wiles finally supplied the world with a valid proof. The objective of this talk is to explain the structure of elliptic curves and explore their important role in the proof of Fermat's Last Theorem. We also explore a bit of history about the many mathematicians who contributed to the proof of FLT. We'll close by discussing a few million-dollar open problems that are related to the theory of elliptic curves.

Matthew Kimm (Graduate), Anthony Okafor-University of West Florida

Machine Learning Techniques and Applications to Higher Education

We explore machine learning techniques and their applications to higher education in predicting academic success. Support vector machines, naïve Bayes classifiers, and decision trees are analyzed in different contexts for predicting academic success. The different approaches are compared on their predictive ability. We also identify important factors and possible combinations of factors for predicting academic success. These potential combinations of factors motivate discussion on course based approaches for predicting student success with the techniques discussed.

Session IV - B

Vincent J. Matsko - Independent Consultant

Making Sequences and Series Accessible

Students tend to have difficulty with sequences and series in a typical Calculus II course. One reason for this difficulty is that the organization of sections in widely-used calculus textbooks does little to motivate the need for Maclaurin and Taylor series until the end of the chapter. By briefly motivating the usefulness of series, rearranging the order in which sections are presented, and emphasizing key conceptual points along the way, this usually challenging topic may be made more accessible to calculus students.

Kurt A. Sebastian - Flagler College

Building a Mathematics and Technology Program at a Small, Private Liberal Arts College

As Chair of the Department of Mathematics and Technology at Flagler College, I will discuss the path we have followed over the last few years in building our program. Going from a department that concentrated solely in the General Education program with minors in Mathematics and Management Information Systems to a program has developed a Secondary Mathematics Education major program and a Computer Information Systems major program has required consistent, significant change. Strategic Planning also calls for us to develop a program in Mathematical Sciences or Applied Mathematics by the Fall of 2020. I will discuss the building of these programs, as well as the efforts to change the reputation of the College through admissions and recruiting. I will solicit advice and comments regarding these efforts, looking to develop relationships with our mathematical partners in the communities local to Flagler College and beyond in the Southeast Region.

Sikha Bagui, Regina Eckhardt (Graduates) – University of West Florida

Deep Learning for Phishing Email Classification

Representation of text is a significant task in natural language processing and in recent years deep learning has been widely used in various natural language processing tasks like topic classification, sentiment analysis and language translation. Until very recently, little work has been devoted to semantic analysis in phishing detection or phishing email detection. In this work we applied semantic analysis, specifically, one-hot encoding with deep learning to classify emails as phishing or non-phishing. A comparison of the results of various deep learning algorithms – Long Short Term Memory (LSTM, a form of recursive neural networks), Convolutional Neural Networks (CNN), and CNN with Word Embedding have been presented in terms of accuracy and computation time. Further sentiment analyses consider the subject of the emails and the industrial aspect for classification.

Contributed Papers Session V

Full Session

Debbie Garrison - Valencia College – retired

Ways to Incorporate GAISE Recommendations in Your Introductory Statistics Class

The original GAISE report and the updated GAISE 2016 recommend, among other things, that Statistics classes foster active learning, integrate real data with a context and purpose, focus on conceptual understanding, use technology to explore concepts and teach statistical thinking. This session will provide participants with several activities that can be used in an Introductory Statistics class to incorporate these recommendations.

Session V - A

Shen Zhang (Graduate) - University of West Florida

Ground state solutions for quasilinear Schrödinger equations with critical growth and lower power subcritical perturbation

We study the following generalized quasilinear Schrödinger equations

$-\mathrm{div}(g^2(u)\nabla u) + g(u)g'(u)|\nabla u|^2 + V(x)u = h(u)$, $x \in \mathbb{R}^N$, where $N \geq 3$, $g : \mathbb{R} \to \mathbb{R}^+$ is an even differentiable function and $g'(t) \geq 0$ for all $t \geq 0$, $h \in C^1(\mathbb{R}, \mathbb{R})$ is a nonlinear function including critical growth and lower power subcritical perturbation, and the potential $V(x) : \mathbb{R}^N \to \mathbb{R}$ is positive. Since the subcritical perturbation does not satisfy the (AR) condition, the standard variational method can not be used directly.

Combining the change of variables and the monotone method developed by Jeanjean in [L. Jeanjean, On the existence of bounded Palais-Smale sequences and application to a Landesman-Lazer-type problem set on R^N , Proc. Roy. Soc. Edinburgh Sect. A 129 (1999), 787−809], we obtain the existence of positive ground state solutions for the given problem. This is a jointed work with Yinbin Deng and Wentao Huang.

Mike Desgrottes (Graduate), Steven Senger, David Soukup, Renjun Zhu -
- University of West Florida

A General Framework for Studying Rainbow Configurations

Given a coloring of a set, classical Ramsey theory looks for various configurations within a color class. Rainbow configurations, also called anti-Ramsey configurations, are configurations that occur across distinct color classes. We present some very general results about the types of colorings that will guarantee various types of rainbow configurations in finite and infinite settings, as well as several illustrative corollaries.

Daniel McGinnis and Eirini Poimenidou - New College of Florida

A Method to Construct 1-Rotational Factorizations of Complete Graphs and Solutions to the Oberwolfach Problem

The concept of 1-rotational factorization of a complete graph under a finite group G was studied in detail by Buratti and Rinaldi. They found that if G admits a 1-rotational 2-factorization , then the involutions of G are pairwise conjugate. We extend their result by showing that if a finite group G admits 1-rotational k-factorization with $k=2^n m$ even and m odd, then G has at most $m(2^n-1)$ conjugacy classes containing involutions. Also, we show that if G has exactly $m(2^n - 1)$ conjugacy classes containing involutions, then the product of a central involution with an involution in one conjugacy class yields an involution in a different conjugacy class. We then demonstrate a method of constructing a 1-rotational $2n$-factorization under $G \times Z_n$ given a 1-rotational 2-factorization under a finite group G. This construction, given a 1-rotational solution to the Oberwolfach problem $OP(a_\infty, a_1, a_2 \cdots, a_n)$, allows us to find a solution to $OP(2a_\infty - 1,^2 a_1,^2 a_2 \cdots,^2 a_n)$ when the a_i's are even ($i \neq \infty$), and $OP(p(a_\infty-1)+1,^p a_1,^p a_2 \cdots,^p a_n)$ when p is an odd prime, with no restrictions on the a_i's.

Session V – B

Christlene Aimetee, Samantha Seals (Undergraduates) - University of West Florida

Hypertension and Diabetes in Southern African Americans: Data from the Jackson Heart Study

This study determined the contribution of the different predictors on the incident of hypertension and diabetes, time-to-hypertension and diabetes in southern African Americans based on the participant's initial visit in the Jackson Heart Study. Data from the Jackson Heart Study were analyzed using Logistic and Gamma regression to model incident of disease and time-to-disease respectively. Predictors considered include age, nutrition, physical activity, current smokers, former smokers, high school graduates, and sex. Adjusted odds ratios (AOR) for logistic regression and incident rate ratios (IRR) are presented for gamma regression. Several of the predictors were significant.

Naimul Chowdhury (Undergraduate) – New College of Florida

The pumping Lemma and Classification of Natural Languages

We explore several theorems colloquially known as the Pumping Lemmata. Each pumping lemma asserts that if a language is classified as Regular, Context-Free, or Tree-Adjoining, then any word in the language of sufficient length may be "pumped" (i.e. a number of substrings of the word may be either deleted or replaced by powers). Usually the pumping lemmata are used in the contrapositive form to assert that a language does not belong to a class because its strings cannot be pumped. In the end, we apply this to Mandarin Chinese to show that it may not be a Tree-Adjoining language provided that certain assumptions about what structures are grammatical in Chinese are correct.

NOTES OF INTEREST

Polk State College, established in 1964, is a multi-campus institution serving over 20,000 students with Bachelor of Applied Science, Bachelor of Science, Associate in Arts and Associate in Science degrees, as well as a wide range of certificate and workforce training options. The College also operates three charter high schools. A quality-driven institution, Polk State transforms students' lives through the power of education by providing access to affordable associate and baccalaureate degrees, career certificates and workforce employment programs, delivered by diverse, qualified faculty and staff.

Connecting to Wi-Fi:

Polk State College Wireless Network Guest Instructions

1. Before your first login to the Polk State College Wireless Network, select the

   Polk State Connect wireless access point.

2. After Selecting Polk State Connect you will see the Polk State College Wireless

   Network portal.

3. Click on "New Guest" or "Returning Guest"

4. Enter the following information:

   Reason for access
   Valid Email address
   Full name
   Mobile phone number

5. Click "Continue" to complete the request.

Once you have clicked "Continue," you will receive a message that a text has been sent to the mobile phone number you entered. Your login credentials should be sent by text message within 30 seconds.

6. Enter the credentials you received by text to sign in.

7. Your Guest access will be valid for five days.

Once you have joined the Polk State Wireless Network, the Polk State website will be displayed. If you do not see the Polk State Website, please refresh your browser.

If you have any questions, call the Help Desk at 863.292.3652 or at extension 5111.

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The Conference Committee:

Carolyn Orr
Kim Hess
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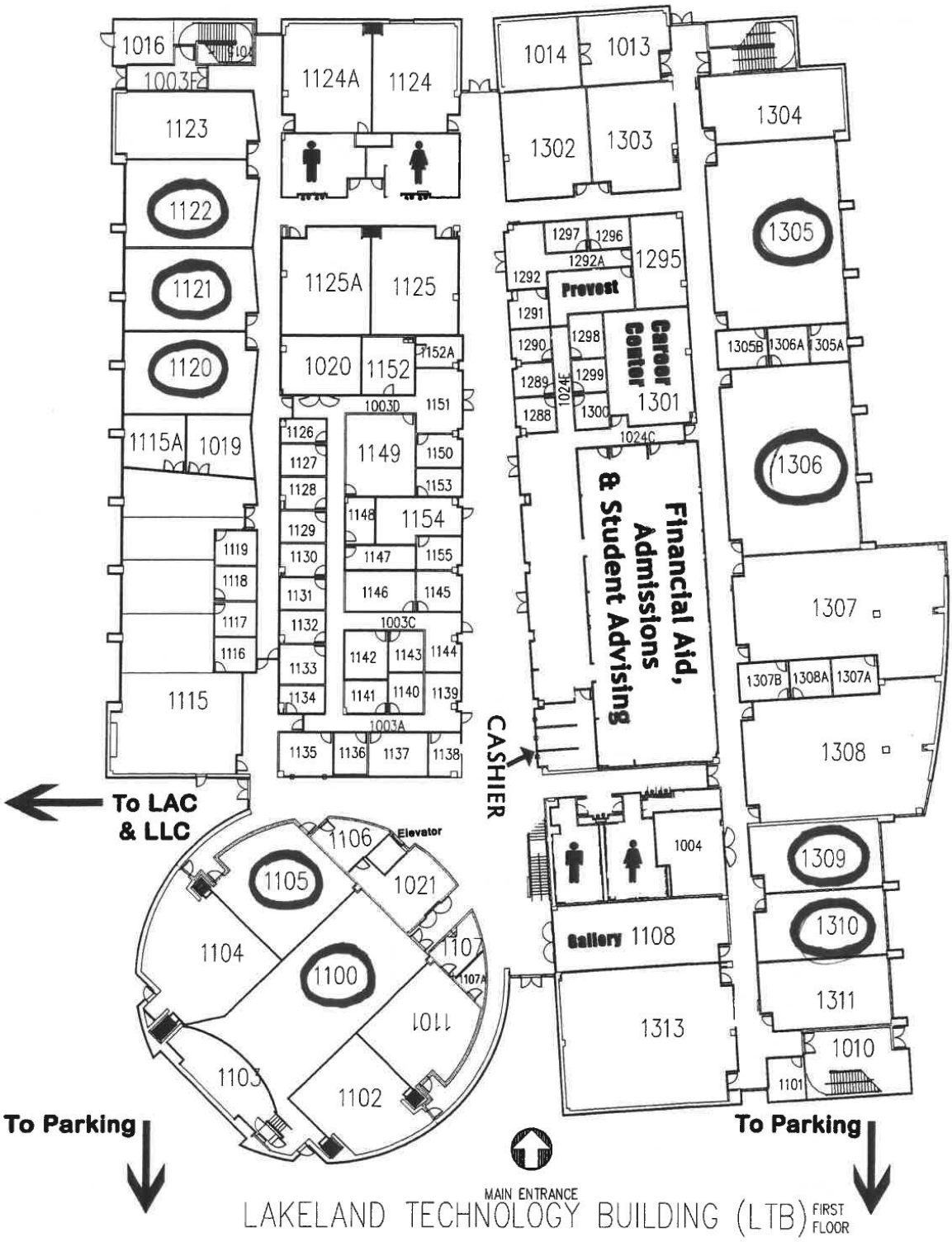
Jim Rhodes
Penny Morris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