The **Department of Mathematics** at **Francis Marion University**

invites undergraduate students to present their research projects in the

2017 Francis Marion Undergraduate Mathematics Conference

Friday, March 24, 2017

on the campus of

Francis Marion University

Florence, South Carolina

— Schedule —

12:30 *p.m.* **Registration begins**. Lobby, Lee Nursing Building.

12:55 *p.m.* **Welcome and Announcements.** Auditorium.

1:00 *p.m.* **Math Jeopardy!** Auditorium.

2:00 *p.m.* **Student Presentations Begin** Classrooms 137, 145, 205

Schedule of talks and abstracts are included in packet.

Snacks provided by the Conference in the lobby. Please enjoy at your leisure. No formal snack break time.

4:30 *p.m.* **Keynote Address, Auditorium**.

Dr. Jenna Carpenter, **Founding Dean and Professor, School of Engineering, Campbell University,**

Top Secret: The History of Women in Computing.

Did you know that the first computers were humans, not machines? Did you know that these computers were women, not men? Did you know that these women were in their late teens and early 20s, not PhDs? We will learn about the central role that a group of mathematically-talented young women, called the Top Secret Rosies, played during the transition to the computer era in World War II.

5:30 *p.m.* **Student Presenter Recognition, Closing Remarks and Conference Picture**

5:45 *p.m.* **M.A.A. State Dinner of South Carolina** Hendricks Room, Ervin Dining Hall

Prior registration required.

— Website —

http://departments.fmarion.edu/mathematics/undergraduate-mathematics-conference.html

Student Talk Schedule

	LNB Room 137	LNB Room 145	LNB Room 205
2:00-2:15	*Polynomial Time Primality Testing Algorithms* Tina Watrous Francis Marion University	*Interesting Induction* Daijonni Ferguson Coastal Carolina University	*Pythagorean Triples* Jackson McDonald Francis Marion University
2:20-2:35	*Lotka-Volterra Analysis of Maxwell-Bloch Equations* Mary Mulholland Francis Marion University	*Catalan Numbers and the Sock Matching Problem* Amy Benton Francis Marion University	*Ramsey Theory* Eric Zhang Coastal Carolina University
2:40-2:55	*Optimizing Softball Strategy with Markov Chains* Taylor Powell Charleston Southern University	*Singular Value Decompositions* Jason Zhang Coastal Carolina University	*Parallel Lines in Hyperbolic Geometry* Teryese Grant Francis Marion University
3:00-3:15	*Most Profitable Properties for Monopoly®* Alexander Joyce Francis Marion University	*Data Analysis of the 2016 Presidential Election in NC* Monica Hammond and Sarah Schneider Campbell University	*Recursive Formulas and the Golden Ratio* Javren Rodriguez Francis Marion University
3:20-3:35	*Modeling Metastatic Breast Cancer Progression with a Markov Chain* Alyssia Nunez Charleston Southern University	*Matrices in Digital Images and Image Restoration* Jordan Rivers Francis Marion University	*Heron the Hero* Alexis Glover Francis Marion University
3:40-3:55	*Can Cellular Automata Improve Data Security?* Bailey Stillman Western Carolina University	*Mathematical Model of the Hiring Process Problem* Mercedes Gainey Francis Marion University	
4:00-4:15	*Lagrangian Relaxation* Javier Bustos Jaimes Francis Marion University	*ANOVA* Dorothanna Belton Francis Marion University	

Student Talk Abstracts

Dorothanna Belton, Francis Marion University
ANOVA

    I will be explain what ANOVA is. The different types of ANOVA. As well as the one way approach of ANOVA.

Amy Benton, Francis Marion University
Catalan Numbers and the Sock Matching Problem

    Catalan numbers play an important role in the solution of many combinatorial mathematics problems. In this talk I will give their recursive and closed-form definitions and provide some geometric interpretations. Finally, I will explain how they arise in the sock matching problem.

Javier Bustos Jaimes, Francis Marion University
Lagrangian Relaxation

    Simplifying linear programs by adding the constraints to the objective function which results in an approximation of the original problem. An optimal solution can be found by penalizing the constraints using a Lagrangian multiplier.

Daijonni Ferguson, Coastal Carolina University
Interesting Induction

    This talk will examine some interesting applications of mathematical induction including a look at the Tower of Hanoi puzzle.

Mercedes Gainey, Francis Marion University
Mathematical Model of the Hiring Process Problem

    The basis of this model is to provide valuable insight to the cost of a company's hiring process. Ultimately deciding when is it better to hire internally versus externally for vacant positions. These two options will be referred to as promotions and new hires, respectively. Furthermore, we want to maximize employee engagement which will be in turn minimizing employee engagement cost.

Student Talk Abstracts

Alexis Glover, Francis Marion University
Heron the Hero

When told to find the area of a triangle, most people rely on the base and height of the triangle. When the height is not given, what should you do? Well Heron of Alexandria had a great solution to this problem. Heron of Alexandria was born around 10 AD and later died around 75 AD. Heron, who taught at the museum in Alexandria, was a physicist, engineer, inventor and also a mathematician who had many published works. One of his greatest contributions was his formula for the area of a triangle. Heron's formula was featured in one of his many works, entitled the Metrica. Heron's formula uses the semiperimeter to find the area of a triangle when only given the length of the three sides. This formula can be proved in a many ways using trigonometry, algebra and also geometry. Heron's formula have been a great help in mathematics.

Teryese Grant, Francis Marion University
Parallel Lines in Hyperbolic Geometry

The talk will be about the history of the discovery of parallel lines in hyperbolic geometry, and who discovered them.

Monica Hammond and Sarah Schneider, Campbell University
Data Analysis of the 2016 Presidential Election in NC

This study collects demographic data from each county in North Carolina. It analyzes the correlation and multi-regression between the presidential election results and several factors including race, sex, age, education, income, poverty, and living location in the counties. Some popular claims are also tested.

Alexander Joyce, Francis Marion University
Most Profitable Properties for Monopoly®

A Markov Chain is a stochastic model which utilizes the current event and transitional probabilities to predict future events. This type of model will be constructed to calculate expected revenues of each property in the game Monopoly® in order to determine the most profitable properties in the game.

Student Talk Abstracts

Jackson McDonald, Francis Marion University
Pythagorean Triples

The Pythagoreans viewed mathematics as parts of their religious purification ritual and their educational curriculum. The purpose of this presentation is to examine Pythagorean Triples, a mathematical exercise that spanned from their religious ritual to their curriculum. The Pythagoreans' method of generating Triples will be discussed, as well as Euclid's contributions to this area of mathematics.

Mary Mulholland, Francis Marion University
Lotka-Volterra Analysis of Maxwell-Bloch Equations

This research is focused on analyzing the chaotic behavior of the Maxwell-Bloch equations, a system of three interdependent differential equations describing laser light. The Euler method will be implemented to simulate the change in the three components of laser light dynamics. The equations will be transformed to a system of two differential equations to be analyzed as a Lotka-Volterra system.

Alyssia Nunez, Charleston Southern University
Modeling Metastatic Breast Cancer Progression with a Markov Chain

Markov chains are useful in a variety of mathematical models. In this talk, we will discuss the metastasis of breast cancer from a longitudinal study using a Markov chain model.

Taylor Powell, Charleston Southern University
Optimizing Softball Strategy with Markov Chains

In this talk we will discuss the various modeling uses of Markov Chains. In particular, we will see their application in the realm of softball. Topics including the optimization of batting line-up, strategy analysis, and a team ranking system will be discussed. These topics will be illustrated using data from my own team, the Charleston Southern Buccaneers.

Jordan Rivers, Francis Marion University
Matrices in Digital Images and Image Restoration

This presentation will briefly explain how matrices are used in the application of digital images and how matrix algebra can be used to alter, transmit, and restore images. MATLAB code will be the primary illustrator of the matrix functions in the presentation.

Student Talk Abstracts

Javren Rodriguez, Francis Marion University
Recursive Formulas and the Golden Ratio

Certain special numbers and sequences appear again and again in nature. The Fibonacci sequence has been observed in biology and in biological systems that expand. There are connections between various forms art and both the Fibonacci Sequence and the Golden Ratio. These sequences and numbers are closely related to recursive and closed formulas.

Bailey Stillman, Western Carolina University
Can Cellular Automata Improve Data Security?

Recently weaknesses in Pseudo-Random Number Generators (PRNGs) which were once secure were discovered. An alternative PRNG, Cellular Automata (CA), are now proffered as a solution. The use of CA was PRNGs pioneered by Dr. Wolfram, who said that some CA had random properties. We will test for randomness using a small battery of tests. And discuss whether the CA we examined make suitable PRNGs.

Tina Watrous, Francis Marion University
Polynomial Time Primality Testing Algorithms

Primality Testing algorithms have been evolving for centuries. The AKS was a major breakthrough for primality testing. Prior to the development of AKS, all algorithms achieved at most three of the four properties (general, polynomial, deterministic, and unconditional). This presentation aims to introduce the audience to some of these methods and their uses.

Jason Zhang, Coastal Carolina University
Singular Value Decompositions

This talk will extend the notion of an eigenvalue decomposition for symmetric square matrices to similar singular value decompositions valid for any matrix. Applications to principle component analysis will also be discussed.

Eric Zhang, Coastal Carolina University
Ramsey Theory

This talk will introduce edge colorings in complete graphs and some Ramsey numbers will be derived using the pigeon hole principle.