Florida Women in Mathematics Day

Event Summary

The second annual Florida Women in Mathematics Day (FWIMD) was held on the campus of Florida Atlantic University (FAU) in Boca Raton, Florida on February 1, 2020. There were over 30 registrants, representing 5 distinct institutions, which included: high school teachers, high school students, undergraduate and graduate students, postdoctoral researchers, university faculty members, and representatives from industry. The IAS WAM Advanced Graduate Ambassador/Graduate Ambassador worked with the executive board of the FAU Association for Women in Mathematics (AWM) student chapter to organize the event as well as a regional collaborator. The organizers are:

Catherine Berrouet	FAU AWM Vice President
Marly Cormar	WAM FWIMD Co-Organizer
Anae Myers	FAU AWM Chapter President/WAM Ambassador
Tran Ngo	FAU AWM Treasurer
Yuan Wang	FAU AWM Faculty Advisor.

Remaining funds from IAS and Lisa Simonyi were used to purchase and disburse promotional healthcare items for a virtual conference on Immuno-Epidemiological Models during the coronavirus lockdown. These activities are described immediately following the FWIMD event summary. The FWIMD agenda is given below.

	UG, GR, Postdocs, Faculty	High School Students
9:00 – 9:30	Registration (SE 215)	
9:30 – 10:40	Research Presentations (SE 215)	
10:40 – 11:00	Coffee Break and Networking (SE 215)	Registration (SE 215)
11:00 – 12:00	Keynote Speaker (SE 215)	
12:00 – 1:30	Group Photo, Lunch, Math Bingo (SE 215)	
1:30 – 2:20	Math and Salsa Dance Activity (PS 109)	
2:30 – 3:30	Career Panel (PS 226)	
3:30 – 4:15	Celebration, Refreshments, final Networking (PS 226)	

The primary goal of FWIMD was to establish a network of mathematicians of all stages across the state of Florida, and to provide a half-day mathematics immersion experience for local high school students. Towards these goals, FWIMD maintained an inclusive experience that challenged and engaged both university-level participants and high school-level participants.

Research Presentations: The morning session was dedicated to research presentations and professional networking in a welcoming, supportive environment. The research titles and abstracts are presented below

Average Length of the Longest Path in Acyclic Orientations on Complete Bipartite Graphs

Jessica Khera
Florida Atlantic University, FL

Abstract: An acyclic orientation on a graph is an assignment of a direction to each edge in a way that does not form any directed cycles. Acyclic orientations on a complete bipartite graph are in bijection with a class of matrices called lonesum matrices, which can be uniquely reconstructed from their row and column sums. We utilize this connection and other properties of lonesum matrices to determine an analytic form of the generating function for the average length of the longest path in an acyclic orientation on a complete bipartite graph.

Invariant Manifolds for a Dynamical Systems with the equation given by Implicit Rule

Archana Neupane Timsina
Florida Atlantic University, FL

Abstract: Implicit form of any equation is equivalent with Explicit form of the equation. While in solving purposes one form can be changed into another form to obtain a solution, but in some situation, the explicit form comes out more complicated than implicit form. By taking care of those points in the top for periodic orbit, using the parameterization method, implicit function theorem and idea of a non-composite periodic function, any dynamical system with the implicit rule can be solved.

Stability Analysis for Time-Delayed Systems with an Application
Dr. Yuan Wang
Florida Atlantic University

Abstract: In this work we will discuss a few results on stability analysis for nonlinear systems with time-delays. Systems with time-delays are usually modeled by functional differential equations on infinite dimensional spaces. A central theme of this work is to treat the state variables with time-delays as disturbances or uncertainties acting on the system. This approach allows one to convert the stability analysis of systems with time delays to a problem of robust stability analysis of finite dimensional systems. After some discussion on the relevant notions and results, we will apply the results to stability analysis of a biological system.

A Fast Delay Vandermonde Solver
Dr. Sirani M. Perera (pereras2@erau.edu),
Embry-Riddle Aeronautical University, FL
Joint work with: Arjuna Madanayake, Austin Ogle, and Daniel Silverio.

Abstract: Delay Vandemonde matrix (DVM) is a superclass of discrete Fourier transform matrix having entries as the powers of delays based on multibeam beamforming. The structure of DVM can be utilized to realize as an analog circuit answering applications in wireless communication. In this talk, we will present a fast and exact algorithm to solve a system of linear equations having the coefficient matrix as the DVM with order n × n.

First, we present a sparse factorization to compute the inverse of the DVM efficiently. Then, we use the proposed factorization to derive a fast algorithm with the arithmetic complexity of order $O(n^2)$ as opposed to $O(n^3)$. Next, we present numerical results for the forward accuracy of the proposed algorithm with different delays. Finally, the language of signal flow graph representation of digital structures is used to describe the proposed algorithm.
This work was funded by the National Science Foundation with Award Numbers 1711625, 1711395, and 1902283.

Keynote Speaker: All FWIMD participants attended the keynote address by Dr. Nancy Scherich of Wake Forest University, NC: A Dancing Introduction to the Braid Groups.

Abstract: Imagine that I have a knot behind my back and you have a piece of rope. What information would I need to tell you so that you could tie my knot? One mathematical answer to this question is a braid description of the knot. I will give an introductory talk about my research of the Braid Groups with the help of some of my Math-Dance projects.

Dr. Scherich was 2017 winner of the Dance your PhD competition. Her innovative expression of mathematical concepts through the medium of dance made her a wonderful choice to promote our mission of engaging women and girls in mathematics. Her talk was aimed at mathematics

enthusiasts of all levels, promoting engagement and participation. During the talk, two volunteers were chosen from audience. One person looked at a knot from the screen and then verbally explain the knot to another person who drew it on the chalk board. This was Dr. Scherich's creative way of explaining how difficult it is to research knot theory and to explain to others. One of the highlights of the talk was an innovative video where the speaker made connections between math and dance. The talk was accessible with an activity that was simple and intuitive enough to engage the entire audience and generate discussion afterwards.

Lunch/Speed Mentoring: The lunch was served buffet style with an interactive "math bingo" session that encouraged mingling and networking. Prizes were given out at the end.

Math and Dance Activity: After lunch, everyone participated in a math and dance activity led by Catherine Berrouet and Alexandra Milbrand. They demonstrated and guided the conference attendees in an exploration of the "salsa rueda" with inquiry-based learning questions related to the mathematics of the dance. This activity was based on Chapter 3 from "The Art of Mathematics and Dance" by Christine von Renesse with Volker Ecke, Julian F. Fleron, and Philip K. Hotchkiss. The math and dance activity was unanimously considered the highlight of the event.

Career Panel: The FWIMD Career Panel involved all participants and was moderated by a faculty volunteer. The panelists were:

Name	Institution	Position
Papiya Bhattacharjee	Florida Atlantic University – Department of Mathematics	Instructor
Jessica Khera	Florida Atlantic University – Department of Mathematics	Graduate Student
Fawn Racicot	National Council on Compensation Insurance – Actuarial & Economic Services	Associate Actuary
Nancy Scherich	Wake Forest University – Department of Mathematics	Visiting Assistant Professor

The audience asked several great questions. Here are a few:

"How do you go about job searches after graduation?"
"What is a postdoc like? How do you search for positions?"
"What exactly does an actuary do?"
"How do you balance career (in academia or industry) with personal life?"

Our feedback from previous years has been that the career panel is always a highlight of FWIMD. This year was no different!

Celebration: The day's events concluded with a celebration, networking, and light refreshments.

Care To BEE – May 5, 2020

Having received both Advanced and Graduate Ambassadorships from IAS WAM, our strategy was to invest the remainder of our funds to strengthen relationships created through FWIMD. Our aim was to leverage existing platforms, namely the FAU AWM Graduate Student Chapter mentoring initiative, Dare To BEE. We planned a follow-up conference to FWIMD called 20/20 vision that would address a need amongst undergraduate students who would benefit from exposure to opportunities that would enrich their academic experience (study abroad, research, internships, etc). In addition, we planned to invite high school students who had previously participated in FWIMD to this event. This initiative was to strengthen and extend our existing community and further our mission to mentor women at all levels in mathematics.

Due to the social-distancing protocols for COVID-19, we were not able to host the event as we originally envisioned. However, we regrouped and adjusted our strategy to still make an impact and a difference. We decided to host a tele-conference, utilizing our "tea time" theme where we asked Dr. Nina Fefferman, a mathematician who specializes in mathematical and computational models of problems in epidemiology, to address our originally intended audience in a virtual Q&A forum. As a group, we watched a pre-recorded NIMBioS Webinar, *The role of applied math in real-time pandemic response: How basic disease models work*. This was followed by an interactive problem solving session with Dr. Fefferman, with Q&A from the audience. We also purchased an institutionally-licensed copy of "Secrets of the Surface" on DVD to show for future events.

We reallocated the remainder of our budget to mail out promotional items that encouraged our audience to stay healthy in these times. This included packages with reusable face masks and blue-light filtering glasses. The unexpected change of events encouraged us to be flexible and address the needs of our community as they arise. We are grateful to IAS WAM for adapting with us and encouraging us in the mission.

The organizers would like to thank IAS Women and Mathematics, Lisa Simonyi, Florida Atlantic University Department of Mathematical Sciences, and the Office of the Dean of the FAU College of Science for the financial support needed to make FWIMD and follow-up events possible. The organizers believe in the continuing potential for FWIMD to be a vehicle to support the community of women in mathematics across the state of Florida and across several levels of mathematics education.

Pre-conference Dinner

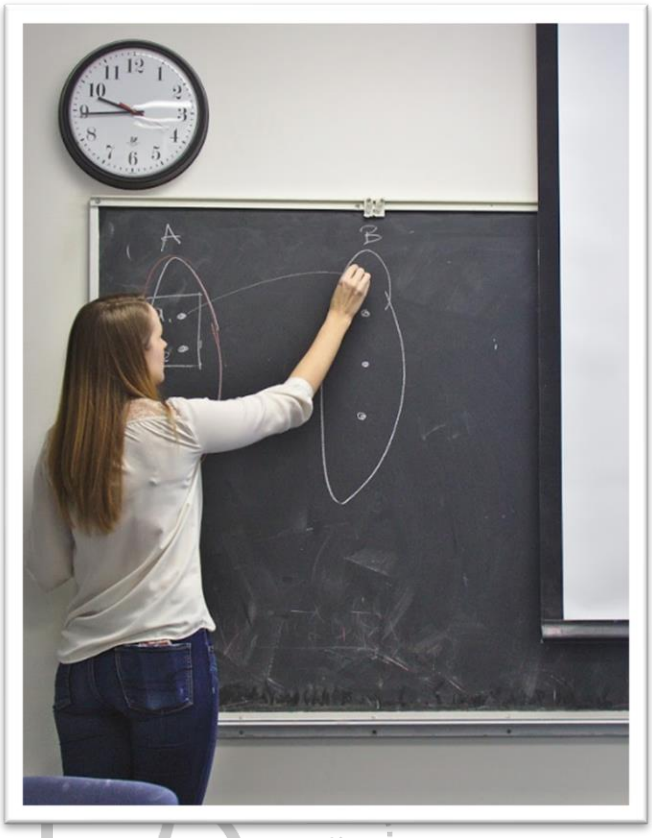
FWIMD Participants

FWIMD Co-organizers and Keynote Speaker

Math and Salsa Dance Activity

Led by Alexandra Milbrand and Catherine Berrouet

Registration and Refreshments



Jessica Thune – Research Presentation

Advanced Ambassadorship Proposal[1]		Actual
Travel support for Graduate/Postdocs: Mileage and lodging; Parking	$800	$194.36
Speaker:		
Flight	$500	$528.40
2-night Hotel stay	$300	$388.72
Transportation/Meals	$0	
Honorarium	$200	$53.00
Materials:		
Craft materials for high school activity	$100	$0.00
Food:		
Coffee/morning refreshments	$200	$199.00
Lunch	$500	$612.75
Afternoon refreshments	$300	$286.50
Promotional Items:		
Bags/Notepads/Highlighters	$100	$336.90
Support for Organizers (700/100 x 3)	$1,000	$1,000.00
Total	$4,000	$3,599.63

Graduate Ambassadorship Proposal[2]		Actual
Refreshments for 3 Panel Lunches/Tea: $75 x 3 = $225	$ 225.00	$0.00
Supplies/Math Games for Ice breakers (Secrets of the Surface DVD)	$ 75.00	$135.95
Promotional Items	$ 200.00	$662.15
Total	$ 500.00	$798.10

Combined		Actual
Ambassadorships	$ 4,500.00	$4,397.73

Remaining Funds	$ 102.27

[1] Due to delays caused by COVID-19, some charges are pending and will be processed as soon as possible
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Thank you for this wonderful opportunity!