
Contact Information

Mathematical Sciences Building, Office 609
Department of Mathematics, Purdue University

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Education & Academic Background

Doctor of Philosophy in Mathematics May 2029
Purdue University, West Lafayette, Indiana

Master of Science in Mathematics May 2026
Purdue University, West Lafayette, Indiana

Bachelor of Science in Pure Mathematics (*Magna Cum Laude*) December 2022
Curricular Sequence in Applied Mathematics for Science and Engineering
University of Puerto Rico, Mayagüez Campus (UPRM), Mayagüez, Puerto Rico

Skills and Other Information

Programming & Computation: Python, Julia, C++, SageMath, MATLAB | Formatting & Tools: HTML, \LaTeX , Git
Math & AI/ML: NumPy, SciPy, PyTorch, Tensorflow, JAX, Flux, CUDA | Spoken Languages: English and Spanish

Research Experience

Research Intern in Dynamical Systems and Machine Learning May 2025–August 2025
URA-Sandia Graduate Student Summer Fellowship & Oak Ridge Institute of Science and Education
Computational & Information Sciences Foundation, Sandia National Laboratories, California Campus
Supervised by: Dr. Moe Khalil, Sandia National Laboratories

Data-Driven Closure Models

- Studied machine learning-based surrogate models, and learned and applied data assimilation for closure models.
- Conducted a parametric study of the optimization step for noisy samples of an SIQR epidemic model.
- Analyzed results with statistical techniques to understand the optimization value distribution of 100 samples of data.

Research Intern in Machine Learning May 2023–August 2023
MIT Lincoln Laboratory Summer Research Program (GEM Fellowship Employer Sponsor)
Group 39, Division 3, MIT Lincoln Laboratory, Massachusetts Institute of Technology
Supervised by: Dr. Sam Polk & Dr. Mabel Ramírez, MIT Lincoln Laboratory

Unsupervised Behavior Inference from Human Action Sequences (UNBIAS)

- Developed mathematical algorithms for autoencoders with LSTM architecture.
- Identified the autoencoder that minimized the loss function.
- Optimized silhouette score and utilized K-medoids, PCA and other clustering techniques for encoded space analysis.

Research Assistant in Number Theory August 2019–December 2022
Puerto Rico Louis Stokes Alliance for Minority Participation
Department of Mathematical Sciences, University of Puerto Rico, Mayagüez Campus
Supervised by: Prof. Reyes M. Ortiz Albino, University of Puerto Rico at Mayagüez

Properties of $\tau_{(n)}$ -primes

- Research based on the theory of generalized factorizations in integral domains.
- Generalized the notion of complete residue systems for $\tau_{(2)}$ -primes, $\tau_{(3)}$ -primes and $\tau_{(6)}$ -primes.
- Extended the Euler totient function to the notion of equivalence classes modulo a $\tau_{(n)}$ -prime.

Research Assistant in Combinatorics June 2022–August 2022
Summer@ICERM 2022: Computational Combinatorics
Institute for Computational and Experimental Research in Mathematics, Brown University
Supervised by: Prof. Pamela E. Harris, University of Wisconsin-Milwaukee

Permutation Invariant Parking Assortments

- Combinatorics research focused on the study of generalizations of parking functions.
- Characterized car length sequence minimal invariance (case when the all-ones sequence is the only permutation invariant parking assortment). Characterized the form of the family of 2-tuple and 3-tuple parking assortments.

Research Assistant in Algebraic Coding Theory

June 2021–August 2021

NSF REU in Combinatorics, Probability and Algebraic Coding Theory

East Tennessee State University & University of Puerto Rico at Ponce

Supervised by: Prof. Fernando Piñero González, University of Puerto Rico at Ponce

Improving the Dimension Bound of Hermitian-Lifted Codes

- Algebraic Geometry research focused on the study of Hermitian-Lifted Codes.
- Developed a formula that improved the counting of good recoverable functions.
- Improved the bound rate of the code from 0.007 to 0.1.

Improving the Minimum Distance Bound of Trace Goppa Codes

- Finite Fields research focused on the development of Goppa codes.
- Worked with Goppa matrices by using quadratic extensions and cubic extensions over finite fields.
- Improved the minimum distance bound of norm and trace Goppa polynomials.

Projects

Project in Numerical Differential Equations

August 2025–December 2025

Purdue University, West Lafayette

MA57300: Numerical Solutions of Ordinary Differential Equations

Instructor: Prof. Di Qi, Purdue University

Data Assimilation for the Lorenz 96 Model

- Explored the topic of data assimilation using the Ensemble Kalman Filter for a toy 1-time scale Lorenz 96 Model.
- Compared results corresponding to ground truth state solutions with sampled data predictions.

Projects in Optimal Transport and Neural Networks

January 2025–May 2025

Purdue University, West Lafayette

MA59500MM: Computational Optimal Transport and Deep Generative Models

Instructor: Prof. Rongjie Lai, Purdue University

Normalizing Flows Optimal Transport implementation on MNIST Dataset

- Developed a normalizing flow neural network that learned the optimal transport path of a Gaussian distributed MNIST image to the target MNIST number distribution.
- Generated recognizable digit images after training.

WGAN and Monge Map implementation on MNIST Dataset

- Constructed a Wasserstein Generative Adversarial Network with Gradient Penalty (WGAN-GP) and Monge Map Network and applied it to the MNIST dataset.
- Successfully generated realistic looking sample numbers at the end of training.
- Compared results between real images and generated images.

Project in Neural Networks and Dynamical Systems

November 2024–December 2024

Purdue University, West Lafayette

MA59500MM: Introduction to Mathematical Modeling

Instructor: Prof. Alexandria Volkening, Purdue University

Physics-Informed Neural Networks (PINNs) for Hurricane Trajectory Prediction

- Exploration of PINNs research through data sets that model hurricane trajectories.
- Learned about the construction of loss functions with non-linear operators that model the physics behind the problem.

Project in Biotechnology

June 2023–July 2023

MIT Lincoln Laboratory Summer Research Program

2023 MIT Lincoln Laboratory Intern Innovative Idea Challenge (I³C)

Supervised by: Ryan Burrow and Ashok Kumar, MIT Lincoln Laboratory

SKINS: Skin-growth boosting and Intra-absorptive Solution bandages

- Ranked Top 3 out of a total of 28 submitted proposals in the competition.
- Biotech research proposal submitted to the 2023 edition of the MIT Lincoln Laboratory I³C.
- Proposed a hydrogel bandage with accelerated wound healing and anti-scarring properties, based on the combination of Sodium Carboxymethyl Cellulose, BMM and Aloe vera.
- Estimated the materials cost, approximate bandage size, and compared performance of materials with standard antibiotics.

Awards and Merits

Fellowships, Scholarships and Prizes

2025 Universities Research Association-Sandia National Labs Graduate Summer Fellowship	May 2025–August 2025
2023 National GEM Consortium PhD Science Fellowship	August 2023–May 2024
• Purdue University Department of Mathematics Sponsorship	August 2023–May 2024
• MIT Lincoln Laboratory Employer Sponsorship (Internship)	May 2023–August 2023
2023 MIT Lincoln Laboratory I ³ C 3 rd Place Research Proposal Prize	July 2023
2022 Evertec Inc. STEM Scholarship	October 2022
Puerto Rico-Louis Stokes Alliance for Minority Participation Research Scholarship	August 2019–December 2022

Merits and Honors

2023 Ford Foundation Predoctoral Fellowship Honorable Mention	March 2023
2022 Hispanic Scholarship Fund Scholar	June 2022
National Math Alliance Predoctoral Scholar	November 2021
UPRM Faculty of Arts and Sciences Honor Roll	August 2018–May 2023
National Trig-Star Math Competition, 16th Overall Finalist	June 2017
Eagle Scout Rank, with 2 Silver Palms	May 2017

Papers and Articles

The asterisk symbol (*) denotes alphabetical order authorship.

- [1] S. Polk, E.J. Pabon-Cancel, R. Paleja, K. Chestnut-Chang, R. Jensen and M. Ramirez.
Unsupervised Behavior Inference from Human Action Sequences (UNBIAS). *2024 IEEE Conference on Games (CoG), Milan, Italy, 2024, pp. 1-8.*
- [2] *A. Allen, E.J. Pabon-Cancel, F. Piñero-Gonzalez and L. Polanco.
Improving the Dimension Bound of Hermitian-Lifted Codes. arXiv: <https://arxiv.org/abs/2302.01557>
- [3] *D. Chen, P.E. Harris, J. Carlos Martinez Mori, E.J. Pabon-Cancel and G. Sargent.
Permutation Invariant Parking Assortments. *Enumerative Combinatorics and Applications*, **4:1**, 1-25 (2024). #S2R4.
- [4] *P.E. Harris, Z. Markman, L. Martinez, A. Mock, E.J. Pabón-Cancel, A. Verga, and S. Wang.
A Model for a One-Hour Workshop on Mentoring. *MAA Focus*, **43**(1), 18-21 (2023).
- [5] *I. Byrne, N. Dodson, R. Lynch, E.J. Pabon-Cancel and F. Piñero-Gonzalez.
Improving the minimum distance bound of Trace Goppa codes. *Designs, Codes and Cryptography*. **91**, 2649–2663 (2023).

Teaching and Grading Experience

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| • MA 59500MB: Mathematical Biology (Grading) | January 2026–May 2026 |
| • MA 32500: History of Mathematics (Grading) | January 2026–May 2026 |
| • MA 26100 REC: Multivariate Calculus Recitation (Teaching) | August 2025–December 2025
January 2025–May 2025
August 2024–December 2024 |
| • MA 13900: Mathematics for Elementary Teachers III (Grading) | June 2024–August 2024 |

Poster Sessions, Presentations and Conferences

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| • URA-Sandia Graduate Summer Fellowship Lightning Talk (<i>Virtual</i>)
Presentation: Data-Driven Closure Models (DDCMs) | 6 August 2025 |
| • Sandia National Laboratories CA SIP Intern Symposium
<i>Auditorium, Sandia National Laboratories-Livermore</i>
Poster: Data-Driven Closure Models (DDCMs) | 5 August 2025
Livermore, California |

- Combinatorics and Coding Theory in the Tropics (UPR-Ponce) 18 July 2025
Invited REU Seminar: My Story & Permutation-Invariant Parking Assortments Virtual Seminar
- Purdue University Student Commutative Algebra Seminar 18 November 2024
Helen B. Schleman Hall, Purdue University West Lafayette, Indiana
Presentation: Results in $\tau_{(n)}$ -factorizations and $\tau_{(n)}$ -primes.
- Purdue University Student Math History Seminar 9 September 2024
Lawson Computer Science Building, Purdue University West Lafayette, Indiana
Presentation: Testimonios: Stories of Latinos and Hispanics in Mathematics
- Underrepresented Students in Topology and Algebra Research Symposium 2024 20-21 April 2024
University of Iowa Iowa City, Iowa
- 2023 MIT Lincoln Lab Intern Innovative Idea Challenge 14, 21 July 2023
MIT Lincoln Laboratory Auditorium Lexington, Massachusetts
Poster: Skin-Absorptive and Skin-Growth Boosting Bandages
Presentation: SKINS: Skin-growth boosting and Intra-absorptive Solution Bandages
- Combinatorics and Coding Theory in the Tropics (UPR-Ponce) 7 July 2023
Invited REU Seminar Talk: Graduate School: Application tips and advice Virtual Seminar
- 2023 ACS Junior Technical Meeting-Puerto Rico Interdisciplinary Scientific Meeting 29 April 2023
University of Puerto Rico at Bayamón, Sponsored by PR-LSAMP Bayamón, Puerto Rico
Presentation: Properties of $\tau_{(n)}$ -primes
- 38th Interuniversity Mathematical Sciences Research Seminar 24-25 February 2023
University of Puerto Rico, Mayagüez Campus Mayagüez, Puerto Rico
Presentation: Permutation Invariant Parking Assortments
- 2023 AAAS Emerging Researchers National Conference in STEM 9-11 February 2023
Omni Shoreham Hotel Washington, District of Columbia
Poster: Permutation Invariant Parking Functions with cars of assorted lengths
- Joint Mathematics Meetings 2023 4-7 January 2023
John B. Hynes Veterans Memorial Convention Center Boston, Massachusetts
Poster: Permutation Invariant Parking Functions with cars of assorted lengths
Presentation: Permutation Invariant Parking Functions with Cars of Arbitrary Lengths
- Field of Dreams Conference 2022 4-6 November 2022
The Graduate Hotel, University of Minnesota-Twin Cities Minneapolis, Minnesota
- 2022 SACNAS National Diversity in STEM Conference 27-29 October 2022
Pedro Roselló Convention Center San Juan, Puerto Rico
Poster: The Study of $\tau_{(n)}$ -primes
- 2022 Gulf Coast Undergraduate Research Symposium 8-9 October 2022
William Marsh Rice University Houston, Texas
Presentation: Properties of $\tau_{(n)}$ -primes
- Summer@ICERM 2022: Computational Combinatorics 3 August 2023
Institute for Computational and Experimental Research in Mathematics Providence, Rhode Island
Presentation: On Permutation-Invariant Parking Sequences
- 2022 ACS Junior Technical Meeting-Puerto Rico Interdisciplinary Scientific Meeting 9 April 2022
University of Puerto Rico at Humacao, Sponsored by PR-LSAMP Humacao, Puerto Rico
Presentation: The Study of $\tau_{(n)}$ -primes
- Joint Mathematics Meetings 2022 (Virtual) 6-9 April 2022
Poster: Improving Bounds of Hermitian-Lifted Codes

- 37th Interuniversity Mathematical Sciences Research Seminar (*Virtual*) 25-26 February 2022
Poster: The Study of $\tau_{(n)}$ -primes
Presentation: Improving Bounds of Hermitian-Lifted Codes
- 2021 Math REU Conference@Clemson University (*Virtual*) 19 July 2021
Presentation: Improved Hermitian-Lifted Codes
- 2021 ACS Junior Technical Meeting-Puerto Rico Interdisciplinary Scientific Meeting (*Virtual*) 23-24 April 2021
Sponsored by PR-LSAMP
Presentation: The Study of $\tau_{(n)}$ -atoms
- 35th Interuniversity Mathematical Sciences Research Seminar 6-7 March 2020
University of Puerto Rico at Cayey Cayey, Puerto Rico
Poster: The Study of $\tau_{(n)}$ -atoms

Academics and Graduate Coursework

Purdue University

Qualifying Exams:

MA 55300: Introduction to Abstract Algebra – Passed August 2024 | Grade: A

MA 54400: Real Analysis and Measure Theory – Passed January 2026 | Grade: B

Coursework:

MA 61500: Numerical Methods for Partial Differential Equations	January 2026–May 2026
MA 55400: Linear Algebra	August 2025–December 2025
MA 51900: Introduction to Probability	August 2025–December 2025
MA 57300: Numerical Solutions of Ordinary Differential Equations	August 2025–December 2025
MA 59500OT: Computational Optimal Transport and Deep Generative Models	January 2025–May 2025
MA 59800: Topics in Dynamical Systems: Bifurcation Theory	January 2025–May 2025
MA 54600: Introduction to Functional Analysis	January 2025–May 2025
MA 59500AFF: Analytic Theory of Function Fields	August 2024–December 2024
MA 59500MM: Introduction to Mathematical Modeling	August 2024–December 2024
MA 54300: Introduction to Ordinary Differential Equations and Dynamical Systems	January 2024–May 2024
MA 54400: Real Analysis and Measure Theory	January 2024–May 2024
MA 55300: Introduction to Abstract Algebra	August 2023–December 2023
MA 53000: Functions of a Complex Variable I	August 2023–December 2023

University of Puerto Rico, Mayagüez Campus

MATE 6101: Number Theory I	August 2022–December 2022
MATE 5150: Linear Algebra	January 2021–May 2021

Student Associations

PythagoRUM

Mayagüez, PR

Co-founder & Vice-President

August 2022–December 2022

- Served as co-founder and Vice-President for the mathematics and computer science student association. This association has the purpose to promote research in mathematics, as well as related fields of STEM, through professional development workshops and research colloquia.
- Coordinated professional development workshops and semester activities.

Society of Physics Students, UPRM Chapter

Mayagüez, PR

Committee Assistant

August 2018–December 2022

- Served as a Demonstration Committee assistant in 2 physics phenomena presentations. The presentations were for an audience of 20+ elementary school students to motivate them to study science. Served as a Sales Committee assistant in chapter food sales events.