Eric J. Pabón Cancel   *Curriculum Vitae*

Contact Information

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Education & Academic Background

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

Bachelor of Science in Pure Mathematics (*Magna Cum Laude*)   June 2023
Minor in Applied Mathematics for Science and Engineering
University of Puerto Rico, Mayagüez Campus (UPRM), Mayagüez, Puerto Rico

Research Experience

Research Intern in Generative AI   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
Unsupervised Network-Based behavior Inference from human Action Sequences (UNBIAS)
Supervised by: Dr. Sam Polk & Dr. Mabel Ramírez, MIT Lincoln Laboratory

- 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
Properties of $\tau_{(n)}$-primes
Supervised by: Prof. Reyes M. Ortiz Albino, University of Puerto Rico at Mayagüez

- 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 clases 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
Permutation Invariant Parking Assortments
Supervised by: Prof. Pamela E. Harris, University of Wisconsin-Milwaukee

- Enumerative Combinatorics research focused on the study of generalizations of parking functions.
- Characterized when the car length vector $\vec{y}$ is minimally invariant (the case when the all-ones sequence is the only 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
Improving the Dimension Bound of Hermitian-Lifted Codes
Supervised by: Prof. Fernando Piñero González, University of Puerto Rico at Ponce

- 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

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

- 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 Mathematical Optimization applied to Biotechnology June 2023–July 2023

MIT Lincoln Laboratory Summer Research Program

2023 MIT Lincoln Laboratory Intern Innovative Idea Challenge (I^{3}C)

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

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

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

Awards and Merits

Fellowships, Scholarships and Prizes

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	December 2022
2023 MIT Lincoln Laboratory I^{3}C 3rd Place Research Proposal Prize	July 2023
2022 Evertec Inc. STEM Scholarship	October 2022
Puerto Rico-Louis Stokes Alliance for Minority Participation 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

[1] <u>E.J. Pabon-Cancel</u> and R.M. Ortiz-Albino. Properties of $\tau_{(n)}$-primes. *Currently in progress*.

[2] S. Polk, <u>E.J. Pabon-Cancel</u>, R. Paleja, K. Chestnut-Chang, R. Jensen and M. Ramirez. Unsupervised Network-Based behavior Inference from human Action Sequences (UNBIAS). *Submitted*.

[3] A. Allen, <u>E.J. Pabon-Cancel</u>, F. Piñero-Gonzalez and L. Polanco. Improving the Dimension Bound of Hermitian-Lifted Codes. *Submitted*. arXiv: https://arxiv.org/abs/2302.01557

[4] D. Chen, P.E. Harris, J. Carlos Martinez Mori, <u>E.J. Pabon-Cancel</u> and G. Sargent. Permutation Invariant Parking Assortments. *Enumerative Combinatorics and Applications*, **4:1**, 1-25 (2024). #S2R4.

[5] P.E. Harris, Z. Markman, L. Martinez, A. Mock, <u>E.J. Pabón-Cancel</u>, A. Verga, and S. Wang. A Model for a One-Hour Workshop on Mentoring. *MAA Focus*, **43**(1), 18-21 (2023).

[6] I. Byrne, N. Dodson, R. Lynch, <u>E.J. Pabon-Cancel</u> and F. Piñero-Gonzalez. Improving the minimum distance bound of Trace Goppa codes. *Designs, Codes and Cryptography*. **91**, 2649–2663 (2023).

Poster Sessions and Presentations

- 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

- 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   23-24 April, 2021
  Sponsored by PR-LSAMP (*Virtual*)
  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

Workshops, Semester Mini-Courses and Summer Schools

Preliminary Arizona Winter School 2023: Elliptic Curves and Abelian Varieties — **Virtual Course**
Topics: Abelian varieties over finite fields — October 2023–November 2023
Organizers: Southwest Center for Arithmetic Geometry, University of Arizona

Preliminary Arizona Winter School 2022: Heights and Model Theory — **Virtual Course**
Topics: Heights in Diophantine geometry — October 2022–November 2022
Organizers: Southwest Center for Arithmetic Geometry, University of Arizona

MSRI Modern Math Workshop 2022 — **San Juan, PR**
Topics: Mathematical Modeling and Data Science — October 2022
Organizers: Hélène Barcelo (MSRI), Christian Ratsch (IPAM), Ulrica Wilson (ICERM)

Thematic Program in p-adic L-functions and Eigenvarieties — **Notre Dame, IN**
Topics: Modular Forms and Elliptic Curves (Undergraduate Summer School) — May 2022–June 2022
Organizers: A. Jorza, C. Raicu, E. O'Dorney (Center for Mathematics, University of Notre Dame)

Algebraic Coding Theory Workshop — **Johnson City, TN**
Topics: Finite Fields and Projective Geometry — June 2021
Organizer: Fernando Piñero González (University of Puerto Rico at Ponce)

Skills and Other Information

Programming: Python, SAGEMath, Julia, C++, MATLAB | Software: Git, LaTeX
Languages: English (fluent) and Spanish (native)

Professional Memberships

- American Mathematical Society Member — since October 2023
- SACNAS Member — since March 2022
- National Eagle Scout Association Member — since June 2017

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.