Eric J. Pabón Cancel

Curriculum Vitae

CONTACT INFORMATION

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

epabonca@purdue.edu
ejpaboncancel.github.io

EDUCATION & ACADEMIC BACKGROUND

Doctor of Philosophy in Mathematics — Starting August 2023
Purdue University, West Lafayette, Indiana

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

High School Diploma (*Highest Honors*) — June 2019
Juan Quirindongo Morell High School, Vega Baja, Puerto Rico

RESEARCH POSITIONS

Research Intern in Machine Learning and 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 Machine Learning via LSTM Autoencoders
Supervised by: Dr. Sam Polk & Dr. Mabel Ramírez, MIT Lincoln Laboratory
Participants: Eric J. Pabón Cancel

- Machine Learning and Mathematical Algorithms research project focused on Long Short-Term Memory autoencoders. I identified the autoencoder that both minimized the reconstruction loss and learned relevant information of encoded sequences.

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
Participants: Eric J. Pabón Cancel

- Algebra and Number Theory research based on the theory of generalized factorizations in integral domains. I generalized the notion of complete residue systems for $\tau_{(2)}$-primes, $\tau_{(3)}$-primes and $\tau_{(6)}$-primes. I 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
Participants: Douglas Chen, J. Carlos Martinez Mori, Eric J. Pabón-Cancel, Gabriel Sargent

- Enumerative Combinatorics research focused on the study of generalizations of parking functions. Characterized when the car length vector $\vec{y}$ is minimally invariant (when (1^n) is the only invariant parking sequence), and characterized the form of the 2-tuple and 3-tuple parking sequences.

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
Participants: Austin Allen, Eric J. Pabón-Cancel, Lesley Polanco

- Algebraic Geometry research focused on locally recoverable codes from elements that arise from regions of the normal basis of the Hermitian Curve. Developed a formula that improved the counting of good recoverable functions. Improved the bound rate of the code from 0.7% to 10%.

Improving the Minimum Distance Bound of Trace Goppa Codes
Supervised by: Prof. Fernando Piñero González, University of Puerto Rico at Ponce
Participants: Isabel Byrne, Natalie Dodson, Eric J. Pabón Cancel, Ryan Lynch

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

PROJECTS

Project in Optimization applied to Biochemistry June 2023–July 2023
MIT Lincoln Laboratory Summer Research Program
2023 MIT Lincoln Laboratory Intern Innovative Idea Challenge (I^3C)
SKINS: Skin-growth boosting and Intra-absorptive Solution bandages
Supervised by: Ryan Burrow and Ashok Kumar, MIT Lincoln Laboratory
Participants: Samuel Brown, Eric J. Pabón-Cancel, Daniel Reyes

- Chemistry and Biotech research project proposal of the 2023 edition of the MIT Lincoln Laboratory Intern Innovative Idea Challenge, based on the development of a hydrogel bandage with accelerated healing and anti-scarring properties. My team proposed a combination of Sodium Carboxymethil Cellulose, BMM and Aloe vera. I focused on estimating the materials cost, as well as establishing an approximate size of the bandage to optimize the amount of medicine that will be applied to the product. The project won 3**rd** Place, ranked Top 3 out of 28 submitted proposals in the competition.

SCHOLARSHIPS, FELLOWSHIPS AND PRIZES

2023 National GEM Consortium PhD Science Fellowship, $16,000 — August 2023–May 2024
- Purdue University Department of Mathematics Sponsorship, $11,700 — August 2023–May 2024
- MIT Lincoln Laboratory Employer Sponsorship — December 2022

2023 MIT Lincoln Laboratory I^3C 3rd Place Prize, $1,000 — July 2023
2022 Evertec Inc. Scholarship, $1,000.00 — October 2022
Puerto Rico-LSAMP Scholarship, $4,800.00 — August 2019–December 2022
UPRM Musical Talent Scholarship, $800.00 — February 2020

TRAVEL FUNDING

2023 GEM Annual Board Meeting and Conference Travel Grant — September 2023
2023 Emerging Researchers National Conference in STEM Travel Grant — February 2023
2022 Field of Dreams Math Alliance Conference Travel Scholarship — November 2022
2022 Puerto Rico-LSAMP Travel Grant — October 2022

AWARDS AND MERITS

2023 MIT Lincoln Laboratory I^3C 3^{rd} Place Research Proposal Winner — July 2023
2023 Ford Foundation Predoctoral Fellowship Honorable Mention — March 2023
2022 Hispanic Scholarship Fund Scholar — June 2022
National Math Alliance Predoctoral Scholar — November 2021-May 2023
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

PREPRINTS AND PAPERS

[1] E.J. Pabon-Cancel and R.M. Ortiz-Albino.
Properties of $\tau_{(n)}$-primes. (In progress).

[2] A. Allen, E.J. Pabon-Cancel, L. Polanco and F. Piñero-Gonzalez.
Improving the Dimension Bound of Hermitian-Lifted Codes. (Submitted).
Submitted to Designs, Codes and Cryptography.
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.
arXiv: https://arxiv.org/abs/2211.01063.

[4] 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). arXiv: https://arxiv.org/abs/2201.03741

Contributions to the Profession

[1] 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).

Invited Talks

- Combinatorics and Coding Theory in the Tropics (UPR-Ponce) — Virtual Seminar
  REU Seminar: Graduate School: Application tips and advice — July 2023

Posters and Presentations

- **2023 MIT Lincoln Lab Intern Innovative Idea Challenge** — **Lexington, MA**
  SKINS: Skin-growth boosting and Intra-absorptive Solution Bandages Presentation — July 2023
- **2023 MIT Lincoln Lab Intern Innovative Idea Challenge** — **Lexington, MA**
  Skin-Absorptive and Skin-Growth Boosting Bandages Poster — July 2023
- **2023 JTM-PRISM** — **Bayamón, PR**
  Properties of $\tau_{(n)}$-primes Presentation — April 2023
- **38th Interuniversity Mathematical Sciences Research Seminar** — **Mayagüez, PR**
  Permutation Invariant Parking Assortments Presentation — February 2023
- **2023 AAAS Emerging Researchers National Conference in STEM** — **Washington, DC**
  Permutation Invariant Parking Functions with cars of assorted lengths Poster — February 2023
- **Joint Mathematics Meetings 2023** — **Boston, MA**
  Permutation Invariant Parking Functions with cars of assorted lengths Poster — January 2023
  Permutation Invariant Parking Functions with Cars of Arbitrary Lengths Presentation
- **2022 SACNAS National Diversity in STEM Conference** — **San Juan, PR**
  The Study of $\tau_{(n)}$-primes Poster — October 2022
- **2022 Gulf Coast Undergraduate Research Symposium** — **Houston, TX**
  Properties of $\tau_{(n)}$-primes Presentation — October 2022
- **Summer@ICERM 2022: Computational Combinatorics** — **Providence, RI**
  On Permutation-Invariant Parking Sequences Presentation — August 2022
- **2022 JTM-PRISM** — **Humacao, PR**
  The Study of $\tau_{(n)}$-primes Presentation — April 2022
- **Joint Mathematics Meetings 2022** — **Virtual Presentation**
  Improving Bounds of Hermitian-Lifted Codes Poster — April 2022
- **37th Interuniversity Mathematical Sciences Research Seminar** — **Virtual Presentation**
  Improving Bounds of Hermitian-Lifted Codes Presentation — February 2022
  The Study of $\tau_{(n)}$-primes Poster
- **2021 Math REU Conference@Clemson University** — **Virtual Presentation**
  Improved Hermitian-Lifted Codes Presentation — July 2021
- **2021 JTM-PRISM** — **Virtual Presentation**
  The Study of $\tau_{(n)}$-atoms Presentation — April 2021
- **35th Interuniversity Mathematical Sciences Research Seminar** — **Cayey, PR**
  The Study of $\tau_{(n)}$-atoms Poster — March 2020

Conferences

- 2023 GEM Annual Board Meeting and Conference — 14-16 September, 2023
  Sheraton Downtown Philadelphia — Philadelphia, Pennsylvania
- 2023 Junior Technical Meeting-PR Interdisciplinary Scientific Meeting — 29 April, 2023
  University of Puerto Rico at Bayamón — Bayamón, Puerto Rico
- 38th Interuniversity Mathematical Sciences Research Seminar — 24-25 February, 2023
  University of Puerto Rico, Mayagüez Campus — Mayagüez, Puerto Rico
- 2023 AAAS Emerging Researchers National Conference in STEM — 9-11 February, 2023
  Omni Shoreham Hotel — Washington, District of Columbia
- Joint Mathematics Meetings 2023 — 4-7 January, 2023
  John B. Hynes Veterans Memorial Convention Center — Boston, Massachusetts
- 2022 Field of Dreams Conference of The National Math Alliance — 4-6 November, 2022
  The 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
- 2022 Gulf Coast Undergraduate Research Symposium — 8-9 October, 2022
  William Marsh Rice University — Houston, Texas
- 2022 Junior Technical Meeting-PR Interdisciplinary Scientific Meeting — 9 April, 2022
  University of Puerto Rico at Humacao — Humacao, Puerto Rico
- Joint Mathematics Meetings 2022 — 6-9 April, 2022
  Zoom Conference
- 37th Interuniversity Mathematical Sciences Research Seminar — 25-26 February, 2022
  Zoom Conference
- 2021 Math REU Conference@Clemson University — 19 July, 2021
  Zoom Conference
- 2021 Junior Technical Meeting-PR Interdisciplinary Scientific Meeting — 23-24 April, 2021
  Virtual Conference, sponsored by Puerto Rico Louis Stokes Alliance for Minority Participation
- 35th Interuniversity Mathematical Sciences Research Seminar — 6-7 March, 2020
  University of Puerto Rico at Cayey — Cayey, Puerto Rico

Workshops and Mini-Courses

Inclusion In Innovation Initiative (I4) PEP Talk Workshop — **Virtual Workshop**
Topics: Pathways to Entrepreneurship in STEM — August 2023
Organizers: Camille Martin (speaker), The National GEM Consortium and NSF I-Corps

Inclusion In Innovation Initiative (I4) GEMpreneur Workshop — **Virtual Workshop**
Topics: Introduction to the NSF I-Corps program — June 2023
Organizers: The National GEM Consortium and NSF I-Corps

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)

2022 NSF/STEM: Fellowships Application Workshop — **Rio Piedras, PR**
Topics: Grants and Fellowships Workshop — May 2022
Organizers: Mike Westrate (Villanova University)

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, Markdown, LaTeX
Languages: English (fluent) and Spanish (native)
Clearance Status: Secret Level Clearance
Professional Memberships:
- SACNAS Member — since March 2022

Graduate Coursework

Purdue University
MA 55300: Introduction to Abstract Algebra I — 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.

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.

Hermandad Colegial de Avivamiento — **Mayagüez, PR**
Committee Assistant — August 2018–December 2022
- Served as percussion musician for Hermandad Colegial de Avivamiento. Went on a mission to the municipality of Vieques, Puerto Rico in the winter of 2019, and helped distribute donated food, clothing and gifts for people in need.

Acting and Music — **Mayagüez, PR**
Acting: Theater Presentations and Roles — February 2019–December 2022
- The Physics Movie (Nicholas Flamel, secondary character) (Animated film in production)
- El Muerto (Sabás Honoré, secondary character) (August 2019)
- The Physics Show (Michael Faraday, secondary character) (March 2019)

Music: Alma Latina UPRM — February 2020–March 2020
- Worked as percussion musician and staff for the Latin jazz and salsa music group Alma Latina at UPRM.

References

Available upon request