

# ALEC S. ZABEL-MENA

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azabelmena.github.io

## EDUCATION

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<b>BS</b>	Pure Mathematics, Minor in Cybersecurity University of Puerto Rico, Río Piedras	August 2016 - June 2022
<b>MS</b>	Pure Mathematics University of Puerto Rico, Río Piedras	August 2022 - Present In Progress

## PRESENTATIONS AND TALKS

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- Zabel-Mena, Alec S., Janwa Heeralal, Agrinsoni, Carlos, (2025, March). Absolute Irreducibility of Generalized Trinomials Defined by APN Functions of the form  $f(x) = x^i + h(x)$  over  $F_2^s$ . [contributed talk]. 56<sup>th</sup> Southeastern International Conference on Combinatorics, Graph Theory, and Computing. Boca Raton, FL.
  - Zabel-Mena, Alec S., Janwa Heeralal, Agrinsoni, Carlos, (2025, March). Absolute Irreducibility of Generalized Trinomials Defined by APN Functions of the form  $f(x) = x^i + h(x)$  over  $F_2^s$ . [contributed talk]. 40<sup>th</sup> Seminario Interuniversitario de Investigación en Ciencias Matemáticas (SIDIM). Ponce, PR.
  - Zabel-Mena, Alec S., Janwa Heeralal, Agrinsoni, Carlos, (2024, March). An Efficient Implementation and Analysis Of Zeta Functions Of APN Curves and Their Protograph LDPC Codes [contributed talk]. 39<sup>th</sup> Seminario Interuniversitario de Investigación en Ciencias Matemáticas (SIDIM), Humacao, PR.

## GRANTS AND AWARDS

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<b>NASA PR Space Grant Fellowships and Scholarship Program (No. 80NSSC20M0052)</b> University of Puerto Rico	August 2024 - May 2025
<b>NASA PR Research Assistantship (No. 80NSSC20M0052)</b> University of Puerto Rico	January 2024 - May 2024
<b>NASA PR Research Assistantship (No. 80NSSC20M0052)</b> University of Puerto Rico	August 2023 - December 2023
<b>Puerto Rico Louis Stokes Alliance for Minority Participation</b> University of Puerto Rico	August 2021 - May 2022

## RESEARCH

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- Absolute Irreducibility of Generalized Trinomials Defined by APN Functions of the form  $f(x) = x^i + h(x)$  over  $F_2^s$ .**  
University of Puerto Rico August 2024 - Present
- Researching generalized trinomials defined by APN functions in search of a resolution to the Exceptional APN conjecture.
  - Supervised by Heeralal Janwa, Ph.D.

## **An Efficient Implementation and Analysis of Zeta Functions of APN Curves and Their Protograph LDPC Codes for Space Applications**

University of Puerto Rico

August 2021 - August 2024

- Researching APN functions and the classification of certain 2-error correcting cyclic codes for use in cryptography and coding theory.
- Mentored by Professor Heeralal Janwa, Ph.D.

## **The General Linear Group: Finding $2 \times 2$ Representations of Finite Groups**

University of Puerto Rico

April 2020

- Final project for the second undergraduate seminar in mathematics (MATE3170). Research the general linear group on  $2 \times 2$  matrices and representations of well known groups using these matrices.
- Worked under the supervision of Professor Raúl Figueroa, Ph.D.

## **Matroid Theory**

University of Puerto Rico

November 2019

- Final project for the first undergraduate seminar in mathematics (MATE3070). Gave a survey of the field of Matroid theory, and its applications in Graph theory, Topology, and Algorithm Design.
- Worked under the supervision of Professor Iván Cardona, Ph.D.

## **Algebraic Codes over Elliptic and Hermitian Curves**

University of Puerto Rico

May 2019

- Research paper, and final project of the Introduction to Coding Theory course. Studied and found algebraic geometric codes using elliptic and Hermitian curves for use in coding theory and cryptography.
- Worked under the supervision of Professor Heeralal Janwa, Ph.D.

## **RESEARCH INTERESTS**

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| • Commutative Algebra                             | • Algorithm Design for use in computer science and computational mathematics             |
| • Algebraic Geometry                              |  |
| • Finite Fields                                   | • High Performance Computing   |
| • Graph theory, Matroid theory, and Combinatorics | • Cybersecurity research and normalizing a culture that is privacy and security oriented |
| • Category Theory and Homotopy Type Theory        | • Post-Quantum error correction  |

## **TEACHING AND MENTORING**

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### **Proyecto Tutorías DECEP**

2020-2021

University of Puerto Rico, Río Piedras  
Mathematics tutor

- Conducted assessments to identify the educational needs of my students and developed individualized learning plans.
- Tasked with providing tutoring services to seven high school students for 10 hours a week in the subjects of Algebra and Pre-Calculus.

### **Self-Employed**

2019-2021

Mathematics tutor

- Evaluated students learning styles and provided appropriate techniques for maximizing understanding and minimizing frustration.
- Simplified math concepts while coaching students to think critically when problem solving; eventually introducing them to axiomatic systems within mathematics.
- Provided tutoring one-on-one to five highschool students in the subjects of Algebra, Pre-Calculus, and Geometry for two times a week, at two hours for each session.

## HONORS AND AWARDS

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Dean's List	2016 - 2021
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## MEMBERSHIPS AND AFFILIATIONS

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Consejo de General De Estudiantes (UPRRP) Representante ante el Consejo de Estudios Graduados e Investigación	August 2024 – May 2025
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Consejo de Estudiantes de Ciencias Naturales Representante ante el Decanato de Estudios Graduados e Investigación	August 2023 – May 2025
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Asociación de Estudiantes de Ciencias de Computos (AECC)	2022 - Present
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Asociación Estudiantil de Matemáticas (AeMAT)	2019-Present
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Treasurer	August 2022 – May 2024
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Lembrança Negra Capoeira (Puerto Rico) Corda Crua-Verde	2016 - 2018
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Senzala Capoeira (Puerto Rico) Corda Crua-Laranja	2018 - Present
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CEO of HTMX	2023 – Present
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## SKILLS

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- **Languages**
  - English
  - Spanish
  - Portuguese
- **Software**
  - Excel
  - $\text{\LaTeX}$
  - Knowledge of UNIX-like systems and the commandline to streamline workflow and automate repetitive tasks
  - Privacy and Security Oriented
  - C programming

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