

# ALEC S. ZABEL-MENA

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## EDUCATION

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

## RESEARCH

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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 - Present

- 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.

## GRANTS AND AWARDS

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Puerto Rico Louis Stokes Alliance for Minority Participation  
University of Puerto Rico August 2021 - May 2022

## RESEARCH INTERESTS

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

## PUBLICATIONS

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### Works in Preparation

Janwa, H. Zabel-Mena, A. *An Efficient Implementation and Analysis of Zeta Functions of APN Curves and Their Protograph LDPC Codes for Space Applications.* unpublished.

## PRESENTATIONS AND TALKS

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- Zabel-Mena, Alec S., Janwa Heeralal, Agrisoni, 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.
- Zabel-Mena, Alec S., Janwa Heeralal, Agrisoni, Carlos, (2023, November 30). An Efficient Implementation and Analysis Of Zeta Functions Of APN Curves and Their Protograph LDPC Codes [poster session]. 2023 Forward Research Innovation Summit, San Juan, PR.
- Zabel-Mena, Alec S., (2022, April). An Efficient Implementation of Computing The Rational Points and Zeta-functions of Curves Associated with APN Monomials and Applications to Cyclic codes [minisymposium talk]. 55<sup>th</sup> ACS Junior Technical Meeting, Humacao, PR.

## 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  
Mathematics tutor

2019-2021

- 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

## MEMBERSHIPS AND AFFILIATIONS

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Asociación de Estudiantes de Ciencias de Computos (AECC)

2022 - Present

Asociación Estudiantil de Matemáticas (AeMAT)

2019-Present

Treasurer

Lembrança Negra Capoeira (Puerto Rico)

2016 - 2018

Senzala Capoeira (Puerto Rico)

2018 - Present

## 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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