Rafael Ceja Ayala

Presidential Postdoctoral Fellow
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Employment/Academic Positions

Arizona State University — July 2024 – Present
Presidential Postdoctoral Fellow — Tempe, AZ
Mentor: Dr. Malena Español

Purdue University — Aug 2018 – May 2024
Student Researcher and Teaching Assistant — West Lafayette, IN

California State University(CSU), Sacramento — 2014 – 2018
Student Researcher and Teaching Assistant — Sacramento, CA

Education

Purdue University — Aug 2018 – May 2024
Ph.D. in Applied Mathematics — Thesis: Analysis and Computation for the inverse scattering problem with conductive boundary conditions.
Advisor and Mentor: Dr. Isaac Harris

Purdue University — May 2022
M.S. in Applied Mathematics — West Lafayette, IN

California State University, Sacramento — Aug 2014 – May 2018
B.A. in Mathematics — Sacramento, CA

Research Interests

My research interests are in **Inverse Problems** for *Partial Differential Equations.* I work with problems related to **transmission eigenvalues** and **reconstructions** of small and extended regions using different areas of *Functional Analysis* and **Scattering Theory**. These problems arise in many physical applications such as **nondestructive testing** and **detecting defects** in complex structures.

Publications

1. **R. Ceja Ayala, I. Harris, and A. Kleefeld**, "Inverse parameter and shape problem for an isotropic scatterer with two conductivity coefficients". *Analysis and Mathematical Physics,* 14, No. 90, DOI:10.1007/s13324-024-00950-x (arXiv:2402.07880) (2024).
2. **R. Ceja Ayala, I. Harris, and A. Kleefeld** , "Direct sampling method via Landweber iteration for an absorbing scatterer with a conductive boundary," *Inverse Problems and Imaging*, DOI:10.3934/ipi.2023051 (arXiv:2305.15310) (2023).
3. **R. Ceja Ayala, I. Harris, A. Kleefeld, and N. Pallikarakis**, "Analysis of the transmission eigenvalue problem with two conductivity parameters," *Applicable Analysis*, DOI: 10.1080/00036811.2023.2181167 (arXiv:2209.07247) (2023).
4. **A. Alvarado, R. Ceja Ayala, E. Knutsen, and J. Turner**, "Investigation of the Collatz Function in the Gaussian and Eisenstein Integers," (Submitted) (2022).
5. **R. Ceja Ayala, S. Farrand, and V. Pigno**, "Using a Geometric View of Relatively Prime Integers to Associate Fractions to Decimals," Published in the McNair 2016-Journal at CSU-Sacramento.

Selected Presentations

1. "Inverse shape problem for an isotropic scatterer with conductivity coefficients," Modeling and Computation seminar at the University of Arizona, Tucson, Arizona, October 2024.
2. "Inverse shape problem for an isotropic scatterer with conductivity coefficients," SACNAS, Phoenix, Arizona, October 2024.
3. "Analysis of the Transmission Eigenvalue Problem with two Conductivity Parameters," Inverse Problems for Partial Differential Equations, New Brunswick, New Jersey, May 2024.
4. "Analysis of the Transmission Eigenvalue Problem with two Conductivity Parameters," SACNAS, Portland Oregon, October 2023.
5. "Analysis of the Transmission Eigenvalue Problem with two Conductivity Parameters," Mathematics Seminar, Virginia Tech, October 2023.
6. "Analysis of the Transmission Eigenvalue Problem with two Conductivity Parameters," Great Lakes Mathematical Physics Meeting, Oberlin Ohio, June 2023.
7. "Analysis of the Transmission Eigenvalue Problem with two Conductivity Parameters," Ohio River Analysis Meeting, Cincinnati Ohio, March 2023.
8. "Analysis of the Transmission Eigenvalue Problem with two Conductivity Parameters," SIAM Conference on Computational Science and Engineering (CSE23), Amsterdam Netherlands, February 2023.
9. "Analysis of the Transmission Eigenvalue Problem with two Conductivity Parameters," Graduate Student Analysis Seminar, Purdue University February 2023
10. "Analysis of the Transmission Eigenvalue Problem with two Conductivity Parameters," Applied Mathematics Seminar (Virtual), New Mexico Tech December 2022
11. "Analysis of the Transmission Eigenvalue Problem with two Conductivity Parameters," Scattering Theory Seminar, Purdue University November 2022
12. "Analysis of the Transmission Eigenvalue Problem with two Conductivity Parameters," Graduate Research Day, Purdue University November 2022
13. The Field of Dreams Conference, Minneapolis Minnesota November 2022
14. The Institute of Teaching and Mentoring, Atlanta Georgia October 2022
15. The Institute of Teaching and Mentoring, Virtual Conference April 2021
16. The Field of Dreams Conference, Virtual Conference November 2020
17. The Field of Dreams Conference, Saint Louis Missouri November 2019

Selected Teaching & Mentoring Experiences

- **Teaching Assignments at Arizona State University:**
  - Fall 2024: MAT 265 (lecture) *Calculus I for engineers* (1 Section)
- **Teaching Assignments at Purdue:**
  - Fall 2023 and 2022: MA 16010 (lecture) *Applied Calculus I* (2 Sections)
  - Summer 2023: MA 51100 (Teaching Assistant) *Graduate Linear Algebra with Applications* (3 Sections)
  - Spring 2023: MA 16010 (Forum Moderator) *Applied Calculus I* (All Sections)
- **Mentorship at Purdue University:**
  - *Association for Women in Mathematics Mentor to* Eric J. Pabón Cancel and Kale Stahl

- *LSAMP Purdue Program Mentor to* Prinitha Senthil (Computer Science) and Kyndahl Bishop (Mathematics) Spring 2023
- *LSAMP Purdue Program Mentor to* Loahni Hernandez (Fall 2022)
- *LSAMP Purdue Program Mentor to* Jessica Soleto and Gabriel Muzio (Spring 2022)
- *LSAMP Purdue Program Mentor to* Santiago Lopez and Oliver Bonilla (Fall 2021)

Selected Awards, Grants & Honors

- Attended ICERM-Empowering a Diverse Computational Mathematics Research Community July – August 2024
- Arizona State University Presidential Fellowship . . . . . 2024 – 2027
- Honorary mentioned NSF Postdoctoral Fellowship . . . . . February 2024
- Bilsland Dissertation Fellowship . . . . . Spring 2024
- Gates Millennium Fellowship/Scholarship . . . . . 2018 – 2024
- Alliance for Graduate Education and the Professoriate (AGEP) Scholar . . . . . 2021 – Present
- Oregon State University Pre-Doctoral Scholar 2023
- Virginia Tech Future Faculty Diversity Program Scholar . . . . . Fall 2023
- Purdue Doctoral Fellowship . . . . . 2018 – 2022

Selected Academic Activities, Service & OUTREACH

- **Co-organizing,** mini-session titled Diverse Perspectives: Interdisciplinary Research in Applied Mathematics at NDiSTEM . . . . . October 2024
- **Co-organizing,** mini-session titled Recent Advances in Numerical and Modeling Methods for Inverse Problems at SIAMCSE25 . . . . . March 2025
- **Invited Speaker,** Graduate Student Panel at Career Paths in the Mathematical Sciences an IMSI/IMA/Math Alliance Workshop . . . . . June 2024
- **Co-organizer,** Basic Skills Seminar at Purdue University . . . . . Fall 2023 – Spring 2024
- **Co-organizer,** Graduate Student Analysis Seminar at Purdue University Fall 2023 – Spring 2024
- **Mathematics Screening Judge,** Mathematics Department at Purdue University August 2023
- **Poster Judge,** Graduate Bridge Program at Purdue University . . . . . August 2023
- **Panel Speaker,** Summer Research Opportunities Program at Purdue University . . . June 2023
- **Mentor,** AWM student Chapter at Purdue University . . . . . Spring 2023
- **Panel Speaker,** Conexiones Retreat at Purdue University . . . . . Fall 2022
- **Writer,** for the Al Punto Newspaper in Ukiah California . . . . . 2012 – 2020
- **Panelist,** for the Science Equity Education (SEE) Program at CSU-Sacramento . . Spring 2022
- **Co-Organizer,** Diversity Statement Virtual Workshop Hosted by AGEP . . . . . Fall 2021
- **Student Rep,** Purdue University "Math Alliance Graduate Fair" . . . . . Fall 2021
- **Student Rep,** Purdue University "Math Alliance Graduate Fair" . . . . . Fall 2020
- **Member,** Purdue University "Latino Graduate Student Organization" . . . . . Since 2018