# ISABEL BARRIO SANCHEZ

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## EDUCATION

**University of Pittsburgh.** **Ongoing, expected completion May 2026**

Ph.D. in Mathematics.
Research area: Numerical Analysis and Scientific Computing.
Areas of Interest: Numerical PDEs, Fluid Structure Interaction, Computational Fluid Dynamics, Data assimilation.

**West Virginia University Institute of Technology** **2017-2021**

Bachelor of Science in Mathematics.
Cumulative GPA: 4.0/4.0.
Minors: Computer Science, Economics.
Women's Basketball team.

## COMPUTING SKILLS

Languages: C++, Python, Java, MatLab, R.
Research: FreeFEM++, AMReX, HPC.
Other: Git, HTML/CSS, UNIX, Numpy, SciPy, Pandas.

## EXPERIENCE

**Mellon Fellow – University of Pittsburgh** **2025-2026**

- One of a select group of PhD students across the School of Arts & Sciences awarded this **competitive fellowship** for exceptional scholarly and institutional contributions.

**Graduate Teaching Assistant - University of Pittsburgh** **2021-2025**

- Served as *instructor of record* for Business Calculus, independently designing lectures, assignments, and assessments.
- Assisted instruction in advanced undergraduate/graduate courses: **Numerical Linear Algebra** (34 students), **Numerical Mathematical Analysis** (40 students), and **Modeling in Applied Math** (20 students).
- Supported multiple sections of Calculus, collectively reaching over **300 students**, through recitations, grading, and office hours.

**Math-to-Industry Bootcamp – University of Minnesota** **Summer 2024**

- 6-week summer program providing graduate students with training and experience that is valuable for employment outside of academia
- Learned fundamentals of data science, machine learning, and optimization, using R and Python.
- Collaborated on a final project with General Electric on CT image reconstruction and denoising algorithms.
- Implemented CT reconstruction algorithms (filtered backprojection, iterative methods) in Python using *scikit-image* and the Core Imaging Library.
- Applied and compared denoising techniques (Tikhonov, L1, total variation) on both simulated (Shepp–Logan phantom) and real CT data.
- Explored deep learning approaches (CNNs, GANs) for image reconstruction and noise reduction.
- Delivered a white paper, a presentation, and a GitHub page for the final project.

Research Intern – Lawrence Berkeley National Lab Summer 2023

- 10-week research internship with Dr. Ann Almgren and Dr. John Bell at the Applied Mathematics and Computational Research Division of the Lawrence Berkeley National Lab.
- Developed and implemented an algorithm extending Adaptive Mesh Refinement (AMR) to new geometries.
- Integrated solution into AMReX/CAMR software framework and deployed on HPC systems.
- Culminated with a research paper "A New Re-redistribution Scheme for Weighted State Redistribution with Adaptive Mesh Refinement". Published in the Journal of Computational Physics.

Assistant for the Computer Science Department – WVU Tech 2018-2021

- Developed and led STEM camps and after-school programs for rural and high-poverty girls in Southern West Virginia. Presented my work at the 2020 ASEE Conference.
- Received grants from NCWIT to develop these programs.
- Assisted Dr Afrin Naz on her Computer Science classes and labs.

TRIO Peer Tutor – WVU Tech 2018-2020

- Tutored math courses to low-income and first-generation college students.
- Courses tutored: College Algebra, Trigonometry, Calculus 1, 2, and 3, Differential Equations, and Probability and Statistics.
- Included online tutoring through Spring 2020.

Fall Orientation Leader – WVU Tech 2018, 2019,2020

- Lead Orientation Leader the two last years (led the other OLs).

- Included virtual orientation in Fall 2020 having to manage big groups and events online.

## RESEARCH

- I. Barrio Sanchez, A.S. Almgren, J.B. Bell, M.T. Henry de Frahan, W. Zhang. "A new re-redistribution scheme for weighted state redistribution with adaptive mesh refinement." *Journal of Computational Physics*, vol. 504, 2024, https://doi.org/10.1016/j.jcp.2024.112879.
- Working on a project on data assimilation using modular nudging with Dr. William Layton and Nanda Rahgunathan.
- Working on a project on partitioned methods for two-domain problems with Dr. Catalin Trenchea and Dr. Rebecca Durst.
- Working on a project on the long term stability of NSE using Cauchy's method.
- A. Naz, M. Lu, C. Broyles, I. Barrio Sanchez, "Competition of VEX Educational Robotics to Advance Girl's Education (COVERAGE)", June 2020, 2020 ASEE Virtual Annual Conference.

## TALKS

- "Second-order in time decoupled time stepping methods for heat transfer." Recent Advances in Numerical PDEs, May 6, 2025. (Link).
- "A new Re-redistribution Scheme for Weighted State Redistribution with Adaptive Mesh Refinement." SIAM Conference on Computational Science and Engineering (CSE25), March 7, 2025. (Link).
- "Long-term $H^1$-Stability of Cauchy's Method for the Navier-Stokes Equations." The 42nd Southeastern-Atlantic Regional Conference on Differential Equations. November 9th, 2024. (SEARCDE 2024).
- "Second-order partitioned algorithms with subiterations." 11th Graduate Student Conference, Clemson University, April 20th, 2024. (Conference page).
- "A new Re-redistribution Scheme for Weighted State Redistribution with Adaptive Mesh Refinement." AWM Student Seminar, November 10, 2023. (Link to talk).
- "Competition of VEX Educational Robotics to Advance Girl's Education (COVERAGE)." 2020 ASEE Virtual Annual Conference, Computers in Education Division Technical Session 10: STEM Outreach, June 2020.

## POSTERS

- "A new Re-redistribution Scheme for Weighted State Redistribution with Adaptive Mesh Refinement." Computing Sciences Summer Program Poster Session, August 10, 2023.

## TEACHING

University of Pittsburgh

| Year | Term | Type | Class |
|---|---|---|---|
| 2025 | Spring | Recitation | Business Calculus (25 students) |
| | | Recitation | Business Calculus (11 students) |
| | | Recitations | Business Calculus (9 students) |
| 2024 | Fall | Recitation | Calculus 1 (28 students) |
| | | Recitation | Calculus 1 (26 students) |
| | | Recitation | Calculus 1 (25 students) |
| | Spring | Grading | Numerical Linear Algebra (20 students) |
| | | Grading | Numerical Linear Algebra (14 students) |
| | | Grading | Ordinary Differential Equations 2 (17 students) |
| 2023 | Fall | Grading | Numerical Mathematical Analysis (29 students) |
| | | Grading | Numerical Mathematical Analysis (11 students) |
| | | Grading | Modeling in Applied Math 1 (20 students) |
| | Spring | Recitation | Calculus 1 (32 students) |
| | | Recitation | Calculus 2 (25 students each) x2 |
| 2022 | Fall | Recitation | Business Calculus (25 students) |
| | | Recitation | Calculus 2 (22 students) |
| | | Recitation | Calculus 2 (18 students) |
| | Summer | Lecture | Business Calculus (15 students) |
| 2021 | Fall | Recitation | Calculus 1 (25 students) |
| | | Recitation | Calculus 1 (22 students) |
| | | Recitation | Calculus 2 (24 students) |

## HONORS AND ACTIVITIES

2025- Received the prestigious **Mellon Fellowship**.

2025- Received the **Achievement in Pedagogy Badge** from the Center for Teaching and Learning at the University of Pittsburgh, focusing on the areas of **Pedagogy, DEI, and Professional Development.**

2024-now Attending the Discipline-Based Science Education Research weekly discussions.

2024-now Officer for the SIAM student chapter at Pitt.

2024 Graduate Student Mentor for Girls Math Camp – University of Pittsburgh.

2023-now Officer for the AWM student chapter at Pitt.

2021 Graduated Summa Cum Laude.

2018-2021 Outstanding Freshman, Sophomore, Junior, and Senior for the Mathematics Department.

2017-2021 Intercollegiate women's basketball student-athlete at WVU Tech.

Four-time Conference Champions and three National Appearances.

River States Conference scholar-athlete award every semester.

2019 Successful Participant – The Interdisciplinary Contest in Modeling, COMAP.

2018 Successful Participant – The Mathematical Contest in Modeling, COMAP.

## PROFESSIONAL ORGANIZATIONS

- Society for Industrial and Applied Mathematics (SIAM).
- American Mathematical Society (AMS).
- Association for Women in Mathematics (AWM).