

EDUCATION

- 06/2023– **Ph.D., Computational Science and Engineering**
Massachusetts Institute of Technology (MIT) - Cambridge, MA
Thesis Topic: Stochastic integration for forward analysis of linearized chaotic dynamical systems
Advisor: David Darmofal
Funding: Department of Energy Computational Science Graduate Fellowship
- 09/2021–06/2023 **M.Sc., Aeronautics and Astronautics**
Massachusetts Institute of Technology (MIT) - Cambridge, MA
Thesis Title: Assessment of wall-modeled large-eddy simulation for high-speed flows and novel modeling strategies
Advisor: Adrián Lozano-Durán
Funding: Research Assistantship (MIT)
- 08/2017–05/2021 **B.Sc., Aerospace Engineering**
University of Illinois Urbana-Champaign (UIUC) - Urbana, IL
Minor: Atmospheric Sciences

RESEARCH EXPERIENCE

Department of Energy Computational Science Graduate Fellow, MIT

Supervisor: David Darmofal, Aerospace Computational Design Laboratory

- 07/2023– **Towards a stochastic subgrid-scale model for turbulence**
Connecting subgrid-scale modeling and stochasticity for nonlinear systems.
Presented work at Advances in Computational Mechanics 2023.
- 02/2023–07/2023 **Higher-order method for stochastic and chaotic IVPs**
Implemented discontinuous Galerkin method in time for stochastic and chaotic systems of ODEs.
Formulated connection between dynamic filtering and subgrid-scale modeling.
Presented work at the DOE CSGF Annual Program Review 2023.

Department of Energy Computational Science Graduate Fellow, MIT

Supervisor: Adrián Lozano-Durán, Computational Turbulence Group

- 08/2022–02/2023 **Wall-modeled large-eddy simulation for supersonic aircraft**
Performed novel wall-modeled large-eddy simulation of the Lockheed Martin X-59 QueSST with error convergence analysis and computational cost estimates.

Compared near-field pressure signature results to existing RANS studies.
Presented work at the American Physical Society Division of Fluid Dynamics 2022.

Graduate Research Assistant, MIT

Supervisor: Adrián Lozano-Durán, Computational Turbulence Group

06/2021–06/2022 Error characterization and reduction for wall-modeled large-eddy simulation

Performed WMLES of high-speed turbulent channel flow and assessed error scaling properties with Mach number, Reynolds number, and grid resolution.

Implemented novel subgrid-scale model based on information-preserving principles to improve mean profile predictions.

Presented work at the AIAA Aviation Forum 2022 and the American Physical Society Division of Fluid Dynamics 2021.

Undergraduate Research Assistant, UIUC

Supervisor: Andrés Goza, Numerics and Unsteady Flows Group

06/2020–05/2021 Immersed boundary smooth extension method for Poisson problem

Investigated the use of higher-order methods for fluid-thermal-structure interaction problems.

Undergraduate Research Assistant, UIUC

Supervisor: Marco Panesi, Center for Hypersonics and Entry Systems Studies

01/2020–05/2021 Fitting potential energy surfaces to acquire chemical reaction rates for hypersonic reentry systems

Used novel optimization techniques for understanding chemical reactions of hypersonic reentry systems.

Presented work at the UIUC Undergraduate Research Symposium 2021.

TEACHING EXPERIENCE

01/2019–05/2021 Head Engineering Learning Assistant, UIUC

Course: ENG 100 - Engineering Orientation

Supervisor: Gretchen Forman, Grainger First-Year Experience

Managed all ENG 100 course activities for the college while providing direction, guidance, and mentorship to two sections of 20+ first-year aerospace students.

01/2020–05/2020 Course Developer and Instructor, UIUC

Course: AE 199 - Introduction to CubeSat Design & Development

Supervisor: Laura Gerhold, Department of Aerospace Engineering

Created and instructed engineering technical elective course in satellite development for 25+ undergraduate students.

- 01/2020–05/2021 **Teaching Assistant, UIUC**
Course: ENG 177 - Grainger First-Year Experience Leadership Scholars
Supervisor: Angie Wolters, Grainger First-Year Experience
Restructured and taught engineering elective course to 25+ first-year students to introduce leadership opportunities on campus.
- 08/2018–05/2021 **Course Assistant, UIUC**
Course: CS 101 - Introduction to Programming for Engineers
Supervisor: Neal Davis, Department of Computer Science
Guided 100+ freshmen engineering students through introductory-level technical course while leading multiple laboratory sessions and office hours.
- 08/2019–05/2021 **Lead Tutor, UIUC**
Location: Center for Academic Resources in Engineering
Supervisor: Dana Tempel, Center for Academic Resources in Engineering
Developed improved curriculum and led exam review sessions while also leading in recruitment efforts and adjustments to COVID-19 while still providing academic assistance to all engineering undergraduate students.
- 01/2020–05/2021 **Cohort Lead, UIUC**
Location: Illinois Leadership Center (ILC)
Served as mentor to first-year students completing the Leadership Certificate.

SELECTED PUBLICATIONS

Papers & Proceedings

1. **Williams, E.**, Arranz, G., and Lozano-Durán, A., “Near-Field Wall-Modeled Large-Eddy Simulation of the NASA X-59 Low-Boom Flight Demonstrator,” arXiv 2307.02725, July 2023.
2. **Williams, E.**, and Lozano-Durán, A., “Information-Theoretic Approach for Subgrid-Scale Modeling for High-Speed Compressible Wall Turbulence,” AIAA Aviation Forum, June 2022.

Presentations

1. **Williams, E.**, and Darmofal, D., “Towards a stochastic subgrid-scale model for turbulence,” Advances in Computational Mechanics, October 2023.
2. **Williams, E.**, Arranz, G., and Lozano-Durán, A., “Wall-Modeled Large-Eddy Simulation of the Lockheed Martin X-59 QueSST,” American Physical Society Division of Fluid Dynamics, November 2022.
3. **Williams, E.**, and Lozano-Durán, A., “Error Scaling of Wall-Modeled Large-Eddy Simulation of Compressible Wall Turbulence,” American Physical Society Division of Fluid Dynamics, November 2021.

Posters

1. **Williams, E.**, and Darmofal, D., “Stochastic Integration for Chaotic Dynamical Systems,” Department of Energy Computational Science Graduate Fellowship Annual Program Review, July 2023.
2. **Williams, E.**, Ling, Y., Arranz, G., and Lozano-Durán, A., “Numerical Schlieren of the X-59 QueSST,” American Physical Society Division of Fluid Dynamics Gallery of Fluid Motion, November 2021.
3. **Williams, E.**, Sharma, M.P., Venturi, S., and Panesi, M., “Relation of Dissociation Rates to the Centrifugal Barrier,” University of Illinois Undergraduate Research Symposium, April 2020.

Thesis

1. **Williams, E.**, “Assessment of wall-modeled large-eddy simulation for high-speed flows and novel modeling strategies,” Master’s thesis, Massachusetts Institute of Technology, June 2023.

COMMUNITY INVOLVEMENT

01/2022–12/2022 **President**

Organization: Graduate Women in Aerospace Engineering, MIT
Led in diversity, inclusion, and equity efforts and assisted in planning and executing multiple department-wide events for graduate students.
Nominated and received Vickie Kerrebrock Award in first year for departmental leadership and advocacy.

08/2021–05/2022 **Social Committee Chair**

Organization: Aerospace Computational Design Laboratory, MIT
Planned and executed multiple social events for all lab members.

08/2017–05/2021 **President**

Organization: Women in Aerospace, UIUC
Planned multiple professional development conferences and expanded executive board to focus on fundraising, outreach, and networking.
Nominated and received Dale Margerum Memorial Award for exemplifying outstanding leadership qualities.

HONORS & AWARDS

May 2023	Graduate Student Leadership Award, MIT.
Jan 2023	AIAA New England Community Award, MIT.
May 2022	Vickie Kerrebrock Award, MIT.
Apr 2022	DOE Computational Science Graduate Fellowship (CSGF).
Apr 2022	NSF Graduate Research Fellowship Program (GRFP) - Declined.

Apr 2022 DOD NDSEG Fellowship - Declined.
Jan 2022 Gardner Fellowship, MIT.
Oct 2021 AIAA Aviation Week Network 20 Twenties, UIUC.
May 2021 University of Illinois Dean's List.
May 2021 James Scholar Honors Program, UIUC.
Mar 2021 Grainger Engineering Knight of St. Patrick, UIUC.
Mar 2021 University of Illinois Tutor of the Year.
Mar 2021 University of Illinois Senior 100 Honorary.
Mar 2021 NSF Graduate Research Fellowship Program (GRFP) - Honorable Mention.
Oct 2020 Scott R. White Aerospace Engineering Visionary Scholarship, UIUC.
Mar 2020 Dale Margerum Memorial Award, UIUC.
Mar 2020 Philip Lazzara Memorial Scholarship, UIUC.
Oct 2018 Boeing Women in Engineering Scholarship, UIUC.
Oct 2018 Illinois Space Grant Consortium (ISGC) Scholarship, UIUC.
Oct 2018 GE Women's Network Scholarship, UIUC.
Mar 2018 Aerospace Department Academic Scholarship, UIUC.
Mar 2018 Ruth and Harold Hayward Tau Beta Pi Scholarship, UIUC.
Mar 2018 H. S. Stillwell Memorial Scholarship, UIUC.
Aug 2017 Illinois Engineering Achievement Scholarship, UIUC.
Aug 2017 Turley Engineering Scholarship, UIUC.
Aug 2017 MSCI Central States Chapter Scholarship.

April 12, 2024