Emily Williams

emlyjwllms.github.io

Education

05/2023– **Ph.D., Aeronautics and Astronautics**
Massachusetts Institute of Technology (MIT) - Cambridge, MA
Thesis: Stochastic integrators for forward analysis of linearized chaotic systems
Advisor: David Darmofal
Funding: Department of Energy Computational Science Graduate Fellowship

08/2021–05/2023 **M.Sc., Aeronautics and Astronautics**
Massachusetts Institute of Technology (MIT) - Cambridge, MA
Thesis: Addressing outstanding limitations of wall-modeled large-eddy simulation for high-speed compressible wall turbulence
Advisor: Adrián Lozano-Durán
Funding: Research Assistantship (MIT)
GPA: 5.00/5.00

08/2017–05/2021 **B.Sc., Aerospace Engineering**
University of Illinois Urbana-Champaign (UIUC) - Urbana, IL
Minor: Atmospheric Sciences
GPA: 3.94/4.00

Research Experience

02/2023– **Department of Energy Computational Science Graduate Fellow, MIT**
Project: Variational Multiscale Method with Discontinuous Subscales (VMSD)
Supervisor: David Darmofal, Darmofal Research Group
Working on variational multiscale method with discontinuous subscales and stochastic integrators for forward analysis of linearized chaotic systems and connection to subgrid-scale modeling.

08/2022–02/2023 **Department of Energy Computational Science Graduate Fellow, MIT**
Project: Wall-modeled large-eddy simulation for supersonic aircraft
Supervisor: Adrián Lozano-Durán, Computational Turbulence Group
Performed novel wall-modeled large-eddy simulation of the Lockheed Martin X-59 QueSST with error convergence analysis and computational cost estimates.
Presented work at the American Physical Society Division of Fluid Dynamics 2022.

06/2021–06/2022 **Graduate Research Assistant, MIT**
Project: Error quantification and reduction for wall-modeled large-eddy simulation
Supervisor: Adrián Lozano-Durán, Computational Turbulence Group
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.

06/2020–05/2021 **Undergraduate Research Assistant, UIUC**
Project: Immersed boundary smooth extension method for Poisson problem
Supervisor: Andrés Goza, Numerics and Unsteady Flows Group
Investigated the use of higher-order methods for fluid-thermal-structure interaction problems.

01/2020–05/2021 **Undergraduate Research Assistant, UIUC**
Project: Fitting potential energy surfaces to acquire chemical reaction rates for hypersonic reentry systems
Supervisor: Marco Panesi, Center for Hypersonics and Entry Systems Studies
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

1. **Williams, E.**, 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.**, 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.
2. **Williams, E.**, 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.**, 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.
2. **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.**, "Addressing outstanding limitations of wall-modeled large-eddy simulation for high-speed compressible turbulence modeling," 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

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.

January 28, 2023