Nirajan Adhikari

nadhika@purdue.edu • https://adnirajan.github.io/mywebpage/

Education

Purdue University — **West Lafayette, IN**
Doctor of Philosophy, PhD — *2018 – 2021*
Aeronautical & Astronautical Engineering

- Research Interests: Nonequilibrium Aerothermochemisty, CFD, Rarefied Gas Dynamics
- Major Area of Concentration: Aerodynamics
- Thesis: Investigation of Aerothermodynamic and Chemical Kinetic Models for High-Speed Nonequilibrium Flows (`https://doi.org/10.25394/PGS.17126774.v1`)
- Advisor: Dr. Alina A. Alexeenko

Auburn University — **Auburn, AL**
Master of Science, MS — *2015 – 2017*
Aerospace Engineering

- Thesis: Numerical Study of High Lift Configurations (`https://hdl.handle.net/10415/5874`)
- Advisor: Dr. D. Stephen Nichols

Professional Experience

Post-Doctoral Researcher — **West Lafayette, IN**
School of Aeronautics & Astronautics, Purdue University — *January 2022 – Present*

New Biologic Entities Formulation Experiential Intern — **North Chicago, IL**
Drug Product/Process Development, AbbVie — *June 2020 – August 2020*

- CFD modeling of a lyophilization process

Publications

Journal Publications

- **N. Adhikari** and A. A. Alexeenko, "A General Form of Macheret-Fridman Classical Impulsive Dissociation Model for Nonequilibrium Flows", *Physics of Fluids*, Vol 33 (5), 2021, pp. 056109. `https://doi.org/10.1063/5.0047341`
- **N. Adhikari** and A. A. Alexeenko, "Development and Verification of Nonequilibrium Reacting Air Flow Modeling in ANSYS Fluent", *Journal of Thermophysics and Heat Transfer*, Vol 36 (1), 2022, pp. 118–128. `https://arc.aiaa.org/doi/10.2514/1.T6271`
- **N. Adhikari**, T. Zhu, F. Jameel, T. Tharp, S. Shang, and A. A. Alexeenko, "Sensitivity Study to Assess the Robustness of Primary Drying Process in Pharmaceutical Lyophilization", *Journal of Pharmaceutical Sciences*, Vol 109 (2), 2020, pp. 1043–1049. `https://doi.org/10.1016/j.xphs.2019.10.012`

Book Chapters

- **N. Adhikari** and D. S. Nichols, "Grid Generation About High-Lift Wing Configurations", Chapter 2, pp. 9–26, In: O. D. L. Mejia, J. A. E. Gomez (eds), *Numerical Simulation of the Aerodynamics of High-Lift Configurations*, Springer, Cham, 2018. `https://doi.org/10.1007/978-3-319-62136-4_2`
- **N. Adhikari** and D. S. Nichols, "Incompressible Solutions About High-Lift Wing Configurations", Chapter 3, pp. 27–43, In: O. D. L. Mejia, J. A. E. Gomez (eds), *Numerical Simulation of the Aerodynamics of High-Lift Configurations*, Springer, Cham, 2018. `https://doi.org/10.1007/978-3-319-62136-4_3`

Conference Proceedings

- **N. Adhikari** and A. Alexeenko, "Modeling Nonequilibrium Aerothermochemistry in a General Purpose CFD Solver", AIAA paper 2020-2408, *23rd AIAA International Space Planes and Hypersonic Systems and Technologies Conference*, Montréal, Canada, March 2020. `https://doi.org/10.2514/6.2020-2408`

Research Experience

Graduate Researcher — **West Lafayette, IN**
Alexeenko Research Team, School of Aeronautics & Astronautics, Purdue University — *August 2018 – December 2021*

- Research Area: Nonequilibrium Aerothermochemisty, CFD, DSMC
  - Studied nonequilibrium hypersonic flow using CFD and DSMC
  - Developed dissociation models for nonequilibrium air
  - Implemented nonequilibrium aerothermochemistry models in a commercial CFD package
  - Investigated slip boundary conditions for rarefied flow simulations
  - Studied reentry aerothermodynamics of a CubeSat with drag-sail

Graduate Research Assistant — **West Lafayette, IN**
Alexeenko Research Team, School of Aeronautics & Astronautics, Purdue University — *January 2021 – August 2021*

- Research Area: Deterministic Boltzmann Methods, Discontinuous Galerkin Fast Spectral
  - Implemented an asymptotic-preserving scheme to a deterministic Boltzmann solver
  - Investigated microchannel flows using a deterministic Boltzmann solver for near-continuum flows

Graduate Research Assistant — **West Lafayette, IN**
Alexeenko Research Team, School of Aeronautics & Astronautics, Purdue University — *August 2018 – January 2019*

- Research Area: Lyophilization, Freeze-drying, Heat and Mass Transfer Modeling
  - Studied the effect of pressure and temperature deviations during a primary drying lyophilization process using uncertainty quantification techniques
  - Analyzed the equipment capability limit of various lab scale and manufacturing scale lyophilizers using CFD

Graduate Researcher — **Auburn, AL**
CFD Laboratory, Department of Aerospace Engineering, Auburn University — *January 2016 – August 2017*

- Research Area: High Lift Aerodynamics, CFD
  - Assessed CFD prediction capabilities of high lift flow fields
  - Developed grids for various aircraft configurations in *Pointwise*

Teaching Experience

Aeronautics & Astronautics Engineering Teaching Fellow — **West Lafayette, IN**
School of Aeronautics & Astronautics, Purdue University — *August 2021 – December 2021*

- Instructor for Fluid Mechanics (Fall 2021)
  - Instructor of record for AAE 333-02 section, total enrollment of 103
  - Conducted lectures, prepared homework & exams

Graduate Teaching Assistant — **West Lafayette, IN**
School of Aeronautics & Astronautics, Purdue University — *August 2020 – December 2020*

- Molecular Gas Dynamics (Fall 2020)
  - Mentored students in their class projects and provided feedback on progress/final reports
  - Developed quizzes

Graduate Teaching Assistant — **Auburn, AL**
Department of Aerospace Engineering, Auburn University — *January 2016 – May 2017*

- Aerospace Fundamentals (Spring 2017, 2016)
- Introduction to Computational Fluid Dynamics (Fall 2016)

Conference and Poster Presentations

- Hypersonics Summit 2.0: Student Poster Presentation, Purdue University, Indiana, August 2021
- Pre-RGD32 workshop on recent hot topics in RGD, online, July 2021
- Direct Simulation Monte Carlo Conference, Santa Fe, New Mexico, September 2019
- ISLFD Midwest Chapter Conference: Student Poster Presentation, Chicago, Illinois, April 2019

Mentoring, Professional Memberships and Services

- Graduate Mentor, Summer Undergraduate Research Fellowship (SURF), 2021
  - Mentored an undergraduate SURF fellow in research related to verification of a deterministic Boltzmann solver
  - Developed research goals and provided feedback on the deliverables
  - Provided training on various research tools
- Member of the *RGD NextGen: Young Professionals Network*, a network of the Young Professionals in the Rarefied Gas Dynamics (RGD) Community

Fellowship and Awards

Teaching Fellowship **West Lafayette, IN**
School of Aeronautics & Astronautics, Purdue University *August 2021 – December 2021*

Training and Workshops

- NVIDIA Deep Learning Institute (DLI) Certificate – Fundamentals of Deep Learning, NVIDIA DLI, Feb 2022
- XSEDE HPC Monthly Workshop - Summer Boot Camp: A Hybrid Computing Workshop by Pittsburgh Supercomputing Center, Purdue University, June 2019
- Clusters 101: Purdue University High Performance Computation Workshop, Purdue University, October 2018
- LyoHUB's Lyo Summer School, Purdue University, July 2018

Technical Skills

- **Computational Fluid Dynamics:** ANSYS Fluent, TENASI, Stanford University Unstructured (SU^2), Pointwise, ANSYS ICEM CFD, SPARTA DSMC, High Performance Computation (HPC)
- **Programming:** C/C++, Python, MATLAB, Open MPI, openACC, openMP, bash
- **Design, Research and Analysis:** SolidWorks, ANSYS SpaceClaim