

## Education

The University of Washington (UW), Seattle, WA

Ph.D. in Mechanical Engineering

Expected 2027

The University of New Mexico (UNM), Albuquerque, NM

Master of Science in **Mechanical Engineering**

Cumulative GPA: 4.0

May 2023

- Thesis title: "Development of models for the velocity-pressure gradient correlations in incompressible wall-bounded planar turbulent flows using multiple linear regression"

Bachelor of Science with Honors, **Mechanical Engineering**, summa cum laude

May 2022

Bachelor of Science, **Applied Mathematics**, summa cum laude

May 2022

## Skills

- Deep learning
- Python programming
- Linux OS
- Batch scripting
- GitHub collaboration
- High-performance computing
- Parallel programming
- SOLIDWORKS 3D (Modeling)
- FORTRAN
- Technical communication
- Computational fluid dynamics
- Fabrication (machining)

## Relevant Work and Research Experience

**Graduate Research Assistant September 2023- Present University of Washington, Seattle, Washington**

Doctoral research project with emphasis in developing interpretable deep learning models for use in medical imaging of the brain. Currently specializing in domain adaptation and transfer learning tasks to adapt segmentation models from large- to small-data regime. Working collaboratively in a multidisciplinary team consisting of neuroscientists, surgeons, engineers, and physicists. Programming in Python using the Pytorch library, using high-performance computing resources running on Linux operating systems to run multi-GPU and -CPU jobs, collaborating on codes using GitHub.

**Research Assistant March 2021-May 2023 University of New Mexico, Albuquerque, New Mexico**

Undergraduate research continued as graduate research project involving statistical data analysis of Direct Numerical Simulations (DNS) datasets from NASA's Turbulence Modeling Resource. Used regression methods to develop models for turbulent flow phenomena from data relevant to aerospace, leading to two conference presentations.

**Staff Research Assistant May 2023-September 2023 University of New Mexico, Albuquerque, New Mexico**

Project developing machine learning tools to accelerate survivability analyses of electrical power grids. Used deep neural networks in TensorFlow as a surrogate to traditional algorithm to reduce time of analysis while preserving accuracy. Gained skills in parallel computing and neural network architectures including transformers and convolutional neural networks (CNNs). Results from project were presented in conference and are under review for submission to a peer-reviewed journal as a paper.

**Summer Intern June 2022-August 2022 Los Alamos National Laboratories (LANL), Los Alamos, New Mexico**

Worked with LANL Theoretical Division as part of computational physics summer workshop on uncertainty quantification of equation of state models. Used Markov Chain Monte Carlo and Bootstrap Sampling techniques to sample from distributions of interest, then trained supervised machine learning models to classify sampled parameter combinations by physical feasibility. Gained experience working with High-Performance Computing Resources at LANL.

**Intern Summer 2021; February 2022- June 2022 Air Force Research Laboratories (AFRL), Albuquerque, New Mexico**

Summer 2021: Worked full-time under the AFRL Scholars Program with Spacecraft Thermal Control research and development group. Designed complex test bed system with numerous physical constraints for large thermal vacuum chamber using SOLIDWORKS 3D CAD software. Mentored high school intern and allocated tasks to ensure design was completed in timely manner. Obtained DoD Secret security clearance as part of requirements for internship.

February 2022-May 2022: Worked part-time aiding in experiment design and Computational Fluid Dynamics (CFD). Worked with spacecraft thermal control systems engineers designing and implementing test setups for experiments. Used Star-CCM+ software as a tool to aid in design of spacecraft thermal components and CFD simulations.

## **Journal and Conference Publications**

1. S. V. Poroseva, **J. E. Heras Rivera**, “On the Contribution of Data Errors in DNS Data-Driven VPG Correlation Models,” Proc. the AIAA Aviation Forum, Chicago, IL, June 27 - July 1, 2022.
2. **J. E. Heras Rivera**, S. V. Poroseva, “Application of Multiple Linear Regression to Deriving Data-Driven Models for Velocity/Pressure-Gradient Correlations in Turbulent Flows,” Proc. the AIAA Region IV Student Conference, San Antonio, TX, April 1- April 2, 2022. Presented research at the conference in 10 minute talk.
3. B. Lindquist, R. Jadrach, **J. E. Heras Rivera**, L. Rondini, “Uncertainty Quantification for High Explosive Reactant and Product Equations of State,” editor’s pick paper published in Journal of Applied Physics.
4. **J. E. Heras Rivera**, S. V. Poroseva, “DNN power grid classifier as a surrogate for graph-search algorithms for the survivability analysis,” Proc. Clearwater Clean Energy Conference, Clearwater, FL, July 23- July 28, 2023. Paper is under review for submission in the International Journal of Energy for a Clean Environment (IJECE).

## **Awards and Membership**

Department of Energy Computational Science Graduate Fellowship (DOE CSGF) fellow

- Highly-selective fellowship awarded to 40 PhD students across the country which fully funds PhD program in computational sciences.

Recipient of 2023-2024 University of Washington College of Engineering Dean’s Fellowship

- Fellowship offered to 3 incoming PhD students in the University of Washington School of Engineering, provides supplemental funding.

Department of Mechanical Engineering Outstanding Senior for 2020-2021 at the University of New Mexico

- Award given to one student in the Mechanical Engineering Department at UNM.

Recipient of Presidential Scholarship at University of New Mexico

- Scholarship funded entirety of undergraduate studies at UNM.

## **Relevant Coursework**

Deep Learning, Stochastic Processes and Applications, Deep Reinforcement Learning, Geometric and Probabilistic Methods in Computer Science, Intro to Computational Fluid Dynamics (CFD), Boundary Layers, Turbulent Flows, Aerospace Structures and Materials, Lean Manufacturing Principles.

## **Extracurricular Activities**

Mentor for Our Future is Science program (September 2022 – May 2023):

- Mentorship program for high school students from underrepresented communities planning to pursue STEM careers.
- Met weekly with mentee in an 8 month period, discussing social justice issues and brainstorming solutions to issues using science.
- Helped mentee develop a capstone project where they began an initiative to address a social justice issue in their community related to mental health awareness.
- Project outputs included a presentation to a technical audience, a poster, and a podcast episode.

## **Languages**

Spanish (Native), English (Native), Portuguese (Elementary Proficiency)