

ELIJAH HOUSE

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Education

Colorado State University

Master of Science in Mechanical Engineering – GPA: 3.9/4.0
Advanced Propulsion and Diagnostics Laboratory

May 2024

Fort Collins, CO

Purdue University

Bachelor of Science in Mechanical Engineering – GPA: 3.7/4.0
Dean's list Every Semester

May 2022

Indianapolis, IN

Marian University

Bachelor of Science in Applied Mathematics (Minor in Physics) – Honors: Cum Laude – GPA: 3.6/4.0
USA Cycling Academic All star, Dean's list Every Semester

May 2022

Indianapolis, IN

Experience

Graduate Research Assistant

August 2022 – Present

Colorado State University

Fort Collins, CO

- Developing an Adaptive Mesh Refinement (AMR) algorithm to enhance the efficiency and accuracy of compressible flow simulations.
- Implementing the AMR algorithm in our in-house code using the AMReX framework. This implementation finds applications in laser-spark plasma ignition and hypersonic simulations, with results being visualized using VisIt.
- Incorporating high-performance computing techniques like MPI and OpenMP to improve code efficiency.
- Authoring technical reports and abstracts for conference submissions.

Graduate Teaching Assistant

August 2022 – Present

Colorado State University

Fort Collins, CO

- Teaching three lab sections for approximately 90 students in MECH 301 (Finite Element Analysis and Computational Fluid Dynamics).
- Instructed students in MECH 103 (Introduction to Mechanical Engineering) on Excel, MATLAB, and Arduino. Conducted lab sections, guest lectures, and office hours.
- Served as a Teaching Assistant for MECH 202 (Solidworks) by conducting office hours and lab sections.
- Completed Graduate Teaching Assistant and DEI training courses.

Projects

Lattice Boltzmann Simulation | C++, MPI, Cuda

January – May 2023

- Developed an MPI parallelized Lattice Boltzmann simulation.
- Implemented CPU and GPU kernels, comparing their efficiency.
- Created a Block-Structured framework for easy parallelization on both GPU and CPU.

Multigrid Convolutional Neural Networks for Solving PDEs | Python, C++

August – December 2022

- Conducted an extensive literature review of the latest methods for integrating multigrid techniques from CFD with machine learning algorithms to solve partial differential equations, laying a solid theoretical foundation for the project.
- Developed and implemented a Convolutional Neural Network-Multigrid (CNN-MG) algorithm, utilizing Python and TensorFlow. This resulted in an improvement in computational efficiency and solution accuracy for three test cases involving PDEs.
- Authored and presented a comprehensive technical report detailing the methodologies, results, and the implications of the project.

Bicycle Wheel Optimization | Matlab, Minitab, Excel

January – May 2022

- Modeled a bicycle wheel in MATLAB and performed reliability-based design to get optimal design variables that satisfy the probability of failure requirements.
- Compared results to an evolutionary algorithm, achieving a wheel four times lighter and safer than the original design.

Relevant Coursework

- Computational Methods for Mech. Eng.
- Advanced Computational Gas Dynamics
- High Performance Computing
- Data Assimilation
- Machine Learning
- Chemical Rocket Propulsion
- Advanced Fluid Mechanics
- Probabilistic Eng. Design

Technical Skills

Programming: Fortran, C++, MATLAB, Python, Linux, Git, LaTeX, Raspberry Pi

Software and Hardware: VisIt, Solidworks, ANSYS, Abaqus, VS Code, Emacs, PTC Creo, Minitab

Leadership and Extracurricular

Professional Cyclist

October 2019 – Present

- Competing at the highest level of cycling in the United States. Traveled to races nationally, racing and representing sponsors.
- Won the 2021 USA Cycling Track National Championships in the points race against the best track cyclists in the country.
- Placed second in the Team Pursuit event at the 2021 Track National championships, improving over 19 seconds in the 4km event after dedicated training with the team.
- Team leader for collegiate cycling team. Organized and led training rides, team meetings, and team events.