Asher Hancock

ajh172@pitt.edu

Education

Princeton University, Princeton, NJ
PhD in Mechanical Engineering (2023 -)

University of Cambridge, Cambridge, UK
MPhil in Engineering (2022 –)
Churchill Scholarship

University of Pittsburgh, Pittsburgh, PA
B.S. in Mechanical Engineering (2017-2022)
Expected Minors: Computer Science, Math
GPA: 3.97/4.00

Interests

Autonomous systems, controls, machine learning, motion-planning, safety

Research Experience

ANSYS Additive Manufacturing Research Laboratory
Undergraduate Research Assistant (Spring 2020 – Present)
Supporting the development of topology optimization algorithms for thermal fluid applications with the Lattice Boltzmann Method and machine learning. Previous work included programming a global heat compliance measure-based topology optimization code for transient heat conduction analysis in metal 3D printed support structures.

Applied Computational Fluid Dynamics Laboratory
Undergraduate Research Assistant (Summer 2019 – Present)
Developed a GPU-accelerated programming methodology to rapidly characterize the radiative view factor in convex and non-convex geometries. Specific applications included radiation analyses in thermoelectric generators, such as where I coordinated with researchers at NASA's Jet Propulsion Laboratory (JPL) to aid in the heat transfer modeling of a Harman measurement.

NSF Center for Space, High-Performance, and Resilient Computing
Summer Undergraduate Research Group Member (Summer 2019)
Programmed a 2D numerical thermal fluid solver to estimate the descent velocity of a robot melting through ice for potential use in NASA's Europa Clipper Mission. Created an advection model in ANSYS CFX for cross-validation.

Laboratory for Advanced Materials at Pitt
Undergraduate Research Assistant (Fall 2018 – Spring 2019)
Worked to simulate Cadmium-based thin-film solar cells, in collaboration with First Solar, to understand efficiency losses and to improve photovoltaic performance. Analyzed the effect of layer thickness and recombination mechanisms with SCAPS-1D and ANSYS Mechanical APDL.

Professional Experience

National Aeronautics and Space Administration, Marshall Space Flight Center
Student Trainee (Engineering) – Pathways Intern Employment Program

Advanced Concepts Office (Fall 2021)
Utilized Copernicus software to perform trajectory optimization for future space missions. Performed trade studies to help select reaction wheels that met mission requirements. Developed beta-angle and eclipse histories of orbits in STK for analysis by the thermal and power teams.

Control Systems and Analysis Branch (Spring 2021)
Developed a visual and validation framework, with Microsoft's AirSim plugin for Unreal Engine 4, for multi-agent control and spacecraft formation-flying with NASA's Smartphone Video Guidance Sensor. Controller logic was implemented with Simulink and software-in-the-loop control was exhibited. Machine learning models with Google's AutoML and TensorFlow were utilized to further increase sensor and controller robustness.

Structural Dynamics and Integration Branch (Summer 2020)
Analyzed the entry, descent, and landing loads exerted on the upcoming Mars Ascent Vehicle, which is part of the Mars Sample Return mission. Additionally, I performed a modal analysis on the Universal Stage Adapter that interfaces between the Orion spacecraft and the Space Launch System's Exploration Upper Stage. In my final project, I contributed to a Python and OpenCV application to estimate modal shapes from vibration test videos.

Collins Aerospace
Engineering Intern (Fall 2019)
Designed ergonomic basket fixtures for housing heat-treated parts. I collaborated with other engineers to ensure the manufacturing feasibility of my design, and I performed numerous thermal-mechanical simulations to validate the design's integrity during operation. Additionally, I prototyped and developed an end-effector for use in a pick and place robotic system.

Publications

Hancock, A. J., Fulton, L. B., Ying, J., Clifford, C. E., Sammak, S., & Barry, M. M. (2021). A GPU-Accelerated ray-tracing method for determining radiation view factors in multi-junction thermoelectric generators. *Energy*, 228, 120438.

Hancock, A. J., Barry, M. M. (2020). Numerically resolved radiation view factors within thermoelectric generators via hybridized CPU-GPU computing. *Ingenium: Undergraduate Research at the Swanson School of Engineering* 2020; 38-41.

Conferences and Presentations

Richmond, K., **Hancock, A. J.**, Sammak, S., Barry, M. M. (2021). Numerically resolved radiation view factors via multi-GPU accelerated ray tracing. *5th Thermal and Fluids Engineering Conference*.

Hancock, A. J., Fulton, L. B., Ying, J., Sammak, S., Barry, M. M. (2021). Numerical resolution of radiation view factors in multi-junction thermoelectric generators via GPU-accelerated ray tracing. *Advancing Research through Computing*.

Hancock, A. J., Fulton, L. B., Ying, J., Sammak, S., Barry, M. M. (2020). GPU-accelerated ray tracing methods for determining radiation view factors in multi-junction thermoelectric generators. *Virtual Conference on Thermoelectrics*.

Awards and Honors

Winston Churchill Foundation of the United States
Churchill Scholarship (2022)

Barry Goldwater Scholarship and Excellence in Education Foundation
Barry M. Goldwater Scholarship (2021)

Sigma Xi (Scientific Research Honor Society)
Associate Member (2021)

Universities Space Research Association
Distinguished Undergraduate Award – Honorable Mention (2021, 2020)

NSF Center for Space, High-Performance, and Resilient Computing
Best Mechanical Engineering Project (2019)

Projects and Outreach

Aerospace Society of Automotive Engineers
Chief Wing Engineer (Fall 2018 – Spring 2020)
Organized a group of undergraduates to design, analyze, and build the wings for a radio-controlled aircraft to compete in the Aero SAE Design West competition. Utilized the Athena Vortex Lattice and ANSYS Workbench to characterize lift characteristics. Modeled the wing in SolidWorks and laser cut the components for manufacturing. Gave tours of the lab to prospective engineering students.

Freshman Engineering Leadership Team
Peer Advisor (Fall 2018)
Facilitated two sections of Freshman Engineering Seminar Recitation where I presented weekly topics to freshman engineering students to ease the transition from high school to college. Maintained classes of 29 students and conducted individual interviews throughout the Fall of 2018 to discuss the college adjustment process and the progression of goals.

Hobbies

Violin, Running, Mountain Biking