
Curriculum Vitae

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Ph.D in Aerospace Engineering

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1 Contact Information

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2 Education

Ph.D Aerospace Engineering, University of Michigan, 2021 - Present
M.Sc Aerospace Engineering, University of Michigan, 2020 - 2021
B.Sc. Mechanical Engineering, Michigan State University, 2016 - 2019
Concentration: Aerospace Engineering
Minor: Computer Science Engineering
Prev. Mechanical Engineering, Oakland University, 2016
Prev. Aerospace Engineering, Illinois Institute of Technology, 2014-2015

3 Academic Awards and Distinctions

- Graduated with Honor, Michigan State University, 2019
- College of Engineering Dean's List, Michigan State University, 2016-2019
- Top Student in Class, Michigan State University, 2017
- Heald Scholar, Illinois Institute of Technology, 2015-2016

4 Experience

Ph.D Candidate, University of Michigan, January 2021 - Present

MDO Lab, Advised by Joaquim Martins

- Aeropropulsive optimization considering the coupling between thermodynamic cycles, CFD, and CAD based geometry.
- Interior penalty Newton solver development using pseudo-transient continuation and an unsteady line search for box-constrained nonlinear systems.
- Multi-objective gradient based optimization a supersonic mixed flow turbofan considering noise and performance.
- Implementation of parallel multi-objective gradient-based strategies for large scale design space optimization.
- Coupling of aero-acoustic models with thermodynamic cycle analysis.
- Mentor for aircraft-design and optimization summer internship project.

Graduate Student Research Assistant, University of Michigan, June 2020 - December 2021

MDO Lab, Advised by Joaquim Martins

- Modeling a N+3 technology (high bypass, geared) turbofan engine to accommodate electric hybridization and increased thermal management capability.
- Increasing robustness of a mixed-flow turbofan thermodynamic cycle model to operate in a larger design space.
- Added a supersonic inlet model to a thermodynamic cycle to study the installed aerodynamic effects on engine performance.

Research Assistant, Michigan State University, May 2019 - December 2019*Combustion Laboratory, Advised by Patton Allison*

- Designed and built a narrow channel combustion device to study turbulent flames through a pre-determined narrow channel.
- Created a ignition control box with a custom single spark ignition circuit for reliable relight of the narrow channel combustion device.
- Worked with Particle Image Velocimetry (PIV) using a McKenna Burner and turbulent fuel sprays.
- Assisted with the repair of a Quanta-Ray high powered laser for use during PIV and PLIF flame studies.
- Constructed of a large acrylic box to study different pre-vaporized fuel sprays using PIV analysis.
- Operated a Phantom high-speed camera for PIV analysis.

5 Academic Projects

Multidisciplinary Design Optimization: Final Project

- Multi-Design point, multi-objective gradient based optimization of N+3 turbofan and simple turbojet engines
- Exploring the trade-off between minimizing NO_x emissions and TSFC using a constraint-epsilon multi-objective approach
- Utilized an empirical NO_x model to constrain the EI_{NO_x} while optimizing the TSFC

Gas Turbine Propulsion: Turbojet Thermodynamic Cycle Design

- Designed a turbojet engine using brayton cycle analysis at a specified design point
- Modeled turbo-machinery and create component maps factoring in blade twist and shaft speeds

Turbulent Flow: Modeling of Turbulent Flows

- Modeled isentropic turbulent flows using RANS and LES in Matlab
- Computed the energy spectrum of a turbulent flow using Fourier transforms and spherical averaging
- Investigated viscous-sub layer and log-law scaling theories for turbulent flows
- Calculated Reynolds stresses and turbulent kinetic energy in terms of near wall units for turbulent flows
- Statistical analysis of turbulent flows to find eddy velocity correlations

Rocket Propulsion: Gradient Based Design and Optimization of a Multi-Stage Rocket

- Created a framework for multi-stage rocket analysis and optimization
- Implemented the minimization of Gibb's Free Energy method to simulate shifting flow chemical equilibrium analysis using complex-step gradients
- Numerically solved for mission trajectories given a rocket design
- Leveraged gradient based optimization to design a second-stage engine concept to meet mission requirements

6 Volunteer Experience

High School Engineering Camp, East Lansing, Michigan, 2019

- Demonstrated an Acrylic and O_2 hybrid rocket to high school students for a summer engineering camp
- Helped students build matchstick rockets and taught them how to make the rockets efficient and aerodynamic

Impression 5 Science Center, Lansing, Michigan, 2017

- Ran engineering activities with children to promote interest in STEM fields
- Taught young students fundamental physics and engineering concepts

Student Gift Organization, Chicago, Illinois, 2015

- Campaigned for student and alumni donations to aid in improving the athletic facilities at Illinois Institute of Technology

Special Olympics Basketball Tournament, Chicago, Illinois, 2015

- Worked a weekend basketball tournament at IIT for the Special Olympics
- Operated the scoreboard, cheered on the participants, and cleaned up after the event

South Side Youth Baseball Camp, Chicago, Illinois, 2015

- Taught baseball fundamentals to young boys and girls from the south side of Chicago
- Helped coach and umpire for camp scrimmages and games
- Provided a safe and fun place for kids to play with their friends after school on the South Side