Rishabh Iyer

Iyer.ris@northeastern.edu | rishiiyer.com/projects.html | https://github.com/rishiiyer01 | 860-501-3912

Experience

Machine Learning Engineer | **Atomic Industries** | Remote | January 2023 - September 2023
Automation of injection molding tools
- Developed proprietary algorithms for characterizing discrete surfaces through discrete differential geometry
- Utilized algorithmic features to embed 50,000 CAD part meshes using Graph Attention Networks and other GNN architectures; immediately delivered value to injection molding companies that use naive part similarity metrics to accelerate design
- Ran experiments for RL based initializations for highly non-convex physics inverse problems

Thermofluids and Combustion Analysis Engineer | **Mesodyne** | Cambridge, MA | July 2022 - January 2023
Solid state generator made from heat stimulated photonic crystal spectra emission
- Conducted heat transfer and combustion simulations to identify power loss areas using numerical optimization, leading to a 10% thermal efficiency improvement
- Created a cross-flow thin-wall heat exchanger, achieving up to 75% power input recuperation in experiment
- Designed and manufactured an oxygen sensor apparatus to measure combustion efficiency to compare to a chemistry with equilibriums simulation of the combustion
- Analyzed combustion via an empirical phase diagram to identify regions of equivalence ratio and fuel flow rates in which the system can be operated within efficiency bounds

Mechanical Engineer | **Massachusetts Materials Technologies** | Waltham, MA | July 2021 - December 2022
Non-destructive testing of material strength properties via regression
- Redesigned a portable material toughness tester using finite element analysis and crack propagation studies
- Proposed machine learning models for material strength based on microstructure analysis
- Automated grain size measurements using the watershed algorithm for image segmentation

Projects

LQG Thrust Vectored Control of Solid Rocket Motors | June 2022 - April 2023
Control of the highly unstable dynamics present in a solid-fuel rocket with no passive fin stabilization
- Developed and tuned a linear quadratic regulator and Kalman filter for the control of an unstable rocket without fins in simulation via derivation of a quasi LTI second order differential equation for the oscillation of rockets under aerodynamic forces
- Utilized inverse kinematics, coefficient matching to develop a representative experiment that matches the LTI aerodynamic model by simply using an inverted spherical pendulum test stand
- Won first place in Northeastern University's Mechanical Engineering Capstone

AeroNU Propulsion Team | Engineer | September 2020- January 2022
Design and manufacturing of a regeneratively cooled, pressure fed rocket engine
- Simulated the pressure drop and cooling of the regenerative channels to estimate the pressure needed from the N2 tanks
- Wrote a calibration procedure to obtain measurements of ~700 lb thrust using load cells
- Designed the first version of the pintle injector used in later versions

AeroNU Simulations Team | Engineer, Co-Lead | September 2019- July 2022
Simulations of computational fluid dynamics for design iteration
- Co-led the development of a rocket stabilization simulation using an explicit Euler MATLAB numerical solver for a second order differential equation using properties from flow simulations (passive control simulation)
- Simulated rotation dynamics of stabilization under gyroscopic precession using Euler rotation matrices, and quantified the stability improvement of adding an internal flywheel to a rocket

Education

Northeastern University | Boston, MA | Graduating May, 2023, 2024
BS in Mechanical Engineering and Physics, MS in Thermofluids, Minor in Mathematics

Research

Northeastern University Mechanical Engineering Thermofluids Research | Under Prof. Hongwei Sun | Current
- Research into applications of Physics Informed Neural Operator and Fourier Neural Operator based architectures for convective heat transfer problems with sparse to zero data