Kelly Mathesius, PhD

kjmath.github.io/portfolio

An engineer with skills in data analysis, modeling and optimization of constrained systems, scientific software, manufacturing, and technical communication. Excited to apply multi-disciplinary experience to new challenges in scientific software.

SKILLS

Programming: python, git, SQL (BigQuery)

Data Analysis: numpy, pandas, seaborn, matplotlib, <u>lmfit</u>, <u>pingouin</u>, statsmodels, scikit-learn

Computational Optimization: CasADi, AeroSandbox

EDUCATION

Massachusetts Institute of Technology

Cambridge, MA

Doctor of Philosophy in Space Propulsion (Aerospace Engineering)

Sept 2019 - June 2023

Key classes: matrix methods in data analysis and machine learning, numerical methods, statistics, rocket propulsion Sept 2017 - June 2019 Master of Science in Aeronautics and Astronautics Bachelor of Science in Aerospace Engineering

Sept 2013 - June 2017

WORK EXPERIENCE

Formlabs Research and Development Engineer

Somerville, MA June 2023 - Present

- Model stereolithography (liquid resin) printing physics in python: custom PDE solver for the Reynolds equation to model fluid pressure on parts; custom fluid-structure interaction model to assess coupled effects between printer stiffness, resin properties, and part motion; optical/fluid model to optimize layer height, exposure time,
- Write SQL queries for print metrics and metadata; analyze data with statistical methods (ANOVA/t-test with effect size) and regression models; visualize data in python and Grafana; use data and models to predict nextgen printer performance
- Propose experiments, collect data, and analyze results to improve print quality and speed

and print time. Clearly document model equations, assumptions, and outputs.

MIT International Center for Air Transportation

Cambridge, MA

Graduate Researcher

Sept 2017 - June 2023

- Developed an **end-to-end differentiable model in python** for exhaust plume radiant emission of rocket motors; utilized model and AeroSandbox computational framework to optimize aircraft design and analyze performance tradeoffs
- Designed and conducted experiments to measure the effects of solid rocket motor design parameters on exhaust plume radiant emission
- Managed a team of undergraduate researchers

Blue Origin Kent, WA

Engines Materials and Processes Intern

June - August 2019

- Identified, mixed, and characterized alternative extrude honing media for improving interior surface finish of cast or additively manufactured metal components
- Designed and built a test rig for evaluating extrude honing media; tested effectiveness of developed media at improving surface finish of test coupons

Boeing Huntsville, AL

SLS Flight Termination System Intern, SLS Cryo Filters and Valves Intern

June - August 2016, 2017

- Compiled and presented test procedure data packages for the Space Launch System's flight termination system pyrotechnics to NASA for Range Safety approval
- Designed and prototyped a life cycle tester for valve limit switches at < 5% of cost of original plan; developed a MATLAB tool to filter and analyze data for lot acceptance testing of switches