ALEXANDER BRUSH

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PROFESSIONAL SUMMARY

Mechanical Engineer with training from MIT and RPI, skilled in product development, DFM, and process optimization. Experienced in cross-functional teams, data-driven problem solving, and improving product reliability.

EDUCATION

Massachusetts Institute of Technology (MIT)
M.Eng – Advanced Manufacturing and Design
GPA: 5.0 / 5.0 | 2024-2025

Rensselaer Polytechnic Institute (RPI)
B.S – Mechanical Engineering
B.S – Design, Innovation, & Society
GPA: 3.86 / 4.0 | 2020-2024

EXPERIENCE

GE Vernova, Consultant   May 2025-August 2025
- Completed MIT master's thesis on *Characterizing and Mitigating Small-Diameter Tool Wear in Nickel-Based Superalloy Machining*, publishing findings on process optimization and cost reduction.
- Applied statistical analysis and implemented tailored CAM program updates to optimize toolpaths and cutting conditions, delivering an estimated $2.5M/year savings in consumable costs.

Manta Product Development, Engineering Internship   January 2023-August 2023
- Led design for manufacturability and testing of a medical device, increasing reliability by 51% through rigorous design iteration and feasibility studies.
- Collaborated on robotics and medical device projects under NDA, participating in early product development, rapid prototyping, failure analysis, and performance optimization with a multi-disciplinary engineering team.

Rensselaer Motorsport, Mechanical Engineer   July 2022 - June 2024
- Developed and implemented a custom battery and motor cooling system using FEA simulation to improve thermal stability under high load.
- Performed tire testing and materials analysis using real-world data to inform vehicle setup and maximize performance.

PROJECTS & APPLIED RESEARCH

Optimization of Metal 3D Printer Utilization – Partnered with Physical Sciences Inc.   Fall 2024
- Developed a Python-based buffer size simulation to optimize throughput and utilization of a Nikon SLM printer.
- Improved projected utilization from ~20% to ~50% through simulation, job scheduling, and inventory strategy.
- Created deliverables including SOPs, live spreadsheets, and simulation tools for PSI implementation.

Ball Balancing Robot - Personal Project   Winter 2025
- Designed and fabricated a vision-based ball balancing robot using a custom parallel plate manipulator, defining the mechanical constraints, actuator geometry, and kinematic relationships required for active plate control.
- Developed a real-time control pipeline in Python integrating computer vision–based ball state estimation and closed-loop PID control to stabilize an unstable system.

Fiber Extrusion Device (FrED) Control & DoE - Partnered with FrED Factory   Fall 2024
- Designed and implemented a PID-controlled temperature system to stabilize extrusion output.
- Conducted a Design of Experiments (DoE) to model effects of temperature, material, and speed on diameter.
- Integrated real-time Statistical Process Control (SPC) into a live dashboard for process monitoring and predictive feedback.

SKILLS

Technical: Solidworks, NX, Rhino, Python, MATLAB, Machining, 3D Printing, Woodworking
Interpersonal: Collaboration, Technical Communication, Risk Mitigation, Leadership, Agile Workflow

LEADERSHIP & ACTIVITIES

RPI eSports, Manager   August 2020 - June 2024
- Managed and coached two competitive teams, winning NACE Starleague title; developed team strategy and handled recruitment.
- Led event planning and new member onboarding, growing club participation across campus.