Joshua Nichols

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EDUCATION

Carnegie Mellon University — Pittsburgh, PA
Bachelor of Science, Electrical and Computer Engineering, 3.55/4.0 GPA — *Aug 2023 – May 2027*
- **Relevant coursework:** Principles of Real Analysis I, Algebraic Structures, Probability Theory, Great Theoretical Ideas in Computer Science, Computer Systems, Principles of Functional Programming.

EXPERIENCE

Carnegie Mellon University — Pittsburgh, PA
Teaching Assistant — *Aug 2024 - Present*
- Taught weekly recitations and labs to undergraduate students for Carnegie Mellon's C programming + Data Structures and Algorithms course.
- Graded homework, programming assignments, and exams for correctness and style in C.
- Collaborated with group of 40+ staff members to run course of over 400 students.

NASA Langley Research Center — Hampton, VA
Computer Science Research Intern — *Jun 2024 - Aug 2024*
- Implemented new data association methods for sensor fusion in OCaml and PVS, a NASA developed mathematical theorem prover, with graph theory algorithms and Kalman filters.
- Developed work on proving robustness properties about Kalman filters and data association methods using real analysis in the PVS theorem prover.
- Proved over 100 fundamental linear algebra theorems in NASA core library with the PVS theorem prover.

Robotic Exploration Lab - Carnegie Mellon University — Pittsburgh, PA
Research Assistant — *Jan 2024 - Apr 2024*
- Rewrote numerical optimization solver in C++ to improve maintainability and development capabilities of codebase
- Improved benchmark time of optimization solver by 20% with low-level C++ techniques and algorithmic improvements.

NASA Langley Research Center — Hampton, VA
Software Engineer Intern — *Jun 2023 - Aug 2023*
- Implemented reinforcement learning methods with PyTorch for optimal control of robotic systems.
- Improved size of numerical flight simulations by over 100x according to benchmarks through GPU parallelization and algorithmic improvements.
- Created visualization tools for robotic system and flight simulations in Unity with C#.

PROJECTS

Numerical Optimization Solver - Sleipnir
https://github.com/SleipnirGroup/Sleipnir
- Founded open-source research project and numerical optimization solver, Sleipnir, written in C++.
- Benchmarks show Sleipnir is over 2x faster than state-of-the-art research and industry solvers as a result of novel differentiable programming developments.
- Sleipnir is used in production by over 5,000 users in FIRST Robotics Competition as part of motion planning app.
- 300 active users and contributors in development discord server.

AWARDS

- NASA Robotics Alliance Project Medal of Excellence

TECHNICAL SKILLS

- **Programming languages:** C, C++, OCaml, Python, MATLAB, Java, Javascript, HTML/CSS