Joshua Nichols

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Education

Carnegie Mellon University Pittsburgh, PA

Bachelor of Science, Computer Science, 3.7/4.0 GPA *May 2023 - Aug 2027*

- **Relevant coursework:** Parallel and Sequential Data Structures and Algorithms, Great Theoretical Ideas in Computer Science, Computer Systems, Principles of Functional Programming, Principles of Real Analysis I.

Experience

Carnegie Mellon University Pittsburgh, PA

Teaching Assistant for 15-122 Principles of Imperative Computation *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++.
- Developed novel differential programming algorithms which improved benchmarks showing Sleipnir is over 2x faster than state-of-the-art research and industry solvers.
- 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