Joshua Nichols

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Education

Carnegie Mellon University — Pittsburgh, PA

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

- **Relevant coursework:** Compiler Design, Algorithm Design, Computer Systems, Queueing Theory, Probability, Parallel Data Structures and Algorithms, Theoretical Computer Science, Functional Programming, Real Analysis.

Experience

NASA Langley Research Center — Hampton, VA

Research Computer Science Intern — *Jun 2025 - Aug 2025*

- Implemented randomized testing framework for graph algorithms, catching multiple undiscovered bugs and improving the robustness of libraries.
- Added lexical analysis, recursive descent parsing, and regex parsing to NASA's PVS core library, improving file processing capabilities.
- Developed sensor fusion library in OCaml using Kalman Filters and graph theory algorithms for data association.

Carnegie Mellon University — Pittsburgh, PA

Teaching Assistant for 15-122 Principles of Imperative Computation — *Aug 2024 - Present*

- Taught weekly recitations and labs to students in CMU's C programming + Data Structures 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 500 students.

NASA Langley Research Center — Hampton, VA

Research Computer Science Intern — *Jun 2024 - Aug 2024*

- Implemented new data association methods for sensor fusion in 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.

NASA Langley Research Center — Hampton, VA

Software Engineering 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 C++ numerical optimization solver, **Sleipnir**, currently used in production by 5,000+ users in First Robotics Competition.
- Developed novel differential programming algorithms which improved performance benchmarks by over 2x compared to state-of-the-art industry and research solvers.
- Built a 300-member open-source community with a support server and active contributors.

Awards

- NASA Robotics Alliance Project Medal of Excellence

Technical Skills

- **Programming languages:** C, C++, OCaml, Python, MATLAB, Java, Javascript
- **Tools/Frameworks:** Git, CMake, Pytorch, Docker, Unity, PVS