

# Joshua Nichols

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## EDUCATION

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### Carnegie Mellon University

Pittsburgh, PA

*Bachelor of Science, Computer Science, 3.6/4.0 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

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### 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

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### 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

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- NASA Robotics Alliance Project Medal of Excellence

## TECHNICAL SKILLS

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