

Education

Georgia Institute of Technology
PhD in Computational Science and Engineering

Started Fall 2023

The University of Alabama – Tuscaloosa
BSc in Computer Engineering - Minors in Computer Science, Math, and Research

Graduated May 2023
GPA: 4.0/4.0

Experience

NATIONAL RADIO ASTRONOMY OBSERVATORY

Software Engineer Trainee, Jan 2023 - May 2023

- Developed remote execution capabilities for various user-facing, scientific applications to support large datasets
- Created documentation for new interactive GUIs to support next-generation radio astronomy pipelines

BREAKTHROUGH LISTEN

Student Researcher/Peer Mentor, June 2022 - August 2022

A 100 million dollar, 10-year research initiative to search for signs of extraterrestrial life through radio and optical astronomy

- Decreased search pipeline runtimes by ~30% by implementing an efficient, GPU-accelerated dedoppler algorithm in Julia
- Benchmarked and compared existing dedoppler algorithm runtime performance, usability, and features
- Analyzed the computational and scientific considerations of Fourier-domain dedoppler algorithms for future work

JULIA COMPUTING

Software Engineering Intern, January 2022 - May 2022

A for-profit company that delivers products to make the Julia programming language easy to use, deploy, and scale

- Helped develop a GPU backend targeting Apple's M-series GPUs for the Julia programming language
- Reverse-engineered Apple IR metadata and altered Julia's compilation flow to be compatible with Apple's Metal tools
- Expanded Julia's Metal array interface allowing for high-level operations to dispatch to M1 GPUs or other accelerators
- Debugged low-level/LLVM IR errors with LLDB and altered codegeneration to maintain compatibility between Julia/Apple

NOAA GOES-R PRODUCT DEVELOPMENT TEAM

Hollings Scholar Intern, May 2021 - August 2021

A government group handling the creation, validation, processing, and dissemination of satellite weather and climate data

- Developed a proof-of-concept, cloud-based, interactive data visualization framework to serve the National Weather Service
- Experimented with low-latency video streaming web platforms
- Evaluated efficacy of time interpolation of the Great Lakes region's radiance data products for ice prediction algorithms

BREAKTHROUGH LISTEN

NSF-Funded REU Participant, June 2020 - August 2020

A 100 million dollar, 10-year research initiative to search for signs of extraterrestrial life through radio and optical astronomy

- Helped develop the data processing pipeline backend at the MeerKAT radio telescope array handling > 200 GB/s
- Integrated C/CUDA code into high-level Julia scripts to create a high-level, high-performance data processing framework
- Worked to accelerate signal processing algorithms with CUDA tensor cores
- Experimented with spectral kurtosis as a general energy detection algorithm

GREEN BANK RADIO ASTRONOMY OBSERVATORY

NSF-Funded REU Participant, May 2019 - August 2019

- Demonstrated data loss reductions by up to 50% by excising RFI at high time resolutions through machine learning
- Utilized Amazon Web Services S3 to manage a >20 terabyte dataset and deployed the trained ML model using Sagemaker
- Created a multi-class semantic segmentation model to classify data as desired signal, unwanted signal, or fast radio bursts
- Created a data annotation and formatting pipeline from scratch for TensorFlow/Keras

UA ECOCAR

Machine Learning Subteam Lead, Sept 2018 - Dec 2019

- Managed a team of 15 undergraduate students to apply machine learning toward automotive autonomy
- Created a customized deep learning binary classifier algorithm to determine driver awareness state using TensorFlow
- Tested on NVIDIA Jetson TX2 and Xavier development boards
- Determined optimal computing, camera, and sensor hardware for a given cost and functionality constraints
- Gained experience with CAN communication, signal processing, and automotive radar sensor fusion

Awards/Skills

- 2021 UA Goldwater Nominee
- 2020 NOAA Hollings Scholar
- 2021 UA Outstanding Junior ECE Student Award
- Primary Programming Language: Julia
- Experience with: LLVM, LLDB, C/C++, CUDA, Python, AWS CLI, Microsoft SQL, Linux, Git

Publications and Presentations

Max Hawkins and Tim Besard, "Metal.jl - A GPU backend for Apple hardware," JuliaCon 2022, virtual, August 2022

- Presentation: <https://youtube.com/watch?v=IARikXzRU7s>
- Code: <https://github.com/JuliaGPU/Metal.jl>

M. W. Hawkins, D. J. Czech, D. H. E. MacMahon, S. Croft and A. P. V. Siemion, "High-Performance Radio Telescope Array Data Processing Framework," in 2021 XXXIVth General Assembly and Scientific Symposium of the International Union of Radio Science (URSI GASS), Rome, Italy, 2021, pp. 1-4, doi: 10.23919/URSIGASS51995.2021.9560539.

- Paper: <https://www.ursi.org/proceedings/procGA21/papers/URSIGASS2021-Fr-J07-AM2-1.pdf>

M. W. Hawkins, "High-Performance Radio Telescope Array Data Processing Framework," Council on Undergraduate Research - Posters on the Hill, Washington D.C., 2021

- Discussed the importance of HPC and SETI research to U.S. Congress members and staffers
- Moved remote due to COVID

Hawkins, M., Lynch, R., Hawkins, L., and Smith, E., "High Time-Resolution Radio Frequency Interference and Single Pulse Pulsar and FRB Detection using Machine Learning Semantic Segmentation," American Astronomical Society Meeting Abstracts, Honolulu, HI, vol. 235, 2020.

Lynch, R. S., Hawkins, L., McCullough, R., Ray, J., Jensen, L., **Hawkins, M.**, Smith, E., "Ultra-wideband Digital Technologies for the Green Bank Telescope," American Astronomical Society Meeting Abstracts, Honolulu, HI, vol. 235, 2020.

Independent Projects and Other Experience

Julia CUDA Tensor Core Interface

Spring 2021

- Extended Julia's CUDA WMMA interface to 8-bit types and additional matrix sizes
- Gained experience with LLVM/NVVM intrinsics and conversion between LLVM and Julia types

Research Mentorship

August 2019 - December 2021

- Mentored freshman students in research ethics, finding a good research fit, and navigating college

International Mentorship

August 2019 - December 2019

- Mentored students new to the U.S. by helping refine their language skills, navigate logistical challenges, and feel at-home

Middle School STEM Showcase Mentorship

October 2022 - January 2023

- Mentoring two students as they create and present engineering science fair projects

NaturallyFundamental.com

January 2018 - December 2018

- Started a science education platform featuring interactive visualizations focusing on engineering
- Wrote articles and graphs featured on Y.Combinator News and Reddit with >17,000 unique page views

Electric Longboard

Summer 2018

- Spot-welded bare 18650 cells together with nickel strips, copper nails, and a lawnmower battery to form the battery pack
- Built the power distribution system and hand-made the longboard deck from plywood