

Tyler M. Garrett, PhD

TylerMG26@gmail.com | 717-476-2419 | linkedin.com/in/tyler-garrett-ece | tylermg26.github.io

Education

Doctor of Philosophy in Electrical and Computer Engineering Graduated: Aug 2024 - GPA: 3.8/4.0
University of Pittsburgh, Pittsburgh, PA (ABET accredited)

Research Areas: Computer Architecture, Fault-Tolerant Design, Reliable Machine Learning, High-Performance and Heterogeneous Computing, Safety-Critical Systems, and Nonvolatile Memories

Master of Science in Electrical and Computer Engineering Graduated: Dec 2018 - GPA: 3.8/4.0
University of Pittsburgh, Pittsburgh, PA (ABET accredited)

Bachelor of Science in Computer Engineering (Minor Math) Graduated: May 2016 - GPA: 3.744/4.0
Shippensburg University of Pennsylvania, Shippensburg, PA (ABET accredited)

Honors & Awards: Rath Fellowship Recipient (Pitt), Shippensburg University Honors Program, Board of Governors Scholarship Recipient, Upsilon Pi Epsilon, Phi Kappa Phi, Kappa Mu Epsilon, Order of Omega Greek Honors Fraternity

Skills

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|------------------------------|--------------------------|---------------------------|
| » Computer Architecture | » Avionic System Design | » GPUs/TPUs |
| » Fault Injection/Simulation | » Computer Vision | » Heterogeneous Computing |
| » Radiation Testing | » GitHub | » Graphics Processing |
| » Dependable Computing | » Non-volatile Memories | » Vivado/Vitis |
| » Machine Learning | » Embedded System Design | » Petalinux |
| » FPGAs (VHDL) | » Parallel Programming | » Autonomous Systems |
| » Edge Computing | » CUDA/OpenCL/Vulkan | » MATLAB |
| » Altium | » TensorFlow/PyTorch | » Microsoft Office |

Languages: C/C++ and Python

Operating Systems: Linux, macOS, Windows

Research Experience/Publications

Highlighted Publications

Tyler Garrett et al. Soft-Error Characterization and Mitigation Strategies for Edge Tensor Processing Units in Space. *2024 IEEE Transactions on Aerospace and Electronic Systems (TAES)*

Tyler Garrett et al. Reliable, ML-Based Image Processing and Compression for an Accelerated Onboard Imaging Pipeline. *2024 IEEE Space Computing Conference (SCC)*

Tyler Garrett et al. Towards a Radiation-Tolerant Display System. *2024 IEEE Space Computing Conference*

Landen Ryder et al. An Examination of Heavy Ion-Induced Persistent Visual Error Signatures in an Electronic Display Driver Integrated Circuit. *2023 Radiation and its Effects on Components and Systems (RADECS)*

Paromita Mitra et al. Trades, Architecture, and Design of the Joint Augmented Reality Visual Informatics System (Joint AR) Product. *2023 52nd International Conference on Environmental Systems (ICES)*.

Tyler Garrett et al. Improving Dependability of Onboard Deep Learning with Resilient TensorFlow. *2021 IEEE Space Computing Conference*

Sami Mian, Tyler Garrett, et al. Autonomous Spacecraft Inspection with Free-Flying Drones. 2020 *39th AIAA/IEEE Digital Avionics Systems Conference (DASC)*

S. Roff  et al. CASPR: Autonomous Sensor Processing Experiment for STP-H7. 2020 *Proceedings of the AIAA/USU Small Satellite Conference (Small Sat)*

Tyler Garrett et al. Enabling Intra-Plane Parallel Block Erase in NAND Flash to Alleviate the Impact of Garbage Collection. 2018 *ACM/IEEE International Symposium on Low Power Electronics and Design*

Highlighted Projects

Radiation-Tolerant Crew Displays: Lead system architect and principal investigator for a radiation-tolerant display system prototype at NASA for future astronaut displays. Developed a modular and scalable solution for spacesuits, rovers, and spacecraft which balances high-performance computing with radiation-tolerance. Constructed and managed a multi-phase development plan starting with a table-top demonstration evolving to engineering and flight model.

CASPR: Hardware and software team member for an International Space Station (ISS) research payload. Configurable and Autonomous Sensor Processing Research (CASPR) was designed to evaluate autonomous, onboard processing strategies of novel sensors, computing technologies, and intelligent applications for SmallSat-based operations. CASPR has been operating on the ISS since 2021 as part of the DoD/NASA Space Test Program – Houston 7 (STP-H7) mission. Lead GPU fault-tolerance sub-experiment.

Radiation Testing of Complex Devices: Conducted radiation test campaigns to evaluate and characterize complex computing devices (System-on-chip, GPUs, TPUs, etc.) By understanding faults and failure modes of each device under test (DUT), mitigation strategies can be developed to enhance reliability. A variety of testing was conducted at Lawrence Berkeley National Laboratory (LBNL) for Total Ionizing Dose (TID) and Destructive Single-Event Effects (SEEs). Additional testing for non-destructive Single-Event Effects were conducted under neutron radiation at Los Alamos National Labs (LANL).

Environmental Data Sensors: Participated on and led a team that utilized rapid prototyping to develop sensors to measure characteristics (pH, temperature, water level, conductivity, etc.) of water in natural environments, especially in coastal settings. Developing wireless implementation for real-time data collection. This project is in partnership with the Chincoteague Bay Field Station at Wallops Island, VA and ongoing research programs with various universities. The abstract of this project was published in the ACM digital library.

PALMER: Personal Assistant Logging My Exercise Routine (PALMER) is an embedded system solution, coupled with machine learning, workout glove that automatically tracks a user’s weight lifted, exercise, and reps. This information is then sent to a custom Android application to log all details of the exercise so that it can be available to the user later without having to stop and log the information manually.

Conference Presentations:

IEEE Space Computing Conference	Summer 2021-2024
AIAA/IEEE Digital Avionics Systems Conference	Summer 2020
AIAA/USU Small Satellite Conference	Summer 2020
ACM/IEEE International Symposium on Low Power Electronics and Design	Summer 2018

Work Experience

Human-Computer Interface Intern

NASA Johnson Space Center, Houston, TX

Jan 2020 – Present

Supporting Avionic Systems Division as a fault-tolerant computing subject matter expert. Researching radiation-tolerant techniques for GPUs to enable resilient display systems and high-performance computing in orbit and beyond. Devised an avionic system architecture for a radiation-tolerant display system for future astronaut displays in deep space. Implemented an advanced gesture-based control scheme for the next-generation spacesuits (xEMU) Heads-In Display leveraging computer vision and machine-learning techniques in a resource-constrained embedded system.

Safety-Critical Avionics Systems Intern

NASA Langley Research Center, Hampton, VA

May 2019 – July 2019

Designed and developed a multi-agent drone system that utilized distributed computing and computer vision to simulate autonomous free flyer inspection of spacecraft. Developed a suite of flight software (cFS) applications for guidance, navigation, and control (GNC) from low-level attitude control up to high-level drone autonomy (path planning, flight distribution, etc).

Pre-Doctoral Fellow

University of Pittsburgh, Pittsburgh, PA

Jan 2019 – Aug 2024

PhD student at the National Science Foundation Center for Space, High-Performance, and Resilient Computing (NSF-SHREC). Researching fault-mitigation strategies for advanced computer architectures, GPUs, and other hardware accelerators.

Graduate Student Researcher

University of Pittsburgh, Pittsburgh, PA

Sept 2016 – Dec 2018

Researched various topics in computer architecture. Investigated how to apply machine learning to various problems within computer architecture to improve performance. Researched 3D NAND Flash Memory to improve performance and endurance by designing disturbance tolerance during read/write/erase operations.

Android Application Developer

HanoverST, Hanover, PA

Dec 2014 – May 2017

Registered Google Play developer. Developed Android applications.

IT Intern

JLG Industries, McConnellsburg, PA

May 2015 – Aug 2015

Served as a member of their networking team. Helped maintain and update their network domestically and abroad. Headed a project to establish an out-of-band management system.

IT Intern

JLG Industries, McConnellsburg, PA

May 2014 – Aug 2014

Served as a member of their infrastructure team assisting in technical support across seven locations. Headed a project to provide shop workers with online access to HR resources in a way that was easy for the user and did not compromise the security of the network.