

Mark Ciora, M.S.

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Summary

Controls engineer with an M.S. in computer engineering from the University of Pittsburgh. Three years of experience in programming, control theory, and machine-learning from both work in industry and graduate research. Interested in designing and implementing the next generation of automated systems in the realms of robotics and advanced perception.

Skills

Python	PyTorch	Numpy	OpenCV	MATLAB
Baremetal C	C++	CUDA	OpenMP	Assembly (ARM, RISC-V)
Linux	Parallel Programming	Kernel Programming	Embedded Programming	Networking
Kalman Filtering	Tracking	Estimation Theory	Control Theory	Optimization
Machine-Learning	Reinforcement-Learning	Computer Vision	DSP	Linear Algebra

Work Experience

NSF SHREC Center – Graduate Researcher – *University of Pittsburgh, Dr. Alan George* August 2023 - April 2025

- Defended sensor tasking research in M.S. thesis and work was accepted to IEEE-SCC, “Satellite Sensor Tasking with Cyclic Slewing for Space Situational Awareness and Tracking” [2]
- Designed the Cyclic Slewing Sensor Tasking Algorithm (CSSTA), a novel sensor tasking algorithm using linear system theory, estimation theory, and convex optimization for missile tracking and space situational awareness
- Collaborated with two other students and Dr. Zhi-Hong Mao on development of sensor tasking approaches and machine-learning models, presenting results and analysis in weekly meetings
- Created missile control models for interception of highly maneuverable hypersonic threats with reinforcement learning algorithms DDPG, PPO, and SAC and compared with proportional navigation

MITRE – Sensor Processing Engineer – *Bedford, MA* May 2024 - Present

- Used synthetic aperture RADAR data to classify data with FFT, Hough and Radon Transform, clustering algorithms, and filters
- Explored algorithms for multi-sensor multi-target missile tracking, and implemented pipelines using Q-Learning, PPO, and MCTS
- Tested sensor tasking models in custom simulations with realistic dynamics for modeling satellites and ballistic missiles

NASA – Software Engineer – *Katherine Johnson IV&V Facility, Fairmont, WV* May 2022 - August 2023

- Collaborated with five engineers on development of testing environments, simulations, and analysis tools for Artemis on JSTAR team
- Modernized custom QEMU model for the RAD750 and tested with flight software
- Created Linux kernel module to facilitate network communication between virtual machines and supplant physical PCI cards
- Contributed substantially to Unity visualization component of Artemis simulation by implementing a moving origin system to avoid floating point precision rendering anomalies among other improvements
- Added features to a PyQt database search and data analysis tool including streamlining and automation of querying operations based on discussions with users

Teaching Assistant – *University of Pittsburgh* January 2020 – May 2025

- *Senior Design*: Guided 83 students in the design and prototyping process with a major focus on machine-learning and robotics
- *Data Structures and Algorithms*: Aided 89 students in learning applications of common data structures, such as stacks, heaps, graphs, binary search trees, and hash maps
- *Problem Solving in C++*: Introduced 41 students to programming concepts in C++, including programming logic, the C++ standard library, and object-oriented design principles
- *Physics II*: Assisted 100+ students understand principles of electromagnetics with a focus on Gauss’s Law, Biot-Savart Law, Maxwell’s Equations, and passive circuits

Research Experience

NSF SHREC Center Undergraduate Research – *University of Pittsburgh, Dr. Alan George* January 2022 - April 2023

- Evaluated performance of different kernels in time decay functions for event-based classification algorithm Hierarchy of Event-Based Time Surfaces for Pattern Recognition
- Implemented hyperdimensional computing and NeuralHD classifiers on GPUs using Intel oneAPI as contribution to work published in IEEE-HPEC, “Multiarchitecture Hardware Acceleration of Hyperdimensional Computing” [1]

SURI Research Internship – *University of Pittsburgh, Dr. Zhi-Hong Mao* May 2021 - August 2021

- Researched and implemented low-cost methods for machine learning classification of human sleep stages using electroencephalogram signals on a portable device in real time with MATLAB
- Authored paper in undergraduate research journal, *Ingenium 2022*, “Classification of Shallow and Deep Sleep Using Electroencephalogram Signals in Real Time”

Projects

- CSSTADLSurrogate** – *CSSTA Extension with DL* – github.com/MarkCiora/CSSTA_DLSurrogate February 2025 - April 2025
- Developed surrogate optimization method with deep-learning and partial differential equations for inferring gradients to optimize sensor assignments in extension to Cyclic Slewing Sensor Tasking Algorithm
 - Derived reparameterization scheme to reduce necessary complexity of DL model while retaining identical optimization manifold
 - Generated data in custom CUDA simulation environment to model estimate error propagation with an Extended Kalman Filter
- ParallelBoid** – *CUDA and OpenMP Parallelized Simulation* – github.com/MarkCiora/ParallelBoid January 2024 - May 2024
- Developed a simulation with another student based on boids, a flock behavior framework that creates mesmerizing bird-like visuals
 - Utilized CUDA and OpenMP to parallelize the physics-based calculations, resulting in up to 1905 times speedup
- TREADS** – *VR Controlled Rover* – github.com/ewang360/Senior-Design-TREADS January 2023 - May 2023
- Partnered with a team of four others to design and prototype a rover controlled with a Meta Quest 2
 - Implemented interface to communicate head orientation from Quest 2 to gimbal that controlled camera orientation
 - Created a custom video streaming protocol that transmitted serialized JPEG data over WiFi to display rover's camera view in VR
 - Integrated video streaming into VR environment with a custom scene in Unity

Education

University of Pittsburgh

- M.S. in Electrical and Computer Engineering April 2025, GPA: 3.969
- M.S. Thesis: "Sensor Tasking with Cyclic Slewing for Space Situational Awareness and Tracking"
- B.S. in Computer Engineering (Autonomous Systems conc.) (Outstanding Student Honorable Mention) April 2023, GPA: 3.904

Publications

- [1] Ian Peitzsch, Mark Ciora, and Alan D. George. "Multiarchitecture Hardware Acceleration of Hyperdimensional Computing". In: *2023 IEEE High Performance Extreme Computing Conference (HPEC)*. 2023, pp. 1–7. DOI: [10.1109/HPEC58863.2023.10363602](https://doi.org/10.1109/HPEC58863.2023.10363602).
- [2] Mark Ciora and Alan D. George. "Satellite Sensor Tasking with Cyclic Slewing for Space Situational Awareness and Tracking". In: *IEEE Space Computing Conference (SCC)*. (Accepted). 2025.