Christopher J. Banks

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Education

Ph.D. Student, Robotics. Georgia Institute of Technology. 2017-present

M.S. Computer Science, Specialization: Computational Perception and Robotics 2021

B.S. Physics, Computer Science Minor. Summa Cum Laude. Norfolk State University 2013-2017

Research Interests

Swarm robotics, linear temporal logic, human-swarm interaction, control theory, machine learning

Research Experience

Research Intern, NASA Jet Propulsion Laboratory **June 2019 – August 2019**

- Participated in the Maritime and Multi-agent Autonomy group
- Focused on developing a algorithm that utilized branch-and-bound techniques for low cost trajectory planning for aquatic vehicles
- Utilized C++ and Object Oriented programming

Ph.D. Student, Robotics, Georgia Institute of Technology **August 2017 – present**

- Created end-to-end platform for the use of temporal logic formula in trajectory generation for quadcopters
- Lead software developer for quadcopter integration into the Robotarium, a remotely accessible robotics testbed at Georgia Tech
- Member of the Robotarium team that manages user input to the system and software updates

Research Intern, Thomas Jefferson National Accelerator Facility **October 2016 - July 2017**

- Studied conventional and hybrid meson structure through photoproduction experiments
- Analyzed the decay states of the phi and omega mesons to find resonance patterns, indicating possible particle production
- Used Perl and Python as a software development platform to contribute to creating a framework for partial wave analysis

Research Intern, Massachusetts Institute of Technology (MIT) **June 2016 – August 2016**

- Participated in automated planning artificial intelligence research
- Integrated a human user in the planning process of an automated planner to improve the plan's efficiency
- Used C++ in a Linux environment to create a file handler and automated planner generation environment and co-authored 1 research paper

Awards

National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) Fellowship
2017-present

Dozoretz National Institute of Mathematics and Applied Science (DNIMAS) Scholar
2013-2017

OS & Programming Language Experience

Programming Languages - C++ | Python | MATLAB

OS experience - Linux (Ubuntu, Redhat) | Robot Operating System (ROS)

Activities & Outreach

RoboGrads, President 2021-2022

RoboGrads, Treasurer 2020-2021

National Society of Black Engineers (NSBE) Member 2013-present

FIRST Robotics Mentor 2013-2017

Selected Courses

CS 6601: Artificial Intelligence

CS 7641: Machine Learning

ECE 6550: Linear Systems and Control

ECE 6552: Non-Linear Systems and Control

Selected Publications

Kim, Joseph, **Christopher J**. **Banks**, and Julie A. Shah. "Collaborative Planning with Encoding of Users' High-Level Strategies." *AAAI*. 2017.

C. Banks, K. Slovak, S. Coogan, and M. Egerstedt. "Specification-Based Maneuvering of Quadcopters Through Hoops." 2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE, 2019.

C. Banks, S. Wilson, S. Coogan, and M. Egerstedt. "Multi-Agent Task Allocation using Cross-Entropy Temporal Logic Optimization." 2020 IEEE International Conference on Robotics and Automation (ICRA). IEEE, 2020.

C. Banks, A. Bono, and S. Coogan. "Physical Human-UAV Interaction via Differentially Flat Output Generation using Admittance Control". 2021 IFAC Modeling and Estimation and Control Conference (MECC). IFAC, 2021.

C. Banks, S. Coogan, and M. Egerstedt. "LTL Cross Entropy Optimization for Quadcopter Task Orchestration". 2022 Cyber-Physical Systems. IEEE, 2022.