Brady Moon

✉ bradygmoon@cmu.edu | 🏠 bradymoon.com | 🐙 bradygm | in bradygmoon | 🎓 Brady M

Education

Carnegie Mellon University   *Pittsburgh, Pennsylvania*

PHD IN ROBOTICS   *August 2019 - Present*

- Advisor: Prof. Sebastian Scherer
- QPA: 4.12/4

Brigham Young University   *Provo, Utah*

B.S. IN ELECTRICAL ENGINEERING   *August 2015 - April 2019*

- Graduated *summa cum laude* (4.0 GPA)
- Emphasis in Signals and Systems

Technical Skills

Programming   C++, C, Python, Matlab, JavaScript, LaTeX
Tools/Libraries   ROS, Gazebo, Git, Linux, Docker, SLURM, PyTorch, OpenCV

Academic Projects and Employment

Autonomous Mission Execution for Teams of Reconnaissance UAVs   *Pittsburgh, Pennsylvania*

AIRLAB RESEARCH ASSISTANT | OFFICE OF NAVAL RESEARCH   *March 2021 - Present*

- Developing autonomy algorithms to search for and track targets for maritime environments, search and rescue, and wildfire management
- Deployed algorithms on both quadrotor and fixed wing platforms with various types of sensors

Close-Proximity Safe and Seamless Operation of Manned and Unmanned Aircraft in Shared Airspace   *Pittsburgh, Pennsylvania*

AIRLAB RESEARCH ASSISTANT | U.S. ARMY AI TASK FORCE   *March 2020 - March 2022*

- Helped develop long-range aircraft detection and tracking strategies using a monocular camera
- Predict the future trajectories of aircraft using Graph Attention Networks
- Constructing a real-world dataset of labeled instances of small aircraft at an airport over many months

DOE Delivery Energy Productivity Project   *Pittsburgh, Pennsylvania*

AIRLAB RESEARCH ASSISTANT | U.S. DEPARTMENT OF ENERGY   *August 2019 - March 2022*

- Evaluated the impact of autonomous robots on the energy productivity of package delivery
- Energy-based flight risk assessment for multirotor UAVs
- Learning and validating energy models for autonomous robots

UAV Gesture Commands   *Provo, Utah*

MAGICC LAB RESEARCH ASSISTANT   *September 2018 - April 2019*

- Designed and trained a model to classify ten gestures with an accuracy of 95% using accelerator and gyroscope measurements .
- Presented the research at the ICUAS 2019 conference
- Designed and tested intuitive gestures and behaviors for natural directing of a fleet of UAVs

Utah Underwater Robotics   *Provo, Utah*

EXECUTIVE DIRECTOR   *January 2016 - April 2019*

- Directed this statewide STEM outreach program, impacting over 800 K-12 students annually
- Designed and organized the annual competition
- Worked closely with local companies to fund and promote the program

UAV Multi-Mission Project   *Provo, Utah*

MAGICC LAB RESEARCH ASSISTANT   *March 2017 - April 2019*

- Developed a decentralized multi-agent search algorithm to maximize area knowledge and number of tracked targets using GP regressions
- Presented the research at the ICUAS 2018 conference
- Implemented a Gaussian Mixture Model-based Kalman filter for more accurate target tracking with heterogeneous sensors

BYU Mathematics   *Provo, Utah*

TEACHING ASSISTANT   *August 2015 - December 2015*

- Taught calculus lectures to a section of 40+ students twice per week
- Graded assignments and held office hours for all math sections where I taught one-on-one and in groups to help students master the subject

Professional Employment

Near Earth Autonomy *Pittsburgh, Pennsylvania*
ROBOTICS ENGINEERING INTERN *May 2019 - August 2019*

Scalar Analytics *Draper, Utah*
SOFTWARE DEVELOPMENT INTERN *June 2016 - July 2016*
- Worked directly with the director of operations in building a new and efficient customer relationship management program
- Created scripts to automate the workflow of employees, saving hours of time each day

Publications

Journal Papers

"Time-Optimal Path Planning in a Constant Wind for Uncrewed Aerial Vehicles using Dubins Set Classification," Brady Moon, Sagar Sachdev, Junbin Yuan, Sebastian Scherer, *IEEE Robotics and Automation Letters (RA-L)*, 2023.

"Quantifying the Effect of Weather on Advanced Air Mobility Operations," Ashima Sharma, Jay Patrikar, Brady Moon, Sebastian Scherer, Constantine Samaras, *Findings*, 2023.

"Aerial Field Robotics," Mihir Kulkarni, Brady Moon, Kostas Alexis, Sebastian Scherer, *Encyclopedia of Robotics*, 2022.

"In-flight positional and energy use dataset of a DJI Matrice 100 quadcopter for small package delivery," Thiago A. Rodrigues, Jay Patrikar, Arnav Choudhry, Jacob Feldgoise, Vaibhav Arcot, Aradhana Gahlaut, Sophia Lau, Brady Moon, Bastian Wagner, H. Scott Matthews, Sebastian Scherer, Constantine Samaras, *Nature Scientific Data*, 2021.

"Gesture Commands for Controlling High-Level UAV Behavior," John Akagi, T. Devon Morris, Brady G. Moon, Xingguang Chen, Cameron K. Peterson, *2021 SN Applied Sciences*, 2021.

Conference Papers

"WIT-UAS: A Wildland-fire Infrared Thermal Dataset to Detect Crew Assets From Aerial Views," Andrew Jong, Mukai Yu, Devansh Dhrafani, Siva Kailas, Brady Moon, Katia Sycara, Sebastian Scherer, *International Conference on Intelligent Robots and Systems (IROS)*, 2023.

"PyPose: A library for robot learning with physics-based optimization," Chen Wang, Dasong Gao, Kuan Xu, Junyi Geng, Yaoyu Hu, Yuheng Qiu, Bowen Li, Fan Yang, Brady Moon, Abhinav Pandey, Jiahe Xu, Tianhao Wu, Haonan He, Daning Huang, Zhongqiang Ren, Shibo Zhao, Taimeng Fu, Pranay Reddy, Xiao Lin, Wenshan Wang, Jingnan Shi, Rajat Talak, Kun Cao, Yi Du, Han Wang, Huai Yu, Shanzhao Wang, Siyu Chen, Ananth Kashyap, Rohan Bandaru, Karthik Dantu, Jiajun Wu, Lihua Xie, Luca Carlone, Marco Hutter, Sebastian Scherer, *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2023.

"AirTrack: Onboard Deep Learning Framework for Long-Range Aircraft Detection and Tracking," Sourish Ghosh, Jay Patrikar, Brady Moon, Milad Moghassem Hamidi, Sebastian Scherer, *International Conference on Robotics and Automation (ICRA)*, 2023.

"TIGRIS: An Informed Sampling-based Algorithm for Informative Path Planning," Brady Moon, Satrajit Chatterjee, Sebastian Scherer, *International Conference on Intelligent Robots and Systems (IROS)*, 2022.

"Predicting Like A Pilot: Dataset and Method to Predict Socially-Aware Aircraft Trajectories in Non-Towered Terminal Airspace," Jay Patrikar, Brady Moon, Jean Oh, Sebastian Scherer, *International Conference on Robotics and Automation (ICRA)*, 2022.

"CVaR-based Flight Energy Risk Assessment for Multirotor UAVs using a Deep Energy Model," Brady Moon*, Jay Patrikar*, Arnav Choudry*, Sebastian Scherer, *International Conference on Robotics and Automation (ICRA)*, 2021.

"Wind and the City: Utilizing UAV-Based In-Situ Measurements for Estimating Urban Wind Fields," Jay Patrikar, Brady G. Moon, Sebastian Scherer, *International Conference on Intelligent Robots and Systems (IROS)*, 2020.

"Learned Search Parameters For Cooperating Vehicles using Gaussian Process Regressions," Brady G. Moon, Cameron K. Peterson, *International Conference on Unmanned Aircraft Systems (ICUAS)*, 2018.

Leadership and Volunteer Experience

Graduate Student Association *Pittsburgh, Pennsylvania*
DEPARTMENT REPRESENTATIVE *June 2022 - Present*
- Nominated to represent the interests and concerns of graduate students in the Robotics Institute to the Graduate Research Association.

Robotics Institute Climate Committee *Pittsburgh, Pennsylvania*
COMMITTEE MEMBER *January 2022 - Present*
- Orchestrated dozens of impactful events like lab tours, speed networking, and Zoom webinars on graduate student admissions
- Led initiatives to improve office spaces and hallway aesthetics, including over 25 new artworks highlighting current student research
- Facilitated sessions with SCS Media Relations and RI media team, and contributed to the revitalization of the RI website and brand

Tartan Planning Series
Pittsburgh, Pennsylvania

ORGANIZER
March 2023 - May 2023

- Organized this series to cover topics in planning with engaging talks by 12 of the leading planning researchers, expanding on the content of our successful SLAM Series

RoboLaunch
Pittsburgh, Pennsylvania

ORGANIZER
May 2022 - Dec 2022

- Helped organize, publicize, and run this initiative which introduces high school and undergrad students to broad topics in robotics through talks, interactive workshops, and a competition
- Led in the design and instructing of a workshop on PID control, including and interactive coding session Reached an audience of over 13,000 students & viewers worldwide

Robotics Student Organization (RoboOrg)
Pittsburgh, Pennsylvania

PhD STUDENTS REPRESENTATIVE
January 2022 - December 2022

- Conducted town halls to facilitate discussions on the PhD experience and find how the student organization and department can assist
- Led in organizing and carrying out our department new student orientation annual robotics competition for 150+ of students
- Started a book club to read and discuss books on helpful topics pertaining to students

Tartan SLAM Series
Pittsburgh, Pennsylvania

LEAD ORGANIZER
April 2021 - December 2021

- Organized and ran the interactive series of talks, tutorials, and learning on SLAM topics
- Hosted over 25 world-renowned SLAM researchers and have grown our audience to thousands

Kiri
Salt Lake City, Utah

VICE PRESIDENT
January 2018 - June 2019

- Founded an educational screenless smart toy start-up as part of a selective interdisciplinary fellowship program
- Won three business model competitions and was successfully funded on Kickstarter
- Mentored by industry leaders from Microsoft, Tinder, and Chrysler

Self-Help Homes
Provo, Utah

EXECUTIVE DIRECTOR
August 2015 - April 2019

- Directed and instructed up to 70 volunteers weekly in assisting low-income families build their own homes
- Personally helped construct over 100 homes

IEEE and BYU Mechatronics
Provo, Utah

CLUB PRESIDENCIES
January 2017 - April 2019

- Led as vice chair in IEEE and vice president in the BYU Mechatronics club
- Designed and planned projects to help students further their knowledge and skills, such as maze-solving robots, Bluetooth RC cars, binary clocks, and ROVs

Scholarships & Grants

2019 **NSF Graduate Research Fellowship,** Three-year stipend and educational allowance

2019 **Warren Rollins and Murdell Hull Scholarship,** Received for graduating from BYU with a 4.0 GPA

2018 **NSF Research Experiences for Undergraduates Supplement,** Supplemental funding for work on cooperative control of UAVs

2018 **Crocker Innovation Fellowship,** Year-long interdisciplinary innovation experience and fellowship stipend

2018 **Tau Beta Pi Scholarship,** For academic achievement, extracurricular activity, and high potential for contributions in engineering

2018 **Edwin S. Hinckley Scholarship,** Two semesters tuition and stipend for exemplary service contributions and academic standards

2017 **BYU ORCA Research Grant,** Research grant awarded to build a gesture controller for UAVs

2017 **Sallie Mae Bank Scholarship (2x),** Twice received this $5000 scholarship from Sallie Mae Bank for excellence in engineering

2013 **Heritage Scholarship,** Four-year full tuition university scholarship

2012 **Nordstrom Scholar,** National four-year scholarship and was one of 40 selected out of 12,000 applicants

Honors & Awards

2019 **Summa Cum Laude,** Brigham Young University

2019 **President's Volunteer Service Award (4x),** National recognition for 150-250 hours of volunteer service each year

2019 **1st Place Miller Business Model Competition,** $5000 prize for Kiri, the screenless smart toy, and received Crowd Favorite award

2019 **1st Place BYU Social Venture Academy Best Product,** $2000 prize for Kiri

2019 **1st Place BYU Department of Technology IoT Competition,** $500 prize for Kiri

2019 **2nd Place Opportunity Quest Business Model Competition,** $2000 prize for Kiri

2019 **3rd Place BYU Student Innovator of the Year,** $2000 prize for Kiri

2018 **Gold Medal Congressional Award,** National award for public service, personal development, physical fitness, and exploration

Projects

AUVSI Student Unmanned Aerial Systems Competition   Developed a robust RRT path planner for the AUVSI SUAS competition. This planner avoided obstacles while minimizing the waypoint capture error through ensuring long straight paths through waypoints. Also fabricated and repaired many fixed-wing UAVs, created an image distortion correction program for letter and shape recognition, and many other tasks over the three years on the team.

Autopilot Implementation   Implemented the autopilot from *Small Unmanned Aircraft: Theory and Practice* in Python. This includes an implementation of the controller, estimator, path planner, and path manager.

Twitter Bot   Built a bot which filters a Twitter stream for all mentions of the US president, runs sentiment analysis on the tweets, and then automatically tweets the daily average score and weekly trends.

Mentoring

Undergrads and Interns   Oswaldo Ramirez (CMU), Tahaseen Shaik (CMU), Daniel Jiang (CMU), Aditya Parandekar (BITS Pilani Goa), Rohit Dasanoor (CMU), Lingpeng Chen (CUHK), Ryan Lilly (USAFA), Leonardo Santos (UFMG), Kaleb Naveed (PolyU), Satrajit Chatterjee (IIT KGP), Rachel Moan (WU)

Master's Thesis & PhD Qualifier Committee   Andrew Saba (Master's Thesis), Andrew Jong (Master's Thesis), Erin Wong (Master's Thesis), Ananya Roa (PhD Qualifier)