Justin M. **Kottinger**

PhD Candidate · Robotics & Autonomous Systems
Smead Aerospace Engineering Sciences, University of Colorado at Boulder
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Education

Ph.D in Robotics — *Boulder, CO*
University of Colorado Boulder — *Aug. 2019 - Aug. 2024*
- Department of Robotics

M.S in Aerospace Engineering — *Boulder, CO*
University of Colorado Boulder — *Aug. 2019 - May 2024*
- Department of Aerospace Engineering Sciences

B.A. in Physics and Astronomy — *Whittier, CA*
Whittier College — *Aug. 2015 - Aug. 2019*
- Minor: Mathematics
- Member of *Sigma Pi Sigma* and *Pi Mu Epsilon*

Skills

Programming Languages	C++, Python, MATLAB, Julia
Modeling and Simulation	ROS / ROS2, Gazebo, Simulink
Workflow	CMake, Docker, Git, Conda, Jira, Confluence, GitHub, Bitbucket
Operating Systems	Linux, Mac OS, Windows

Coursework

- Linear Control Theory
- Mathematical Statistics
- Statistical Estimation
- Decision Making Under Uncertainty
- Spacecraft Attitude Dynamics and Control
- Algorithmic Motion Planning
- Statistical Learning
- Verification & Synthesis of Stochastic Sys.
- Coord. Control of Multi-Agent Systems
- Hybrid Control Systems

Project Experience

Trimble Autonomous Solutions — *Westminster, CO*
Navigation and Controls Engineer Intern — *May 2023 - Current*
- Conceptualized and developed a containerized physics-based simulator using Docker, ROS2, and Gazebo to test GNC service product
- Implemented motion planning algorithms for line acquisition of autonomous agricultural vehicles
- Enabled autonomous line acquisition in reverse and validated on-vehicle

University of Colorado Boulder — *Boulder, CO*
Fault Identification of Autonomous Vehicles via Bayesian Inference — *Oct. 2022 - Mar. 2023*
- Utilized Bayesian hypothesis testing to accurately identify faults and unknown anomalies within autonomous robots.
- Implemented statistical estimation algorithms such as Kalman Filter, Extended Kalman Filter, and Unscented Kalman Filter in C++.
- Conceptualized and implemented *moving time-windows* and *fault-partitioning* to improve the baseline approach.
- Delivered a final product that identified faults and unknown anomalies with over 95% success.

The Aerospace Corporation — *El Segundo, CA*
Autonomous Systems Engineer Graduate Intern — *Summer 2020, 2021*
- Assisted in design, control, and system identification of an omni-directional octocopter
- Implemented advanced algorithms and data structures to create novel flight software in Python and C++.
- Validated custom flight modules inside simulation using ROS and Gazebo, and tested them onboard the vehicle.
- Assisted in the development of a Risk-Aware framework for Uber ATG's self-driving vehicle stack
- Formulated probabilistic dynamics propagation and intent models for self-driving vehicle and pedestrian models
- Implemented probabilistic models in Python and C++ using Bayesian derived statistics

Research Publications

Introducing Delays in Multi Agent Path Finding *Under Review*

J.Kottinger, S.Almagor, O.Salzman and M.Lahijanian, International Conference on Automated Planning and Scheduling (ICAPS)

Explainability of Multi Agent Path Finding *Under Review*

S. Almagor, J.Kottinger, and M. Lahijanian, "Explainability of Multi Agent Path Finding," Artificial Intelligence Journal, 2023

Chance-Constrained Multi-Robot Motion Planning Under Gaussian Uncertainties *2023*

J. Kottinger, A. Theurkauf, N. Ahmed and M. Lahijanian, "Chance-Constrained Multi-Robot Motion Planning Under Gaussian Uncertainties," in IEEE Robotics and Automation Letters, vol. 9, no. 1, pp. 835-842, Jan. 2024, doi: 10.1109/LRA.2023.3337700.

Conflict-Based Search for Multi-Robot Motion Planning with Kinodynamic Constraints *2022*

J.Kottinger, S. Almagor, and M. Lahijanian, "Conflict-based Search for Multi-Robot Motion Planning with Kinodynamic Constraints," To appear in International Conference On Intelligent Robots and Systems (IROS), 2022

Conflict-Based Search for Explainable Multi-Agent Path Finding *2022*

J.Kottinger, S.Almagor, and M.Lahijanian,Proceedings of the International Conference on Automated Planning and Scheduling (ICAPS), 32(1), 692-700. https://doi.org/10.1609/icaps.v32i1.19859

Towards Explainable Multi-Robot Motion Planning *2021*

J. Kottinger, S. Almagor, and M. Lahijanian, "Towards Explainable Multi-robot Motion Planning," in Robotics: Science and Systems workshop on Robotics for People: Perspectives on Interaction, Learning, and Safety, 2021

MAPS-X: Explainable Multi-Robot Motion Planning via Segmentation *2021*

J. Kottinger, S. Almagor and M. Lahijanian, "MAPS-X: Explainable Multi-Robot Motion Plan- ning via Segmentation," 2021 IEEE International Conference on Robotics and Automation (ICRA), 2021, pp. 7994-8000, doi: 10.1109/ICRA48506.2021.9561893

Explainable Multi-Agent Path Planning *2020*

J. Kottinger, S. Almagor, and M. Lahijanian, "Explainable Multi-Agent Path Planning," in Robotics: Science and Systems workshop on Explainable and Trustworthy Robot Decision Making for Scientific Data Collection, 2020.

Presentations

"Conflict-based Search for Multi-Robot Motion Planning with Kinodynamic Constraints" *Kyoto, JP*

International Conference On Intelligent Robots and Systems (IROS) *Oct. 26, 2022*

"Explainable Multi-Robot Motion Planning" *Bolder, CO*

Robotics Summer Graduate Student Seminar *Jul. 14, 2022*

"Conflict-Based Search for Explainable Multi-Agent Path Finding" *(Remote), SG*

International Conference on Automated Planning and Scheduling (ICAPS) *Jun. 20, 2022*

"MAPS-X: Explainable Multi-Robot Motion Planning via Segmentation" *(Remote), CN*

International Conference on Robotics and Automation (ICRA) *Jun. 1, 2021*

Achievements

2021 **Recipient**, Graduate Assistantships for Areas of National Need (GAANN) Fellowship *Boulder, CO*
2019 **Recipient**, Undergraduate Award for Outstanding Academic Performance in the Major *Whittier, CA*
2019 **Recipient**, Magna Cum Laude Honors *Whittier, CA*
2018 **2nd Place**, Research Presentation Competition at NSF funded REU *College Station, TX*
2018 **Captain**, Whittier College NCAA Baseball Team *Whittier, CA*