

Christoffer R. Heckman

CONTACT INFORMATION	Autonomous Robotics & Perception Group 1111 Engineering Drive ECOT 717, UCB 430 (mail) Boulder, CO 80309 USA	<i>Phone:</i> (303) 492-2961 <i>E-mail:</i> christoffer.heckman@colorado.edu <i>Office:</i> ECES 130 <i>Website:</i> arpg.colorado.edu
EDUCATION	Field of Theoretical and Applied Mechanics , Cornell University Doctor of Philosophy with Prof. Richard Rand Department of Mechanical Engineering , University of California at Berkeley Bachelor of Science (cum Laude)	 <i>August 2012</i> <i>May 2008</i>
PROFESSIONAL APPOINTMENTS	Department of Computer Science , University of Colorado Boulder Department of Aerospace Engineering Sciences (by courtesy) Department of Electrical, Computer & Energy Engineering (by courtesy) Associate Professor Assistant Professor Amazon , Scout Program Visiting Academic , Applied Science Department of Computer Science , University of Colorado at Boulder Research Scientist with Prof. Gabe Sibley U.S. Naval Research Laboratory Post-doctoral Research Associate with Dr. Ira Schwartz	 <i>August 2023–Present</i> <i>August 2016–July 2023</i> <i>August 2021–January 2023</i> <i>October 2014–August 2016</i> <i>January 2013–October 2014</i>
HONORS AND AWARDS	Third Place: DARPA Subterranean Challenge CU Boulder Research and Innovation Office Faculty Fellow, 2019 Jacques I. Pankove Faculty Fellow, 2018 Best Blue Sky Paper, Materials that Make Robots Smart, <i>International Symposium on Robotics Research</i> 2017 National Research Council Research Apprenticeship Program Fellowship, 2013–2014 National Science Foundation Graduate Research Fellowship, 2009–2012 Cornell University College of Engineering Olin Fellowship, 2008–2009	

Research.

[Google Scholar page](#). H-index as of January 2024: 19.

BOOKS	Correll N, Hayes B, Heckman CR , Roncone A. Introduction to Autonomous Robots: Mechanisms, Sensors, Actuators, and Algorithms. <i>MIT Press</i> 2022.
JOURNAL ARTICLES (*: ADVISEE)	Harlow K*, Jang H, Barfoot T, Kim A, Heckman CR . A New Wave in Robotics: Survey on Recent mmWave Radar Applications in Robotics. In review at <i>IEEE Transactions on Robotics</i> . Biggie H*, Rush E, Riley D, Ahmad S, McGuire S*, Ohradzansky M, Harlow K*, Miles M*, Torres D*, Frew E, Heckman CR , Humbert J. Flexible supervised autonomy for exploration in subterranean environments. <i>Field Robotics Journal</i> 2023 (in press).

Kramer A*, Harlow K*, Williams C, **Heckman CR**. ColoRadar: The Direct 3D Millimeter Wave Radar Dataset. *International Journal of Robotics Research* 2022 351–360.

McGuire S*, Furlong PM, **Heckman CR**, Julier S, Ahmed N. Human-Aware Reinforcement Learning for Fault Recovery Using Contextual Gaussian Processes. *Journal of Aerospace Information Systems* 2021 1–13.

Ohradzansky MT, Rush ER, Riley DG, Mills AB, Ahmad S, McGuire S*, Biggie H*, Harlow K*, Miles M*, Frew EW, **Heckman CR**, Humbert JS. Multi-Agent Autonomy: Advancements and Challenges in Subterranean Exploration. *Field Robotics Journal* 2022 (in print, 39 pages).

Prendergast JM, Formosa GA, Fulton MJ, **Heckman CR**, Rentschler ME. A Real-Time State Dependent Region Estimator for Autonomous Endoscope Navigation. *IEEE Transactions on Robotics* 2020 1–17.

Kress-Gazit H, Eder K, Hoffman G, Admoni H, Argall B, Ehlers R, **Heckman CR**, Jansen N, Knepper R, Křetínský J, Levy-Tzedek S. Formalizing and Guaranteeing* Human-Robot Interaction. *Communications of the ACM* 2021 78–84.

McGuire S*, Furlong PM, Fong T, **Heckman CR**, Szafir DJ, Julier S, Ahmed N. Everybody Needs Somebody Sometimes: Validation of Adaptive Recovery in Robotic Space Operations. *IEEE Robotics and Automation Letters* **4** (2) 1216–1223 2019; also appeared at 2019 IEEE International Conference on Robotics and Automation (ICRA).

Nobre F*, **Heckman CR**. Learning to Calibrate: Reinforcement Learning for Guided Calibration of Visual-Inertial Rigs. *International Journal of Robotics Research* (IF: 4.047); **38** (12–13) 2019. Special issue invited article based on 2017 International Symposium on Robotics Research (ISRR).

Hughes D, **Heckman CR**, Correll N. Materials that make robots smart. *International Journal of Robotics Research* **38** (12–13) 2019. Special issue invited article based on 2017 International Symposium on Robotics Research (ISRR).

McGuire S*, Furlong PM, **Heckman CR**, Julier S, Szafir D, Ahmed N. Failure is Not an Option: Policy Learning for Adaptive Recovery in Space Operations. *IEEE Robotics and Automation Letters* **3** 3 1639–1646 2018.

Szwaykowska K, Schwartz IB, Luis MTR, **Heckman CR**, Mox D, Hsieh MA. Collective motion patterns of swarms with delay coupling: Theory and experiment. *Physical Review E* (IF: 2.353); **93** 032307 2016.

Heckman CR, Hsieh MA, Schwartz IB. Toward efficient navigation in uncertain gyre-like flows. *International Journal of Robotics Research* (IF: 4.047); **34** 13 1590–1603 2015. Special issue invited article based on 2014 International Symposium on Experimental Robotics (ISER).

Heckman CR, Hsieh MA, Schwartz IB. Going with the flow: enhancing stochastic switching rates in multi-gyre systems. *ASME Journal of Dynamic Systems, Measurement and Control* (IF: 1.521); **137** 031006 2014.

Heckman CR, Schwartz IB. Stochastic switching in slow-fast systems: a large fluctuation approach. *Physical Review E* (IF: 2.353); **89** 022919 2014.

Heckman CR, Rand RH. Dynamics of microbubble oscillators with delay coupling. *Nonlinear Dynamics* (IF: 3.464); **71** 121–132 2013.

Heckman CR, Kotas J, Rand RH. Asymptotic Analysis of the Hopf-Hopf Bifurcation in a Time Delay System. *Journal of Applied Nonlinear Dynamics* **1** 159–171 2012.

Heckman CR, Kotas J, Rand RH. Center Manifold Reduction of the Hopf-Hopf Bifurcation in a Time Delay System. *Proceedings of the European Series in Applied and Industrial Mathematics* (IF: 1.00); **39** 57–65 2013.

Heckman CR, Sah SM, Rand RH. Dynamics of microbubble oscillators with delay coupling. *Communications in Nonlinear Science and Numerical Simulation* (IF: 3.967); 15 2735–2743 2010.

PEER-REVIEWED
CONFERENCE
PROCEEDINGS

Biggie H*, Mopidevi AN*, Woods D, **Heckman CR**. Tell Me Where to Go: A Composable Framework for Context-Aware Embodied Robot Navigation. Accepted to *Conference on Robot Learning (CoRL)*; 2023. 8 pages, acceptance rate: 39%.

Bhattacharyya A*, Palmer M, **Heckman CR**. CRAPES: Cross-modal Annotation Projection for Visual Semantic Role Labeling. *Proceedings of the 12th Joint Conference on Lexical and Computational Semantics (*SEM 2023)*, pp. 61–70, Toronto, Canada.

Biggie H*, Beathard A*, **Heckman CR**. BO-ICP: Initialization of Iterative Closest Point Based on Bayesian Optimization. *IEEE International Conference on Robotics and Automation (ICRA)*; 2023. 6 pages, acceptance rate: 42%.

Reed A*, Berger G, Sankaranarayanan S, **Heckman CR**. Verified Path Following Using Neural Control Lyapunov Functions. *Conference on Robot Learning (CoRL)*; 2022. 10 pages, acceptance rate: 39%.

Chen Z*, Julier S, Ahmed N, **Heckman CR**. Time Dependence in Kalman Filter Tuning. *IEEE International Conference on Information Fusion (FUSION)*; 2021. 8 pages, acceptance rate: $\approx 50\%$.

Chen Z*, **Heckman CR**. Robust Pose Estimation Based on Normalized Information Distance. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*; 2021. 6 pages, acceptance rate: 45%.

Walker M, Chen Z*, Whitlock M, Blair D, Albers-Szafir D, **Heckman CR**, Szafir D. A Mixed Reality Supervision and Telepresence Interface for Outdoor Field Robotics. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*; 2021. 6 pages, acceptance rate: 45%.

Kramer A*, **Heckman CR**. Radar-Inertial State Estimation and Obstacle Detection for Micro-Aerial Vehicles in Dense Fog. *International Symposium on Experimental Robotics (ISER)* 2020. 14 pages, acceptance rate: 40%.

Kasper M*, Nobre F, **Heckman CR**, Keivan N. Unsupervised Metric Relocalization Using Transform Consistency Loss. *Conference on Robot Learning (CoRL)*; 2020. 10 pages, acceptance rate: $\approx 35\%$.

Koh JJ, Ding G, **Heckman CR**, Chen L, Roncone A. Cooperative Control of Mobile Robots with Stackelberg Learning. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*; 2020 Oct 25–29. 8 pages, acceptance rate: $\approx 40\%$.

Bateman S*, Harlow K*, **Heckman CR**. Better Together: Online Probabilistic Clique Change Detection in 3D Landmark-Based Maps. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*; 2020 Oct 25–29. 8 pages, acceptance rate: $\approx 40\%$.

Kramer A*, Stahoviak C, Santamaria-Navarro A, Agha-mohammadi A-A, **Heckman CR**. Radar-inertial ego-velocity estimation for visually degraded environments. *IEEE International Conference on Robotics and Automation (ICRA)*; 2020 5739–5746. 7 pages, acceptance rate: 42%.

Kasper M*, **Heckman CR**. Multiple Point Light Estimation from Low-Quality 3D Reconstructions. *International Conference on 3D Vision (3DV)*; 2019 Sept 16–19. 9 pages, acceptance rate: $\approx 30\%$.

Kasper M*, McGuire S*, **Heckman CR**. A Benchmark for Visual-Inertial Odometry Systems Employing Onboard Illumination. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*; 2019 Nov 4–8. 7 pages, acceptance rate: 45%.

Kramer A*, Kasper M*, **Heckman CR**. VI-SLAM for Subterranean Environments. *Field and Service Robotics (FSR)*; 2019 Aug 29–31. 15 pages, acceptance rate: 76%.

Loefgren I, Ahmed N, Frew E, **Heckman CR**, Humbert S. Scalable Event-Triggered Data Fusion

for Autonomous Cooperative Swarm Localization. *International Conference on Information Fusion (FUSION)*; 2019 Jul 2–5. 8 pages.

Stechschulte J*, Ahmed N, **Heckman CR**. Robust low-overlap 3-D point cloud registration for outlier rejection. *IEEE International Conference on Robotics and Automation (ICRA)*; 2019 May 20–24. 8 pages, acceptance rate: 44%.

Nobre F*, **Heckman CR**. FastCal: Robust Online Self-Calibration for Robotic Systems. *International Symposium on Experimental Robotics (ISER)*; 2018 Nov 5–8. 10 pages.

Ding G, Aghli S*, **Heckman CR**, Chen L. Game-Theoretic Cooperative Lane Changing Using Data-Driven Models. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*; 2018 Oct 1–5. 6 pages, acceptance rate: 47%.

Prendergast JM, Formosa G, **Heckman CR**, Rentschler M. Autonomous Localization, Navigation and Haustral Fold Detection for Robotic Endoscopy. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*; 2018 Oct 1–5. 6 pages, acceptance rate: 47%.

Ravanbakhsh H, Aghli S*, **Heckman CR**, Sankaranarayanan S. Path-Following through Control Funnel Functions. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*; 2018 Oct 1–5. 6 pages, acceptance rate: 47%.

Chen Zhaozhong*, **Heckman CR**, Julier S, Ahmed N. Weak in the NEES?: Auto-tuning Kalman Filters with Bayesian Optimization. *International Conference on Information Fusion (FUSION)*; 2018 Jul 10–13. 8 pages, acceptance rate: $\approx 70\%$.

Aghli S*, **Heckman CR**. Online System Identification and Calibration of Dynamic Models for Autonomous Ground Vehicles. *IEEE International Conference on Robotics and Automation (ICRA)*; 2018 May 21–25. 7 pages, acceptance rate: 41%.

Nobre F*, **Heckman CR**, Ozog P, Wolcott RW, Walls JM. Online Probabilistic Change Detection in Feature-Based Maps. *IEEE International Conference on Robotics and Automation (ICRA)*; 2018 May 21–25. 7 pages, acceptance rate: 41%.

Nobre F*, **Heckman CR**. Reinforcement Learning for Assisted Visual-Inertial Robotic Calibration. *International Symposium on Robotics Research (ISRR)*; 2017 Dec 13; Puerto Varas, Chile. 16 pages.

Correll N, **Heckman CR**. Materials that Make Robots Smart (**best paper award winner**). *International Symposium on Robotics Research (ISRR)*; 2017 Dec 13; Puerto Varas, Chile. 8 pages.

Nobre F*, Kasper M*, **Heckman CR**. Drift-Correcting Self-Calibration for Visual-Inertial SLAM. *IEEE International Conference on Robotics and Automation (ICRA)*; 2017 May 29–Jun 3; Singapore. 8 pages, acceptance rate: 41%.

Nobre F*, **Heckman CR**, Sibley GT. Multi-Sensor SLAM with Online Self-Calibration and Change Detection. *International Symposium on Experimental Robotics (ISER)*; 2016 Oct 3–6; Tokyo, Japan. 10 pages.

Hsieh MA, Hajieghrary H, Kularatne D, **Heckman CR**, Forgoston E, Schwartz IB, Yecko PA. Small and Adrift with Self-Control: Using the Environment to Improve Autonomy. *International Symposium on Robotics Research (ISRR)*; 2015 Sep 12–15; Sestri Levante, Italy. 16 pages.

Heckman CR, Schwartz IB, Hsieh MA. Controlling Basin Breakout for Robots Operating in Uncertain Flow Environments. *International Symposium on Experimental Robotics (ISER)*; 2014 Jun 15–18; Marrakech/Essaouira, Morocco. 10 pages.

Heckman CR, Kotas J, Rand RH. Center Manifold Reduction of the Hopf-Hopf Bifurcation in a Time Delay System. *International Conference on Structural Nonlinear Dynamics and Diagnosis 2012*; 2012 Apr 30–May 2; Marrakech, Morocco. 3 pages.

Rand RH, **Heckman CR**. Dynamics of Coupled Bubble Oscillators with Delay. *ASME 2009 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*; 2009 Aug 30–Sep 2; San Diego, California. 4 pages.

PEER-REVIEWED
WORKSHOPS

Dagan O, Cinquini T, Morrissey L, Such K*, Ahmed N, **Heckman CR**. Towards Decentralized Heterogeneous Multi-Robot SLAM and Target Tracking. *Distributed Graphs Workshop at ICRA 2023*. 5 pages, acceptance rate: $\approx 80\%$.

Bhattacharyya A*, Mauceri C*, Palmer M, **Heckman CR**. Aligning Images and Text with Semantic Role Labels for Fine-Grained Cross-Modal Understanding. *Proceedings of the LREC 2022 Workshop on Citizen Linguistics in Language Resource Development*; 2022. 10 pages, acceptance rate: $\approx 50\%$.

Martin M*, Mauceri C *, Palmer M, **Heckman CR**. Leveraging Non-Specialists for Accurate and Time Efficient AMR Annotation. *Proceedings of the LREC 2020 Workshop on Citizen Linguistics in Language Resource Development*; 2020 May. 5 pages, acceptance rate: $\approx 50\%$.

Mauceri C*, Palmer M, **Heckman CR**. SUN-Spot: An RGB-D Dataset With Spatial Referring Expressions. *International Conference on Computer Vision (ICCV) Workshop on Closing the Loop Between Vision and Language*; 2019 Oct 28. 4 pages.

Kramer A*, Kasper M*, **Heckman CR**. Perception in Subterranean Planetary Environments. *Robotics: Science and Systems (RSS) Workshop on Space Robotics*; 2019 Jun 22–23. 6 pages.

Aghli S*, **Heckman CR**. Terrain Aware Model Predictive Controller for Autonomous Ground Vehicles. *Robotics: Science and Systems (RSS) Workshop on Bridging the Gap in Space Robotics*; 2017 Jul 17. 4 pages.

Hughes D, **Heckman C**, Correll N. Terrain Sensitive Tires for Autonomous Driving. *Robotics: Science and Systems Workshop (RSS) on Material Robotics*; 2017 Jul 17. 2 pages.

Kasper M*, Keivan N, Sibley GT, **Heckman CR**. Light Source Estimation in Synthetic Images. *European Conference on Computer Vision (ECCV) Workshop on Virtual/Augmented Reality for Visual Artificial Intelligence*; 2016 Oct 16; Amsterdam, Netherlands. 7 pages.

Heckman CR, Keivan N, Sibley G. Simulation-in-the-loop for Planning and Model-Predictive Control. *Robotics Science and Systems (RSS) Workshop on Realistic, Rapid and Repeatable Robot Simulation*; 2015 Jul 12–17; Rome, Italy. 4 pages.

CONFERENCE
ABSTRACTS

Ding G, Koh JJ, Merckaert K, Vanderborght B, Nicotra M, **Heckman CR**, Roncone A, Chen L. Distributed reinforcement learning for cooperative multi-robot object manipulation. *International Conference On Autonomous Agents and Multi-Agent Systems (AAMAS)*; 2020 May 9–13. 3 pages, acceptance rate: $\approx 20\%$.

Heckman CR. Using Modeled Dynamics for the Control of Autonomous Vehicles. *SIAM Conference on Applications of Dynamics Systems*; 2017 May 24; Snowbird, Utah.

Heckman CR, Hsieh MA, Schwartz IB. Using Stochastic Effects in Fluid Environments with Minimal Control. *International Conference on Structural Nonlinear Dynamics and Diagnosis*; 2016 May 23–25; Marrakech, Morocco.

Heckman CR, Hsieh MA, Schwartz IB. Controlling Long-Term Spatial Distributions of Autonomous Vehicles in Stochastic Flow Environments. *SIAM Conference on Applications of Dynamical Systems*; 2015 May 13–17; Snowbird, Utah.

Heckman CR, Scwhartz IB. Rare Event Prediction in Stochastic Systems with Multiple Time Scales. *Dynamics Days Europe XXXIII*; 2013 Jul 3–7; Madrid, Spain.

Heckman CR, Rand RH. Dynamics of Coupled Microbubbles with Large Fluid Compressibility Delays. *EUROMECH 2011 European Nonlinear Oscillations Conference*; 2011 July 24–29; Rome, Italy.

Szeri AJ, Toilliez JO, **Heckman CR**, Eslami P. Bubble-bubble interaction in disperse bubble clouds. *Acoustics 2008*; 2008 Jun 30–Jul 4; Paris, France. *Journal of the Acoustical Society of America* 123 (5):3557 2008.

FUNDING

Awardee, DARPA MARBLE Subterranean Challenge 3rd Place Prize (\$150k), September 2021.

PI, USDA-NIFA NRI INT: Autonomous Restoration and Revegetation of Degraded Ecosystems (\$1.2M, Heckman part: \$600k), October 2021–Present. Co-PIs: Nikolaus Correll and Nichole Barger.

PI, AFOSR STTR AF19B-T005, Passive Image Processing Algorithm for Automated Target Attitude Estimation (\$50k), April–October 2020.

Co-PI, NSF CPS: Medium: Collaborative Research: Learning and Verifying Conformant Data-Driven Models for Cyber-Physical Systems (CU part: \$529k, Heckman part: \$176k), October 2019–Present. PI: Sriram Sankaranarayanan, Co-PI: Sina Aghli.

Co-PI, US-Ignite: Evaluating Onbase Deployment of Smart Transportation Technologies (\$498k, Heckman part: \$125k), August 2019–Present. PI: Sriram Sankaranarayanan.

Co-PI, NSF S&AS: INT: COLLAB: An Intelligence-Driven Patient Care Approach to Reduce Medical Errors (I-CARE) (\$900k, CU part: \$450k, Heckman part: \$225k), April 2019–Present. PI: Mark Rentschler, Co-PIs: Hao Zhang and Hua Wang (Colorado School of Mines).

Sole PI, NASA Space Technology Research Fellowship: Feature-Based Visual SLAM For Shadowed, Specular, and Hazy Environments (\$300k), August 2018–Present.

Co-PI, DARPA Tactical Technology Office Subterranean Challenge: MARBLE (\$4.5M, CU part: \$3M, Heckman part: \$1.5M), August 2018–Present. PI: Sean Humbert, Co-PIs: Christopher Williams, Eric Frew, Ron Rorrer (UC Denver), Hector Escobar (SSCI).

Co-PI, DARPA Tactical Technology Office OFFset Sprinter: Enhanced Swarm Perception through Autonomous Sensor Fusion and Map+Communication-Aware Planning (\$372k, Heckman part: \$124k), September 2018–June 2019. PI: Eric Frew, Co-PIs: Nisar Ahmed, Sean Humbert.

Co-PI, NSF NRI: FND: Life-Long Learning for Motion Planning by Robots in Human Populated Environments (\$749k, Heckman part: \$375k), September 2018–Present. PI: Brad Hayes.

Co-PI, NSF CHS: Medium: Data-Mediated Communication with Proximal Robots for Emergency Response (\$1.19M, Heckman part: \$397k), September 2018–Present. PI: Dan Szafir, Co-PI: Danielle Szafir.

Sole PI, (industrial sponsor name withheld): Agricultural Autonomous Vehicles (\$119k), January 2018–March 2019.

Co-PI, DARPA Information Innovation Office AIDA: RAMFIS (\$2.76M, Heckman part: \$550k), January 2018–Present. PI: Martha Palmer, Co-PIs: Jim Martin, James Pustejovsky (Brandeis), Bruce Draper (Colorado State).

Co-PI, Wright Brothers Institute Summer of Innovation Subject Matter Expert Support (\$90k, Heckman part: \$15k), May–August 2017. PI: Sriram Sankaranarayanan, Co-PIs: Eric Frew, Xi Chen, Dirk Grunwald.

PI, NSF CPS: Synergy: Verified Control of Cooperative Autonomous Vehicles (\$777k, Heckman part: \$259k), Award #1646556, October 2016–Present. Co-PIs: Sriram Sankaranarayanan, Lijun Chen, John Hauser, Dirk Grunwald.

PI, DARPA Defense Sciences Office: Ninja Car (\$1.04M, CU part: \$750k), January 2016–July 2018. Co-PI: George Small (Moog).

Sole PI, Toyota: Vehicle Perception Research (\$469k), August 2015–February 2017.

FUNDING PENDING OR NOT AWARDED PI, NSF CAREER (pending).
 Co-PI, Army STRONG (2022).
 PI, AFOSR STTR Phase I (2022).
 PI, NSF OPP Snowmobot (2022).
 PI, DARPA RACER-Sim (2021).
 Co-PI, DARPA PTG (2021).
 PI, DARPA RACER (2020).
 Co-PI, NSF LEAP-HI (2020).
 PI, Army Research Labs (2020).
 PI, NASA Early Career Faculty Award (2019).
 Co-PI, NSF LEAP-HI (2019).
 Co-PI, NSF Cyber-Physical Systems Medium (2018).
 PI, NSF National Robotics Initiative Foundational (2017).
 Co-PI, NSF Smart and Connected Communities Planning (2017).
 Co-PI, NSF National Robotics Initiative (2016).
 Co-PI, NSF CISE Research Infrastructure (2016).
 Co-PI, NASA Early Stage Innovation (2016).
 Co-PI, NSF National Robotics Initiative (2015).

INTERNAL FUNDING PI, Research and Innovation Office Seed Grant with Toby Minear (\$50k), 2022.
 Senior Personnel, CIRES Seed Grant with Toby Minear (\$44k), 2017–2018.
 PI, Multifunctional Materials IRT Seed Grant (\$5k), June–August 2018.
 Co-PI, Multifunctional Materials IRT Seed Grant with Brad Hayes (\$18k), 2018–2019.
 Co-PI, Autonomous Systems IRT Seed Grant with Brad Hayes (\$16k), 2018–2019.
 Co-PI, Autonomous Systems IRT Seed Grant with Sean Humbert (\$14k), 2018–2019.
 Co-PI, Autonomous Systems IRT Seed Grant with Mark Rentschler (\$8k), 2018–2019.

Teaching.

COURSES TAUGHT Fall 2022: CSCI 7000 “Modern Machine Learning Techniques in Robotic Perception and Autonomy”.
 Spring 2022: ATLS 4900 “Independent Study: Visualization of Subterranean Robot Perception”; CSCI 4900 “Independent Study: Algorithmic Path Planning in Dynamic Environments”; CSCI 7900 “Independent Study: Visual Transformers”.
 Fall 2021: ATLS 4900 “Independent Study: Visualization of Subterranean Robot Trajectories”; CSCI 4900 “Independent Study: Cooperative Multi-Agent Autonomy”; CSCI 7900 “Independent Study: Multimodal Human-Robot Interactions”.
 Spring 2021: CSCI 3202 “Introduction to Artificial Intelligence” (approx. 180 students); CSCI 7900 “Independent Study: Information-theoretic Robotic Perception”.
 Fall 2020 (parental leave): CSCI 4900 “Independent Study: Machine Learning Techniques in Robotic Planning”.
 Spring 2020: CSCI 5900 “Independent Study: Cloud Robotics”; CSCI 7900 “Independent Study: Millimeter-wave Robotic Perception”.
 Fall 2019: CSCI 4302/5302 “Advanced Robotics”, FCQ: 5.5; CSCI 4830/7000 “Autonomous Vehicle Competition”, FCQ: 6.0; CSCI 5900 “Independent Study: Data-driven Target Tracking and Pose Estimation”; ECEN 5840 “Independent Study: Learning-based Visual Robotic Perception”.
 Spring 2019: CSCI 4302/5302 “Advanced Robotics”, FCQ: 5.4; CSCI 5900 “Independent Study: Agricultural Autonomous Robotics”; CSCI 7000 “Independent Study: Godel, Escher, Bach: A Computational Paradigm”; ECEN 5840 “Independent Study: Robust Estimation and Covariance Tuning”.

Fall 2018: CSCI 3302 “Introduction to Artificial Intelligence”, FCQ: 4.6 (approx. 120 students); CSCI 5900: “Independent Study: Mechatronics for Autonomous Robots”.

Spring 2018: CSCI 4302/5302 “Advanced Robotics”, FCQ: 5.5; CSCI 4900 “Independent Study: Convolutional Neural Networks for Autonomous Planning”; CSCI 7000 “Machine Learning in Robotic Perception”.

Fall 2017: CSCI 4830/7000 “Physical Systems Modeling & Analysis”, FCQ: 5.3; CSCI 7900 “Independent Study: Multi-layer Perceptrons for Robotic Modeling”.

Spring 2017: CSCI 4302/5302 “Advanced Robotics”, FCQ: 5.5; CSCI 5900: “Independent Study: Robust Global Bundle Adjustment”.

Fall 2016: CSCI 7000 “Robot Perception, Planning and Control”, FCQ: 5.7.

Fall 2015: CSCI 5722 “Computer Vision” (shared lectures with Gabe Sibley)

PERSONNEL
ADVISED

Postdoctoral researchers: 1. Steve McGuire (2019–2020, now an Assistant Professor at UCSC).

Doctoral students graduated: 8. Zhaozhong Chen (2016–2021, ECEE, now at Oppo, an augmented reality company), 7. Cecilia Mauzeri (2016–2021, now at Jet Propulsion Laboratory), 6. Andrew Kramer (2017–2021, now at Amazon Scout), 5. Mike Kasper (2015–2020, now at an AI startup), 4. John Stechschulte (2015–2019, now at XPeng, a self-driving car company), 3. Fernando Nobre (2015–2018, now CTO at an AI startup), 2. Sina Aghli (2015–2018, now a Teaching Assistant Professor at CU Boulder), 1. Juan Falquez (2015–2018, now at Amazon Robotics).

Doctoral students in progress: 8. Doncey Albin (2022–present, ME), 7. Alec Reed (2021–present), 6. Anna Zavei-Boroda (2021–present), 5. Kristen Such (2020–present, ME), 4. Harel Biggie (2019–present), 3. Mary Martin (2019–present), 2. Kyle Harlow (2018–present), 1. Mike Miles (2018–present, ME).

Doctoral students jointly advised and/or previously supervised: 7. Abhidip Bhattacharyya (2020–present; principal: Martha Palmer), 6. Guohui Ding (2019–2021; principal: Lijun Chen), 5. Caleb Escobedo (2019–2020; now with Alessandro Roncone). 4. Steve McGuire (2015–2019; principal: Nisar Ahmed), 3. Yang Li (2018–2019; principal: Nikolaus Correll), 2. Christopher Gavin (2017–2018; now with Nikolaus Correll), 1. Dana Hughes (2016–2017; principal: Nikolaus Correll),

Master’s students graduated: 12. Daniel Torres Dominguez (2020–2022; thesis). 11. Rio McMahan (2020–2021, AES; thesis), 10. Amit Rege (2018–2019), 9. Yash Gandhi (2018–2019; thesis), 8. Wyatt Raich (2018–2019, AES; thesis), 7. Chu-Sheng Ku (2017–2019), 6. Carl Stahoviak (2017–2019, AES; thesis), 5. Siddhartha Shrivastava (2017–2019, ECE), 4. Corin Sandford (2015–2017), 3. Soham Banerjee (2015–2017, ECE), 2. Nikhil Mahendra (2015–2016, ECE), 1. Akshay Singh (2015–2017, ECE).

Undergraduate thesis students advised: 2. Xuefei Sun (2020–2021; thesis), 1. Sam Bateman (2019–2020; thesis),

Undergraduate students advised: 22. Edward Shi (2021–present, ME), 21. Sam Williams (2021–present), 20. Andrew Beathard (2021–2022, ATLAS), 19. Max Patwardhan (2021–2022, ME), 18. Caitlyn Robinson (2021–2022, ME), 17. Akanksha Nelacanti (2021–2022, ME), 16. Nicole Gunderson (2021–2022, ME), 15. Patrick Cummings (2021–2022, ME), 14. Molly McFaul (2021, ME), 13. Ben Rautio (2020–2021, ECEE), 12. Greg Lund (2020–2021, ME/CS), 11. Earl Potters (2020–2021), 10. Davis Landry (2017–2021, ECE), 9. Nikolaas Bender (2019–2021), 8. ECE Capstone Team “Prometheus” (Jason Gallmeyer, Sarah Withee, Kyle Wislinksi, Josh Biggio, Xi Hu, Nur Umar, 2018–2019 AY), 7. Scott Marin (2018–2019), 6. Daniel Torres Dominguez (2016–2019, ME), 5. Boston Cleek (2017–2019, ME), 4. Christopher Gerbig (2018), 3. Gage Froelich (2016–2019, ME), 2. Ryan Leonard (2016–2018), 1. Zachary Asmussen (2015–2019, ECE).

Service.

INVITED TALKS

Stanford University Robotics Seminar, Palo Alto CA, Fall 2022 (invited)
 MIT LIDS Seminar, Cambridge MA, Fall 2022 (invited)
 University of Pennsylvania GRASP On Robotics Seminar, Philadelphia PA, December 2022
 University of California San Diego Contextual Robotics Institute Seminar, San Diego CA, November 2022
 University of Southern California CS Colloquium, Los Angeles CA, September 2022.
 ICRA Legged Robots Workshop Invited Talk, Virtual, May 2022
 University of Edinburgh Robotics Seminar, Virtual, March 2022
 Amazon Robotics: AI, Virtual, January 2022
 ATLAS Colloquium, Boulder CO, December 2021
 Nvidia Robotics, Seattle WA, February 2020
 Stanford University Robotics Seminar, Palo Alto CA, January 2020
 University of Rochester School of Engineering and Applied Science Seminar, Rochester NY, November 2019
 PEO, Loveland CO, November 2019
 National Academy of Engineering Frontiers of Engineering, Charleston SC, September 2019
 Zoox Perception and Prediction, Foster City CA, January 2019
 Loveland Rotary, Loveland CO, January 2019
 Johns Hopkins University Mechanical Engineering Department Seminar, Baltimore MD, November 2018
 Travelers Institute “Every Second Counts” Invited Talk, Denver CO, April 2018
 Lockheed AMAS, Virtual, October 2017
 US Naval Academy Mathematics Colloquium, Annapolis MD, November 2017
 US Naval Research Laboratory Seminar, Washington DC, May 2017
 Cornell Center for Applied Mathematics Colloquium, Ithaca NY, October 2016
 Denver Museum of Nature and Science Invited Talk, Denver CO, February 2016

INSTITUTIONAL SERVICE

College Ad-hoc Faculty Governance Committee, 2019–2022
 Campus Working Group on the Academies, 2020
 College Ad-hoc Budget Reduction Committee, 2020–2021
 Associate Director, Autonomous Systems Interdisciplinary Research Theme, 2019–2020
 Executive Committee Member, Department of Computer Science, 2018
 Former Graduate Committee Member, Chair of Petitions Subcommittee, 2016–2018
 College Search Committee Member, 2018
 Department Search Committee Member, Chair of Robotics Search, 2017
 RIO Innovative Seed Grant Review Panelist
 Cornell Graduate School General Committee, 2011–2012
 Cornell University Trustee Nominating Committee, 2012
 Cornell Graduate & Professional Student Assembly Appropriations Chair & Treasurer, Liaison to the Faculty Senate, and Voting Member, 2008–2012

PROFESSIONAL SERVICE

NSF Panelist 2017–2022
 Robotics: Science and Systems Area Chair (2021, 2022)
 IEEE International Conference on Robotics and Automation (ICRA) Workshop on Robust Perception in Challenging Environments (2021) Organizer
 NAE US Frontiers of Engineering Organizing Committee (2019)
 DARS 2018 Industry Chair (2018)
 Robotics: Science and Systems Workshop on Space Robotics Organizing Committee (2018: Chair; 2017, 2019: Co-chair)
 IEEE International Conference on Robotics and Automation (ICRA) Associate Editor (2019–2022)
 IEEE Transactions on Robotics Referee (2016–present)
 IEEE Robotics and Automation Letters Referee (2016–present)
 IEEE International Conference on Robotics and Intelligent Systems (IROS) Referee(2016–present)
 RSS Program Committee Member (2016–present)
 Autonomous Robotics Referee (2017–present)
 Journal of Field Robotics Referee (2019–present)
 IEEE Conference on Decision and Control Referee (2018–2020)
 IFAC WC Referee (2018)

Nonlinear Dynamics Referee (2014–2018)

INVITED
WORKSHOP
PARTICIPATION

National Workshop on Human-like Robots, Washington DC, USA, July 2022
 Verification and Synthesis of Human-Robot Interaction, Dagstuhl, Germany, February 2019
 US AFRL Science & Technology Strategy 2030 Meeting, Salt Lake City UT, USA, July 2018
 CRA CCC Robotic Materials, Washington DC, USA, April 2018
 CRA CCC Symposium on Computing Research, Washington DC, USA, October 2017
 Computer-Assisted Engineering for Robotics and Autonomous Systems, Dagstuhl, Germany, February 2017
 Workshop on Robotic Materials, Boulder CO, USA, February 2017

EXTERNAL
ACTIVITIES

Amazon Visiting Academic, 2021–present
 Hacking 4 Defense Subject Matter Expert
 Co-organizer and speaker at Boulder is for Robots
 Tau Beta Pi CA-A (UC Berkeley) Chapter Adviser 2008–2010
 Berkeley Undergraduate Scholarship, 2006–2008
 Eagle Scout, Boy Scouts of America, April 2004