Christoffer R. Heckman

CONTACT INFORMATION

Autonomous Robotics & Perception Group
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ECOT 717, UCB 430 (mail)
Boulder, CO 80309 USA

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E-mail: christoffer.heckman@colorado.edu
Office: ECES 130

EDUCATION

Field of Theoretical and Applied Mechanics, Cornell University

Doctor of Philosophy with Prof. Richard Rand — *August 2012*

Department of Mechanical Engineering, University of California at Berkeley

Bachelor of Science (cum Laude) — *May 2008*

PROFESSIONAL EXPERIENCE

Department of Computer Science, University of Colorado at Boulder
Department of Aerospace Engineering Sciences (by courtesy)
Department of Electrical, Computer & Energy Engineering (by courtesy)

Assistant Professor — *August 2016–Present*

Department of Computer Science, University of Colorado at Boulder

Research Scientist with Prof. Gabe Sibley — *October 2014–August 2016*

U.S. Naval Research Laboratory

Post-doctoral Research Associate with Dr. Ira Schwartz — *January 2013–October 2014*

JOURNAL ARTICLES

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* 2020.

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. 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

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: ≈ 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*; 2020 Oct 25–29. 8 pages, acceptance rate: ≈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*; 2020 Oct 25–29. 8 pages, acceptance rate: ≈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*; 2019 Sept 16–19. 9 pages, acceptance rate: ≈30%.

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

Kramer A*, Kasper M*, **Heckman CR**. VI-SLAM for Subterranean Environments. *Field and Service Robotics*; 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. *22nd International Conference on Information 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*; 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*; 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*; 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*; 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*; 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. *FUSION 2018*; 2018 Jul 10–13. 8 pages, acceptance rate: ≈70%.

Aghli S*, **Heckman CR**. Online System Identification and Calibration of Dynamic Models for Autonomous Ground Vehicles. *IEEE International Conference on Robotics and Automation*; 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*; 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*; 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*; 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*; 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 on Intelligent Robots*; 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*; 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*; 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

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: ≈50%.

Mauceri C*, Palmer M, **Heckman CR**. SUN-Spot: An RGB-D Dataset With Spatial Referring Expressions. *International Conference on Computer Vision 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 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 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 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* Workshop on Virtual/Agumented 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* 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*; 2020 May 9–13. 3 pages, acceptance rate: ≈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.

Teaching

By semester at CU Boulder:

Spring 2021: CSCI 3202 “Introduction to Artificial Intelligence”, in progress.

Fall 2019: CSCI 4302/5302 “Advanced Robotics”, FCQ: 5.5; CSCI 4830/7000 “Autonomous Vehicle Competition”, FCQ: 6.0.

Spring 2019: CSCI 4302/5302 “Advanced Robotics”, FCQ: 5.4.

Fall 2018: CSCI 3302 “Introduction to Artificial Intelligence”, FCQ: 4.6.

Spring 2018: CSCI 4302/5302 “Advanced Robotics”, FCQ: 5.5.

Fall 2017: CSCI 4830/7000 “Physical Systems Modeling & Analysis”, FCQ: 5.3.

Spring 2017: CSCI 4302/5302 “Advanced Robotics”, FCQ: 5.5.

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

By courses taught historically:

University of Colorado at Boulder

CSCI 3202: Introduction to Artificial Intelligence
CSCI 4302/5302: Advanced Robotics
CSCI 4830/7000: Autonomous Vehicle Competition

CSCI 4830/7000: Physical Systems Modeling & Analysis
CSCI 7000: Robot Perception, Planning and Control
CSCI 5722: Computer Vision (shared lectures with Gabe Sibley)

Cornell University

MATH 2930: Differential Equations
MATH 2940: Linear Algebra for Scientists & Engineers (TA, Instructor: Ramakrishna)
MATH 6170: Graduate Dynamical Systems (Grader, Instructor: Guckenheimer)
TAM 6130: Perturbations & Asymptotics (Grader, Instructor: Strogatz)

Personnel Advised

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

Doctoral students graduated: Mike Kasper (2015–2020, now at Amazon Robotics), John Stechschulte (2015–2019, now at PickNik), Fernando Nobre (2015–2018, now at Amazon Robotics), Sina Aghli (2015–2018, now an Instructor at CU Boulder), Juan Falquez (2015–2018, now at Amazon Robotics).

Doctoral students in progress: Cecilia Mauceri (2016–present), Andrew Kramer (2017–present), Zhaozhong Chen (2017–present, ECE), Kyle Harlow (2018–present), Mike Miles (2018–present, ME), Harel Biggie (2019–present), Mary Martin (2019–present), Kristen Such (2020–present, ME).

Doctoral students jointly advised and/or previously supervised: Christopher Gavin (2017–2018; now with Nikolaus Correll), Dana Hughes (2016–2017; principal: Nikolaus Correll), Steve Mcguire (2015–2019; principal: Nisar Ahmed), Yang Li (2018–2019; principal: Nikolaus Correll), Guohui Ding (2019–present; principal: Lijun Chen), Caleb Escobedo (2019–2020; now with Alessandro Roncone).

Master's students graduated: Amit Rege (2018–2019), Yash Gandhi (2018–2019), Wyatt Raich (2018–2019, AES), Chu-Sheng Ku (2017–2019), Carl Stahoviak (2017–2019, AES), Siddhartha Shrivastava (2017–2019, ECE), Corin Sandford (2015–2017), Soham Banerjee (2015–2017, ECE), Nikhil Mahendra (2015–2016, ECE), Akshay Singh (2015–2017, ECE).

Master's students in progress: Daniel Torres Dominguez (2020–present), Rio McMahon (2020–present, AES).

Undergraduate students advised: Xuefei Sun (2020–present), Greg Lund (2020–present, ME/CS), Earl Potters (2020–present), Davis Landry (2017–present, ECE), Nikolaas Bender (2019–present), Sam Bateman (2019–2020), Daniel Torres Dominguez (2016–2019, ME), Zachary Asmussen (2015–2019, ECE), Boston Cleek (2017–2019, ME), Gage Froelich (2016–2019, ME), Christopher Gerbig (2018), Ryan Leonard (2016–2018), Scott Marin (2018–2019), ECE Capstone Team "Prometheus" (Jason Gallmeyer, Sarah Withee, Kyle Wislinksi, Josh Biggio, Xi Hu, Nur Umar, 2018–2019 AY).

Funding

Total of $2.4M in total expenditures at CU through October, 2019.
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 not awarded

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

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.

Institutional Service

Campus Working Group on the Academies, 2020
College Ad-hoc Budget Reduction Committee, 2020–2021
Associate Director, Autonomous Systems Interdisciplinary Research Theme, 2019–2020

College Ad-hoc Faculty Governance Committee, 2019
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

Robotics: Science and Systems Area Chair (2021)
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 (2019–2021)
NSF Panelist 2017–2021
IEEE Transactions on Robotics Referee
IEEE Robotics and Automation Letters Referee
IEEE International Conference on Robotics and Intelligent Systems (IROS) Referee
IEEE Conference on Decision and Control Referee
RSS Program Committee Member
Autonomous Robotics Referee
IFAC WC Referee
Nonlinear Dynamics Referee
Journal of Field Robotics Referee

External Activities

US AFRL Science & Technology Strategy 2030 Meeting in Salt Lake City, UT (7/11/18)
National Academies Workshop on Robotic Materials in Washington, DC (5/23/18)
CCC CRA Presenter in Washington, DC (10/23/17)
Hacking 4 Defense Subject Matter Expert
Technical advisor to three local robotics companies
Co-organizer and speaker at Boulder is for Robots
Tau Beta Pi CA-A (UC Berkeley) Chapter Adviser 2008–2010

Personal Acknowledgments

CU Boulder Research and Innovation Office Faculty Fellow, 2019
Jacques I. Pankove Faculty Fellow, 2018
College of Engineering and Applied Science Top Research Performer: 2017, 2018
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
Berkeley Undergraduate Scholarship, 2006–2008
Eagle Scout, Boy Scouts of America, April 2004