Nisar R. Ahmed
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www.cohrint.info

EDUCATION

Ph.D. **Cornell University**
Mechanical Engineering (Dynamics, Systems, and Control), January 2012

Dissertation Title: Probabilistic Modeling and Estimation with Human Inputs in Semi-Autonomous Systems

Examination Fields: Mechanical Engineering, Electrical and Computer Engineering, Applied Mathematics

Thesis Committee: Prof. Mark Campbell (chair), Prof. Mark Psiaki, Prof. Lang Tong, Prof. Phaedon-Stelios Koutsourelakis

M.S. **Cornell University**
Mechanical Engineering, January 2010

B.S.E. **The Cooper Union for the Advancement of Science and Art**
General Engineering (Biomedical concentration), May 2006

PROFESSIONAL EXPERIENCE AND APPOINTMENTS

University of Colorado Co-site Director, NSF I/UCRC Center for Unmanned Aerial Systems (C-UAS), July 2018 – present

Assistant Professor, Ann and H.J. Smead Aerospace Engineering Sciences University of Colorado Boulder, January 2014 – present

Visiting Assistant Professor, Ann and H.J. Smead Aerospace Engineering Sciences University of Colorado Boulder, July 2013 – December 2013

Postdoctoral Research Associate, Autonomous Systems Laboratory, Cornell University, October 2011 – December 2013

Graduate Research Associate, Autonomous Systems Laboratory, Cornell University, November 2006 – September 2011

PEER-REVIEWED JOURNAL PUBLICATIONS

(*:graduate student advisees; ^:undergraduate advisees)

J16. S. McGuire*, P.M. Furlong, T. Fong, C. Heckman, D.J. Szafir, S. Julier, and **N. Ahmed**, "Everybody Needs Somebody Sometimes: Validation of Adaptive Recovery in Robotic Space Operations," *IEEE Robotics and Automation Letters*, pp. 1-8, in press.

J15. B. Israelsen* and **N. Ahmed**, "'Dave…I can assure you…it's going to be alright…': A definition, case for, and survey of algorithmic assurances in human-autonomy trust relationships," *ACM Computing Surveys*, v.51 no.6, Jan 2019, 113:1-113:37.

J14. **N. Ahmed**, "Data-Free/Data-Sparse Softmax Parameter Estimation with Structured Class Geometries," *IEEE Signal Processing Letters,* Volume: 25 Issue: 9, pp. 1408-1412, September 2018.

J13. M. Ouimet, **N. Ahmed**, D. Iglesias*, and S. Martinez, “Cooperative Robot Localization Using Event-triggered Estimation,” *AIAA Journal of Aerospace Information Systems*, Vol. 15, No. 7, 2018, pp. 427-449.

J12. S. McGuire*, P.M. Furlong, C. Heckman, S. Julier, D. Szafir, and **N. Ahmed**, “Failure is Not an Option: Policy Learning for Adaptive Recovery in Space Operations,” *IEEE Robotics and Automation Letters*, vol.3, no. 3, pp. 1639-1646.

J11. B. Israelsen*, **N. Ahmed**, K. Center, R. Green, and W. Bennett, “Adaptive Simulation-based Training of Artificial Intelligence Decision-makers Using Bayesian Optimization,” *AIAA Journal of Aerospace Information Systems*, Vol. 15, No. 2 (2018), pp. 38-56.

J10. **N. Ahmed**, D. Casbeer, Y. Cao, and D. Kingston, “Multi-target Localization on Road Networks with Hidden Markov Rao-Blackwellized Particle Filters,” *AIAA Journal of Aerospace Information Systems*, vol. 14, No. 11 (2017), pp. 573-596.

J9. M. Campbell and **N. Ahmed**, "Distributed Data Fusion: Neighbors, Rumors, and the Art of Collective Knowledge," *IEEE Control Systems*, v. 36, issue 4, 2016.

J8. R. Tse, **N. Ahmed**, and M. Campbell, “Unified Terrain Mapping Model with Markov Random Fields,” *IEEE Transactions on Robotics*, v.31, issue 2, p. 290-306, 2015.

J7. **N. Ahmed**, E. de Visser, T. Shaw, A. Mohammed-Ameen, M. Campbell, and R. Parasuraman, “Statistical Modeling of Networked Human-Automation Performance Using Working Memory Capacity,” *Ergonomics* , v. 57, no. 3, pp. 295-318, 2014.

J6. **N. Ahmed**, E. Sample, and M. Campbell, “Bayesian Multi-Categorical Soft Data Fusion for Human-Robot Collaboration,” *IEEE Transactions on Robotics*, v. 29, no.1, pp. 189-206, 2013.

J5. **N. Ahmed** and M. Campbell, “Fast Consistent Chernoff Fusion of Gaussian Mixtures for Ad Hoc Sensor Networks,” *IEEE Transactions on Signal Processing*, v. 60, no. 12, December 2012, pp. 6739-6745.

J4. **N. Ahmed** and M. Campbell, “Variational Bayesian Learning of Probabilistic Discriminative Models with Latent Softmax Variables,” *IEEE Transactions on Signal Processing*, v. 59, no. 7, August 2011, pp. 3143-3154.

J3. **N. Ahmed** and M. Campbell, “On Estimating Simple Probabilistic Discriminative Subclass Models,” *Expert Systems with Applications*, vol. 39, 2012, pp.6659-6664.

J2. D. R. Schneider, M. Leon, C. Van Der Blink, **N. Ahmed**, D. Shah, and K. Li. "Active Learning and Assessment within the NASA Robotics Alliance Cadets Program." *International Journal of Engineering Education*, vol. 24, no. 6, 2008, pp. 1091-1102.

J1. F. Casas, **N. Ahmed**, and A. Reeves, "A Minimal Sensor Count Approach to Fuzzy Logic Rotary Blood Pump Flow Control," *ASAIO Journal*, vol. 53, no. 2, March/April 2007, pp. 140-146.

SUBMITTED JOURNAL PAPERS IN PEER-REVIEW

S1. L. Burks*, I. Loefgren^, and N. Ahmed, "Optimal Continuous State POMDP Planning with Semantic Observations: A Variational Approach", submitted to *IEEE Transactions on Robotics* (in review).

PEER-REVIEWED INTERNATIONAL CONFERENCE PROCEEDINGS

C32. B. Israelsen*, N. Ahmed, E. Frew, D. Lawrence, and B. Argrow, "Machine Self-Confidence in Autonomous Systems via Meta-Analysis of Decision Processes," *2019 Applied Human Factors and Ergonomics Conference (AHFE 2019)*, Washington, DC, pp.1-12.

C31. S. McGuire*, P.M. Furlong, T. Fong, C. Heckman, D.J. Szafir, S. Julier, and **N. Ahmed**, "Everybody Needs Somebody Sometimes: Validation of Adaptive Recovery in Robotic Space Operations," *2019 IEEE/RAS International Conference on Robotics and Automation (ICRA 2019)*, Montreal, CA, accepted.

C30. J. Stechschulte, **N. Ahmed**, and C. Heckman, "Low-overlap 3-D point cloud registration with Bayesian outlier rejection," *2019 IEEE/RAS International Conference on Robotics and Automation (ICRA 2019)*, Montreal, CA, accepted.

C29. S. Moon, R. Kanlapuli, K. Glasheen, **N. Ahmed**, and E. Frew, "Particle Methods for Integrated Sensor Fusion and Cooperative Planning for Tracking Emitters using Airborne Directional Sensors," *InfoTech@Aerospace at AIAA SciTech 2019*, San Diego, CA, pp. 1-15.

C28. J. Muesing*, L. Burks*, M. Iuzzolino, D.A. Szafir, **N. Ahmed**, "Fully Bayesian Human-Machine Data Fusion for Robust Dynamic Target Surveillance and Characterization," *InfoTech@Aerospace at AIAA SciTech 2019*, San Diego, CA, pp. 1-18.

C27. J. Klingner, **N. Ahmed**, and N. Correll, "Fault-Tolerant Covariance Intersection for Localizing Robot Swarms," *2018 International Symposium on Distribution Autonomous Systems*, Boulder, CO, October 2018.

C26. L. Burks*, I. Loefgren^, L. Barbier^, J. Muesing^, J. McGinley^, S. Vunnam^, and **N. Ahmed**, "Closed-loop Bayesian Semantic Data Fusion for Collaborative Human-Autonomy Target Search," *2018 International Conference on Information Fusion (FUSION 2018)*, Cambridge, UK.

C25. Z. Chen, C. Heckman, S. Julier, and **N. Ahmed**, "Weak in the NEES? Auto-tuning Kalman Filters with Bayesian Optimization," *2018 International Conference on Information Fusion (FUSION 2018)*, Cambridge, UK.

C24. L. Burks* and **N. Ahmed**, “Optimal Continuous State POMDP Planning with Semantic Observations,” *2017 IEEE Conference on Decision and Control*, Melbourne, Australia, pp. 1509-1516, 2017.

C23. S. Moon, V. Ramaswamy, E. Frew, and **N. Ahmed**, “Co-optimization of Communication, Sensing, and Computation for Information Gathering using Cloud Computing,” *2017 IEEE Conference on Control Technology and Applications*, Hawai’i, pp. 1861-1867, 2017.

C22. B. Israelsen*, **N. Ahmed**, K. Center, R. Green, and W. Bennett, “Towards Adaptive Training of Agent-based Sparring Partners for Fighter Pilots,” *InfoTech@Aerospace at AIAA SciTech 2017*, Grapevine, TX, pp. 1-16. [**Best Intelligent Systems Student Paper Award]**

C21. Y. Cao, D. Casbeer, **N. Ahmed**, and D. Kingston, "Density Estimation of Moving Targets on a Road Network." AIAA Information Systems-AIAA Infotech @ Aerospace, AIAA SciTech Forum, Grapevine, TX, pp. 1-11.

C20. V. Ramaswamy, S. Moon, E. Frew, **N. Ahmed**, “Mutual Information based communication aware path planning: A game theoretic perspective,” *2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2016)*, Daejon, Korea, pp. 1823-1828.

C19. **N. Ahmed**, W. Whitacre, S. Moon, and E. Frew, "Factorized Covariance Intersection for Scalable Partial State Decentralized Data Fusion," *2016 IEEE/ISIF International Conference on Information Fusion (FUSION 2016)*, Heidelberg, Germany, pp. 1049 - 1056.

C18. N. Sweet* and **N. Ahmed**, “Structured Synthesis and Compression of Semantic Human Sensor Models for Bayesian Estimation,” *2016 IEEE/CSS American Control Conference (ACC 2016)*, Boston, MA, pp. 5479 - 5485.

C17. K. Lore, N. Sweet*, K. Kumar, **N. Ahmed**, and S. Sarkar, “Deep Value of Information Estimators for Collaborative Human-Machine Information Gathering,” *2016 ACM/IEEE International Conference on Cyberphysical Systems (ICCPS 2016)*, Vienna, Austria, vol. 3, pp.1-10 **[highly selective single track: 28% acceptance rate]**

C16. N. Sweet*, **N. Ahmed**, U. Kuter, and C. Miller, "Towards Self-Confidence in Autonomous Systems," *AIAA SciTech 2016 Infotech@Aerospace Conference*, San Diego, CA, pp.1-12.

C15. **N. Ahmed**, W. Whitacre, S. Moon, and E. Frew, "Scalable Decentralized Target Localization with Ownship uncertainties Using Factorized Data Fusion," *AIAA SciTech 2016 Infotech@Aerospace Conference*, San Diego, CA, pp.1-12.

C14. M. Ouimet, **N. Ahmed**, and S. Martinez, "Event-based Cooperative Localization using Implicit and Explicit Measurements," *2015 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI 2015)*, San Diego, CA, pp. 246 - 251.

C13. **N. Ahmed**, "What's One Mixture Divided by Another?: A Unified Approach to High-fidelity Distributed Data Fusion with Mixture Models," *2015 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI 2015)*, San Diego, CA, pp. 289-296.

C12. **N. Ahmed,** M. Campbell, D. Casbeer, Y. Cao, and D. Kingston, "Fully Bayesian Learning and Spatial Reasoning with Flexible Human Sensor Networks," *2015 IEEE/ACM International Conference on Cyberphysical Systems (ICCPS 2015)*, Seattle, WA, pp.80-89 **[highly selective single track: 27% acceptance rate]**

C11. **N. Ahmed,** "Conditionally Factorized DDF for General Distributed Bayesian Estimation," *2014 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI 2014)*, Beijing, China, pp.1-7.

C10. **N. Ahmed**, J. Schoenberg, and M. Campbell, "Fast Weighted Exponential Product Rules for Robust Distributed Data Fusion in General Multi-Robot Networks," *Robotics: Science and Systems VIII, 2012 (RSS 2012)*, Sydney, NSW, Australia, pp. 9-16 **[highly selective single track: 33% acceptance rate]**

C9. E. Sample, **N. Ahmed**, and M. Campbell, "An Experimental Evaluation of Bayesian Soft Human Sensor Fusion in Robotic Systems," *2012 AIAA Guidance, Navigation and Control Conference (GNC 2012)*, Minneapolis, MN, pp.1-19.

C8. R. Tse, **N. Ahmed**, and M. Campbell, "Unified Mixture-Model Based Terrain Estimation with Markov Random Fields," *2012 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI 2012)*, Hamburg, Germany, pp 238-243.

C7. **N. Ahmed**, E. Sample, K. Ho, T. Hoossainy and M. Campbell, "Soft Categorical Data Fusion via Variational Bayesian Importance Sampling, with Applications to Cooperative Search," *2011 IEEE/CSS American Control Conference (ACC 2011)*, San Francisco, CA, pp. 1268 - 1273. **[Best in Session Award]**

C6. **N. Ahmed** and M. Campbell, "Variational Learning of Autoregressive Mixtures of Experts for Fully Bayesian Hybrid System Identification," *2011 IEEE/CSS American Control Conference (ACC 2011)*, San Francisco, CA, pp. 139 - 144.

C5. S. Ponda, **N. Ahmed**, B. Luders, E. Sample, D. Levine, T. Hoossainy, D. Shah, M. Campbell, and J. How, "Decentralized Information-Rich Path Planning and Hybrid Sensor Fusion for Uncertainty Reduction in Human-Robot Missions," *2011 AIAA Guidance Navigation and Control Conference 2011 (GNC 2011)*, Portland, OR, pp.1-22. **[Best Technical Paper Award]**

C4. **N. Ahmed** and M. Campbell, "Variational Bayesian Data Fusion of Multi-category Discrete Observations, with Applications to Cooperative Human-Robot Estimation," *2010 IEEE/RAS International Conference on Robotics and Automation (ICRA 2010)*, Anchorage, AK, pp. 186 – 191.

C3. D. Shah, M. Campbell, F. Bourgault, **N. Ahmed**, S. Galster, and B. Knott, "An Empirical Study of Human-Robotic Teams with Three Levels of Autonomy," *2009 AIAA InfoTech@Aerospace Conference*, Seattle, WA, pp.1-13.

C2. **N. Ahmed** and M. Campbell, "Multimodal Operator Decision Models," *2008 IEEE/CSS American Control Conference 2008 (ACC 2008)*, Seattle, WA, pp. 4504 - 4509 **[Best in Session Award]**

C1. F. Bourgault, **N. Ahmed**, D. Shah, and M. Campbell, "Probabilistic Operator-Multiple Robot Modeling Using Bayesian Network Representation," *2007 AIAA Guidance, Navigation and Control Conference (GNC 2007)*, Hilton Head, SC, pp.1-18.

PEER-REVIEWED INTERNATIONAL WORKSHOP PAPERS

W11. S. McGuire*, M. Walker, J. McGinley^, N. Ahmed, T. Clark, and D.J. Szafir, "TRAADRE: TRustin Autonomous ADvisors for Robotic Exploration," *Workshop on Autonomous Space Robotics held at Robotics: Science & Systems (RSS)*, July 2018

W10. S. McGuire*, P.M. Furlong, and **N. Ahmed**, "On the Development of an Online Assistant Selection Dataset for Planetary Exploration Systems," *2017 RSS Workshop on Bridging the Gap in Space Robotics*, Cambridge, MA.

W9. L. Burks* and **N. Ahmed**, "Optimal Continuous State Planning with Semantic Observations," to appear in the *2017 Multi-Disciplinary Conference on Reinforcement Learning and Decision Making*, Ann Arbor, MI.

W8. B. Israelsen* and **N. Ahmed**, "Hybrid Repeat/Multi-point Sampling for Highly Volatile Objective Functions," *2016 NIPS Workshop on Bayesian Optimization*, Barcelona, Spain.

W7. S. McGuire*, P. Michael Furlong, C. Heckman, S. Julier, D. Szafir, and **N. Ahmed**, "Teamwork Across the Stars: Machine Learning to Overcome the Brittleness of Autonomy," *2016 IROS Workshop on Human-Robot Collaboration: Towards Co-Adaptive Learning Through Semi-Autonomy and Shared Control*, Daejon, Korea, 2016.

W6. N. Sweet* and **N. Ahmed**, "Toward Natural Language Semantic Sensing in Dynamic State Spaces," *RSS 2016 Workshop on Model Learning for Human-Robot Communication*, Ann Arbor, MI.

W5. M. Aitken*, **N. Ahmed**, D. Lawrence, B. Argrow, and E. Frew, "Assurances and Machine Self-Confidence for Enhanced Trust in Autonomous Systems," *RSS 2016 Workshop on Social Trust in Autonomous Robots*, Ann Arbor, MI.

W4. **N. Ahmed** and N. Sweet*, "Softmax Modeling of Piecewise Semantics in Arbitrary State Spaces for 'Plug and Play' Human-Robot Sensor Fusion," presented at the *RSS 2015 Workshop on Model Learning for Human-Robot Communication*, Rome, Italy.

W3. **N. Ahmed**, R. Tse, and M. Campbell, "Enabling Robust Human-Robot Cooperation through Flexible Fully Bayesian Shared Sensing", presented at the *AAAI 2014 Spring*

Symposium Workshop on the Intersection of Robust Intelligence and Trust in Autonomous Systems, Stanford University, Palo Alto, CA.

W2. **N. Ahmed**, E. de Visser, T. Shaw, A. Mohammed-Ameen, R. Parasuraman, and M. Campbell, "A Look at Probabilistic Gaussian Process, Bayes Net, and Classifier Models for Prediction and Verification of Human Supervisory Performance," presented at the *AAAI 2014 Spring Symposium Workshop on Formal Verification and Modeling for Human-Machine Systems*, Stanford University, Palo Alto, CA.

W1. **N. Ahmed**, E. Sample, T-L. Yang, D. Lee, L. de la Garza, A. Elsamadisi, A. Sullivan, K. Wang, X. Lao, R. Tse, and M. Campbell "Towards Cooperative Bayesian Human-Robot Perception: Theory, Experiments, Opportunities," *AAAI 2013 Workshop on Intelligent Robotic Systems*, Bellevue, WA.

NON-ARCHIVAL CONFERENCE AND WORKSHOP PAPERS

N6. L. Burks* and **N. Ahmed**, "Flexible Semantic Human-Robot Sensing in Unknown Environments using Dynamic Information Gathering Policies", *ICRA 2018 Workshop on Robot Teaming in Dynamic Unstructured Environments (RT-DUNE)*, Melbourne, QLD, Australia.

N5. S. Dourmashkin*, W. Whitacre, D. Akos, and **N. Ahmed**, "GPS-Limited Cooperative Positioning Using Scalable Approximate Decentralized Data Fusion," *2018 ION Position Location and Navigation Symposium (PLANS)*, Monterrey, CA.

N4. **N. Ahmed,** "Collaborative autonomous sensing with Bayesians in the loop," *Proc. SPIE* 9986, *Unmanned/Unattended Sensors and Sensor Networks XII, 2016 International Society for Optics and Photonics Defense+ Security Symposium (SPIE DSS 2016)*, Edinburgh, UK, 2016, pp. 99860B-99860B **[Submitted as part of invited keynote talk]**

N3. **N. Ahmed,** D. Casbeer, Y. Cao, and D. Kingston, "Bayesian Hidden Markov Models for UAV-enabled Target Localization on Road Networks with Soft-Hard Data," *2015 International Society for Optics and Photonics Defense+ Security Symposium (SPIE DSS 2015)*, Baltimore, MD, pp. 94640Q-94640Q.

N2. **N. Ahmed**, T.L Yang, and M. Campbell, "On Generalized Bayesian Data Fusion with Complex Models in Large Scale Networks," *1st Annual NSF-IGERT Workshop on Wireless Intelligent Sensor Networks (WISeNET)*, Duke University, Raleigh, NC.

N1. **N. Ahmed**, T.-L. Yang, E. Sample, and M. Campbell, "Bayesian Sketch and Share: Enhanced Information Fusion for Mixed Large Scale Robot-Human Search Teams," poster session at the 2012 *Symposium on Distributed Autonomous Robotic Systems (DARS 2012)*, Baltimore, MD. **(Best Poster Award)**

EDITED INVITED BOOK CHAPTERS

B1. **N. R. Ahmed**, S. J. Julier, J. R. Schoenberg, and M. E. Campbell, "Decentralized Bayesian Fusion in Networks with Non-Gaussian Uncertainties," in *Multisensor Data Fusion: From Algorithm and Architecture Design to Applications*, ser. Devices, Circuits, and Systems, H. Fourati and K. Iniewski, Eds. CRC, 2015, pp. 383–408.

RESEARCH GRANTS AND AWARDS (including PI Shares)

PI, "Collaborative Analyst-Machine Perception for Robust Data Fusion"
Source: US Air Force Space and Missile Systems Center, Remote Sensing BAA
Total Award Amount: $353,936 (May 2017- April 2018)
PI Share: $313,936

University Co-PI, "Data Architecture Enabling Robust Cooperative Autonomy with Minimal Information Exchange"
Source: Office of Naval Research STTR
(Industry Lead: Dr. Ken Center, Orbit Logic, Inc.; CU PI: Nisar Ahmed; UCSD Co-PI/sub: Sonia Martinez)
Phase 1 Total Award: $150,000 (June 2017 - January 2018)
PI/co-PI Share: $40,000
Phase 2 Total Award: $2.3 million (October 2018-September 2020)
PI Share: $280,000

University PI, "A Comprehensive Framework to Develop, Refine and Validate Learning Agents for Tactical Autonomy"
Source: Air Force Research Laboratory STTR
(Industry Lead: Dr. Ken Center, Orbit Logic, Inc., CU PI: Nisar Ahmed)
Phase 1 Total Award: $150,000 (August 2015 - March 2016)
PI Share: $40,000

Co-PI, OFFSET Sprinter 2 Enhanced Swarm Perception through Autonomous Sensor Fusion, Communication-Aware Planning, and Transfer Learning
Source: DARPA
Total Award Amount: $450,000 (September 2018 – June 2019)
Co-PI Share: $10,000

Co-PI, ESI: Autonomous Maneuvering within Chaotic Multi-body Systems
Source of support: NASA
Total Award Amount: $500,000(February 2019 – January 2022)
Co-PI Share: $35,000

Co-PI, "I/UCRC Phase 2: Center for Unmanned Aircraft Systems: I/UCRC for Unmanned Aircraft Systems"
Source: NSF I/UCRC (CISE Directorate); Eric W. Frew (PI)
Total Award Amount: $500,000
Period Covered: 3/1/2017 - 2/28/2022

PI, "Distributed Partial Data Fusion for Robust Cooperative Positioning"
Source: Army Space and Missile Defense Command
Year 1 Amount: $100,000 (October 2016 – September 2017)
Year 2 Amount: $100,000 (October 2017 – December 2018)
PI Share: full amount both years

PI, “Self-confidence Reporting for Mediating Intelligent Human-Autonomy Interaction in Uncertain Dynamic Planning”
Source: Northrop Grumman (Research Gift)
2016 Amount: $60,000 total (full PI share)

PI, “Harnessing Human Perception in UAS via Bayesian Active Sensing”
Source: NSF IUCRC Center for Unmanned Systems (CUAS)
Year 1 Amount: $80,000 (September 2014 - August 2015)
Year 2 Amount: $70,000 (September 2015- August 2016)
Year 3 Amount: $60,000 (September 2016 - August 2017)
PI Share: full amount, all years

PI, “Active Collaborative Sensing, Learning and Planning with Humans in UAS”
Source: NSF IUCRC Center for Unmanned Systems (CUAS)
Year 1 Amount: $65,000 (September 2017 – August 2018)
Year 1 Amount: $60,000 (September 2018 – August 2019)
PI Share: full amount

PI, “Scalable Cooperative Tracking of Moving RF Ground Targets”
Source: NSF IUCRC Center for Unmanned Systems (CUAS)
Year 1 Amount: $70,000 (September 2015 - August 2016)
Year 2 Amount: $40,000 (September 2016- August 2017)
PI Share: full amount, all years

PI/Co-PI, “User-Adaptive Assurances for Enhancing Trust”
Source: NSF IUCRC Center for Unmanned Systems (CUAS)
Year 1 Amount (co-PI): $60,000 (September 2015 - August 2016)
Year 2 Amount (co-PI): $40,000 (September 2016 - August 2017)
Year 3 Amount (PI): $60,000 (September 2017 – August 2018)
Year 4 Amount (PI): $60,000 (September 2018 – August 2019)
Co-PI Share (years 1 and 2): $40,000
PI Share (year 3 and 4): full amount

OTHER SCHOLARLY HONORS AND AWARDS

Aerospace Control and Guidance Systems Committee (ACGSC) Dave Ward Memorial Lecture Award, 2018
ASEE Air Force Summer Faculty Fellowship, 2014
Best Technical Paper Award (co-author),
2011 AIAA Guidance, Navigation, and Control Conference
Best Poster Award (first author),
2012 International Symposium on Distributed Autonomous Robotic Systems
Best Session Papers (first author),
2011 American Control Conference (Sensor Fusion Session)
2008 American Control Conference (Machine Learning Session)
Ralph A. Bolgiano Outstanding Teaching Assistant Award, 2009
National Science Foundation Graduate Research Fellowship, 2007-2010
Society of American Military Engineers Scholarship, 2006

INVITED SEMINARS AND RESEARCH TALKS

United Technologies Research Center, December 2018
Invited research seminar, East Hartford, CT

University of New Mexico ECEE Colloquium, December 2018
Invited Seminar, Albuquerque, NM

2018 Networked and Autonomous Air and Space Systems Workshop: Blending Human-Machine Intelligence for Collaborative Autonomous Systems, June 2018
Invited Plenary Session Talk, Santa Fe, NM

IROS 2017 Workshop on Complex Collaborative Systems: Closing the Loop, Learning and Self-Confidence, September 2017
Invited keynote talk, Vancouver, Canada

NASA Ames Research Center, June 2017
Invited seminar, Intelligent Robotics Group, Mountain View, CA

Iowa State University, October 2016
Department of Mechanical Engineering Seminar, Ames, IA

SPIE 2016 Unmanned/Unattended Sensors and Sensor Networks, September 2016
Invited keynote talk, Edinburgh, Scotland, UK

NASA Ames Research Center, June 2016
Invited seminar, Intelligent Robotics Group, Mountain View, CA

RSS 2016 Workshop on Social Trust in Autonomous Robotics, June 2016
Invited keynote talk, Ann Arbor, MI

AFRL Workshop on Integration of Control Theory, Formal Methods, Learning and Human Factors for Autonomous Systems, April 2016
Invited presentation, Austin, TX

Army Science Planning Meeting on Intelligent Systems, December 2015
Invited presentation, Adelphi, MD

Air Force Research Laboratory, October 2015
Invited research seminar, Fort Walton, FL

Northrop Grumman Electronic Systems, October 2015
Invited research seminar, Linthicum, MD

Northrop Grumman Autonomous Systems Workshop, August 2015
Invited research presentation, Redondo Beach, CA

Human-Propelled Machine Learning Workshop, December 2014
Invited talk at 2014 Neural Information Processing Systems Conference, Montreal, CA

United Technologies Research Center, November 2014
Invited research seminar, East Hartford, CT

University of Colorado at Boulder, September 2014
Control, Dynamics and Systems Seminar

University of Colorado at Boulder, February 2014
Institute of Cognitive Science Colloquium

University of California at San Diego, November 2013
CCSD Seminar, Department of Mechanical and Aerospace Engineering

Cornell University, September 2013
Department of Mechanical and Aerospace Engineering

University of Illinois at Urbana-Champaign, April 2013
Department of Aerospace Engineering

University of Colorado at Boulder, March 2013
Department of Aerospace Engineering Sciences

University of California at Riverside, March 2013
Department of Mechanical Engineering

Rennselaer Polytechnic Institute, February 2013
Department of Mechanical, Aerospace and Nuclear Engineering

Massachusetts Institute of Technology, March 2012
Department of Aeronautical and Astronautical Engineering

TEACHING EXPERIENCE

University of Colorado Boulder

Graduate courses taught and developed:

ASEN 5014, Linear Control Systems,

Spring 2014: 24 students, 3 credit hours
Course FCQ Rating: 5.3/6.0; Instructor FCQ Rating: 5.7 / 6.0

Fall 2014: 19 students, 4 online distance learning students, 3 credit hours
Course FCQ Rating: 5.0/6.0; Instructor FCQ Rating: 5.6 / 6.0

Fall 2015: 50 students, 4 online distance learning students, 3 credit hours
Course FCQ Rating: 5.0 / 6.0; Instructor FCQ Rating: 5.6 / 6.0

ASEN 6519, Model-Based Parameter and State Estimation

Graduate-level special topics course
Spring 2015; 26 students, 1 online distance learning student, 3 credit hours
Course FCQ Rating: 5.0/6.0; Instructor FCQ Rating: 5.5 / 6.0

ASEN 5044, Statistical Estimation for Dynamical Systems, Fall 2016
(newly developed 3 credit first year core graduate course, first offering in Fall 2016)

Fall 2016: 71 students (incl. 6 online/distance), 3 credit hours
Course FCQ Rating: 5.2 / 6.0; Instructor FCQ Rating: 5.6 / 6.0

Fall 2017: 78 students (incl. 17 online/distance), 3 credit hours
Course FCQ Rating: 5.32 / 6.0; Instructor FCQ Rating: 5.58 / 6.0

Fall 2018: 96 students including distance/online, 3 credit hours
Course FCQ Rating: 5.5 / 6.0; Instructor FCQ Rating: 5.76 / 6.0

ASEN 6519: Special Topics: Probabilistic Algorithms for Aerospace Autonomy
(newly developed 3 credit advanced graduate course, first offering in Spring 2017)

Spring 2017: 20 students, 3 credit hours
Course FCQ Rating: 5.0 / 6.0; Instructor FCQ Rating: 5.4 / 6.0

Spring 2019: 32 students, 3 credit hours
Course FCQ Rating: TBD; Instructor FCQ Rating: TBD

Undergraduate courses taught:
ASEN 3128, Aircraft Dynamics (core third year aerospace course, 3 credit hours + lab)

Spring 2016 -- 106 students, co-taught with Eric Frew,
Course FCQ Rating: 3.7 / 6.0; Instructor FCQ: 4.5 / 6.0

Spring 2017 -- 137 students, co-taught with Dale Lawrence,
Course FCQ Rating: 3.4 / 6.0; Instructor FCQ: 4.7 / 6.0

Spring 2018 -- 143 students, co-taught with Dale Lawrence,
Course FCQ Rating: 3.68 / 6.0; Instructor FCQ: 5.0 / 6.0

Spring 2018 -- 143 students, co-taught with Dale Lawrence,
Course FCQ Rating: 3.68 / 6.0; Instructor FCQ: 5.0 / 6.0

Cornell University (Teaching Assistantships)
MAE 4780/5780, Feedback Control Systems, Fall 2008
(70 students, senior/1st year graduate elective course, 3 credit hours + lab)

MAE 3260, System Dynamics, Spring 2009
(110 students, required junior year MAE course, 3 credit hours + lab)

THESIS ADVISING

University of Colorado Boulder

Current Ph.D. Advisees (Thesis Committee Chair – as of December 2018)

Aastha Acharya, Aerospace Engineering Science [**Draper Fellowship]**
Charles Luke Burks, Aerospace Engineering Sciences
Ofer Dagan, Aerospace Engineering Sciences **[Rafa-El Employee Fellowship]**
Brett Israelsen, Computer Science
Jonathan Manni, Aerospace Engineering Sciences **[AES Smead Scholar; Draper Fellowship]**
Stephen McGuire, Aerospace Engineering Sciences **[NASA STR Fellowship]**
Shohei Wakayama, Aerospace Engineering Sciences **[Masayoshi Son Foundation Fellowship]**

M.S. Advisees (Thesis Committee Chair)

Nicholas Sweet, Aerospace Engineering Sciences *(graduated Summer 2016)*
Matthew Aitken, Aerospace Engineering Sciences *(graduated Summer 2016)*
David Iglesias, Aerospace Engineering Sciences **[Balsells Fellow]**, *(graduated Summer 2017)*
Jeremy Muesing, Aerospace Engineering Sciences
Ian Loefgren, Aerospace Engineering Sciences
Benjamin Mellinkoff, Aerospace Engineering Sciences
Cody Charland, Aerospace Engineering Sciences

Ph.D. Dissertation Committee Memberships

David Surovik, Aerospace Engineering Sciences
Lu Ma, Computer Science
Neeti Waggle, Computer Science
Douglas Weibel, Aerospace Engineering Sciences
Christine Fanchiang, Aerospace Engineering Sciences
Steven Gehly, Aerospace Engineering Sciences
Sarah Smith, Aerospace Engineering Sciences
Ryan King, Mechanical Engineering
Nima Keivan, Computer Science
Juan Falquez, Computer Science
Roger Laurence, Aerospace Engineering Sciences
Stu Bryant, Aerospace Engineering Sciences
Ryan Darragh, Aerospace Engineering Sciences
Gregory Formosa, Mechanical Engineering
Mohammed Khajah, Computer Science
Fernando Nobre, Computer Science
John Klingner, Computer Science
Andrew Kramer, Computer Science
Kristen Strandjord, Computer Science
John Stechschulte, Computer Science
Damian Mirales, Aerospace Engineering Sciences

M.S. Dissertation Committee Memberships

William Silva, Aerospace Engineering Sciences
Zhaozhong Chen, Computer Science
Spencer Watza, Aerospace Engineering Sciences
Bryce Garby, Aerospace Engineering Sciences

Undergraduate Research Advisees:

Jeremy Muesing, Aerospace Engineering Sciences (CU DLA Apprenticeship)
Sierra Williams, Aerospace Engineering Sciences
Ian Loefgren, Aerospace Engineering Sciences
Luke Barbier, Electrical, Computer, and Energy Engineering
Sousheel Vunnam, Computer Science and Applied Math
Jamison McGinley, Aerospace Engineering Sciences

STUDENT PROJECTS ADVISED

ASEN 6028 Graduate Projects: Drones vs. Zombies (DVZ) (Fall 2014-Spring 2015)
Customer for indoor aerial robotics team consisting of 8 M.S. and 1 PhD student

ASEN 4018/4028 Senior Projects: Rover and Air Visual Environment Navigation (RAVEN) (Fall 2017-Spring 2018)

Customer for outdoor air-ground GPS-denied cooperative robotics localization application, team consisting of 11 undergraduate senior Aerospace students.

ASEN 4018/4028 Senior Projects: Rover and Air Visual Environment Navigation (DRAGON) (Fall 2018-Spring 2019)

Customer for ground robotics outdoor beacon-based GPS-denied localization application, team consisting of 11 undergraduate senior Aerospace students.

STUDENT OUTREACH AND MENTORSHIP

Faculty Advisor, CU Boulder NSF S-STEM Goldshirt Program (Spring 2017 – present)
Student mentees (Cohort 8): Abdul Dawlatzai, Neal Noll, Benjamin Sandoval

PROFESSIONAL SERVICE

Workshop organizer:

2017 Robotics: Science and Systems Workshop on Bridging the Gap in Space Robotics, July 15, 2017 in Cambridge, MA
(co-organized with Christoffer Heckman, Jay McMahon, Daniel Szafir)

2017 Robotics: Science and Systems Workshop on Morality and Social Trust in Autonomous Robots, July 16, 2017 in Cambridge, MA
(co-organized with Morteza Lahijanian, Mária Svoreňová, Patrick Lin, Marta Kwiatkowska)

2016 American Control Conference Workshop on Collaborative Learning, Sensing and Control in Human-Machine Systems, July 5, 2016 in Boston, MA
(co-organized with Soumik Sarkar, Luca Bertucelli, Girish Chowdhary)

AAAI 2015 Fall Symposium on Self-Confidence in Autonomous Systems, November 12-14, 2015 in Washington, D.C.
(co-organized with Christopher Miller, Mary Cummings, Ugur Kuter, Andrew Hutchins, Nicholas Sweet)

2015 IEEE International Multisensor Fusion and Integration for Intelligent Systems Conference Workshop on Large-scale Bayesian Data Fusion and Consensus, September 14, 2015 in San Diego, CA
(co-organized with Daniel Clarke, Tansel Yucelen, William Whitacre, David Casbeer)

2015 Robotics: Science and Systems Workshop on Realistic Rapid and Repeatable Robotic Simulation (R4Sim), July 15, 2015 in Rome, Italy
(co-organized with Andrew Symington, Simon Julier, Gabe Sibley, Tully Foote, Nate Koenig)

2014 Robotics: Science and Systems Workshop on Distributed Control and Estimation for Robotic Vehicle Networks, July 12, 2014 in Berkeley, CA
(co-organized with Jorge Cortes and Sonia Martinez)

Special magazine/journal issues organized:

Guest editor, *IEEE Control Systems Magazine*: Special Issue on "Distributed Control and Estimation of Robotic Vehicle Networks"
(co-organized with Prof. Jorge Cortes and Prof. Sonia Martinez of UC San Diego)

Technical Committee Membership:

AIAA Intelligent Systems Technical Committee (2014-present):

Conference Planning Sub-committee co-chair,
Intelligent Systems Technical Discipline Chair for
2016 Information Systems-InfoTech@Aerospace Conference

Peer-reviewer for following journals and society magazines:

IEEE Transactions on Robotics
IEEE Transactions on Networked Control Systems
IEEE Transactions on Signal Processing
IEEE Transactions on Systems, Man and Cybernetics, Part B: Cybernetics
IEEE Transactions on Automatic Control
IEEE Transactions on Control of Network Systems
AIAA Journal of Guidance, Controls and Dynamics
AIAA Journal of Aerospace Information Systems
International Journal of Robotics Research
IEEE Transactions on Human-Machine Systems
ISIF Journal of Advances in Information Fusion
IEEE Control Systems
IEEE Robotics and Automation Magazine
Journal of Field Robotics

Associate Editor for 2017 Multisensor Fusion and Integration for Intelligent Systems

Regular peer-reviewer for following international conferences:

Robotics: Science and Systems Conference (RSS)
IEEE/CSS Conference on Decision and Control (CDC)
IEEE/RAS International Conference on Robotics and Automation (ICRA)
IEEE/CSS American Control Conference (ACC)
IEEE/RAS Conference on Intelligent Robots and Systems (IROS)
AIAA Information Systems-InfoTech@Aerospace (I@A)
AIAA Guidance, Navigation and Control Conference (GNC)
IEEE/RAS Multisensor Fusion and Integration for Intelligent Systems (MFI)
ACM/IEEE International Conference on Cyberphysical Systems (ICCPS)
IEEE/ISIF International Conference on Information Fusion (FUSION)

Conference Session Chair/Co-Chair:

"Novel Estimation, Tracking and Guidance Techniques":

GNC Forum, AIAA 2017 SciTech Conference, Dallas, TX;
GNC Forum, AIAA 2016 SciTech Conference, San Diego, CA;
GNC Forum, AIAA 2015 SciTech Conference, Kissimmee, FL.

External Proposal Reviewer:

Canada NSERC Discovery Grant (2016)

Department service:

AES Seminar Committee (2014-present)
AES Graduate Committee (2014-2017) – Controls Focus Lead (2015-2017)
AES Distinguished Visiting Scholar and Lecturer Committee (2015-present; chair: 2017-present)
AES Undergraduate Committee (2017-present)
Preliminary qualifying exam committee member for numerous Ph.D. students

Other College of Engineering and Applied Science and University of Colorado Service:

Robotics, Control, Systems and Dynamics Seminar Series, co-organizer (Spring 2015-present)
IGP SEED Grant Proposal Reviewer (Spring 2015)
Machine Learning, Data Science, and Security Faculty Search Committee Member (AY 2017-2018)

Other External Service:

Advisory Board Member of Dauntless.io, Berkeley, CA

PROFESSIONAL AFFILIATIONS

Institute for Electrical and Electronics Engineers (IEEE), Member
American Institute for Aerospace and Astronautics (AIAA), Member