Abhishek Halder

CONTACT INFORMATION

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PROFESSIONAL APPOINTMENTS

Assistant Professor October 2017 -- Current

Department of Applied Mathematics
Department of Electrical and Computer Engineering (affiliated faculty)
University of California, Santa Cruz

Postdoctoral Scholar February 2017 -- September 2017

Department of Mechanical and Aerospace Engineering
University of California, Irvine
- Topic: *Stochastic control, filtering and optimal transport*
- Host: Tryphon T. Georgiou

Postdoctoral Research Associate June 2014 -- January 2017

Department of Electrical and Computer Engineering
Texas A&M University
- Topic: *Demand response in smart grid, unmanned aerial systems traffic management*
- Host: P.R. Kumar

Global Research Innovation and Technology Intern Summer 2013

Systems Modeling and Control
Eaton Corporation, Eden Prairie, Minnesota
- Topic: *Voltage Control in UPS: Modeling, Controller Synthesis, and Hardware-in-loop Simulation*
- Host: Yigang Wang
- Projects: (1) Model Based Design in Power Electronics
  (2) Co-operative Control of Generator and UPS

Visiting Researcher Summer 2012

Dynamics and Control, Coordinated Science Laboratory
University of Illinois at Urbana-Champaign
- Topic: *Nonlinear Estimation as Gradient Flow*
- Host: Prashant Mehta

Research Intern Summer 2006

Advanced Systems Development Section, Control Systems Group
Indian Space Research Organization Satellite Center (ISAC), Bangalore INDIA
- Topic: *A Study of Petri Nets: Modeling, Analysis and Simulation*
- Host: A. Venkateswarlu, Deputy Director, CSG, ISAC

EDUCATION

Ph.D. in Aerospace Engineering May 2014

Texas A&M University, College Station, Texas USA

- Dissertation: *Probabilistic Methods for Model Validation* (**Outstanding Doctoral Student Award**)
- Advisor: Raktim Bhattacharya

Bachelors and Masters in Aerospace Engineering July 2008

Indian Institute of Technology Kharagpur, West Bengal INDIA

- Thesis: *Development of An Autonomous Reconfigurable UAV* (**Best Dual Degree Thesis Award**)
- Advisor: Manoranjan Sinha

Research Interests

Broad area

Systems, control, learning and optimization

Theory focus

- Stochastic uncertainty propagation and nonlinear estimation
- Monge-Kantorovich optimal transport
- Randomized algorithms
- Density control
- Learning theory

Application focus

- Application of density control in aerial robotics, and energy systems
- Cyber-physical systems
- Model validation, controller robustness verification, model reduction
- Data driven modeling for control, optimization and machine learning

Grants

G7. *Computation-Aware Algorithmic Design for Cyber-Physical Systems.*
PI: Ricardo Sanfelice [UC Santa Cruz], Co-PIs: Abhishek Halder [UC Santa Cruz], Heiner Litz [UC Santa Cruz], Murat Arcak [UC Berkeley], Linh Pham [UPenn], Jonathan Sprinkle [Vanderbilt University], Majid Zamani [University of Colorado at Boulder].
Duration: 07/01/2022--07/30/2027.
National Science Foundation.
Total award amount: $5.78M.
Abhishek's award amount: $685,735.
Indirect costs for Abhishek's budget: $208,699.

G6. *Learning and Distributional Feedback Control for Fabrication of Advanced Materials.*
PI: Abhishek Halder, Co-PI: Ali Mesbah [UC Berkeley].
Duration: 08/01/2021--07/31/2024.
National Science Foundation.
Total award amount: $650,461.
Abhishek's award amount: $296,069.
Indirect costs for Abhishek's budget: $80,549.

G5. *Optimal Transport Algorithms for Stochastic Uncertainty Management in Modern Power Systems.*
PI: Abhishek Halder.
Duration: 09/01/2019--08/31/2022.
National Science Foundation.

Total/Abhishek's award amount: $279,830.
Indirect costs for Abhishek's budget: $52,813.

G4. *Computation-Aware Algorithmic Design for Cyber-Physical Systems for Intelligent Transportation.*
PI: Ricardo Sanfelice, co-PIs: Heiner Litz, Abhishek Halder.
Duration: 09/01/2020--09/30/2021.
UCSC Office of Research Seed Grant.
Total award amount: $75,000.
Abhishek's award amount: $0.
Indirect costs for Abhishek's budget: $22,057.

G3. *Fast Computation of Stochastic Reachability for Provably Safe Planning and Control in Automated Driving.*
Lead PI: Abhishek Halder, Ford PI: Baljeet Singh.
Duration: 01/01/2018--12/31/2019.
University Research Project, Ford Motor Company.
Total/Abhishek's award amount: $50,000.
Indirect costs for Abhishek's budget: $0.

G2. *Cloud-based Anytime Computation of Reachable Tubes for Provably Safe Unmanned Aerial Systems Traffic Management.*
Lead PI: Abhishek Halder, Co-I: Mark Mueller [UC Berkeley], Ricardo Sanfelice [UC Santa Cruz], Claire Tomlin [UC Berkeley].
Duration: 04/01/2018--06/30/2019.
Center for Information Technology Research in the Interest of Society (CITRIS) Seed Fund Award.
Total award amount: $60,000.
Abhishek's award amount: $30,000.
Indirect costs for Abhishek's budget: $0.

G1. *Real-time Computation of Reachable Tubes for Provably Safe Unmanned Aerial Systems Traffic Management.*
PI: Abhishek Halder.
Duration: 02/01/2018--08/31/2018.
UCSC Committee on Research New Faculty Research Grant.
Total/Abhishek's award amount: $4,000.
Indirect costs for Abhishek's budget: $0.

Journal Publications

J24. **A. Halder**, K.F. Caluya, P. Ojaghi, and X. Geng. Stochastic Uncertainty Propagation in Power System Dynamics using Measure-valued Proximal Recursions. *IEEE Transactions on Power Systems*, 2022.
doi:10.1109/TPWRS.2022.3217267

J23. S. Haddad, and **A. Halder**. Certifying the Intersection of Reach Sets of Integrator Agents with Set-valued Input Uncertainties. *IEEE Control Systems Letters*, 2022.
doi:10.1109/LCSYS.2022.3179666

J22. S. Haddad, **A. Halder**, and B. Singh. Density-based Stochastic Reachability Computation for Occupancy Prediction in Automated Driving. *IEEE Transactions on Control Systems Technology*, 2022.
doi:10.1109/TCST.2022.3145976

J21. K.F. Caluya, and **A. Halder**. Wasserstein Proximal Algorithms for the Schrödinger Bridge Problem: Density Control with Nonlinear drift. *IEEE Transactions on Automatic*

Control, 2021.
doi:10.1109/TAC.2021.3060704

J20. S. Haddad, K.F. Caluya, **A. Halder**, and B. Singh. Prediction and Optimal Feedback Steering of Probability Density Functions for Safe Automated Driving. *IEEE Control Systems Letters*, 5(6):2168--2173, 2021.
doi:10.1109/LCSYS.2020.3045105

J19. A. Halder. Smallest Ellipsoid Containing p-Sum of Ellipsoids with Application to Reachability Analysis. *IEEE Transactions on Automatic Control*, 66(6):2512--2525, 2021.
doi:10.1109/TAC.2020.3009036

J18. A. Halder, K.F. Caluya, B. Travacca, and S.J. Moura. Hopfield Neural Network Flow: A Geometric Viewpoint. *IEEE Transactions on Neural Networks and Learning Systems*, 31(11): 4869--4880, 2020.
doi:10.1109/TNNLS.2019.2958556

J17. K.F. Caluya, and **A. Halder**. Gradient Flow Algorithms for Density Propagation in Stochastic Systems. *IEEE Transactions on Automatic Control*, 65(10):3991--4004, 2020.
doi:10.1109/TAC.2019.2951348

J16. F.A.C.C. Fontes, **A. Halder**, J. Becerril, and P.R. Kumar, Optimal Control of Thermostatic Loads for Planning Aggregate Consumption: Characterization of Solution and Explicit Strategies. *IEEE Control Systems Letters*, 3(4):877--882, 2019.
doi:10.1109/LCSYS.2019.2918978

J15. Z. Askarzadeh, R. Fu, **A. Halder**, Y. Chen, and T.T. Georgiou. Stability Theory for Stochastic Models in Opinion Dynamics. *IEEE Transactions on Automatic Control*, 65(2):522--533, 2020.
doi:10.1109/TAC.2019.2912490

J14. A. Halder. DeGroot-Friedkin Map in Opinion Dynamics is Mirror Descent. *IEEE Control Systems Letters*. 3(2):463--468, 2019.
doi:10.1109/LCSYS.2019.2900452

J13. A. Halder, and R.G. Sanfelice. CPAR Control Theory and Automation Symposium. *IEEE Control Systems Magazine*. February, 2019.
doi:10.1109/MCS.2018.2876965

J12. A. Halder, X. Geng, F.A.C.C. Fontes, P.R. Kumar, and L. Xie. Optimal Power Consumption for Demand Response of Thermostatically Controlled Loads. *Optimal Control Applications and Methods*. 40(1):68--84, 2019.
doi:10.1002/oca.2467

J11. A. Halder, X. Geng, P.R. Kumar, and L. Xie. Architecture and Algorithms for Privacy Preserving Thermal Inertial Load Management by A Load Serving Entity. *IEEE Transactions on Power Systems*. 32(4):3275--3286, 2017. [**Paper selected by the IEEE Power & Energy Society (PES) Technical Committee for presentation in 2017 PES General Meeting.**]
doi:10.1109/TPWRS.2016.2628055

J10. A. Halder, K. Lee, and R. Bhattacharya. A Probabilistic Method for Nonlinear Robustness Analysis of F-16 Controllers. *Journal of Guidance, Control, and Dynamics*. 38(10):1935--1946, 2015.
doi:10.2514/1.G000386

J9. P. Dutta, **A. Halder**, and R. Bhattacharya. Nonlinear Estimation with Perron-Frobenius Operator and Karhunen-Loève Expansion. *IEEE Transactions on Aerospace and Electronic Systems*. 51(4):3210-3225, 2015.
doi:10.1109/TAES.2015.140591

J8. K. Lee, **A. Halder**, and R. Bhattacharya. Performance and Robustness Analysis of Stochastic Jump Linear Systems using Wasserstein Metric. *Automatica*. 51:341--347, 2015.
doi:10.1016/j.automatica.2014.10.080

J7. **A. Halder**, and R. Bhattacharya. Probabilistic Model Validation for Uncertain Nonlinear Systems. *Automatica*. 50(8):2038--2050, 2014.
doi:10.1016/j.automatica.2014.05.026

J6. T. Kalmár-Nagy, P. Wahi, and **A. Halder**. Dynamics of a Hysteretic Relay Oscillator with Periodic Forcing. *SIAM Journal on Applied Dynamical Systems*. 10(2):403--422, 2011.
doi:10.1137/100784606

J5. **A. Halder**, and R. Bhattacharya. Dispersion Analysis in Hypersonic Flight During Planetary Entry Using Stochastic Liouville Equation. *Journal of Guidance, Control and Dynamics*, 34(2):459--474, 2011.
doi:10.2514/1.51196

J4. S. Ghosh, **A. Halder**, and M. Sinha. Micro Air Vehicle Path Planning in Fuzzy Quadtree Framework. *Applied Soft Computing*, 11(8):4859--4865, 2011.
doi:10.1016/j.asoc.2011.06.014

J3. S. Zhao, **A. Halder**, and T. Kalmár-Nagy. Nonlinear Dynamics of Unicycles in Leader-Follower Formation. *Communications in Nonlinear Science and Numerical Simulations*, 14(12):4204--4219, 2009.
doi:10.1016/j.cnsns.2009.02.028

J2. S. Chauhan, C. Patil, M. Sinha, and **A. Halder**. Fuzzy State Noise Driven Kalman Filter for Sensor Fusion. *Journal of Aerospace Engineering, Proceedings of the Institution of Mechanical Engineers, Part G*, 223(8):1091--1097, 2009.
doi:10.1243/09544100JAERO536

J1. **A. Halder**, R. Garhwal, V. Agarwal, and M. Sinha. Determination of Inertial Characteristics of A High Wing Unmanned Air Vehicle. *Journal of Institute of Engineers (India)*, 89:3--8, 2008.

Conference Publications

C37. I. Nodozi, and **A. Halder**. Schrödinger Meets Kuramoto via Feynman-Kac: Minimum Effort Distribution Steering for Noisy Nonuniform Kuramoto Oscillators. *61st IEEE Conference on Decision and Control*, Cancún, Mexico, 2022.
doi:

C36. I. Nodozi, and **A. Halder**. A Distributed Algorithm for Measure-valued Optimization with Additive Objective. **Invited Paper**, *25th International Symposium on Mathematical Theory of Networks and Systems (MTNS 2022)*, Beyreuth, Germany, 2022.
doi:

C35. S. Haddad, and **A. Halder**. Boundary and Taxonomy of Integrator Reach Sets. *American Control Conference*, Atlanta, 2022.
doi:

C34. I.M. Balci, **A. Halder**, and E. Bakolas. On the Convexity of Discrete Time Covariance Steering in Stochastic Linear Systems with Wasserstein Terminal Cost. *60^{th} IEEE Conference on Decision and Control*, Austin, 2021.
doi:10.1109/CDC45484.2021.9683514

C33. S. Haddad, and **A. Halder**. Anytime Ellipsoidal Over-approximation of Forward Reach Sets of Uncertain Linear Systems. *Workshop on Computation-Aware Algorithmic Design of Cyber-Physical Systems*, CPS-IoT Week, 2021.
doi:10.1145/3457335.3461711

C32. K.F. Caluya, and **A. Halder**. Reflected Schrödinger Bridge: Density Control with Path Constraints. *American Control Conference*, New Orleans, 2021.
doi:10.23919/ACC50511.2021.9482813

C31. S. Haddad, and **A. Halder**. The Convex Geometry of Integrator Reach Sets. *American Control Conference*, Philadelphia, 2020.
doi:10.23919/ACC45564.2020.9147611

C30. K.F. Caluya, and **A. Halder**. Finite Horizon Density Steering for Multi-input State Feedback Linearizable Systems. *American Control Conference*, Philadelphia, 2020.
doi:10.23919/ACC45564.2020.9147847

C29. **A. Halder**, and T.T. Georgiou, Proximal Recursion for the Wonham Filter. **Invited Paper**, *58^{th} IEEE Conference on Decision and Control*, Nice, France, 2019.
doi:10.1109/CDC40024.2019.9030018

C28. K.F. Caluya, and **A. Halder**. Proximal Recursion for Solving the Fokker-Planck Equation. *American Control Conference*, Philadelphia, 2019.
doi:10.23919/ACC.2019.8814363

C27. Z. Askarzadeh, R. Fu, **A. Halder**, Y. Chen, and T.T. Georgiou. Opinion Dynamics over Influence Networks. *American Control Conference*, Philadelphia, 2019.
doi:10.23919/ACC.2019.8815341

C26. **A. Halder**. On the Parameterized Computation of Minimum Volume Outer Ellipsoid of Minkowski Sum of Ellipsoids. *57^{th} IEEE Conference on Decision and Control*, Miami, 2018.
doi:10.1109/CDC.2018.8619508

C25. **A. Halder**, and T.T. Georgiou. Gradient Flows in Filtering and Fisher-Rao Geometry. **Invited Paper**, *American Control Conference*, Milwaukee, 2018.
doi:10.23919/ACC.2018.8431003

C24. **A. Halder**, and T.T. Georgiou. Gradient Flows in Uncertainty Propagation and Filtering of Linear Gaussian Systems. *56^{th} IEEE Conference on Decision and Control*, Melbourne, 2017.
doi:10.1109/CDC.2017.8264109

C23. **A. Halder**, and E.D.B. Wendel. Finite Horizon Linear Quadratic Gaussian Density Regulator with Wasserstein Terminal Cost. *American Control Conference*, Boston, 2016.
doi:10.1109/ACC.2016.7526817

C22. **A. Halder**, X. Geng, G. Sharma, L. Xie, and P.R. Kumar. A Control System Framework for Privacy Preserving Demand Response of Thermal Inertial Loads. *IEEE International Conference on Smart Grid Communications (SmartGridComm*

2015), Miami, 2015, pp. 181--186.
doi:10.1109/SmartGridComm.2015.7436297

C21. A. Halder, K. Lee, and R. Bhattacharya. A Dynamical System Pair with Identical First Two Moments But Different Probability Densities. **Invited Paper**, *53rd IEEE Conference on Decision and Control*, Los Angeles, 2014.
doi:10.1109/CDC.2014.7040335

C20. A. Halder, and R. Bhattacharya. Geodesic Density Tracking with Applications to Data Driven Modeling. **Invited Paper**, *American Control Conference*, Portland, 2014.
doi:10.1109/ACC.2014.6859361

C19. K. Lee, **A. Halder**, and R. Bhattacharya. Probabilistic Robustness Analysis of Stochastic Jump Linear Systems. *American Control Conference*, Portland, 2014.
doi:10.1109/ACC.2014.6859432

C18. A. Halder, and R. Bhattacharya. Frequency Domain Model Validation in Wasserstein Metric. *American Control Conference*, Washington DC, 2013.
doi:10.1109/ACC.2013.6580754

C17. A. Halder, K. Lee, and R. Bhattacharya. Probabilistic Robustness Analysis of F-16 Controller Performance: An Optimal Transport Approach. *American Control Conference*, Washington DC, 2013.
doi:10.1109/ACC.2013.6580708

C16. P. Dutta, **A. Halder**, and R. Bhattacharya. Nonlinear Filtering with Transfer Operator. *American Control Conference*, Washington DC, 2013.
doi:10.1109/ACC.2013.6580302

C15. A. Halder, and R. Bhattacharya. Further Results on Probabilistic Model Validation in Wasserstein Metric. *51st IEEE Conference on Decision and Control (CDC)*, Maui, Dec. 2012.
doi:10.1109/CDC.2012.6425987

C14. P. Dutta, **A. Halder**, and R. Bhattacharya. Uncertainty Quantification for Stochastic Nonlinear Systems with Perron-Frobenius Operator and Karhunen-Loève Expansion. *IEEE Multi-Conference on Systems and Control*, Dubrovnik, Croatia, Oct. 2012.
doi:10.1109/CCA.2012.6402455

C13. A. Halder, and R. Bhattacharya. Model Validation: A Probabilistic Formulation. *50th IEEE Conference on Decision and Control (CDC) and European Control Conference (ECC)*, Orlando, Dec. 2011.
doi:10.1109/CDC.2011.6161465

C12. A. Halder, and R. Bhattacharya. Beyond Monte Carlo: A Computational Framework for Uncertainty Propagation in Planetary Entry, Descent and Landing. *AIAA Guidance, Navigation and Control Conference*, Toronto, Aug. 2010.
doi:10.2514/6.2010-8029

C11. S. Zhao, **A. Halder**, and T. Kalmár-Nagy. Leader-Follower Dynamics for Unicycles. *American Control Conference*, St. Louis, June 2009.
doi:10.1109/ACC.2009.5160706

C10. S. Zhao, **A. Halder**, and T. Kalmár-Nagy. Nonlinear Dynamics of Unicycles in Leader-Follower Formation. *8th MSU-UAB Conference on Differential Equations and Computational Simulations*, Mississippi State University, May 2009.

C9. T. Kalmár-Nagy, **A. Halder**, and S. Zhao. Delay Tuned Phase Locking in A Pair of Coupled Limit Cycle Oscillators. *6^{th} International Conference on Mathematical Modeling*, Vienna, Feb. 2009.

C8. S. Chauhan, C. Patil, **A. Halder**, and M. Sinha. FLIER: A Novel Sensor Fusion Algorithm. *3^{rd} IEEE International Conference on Industrial and Information Systems*, IIT Kharagpur, Dec. 2008.
doi:10.1109/ICIINFS.2008.4798459

C7. M. Sinha, **A. Halder**, R. Garhwal, N. S. Gopinath, and N. K. Malik. Lunar Satellite Observation Vector Construction using Non-rotating Origin and IAU2000A Precession-Nutation Model. *Conference on Advances in Space Science and Technology*, IIT Kharagpur, Jan. 2008.

C6. M. Sinha, **A. Halder**, R. Garhwal, A. K. Ghosh, N. S. Gopinath, and N. K. Malik. Lunar Gravity Field Modeling: A Critical Survey. *Conference on Advances in Space Science and Technology*, IIT Kharagpur, Jan. 2008.

C5. V. Agarwal, **A. Halder**, R. Garhwal, A. Gupta, S. Ghosh, S. Saxena, and M. Sinha. Inertial Characterization of Unmanned Aerial Vehicle AX-1. *4^{th} International Conference on Theoretical, Applied, Computational and Experimental Mechanics*, IIT Kharagpur, Dec. 2007.

C4. **A. Halder**, S. Ghosh, and M. Sinha. Fuzzy Quadtree based Path Planner and Trajectory Smoother for A Low Cost Unmanned Aerial Vehicle. *3^{rd} Indian International Conference on Artificial Intelligence*, Pune, Dec. 2007.

C3. R. Garhwal, **A. Halder**, and M. Sinha. Sensitivity Analysis using Neural Network for Estimating Aircraft Stability and Control Derivatives. *IEEE International Conference on Intelligent and Advanced Systems*, Kuala Lumpur, Nov. 2007.
doi:10.1109/ICIAS.2007.4658380

C2. R. Garhwal, **A. Halder**, and M. Sinha. An Adaptive Fuzzy State Noise Driven Extended Kalman filter for Real-time Orbit Determination. *58^{th} International Astronautical Congress*, Hyderabad, Sep. 2007.

C1. S. Ghosh, **A. Halder**, and M. Sinha. Path Planning for A Fixed Wing Micro Air Vehicle in Fuzzy Quadtree Framework. *7^{th} European Micro Air Vehicle Conference*, Toulouse, Sep. 2007.

PAPERS UNDER REVIEW/REVISION

R8. I. Nodozi, and **A. Halder**. Wasserstein Consensus ADMM.

R7. A.M. Teter, I. Nodozi, and **A. Halder**. Proximal Mean Field Learning in Shallow Neural Networks.

R6. S. Haddad, and **A. Halder**. Convex and Nonconvex Sublinear Regression with Application to Data-driven Learning of Reach Sets.

R5. I. Nodozi, J. O'Leary, A. Mesbah, and **A. Halder**. A Physics-informed Deep Learning Approach for Minimum Effort Stochastic Control of Colloidal Self-Assembly.

R4. S. Haddad, and **A. Halder**. Hausdorff Distance between Norm Balls and their Linear Maps.

R3. S. Haddad, and **A. Halder**. The Curious Case of Integrator Reach Sets, Part I: Basic Theory.

R2. W. Krichene, K.F. Caluya, and **A. Halder**. Global Convergence of Second-order Dynamics in Two-layer Neural Networks.

R1. K.F. Caluya, and **A. Halder**. Finite Horizon Density Control for Static State Feedback Linearizable Systems.

Poster Presentations

P4. ``Control of Large Scale Cyberphysical Systems". *IEEE CDC*, Las Vegas, NV, Dec. 12, 2016.

P3. ``Boolean Microgrid: A Theory of Operation for the Load Serving Entity". *NSF CPS PI Meeting*, Arlington, VA, Oct. 31--Nov. 1, 2016.

P2. ``Boolean Microgrid". *NSF CPS PI Meeting*, Arlington, VA, Nov. 16--17, 2015.

P1. ``A Control System Framework for Privacy Preserving Demand Response of Thermal Inertial Loads". *Winedale Workshop*, Round Top, TX, Oct. 9, 2015.

Professional Activities

Outreach

- *Co-founder and co-instructor* for Cluster ``Feedback Control with Applications to Robotics" in California State Summer School for Mathematics and Science (COSMOS), UC Santa Cruz, **Summer 2021, Summer 2022**. This is a 4-week summer program for high school scholars with demonstrated interest and achievement in mathematics and science.
- *Co-founder* of the NorCal Control Workshop, 2019 -- present. This annual workshop brings together systems-control researchers from academia and industry in the Northern California region fostering collaboration and professional networking.

Associate Editor

- *Systems and Control Letters*, June 2022 -- present.
- *IEEE Transactions on Aerospace and Electronic Systems*, Jan. 2019 -- Dec. 2020.
- *IEEE Control Systems Society Conference Editorial Board*, June 2019 -- present.

Reviewer for Papers

Journal (95)

- *IEEE Transactions on Automatic Control (11)*
- *Automatica (9)*
- *SIAM Journal on Control and Optimization (3)*
- *IEEE Transactions on Information Theory (1)*
- *IEEE Transactions on Neural Networks and Learning Systems (5)*
- *IEEE Transactions on Artificial Intelligence (1)*
- *IEEE Transactions on Control of Network Systems (1)*
- *IEEE Control Systems Letters (10)*
- *IEEE Control Systems Magazine (1)*
- *International Journal of Robust and Nonlinear Control (1)*
- *International Journal of Control (1)*
- *IEEE Robotics and Automation Letters (1)*
- *AIAA Journal of Guidance, Control, and Dynamics (1)*
- *ASME Journal on Dynamic Systems, Measurement and Control (24)*
- *Optimal Control Applications and Methods (2)*
- *IET Control Theory & Applications (1)*
- *IEEE Transactions on Power Systems (3)*
- *IEEE Transactions on Smart Grid (6)*
- *IEEE Internet of Things Journal (4)*
- *Proceedings of the Royal Society A (1)*
- *SIAM Review (1)*

- *Advances in Space Research (1)*
- *Electric Power Systems Research (3)*
- *Energy Science & Engineering (1)*
- *Energies (2)*

Conference (79)

- *European Control Conference 2023 (1)*
- *26th International Conference on Artificial Intelligence and Statistics 2023 (3)*
- *American Control Conference 2023 (2)*
- *Conference on Neural Information Processing Systems 2022 (5)*
- *4th IFAC Workshop on Cyber-Physical & Human-Systems 2022 (2)*
- *IEEE Conference on Decision and Control 2022 (2)*
- *International Conference on Machine Learning 2022 (2)*
- *Mathematical Theory of Networks and Systems 2022 (1)*
- *American Control Conference 2022 (3)*
- *IEEE Conference on Decision and Control 2021 (2)*
- *American Control Conference 2021 (3)*
- *IEEE Conference on Decision and Control 2020 (3)*
- *Mathematical Theory of Networks and Systems 2020 (1)*
- *American Control Conference 2020 (2)*
- *IEEE Conference on Decision and Control 2019 (3)*
- *American Control Conference 2019 (2)*
- *Indian Control Conference 2019 (2)*
- *IEEE Conference on Decision and Control 2018 (3)*
- *Mathematical Theory of Networks and Systems 2018 (1)*
- *American Control Conference 2018 (3)*
- *IEEE Conference on Decision and Control 2017 (3)*
- *IEEE Power & Energy Society General Meeting 2017 (1)*
- *American Control Conference 2017 (1)*
- *IEEE Conference on Decision and Control 2016 (3)*
- *American Control Conference 2016 (3)*
- *American Control Conference 2015 (4)*
- *IEEE Multi-conference on Systems and Control 2014 (1)*
- *IEEE Conference on Decision and Control 2014 (1)*
- *American Control Conference 2014 (3)*
- *IEEE Conference on Decision and Control 2013 (1)*
- *American Control Conference 2013 (4)*
- *American Control Conference 2012 (2)*
- *ASME Dynamic Systems and Control Conference 2012 (1)*
- *IEEE Conference on Decision and Control 2011 (1)*
- *IEEE Conference on Robotics and Automation 2010 (2)*
- *American Control Conference 2009 (1)*
- *IEEE International Conference on Intelligent and Advanced Systems 2007 (1)*

Invited Reviewer for Grant Proposals/Panels

- NSF
- University Grants Academy, San José State University

Conference/Workshop Organization

- *International Program Committee Member* of the 4th IFAC Workshop on Cyber-Physical & Human-Systems (CPHS), December 1-2, 2022.
- *Co-organizer (with M. Arcak, H. Litz, L. Pham, R. Sanfelice, and M. Zamani)*, 2nd Workshop on ``Computation-Aware Algorithmic Design for Cyber-Physical Systems" at 2022 CPS-IoT week, May 3, 2022.

- *Co-organizer (with M. Chertkov, and M. Korkali)*, Full day workshop: ``Uncertainty Management in Power System Dynamics" at IEEE Conference on Decision and Control 2021.
- *Chair* for Session: ``Stochastic Systems", American Control Conference 2021.
- *Co-organizer (with E. Bakolas, Y. Chen, and P. Tsiotras)*, Full day workshop: ``Control of Distributions: Theory and Applications" at 2021 American Control Conference, May 24, 2021.
- *Co-organizer (with M. Arcak, H. Litz, L. Pham, R. Sanfelice, and M. Zamani)*, 1st Workshop on ``Computation-Aware Algorithmic Design for Cyber-Physical Systems" at 2021 CPS-IoT week, May 18, 2021.
- *Chair* for Session: ``Uncertain Systems II"; *co-Chair* for Session: ``Stochastic Systems", American Control Conference 2020.
- *Co-organizer (with K. Sreenath, M. Arcak, and R. Sanfelice)*, CITRIS/CPAR Control Theory and Automation Symposium and 2nd Norcal Control Workshop, University of California Berkeley, April 26, 2019.
- *Chair* for Session: ``Optimization Algorithms III"; *co-Chair* for Session: ``Markov Processes II", American Control Conference 2019.
- *Co-Chair*, Session: ``Computational Methods II", IEEE Conference on Decision and Control 2018.
- *Chair*, Session: ``Filtering", American Control Conference 2018.
- *Organizer (with R. Sanfelice, K. Goldberg, and R. Berenstein)*, CITRIS/CPAR Control Theory and Automation Symposium and 1st Norcal Control Workshop, University of California Santa Cruz, April 27, 2018.
- *Member* of the IEEE Control Systems Society (CSS) Technical Committee on ``Systems with Uncertainty" (Jan 2018 -- current).
- *Organizer (with P.R. Kumar and L. Xie)*, Invited Session: ``Recent Advances in Control of Thermal Inertial Loads and DC Microgrid Stability", American Control Conference 2017.
- *Co-Chair*, Session: ``Modeling", IEEE Conference on Decision and Control 2014.

Selected University Service

- *Best Dissertation Award Committee*, Cyber-Physical Systems Research Center, UC Santa Cruz, 2022 -- present.
- *Faculty Hiring Committee on Scientific Machine Learning*, Department of Applied Mathematics, UC Santa Cruz, 2022--23.
- *Senate Committee Member for Committee on Library and Scholarly Communication*, UC Santa Cruz, 2022--23.
- *Senate Committee Member for Committee of Research*, UC Santa Cruz, 2019--20.
- *Member of Website Committee*, Baskin School of Engineering, UC Santa Cruz, 2019--20.
- *Member of Graduate Committee*, Department of Applied Mathematics, UC Santa Cruz, 2018 -- present.

Awards

Research Awards

- Outstanding Doctoral Student Award
  Department of Aerospace Engineering, Texas A&M University, 2014.
- Best Presentation in Session Award
  Session: `Filtering', American Control Conference, Washington, D.C., 2013.
- Best Thesis Award (Dual Degree)
  Development of An Autonomous Reconfigurable UAV
  Department of Aerospace Engineering, IIT Kharagpur, INDIA 2008.

Travel Awards

- Institute of Mathematics and its Applications (IMA) Travel Support Award
  Workshop on Control at Large Scales: Energy Markets and Responsive Grids, IMA Thematic Year on Control Theory and its Applications, Minneapolis, 2016.
- IEEE Control Systems Society Student Travel Award
  American Control Conference, Portland, 2014.
- IEEE Control Systems Society Student Travel Award
  American Control Conference, Washington, D.C., 2013.
- IEEE Control Systems Society Student Travel Award
  51st IEEE Conference on Decision and Control, Maui, 2012.

Invited Talks (excluding conference paper talks)

T38. Invited Speaker at the Dept. of Aerospace Engineering, Iowa State University, Ames, November 17, 2022.

T37. Invited Speaker at the Dept. of Applied Mathematics, University of California, Santa Cruz, November 07, 2022.

T36. Invited Speaker at the Dept. of Mechanical Engineering, University of Alabama, Tuscaloosa, November 04, 2022.

T35. Invited Speaker at the Palo Alto Research Center, June 14, 2022.

T34. Invited Speaker at the 2022 NSF AMPS PIs Workshop, George Mason University, May 26, 2022.

T33. Invited Speaker at Yahoo! Research, March 30, 2022.

T32. Invited Speaker at the Optimal Transport and Mean Field Games Seminar, University of South Carolina, January 26, 2022.

T31. Invited Speaker at the Technical Design Review, Ford Research and Advanced Engineering, January 20, 2022.

T30. Invited Speaker at the Two Day Workshop on Uncertainty Management in Power System Dynamics, 60th IEEE conference on Decision and Control, December 12, 2021.

T29. Discovery Lecture at the 2021 California State Summer School for Mathematics and Science (COSMOS), University of California Santa Cruz, CA, July 19, 2021.

T28. Invited Speaker at the Full Day Workshop on Control of Distributions: Theory and Applications, 2021 American Control Conference, May 24, 2021.

T27. Invited Speaker at the 1st Workshop on Computation-Aware Algorithmic Design for Cyber-Physical systems, 2021 CPS-IoT week, May 18, 2021.

T26. Invited Speaker at the 2020 NSF AMPS PIs Workshop, Virtual event, November 19, 2020.

T25. Invited Speaker at the Controls, Autonomy and Robotics Seminar, University of Texas, Austin, November 18, 2020.

T24. Invited Speaker at the Probabilistics Seminar Series, GE Research, May 27, 2020.

T23. Invited Speaker at the SIAM mini-symposium on ``Optimal Control Methods for Nonlinear Filtering and Data Assimilation", SIAM Conference on Uncertainty Quantification (UQ), Munich, Germany, March 26, 2020.
[**Canceled due to COVID-19**]

T22. Applied Mathematics Seminar, Naval Postgraduate School, Monterey, CA, February 25, 2020.

T21. Invited Speaker at the ``Uncertainty Synthesis" Workshop (half-day), 2019 CDC, Nice, France, December 10, 2019.

T20. Invited Speaker at the 2019 Bay Area Robotics Symposium, University of California, Berkeley, CA, November 15, 2019.

T19. Google Research Invited Seminar, Mountain View, CA, October 31, 2019.

T18. 2019 NSF AMPS PIs Workshop, George Washington University, Washington DC, October 23, 2019.

T17. Applied Mathematics Seminar, University of California Santa Cruz, CA, October 07, 2019.

T16. Center for Control, Dynamical Systems, and Computation Seminar, University of California Santa Barbara, CA, October 04, 2019.

T15. Electrical and Computer Engineering Seminar, University of California Santa Cruz, CA, May 20, 2019.

T14. Mathematics/Statistics colloquium, San Jose State University, San Jose, CA, October 10, 2018.

T13. Center for Information Technology in the Interest of Society (CITRIS) ``People and Robots" and ``Design of Robotics and Embedded systems, Analysis, and Modeling" (DREAMS) Seminar, University of California, Berkeley, CA, February 12, 2018.

T12. Special Seminar at Jack Baskin School of Engineering, University of California Santa Cruz, CA, December 4, 2017.

T11. Second Annual Center for Research in Open Source Software (CROSS) Research Symposium, University of California Santa Cruz, CA, October 4, 2017.

T10. 32$^{\text{nd}}$ Southern California Control Workshop, Caltech, CA, April 21, 2017.

T9. Department of Aerospace Engineering, Mississippi State University, MS, April 13, 2017.

T8. Department of Mechanical and Aerospace Engineering, Syracuse University, NY, March 31, 2017.

T7. Department of Mechanical Engineering, University of Texas at Dallas, TX, March 20, 2017.

T6. Department of Applied Mathematics and Statistics, University of California Santa Cruz, CA, January 27, 2017.

T5. Comverge Inc., Denver, CO, December 5, 2016.

T4. Workshop on Architecture and Economics of the Future Grid, Texas A&M University, College Station, TX, November 3, 2016.

T3. Electric Power and Power Electronics Institute Seminar, Department of Electrical and Computer Engineering, Texas A&M University, College Station, TX, October 26, 2015.

T2. Schlumberger-Doll Research Center, Cambridge, MA, July 8, 2014.

T1. Department of Mechanical and Aerospace Engineering, University of Florida, Gainesville, FL, May 15, 2012.

Teaching Experience

University of California, Santa Cruz, Santa Cruz, California USA

Instructor for AM/AMS 20: Mathematical Methods for Engineers II
Spring 2018, Spring 2019, Spring 2020

- Undergraduate level, class size: 131 (S18), 167 (S19), 161 (S20).
- Ordinary differential equations.
- Course website: AMS20-S18, AMS20-S19, AM20-S20

Instructor for AM 147: Computational Methods and Applications
Winter 2020, Winter 2021, Winter 2022, Winter 2023

- Undergraduate level, class size: 143 (W20), 124 (W21), 131 (W22).
- Numerical methods for solving scientific and engineering problems.
- Course website: AM147-W20, AM147-W21, AM147-W22

Instructor for AM/AMS 229: Convex Optimization
Fall 2018, Fall 2020, Fall 2022

- Graduate level, class size: 12 (F18), 33 (F20), 27 (F22).
- Recognizing, analyzing and transforming convex optimization problems with focus on solving the same using `cvx` in MATLAB, Python or Julia.
- Course website: AMS229-F18, AM229-F20

Instructor for AM/AMS 232: Applied Optimal Control
Spring 2019, Spring 2021

- Graduate level, class size: 15 (S19), 9 (S21).
- Deterministic and stochastic optimal control.
- Course website: AMS232-S19, AM232-S21

Instructor for AM/AMS 231: Nonlinear Control Theory
Winter 2018, Spring 2020, Spring 2022

- Graduate level, class size: 16 (W18), 11 (S20), 6 (S22).
- Control of finite dimensional nonlinear systems.
- Course website: AMS231-W18, AM231-S20, AM231-S22

Instructor for AM/AMS 280B: Seminar in Applied Mathematical Modeling
Winter 2019, Fall 2019, Winter 2020, Winter 2021, Fall 2021, Winter 2022, Fall 2022

- Graduate level departmental seminar during the academic quarters: Fall, Winter and Spring.
- Invitation and hosting of external seminar speakers in research areas of interest in applied mathematics.

University of California, Irvine, Irvine, California USA

Co-lecturer for MAE 295: Networks and Control **Spring 2017**

- Graduate level course.
- Delivered in-class lectures on dynamics and control of multi-agent systems over networks.

Texas A&M University, College Station, Texas USA

Teaching Assistant for AERO 320: Numerical Methods **Fall 2013**

- Junior level undergraduate course.
- Designed and graded homeworks and tests.
- Designed lab assignments and conducted lab sessions for implementing the numerical methods in C++.
- Held help sessions.
- Course material: abhishekhalder.org/Aero320Fall2013

Grader for ENGR 111: Foundations of Engineering **Fall 2009**

- Freshman level undergraduate course.
- Graded weekly assignments on engineering mechanics and statistics.
- Held weekly help sessions.

Indian Institute of Technology Kharagpur, West Bengal INDIA

Instructor for AE21008: Introduction to Flight Vehicle Controls **Spring 2008**

- Sophomore level undergraduate course.
- Delivered in-class lectures on the basics of feedback control systems, block diagrams, dynamic system modeling and response, designing PID controller, root-locus design, frequency response design, state space design.

Mentoring and Advising

Doctoral Students

- Primary supervisor: Georgiy Bondar (Applied Mathematics). Fall 2022 -- present. [**Winner of 2022 Dean's Fellowship**]
- Primary supervisor: Alexis Teter (Applied Mathematics). Fall 2021 -- present.
- Primary supervisor: Iman Nodozi (Electrical and Computer Engineering). Summer 2021 -- present. [**Winner of 2018-19 Regent's Fellowship**]
- Primary supervisor: Shadi Haddad (Applied Mathematics). Fall 2019 -- present. [**Winner of 2018-19 Chancellor's Fellowship, 2022 Applied Mathematics Research Award**]
- Primary supervisor: Kenneth Caluya (Applied Mathematics). Fall 2017 -- present.
- Ph.D. Committee Member: Santiago Jimenez Leudo (Electrical and Computer Engineering). Fall 2021 -- present.
- Ph.D. Committee Member: Abram Rodgers (Applied Mathematics). Spring 2021 -- present.
- Ph.D. Committee Member: Tenavi Nakamura-Zimmerer (Applied Mathematics). Fall 2019 -- Spring 2022.
- Ph.D. Committee Member: Marcello Guarro (Electrical and Computer Engineering). Fall 2019 -- Summer 2021.
- Ph.D. Committee Member: Dawn Hustig-Schultz (Electrical and Computer Engineering). Fall 2018 -- present.
- Ph.D. Committee Member: Richard Shaffer (Applied Mathematics). Fall 2017 -- Winter 2018.

Masters Students

- Primary supervisor: Charlie Yan (Electrical and Computer Engineering). Summer 2022 -- present.
- Primary supervisor: Qingyuan Cui (Applied Mathematics). Summer 2020 -- Summer 2021.
  M.S. Thesis: Graph Curvature for COVID-19 Network Risk Analytics.
- Primary supervisor: Lia Gianfortone (Applied Mathematics). Fall 2017 -- Summer 2018.
  M.S. Thesis: Ellipsoidal Algorithm for Fast Computation of Reachable Tubes.
- M.S. Thesis Committee Member: Harsh Bhakta (Computer Science and Engineering). Spring 2021 -- present.
- M.S. Thesis Committee Member: David Kooi (Electrical and Computer Engineering). Spring 2020 -- Winter 2021.
- M.S. Thesis Committee Member: Adam Ames (Electrical and Computer Engineering). Spring 2020 -- present.
- M.S. Thesis Committee Member: Wuyuan Chen (Electrical and Computer Engineering). Fall 2018 -- present.
- M.S. Thesis Committee Member: Yegeta Zeleke (Electrical and Computer Engineering). Fall 2018 -- present.
- M.S. Thesis Committee Member: Marcello Guarro (Electrical and Computer Engineering). Spring 2018 -- Summer 2019.

Undergraduate Students

- Primary supervisor: Karthik Sivaramakrishnan (Mathematics). Summer 2020 -- Fall 2020.
  Senior Thesis: Ollivier-Ricci Curvature for Directed Weighted Graphs.

High school Students

- Pranav Eranki (Cupertino High School). Winter 2020 -- Fall 2020.

PROFESSIONAL MEMBERSHIP

Senior member, IEEE
IEEE Control Systems Society (CSS)
International Federation of Automatic Control (IFAC)