

## Abhishek Halder

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CONTACT INFORMATION	333A Wisenbaker Engineering Building Bizzell Street, Texas A&M University College Station, TX 77843 USA	☎ +1-979-583-6070 ✉ halder.abhishek@gmail.com 🌐 abhishekhalder.org
EDUCATION	<b>Ph.D. in Aerospace Engineering</b>  <b>Texas A&amp;M University</b> , College Station, Texas USA <ul style="list-style-type: none"><li>Dissertation: <i>Probabilistic Methods for Model Validation</i> (<b>Outstanding Doctoral Student Award</b>)</li><li>Advisor: Raktim Bhattacharya</li></ul> <b>Bachelors and Masters in Aerospace Engineering</b>	May 2014      July 2008
PROFESSIONAL APPOINTMENTS	<b>Postdoctoral Scholar</b>  Department of Mechanical and Aerospace Engineering University of California Irvine <ul style="list-style-type: none"><li>Topic: <i>Stochastic control, filtering and optimal transport</i></li><li>Advisor: Tryphon Georgiou</li></ul> <b>Postdoctoral Research Associate</b>	February 2017 – Current          June 2014 – January 2017
	Department of Electrical and Computer Engineering Texas A&M University <ul style="list-style-type: none"><li>Topic: <i>Demand response in smart grid, unmanned aerial systems traffic management</i></li><li>Advisor: P.R. Kumar</li></ul> <b>Global Research Innovation and Technology Intern</b>	           Summer 2013
	Systems Modeling and Control Eaton Corporation, Eden Prairie, Minnesota <ul style="list-style-type: none"><li>Topic: <i>Voltage Control in UPS: Modeling, Controller Synthesis, and Hardware-in-loop Simulation</i></li><li>Advisor: Yigang Wang</li><li>Projects: (1) Model Based Design in Power Electronics (2) Co-operative Control of Generator and UPS</li></ul> <b>Visiting Researcher</b>	           Summer 2012
	Dynamics and Control, Coordinated Science Laboratory University of Illinois at Urbana-Champaign <ul style="list-style-type: none"><li>Topic: <i>Nonlinear Estimation as Gradient Flow</i></li><li>Advisor: Prashant Mehta</li></ul>	

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

RESEARCH  
INTERESTS**Broad area**

Systems, control and optimization

**Theory focus**

- Dynamics and control of stochastic systems
- Uncertainty propagation and nonlinear estimation
- Monge-Kantorovich optimal transport
- Randomized algorithms
- Density control

**Application focus**

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

JOURNAL  
PUBLICATIONS

- 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*. accepted. **[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:10.1016/j.cnsns.2009.02.028
- 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)*, 223:3–8, 2008.

CONFERENCE  
PUBLICATIONS

- 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**, *53<sup>rd</sup> 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. *51<sup>st</sup> 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. *50<sup>th</sup> 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<sup>th</sup> 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<sup>rd</sup> 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<sup>th</sup> 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<sup>rd</sup> 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<sup>th</sup> 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<sup>th</sup> European Micro Air Vehicle Conference*, Toulouse, Sep. 2007.

PAPERS UNDER  
REVIEW

- 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.
- K. Lee, **A. Halder**, and R. Bhattacharya. A New Framework for Mean Square Stability of Stochastic Jump Linear Systems via Optimal Transport.

WORKING  
MANUSCRIPTS

- A. Halder et. al.** Optimal Control of Thermal Inertial Loads for Demand Response.
- A. Halder.** Sparse Optimal Transport.
- A. Halder.** Linear Quadratic Gaussian Density Regulator.

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

**Referee Service**

Journal (28)

- *Automatica* (4)
- *ASME Journal on Dynamic Systems, Measurement and Control* (19/)
- *IET Control Theory & Applications* (1)
- *IEEE Transactions on Power Systems* (1)
- *IEEE Transactions on Smart Grid* (2)
- *Proceedings of the Royal Society A* (1)

Conference (31)

- *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 (2)*

#### Conference/Workshop Activities

- *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.*

#### 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

- 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  
*51<sup>st</sup> IEEE Conference on Decision and Control, Maui, 2012.*

#### INVITED TALKS

- 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

**Texas A&M University**, College Station, Texas USA

*Teaching Assistant for AERO 320: Numerical Methods*

**Fall 2013**

- 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](http://abhishekhalder.org/Aero320Fall2013)

*Grader for ENGR 111: Foundations of Engineering*

**Fall 2009**

- 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**

- 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.

PROFESSIONAL  
MEMBERSHIP

IEEE Control Systems Society