

Mrinal Kumar
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Education

- **Texas A&M University** College Station, TX
Ph.D. Aerospace Engineering Dec 2009
 - Dissertation: Design and Analysis of Stochastic Dynamical Systems with Fokker-Planck Equation
 - Co-Advisors: Dr. Suman Chakravorty and Dr. John L. Junkins
- **Indian Institute of Technology** Kanpur, India
B.Tech. Aerospace Engineering May 2004
 - Proficiency Medals (2004), Notional Award for Academic Excellence (2003): see Awards

Work Experience

- **Mechanical and Aerospace Engineering, The Ohio State University** Columbus, OH
Associate Professor Aug 2016 - Present
Director, Laboratory for Autonomy in Data-Driven and Complex Systems (LADDCS)
- **Mechanical and Aerospace Engineering, University of Florida** Gainesville, FL
Assistant Professor Aug 2010 - Aug 2016
Director, Stochastic Systems Laboratory (SSL)
- **Aerospace Engineering, Texas A&M University** College Station, TX
Post-Doctoral Researcher Dec 2009 - Jun 2010
Graduate Research Assistant Sep 2004 - Dec 2009
Graduate Teaching Assistant Sep 2005 - Aug '06, Feb '07 - May '09
- **Vikram Sarabhai Space Center, Indian Space Research Organization** Trivandrum, India
Intern May - Jul 2003

Research Interests

- Uncertainty quantification in complex stochastic systems, optimal nonlinear state estimation, Fokker-Planck equations.
Application areas: forecasting for sustainable energy (e.g. wind), space-situational awareness, multi-target tracking, hazardous events, subcritical spray atomization in rocket engines, random vibrations;
- Chance-constrained optimization and control
Application areas: design optimization, mission design, path-planning, resource allocation.
- Randomization techniques, Markov chain Monte Carlo.
Application areas: space-situational awareness, stochastic global optimization (e.g. building optimization), high dimensional Bayesian data fusion.

Awards and Activities

- 2020 **Gerald M. Gregorek Excellence in Teaching Award:** This award recognizes the exceptional dedication to teaching exhibited by Professor Emeritus Gerald M. Gregorek throughout his career. In his honor, faculty who have exhibited similar dedication and excellence in undergraduate teaching of aerospace engineering in the Department of Mechanical and Aerospace Engineering at OSU are recognized. [[Weblink](#)]
- 2020 and 2019 **Air Force Research Lab Summer Faculty Fellow** at AFRL-Aerospace Systems, Wright Patterson Air Force Base, Dayton, OH [[Weblink](#)]
- 2019 **AIAA Sensor System and Information Fusion Best Paper.** Paper title: “Autonomous Wildfire Monitoring Using Airborne and Temperature Sensors in an Evidential Reasoning Framework”, AIAA Paper Number 2019-2263 presented at AIAA Scitech Forum and Expo, San Diego, Jan 7-11, 2019 [[Weblink](#)]
- 2015 **AFOSR YIP¹ Award:** The objective of this program is to foster creative basic research in science and engineering; enhance early career development of outstanding young investigators; and increase opportunities for the young investigator to recognize the Air Force mission and related challenges in science and engineering.
- 2013 **NSF CAREER Award:** The Faculty Early Career Development (CAREER) Program is a Foundation-wide activity that offers the National Science Foundation’s most prestigious awards in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations.
- 2012 **Best Paper in Session Award** at the AIAA Guidance, Navigation and Control Conference, held in Minneapolis MN. Paper title: “A Markov Chain Monte Carlo Particle Solution of the Initial Uncertainty Propagation Problem”
- 2008 TATEP Mentor: Mentor for *Teaching Assistant Training and Evaluation Program (TATEP)* of The Center for Teaching Excellence (CTE) at Texas A&M University, Aug 20-21, 2008
- 2007 **AIAA Open Topic Research Award:** *Up to 4 open topic awards are granted annually* by the American Institute of Aeronautics and Astronautics (AIAA) Awards Foundation for outstanding research in one of 65 areas represented by the AIAA technical committees. Research topic: “Uncertainty Propagation with the Fokker-Planck Equation.” [[Weblink](#)]
- 2007 George Bush Presidential Library Foundation Travel Grant, Texas A&M University
- 2006 **Best Paper in Conference Award:** AIAA/AAS Astrodynamics Specialist Conference, held in Keystone CO. Paper title: “Partition of Unity Finite Element Approach to the Stationary Fokker-Planck Equation.” [[Weblink](#)]
- Summer 2005 Graduate Scholarship: Department of Aerospace Engineering, Texas A&M University
- First position - paper presentation at the 2005 Student Research Week, Texas A&M University: Title: “Uncertainty Propagation with the Fokker-Planck Equation for Estimation of Probability of Collision of Potentially Hazardous Asteroids with the Earth.” Third position in the same event in 2006: Title: “New Local Methods for Uncertainty Propagation in Nonlinear Dynamical Systems”
- 2004 **General Proficiency Medal:** Highest GPA in the 2004 graduating class of Aerospace Engineering at the Indian Institute of Technology, Kanpur (IITK)

¹Young Investigator Research Program

- 2004 **Proficiency Medal**: Best B.Tech project in the 2004 graduating class of Aerospace Engineering at IITK
- 2003 **National Award for Academic Excellence**: Annual GPA in top 7% in IITK (including all departments)

Research Grants

- Topic: *Adaptive Data-Driven Actionable Intelligence for SSA in an Evidential Framework*
Agency: Air Force Office of Scientific Research (**AFOSR**)/Remote Sensing (RTB1)
Duration: May 1, 2020 - April 30, 2023
Role: PI
Total Grant Amount: \$481,326
- Topic: *Data Security Measures and User-Layer Development for a Prognostics Use Case*
Agency: Technology Validation and Start-up Fund (TVSF) Program through the **Ohio Third Frontier Incubator**
Duration: June 2020 - May 2021
Role: PI
Total Grant Amount: \$99,942
- Topic: *Hierarchical reduced order modeling of nuclear weapons electromagnetic effects for networked infrastructure system analysis*
Agency: Defense Threat Reduction Agency (**DTRA**)
Duration: Sep 2018- Sep 2021
Role: Co-PI with PI F. Teixeira (ECE, OSU) and A. Eryilmaz (ECE, OSU)
Grant Amount (Kumar Portion): \$298,273
- Topic: *Validation of Trustworthiness in a Closed Loop Particle Forecasting Platform for System Prognostics and Decision Support*
Agency: **I-Corps @ Ohio** Program through the Ohio Department of Higher Education
Duration: April 2019- Oct 2019
Role: PI
Total Grant Amount: \$15,000
- Topic: *A Novel Computational Framework for Chance-Constrained Optimal Control*
Agency/Program: National Science Foundation (**NSF**)/CMMI²/SDC³
Duration: Jul 2016 - Jun 2019
Role: Co-PI with Dr. Anil Rao (MAE/UF)
Total Grant Amount: \$398,917. Kumar Portion: \$198,668
- Topic: **YIP**: *A Unified Dynamic Information Guided Particle Framework for Mission Design and Execution*
Agency/Program: Air Force Office of Scientific Research (**AFOSR**)/DDDAS⁴ (RTA2)
Duration: Sep 2015 - July 2020
Role: PI
Total Grant Amount: \$358,606
- Topic: **CAREER**: *An Integrated Hybrid Forecasting Framework for Increased Wind Penetration*
Agency/Program: National Science Foundation (**NSF**)/ECCS⁵/EPAS⁶.
Duration: Feb 2013 - Jan 2018
Role: PI
Total Grant Amount: \$400,000

²Civil, Materials, Mechanical, Industrial

³Sensors, Dynamics and Control

⁴Dynamic Data Driven Applications Systems

⁵Electrical, Communications and Cyber Systems Division

⁶Energy Power and Adaptive Systems Program (now EPCN: Energy, Power, Control and Networks)

- Topic: *Integrated Space Situational Awareness: Data, Algorithms and Sensors*
Agency: Space Research Initiative (SRI)
Duration: Jun 2016 - May 2017
Role: PI with Co-PIs Riccardo Bevilacqua (MAE/UF) and Dr. Yunjun Xu (MAE/UCF)
Total Grant Amount: \$75,000. Kumar Portion: \$33,000
- Topic: *Development of Subcritical Atomization Models in the Loci Framework for Liquid Rocket Injectors*
Agency: **NASA/Marshall Space Flight Center**
Duration: Sep 2012 - Jan 2015
Role: Co-PI with Dr. Siddharth Thakur (MAE/UF) and Dr. Edward Luke (CS/Mississippi State University)
Total Grant Amount: \$301,087. Kumar portion: \$183,633
- Topic: *Exploration of Modern Filtering Techniques for ISR Air to Ground Radar Tracking*
Agency: **Northrop Grumman Corporation**, Melbourne, FL
Program: REU⁷: University Student Project Program
Duration: Sep 2014 - May 2015
Role: PI
Total Grant Amount: \$8,000
- Topic: *A Computational Approach for Probabilistically Constrained Design Optimization Using Generalized Polynomial Chaos and Pseudospectral Methods*
Agency: **U.S. Department of the Navy/SPAWAR Systems Center Atlantic**
Duration: Oct 2013 - Dec 2014
Role: Co-PI with Dr. Anil Rao (MAE/UF)
Total Grant Amount: \$250,000. Kumar portion: \$104,371.

Independent Consulting and Entrepreneurial Activities

- **[Consulting]** Topic: *Deliberate Battle Planning for Post-Intercept Debris (PID) Consequence Mitigation in Ballistic Missile Defense Engagements*
Agency: **MITRE Corporation**, McLean VA
Duration: Oct 2015 - Sep 2017 Role: Technical Consultant
- **[Entrepreneurial Workshop]:** *Customer Learning Lab* September 19-21, 2018
Agency: **Rev1 Ventures**, Columbus OH
Startup Name: Point Prognostics
- **[Entrepreneurial Mentoring Program]:** *Buckeye Venture Mentoring Service* April-December 2020
Agency: **Technology Commercialization Office**, Ohio State University
Startup: Point Prognostics

Inventions and Copyrights

- Non-Provisional Patent "Closed Loop Particle Forecasting Platform for Decision Support and System Prognostics", filed on 5/21/2020. Patent owned by **Mrinal Kumar** and Chao Yang. Provisional Patent Number: 62/851,453 2020
- Software Copyright: *Closed Loop Particle Forecasting Platform for Decision Support and System Prognostics*. Copyright owned by **Mrinal Kumar** and Chao Yang 2018

⁷Research Experience for Undergraduates

Invited Talks

- Indian Institute of Technology, Kanpur India Jan 31, 2019
 Department of Aerospace Engineering
 Title: *Definitely, Maybe..? The Role Uncertainty Does, and Must Play in Autonomy*
- Ohio State University, Columbus OH Nov 10, 2015
 Department of Mechanical and Aerospace Engineering
 Title: *Towards Scalable Uncertainty Quantification for Space-Situational Awareness*
- Texas A&M University, College Station TX Sep 03, 2015
 Department of Aerospace Engineering
 Title: *New Parametric Approximations of Chance Constraints with Application to Optimization and Control*
- Mississippi State University, Starkville MS Feb 13, 2015
 Department of Aerospace Engineering
 Title: *Particle Methods for Space Situational Awareness*
- AFRL Mathematical Modeling and Optimization Institute @ REEF, Shalimar FL July 29, 2014
 Title: *A Semi-analytical split-Bernstein Approach to Chance Constrained Programs*
- AFRL Kirtland, Space Vehicles Directorate, Albuquerque NM May 25, 2011
 Title: *Advanced Techniques for Uncertainty Quantification*
- AIAA General Body Meeting (South East Region, Central Florida Section) Oct 27, 2010
 Title: *Current Trends in Spaceflight Research: From Galileo to Cassini and Beyond*
- University at Buffalo, NY Mar 15, 2010
 Department of Mechanical and Aerospace Engineering
 Title: *Analysis of Stochastic Systems with the Fokker-Planck Equation*
- University of Florida, Gainesville FL Feb 11, 2010
 Department of Mechanical and Aerospace Engineering
 Title: *New Directions for an Old Problem: Dealing with the Curse of Dimensionality in Fokker-Planck Equation*
- University at Buffalo, NY Aug 16, 2009
 Department of Mechanical and Aerospace Engineering
 Title: *On the Curse of Dimensionality in Fokker-Planck Equation*

Teaching

- At The Ohio State University (overall student evaluation (/5) in brackets:)
 1. *Stability and Control of Flight* (AAE 5620) **SP**⁸: 2017 (5.0), '19 (4.3)
 2. *Flight Vehicle Dynamics* (AAE 3520) **FL**⁹: 2017 (4.6)
 3. *Robust Control with Applications* (AAE 8820) **FL**: 2017 (4.7)
 4. *Random Dynamical Systems* (AAE 8194) **SP**: 2018 (4.8), '20 (4.7)
 5. *Advanced Mathematical Methods* (AAE 8802/ME 8518) **FL**: 2018 (4.4), '19 (4.6)
 6. *Orbital Mechanics for Engineers* (AAE 5626) **FL**: 2019 (4.9), '20
- At University of Florida (overall student evaluation (/5) in brackets:)
 1. *Astrodynamics* (EAS 4510) **SP**: 2015 (4.7), '14 (4.5), '13 (4.4)
 2. *Dynamics and Control of Space Vehicles* (EAS 4412) **FL**: 2013 (5.0), '10 (4.7)

⁸Spring Semester

⁹Fall Semester

- 3. *Intro to Random Dynamical Systems* (EML 6229) FL: 2014 (4.8), '12 (4.4), SP: '16 (4.5), '11 (4.4)
- 4. *Control of Mechanical Engineering Systems* (EML 4312) FL: 2015¹⁰, SP '12 (4.1), '16 (4.3)
- 5. *Stability and Control of Aircraft* (EAS 4400) FL 2011 (4.0)

- At Texas A&M University: co-taught the following courses:

- 1. *Introduction to Random Processes* (AERO 630) SP 2009 (with Dr. Suman Chakravorty)
- 2. *Space Mechanics I* (AERO 423) SP 2009, 2008, 2007 (with Dr. Daniele Mortari)

Advising

- **Post-doctoral Associates**

- 1. Dr. Chao Yang Feb - Nov 2018
Research area: *Adaptive Particle Methods for Forecasting and Estimation*
- 2. Dr. Donghoon Kim Mar - May 2017
Research area: *Collaborative Autonomy in Multi-agent Systems*
- 3. Dr. Yifei Sun Jan - Jul 2015
Research area: *Tensor Methods for Complex Dynamic Systems*

- **Ph.D. Students**

- 12. Jonathan Kadowaki Expected graduation: 2024
Research area: *Robust Uncertainty Quantification for Model ID in Space Situational Awareness*
- 11. Andrew VanFossen Expected graduation: 2023
Research area: *Robust Uncertainty Quantification in Space Situational Awareness*
Recipient of *Distinguished University Fellowship (2 years)* and *MAE Fellowship (1 year)*
- 10. Indranil Nayak Expected graduation: May 2022
Research area: *Data-Driven Modeling and Estimation of Electromagnetic Phenomena in Space*
Co-advised with Fernando Teixeira of ECE, OSU
- 9. Bander Jabr Expected graduation: Dec 2021
Research area: *Mapping and Planning for Autonomous Agents Operating in a Human Rich Environment*
- 8. Rachit Aggarwal Expected graduation: May 2021
Research area: *Chance-Constrained Path Planning under Unstructured Uncertainty*
- 7. Alex Soderlund May 2020
Dissertation title: *Characterization of Wildland Fires through Evidence-based Sensor Fusion and Planning*
Recipient of *AFRL Summer Fellowship (2018-19)*
Recipient of *NRC Post-Doctoral Research Associateship*
- 6. Huang Meng Dec 2019
Dissertation title: *On the Identification of Favorable Data Profile for Lithium-Ion Battery Aging Assessment with Consideration of Usage Patterns in Electric Vehicles*
- 5. Sriram Krishnaswamy Dec 2019
Dissertation title: *On Computationally Efficient Frameworks For Data Association In Multi-Target Tracking*

¹⁰Taught 1/2 Semester: On Parental Leave

4. Chao Yang Dec 2017
Dissertation title: *On Particle Methods for Uncertainty Quantification in Complex Systems*
3. Zinan Zhao April 2015
Dissertation title: *A New Scalable Paradigm for High Dimensional Chance-Constrained Programs*
2. Yifei Sun Dec 2014
Dissertation title: *On the Numerical Solution of High-Dimensional Fokker-Planck Equations*
Recipient of *College of Engineering Outstanding International Student Award 2013-2014*.
Recipient of *DSC¹¹ Graduate Research Award in Mechanical and Aerospace Engineering 2014-2015*.
1. Ahmed Jorge (co-chair with Dr. Rick Lind) Aug 2014
Dissertation title: *Control of a Stochastic Model of an Aeroelastic MAV in Turbulence*

• Masters Students

7. David Parkerson March 2016
Thesis: *Chance-constrained Optimal Control of Aerobraking*
6. Sriram Krishnaswamy March 2016
Thesis: *Uncertainty Forecasting For Lorenz Models Using A Tensor Decomposition Approach*
5. Sandor Valenciaga March 2016
Thesis: *Determination Of Optimal Hermite Polynomial Expansion Order For Systems With Gaussian Parametric Uncertainty*
4. Kang Ye May 2015
Non-Thesis Option. Project: *Applications of the Ensemble Kalman Filter*
3. Hongnan Lin May 2013
Thesis: *Polynomial Chaos Based Analysis of Volcanic Eruptions*
2. Jae Myung Yoon May 2012
Thesis: *A Comparative Analysis of Adaptive MCMC based Particle Filtering Methods*
1. Diwakar Sinha May 2012
Thesis: *Design of Energy Efficient Buildings via Multivariate Stochastic Optimization*

• Undergraduate Students

9. Steven Romeo June-Dec 2019
Topic: *Adaptive Monte Carlo Forecasting*
8. William Laidler Summer 2019
Topic: *Association Experiments for Multi-target tracking*
7. Shane Vitullo June 2018 - Dec 2019
Research Topic: *Accurate Prediction of Conjunction Events in Space Situational Awareness*
6. Wilson Flores Dec 2016 - May 2018
Topic: *Multisensor Data Fusion for Target Tracking*
Honor's Thesis Title: *"Orbital Debris Tracking using a Wireless Sensor Network"*
5. David Gedeon May - Dec 2017
Topic: *Adaptive Monte Carlo for Space-Situational Awareness*

¹¹Dynamics Systems and Control

4. Kevin Buck May 2014 - May 2016
 Topic 1: *Particle Methods for Space Situational Awareness*
 Topic 2: *Advanced State Estimation Techniques for JSTARS*
 Selected as University Scholar for 2015-2016.
 Title of research: *Advanced Particle Methods for Tracking Applications.*
3. David Parkerson Fall 2014
 Topic: *Initial Uncertainty Forecasting with MCMC*
2. Eric Moale Summer 2013
 Topic: *The Keyholes of Apophis 99942*
1. Eric Kazmierczak Summer 2011
 Topic: *Study of Parametric Uncertainty during Atmospheric Reentry*

• **School Students**

10. Raaghav Malik Summer Internship: 2020
Columbus Academy, Columbus OH
 Topic: *Autonomous SUAS Path Planning*
9. Dhruva Thimmenahalli Summer Internship: 2020
Dublin Jerome High School, Dublin OH
 Topic: *Forecasting for Space Situational Awareness*
8. Curbee Wheeler-Hall Summer Internship: 2017
Northland High School, Columbus OH
7. Curbee Wheeler-Hall Summer Internship: 2017
Northland High School, Columbus OH
6. Gabriel McAllister Summer Internship: 2017
West High School, Columbus OH
5. James Wang Summer Science Training Program (SSTP): 2015
Palo Alto High School, Palo Alto, CA
 Topic: *Adaptive Least Squares Wind Speed Estimation*
4. Brandon Dubner SSTP: 2015
Stoneman Douglas High School, Parkland, FL
 Topic: *ARMA Models for Wind Forecasting*
3. Risham Sidhu Independent study: Summer 2014 - May 2016
Eastside High School, Gainesville FL
 Topic: *Uncertainty Quantification for Wind*
2. Christopher Blake SSTP: 2014
Pine View School, Sarasota FL
 Topic: *Derivatives, Linearization and the Lorenz Attractor*
1. Daniel Yohann SSTP: 2013
Pine View School, Sarasota FL
 Topic: *Chaotic Systems of Nonlinear Differential Equations to Predict Localized Wind Patterns*

Service

Conference Chair

- **Deputy Chair:** Guidance, Navigation and Control Conference @ AIAA SciTech
Nashville, TN Jan 11-15, 2021
- **Deputy Chair:** Guidance, Navigation and Control Conference @ AIAA SciTech [\[Weblink\]](#)
Orlando, FL Jan 06-10, 2020
- **General Co-Chair:** 2nd IAA¹² International Conference on Space Situational Awareness
Washington DC [\[Weblink\]](#) Jan 14-16, 2020
- **General Co-Chair:** 1st IAA International Conference on Space Situational Awareness
Orlando FL [\[Weblink\]](#) Nov 13-15, 2017

Technical Area Chair

- Control and Autonomy: Theory, Analysis, and Design AIAA GNC¹³ Conference @ Scitech, 2019

Technical Committee Member

- AIAA Guidance, Navigation and Control Technical Committee Jan 2014 - present

Editor

- Bevilacqua, R., **Kumar, M.**, Alfriend, K., Krag, H., and Anselmo, L. (Eds.), Special issue on Space Situational Awareness from the 1st International Academy of Astronautics Conference on Space Situational Awareness (ICSSA 2017), *Acta Astronautica*, Vol 155, Feb 2019, doi.org/10.1016/j.actaastro.2019.02.027

Associate Editor

- American Control Conference 2013-2016, 2018-19
- AIAA Conference on Guidance, Navigation and Control 2018

Review Panels

- NSF Proposal Review Panels
 1. CISE¹⁴ Division/IIS¹⁵ Program 2018-20
 2. EPSCoR¹⁶ Research Infrastructure Improvement Program 2017-20
 3. ECCS Division/EPCN¹⁷ Program 2016
 4. ECCS Division/EPAS Program 2012-13
 5. CBET Division¹⁸ Energy for Sustainability Program 2013
- University of Florida Office of Research 2016
 1. Research Opportunity Seed Fund

¹²International Academy of Astronautics

¹³Guidance Navigation and Control

¹⁴Computer & Information Science & Engineering

¹⁵Information and Intelligent Systems

¹⁶Experimental Program to Stimulate Competitive Research

¹⁷Energy, Power, Control and Networks

¹⁸Chemical, Bioengineering, Environmental and Transport Systems

- American Institute of Aeronautics and Astronautics
 1. Guidance Navigation and Control Conference: Best Paper Award Panel 2016, 2011
 2. AIAA Foundation Graduate Student Award Panel 2015

Peer Review

- *Automatica, AIAA Journal of Guidance Control and Dynamics, Acta Astronautica, IEEE Transactions on Automatic Control, Journal of Vibration and Control, Probabilistic Engineering Mechanics, IEEE Transactions on Smart Grid, ASME Journal of Dynamic Systems, Measurement and Control, Computers and Methods with Applications, International Journal of Robust and Nonlinear Control, IET¹⁹ Radar, Sonar & Navigation, Aerospace Science and Technology, Entropy, IEEE Transactions on Aerospace and Electronic Systems*
- *American Control Conference (2008-), Conference on Decision and Control (2009-), AIAA Guidance Navigation and Control Conference (2010-), Design Engineering Technical Conference (2009)*

Departmental Service

- Developed new required²⁰ grad course “*Advanced Mathematical Methods*” *First offering: Autumn 2018 @ OSU*
- Introduced new grad course “*Random Dynamical Systems*” *First offering: Spring 2018 @ OSU*
- Aerospace Graduate Admissions Committee *Chair, Aug 2017 - Present*
- MAE Curriculum Revision Committee (CQIC) *Member, Dec 2018 - Present*
- Aerospace Strategic Planning Steering Committee *Member, March 2018 - Present*
- Graduate Studies Committee *Member, Aug 2016 - Present*
- Faculty Search Committee *Member, Oct 2016 - Aug 2017*
- Aerospace Engineering Curriculum Committee *Member, 2013-2016*
- Graduate Recruitment and Admissions Committee *Member, 2015-2016*
- Faculty Search Committee *Member, 2015-16*
- Outcomes Committee for ABET *Member, 2014*
- Developed new grad course “*Introduction to Random Dynamical Systems*” *First offering: Spring 2011 @ UFL*

Society Membership

- American Institute of Aeronautics and Astronautics **Senior Member**
- Institute of Electrical and Electronics Engineers **Member**

Publications

Journal Papers

1. Aggarwal, R., **Kumar, M.**, Keil, R. E. and A. V. Rao “Chance-Constrained Optimal Control Approach to Path Planning in a Cluttered Environment”, *IEEE Transactions on Aerospace and Electronic Systems*, under review
2. Keil, R. E., Miller, A. **Kumar, M.** and Rao, A. V., “Method for Solving Chance Constrained Optimal Control Problems Using Biased Kernel Density Estimators”, *Computational Optimization and Applications*, under review
3. Soderlund, A. and **Kumar, M.**, “Estimating the Spread of Wildfires via Evidence-based Information Fusion”, *International Journal of Wildland Fire*, under review
4. Krishnaswamy, S. and **Kumar, M.**, “Tensor Decomposition framework for Data Association in Low Earth Orbit Space Situational Awareness”, *IEEE Transactions on Aerospace and Electronic Systems*, under review

¹⁹The Institution for Engineering and Technology

²⁰Pre-Req for MAE Ph.D. Qualifying Exam

5. Krishnaswamy, S. and **Kumar, M.**, “A Tensor Decomposition Approach to Data-Association for Multi Target Tracking,” *Journal of Guidance, Control and Dynamics* (AIAA), Vol. 42, No. 9, Sep. 2019, pp. 2007-2025: <https://doi.org/10.2514/1.G004122>
6. Yang, C. and **Kumar, M.**, “A Closed-Loop Adaptive Monte Carlo Framework for Uncertainty Forecasting in Nonlinear Dynamic Systems,” *AIAA Journal of Guidance, Control and Dynamics*, Vol. 42, No. 6, June 2019, pp. 1218-1236: <https://doi.org/10.2514/1.G003853>
7. Soderlund, A. and **Kumar, M.**, “Optimization of Multi-Target Tracking within a Sensor Network via Information Guided Clustering”, *AIAA Journal of Guidance, Control and Dynamics*, Vol.42, pp. 317-334, 2019, doi: 10.2514/1.G003656
8. Yang, C., and **Kumar, M.**, “An Adaptive Monte Carlo Method for Uncertainty Forecasting in Perturbed Two-Body Dynamics,” *Acta Astronautica: Special Issue on Space Situation Awareness*, Vol 155, Feb 2019, pp. 369-378 doi: /10.1016/j.actaastro.2018.05.053
9. Yang, C., and **Kumar, M.**, “On the Effectiveness of Monte Carlo for Initial Uncertainty Propagation in Dynamical Systems” *Automatica*, Vol 87, pp 301-309, 2018
10. Zhao, Z. and **Kumar, M.**, “A Split-Bernstein Approach to Chance-Constrained Optimal Control”, *AIAA Journal of Guidance, Control and Dynamics*, Vol. 40, No. 11, pp. 2782-2795, 2017
11. Sun, Y. and **Kumar, M.**, “Uncertainty Propagation in Orbital Mechanics via Tensor Decomposition”, *Celestial Mechanics and Dynamical Astronomy* (Springer), Vol. 124, Issue 3, March 2016, pp. 269-294
12. Sun, Y. and **Kumar, M.**, “A Numerical Solver for High Dimensional Transient Fokker-Planck Equation in Modeling Polymeric Fluids”, *Journal of Computational Physics* (Elsevier), Vol. 289, 2015, pp. 149-168
13. Yang, C. and **Kumar, M.**, “An Information Guided Framework for Simulated Annealing,” *Journal of Global Optimization* (Springer), Aug. 2014, pp. 1-24, doi: 10.1007/s10898-014-0229-4
14. Sun, Y. and **Kumar, M.**, “Numerical solution of high dimensional stationary Fokker-Planck equations via tensor decomposition and Chebyshev spectral differentiation”, *Computers & Mathematics with Applications* (Elsevier), Vol. 67, 2014, pp. 1960-1977
15. **Kumar, M.** and Chakravorty, S., “Nonlinear Filter Based on the Fokker-Planck Equation,” *Journal of Guidance Control and Dynamics* (AIAA), Vol.35, No.1, 2012, pp. 68-79. doi: 10.2514/1.54070
16. Lampton, A., Valasek, J. and **Kumar, M.**, “Multi-Resolution State-Space Discretization for Q-Learning with Pseudo-Randomized Discretization,” *Journal of Control Theory and Applications*, Vol. 9, Issue 1, 2011, pp. 123-130
17. **Kumar, M.**, Chakravorty, S. and Junkins, J. L., “A Semianalytic Meshless Approach to the Transient Fokker-Planck Equation,” *Probabilistic Engineering Mechanics* (Elsevier), Vol. 25, Issue 3, Jul. 2010, pp. 323-331. doi:10.1016/j.probengmech.2010.01.006
18. **Kumar, M.**, Mortari, D. and Junkins, J. L., “An Analytical Approach to Star Identification Reliability,” *Acta Astronautica* (Elsevier), Vol. 66, Issues 3-4, Feb-Mar 2010, pp. 508-515. doi:10.1016/j.actaastro.2009.07.005
19. **Kumar, M.**, Chakravorty, S., Singla, P. and Junkins, J. L., “The Partition of Unity Finite Element Approach with hp-refinement for the Stationary Fokker-Planck Equation,” *Journal of Sound and Vibration* (Elsevier), Vol. 327, Issues 1-2, Oct. 2009, pp. 144-162 doi:10.1016/j.jsv.2009.05.033
20. **Kumar, M.**, Chakravorty, S. and Junkins, J. L., “A Homotopic Approach to Domain Determination and Solution Refinement for the Stationary Fokker-Planck Equation,” *Probabilistic Engineering Mechanics* (Elsevier), Vol. 24, Issue 3, July 2009, pp. 265-277 doi:10.1016/j.probengmech.2008.07.006
21. **Kumar, M.**, Chakravorty, S. and Junkins, J. L., “Computational Nonlinear Stochastic Control,” (Engineering Note) *Journal of Guidance Control and Dynamics* (AIAA), Vol. 32, No. 3, May-Jun 2009, pp. 1050-1055. doi: 10.2514/1.37128
22. **Kumar, M.**, and Tewari, A., “Trajectory and Attitude Simulation for Mars Aerocapture and Aerobraking,” *Journal of Spacecraft and Rockets* (AIAA), Vol. 43, No. 3, 2006, pp. 585-593. doi: 10.2514/1.15458
23. **Kumar, M.**, and Tewari, A., “Trajectory and Attitude Simulation for Aerocapture and Aerobraking,” *Journal of Spacecraft and Rockets* (AIAA), Vol. 42, No. 4, 2005, pp. 684-693. doi: 10.2514/1.7117

Book Chapters

24. **Kumar, M.**, Chakravorty, S. and Valasek, J., “Hierarchical Control and Planning for Advanced Morphing Systems,” in *Morphing Aerospace Vehicles and Structures*, J. Valasek (Ed.), John Wiley and Sons, Chichester, UK, April 2012, pp. 261-280
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37. Yang, C. and **Kumar, M.**, “A Closed-Loop Adaptive Monte Carlo Framework for Forecasting in GEO”, *Guidance, Navigation and Control Conference @AIAA SciTech*, San Diego, CA, January 7-11, 2019
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