

Curriculum Vitae

Grace X. Gao

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Academic Appointments

Assistant Professor

Aug. 2019–present

James and Anna Marie Spilker Faculty Fellow
Department of Aeronautics and Astronautics
Department of Electrical Engineering (by courtesy)

Director, Navigation and Autonomous Vehicles Laboratory (Stanford NAV Lab)
Lead, Robotics and Autonomous Systems Area, Stanford SystemX Alliance
Member, Stanford Center for AI Safety
Member, Center for Automotive Research at Stanford

Stanford University

Adjunct Professor

Department of Aerospace Engineering
University of Illinois at Urbana-Champaign

Assistant Professor

Oct. 2012–Jul. 2019

(Received tenure in May 2019, but declined the promotion due to moving to Stanford)
Department of Aerospace Engineering

with affiliate appointments in:
Coordinated Science Laboratory
Department of Electrical and Computer Engineering
Department of Computer Science
Information Trust Institute
Computational Science and Engineering

University of Illinois at Urbana-Champaign

Education

Ph.D. Electrical Engineering
Stanford University

Stanford, California
2004–2008

M.S. Electronics Engineering
Tsinghua University

Beijing, China
2001–2003

B.S. Mechanical Engineering
Tsinghua University

Beijing, China
1997–2001

Honors and Awards

Research Awards

- 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010, 2008, 2007
Best Paper/Presentation of the Session Award, *ION GNSS+ Conference*
(14 times in total)
- 2019
Campus Distinguished Promotion Award, *University of Illinois at Urbana-Champaign*
- 2018
CAREER Award, *National Science Foundation*
- 2017
Dean's Award for Excellence in Research,
College of Engineering, University of Illinois at Urbana-Champaign
- 2017
Fellow of Center for Advanced Study, *University of Illinois at Urbana-Champaign*
- 2016
Best Paper Award, *IEEE/ION PLANS Conference*
- 2014
Air Force Summer Faculty Fellow
- 2009
William E. Jackson Award, for outstanding Ph.D. thesis, *Radio Technical Commission for Aeronautics (RTCA)*
- 2009
50 GNSS Leaders to Watch, *GPS World Magazine*
- 2008
Early Achievement Award, *Institute of Navigation*
- 2007
Student Paper Award, *ION GNSS Conference*
- 2004
Graduate Student Fellowship, *Dept. of Electrical Engineering, Stanford University*
- 2003
Excellent Master's Thesis Award, *Tsinghua University*
- 2001
Exceptional Graduate of Beijing, *Beijing City Government*
- 2001
Exceptional Graduate of Tsinghua University, *Tsinghua University*
- 2001
Excellent Undergraduate Thesis Award, *Tsinghua University*

Teaching and Advising Awards

- 2018, 2017
Engineering Council Award for Excellence in Advising, *University of Illinois at Urbana-Champaign*
- 2018, 2017, 2015, 2014
Teachers Ranked as Excellent, *University of Illinois at Urbana-Champaign*
- 2016
AIAA Teacher of the Year, *AIAA Illinois Chapter*
- 2015
Everitt Award for Teaching Excellence, *College of Engineering, University of Illinois at Urbana-Champaign*

Other Research and Work Experience

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| Research Associate GPS Laboratory, Stanford University | Stanford, California Sep. 2008–Oct. 2012 |
| Research Assistant GPS Laboratory, Stanford University | Stanford, California 2005–2008 |
| Research Intern SiRF Technology, Inc. | San Jose, California Summer 2006 |
| R&D Engineer IBM China Research Laboratory | Beijing, China 2003–2004 |
| Research Intern Microsoft Research Asia | Beijing, China 2002–2003 |

Major Research Funding

\$8.3 Million allocated to Prof. Gao out of *\$57.6 Million* in total

Research Funding

1. 2021-2026, Kirtland Air Force Research Lab, \$2,663,313, “R&D to Improve the Integrity and Safety of the PNT Solution Using Current and Future SatNav signals,” PI
2. 2021-2024, Toyota TRI, \$600,000 out of \$2,572,639, “Autonomous Drifting: Demonstrating a Reciprocal Architecture for Motion Planning and Control,” Co-PI
3. 2021-2023, Ford, \$355,216, “A framework for localization integrity and robustness, through multi-modal sensor fusion ,” PI
4. 2021-2022, Amazon, \$80,000, “Trustworthy Autonomous Vehicle Localization using a Joint Model-driven and Data-driven Approach,” PI
5. 2020-2021, the Allstate Corporation, \$100,000 out of \$300,000, “Adaptive Stress Testing for Autonomous Vehicle Risk Assessment,” Co-PI
6. 2019-2021, Kirtland Air Force Research Lab, \$599,591, “Deep Learning for Optimal Satellite Navigation codes,” PI
7. 2018-2023, National Science Foundation, \$517,473, “CAREER: High Integrity Navigation for Autonomous Vehicles,” PI
8. 2018-2019, Kirtland Air Force Research Lab, \$100,000, “Deep Learning for Optimal Satellite Navigation codes,” PI
9. 2018-2021, Department of Education, \$150,000 out of \$1.2 Million, “GAANN: Enhancing Opportunities for Research and Training in Space Engineering,” Co-PI
10. 2017-2019, Department of Homeland Security, \$449,981, “Networked GPS Spoofing Detection for Power Systems,” PI
11. 2017-2022, Air Force Test Wing, \$226,000, “Education Partnership with Edwards Air Force Base for GPS Testing,” PI
12. 2017-2020, Army CERDEC, \$489,204, “GPS Receiver Integrity Monitoring,” PI
13. 2017, NASA Ames, \$60,803, “LiDAR-GPS Integration for Navigating UAVs in Urban Environments,” PI
14. 2016-2018, Kirtland Air Force Research Lab, \$150,000, “Optimal Solutions for GPS Reconfigurability,” PI

15. 2015-2020, Department of Energy, \$628,682 out of \$28.1 Million, “Secure GPS-based timing for the power grid, as part of the Center of Resilient Energy Delivery and Control (CREDC) center,” Senior Personnel
16. 2015-2018, Wright-Patterson Air Force Research Lab, \$438,435, “GNSS Vector Correlator: Harnessing Satellite Direction Cosine Diversity for Robust Positioning,” PI
17. 2015-2016, NASA Illinois Space Grant Consortium, \$10,000, “3-D Printing and Assembly of Nano-Satellites in Space,” Co-PI
18. 2014-2019, Rockwell Collins, \$100,000, “Gift fund for equipment for Advanced Satellite Navigation Laboratory,” PI
19. 2014, AFOSR summer faculty fellow, \$22,000, “Cooperative GPS Authentication,” PI
20. 2013-2015, UIUC Campus Research Board, \$17,200, “Authenticating GPS Data for Traffic Monitoring,” PI
21. 2013-2015, Department of Energy, \$488,140 out of \$18 Million, “GPS-based timing for the power grid, as part of the Trustworthy Cyber Infrastructure for the Power Grid (TCIPG) center,” Senior Personnel

Publications

Students supervised: **bold**; post-docs supervised: *italic*; Co-first authors: *

Note: the customary practice in the field for order of authors on scholarly publications is that students are named first; faculty are named last.

Journal Papers

[J32]. *Shreyas Kousik*, **Adam Dai** and Grace X. Gao, Ellipsotopes: Combining Ellipsoids and Zonotopes for Reachability Analysis and Fault Detection, IEEE Transactions on Automatic Control. Submitted.

[J31]. **Tara Mina** and Grace X. Gao, Designing Low-Correlation GPS Spreading Codes with a Natural Evolution Strategy Machine Learning Algorithm, Navigation: Journal of the Institute of Navigation. Submitted.

[J30]. **Sriramya Bhamidipati** and Grace X. Gao, Robust GPS-Vision Localization via Integrity-Driven Landmark Attention, Navigation: Journal of the Institute of Navigation. Submitted.

[J29]. **Sriramya Bhamidipati** and Grace X. Gao, Networked Timing Risk Analysis Against GPS Spoofing via Stochastic Reachability in PMUs, Navigation: Journal of the Institute of Navigation. Submitted.

[J28]. **Akshay Shetty**, **Derek Knowles** and Grace X. Gao, Connectivity Maintenance for Multi-Robot Systems Under Motion and Sensing Uncertainties Using Distributed ADMM-based Trajectory Planning, IEEE Transactions on Control of Network Systems. Submitted.

[J27]. **Adyasha Mohanty**, **Shubh Gupta** and Grace X. Gao, A Particle Filtering Framework for Integrity Risk of GNSS-Camera Sensor Fusion, Navigation: Journal of the Institute of Navigation. Accepted.

[J26]. **Shubh Gupta** and Grace X. Gao, Particle RAIM, Navigation: Journal of the Institute of Navigation. Accepted.

[J25]. **Akshay Shetty** and Grace X. Gao, Predicting State Uncertainty Bounds Using Non-linear

- Stochastic Reachability Analysis for Urban GNSS-based UAS Navigation, *IEEE Intelligent Transportation Systems*, vol. 22, no. 9, pp. 5952-5961, Sept. 2021. doi: 10.1109/TITS.2020.3040517.
- [J24]. **Shubhendra Chauhan** and Grace X. Gao, Spoofing Resilient State Estimation for the Power Grid Using an Extended Kalman Filter, *IEEE Transactions on Smart Grid*, Jan 2021. vol. 12, no. 4, pp. 3404-3414, July 2021. doi: 10.1109/TSG.2021.3051920.
- [J23]. **Shubhendra Chauhan** and Grace X. Gao, Synchronphasor Data Under GPS Spoofing: Attack Detection and Mitigation Using Residuals, *IEEE Transactions on Smart Grid*, Jan 2021. vol. 12, no. 4, pp. 3415-3424, July 2021. doi: 10.1109/TSG.2021.3051926.
- [J22]. **Cara Kataria**, Steven Franke, Grace X. Gao and Jennifer Bernhard, Secure Antenna Polarization Modulation Line-of-Sight Analysis and Demonstration, *IEEE Transactions on Antennas and Propagation*, vol. 69, no. 7, pp. 4100-4108, July 2021. doi: 10.1109/TAP.2021.3060454.
- [J21]. **Matthew Peretic** and Grace X. Gao, Design of a Parallelized Direct Position Estimation-Based GNSS Receiver, *Navigation: Journal of the Institute of Navigation*, vol. 68, no. 1, pp. 21-39, Dec 2020. doi: 10.1002/navi.402.
- [J21]. **Akshay Shetty** and Grace X. Gao, Predicting State Uncertainty Bounds Using Non-linear Stochastic Reachability Analysis for Urban GNSS-based UAS Navigation, *IEEE Intelligent Transportation Systems*. pp.1-10, Dec 2020. doi: 10.1109/TITS.2020.3040517.
- [J20]. **Sriramya Bhamidipati** and Grace X. Gao, Integrity Monitoring of Graph-SLAM Using GPS and Fish-eye Camera, *Navigation: Journal of the Institute of Navigation*, vol. 67, no. 3, pp. 583-600, Aug 2020.
- [J19]. **Arthur Chu, Shubhendra Chauhan** and Grace X. Gao, GPS Multi-Receiver Direct Position Estimation for Aerial Applications, *IEEE Transactions on Aerospace and Electronic Systems*, vol. 56, no. 1, pp. 249 - 262, Feb 2020.
- [J18]. **Tara Mina, Sriramya Bhamidipati** and Grace X. Gao, GPS Spoofing Detection for the Power Grid Network using a Multi-Receiver Hierarchical Framework Architecture, *Navigation: Journal of the Institute of Navigation*, vol. 66, no. 4, pp. 857-875, Dec 2019.
- [J17]. **Sriramya Bhamidipati** and Grace X. Gao, GPS Multi-Receiver Joint Direct Time Estimation and Spoofer Localization, *IEEE Transactions on Aerospace and Electronic Systems*, vol. 55, no. 4, pp. 1907-1919, Aug 2019.
- [J16]. **Akshay Shetty** and Grace X. Gao, Adaptive Covariance Estimation of LiDAR-based Positioning Errors for UAVs, *Navigation: Journal of the Institute of Navigation*, vol. 66, no. 2, pp. 463-476, May 2019.
- [J15]. **Cara Kataria**, Grace X. Gao and Jennifer Bernhard, Design of a Compact Hemispherical GPS Antenna with Direction Estimation Capabilities, *IEEE Transactions on Antennas and Propagation*, vol. 67, no. 5, pp. 2878-2885, May 2019.
- [J14]. **Sriramya Bhamidipati** and Grace X. Gao, Locating Multiple GPS Jammers Using Networked UAVs, *IEEE Transactions on Internet of Things*, vol. 6, no. 2, pp. 1816 - 1828, Apr 2019.
- [J13]. **Derek Chen** and Grace Xingxin Gao, Probabilistic Graphical Fusion of LiDAR, GPS, and 3D Building Maps for Urban UAV Navigation, *Navigation: Journal of the Institute of Navigation*, vol. 66, no. 1, pp. 151-168, Mar 2019.

- [J12]. **Yuting Ng** and Grace X. Gao, GNSS Multi-Receiver Vector Tracking, *IEEE Transactions on Aerospace and Electronic Systems*, vol. 53, no. 5, pp. 2583-2593, Oct 2017.
- [J11]. *Liang Heng* and Grace X. Gao, Accuracy of Range-Based Cooperative Positioning: A Lower Bound Analysis, *IEEE Transactions on Aerospace and Electronic Systems*, vol. 53, no. 5, pp. 2304-2316, Oct 2017.
- [J10]. *Liang Heng*, **Athindran Rakesh Kumar** and Grace X. Gao, Location Hash: Private Proximity Detection Using Partial GPS Information, *IEEE Transactions on Aerospace and Electronic Systems*, vol. 52, no. 6, pp. 2873-2885, Dec 2016.
- [J9]. Grace X. Gao, Matteo Sgammini, Mingquan Lu and Nobuaki Kubo, Protecting GNSS Receivers from Jamming, *Proceedings of the IEEE*, vol. 104, no. 6, pp. 1327-1338, Jun 2016.
- [J8]. *Liang Heng*, Daniel B. Work and Grace X. Gao, GNSS Signal Authentication from Cooperative Peers, *IEEE Intelligent Transportation Systems*, vol. 16, no. 4, pp. 1794-1805, Aug 2015.
- [J7]. *Liang Heng*, Todd Walter, Per Enge and Grace X. Gao, GNSS Multipath and Jamming Mitigation Using High-Mask-Angle Antennas and Multiple Constellations, *IEEE Transactions on Intelligent Transportation Systems*, vol. 16, no. 2, pp. 741-750, Apr 2015.
- [J6]. Grace X. Gao, Holmer Denks, Achim Steingassnd, Michael Meurer, Todd Walter and Per Enge, DME Interference Mitigation Based on Flight Test Data Over European Hot Spot, *GPS Solutions*, vol. 17, no. 1, Jan 2013.
- [J5]. Grace X. Gao and Per Enge, How Many GNSS Satellites Are Too Many? *IEEE Transactions on Aerospace and Electronic Systems*, vol. 48, no. 4, pp. 2865-2874, Oct 2012.
- [J4]. Liang Heng, Grace X. Gao, Todd Walter and Per Enge, GPS Signal-in-Space Integrity Performance Evolution in the Last Decade, *IEEE Transactions on Aerospace and Electronic Systems*, *IEEE Transactions on Aerospace and Electronic Systems*, vol. 48, no. 4, pp. 2932-2946, Oct 2012.
- [J3]. Patrick Henkel, Grace X. Gao, Todd Walter and Christoph Gunther, Robust Multi-Carrier, Multi-Satellite Vector Phase Locked Loop with Wideband Ionospheric Correction and Integrated Weighted RAIM, *Journal of Italian Institute of Navigation*, issue 190, Dec 2009.
- [J2]. Grace X. Gao, Alan Chen, Sherman Lo, David De Lorenzo and Per Enge, Compass-M1 Broadcast Codes in E2, E5b and E6 Frequency Bands, *IEEE Journal of Selected Topics in Signal Processing*, Special Issue on Advanced Signal Processing for GNSS and Robust Navigation, vol. 3, no. 4, pp. 599-612, Aug 2009.
- [J1]. Zhe Xiang, Song Song, Jin Chen, Hao Wang, Jian Huang and Grace X. Gao, A Wireless LAN-based Indoor Positioning Technology, *IBM Journal of Research and Development*, vol. 48, no. 5, pp. 617-626, Sep 2004.

Books

- [B2]. Jade Morton, Frank van Diggelen, Bradford Parkinson, James Spilker, Jr., Sherman Lo, and Grace X. Gao, "Position, Navigation, and Timing Technologies in the 21st Century: Integrated Satellite Navigation, Sensor Systems, and Civil Applications, vol. 1 & 2" *John Wiley & Sons*, 2021.
- [B1]. Lance Davis, Per Enge and Grace X. Gao, "Global Navigation Satellite Systems: Report of a Joint Workshop of the National Academy of Engineering and the Chinese Academy of Engineering," the National Academies Press, ISBN 13: 978-0-309-22275-4, 2012.

Conference Papers

- [C93]. **Sriramya Bhamidipati**, *Shreyas Kousik* and Grace X. Gao, Set-valued Shadow Matching using Zonotopes, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2021), St. Louis, MO, Sep 2021.
- [C92]. **Sriramya Bhamidipati**, **Tara Mina** and Grace X. Gao, Design Considerations of a Lunar Navigation Satellite System with Time-Transfer from Earth-GNSS, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2021), St. Louis, MO, Sep 2021.
- [C91]. **Adyasha Mohanty** and Grace X. Gao, A Particle Filtering Framework for Tight GNSS-Camera Fusion using Convolutional Neural Networks, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2021), St. Louis, MO, Sep 2021.
- [C90]. **Adyasha Mohanty**, **Remy Zawislak**, **Sriramya Bhamidipati**, and Grace X. Gao, Precise Relative Positioning in Tandem Drifting using Drift Dynamics, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2021), St. Louis, MO, Sep 2021.
- [C89]. **Derek Knowles** and Grace X. Gao, Euclidean Distance Matrix-based Rapid Fault Detection and Exclusion, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2021), St. Louis, MO, Sep 2021.
- [C88]. **Tara Mina**, **Ashwin V. Kanhere**, *Shreyas Kousik* and Grace X. Gao, Continuous GPS Authentication with Chimera using Stochastic Reachability Analysis, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2021), St. Louis, MO, Sep 2021.
- [C87]. **Ashwin V. Kanhere***, **Shubh Gupta***, **Akshay Shetty** and Grace X. Gao, Improving GNSS Positioning using Neural Network-based Corrections, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2021), St. Louis, MO, Sep 2021.
- [C86]. **Akshay Shetty**, **Timmy Hussain** and Grace X. Gao, Decentralized Connectivity Maintenance for Multi-robot Systems Under Motion and Sensing Uncertainties, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2021), St. Louis, MO, Sep 2021.
- [C85]. **Long Kiu Chung***, **Adam Dai***, *Shreyas Kousik* and Grace X. Gao, Constrained Feed-forward Neural Network Training via Reachability Analysis, Robotics: Science and Systems (RSS 2021) Robotics for People (R4P) Workshop, Jul 2021.
- [C84]. **Sriramya Bhamidipati** and Grace X. Gao, Integrity-driven Landmark Attention for GPS-Vision Navigation via Stochastic Reachability, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2020), St. Louis, MO, Sep 2020.
- [C83]. **Shubh Gupta** and Grace X. Gao, Data-Driven Protection Levels for Camera and 3D Map-based Safe Urban Localization, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2020), St. Louis, MO, Sep 2020.
- [C82]. **Adyasha Mohanty**, **Shubh Gupta** and Grace X. Gao, A Particle Filtering Framework for Sensor Fusion Integrity Monitoring, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2020), St. Louis, MO, Sep 2020.
- [C81]. **Tara Mina** and Grace X. Gao, Devising Low-Correlation Spreading Code Families via Reinforcement Learning, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2020), St. Louis, MO, Sep 2020. *Best Presentation of the Session Award.*

- [C80]. **Akshay Shetty** and Grace X. Gao, Trajectory Planning Under Stochastic and Bounded Sensing Uncertainties Using Stochastic Reachability, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2020), St. Louis, MO, Sep 2020.
- [C79]. **Sriramya Bhamidipati** and Grace X. Gao, GPS Spoofing Mitigation and Timing Risk Analysis in Networked PMUs via Stochastic Reachability, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2020), St. Louis, MO, Sep 2020.
- [C78]. **Shubhendra Chauhan** and Grace X. Gao, Hardware-In-the-Loop GPS and PMU Integrated Datasets for the Power Grid Under GPS Spoofing Attacks, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2020), St. Louis, MO, Sep 2020.
- [C77]. **Andrew Neish**, Tyler Reid, Frank van Diggelen and Grace X. Gao, GNSS in the Classroom: Taking the Paralysis out of Analysis, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2020), St. Louis, MO, Sep 2020.
- [C76]. **Ashwin Kanhere** and Grace X. Gao, LiDAR SLAM Utilizing Normal Distribution Transform and Measurement Consensus, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2019), Miami, FL, Sep 2019.
- [C75]. **Sriramya Bhamidipati** and Grace X. Gao, SLAM-based Integrity Monitoring Using GPS and Fisheye Camera, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2019), Miami, FL, Sep 2019.
- [C74]. **Akshay Shetty** and Grace X. Gao, Predicting State Uncertainty for GNSS-based UAV Path Planning Using Stochastic Reachability, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2019), Miami, FL, Sep 2019.
- [C73]. **Shubh Gupta** and Grace X. Gao, Particle RAIM for Integrity Monitoring, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2019), Miami, FL, Sep 2019.
- [C72]. **Sriramya Bhamidipati** and Grace X. Gao, Distributed Cooperative SLAM-based Integrity Monitoring Via a Network of Receivers, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2019), Miami, FL, Sep 2019.
- [C71]. **Siddharth Tanwar** and Grace X. Gao, Multi-Epoch Multi-Agent Collaborative Localization Using Grid-based 3DMA GNSS and Inter-Agent Ranging, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2019), Miami, FL, Sep 2019.
- [C70]. **Tara Mina** and Grace X. Gao, Devising High-Performing GPS Pseudo-Random Noise Codes Using Evolutionary Learning Algorithms, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2019), Miami, FL, Sep 2019. *Best Presentation of the Session Award.*
- [C69]. **Shubhendra Chauhan** and Grace X. Gao, Vertical Protection Level Estimation for Direct Positioning Using a Bayesian Approach, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2019), Miami, FL, Sep 2019.
- [C68]. **Akshay Shetty** and Grace X. Gao, UAV Pose Estimation Using Cross-view Geolocalization with Satellite Imagery, Proceedings of the 2019 IEEE International Conference on Robotics and Automation (ICRA), Montreal, Canada, May 2019.
- [C67]. **Ashwin Kanhere** and Grace X. Gao, Integrity for GPS/LiDAR Fusion Utilizing a RAIM Framework, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2018), Miami, FL, Sep 2018. *Best Presentation of the Session Award.*

- [C66]. **Siddharth Tanwar** and Grace X. Gao, Decentralized Collaborative Localization in Urban Environments Using 3D-Mapping-Aided (3DMA) GNSS and Inter-Agent Ranging, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2018), Miami, FL, Sep 2018.
- [C65]. **Sriramya Bhamidipati** and Grace X. Gao, Multiple GPS Fault Detection and Isolation Using a Graph-SLAM Framework, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2018), Miami, FL, Sep 2018.
- [C64]. **Tara Mina, Sriramya Bhamidipati** and Grace X. Gao, Detecting GPS Spoofing via a Multi-Receiver Hybrid Communication Network for Power Grid Timing Verification, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2018), Miami, FL, Sep 2018.
- [C63]. **Siddharth Tanwar** and Grace X. Gao, Decentralized Collaborative Localization with Deep GPS Coupling for UAVs, Proceedings of the IEEE/ION PLANS conference, Monterey, CA, Apr 2018.
- [C62]. **Arthur Chu** and Grace X. Gao, Vertical Integrity Monitoring with Direct Positioning, Proceedings of the IEEE/ION PLANS conference, Monterey, CA, Apr 2018.
- [C61]. **Sriramya Bhamidipati** and Grace X. Gao, Simultaneous Localization of Multiple Jamers and Receivers Using Probability Hypothesis Density, Proceedings of the IEEE/ION PLANS conference, Monterey, CA, Apr 2018.
- [C60]. **Sriramya Bhamidipati, Tara Mina** and Grace X. Gao, GPS Time Authentication against Spoofing via a Network of Receivers for Power Systems, Proceedings of the IEEE/ION PLANS conference, Monterey, CA, Apr 2018.
- [C59]. **Sriramya Bhamidipati** and Grace X. Gao, GPS Spoofer Localization for PMUs using Multi-Receiver Direct Time Estimation, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2017), Portland OR, Sep 2017. *Best Presentation of the Session Award.*
- [C58]. **Akshay Shetty** and Grace X. Gao, Covariance Estimation for GPS-LiDAR Sensor Fusion for UAVs, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2017), Portland OR, Sep 2017.
- [C57]. **Arthur Chu** and Grace X. Gao, Multi-Receiver Direct Position Estimation Tested on a Full-Scale Fixed-wing Aircraft, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2017), Portland OR, Sep 2017.
- [C56]. **Shubhendra Chauhan** and Grace X. Gao, Joint GPS and Vision Estimation Using an Adaptive Filter, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2017), Portland OR, Sep 2017.
- [C55]. **Cara Kataria** and Grace X. Gao, A Single Hemispherical Antenna for GNSS Interference Mitigation and Direction Estimation, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2017), Portland OR, Sep 2017.
- [C54]. **Sriramya Bhamidipati, Yuting Ng** and Grace X. Gao, Multi-Receiver GPS-based Direct Time Estimation for PMUs, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2016), Portland OR, Sep 2016. *Best Presentation of the Session Award.*
- [C53]. **Yuting Ng** and Grace X. Gao, Direct Position Estimation Utilizing Non-Line-of-Sight (NLOS) GPS Signals, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2016), Portland OR, Sep 2016.

- [C52]. **Yuting Ng** and Grace X. Gao, Computationally Efficient Direct Position Estimation via Low Duty-Cycling, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2016), Portland OR, Sep 2016.
- [C51]. **Enyu Luo, Xin Hui Fang, Yuting Ng** and Grace X. Gao, Shinerbot: Bio-inspired Collective Robot Swarm Navigation Platform, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2016), Portland OR, Sep 2016.
- [C50]. **Yuting Ng** and Grace X. Gao, Mitigating Jamming and Meaconing Attacks Using Direct GPS Positioning, in Proceedings of the IEEE/ION PLANS conference, Savannah GA, Apr 2016. *Best Paper Award.*
- [C49]. **Yuting Ng** and Grace X. Gao, Joint GPS and Vision Direct Position Estimation, Proceedings of the IEEE/ION PLANS conference, Savannah GA, Apr 2016.
- [C48]. **Yuting Ng** and Grace X. Gao, Robust GPS-Based Direct Time Estimation for PMUs, Proceedings of the IEEE/ION PLANS conference, Savannah GA, Apr 2016.
- [C47]. **Yuting Ng** and Grace X. Gao, Advanced Multi-Receiver Position-Information-Aided Vector Tracking for Robust GPS Time Transfer to PMUs, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2015), Tampa FL, Sep 2015. Best Paper of the Session Award.
- [C46]. **Yuting Ng** and Grace X. Gao, Advanced Multi-Receiver Vector Tracking for Positioning a Land Vehicle, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2015), Tampa FL, Sep 2015.
- [C45]. **Akshay Shetty** and Grace X. Gao, Vision-Aided Measurement Level Integration of Multiple GPS Receivers for UAVs, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2015), Tampa FL, Sep 2015.
- [C44]. **Derek Chen** and Grace X. Gao, Robust MAV State Estimation Using an M-Estimator Augmented Sensor Fusion Graphs, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2015), Tampa FL, Sep 2015.
- [C43]. **Akshay Shetty** and Grace X. Gao, Measurement Level Integration of Multiple Low-Cost GPS Receivers for UAVs, ION International Technical Meeting 2015, Dana Point, California, Jan 2015.
- [C42]. **Derek Chen** and Grace X. Gao, Simultaneous State Estimation of UAV Trajectory Using Probabilistic Graph Models, ION International Technical Meeting 2015, Dana Point, California, Jan 2015.
- [C41]. **Daniel Chou, Yuting Ng** and Grace X. Gao, Robust GPS-Based Timing for PMUs Based on Multi-Receiver Position-Information-Aided Vector Tracking, ION International Technical Meeting 2015, Dana Point, California, Jan 2015.
- [C40]. **Yuting Ng** and Grace X. Gao, Multi-Receiver Vector Tracking Based on a Python Platform, ION International Technical Meeting 2015, Dana Point, California, Jan 2015.
- [C39]. *Liang Heng*, **Daniel Chou** and Grace X. Gao, Cooperative GPS Signal Authentication from Unreliable Peers, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2014), Tampa FL, Sep 2014. *Best Presentation of the Session Award.*
- [C38]. **Athindran Ramesh Kumar**, *Liang Heng* and Grace X. Gao, GPS Privacy: Enabling

Proximity-based Services While Keeping GPS Locations Private, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2014), Tampa FL, Sep 2014.

[C37]. **Daniel Chou, Liang Heng** and Grace X. Gao, Robust GPS-Based Timing for Phasor Measurement Units: A Position-Information-Aided Vector Tracking Approach, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2014), Tampa FL, Sep 2014. *Best Presentation of the Session Award*.

[C36]. **Eliot Wycoff** and Grace X. Gao, A Python Software Platform for Cooperatively Tracking Multiple GPS Receivers, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2014), Tampa FL, Sep 2014.

[C35]. *Liang Heng* and Grace X. Gao, Navigating Robot Swarms Using Collective Intelligence Learned from Golden Shiner Fish, Proceedings of the Collective Intelligence Conference (CI2014), Cambridge, MA, Jun 2014.

[C34]. *Liang Heng*, Jonathan Makela, Alejandro Dominguez-Garcia, Rakesh Bobba, William Sanders and Grace X. Gao, Reliable GPS-based Timing for Power System Applications: A Multi-Layered Multi-Receiver Approach, Proceedings of the 2014 IEEE Power and Energy Conference at Illinois (IEEE PECE 2014), Champaign, IL, Feb 2014.

[C33]. *Liang Heng* and Grace X. Gao, Accuracy of Range-Based Localization Schemes in Random Sensor Networks: A Lower Bound Analysis, Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IEEE/RSJ IROS 2013), Tokyo, Japan, Nov 2013.

[C32]. **Derek Chen, Liang Heng, Dan Jia** and Grace X. Gao, Distributed Array of GPS Receivers for 3D Wind Profile Determination in Wind Farms, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2013), Nashville, TN, Sep 2013. *Best Presentation of the Session Award*.

[C31]. *Liang Heng* and Grace X. Gao, Networked GPS Approach to Tracking Marine Animal Schools, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2013), Nashville, TN, Sep 2013.

[C30]. *Liang Heng*, Todd Walter, Per Enge and Grace X. Gao, Overcoming RFI with High Mask Angle Antennas and Multiple GNSS Constellations, Proceedings of the Institute of Navigation GNSS+ conference (ION GNSS+ 2013), Nashville, TN, Sep 2013.

[C29]. Grace X. Gao, Kaz Gunning, Todd Walter and Per Enge, Mitigating Personal Privacy Device Interference for Aviation Users, Proceedings of the 25th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS 2012), Nashville, TN, Sep 2012.

[C28]. *Liang Heng*, Grace X. Gao, Todd Walter and Per Enge, GLONASS signal-in-space anomalies since 2009, Proceedings of the 25th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS 2012), Nashville, TN, Sep 2012. *Best Presentation of the Session Award*.

[C27]. *Liang Heng*, Grace X. Gao, Todd Walter and Per Enge, Automated Verification of Potential GPS Signal-In-Space Anomalies Using Ground Observation Data, Proceedings of the IEEE/ION PLANS conference, Myrtle Beach, SC, Apr 2012.

[C26]. Sam Pullen, Grace X. Gao, Carmen Tedeschi and John Warburton, The Impact of Uninformed RF Interference on GBAS and Potential Mitigations, ION International Technical Meeting 2012, Newport Beach, California, Jan 2012.

- [C25]. Liang Heng, Grace X. Gao, Todd Walter and Per Enge, Statistical Characterization of GLONASS Broadcast Clock Errors and Signal-In-Space Errors, ION International Technical Meeting 2012, Newport Beach, California, Jan 2012.
- [C24]. Grace X. Gao, Liang Heng, Todd Walter and Per Enge, Breaking the Ice: Navigating in the Arctic, Proceedings of the Institute of Navigation GNSS conference (ION GNSS 2011), Portland, Oregon, Sep 2011. *Best Presentation of the Session Award*.
- [C23]. Liang Heng, Grace X. Gao, Todd Walter and Per Enge, Statistical Characterization of GLONASS Signal-In-Space Errors, Proceedings of the Institute of Navigation GNSS conference (ION GNSS 2011), Portland, Oregon, Sep 2011.
- [C22]. Myungjun Choi, Juan Blanch, Dennis Akos, Liang Heng, Grace X. Gao, Todd Walter and Per Enge, Demonstrations of Multi-Constellation Advanced RAIM for Vertical Guidance using GPS and GLONASS Signals, Proceedings of the Institute of Navigation GNSS conference (ION GNSS 2011), Portland, Oregon, Sep 2011.
- [C21]. Stefan Erker, Steffen Thoelet, Johann Furthner, Michael Meurer, Grace X. Gao, Liang Heng, Todd Walter and Per Enge, GLONASS K First in Orbit Signal in Space Analysis of Russian New Satellite Generation, Proceedings of the Institute of Navigation GNSS conference (ION GNSS 2011), Portland, Oregon, Sep 2011.
- [C20]. Liang Heng, Grace X. Gao, Todd Walter and Per Enge, Statistical Characterization of GPS Signal-In-Space Errors, ION International Technical Meeting 2011, San Diego, California, Jan 2011.
- [C19]. Patryk Jurkowski, Patrick Henkel, Grace X. Gao and Christoph Gunther, Integer ambiguity resolution with tight and soft baseline constraints for freight stabilization at helicopters and cranes, ION National Technical Meeting 2011, San Diego, California, Jan 2011.
- [C18]. David Varodayan and Grace X. Gao, Redundant Metering for Integrity with Information-Theoretic Confidentiality, Proceedings of the IEEE International conference on Smart Grid Communications, SGC 2010, Gaithersburg, Maryland, Oct 2010.
- [C17]. Grace X. Gao, Liang Heng, Gabriel Wong, Eric Phelts, Juan Blanch, Todd Walter, Per Enge, Stefan Erker, Steffen Thoelet and Michael Meurer, GPS in Mid-life with an International Team of Doctors, Analyzing IIF-1 Satellite Performance and Backward- Compatibility, Proceedings of the Institute of Navigation GNSS conference (ION GNSS 2010), Portland, Oregon, Sep 2010. *Best Presentation of the Session Award*.
- [C16]. Liang Heng, Grace X. Gao, Todd Walter and Per Enge, GPS Signal-in-Space Anomalies in the Last Decade, Data Mining of 400,000,000 GPS Navigation Message, Proceedings of the Institute of Navigation GNSS conference (ION GNSS 2010), Portland, Oregon, Sep 2010.
- [C15]. Grace X. Gao, Haochen Tang, Juan Blanch, Jiyun Lee, Todd Walter and Per Enge, Methodology and Case Studies of Signal-in-Space Error Calculation Top-down Meets Bottom-up, Proceedings of the Institute of Navigation GNSS conference (ION GNSS 2009), Savannah, Georgia, Sep 2009.
- [C14]. Patrick Henkel, Grace X. Gao, Todd Walter and Christoph Gunther, Robust Multi-Carrier, Multi-Satellite Vector Phase Locked Loop with Wideband Ionospheric Correction and Integrated Weighted RAIM, ENC Global Navigation Satellite Systems Conference 2009, Naples, Italy, May 2009.
- [C13]. Grace X. Gao, Dennis Akos, Todd Walter and Per Enge, Understanding the GIOVE-

B Broadcast Codes of the Galileo System, IEEE Asilomar Conference on Signals, Systems and Computers, Pacific Grove, California, Oct 2008.

[C12]. Shankar Ramakrishnan, Grace X. Gao, David De Lorenzo, Todd Walter, Per Enge and Dennis Akos, Design and Analysis of Reconfigurable Embedded GNSS Receivers Using Model-Based Design Tools, Proceedings of the Institute of Navigation GNSS conference (ION GNSS 2008), Savannah, Georgia, Sep 2008. *Best Presentation of the Session Award*.

[C11]. Grace X. Gao, Alan Chen, Sherman Lo, David De Lorenzo and Per Enge, Compass-M1 Broadcast Codes and their Application to Acquisition and Tracking, ION National Technical Meeting 2008, San Diego, California, Jan 2008.

[C10]. Grace X. Gao, DME/TACAN Interference and its Mitigation in L5/E5 Bands, Proceedings of the Institute of Navigation GNSS (ION GNSS 2007), Fort Worth, Texas, Sep 2007. *Best Presentation of the Session Award* and Student Paper Award.

[C9]. Grace X. Gao, David De Lorenzo, Todd Walter and Per Enge, Acquisition and Tracking of GIOVE-A Broadcast L1/E5/E6 Signals and Analysis of DME/TACAN Interference on Receiver Design, ENC Global Navigation Satellite Systems Conference 2007, Geneva, Switzerland, May 2007.

[C8]. Grace X. Gao, Seebany Datta-Barua, Todd Walter and Per Enge, Ionosphere Effects for Wideband GNSS Signals, ION Annual Meeting 2007, Cambridge, Massachusetts, Apr 2007.

[C7]. Grace X. Gao, David De Lorenzo, Alan Chen, Sherman Lo, Dennis Akos, Todd Walter and Per Enge, Galileo GIOVE-A Broadcast E5 Codes and their Application to Acquisition and Tracking, ION National Technical Meeting 2007, San Diego, California, Jan 2007.

[C6]. Grace X. Gao, Jim Spilker Jr., Todd Walter, Per Enge and Anthony Pratt, Code Generation Scheme and Property Analysis of Broadcast Galileo L1 and E6 Signals, Proceedings of the Institute of Navigation GNSS (ION GNSS 2006), Fort Worth, Texas, Sep 2006.

[C5]. Grace X. Gao, Zhe Xiang, Hao Wang, Jun Shen, Jian Huang and Song Song, An Approach to Security and Privacy of RFID System for Supply Chain, IEEE International Conference on e-Commerce Technology for Dynamic e-Business 2004, Beijing, China, Sep 2004.

[C4]. Grace X. Gao, Richard Yao and Zhenming Feng, Hadamard Coded Multi-band UWB, IEEE Semiannual Vehicular Technology Conference (VTC) 2003, Orlando, Florida, Oct 2003.

[C3]. Richard Yao, Grace X. Gao, Zhengqi Chen and Wenwu Zhu, UWB Multipath Channel Model Based on Time-Domain UTD Technique, IEEE Global Communications Conference GLOBECOM 2003, San Francisco, California, Dec 2003.

[C2]. Grace X. Gao, Lu Mingquan and Feng Zhenming, Asymmetric Hexagonal QAM Based OFDM System, IEEE International Conference on Communications, Circuits and Systems and West Sino Expositions 2002, Xi'an, China, Jun 2002.

[C1]. Grace X. Gao, Lu Mingquan and Feng Zhenming, Optimal Wavelet Packet Based Multicarrier Modulation over Multipath Wireless Channels, IEEE International Conference on Communications, Circuits and Systems and West Sino Expositions 2002, Xi'an, China, Jun 2002.

Magazine Articles

[M16]. **Akshay Shetty** and Grace X. Gao, GPS-Lidar Fusion with 3D City Models, GPS World

Magazine, Sep 2017. Cover Story.

[M15]. **Yuting Ng** and Grace X. Gao, Position Estimation Using Non-Line-of-Sight GPS signals, GPS World Magazine, Mar 2017.

[M14]. **Sriramya Bhamidipati**, Yuting Ng and Grace X. Gao, Multi-Receiver GPS-Based Direct Time Estimation for PMUs, Inside GNSS Magazine, Jan-Feb 2017. Cover Story.

[M13]. *Liang Heng*, **Athindran Ramesh Kumar** and Grace X. Gao, GPS Confidential: Enabling Proximity Detection While Preserving Location Privacy, Inside GNSS Magazine, Sep-Oct 2015.

[M12]. **Eliot Wycoff**, **Yuting Ng** and Grace X. Gao, Python GNSS Receiver: An Object-Oriented Software Platform Suitable for Multiple Receivers, GPS World Magazine, Feb 2015.

[M11]. *Liang Heng*, **Daniel Chou** and Grace X. Gao, Reliable GPS-Based Timing for Power Systems: A Multi-Layered, Multi-Receiver Architecture, Inside GNSS Magazine, Nov-Dec 2014.

[M10]. *Liang Heng*, Daniel B. Work and Grace X. Gao, Reliability from Unreliable Peers: Cooperative GNSS Authentication, Inside GNSS Magazine, Sep-Oct 2013.

[M9]. Sam Pullen and Grace X. Gao, GNSS Jamming in the Name of Privacy: Potential Threat to GPS Aviation, Inside GNSS Magazine, Mar-Apr 2012.

[M8]. Liang Heng, Grace X. Gao, Todd Walter and Per Enge, Digging into GPS integrity: Charting the evolution of signal-in-space performance by data mining 400,000,000 navigation messages, GPS World, vol. 22, no. 11, pp. 4449, Nov 2011.

[M7]. Grace X. Gao, Liang Heng, Todd Walter and Per Enge, Breaking the Ice: Navigation in the Arctic, Inside GNSS Magazine, Sep-Oct 2011.

[M6]. R. Eric Phelts, Grace X. Gao, Gabriel Wong, Liang Heng, Todd Walter, Per Enge, Stefan Erker, Steffen Thoenert and Michael Meurer, Aviation Grade, New GPS Signals Chips Off the Block IIF, Inside GNSS Magazine, Jul-Aug 2010.

[M5]. Steffen Thoenert, Stefan Erker, Michael Meurer, Liang Heng, Eric Phelts, Grace X. Gao, Gabriel Wong, Todd Walter and Per Enge, On the Air, New Signals from the First GPS IIF Satellite, Inside GNSS Magazine, Jul-Aug 2010. Cover Story.

[M4]. Grace X. Gao, Liang Heng, David De Lorenzo, Sherman Lo, Dennis Akos, Alan Chen, Todd Walter, Per Enge and Bradford Parkinson, Modernization Milestone: Observing the First GPS Satellite with an L5 Payload, Inside GNSS Magazine, May-Jun 2009.

[M3]. Grace X. Gao, Dennis Akos, Todd Walter and Per Enge, GIOVE-B on the Air: Understanding Galileo's New Signals, Inside GNSS Magazine, May-Jun 2008. [M2]. Grace X. Gao, Alan Chen, Sherman Lo, David De Lorenzo and Per Enge, GNSS over China: the Compass MEO Satellite Codes, Inside GNSS Magazine, Jul-Aug 2007. Cover Story.

[M1]. Sherman Lo, Alan Chen, Per Enge, Grace X. Gao, Dennis Akos, Jean-Luc Issler, Lionel Ries, Thomas Grelier and Joel Dantepal, GNSS Album: Images and Spectral Signatures of the New GNSS Signals, Inside GNSS Magazine, May-Jun 2006. Cover Story.

Patents

[P2]. Grace X. Gao and David Varodayan, "Method and Apparatus for Processing Signals," United States Patent 12/912,878.

[P1]. Hao Wang, Rongyao Fu, Song Song, Grace X. Gao, Zhe Xiang, and Jian Huang, “Apparatus and Method for Detecting Asset Position,” United States Patent 200707309.

Invited Talks

2021 AI Safety Workshop, Stanford CA
2020 Center for Automotive Research at Stanford (CARS)
2020 Stanford SystemX
2020 West Virginia University Robotics Seminar Series
2020 Ford Autonomous Driving, CA
2018 Lawrence Livermore National Laboratory, Livermore, CA
2018 Department of Aeronautics and Astronautics, Stanford University
2017 Sibley School of Mechanical and Aerospace Engineering, Cornell University
2017 School of Aerospace Engineering, Georgia Institute of Technology
2017 Wright-Patterson Air Force Research Lab, Dayton, OH
2017 Kirtland Air Force Research Lab, Albuquerque, NM
2017 Robotics Seminar, MIT
2017 Department of Aerospace Engineering, University of Michigan
2017 Department of Mechanical and Aerospace Engineering, Illinois Institute of Technology
2016 US Army Communications-Electronics Research, Development and Engineering Center, (CERDEC), Aberdeen MD
2016 National Institute of Standards and Technology (NIST), Gaithersburg, MD
2016 Dept. of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign
2016 Field Robotics Center, Carnegie Mellon University
2016 InsideGNSS Magazine Webinar
2016 Engineering for Everyone, University of Illinois
2015 Autonomous Systems and Robotics Technical Area, NASA Ames
2015 GPS World Magazine Webinar
2015 The GPS Laboratory, Stanford University
2014 Illinois State Geological Survey
2014 Stanford Center for Position, Navigation and Time Symposium, Stanford University
2014 Illinois State Geological Survey
2014 Rockwell Collins, Inc. Cedar Rapids, IA
2014 Qualcomm Inc, San Diego, CA
2014 CyberGIS Center, University of Illinois at Urbana-Champaign
2013 Illinois Space Society, University of Illinois at Urbana-Champaign
2013 Quantitative Division, Dept. of Psychology, University of Illinois at Urbana-Champaign
2013 ION Dayton Section
2013 School of Aeronautics and Astronautics, Purdue University
2013 Dept. of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign
2012 Dept. of Aerospace Engineering and Engineering Mechanics, University of Texas at Austin
2012 Sibley School of Mechanical and Aerospace Engineering, Cornell University
2012 Dept. of Aerospace Engineering, University of Illinois at Urbana-Champaign
2011 Dept. of Aerospace Engineering Sciences, University of Colorado Boulder
2011 U.S. NAE and Chinese CAE Joint Workshop on GNSS
2011 Dept. of Aeronautics and Astronautics, Stanford University
2011 Dept. of Aeronautics and Astronautics, MIT
2010 German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt)
2009 Qualcomm Inc, Santa Clara, California
2008 Stanford Center for Positioning, Navigation and Time, Stanford University
2007 The MITRE Corporation
2007 German Aerospace Center
2007 University of the German Federal Armed Forces (Universität der Bundeswehr)
2007 University of Calgary, Canada

Teaching

| | |
|--|---|
| Instructor , AA 275: <i>Navigation for Autonomous Systems</i> Stanford University | Fall 2021, Fall 2020 |
| Instructor , AA 173: <i>Flight Mechanics and Controls</i> Stanford University | Spring 2021, Spring 2020 |
| Instructor , AA 272: <i>Global Positioning Systems</i> Stanford University | Winter 2021, Winter 2020 |
| Instructor , AE 483: <i>UAV Navigation and Control</i> University of Illinois at Urbana-Champaign | Fall 2018, Fall 2015 |
| Instructor , AE 598ANS: <i>Advanced Navigation Systems</i> University of Illinois at Urbana-Champaign | Spring 2019, Spring 2018 Spring 2017, Spring 2016, Spring 2015 |
| Instructor , AE/ECE 456: <i>Global Navigation Satellite Systems</i> University of Illinois at Urbana-Champaign | Fall 2016, Fall 2014, Spring & Fall 2013 |
| Teaching Assistant , AA272C: <i>Global Positioning System</i> Stanford University | Winter 2007 |

Service

Professional Service

Journal Editorial Activities

2016-2018 Associate Editor, *IEEE Transactions on Aerospace and Electronic Systems*

Conference and Workshop Organizing

2021 Program committee member, *1st Workshop on AI for Space, CVPR 2021*
2018, 2016, 2013 Track Chair, *Institute of Navigation (ION) GNSS+ Conference*
2017, 2015, 2012, Session Chair, *ION GNSS+ Conference*
2011, 2008
2018, 2016 Session Chair, *IEEE/ION PLANS Conference*
2016, 2015, Session Chair, *ION ITM Conference*
2012, 2011

Memberships

2015-present IEEE Senior member
2006-present Institute of Navigation (ION) member

Affiliations

2017 Founding member, *National UAS Standardized Testing and Rating Board*
2019, 2017, Review panelist, *National Science Foundation*
2016, 2015
2016, 2015 Reviewer for NASA Postdoctoral Program
2015, 2014 Treasurer, Satellite Division, *ION*
2013, 2012 Elected Officer (Air Representative), *ION*
2011, 2010 Judging Panel, Fulbright Scholar Program, Stanford University
2010 Judging Panel, GNSS USA Challenge

University and Departmental Service

University Service

at University of Illinois at Urbana-Champaign

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|---------------------------|---|
| 2019 | Aerospace Engineering department head search committee |
| 2019 | Faculty search committee, Department of Computer Science |
| 2019, 2018, 2016, 2015 | Coordinated Sciences Lab (CSL) advisory committee |
| 2018, 2017 | CSL staff award committee |
| 2017 | Information Trust Institute (ITI) search committee for CREDC Managing Director |
| 2017 | Committee for implementing a new degree program in Innovation, Leadership and Engineering Entrepreneurship (ILEE) |
| 2016 | CSL search committee for a Robotics Institute technical engineer |

Department Service

at Stanford University

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| 2020-present | Co-chair of Aero/Astro diversity and inclusion committee |
| 2019-present | Aero/Astro graduate admission committee |
| 2021-present | Aero/Astro teaching cluster 3 lead |
| 2020 | Aero/Astro new direct PhD program committee |

at University of Illinois at Urbana-Champaign

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|------------|---|
| 2018-2019 | Aerospace Engineering (AE) faculty search committee |
| 2018-2019 | AE graduate program committee |
| 2016-2019 | AE department awards committee |
| 2017, 2016 | Chair of AE department undergrad curriculum committee (Passed a major undergrad curriculum change) |
| 2016, 2015 | AE department advisory committee |
| 2016, 2015 | Chair of AE faculty meeting |
| 2016, 2015 | AE department undergrad curriculum committee |
| 2015, 2014 | AE graduate admission committee |
| 2015, 2014 | Secretary of AE department faculty meeting |
| 2015, 2014 | Chair of Engineering Open House |
| 2013 | AE faculty search committee |

Student Service

at Stanford University

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|----------------|---|
| 2019 - present | Faculty advisor, Women in Aeronautics and Astronautics (WIAA) |
| 2021 | IDEAL faculty advisor |
| 2021 | Faculty panelist, SURF and Summer First Program |

at University of Illinois at Urbana-Champaign

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|---------------------------|--|
| 2018, 2017, 2016, 2015 | Faculty advisor of UIUC team for NASA Micro-g NExT competition (The student teams were selected all four years.) |
| 2016, 2015 | Faculty advisor for UIUC Engineering Open House projects |
| 2015 | Faculty advisor for Boeing IT Case Competition (The student team won the 2nd place, and was invited to Boeing headquarters for the award ceremony.) |

Outreach

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|------------------|--|
| 2019, 2017 | Workshop for Girls Learning Electrical Engineering (GLEE) Summer Camp |
| 2019 | Workshop for Catalyzing Inclusive STEM Experiences All Year Round (CIS-TEME365) |
| 2013-2019 | Showcase research projects in UIUC Engineering Open House |
| 2018 | Lecture and demo for Girls Adventures in Mathematics, Engineering, and Science (GAMES) Summer Camp |
| 2017 | Lecture and demo for Girls Learning Air and Space Science (GLASS) |
| 2017, 2016, 2015 | Panelist at Women in PNT Event at ION GNSS+ Conferences |
| 2017 - 2013 | Outreach through DoE CREDC Center |
| 2016 | Lecture for "Saturday Engineering for Everyone" |
| 2015 | Lectures and demo at Hobbico E-fest |
| 2008, 2007 | Workshop at Sally Ride Science Festival |