Taeyoung Lee: Curriculum Vitae

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Education

Ph. D	Department of Aerospace Engineering UNIVERSITY OF MICHIGAN, Ann Arbor, MI *Thesis: Computational Geometric Mechanics and Control of Rigid Bodies* *Advisors: N. Harris McClamroch, Melvin Leok (Mathematics)* *Committee: Daniel Scheeres, Anthony Bloch, Jessy Grizzle*	Sep 2004-Apr 2008
M. S	Department of Mathematics UNIVERSITY OF MICHIGAN, Ann Arbor, MI	Sep 2007-Apr 2008
M. S	Department of Aerospace Engineering SEOUL NATIONAL UNIVERSITY, Korea *Thesis: Nonlinear Adaptive and Robust Flight Control Using the Backstepping Algorithm* *Advisor: Youdan Kim*	1998-2000
B. S	Department of Aerospace Engineering SEOUL NATIONAL UNIVERSITY, Korea	1994-1998

Professional Experience

Professor	Department of Mechanical and Aerospace Engineering Department of Computer Science (*courtesy appointment, pending*) THE GEORGE WASHINGTON UNIVERSITY, Washington DC	2020-present
Associate Professor	Department of Mechanical and Aerospace Engineering THE GEORGE WASHINGTON UNIVERSITY, Washington DC	2015-2020
Assistant Professor	Department of Mechanical and Aerospace Engineering THE GEORGE WASHINGTON UNIVERSITY, Washington DC	2011-2015
Assistant Professor	Department of Mechanical and Aerospace Engineering FLORIDA INSTITUTE OF TECHNOLOGY, Melbourne FL	2008-2011
Military Service	Second Lieutenant, Tactical Control Officer The 3rd Air Defense Artillery Division, Republic of Korea Air Force	2001–2004

Research Interests

Geometric Mechanics and Control: Global, intrinsic formulation of Lagrangian/Hamiltonian mechanics, optimization, and control systems on nonlinear manifold

Geometric Machine Learning: Reinforcement learning, imitation learning that respect the underlying structures of configuration manifold and symmetry of dynamic systems

Aerial Robotics: Dynamics, control, and vision-based perception for autonomous aerial systems, including multirotor UAV and micro flapping-wing UAV; Indoor/outdoor flight experiments for agile maneuvering, aerial transportation, autonomous landing on a ship, and aerial mapping

Stochastic Analysis on Manifolds: Uncertainty propagation and Bayesian estimation on nonlinear manifold

Geometric Numerical Integration: Structure-preserving numerical integration schemes for Hamiltonian systems

Biomedical Engineering: Data-driven autonomous cancer treatment with cold atmospheric plasma

Research Grants

AFOSR/DoD Multidisciplinary University Research Initiative (MURI) *($7.5M, Lead-PI)* 2023-2028
Unified Large-Scale Theoretical and Computational Frameworks for Invariance and Composition of Open Hybrid Dynamical Systems

Office of Naval Research (ONR) Science of AI *($1.5M, co-PI)* 2023-2027
CHASE: Cultivating Human-AI Synergy via Decentralized Elicitation and Learning

Office of Naval Research (ONR) *($12M, co-PI)* 2023-2028
CoNEP: Consortium on Naval Enterprise Pathways

Naval Air System (NAVAIR) / US Naval Academy (USNA) *($190K, PI)* 2019-2024
Autonomous Landing on a Ship

NSF CNS Computer and Network Systems #1837382 *($1M, co-PI)* 2019-2022
CPS: Medium: Edge-Cloud Support for Predictable, Global Situational-Awareness for Autonomous Vehicle

Air Force Office of Scientific Research (AFOSR) *($600K, PI)* 2018-2022
Uncertainty Quantification, Estimation, and Optimal Control for Stochastic Hybrid Systems on a Manifold

NSF CMMI Dynamics, Control and Systems Diagnostics #1760928 *($261K, PI)* 2018-2022
Dynamics and Control of Long Range Micro Air Vehicles Inspired by Monarch Butterflies

NASA Innovative Advanced Concepts (NIAC) Award *($125K, co-PI)* 2018-2019
Marsbee - Swarm of Flapping Wing Flyers for Enhanced Mars Exploration

NSF IUCRC #1747760 *($750K, co-PI)* 2018-2023
Center for High Pressure Plasma Energy, Agriculture, and Biomedical Technologies

Office of Naval Research (ONR) Grant #N00014-15-1-2043 *($655K, co-PI)* 2015-2018
Analysis of Ship Air Wakes

Naval Research Laboratory (NRL) Contract #N00173-14-F-0584 *($326K, PI)* 2015-2017
Collaborative Autonomous Aerial Exploration

NSF CMMI Control Systems #1335008 *($220K, PI)* 2013-2018
Stochastic Motion Planning and Estimation with Non-Gaussian Uncertainty Distributions on a Lie Group

NSF CNS Major Research Instrumentation #1337722 *($500K, co-PI)* 2013-2018
Development of Large-Scale Dense Scene Capture and Tracking Instrument

NSF CMMI Dynamic Systems #1029551 *($150K, PI)* 2010-2014
Computational Geometric Uncertainty Propagation for Hamiltonian Systems on a Lie Group

GWU Institute For Biomedical Engineering Interdisciplinary Research Grant *(PI)* 2011-2012
Optimal Control of Anti-Tachycardia Pacing Therapy

FIT Faculty Professional Development Grant *(PI)* 2010-2011
Development of an Autonomous Quadrotor UAV for Educational Research

Honor & Awards

Air Force Summer Faculty Fellowship, Air Force Office of Scientific Research, Kirtland AFB, Albuquerque NM 2013
Vision-Based Spacecraft Formation Control and Estimation Network

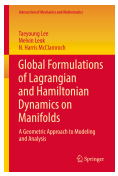
Air Force Summer Faculty Fellowship, Air Force Office of Scientific Research, Kirtland AFB, Albuquerque NM 2012
Vision-Based Spacecraft Relative Attitude Control and Estimation

Best Student Course Evaluation, Mechanical and Aerospace Engineering, Florida Institute of Technology 2010
Distinguished Dissertation Award, honorable mention, University of Michigan 2009
Distinguished Achievement Award, College of Engineering, University of Michigan 2008
Ivor K. McIvor Award, College of Engineering, University of Michigan (outstanding research in applied mechanics) 2008
SIAM Conference on Computational Science and Engineering, BGCE Student Paper Prize, finalist 2007
Rackham Predoctoral Fellowship, University of Michigan 2006-2007
Rackham International Students Fellowship, University of Michigan 2006
Rackham Travel Grant, University of Michigan Feb, Aug 2006
International Scholarship, Ministry of Education & Human Resources Development, Korea 2004

Publications

(available at Google scholar)

Book



[1] T. Lee, M. Leok, and N.H. McClamroch. *Global Formulation of Lagrangian and Hamiltonian Dynamics on Manifolds*. Springer, 2018.

Geometric Controls

*[1] T. C and T. Lee. Alternating learning for modular sensorimotor control of a flapping wing UAV. *IEEE Robotics and Automation Letters*, December 2023. in preparation.

*[2] B. Yu and T. Lee. Sim-to-real transfer for multi-agent reinforcement learning of a quadrotor UAV. *IEEE Robotics and Automation Letters*, December 2023. in preparation.

[3] T. Lee. G-learning: Equivariant indirect optimal control with generating function. In *Proceedings of IEEE Conference on Decision and Control*, December 2023. accepted.

*[4] K. Gamagedara, T. Lee, and M. Snyder. Delayed Kalman filter for vision-based autonomous flight in ocean environments. *Control Engineering Practice*, October 2023. submitted.

*[5] B. Yu and T. Lee. Multi-agent reinforcement learning for the low-level control of a quadrotor UAV. In *Proceedings of the American Control Conference*, September 2023. submitted.

*[6] T. Lee. Intermittent stochastic optimal control of the bouncing ball dynamics. In *Proceedings of the American Control Conference*, September 2023. submitted.

[7] B. Yu and T. Lee. Equivariant reinforcement learning for quadrotor UAV. In *Proceedings of the American Control Conference*, pages 2842–2847, June 2023.

[8] T. C and T. Lee. Constrained imitation learning for a flapping wing unmanned aerial vehicle. *IEEE Robotics and Automation Letters*, 7(4):10534–10541, October 2022. doi:10.1109/LRA.2022.3194682.

[9] T. C and T. Lee. Geometric optimal controls for flapping wing UAV on a Lie group. In *IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control*, October 2021.

[10] K. Gamagedara, T. Lee, and M. Snyder. Unscented Kalman filter for INS/GNSS data fusion with time delay. In *Proceedings of AIAA Aviation Forum*, August 2021. AIAA 2021-2486.

[11] M. Snyder, K. Gamagedara, T. Lee, and J. Pritchard. In situ detection and analysis of ship air wakes from a US navy research vessel. In *Proceedings of AIAA Aviation Forum*, August 2021. AIAA 2021-2485.

[12] M. Bisheban and T. Lee. Geometric adaptive control with neural networks for a quadrotor UAV in wind fields. *IEEE Transactions on Control Systems Technology*, 29(4):1533–1548, July 2021. doi:10.1109/TCST.2020.3006184.

[13] T. C, C. Kang, and T. Lee. Dynamics and control of a flapping wing UAV with abdomen undulation inspired by Monarch butterfly. In *Proceedings of the American Control Conference*, pages 66 – 71, May 2021.

[14] B. Yu, K. Gamagedara, S. Kim, T. Lee, and J. Suk. Geometric control and experimental validation for a quadrotor UAV transporting a payload. In *Proceedings of IEEE Conference on Decision and Control*, pages 201–207, December 2020.

[15] K. Gamagedara, M. Bisheban, E. Kaufman, and T. Lee. Geometric controls of a quadrotor with a decoupled yaw control. In *Proceedings of the American Control Conference*, June 2019.

* pending

[16] M. Bisheban and T. Lee. Geometric adaptive control for a quadrotor UAV with wind disturbance rejection. In *Proceedings of IEEE Conference on Decision and Control*, pages 2816–2821, December 2018.

[17] T. Lee, D. Chang, and Y. Eun. Semi-global non-memoryless attitude controls on the special orthogonal group. *ASME Journal of Dynamic Systems, Measurement, and Control*, 141(2):021005, October 2018. doi:10.1115/1.4041447.

[18] Z. Zhao, G. Cruz, T. Lee, and D. Bernstein. Adaptive attitude control of a dual-rigid-body spacecraft with unmodeled nonminimum-phase dynamics. In *Proceedings of the American Control Conference*, pages 2503–2508, June 2018.

[19] L. Simon, R. Agnes, K. Gamagedara, K. Takami, M. Snyder, and T. Lee. Studies on autonomous landing of an unmanned aerial vehicle on a vessel. In *Proceedings of AIAA Information Systems*, January 2018. AIAA 2018-1461.

[20] T. Lee. Geometric control of quadrotor UAVs transporting a cable-suspended rigid body. *IEEE Transactions on Control Systems Technology*, 26(1):255–264, January 2018. doi:10.1109/TCST.2017.2656060.

[21] S. Kulumani and T. Lee. Constrained geometric attitude control on SO(3). *International Journal of Control, Automation, and Systems*, 15(6):2796–2809, December 2017. doi:10.1007/s12555-016-0607-4.

[22] T. Wu, B. Flewelling, F. Leve, and T. Lee. Spacecraft attitude formation tracking using line-of-sight measurements. *AIAA Journal of Guidance, Control, and Dynamics*, 40(10):2616–2629, October 2017. doi:10.2514/1.G001727.

[23] S. Kulumani, K. Takami, and T. Lee. Geometric control for autonomous landing on asteroid Itokawa using visual localization. In *Proceedings of the AAS/AIAA Astrodynamics Specialist Conference*, August 2017. AAS 17-720.

[24] T. Lee, D. Chang, and Y. Eun. Attitude control strategies overcoming the topological obstruction on SO(3). In *Proceedings of the American Control Conference*, pages 4942–4947, May 2017.

[25] T. Lee. Optimal hybrid controls for global exponential tracking on the two-sphere. In *Proceedings of the IEEE Conference on Decision and Control*, pages 3331–3337, Las Vegas, NV, December 2016.

[26] F. Goodarzi and T. Lee. Stabilization of a rigid body payload with multiple cooperative quadrotors. *ASME Journal of Dynamic Systems, Measurement, and Control*, 138(12):121001–121001–17, December 2016. doi:10.1115/1.4033945.

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[28] K. Lee, C. Park, T. Lee, and S. Park. Spacecraft formation keeping via discrete-time Hamilton-Jacobi theory. In *Proceedings of the AIAA Guidance, Navigation and Control Conference*, January 2016. AIAA 2016-0874.

[29] T. Lee. Geometric controls for a tethered quadrotor UAV. In *Proceedings of the IEEE Conference on Decision and Control*, pages 2749–2754, Osaka, Japan, December 2015.

[30] F. Goodarzi, D. Lee, and T. Lee. Geometric control of a quadrotor UAV transporting a payload connected to a quadrotor UAV via flexible cable. *International Journal of Control, Automation, and Systems*, 13(6):1–13, December 2015. doi:10.1007/s12555-014-0304-0.

[31] T. Lee. Global exponential attitude tracking controls on SO(3). *IEEE Transactions on Automatic Control*, 60(10):2837–2842, October 2015. doi:10.1109/TAC.2015.2407452.

[32] T. Lee. Geometric adaptive control for aerial transportation of a rigid body. In *Proceedings of the IMA Conference on Mathematics of Robotics*, September 2015.

[33] F. Goodarzi, D. Lee, and T. Lee. Geometric adaptive tracking control of a quadrotor unmanned aerial vehicle on SE(3). *ASME Journal of Dynamic Systems, Measurement, and Control*, 137(9), September 2015. doi:10.1115/1.4030419.

[34] F. Goodarzi and T. Lee. Dynamics and control of quadrotor UAVs transporting a rigid body connected via flexible cables. In *Proceedings of the American Control Conference*, pages 4677–4682, July 2015.

[35] T. Lee. Collision avoidance via Voronoi tessellation for quadrotor UAVs transporting a payload. In *Proceedings of the American Control Conference*, pages 1842–1848, July 2015.

[36] E. Kaufman and T. Lee. Geometric adaptive control for aerial transportation of a rigid body. Presented at International Conference on Robotics and Automation, May 2015.

[37] T. Wu and T. Lee. Spacecraft attitude formation stabilization using lines-of-sight without angular velocity measurements. In *Proceedings of the AAS/AIAA Space Flight Mechanics Meeting*, February 2015. AAS 15-441.

[38] S. Dai, T. Lee, and D. Bernstein. Adaptive control of a quadrotor UAV transporting a cable-suspended load with unknown mass. In *Proceedings of the IEEE Conference on Decision and Control*, pages 6149–6154, December 2014.

[39] T. Wu and T. Lee. Spacecraft position and attitude formation control using line-of-sight observations. In *Proceedings of the IEEE Conference on Decision and Control*, pages 970–975, December 2014.

[40] T. Lee. Geometric control of multiple quadrotor UAVs transporting a cable-suspended rigid body. In *Proceedings of the IEEE Conference on Decision and Control*, pages 6155–6160, December 2014.

[41] F. Goodarzi, D. Lee, and T. Lee. Geometric stabilization of a quadrotor UAV with a payload connected by flexible cable. In *Proceedings of the American Control Conference*, pages 4925–4930, June 2014.

[42] J. Dougherty, D. Lee, and T. Lee. Laser-based guidance of a quadrotor UAV for precise landing on an inclined surface. In *Proceedings of the American Control Conference*, pages 1210–1215, June 2014.

[43] E. Kaufman, K. Caldwell, D. Lee, and T. Lee. Design and development of a free-floating hexrotor UAV for 6-dof maneuvers. In *Proceedings of the IEEE Aerospace Conference*, March 2014.

[44] T. Lee, K. Sreenath, and V. Kumar. Geometric control of cooperating multiple quadrotor UAVs with a suspended load. In *Proceedings of the IEEE Conference on Decision and Control*, volume 5510–5515, Florence, Italy, December 2013.

[45] K. Sreenath, T. Lee, and V. Kumar. Geometric control and differential flatness of a quadrotor UAV with a cable-suspended load. In *Proceedings of the IEEE Conference on Decision and Control*, pages 2269–2274, Florence, Italy, December 2013.

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[47] T. Lee. Robust adaptive tracking on SO(3) with an application to the attitude dynamics of a quadrotor UAV. *IEEE Transactions on Control Systems Technology*, 21(5):1924–1930, September 2013. doi:10.1109/TCST.2012.2209887.

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[50] T. Lee. Robust global exponential attitude tracking controls on SO(3). In *Proceedings of the American Control Conference*, pages 2103–2108, Washington, DC, June 2013.

[51] T. Wu, B. Flewelling, F. Leve, and T. Lee. Spacecraft relative attitude formation tracking on SO(3) based on line-of-sight measurements. In *Proceedings of the American Control Conference*, pages 4827–4832, Washington, DC, June 2013.

[52] T. Lee, M. Leok, and N.H. McClamroch. Nonlinear robust tracking control of a quadrotor UAV on SE(3). *Asian Journal of Control*, 15(2):391–408, March 2013. doi:10.1002/asjc.567.

[53] T. Lee, M. Leok, and N.H. McClamroch. Dynamics and control of a chain pendulum on a cart. In *Proceedings of the IEEE Conference on Decision and Control*, pages 2502–2508, Maui, HI, December 2012.

[54] T. Lee, M. Leok, and N.H. McClamroch. Nonlinear robust tracking control of a quadrotor UAV on SE(3). In *Proceedings of the American Control Conference*, pages 4649–4654, Montreal, Canada, June 2012.

[55] T. Lee. Relative attitude control of two spacecraft on SO(3) using line-of-sight observations. In *Proceedings of the American Control Conference*, pages 167–172, Montreal, Canada, June 2012.

[56] T. Lee. Exponential stability of an attitude tracking control system on SO(3) for large-angle rotational maneuvers. *Systems and Control Letters*, 61(1):231–237, January 2012. doi:10.1016/j.sysconle.2011.10.017.

[57] T. Fernando, J. Chandiramani, T. Lee, and H. Gutierrez. Robust adaptive geometric tracking controls on SO(3) with an application to the attitude dynamics of a quadrotor UAV. In *Proceedings of the IEEE Conference on Decision and Control*, pages 7380–7385, Orlando, FL, December 2011.

[58] T. Lee, M. Leok, and N.H. McClamroch. Geometric tracking control of a quadrotor UAV for extreme maneuverability. In *Proceedings of the World Congress of the International Federation of Automatic Control*, pages 6337–6342, Milano, Italy, August 2011.

[59] T. Lee. Geometric tracking control of the attitude dynamics of a rigid body on SO(3). In *Proceedings of the American Control Conference*, pages 1200–1205, San Francisco, CA, June 2011.

[60] T. Lee, M. Leok, and N.H. McClamroch. Geometric tracking control of a quadrotor UAV on SE(3). In *Proceedings of the IEEE Conference on Decision and Control*, pages 5420–5425, Atlanta, GA, December 2010.

Computational Geometric Optimization

[1] T. C and T. Lee. Iterative supervised learning for regression with constraints. In *International Conference on Ubiquitous Robots*, July 2022.

[2] S. Kulumani and T. Lee. Bayesian shape reconstruction and optimal guidance for autonomous landing on asteroids. *Journal of the Astronautical Sciences*, 69:335–367, March 2022. doi:10.1007/s40295-022-00310-6.

[3] T. Lee, M. Tao, and M. Leok. Variational symplectic accelerated optimization on Lie groups. In *Proceedings of IEEE Conference on Decision and Control*, pages 233 – 240, December 2021.

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[6] S. Kulumani and T. Lee. Systematic design of optimal low-thrust transfers for the three-body problem. In *Proceedings of the AIAA/AAS Astrodynamics Specialist Conference*, August 2015. AAS 15-757.

[7] T. Lee. Optimal control of partitioned hybrid systems via discrete-time Hamilton-Jacobi theory. *Automatica*, 50(8):2062–2069, August 2014. doi:10.1016/j.automatica.2014.05.024.

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[11] T. Lee, M. Leok, and N.H. McClamroch. Optimal attitude control of a rigid body using geometrically exact computations on SO(3). *Journal of Dynamical and Control Systems*, 14(4):465–487, October 2008. doi:10.1007/s10883-008-9047-7.

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[13] T. Lee, M. Leok, and N.H. McClamroch. Computational geometric optimal control of rigid bodies. *Communications in Information and Systems, special issue dedicated to R. W. Brockett*, 8(4):445–472, 2008.

[14] T. Lee, M. Leok, and N.H. McClamroch. A combinatorial optimal control problem for spacecraft formation reconfiguration. In *Proceedings of the IEEE Conference on Decision and Control*, pages 5370–5375, New Orleans, LA, December 2007.

[15] T. Lee, M. Leok, and N.H. McClamroch. Optimal attitude control for a rigid body with symmetry. In *Proceedings of the American Control Conference*, pages 1073–1078, New York, NY, July 2007.

[16] T. Lee, M. Leok, and N.H. McClamroch. Optimal control of a rigid body using geometrically exact computations on SE(3). In *Proceedings of the IEEE Conference on Decision and Control*, pages 2170–2175, San Diego, CA, December 2006.

[17] T. Lee, M. Leok, and N.H. McClamroch. Attitude maneuvers of a rigid spacecraft in a circular orbit. In *Proceedings of the American Control Conference*, pages 1742–1747, Minneapolis, MN, June 2006.

Computational Geometric Mechanics

[1] C. Kang, M. Sridhar, R. Twigg, J. Pohly, T. Lee, and H. Aono. Power benefits of high-altitude flapping wing flight at Monarch butterfly scale. *Biomimetics*, 8(4):352, August 2023. doi:10.3390/biomimetics8040352.

[2] M. Tarpley, J. Pohly, C. Kang, T. Lee, and H. Aono. Numerical analysis of flight performance of bioinspired Mars flight vehicles. In *AIAA Scitech Forum*, January 2023. AIAA 2023-1219.

[3] J. Pohly, C. Kang, T. C, T. Lee, and H. Aono. Climbing flight of Monarch butterflies via wing and abdomen kinematic modulation using a high-fidelity numerical framework. In *AIAA Scitech Forum*, January 2023. AIAA 2023-1789.

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[8] H. Sharma, T. Lee, M. Patil, and C. Woolsey. Symplectic accelerated optimization on SO(3) with Lie group variational integrators. In *Proceedings of the American Control Conference*, pages 2826–2831, July 2020.

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[10] H. Sharma and T. Lee. Energy-preserving, adaptive time-step Lie group variational integrators for the attitude dynamics of a rigid body. In *Proceedings of the American Control Conference*, pages 5487–5492, June 2019.

[11] J. Pohly, C. Kang, M. Sridhar, D. Landrum, F. Fahimi, J. Bluman, H. Aono, and T. Lee. Scaling bioinspired Mars flight vehicles for hover. In *Proceedings of the AIAA Scitech Forum*, January 2019. AIAA 2019-0567.

[12] T. Lee, M. Leok, and N.H. McClamroch. Geometric formulations of Furuta pendulum control problems. *Mathematics in engineering, science and aerospace*, 7(1):69–81, 2016.

[13] T. Lee, M. Leok, and N.H. McClamroch. Global formulations of Lagrangian and Hamiltonian mechanics on two-spheres. In *Proceedings of the IEEE Conference on Decision and Control*, pages 6010–6015, Osaka, Japan, December 2015.

[14] T. Lee, M. Leok, and N.H. McClamroch. Global formulations of Lagrangian and Hamiltonian dynamics on embedded manifolds. In *Proceedings of the IMA Conference on Mathematics of Robotics*, September 2015.

[15] T. Lee, F. Leve, M. Leok, and N.H. McClamroch. Lie group variational integrators for spacecraft with variable speed control moment gyros. In *Proceedings of the U.S. National Congress on Computational Mechanics*, July 2015.

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[17] T. Lee, M. Leok, and N.H. McClamroch. High-fidelity numerical simulation of complex dynamics of tethered spacecraft. *Acta Astronautica*, 99(1):215–230, June 2014. doi:10.1016/j.actaastro.2014.02.021.

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[20] T. Lee, M. Leok, and N.H. McClamroch. Geometric numerical integration for complex dynamics of tethered spacecraft. In *Proceedings of the American Control Conference*, pages 1885–1891, San Francisco, CA, June 2011.

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Uncertainty Propagation / Estimation

[1] W. Wang and T. Lee. INS-GNSS navigation for large attitude uncertanties with the matrix Fisher–Gaussian distribution. In *Proceedings of the American Control Conference*, pages 4858–4863, may 2023.

[2] T. C and T. Lee. Deep neural pose estimation for a flapping wing unmanned aerial vehicle with visual-inertial sensor fusion. In *AIAA Scitech Forum*, May 2023. accepted.

[3] M. Wickramasuriya, T. Lee, and M. Snyder. Deep monocular relative 6D pose estimation for ship-based autonomous uav. In *AIAA Scitech Forum*, May 2023. AIAA 2023-1789.

[4] W. Wang, K. Gamagedara, and T. Lee. On the observability of attitude with single direction measurements. *IEEE Transactions on Automatic Control*, 67(9):4986–4993, September 2022. doi:10.1109/TAC.2022.3179214.

[5] W. Wang and T. Lee. Uncertainty propagation for general stochastic hybrid systems on compact Lie groups. *SIAM Journal on Applied Dynamical Systems*, 21(3):2215–2240, June 2022. doi:10.1137/21M144147X.

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[12] T. Lee. Stochastic attitude smoothing and interpolation on SO(3) with matrix Fisher distributions. In *Proceedings of the American Control Conference*, pages 1161 – 1167, May 2021.

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[14] W. Wang and T. Lee. Spectral uncertainty propagation for generalized stochastic hybrid systems with applications to a bouncing ball. In *Proceedings of the American Control Conference*, pages 1803–1808, July 2020.

[15] T. Lee. Adaptive learning Kalman filter with Gaussian process. In *Proceedings of the American Control Conference*, pages 4442–4447, July 2020.

[16] W. Wang and T. Lee. Matrix Fisher–Gaussian distribution on so(3)xrn for attitude estimation with a gyro bias. In *Proceedings of the American Control Conference*, pages 4429–4434, July 2020.

[17] W. Wang and T. Lee. Spectral bayesian estimation for general stochastic hybrid systems. *Automatica*, 117, July 2020. doi:10.1016/j.automatica.2020.108989.

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[20] T. Lee. Spacecraft attitude estimation with a single magnetometer using matrix Fisher distributions on SO(3). In *Proceedings of the AIAA Guidance, Navigation and Control Conference*, January 2019. AIAA 2019-1173.

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[22] E. Kaufman and T. Lee. Autonomous aerial exploration for topological mapping of Mars environments. In *Proceedings of the AIAA Guidance, Navigation and Control Conference*, January 2019. AIAA 2019-1915.

[23] T. Lee. Bayesian attitude estimation with approximate matrix Fisher distributions on SO(3). In *Proceedings of IEEE Conference on Decision and Control*, pages 5319–5325, December 2018.

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[27] K. Takami and T. Lee. Environment dependent depth enhancement with multi-modal sensor fusion learning. In *Proceedings of the IEEE International Conference on Robotic Computing*, pages 232–237, January 2018.

[28] E. Kaufman, K. Takami, and T. Lee. Autonomous quadrotor 3d mapping and exploration using exact occupancy probabilities. In *Proceedings of the IEEE International Conference on Robotic Computing*, pages 49–55, January 2018.

[29] F. Goodarzi and T. Lee. Global formulation of an extended Kalman filter on SE(3) for geometric control of a quadrotor UAV. *Journal of Intelligent and Robotic Systems*, 88(2–4):395–416, December 2017. doi:10.1007/s10846-017-0525-6.

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[31] M. Bisheban and T. Lee. Computational geometric identification for the quadrotor dynamics in wind fields. In *Proceedings of the IEEE Conference on Control Technology and Applications*, pages 1153–1158, August 2017.

[32] M. Bisheban and T. Lee. Computational geometric system identification for the attitude dynamics on SO(3). In *Proceedings of the American Control Conference*, pages 2249–2254, May 2017.

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[56] T. Lee, M. Leok, N.H. McClamroch, and A. Sanyal. Global attitude estimation using single direction measurements. In *Proceedings of the American Control Conference*, pages 3659–3664, New York, NY, July 2007.

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Nonlinear Flight Control

[1] N.H. McClamroch and T. Lee. Optimal flight planning for a jet aircraft mission. In K. Murty, editor, *Case Studies in Operations Research*, volume 212 of *International Series in Operations Research and Management Science*, , pages 355–390. Springer, 2015.

[2] T. Lee and Y. Kim. Nonlinear adaptive flight control using backstepping and neural networks controller. *AIAA Journal of Guidance, Control, and Dynamics*, 24(4):675–682, July 2001. doi:10.2514/2.4794.

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[4] T. Lee and Y. Kim. Nonlinear adaptive flight control using neural networks and backstepping. *Journal of Control, Automation and Systems Engineering*, 6(12):1070–1078, 2000.

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Control of Biomedical Systems

[1] Z. Hou, T. Lee, and M. Keidar. In-situ adaptive plasma cancer treatment with electromechanical impedance spectroscopy. *IEEE Transactions on Radiation and Plasma Medical Sciences*, dec 2023. in preparation.

[2] Z. Hou, T. Lee, and M. Keidar. Canonical correlation analysis for real-time diagnostics of cancer cell viability with impedance. In *International Workshop On Plasma For Cancer Treatment*, March 2023.

[3] Z. Hou, T. Lee, and M. Keidar. Reinforcement learning with safe exploration for adaptive plasma cancer treatment. *IEEE Transactions on Radiation and Plasma Medical Sciences*, 6(4):482–492, April 2022. doi:10.1109/TRPMS.2021.3094874.

[4] L. Lin, D. Yan, T. Lee, and M. Keidar. Self-adaptive plasma chemistry and intelligent plasma medicine. *Advanced Intelligent Systems*, October 2021. doi:10.1002/aisy.202100112.

[5] L. Lin, Z. Hou, X. Yao, Y. Liu, J. Sirigiri, T. Lee, and M. Keidar. Introducing adaptive cold atmospheric plasma: The perspective of adaptive cold plasma cancer treatments based on real-time electrochemical impedance spectroscopy. *Physics of Plasma*, 27(6):063501, June 2020. doi:10.1063/5.0003528.

[6] T. Lee and M. Keidar. Adaptive plasma and machine learning. In M. Keidar, editor, *Plasma Cancer Therapy*, pages 223–250. Springer, 2020.

[7] Y. Lyu, L. Lin, E. Gjika, T. Lee, and M. Keidar. Mathematical modeling and control for cancer treatment with cold atmospheric plasma jet. *Journal of Physics D: Applied Physics*, 52(18):185202, May 2019. doi:10.1088/1361-6463/ab061d.

Open-Source Software Development

[1] *Control Systems Design with Python*, `https://mae4182.readthedocs.io`

[2] *Pose Estimation with ArUco markers*, `https://github.com/fdcl-gwu/aruco-markers`

[3] *Python-Gazebo Environment for UAV with Geometric Control*, `https://github.com/fdcl-gwu/uav_simulator`

[4] *OpenAI Gym Environment for Quadrotor UAV*, `https://github.com/fdcl-gwu/gym-rotor`

[5] *Fast Fourier Transform on SO(3)*, `https://fdcl-gwu.github.io/FFTSO3`

[6] *Matrix Fisher Distribution on SO(3)*, `https://github.com/tylee-fdcl/Matrix-Fisher-Distribution`

[7] *Geometric Formulations for the Flapping Wing UAV*, `https://github.com/fdcl-gwu/FWUAV`

Invited Talks

[1] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Systems* (Jun 2024)
Keynote (invited)
IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control, Besancon, France

[2] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Aug 2022
Chungnam National University

[3] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Jul 2021
Korea Aerospace University (virtual)

[4] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Nov 2020
University of Minnesota (virtual)

[5] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Oct 2019
Rutgers University, New Brunswick NJ

[6] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Oct 2019
University of Maryland, College Park MD

[7] *Stochastic Hybrid Systems on a Manifold* Aug 2019
Air Force Office of Scientific Research, Arlington VA

[8] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Oct 2018
University of Maryland, College Park MD

[9] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Apr 2018
Virginia Tech, Blacksburg VA

[10] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Mar 2018
University of Alabama, Huntsville, Huntsville AL

[11] *Intrinsic Formulation of Bayesian Estimation on a Lie Group* Aug 2017
Electrical Engineering, KAIST, Daejeon, South Korea

[12] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Aug 2017
Aerospace Engineering, KAIST, Daejeon, South Korea

[13] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Mar 2016
University of Michigan, Ann Arbor, MI

[14] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Mar 2016
MAE Seminar Series, Syracuse University, Syracuse, NY

[15] *Global Formulations of Stochastic Analysis on Manifolds* Aug 2015
NSF Workshop on Learning, Perception and Control in Robots and Humans, Arlington VA

[16] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Sep 2014
MAE Seminar Series, Seoul National University, South Korea

[17] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Sep 2014
Department Seminar Series, Yonsei University, South Korea

[18] *Stochastic Optimal Motion Planning and Estimation for the Attitude Kinematics on SO(3)* Mar 2014
AMS Eastern Sectional Meeting, Special Session on Mechanics and Control, Baltimore MD

[19] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Jul 2013
AFRL Seminar Series, Kirtland AFB, Albuquerque NM

[20] *Computational Geometric Mechanics and Controls for Complex Aerospace Systems* Mar 2013
ECE Seminar Series, University of Virginia

[21] *Computational Geometric Mechanics and Control on Nonlinear Manifolds* Nov 2011
Mathematics Colloquium Series, University of Maryland Baltimore County

[22] *Geometric Control on Nonlinear Manifolds for Complex Aerospace Systems* Apr 2011
Physical Sciences Department Colloquium Series, Embry-Riddle Aeronautical University

[23] *Geometric Control on Nonlinear Manifolds for Complex Aerospace Systems* Mar 2011
MAE Seminar, George Washington University

[24] *Discrete Geometric Mechanics* Dec 2010
Young Researchers Workshop on Geometry, Mechanics and Control, University of La Laguna, Spain

[25] *Computational Geometric Mechanics and Control of Multibody Systems* May 2010
University of Michigan

[26] *Lie Group Variational Integrator for Dynamics and Control of Multibody Systems* Apr 2010
Structured Integrators Workshop, University of California, San Diego

[27] *Computational Geometric Mechanics and Control of Rigid Bodies* Feb 2008
Florida Institute of Technology, Melbourne, Florida

[28] *Computational Geometric Mechanics, Control, and Estimation of Rigid Bodies on Lie Groups* Feb 2007
SIAM Conference on Computational Science and Engineering, Costa Mesa, California

[29] *Optimal Control of a Rigid Body using Geometrically Exact Computations on Lie Groups* Oct 2006
Flight Dynamics and Control Seminar, University of Michigan

[30] *Attitude Maneuvers of a Rigid Spacecraft in a Circular Orbit* Nov 2005
Flight Dynamics and Control Seminar, University of Michigan

[31] *Lie Group Variational Integrator for the Attitude dynamics of a Rigid body* Feb 2005
Flight Dynamics and Control Seminar, University of Michigan

Editorial Services

Associate Editor: IEEE Transactions on Control Systems Technology 2023-present

Associate Editor: IEEE Transactions on Aerospace and Electronic Systems 2023-present

Senior Editor: Conference Editorial Board 2018-2023
International Conference on Ubiquitous Robotics

Committee Member: Technical Program Committee 2016, 2018
American Control Conference

Associate Editor: Conference Editorial Board, IEEE Robotics and Automation Society 2014-2020
2015, 2016, 2017, 2018, 2019 IEEE Conference on Robotics and Automation

Associate Editor: Conference Editorial Board, IEEE Control System Society 2013-2020
2014, 2015, 2016, 2017, 2018, 2019, 2020 American Control Conference
2014, 2015, 2016, 2017, 2018, 2019, 2020 IEEE Conference on Decision and Control

Committee Member: Program Committee, Conference Organization Board 2015, 2021
IMA Conference on Mathematics on Robotics

Conference Organization and Service

Committee Member: Local Arrangement Committee, Conference Organization Board 2013
American Control Conference

Organizer, Chair: Geometric Control on Nonlinear Manifolds 2010
Invited Session at IEEE Conference on Decision and Control, Atlanta

Organizer, Chair: Synergies and Interplay of Nonlinear Dynamics and Control 2010
Symposium in honor of Dr. Harris McClamroch, University of Michigan
"HarrisFest [Conference Report]," *IEEE Control System Magazine*, vol. 30, no. 5, pp. 81-83, 2010

Media Coverage

Inquisitr: GWU Engineer To Develop Robo Bees That Will Map The Surface Of Mars 2018

Gizmodo: Buzz Buzz, NASA Funds Project to Put Bee Robots on Mars 2018

The engineer: "Marsbees" chosen as potential pioneers of Martian exploration 2018

Mars daily: UAH gets NASA early-stage funding for "Marsbees" concept 2018

Professional Service and Review

Review Panelist: NASA

Review Panelist: National Science Foundation (NSF)

Reviewer: National Science Foundation (NSF); Air Force Office of Scientific Research (AFOSR); IEEE Transactions on Automatic Control; IEEE Transactions on Control Systems Technology; IEEE Transactions on Mechatronics; IEEE Transactions on Neural Networks; IEEE Transaction on Plasma Science; IEEE Transactions on Industrial Electronics; IEEE Transactions on Aerospace and Electronic Systems; IEEE Robotics and Automation Magazine; SIAM Journal on Control and Optimization; ASME Journal of Dynamics, Measurements, and Control; AIAA Journal of Guidance, Control, and Dynamics; International Journal of Aerospace Engineering; International Journal of Adaptive Control and Signal Processing; International Journal of Advanced Robotic Systems; International Journal of Control; International Journal of Control, Automation and Systems; International Journal of Robust and Nonlinear Control; Asian Journal of Control; Acta Astronautica; Aerospace Science & Technology; Automatica; Celestial Mechanics and Dynamical Astronomy; The Astronomical Journal; Control Engineering Practice; Computer Physics Communications; Chinese Journal of Aeronautics; The Astronomical Journal; Journal of Aerospace Engineering; Journal of Geometric Mechanics; Journal of Nonlinear Science; Mathematics of Control, Signals, and Systems; Transactions of the Japan Society for Aeronautical and Space Sciences, Aerospace Technology; Robotica; Symmetry, Integrability and Geometry: Methods and Applications; Systems and Control Letters; IEEE Conference on Decision and Control; IEEE Multi-conference on Systems and Control; IEEE International Conference on Robotics and Automation; IEEE International Conference on Intelligent Robots and Systems; AIAA Guidance, Navigation and Control Conference; American Control Conference; Applied Mathematical Modelling; European Control Conference; International Conference on Unmanned Aircraft Systems; IMA Conference on Mathematics of Robotics

Assessment Coordinator: FIT University coordinator for Southern Association of Colleges and Schools (SACS) accreditation 2011

Judge: SSPI Mid-Atlantic Regional Chapter Scholarship Competition 2011

Judge: GWU SEAS Research and Development Showcase 2013, 2014

Judge: GWU Research Day 2017

Judge: GWU SEAS Pelton Senior Project Award 2017

University Service

Committee Member: Ad-hoc Committee for MEng in ML/AI, School of Engineering and Applied Science, GWU 2023-present

Committee Member: Finance Committee, School of Engineering and Applied Science, GWU 2023-present

Committee Member: Personnel Subcommittee, School of Engineering and Applied Science, GWU 2021-2023

Committee Chair: Personnel Subcommittee, Mechanical and Aerospace Engineering, GWU 2021-present

Committee Chair: Lab Committee, Mechanical and Aerospace Engineering, GWU 2021-present

Committee Member: Graduate Curriculum Committee, Mechanical and Aerospace Engineering, GWU 2021-2024

Committee Chair: Faculty Search Committee, Mechanical and Aerospace Engineering, GWU 2019-2020

Committee Member: Finance Committee, School of Engineering and Applied Science, GWU 2018-2019

Committee Member: Faculty Search Committee, Mechanical and Aerospace Engineering, GWU 2018-2019

Committee Member: Undergraduate Curriculum Committee, Mechanical and Aerospace Engineering, GWU 2018-2021

Committee Member: Research Committee, Faculty Senate, GWU 2013-2014

Committee Member: Graduate Curriculum Committee, Mechanical and Aerospace Engineering, GWU 2013-2015

Faculty secretary: Mechanical and Aerospace Engineering, GWU 2012-2013

Dissertation Directed

[1] Tejasswi C., *Data-Driven Controls of a Flapping Wing Unmanned Aerial Vehicle Inspired by Monarch Butterfly*, Ph.D Dissertation, The George Washington University, November 2023 (pending)

[2] Z. Hou, *Adaptive Cold Atmospheric Plasma Cancer Treatment with Real-Time Electrochemical Impedance Spectroscopy*, Ph.D Dissertation, The George Washington University, November 2023 (pending)

[3] W. Wang, *Geometric Formulation of Uncertainties and Estimation for Three-Dimensional Rotations*, Ph.D Dissertation, The George Washington University, 2022

[4] K. Gamagedara, *Geometric Control and Estimation for Autonomous UAVs in Ocean Environments*, Ph.D Dissertation, The George Washington University, 2022

[5] M. Bisheban, *Geometric Estimation and Control of Quadrotor UAVs in Wind Fields*, Ph.D Dissertation, The George Washington University, 2018

[6] E. Kaufman, *Multi-Robot Probabilistic Mapping and Exploration*, Ph.D Dissertation, The George Washington University, 2018

[7] S. Kulumani, *Geometric Mechanics and Control for Small Body Missions*, Ph.D Dissertation, The George Washington University, 2018

[8] T. Wu, *Geometric Attitude Controls And Estimations On The Special Orthogonal Group*, Ph.D Dissertation, The George Washington University, 2016

[9] F. Goodarzi, *Geometric Nonlinear Controls for Multiple Cooperative Quadrotor UAVs Transporting a Rigid Body*, Ph.D Dissertation, The George Washington University, 2015

[10] J. Dougherty, *Laser-Guided Autonomous Landing of a Quadrotor UAV on an Inclined Surface*, MS Thesis, 2014

[11] T. Wu, *Spacecraft Relative Attitude Formation Tracking on SO(3) Based on Line-of-Sight Measurements*, MS Thesis, 2013

Mentoring Experiences

Postdoctoral Scientist	Dr. Kuya Takami: Autonomous aerial exploration	2016-2017
	Dr. Daewon Lee: Adaptive control of autonomous load transportation	2012-2014
Doctoral Students	Maneesha Wickramasuriya : Vision-based estimation	2021-present
	Beomyeon Yu : Reinforcement Learning for Quadrotor	2021-present
	Tejaswi K. C. : Flapping wing UAV	2020-present
	Zichao Hou : Autonomous cancer treatment	2019-present
	Weixin Wang : Hybrid systems on a manifold	2019-2022
	Kanishke Gamagedar : Autonomous landing on a ship	2018-2022
	Mahdis Bisheban : Geometric control of quadrotors under wind	2015-2018
	Shankar Kulumani : Low thrust optimal orbital maneuvers	2014-2018
	Evan Kaufman : Autonomous aerial exploration	2012-2018
	Tse-Huai Wu : Geometric control and estimation on SO(3)	2013-2015
	Farhad Goodarzi : Geometric control of quadrotor UAV	2011-2015
Masters Students	Tejaswi K. C. : Flapping wing UAV	2019-2020
	Zichao Hou : Autonomous exploration of Mars	2018-2019
	Kanishke Gamagedar : Development of telemetry for ship air wakes	2016-2017
	Kalpesh Patil : Development of telemetry for ship air wakes	2015-2017
	Kiren Caldwell : Outdoor flight of quadrotor UAV via differential GPS	2014-2015
	John A. Dougherty : Laser-based guidance of quadrotor UAV	2013-2014
	Tse-Huai Wu : Vision-based spacecraft formation control	2011-2013
Undergraduate Students	Karl Simon : Vision-based UAV control	2022-present
	Allegra Farrar : Interaction between UAV and human	2018-2020
	Noah Curtiss : Development of multirotor UAV	2017-2019
	Carolyn Fisk : Cubesat mission analysis and design	2017-2019
	Chris Poole : Development of multirotor UAV	2015-2018
	Kiren Caldwell : Development of user interface for UAV control	2013-2014
	John Dougherty: Development of i2c interface circuit board	2012-2013
	Ryan Mossbarger: Development of thrust stand	2012-2013
Visiting Scholar	Charles Joyner (Stanford) : Vision-based UAV control	2023
	Nathan Park (McLean High) : UAV design and development	2023
	Prof. S. Kim (CNU South Korea) : Autonomous aerospace system	2019-2020
	Harsh Sharmar (VaTech) : Geometric numerical integration	2018, 2019

Student Recognition

DoD SMART Scholarship: (Karl Simon) 2022

Most Innovative/Creative Project Award: (Weixin Wang) 2021
Matrix Fisher–Gaussian Distribution for Spacecraft Attitude Estimation
The 11th Annual Student Competition, Society for Satellite Professional Internationals (SSPI)

NSF Graduate Research Fellow: (Allegra Farrar) 2020

AFRL Scholar: (Carolyn Fisk) 2018
Kirtland AFB, Albuquerque NM

Most Innovative/Creative Project Award: (Shankar Kulumani) 2017
Spacecraft trajectory design near asteroid 4769 Castalia
The 7th Annual Student Competition, Society for Satellite Professional Internationals (SSPI)

Mechanical and Aerospace Engineering – 1st Place: (Shankar Kulumani) 2017
Spacecraft trajectory design near asteroid 4769 Castalia
GWU Research Day

Best Theoretical Poster – Runner-up (Shankar Kulumani) 2017
Spacecraft trajectory design near asteroid 4769 Castalia
SEAS R&D Showcase, George Washington University

Entrepreneurship Prize (Evan Kaufman) 2017
A robotic vacuuming software tool with autonomous exploration via exact occupancy grid mapping
SEAS R&D Showcase, George Washington University

Best Theoretical Poster – 3rd Place (Mahdis Bisheban) 2017
Computational geometric system identification
SEAS R&D Showcase, George Washington University

Student Travel Award: (Mahdis Bisheman), American Control Conference 2017

Student Travel Award: (Evan Kaufman, Shankar Kulumani), American Control Conference 2016

Experimental Research Awards– 1st Place (Shankar Kulumani, Christopher Poole) 2016
Geometric adaptive control of attitude dynamics on SO(3) with state inequality constraints
SEAS R&D Showcase, George Washington University

Heatherington Family Annual Scholarship: (Shankar Kulumani) 2016

Most Innovative/Creative Project Award: (Shankar Kulumani) 2015
Systematic design of optimal low-thrust orbital transfers in the three-body problem
The 5th Annual Student Competition, Society for Satellite Professional Internationals (SSPI)

Second Prize: (John Dougherty)
Laser-based onboard sensing and estimation for precise landing of a quadrotor UAV on an inclined surface 2014
AIAA Region I Student Conference

Second Prize: (Tse-Huai Wu), Vision-based spacecraft attitude formation control 2014
GWU Research Day

Student Travel Award: (Farhad Goodarzi, John Dougherty), American Control Conference 2014

AFRL Scholar: (Evan Kaufman) 2014
Kirtland AFB, Albuquerque NM

AFRL Scholar: (Evan Kaufman) 2013
Kirtland AFB, Albuquerque NM

Third Place Prize: (Tse-Huai Wu), Vision-Based Spacecraft Formation Control and Estimation Network 2013
The 3rd Annual Student Competition, Society for Satellite Professional Internationals (SSPI)

SUPER Fellowship: (Kiren Caldwell), Spacecraft Formation Control Testbed with Free-Floating Aerial Vehicles 2013
Summer Undergraduate Program in Engineering Research, The George Washington University

Teaching Experience (average student evaluation: 4.8/5.0)

MAE3145: Orbital Mechanics and Space Dynamics	Fall 2011-2016
MAE4182: Electromechanical Control Systems	Fall 2018-2023
MAE6254: Applied Nonlinear Control	Spring 2012,2014,2016,2018,2019,2023
MAE6292: Special Topic: Robotics Vision and Perception	Spring 2021, 2022, 2024
MAE6292: Special Topic: Optimal Control and Estimation	Spring 2015, 2020
MAE6277: Spacecraft Attitude Control	Spring 2013, 2017
MAE6246: Electromechanical Control Systems (Linear Systems)	Spring 2013, Fall 2013-2016

Department of Mechanical and Aerospace Engineering, The George Washington University

MAE5690: Special Topic: Spacecraft Dynamics and Control	Spring 2011
MAE5690: Special Topic: Nonlinear Systems	Fall 2010
MAE4600: Engineering Astrodynamics	Fall 2009
MAE4242: Aircraft Stability and Control	Fall 2008-2010
MAE4014: Control Systems	Spring 2009-2011
MAE2082: Dynamics	Spring, Summer 2010

Department of Mechanical and Aerospace Engineering, Florida Institute of Technology

Outreach

Introduction to Control System Engineering — May 2015
Workshop for Robotics Group at Bell Multicultural High School

Introduction to Control System Engineering — May 2014
Workshop for Robotics Group at Bell Multicultural High School

Introduction to Control System Engineering — Jul 2010
Engineering Summer Camp for K-12 Students, Florida Institute of Technology