

# Melkior Ornik

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CURRENT POSITIONS	<b>University of Illinois Urbana-Champaign</b> , Urbana, IL, USA Assistant Professor, Department of Aerospace Engineering Assistant Professor, Department of Electrical and Computer Engineering (0%) Assistant Professor, Coordinated Science Laboratory (0%) <b>Discovery Partners Institute</b> , Chicago, IL, USA Affiliate (0%)	<b>2019 –</b> <b>2019 –</b> <b>2019 –</b> <b>2020 –</b>
PREVIOUS POSITIONS	<b>University of Illinois Urbana-Champaign</b> , Urbana, IL, USA Adjunct Assistant Professor, Department of Aerospace Engineering (0%) <b>University of Texas at Austin</b> , Austin, TX, USA Research Associate, Institute for Computational Engineering and Sciences Postdoctoral Fellow, Institute for Computational Engineering and Sciences	<b>2018</b> <b>2018</b> <b>2017 – 2018</b>
EDUCATION	<b>University of Toronto</b> , Toronto, ON, Canada Ph.D., Dept. of Electrical and Computer Engineering Thesis: <i>New Mathematical Tools in Reach Control Theory</i> Advisor: Mireille E. Broucke <b>Queen’s University</b> , Kingston, ON, Canada M.Sc., Dept. of Mathematics and Statistics Thesis: <i>Some Observations on Orbits of Driftless Bilinear Systems</i> Advisor: Andrew D. Lewis <b>University of Zagreb</b> , Zagreb, Croatia B.Sc., Dept. of Mathematics	<b>2017</b> <b>2013</b> <b>2011</b>
LONG-TERM VISITING RESEARCH	<b>Technion – Israel Institute of Technology</b> , Haifa, Israel <b>Queen’s University</b> , Kingston, ON, Canada <b>Weizmann Institute of Science</b> , Rehovot, Israel	<b>2016</b> <b>2012</b> <b>2011</b>
JOURNAL PUBLICATIONS	[1] P. Thangeda, H. Helmi, M. Ornik. Optimizing agricultural order fulfillment systems: A hybrid tree search approach. Submitted. [2] N. Chakraborty, M. Ornik, K. Driggs-Campbell. Hallucination detection in foundation models for decision-making: A flexible definition and review of the state of the art. Submitted. [3] T. Shafa, M. Ornik. Guaranteed reachability on Riemannian manifolds for unknown nonlinear systems. Submitted. [4] Y. Meng, T. Shafa, J. Wei, M. Ornik. Online learning and control synthesis for reachable paths of unknown nonlinear systems. Submitted. [5] J.-B. Bouvier, H. Panag, R. Woollands, M. Ornik. Delayed resilient trajectory tracking after partial loss of control authority over actuators. Submitted. [6] J.-B. Bouvier, S. P. Nandanoori, M. Ornik. Losing control of your linear network? Try resilience theory. <i>IEEE Transactions on Control of Network Systems</i> , 2024.	

- [7] H. El-Kebir, A. Pirozmanishvili, M. Ornik. Online guaranteed reachable set approximation for systems with changed dynamics and control authority. *IEEE Transactions on Automatic Control*, 69(2), pp. 726–740, 2024.
- [8] M. O. Karabag, M. Ornik, U. Topcu. Identity concealment games: How I learned to stop revealing and love the coincidences. *Automatica*, 161, 2024.
- [9] H. El-Kebir, R. Berlin, J. Bentsman, M. Ornik. Viability under degraded control authority. *IEEE Control Systems Letters*, 7, pp. 3765–3770, 2023.
- [10] Y. Wang, M. Ornik, R. Dong. Connection of optimal stopping time to s-t cut problems on trees. *IEEE Control Systems Letters*, 7, pp. 3729–3734, 2023.
- [11] J.-B. Bouvier, K. Xu, M. Ornik. Quantitative resilience of generalized integrators. *IEEE Transactions on Automatic Control*, 68(12), pp. 7591–7600, 2023.
- [12] F. Nawaz, M. Ornik. Multiagent, multitarget path planning in Markov decision processes. *IEEE Transactions on Automatic Control*, 68(12), pp. 7560–7574, 2023.  
*F. Nawaz was awarded Best Poster Award for related work at the 16th CSL Student Conference, 2021.*
- [13] K. Garg, C. Dawson, K. Xu, M. Ornik, C. Fan. Model-free neural fault detection and isolation for safe control. *IEEE Control Systems Letters*, 7, pp. 3169–3174, 2023.
- [14] F. Blahoudek, P. Novotný, M. Ornik, P. Thangeda, U. Topcu. Efficient strategy synthesis for MDPs with resource constraints. *IEEE Transactions on Automatic Control*, 68(8), pp. 4586–4601, 2023.
- [15] M. O. Karabag, M. Ornik, U. Topcu. Exploiting partial observability for optimal deception. *IEEE Transactions on Automatic Control*, 68(7), pp. 4443–4450, 2023.
- [16] M. Vora, P. Thangeda, M. N. Grussing, M. Ornik. Welfare maximization algorithm for solving budget-constrained multi-component POMDPs. *IEEE Control Systems Letters*, 7, pp. 1736–1741, 2023.
- [17] T. Shafa, M. Ornik. Reachability of nonlinear systems with unknown dynamics. *IEEE Transactions on Automatic Control*, 68(4), pp. 2407–2414, 2023.
- [18] J.-B. Bouvier, M. Ornik. Resilience of linear systems to partial loss of control authority. *Automatica*, 152, 2023.
- [19] P. Thangeda, M. Ornik, U. Topcu. Expedited online learning with spatial side information. *IEEE Transactions on Automatic Control*, 68(3), pp. 1479–1491, 2023.
- [20] J.-B. Bouvier, M. Ornik. Designing resilient linear systems. *IEEE Transactions on Automatic Control*, 67(9), pp. 4832–4837, 2022.
- [21] J.-B. Bouvier, M. Ornik. The maximax minimax quotient theorem. *Journal of Optimization Theory and Applications*, 192, pp. 1084–1101, 2022.
- [22] M. O. Karabag, M. Ornik, U. Topcu. Deception in supervisory control. *IEEE Transactions on Automatic Control*, 67(2), pp. 738–753, 2022.
- [23] H. Chen, M. Ornik, K. Ho. Space exploration architecture and design framework for commercialization. *Journal of Spacecraft and Rockets*, 59(2), pp. 538–551, 2022.
- [24] Z. Dai, K. Xu, M. Ornik. Repulsion-based p-dispersion with distance constraints in non-convex polygons. *Annals of Operations Research*, 307, pp. 75–91, 2021.
- [25] M. Ornik. Comment on “TVOR: Finding Discrete Total Variation Outliers Among Histograms”. *IEEE Access*, 9, pp. 78586–78593, 2021.
- [26] M. Ornik, U. Topcu. Learning and planning for time-varying MDPs using maximum likelihood estimation. *Journal of Machine Learning Research*, 22(35), pp. 1–40, 2021.
- [27] M. Ornik, S. Carr, A. Israel, U. Topcu. Control-oriented learning on the fly. *IEEE Transactions on Automatic Control*, 65(11), pp. 4800–4807, 2020.
- [28] Y. Savas, M. Ornik, M. Cubuktepe, M. O. Karabag, U. Topcu. Entropy maximization for Markov decision processes under temporal logic constraints. *IEEE Transactions on Automatic Control*, 65(4), pp. 1552–1567, 2020.
- [29] M. Ornik, M. E. Broucke. Chattering in the reach control problem. *Automatica*, 89, pp. 201–211, 2018.
- [30] M. E. Broucke, M. Ornik, A. Mansouri. A topological obstruction in a control problem. *Systems & Control Letters*, 108, pp. 71–79, 2017.

- [31] M. Ornik, M. E. Broucke. Characterization of a topological obstruction to reach control by continuous state feedback. *Mathematics of Control, Signals, and Systems*, 29(2), 2017.
- [32] M. Moarref, M. Ornik, M. E. Broucke. An obstruction to solvability of the reach control problem using affine feedback. *Automatica*, 71, pp. 229–236, 2016.
- [33] M. Ornik. Modeling the role of mutations and density independent dispersal in evolutionary rescue. *Journal of Biological Systems*, 22(1), pp. 123–132, 2014.

PEER-REVIEWED  
CONFERENCE  
PUBLICATIONS

- [34] Y. Meng, R. Zhou, M. Ornik, J. Liu. Koopman-based learning of infinitesimal generators without operator logarithm. Accepted to *63rd IEEE Conference on Decision and Control*, 2024.
- [35] R. Padmanabhan, C. Bakker, S. A. Dinkar, M. Ornik. How much reserve fuel: Quantifying the maximal energy cost of system disturbances. Accepted to *63rd IEEE Conference on Decision and Control*, 2024.
- [36] Y. Meng, H. Li, M. Ornik, X. Li. Koopman-based data-driven techniques for adaptive cruise control system identification. Accepted to *27th IEEE International Conference on Intelligent Transportation Systems*, 2024.
- [37] G. Puthumanaillam, M. Vora, M. Ornik. ComTraQ-MPC: Meta-trained DQN-MPC integration for trajectory tracking with limited active localization updates. Accepted to *2024 IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2024.
- [38] E. Fernández Bravo, M. Ornik, J. T. Allison. Numerical estimation of bidirectional plant-control design coupling in control co-design. Accepted to *ASME 2024 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference — 50th Design Automation Conference*, 2024.
- [39] H. El-Kebir, R. Berlin, J. Bentsman, M. Ornik. Viabilizability of control signals under control authority degradation. *22nd European Control Conference*, 2024.
- [40] G. Puthumanaillam, X. Liu, N. Mehr, M. Ornik. Weathering ongoing uncertainty: Learning and planning in a time-varying partially observable environment. *2024 IEEE International Conference on Robotics and Automation*, 2024.
- [41] T. Shafa, R. Dong, M. Ornik. Identifying single-input linear system dynamics from reachable sets. *62nd IEEE Conference on Decision and Control*, pp. 3527–3532, 2023.
- [42] K. Jagdale, Z. S. Khan, M. Menéndez, M. Ornik. Optimal planning on a single-route transit system with modular buses. *26th IEEE International Conference on Intelligent Transportation Systems*, pp. 3046–3051, 2023.
- [43] H. El-Kebir, J. Bentsman, M. Ornik. Lodestar: an integrated embedded real-time control engine. *7th IEEE Conference on Control Technology and Applications*, pp. 886–891, 2023.
- [44] Y. Zhu, P. Thangeda, M. Ornik, K. Hauser. Few-shot adaptation for manipulating granular materials under domain shift. *Robotics: Science and Systems*, 2023.
- [45] X. Duan, N. Baharisangari, R. Yan, Z. Xu, M. Ornik. On a notion of resilience for Markov decision processes with reachability objectives. *22nd IFAC World Congress*, pp. 12083–12088, 2023.
- [46] H. El-Kebir, J. Bentsman, M. Ornik. Robustly linearized model predictive control for nonlinear infinite-dimensional systems. *22nd IFAC World Congress*, pp. 9660–9665, 2023.
- [47] K. Jagdale, M. Ornik. Optimal routing of modular agents on a graph. *2023 IEEE Intelligent Vehicles Symposium*, 2023.
- [48] T. Shafa, M. Ornik. Maximal ellipsoid method for guaranteed reachability of unknown fully actuated systems. *61st IEEE Conference on Decision and Control*, pp. 5002–5007, 2022.
- [49] P. Thangeda, M. Ornik. Adaptive sampling site selection for robotic exploration in unknown environments. *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems*, pp. 4120–4125, 2022.
- [50] A. Dey, M. Ornik. Post-disaster repair crew assignment optimization using minimum latency. *8th IEEE International Smart Cities Conference*, 2022.
- [51] M. Ornik, J.-B. Bouvier. Assured system-level resilience for guaranteed disaster response. *8th IEEE International Smart Cities Conference*, 2022.
- [52] J.-B. Bouvier, M. Ornik. Quantitative resilience of linear systems. *20th European Control Conference*, pp. 477–482, 2022.

- [53] M. Ornik. Deceptive trajectory imitation using affine feedback. *2022 American Control Conference*, pp. 5211–5216, 2022.
- [54] J.-B. Bouvier, S. P. Nandanoori, M. Ornik, S. Kundu. Distributed transient safety verification via robust control invariant sets: A microgrid application. *2022 American Control Conference*, pp. 2202–2207, 2022.
- [55] F. Blahoudek, M. Cubuktepe, P. Novotný, M. Ornik, P. Thangeda, U. Topcu. Fuel in Markov decision processes (FiMDP): A practical approach to consumption. *Formal Methods 2021*, pp. 640–656, 2021.
- [56] H. El-Kebir, T. Shafa, A. Purushottam, M. Ornik, A. Soylemezoglu. High-frequency vibration reduction for unmanned ground vehicles on unstructured terrain. *8th International Conference on Modelling and Simulation for Autonomous Systems*, pp. 74–92, 2021.
- [57] W. Zheng, P. Thangeda, Y. Savas, M. Ornik. Optimal routing in stochastic networks with reliability guarantees. *24th IEEE International Conference on Intelligent Transportation Systems*, pp. 3521–3526, 2021.
- [58] J.-B. Bouvier, K. Xu, M. Ornik. Quantitative resilience of linear driftless systems. *2021 SIAM Conference on Control and Its Applications*, pp. 32–39, 2021.
- [59] H. El-Kebir, M. Ornik. Online inner approximation of reachable sets of nonlinear systems with diminished control authority. *2021 SIAM Conference on Control and Its Applications*, pp. 9–16, 2021.
- [60] M. Ornik. Measuring target predictability for optimal environment design. *59th IEEE Conference on Decision and Control*, pp. 5023–5028, 2020.
- [61] M. Ornik. Guaranteed reachability for systems with unknown dynamics. *59th IEEE Conference on Decision and Control*, pp. 2756–2761, 2020.
- [62] F. Nawaz, M. Ornik. Explorative probabilistic planning with unknown target locations. *59th IEEE Conference on Decision and Control*, pp. 2732–2737, 2020.
- [63] P. Thangeda, M. Ornik. PROTRIP: Probabilistic risk-aware optimal transit planner. *23rd IEEE International Conference on Intelligent Transportation Systems*, 2020.
- [64] F. Blahoudek, T. Brázdil, P. Novotný, M. Ornik, P. Thangeda, U. Topcu. Qualitative controller synthesis for consumption Markov decision processes. *32nd International Conference on Computer-Aided Verification*, part II, pp. 421–447, 2020.
- [65] J.-B. Bouvier, M. Ornik. Resilient reachability for linear systems. *21st IFAC World Congress*, pp. 4409–4414, 2020.
- [66] P. Thangeda, M. Ornik. Safety-guaranteed, accelerated learning in MDPs with local side information. *2020 American Control Conference*, pp. 1099–1105, 2020.
- [67] Y. Savas, V. Gupta, L. J. Ratliff, M. Ornik, U. Topcu. Incentive design for temporal logic objectives. *58th IEEE Conference on Decision and Control*, pp. 2251–2258, 2019.
- [68] M. O. Karabag, M. Ornik, U. Topcu. Optimal deceptive and reference policies for supervisory control. *58th IEEE Conference on Decision and Control*, pp. 1323–1330, 2019.
- [69] Z. Xu, M. Ornik, A. A. Julius, U. Topcu. Information-guided temporal logic inference with prior knowledge. *2019 American Control Conference*, pp. 1891–1897, 2019.
- [70] M. O. Karabag, M. Ornik, U. Topcu. Least inferable policies for Markov decision processes. *2019 American Control Conference*, pp. 1224–1231, 2019.
- [71] M. Ornik, S. Carr, A. Israel, U. Topcu. Myopic control of systems with unknown dynamics. *2019 American Control Conference*, pp. 1064–1071, 2019.
- [72] M. Ornik, J. Fu, N. T. Lauffer, W. K. Perera, M. Alshiekh, M. Ono, U. Topcu. Expedited learning in MDPs with side information. *57th IEEE Conference on Decision and Control*, pp. 1941–1948, 2018.
- [73] M. Ornik, M. S. Moura, A. Peplowski, M. E. Broucke. Adaptive cruise control design using reach control. *21st IEEE International Conference on Intelligent Transportation Systems*, pp. 111–116, 2018.
- [74] Y. Savas, M. Ornik, M. Cubuktepe, U. Topcu. Entropy maximization for constrained Markov decision processes. *56th Annual Allerton Conference on Communication, Control, and Computing*, pp. 911–918, 2018.

- [75] M. Ornik, U. Topcu. Deception in optimal control. *56th Annual Allerton Conference on Communication, Control, and Computing*, pp. 821–828, 2018.
- [76] M. Bucić, M. Ornik, U. Topcu. Graph-based controller synthesis for safety-constrained, resilient systems. *56th Annual Allerton Conference on Communication, Control, and Computing*, pp. 297–304, 2018.
- [77] P. Mercader, M. Ornik, P.-O. Gutman, I. Ioslovich. Optimal signal timing for multi-phase intersections. *15th IFAC Symposium on Control in Transportation Systems*, pp. 476–481, 2018.
- [78] M. Ornik, M. E. Broucke. A graph-theoretic approach to the reach control problem. *56th IEEE Conference on Decision and Control*, pp. 4952–4957, 2017.
- [79] M. Ornik, M. E. Broucke. A nerve-theoretic result on the problem of a topological obstruction in reach control. *56th IEEE Conference on Decision and Control*, pp. 3009–3114, 2017.
- [80] M. Ornik, M. Moarref, M. E. Broucke. An automated parallel parking strategy using reach control theory. *20th IFAC World Congress*, pp. 9419–9424, 2017.
- [81] M. Ornik, A. C. Sniderman, M. E. Broucke, G. M. T. D’Eleuterio. Pattern identification in distributed systems. *55th IEEE Conference on Decision and Control*, pp. 6895–6900, 2016.
- [82] M. Ornik, M. E. Broucke. Characterizing equilibria in reach control under affine feedback. *10th IFAC Symposium on Nonlinear Control Systems*, pp. 1078–1083, 2016.
- [83] M. Ornik, M. E. Broucke. A topological obstruction to reach control by continuous state feedback. *54th IEEE Conference on Decision and Control*, pp. 2258–2263, 2015.
- [84] M. Ornik, M. E. Broucke. On a topological obstruction in the reach control problem. *2015 AMMCS-CAIMS Congress*, pp. 677–687, 2015.

PUBLICATIONS IN  
OTHER VENUES

- [85] A. N. Sivakumar, P. Thangeda, Y. Fang, M. V. Gasparino, J. Cuaran, M. Ornik, G. Chowdhary. Learning to Turn: Diffusion imitation for robust row switching in under-canopy robots. Accepted to *40th Anniversary of the IEEE Conference on Robotics and Automation* (extended abstract), 2024.
- [86] H. El-Kebir, M. Ornik, Y. K. Nakka, C. Choi, A. Rahmani. Robust detection and identification of simultaneous sensor and actuator faults. *IEEE Aerospace Conference*, 2024.
- [87] G. Puthumanaillam, M. Vora, T. Shafa, Y. Li, M. Ornik, S. Mitra. Assured collision avoidance for learned controllers: A case study of ACAS Xu. *2024 AIAA SciTech Forum*, 2024.
- [88] G. Puthumanaillam, Y. Mamik, M. Ornik. Online learning and planning in time-varying environments: An aircraft case study. *2024 AIAA SciTech Forum*, 2024.
- [89] P. Thangeda, A. Goel, E. Tevere, Y. Zhu, E. Kramer, A. Daca, H. Nayar, K. Hauser, M. Ornik. Learning and autonomy for extraterrestrial terrain sampling: An experience report from OWLAT deployment. *2024 AIAA SciTech Forum*, 2024.
- [90] J.-B. Bouvier, H. Panag, R. Woollands, M. Ornik. Resilience of orbital inspections to partial loss of control authority of the chaser satellite. *2022 AAS/AIAA Astrodynamics Specialist Conference*, 2022. *J.-B. Bouvier received the John V. Breakwell Student Award by the American Astronautical Society Space Flight Mechanics Committee for this paper.*
- [91] H. El-Kebir, M. Ornik. In-flight air density estimation and prediction for hypersonic flight vehicles. *23rd AIAA International Space Planes and Hypersonic Systems and Technologies Conference*, 2020.
- [92] H. Chen, M. Ornik, K. Ho. Incentive design for commercial participation in space logistics infrastructure development and deployment. *70th International Astronautical Congress*, 2019. *H. Chen received the Luigi G. Napolitano Award of the International Astronautical Federation for his contributions in this paper.*
- [93] D. Ge, M. Ornik, U. Topcu. Robust myopic control for systems with imperfect observations. *2018 AAS/AIAA Astrodynamics Specialist Conference*, pp. 3057–3072, 2018.
- [94] M. Ornik, A. Šušnjara (supervised by Z. Drmač). Neki prilozi teoriji egzaktne rekonstrukcije poligona [Some Contributions to the Theory of Exact Polygon Reconstruction]. *University of Zagreb Rector’s Award winning paper*, 2012.
- [95] M. Berljafa, S. Muhvić, M. Ornik (supervised by S. Singer). Računanje Gaussovih integracijskih formula za sažimajuću bazu [Computation of Gaussian Quadrature Formulae for Compression Basis]. *University of Zagreb Rector’s Award nominated paper*, 2011.

Funding source: UIUC and University of Birmingham  
 Role: Principal Investigator (co-PI: X. Zhou)  
**Total award amount: \$14,500** (Ornik/UIUC Portion: \$6,500)

**Synthesizing Temporal Logic and Human Performance Models for Deception Mitigation** 2023 – 2028  
 Funding source: Office of Naval Research  
 Role: Co-Principal Investigator (PI: M. L. Cummings)  
**Total award amount: \$1,599,978** (Ornik/UIUC portion: \$655,725)

**Distributed Swarm Planning in Complex, Low-Communication Environments** 2023 – 2026  
 Funding source: Office of Naval Research  
 Role: Principal Investigator  
**Total award amount: \$600,000** (Ornik/UIUC portion: \$300,000)

**Resilience and Guaranteed Task Completion for Partially Unknown Nonlinear Control Systems** 2023 – 2026  
 Funding source: Air Force Office of Scientific Research  
 Role: Principal Investigator  
**Total award amount: \$450,000** (Ornik/UIUC portion: \$450,000)

**Computational Tools for Dynamics and Control** 2023 – 2025  
 Funding source: UIUC — Strategic Instructional Innovations Program  
 Role: Co-Principal Investigator (PI: S. Hilgenfeldt)  
**Total award amount: \$81,120** (Ornik portion: N/A; instructional project)

**Optimal Planning for Ag Systems** 2022 – 2025  
 Funding source: Corteva  
 Role: Principal Investigator  
**Total award amount: \$225,000** (Ornik/UIUC portion: \$225,000)

**Robust and Resilient Autonomy for Advanced Air Mobility** 2022 – 2025  
 Funding source: NASA  
 Role: Co-Principal Investigator (PI: N. Hovakimyan)  
**Total award amount: \$5,999,216+\$715,459 cost sharing**  
 (UIUC portion: \$3,126,427+\$593,005 cost sharing)

**Optimal Infrastructure Assessment and Management Through Active Learning and Data-Driven Planning** 2022 – 2024  
 Funding Source: US Army Engineer Research and Development Center  
 Role: Principal Investigator  
**Total award amount: \$200,000** (Ornik/UIUC portion: \$200,000)

**DRILLAWAY: aDaptive, ResIllient Learning-enabLed oceAn World AutonomY** 2021 – 2024  
 Funding source: NASA  
 Role: Principal Investigator  
**Total award amount: \$1,000,000** (UIUC portion: \$1,000,000)

**Net Zero Transportation Infrastructure** 2021 – 2023  
 Funding source: Discovery Partners Institute  
 Role: Co-Principal Investigator (PI: F. Ansari)  
**Total award amount: \$125,014** (UIUC portion: ~\$50,000)

**LEONA: Logic-Based Context-Aware Activity Interpreter for Geospatial Intelligence** 2021  
 Funding source: UIUC — New Frontiers Initiative  
 Role: Principal Investigator  
**Total award amount: \$10,323** (Ornik portion: \$10,323)

**System for Avoidance and Flight-path Execution based on Risk Reduction (SAFERR)** 2020 – 2021  
 Funding source: US Air Force — AFWERX

Role: Co-Principal Investigator (PI: K. McDonough)  
**Total award amount: ~\$150,000** (Ornik/UIUC portion: \$54,915)

**Seedling: Synthesis of Control Protocols for Integrated Mission Planning, Resource Management and Information Acquisition** **2020 – 2021**  
Funding source: Defense Advanced Research Projects Agency  
Role: Co-Principal Investigator (PI: U. Topcu)  
**Total award amount: \$293,258** (Ornik/UIUC portion: \$133,846)

**LDRD: Learning of Time-Varying Dynamics** **2019 – 2020**  
Funding source: Sandia National Laboratories  
Role: Principal Investigator  
**Total award amount: \$75,000** (Ornik/UIUC portion: \$75,000)

**Safety-Constrained and Efficient Learning for Resilient Autonomous Space Systems** **2019 – 2023**  
Funding source: NASA  
Role: Principal Investigator  
**Total award amount: \$500,000** (Ornik/UIUC portion: \$340,138)

**Enhancing Opportunities for Research and Training in Space Engineering** **2018 – 2022**  
Funding source: US Department of Education  
Role: Faculty Team member (Project Director: J. Rovey)  
**Total award amount: \$1,251,978** (UIUC portion: \$1,251,978)

RECENT PROFESSIONAL RECOGNITION AND HONORS

AIAA Senior Member **2024 –**  
IEEE Senior Member **2022 –**  
AFOSR Young Investigator Program awardee **2023**  
Faculty lead for the UIUC Lunar Entry and Approach Platform for Research on Ground (LEAPFROG) Challenge team, winners of the 2021 LEAPFROG competition **2021**

Included on the *List of Teachers Ranked as Excellent by Their Students* **Fall 2023, Fall 2022, Spring 2020, Spring 2019**

INVITED TALKS *(Talks at program review workshops and to industrial partners not listed.)*

- [1] Control of Unknown Systems in Unlearnable Environments: Fundamental Limits of Knowledge. *AIAA Intelligent Systems Technical Committee Seminar Series* organized by AIAA, online, 2024.
- [2] Control of Nonlinear Systems in Unlearnable Environments: Fundamental Limits of Knowledge. *Special Robotics Seminar* at Massachusetts Institute of Technology, Cambridge, MA, USA, 2024.
- [3] Complex Teams on Complex Missions: Interplay of Resources, Information, and the Environment. *ICON Seminar in Robotics* at Purdue University, West Lafayette, IN, USA, 2024.
- [4] Autonomous System Resilience and Guaranteed Performance in the Face of Unexpected Adversity. *Mechanical & Aerospace Seminars* at Arizona State University, Tempe, AZ, USA, 2024.
- [5] From Fast Kebab Delivery to Modularity: Complex Scenarios in Multi-Agent, Multi-Target Planning. *School of Mechanical and Aerospace Engineering Seminar* at Nanyang Technological University, Singapore, 2023.
- [6] Deceptive Decision-Making: Inference, Strategies, and Environment Co-design. *“Counter-Adversarial Inference, Control and Learning: New Frontiers, Newer Challenges” Workshop* at the 62nd IEEE Conference on Decision and Control, Singapore, 2023.
- [7] Resilience and Guaranteed Task Completion for Partially Unknown Nonlinear Control Systems. *Control Theory Seminar* at University of Waterloo, Waterloo, ON, Canada, 2023.
- [8] A Step Beyond Adaptation and Robustness: Resilience and Guaranteed Capabilities in Control Systems. *Workshop on Control and Machine Learning: Challenges and Progress* at Northeastern University, Boston, MA, USA, 2023.
- [9] Control System Resilience and Guaranteed Performance in the Face of Unexpected Adversity. *Centre for Research in Earth and Space Science seminar* at York University, Toronto, ON, Canada, 2023.

- [10] Resilience and Guaranteed Performance for Control Systems with Unknown Dynamics. *Graduate Seminar on Stochastic Control (and Related Fields)* at Queen’s University, Kingston, ON, Canada, 2023.
- [11] Resilience and Guaranteed Performance for Control Systems with Unknown Dynamics. *Wisconsin Robotics Seminar Series* at University of Wisconsin–Madison, Madison, WI, USA, 2023.
- [12] System Resilience and Guaranteed Performance in the Face of Unexpected Adversity. *RD2C Seminar* at Pacific Northwest National Laboratory, Richland, WA, USA, 2023.
- [13] System Resilience and Guaranteed Performance in the Face of Unexpected Adversity. *GRASP Student Faculty Industry Seminar Series* at University of Pennsylvania, Philadelphia, PA, USA, 2023.
- [14] Certifiable System Resilience in the Face of Adversity. *G-34/WG-114 Artificial Intelligence in Aviation Technical Talks* organized by SAE International and EUROCAE, online, 2023.
- [15] From Burrito Delivery to Modularity: Complex Scenarios in Multi-Agent, Multi-Target Planning. *Multi-Agent Tech Talks* at NASA Jet Propulsion Laboratory, Pasadena, CA, USA, 2022.
- [16] Resilience of Autonomous Systems: A Step Beyond Adaptation. *Department of Aerospace Engineering Seminar* at University of Illinois Urbana-Champaign, Urbana, IL, USA, 2022.
- [17] Resilience of Control Systems and Infrastructure: A Step Beyond Ad-Hoc Adaptation. *R&D Seminar Series* at Discovery Partners Institute, Chicago, IL, USA, 2022.
- [18] Squeezing the Side Information: Sampling and Motion Planning Strategies in Unknown Environments. *NASA Ames Planning and Scheduling Group* talk at NASA Ames Research Center, Mountain View, CA, USA (*held online*), 2022.
- [19] Resilience of Autonomous Systems: A Step Beyond Adaptation. *Institute for Robotics and Intelligent Machines Seminar Series* at Georgia Institute of Technology, Atlanta, GA, USA, 2022.
- [20] Resilience of Autonomous Systems: A Step Beyond Adaptation. *System Wide Safety Tech Talks* organized by NASA, online, 2022.
- [21] The Mirage of “Mathematical Proof”: The Need for Context in Statistical Analysis. *Jasenovac Past and Present: History and Memory of Institutionalised Destruction* organized by Uppsala University, online, 2021.
- [22] Resilience of Autonomous Systems: A Step Beyond Adaptation. *Control, Autonomy and Robotics Seminar* at University of Texas at Austin, Austin, TX, USA, 2021.
- [23] Resilience of Autonomous Systems: A Step Beyond Adaptation. *Robotics Seminar @ Illinois* at University of Illinois Urbana-Champaign, Urbana, IL, USA, 2021.
- [24] Temporal Logic for Automated (Geospatial) Intelligence Analysis. *New Frontiers Initiative Webinar and Training Series* at University of Illinois Urbana-Champaign, Urbana, IL, USA (*held online*), 2021.
- [25] Resilience and Guaranteed Reachability After Adverse Mid-Mission Events. *System Wide Safety Tech Talks* organized by NASA, online, 2020.
- [26] Planning in Complex and Contested Environments Through Online Learning and Formal Methods. *Distinguished Lecture Series* seminar at Naval Surface Warfare Center Crane Division, Crane, IN, USA (*held online*), 2020.
- [27] Planning in Complex and Contested Environments Through Online Learning and Formal Methods. *Naval Mathematics Group* seminar at Naval Surface Warfare Center Panama City Division, Panama City, FL, USA (*held online*), 2020.
- [28] Deception and Counter-Deception in Planning and Environment Design. *Society of American Military Engineers Illini Post*, Champaign, IL, USA, 2020.
- [29] Safe, Efficient, and Meaningful Learning and Planning for Resilient Autonomous Systems. *Pacific Northwest National Laboratory*, Richland, WA, USA, 2019.
- [30] Safety-Constrained and Efficient Learning for Resilient Autonomous Space Systems. *Department of Aerospace Engineering Seminar* at University of Illinois Urbana-Champaign, Urbana, IL, USA, 2019.
- [31] Safety-Constrained and Efficient Learning for Resilient Autonomous Space Systems. *NASA Ames Research Center*, Mountain View, CA, USA, 2019.
- [32] Deception and Unpredictability in Stochastic Control. *Control Theory Seminar* at Queen’s University, Kingston, ON, Canada, 2019.



- [33] Deception and Counter-Deception in Physical Security. *UIUC-CERL Seminar* at U.S. Army Engineer Research and Development Center, Champaign, IL, USA, 2019.
- [34] Deception and Unpredictability in Control Systems. *Rigorous Systems Engineering Seminar* at IST Austria, Klosterneuburg, Austria, 2018.
- [35] Control-Oriented Learning for Safety-Critical Autonomous Systems. University of Toronto, Toronto, ON, Canada, 2018.
- [36] Safety-Guaranteed Learning and Control in Complex Environments. University of Illinois at Urbana-Champaign, Urbana, IL, USA, 2018.
- [37] Control-Oriented Learning for Safety-Critical Autonomous Systems. *Department of Aerospace Engineering Seminar* at University of Illinois at Urbana-Champaign, Urbana, IL, USA, 2018.
- [38] Topological and Affine Obstructions in Reach Control. *Control & Systems Theory Seminar* at Technion – Israel Institute of Technology, Haifa, Israel, 2016.

PANEL  
RESEARCH  
DISCUSSIONS

- [39] Next Generation of Testbeds/Use Cases, Challenge Problems, Infrastructure/Data for DoN Large Scale Open World Problems. *Science of Autonomy 2024 Meeting* organized by Office of Naval Research, Alexandria, VA, USA, 2024.
- [40] Safety of Autonomous Systems – From Research to Real-World. *Robotics Seminar @ Illinois* at University of Illinois Urbana-Champaign, Urbana, IL, USA, 2023.

INSTRUCTION

*(Only courses where I was the primary instructor are listed; thesis research courses not included.)*

**University of Illinois Urbana-Champaign**, Urbana, IL, USA

- AE 598 — Autonomy Against the Odds: Stochastic Control for Motion and Mission Planning **Spring 2022, Spring 2024**
- AE 353 — Aerospace Control Systems **Fall 2019, Fall 2020, Fall 2021, Fall 2022, Fall 2023**
- AE 504 — Optimal Aerospace Systems **Spring 2019, Spring 2020, Spring 2023**
- AE 555 — Multivariable Control Design **Spring 2021**
- AE 497 — Independent Study **Fall 2019, Spring 2020, Fall 2021, Spring 2022, Fall 2022, Spring 2023, Fall 2023, Spring 2024**
- ECE 397 — Individual Study in ECE **Spring 2024**
- AE 597 — Independent Study **Fall 2018, Summer 2020, Fall 2023**

**International Mathematics Master**,

organized by **International Centre for Theoretical Physics**, Trieste, Italy

Dynamical Systems (*co-instructor, 2 weeks*)

**Spring 2023**

*in 2023 held at COMSATS University Islamabad, Lahore Campus, Lahore, Pakistan*

TEACHING AND  
SUPPORT  
DEVELOPMENT

Reflective Practice Retreat Participant, organized by **Amizade**, Pittsburgh, PA, USA **2024**  
*in 2024 held in partnership with Nido de Vida in La Bolivarense, Ecuador*

**University of Illinois Urbana-Champaign**, Urbana, IL, USA

- Faculty Mental Health Ambassador **2022 – 2024**
- Academic Leadership and Management Institute Participant **2024**
- Collins Scholars Program Peer Co-Observer **Fall 2021, Spring 2022, Fall 2023, Spring 2024**
- Collins Scholars Program Graduate **2020**

**University of Toronto**, Toronto, ON, Canada

Teaching Fundamentals Certificate Program Graduate **2014**

GRADUATE  
STUDENTS  
ADVISED –  
CURRENT

*(Only students for I am serving as a primary, long-term research advisor listed.)*

**University of Illinois Urbana-Champaign**, Urbana, IL, USA

- Hamza El-Kebir (*co-advised with J. Bentsman*) **PhD, 2020 –**
- Pranay Thangeda **PhD, 2021 –**
- Taha Shafa **PhD, 2021 –**

	Gokul Puthumanaim	PhD, 2022 –
	Manav Vora	PhD, 2022 –
	Ram Padmanabhan	PhD, 2023 –
	Sihang Wei ( <i>co-advised with H. Tsukamoto</i> )	PhD, 2024 –
	Zhiquan Zhang	PhD, 2024 –
GRADUATE STUDENTS ADVISED – COMPLETED	<b>University of Illinois Urbana-Champaign</b> , Urbana, IL, USA	
	Jean-Baptiste Bouvier	PhD, 2023
	<i>Thesis title: Guaranteed Resilience of Autonomous Systems to Partial Loss of Control Authority over Actuators</i>	
	Karan Jagdale	MSc, 2023
	<i>Thesis title: Planning in Modular Multi-Agent Systems</i>	
	Farhad Nawaz	MSc, 2021
	<i>Thesis title: Multi-Agent, Multi-Objective Path Planning in Complex Environments</i>	
	Pranay Thangeda	MSc, 2020
	<i>Thesis title: Efficient Learning and Planning Using Spatial Side Information</i>	
POSTDOCTORAL SCHOLARS ADVISED	<b>University of Illinois Urbana-Champaign</b> , Urbana, IL, USA	
	Yiming Meng	2023 –
VISITING SCHOLARS HOSTED	<b>University of Illinois Urbana-Champaign</b> , Urbana, IL, USA	
	Aamir Hussain Chughtai <i>Lahore University of Management Sciences</i>	2024
MENTORSHIP AND OUTREACH	( <i>Formal graduate student advising not included</i> )	
	Academic and research advisor for a diverse group of undergraduate students (research: $\approx 5$ /year, academic: $\approx 25$ /year), UIUC	2019 –
	Mavis Future Faculty Fellows program mentor for 3 Ph.D. students, UIUC	2022/2023, 2023/2024
	Mentor, National Alliance for Doctoral Studies in the Mathematical Sciences	2019 –
	Scientist participant, “Skype a Scientist”	2019 –
	Guest scientist, Yankee Ridge Elementary School, Urbana, IL, USA	2021 – 2024
	Participant, Professor Panel, Engineering Open House, UIUC	2024
	Organizer and moderator, Department of Aerospace Engineering	2021, 2022
	Graduate School Panel for Undergraduates, UIUC	
	Judge, Undergraduate Research Symposium, UIUC	2021, 2022
	Judge, Coordinated Science Laboratory Student Conference 2019, UIUC	2019
	Course developer and instructor, SEEDS In Residence, Queen’s University	2013
OTHER SERVICE – RESEARCH	<b>Editor</b>	
	Associate Managing Editor of <i>IEEE Smart Cities Newsletter</i> (2022 – 2023), Associate Editor of “ <i>Formal Verification and Synthesis of Cyber-Physical Systems</i> ” special section in <i>IEEE Open Journal of Control Systems</i> (2023)	
	<b>Workshop Organizer (Self-Standing)</b>	
	Workshop Series “Autonomous and Resilient Transportation Systems” at University of Birmingham and University of Illinois Urbana-Champaign (2024 – 2025, upcoming)	
	<b>Workshop and Session Organizer (at Conferences)</b>	
	Invited session “Learning-empowered Intelligent Transportation Systems: Foundation Vehicles and Coordination Technique” at 27th IEEE International Conference on Intelligent Transportation Systems (2024, upcoming), Invited session “AI-Enhanced Safety-Certifiable Autonomous Vehicles” at 27th IEEE International Conference on Intelligent Transportation Systems (2024, upcoming), Workshop “Robust and Resilient Autonomy: Progress and Challenges” at 22nd IFAC World Congress (2023), Workshop	

“Learning and Control for Safety-Critical Systems” at *2022 American Control Conference* (2022), Invited session “Learning and Planning in Adversarial Environments” at *57th Annual Allerton Conference on Communication, Control, and Computing* (2019)

**Technical and Professional Committee Member**

*IFAC Technical Committee on Robust Control* (2021 –), *IEEE Control Systems Society Technical Committee on Robust and Complex Systems* (2021 –), *IEEE Smart Cities Publication Committee* (2022 –), *IEEE Control Systems Society Technical Committee on Hybrid Systems* (2022 –), *IEEE Control Systems Society Technical Committee on Smart Cities* (2022 –), *AIAA Unidentified Aerospace Phenomena Integration and Outreach Committee* (2023)

**Program Reviewer**

*Deutscher Akademischer Austauschdienst [German Academic Exchange Service] Postdoc-NeT-AI* (proposal review), *International Space Station* (proposal review), *National Science Foundation Cyber-Physical Systems* (proposal review panel), *National Science Foundation AccelNet* (proposal review), *IEEE Senior Member Application Review* (panel)

**Publication Reviewer**

*Communications Engineering, IEEE Transactions on Control Systems Technology, Acta Astronautica, Engineering Applications of Artificial Intelligence, IEEE Transactions on Transportation Electrification, Advanced Control for Applications, Aeronautical Journal, Information Processing Letters, IEEE Transactions on Automation Science and Engineering, IEEE Access, Proceedings of the Royal Society A, IEEE Transactions on Control of Network Systems, IEEE Transactions on Games, IEEE Control Systems Letters, Automatica, IEEE Transactions on Automatic Control, Robotics: Science and Systems* (2024), *Learning for Dynamics & Control Conference* (2024), *American Control Conference* (2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024), *IFAC World Congress* (2017, 2020, 2023), *IEEE Conference on Decision and Control* (2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024), *European Control Conference* (2020, 2021, 2022), *International Conference on Modelling and Simulation for Autonomous Systems* (2021), *NASA Formal Methods Symposium* (2020), *Allerton Conference on Communication, Control, and Computing* (2019, 2023, 2024 — reviewer/program committee member), *AIAA SciTech Forum* (2025 — abstract reviewer)

**Session Chair and Co-Chair**

*European Control Conference* (2024), *IEEE Conference on Decision and Control* (2019, 2023), *IEEE International Smart Cities Conference* (2022), *Allerton Conference on Communication, Control, and Computing* (2019), *American Control Conference* (2019), *IFAC Symposium on Nonlinear Control Systems* (2016)

OTHER SERVICE –	Member, AE Advisory Committee, UIUC	2022 –
TEACHING AND	Member, AE Space to Belong – Diversity, Equity and Inclusion Committee, UIUC	2022 –
UNIVERSITY	Member, AE Graduate Policy Committee, UIUC	2019 – 2023
	Chair, EngineeringIT Governance Education Working Group, UIUC	2022 – 2023
	Secretary, AE monthly faculty meetings, UIUC	2022 – 2023
	Member, EngineeringIT Governance Education Working Group, UIUC	2020 – 2022
	Chair, AE monthly faculty meetings, UIUC	2021 – 2022
	Coordinator, AE-CDS qualifying exam, UIUC	Spring 2020
	Member, AE Graduate Admissions Committee, UIUC	Spring 2019, Fall 2019

**Thesis Committee Member** (*own advised students not listed*)

Kristina Miller, University of Illinois Urbana-Champaign	PhD, awarded 2024
Mustafa O. Karabag, University of Texas at Austin	PhD, awarded 2023
Peter Du, University of Illinois Urbana-Champaign	PhD, awarded 2023
Giusy Falcone, University of Illinois Urbana-Champaign	PhD, awarded 2022

Sriramya Bhamidipati, University of Illinois Urbana-Champaign  
Noel Brindise, University of Illinois Urbana-Champaign  
M. Ugur Akcal, University of Illinois Urbana-Champaign

**PhD, awarded 2021**  
**PhD, in progress**  
**PhD, in progress**