

MORTEZA LAHIJANIAN

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RESEARCH INTERESTS

- My research is at the intersection of *machine learning*, *control theory*, and *formal methods*. The main theme of my work is *safety* and *soundness*, and the emphasis is on *safe autonomy* through *correct-by-construction* algorithmic approaches to robotic, aerospace, and cyber-physical systems.
 - Safe AI
 - Data-driven verification and synthesis for complex, possibly unknown systems
 - Temporal logic planning for complex and uncertain systems
 - Decision making under uncertainty
 - **Keywords:** verified AI, strategy synthesis, motion planning, model checking, hybrid systems, human-robot interaction, dynamics, and systems with applications in robotics and aerospace.

EDUCATION

- | | | |
|---------|--|-------------------|
| 01/2013 | Ph.D. in Mechanical Engineering | Boston University |
| | <ul style="list-style-type: none">• Dissertation: Formal Verification and Synthesis for Discrete-time Stochastic Systems• Advisors: Sean B. Andersson & Calin Belta | |
| 05/2008 | M.S. in Mechanical Engineering | Boston University |
| | <ul style="list-style-type: none">• Emphasis: Control theory & Robotics | |
| 05/2005 | B.S. in Bioengineering | UC Berkeley |
| | <ul style="list-style-type: none">• Emphasis: Biorobotics & MEMS | |

EMPLOYMENT

- | | | |
|---------------|---|-------------|
| 03/21-present | Dept. of Computer Science, University of Colorado | Boulder, CO |
| | <ul style="list-style-type: none">• Assistant Professor by Courtesy: member of the Programming Languages and Verification at the University of Colorado (CUPLV). | |
| 10/18-present | Dept. of Aerospace Eng. Sciences, University of Colorado | Boulder, CO |
| | <ul style="list-style-type: none">• Assistant Professor: member of the Research and Engineering Center for Unmanned Vehicles (RECUV). | |
| 12/15-08/18 | Dept. of Computer Science, University of Oxford | Oxford, UK |
| | <ul style="list-style-type: none">• Research Scientist: mobile autonomy - safety, trust, and integrity of autonomous mobile robots; enabling a pervasive technology of the future. Collaborators: Marta Kwiatkowska & Ingmar Posner. | |

09/12-08/15

Dept. of Computer Science, Rice University

Houston, TX

- **Postdoctoral Research Associate:** motion planning and control synthesis for complex and uncertain systems from task-level specifications at Kavraki Lab and Computer-Aided Verification and Reasoning (CAVR) group. Collaborators: Lydia E. Kavraki & Moshe Y. Vardi.

AWARDS & HONORS

- RIO Faculty Fellow, University of Colorado Boulder (2024-2025)
- Outstanding junior faculty, Aerospace Eng. Sci. Dept., Univ. of Colorado (2023)
- Nominated for best paper award at Conference on Decision and Control (2023)
- Nominated for Outstanding Faculty Advisor Award, University of Colorado Boulder (2023)
- Nominated for The Grainger Foundation Frontiers of Engineering Symposium (2023)
- Wadham College Research Fellow (2016-2017)
- Best Presenter at American Control Conference (2011)
- Travel Grant to American Control Conference (2011)
- NSF GRASSROOTS Fellowship (2009)
- NSF Travel Grant to IEEE International Conference on Robotics and Automation (2009)
- NSF-GK12 Fellowship (2007-2008)
- Graduate Teaching Fellowship (2006-2007)
- Federal SEOG Grant Fall (2004)
- UC Spring Grant (2004)
- Cal Grant B (2002-2003)
- Ella Mae & Lawrence R. Quarles Physical Science Achievement Award (2001)
- Arthure E. & Glaydys P. Flum Outstanding Achievement in Physical, Health Science (2001)
- Jack White Engineering Physics Award (2001)

TEACHING

01/19-present

Dept. of Aerospace Eng. Sciences, University of Colorado

Boulder, CO

- **Instructor:** created three new courses at CU Boulder
 - AESN 6519 - Hybrid Systems: Theory, Computation, and Applications (Spring 2024)
 - ASEN 3728 - Aircraft Dynamics (Fall 2023)
 - ASEN 5254 - Algorithmic Motion Planning (Fall 2023)
 - ASEN 5519 - Verification & Control Synthesis for Stochastic Systems (Spring 2023)
 - ASEN 3128 - Aircraft Dynamics (Spring 2023)
 - ASEN 5254 - Algorithmic Motion Planning (Fall 2022)
 - ASEN 3128 - Aircraft Dynamics (Spring 2022)
 - ASEN 6519 - Hybrid Systems: Theory, Computation, and Applications (Spring 2022)
 - ASEN 5519 - Algorithmic Motion Planning (Fall 2021)
 - ASEN 5519 - Verification & Control Synthesis for Stochastic Systems (created & taught Spring 2021)
 - ASEN 5519 - Algorithmic Motion Planning (Fall 2020)
 - ASEN 4028 - Senior Projects 2: Design Practicum (Spring 2020)

- ASEN 4018 - Senior Projects 1: Design Synthesis (Fall 2020)
- ASEN 5519 - Algorithmic Motion Planning (created & taught Fall 2019)
- ASEN 6519 - Hybrid Systems: Theory, Computation, and Applications (created & taught Spring 2019)

08/16-08/18 **Dept. of Computer Science, University of Oxford** Oxford, UK

- **Co-Instructor:** co-taught a graduate-level course entitled, “Probabilistic Model Checking” and managed the teaching and lab assistants of the course in Michaelmas 2016 and 2017 terms.

01/13-05/13 **Dept. of Computer Science, Rice University** Houston, TX

- **Co-Instructor:** co-instructed a graduate-level seminar course entitled, “Extensive Introduction to MDPs and POMDPs.”

10/12-11/12 **Dept. of Computer Science, Rice University** Houston, TX

- **Lecturer:** gave a series of 4 lectures on the topic of probabilistic robotics in a senior-level course titled, “Algorithmic Robotics.”

09/09-12/09 **Mechanical Engineering, Boston University** Boston, MA

- **Graduate Teaching Fellow:** dynamics course teaching assistant – 1 semester.

06/07-06/08 **Chelsea High School** Chelsea, MA

- **NSF GK-12 Fellow:** taught 11th and 12th grade physics and enhanced the content of curriculum by developing new modules, designed activities, assisting with labs, and helping students with science fair projects; also provided demos of my research and organized robotic competitions to inspire students to pursue education and careers in STEM. Physics, Control, and Robotics Lesson Plans available at www.bu.edu/gk12/morteza/.

09/06-05/07 **Mechanical Engineering, Boston University** Boston, MA

- **Graduate Teaching Fellow:** fluid mechanics laboratory instructor and course teaching assistant – 2 semesters.

09/05-12/05 **Team-Up for Youth: Coaching Corps (Outreach Program)** Oakland, CA

- **Volunteer Coach:** serving low-income young people and utilizing the potential of children of color by teaching important life lessons like teamwork, leadership, and dedication; also strengthening youth and communities through the power of sports in after school programs.

PUBLICATIONS

Statistics from [Google Scholar](#)

- total citations 1831
- h-index 23
- i10-index 39

Key

- advised and mentored students are indicated by ‘*’ and ‘†’, respectively
- the author list is alphabetically ordered for publications in computer sciences venues

- “Journal-Equivalent” conference publications with double-blind review process, rebuttal phase, and acceptance rate of less than or equal to 35% are indicated with ‘J. E.’
- Journal articles are indicated with ‘J.’

Papers currently under review

- [1] L. Laurenti and Morteza Lahijanian, “Unifying Safety Approaches for Stochastic Systems: From Barrier Functions to Uncertain Abstractions via Dynamic Programming,” *IEEE Transactions on Automatic Control*, Sep. 2023. (J.)
- [2] Qi Heng Ho*, Tyler Becker, Ben Kraske, Zakariya Laouar, Martin Feather, Federico Rossi, Morteza Lahijanian, and Zachary N. Sunberg, “Recursively Constrained Partially Observable Markov Decision Processes,” in *AAAI Conf. on Artificial Intelligence*, 2024 (J. E.)
- [3] Justin Kottinger*, Shaull Almagor, Oren Salzman, and Morteza Lahijanian, “Introducing Delays in Multi-Agent Path Finding,” in *AAAI Conf. on Artificial Intelligence*, 2024 (J. E.)
- [4] J. Jackson*, L. Laurenti, E. Frew, and M. Lahijanian, “Formal verification of unknown dynamical systems via Gaussian process regression,” *IEEE Transactions on Automatic Control*, 2023. (J.)
- [5] F. B. Mathiesen, M. Lahijanian, L. Laurenti, “IMDP.jl: Accelerated Value Iteration for Interval Markov Decision Processes,” *IFAC Conference on Analysis and Design of Hybrid Systems (ADHS)*, 2024. (J.E.)

Peer-reviewed publications

2024

- [1] S. Almagor, J. Kottinger*, M. Lahijanian, “Temporal Segmentation in Multi Agent Path Finding with Applications to Explainability,” *Journal of Artificial Intelligence*. 2024. (accepted) (J.)
- [2] K. Muvvala*, A. Wells†, M. Lahijanian, L. E. Kavraki, M. Y. Vardi, “Stochastic Games for Interactive Manipulation Domains,” *IEEE Int’l Conference on Robotics and Automation (ICRA)*, Sep. 2024. (accepted)
- [3] Kandai Watanabe*, Georgios Fainekos, Bardh Hoxha, Morteza Lahijanian, Hideki Okamoto, and Sriram Sankaranarayanan, “Optimal Planning for Timed Partial Order Specifications,” *IEEE Int’l Conference on Robotics and Automation (ICRA)*, Sep. 2024. (accepted)
- [4] Robert Reed*, Hanspeter Schaub, and Morteza Lahijanian, “Shielded Deep Reinforcement Learning for Complex Spacecraft Specifications,” *IEEE American Control Conference (ACC)*, 2023. (accepted)

2023

- [5] Robert Reed*, Luca Laurenti, and Morteza Lahijanian, “Promises of Deep Kernel Learning for Control Synthesis,” *IEEE Control Systems Letters*, 2023 (J.)
- [6] J. Jackson*, L. Laurenti, E. Frew, and M. Lahijanian, “Formal Abstraction of General Stochastic Systems via Noise Partitioning,” *IEEE Control Systems Letters*, 2023. (J.)
- [7] Anne Theurkauf*, Justin Kottinger*, Nisar Ahmed, and Morteza Lahijanian, “Chance-Constrained Multi-Robot Motion Planning under Gaussian Uncertainties,” *IEEE Robotics and Automation Letters (RA-L)*, 2023 (J.)
- [8] Qi Heng Ho*, Zachary N. Sunberg, and Morteza Lahijanian, “Sampling-based Reactive Synthesis for Nondeterministic Hybrid Systems,” *IEEE Robotics and Automation Letters (RA-L)*, 2023 (J.)
- [9] J. McMahon, N. Ahmed, M. Lahijanian, P. Amorese*, T. Deka, K. Muvvala*, T. Slack, and S. Wakayama, “REASON-RECOURSE Software for Science Operations of Autonomous Robotic Landers,” in *IEEE Aerospace Conference (AERO)*, Big Sky, MT, USA, 2023, pp. 1–11.

- [10] K. Watanabe*, B. Hoxha, D. Prokhorov, G. Fainekos, M. Lahijanian, S. Sankaranarayanan, and T. Yamaguchi, "Timed Partial Order Inference Algorithm," *Int'l Conference on Automated Planning and Scheduling (ICAPS)*, Sep. 2023 (J. E.)
- [11] K. Muvvala* and M. Lahijanian, "Efficient Symbolic Approaches for Quantitative Reactive Synthesis with Finite Tasks," in *Int'l Conference on Intelligent Robots and Systems (IROS)*, Detroit, MI, USA, 2023.
- [12] P. Amorese*, M. Lahijanian, "Optimal Cost-Preference Trade-off Planning with Multiple Temporal Tasks," *IEEE Int'l Conference on Robotics and Intelligent Systems (IROS)*, Oct. 2023.
- [13] S. Adams[†], A. Patane, M. Lahijanian, and L. Laurenti, "BNN-DP: Robustness Certification of Bayesian Neural Networks via Dynamic Programming," in *Int'l Conference on Machine Learning*, Honolulu, HI, USA, 2023. (J. E.)
- [14] Q. H. Ho*, Z. Sunberg, M. Lahijanian, "Planning with SiMBA: Motion Planning under Uncertainty for Temporal Goals using Simplified Belief Guides," *IEEE Int'l Conference on Robotics and Automation (ICRA)*, Sep. 2023.
- [15] A. Theurkauf*, Q. H. Ho*, R. Illyes*, M. Lahijanian, "Chance-Constrained Motion Planning with Event-Triggered Estimation," *IEEE Int'l Conference on Robotics and Automation (ICRA)*, Sep. 2023.
- [16] R. Illyes*, Q. H. Ho*, M. Lahijanian, "Stochastic Robustness Interval for Motion Planning with Signal Temporal Logic," *IEEE Int'l Conference on Robotics and Automation (ICRA)*, Sep. 2023.
- [17] G. Delimpaltadakis, M. Lahijanian, M. Mazo Jr., L. Laurenti, "Interval Markov Decision Processes with Continuous Action-Spaces," *Hybrid Systems: Computation and Control (HSCC)*, ACM, April 2023 (J. E.)

2022

- [18] S. A. Adams[†], M. Lahijanian, and L. Laurenti, "Formal Control Synthesis for Stochastic Neural Network Dynamic Models," *IEEE Control Systems Letters (L-CSS)*, 2022. (J.)
- [19] Q. H. Ho*, R. B. Illyes*, Z. Sunberg, and M. Lahijanian, "Automaton-Guided Control Synthesis for Signal Temporal Logic Specifications," *IEEE Conference on Decision and Control (CDC)*, Cancun, Mexico, 2022.
- [20] A. Theurkauf*, N. Ahmed, and M. Lahijanian, "Pareto Optimal Strategies for Event Triggered Estimation," in *IEEE Conference on Decision and Control (CDC)*, Cancun, Mexico, 2022.
- [21] G. O. Berger, M. Narasimhamurthy, K. Watanabe*, M. Lahijanian, and S. Sankaranarayanan, "An Algorithm for Learning Switched Linear Dynamics from Data," in *Advances in Neural Information Processing Systems (NeurIPS)*, New Orleans, Louisiana, USA, 2022. (J. E.)
- [22] R. Mazouz*, K. Muvvala*, A. Ratheesh Babu*, L. Laurenti, and M. Lahijanian, "Safety Guarantees for Neural Network Dynamic Systems via Stochastic Barrier Functions," in *Advances in Neural Information Processing Systems (NeurIPS)*, New Orleans, Louisiana, USA, 2022. (J. E.)
- [23] J. Kottinger*, S. Almagor, and M. Lahijanian, "Conflict-based Search for Multi-Robot Motion Planning with Kinodynamic Constraints," in *Int'l Conference on Intelligent Robots and Systems (IROS)*, Kyoto, Japan, 2022.
- [24] I. Nazmy, A. Harris, M. Lahijanian, and H. Schaub, "Shielded Deep Reinforcement Learning for Multi-Sensor Spacecraft Imaging," *American Control Conference (ACC)*, IEEE, Jun. 2022.
- [25] J. Kottinger*, S. Almagor, and M. Lahijanian, "Conflict-Based Search for Explainable Multi-Agent Path Finding," in *Int'l Conference on Automated Planning and Scheduling (ICAPS)*, Singapore, 2022. (J. E.)
- [26] Q. Ho*, Z. Sunberg, M. Lahijanian, "Gaussian Belief Trees for Chance Constrained Asymptotically Optimal Motion Planning," *IEEE Int'l Conference on Robotics and Automation (ICRA)*, May. 2022.
- [27] K. Muvvala*, P. Amorese*, and M. Lahijanian, "Let's Collaborate: Regret-based Reactive Synthesis for Robotic Manipulation," *IEEE Int'l Conference on Automatic Control (ICRA)*, May. 2022.

- [28] J. McMahon, N. Ahmed, M. Lahijanian, P. Amorese*, T. Deka, K. Muvvala*, T. Slack, and S. Wakayama, "Expert-Informed Autonomous Science Planning for In-situ Observations and Discoveries," in *IEEE Aerospace Conference*, 2022.

2021

- [29] Èric Pairet[†], Juan David Hernández, Marc Carreras, Yvan Petillot, and Morteza Lahijanian, "Online Mapping and Motion Planning under Uncertainty for Probabilistically Safe Autonomous Navigation," *IEEE Transactions on Automation Science and Engineering (T-ASE)*, 2021. (J.)
- [30] L. Laurenti, M. Lahijanian, A. Abate, L. Cardelli, and M. Kwiatkowska, "Formal and Efficient Synthesis for Continuous-Time Linear Stochastic Hybrid Processes," *IEEE Transactions on Automatic Control (TAC)*, vol. 66, no. 1, pp. 17-32, Jan. 2021. (J.)
- [31] J. Jackson*, L. Laurenti, E. Frew, and M. Lahijanian, "Synergistic Offline-Online Control Synthesis via Local Gaussian Process Regression," *IEEE Conf. on Decision and Control (CDC)*, Austin, TX, Dec. 2021.
- [32] K. Watanabe*, N. Renninger*, S. Sankaranarayanan, and M. Lahijanian, "Probabilistic Specification Learning for Planning with Safety Constraints," *IEEE Int. Conf. on Intelligent Robots and Systems (IROS)*, Prague, Czech Republic, Sep. 2021.
- [33] A. Wells[†], M. Lahijanian, L. E. Kavraki, M. Y. Vardi, "Finite Horizon Synthesis for Probabilistic Manipulation Domains," *IEEE International Conference on Robotics and Automation (ICRA)* Xi'an, China, May 2021
- [34] J. Kottinger*, S. Almagor, and Morteza Lahijanian, "MAPS-X: Explainable Multi-Robot Motion Planning via Segmentation," *IEEE International Conference on Robotics and Automation (ICRA)*, Xi'an, China, May 2021
- [35] J. Jackson*, L. Laurenti, E. Frew, and M. Lahijanian, "Strategy Synthesis for Partially-known Switched Stochastic Systems," *Hybrid Systems: Computation and Control (HSCC)*, ACM, May 2021. (J. E.)

2020

- [36] A. Wells[†], M. Lahijanian, L. E. Kavraki, and M. Y. Vardi "LTLf Synthesis on Probabilistic Systems," *International Symposium on Games, Automata, Logics, and Formal Verification (GandALF)*, Sep. 2020.
- [37] J. Jackson*, L. Laurenti, E. Frew, and M. Lahijanian, "Safety verification of unknown dynamical systems via Gaussian process regression," *IEEE Conf. on Decision and Control (CDC)*, Dec. 2020.
- [38] S. Almagor and M. Lahijanian, "Explainable Multi Agent Path Finding," *Int. Conf. on Autonomous Agents and Multiagent Systems (AAMAS)*, ACM, pp. 34-42, May 2020. (J. E.)

2019

- [39] M. Wu, T. Louw, M. Lahijanian, W. Ruan, X. Huang, N. Merat, and M. Kwiatkowska, "Gaze-based Intention Anticipation over Driving Manoeuvres in Semi-Autonomous Vehicles," *IEEE Int. Conf. on Intelligent Robots and Systems (IROS)*, Oct. 2019.
- [40] F. Eiras[†], M. Lahijanian, and M. Kwiatkowska, "Correct-by-Construction Advanced Driver Assistance Systems based on a Cognitive Architecture," *IEEE Connected and Automated Vehicles Symposium (IEEE CAV)*, IEEE, Sep. 2019.
- [41] N. Cauchi, L. Laurenti, M. Lahijanian, A. Abate, M. and L. Cardelli, "Efficiency through Uncertainty: Scalable Formal Synthesis for Stochastic Hybrid Systems," *Hybrid Systems: Computation and Control (HSCC)*, ACM, Apr. 2019. (J. E.)
- [42] E. M. Hahn, V. Hashemi, H. Hermanns, M. Lahijanian, and A. Turrini, "Pareto Curves and Robust Strategies for Interval Markov Decision Processes," *invited for publication in ACM Transactions on Modeling and Computer Simulation (TOMACS)*, vol. 29, no. 4, pp. 1-31, 2019. (J.)

- [43] K. He[†], M. Lahijanian, L. E. Kavraki, M. Vardi, "Automated Abstraction of Manipulation Domains for Cost-Based Reactive Synthesis," *IEEE Robotics and Automation Letters (RA-L)*, vol. 4, no. 2, pp. 285-292, Apr. 2019. (J.)

2018

- [44] S. Edelkamp, M. Lahijanian, D. Magazzeni, and E. Plaku, "Integrating Temporal Reasoning and Sampling-Based Motion Planning for Multi-Goal Problems with Dynamics and Time Windows," *IEEE Robotics and Automation Letters (RA-L)*, vol. 3, no. 4, pp. 3473-3480, Oct. 2018. (J.)
- [45] M. Lahijanian, M. Svorenova, A. Morye, B. Yeomans, D. Rao, I. Posner, P. Newman, H. Kress-Gazit, and M. Kwiatkowska, "Resource-Performance Trade-off Analysis for Mobile Robots," *IEEE Robotics and Automation Letters (RA-L)*, vol. 3, no. 3, pp. 1840-1847, July 2018. (J.)
- [46] H. Kress-Gazit and M. Lahijanian, "Synthesis for Robots: Guarantees and Feedback for Robot Behavior," *Journal of Annual Review of Control, Robotics, and Autonomous Systems*, 2018. (J.)
- [47] E. Pairet[†], J. D. Hernandez, M. Lahijanian, and Marc Carreras, "Uncertainty-based Online Mapping and Motion Planning for Marine Robotics Guidance," *IEEE Int. Conf. on Intelligent Robots and Systems (IROS)*, Oct. 2018.

2017

- [48] K. He, M. Lahijanian, L. E. Kavraki, and M. Y. Vardi, "Reactive Synthesis for Finite Tasks Under Resource Constraints," *IEEE International Conference on Intelligent Robots and Systems (IROS)*, pp. 5326-5332, Vancouver, BC, Sep. 2017.
- [49] E. M. Hahn, V. Hashemi, H. Hermanns, M. Lahijanian, and A. Turrini, "Multi-objective Robust Strategy Synthesis for Interval Markov Decision Processes," *International Conference on Quantitative Evaluation of SysTems (QEST)*, pp. 207-223, Berlin, Germany, Sep. 2017.

2016

- [50] M. Lahijanian, M. Maly[†], D. Fried, L. E. Kavraki, H. Kress-Gazit, and M. Y. Vardi, "Iterative Temporal Planning in Uncertain Environments with Partial Satisfaction Guarantees," *IEEE Transactions on Robotics*, vol. 32, no. 3, pp. 583-599, May 2016. (J.)
- [51] M. Lahijanian and M. Kwiatkowska, "Specification Revision for Markov Decision Processes with Optimal Trade-off," *IEEE Conf. on Decision and Control (CDC)*, pp. 7411-7418, Las Vegas, NV, Dec. 2016.
- [52] M. Lahijanian and M. Kwiatkowska, "Social Trust: a Major Challenge for the Future of Autonomous Systems," *AAAI Fall Symposium on Cross-Disciplinary Challenges for Autonomous Systems (AAAI FSS)*, pp. 189-193, Arlington, VA, Nov. 2016.

2015

- [53] M. Lahijanian, S. B. Andersson, and C. Belta, "Formal Verification and Synthesis for Discrete-Time Stochastic Systems," *IEEE Transactions on Automatic Control*, vol. 60, no. 8, pp. 2031-2045, Aug. 2015. (J.)
- [54] J. Wang, X. C. Ding, M. Lahijanian, I. Ch. Paschalidis, and C. Belta, "Temporal Logic Motion Control Using Actor-Critic Methods," *Int. Journal of Robotics Research*, vol. 34, no. 10, pp. 1329-1344, Aug. 2015. (J.)
- [55] K. He[†], M. Lahijanian, L. E. Kavraki, M. Y. Vardi, "Towards Manipulation Planning with Temporal Logic Specifications," *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 346-352, Seattle, WA, May, 2015.

- [56] M. Lahijanian, S. Almagor, D. Fried, L. E. Kavraki, M. Y. Vardi, "This Time the Robot Settles for a Cost: A Quantitative Approach to Temporal Logic Planning with Partial Satisfaction," *AAAI Conf. on Artificial Intelligence*, pp. 3664-3671, Austin, TX, Jan. 2015. (J. E.)

2014

- [57] R. Luna, M. Lahijanian, L. E. Kavraki, M. Moll, "Asymptotically Optimal Stochastic Motion Planning with Temporal Goals," *Workshop on the Algorithmic Foundations of Robotics (WAFR)*, pp. 335-352, Istanbul, Turkey, Aug. 2014. (J. E.)
- [58] R. Luna, M. Lahijanian, L. E. Kavraki, M. Moll, "Optimal and Efficient Stochastic Motion Planning in Partially-Known Environments," *AAAI Conference on Artificial Intelligence*, pp. 2549-2555, Quebec City, Canada, July, 2014. (J. E.)
- [59] M. Lahijanian, L. E. Kavraki, M. Y. Vardi, "A Sampling-Based Strategy Planner for Nondeterministic Hybrid Systems," *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3005-3012, Hong Kong, China, May, 2014.
- [60] R. Luna, M. Lahijanian, L. E. Kavraki, M. Moll, "Fast Stochastic Motion Planning with Optimality Guarantees Using Local Policy Reconfiguration," *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3013-3019, Hong Kong, China, May, 2014.

2013

- [61] M. R. Maly, M. Lahijanian, L. E. Kavraki, H. Kress-Gazit, and M. Y. Vardi, "Iterative Temporal Motion Planning for Hybrid Systems in Partially Unknown Environments," *ACM International Conference on Hybrid Systems: Computational and Control (HSCC)*, pp. 353-362, Philadelphia, PA, Apr., 2013. (J. E.)

2012

- [62] M. Lahijanian, S. B. Andersson, and C. Belta, "Temporal Logic Motion Planning and Control with Probabilistic Satisfaction Guarantees," *IEEE Transactions on Robotics*, vol. 28, no. 2, pp. 396-409, 2012. (J.)
- [63] M. Lahijanian, S. B. Andersson, and C. Belta, "Approximate Markovian Abstractions for Linear Stochastic Systems," *IEEE Conference on Decision and Control (CDC)*, pp. 5966-5971, Maui, HI, Dec., 2012.
- [64] X. C. Ding, J. Wang, M. Lahijanian, I. Paschalidis, and C. Belta, "Temporal Logic Motion Control using Actor-Critic Methods," *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 4687-4692, St. Paul, MN, May, 2012.

2011

- [65] R. Moazzez Estanjini, X. C. Ding, M. Lahijanian, C. Belta, I. Paschalidis, "Least Squares Temporal Difference Actor-Critic Methods with Applications to Robot Motion Control," *IEEE Conference on Decision and Control (CDC)*, pp. 704-709, Orlando, FL, Dec. 2011.
- [66] Cizelj, X. C. Ding, M. Lahijanian, A. Pinto, C. Belta, "Probabilistically Safe Vehicle Control in a Hostile Environment," *Int'l Federation of Automatic Control (IFAC) 18th World Congress*, Milan, Italy, 2011.
- [67] M. Lahijanian, S. B. Andersson, and C. Belta, "Controlling an MDP from a PCTL specification," *American Controls Conference (ACC)*, pp. 311-316, San Francisco, CA, Jun., 2011.

2010

- [68] M. Lahijanian, J. Wasniewski, S.B. Andersson, and C. Belta, "Motion planning and control from temporal logic specifications with probabilistic satisfaction guarantees," *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3227-3232, Anchorage, Alaska, May, 2010.

2009

- [69] S. B. Andersson, D. Hristu-Varsakelis, and M. Lahijanian, "Observers in Language-based Control," *Communications in Information and Systems (Special Issue Dedicated to the 70th Birthday of Roger Brockett)*, vol. 8, no. 2, pp. 85-106, 2009. (J.)
- [70] M. Lahijanian, S. B. Andersson, and C. Belta, "A probabilistic approach for control of a stochastic system from LTL specifications," *IEEE Conference on Decision and Control (CDC)*, pp. 2236-2241, Shanghai, China, Dec., 2009.
- [71] M. Lahijanian, M. Kloetzer, S. Itani, C. Belta, and S. B. Andersson, "Automatic deployment of autonomous cars in a robotic urban-like environment (RULE)," *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 2055-2060, Kobe, Japan, May, 2009.

INVITED TALKS

- [1] Keynote Talk – "Data-driven Verification and Control Synthesis for Dynamical Systems via Bayesian Reasoning," Workshop on Formal Methods and Decision Making in the Age of AI, Dec. 2023
- [2] Invited Talk – "Verification and Control synthesis for Stochastic Neural Network Dynamic Models," RTX Technology Research Center, Nov. 2023
- [3] Invited Talk – "Verification and Control synthesis for Stochastic Neural Network Dynamic Models," University of Oxford, UK, June 2023
- [4] Invited Talk – "Resource-aware Motion Planning under Motion and Sensor Uncertainty," Cardiff University, UK, May 2023
- [5] Invited Talk – "Verification and Control synthesis for Stochastic Neural Network Dynamic Models," Boston University, April 2023
- [6] Invited Talk – "Resource-aware Motion Planning under Motion and Sensor Uncertainty," Rice University, April 2023
- [7] Invited Talk – "Social Trust in Autonomous Robots: a Formal Methods Perspective," Philosophy of Science, University of Colorado Boulder, March 2023
- [8] Invited Talk - "Motion Planning under Sensor and Motion Uncertainty with Complex Tasks," Technion, Israel, Dec. 2022
- [9] Invited Talk - "Data-driven Formal Control Synthesis for Dynamical Systems," Washington University, Oct. 2022
- [10] Invited Talk - "Motion Planning for Complex tasks with Safety Guarantees," Amazon AI Robotics, Jul. 2022
- [11] Invited Talk - "Data-driven Synthesis for Partially-known Stochastic Systems," Jet Propulsion Laboratory (JPL), Oct. 2021
- [12] Invited Talk - "Data-driven Synthesis for Partially-known Stochastic Systems," Int'l Colloquium on Automata, Languages and Programming Workshop on Flavors of Uncertainty in Verification, Planning, and Optimization, July 2021
- [13] Invited Talk - "Data-driven Formal Synthesis for Partially-known Stochastic Systems," Autonomy Talks, Institute for Dynamic Systems and Control, ETH Zürich, Switzerland, May 2021

- [14] Invited Talk - "Safety in Face of Complexity: An Algorithmic Approach," Robotics: Science and System (RSS) Workshop on Robust Autonomy, Jun 2019.
- [15] Invited Talk - "Towards Safe Autonomy through Correct-by-Construction Algorithmic Approaches," Dept. of Aerospace Engineering Sciences, University of Colorado Boulder, CO, U.S.A., 2018.
- [16] Invited Talk - "Towards Safe Autonomy through Correct-by-Construction Algorithmic Approaches," Dept. of Mechanical Engineering, Temple University, PA U.S.A., 2018.
- [17] Invited Talk - "Towards Safe Autonomy through Correct-by-Construction Algorithmic Approaches," Dept. of Mechanical Engineering & Mechanics, Lehigh University, PA U.S.A., 2018.
- [18] Invited Talk - "Towards Safe Autonomy through Correct-by-Construction Algorithmic Approaches," Dept. of Computing, Imperial College, London, U.K., 2018.
- [19] Invited Talk - "How Much Should You Trust a Robot," Safety and Reliability Society," London, U.K., 2017.
- [20] Invited Talk - "Bestowing Robot Autonomy Through Formal Methods," School of Electrical Engineering and Computer Science, Queen Mary University of London, U.K., 2016.
- [21] Invited Talk - "Enabling Robot Autonomy in Complex Missions: Automatic Control Generation from Task-Level Specifications," Max Planck Institute for Informatics, Dependable Systems and Software Group, Saarland University, Germany, 2016.
- [22] Invited Talk - "Enabling Robot Autonomy in Complex Navigational Missions," Department of Computer Science, University of Oxford, Oxford, U.K., 2015.
- [23] Invited Talk - "Bestowing Intelligence upon Robots: Automatic Control Generation from Task-Level Specifications," Mechanical Engineering Department, University of Nevada, Reno, NV, 2015.
- [24] Workshop Speaker - "Robot Motion Planning Under Uncertainty with Temporal Logic Tasks: from Nondeterministic Discrete Disturbances to Continuous Stochastic Noise," ExCAPE Robotics Workshop, Houston, TX, 2013.
- [25] Invited Talk - "Automatic Deployment of Autonomous Cars with Complex Tasks in an Urban-Like Environment," University of Tokyo, Tokyo, Japan, 2009.

RESEARCH PROJECTS

Funded Projects

1. Robust Data-driven Control for Uncertain Robotic Systems
 - Funding: IUCRC NSF (CAAMS)
 - Period of Performance: Sep. 2023 – Aug. 2026
 - Award Amount: \$180,000
2. AI-Driven Cooperative Task Execution by a Team of Spacecraft with Safety Guarantees
 - Funding: AFRL
 - Period of Performance: Aug. 2022 – Jul. 2025
 - Award Amount: \$900,000
3. IUCRC Phase I University of Colorado Boulder: Center for Autonomous Air Mobility and Sensing (CAAMS)

- Funding: NSF
 - Period of Performance: Aug. 2022 – Jul. 2027
 - Award Amount: \$2,210,225
4. Expert-informed Autonomous Science Planning for In-situ Observations and Discoveries
 - Funding: NASA
 - Period of Performance: Jun. 2020 – May 2023
 - Award Amount: \$997,381
 5. CPS: Medium: Correct-by-Construction Controller Synthesis using Gaussian Process Transfer Learning
 - Funding: NSF CPS
 - Period of Performance: Jan. 2020 – Dec. 2023
 - Award Amount: \$1,200,000
 6. IN-PASS - Intelligent Navigation, Planning, and Awareness for Swarm Systems
 - Funding: NASA, Orbit Logic sub-contractor STTR Phase 2
 - Period of Performance: Apr. 2022 – Apr. 2024
 - Award Amount: \$324,996
 7. Verifiable Control Synthesis through Model-based Learning with Safety Guarantees
 - Funding: NSF IUCRC Center for Unmanned Aircraft Systems
 - Period of Performance: Sep. 2019 – Aug. 2021
 - Award Amount: \$112,000
 8. Evaluating Onbase Deployment of Smart Transportation Technologies
 - Funding: US Army Corp of Engineers ERDC
 - Period of Performance: Oct. 2019 – Sep. 2021
 - Award Amount: \$498,518
 9. Streamlined Data-Driven Anomaly Monitoring and Causation Analysis
 - Funding: Air Force, Verus Research sub-contractor STTR Phase I (PI: Schaub, Co-PI: Lahijanian)
 - Period of Performance: Jan. 2021 – Aug. 2021
 - Award Amount: \$52,411
 10. Agility Prime Shielded Reinforcement Learning
 - Funding: Air Force, Scientific Systems Company Inc. sub-contractor STTR Phase I
 - Period of Performance: Jan. 2021 – Jun. 2021
 - Award Amount: \$67,434
 11. Enabling Long-term Robotic Autonomy: from Learning Specifications to Autonomous Navigation and Interaction
 - Funding: Autonomous Systems IRT, CU Boulder

- Period of Performance: Jan. 2019 – Aug. 2019
- Award Amount: \$44,500

ADVISING & MENTORING

- **Current PhD Students**

- John Jackson (co-advised with Eric Frew), University of Colorado Boulder
 - Expected graduation date: May 2024
- Justin Kottinger, University of Colorado Boulder
 - Expected graduation date: May 2024
- Kandai Watanabe (co-advised with Sriram Sankaranarayanan), University of Colorado Boulder (expect graduation: May 2024)
 - Expected graduation date: May 2024
- Anne Theurkauf (co-advised with Nisar Ahmed), University of Colorado Boulder
 - Expected graduation: Dec. 2024
- Qi Heng Ho (co-advised with Zachary Sunberg), University of Colorado Boulder
 - Expected graduation date: May 2025
- Karan Muvvala, University of Colorado Boulder
 - Expected graduation date: May 2026
- Rayan Mazouz, University of Colorado Boulder
 - Expected graduation date: May 2026
- Robert Reed, University of Colorado Boulder
 - Expected graduation date: May 2026
- Ibon Gracia, University of Colorado Boulder
 - Expected graduation date: May 2027
- Peter Amorese, University of Colorado Boulder
 - Expected graduation date: May 2027
- Chun-Wei Kong (co-advised with Jay McMahan), University of Colorado Boulder
 - Expected graduation date: May 2028

- **Current MS Students**

- Nicolas Perrault (MS thesis)
 - Expected graduate date: May 2025

- **Graduated students:**

- Roland Ilyes (MS)
 - Thesis title: “Robustness Measure for Monitoring and Motion Planning for Stochastic Systems under Signal Temporal Logic”

- University of Colorado Boulder, 2022
- Daniel Crook (BS), University of Colorado Boulder, 2021
- Peter Amorese (BS), University of Colorado Boulder, 2021
- Karan Muvvala (MS)
 - Thesis title: “Human-aware Strategy Synthesis for Robotic Manipulators using Regret Games”
 - University of Colorado Boulder, 2021
- Richard Moon (MS)
 - Thesis title: “Suggestion-based Advanced Driving Assistance System for Semi-autonomous Vehicles in Safety Critical Situations”
 - University of Colorado Boulder, 2020
- Akash Ratheesh Babu (MS, co-advised with Nisar Ahmed)
 - Thesis title: “Resource-Aware Planning Framework for Autonomous Systems in Communication-limited Environments”
 - University of Colorado Boulder, 2020
- Nicholas Renninger (MS)
 - Thesis title: “An End-to-end Framework for Control Synthesis from Demonstrations via Probabilistic Automata Learning”
 - University of Colorado Boulder, 2020
- Francisco Girbal Eiras (MS)
 - Thesis title: “To Err is Human: Designing Correct-by-Construction Driver Assistance Systems using Cognitive Modelling,”
 - University of Oxford, UK, 2018
- Èric Pairet Artau (MS, co-advised with Juan David Hernández and Marc Carreras)
 - Thesis title: “Uncertainty-based Online Mapping and Motion Planning for Marine Robotics Guidance,”
 - University of Girona, Spain, 2017
- Chak Yan Lam (MS)
 - Thesis title: “Driver Assistance Using Cognitive Modelling and Strategy Synthesis”
 - University of Oxford, UK, 2017
- **Mentored** four graduate students (Matthew R. Maly, Keliang He, Min Wu, and Andrew Wells) on research projects involving motion planning for robotic systems with high-level tasks and safe interaction with semi-autonomous vehicles. All projects have resulted in publication (HSCC’13, ICRA’15, IROS’17, RA-L’18, IROS’19, GandALF’20, ICRA’21).

PROFESSIONAL SERVICES

- **Editorial board:**
 - Associate editor for *IEEE Int’l Conference on Robotics and Automation (ICRA 2022 & 2023 & 2024)*

- Member of the editorial board for “*Inspired Research Magazine*,” (University of Oxford 2016 – 2018)
- **Special-Session Chair:**
 - Special Session: Control Synthesis and Motion Planning for Cyber-physical and Control Systems at *Int’l Conference on Formal Modeling and Analysis of Timed Systems (FORMAT 2021)*
- **Program Committee Co-Chair:**
 - PC co-chair for International Conference on Quantitative Evaluation of SysTems (QEST 2024)
- **Program committee:** member of technical program committee:
 - International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS 2024)
 - Conference on Analysis and Design of Hybrid Systems (ADHS 2024)
 - ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2024)
 - AAAI Conference on Artificial Intelligence (AAAI 2016, 2022, & 2023)
 - Int’l Conference on Runtime Verification (RV 2021)
 - Int’l Conference on Formal Modeling and Analysis of Timed Systems (FORMATS 2021)
 - Int’l Joint Conf. on Artificial Intelligence (IJCAI 2020)
 - Robotics: Science and Systems Conference (RSS 2013 & 2017)
 - Artificial Intelligence Conference (AAAI 2016)
 - Combining AI Reasoning and Cognitive Science with Robotics Workshop at the Robotics: Science and Systems Conference (RSS 2015)
- **Proposal Reviewer:**
 - NSF panelist for Software and Hardware Foundations: Formal Methods and AI program (2024)
 - NSF panelist for Robust Intelligence program (2020)
 - NSF panelist for Cyber-Physical Systems program (2019)
 - Dutch Research Council – NOW (2019)
- **Workshop Organizer:** Co-organizer of the following workshops:
 - “Robots, Morality, and Trust through the Verification Lens” as part of Federated Logic Conference and Computer Aided Verification (FLoC & CAV 2018)
 - “Morality and Social Trust in Autonomous Robots” as part of Robotics: Science and Systems Conference (RSS 2017)
 - “Social Trust in Autonomous Robots” as part of Robotics: Science and Systems Conference (RSS 2016)
 - ExCAPE Robotics Workshop at Rice University (ExCAPE 2013)
- **Thesis Committees:** Member of the following thesis committees
 - PhD
 - Taralacin Deka, University of Colorado Boulder, PhD, 2023
 - Monal Narasimhamurthy, University of Colorado Boulder, PhD, 2023
 - Adam Herrmann, University of Colorado Boulder, PhD, 2023

- Thomas Raymond Smith, University of Colorado Boulder, PhD, 2023
- Shakeeb Ahmad, University of Colorado Boulder, PhD, 2022
- Sarah Aguasvivas Manzano, University of Colorado Boulder, PhD, 2022
- Hansol Yoon, University of Colorado Boulder, PhD, 2022
- Gilles Nies, Saarland University, Saarbrücken, Germany, PhD, 2021
- Andrew Baker Mills, University of Colorado Boulder, PhD, 2021
- Katherine Glasheen, University of Colorado Boulder, PhD, 2021
- Andrew Wells, Rice University, PhD, 2021
- Andrew Harris, University of Colorado Boulder, PhD, 2021
- Sangwoo Moon, University of Colorado Boulder, PhD, 2020
- MS
 - Disip Chaturvedi, University of Colorado Boulder, MS, 2023
 - William Pope, University of Colorado Boulder, MS, 2022
 - Roland Illyes, University of Colorado Boulder, MS, 2022
 - Dawson Beatty, University of Colorado Boulder, MS, 2021
 - Jack Center, University of Colorado Boulder, MS, 2021
 - Arturo Freydig Avila, University of Colorado Boulder, MS, 2020
 - Cody Charland, University of Colorado Boulder, MS 2020
 - Kyle Harlow, University of Colorado Boulder, MS 2019
- **Referee:**
 - European Best PhD Thesis Award on Control for Complex and Heterogeneous Systems (2021)
 - IFAC journal of Nonlinear Analysis: Hybrid Systems (NAHS 2017-present)
 - IFAC journal Automatica (2013-present)
 - IEEE Transactions on Robotics (TRO 2013-present)
 - IEEE Transactions on Automatic Control (ITAC 2012-present)
 - American Control Conference (ACC 2011-present)
 - IEEE Int. Conf. on Intelligent Robots and Systems (IROS 2011-present)
 - IEEE Int. Conf. on Robotics and Automation (ICRA 2009-present)
 - IEEE Conf. on Decision and Control (CDC 2009-present)
 - Symposium on Combinatorial Search (SoCS 2013)

UNIVERSITY SERVICES

- **Committees**
 - AES Department, Faculty Search Committee, Fall 2023 – present
 - AES Department, Dynamics and Controls Curriculum Group Lead, Fall 2022 – present

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- AES Department, Undergraduate Committee, Fall 2018 – present
 - AES Department, Distinguished Lecturer Committee, Fall 2019 – Fall 2022
 - AES Department, Strategic Vision Committee, Fall 2020 – Spring 2021
 - **Outreach**
 - Faculty mentor for GoldShirt S-STEM, Fall 2020 – Present
 - Angelina Miller, Freshman, Aerospace Engineering Sciences
 - Eduardo Villalobos, Freshman, Aerospace Engineering Sciences
 - Gustavo Rocha-Martinez, Freshman, Aerospace Engineering Sciences