

Nikolai Matni

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3330 Walnut Street

Philadelphia, PA 19104

☎ (626) 787-5914

✉ nmatni@seas.upenn.edu

🌐 <http://nikolaimatni.github.io>

🔍 [Google Scholar](#)

📄 [Github](#)

Academic Positions

- Jul 2025 – **Associate Professor, Department of Electrical and Systems Engineering,**
Present *University of Pennsylvania*, Philadelphia, PA, (Early Tenure).
- Aug 2019 – **Assistant Professor, Department of Electrical and Systems Engineering,**
June 2025 *University of Pennsylvania*, Philadelphia, PA.
- Sep 2021 – **Visiting Research Faculty, Robotics Group,**
Feb 2023 *Google Brain*, New York, NY.
- Oct 2017 – **Postdoctoral Scholar, Department of Electrical Engineering and Computer Science,**
July 2019 *UC Berkeley*, Berkeley, CA.
- Dec 2015 – **Postdoctoral Scholar, Department of Computing and Mathematical Sciences,**
Sep 2017 *California Institute of Technology*, Pasadena, CA.

Administrative Positions

- Jul 2025 – **Graduate Chair, Department of Electrical and Systems Engineering,**
Present *University of Pennsylvania*, Philadelphia, PA.

Education

- 2010–2015 **Ph.D. in Control and Dynamical Systems, conferred June 2016,**
California Institute of Technology, Pasadena, CA.
Advisor: John C. Doyle
Thesis: *Distributed Optimal Control of Cyber-Physical Systems: Controller Synthesis, Architecture Design and System Identification*
- 2008–2010 **M. A.Sc. in Electrical and Computer Engineering,**
The University of British Columbia, Vancouver, Canada.
Advisor: Meeko M. Oishi
Thesis: *Stability of switched systems with switching delay: application to remote operation of aircraft under distributed control*
- 2004–2008 **B. A.Sc. in Electrical and Computer Engineering, with distinction,**
The University of British Columbia, Vancouver, Canada.

Honors and Awards

- 2024 **IEEE Transactions on Control of Network Systems Best Paper Award, IEEE Control Systems Society** To recognize (at most two) outstanding paper(s) published in the IEEE Transactions on Control of Network Systems during the two calendar years preceding the award. For the paper “Distributed and localized model predictive control—Part II: Theoretical guarantees” co-authored with Carmen Amo Alonso, Jing Shuang (Lisa) Li, and James Anderson.

- 2024 **Best Paper Award Finalist**, *Conference on Learning for Dynamics and Control (L4DC)*
One of three finalists selected from 225 submissions for the best paper award at the 2024 Conference on Learning for Dynamics and Control, for the paper “Nonasymptotic Regret Analysis of Adaptive Linear Quadratic Control with Model Misspecification” co-authored with Bruce Lee and Anders Rantzer.
- 2024 **Young Investigator Program**, *Air Force Office of Scientific Research (AFOSR)*
Through the YIP, the Department of the Air Force fosters creative basic research in science and engineering, enhances early career development of outstanding young investigators and increases opportunities for the young investigators to engage in forwarding the Department of the Air Force, or DAF mission and related challenges in science and engineering.
- 2022 **Best Student Paper Award**, *IEEE Conference on Decision and Control (as co-advisor)*
For the paper “How are policy gradient methods affected by the limits of control?” co-authored with Ingvar Ziemann, Anastasios Tsiamis, and Henrik Sandberg. A major award recognizing the best paper written by a student at CDC 2022.
- 2022 **2022 US Frontiers of Engineering Symposium**, *National Academy of Engineering*,
About 100 outstanding early career engineers met for an intensive 2-1/2 day symposium to discuss cutting-edge developments in four cross-cutting areas. The goal of the Frontiers of Engineering program is to bring together engineers from all engineering disciplines and from industry, universities, and federal labs to facilitate cross-disciplinary exchange and promote the transfer of new techniques and approaches across fields in order to sustain and build US innovative capacity.
- 2021 **Outstanding Reviewer Award**, *NeurIPS*,
Given to the top 8% of reviewers who were judged to be instrumental to the review process based on Area Chair and author feedback.
- 2021 **George S. Axelby Award**, *IEEE Control Systems Society*,
To recognize outstanding papers published in the IEEE Transactions on Automatic Control during the two calendar years preceding the year of the award, as judged on the originality, potential impact on the theoretical foundations of control, importance and practical significance in applications, and clarity of the paper.
- 2021 **Google Research Scholar Award**, *Google*,
The Google Research Scholar Award supports early-career faculty (those who have received their doctorate within the past 7 years) who are doing impactful research in fields relevant to Google, and is intended to help to develop new collaborations and encourage long term relationships. One of 77 award recipients.
- 2021 **CAREER Award**, *National Science Foundation*,
The Faculty Early Career Development (CAREER) Program is a Foundation-wide activity that offers the National Science Foundation’s most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization.
- 2017 **Keynote Speaker**, *The ACEMS Workshop on Challenges of Data and Control of Networks*
Invited to be a keynote speaker at the upcoming ACDCN workshop at the University of Adelaide. One of four keynote speakers, including Paul Barford, Walter Willinger and John C. Doyle.
- 2017 **Best Student Paper Award (as co-advisor)**, *IEEE American Control Conference*
For the paper “System level parameterizations, constraints and synthesis” co-authored with Yuh-Shyang Wang and John C. Doyle. A major award recognizing the best paper written by a student at ACC 2017.
- 2016 **Everhart Lecture Series speaker**, *California Institute of Technology*
One of four graduate-student lecturers selected to present their work to a campus-wide audience based on dynamic speaking skills, ability to communicate their research field’s broader importance and impact on the scientific community. Presentation available on youtube (<http://youtube.com/watch?v=1S-Y5iVNQ-U>) and iTunes U .

- 2013 **Best Student Paper Award, IEEE Conference on Decision and Control**
For the **sole-author** paper “Communication delay co-design in \mathcal{H}_2 decentralized control using atomic norm minimization.” A major award recognizing the best paper written by a student at CDC 2013. First ever sole-author award winner.
- 2008–2010 **NSERC Alexander Graham Bell Canada Graduate Scholarship,**
Funding from the Canadian federal government to support graduate studies.
- 2009 **General Chairs’ Recognition Award for Interactive Papers, IEEE Conference on Decision and Control**
For the paper “Reachability analysis for continuous systems under shared control: Application to user-interface design.”
- 2008 **APEG BC Achievement Award in Engineering, University of British Columbia**
As selected by the faculty of engineering at the University of British Columbia for demonstrating great promise in electrical engineering in the final undergraduate year.
- 2004–2008 **Academic All Canadian, Canadian Inter-university Sport**
A recognition of student-athletes who achieve an academic standing of 80% or better while playing on one of their university’s varsity teams.

Invited Talks

- [T1] Dec 2024 *Representation Learning for Dynamics and Control*, From Formal Methods to Data-Driven Verification and Control Workshop, IEEE Conference on Decision and Control, Milan, Italy
- [T2] Dec 2024 *Layering as Optimal Control Decomposition*, Control Architecture Theory Workshop, IEEE Conference on Decision and Control, Milan, Italy
- [T3] Nov 2024 *What Makes Learning to Control Easy or Hard*, Semiautonomous Systems Seminar Series, UC Berkeley, Berkeley, CA
- [T4] Oct 2024 *What Makes Learning to Control Easy or Hard*, Robotics Seminar, Princeton University, Princeton, NJ
- [T5] Oct 2024 *What Makes Learning to Control Easy or Hard*, Coordinate Science Lab Seminar, University of Illinois Urbana-Champaign, Champaign, IL
- [T6] Oct 2024 *What Makes Learning to Control Easy or Hard*, Control Seminar, University of Michigan, Ann Arbor, MI
- [T7] Sep 2024 *What Makes Learning to Control Easy or Hard*, Mathematical and Scientific Foundations of Deep Learning Annual Meeting, Simons Foundation, New York, NY
- [T8] Sep 2024 *What Makes Learning to Control Easy or Hard*, Robotics Institute Seminar Colloquium, Carnegie Mellon University, Pittsburgh, PA
- [T9] Jun 2024 *Representation Learning for Dynamics and Control*, Rantzerfest Workshop, European Control Conference, KTH, Stockholm, Sweden
- [T10] Apr 2024 *What Makes Learning to Control Easy or Hard*, Special Invited Lecture, Boston Dynamics AI Institute, Boston, MA
- [T11] Apr 2024 *What Makes Learning to Control Easy or Hard*, ISL Colloquium, Stanford University, Palo Alto, CA
- [T12] Apr 2024 *What Makes Learning to Control Easy or Hard*, Control and Dynamical Systems (CDS) Invited Lecture, University of Maryland, College Park, MD (virtual)
- [T13] Apr 2024 *What Makes Learning to Control Easy or Hard*, Robot Autonomy Seminar, Lehigh University, Lehigh, PA
- [T14] Mar 2024 *What Makes Learning to Control Easy or Hard*, CCI-AAI-MHI Seminar, University of Southern California, Los Angeles, CA

- [T15] Feb 2024 *Sample-Efficient Linear Representation Learning from Non-IID Non-Isotropic Data*, Invited Session on Machine Learning and Control, Workshop on Information Theory and Applications (ITA), San Diego
- [T16] Dec 2023 *Representation Learning for Dynamics and Control*, MCE Seminar, California Institute of Technology, Pasadena, CA
- [T17] Dec 2023 *Representation Learning for Dynamics and Control*, EE Special Seminar, University of Southern California, Los Angeles, CA
- [T18] Nov 2023 *Session on Control and Learning*, NSF Workshop: Towards Re-architecting Today's Internet for Survivability, Evanston, IL
- [T19] Nov 2023 *Representation Learning for Dynamics and Control*, UPenn Optimization Seminar, University of Pennsylvania, Philadelphia, PA
- [T20] Aug 2023 *Meta-Learning Linear Operators to Optimality from Multi-Task Non-IID Data*, MOPTA Invited Talk, Lehigh University, Lehigh, PA
- [T21] Apr 2023 *What makes learning to control easy or hard?*, Decision and Control Laboratory Seminar, GaTech, Atlanta, GA
- [T22] Mar 2023 *What makes learning to control easy or hard?*, Reinforcement Learning Seminar Series, Microsoft Research, New York, NY
- [T23] Feb 2023 *TaSIL: Taylor Series Imitation Learning*, Invited Session on Statistical Learning Theory for Control, Workshop on Information Theory and Applications (ITA), San Diego
- [T24] Jan 2023 *What makes learning to control easy or hard?*, ASSET Seminar Series, University of Pennsylvania, Philadelphia, PA
- [T25] Nov 2022 *What makes learning to control easy or hard?*, Robotics Institute Seminar Series, University of Toronto Robotics Institute, Toronto, Canada
- [T26] Nov 2022 *What makes learning to control easy or hard?*, Special Seminar, Massachusetts Institute of Technology, Cambridge, MA
- [T27] Nov 2022 *What makes learning to control easy or hard?*, EE Departmental Seminar, Harvard University, Cambridge, MA
- [T28] Oct 2022 *What makes learning to control easy or hard?*, Autonomy Talks seminar series, ETHz, Zurich, Switzerland (virtual)
- [T29] Sep 2022 *TaSIL: Taylor Series Imitation Learning*, Invited Session on Learning, Dynamics, and Control, Allerton Conference, UIUC, Illinois
- [T30] June 2022 *What makes learning to control easy or hard?*, Control and Dynamical Systems Seminar, Caltech, Pasadena
- [T31] June 2022 *TaSIL: Taylor Series Imitation Learning*, Stockholm Workshop on Emerging Topics in Systems and control, KTH, Stockholm, Sweden
- [T32] May 2022 *On the Sample Complexity of Stability Constrained Imitation Learning*, Workshop on Safe and Reliable Robot Autonomy under Uncertainty, ICRA 2022
- [T33] Apr 2022 *Robust Learning for Safe Control*, ECE Seminar Series, University of Illinois, Chicago
- [T34] Oct 2021 *Robust Learning for Safe Control*, Signal Processing, Communication, and Control Seminar, University of Delaware
- [T35] Aug 2021 *Robust Learning for Safe Control*, Optimization and Control Group Seminar, PNNL (virtual)
- [T36] June 2021 *Learning and Control with Safety and Stability Guarantees for Nonlinear Systems*, Foundations and Mathematical Guarantees of Data-Driven Control Virtual Summer School, EPFL and ETHZ (8-hour lecture series join with Stephen Tu, virtual)

- [T37] May 2021 *Closing the Closed-Loop Distribution Shift in Safe Imitation Learning*, Invited Session on Data-Driven Analysis and Control of Dynamical Systems, SIAM Conference on Applications of Dynamical Systems (DS21) (virtual)
- [T38] May 2021 *Robust Guarantees for Perception-Based Control*, Workshop on Cognition and Control, IEEE ACC 2021 (virtual)
- [T39] May 2021 *Robust Learning for Safe Control*, Control Systems Seminar, University of California, San Diego (virtual)
- [T40] May 2021 *Robust Learning for Safe Control*, Invited seminar, KTH Royal Institute of Technology (virtual)
- [T41] May 2021 *Robust Learning for Safe Control*, Invited seminar, Max Planck Institute for Intelligent Systems (virtual)
- [T42] May 2021 *Robust Learning for Safe Control*, Lockheed Martin Seminar series, University of Maryland (virtual)
- [T43] Mar 2021 *Learning Control Barrier Functions from Expert Demonstrations*, Invited session on Learning and Control, CISS 2021, Johns Hopkins University (virtual)
- [T44] Mar 2021 *Closing the Closed-Loop Distribution Shift in Safe Imitation Learning*, Google Machine Learning and Robot Safety Workshop (virtual)
- [T45] Dec 2020 *Learning Control Barrier Functions from Data*, Workshop on Data-Driven Control, IEEE CDC 2020, Jeju Island, Korea (virtual)
- [T46] Nov 2020 *Safety and Robustness Guarantees with Learning in the Loop*, Webinar, IEEE Joint Control, Robotics, and Cybernetics Chapter of the Vancouver Section, Vancouver, BC, Canada (virtual)
- [T47] Nov 2020 *Learning Control Barrier Functions from Expert Demonstrations*, Invited Session on Recent Advances in Learning, Optimization, and Control, Informs 2020 (virtual)
- [T48] Aug 2020 *Learning Control Barrier Functions from Expert Demonstrations*, Tutorial Session on Control/Optimization in Machine Learning/AI, IEEE CCTA, Montreal, QC (virtual)
- [T49] Nov 2019 *Safety and Robustness Guarantees with Learning in the Loop and Panel Discussion*, Workshop on Learning for Control at NSF CPS PI Meeting, Arlington, VA
- [T50] Nov 2019 *Safety and Robustness Guarantees with Learning in the Loop*, Control Seminar Series, ETH Zurich
- [T51] Oct 2019 *Safety and Robustness Guarantees with Learning in the Loop*, Laboratory for Computational Sensing and Robotics Seminar, John Hopkins University
- [T52] Oct 2019 *Robust Guarantees for Perception Based Control*, NSF-Sponsored Robot Learning Workshop, Lehigh University
- [T53] Sep 2019 *On the Sample Complexity of Distributed Linear Optimal Controllers*, Invited Session on Reinforcement Learning, IEEE Allerton Conference, UIUC
- [T54] Feb 2019 *Safety and Robustness Guarantees with Learning in the Loop*, ESE Seminar, U Penn
- [T55] Feb 2019 *Safety and Robustness Guarantees with Learning in the Loop*, SILO Seminar, UW-Madison
- [T56] Aug 2018 *Robustness Guarantees with Learning in the Loop*, ME Seminar, USC
- [T57] Apr 2018 *A System Level Approach to Robust Autonomy*, EE Seminar, USC
- [T58] Mar 2018 *A System Level Approach to Distributed and Adaptive Control*, ME Seminar, UCSB
- [T59] Mar 2018 *A System Level Approach to Distributed and Adaptive Control*, ECE Seminar, U of Minnesota

- [T60] Feb 2018 *A System Level Approach to Distributed and Adaptive Control*, ECE Seminar, UIUC
- [T61] Jan 2018 *A System Level Approach to Distributed and Adaptive Control*, EE Seminar, UCLA
- [T62] Jan 2018 *A System Level Approach to Distributed and Adaptive Control*, ECE Seminar, U of Michigan
- [T63] Dec 2017 *A System Level Approach to Controller Synthesis with Applications to Software Defined Networking*, **Keynote Speaker**, ACDCN Workshop, U of Adelaide
- [T64] Sep 2017 *On the Sample Complexity of the Linear Quadratic Regulator*, EE Seminar, USC
- [T65] Aug 2017 *A System Level Approach to Controller Synthesis*, Guest Lecturer, USC
- [T66] July 2017 *New Math for Living Machines*, Living Machines 2017 Workshop, Stanford University
- [T67] June 2017 *A System Level Approach to Controller Synthesis*, EECS Seminar, UC Berkeley
- [T68] May 2017 *A System Level Approach to Controller Synthesis*, EE Seminar, U Washington
- [T69] Apr 2017 *A System Level Approach to Controller Synthesis*, EECS LIDS Seminar, MIT
- [T70] Apr 2017 *A System Level Approach to Controller Synthesis*, EE Seminar, Harvard
- [T71] Mar 2017 *A System Level Approach to Controller Synthesis*, ECE ISS Seminar, McGill University
- [T72] Feb 2017 *A System Level Approach to Controller Synthesis*, CommNets Seminar, USC
- [T73] Jan 2017 *A System Level Approach to Controller Synthesis*, CCDC Seminar, UCSB
- [T74] Nov 2016 *Layering, Dynamics, Optimization and Control in SDNs*, Huawei Future Network Theory Lab, Hong Kong
- [T75] June 2016 *Layering, Dynamics, Optimization and Control in SDNs*, NSF AiTF Workshop on Algorithms for SDN, DiMACS (Rutgers)
- [T76] May 2016 *A Theory of Architecture and Co-Design for Cyber-Physical Systems*, ECE Seminar, UCSD
- [T77] Apr 2016 *Building and Controlling Complex Interconnected Systems*, Caltech Everhart Lecture Series, Caltech
- [T78] Mar 2016 *A Theory of Architecture and Co-Design for Cyber-Physical Systems*, EECS/IDSS Seminar, MIT
- [T79] Mar 2016 *A Theory of Architecture and Co-Design for Cyber-Physical Systems*, ECE Seminar, Cornell University
- [T80] Feb 2016 *A Theory of Architecture and Co-Design for Cyber-Physical Systems*, EE Seminar, Stanford University
- [T81] Jan 2016 *Regularization for Design*, ECE/ISN Seminar Series, Cornell University
- [T82] Dec 2014 *Tutorial on Distributed Control and Optimization*, Caltech CDS@20 workshop at IEEE CDC

- [T83] Oct 2014 *Regularization for Design: Connections Between Distributed Control and Sparse Reconstruction Theory*, University of Minnesota
- [T84] Aug 2014 *Tutorial Session on Distributed Control and Optimization*, CDS@20 celebration at Caltech
- [T85] Aug 2014 *A Convex Approach to Visual Pose Estimation*, UCLA
- [T86] Nov 2013 *Delay Pattern Design in Decentralized H2 Optimal Control Using Convex Optimization*, Linköping University
- [T87] Nov 2013 *Delay Pattern Design in Decentralized H2 Optimal Control Using Convex Optimization*, Lund University
- [T88] Dec 2012 *Some recent results in decentralized optimal H2 control subject to delays*, Southern California Control Workshop, USCD

Teaching and Advising

Teaching Activities

- Fall '24 **Instructor: ESE 2030: Linear Algebra with Applications to Engineering and AI,**
A complete redesign of a first course in linear algebra aimed at freshman/sophomore engineering students. Students are introduced to key concepts of the field, including but not limited to vectors, vector norms and inner products, matrices, matrix-vector and matrix-matrix multiplication, matrix inverses, solving systems of linear equations, vector spaces, orthogonality, least-squares, eigenvalues and eigenvectors, singular value decompositions, and principal component analysis. These theoretical tools will be grounded in exciting problems from the sciences, engineering, machine learning, data science, logistics, and economics. Through application-based case studies, students will be shown how to model problems using linear algebra and how to solve the resulting problem using standard Python scientific computing modules.
- Fall '22-'23 **Instructor: ESE 2040: Decision Models,**
Designed new curriculum on decision models with a focus on use of applied mathematics in quantitative application areas. Students further learn how to operationalize their newly acquired mathematical modeling skills through the completion of structured but challenging Python Notebook based assignments.
- Fall 2021 **Instructor: ESE 618-001: Learning for Dynamics and Control,**
Proposed and designed the curriculum for a new advanced graduate level course on the emerging research area at the intersection of learning control.
- Spring '20-'24 **Instructor: ESE 605-001: Modern Convex Optimization,**
A first course in convex optimization covering basic theory, applications, and algorithms.
- Fall 2019 **Instructor: ESE 680-004: Learning and Control,**
An advanced topics course on the emerging research area at the intersection of learning control. Produced a publicly available reading list and high quality set of scribed notes.
- Apr–Jun 2014 **Teaching Assistant: ACM/CMS/EE 218 Statistical Inference,**
taught by V. Chandrasekaran at Caltech
- Jan–Mar 2014 **Co-Instructor: CDS 110b Introduction to Control Theory,**
co-taught with J. C. Doyle at Caltech
This was an unofficial position in which I taught approximately 90% of the lectures and helped develop the syllabus.

Advising Activities

Postdocs: **Current:**

- David Snyder (ESE, co-advised with G. J. Pappas, start F25)

Alumni:

- Ingvar Ziemann (ESE, co-advised with G. J. Pappas, start F23): Quantitative Researcher, Xantium Group

Ph.D. **Current:**

- Thomas Zhang (ESE, start F20, candidacy on 02/21/2025, expected graduation 09/2025)
- Alex Nguyen-Le (ESE, start F20, joined group F23, expected graduation Sp26)
- Anish Bhattacharya (CIS, co-advised with V. Kumar, start F20, expected graduation Sp26)
- Fengjun Yang (CIS, start F20, expected graduation Sp26)
- Anusha Srikanthan (ESE, co-advised with V. Kumar, start F21)
- Farhad Nahwaz (ESE, co-advised with N. Figueroa, start F21)
- Anne Somalwar (AMCS, co-advised with G. J. Pappas, start F23)
- Eliot Seo Shekhtman (CIS, start F24)
- Kyle Horton (ESE, co-advised G. J. Pappas, start F25)

Alumni:

- Bernadette Bucher (CIS, co-advised with K. Daniilidis, graduated 05/23): Asst. Prof. at University of Michigan Robotics (formerly BDAI Senior Researcher)
- Kendall Queen (ESE, co-advised with K. Daniilidis, graduated 05/23): Asylon Robotics (Robotics Software Engineer)
- Bruce Lee (ESE, graduate 05/25): ETHz AI Postdoctoral Fellow

Master's **Alumni:**

- Hanli Zhang (ESE, '24): PhD at EPFL
- Bo Wu (ROBO, '24): PediaMetrix Inc.
- Yug Ajmera (ROBO, '23): NEC Labs Research Engineer
- Dhruv Parikh (ROBO, '23): BotBuilt
- Lejun Jiang (ROBO, '22): Waymo Research Engineer

Undergrads Current:

- Alok Shah (CIS)
- Vincent Zhang (CIS and Math)
- James Wang (CIS)
- John D'Ambrosio (MEAM)

Alumni:

- Wonbin (Brian) Lee (Wharton, '24): EECS PhD at UC Berkeley with B. Recht and N. Haghtalab
- Daniel Pfrommer (CIS, '22): EECS PhD at MIT with A. Jadbabaie

Journal Publications

- [J1] A. Srikanthan, A. Karapetyan, V. Kumar, and **N. Matni**, "Closed-loop analysis of admm-based suboptimal linear model predictive control," *IEEE Control Systems Letters*, pp. 1–1, 2024.
- [J2] B. D. Lee, T. T. Zhang, H. Hassani, and **N. Matni**, "Performance-robustness tradeoffs in adversarially robust control and estimation," *IEEE Transactions on Automatic Control*, 2024.
- [J3] **N. Matni**, A. D. Ames, and J. C. Doyle, "A quantitative framework for layered multirate control: Toward a theory of control architecture," *IEEE Control Systems Magazine*, vol. 44, no. 3, pp. 52–94, 2024.
- [J4] L. Lindemann, A. Robey, L. Jiang, S. Das, S. Tu, and **N. Matni**, "Learning robust output control barrier functions from safe expert demonstrations," *IEEE Open Journal of Control Systems*, 2024.
- [J5] S. Chen, V. M. Preciado, M. Morari, and **N. Matni**, "Robust model predictive control with polytopic model uncertainty through system level synthesis," *Automatica*, vol. 162, p. 111431, 2024.
- [J6] A. Alleyne, F. Allgöwer, A. Ames, S. Amin, J. Anderson, A. Annaswamy, P. Antsaklis, N. Bagheri, H. Balakrishnan, B. Bamieh, *et al.*, "Control for societal-scale challenges roadmap 2030," 2023.
- [J7] A. Tsiamis, I. Ziemann, **N. Matni**, and G. J. Pappas, "Statistical learning theory for control: A finite-sample perspective," *IEEE Control Systems Magazine*, vol. 43, no. 6, pp. 67–97, 2023.
- [J8] L. Lindemann, L. Jiang, **N. Matni**, and G. J. Pappas, "Risk of stochastic systems for temporal logic specifications," *ACM Transactions on Embedded Computing Systems*, vol. 22, no. 3, pp. 1–31, 2023.
- [J9] C. A. Alonso, F. Yang, and **N. Matni**, "Data-driven distributed and localized model predictive control," *IEEE Open Journal of Control Systems*, vol. 1, pp. 29–40, 2022.
- [J10] C. A. Alonso, J. S. Li, J. Anderson, and **N. Matni**, "Distributed and localized model-predictive control—part i: Synthesis and implementation," *IEEE Transactions on Control of Network Systems*, vol. 10, no. 2, pp. 1058–1068, 2023.
- [J11] C. A. Alonso, J. S. Li, **N. Matni**, and J. Anderson, "Distributed and localized model predictive control—part ii: Theoretical guarantees," *IEEE Transactions on Control of Network Systems*, vol. 10, no. 3, pp. 1113–1123, 2023, **IEEE TCNS Best Paper Award**.
- [J12] S. Fattahi, **N. Matni**, and S. Sojoudi, "Efficient learning of distributed linear-quadratic control policies," *SIAM Journal on Control and Optimization*, vol. 58, no. 5, pp. 2927–2951, 2020. [Online]. Available: <https://doi.org/10.1137/19M1291108>
- [J13] J. Anderson, J. C. Doyle, S. H. Low, and **N. Matni**, "System level synthesis," *Annual Reviews in Control*, 2019. [Online]. Available: <http://www.sciencedirect.com/science/article/pii/S1367578819300215>
- [J14] S. Dean, H. Mania, **N. Matni**, B. Recht, and S. Tu, "On the sample complexity of the linear quadratic regulator," *Foundations of Computational Mathematics*, Aug 2019. [Online]. Available: <https://doi.org/10.1007/s10208-019-09426-y>
- [J15] N. Wu, Y. Bi, N. Michael, A. Tang, J. C. Doyle, and **N. Matni**, "A control-theoretic approach to in-network congestion management," *IEEE/ACM Transactions on Networking*, pp. 1–14, 2018.

- [J16] Y. Wang, **N. Matni**, and J. C. Doyle, "A system-level approach to controller synthesis," *IEEE Transactions on Automatic Control*, vol. 64, no. 10, pp. 4079–4093, Oct 2019, **George S. Axelby Award**.
- [J17] Y. Wang, **N. Matni**, and J. C. Doyle, "Separable and localized system-level synthesis for large-scale systems," *IEEE Transactions on Automatic Control*, vol. 63, no. 12, pp. 4234–4249, Dec 2018.
- [J18] **N. Matni**, "Communication delay co-design in \mathcal{H}_2 -distributed control using atomic norm minimization," *IEEE Transactions on Control of Network Systems*, vol. 4, no. 2, pp. 267–278, June 2017.
- [J19] **N. Matni** and V. Chandrasekaran, "Regularization for design," *IEEE Transactions on Automatic Control*, vol. 61, no. 12, pp. 3991–4006, Dec 2016.
- [J20] V. Jonsson, C. Blakely, ..., **N. Matni**, ..., and T. Bivona, "Novel computational method for predicting polytherapy switching strategies to overcome tumor heterogeneity and evolution," *Nature Scientific Reports*, 2016.
- [J21] M. M. Oishi, **N. Matni**, A. Ashoori, and M. J. McKeown, "Switching restrictions for stability despite switching delay: Application to switched tracking tasks in parkinson's disease," *Journal of Nonlinear Systems and Applications*, vol. 16, p. 25, 2011.

Refereed Conference Publications

- [C1] T. T. Zhang, B. Moniri, A. Nagwekar, F. Rahman, A. Xue, H. Hassani, and **N. Matni**, "On the concurrence of layer-wise preconditioning methods and provable feature learning," in *Forty-second International Conference on Machine Learning*, 2025. [Online]. Available: <https://openreview.net/forum?id=aRUUFFycNh>
- [C2] I. Ziemann, **N. Matni**, and G. J. Pappas, "State space models, emergence, and ergodicity: How many parameters are needed for stable predictions?" *Learning for Dynamics and Control 2025, to appear.*, 2025.
- [C3] T. Fujinami, B. D. Lee, **N. Matni**, and G. J. Pappas, "Domain randomization is sample efficient for linear quadratic control," *Learning for Dynamics and Control 2025, to appear.*, 2025.
- [C4] J. Wang, B. D. Lee, I. Ziemann, and **N. Matni**, "Logarithmic regret for nonlinear control," *Learning for Dynamics and Control 2025, to appear.*, 2025.
- [C5] B. D. Lee, L. F. Toso, T. T. Zhang, J. Anderson, and **N. Matni**, "Regret analysis of multi-task representation learning for linear-quadratic adaptive control," in *The 39th Annual AAAI Conference on Artificial Intelligence*, 2024. [Online]. Available: <https://openreview.net/forum?id=HcS0a3Npv5>
- [C6] A. Bhattacharya, M. Cannici, N. Rao, Y. Tao, V. Kumar, **N. Matni**, and D. Scaramuzza, "Monocular event-based vision for obstacle avoidance with a quadrotor," in *8th Annual Conference on Robot Learning*, 2024. [Online]. Available: <https://openreview.net/forum?id=82bpTugrMt>
- [C7] A. Nguyen-Le and **N. Matni**, "Moving average estimation by geometric optimization," in *2024 IEEE 63rd Conference on Decision and Control (CDC)*, 2024, pp. 6981–6988.
- [C8] F. Yang and **N. Matni**, "Coordinating planning and tracking in layered control policies via actor-critic learning," in *2024 IEEE 63rd Conference on Decision and Control (CDC)*, 2024, pp. 3762–3769.
- [C9] B. Lee and **N. Matni**, "Single trajectory conformal prediction," in *2024 IEEE 63rd Conference on Decision and Control (CDC)*, 2024, pp. 3019–3024.
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Theses

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Patents

- [P1] V. Jonsson, **N. Matni**, A. Rantzer, and B. Bernhardsson, "Designing combinations therapies of non-interacting drugs for evolutionary dynamics of disease using optimal control," USA Patent 20 150 278 485, CIT 14-135, Oct. 1, 2015.
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Active

Total funding	Total funding raised as PI: \$ 2,995,466.00
DARPA TRS	<i>LieAD: Uncovering Hidden Linear Structure in Complex Continuum Systems</i> , 07/15/2025-07/24/2027 (estimated), award amount: \$ 600,00.00.
NSF-2429166	<i>Northeast Systems and Control Workshop</i> , 06/15/2024-05/31/2025 (estimated), award amount: \$ 12,000.00, Principal Investigator .
AFOSR YIP	<i>Towards a Statistical Learning Theory of Nonlinear Control</i> , 03/01/2024-03/01/2027 (estimated), award amount: \$ 450,000.00, Principal Investigator .
NSF-2331880	<i>Collaborative Research: SLES: Bridging offline design and online adaptation in safe learning-enabled systems</i> , 10/01/2023-09/30/2026 (estimated), award amount: \$ 533,411.00, Principal Investigator .
NSF-2231349	<i>Collaborative Research: Scalable & Communication Efficient Learning-Based Distributed Control</i> , 09/01/2022-08/31/2025 (estimated), award amount: \$ 240,000.00, Principal Investigator .
NSF-2045834	<i>CAREER: Towards a Theory of Robust Learning & Control for Safety-Critical Autonomous Systems</i> , 02/15/2021-01/31/2026 (estimated), award amount: \$ 500,000.00, Principal Investigator .

Completed

Google	<i>Google Research Scholar Award: Robust Learning for Safe Control</i> , 04/01/2021-04/01/2022, award amount: \$ 60,000.00, Principal Investigator .
NSF-2038873	<i>CPS: Medium: Robust Learning for Perception Based Autonomy</i> , 09/15/2020-08/31/2024, award amount: \$ 1,199,055.00, Principal Investigator .

Professional Activities

Professional Memberships

- **Senior Member**, IEEE, 2022

External Service

- **Founder and Steering Committee Member:** Northeastern Systems and Control Workshop, 2024, University of Pennsylvania
- **Conference Organizer:** Learning for Dynamics and Control 2023, University of Pennsylvania
- **Associate Editor:** IEEE Control Systems Society Conference Editorial Board (2020 to present)
- **NSF Panel:** Served on EPCN and CPS panels
- **Best Student Paper Committee:** CDC 2023
- **Program Committee:** CDC 2025, ICCPS 2024, L4DC 2020-2024, CORL 2020, RSS 2020, HSCC 2020
- **Publicity chair:** ICCPS 2021
- **Session Organizer:** (Co)-organizer of tutorial on Statistical Learning in Control (CDC 2023), workshop on Statistical Learning in Control (CDC 2022), workshop on Robust Deep Learning-based Control (CDC 2021), tutorial session on Self-Tuning Control and Reinforcement Learning (CDC 2019), invited session on Identification, Learning, and Adaptation in Control (ACC 2018)

Internal Service

- **Penn Engineering 2030 Strategic Plan Implementation Committee:** Reimagining Education Pillar, 2025
- **Graduate Chair:** Dept. of Electrical and Systems Engineering (2025-present)
- **Curriculum Committee:** BSE in Artificial Intelligence, (2023-present), and ESE (2024-2025)
- **Consultative Committee:** Consultative Committee for the Chair of the Department of Electrical and Systems Engineering, 2023
- **Hiring Committee:** IDS search committee member (2021-2023)
- **Ph.D. Admissions Committee:** IDS member (Spring 2020)

Peer Review

- **Journals:** Transactions on Machine Learning, IEEE Transactions on Computational Social Systems, IEEE Transactions on Networking, IEEE Signal Processing Letters, Proceedings of the National Academy of Science, Automatica, IEEE Transactions on Automatic Control, SIAM Journal of Optimization and Control, IEEE Transactions on Control of Networked Systems, IEEE Control Systems Magazine, IEEE Open Journal of Control Systems, and others.
- **Conferences:** International Conference on Machine Learning, Neural Information Processing Systems, IEEE Conference on Decision and Control, IEEE American Control Conference, IEEE European Control Conference, IEEE Multi-Conference on Systems and Control, IEEE Mediterranean Conference on Automation and Control, and others.