

Ali Baheri

Curriculum Vitae

Research Interests

- Theory Reinforcement learning, machine learning, decision making under uncertainty, optimal control, Bayesian optimization
- Application areas Autonomous systems, robotics, energy systems

Position

- 6/22–present **Visiting Scholar**, *Stanford University*
Host: Mykel Kochenderfer
- 8/19–present **Assistant Professor (Research)**, *West Virginia University*
- 2018–2019 **Postdoctoral Fellow**, *University of Michigan Ann Arbor*
Advisors: Ilya Kolmanovsky, Anouck Girard

Education

- 2015–2018 **Ph.D.**, *University of North Carolina at Charlotte*
Specialized in machine learning and control theory, Advisor: Chris Vermillion
- 2012–2014 **M.S.**, *University of Louisiana at Lafayette*
Specialized in Mechanical Engineering - systems, dynamics, and control
- 2002–2006 **B.S.**, *Sharif University of Technology*
Specialized in Mechanical Engineering - solid design

Research Grants & Funding

Federal Grants

- 2022–2024 **RII Track-4: NSF: Safety Validation of Autonomous Systems from Multiple Sources of Information**, *NSF*- $\approx \$200K$, Single PI
- 2021–2023 **Safety Verification Framework for Learning-based Aviation Systems (SVF-LAS)**, *Federal Aviation Administration*- $\$400K$, Lead PI
- 2021–2022 **Fault Diagnosis for Safety-Critical Autonomous Systems using Reinforcement Learning**, *NASA*- $\$100K$, Lead PI
- 2021–2022 **Black-Box Verification of Autonomous Systems Using Modular Reinforcement Learning**, *NASA WV Space Grant Consortium*- $\approx \$30K$, Single PI
- 2020–2021 **Robust Autonomy Through Experimentally Infused Decision Making with the Application to Planetary Mars Rover**, *NASA WV Space Grant Consortium*- $\approx \$23K$, Single PI

Internal Grants

2021-2022 **Verification of Multi-Agent Autonomous Planning and Control**, West Virginia University Research Office Program- \approx \$25K, Single PI

Publications

Journal Publications

- [J6] **Ali Baheri**, Safe Reinforcement Learning with Mixture Density Network, with Application to Autonomous Driving. *Results in Control and Optimization*, Vol. 6, 2022
- [J5] **Ali Baheri**, C. Vermillion, Combined Plant and Controller Design Using Batch Bayesian Optimization: A Case Study in Airborne Wind Energy Systems. *ASME Journal of Dynamics, Measurement, and Control*, Vol. 141, Issue 9, 2019.
- [J4] S. Bin-Karim, A. Bafandeh, **Ali Baheri**, and C. Vermillion, Spatiotemporal Optimization Through Gaussian Process Based Model Predictive Control: Case Study in Airborne Wind Energy. *IEEE Transactions on Control Systems Technology*, Vol. 27, Issue 2, pp. 798-805, 2019.
- [J3] **Ali Baheri**, P. Ramaprabhu, and C. Vermillion, Iterative 3D Layout Optimization and Parametric Trade Study for a Reconfigurable Ocean Current Turbine Array Using Bayesian Optimization. *Renewable Energy*, Vol. 127, pp. 1052-1063, 2018.
- [J2] A. Bafandeh, S. Bin-Karim, **Ali Baheri**, and C. Vermillion, A Comparative Assessment of Hierarchical Control Structures for Spatiotemporally Varying Systems, with Application to Airborne Wind Energy. *Control Engineering Practice*, Vol. 74, pp. 71-83, 2018.
- [J1] **Ali Baheri**, S. Bin-Karim, A. Bafandeh, and C. Vermillion, Real-Time Control Using Bayesian Optimization: A Case Study in Airborne Wind Energy Systems. *Control Engineering Practice*, Vol. 69, pp. 131-140, 2017.

Conference Publications

- [C13] **Ali Baheri**, H. Ren, B. Johnson, P. Razzaghi, and P. Wei, A Verification Framework for Certifying Learning-based Safety-Critical Aviation Systems. *In AIAA*, Chicago, IL, 2022
- [C12] **Ali Baheri**, Safe Reinforcement Learning with Mixture Density Network: A Case Study in Autonomous Highway Driving. *In Robotics: Science and Systems*, Corvallis, OR, 2020
- [C11] **Ali Baheri**, S. Nagesh Rao, I. Kolmanovsky, A. Girard, E. Tseng, and D. Filev, Deep Reinforcement Learning with Enhanced Safety for Autonomous Highway Driving. *In 31st IEEE Intelligent Vehicles Symposium*, Las Vegas, NV, 2020
- [C10] **Ali Baheri**, I. Kolmanovsky, A. Girard, E. Tseng, and D. Filev, Vision-Based Autonomous Driving: A Model Learning Approach. *In American Control Conference*, Denver, CO, 2020
- [C9] **Ali Baheri**, C. Vermillion, Waypoint Optimization Using Bayesian Optimization: A Case Study in Airborne Wind Energy Systems. *In American Control Conference*, Denver, CO, 2020
- [C8] **Ali Baheri**, S. Nagesh Rao, I. Kolmanovsky, A. Girard, E. Tseng, and D. Filev, Deep Q-Learning with Dynamically-Learned Safety Module: A Case Study in Autonomous Driving. *In 33rd Conference on Neural Information Processing Systems (NeurIPS 2019)*
- [C7] **Ali Baheri**, C. Vermillion, Context-Dependent Bayesian Optimization in Real-Time Optimal Control: A Case Study in Airborne Wind Energy Systems. *In Neural Information Processing System, NIPS Workshop on Bayesian Optimization*, Long Beach, CA, 2017

- [C6] **Ali Baheri**, J. Deese, and C. Vermillion, Combined Plant and Controller Design Using Bayesian Optimization: A Case Study in Airborne Wind Energy Systems. *In 2017 ASME Dynamic Systems and Control Conference*, Tysons Corner, VA, 2017.
- [C5] **Ali Baheri**, P. Ramaprabhu, and C. Vermillion, Iterative In-Situ 3D Layout Optimization of a Reconfigurable Ocean Current Turbine Array Using Bayesian Optimization. *In ASME Dynamic Systems and Control Conference*, Tysons Corner, VA, 2017.
- [C4] **Ali Baheri**, C. Vermillion, Altitude Optimization of Airborne Wind Energy Systems: A Bayesian Optimization Approach. *In American Control Conference*, Seattle, WA, 2017.
- [C3] **Ali Baheri**, J. Vaughan, Concurrent Design of Unity-Magnitude Input Shapers and Proportional-Derivative Feedback Controllers. *In American Control Conference*, Chicago, IL, 2015.
- [C2] **Ali Baheri**, J. Vaughan, Robust Concurrent Design of Input and Proportional-Derivative Feedback Controllers. *In International Symposium on Flexible Automation*, Awaji-Island, Japan, 2014.
- [C1] **Ali Baheri**, J. Vaughan, Concurrent Command and Mechanical System Design to Limit Transient and Residual Vibration. *In International Conference on Motion and Vibration Control (MOVIC)*, Sapporo, Japan, 2014.

Honors and Awards

- 2022 National Science Foundation EPSCOR Track 4 Fellowship
- 2018 Ford Motor Company Postdoctoral Fellowship
- 2018 SigOpt Inc. Graduate Research Fellowship
- 2015-2018 Graduate Research Assistantship at University of North Carolina at Charlotte
- 2014-2015 Graduate Research Assistantship at University of Louisiana at Lafayette, Department of Computer Science and Computer Engineering
- 2012-2014 Graduate Research Assistantship at University of Louisiana at Lafayette, Department of Mechanical Engineering

Invited Talk and Presentations

- May 2022 Safety Verification of Autonomous Systems: a Multi-Fidelity Reinforcement Learning Approach, ICRA 2022 Workshop on the Verification of Autonomous Systems (VAS).
- Apr 2022 Safe Decision Making in an Evolving Environment for Safety-Critical Autonomous Systems, The University of North Texas
- Mar 2022 Lessons from Safe Learning and Safety Validation Research for Autonomous Systems in the Wild, Rochester Institute of Technology
- Aug 2020 Safety Learning in Autonomous Driving, Ford Motor Company
- Feb 2020 Safe and Human-like Decision Making for Autonomous Systems, University of New Mexico
- Nov 2018 Guest Invited Lecture, Deep Reinforcement Learning, University of North Carolina at Charlotte

Professional Experiences

- Summer 2017 Machine Learning Summer Intern, UNC Coastal Studies Institute

Teaching Experience

Course Instructor

- C1. Developed and taught new graduate level course entitled **Reinforcement Learning and Control**, Spring 2021 (class size: 18, SEI: 4.6/5.0)
- C2. MAE 460: **Automatic Control**, Summer 2021 (class size: 45, SEI: 4.7/5.0)
- C3. Developed new undergraduate level course entitled **Deep Learning for Engineering Students**, Fall 2022

Professional Services

Panel Reviewer, National Science Foundation (2021- DCSD), (2022-CPS)

Co-organize “Machine Learning for Autonomous Driving (ML4AD)” workshop at NeurIPS, 2021

Co-organize “Fault Diagnosis for Safety-Critical Autonomous Spacecraft Systems” workshop, 1st Meeting of the Mid-Atlantic Space Grant Data Science Consortium funded by NASA

Co-organize “Robotics Seminar Series” at West Virginia University

Reviewer Services

IEEE Transactions on Intelligent Vehicles, IEEE Transactions on Vehicular Technology, IEEE Transactions on Vehicular Technology, Journal of Advanced Research, Energies, Sustainable Energy Technologies and Assessments, Journal of Machine Learning Research, Energy for Sustainable Development Journal, IEEE Aerospace and Electronic Systems, Conference on Decision and Control, American Control Conference, European Control Conference, ASME Dynamic Systems and Control Conference, IEEE Intelligent Vehicles Symposium, IEEE International Conference on Intelligent Transportation Systems