

# Ali Baheri

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## Curriculum Vitae

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### Research Interests

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

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### Position

6/22 (starting)	<b>Visiting Scholar</b> , <i>Stanford University</i> Host: Mykel Kochenderfer
8/19–present	<b>Assistant Professor (Research)</b> , <i>West Virginia University</i>
1/19–7/19	<b>Research Fellow</b> , <i>Ford Motor Company</i>

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### Education

2018–2019	<b>Postdoctoral Fellow</b> , <i>University of Michigan Ann Arbor</i> Advisors: Ilya Kolmanovsky, Anouck Girard
2015–2018	<b>Ph.D.</b> , <i>University of North Carolina at Charlotte</i> Specialized in machine learning and control theory, Advisor: Chris Vermillion
2012–2014	<b>M.S.</b> , <i>University of Louisiana at Lafayette</i> Specialized in Mechanical Engineering - Systems, dynamics, and control
2002–2006	<b>B.S.</b> , <i>Sharif University of Technology</i> Specialized in Mechanical Engineering - Solid design

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### Ph.D Thesis

Title	Real-Time Control and Optimal Design for Renewable Energy Systems: A Bayesian Optimization Approach
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### Research Grants & Funding

#### External Grants

2022-2024	<b>RII Track-4: NSF: Safety Validation of Autonomous Systems from Multiple Sources of Information</b> , <i>NSF</i> - $\approx \$200K$ , Single PI
2021-2023	<b>Safety Verification Framework for Learning-based Aviation Systems (SVF-LAS)</b> , <i>Federal Aviation Administration</i> - $\$400K$ , Lead PI
2021-2022	<b>Fault Diagnosis for Safety-Critical Autonomous Systems using Reinforcement Learning</b> , <i>NASA</i> - $\$100K$ , 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

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## Publications

### Journal Publications

- [J7] **Ali Baheri**, Safe Reinforcement Learning with Mixture Density Network, with Application to Autonomous Driving. *Results in Control and Optimization*, 2022
- [J6] S. Bin-Karim, M. Muglia, **Ali Baheri**, A. Mazzoleni, and C. Vermillion, Position Optimization of a Relocatable Energy-Harvesting Autonomous Underwater Vehicle in a Spatiotemporally-Varying Gulf Stream Environment. *Submitted to the IEEE Transactions on Control System Technology*, 2021 (under review)
- [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

- [C15] **Ali Baheri**, H. Ren, B. Johnson, P. Razzaghi, and P. Wei, A Verification Framework for Certifying Learning-based Safety-Critical Aviation Systems. *Submitted to AIAA 2022*
- [C14] S. Jacobs, R. Butts, **Ali Baheri**, Y. Gu, and G. Pereira, A Framework for Controlling Multi-Robot Systems Using Bayesian Optimization and Linear Combination of Vectors. *Submitted to ICRA 2022*
- [C13] **Ali Baheri**, Safe Reinforcement Learning with Mixture Density Network: A Case Study in Autonomous Highway Driving. *In Robotics: Science and Systems (RSS)* Corvallis, OR, 2020
- [C12] **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

- [C11] **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
- [C10] **Ali Baheri**, C. Vermillion, Waypoint Optimization Using Bayesian Optimization: A Case Study in Airborne Wind Energy Systems. *In American Control Conference* Denver, CO, 2020
- [C9] **Ali Baheri**, S. Nageshrao, 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)*
- [C8] **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
- [C7] **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.
- [C6] **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.
- [C5] **Ali Baheri**, C. Vermillion, Altitude Optimization of Airborne Wind Energy Systems: A Bayesian Optimization Approach. *In American Control Conference*, Seattle, WA, 2017.
- [C4] **Ali Baheri**, J. Vaughan, Concurrent Design of Unity-Magnitude Input Shapers and Proportional-Derivative Feedback Controllers. *In American Control Conference*, Chicago, IL, 2015.
- [C3] **Ali Baheri**, J. Vaughan, Robust Concurrent Design of Input and Proportional-Derivative Feedback Controllers. *In International Symposium on Flexible Automation*, Awaji-Island, Japan, 2014.
- [C2] **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.
- [C1] M. Hedayati, **Ali Baheri**, Y. Liu, Study on Tube Hydro Forming Process Using Finite Element Analysis and Compare with Experimental Data. *In ASSE Gulf-Southwest Annual Conference*, Arlington, TX, 2013.

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## Professional Experiences

Summer 2017   Machine Learning Summer Intern, UNC Coastal Studies Institute

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## Honors and Awards

2018-2019   Ford Motor Company Postdoctoral Fellowship  
 Summer 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

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## Invited Talk and Presentations

- 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
- Oct 2017 ASME Dynamic Systems and Control Conference
- May 2017 American Control Conference
- July 2015 American Control Conference

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## 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

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## Committee Chair

- G1. Eric Swanson (MS MAE, Spring 2021- present)
- G2. Lunet Yifru (MS MAE, Fall 2021- present)
- G3. Joshua Yancosek (MS MAE, Fall 2021- present)

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## Professional Services

- Panel Reviewer, National Science Foundation, 2021
- Co-organize “Machine Learning for Autonomous Driving (ML4AD)” workshop at NeurIPS, 2021
- Co-organize “Fault Diagnosis for Safety-Critical Autonomous Spacecraft Systems” workshop, 1<sup>st</sup> Meeting of the Mid-Atlantic Space Grant Data Science Consortium supported by NASA
- Co-organize “Robotics Seminar Series” at West Virginia University

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## 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