Ali Baheri

Curriculum Vitae

Research Interests

Theory — Reinforcement learning, machine learning, decision making under uncertainty, optimal control, Bayesian optimization

Application areas — Autonomous systems, energy systems, robotics

Position

8/19–present **Assistant Professor (Research)**, *West Virginia University*

1/19–7/19 **Research Fellow**, *Ford Motor Company*

Education

2018–2019 **Postdoctoral Fellow**, *University of Michigan Ann Arbor*
Advisors: Ilya Kolmanovsky, Anouck Girard

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

Ph.D Thesis

Title — Real-Time Control and Optimal Design for Renewable Energy Systems: A Bayesian Optimization Approach

Research Grants & Funding

Federal Grants

2022-2024 **RII Track-4: NSF: Safety Validation of Autonomous Systems from Multiple Sources of Information**, *NSF- ≈$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- ≈$30K*, Single PI

2020–2021 **Robust Autonomy Through Experimentally Infused Decision Making with the Application to Planetary Mars Rover**, *NASA WV Space Grant Consortium- ≈$23K*, Single PI

Internal Grants

2021-2022 **Verification of Multi-Agent Autonomous Planning and Control**, *West Virginia University Research Office Program- ≈$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

[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. Nageshrao, 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 33st 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 the Tube Hydroforming Process Using Finite Element Analysis and Compared with Experimental Data. *In ASSE Gulf-Southwest Annual Conference*, Arlington, TX, 2013.

Professional Experiences

Summer 2017 Machine Learning Summer Intern, UNC Coastal Studies Institute

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

Invited Talk and Presentations

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

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

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 supported 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