Ali Baheri

Curriculum Vitae

Research Interests

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

Application areas — Autonomous systems, robotics, energy systems

Position

2023–onward **Assistant Professor (tenure-track)**, *Rochester Institute of Technology*

2022–2023 **Visiting Scholar**, *Stanford University*

2019–2022 **Assistant Professor (research-track)**, *West Virginia University*

2018–2019 **Postdoctoral Fellow**, *University of Michigan Ann Arbor*

Education

2015–2018 **Ph.D**, *University of North Carolina at Charlotte*
Specialized in machine learning and control theory

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

Honors and Awards

2023 AAAI-23 New Faculty Highlights

2022 National Science Foundation EPSCoR Fellowship

2018 Ford Motor Company Postdoctoral Fellowship

2018 SigOpt Inc. Graduate Research Fellowship

Research Funding

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

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

Publications

Journal Publications

[J10] P. Razzaghi, A. Tabrizian, W. Guo, S. Chen, A. Taye, E. Thompson, A. Bregeon, **Ali Baheri**, P. Wei, A survey on reinforcement learning in aviation applications. *Engineering Applications of Artificial Intelligence*, Vol. 135, 2024.

[J9] L. Yifru, **Ali Baheri**, Concurrent Learning of Control Policy and Unknown Safety Specifications in Reinforcement Learning. *IEEE Open Journal of Control Systems*, Vol. 3, pp. 266-281, 2024.

[J8] **Ali Baheri**, Exploring the role of simulator fidelity in the safety validation of learning-enabled autonomous systems. *AI Magazine*, Vol. 44, pp. 453-459, 2023.

[J7] **Ali Baheri**, Safety validation of learning-based autonomous systems: a multi-fidelity approach. *Proceedings of the AAAI Conference on Artificial Intelligence*, Vol. 37, Issue 13, pp. 15432-15432, 2023.

[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.

Journal Publication (Under Review)

[UR3] Z. Shahrooei, M. Kochenderfer, and **Ali Baheri**, Optimizing Falsification for Learning-Based Control Systems: A Multi-Fidelity Bayesian Approach. 2024 (under revision)

[UR2] J. Yancosek, **Ali Baheri**, BEACON: A Bayesian Evolutionary Approach for Counterexample Generation of Control Systems. 2024 (under revision)

[UR1] K. Hayes, M. Fouts, **Ali Baheri**, D. Mebane, Forward variable selection enables fast and accurate dynamic system identification with Karhunen-Loève decomposed Gaussian processes. 2024 (under revision)

Conference and Workshop Publications

[C20] Z. Shahrooei, **Ali Baheri**, Optimal Transport-Assisted Risk-Sensitive Q-Learning. *Towards Safe Autonomy: Emerging Requirements, Definitions, and Methods* workshop, RSS 2024.

[C19] **Ali Baheri**, C. Alm, LLMs-Augmented Contextual Bandit. *Optimal Transport and Machine Learning* workshop, NeurIPS 2023.

[C18] **Ali Baheri**, Understanding Reward Ambiguity Through Optimal Transport Theory in Inverse Reinforcement Learning. *Optimal Transport and Machine Learning* workshop, NeurIPS 2023.

[C17] **Ali Baheri**, Risk-Aware Reinforcement Learning Through Optimal Transport Theory. *3rd RL-CONFORM* workshop, IROS 2023.

[C16] **Ali Baheri**, Policy Refinement with Human Feedback for Safe Reinforcement Learning. *RL Workshop Series Bridging the Gap Between AI Planning and Reinforcement Learning*, ICAPS 2023

[C15] L. Yifru, **Ali Baheri**, Joint Learning of Policy with Unknown Temporal Constraints for Safe Reinforcement Learning. *PRL Workshop Series Bridging the Gap Between AI Planning and Reinforcement Learning*, ICAPS 2023.

[C14] Z. Shahrooei, M. Kochenderfer, and **Ali Baheri**, Falsification of Learning-Based Controllers through Multi-Fidelity Bayesian Optimization. *In European Control Conference*, Bucharest, Romania, 2023.

[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. 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.

[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. 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 Neural Information Processing Systems*, Vancouver, Canada, 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 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*, Sapporo, Japan, 2014.

Non-Peer-Reviewed Publications

[NPP3] **Ali Baheri**, M. Kochenderfer, The Synergy Between Optimal Transport Theory and Multi-Agent Reinforcement Learning, 2024. *https://arxiv.org/abs/2401.10949*

[NPP2] **Ali Baheri**, M.Kochenderfer, Joint Falsification and Fidelity Settings Optimization for Validation of Safety-Critical Systems: A Theoretical Analysis, 2023. *https://arxiv.org/abs/2305.06111*

[NPP1] 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, 2022. *https://arxiv.org/abs/2203.12416*

Invited Talk and Presentations

Mar 2024 Evolving AI Decision-Making: From Safe Reinforcement Learning to Intelligent Systems with Language Models, RIT Center for Human-aware AI (CHAI) Seminar

Feb 2023 On the Role of Fidelity in the Safety Evaluation of Learning-Based Autonomous Systems, RIT Graduate Seminar

Feb 2023 On the Role of Fidelity in the Safety Evaluation of Learning-Based Autonomous Systems, AAAI-23 New Faculty Highlights Program

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 Evolving Environments 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

[T4] Developed new graduate level course entitled **Understanding Reinforcement Learning**, Fall 2024

[T3] MECE: **System Dynamics** (RIT), Spring 2024 (class size: 19, SEI: 4.4/5.0)

[T2] Developed and taught new graduate level course entitled **Reinforcement Learning and Control** (WVU), Spring 2021 (class size: 18, SEI: 4.6/5.0)

[T1] MAE 460: **Automatic Control** (WVU), Summer 2021, 2022 (class size: 45, SEI: 4.7/5.0)

Professional Services

Panel National Science Foundation: DCSD, 2021, 2023, 2024 (twice)

Panel National Science Foundation: CPS 2022

Panel National Science Foundation: SLES 2023 (twice)

Panel National Science Foundation: FMitF 2024

Program Committee "Foundation Models for Decision Making workshop at NeurIPS" 2023, 2024

Co-organize "Machine Learning for Autonomous Driving (ML4AD) workshop at NeurIPS" 2021, 2022

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

Sustainable Energy Technologies and Assessments

IEEE Aerospace and Electronic Systems

Journal of Aerospace Information Systems

IEEE Robotics and Automation Letters

Energies

IEEE Transactions on Vehicular Technology

International Conference on Intelligent Robots and Systems (IROS)

Conference on Decision and Control (CDC)

American Control Conference (ACC)

European Control Conference (ECC)

ASME Dynamic Systems and Control Conference

IEEE International Conference on Intelligent Transportation Systems

Advising Experience

2024-present Chirayu Salgarkar, Ph.D. Student

2023-present Zahra Shahrooei, Ph.D. Student

2021-2024 Lunet Yifru, M.S. Student

2021-2024 Joshua Yancosek, M.S. Student

2023-2024 Aniket Narendra Patil, M.S. Student (Co-advised with Prof. Cecilia Alm)
2023-2024 Kaustubh Gaikwad, M.S. Student (Co-advised with Prof. Cecilia Alm)

Ph.D. Thesis Committe Member

2023 Rogerio Rodrigues Lima, West Virginia University
2022 Robert Tempke, West Virginia University
2021 Jared Strader, West Virginia University

Memberships

2023-present IEEE Member
2024-present ASME Member