Erfan Aasi

14 Buswell Street, Boston
Massachusetts, USA 02215
✉ eaasi@bu.edu
⅄ linkedin.com/in/erfan-aasi
Github: erfanaasi
h-index: 5, Citations: 112
Last update: 9 November, 2023

Education

2018–2023 **PhD**, *Mechanical Engineering, Boston University, Boston, USA*,
Hybrid and Networked Systems (HyNeSs) Group, Advisor: Calin Belta.
GPA: *3.87/4.00*

2018–2022 **Master of Science**, *Mechanical Engineering, Boston University, Boston, USA*.
GPA: *3.87/4.00*

2013–2018 **Bachelor of Science**, *Electrical Engineering, Sharif University of Technology, Tehran, Iran*,
Robotics and Machine Vision Laboratory, Advisor: Mehran Jahed.
GPA: *3.60/4.00*

Research Interests

- Motion planning and control for dynamic systems
- Decision making and interpretability
- Runtime monitoring and verification
- Automated synthesis and inference from data
- Time-series analysis and prediction
- Applications of machine learning for dynamic systems

Research Experience

Sept. 2022– **Machine Learning Intern**, *Symbotic*,
Apr. 2023 Wilmington, MA, USA, Advisor: Dan Burns,
Developing anomaly detection methods using machine learning techniques, for the time-series behavior analysis of warehouse robots.

2018–2023 **Research Assistant**, *Hybrid and Networked Systems (HyNeSs) Group, BU Robotics Lab*,
Boston University, Boston, USA, Advisor: Calin Belta.

2016–2018 **Research Assistant**, *Robotic and Machine Vision Laboratory*,
Sharif University of Technology, Tehran, Iran, Advisor: Mehran Jahed.

Summer **Robotics Intern**, *Research Center for Biomedical Technologies and Robotics (RCBTR)*,
2016 Tehran University of Medical Sciences, Tehran, Iran, Advisor: Reza Mirbagheri.

Projects

Spring 2019 – **Control Architecture for Provably-Correct Autonomous Driving**.
Fall 2020
- Proposed a model predictive control method for autonomous vehicles in a deterministic environments, constrained to traffic rules as temporal logic specifications.
- Achieved substantial improvements in the sense of runtime performance over existing approaches.

Fall 2020 – **Classification of Time-Series Data using Boosted Decision Trees**.
Fall 2021
- Developed a decision-tree based approach for data classification using temporal logic specifications.
- Aimed to improve runtime performance and misclassification rate over existing approaches.

Fall 2021 – **Time-Incremental Learning from Data Using Temporal Logics**.
Fall 2022
- Temporal logic-based classification method for time-series data in an incremental learning framework.
- Used decision trees and neural networks to minimize the misclassification rate over time.

Fall 2021 – Spring 2022	**Overcoming Exploration: Deep Reinforcement Learning for Continuous Control in Cluttered Environments From Temporal Logic Specifications**.
	○ Proposed a deep policy gradient algorithm for controlling a robot with unknown dynamics in a cluttered environment, where the robot's task is specified using temporal logic formulas.
	○ Designed a path planning-guided reward scheme, using sampling based methods, to overcome the environmental challenge of exploration.
Fall 2021 – Spring 2023	**Two-Level Control Algorithm for Autonomous Driving in Urban Environments**.
	○ Developed a control method for self-driving cars in uncertain environments, while avoiding collision with other vehicles and satisfying traffic rules.
	○ Achieved noticeable improvements in real-world urban scenarios, compared to existing works.
Fall 2020 – Fall 2021	**Learning Spatio-Temporal Specifications for Dynamical Systems**, *Collaboration*.
	○ Developed a spatio-temporal logic based algorithm for generating desired patterns in dynamical systems.
	○ Maximized occurrence of desired patterns, using clustering, supervised learning and optimization methods.
Spring 2020 – Fall 2020	**Robust Planning and Control Algorithm in Polygonal Environments**, *Collaboration*.
	○ Developed a robust navigation method in polygonal environments, based on linear programming methods.
	○ Provided stability and safety guarantees by enforcing Control Barrier Function (CBF) constraints to optimization.
Spring 2022	**EfficientNetV2: Smaller Models and Faster Training**, *Course Project*.
	○ Investigate the features of the image classification method "EfficientNetV2", and its advantages over literature works
	○ Used the pre-trained model on ImageNet dataset, fine-tuned it on CIFAR datasets, and compared its performance with "EfficientNet" and "Vision Transformers"
Spring 2020	**Learning Policies for Markov Decision Processes: a Survey**, *Course Project*.
	○ Explored practical algorithms for learning policies for Markov decision processes from data.
	○ Designed a case study, based on stochastic shortest path problem, and implemented dynamical programming, reinforcement learning (SARSA), and apprenticeship learning algorithms for solving problem.

Publications

○ E. Aasi, C. I. Vasile, M. Bahreinian, and C. Belta, "Classification of Time-Series Data Using Boosted Decision Trees," 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pp. 1263-1268. IEEE, 2022, doi:10.1109/IROS47612.2022.9982105.

○ E. Aasi, M. Cai, C. I. Vasile, and C. Belta, "Time-incremental learning from data using temporal logics," 2023 Learning for Dynamics and Control conference (L4DC), 2023, pp. 547-559, PMLR 211:547-559, 2023.

○ E. Aasi, C. I. Vasile, and C. Belta, "A Control Architecture for Provably-Correct Autonomous Driving," 2021 American Control Conference (ACC), 2021, pp. 2913-2918, doi:10.23919/ACC50511.2021.9482810.

○ M. Cai, E. Aasi, C. Belta, and C. I. Vasile, "Overcoming Exploration: Deep Reinforcement Learning for Continuous Control in Cluttered Environments From Temporal Logic Specifications", IEEE Robotics and Automation Letters 8, no. 4 (2023): 2158-2165, doi:10.1109/LRA.2023.3246844.

○ S. Alsalehi, E. Aasi, R. Weiss, and C. Belta, "Learning Spatio-Temporal Specifications for Dynamical Systems," 2022 Learning for Dynamics and Control conference (L4DC) , 2022, pp. 968-980, PMLR 168:968-980.

○ M. Bahreinian, E. Aasi and R. Tron, "Robust Path Planning and Control For Polygonal Environments via Linear Programming," 2021 American Control Conference (ACC), 2021, pp. 5035-5042, doi: 10.23919/ACC50511.2021.9483196.

Community Service

Membership	IEEE member
Service	**Program Committee**
	○ International Symposium on Distributed Autonomous Robotics Systems (DARS 2022)
Reviewer	*16 papers, Verified on Web of Science*

- IEEE International Conference on Robotics and Automation (ICRA 2023)
- IEEE International Conference on Intelligent Robots and Systems (IROS 2023)
- IEEE Robotics and Automation Letters (RA-L 2021, 2022, 2023)
- American Control Conference (ACC 2021, 2023)
- International Symposium on Distributed Autonomous Robotic Systems (DARS 2022)
- Engineering Applications of Artificial Intelligence (EAAI 2022)
- IEEE Transactions on Control System Technology (TCST 2021)
- IEEE Transactions on Automatic Control (TAC 2020)
- IEEE Conference on Decision and Control (CDC 2020)

Skills

Languages	Python, C++, ROS, SQL
Libraries	PyTorch, Pandas
Simulators	CARLA, AirSim, Gazebo, CoppeliaSim
Utilities	Anaconda, Git, Jupyter Notebook, Azure Microsoft, Tableau, Snowflake

Relevant Courses

Classroom	Deep Learning; Learning From Data; Introduction to Data Structures with Python; Stochastic Processes; Optimization Theory; Robot Motion Planning; Dynamic Systems Theory; Vision, Robotics and Planning; Nonlinear Systems and Control; Hybrid Systems; Signals and Systems; Biosensors; Principles of Biomedical Engineering; Applied Electronics in Bioengineering
Online	Introduction to Machine Learning; Introduction to Self-Driving Cars; Motion Planning for Self-Driving Cars; Fundamentals of Reinforcement Learning

Teaching Experience

2020-2021	**Instrumentation Lab**, *Teaching Assistant, Boston University*.
Fall 2017	**Artificial Intelligence and Biological Computations**, *Teaching Assistant, Sharif University of Technology*.
Fall 2017	**Biosensors**, *Teaching Assistant, Sharif University of Technology*.
Fall 2017	**Logic Circuits and Digital Systems**, *Teaching Assistant, Sharif University of Technology*.
Spring 2017	**Modeling and Control of Neuromuscular Systems**, *Teaching Assistant, Sharif University of Technology*.
Spring 2017	**Computer and Microprocessor Architecture**, *Teaching Assistant, Sharif University of Technology*.

Languages

- English: Fluent
- Persian: Native
- Turkish: Fluent

References

Calin Belta

- Professor of Mechanical Engineering, Electrical and Computer Engineering, and Systems Engineering
- Boston University, Boston, MA, USA
- cbelta@bu.edu

Cristian Ioan Vasile

- Assistant Professor of Mechanical Engineering and Mechanics
- Lehigh University, Bethlehem, PA, USA
- crv519@lehigh.edu

Roberto Tron

- Professor of Mechanical Engineering, and Systems Engineering
- Boston University, Boston, MA, USA
- tron@bu.edu

- Professor of Mechanical Engineering, and Systems Engineering
- Boston University, Boston, MA, USA
- tron@bu.edu