

# Ali BaniAsad

## Curriculum Vitae

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## PROFESSIONAL SUMMARY

Aerospace Engineering graduate student with 4+ years of research experience in reinforcement learning, robotics, and embedded systems. Published 5 papers in control systems and AI applications. Proven expertise in developing robust multi-agent RL algorithms, embedded machine learning for resource-constrained hardware, and real-time control systems using ROS, PyTorch, and TensorFlow. Strong background in differential game theory, optimal control, and system identification with hands-on experience in hardware-in-the-loop testing.

## TECHNICAL SKILLS

**Programming Languages:** C, C++, Embedded C, Python, MATLAB

**Machine Learning Frameworks:** PyTorch, TensorFlow, Keras, JAX, Scikit-learn, OpenAI Gym

**Robotics & Simulation:** ROS, ROS 2, Gazebo, MuJoCo, Simulink

**Data Analysis:** NumPy, Pandas, Matplotlib, Seaborn, Plotly, OpenCV

**Development Tools:** Git, Linux, LaTeX, Terminal

**AI/ML Specializations:** Reinforcement Learning, Deep Learning, Multi-Agent Systems, Embedded Machine Learning, Neural Networks, Computer Vision, Optimization, Game Theory

**Control Systems:** Optimal Control, Automatic Control, Robust Control, MPC, System Identification

**Languages:** English (TOEFL iBT 96), Farsi (Native)

## EDUCATION

### Master of Science in Aerospace Engineering

Sep 2022 – Sep 2025

Sharif University of Technology, Tehran, Iran

Thesis: Embedded RL Control for Robots

Advisors: Hadi Nobahari, PhD

### Bachelor of Science in Aerospace Engineering

Sep 2017 – May 2022

Sharif University of Technology, Tehran, Iran

Thesis: Game Theory-Based Control for 3-DoF Platform (Best Undergraduate Thesis Award)

## RESEARCH EXPERIENCE

### Robotic Engineer

Oct 2025 – Present

Fasta Robotics, Tehran, Iran

Autonomous Mobile Robot Development

- Developed AI-powered systems for autonomous mobile robots (AMRs) in warehouse and industrial environments
- Implemented embedded ML algorithms for real-time obstacle detection, path planning, and collision avoidance
- Designed fleet management algorithms for coordinating multiple AMRs, optimizing task allocation and traffic flow
- Integrated computer vision and sensor fusion (LiDAR, cameras, IMU) for robust localization and mapping
- Collaborated on ROS 2-based architecture for seamless communication between robot hardware and control systems

### **Graduate Research Assistant**

Aug 2022 – Apr 2025

Sharif University of Technology, Tehran, Iran

Master's Thesis: Embedded RL Control for Robots

Supervisor: Hadi Nobahari, PhD

- Developed zero-sum disturbance-augmented reinforcement learning training framework achieving stable policies under 10x worst-case perturbations for robotic control systems
- Built 15,000+ lines of code RL control stack implementing DDPG, TD3, SAC, and PPO algorithms in PyTorch and TensorFlow with OpenAI Gym integration for embedded robot platforms
- Optimized neural network models through quantization techniques to reduce memory footprint by 75% for deployment on CPU-constrained embedded hardware
- Validated algorithm robustness on 4 Gymnasium locomotion benchmarks (Ant, Humanoid, HalfCheetah, Walker2d) demonstrating 30% improvement in disturbance rejection compared to baseline methods
- Implemented C++ and Python ROS 2 hardware-in-the-loop node for on-board testing and real-time control validation
- Open-sourced complete codebase with LaTeX documentation and Jupyter notebooks enabling one-command reproduction for research community

### **Research Assistant and Lab Head**

May 2020 – Feb 2025

CNAV Lab, Sharif University of Technology, Tehran, Iran

Supervisors: Hadi Nobahari, PhD and Alireza Sharifi, PhD

- Led 5+ research projects on embedded AI in C, reinforcement learning algorithms, and ROS-based robotic control systems as Lab Head
- Designed reinforcement learning algorithms improving robotic navigation accuracy by 40% and enhancing autonomous decision-making capabilities in dynamic environments
- Developed LSTM-MLP neural network architecture for in-motion transfer alignment using IMU and SINS data during GPS outages, published in Engineering Applications of Artificial Intelligence
- Reduced navigation drift to less than 0.1% of Kalman-INS error during 100-second GPS outages in real-world testing scenarios

- Achieved cross-domain generalization across ship, ROV, and car datasets with 25% performance improvement over conventional Kalman filtering methods
- Published 2 journal papers and 2 conference papers on AI-enhanced navigation and robust control systems

**Undergraduate Research Assistant**

Feb 2021 – Sep 2023

Sharif University of Technology, Tehran, Iran

Bachelor's Thesis: Game Theory-Based Control for 3-DoF Platform

Supervisor: Hadi Nobahari, PhD

- Developed robust control system for 3-DoF quadcopter test stand using differential game theory and Nash equilibrium optimization achieving 45% better disturbance rejection than baseline controllers
- Performed system identification and parameter estimation using optimization algorithms to model quadcopter dynamics in Simulink with 95% accuracy
- Implemented real-time controller through MATLAB Simulink-to-C code generation pipeline for embedded hardware deployment on microcontroller
- Benchmarked controller performance against ADRC and DOBC methods demonstrating superior robustness to external disturbances and parameter uncertainties
- Awarded Best Undergraduate Thesis by Iranian Aerospace Society for excellence in control systems research

**Research Project: Multi-Agent Autonomous Systems**

July 2023

Sharif University of Technology, Tehran, Iran

Supervisor: Hadi Nobahari, PhD

- Optimized multi-agent swarm model addressing communication delays and obstacle avoidance for coordinated robot navigation
- Implemented flocking behavior algorithms in Simulink and validated through hardware-in-the-loop testing using embedded C on microcontroller platforms
- Demonstrated system robustness and reliability through real-time performance validation in dynamic environments

**Research Project: Multi-Objective Heuristic Optimization**

Feb 2023

Sharif University of Technology, Tehran, Iran

Supervisor: Hadi Nobahari, PhD

- Implemented REMARK algorithm for multi-objective optimization with conflicting objectives enabling effective trade-off evaluation
- Utilized heuristic optimization methods achieving high-quality approximations of Pareto Set for optimal multi-criteria decision-making

**Research Project: Aircraft Trim Stability Analysis**

Mar 2022

Sharif University of Technology, Tehran, Iran

Supervisor: Afshin Banazadeh, PhD

- Developed advanced GUI software for aircraft stability analysis providing real-time interactive adjustments for performance evaluation
- Created DATCOM-based trim diagram tool streamlining aircraft design process for engineers and researchers

### **AIAA Regional Jet Design Competition**

June 2021

Sharif University of Technology, Tehran, Iran

Supervisor: Afshin Banazadeh, PhD

- Led regional jet design project integrating multidisciplinary analysis for aerodynamic performance and industry compliance
- Applied computer modeling for aerodynamic, structural, and performance analysis of complete aircraft design
- Developed automated design cycle workflow enabling seamless updates across all design stages reducing iteration time by 60%
- Presented comprehensive design report and technical presentation to faculty panel

## **PUBLICATIONS**

### **Journal Papers**

- A. Sharifi, A. BaniAsad, and S. Mozafari, “Applied an in-motion transfer alignment approach during global positioning system outages utilizing a recurrent neural network algorithm,” *Engineering Applications of Artificial Intelligence*, vol. 157, pp. 111167, 2025
- A. BaniAsad, et al., “Attitude Control of a 3-DoF Quadrotor Platform Using a Linear Quadratic Integral Differential Game Approach,” *ISA Transactions*, vol. 148, pp. 515-527, 2024

### **Conference Papers**

- A. BaniAsad and H. Nobahari, “Robust DDPG Reinforcement Learning Differential Game Guidance in Low-Thrust, Multi-Body Dynamical Environments,” Proc. of 23rd International Conference of Iranian Aerospace Society, 2025
- M. Amirpour, A. BaniAsad, and H. Nobahari, “Reinforcement Learning-Based Controller Design for a Suspended Ball Plant,” Proc. of 23rd International Conference of Iranian Aerospace Society, 2025
- H. Nobahari, A. BaniAsad, and A. Sharifi, “Linear Quadratic Integral Differential Game applied to the Real-time Control of a Quadrotor Experimental setup,” Proc. of 2022 10th RSI International Conference on Robotics and Mechatronics, 2022

### **Preprints and Under Review**

- A. BaniAsad, H. Nobahari, “Robustness on Demand: Transformer-Directed Switching in Multi-Agent RL,” in preparation, 2025

- R. Pordal, A. Sharifi, and A. BaniAsad, “Ellipsoidal Set-Theoretic Design of Robust Safety Filters for Constrained Linear Systems,” arXiv: 2510.22790, 2025

## TEACHING EXPERIENCE

**Section Leader** Apr 2025 – June 2025  
 Stanford University Code in Place (CS106A), Online

- Mentored 10 international learners in Python programming fundamentals through weekly section meetings
- Provided code review and debugging support for student projects demonstrating pedagogical expertise

**Teaching Assistant** Sep 2018 – Present  
 Sharif University of Technology, Tehran, Iran

- Automatic Control (2021 – Present) - Instructors: Hadi Nobahari, PhD and Alireza Sharifi, PhD
- Control Lab (2022 – Present) - Instructors: Hadi Nobahari, PhD and Alireza Sharifi, PhD
- Dynamics (Jan 2023 – Dec 2023) - Instructor: Alireza Sharifi, PhD
- Aircraft Design II (Fall 2021) - Instructor: Afshin Banazadeh, PhD
- Fundamentals of Programming in C/C++ (Fall 2018)

**Volunteer Tutor** Sep 2020 – Dec 2021  
 Virgol Charity, Tehran, Iran

- Provided university entrance exam preparation tutoring to underprivileged students in STEM subjects

## AWARDS AND HONORS

- Best Undergraduate Thesis Award, Iranian Aerospace Society 2023
- National Master’s Entrance Exam in Aerospace Engineering, Ranked 23 of 1000+ 2022
- National Bachelor’s Entrance Exam, Top 0.5% of 150,000 participants 2017
- National Organization for Development of Exceptional Talents (NODET) Member 2010 – 2017

## CERTIFICATIONS

- Robotics Specialization (6 courses), University of Pennsylvania, Coursera
- Reinforcement Learning Specialization (4 courses), University of Alberta, Coursera
- IBM AI Engineering Professional Certificate (6 courses), IBM, Coursera

- Fundamentals of Accelerated Computing with CUDA Python, NVIDIA
- Neural Networks and Deep Learning, deeplearning.ai, Coursera
- Introduction to Embedded Machine Learning, Edge Impulse, Coursera
- Game Theory, Stanford University, Coursera
- Python Data Structures, University of Michigan, Coursera

## SELECTED COURSEWORK

**Programming and Computational Methods:** Basic C Programming (20/20), Numerical Calculations (20/20)

**Mathematics and Statistics:** Engineering Mathematics (19.8/20), Probability and Statistics (20/20)

**Control Systems:** Automatic Control (18.1/20), Control Lab (18.5/20), Optimal Control (17.5/20)

**Aerospace Engineering:** Aircraft Design II (18.3/20), Flight Dynamics II (18.3/20)

**Research:** Bachelor Thesis (20/20)