

Mahdi Shahrajabian

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A passionate researcher in control theory and AI, dedicated to developing safe learning-based algorithms for decision-making, planning, fault detection and control in safety-critical autonomous systems

Research Interests

Control Theory, Data-Driven Modeling, Fault Diagnosis, and Control, Safe Learning-Based Decision-Making and Control, Trustworthy AI and Assured Autonomy in Cyber-Physical Systems, Robotics, Software Engineering

Education

Master of Science in Aerospace Engineering (Dynamics and Control) <i>Sharif University of Technology (SUT)</i> CGPA: 19.4/20.0 (4-point scale CGPA: 4.0/4.0)	Tehran, Iran 2022–2025
Bachelor of Science in Aerospace Engineering (Dynamics and Control) <i>Amirkabir University of Technology - Tehran Polytechnic (AUT)</i> CGPA: 18.1/20.0 (4-point scale CGPA: 3.86/4.0 and last six semester GPA: 4.0/4.0)	Tehran, Iran 2017–2022
Bachelor of Science in Electrical Engineering (Control Systems) <i>Amirkabir University of Technology - Tehran Polytechnic (AUT)</i> CGPA: 17.8/20.0 (4-point scale CGPA: 3.64/4.0)	Tehran, Iran 2017–2022

Work & Research Experiences

Graduate Research Assistant <i>Department of Aerospace Engineering, SUT</i> Supervisor: Prof. Fariborz Saghafi	Tehran, Iran Jan 2024 – Jun 2025
Master's Thesis: Fault-Tolerant Adaptive Intelligent Control of an Autonomous Multi-rotor eVTOL Air Taxi <ul style="list-style-type: none">Developed a detailed simulation model for an octodecarotor eVTOL air taxiProposed a safe Composite-Learning-Based Adaptive Neural Control with Disturbance Observer (CANCDO) approach for multirotors using control barrier functions in the presence of uncertainties, disturbances and actuator faultsDeveloped of a dynamic control allocation algorithm to handle motor failures considering actuator saturation and fault estimation error	
Undergraduate Research Assistant <i>Hardware-in-the-Loop Lab, Department of Aerospace Engineering, AUT</i> Supervisor: Dr. Seyed Majid Esmailifar	Tehran, Iran May 2021 – Sep 2022
Bachelor's Thesis: Design and Implementation of Autopilot for Automatic Takeoff and Landing of a Quadrotor using the Model-Based Design Approach <ul style="list-style-type: none">Designed and implemented flight management, waypoint following and control algorithms for the quadrotorImplemented custom automatic flight control algorithms on the Pixhawk using SimulinkPerformed Software-in-the-Loop (SIL) simulation, Hardware-in-the-Loop (HIL) simulation and flight tests for verification of custom-designed autopilot using Simulink and the Pixhawk	
Embedded Software Engineer (Part-time) <i>Avionics Office, ARC Aerosystems Ltd.</i>	Tehran, Iran Oct 2021 – Sep 2022
<ul style="list-style-type: none">Conducted a comprehensive survey of basic standards for the design of aircraft Flight Control Computer (FCC)Setting up embedded systems communication protocols with TI C2000 microcontrollerCreated an intuitive GUI for eVTOL aircraft simulation using MATLAB app designer	
Engineering Intern <i>Avionics Office, ARC Aerosystems Ltd.</i>	Tehran, Iran Jul 2021 – Sep 2021
<ul style="list-style-type: none">Gained expertise in utilizing Pixhawk autopilot and PX4 firmwareAcquired proficiency in working with QGroundControlCompared and evaluated various control methods employed in control system of a lift + cruise eVTOL aircraft.	

Publications

- Shahrajabian, M., Saghafi, F. (2025).** Safe Robust Fault-Tolerant Composite Adaptive Neural Control of Multirotors: Toward Assured Autonomous Urban Air Mobility. *Control Engineering Practice* (in preparation)

2. **Shahrajabian, M.**, Otroushi, H., Emami, S. A. (2025). End-To-End Deep Reinforcement Learning for Minimum-Time Aerial Manipulation in Cluttered Environments (in progress)

Teaching Experiences

Teaching Assistant, Sharif University of Technology

- AE 45-787: Principles of Machine Learning (Undergraduate/Graduate) Spring 2025
- AE 45-765: Optimal Control Theory (Graduate) Fall 2024
- AE 45-113: Dynamics Fall 2024, Fall 2023
- AE 45-135: Automatic Control Spring 2024

Teaching Assistant, Amirkabir University of Technology

- EE 23-84543: Intelligent Control and Fault Diagnosis (Graduate) Spring 2025
- EE 23-56113: Modern Control Fall 2024, Fall 2023, Fall 2022
- AE 29-05343: Automatic Control Spring 2023

Instructor, Amirkabir University of Technology

- EE 23-02241: Linear Control Systems Lab Spring 2024
- **Advanced MATLAB and Simulink** Summer 2024
- **Introduction to MATLAB for Engineers** Spring 2024

Honors & Awards

- Ranked 1st among all 64 peer master's students in the Aerospace Engineering Department at SUT (Sep 2024)
- Winner of the Academic Excellence Fellowship from Iran's National Elite Foundation (Jan 2023)
- Received a merit-based direct admission offer for the Master of Aerospace Engineering at SUT (Feb 2022)
- Ranked 3rd among all 71 bachelor's students in the Aerospace Engineering Department at AUT (Nov 2020)
- Recognized as an outstanding student (exceptional talent) and granted the opportunity to pursue Electrical Engineering as a second major during my BSc at AUT (Sep 2019)
- Ranked within the top 1.3% among more than 148000 participants in the 2017 Iranian University Entrance Exam issued by the National Organization for Educational Testing (Aug 2017)

Selected Academic Projects

Nonlinear Control

Jan 2024 – Jun 2024

Nonlinear Fault-tolerant control of a quadrotor using an OS-ELM-based actuator LoE fault estimator

Supervisor: **Dr. Seyyed Ali Emami**

Intelligent Control

Jan 2023 – Jun 2023

Robust fault-tolerant trajectory tracking of a quadrotor based on learning-based adaptive model predictive control

Supervisor: **Dr. Seyyed Ali Emami**

Optimal Control Theory

Jan 2023 – Jun 2023

Optimal attitude control of a tri-axial air-bearing satellite simulator platform

Supervisor: **Prof. Seid H. Pourtakdoust**

Digital Control Systems

Jan 2022 – Jun 2022

- Implementation of discrete-time PID controller on Raspberry Pi for motion control of a wheeled mobile robot
- Control system design for a two-robot soccer game in Webots

Supervisor: **Prof. Heidar Ali Talebi**

Instrumentation

Mar 2021 – Jun 2021

Smart Home Lighting: Energy-efficient brightness adjustment based on ambient light and movement detection

Supervisor: **Dr. Iman Sharifi**

Computational Intelligence

Nov 2020 – Dec 2020

- Fuzzy Logic Control of a three-link gymnastic robot (Teamwork-Leader)
- Adaptive cruise control of an autonomous vehicle based on self-tuning fuzzy PID control
- System identification of robotic manipulator using neural networks

Supervisor: **Prof. Farzaneh Abdollahi**

Languages

- **Persian:** Mother Tongue
- **English:** Fluent (The TOEFL test will be taken on October 4th, 2025)

Skills

- **Programming:** MATLAB (Script, Simulink, Stateflow), Python (Numpy, TensorFlow, Keras, Gym), C, C++
- **Engineering Softwares:** Solidworks, Ansys Fluent, XFLR5, AVL, OpenVSP, QGroundControl, PX4 firmware, CIPHER, Keil uVision, STM32 CubeMX, Code Composer Studio, Proteus, Arduino
- **General:** Windows, Ubuntu, Microsoft Office Collection, Git, L^AT_EX

Voluntary Experience

Contributing Author

Aug 2023 – Dec 2023

Book: Emami, S. A., Castaldi, P., Narimani, M., Ezabadi, M., *Neural Network-based Control Systems with Application to Flight Control: From Classical Neural Control to Reinforcement Learning*. (in preparation)

Responsibilities: Designing multiple examples, writing the solutions, conducting the corresponding simulations, analyzing the results, and drawing conclusions

Notable Courses

▪ Related Courses in M.Sc.

- ◇ Advanced Automatic Control (1st rank)
- ◇ Nonlinear Control (1st rank)
- ◇ Optimal Control 1 (1st rank)
- ◇ Optimal Control 2 (1st rank)
- ◇ Intelligent Control (3rd rank)
- ◇ Deep Reinforcement Learning (1st rank)
- ◇ Advanced Mathematics
- ◇ System Identification (1st rank)
- ◇ Advanced Flight Dynamics and Control (1st rank)
- ◇ Modeling of Aerospace Dynamic Systems
- ◇ Flight Simulation (1st rank)

▪ Related Courses in B.Sc.

- ◇ Linear Control Systems + Lab (1st rank)
- ◇ Applied Linear Algebra (1st rank)
- ◇ Computational Intelligence + Lab (2nd rank)
- ◇ Digital Control Systems + Lab
- ◇ Modern Control (2nd rank)
- ◇ Industrial Control + Lab
- ◇ Mechatronics
- ◇ Avionics + Workshop
- ◇ Flight Dynamics + Lab (1st rank)
- ◇ Aircraft Design (1st rank)
- ◇ Satellite Systems (1st rank)
- ◇ Computational Fluid Dynamics (1st rank)

▪ Coursera

- ◇ Machine Learning Specialization (Certificate)
- ◇ Robotics Specialization (Audited)

▪ Others

- ◇ Artificial Intelligence and Deep Learning (Certificate)
- ◇ ETHZ Computational Control (Course page)

References

Fariborz Saghafi

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Sharif University of Technology
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Seyed Majid Esmailifar

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