Mahdi Shahrajabian

+98 (913) 730 9687 m.shahrajabian99@gmail.com Mahdi-Shahrajabian
shahrajabian.github.io

A passionate advanced control researcher dedicated to developing computationally efficient optimal control methods for partially or fully unknown nonlinear systems using safe learning-based control approaches

Research Interests

- Automatic Control
- Model Predictive Control
- Safe Learning-Based Control
- Data-Driven Modeling and Control
- Assured Autonomous Systems and Robotics

Education

Master of Science in Aerospace Engineering (Dynamics and Control) — **Tehran, Iran**
Sharif University of Technology (SUT) — *2022–Present*
CGPA: 19.4/20.0 (4-point scale CGPA: 4.0/4.0)

Bachelor of Science in Aerospace Engineering (Dynamics and Control) — **Tehran, Iran**
Amirkabir University of Technology - Tehran Polytechnic (AUT) — *2017–2022*
CGPA: 18.1/20.0 (4-point scale CGPA: 3.86/4.0 and last six semester GPA: 4.0/4.0)

Bachelor of Science in Electrical Engineering (Control Systems) — **Tehran, Iran**
Amirkabir University of Technology - Tehran Polytechnic (AUT) — *2017–2022*
CGPA: 17.8/20.0 (4-point scale CGPA: 3.64/4.0)

Work & Research Experiences

Graduate Research Assistant — **Tehran, Iran**
Department of Aerospace Engineering, SUT — *Jan 2024 – Present*
Supervisor: Prof. Fariborz Saghafi

Master's Thesis: Fault-Tolerant Adaptive Intelligent Control of an Autonomous Multi-rotor eVTOL Air Taxi

- Modeling and simulation of an octodecarotor eVTOL air taxi
- Barrier Lyapunov function-based adaptive neural control system design for trajectory tracking of an autonomous octodecarotor air taxi in the presence of uncertainties, disturbances and actuator faults
- Development of a dynamic control allocation algorithm for the new configuration to handle motor failures considering actuator saturation and fault estimation error

Undergraduate Research Assistant — **Tehran, Iran**
Hardware-in-the-Loop Lab, Department of Aerospace Engineering, AUT — *May 2021 – Sep 2022*
Supervisor: Dr. Seyed Majid Esmailifar

Bachelor's Thesis: Design and Implementation of Autopilot for Automatic Takeoff and Landing of a Quadrotor using the Model-Based Design Approach

- Modeling of quadrotor dynamics, Brushless DC motors and wind effects
- Designed and implemented flight management, waypoint following and control algorithms for the quadrotor
- Implemented custom automatic flight control algorithms on the Pixhawk using Simulink
- Performed 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) — **Tehran, Iran**
Avionics Office, ARC Aerosystems Ltd. — *Oct 2021 – Sep 2022*

Contributed as a junior Embedded Software Engineer in an air taxi development co.

- Conducted a comprehensive survey of basic standards for the design, development, and manufacturing of aircraft Flight Control Computer (FCC)
- Participated in flight control software design and development for a lift + cruise eVTOL aircraft according to DO-178C and Model-Based Design (MBD) approach (DO-331)
- Implemented C code on the FCC hardware with TI C2000 microcontroller
- Setting up embedded systems communication protocols
- Created an intuitive GUI for eVTOL aircraft simulation using MATLAB app designer

Engineering Intern **Tehran, Iran**
Avionics Office, ARC Aerosystems Ltd. *Jul 2021 – Sep 2021*

- Gained expertise in utilizing Pixhawk autopilot and PX4 firmware
- Acquired proficiency in working with QGroundControl
- Conducted an in-depth study and analysis of quadrotor control methods and algorithms
- Compared and evaluated various control methods employed in control system of a lift + cruise eVTOL aircraft.

Publications

1. **Shahrajabian, M.**, Saghafi, F. (2025). Safe learning-based control of an autonomous multirotor eVTOL air taxi in the presence of uncertainties and actuator faults (in progress)
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

Graduate Teaching Assistant **Tehran, Iran**
Intelligent Control & Fault Diagnosis, Department of Electrical Engineering, AUT *Spring 2025*

Graduate Teaching Assistant **Tehran, Iran**
Principles of Machine Learning, Department of Aerospace Engineering, SUT *Spring 2025*

Graduate Teaching Assistant **Tehran, Iran**
Optimal Control Theory, Department of Aerospace Engineering, SUT *Fall 2024*

Head Teaching Assistant **Tehran, Iran**
Modern Control, Department of Electrical Engineering, AUT *Fall 2024, Fall 2023, Fall 2022*

Graduate Teaching Assistant **Tehran, Iran**
Dynamics, Department of Aerospace Engineering, SUT *Fall 2024, Fall 2023*

Instructor **Tehran, Iran**
Advanced MATLAB and Simulink, Scientific Association of Mechanical Engineering, AUT *Summer 2024*

Instructor **Tehran, Iran**
Introduction to MATLAB, Scientific Association of Mechanical Engineering, AUT *Spring 2024*

Lab Instructor **Tehran, Iran**
Linear Control Systems Lab, Department of Electrical Engineering, AUT *Spring 2024*

Graduate Teaching Assistant **Tehran, Iran**
Automatic Control, Department of Aerospace Engineering, SUT *Spring 2024*

Graduate Teaching Assistant **Tehran, Iran**
Automatic Control, Department of Aerospace Engineering, AUT *Spring 2023*

Instructor **Tehran, Iran**
Calculus and Differential Equations Exam Preparation Courses (offered 8 times), Scientific Association of Aerospace Engineering, AUT *Oct 2018 – May 2022*

Honors & Awards

- Ranked 1st among all 64 peer master's students in the Aerospace Engineering Department at SUT (Sep 2024)
- Winner of the Shahid Vezvaei Award 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

System Identification Jan 2024 – Jun 2024
Frequency response analysis for equivalent linear state-space model identification of a jet airliner
Supervisor: Prof. Afshin Banazadeh

Nonlinear Control Jan 2024 – Jun 2024
Nonlinear Fault-tolerant control of a quadrotor subject to disturbances using an OS-ELM-based actuator loss of effectiveness fault estimator
Supervisor: Dr. Seyyed Ali Emami

Intelligent Control Jan 2023 – Jun 2023
Resilient trajectory tracking of a quadrotor based on adaptive neural 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

Advanced Automatic Control Sep 2022 – Jan 2023
Paper Regeneration: Feedback Linearization with Zero Dynamics Stabilization for Quadrotor Control
Supervisor: Prof. Afshin Banazadeh

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

Aircraft Design Mar 2021 – Jun 2021
Conceptual design of the 116-seat regional jet aircraft (Teamwork-Leader)
Supervisor: Dr. Mohammad Ali Vaziri Zanjani

Flight Dynamics and Control Mar 2021 – Jun 2021
6DOF flight simulation of the Boeing 757-200 using XFLR5, AVL and Simulink
Supervisor: Dr. Hamed Mohammadkarimi

Instrumentation Mar 2021 – Jun 2021
Efficient Smart Home Lighting: Energy-efficient brightness adjustment based on ambient light and movement detection (Teamwork-Leader)
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

Exam: TOEFL test will be taken as soon as possible.

Skills

- **Programming:** MATLAB (Script, Simulink, Stateflow, Simscape), Python (NumPy, TensorFlow, Keras, PyTorch, Gym, Control, CasADi), C, C++, familiar with VHDL
- **Engineering Softwares:** Solidworks, Ansys Fluent, XFLR5, AVL, OpenVSP, QGroundControl, PX4 firmware, Gazebo, CIFER, Keil uVision, STM32 CubeMX, Code Composer Studio, Proteus, Arduino
- **General:** Windows, Ubuntu, Microsoft Office Collection, Git, LaTeX

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)
  - ◇ ETH Zürich Computational Control (Course page)

References

Fariborz Saghafi
Associate Professor
Department of Aerospace Engineering
Sharif University of Technology
Tehran, Iran
Email: saghafi@sharif.edu

Seid Hossein Pourtakdoust
Professor
Department of Aerospace Engineering
Sharif University of Technology
Tehran, Iran
Email: pourtak@sharif.edu

Seyed Majid Esmailifar
Assistant Professor
Department of Aerospace Engineering
Amirkabir University of Technology
Tehran, Iran
Email: esmailifar@aut.ac.ir

Seyyed Ali Emami
Assistant Professor
Department of Aerospace Engineering
Sharif University of Technology
Tehran, Iran
Email: emami@sharif.edu

Hajar Atrianfar
Assistant Professor
Department of Electrical Engineering
Amirkabir University of Technology
Tehran, Iran
Email: atrianfar@aut.ac.ir

Farzaneh Abdollahi
Associate Professor
Department of Electrical Engineering
Amirkabir University of Technology
Tehran, Iran
Email: f_abdollahi@aut.ac.ir