MUHAMMAD RAFEY TAHIR

L'Aquila, Italy +33-761826626 rafeyt21@gmail.com RafeyTahir

EDUCATION

Erasmus Mundus Joint Master Degree on E-PiCo+
Università degli Studi dell'Aquila, Italy. *Feb 2026 - Present*
Master in Control Systems and Automation Engineering (2^{nd} Semester)
École Centrale de Nantes, France. *Sep 2025 - Jan 2026*
Masters in Control & Robotics (1^{st} Semester)

National University of Sciences & Technology, Islamabad (PK). *Aug 2021 - Jan 2024*
Master in Electrical Engineering (Control Systems) **GPA: 3.70**
Core Courses: *Power Electronics, Optimal Control, Convex Optimization, Nonlinear Control Systems & Adaptive Control.*

Muhammad Nawaz Sharif University of Engineering & Technology, Multan (PK). *Oct 2017 - July 2021*
Bachelor of Science in Electrical Engineering, ***GPA: 3.61*** (4^{th} *Position*)
• Award-winning Final Year Project.
• Ranked in the top 10% of Engineering Science students.
• Registered Engineer **PEC : ELECT/94875**
Core Courses: *Linear Control Systems, Digital Logic Design, Microprocessor Systems, Integrated Electronics, Digital Signal Processing.*

WORK & RESEARCH EXPERIENCE

Research Officer -**Al-Khawarizmi Institute of Computer Science (KICS)** *Dec 2024 - Aug 2025*
• Development of 6+ DOF robot manipulator (Dexter 6 Pro), focusing on design, control, and integration for automation tasks.
• Implementation of EtherCAT communication protocols for high-DOF robotic manipulators, enabling seamless operation in industrial automation systems.
• Design and implementation of forward & inverse kinematics and algorithms for trajectory optimization, path planning to enhance manipulator's precision and efficiency in dynamic environments.

Product Excellence Officer -**SkyElectric Pvt. Ltd** *March 2024 - Dec 2024*
• Worked with the Software/Cloud team to develop an AI-based monitoring system for optimizing the performance and stability of solar inverters and battery energy storage systems. Analyzed electrical parameters such as voltage, current, frequency, and harmonics to improve energy conversion efficiency and system reliability.
• Conducted performance evaluations of inverter systems under varying load and grid conditions, gaining hands-on experience in power quality analysis, fault detection, and stability assessment.

Research Assistant -Control Systems Laboratory -SEECS, NUST *Sep 2022 - Feb 2024*
Advisor: Dr. Usman Ali
• Implementated of Model-free Robust Adaptive controller on Quanser QNET Rotary Inverted Pendulum Board 2.0 hardware setup.
• Performance validation on Quanser QNET Vertical Take-off and Landing system 2.0 hardware setup.
• Conducted research on controller design and optimization techniques for underactuated mechanical systems.
• Designed and implementated of a novel model-free control framework for underactuated systems
• Circuit Design Automation using Reinforcement Learning.
• Collaborated with a research team to refine the approach and develop solutions to research problems.
• Assembling of a 6 Degree-of-Freedom Robot Manipulator from the Ground Up.

TEACHING EXPERIENCE

National University of Sciences & Technology *Islamabad, PK*
• Teaching Assistant, MATH-816: Applied Linear Algebra *Fall 2023*
Muhammad Nawaz Sharif University of Engineering & Technology *Multan, PK*
• Teaching Assistant, CSC-341: Introduction to Computing *Fall 2019*
• Teaching Assistant, EEE-562: Linear Control Systems *Fall 2020*

PUBLICATIONS

M. R. Tahir, M. A. Murtaza, R. Hayat, S. Hutchinson and U. Ali, "A Hierarchical Model-Free Controller for Stable Limit Cycle Generation in Underactuated Mechanical Systems ," in *American Control Conference* (**ACC**) (*accepted*), 2026.

SCHOLARSHIPS & AWARDS

- Erasmus Mundus Scholarship for Joint Master Degree on electric vehicle propulsion and control.
- Honored with a laptop by the Prime Minister of Pakistan for sustaining a high GPA in Masters.
- Dean's Honour Roll - Fall 2019, Spring 2020, Fall 2020 & 2021
- HEC Merit based Scholarship
- Awarded Scholarship AMERICA from PepsiCo Foundation in B.Sc. Electrical Engineering.
- Best Final Year Project of Batch EE-2017.

PROJECTS **LINKS TO FULL REPORTS EMBEDDED*

Model-Free Intelligent Control Design For Underactuated Mechanical Systems *-Master's Thesis*

In recent years, there has been growing interest in the development of controller design and algorithms for underactuated systems. Underactuated systems are those in which the number of actuators is less than the number of degrees of freedom. This makes them more challenging to control, but they are also more common in practice. Model-free control techniques are attractive because they does not require any information about system's dynamics. In my research, I have developed a new control framework using model-free robust adaptive controller for underactuated systems.

Intelligent SOC–SOH Estimation for Li-ion Batteries *-E-PiCo+ Project*

Designed and implemented LSTM models for SOC and SOH estimation with optimized computational efficiency for embedded BMS. Automated hyperparameter tuning via Optuna and conducted comparative analysis against FCN and CNN architectures to validate real-time performance.

Smart Bionic Prosthetic Leg (Best Final Year Project Award) *-Bachelor's Thesis*

My Final Year Project is a Smart Prosthetic Leg which mainly focuses on patients of an above-the- knee amputee. In this project, we have designed a smart and safe embedded system that controls the leg using different modes for different activities. Due to the low cost of our design, this prosthetic technology could be applied in public sector hospitals to serve the less fortunate.

TECHNICAL SKILLS

Professional:	Communication Skills, Problem Solving, Data Management, Leadership
Programming:	Julia, Python, C/C++, Assembly Language, Ladder Logic Language(PLC), LaTeX
Software & Tools:	MATLAB/Simulink, Git, ROS, Proteous, Multisim, LabVIEW, Microwind, Simcenter Amesim

LANGUAGES

- **E**nglish
- **F**rench
- **U**rdu

REFERENCES

Dr. Usman Ali
Assistant Professor
School of Electrical Engineering and Computer Sciences
National University of Sciences & Technology
Email: usman.ali@seecs.edu.pk

Muhammad Ali Murtaza, Ph.D.
Electrical and Computer Engineering Department
Georgia Institute of Technology, Atlanta, USA
Email: mamurtaza@gatech.edu

Dr. Rameez Hayat
Assistant Professor
School of Electrical Engineering and Computer Sciences
National University of Sciences & Technology
Email: rameez.hayat@seecs.edu.pk