

# Muhammad Muneeb ur Rehman

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## 1 Summary

To advance innovation in robotics and multi-body dynamic systems by leveraging digital twins and reinforcement learning to enhance robotic behavior and performance. My objective is to bridge the gap between simulation and real-world deployment through Sim2Real transfer, enabling intelligent and adaptive robotic systems. I aim to contribute to cutting-edge research and development in robotics, artificial intelligence, and control systems, with applications in autonomous systems, UAV platforms, industrial automation, and human-robot interaction.

## 2 Experience

**Research Assistant**, Swarm Robotics Lab, National Center of Robotics and Automation, UET Taxila  
**03/2025 – Present**

- Working on the cutting edge of Indigenous Robot Kits Development.
- Developing State-of-the-Art Remote Robotics Learning Lab.
- Working with Development of Software Stack for Mobile Robots for Mapping and Navigation.
- Working with Sim2Real for Hardware and Software Validation.
- Developed a digital twin of an indigenously designed miniature robot and simulated it in a multi-physics simulation engine integrated with ROS.

**Senior Robotics Engineer**, BrainSwarm Robotics, Islamabad

**01/2026 – Present**

- Leading the development of cutting-edge Miniature Robot Kits and UAV platforms.
- Developed a Flight Dynamics Model (FDM) for a quadcopter UAV in Gazebo simulation, enabling high-fidelity multi-rotor flight behavior modeling.
- Achieved synchronized flight between a virtual twin and real quadcopter hardware, validating Sim2Real transfer for UAV control systems.

**Robotics Engineer**, BrainSwarm Robotics, Islamabad

**08/2023 – 12/2025**

- Developed a State-of-the-Art Remote Robotics Learning Lab.
- Designed and developed low-cost, plug-and-play, IoT-connected miniature robot kits.
- Deployed real robot hardware into Gazebo simulation for algorithm validation and testing using ROS before deployment on real hardware.
- Developed a digital twin of an indigenously designed miniature robot and simulated it in a multi-physics simulation engine integrated with ROS.

### 3 Education

**University of Engineering and Technology, Taxila**, Master's in Computer Engineering   **2023 – Present**

**CGPA:** 3.30 / 4.00

**Research Domain:** Context-Aware Task Allocation for Multi Agent Heterogeneous Robots with LLM and Vision Grounding

**Institute of Space Technology**, Bachelor's in Mechanical Engineering   **2018 – 2022**

**CGPA:** 2.81 / 4.00

**Final Year Design Project:** Vision-Based Real-Time Pick and Place Robotic Arm with Object Localization and Detection

- Developed a complete framework for a vision-based pick-and-place robotic arm.
- Utilized simulation for high-fidelity visual data collection.
- Sim2Real transfer for object detection pipeline.
- High-accuracy system design with error detection and preemption.

### 4 Volunteer Experience

**Oxford University Press - Student Volunteer**

**March 2014 – April 2014**

- Youngest student to represent my school at the first-ever Islamabad Literature Festival.
- Amongst only two students to be nominated from my school for the Islamabad Literature Festival held in 2014.
- Worked closely with other community members and volunteers in organizing and managing the events.
- Developed engagement activities for assisting guests and delegates from various countries.

**Shaukat Khanum Memorial Trust - Community Volunteer**

- Organized and actively participated in a Blood Donation Camp.
- Mobilized blood donors for the blood donation camp.
- Held awareness sessions for fundraising activities.

### 5 Certifications and Licenses

- **September 2022** - Code Foundation of ROS (The Construct Sim - Robot Ignite Academy)
- **September 2022** - ROS for Beginners: Basics, Motion and OpenCV (Udemy)
- **May 2021** - Google Cloud Skills Boost (Google Cloud Platform)

### 6 Hobbies & Interests

**Hobbies:** Coding, Swimming, Playing Football, Reading Books, Watching Movies and TV Series. **Interests:** Developing new skills, Learning new frameworks, Programming, Blogging.

## 7 Key Distinctions

- Communication Skills
- Interpersonal Skills
- Problem Solving
- Critical Thinking
- Teamwork
- Leadership

## 8 Key Accomplishments

- State-of-the-art algorithm for use with any off-the-shelf robotic arm with little or no change in code base.
- Achieved high level of autonomy by developing an algorithm to work in dynamic and unstructured environments.
- Fully distributed and modular system with all components separated according to their function.
- Developed and validated a Flight Dynamics Model (FDM) for a quadcopter, achieving synchronized flight between virtual twin and real hardware.

## 9 Technical Proficiency

- CAD Modeling: SOLIDWORKS / CREO Parametric
- Framework: ROS / ROS 2, MoveIt, OpenAI Gym
- Simulation: Gazebo / Ignition, Multi-Physics Simulation, Digital Twin Development, UAV Flight Dynamics Modeling
- UAV Systems: Quadcopter FDM, Multi-Rotor UAV Design, Sim2Real for UAV Control, Synchronized Virtual-Real Flight
- Machine Learning: Reinforcement Learning, Computer Vision
- Programming: Python, C++, MATLAB
- Hardware: ESP32, STM32, AVR ATMEGA, OpenCR, RaspberryPi, ARM Cortex, Flight Controllers