

# MUHAMMAD FARHAN AHMED

## Robotics Researcher/Embedded Systems Engineer

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MFA    Muhammad Farhan Ahmed    MF-Ahmed

### WORK EXPERIENCE

Laboratoire des Sciences du Numérique de Nantes (LS2N)  
École Centrale de Nantes, France

#### Postdoctoral Researcher

March 2025 – Present    Nantes, France

- PerCoMa project (ANR), Collaborative Perception Using Drone Fleets for Marine Environment Monitoring

#### Ph.D Candidate/Researcher

November 2021 – December 2024    Nantes, France

- Multi-robot active autonomous navigation and mapping (Active SLAM) for efficient environment exploration and mapping (list of publications refer to page 2)

SmartPCBs, Islamabad, Pakistan

#### Principal Engineer (Plant Automation Group)

December 2019 – July 2021    Islamabad, Pakistan

- Team leader.** Supervised and guided a team of 2 automation engineers and 4 technicians. Mentored team members, providing training and support to enhance their technical and professional skills
- Implemented** of QMS and 5S (ISO-9001) to enhance efficiency and safety, conducting audits and training
- Managed** project planning, timelines, and resource allocation, ensuring milestone completion

#### Senior Engineer (Embedded control system design)

December 2012 – November 2019    Islamabad, Pakistan

- Designed and developed** PIC32-based embedded systems for process control, monitoring pneumatic valves, temperature/pressure sensors
- Developed** control system testing strategies for interlock verification, ensuring alignment with control philosophy
- Diagnosed and resolved** control system issues, minimizing downtime and ensuring compliance with industry standards
- Designed and developed** an inverter-based power distribution system for HVAC, CNC, and welding machines
- Implemented** a 30-channel remote monitoring system for HVAC chiller and pump status logging
- Designed and implemented** a remote diesel-level monitoring system for four 1000L fuel storage tanks

#### Assistant Engineer (Maintenance)

July 2007 – November 2012    Islamabad, Pakistan

- Develop and implement** preventive maintenance schedules of plant process control systems and conduct regular inspections
- Ensure** all maintenance activities comply with safety standards and regulations. Conduct safety inspections and risk assessments
- Maintain** records of all maintenance activities, including inspections, repairs, and replacements. Keep technical documentation, such as equipment manuals and maintenance procedures, up to date
- Identify** opportunities for improving maintenance processes and implement best practices to enhance efficiency.

### TECHNICAL EXPERIENCE

### EDUCATION

École Centrale de Nantes, LS2N, France

#### Ph.D. in Robotics

Nov 2021 – Dec 2024    Nantes, France

Thesis title: Collaborative active SLAM and distributive navigation strategies for high precision relative localization in heterogeneous fleets of ground and aerial vehicles.

École Centrale de Nantes, France

#### Masters in Advance Robotics - ROBA

Sept 2014 – Aug 2015    Nantes, France

EMARO (European Master on Advanced Robotics)  
University Of Genoa, Italy

#### Masters in Robotics Engineering

Sept 2013 – July 2014    Genoa, Italy

EMARO (European Master on Advanced Robotics)

Mehran University, Pakistan

#### B.E (Electronics Engineering)

Sept 2002 – July 2006    Karachi, Pakistan

### SKILLS

- Programming**  
Python    C++    Embedded C/C++/Assembly  
PyQT5    ROS1/2    MatLab/Octave    Ubuntu
- Robotics**  
Mobile Robots    Computer Vision    SLAM  
Mapping    Path Planning    Navigation
- Embedded Systems**  
PIC32    PIC24    Atmega2560    I<sup>2</sup>C    SPI  
USART    ADC    DAC    Timers    Interrupts  
Driver Programming    MPLABX    AVR Studio
- Electronics Engineering**  
Instrumentation    Sensor interfacing  
Motor control    Maintenance

### SUPERVISION & TEACHING

Undergraduate Project Supervision

#### Comparative study of ORBSLAM2 and CCM SLAM

March-April 2024    ECN, LS2N, Nantes, France

- A comprehensive comparative study was performed between ORBSALM2 and CCM SLAM, two popular single and multi-agent visual SLAM methods

- **Instrumentation, monitoring, control and status** logging of temperature and pressure sensors, pneumatic valves, chiller status, pumps and servo/stepper motors with reference to plant control philosophy
- Programming in C/C++, Python, and Assembly on MikroC and Keil IDEs using compilers from Microchip C16/C18/C30/C32, CCS C, and WinAVR
- GUI, software simulators and MIMIC deign for data acquisition, logging and reporting for industrial process automation systems

## PEER REVIEWED PUBLICATIONS

### Journal Articles

- **M. F. Ahmed**, M. Maragliano, V. Frémont, and C. T. Recchiuto, "Efficient multi-robot active slam," *Journal of Intelligent & Robotic Systems*, vol. 111, no. 2, 2025. DOI: 10.1007/s10846-025-02275-8.
- **M. F. Ahmed**, K. Masood, V. Fremont, and I. Fantoni, "Active slam: A review on last decade," *Sensors*, vol. 23, no. 19, 2023, ISSN: 1424-8220. DOI: 10.3390/s23198097.

### Conference Proceedings

- **M. F. Ahmed**, V. Frémont, and I. Fantoni, "Active collaborative visual slam exploiting orb features," in *2024 18th International Conference on Control, Automation, Robotics and Vision (ICARCV)*, 2024, pp. 966–971. DOI: 10.1109/ICARCV63323.2024.10821699.
- **M. F. Ahmed**, M. Maragliano, V. Frémont, C. T. Recchiuto, and A. Sgorbissa, "Efficient frontier management for collaborative active slam," in *2024 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI)*, 2024, pp. 1–7. DOI: 10.1109/MFI62651.2024.10705778.
- **M. F. Ahmed**, V. Frémont, and I. Fantoni, "Active slam utility function exploiting path entropy," in *2023 IEEE International Conference on Service Operations and Logistics, and Informatics (SOLI)*, **Best student paper award**, 2023, pp. 1–7. DOI: 10.1109/SOLI60636.2023.10425063.

## COURSES AND WORKSHOPS

- Basic Management Course at PIEAS, Islamabad, Pakistan 2017
- Attended "innorobo" robots workshop at Lyon, France 2015
- Course on "FPGA based Chip Designing Using Verilog HDL" 2012 from Skill Development Council Islamabad, Pakistan
- Workshop "Engineers as Managers" 2009 at CASE Islamabad, Pakistan
- Workshop "FPGA Chip Design" 2008 at NUST Rawalpindi, Pakistan
- Course on "Microcontroller (MCS-51 Family)" 2005. Karachi, Pakistan

## OTHER ACTIVITIES

### Invited Presentations

#### "Entropy-Based Multirobot Active SLAM"

October, 2023 Moliets dans les Landes, France

Journées Nationales de la Recherche en Robotique

#### Collaborative Active SLAM

April, 2023 Vannes, France

SIS doctoral school seminar

#### "Active SLAM and MPC and DRL formulation"

February, 2023 Nantes, France

ARMEN Team seminar

#### "Visual Odometry And Its Application to SLAM"

November, 2022 Nantes, France

Student seminar presentation

- Organiser monthly student seminar of Ph.D students from November 2022 to September 2023

### Master M2 Thesis co-supervision

#### Synchronous and Asynchronous Coordination in Collaborative Active SLAM

April-July 2023 ECN, LS2N, Nantes, France

- Two navigation strategies along-with efficient frontier sharing strategies are proposed which enhance active exploration and mapping by a team of ground robots.

### Master M1 Project supervision

#### Deep learning-based Distributed UAV Target Detection over Multi-sensor Network

March-May 2022 ECN, LS2N, Nantes, France

- UAV target detection based on CenterNet (CNN) and sensor fusion using weighted average consensus

### Master M2 Lab teaching

#### Implementation of ICP on nuScenes dataset for AUVe subject

Nov 2022 ECN, Nantes, France

- Application of ICP algorithm for localization and Occupancy Grid Mapping on real driving data from NuScenes dataset

## LANGUAGES

English (Professional)

French (B1)



## THINGS I ENJOY

- Hiking, cycling and travelling

## REFEREES

To respect privacy of references, the contact details will be provided upon request.

**Vincent FRÉMONT**

Full Professor, École Centrale de Nantes, NU

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