Usama Jahangir

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PROFILE

Mechatronics Engineer with ∼2 years of industry experience, specializing in embedded firmware and algorithm design. Led the development of 2 AI-powered robots and contributed to a Level 2 ADAS, 2 IoT products, and 5 embedded Android applications.

RESEARCH INTERESTS

Robotics and Autonomous Systems, Sensor Fusion, Embedded Systems, Human-Robot Interaction, Edge Computing

EDUCATION

National University of Sciences and Technology — Islamabad, Pakistan
BEng. Mechatronics Engineering (CGPA: 3.66, Rector's Gold Medal) — Graduation Date: Jun 2023

Extra Coursework: Machine Learning, Control Systems, Robotics, Artificial Neural Network & Advance Embedded Systems
Senior Year Research Project: Assistive Feeding System, Vision-Guided Feeding Robot (Conference Publication ICRAI'24)

WORK EXPERIENCE

Software Motion — Suzhou, China (Remote)
Algorithm Engineer — Dec 2024 - Present

- Contributing to object and ego-motion modules of Level 2 ADAS by fusing camera and radar data for ACC, AEB, and LCC.
- Designed algorithms for lane line fusion (Kalman Filters) and tracking (Track-to-Track Association) for LAC & LDW using C.

Cowlar Design Studio (Y-Combinator Backed) — Islamabad, Pakistan
Team Lead, Industrial Automation — Sep 2024 - Oct 2024

- Led a team of 5 to automate optical fiber assembly processes using AI-powered robots, resulting in a 4x throughput increase
- Directed client communication, weekly meetings, and task delegation to deliver mission-critical support for production robots
- Contributed to component integration, control logic, and data flow utilizing Python, Docker, and Rockchip's RK3588

Embedded Design Engineer — Jun 2023 - Aug 2024

- Led prototype development of a fiber insertion robot with 250-micron precision in 15 days, leading to a successful demo
- Collaborated with a cross-functional team of over 50, contributing to five Android applications using Kotlin and C
- Developed the "Sensor App" from scratch, integrating IMU, cameras, and barcode scanners, deployed in smart carts
- Automated deployments with Docker and Shell-based GitLab runners, improving pipeline efficiency by up to 60%
- Created automation scripts for testing and maintenance using Python and Shell scripting, streamlining operational efficiency

Qadri Group — Lahore, Pakistan
Leaders for Manufacturing Intern — Jul 2022 - Sep 2022

- Conducted ergonomic analysis & tested fixture designs to improve labor output for three parts, increasing throughput by 33%
- Collaborated with a team of 3 and presented feasibility reports and solutions, driving informed decision-making

National Centre of Robotics and Automation — Rawalpindi, Pakistan
Biomedical Research & Development Intern — Jul 2021 - Aug 2021

- Restored a 3D-printed, parallel manipulator-based "Upper Limb Prosthesis," enhancing control for people with amputations
- Programmed linear actuators in C, enabling multi-grasp capabilities to support dexterity and usability for prosthesis users

PUBLICATIONS

Usama Jahangir, Fahad Aamir, Wajid Ali, Mohsin Tiwana, Hamid Jabbar. (2024). "Assistive Feeding System: Design and Evaluation" Proceedings of the 6th IEEE International Conference on Robotics and Automation in Industry

TECHNICAL SKILLS

Software Development: Python, C, C++, Kotlin, Shell Scripting, Android SDK, Docker, GitLab CI/CD, Git, REST APIs
Embedded Systems: Protocols (CAN, I2C, UART, SMBus, MQTT), ESP32, FreeRTOS, SoC (BCM2711, RK3588, SG865W)

Robotics & AI: ROS2, Sensor Fusion (LKF, EKF), Computer Vision (OpenCV, YOLO), Sensor Integration

Simulation & Prototyping: Proteus, SOLIDWORKS, ANSYS, 3D Printing (FDM), MATLAB/Simulink

PROJECTS

Fiber Termination Line: Led the development of an AI-powered 5-stage optical fiber assembly robot, leveraging Python & OrangePi to reduce processing time by 80% (from 60 to 12 minutes). Deployed 1 unit on the production floor.

Fiber Sorting Robot: Contributed to sensor integration and control system design for automated fiber sorting using Python & OrangePi, achieving 30x faster operation (from 240 to 8 seconds). Five robots deployed to assist in production.

Assistive Feeding System: Led a team of 3 to develop a vision-guided 6 DoF serial robotic manipulator to assist in feeding tasks by using hybrid methods for 3D localization and kinematic modelling. Successfully fed rice to 3 test users.

Indigenous Harvesting Robot: Led a team of 6 to design and develop a mobile robot to harvest fruits with line and wall following features using C and ATMega328P, competed at national-level in NERC'22 to the quarterfinals.

Wearable Exo-Glove: Developed a TPU-based tendon-driven exo-glove as an assistive device for stroke patients using FDM.

Serial USB Driver: Developed a driver in C using JNI to map tty device paths, enabling USB detection for custom devices.

SMBus: Implemented SMBus over I2C on ESP32 using C and FreeRTOS, debugged a protocol error using a logic analyzer within the official BQ40Z50 manual. Enabled data acquisition from smart cart batteries.

Chess 1.0: Created a CLI-based game with graphics using C++, enhancing user engagement through interactive gameplay.

AWARDS & ACHIEVEMENTS

Houston Award (Cowlar, 2024)**:** Awarded for exceptional leadership and contributions in the Industrial Automation sector.

National Grassroots ICT Research Grant (IGNITE, 2024)**:** Received grant of PKR 54,618 for "Assistive Feeding System."

News Coverage (2024)**:** Presented "Assistive Feeding System" on 5 National television interviews, including ARY News etc.

Rector's Gold Medal (NUST, 2023)**:** Received for the best capstone project in the Dept. of Mechatronics Engineering, NUST.

1st Prize (COMMPEC, 2023)**:** Winner in the electromechanical system category in this national-level competition.

Distinguished Student Award (NUST, 2022, 2023)**:** For securing an SGPA above 3.5 for four or more consecutive semesters.

VOLUNTEER EXPERIENCE

Robotics and Automation Club — Rawalpindi, Pakistan
Mentor & Advisor — Sep 2021 - Jun 2023

- Mentored over 50 cross-department students through 3D printing and a series of programming workshops for robotics beginners.
- Led a team of 3 mentor to structure the learning material for workshop series on programming, 3D printing and electronics.

REFERENCES

Dr. Umar Shahbaz Khan
Professor, National University of Sciences and Technology, u.shahbaz@ceme.nust.edu.pk, +92-300-5533775

Dr. Hamid Jabbar
Associate Professor, National University of Sciences and Technology, hamid.jabbar@ceme.nust.edu.pk, +92-300-5274026

Mr. Hamza Naeem
Co-Founder & SVP Robotics and Automation, Cowlar Design Studio, hamza@cowlar.com, +1-617-238-4508