

Reehab Ahmad

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EDUCATION

Riphah International University, Islamabad, Pakistan.

July 2025

Bachelor of Science in Biomedical Engineering

- Cumulative GPA: 3.82/4.00
- Relevant Coursework: Biomedical Signal Processing, Neuroscience, Signals and Systems, Digital Signal Processing, Biomechanics, Control Systems, Rehabilitation Engineering, Image Processing, Artificial Intelligence

WORK EXPERIENCE

Ruten Inc., Neural Engineer Intern

August 2026 – Present

- Developing the real-time neural decoder for a closed-loop brain-computer interface device for dysphagia.
- Work spans signal acquisition, decoding pipeline development, and integration of sensing hardware with real-time software.

Research Assistant, Neuromusculoskeletal Rehabilitation Research Group, University of Sharjah

January 2026 – Present

Supervisors: Dr. Ibrahim M. Moustafa, Dr. Alham Al-Sharman, Dr. Meeyoung Kim

- Data analyst across four studies on the neural and biomechanical consequences of postural malalignment.
- Corticomuscular and intramuscular coherence during balance tasks of graded difficulty in forward head posture and control groups; manuscript under review at IEEE J-TEHM.
- EEG functional connectivity analysis comparing forward head posture and control groups during unstable balance tasks; manuscript under review.
- EEG and balance data analysis for a cross-sectional study linking forward head posture to executive function and cortical activity.
- Cortical excitability, balance, and gait comparison in university students with and without forward head posture.
- Methods: EEG acquisition and preprocessing (Nexus), surface EMG, coherence analysis, functional connectivity, time-frequency analysis, balance and posturography measures.

Research Assistant, Department of Biomedical Engineering, Riphah Int. University

March 2023 – June 2025

Focus: biomedical signal processing, balance analysis, BCI, Modeling & Simulation

- Designed and built a real-time motor imagery BCI for robotic hand control (see Research Projects).
- Developed algorithms for real-time stress detection from physiological signals.

Research Intern, Biomedical Team, National Centre for Robotics and Automation (NCRA), NUST

July – August 2024

- Hands-on work with EEG-based BCIs, Arduino, 3D printing, and 3D scanning.

Project Manager, Tehqeeq Lab & Revive Medical Technologies, Islamabad

January – March 2025

- Led cross-functional teams on healthcare technology projects, overseeing hardware prototyping and data analysis.

PROJECT EXPERIENCE

Real-Time Motor Imagery BCI for Robotic Hand Control

August 2024 – June 2025

Final Year Project | Riphah International University

- Built an end-to-end real-time BCI decoding motor imagery from three EEG channels to control a robotic hand, deployed on a Raspberry Pi for low-latency command execution.
- Designed the stimulus protocol in PsychoPy and refined it across multiple pilot rounds, varying cue timing, trial structure, and task instructions to obtain discriminable motor imagery responses.
- Built a custom real-time streaming and processing pipeline using Lab Streaming Layer (LSL).
- Collected an EEG dataset of approximately 30+ participants.
- Implemented the full pipeline: bandpass filtering, artifact removal, Common Spatial Patterns feature extraction, and Linear Discriminant Analysis classification.
- Identified cross-session and cross-subject transfer, rather than offline accuracy, as the limiting factor on real-time performance.

Smart Occlusal Splint for Bruxism Detection

August 2024

Lead Research Project | Riphah International University

- Designed a wearable intraoral device to detect bruxism episodes from bite force, addressing a behaviour associated with psychological stress that conventional splints protect against but do not detect.
- Integrated a BHF350-3AA piezoelectric sensor into a custom occlusal splint and interfaced it with an STM32 microcontroller for analog signal acquisition.

- Sensor characterisation complete; ongoing work covers noise filtering, real-time episode detection, and a feedback mechanism.

Medication-Related Changes in Functional Connectivity in Parkinson's Disease

May 2024

Lead Research Project | Riphah International University

- Analysed resting-state fMRI data to evaluate medication-related connectivity changes.
- Preprocessing and analysis in SPM and CONN Toolbox (MATLAB); ROI-to-ROI and seed-to-voxel approaches.

3D Colour Medical Image Encryption

February 2025

Collaborative Research Project | Published at ICIMTH 2025

- Implemented a 3D hyperchaotic map for permutation and diffusion followed by DWT, achieving UACI 36.17% and NPCR 99.57% with a large key space.

PUBLICATIONS AND MANUSCRIPTS

Peer-Reviewed

Abbasi SF, Ahmad R, Mukherjee T, Ding X, Bai L, Pournik O, Arvanitis TN. A Novel and Secure 3D Colour Medical Image Encryption Technique Using 3D Hyperchaotic Map, S-box and Discrete Wavelet Transform. Studies in Health Technology and Informatics. 2025;328:268–272. doi:10.3233/SHTI250717. Presented at ICIMTH 2025.

Under Review

Neural Cost of Postural Malalignment: Corticomuscular Coherence Reveals Increased Cortical Engagement During Challenging Balance Tasks. IEEE Journal of Translational Engineering in Health and Medicine.

Acknowledged Contributor

Cognitive Performance and Dynamic Spinopelvic Kinematics Across Walking Speeds in Healthy Young Adults. Scientific Reports.

TECHNICAL SKILLS

- Programming: Python, MATLAB, C, C++, Git
- Neural and physiological signal analysis: EEG and EMG acquisition and preprocessing, corticomuscular and intramuscular coherence, functional connectivity, time-frequency analysis, Common Spatial Patterns, artifact removal, motor imagery decoding, real-time decoding pipelines
- Neuroimaging: resting-state fMRI preprocessing (SPM, CONN Toolbox), ROI-to-ROI and seed-to-voxel connectivity, network analysis
- Machine learning: LDA, feature engineering and selection, classification for physiological signals
- Hardware and embedded systems: Raspberry Pi, STM32, Arduino, biomedical instrumentation, real-time closed-loop integration
- Experimental tools: PsychoPy, Nexus (Mind Media)
- Design and simulation: SolidWorks, Simulink, COMSOL

AWARDS & SCHOLARSHIPS

Riphah Talent Scholarship recipient since admission

2021 - 2025

Best Student Branch-IEEE Islamabad Section

2024

LEADERSHIP ACTIVITIES

Qalam Society: Taught children in slum areas of Islamabad

2021 - 2022

Qalb Blood Donation Society: Worked with their marketing team to help find donors.

2021 - 2022

IEEE – Chairperson/ President, Riphah Int. University Student Branch

REFERENCES

Available upon request

- Dr. Alham Jehad Ali Al-Sharman, Associate Professor, College of Health Sciences, University of Sharjah
aal-sharman@sharjah.ac.ae
- Dr. Faraz Akram, HOD Biomedical Engineering, Riphah International University
faraz.akram@riphah.edu.pk
- Dr. Saadullah Farooq Abbasi, Research Fellow, University of Birmingham
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