Muhammad Bilal

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CONTACT INFORMATION	Melbourne, Australia	*Phone:* +61 498 996 037
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RESEARCH INTERESTS
Robotics, Learning from Demonstration, Human-Robot Interaction

EDUCATION
The University of Melbourne, Melbourne, Australia

Ph.D. Computing & Information Systems · Apr 2023 – Mar 2026

- Research Topic: *Towards Interactive Robot Learning for Complex Sequential Tasks*
- Supervisors: A/Prof Wafa Johal; A/Prof Nir Lipovetzky; Prof Denny Oetomo
- **Thesis under review**

University of Engineering & Technology (UET), Lahore, Pakistan

M.Sc. Mechatronics Engineering · Sep 2018 – Oct 2020

- Research Topic: *Implementation of Adaptive Variable Impedance Control for Dynamic Force Tracking on Redundant Manipulator*
- *CGPA:* **3.80/4.00**

B.Sc. Mechatronics & Control Engineering · Sep 2014 – Aug 2018

- Research Topic: *Design and Control of 6 DoF Robotic Manipulator*
- **With Honors in Engineering**
- *CGPA:* **3.703/4.00**

CONFERENCE PUBLICATIONS

[1] **Muhammad Bilal**, Tharaka Ratnayake, D. Antony, Nir Lipovetzky, Denny Oetomo, and Wafa Johal. "*Design and Evaluation of AR-Based Real-Time Feedback System for Kinesthetic Robot Teaching.*" **ACM Designing Interactive Systems (DIS)**, 2026. [**Under Review**]

[2] **Muhammad Bilal**, Nir Lipovetzky, Denny Oetomo, and Wafa Johal. "*Quality-Aware Robot Learning from Failed and Suboptimal Demonstrations via Optimization.*" **IEEE Robotics and Automation Letters (RA-L)**, 2026. [**Manuscript in Preparation**]

[3] **Muhammad Bilal**, D. Antony Chacon, Nir Lipovetzky, Denny Oetomo, and Wafa Johal. "*Investigating the Impact of Robot Degree of Redundancy on Learning from Demonstration.*" **ACM/IEEE International Conference on Human-Robot Interaction (HRI)**, 2026. [**In Press**]. doi:10.1145/3757279.3785606

[4] Jiahe Pan, Sarah Schömbs, Yan Zhang, Ramtin Tabatabaei, **Muhammad Bilal**, and Wafa Johal. "*OfficeMate: Pilot Evaluation of an Office Assistant Robot.*" **ACM/IEEE International Conference on Human-Robot Interaction (HRI)**, pp. 1529–1533, 2025. doi:10.1109/HRI61500.2025.10974132

[5] Chen, Jiahao, D. Antony Chacon, **Muhammad Bilal**, Qiushi Zhou, and Wafa Johal. "*Mr. LfD: A Mixed Reality Interface for Robot Learning from Demonstration.*" **Proceedings of the 36th Australasian Conference on Human-Computer Interaction (OzCHI)**, pp. 275–285, 2024. doi:10.1145/3726986.3727004

[6] **Muhammad Bilal**, Nir Lipovetzky, Denny Oetomo, and Wafa Johal. "*Beyond Success: Quantifying Demonstration Quality in Learning from Demonstration.*" **IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)**, pp. 5120–5127, 2024. doi:10.1109/IROS58592.2024.10802187

[7] Syed Ali Huzaifa, Abdurrehman Akhtar, Meeran Ali Khan, and **Muhammad Bilal**. "*Detection of Parkinson's Tremor in Real Time Using Accelerometers.*" **IEEE 7th International Conference on Smart Instrumentation, Measurement and Applications (ICSIMA)**, pp. 5–9, 2021. doi:10.1109/ICSIMA50015.2021.9526327

[8] **Muhammad Bilal**, Mohsin Rizwan, Ali Raza, and Muhammad Ali. "*Implementation of Impedance Control Schemes for Position and Force Tracking on Redundant Manipulator.*" **International Conference on Mechanical Engineering (ICME)**, pp. 497–505, 2020.

[9] **Muhammad Bilal**, Ali Raza, Mohsin Rizwan et al. "*Towards Rehabilitation of Mughal Era Historical Places Using 7-DOF Robotic Manipulator.*" **International Conference on Robotics and Automation in Industry (ICRAI)**, pp. 1–6, 2019. doi:10.1109/ICRAI47710.2019.8967360

JOURNAL PUBLICATIONS

[10] **Muhammad Bilal**, Mohsin Rizwan et al. "*Design Optimization of Powered Ankle Prosthesis to Reduce Peak Power Requirement.*" **Science Progress**, vol. 105, no. 3, pp. 1–16, 2022. doi:10.1177/00368504221117895   **IF = 2.774**

[11] **Muhammad Bilal**, M. Nadeem Akram, Mohsin Rizwan. "*Adaptive Variable Impedance Control for Multi-Axis Force Tracking in Uncertain Environment Stiffness with Redundancy Exploitation.*" **Journal of Control Engineering and Applied Informatics**, vol. 24, no. 2, pp. 35–45, 2022.   **IF = 1.299**

[12] **Muhammad Bilal**, M. Nadeem Akram. "*Indigenously Designed Development and Motion Control of Multi-DoF Robotic Manipulator.*" **International Research Journal of Engineering and Technology**, vol. 9, no. 1, pp. 1–9, 2022.

TUTORING

[The University of Melbourne](#), Melbourne, Australia

Master Course: AI Planning for Autonomy COMP90054
Since Semester 2, 2023 – Ongoing

- Search algorithms and heuristic functions, Classical (AI) planning, Markov Decision Processes, Reinforcement learning, Game theory, Ethics in AI planning

Master Course: Designing Novel Interactions INFO90003
Semester 1 (2024); Semester 1 (2025)

- Development of novel interaction technologies, design and implementation of interactive systems, prototyping and evaluation of user interaction models

PROFESSIONAL EXPERIENCE [>4 YEARS]

[Human-Centered Robotics Lab](#), [National Center of Robotics & Automation](#), UET Lahore, Pakistan

Team Lead   **Oct 2021 – Feb 2023** (40-hr/week)

- Exercised the team's abilities to achieve the three major lab objectives: design and development of 1) *Collaborative Robot for Safe Human-Robot Interaction*, 2) *Upper Limb Exoskeleton*, and 3) *Lower Limb Prosthesis*

- Performed managerial tasks, including procurement and collaboration with other labs under the National Center of Robotics and Automation, Islamabad, Pakistan

Research Assistant   Mar 2019 – Sep 2021 (40-hr/week)

- Mathematical modelling of robot's *motion planning*, including its *kinematics* and *dynamics*, for industrial applications
- Mathematical modelling and control of *Semi-active Prosthetic Ankle Joint* for below-knee amputees

Department of Mechatronics & Control Engineering, UET Lahore, Pakistan

Graduate Assistant   Oct 2018 – Mar 2019 (20-hr/week)

- Instructed and developed laboratory subjects, including *Robotics* and *Control Systems*
- Supervised term projects related to *soft robotics* and *control systems*
- Prepared and graded quizzes, assignments, and maintained subject files

AWARDS	- Awarded the **Melbourne Teaching Certificate** (2025), University of Melbourne, Australia.

- Awarded the **Melbourne Teaching Certificate** (2025), University of Melbourne, Australia.
- Winner, **Robot Competition**, International Conference on Human–Robot Interaction (HRI 2024), Boulder, Colorado, USA.
- Runner-up, **Robotics Vision Summer School (RVSS) 2024**, Australian National University, Kioloa Coastal Campus, Sydney, Australia.
- Recipient, **Melbourne Research Scholarship**, University of Melbourne, Australia.
- **Best Paper Award**, Mechatronics & Control Engineering Track, International Conference on Mechanical Engineering (ICME 2020), UET Lahore, Pakistan.
- Graduated with **B.Sc. (Honours)** in Mechatronics & Control Engineering, University of Engineering & Technology (UET), Lahore, Pakistan.

TECHNICAL SKILL-SET

- Mathematical modelling of robotic systems, including **kinematics** and **dynamics**.
- Development of **motion planning** algorithms using **ROS–MoveIt** on Linux (Ubuntu).
- Simulation of robotic systems using **MATLAB & Simulink**, **LabVIEW**, and **Gazebo**.
- Statistical analysis using ANOVA and Linear/Cumulative-Link Mixed-Effects Models.
- Development of **Vision Systems** for robotic manipulation using **OpenCV**.
- Numerical computation and data analysis with **NumPy, SciPy, Scikit-learn, MATLAB**, and **Jupyter Notebook**.
- 2D and 3D CAD modelling with **AutoCAD** and **SolidWorks**.
- Circuit design and simulation using **Multisim, Proteus**, and **Eagle**.
- Programming proficiency in **Python, C/C++, MATLAB, R**, and graphical programming (**LabVIEW G**).

PROFESSIONAL MEMBERSHIPS

- SIGCHI Melbourne chapter member (2024 – Present)
- Institute for Electrical and Electronics Engineers (IEEE), Member (2025 – Present)
- IEEE Robotics and Automation Society (2025 – Present)