Moh Shahid Khan

Senior Research Fellow (PhD) | Assistant Professor | Graphic Designer | Deputy Exam Superintendent | Social Media Coordinator
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Career Summary

I am a robotics researcher and engineer with over 7-years of experience designing, developing, and optimizing advanced robotic systems. My expertise lies in the full-cycle development of robotics platforms. My PhD work focused on biped robots, particularly the AZAD-16 (mini humanoid robot) project, demonstrating my proficiency in control systems, dynamic modelling, and gait generation. I am skilled in CAD (SolidWorks, Creo), MATLAB, Python, ROS, and 3D printing, enabling me to create innovative robotics solutions. In addition to my technical skills, I have a proven track record in project management, collaboration, and mentorship within academic and research environments, consistently driving impactful results through interdisciplinary teamwork and strong leadership.

Education

Doctor of Philosophy (Robotics) | Nov. 2024

- Maulana Azad National Institute of Technology (MANIT), Bhopal, India
- Thesis: **Gait Analysis and Design of Adaptive PID Controllers for the Biped Robot While Crossing Complex Terrains.**
- Supervisors: Dr Ravi Kumar Mandava, Dr Vijay Panchore
- Developed and optimized adaptive PID controllers for gait generation in biped robots navigating challenging terrains. Led the complete design, fabrication, and testing of a 16-DOF humanoid robot, AZAD-16.

Master of Technology (Thermal Engineering) | Feb. 2020
TITR, RGPV University, Bhopal, India – 77.10%

Bachelor of Engineering (Mechanical Engineering) | Jun. 2011
SRIST, RGPV University, Bhopal, India – 66.47%

Diploma (Mechanical Engineering) | Aug. 2008
Government Polytechnic College Shahdol, RGPV University, Bhopal, India – 69.30%

Research Experience (4 Years)

Ph.D. Research Scholar (Robotics) | Jan. 2021 – Present
Maulana Azad National Institute of Technology (MANIT), Bhopal, India

- Designed and developed AZAD-16, a 16-DOF mini humanoid (biped) robot with servo motors, using SOLIDWORKS for design and 3D printing for brackets and body parts.
- Designed and implemented a ZMP-based gait planner in MATLAB, ensuring dynamic balance and stability during complex tasks like ditch crossing and obstacle navigation.
- Integrated adaptive PID controllers with neural network-based tuning to optimize gait generation across various terrains.
- Conducted extensive simulations and real-world testing, improving robot control performance in challenging terrains.
- Published multiple papers in high-impact, peer-reviewed journals like the Journal of Field Robotics, and Robotics.

Publications

SCI Journals

- **Khan MS**, Mandava RK. A review on gait generation of the biped robot on various terrains. **Robotica**. 2023;41(6):1888-1930. doi:10.1017/S0263574723000097, CORRIGENDUM." **Robotica** 41, no. 10 (2023): 3233–3233. (SCIE, Q1, I.F.: 2.7)
- **Khan, MS**, & Mandava, R., 2024, *Design of Dynamically Balanced Gait for the Biped Robot While Crossing the Ditch*, **Acta Polytechnica Hungarica**, Vol. 20, No. 7, 2023. http://acta.uni-obuda.hu/Issue136.html (SCIE, Q2, I.F.: 1.7)
- **Khan, MS**, & Mandava, R., 2024, *Design of Dynamically Balanced Gait for the Biped Robot While Crossing the Obstacle*, **Part C- Journal of Mechanical Engineering Science**. https://doi.org/10.1177/09544062241246878 (SCIE, Q2, I.F.: 2.0)
- **Khan, MS**, Mandava, R, & Vijay, P., 2024, *Optimizing PID control for enhanced stability of a 16-DOF biped robot during ditch crossing*. **Journal of Field Robotics**. https://doi.org/10.1002/rob.22425 (SCIE, Q1, I.F.: 4.2) | View Full Text
- **Khan, MS**, Mandava, R., & Vijay, P., 2024, *Design of an optimal PID controller for the 16-DOF Biped Robot While Crossing the Obstacle on Flat Terrain*. **Intelligent Service Robotics** (Communicated), (SCIE, Q1, I.F.: 4.3)
- **Khan, MS**, & Mandava, R., 2024, *Development of an adaptive and optimal PID controller for the 16-DOF Biped Robot While*

Crossing the Ditch on Flat Terrain. **International Journal of Social Robotics** (Communicated), (SCIE, Q1, I.F.: 3.8)

- **Khan, MS**, & Mandava, R., 2024, *Development of an adaptive and optimal PID controller for the 16-DOF Biped Robot While Crossing the Obstacle on Flat Terrain*. (Under Writing).
- Sagar Seth, **Moh Shahid Khan**, Vijay Panchore, Ravi Kumar Mandava, Rajesh Purohit, 2024, *A Hybrid Navigation Algorithm Integrating PID Control and YOLOv8 for Enhanced SLAM Performance in Mecanum*. (Under Writing).

International Conferences

Research Article

- **IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS)** Bhopal, India 19-20 Feb 2022

Tomar, Mukti, **Moh Shahid Khan**, Ravi Kumar Mandava, and D. Giri Babu. *"A Review on Sliding Mode Controller in Real-Time Applications*." In 2022 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS), pp. 1-6. IEEE, 2022. http://dx.doi.org/10.1109/SCEECS54111.2022.9741055 (**Scopus, IEEE Xplore**)

Book Chapter

- **MIND 2022: Machine Learning, Image Processing, Network Security and Data Sciences** Bhopal, India 19-20 Jan 2023

Khan, M.S., Mandava, R.K. (2022). *Estimation of Dynamic Balancing Margin of the 10-DOF Biped Robot by Using Polynomial Trajectories*. In: Khare, N., Tomar, D.S., Ahirwal, M.K., Semwal, V.B., Soni, V. (eds) Machine Learning, Image Processing, Network Security and Data Sciences. MIND 2022. Communications in Computer and Information Science, vol 1762. Springer, Cham. https://doi.org/10.1007/978-3-031-24352-3_7 (**Scopus, Springer Nature**)

Professional Experience (4 Years+)

Assistant Professor, Dept. of Mechanical Engineering |Aug. 2018–Dec. 2020
Sagar Institute of Science and Technology (SISTec), Bhopal, India

- Played a key role in achieving NBA accreditation by organizing a 50GB departmental data repository, ensuring compliance with accreditation standards.
- Taught a wide range of core mechanical engineering courses, including Thermodynamics, Fluid Mechanics, and Strength of Materials, employing an interactive and practical learning approach.
- Designed and implemented creative educational materials, resulting in a 15% improvement in student engagement and satisfaction.
- Managed multiple projects, including digital marketing initiatives, graphic design, and social media campaigns, contributing to the institute's increased online presence and student recruitment.

Deputy Exam Superintendent, Dept. of Mechanical Engineering |Aug. 2018–Dec. 2020
Sagar Institute of Science and Technology (SISTec), Bhopal, India

- Ensured the smooth operation of exam processes for multiple undergraduate programs, maintaining the highest standards of confidentiality and accuracy.

Guest Faculty, Dept. of Mechanical Engineering | Aug. 2013–Dec. 2014
Government Engineering College (GEC), Rewa, India

- Delivered comprehensive lectures on mechanical engineering subjects, enhancing the practical understanding of over 200 undergraduate students.

Assistant Professor, Dept. of Mechanical Engineering | Jul. 2012–Oct. 2012
ABES IT Group of Institutions, Ghaziabad, India

- Delivered a comprehensive curriculum encompassing the subject 'Life Science' and core Mechanical Engineering subjects, catering to undergraduate students across diverse academic branches.

Key Projects

AZAD-16 Humanoid Robot:

- Led the design, development, and testing of a fully functional 16-DOF humanoid robot using SolidWorks for CAD, 3D printing for manufacturing, and MATLAB for gait analysis and control system development.

ROS-based Autonomous Navigation Car:

- Currently developing a 4-wheeled autonomous car using ROS and SLAM algorithms for real-time obstacle avoidance and path planning.

Skills

Technical Skills

- **Programming & Development:** Python (Beginner), MATLAB, Block Programming, ROS (Beginner), Python Libraries (pandas, NumPy, Matplotlib), HPC Cluster (PBS Script)
- **CAD & Modelling:** SOLIDWORKS, PTC Creo, AutoCAD
- **3D Printing:** Ultimaker Cura, Creality Ender-3, Flashforge Dreamer NX
- **Control Systems:** Adaptive PID Controllers, Neural Networks, Evolutionary Algorithms
- **Hardware:** Arduino, Rasberry Pi (Planned)
- **Simulations & Data & Analysis:** Origin Pro, Simulink, Simscape
- **Operating Systems**: Windows, Ubuntu (Beginner), Oracle VM VirtualBox
- **Graphics & Media:** CorelDRAW (Highly Proficient), Photoshop, Canva, Draw.io, Photography, Videography, Video Editing (Capcut, Movavi, Adobe Premiere Pro)
- **Productivity:** Google Docs, Drive, Microsoft Office Suite (Word, PowerPoint, Excel), Mathtype, Microsoft Whiteboard, OneNote, Mendeley

Interpersonal Skills

- **Leadership & Project Management:** Proven ability to lead complex projects from conception to completion, managing both technical and interdisciplinary teams.
- **Communication:** Adept at presenting complex technical concepts to diverse audiences through clear and visually compelling presentations.
- **Collaboration:** Successfully mentored and collaborated with PhD scholars and interdisciplinary teams across computer science, electrical engineering, and robotics.

Achievements & Honors

Academic Achievements (National Level Exams)

- **Best Social Media Coordinator (2019):** Recognized for boosting student engagement through creative content, earning the Star Performer of the Year award.
- **GATE Qualified:** Successfully passed GATE exams with high percentiles, demonstrating academic excellence.
- **Staff Selection Commission (SSC) Junior Engineer (JE) 2015:** Prelims and Mains Qualified
- **CSIR, CIMFR Technical Officer (TO – Mechanical Engineering) 2019:** Prelims Qualified
- **Robotics & 3D Printing:** Recognized for developing the AZAD-16 robot and implementing innovative control algorithms for its operation.

Mentorship and Professional Collaborations

- Guided a computer science PhD scholar in integrating IoT, MATLAB code, and sensor data for robotics applications.
- Leading the development of a ROS2-based mobile robot with a master's student, focusing on auto-navigation and obstacle avoidance.
- Actively involved in soft robotics research, contributing to the design and 3D printing of test samples for material analysis.

Teaching Experience

Assistant Professor

- Taught courses in Mechanical Engineering, including
  - **Core Subjects:** Basic Mechanical Engineering (BME), Production Technology, Thermodynamics, Fluid Mechanics (FM), Power Plant Engineering (PPE), Internal Combustion (IC) Engine, Refrigeration and Air Conditioning (RAC), Strength of Materials (SOM), Machine Design (MD), Machine Drawing, 3D Modelling in PTC Creo Parametric (Lab)
  - **Interdisciplinary Subjects:** Engineering Drawing (ED), Life Science

Professional Activities

- Reviewer for SCI journals including, Journal of Mechanical Science and Technology, (Springer), Flow Measurement and Instrumentation (Elsevier), Sensors (MDPI), and Journal of Bionic Engineering (Springer)
- Reviewed articles for MIND-2022 International Conference on Machine Learning, Image Processing, Network Security and Data Sciences

Languages

- **English:** Fluent (Reading, Writing, Speaking, Listening)
- **Hindi:** Fluent (Mother Tongue)

Links to Profiles

Professional

- Google Scholar
- ResearchGate
- researchid
- ORCiD
- Scopus
- Web of Science
- Kaggle

Social

- LinkedIn
- Instagram
- Facebook
- X / Twitter

References

1. Dr Ravi Kumar Mandava
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