MOHAMMAD ZUBAIR

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Assistant Professor,
Department of Mechanical Engineering,
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DOB: March 12, 1987

Objective: To grow in a research and academic-oriented environment, impart and gain knowledge and serve society for a better future.
Area of expertise: Robotics, Computer-Aided Design, Design of Machine Elements, Kinematics of Machine, Finite Element Analysis Biomechanics, and Flexure Mechanics.
Work experience: Research and Teaching experience in a total of **9+ years**.

ACADEMIA

Ph.D.	Department of Mechanical Engineering, Indian Institute of Technology Delhi, Hauz Khas, New Delhi, India.	**May 2019**
M. Tech (Machine Design)	Department of Mechanical Engineering, Faculty of Engineering and Technology, Jamia Millia Islamia, New Delhi, India,	**June 2011**
B. Tech. (Mechanical Engg.)	Department of Mechanical Engineering, Faculty of Engineering and Technology, Jamia Millia Islamia, New Delhi, India	**June 2009**

RESEARCH EXPERIENCE (5+ years)

Post-Doctoral Fellow, Chungnam National University, Daejeon, South Korea (January 2021-February 2022)

- Flexure mechanisms to suppress the vibration in a robotic system
- Physiological Tremor Modelling, and flexure mechanism-based tremor compensation System

Doctoral Dissertation, Indian Institute of Technology Delhi

Thesis Title: In-situ Evaluation of Load Response of the Craniovertebral Junction Implants: Experimental and FEA Study

- Design and development of experimental setup for conducting cadaveric experiments

without decapitation. A hybrid manually actuated seven DOF parallel manipulator (MA7DPM) was designed and developed to achieve the kinematic path of the neck region. Also, a customized chair was developed to hold the cadaver in a sitting posture.

- Experimentation on a cadaver to analyze the behavior of the different implants in the craniovertebral junction region.
- Development of finite element model of the craniovertebral junction with biomechanical fidelity. The model was created using the CT-Scan images. Mimics software was used for extracting the vertebrae. Ligaments were modeled as per the anatomy in 3-Matics. FE mesh was done in HyperMesh to which FE simulation was carried out in ANSYS environment for pre-and post-implants fixation.

Senior Research Fellow, Indian Institute of Technology Delhi (January 2012-July 2016)

- Design and development of arm exoskeleton for teleoperation of an industrial robot. Worked with a team to carry out the research at the Program of Autonomous Robotics Lab. The project grant was from Bhabha Atomic Research Center (BARC) and the Board of Research in Nuclear Science (BRNS), Mumbai, India.
- KUKA KR5 robot was teleoperated using the arm exoskeleton for the peg in a hole insertion.

TEACHING EXPERIENCE (4 years)

Adamas University, Kolkata, India

Worked as an Assistant Professor since March 2022.

Subjects taught/teaching: Engineering Mechanics, Robotics, Kinematic and Dynamics of Machine.

JK Lakshmipat University, Jaipur, India

Worked as an Assistant Professor from July 2019 to January 2021.

Subjects taught/teaching: Theory of Machine, Machine Design, Finite Element Analysis, Mechatronics and Robotics, Strength of Material and Analysis, Computer Aided Modeling and Simulation, ME CAD Lab., Mechanical and Electrical Machines (sharing with Electrical Engineering Dept.), Engineering Measurement and Machines (sharing with Electrical Engineering Dept.), and Element of Stress Analysis.

Birla Institute of Technology and Science (Pilani) -WILP, NCR Cluster, Delhi

Worked as a guest faculty from August 2016, to September 2018.

Subjects taught: Mechanisms and Robotics, Computer Aided Analysis and Design (CAAD),

and Finite Element Methods (FEM).

PATENT

Indian Patent Application No. 202111005473, Filing date: 09.02.2021, on "A System for Evaluating the Performance of Craniovertebral Junction Implant"

Indian Design Application No. 358617-001, filling date: 15.02.2022, on "Flexure mechanism for vibration reducer".

Korean Design Application in progress, on "Adaptive flexure mechanism".

PUBLICATIONS

Journal Publications

Gupta, D., Zubair, M., Lalwani, S., Gamanagatti, S., Roy, T.S., Mukherjee, S. and Kale, S.S., 2020. Development and Validation of Finite Element Analysis Model (FEM) of Craniovertebral Junction: Experimental Biomechanical Cadaveric Study. Spine, 45(16), pp.E978-E988.DOI: 10.1097/BRS.0000000000003491

Sachin Kansal, Mohd. Zubair, Bhivraj Suthar, Sudipto Mukherjee, (2021) "Tele-operation of an industrial robot by an arm exoskeleton for peg-in-hole operation using immersive environments", Robotica, page 1-16.
DOI: https://doi.org/10.1017/S0263574721000485

Mohd. Zubair, Sachin Kansal, and Sudipto Mukherjee. "Vision-based pose estimation of craniocervical region: experimental setup and saw bone-based study." Robotica (2021): 1-16. DOI: https://doi.org/10.1017/S0263574721001508

Deepika Mishra, Ravi Shankar Prasad, Mohd Zubair, Piyush Gaur, "An ANFIS Model for Study of Surface Roughness for Metallic Materials on Optimized Machining Parameters", ARCTIC Journal, Vol. 73(11), November 2020, pp 106-134.

Mohd Zubair, Bhivraj Suthar, Seul Jung, "Design and Analysis of Flexure Mechanisms for Human Hand Tremor Compensation" IEEE Access 10 (2022): 36006-36017.

Mohd Zubair, Yejin Choi, Seul Jung, "Design and Analysis of Flexure Mechanism to Suppress Vibration in a Foldable Robot Arm" Manuscript submitted in IEEE Access.

Bhivraj Suthar, Mohd Zubair, Sachin Kansal, Sudipto Mukherjee, "Development of a Compliant Joint-based Upper Limb Exoskeleton: CJ-EXO" Manuscript submitted for IEEE R-AL.

Bhivraj Suthar, Mohd Zubair, Seul Jung, “Development of a Self-folding Gravity Balance Mechanism for a Supplementary Foldable Robot Arm for Collaborative Work” Manuscript in preparation for IEEE RAL.

Kumar, Rajesh, Mohd Zubair, Sudipto Mukherjee, and Jacobo Antona Makoshi. “A Method to Predict Location of Non-Coup Brain Injuries.” arXiv preprint arXiv:2011.13111 (2020).

Mohd. Zubair, Deepak K Gupta, Sudipto Mukherjee, Shashank S. Kale, “Design of Loading setup for In-situ Study of Implants in Craniovertebral Junction: A manually actuated seven-DOF parallel manipulator”, Manuscript submitted in IEEE transaction on Robotics.

Conference Papers

(Peer-Reviewed)

Mohd Zubair, Bhivraj Suthar, Seul Jung, “An Experimental Setup to Study the Performance of Flexure Mechanism”, in Proceedings of The 21st International Conference on Control, Automation and Systems (ICCAS 2021), Jeju, South Korea.

Mohd Zubair, Seul Jung, “Design of Mechanical Compensation System for Hand Tremor of the Old People”, in Proceedings of The 21st International Conference on Control, Automation and Systems (ICCAS 2021), Jeju, South Korea.

Mohd Zubair, Seul Jung, “Mechanical Joint Design for Gravity Compensation of a Robot Manipulator”, in Proceedings of The 21st International Conference on Control, Automation and Systems (ICCAS 2021), Jeju, South Korea.

Mohd Zubair, Ye Jin Choi, Bhivraj Suthar, Seul Jung, “Vibration Suppression Mechanism for Foldable Robot Arm for Drones” in Proceedings of Ubiquitous Robotics 2021, Gangwon-Do, South Korea, July 13, 2021.

Shubham Bhandari, Payal Sharma, Rohit Bindra, Mohd Zubair, Divyanshu Jain “Design of Robotic Hand and Wireless Glove to Tele-operate”, Advances in Robotics-2021, Kanpur, India.

YeJin Choi, Mohd Zubair, Bhivraj Suthar, Seul Jung, “Study on a Foldable Robot Arm with a Flexure End-Effector for Achieving Stable Cleaning Operation” in the Proceedings of Summer Annual Conference of IEIE-2021, The Korean Society of Electronic Engineering, Jeju, South Korea, June-2021.

Mohd Zubair, Vineet Mathew, Sudipto Mukherjee, Deepak K Gupta, “Forward kinematics

analysis of a stewart platform using computer vision pose estimation" in Proceedings of the 8th ECCOMAS Thematic Conference on MULTIBODY DYNAMICS-2017, January-2017, pp. 665-670, Czech technical university, Prague, Czech Republic, ISBN: 978-800106174-9, (SCOPUS-Indexed).

Mohd Zubair, Sachin Kansal, Bhivraj Suthar, Sudipto Mukherjee, "Kinematic mapping of Exoskeleton with virtual KUKA robot" International Conference on Robotics and Automation for Humanitarian Applications, RAHA 2016 - Conference Proceedings, Kollam, Kerala, India, ISBN: 978-150905203-5, DOI: 10.1109/RAHA.2016.7931869, (SCOPUS-Indexed).

Mohd Zubair, Bhivraj Suthar, Zubin Priyansh, Sachin Kansal, Siddhartha Jaitly, Sudipto Mukherjee "Implementation of I2C Communication Protocol in Exoskeleton for Teleoperation of Industrial Robot" in 4th International Conference on Multibody System Dynamics -2016, McGill University, Montreal, Canada.

Bhivraj Suthar, Sachin Kansal, Mohd Zubair, Siddhartha Jaitly, Sudipto Mukherjee, "Removal of Jittering in KUKA KR5 while tele-operation with Exoskeleton", Advances in Robotics-2015, Goa, India, ISBN: 978-145033356-6, DOI: 10.1145/2783449.2783496 (SCOPUS-Indexed).

Mohd Zubair, Sachin Kansal, Sudipto Mukherjee, Deepak Kumar Gupta, Shashank Kale, "Design of Loading Setup for Craniovertebral Junction", 3rd Joint International Multibody System Design and 7th Asian Conference in Multibody Design-2014, Busan, Korea

Mohd Zubair, Bhivraj Suthar, Sachin Kansal, Sudipto Mukherjee, "Haptic Exoskeleton for Teleoperation of Industrial Robot", 3rd Joint International Multibody System Design and 7thAsian Conference in Multibody Design-2014, Busan, Korea.

Sudipto Mukherjee, Mohd Zubair, Bhivraj Suthar, Sachin Kansal, "Exoskeleton for Tele-Operation of Industrial Robot" Advances in Robotics-2013, Pune, India, ISBN: 978-145032347-5, DOI: 10.1145/2506095.2506108, (SCOPUS-Indexed).

Sudipto Mukherjee, Mohd Zubair, Bhivraj Suthar, Sachin Kansal, "Closed Loop Autonomous Calibration of Tele-operation Exoskeleton" Advances in Robotics-2013, Pune, India, ISBN: 978-145032347-5, DOI: 10.1145/2506095.2506109, (SCOPUS-Indexed).

(Abstract-Reviewed)

Mohd. Zubair, Yogesh Rohilla, Bhargav P. Pathri, Tanmoy K. Deb, "Quadcopter Design as an Interdisciplinary Course: A Project Based Teaching Methodology" in The International

conference on Innovations in Technology and Management for Achieving Sustainable Development Goals-2020, in Jaipur, India

Sachin Kansal, Nishant Bugalia, Bhivraj Suthar, Mohd.Zubair, Sudipto Mukherjee, "Tele-operation of KUKA KR5 by an Arm Exoskeleton through Immersive Environment for Peg-in-Hole Operation" in 8thAsian Conference in Multibody Dynamics-2016, in Kanazawa, Japan.

Mohd Zubair, Deepak. K. Gupta, Shashank S. Kale, Sudipto Mukherjee, "Finite Element Model of Craniovertebral Junction", 25th Annual Conference of Neurotrauma Society of India, All India Institute of Medical Science (AIIMS), New Delhi, India (2016).

Mohd Zubair, Sudipto Mukherjee, Deepak Kumar Gupta, Shashank Kale, "Virtual Model of Craniovertebral Junction to validate the Implant performance", 3rd AIIMS Neurotrauma conference-2015, AIIMS, New Delhi, India.

PRESENTATIONS

- **Paper Presentation**, "Design of Mechanical Compensation System for Hand Tremor of the Old People", The 21st International Conference on Control, Automation and Systems (ICCAS 2021), Jeju, South Korea, October 12-15, 2021.

- **Paper Presentation**, "Vibration Suppression Mechanism for Foldable Robot Arm for Drones", Ubiquitous Robotics 2021, Gangwon-Do, South Korea, July 13, 2021.

- **Poster Presentation**, "An In-house Development of Haptic Exoskeleton for Teleoperation" OPENHOUSE 2017, IIT Delhi, New Delhi, India, April 22, 2017.

- **Poster Presentation**, "Finite Element Model of Craniovertebral Junction", 25th Annual Conference of Neurotrauma Society of India, All India Institute of Medical Science (AIIMS), New Delhi, India, Aug 12 - 14, 2016.

- **Paper Presentation**, "Evolution of Arm Exoskeleton at IIT Delhi", 8th Asian Conference in Multibody Dynamics, Kanazawa, Japan, August 7 – 10, 2016.

- **Paper Presentation**, "Implementation of I^2C Communication Protocol in Exoskeleton for Teleoperation of Industrial Robot" The 4th Joint International Conference on Multibody System Dynamics, McGill University, Montreal, Canada, May 29–June 2, 2016.

- **Paper Presentation**, "Virtual Model of Craniovertebral Junction to validate the Implant performance", 3rd AIIMS Neurotrauma Conference, All India Institute of Medical Science (AIIMS), New Delhi, India, October 28 – 31, 2015.

- **Paper Presentation**, "Design of Loading Setup for Craniovertebral Junction" 3rd Joint International Multibody System Design and 7th Asian Conference in Multibody Design, Busan, Korea, June 30 - July 3, 2014.

- **Paper Presentation**, "Exoskeleton for Tele-Operation of Industrial Robot" Advances in Robotics, R&DE, DRDO, Pune, July 4 - 6, 2013.

HONORS AND AWARDS

- July 2021: Best paper award by The Korean Society of Electronic Engineering 2021 Summer Conference, Jeju, South Korea.

- April 2017: Poster appreciation award (PG) from Alumni Association-IIT Delhi for the poster presentation at Open House-2017 in IIT Delhi.

- May 2017: International Travel Grant from IRD, to attend 8th Asian Conference in Multibody Dynamics, Kanazawa, Japan.

- October 2015: Best paper awards at AIIMS Neuro Trauma Conference-2015, AIIMS, New Delhi, India.

- June 2014: International Travel Grant from BRNS, Mumbai, India, to attend 3rd Joint International Multibody System Design and 7th Asian Conference in Multibody Design at Busan, Korea.

PROFESSIONAL ACTIVITIES AND RESPONSIBILITIES

- International Relationship Officer for the School of Engineering and Technology, Adamas University, Kolkata, India.
- Conducted Five-day International Lecture Series on the Latest Trends in Mechanical Engineering, Organized by the Department of Mechanical Engineering, School of Engineering and Technology, Adamas University, Kolkata, India.
- Reviewer for the Journal Sadhana- Academy Proceedings in Engineering Sciences.
- Reviewer for the conference, The 21st International Conference on Control, Automation and Systems, ICCAS-2021
- Reviewer for the conference, The 5th International Conference of the Robotics Society, Advances in Robotics-2021.
- Delivered lecture on "Parallel Manipulator & Autodesk Inventor" for the faculty development programme on "Theory and Simulations in Robotics" on 5th June 2020.

- Board of Studies faculty representative from the Department of Mechanical Engineering, JK Lakshmipat University, for the academic session: 2019-2020 and 2020-2021.
- Student's mentor from the Department of Mechanical Engineering, JK Lakshmipat University, for the academic session: 2019-2020 and 2020-2021.
- Jury for the technical and cultural fest-2019, in the Institute of Engineering and Technology, JK Lakshmipat University.
- Student Representative in Robotic society of India from July 2017- present.
- Volunteered in international conference AIR-2017 at IIT Delhi, New Delhi, India during June 28-July 1, 2017
- Editorial member of bi-annual newsletter, "RS News" at Department of Mechanical engineering, IIT Delhi from July 2014 to June 2015.
- Volunteered in OPENHOUSE-2014 and 2015 at Mechanical Engineering, IIT Delhi.
- Volunteered in International Workshop on Autonomous Vehicles and Mobile Robotics, held at IIT Delhi, New Delhi, during July 6-8, 2014.
- Assisted in purchasing of KUKA youBot mobile robot, in 2014 for the development of interdisciplinary laboratory, Programme for Autonomous Robotics, IIT Delhi, New Delhi.
- Volunteered in AIR-2013 at R&DE, DRDO, Pune during July 4-6, 2013.
- Assisted in purchasing KUKA LBR iiwa robot, first of its kind in Asia in 2013 for the development of interdisciplinary laboratory, Programme for Autonomous Robotics, IIT Delhi, New Delhi.
- Volunteered in Workshop on Advances in Robotics, held at IIT Delhi, New Delhi, during July 5-7, 2012
- Volunteered in ENERZIA-2011, Jamia Millia Islamia, New Delhi, 2011.
- Volunteered in CRESON-2006, Jamia Millia Islamia, New Delhi, 2011.

MEMBERSHIP

- Member of The Robotic Society of India.
- Member of IEEE, as a Young Professional.

COMPUTER SKILLS AND TRAINING

- Mathematical Packages: MATLAB

- CAD and Analysis Packages: AUTODESK INVENTOR, SOLIDWORKS, ANSYS, Mimics, 3-Matics, HyperMesh, ABAQUS,
- Languages: C#, C/C++ Language, Visual Basic.

TRAINING

- Basic Robot Programming on software version KSS2 (KRC2) KUKA Industrial Robots at AKGEC KUKA Industrial Training Center Ghaziabad, during February 2012.
- Advanced Robot Programming on software version KSS2 (KRC2) KUKA Industrial Robots at AKGEC KUKA Industrial Training Center Ghaziabad, during May 2012.

REFEREES

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