

Pushpendra Gupta

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🇮🇳 Indian

Education

Indian Institute of Technology Kharagpur, West Bengal, India <i>Title: Multi- and Many-Objectives Optimization in Gait Generation of 25-DoF Humanoid Robot Using Genetic and Evolutionary Algorithms.</i> Under the Joint Supervision of: Prof. D.K. Pratihar (IIT Kharagpur, India) and Prof. Kalyanmoy Deb (Michigan State University, USA)	Ph.D. 2018 – 2025
National Institute of Technology Agartala, Tripura, India <i>Computer Integrated Manufacturing (Secured 9.17 CGPA)</i>	M. Tech (Gold Medalist) 2013 – 2015
Maharshi Dayanand University, Rohtak, Haryana, India <i>Mechanical and Automation (Secured 72.61%)</i>	B. Tech (Hons) 2007 – 2011

Employment

Birla Institute of Technology And Science, Pilani (BITS Pilani) <i>Digital Learning Division</i>	Assistant Professor Jul 2025 – Present
The LNM Institute of Information Technology, Jaipur <i>Mechanical-Mechatronics Department</i>	Assistant Professor (On Contract) Aug 2024 – May 2025
National Programme on Technology Enhanced Learning Experimental Robotics Conducted and Recorded <i>Experiment 5: Path and Gait Planning of Humanoid Robot</i> for the NPTEL course on <i>Experimental Robotics</i> as an Instructor.	Resource Person Apr 2023 – Apr 2024
Modern Institute of Technology and Research Centre, Alwar <i>Mechanical Engineering Department</i>	Assistant Professor Jul 2015 – Dec 2017

Skills

Areas of Research Expertise	Machine Learning, Optimization, Robotics, Soft Computing
Languages	Hindi, English
Programming Language	Python, Matlab, Wolfram, R
Design and Modeling Software	AutoCAD, Solidworks
Scientific Abilities	Academic Research, Teaching, L ^A T _E X Typesetting and Publishing

Courses Taught

At The LNM Institute of Information Technology, Jaipur (2024-2025)

1. Artificial Intelligence in Robotics and Automation (**Rating: 5.00/5.00**)
2. Electrical Technology (**Rating: 4.46/5.00**)
3. Control and Optimization in Automation and Robotics (**Rating: 4.44/5.00**)
4. Introduction to Computational Methods (**New Course Developed**) (**Rating: 4.35/5.00**)

At Other Institutions

1. Robotics
2. Evolutionary Algorithms
3. Traditional and Non-Traditional Optimization Tools
4. Soft Computing Approaches

Publications

Edited Book

1. Faiz Iqbal, **Pushpendra Gupta**, Vidyapati Kumar, Dilip Kumar Pratihari, (Eds.), *Biomedical Robots and Devices in Healthcare: Opportunities and Challenges for Future Applications*, Elsevier, Dec 2024.
Hardback ISBN: 9780443222061 | eBook ISBN: 9780443222078
<https://doi.org/10.1016/C2023-0-00581-7>

Journals

1. **Pushpendra Gupta**, Dilip Kumar Pratihari and Kalyanmoy Deb, *Many-Objective Robust Gait Optimization for a 25-DOF NAO Robot Using NSGA-III*, Engineering Optimization, Taylor & Francis, pp. 1–39, 2025. SCIE, IF 2.2, Q2 <https://doi.org/10.1080/0305215X.2025.2502574>
2. **Pushpendra Gupta**, Dilip Kumar Pratihari, Kalyanmoy Deb, *Analysis and optimization of gait cycle of 25 dof robot using particle swarm optimization and genetic algorithms.*, International Journal of Humanoid Robotics, Vol 21, No. 2, 2024, pp. 2350011(1)–2350011(44), SCIE, IF 0.9, Q3 <https://doi.org/10.1142/S0219843623500111>
3. **Pushpendra Gupta**, Dilip Kumar Pratihari and Kalyanmoy Deb, *Dynamic Performance Evaluation of Evolutionary Multi-Objective Algorithms for Gait Cycle Optimization of 25 DOF NAO Humanoid Robot*, 2025. [Under Review]
4. Venkatasainath Bondada, **Pushpendra Gupta**, Mohammad Zaved Siddiqui, Jose Thomas, Dilip Kumar Pratihari, *Designing Driver Drowsiness Detection Systems: Challenges and Solutions*, International Journal of Commercial Vehicles. SAE International, 2025. [Under Review]
5. Vidyapati Kumar, **Pushpendra Gupta**, Ankita Mistri, *Sustainable Optimization of Micro-EDM Process Parameters Using Multi-Objective Bonobo Optimizer: A Metaheuristic Approach for Precision Manufacturing*, International Journal of Precision Engineering and Manufacturing, 2025. [Under Review]

Conferences

1. **Pushpendra Gupta**, Dilip Kumar Pratihari and Kalyanmoy Deb, *A Comparative Study of Pareto optimal Solution Sets for NAO Robot Gait Optimization using the Dominance Move Indicator based on Mixed Integer Programming*, Proceedings of the 6th National Conference on Advances in Multidisciplinary Design, Analysis and Optimization 2023, Lecture Notes in Mechanical Engineering, Springer 2025, pp 427-435. https://doi.org/10.1007/978-981-96-1158-4_45.
2. **Pushpendra Gupta**, Kalyanmoy Deb & Dilip Kumar Pratihari, *A knee-based multi-objective optimization for gait cycle of 25-dof NAO humanoid robot in single and double support phases.*, Proceedings of the 12th International Conference on Soft Computing for Problem Solving 2023, Lecture Notes in Networks and Systems, vol 994, pp 47-62, Springer 2024 https://doi.org/10.1007/978-981-97-3180-0_4
3. **Pushpendra Gupta**, Joydeep Roy, Ram Naresh Rai, A.K. Prasada Rao & Subhash Chandra Saha, *Effect of B₂O₃ containing fluxes on the microstructure and mechanical properties in submerged arc welded mild steel plates*. In IOP Conference Series: Materials Science and Engineering, 2016 Feb (Vol. 114, No. 1, p. 012102). DOI 10.1088/1757-899X/114/1/012102
4. Venkatasainath Bondada, **Pushpendra Gupta**, Dhrubajyoti Gupta, Dilip Kumar Pratihari, and Cheruvu Siva Kumar, *Novel Machine Vision Method for Unwrapping Images of Pipelines*, ISME 2025. [Under Review]
5. **Pushpendra Gupta**, Vidyapati Kumar, Dilip Kumar Pratihari, and Kalyanmoy Deb, *Dynamic Gait Planning for the NAO Humanoid Robot Using a 3D Linear Inverted Pendulum Model with Integrated Double Support Phase*, ISME 2025. [Under Review]

Book Chapters

1. **Pushpendra Gupta**, Vidyapati Kumar, Dilip Kumar Pratihari, Kalyanmoy Deb, *Multi-objective optimization of Rotational Magnetorheological Abrasive Flow Finishing Process*, Nanofinishing of Materials for Advanced Industrial Applications, CRC Press / Taylor & Francis, 2023 <http://dx.doi.org/10.1201/9781003496298-2>
2. **Pushpendra Gupta**, Pradeep Nahak, Vidyapati Kumar, and Dilip Kumar Pratihari, *Comparative Evaluation of Deep Learning Techniques for Multi-Stage Alzheimer's Prediction from Magnetic Resonance Images* in Biomedical Robots and Devices in Healthcare: Opportunities and Challenges for Future Applications, Elsevier, 2025.

<https://doi.org/10.1016/B978-0-443-22206-1.00007-3>

3. Thomas Gaskins, **Pushpendra Gupta**, Vidyapati Kumar, DK Pratihari, Faiz Iqbal, *Soft Robotics and Computational Intelligence: Transformative Technologies Reshaping Biomedical Engineering in Biomedical Robots and Devices in Healthcare: Opportunities and Challenges for Future Applications*, Elsevier, 2025
<https://doi.org/10.1016/B978-0-443-22206-1.00008-5>
4. Vidyapati Kumar, **Pushpendra Gupta**, Dilip Kumar Pratihari, *Advancing Ankle-Foot Orthosis Design through Biomechanics, Robotics, and Additive Manufacturing: A Review in Biomedical Robots and Devices in Healthcare: Opportunities and Challenges for Future Applications*, Elsevier, 2025 <https://doi.org/10.1016/B978-0-443-22206-1.00006-1>
5. Vidyapati Kumar, **Pushpendra Gupta**, Dilip Kumar Pratihari, *A Research Perspective on Ankle-Foot Prosthetics Designs for Transtibial Amputees.*, In *Mechanical Engineering in Biomedical Applications* (eds J.P. Srivastava, D. Kozak, V. Ranjan, P. Kumar, R. Kumar and S. Tayal), Scrivener Publishing, Wiley, 2024, pp. 397–412
<https://doi.org/10.1002/9781394175109.ch16>
6. **Pushpendra Gupta**, Joydeep Roy, & Subhash Chandra Saha, *Effect of Boron Trioxide Enriched Fluxes on the Microstructure and Mechanical Properties in Submerged Arc Welded Mild Steel Plates*. *Advanced Aspects of Engineering Research* Vol. 1, 83–89, 2021 <https://doi.org/10.9734/bpi/aaer/v1/7077D>
7. **Pushpendra Gupta**, Dilip Kumar Pratihari, Kalyanmoy Deb, *Emerging Techniques for Evolutionary Single- and Multi-Objective Optimization with Application to Humanoid Robot Gait Generation In Contemporary Advancement in Evolutionary Multi-Objective Optimization (CAEMOO)*, Springer Book Series "Genetic and Evolutionary Computation (GEVO)", Springer. [Abstract Accepted]

Academic Research Projects

1. Optimal Gait Generation of Bipedal Locomotion using Evolutionary Computation 2018 – 2025

Ph.D. Thesis

Focused on developing robust and stable gaits for bipedal locomotion in humanoid robots using evolutionary computation techniques. Formulated single/multi/many-objective optimization problems for single and double support gait phases and solved them using genetic and evolutionary algorithms. Introduced novel methods to compare algorithms, prioritized knee-region solutions on the Pareto Front for decision-making, and ensured robustness in locomotion.

2. Effect of Enriched Fluxes on the Microstructure and Mechanical Properties 2014 – 2015

M. Tech Dissertation

The effects of TiO_2 and B_2O_3 on the microstructure and mechanical properties of high-strength and mild steel during the Submerged Arc Welding process were investigated. Metallurgical microstructure and mechanical properties data were collected, and the Grey Relational Coefficient was applied to determine the best process parameters for optimizing the desired mechanical properties. This research developed an understanding of how different alloys affect weld metal properties and established meaningful correlations between process parameters and mechanical/microstructural properties.

3. A Micro-Controller Based Robotic Arm for Autonomous Material Handling 2010 – 2011

B. Tech Final Year Project

An attempt was made to create a material handling device employing a robotic arm that operates autonomously upon receiving a signal from the micro-controller. It can be implemented in any automated material handling system where destination is already known.

Machine Learning Based Projects

1. Designing Driver Drowsiness Detection Systems 2024 – 2025

- Conducted comprehensive review of state-of-the-art driver drowsiness detection systems and highlighted main challenges in existing methods
- Focused on how to develop an Adaptive Driver Drowsiness Alert System (ADDAS) that uses responsible AI techniques to provide personalized and secure drowsiness prediction
- Suggested solutions for feature discrepancy, privacy concerns, model robustness, and explainability challenges using transduction transfer learning and multimodal data integration

Research Output: Communicated with International Journal of Commercial Vehicles, SAE International.

- 2. Novel Machine Vision Method for Unwrapping Images of Pipelines** 2024 – 2025
- Developed a novel machine vision framework for unwrapping pipeline images by imposing and exploiting scene constraints for efficient inspection
 - Integrated Canny edge detection with geometric transformation models to achieve accurate surface reconstruction with 93.2% surface area recovery after unwrapping
 - Addressed fundamental challenges in computer vision-based pipeline inspection by providing simplified yet effective solution for pixel scale calculation using system constraints
- Research Output:** Communicated with ISME 2025 Conference
- 3. Deep Learning Techniques Comparison for Multi-Stage Alzheimer’s Prediction** 2023 – 2024
- Applied deep learning techniques (CNN, VGG-16, and ResNet-50) to predict different stages of Alzheimer’s disease from magnetic resonance imaging (MRI) scans
 - Implemented data augmentation techniques to create balanced dataset of 12,800 training images from original 6,400 MRI images labeled across four dementia classes
 - Achieved 90% testing accuracy with VGG-16 model, demonstrating superior performance in multi-class classification with highest precision, recall, and F1-scores for all dementia stages
- Research Output:** Published as Book Chapter in *Biomedical Robots and Devices in Healthcare*, Elsevier, 2025

Projects handled as Senior Research Fellow

1. Project Details	Description
Project Title	Failure Analysis of Reformer PIGTAILS
Duration	Nov 2022 – May 2023
Project Type	Consultancy Project
Funding Agency	MATIX Fertilisers and Chemicals Ltd
Project Cost	9.8 Lakhs
Status	Completed
Objective	Investigated and found remedies to prevent the initiation of cracks in Austenitic Stainless Steel (SS304H) material due to high-temperature fluid exposure in Matix Fertilisers & Chemicals Limited
Supervision	Prof. D.K. Pratihari (Principal Investigator) and Prof. Debalay Chakrabarti (co-PI), IIT Kharagpur, West Bengal, India

2. Project Details	Description
Project Title	High-Speed Walking Gait Control of a Life-Size Humanoid Robot
Duration	March 2019 – Sept 2021
Project Type	Sponsored Project
Funding Agency	Shashtri Institute, Delhi
Project Cost	1.7 Lakhs
Status	Completed
Objective	The robot was investigated and studied for defence and humanitarian aid applications
Supervision	Prof. D.K. Pratihari (Principal Investigator), IIT Kharagpur, West Bengal, India and Prof. Alejandro Ramírez-Serrano, University of Calgary, Alberta, Canada

Courses and Certifications

Machine Learning	<i>Sept 2023</i>
Taught by Prof. Andrew Ng, Stanford University, USA offered through Coursera	
Deep Learning Specialization	<i>Nov 2020</i>
Taught by Prof. Andrew Ng, Stanford University, USA offered through Coursera	
Complete Python Bootcamp	<i>Aug 2019</i>
Taught by Prof. Jose Marcial Portilla, Torrens University, Australia offered through Udemy	
Nonlinear Dynamics: Mathematical and Computational Approaches	<i>May 2019</i>

Introduction to Genetic Algorithms: Theory and Applications

Feb 2019

Taught by Prof. Seyedali Mirjalili, Torrens University, Australia offered through [Udemy](#)

Training

1. Participated in IOT workshop and completed the training on *IOT & Embedded Systems* at Composit 2018, IIT Kharagpur.
2. Gained hands-on experience in designing and modeling software like ProE and CAD from Mitsu CAD Centre, Faridabad, Haryana. [Nov 2010-Apr 2011]
3. Completed training on PLC and SCADA from Sofcon India Pvt Limited, Noida, Uttar Pradesh. [Jun 2010-July 2010]
4. Completed training on CNC machining as a part of BTech coursework from PP Institute, Faridabad, Haryana. [Sept 2009-Oct 2010]

Invited Lectures

1. Delivered lectures in the 5-day Faculty Development Program on "**Theory to Code: Hands-on ML, Genetic Algorithms, and Fuzzy Logic with Python**" at Geethanjali College of Engineering and Technology Hyderabad, organized by the Department of CSE (Cyber Security), March 2024.
2. Delivered a lecture in the 5-day Faculty Development Program on "**Current Trends in Mechanical Engineering: Case Studies From Industries and Academia to Promote Innovation, Design Thinking and Startups**" at Shri Vishnu Engineering College for Women Vishnupur, Bhimavaram, organized by the Department of Mechanical Engineering, May 2024.
3. Delivered an online lecture on **Quantum Machine Learning** at Mercedes-Benz India in May 2024.
4. Delivered a lecture on "**Genetic Algorithm-based Approach to Improve Humanoid Robot Stability on Different Terrains**" as part of the "*AICTE-QIP Short-Term Course on Robotics*", at IIT Kharagpur, November 2019.

Attended Workshops

1. Participated in a five-day online workshop on "**Generative AI**," organized by The LNM Institute of Information Technology from March 10th to 15th, 2025.
2. Participated in an intensive eight-day, 40-hour Faculty Development Program (FDP) on "**Outcome-Based Education & Accreditation**," jointly organized by The LNM Institute of Information Technology and Malaviya National Institute of Technology, Jaipur, held from 03/03/2025 to 12/03/2025.
3. Participated in a five-day FDP on "**Introduction to Entrepreneurship for Trainers**," organized by the Department of Mechanical-Mechatronics at The LNM Institute of Information Technology, Jaipur, from 03/10/2024 to 09/10/2024.
4. Participated in two days workshop on *Recent Advances In Welding Process* Under TEQIP-II and *Entrepreneurship Awareness Program* at NIT Agartala in 2014.

Awards and Academic Achievements

1. Presented a paper entitled "**A Comparative Study of Pareto-front of Optimal Solutions Set for NAO Robot's Gait Optimization Using the Dominance Move Indicator based on Mixed Integer Programming (Paper ID: 124)**" during the *6th National Conference on Multidisciplinary Design, Analysis and Optimization (NCMDAO 2023)* held at the Indian Institute of Technology Guwahati, Roorkee, India from 6th to 8th December 2023.
2. Presented a paper entitled "**A knee-based Multi-objective Optimization for Gait Cycle of 25-DOF NAO Humanoid Robot (Paper ID: 11)**" during the *12th International Conference on Soft Computing for Problem*

Solving (SocProS 2023) held at the Indian Institute of Technology Roorkee, Roorkee, India from 11th to 13th August 2023.

3. Teaching assistant in the short-term course entitled “**Short-term Virtual Course on Artificial Intelligence(AI) in Robotics**” under Prof. D. K. Pratihari organized by Shastri Indo-Canadian Institute in December 2022.
4. Received an Institute Assistantship from the Ministry of Education, Government of India, as a Ph.D. research scholar at the Indian Institute of Technology Kharagpur.
5. Received a **Gold Medal** from AICTE Chairman in Computer Integrated Manufacturing from the Production Engineering Department during M.Tech at NIT Agartala (2015 Batch).
6. Qualified **GATE 2013** and **GATE 2015**.
7. Received Certificate of Excellence and Scholarship for excellent academic performance during B.Tech (2011 Batch) in 1st, 5th, 7th, and 8th Semesters.
8. Received a certificate of Appreciation for Assisting in the accomplishment of the Two Days Workshop on **MATLAB and its Application in ANN, FUZZY Logic and Genetic Algorithm** at NIT, Agartala.

Extracurricular Activities

1. Volunteered at Convocation 2019, IIT Kharagpur, assisting in the organization and execution of the event.
2. Managed and organized the *HINDI DIWAS 2014 Program* at NIT Agartala.

References

1. Prof. Dilip Kumar Pratihari

Professor, Department of Mechanical Engineering,
Indian Institute of Technology Kharagpur,
Kharagpur-721302, West Bengal, India.
Email: dkpra@mech.iitkgp.ac.in

2. Prof. Kalyanmoy Deb

Professor, Department of Electrical and Computer Engineering,
Michigan State University, East Lansing,
Michigan-48824, USA.
Email: kdeb@egr.msu.edu

3. Prof. Ram Naresh Rai

Professor, Department of Production Engineering,
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