Nilay Kushawaha

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nilaykush nilay121 Scholar

Profile Summary

Final-year doctoral research candidate in Continual Learning and Robotics with a strong track record in designing adaptive AI algorithms for robotic control, multimodal data fusion, and soft robot behavior modeling. Experienced in real-time control, reinforcement learning, computer vision, and sensor data processing. Proven ability to bridge theory and practice through publications in top-tier journals and hands-on robotics experiments. Passionate about translating cutting-edge research into impactful real-world applications.

Work Experience

Visiting Researcher, National University of Singapore, Singapore *June 2025 – September 2025*
(Prof. Cecilia Laschi)

- Developed dynamic continual learning algorithm for modular soft robot (MSR) to enable localized precise control.
- Tested the controller in real-time for trajectory tracking and dynamic reaching tasks, achieving an error less than 6 mm in position and 3° in orientation.

Master's Thesis Project, Jefferson Lab, U.S.A *July 2021 – July 2022*
(Dr. Yulia Furletova)

- Simulated and modeled the Gas Electron Multiplier (GEM) detector for Electron-Ion Collider project.
- Applied AI algorithm for extracting sensitive particle signals from high-noise environment, improving detection accuracy.

Education

The Biorobotics Institute, Scuola Superiore Sant'Anna, Pisa, Italy *Oct 2022 – April 2026 (Tentative)*
PhD in Biorobotics & AI (Supervisor : Prof. Egidio Falotico)

- Credits : 20/20
- Coursework: Machine Learning, Brain Inspired Control, Finite Elements Methods, Deep Learning for Medical Imaging, Robot Programming, Ethics in AI.

Indian Institute of Technology, Indore, India *July 2020 – July 2022*
Master of Science (M.Sc) in Physics (Supervisor : Prof. Ankhi Roy)

- CGPA : 8.65/10
- Coursework: Mathematical Physics, Statistical Mechanics, Classical Mechanics, Quantum Mechanics, Detector Physics.

University of Delhi, Delhi, India *August 2017 – July 2020*
Bachelor of Science (B.Sc) in Physics

- CGPA : 8.46/10
- Coursework: Numerical Methods, Introduction to Programming, Computational Physics, Digital/Analog Electronics, Modern Physics.

Selected Publications and Pre-Prints

- SynapNet: A Complementary Learning System Inspired Algorithm With Real Time Application in Multimodal Perception, **Nilay Kushawaha**, L. Fruzetti, E. Donato, E. Falotico, ***IEEE Transactions on Neural Networks and Learning Systems (2024)***, *Paper link*
- Continual Learning for Multimodal Data Fusion of a Soft Gripper, **Nilay Kushawaha**, E. Falotico, ***Wiley Advanced Robotics Research (2025),*** *Paper link*
- AGPNN: A Dynamic Architecture based Continual Reinforcement Learning Algorithm for Robotic Control, **Nilay Kushawaha**, G. Perovic, E. Donato, E. Falotico, ***Under Review (IEEE Transactions on Systems, Man,***

and Cybernetics: Systems)

- A Continual Learning Framework for Adaptive Control of Modular Soft Robots, **Nilay Kushawaha**, S. Nazeer, C. Laschi, E. Falotico, ***Under Review (IEEE Robotics and Automation Letters (RAL))***
- Adaptive Drift Compensation for Soft Sensorized Finger Using Continual Learning, **Nilay Kushawaha**, R. Pathan, N. Pagliarani, M. Cianchetti, E. Falotico, ***IEEE Robosoft Conference (2025)***, *Paper link*
- Domain Translation of a Soft Robotic Arm Using Conditional Cycle Generative Adversarial Network, **Nilay Kushawaha**, C. Alessi, L. Fruzetti, E. Falotico, ***IEEE International Conference on Robotic Systems and Applications (2025)***, *Paper link*

Skillset

Programming Languages : Python, C++, Scilab, SQL

AI Skills : Machine Learning, Deep Learning, Continual Learning, Reinforcement Learning, Generative AI, Data-driven Control

Platforms & Misc. : VSCode, Pytorch, Arduino, Basics of Ethical Hacking, ROS 1, Labview, Franka ROS, Scikit-learn, Numpy, Pandas, Github, HTML5, CSS, Latex

Soft Skills: Leadership, Teamwork, Adaptability

Training & Certifications

- Advanced Course on Data Science & Machine Learning (Italy, 2024).
- Fundamentals of Deep Learning (Nvidia, India, 2021).
- 1st Indian Workshop on Artificial Intelligence (IIT Indore, India, 2021).

Organizational & Supervision Activities

- Supervised 6 students on a project for the course "Introduction to Robotics & AI", taught by Dr. Falotico.
- Created 4 hour tutorial video on "Advancements in Continual Learning for Robotics" for the Ebrains-Italy project.
- Student Coordinator, Dept. of Physics, IIT Indore.
- Robotics Club Coordinator, University of Delhi.

Achievements & Awards

- Recipient of Enfield AI Scholarship 2025 for exchange.
- Recipient of full PhD scholarship at Scuola Superiore Sant'Anna.
- Recipient of Ishan Uday undergraduate scholarship for 3 consecutive years.
- Undergraduate 2^{nd} semester examination topper.

Academic Service (Reviewer For)

- ICRA 2026
- IROS 2025
- IEEE Transactions on Neural Networks and Learning Systems
- IOP Measurement Science and Technology

Side Project – (Calorie Tracking App)

CalCal

- Developed a mobile application that estimates calorie content from food images, barcode scans, or manual inputs.
- Implemented features to log and monitor calories burned through selected physical activities.
- Designed an intuitive dashboard summarizing daily and weekly calorie intake and expenditure.