Thilina Hemaka Weerakkody, Ph.D.

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Research Interests

- **Scientific Machine Learning and Cyber-Physical Systems:** Integration of physics-based modeling, control, and data-driven learning to enable reliable, high-performance operation of complex dynamical systems.
- **Mathematical Modeling and Control Theory:** Robust and $\mathcal{L}_1$ adaptive control, system identification, and physics-informed machine learning for nonlinear, hysteretic, and multi-physics actuators.
- **Robotics and Intelligent Automation:** Design, modeling, and control of robotic and mechatronic systems for medical, rehabilitation, and experimental automation applications.
- **Real-Time Sensing, Data Acquisition, and Control:** Development of cyber-physical infrastructures for closed-loop experimentation, system optimization, and autonomous operation.
- **High-Throughput Radiochemistry and Multi-Physics Platforms:** Application of robotic and ML-based frameworks for automated molecular synthesis, imaging, and energy-efficient system design.

Education

2019 - 2024 | **PhD in Mechanical Engineering, University of Iowa, IA.**
Thesis: Design and Control of Artificial Muscles for Robotic Applications
Advisors: Dr. Caterina Lamuta and Dr. Venanzio Cichella

2011 - 2016 | **B.Sc. (Hons.) in Mechanical Engineering, University of Moratuwa, Sri Lanka.**
Second Class-Upper Division (Top 10%)
Thesis: Development and Control of a Modular Artificial Shoulder Prosthetic Device.

2010 | **Diploma in Information Technology (HEQ), British Computer Society (BCS), UK.**
Equivalent to an associate degree in Information Technology.
Relevant Courses: Knowledge-Based Systems, Object-Oriented Programming, Software Engineering, Information Systems, and Network Information Systems.

Employment History

2024 – Pre | **Postdoctoral Scholar, CNSI, University of California Los Angeles, CA.**
Advisor: Prof. R. Michael van Dam
Research focus: High-throughput radiochemistry robotic platform development and optimization, In situ radioactivity measurements in high-throughput radiochemistry.

2019 - 2024 | **Research Assistant, SMMS Lab, University of Iowa, IA.**
Research focus: Novel mechanism design and development, Mathematical and control system modeling, Underwater, rehabilitation, and medical robotic system development and real-time control.

Graduate Teaching Assistant, Mechanical Engineering, University of Iowa, IA.
ME6130: Novel Artificial Muscles & Sensors, *Tutorial/Lab session on MATLAB/Simulink for mathematical modeling in graduate-level research.* ***(Spring 2023-2024)***

Research Engineer, Juggernaut Life Sciences – Funded by NIH, Iowa City, IA.
External collaborator with PhD advisor; responsible for CAD modeling (SOLIDWORKS/Fusion 360), novel mechanism design, and mechanical & control system development for medical robot applications.

2018 - 2019 **Instructor (Assistant Lecturer), Mechanical Engineering, SLIIT, Malabe, Sri Lanka.**
ME2021: Mechanics of Machines, ME2031: Engineering Drawing, ME3531: Solid Mechanics & Mechanical Design, ME3620: Control Systems, ME2541/ME3640: Mechatronics System.

Mechatronics Lab Manager, Mechanical Engineering, SLIIT, Malabe, Sri Lanka.
Projects: Developed lab setups for undergraduate Mechanical/Mechatronics courses.

2016 - 2018 **Research Assistant, Bionics Lab, Mechanical Eng., University of Moratuwa, Sri Lanka.**
Research focus: Designing lower–limb prostheses and an adaptive foot device considering kinematics, dynamics, and 3D print prototyping (Funded by National Research Council grant 15-068).

Graduate Teaching Assistant, Mechanical Eng., University of Moratuwa, Sri Lanka.
ME4700/ME4310: COMSOL multi-physics structural modeling for MEMS/NEMS, ME1802: Introduction to Manufacturing Engineering, ME2160: Automotive transmission system & brake system, ME2040: Fundamentals of Mechatronics, ME2023: Manufacturing Engineering I, ME4462: Automation Systems, TT4162: Control Systems & Applications, ME5124: Automation and Control of Manufacturing Systems (Graduate-level course).

2014 - 2015 **Engineering Internship (6 months), Shin Nippon Air Technologies Co. Ltd., Sri Lanka.**
Refrigeration & Air system designing. On-site MEP Supervision at Aitken Spence Resort Project.

Technical Skills

Mathematical Modeling:	Control System Design, Physics-Based and Data-Driven Modeling, Scientific Machine Learning (SciML), $\mathcal{L}_1$ Adaptive Control, Deep Learning for Dynamical Systems, System Identification.
3D Modelling & Simulation:	SOLIDWORKS, Fusion 360, AutoCAD, COMSOL, ABAQUS (FEA), V-REP/CoppeliaSim, Simscape Multibody, PyBullet, MuJoCo, Gazebo.
Programming & Tools:	MATLAB/Simulink, Python (NumPy, SciPy, PyTorch, TensorFlow), C++, Julia, LabVIEW, ROS/ROS2, Linux, Git, Docker, High-Performance Computing (HPC) for simulation workflows.
Hardware & Data Acquisition:	Arduino, Raspberry Pi, Teensy, National Instruments DAQ, Sensor Fusion, Signal Processing, Real-Time Data Logging, IoT Integration, Networked Robotic Systems.
Control Systems & Robotics:	Robust-Adaptive Control, Model Predictive Control (MPC), System Identification, Kalman Filtering, Observer Design, Robot Kinematics & Dynamics, Motion Planning, Digital Twin Development.
Fabrication & Manufacturing:	Soldering, 3D Printing (FDM & SLA), Molding, Machining, Prototyping.
PCB Design:	EasyEDA, Altium.
Documentation & Graphics:	LaTeX, Microsoft Office, Technical Illustration & Visualization.

Certifications

1. Certificate in Teaching Methodology in Higher Education conducted by Sri Lanka Institute of Information Technology (SLIIT) (August - December 2018).

Awards

2023	Editor's Choice Article in MDPI - Robotics.
2016	Research assistant fellowship, National Research Council, SL. (Grant (15-068))
2016	Dean's List–Semester 8, Undergraduate studies, University of Moratuwa, Sri Lanka.
2009	Higher Distinction, Sri Lankan Mathematics Olympiad High-School Competition.
2008	Higher Distinction, Australian Chemistry High-School Quiz Competition, Sri Lanka.

Professional Membership

2012 – Present	Institute of Electrical and Electronic Engineers (IEEE)–92445858
2016 – Present	Associate Engineer, Institution of Engineers in Sri Lanka, (IESL)
2015 – Present	IEEE Robotics and Automation Society
2018 – Present	IEEE Control Systems Society
2019 – Present	Registered Practitioner, Engineering Council Sri Lanka, (ECSL)–206823
2024 – Present	American Society of Mechanical Engineers, (ASME)–000103812978
2024 – Present	American Institute of Aeronautics and Astronautics, (AIAA)
2024 – Present	Society of Industrial and Applied Mathematics (SIAM)

Peer-review Publications

Journals

1. **Thilina H. Weerakkody**, Elio Matteo Curcio, Giuseppe Carbone, Carmine Maletta, Emanuele Sgambitterra, and Caterina Lamuta, "Robust Control of Shape Memory Alloys for Assistive Robotics Applications", *Journal of Shape Memory and Superelasticity* ***(Accepted)***.

2. Sean Maxson, **Thilina H. Weerakkody**, Maxwell Hammond, Venanzio Cichella, and Caterina Lamuta, "Design of a low-cost continuum soft robotic arm powered by Twisted and Coiled Artificial Muscles (TCAMs)", *ASME Journal of Mechanisms and Robotics* ***(Under-review)***.

3. Rabiu Mamman, **Thilina H. Weerakkody**, and Caterina Lamuta, "Bioinspired Active Vortex Generators for Underwater Flow Control", *Robotics Reports*, 3(1), 26-36, 2025.

4. Rabiu Mamman, Tatum Johnson, **Thilina H. Weerakkody**, and Caterina Lamuta, "Fouling Release Mechanism of an Octopus-Inspired Smart Skin", *Advanced Functional Materials*, p. 2406405, 2024.

5. Sean Maxson, Parth Kotak, **Thilina H. Weerakkody**, and Caterina Lamuta, "Manufacturing and underwater cyclic behavior of different types of twisted and coiled artificial muscles (TCAMs)", *Manufacturing Letters, Elsevier*, 2024.

6. Parth Kotak, Sean Maxson, **Thilina H. Weerakkody**, Venanzio Cichella, and Caterina Lamuta, "Octopus-Inspired Muscular Hydrostats Powered By Twisted and Coiled Artificial Muscles", *Soft Robotics*, 2023.

7. Rabiu Mamman, Parth Kotak, **Thilina H. Weerakkody**, Tatum Johnson, Austin Krebill, James Buchholz, and Caterina Lamuta, "Deployable vortex generators for low-Reynolds-number applications powered by cephalopod-inspired artificial muscles", *iScience*, 26(12), 2023.

8. **Thilina H. Weerakkody**, Maxwell Hammond, James H Neilan, Venanzio Cichella, and Caterina Lamuta, "Modeling and control of twisted and coiled artificial muscles for Soft Robotics", *Meccanica*, 58(4):643–658, 2023.

9. Carlo Greco, **Thilina H. Weerakkody**, Venanzio Cichella, Leonardo Pagnotta, and Caterina Lamuta, "Lightweight Bioinspired Exoskeleton for Wrist Rehabilitation Powered by Twisted and Coiled Artificial Muscles", *Robotics*, 12(1):27, 2023. **(Editor's Choice Article)**

10. Samantha Bell, Arnold Bangel, **Thilina Weerakkody**, Xuan Song, and Caterina Lamuta, "Automated manufacturing system for carbon fiber-based twisted and coiled artificial muscles (TCAMs)", *Manufacturing Letters*, 33:19–23, 2022.

11. Maxwell Hammond, Venanzio Cichella, **Thilina H. Weerakkody**, and Caterina Lamuta, "Robust and adaptive sampled-data control of twisted and coiled artificial muscles", *IEEE Control Systems Letters*, 6:1232–1237, 2021.

12. Parth Kotak, **Thilina H. Weerakkody**, and Caterina Lamuta, "Physics-based dynamic model for the electro-thermal actuation of bio-inspired twisted spiral artificial muscles (TSAMs)", *Polymer*, 222:123642, 2021.

13. **Thilina H. Weerakkody**, Thilina Dulantha Lalitharatne, and R.A.R.C. Gopura, "Adaptive foot in lower-limb prostheses", *Journal of Robotics*, 2017.

Conference Proceedings

1. Rabiu Mamman, **Thilina H. Weerakkody**, and Caterina Lamuta, "Bioinspired Active Vortex Generators for Enhanced Underwater Flow Control," in *ASME 2025 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, 2025.

2. Mahmudul A. Shakib, Zhaolin Gao, **Thilina H. Weerakkody**, Aditya L. Tamilkovan, and Caterina Lamuta, "Geopolymers for Neuromorphic and Piezoelectric Applications," in *ASME 2024 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, 2024.

3. Elio M. Curcio, **Thilina H. Weerakkody**, Emanuele Sgambitterra, Carmine Maletta, Giuseppe Carbone, Venanzio Cichella, Caterina Lamuta, "Adaptive control strategy for SMA-based artificial muscles," in ESOMAT (13th European Symposium on Martensitic Transformation), Lecco, Italy, 26-30 August, 2024.

4. Sean Maxson, Parth Kotak, **Thilina H. Weerakkody**, and Caterina Lamuta, "Soft Tentacles for Underwater Robotics Powered by Twisted and Coiled Artificial Muscles (TCAMs)," in *ASME SMASIS 2023 Austin, TX,*, 11-13 September 2023.

5. **Thilina H. Weerakkody**, Maxwell Hammond, Venanzio Cichella, and Caterina Lamuta, "Dynamic Modelling and Robust Control for Twisted and Coiled Artificial Muscles," in *ASME SMASIS 2022 Dearborn, MI,* 12-14 September 2022.

6. Maxwell Hammond, Venanzio Cichella, **Thilina H. Weerakkody**, and Caterina Lamuta, "Robust and Adaptive Sampled-Data Control of Twisted and Coiled Artificial Muscles," in *2021 IEEE Conference on Decision and Control*, Dec. 2021.

7. **Thilina H. Weerakkody**, Parth Kotak, Mahmudul A. Shakib, and Caterina Lamuta, "Cephalopod-inspired muscular hydrostats from twisted and coiled artificial muscles (TCAMs)," in *ASME 2021 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, 2021.

8. **Thilina H. Weerakkody**, Parth Kotak, and Caterina Lamuta, "Artificial papillae for self-morphing skin: A Dynamic Model," in *Society of Engineering Science*, 2020.

9. Parth Kotak, **Thilina H. Weerakkody**, Casey Harwood, James Buchholz, and Caterina Lamuta, "Boundary Layer Transition Induced by Twisted Spiral Artificial Muscles (TSAMs)," in *ASME 2020 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, 2020.

10. Carlo Greco, **Thilina H. Weerakkody**, Calvin Kielas-Jensen, Venanzio Cichella, Leonardo Pagnotta and Caterina Lamuta, "Lightweight and Anthropomorphic Assistive Robotics from Twisted and Coiled Artificial Muscles," in *Society of Engineering Science (SES) Conference*, 2020.

11. Carlo Greco, **Thilina H. Weerakkody**, Calvin Kielas-Jensen, Venanzio Cichella, Leonardo Pagnotta, and Caterina Lamuta, "Rehabilitation Glove powered by Twisted and Coiled Artificial Muscles," in *ASME SMASIS* 2020.

12. **Thilina H. Weerakkody**, Nirmala N. Liyanaarachchi, H.M. Chinthaka Herath, R.A.R.C. Gopura, and Thilina D. Lalitharatne, "Development of an Active Shoulder Prosthesis with Low-Level Control Validation, " In *Proceedings of the IASTED International Conference Modeling, Identification and Control*, volume 848, pages 194–199, 2017, ACTA Press.

Poster Presentations

1. George Elias, Braeden Harrell, **Thilina H. Weerakkody**, Kirsten M. Anderson, Jason Wilken, Caterina Lamuta, Deema Totah, "Adaptive ankle foot orthoses stiffness powered by artificial muscles", American Society of Biomechanics, Madison, Wisconsin, Aug 5–8, 2024.

2. Sean Maxson, **Thilina H. Weerakkody**, Caterina Lamuta, "Design of a low-cost continuum soft robotic tentacle powered by Twisted and Coiled Artificial Muscles (TCAMs)", Research Open House, CoE UIowa, April 25, 2024.

3. Rabiu Mamman, Tatum Johnson, **Thilina H. Weerakkody**, Caterina Lamuta, "Theoretical model for antifouling performance of bio-inspired smart skin", Research Open House, CoE UIowa, April 25, 2024.

4. George Elias, Marissa McFadden, **Thilina H. Weerakkody**, Braeden Harrell, Kirsten M. Anderson, Jason Wilken, Caterina Lamuta, Deema Totah, "Ankle Foot Orthoses Powered Using Artificial Muscles", Research Open House, CoE UIowa, April 25, 2024.

5. Sean Maxson, Parth Kotak, **Thilina H. Weerakkody**, Caterina Lamuta, "Octopus-inspired Soft tentacles", Research Open House, CoE UIowa, April 20, 2023.

6. **Thilina H. Weerakkody**, Maxwell Hammond, Venanzio Cichella, Caterina Lamuta, "Twisted and Coiled Artificial Muscles Modeling and Control", Research Open House, CoE UIowa, April 15, 2022.

7. **Thilina H. Weerakkody**, Carlo Greco, Venanzio Cichella, Leonardo Pagnotta, Caterina Lamuta, "Wearable rehabilitation glove powered by Twisted and Coiled Artificial Muscles (TCAMs)" in Research Open House 2020.

Talks

1. "Design and Control of Artificial Muscles for Robotic Applications", at the Mechanical Engineering Graduate Seminar at the University of Iowa, February 29, 2024.

2. "Limitless Horizon - Graduate studies in the USA", (virtual) organized by Rotaract club of Alumni of University of Moratuwa, April 01, 2022.

Review Experience

1. IEEE International Conference on Systems, Man, and Cybernetics (SMC), Oct 05- 08, 2017, Banff, Canada. (Reviewed 1 manuscript).

2. 6th IEEE Region 10 Humanitarian Technology Conference 2018 (R10 HTC'18), Dec. 06 - 08, 2018, Sri Lanka. (Reviewed 1 manuscript).

3. American Society of Mechanical Engineers (ASME) - The Journal of Medical Devices Reviewer, 2025 – present. (Reviewed 2 manuscript).
4. American Society of Mechanical Engineers (ASME) - The Journal of Mechanisms and Robotics Reviewer, 2025 – present. (Reviewed 2 manuscripts).
5. MERCon 2025 - Moratuwa Engineering Research Conference, Aug. 14-15, 2025, Sri Lanka. (Reviewed 5 manuscripts).

Pending Patent Disclosures

1. Muhammad Taifur Rahman, Nashwaan Khan, Mahmudul Alam Shakib, Thilina Weerakkody, Ibrahim Razu, Marlan Hasnsen. Semi-Automated Immunolabeling Systems and Associated Devices and Methods. Affiliation: University of Iowa Research Foundation. Appln. No. 19/029,665 - DDB No. 8132910-194890 (Patent Filed)
2. Automated Sample Preparation Device (ASAP Device). *This innovation was designed in collaboration with the Department of Otolaryngology at the University of Iowa to automate the sample preparation process for Immunolabeling. (**Disclosed** with the University of Iowa Research Foundation (UIRF))*

News Coverage

1. Iowa researchers' octopus-like design improves underwater vehicle maneuverability Iowa Now.
2. Rehabilitation glove, The University of Iowa: The Daily Iowan, UIowa–engineering news.
3. Robot Battle 2018–Uwa Wellassa University, Sri Lanka: UWU Link, YouTube Link.
4. SAKURA Science Exchange Program participation (2018), Sri Lanka. Daily Mirror, UOM Link

Competitions

- **IEEE Xtream Programming Competition** — Participated in editions 6.0 (2012), 7.0 (2013), and 8.0 (2014).

Exchange Program Representation

1. Representing Sri Lanka for Japan-Asia Youth Exchange Program in Science (SAKURA) held in January/February 2018, Miyazaki, Japan. Attended the International Conference on Artificial Life and Robotics 2018, held in Beppu, Oita, Japan, from February 1-4, 2018.

Volunteering Experience

2018	Adjudicator-Panelist, **Robot Battle 2018, Uwa Wellassa University, Sri Lanka.**
2017	Exhibitor, **ExMo 2017, University of Moratuwa, Sri Lanka.**
2016	Exhibitor, **Techno 2016, Organized by IESL Sri Lanka.**
2015 – 2015	Assistant Treasurer, **IMechE (UK) Student Chapter, University of Moratuwa, SL.**
2016 – 2022	**Rotaract Club of Alumni of University of Moratuwa, Sri Lanka.**
	2017/18: Vice President.
	2016/17: Community Service Director.
2012 – 2015	**Rotaract Club of University of Moratuwa, Sri Lanka.**

Personal Information

1. Citizenship: Sri Lankan.
2. Visa status in the USA: F-1/STEM–OPT
3. Languages: English (Fluent).

Last Updated – November 4, 2025.