CHAWIN OPHASWONGSE

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EDUCATION

Columbia University New York, NY
Doctor of Philosophy (Ph.D.) in Mechanical Engineering (GPA 4.00/4.00) Jan. 2018 - Oct. 2021
Dissertation: "Design of Wheelchair Robot for Active Postural Support (WRAPS) for Users with Trunk Impairment"
Master of Science (M.S.) in Mechanical Engineering: Robotics and Control (GPA 4.11/4.00) Aug. 2016 - Dec. 2017

Chulalongkorn University Bangkok, Thailand
Bachelor of Engineering (B.E.) in Mechanical Engineering (GPA 3.90/4.00, 1st Class Honors, Gold Medal Award) May 2011 - Jul. 2015

GRANTS AND AWARDS

Individual Postdoctoral Fellowship in Spinal Cord Injury Research 2023 - 2025
New York State Spinal Cord Injury Research Board (SCIRB), New York State Department of Health
Innovative, Developmental, or Exploratory Activities (IDEA) Grant in Spinal Cord Injury 2021 - 2023
New York State Spinal Cord Injury Research Board (SCIRB), New York State Department of Health
Anandamahidol Foundation Scholarship under the Patronage of His Majesty the King of Thailand 2015 - 2021
Unconditional full-ride scholarship for graduate studies, one of just two awarded nationwide in the field of engineering
Academic Excellence in Graduate Studies, M.S. in Mechanical Engineering Class of 2018 2018
Among the top 10% of students with the highest GPAs from a total of $\sim$ 70 students, Columbia University, NY
Gold Medal Award for achieving the highest GPA in the Mechanical Engineering Department ($\sim$100 students) 2015
Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand
Outstanding Senior Project Award: 2nd Place Senior Project out of 41 Projects in the Academic Year 2014 2015
Department of Mechanical Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand
Dean's List throughout undergraduate studies 2011 - 2014
Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand

EXPERIENCE

Robotics And Rehabilitation Laboratory (ROAR Lab), Columbia University New York, NY
Postdoctoral Fellow | Advisor: Sunil K. Agrawal, Ph.D. Oct. 2021 - Oct. 2025
Graduate Research Student Jul. 2016 - Oct. 2021
Main Project: Wheelchair Robot for Active Postural Support (WRAPS) for users with trunk impairments
- Invented robotic torso exoskeletons to assist seated movements for individuals with cervical or thoracic spinal cord injury (SCI)
- Developed a novel robotic mechanism optimization for maximizing human ergonomics and transmission using motion capture
- Led a cross-functional team to build a ROS-integrated VR/AR platform combining Unity-based tasks, seat pressure sensing, haptic interface, and real-time control of the robots for immersive postural training experiments with over 50 human subjects
- Innovated an adaptive impedance control method leveraging Gaussian Mixture Modeling (GMM) and Deep Neural Network (DNN) for reach phase prediction, integrated with custom C++ scripts for closed-loop dynamics and online Lyapunov-based stability regulation
- Implemented teleoperation on robotic exoskeletons using a bilateral impedance controller with a 6-DOF haptic device
- Engineered test rigs with a 6-axis force/torque sensor to validate end-effector wrench estimates from joint torque sensors, achieving <10% error and enhancing reliability of human–robot interaction in integration builds

Regional Center of Robotics Technologies, Chulalongkorn University Bangkok, Thailand
Research Assistant | Advisor: Viboon Sangveraphunsiri, Ph.D. Aug. 2015 - Jun. 2016
Main Project: Upper-limb Rehabilitation Robot for Stroke Patients
- Designed and built a 2-DOF five-bar robot for upper-limb stroke rehabilitation, deployed at King Chulalongkorn Memorial Hospital
- Led mechanical design calculations and CAD modeling in CATIA, achieving sub-millimeter deflection under a 20 kg end-effector load
- Developed a low-impedance torque control in C++ on AC servo motors via low-latency communication using a Sensoray DAQ board

Center of Excellence for Prosthetic and Orthopedic Implant, Chulalongkorn University Bangkok, Thailand
Research Assistant | Advisor: Pairat Tangpornprasert, Ph.D. Jun. 2014 - Jul. 2015
Senior Capstone Research Project: "Design of a Hydraulic Knee Prosthesis Using a Valve Controlling Mechanism"
- Led a 3-person team to design and prototype a low-cost mobile hydraulic system for a passive knee prosthesis, enabling stance-phase locking and swing-phase damping; awarded 2nd place out of 40+ senior projects and published the design in a peer-reviewed journal
- Conducted simulations in MATLAB Simulink to optimize component sizing for off-the-shelf and custom hydraulic elements

Triumph Aviation Services - Asia, Ltd. (TASA) Chonburi, Thailand
Aerospace/Mechanical Engineering Intern, Reverse Engineering Team, Repair Product Line Mar. 2014 - May 2014
- Established a 3D database of mechanical components in Auxiliary Power Units (APUs) using a FARO 3D scanner and reverse engineering software (Polyworks Inspector, Geomagic Design X), ensuring GD&T compliance and adherence to FAA maintenance standards
- Developed a 3D SOLIDWORKS model of an APU shipping stand for in-house handling and transportation

Invited Talks and Presentations

Guest Speaker, Graduate-level Course in Rehabilitation Engineering Oct. 7th 2025
"Design of a Robotic Pelvic Exoskeleton to Enhance Seated Postural Control in Wheelchair Users" Texas, TX
Oral presentation delivered online at University of North Texas (UNT)

Columbia University Postdoctoral Research Symposium May. 3rd 2024
"Training Seated Postural Coordination in a Virtual Reality Reaching Game by Active Pelvic Guidance from New York, NY
a Robotic Exoskeleton", Poster presentation delivered at Columbia University Irving Medical Center

Robotics and Human Health: Assessment and Rehabilitation Workshop Jun. 2nd 2023
"Design and Kinematic Validation of a Robotic Exoskeleton for Assisting Seated Pelvic Movements by Wheelchair Users Sousse, Tunisia
with Trunk Impairments", Oral presentation delivered online at the University of Sousse

Tikkun Olam Makers (TOM) Talks: Medical Design Mar. 15th, 2021
"Wheelchair Robot for Active Postural Support (WRAPS) for Users with Impairment of the Trunk" New York, NY
Oral presentation delivered online as collaboration between Pratt Institute and Columbia University

IEEE International Conference on Robotics and Automation (ICRA), 2020 Jun. 3rd, 2020
"Optimal Design of a Novel 3-DOF Orientational Parallel Mechanism for Pelvic Assistance on a Wheelchair" Paris, France
Oral presentation delivered online at the fully virtual conference

NYS Spinal Cord Injury Research Symposium 2018 Oct. 16th, 2018
"Wheelchair Robot for Active Postural Support (WRAPS) for SCI Patients" New York, NY
Poster presentation delivered at The Rockefeller University

ASME 41st Mechanisms and Robotics Conference, 2017 Aug. 8th, 2017
"Design of a Parallel Architecture Robotic Spine Exoskeleton with Series Elastic Actuators", Oral presentation Cleveland, OH

Conference Proceedings

[1] **C. Ophaswongse**, P. M. Puma, I. Daley, V. Santamaria, and S. K. Agrawal, "Training Seated Postural Coordination in a Virtual Reality Reaching Game by Active Pelvic Guidance from a Robotic Exoskeleton," in *Proceedings of the 2024 10th IEEE RAS/EMBS International Conference for Biomedical Robotics and Biomechatronics (BioRob)*, Heidelberg, Germany: IEEE, Sep. 2024, pp. 1655–1662. DOI: 10.1109/BioRob60516.2024.10719943.

[2] **C. Ophaswongse**, V. Lent, and S. K. Agrawal, "Kinematic Validation of a Robotic Exoskeleton for Assisting Seated Pelvic Movements by Wheelchair Users with Trunk Impairments," in *Proceedings of the 2022 9th IEEE RAS/EMBS International Conference for Biomedical Robotics and Biomechatronics (BioRob)*, vol. 2022-Aug, Seoul, Korea, Republic of: IEEE, 2022, pp. 1–6. DOI: 10.1109/BioRob52689.2022.9925527.

[3] **C. Ophaswongse**, R. Murray, and S. Agrawal, "Design of a parallel architecture robotic spine exoskeleton with series elastic actuators," in *Proceedings of the ASME 2017 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC)*, vol. 5A: 41st Mechanisms and Robotics Conference, Cleveland, OH, USA, Aug. 2017. DOI: 10.1115/DETC2017-67842.

Journal Publications

[4] **C. Ophaswongse** and S. K. Agrawal, "Optimal Design of a Novel 3-DOF Orientational Parallel Mechanism for Pelvic Assistance on a Wheelchair: An Approach Based on Kinematic Geometry and Screw Theory," *IEEE Robotics and Automation Letters*, vol. 5, no. 2, pp. 3315–3322, Apr. 2020. DOI: 10.1109/LRA.2020.2975720.

[5] R. C. Murray, **C. Ophaswongse**, J. Park, and S. K. Agrawal, "Characterizing Torso Stiffness in Female Adolescents With and Without Scoliosis," *IEEE Robotics and Automation Letters*, vol. 5, no. 2, pp. 1634–1641, Apr. 2020. DOI: 10.1109/LRA.2020.2969945.

[6] **C. Ophaswongse**, R. C. Murray, V. Santamaria, Q. Wang, and S. K. Agrawal, "Human Evaluation of Wheelchair Robot for Active Postural Support (WRAPS)," *Robotica*, vol. 37, no. 12, pp. 2132–2146, Dec. 2019. DOI: 10.1017/S0263574719000948.

[7] R. C. Murray, **C. Ophaswongse**, and S. K. Agrawal, "Design of a Wheelchair Robot for Active Postural Support," *Journal of Mechanisms and Robotics*, vol. 11, no. 2, pp. 20 911–20 919, Feb. 2019. DOI: 10.1115/1.4042544.

[8] S. Keeratihattayakorn, C. Virulsri, **C. Ophaswongse**, and P. Tangpornprasert, "Design and evaluation of a hydraulic mechanism with available components for passive knee prostheses," *Disability and Rehabilitation: Assistive Technology*, pp. 1–8, Sep. 2019. DOI: 10.1080/17483107.2019.1642396.

[9] **C. Ophaswongse**, R. C. Murray, and S. K. Agrawal, "Wrench Capability of a Stewart Platform With Series Elastic Actuators," *Journal of Mechanisms and Robotics*, vol. 10, no. 2, pp. 21 002–21 008, Jan. 2018. DOI: 10.1115/1.4038976.

Professional Associations

- American Society of Mechanical Engineers (ASME): Member
- Institute of Electrical and Electronics Engineers (IEEE): Member

Editorial Work

Journal/Conference Manuscript Reviewer   2017 – Present
- IEEE Robotics and Automation Letters (RA-L), 2025
- Disability and Rehabilitation: Assistive Technology, 2025
- Robotica, 2024
- ASME Journal of Mechanisms and Robotics (JMR), 2024
- ASME International Mechanical Engineering Congress & Exposition (IMECE), 2024
- IEEE International Conference for Biomedical Robotics and Biomechatronics (BioRob), 2024
- IEEE Transactions on Neural Systems and Rehabilitation (TNSRE), 2024
- IEEE Transactions on Biomedical Engineering (TBME), 2024
- IEEE Transactions on Neural Systems and Rehabilitation (TNSRE), 2023
- IEEE Robotics and Automation Letters (RA-L), 2023
- ASME 47th Mechanisms and Robotics Conference (MR), 2023
- IEEE International Conference on Robotics and Automation (ICRA), 2023
- IEEE Robotics and Automation Letters (RA-L), SI: Intelligent Human-Robot Interaction for Rehabilitation and Physical Assistance, 2018
- IEEE Robotics and Automation Society (RAS) 18th International Conference on Humanoid Robots (Humanoids), 2018
- IEEE International Conference on Intelligent Robots and Systems (IROS), 2017

Volunteer and Outreach Activities

Mentorship for a high school student from Edgemont Jr./Sr. High School, Scarsdale, NY   Summers 2024 – 2025
- Mentored student in developing PTInspect, an AR-based rehabilitation tool integrating Unity/C#, real-time motion tracking, and CAD-designed custom hardware to support therapist-assisted reach training
- Guided on system architecture, prototyping iterations, calibration methodology, and technical alignment with clinical rehab goals
- Student received IBM Visionary Engineer Award (WESEF) and 3rd place at GENIUS Olympiad; pursuing Regeneron STS submission

Tikkun Olam Makers (TOM): Columbia University Makeathon, New York, NY   Feb. 21st – 23rd, 2020
- Led hardware design, CAD, and fabrication in a 3-day rapid prototyping challenge to create assistive technology under $500
- Collaborated with a multidisciplinary team—including engineers, a product manager, an occupational therapist, and a quadriplegic "need-knower" with Charcot–Marie–Tooth (CMT) condition—to co-design user-centered solutions
- Built a 5-DOF tabletop robot capable of brush-based kanji character rendering; awarded "Most Innovative Project" among six teams

Mentorship for a high school student from the Bronx High School of Science, Bronx, NY   2017 - 2018
- Supervised development of Posture Monitoring Shirt (PoMS): a comfortable shirt that utilizes Machine Learning to generate posture-defining coordinate transforms based on electrical resistance from stretch sensors
- Student mentee achieved the top 300 scholars in the Regeneron Science Talent Search through this project
- Filed an invention report to the Columbia Technology Ventures Office

NSF STEM Outreach Internship Program with Marymount High School, New York, NY   Summer 2018
- Collaborated with a science teacher and mentored two high school students who are interested in robotics and its human applications as part of Grant NSF IIS-1527087, Dynamic Braces for Quantification and Treatment of Abnormal Curves in the Human Spine
- Guided hardware and software preparation for a posture training experiment using Robotics Spine Exoskeleton (RoSE)

Hk Maker Lab Internship for a high school student from Francis Lewis High School, Fresh Meadows, NY   Summer 2017
- Supervised development of spring-loaded modules for an unpowered RoSE for potential treatment of adolescent idiopathic scoliosis
- Instructed robotic fundamentals and prototype development, including mechanical design, CAD, electronics, and 3D printing

References

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