SOUMITRA SITOLE

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SUMMARY

Robotics researcher with expertise in real-time control, human–robot interaction, teleoperation, and rehabilitation robotics. Experienced in developing and deploying robotic systems integrating haptic feedback, assistive force control, multimodal sensing, and human-in-the-loop control strategies. Research spans EMG-driven interfaces, ROS-based simulation and hardware validation, robot-assisted rehabilitation, and imitation-learning pipelines for robotic manipulation. Strong track record of translating research concepts into functional robotic systems through software development, experimental validation, and human-subject studies.

EXPERIENCE

Postdoctoral Research Associate

Neuromotor Systems Lab, Northeastern University Jan 2026 – Present

- Designed and implemented real-time controllers for haptic device-based teleoperation of a Barrett WAM rehabilitation robot, including therapist-guided assistive force control with and without programmed trajectories.
- Designed and prototyped human-to-robot attachment interfaces for robot-assisted locomotor rehabilitation.
- Implemented locomotor training controller architectures using admittance and impedance strategies.
- Built and led human-in-the-loop data-collection workflows and studies to capture and model physical assistance strategies through human and robotic interventions.

Postdoctoral Research Associate

Elaine Marieb Center for Nursing & Engineering Innovation (EMCNEI), UMass Amherst Dec 2024 – Oct 2025

- Developed a bimanual imitation-learning platform based on open-source projects for recording manipulation policies from human demonstrations to capture high-quality demonstration data for learning-based control.
- Evaluated a commercial imitation-learning system for fine-grained manipulation tasks, assessing demonstration efficiency and task performance for nursing and healthcare applications.
- Explored robotic and automation solutions for reducing workload and improving workflow efficiency in healthcare settings.

Postdoctoral Research Associate

Mechatronics & Robotics Research Lab (MRRL), UMass Amherst Dec 2023 – Oct 2025

- Continued the UMass–Honda R&D (Japan) collaboration on hybrid state- and bioelectrical-sensor-based motion prediction for humanoid robot teleoperation.
- Designed experimental protocols and led human data-collection studies for EMG–IMU fused motion prediction.
- Evaluated and trained neural-network architectures for reduced-latency teleoperation control.
- Supported real-time deployment of prediction and control pipelines on the Honda Avatar robot.

Graduate Research Assistant

Mechatronics & Robotics Research Lab (MRRL), UMass Amherst Jun 2017 – Dec 2023

- Proposed and developed deep-learning approaches for real-time latency reduction in human–robot teleoperation using electromyography (EMG).
- Led the UMass–Honda collaboration on EMG-supported teleoperation.
- Developed real-time inverse-kinematics estimation for robot teleoperation from wearable position trackers.
- Designed and developed the actuation system for fluid-powered gait assistance system.
- Designed and built custom VR lighthouse motion-capture trackers for human kinematics; evaluated lighthouse precision on a 7-DOF industrial robot arm.

Research Intern

Honda Research Institute, Japan Feb 2019 – May 2019

- Developed simulation and ROS pipelines for direct teleoperation of humanoid robots.
- Developed a real-time ROS package using a TCP/IP socket for real-time EMG sensor-data acquisition.
- Built a teleoperation pipeline using the XSens motion-capture suit and tested it on the ASIMO humanoid robot; reviewed motion-prediction and intent-recognition strategies for shared control.

Engineering Intern
TATA Motors, India Jun 2015 – Jul 2016

- Designed, tested, and characterized an electromagnetic clutch for cabin-cooling in start-stop hybrid electric vehicles.

EDUCATION

- **Ph.D., Mechanical Engineering —** University of Massachusetts Amherst (GPA 3.7) 2018 – 2023
- **M.S., Mechanical Engineering (Dynamic Systems & Controls) —** University of Massachusetts Amherst (GPA 3.7) 2016 – 2018
- **B.E., Mechanical Engineering (Design) —** University of Pune, First Class with Distinction 2012 – 2016

TECHNICAL SKILLS

Primary languages: Python, MATLAB, C, C++

Robotics / control: ROS, CAN, OpenSim, Simulink

Hardware / design: Embedded systems & microcontroller programming, motion capture, 3D printing, FEA, PTC Creo, SolidWorks, ANSYS, AutoCAD, SteamVR/Unity

PATENTS

Operation System and Operation Method (United States)
T. Yoshiike, C. Garry, F. C. Sup IV, S. P. Sitole, M. A. Price
U.S. Patent No. 12,115,686 B2 — issued October 15, 2024
Assignees: Honda Motor Co., Ltd. & University of Massachusetts Amherst · Priority: JP2021-096183 (filed June 8, 2021)

Operation System and Operation Method (Japan)
T. Yoshiike, C. Garry, F. C. Sup IV, S. P. Sitole, M. A. Price
Japan Patent No. 7603935 B2 — issued December 23, 2024
Assignee: Honda Motor Co., Ltd. · Application JP2021-096183 (filed June 8, 2021)

PUBLICATIONS & POSTERS

Journal Articles

Application and Evaluation of Lighthouse Technology for Precision Motion Capture
S. P. Sitole, A. K. LaPre, F. C. Sup
IEEE Sensors Journal, 20(15):8576–8585, 2020

Continuous Prediction of Human Joint Mechanics using EMG Signals: A Review of Model-based and Model-free Approaches
S. P. Sitole, F. C. Sup IV
IEEE Trans. Medical Robotics and Bionics, 5(3):528–546, 2023

Conference & Posters

Temporal Structure and Adaptation of Therapist-Applied Gait Assistance
S. P. Sitole, J. Manczurowsky, J. P. Whitney, C. J. Hasson
Society for the Neural Control of Movement (NCM), Poster, 2026

Force Transmission in Non-Uniform Fluid Flow by Controlling Vortices
R. Bose, A. Carleton, S. Sitole, Y. Modarres-Sadeghi, F. C. Sup
IEEE Int. Conf. on Advanced Intelligent Mechatronics (AIM), pp. 434–439, 2024

In Preparation / Under Review

Robotic Augmentation of Physical Therapists for Locomotor Rehabilitation
S. P. Sitole, P. Whitney, R. Reiner, C.J. Hasson
IEEE Trans. Of Neural Systems and Rehabilitation Engineering (in progress)

Lead-Aligned EMG Supervision for Continuous Anticipatory Upper-Limb Kinematics Prediction
S. P. Sitole, C. Obayashi, F. C. Sup IV
IEEE Trans. Medical Robotics and Bionics (under review)

Hybrid Deep-Learning and Model-based Approaches for Improved Motion Prediction using EMG
S. P. Sitole, T. Yoshiike, F. C. Sup IV
IEEE Trans. Biomedical Engineering (in progress)

Design Optimization of Custom Wearable Trackers using Lighthouse Technology
S. P. Sitole, S. Lee, F. C. Sup IV
IEEE Sensors (in progress)

PROJECTS

- **Telerobotic rehabilitation system controller** *(Neuromotor Systems Lab, Northeastern, 2026–present)* — real-time C++ control stack for therapist-guided haptic teleoperation of the Barrett WAM; implemented nudge-based assistive force control, a runtime step-target display system, and frame-synchronized live/baseline/normalized feedback.
- **Bimanual imitation-learning system** *(EMCNEI, UMass-Amherst, 2025–2026)* — commercial and custom dual-arm platforms for recording human manipulation demonstrations and replaying learned policies on fine-grained manipulation tasks; supported manipulation jig design and prototyping for evaluating manipulation performance, assessed task performance for nursing and healthcare applications
- **Supported teleoperation** *(Honda R&D, Tokyo, 2019–2025)* — EMG&IMU fused sensing pipeline with deep-learning motion-prediction models to provide intent-aware shared control for humanoid robot teleoperation; trained and evaluated neural-network architectures for reduced-latency control and validated on the Honda Avatar robot.
- **Direct teleoperation** *(Honda Research Institute, Tokyo, 2019–2021)* — full-body motion-capture-driven teleoperation using XSens inertial suit and HTC VIVE lighthouse tracking with real-time IK solvers for joint-space mapping; validated pipeline on the ASIMO humanoid robot.
- **Fluid-powered manipulation for gait assistance** *(MRRL, UMass-Amherst, 2020–2021)* — designed and built a fluid-powered actuation system for assistive/rehabilitative gait forces (with the Fluid–Structure Interactions Lab, UMass).
- **Sensorized prosthetic alignment read-out** *(FTL Labs, 2017–2021)* — instrumented alignment system with inverse-kinematics-based joint-variable quantification on a phantom prosthetic limb.
- **Propeller-levitated arm** *(2023)* — designed and implemented real-time adaptive closed-loop control for an underactuated propeller-levitated arm.

AWARDS & CERTIFICATIONS

- NSF I-Corps Award Recipient, 2025
- FAA Part 107 / TRUST (Recreational UAS Safety Test), 2022
- PTC Creo Parametric for Design Engineers (PTC University), 2015