Shivani Kiran Kamtikar

Webpage | LinkedIn | Google Scholar | Email

EDUCATION

University of Illinois at Urbana-Champaign May 2022 - *Dec 2026 (expected)*
Doctor of Philosophy (Ph.D.) in Computer Science, Advisor - Prof. Girish Chowdhary
Relevant Courses - Robot Learning, 3-D Vision, Transfer Learning, Meta Learning

Master of Science in Computer Science (MSCS), Advisor - Prof. Girish Chowdhary *May 2022*
Relevant Courses - Machine learning, Computer Vision, Learning-Based Robotics, Autonomous Systems and Robots

Savitribai Phule Pune University *August 2020*
Bachelor of Technology in Information Technology

PUBLICATIONS

Conference/Journal (in order of relevance)

- **S. K. Kamtikar,** Chung Hee Kim, Joshua Migdal, Camilla Tabasso, Tye Brady, Taskin Padir, *"TACTFUL: Tactile-Driven Exploration For Object Localization and Identification in Confined Environments",* under review
- **S. K. Kamtikar**, K. Koe, J. Wasserman, S. Marri, B. T. Walt, N. K. Uppalapati, G. Krishnan, and G. Chowdhary, "*HyReach: Vision-Guided Hybrid Manipulator Reaching in Unseen Cluttered Environments",* under review
- C. H. Kim, **S. K. Kamtikar**, T. Brady, T. Padir, J. Migdal, "Grasp, Slide, Roll: Comparative Analysis of Contact Modes for Tactile-Based Shape Reconstruction", **ICRA 2026**
- **S. K. Kamtikar**, S. Marri, B. T. Walt, N. K. Uppalapati, G. Krishnan, and G. Chowdhary, *"Visual servoing for pose control of soft continuum arm in a structured environment"*, **IEEE Robotics and Automation Letters (RA-L), and IEEE International Conference on Soft Robotics (RoboSoft) 2022 - oral presentation**
- K. Koe, S. Marri, B. Walt, **S. K. Kamtikar**, N. K. Uppalpati, G. Krishnan, G. Chowdhary, *"Learning-Based Position and Orientation Control of a Hybrid Rigid-Soft Arm Manipulator"*, **Asme Journal of Mechanics and Robotics 2025**
- K. Koe, P. K. Shah, B. Walt, J. Westphal, S. Marri, **S. K. Kamtikar**, J. S. Nam, N. K. Uppalapati, G. Krishnan, G. Chowdhary, *"Precision Harvesting in Cluttered Environments: Integrating End Effector Design with Dual Camera Perception"*, **ICRA 2025**

Workshop

- **S. K. Kamtikar**, K. Koe, S. Marri, B. Walt, N. K. Uppalpati, G. Krishnan, G. Chowdhary, *"Visual Servoing for Pose Control of Hybrid Continuum Manipulator in an Unstructured Environment"*, CoRL 2023 Workshop on Learning for Soft Robots
- **S. K. Kamtikar**, E. Ji, N. K. Uppalapati, G. Krishnan, and G. Chowdhary, *"Realistic Simulation Environments to Achieve Visual Servoing on Soft Continuum Arms in Constrained Environments"* - Fourth International Workshop on Machine Learning for Cyber-Agricultural Systems (MLCAS) 2022
- **S. K. Kamtikar**, S. Marri, B. T. Walt, N. K. Uppalapati, G. Krishnan, and G. Chowdhary, *"Towards Autonomous Berry Harvesting using Visual Servoing of Soft Continuum Arm"* - AI for Agriculture and Food Systems (AIAFS) workshop 2022

WORK EXPERIENCE

Applied Scientist II Co-op, Amazon Robotics - Dr. Taskin Padir Jan 2025 - July 2025

- Developed a real-world, vision-free autonomous tactile exploration framework enabling anthropomorphic manipulators to localize and identify objects in confined environments

- Designed a learned policy combining behavior cloning and reinforcement learning (RL) for autonomous tactile exploration using tactile point clouds
- performed object identification using a dynamic reward schedule to balance global exploration and local interaction for 3D reconstruction of object geometry
- Demonstrated lower Chamfer distances, higher success, and improved reconstruction accuracy compared to baseline methods
- Advanced the use of tactile sensing as a primary perception modality for robotic manipulation

RESEARCH EXPERIENCE

Diffusion-Based Path Planning of Hybrid Continuum Manipulators in Confined Spaces

- Designed a diffusion-based generative planner that models feasible backbone trajectories of a hybrid soft–rigid manipulator, conditioned on scene geometry and goal constraints
- Developed a unified, shape-aware motion planning framework that produces low-strain, collision-free, and goal-aligned motion in confined spaces
- Fine-tuned the diffusion model with online RL, enabling smooth adaptation to real-world dynamics and hardware variability
- Created a learned shape-to-actuation controller that maps the configuration manifold of the hybrid continuum arm to physically realizable control inputs

Contact-Driven Planning for Hybrid Manipulators using Vision Language Models (VLMs)

- Developed a VLM-guided contact-aware planning framework for hybrid soft–rigid manipulators, enabling robots to identify bracing/wrapping surfaces and intentionally leverage obstacles
- Designed a diffusion-based motion generator conditioned on VLM-predicted contact affordances, producing short hybrid-arm trajectories for confined-space manipulation
- Enabled extension of robot workspace through bracing or wrapping, lower actuator strain, and improved stability near obstacles
- Increased potential for contact-based manipulation tasks like sliding, pushing, or lifting

3D Vision-Guided Autonomous Manipulation of Hybrid Robots in Cluttered, Unstructured Environments

- Novel approach demonstrating real-time, open-world object reaching using rigid-soft continuum manipulators in complex, unstructured environments
- Enabled obstacle avoidance through 3D reconstruction and shape-informed path planning
- Developed a path planner paired with shape estimation using a Constant Curvature model, eliminating the need for expensive sensors
- Developed a novel learned controller that is capable of successfully actuating the hybrid arm system into any pose for manipulation with an accuracy of 98%.

Learning-Based Manipulation of Soft Robotic Arms in a Structured Environment

- Developed a deep neural network-based method for robust 3D positioning of soft robotic arms using vision
- Developed a network to predict controls required for desired target poses, leveraging visual feedback from a camera mounted at the distal end of the arm
- Devised a proportional control law that utilizes visual feedback to minimize the error between desired and current poses
- Demonstrated the model's transferability to new environments with minimal effort, showcasing an adaptable and scalable robotic system
- Achieved state-of-the-art performance in manipulation of soft robotic arms with translation error less than 2 cm and rotation error less than 0.25 rad

TEACHING

Teaching Assistant - Prof. Lana Lazebnik Jan 2026 - May 2026
- CS102 Little Bits to Big Ideas

Teaching Assistant - Prof. Lana Lazebnik Sep 2020 - Dec 2020
- CS498 Introduction to Deep Learning

TECHNICAL SKILLS

Research Areas: Robotics (Tactile Sensing, Reinforcement Learning, Imitation Learning, Visual Servoing, Soft Robotics, Robot Manipulation), 3D Computer Vision (SLAM, 3D Reconstruction, RGB-D Fusion), Generative Models (Diffusion Models, Vision Language Models (VLMs), Transformers) for Robot Planning

Programming and Tools: Python, PyTorch, ROS, ROS2

CONFERENCE/JOURNAL REVIEWER

IEEE Robotics and Automation Letters (RA-L)

IEEE International Conference on Robotics and Automation (ICRA)

21st IEEE India Council International Conference (INDICON)-2024

INVITED TALKS

- Future Leaders of Robotics and AI Seminar Series, at the University of Maryland, College Park - 2025
- Fourth International Workshop on Machine Learning for Cyber-Agricultural Systems (MLCAS) - 2022
- AI for Agriculture and Food Systems (AIAFS) workshop - 2022
- Illinois Autonomous Farms (IAF) Workshop, UIUC - 2021

PATENTS

- Patent granted by the Indian Patent Office for final-year undergraduate project on “Indian Sign Language Recognition”

AWARDS AND RECOGNITION

- Award recipient of Future Leaders of Robotics and AI, University of Maryland, College Park - 2025
- Award recipient of the Student Leadership Award (GIANT Award) by the IDEA Institute - 2025
- Received "Best Outgoing Student Award" awarded by Savitribai Phule Pune University, Pune, India
- Awarded a grant of 11000 USD from IBM for a final-year undergraduate project - 2021
- Awarded a full scholarship from iSURE - International Student Undergraduate Research Experience - 2021

LEADERSHIP EXPERIENCE

- GradSWE Director 2025-2026
- weSTEM 2025 Director
- Computer Science Representative at the Engineering Graduate Student Advisory Council (EGSAC), UIUC - 2023-2024
- General Chair for CSL Student Conference 2024
- Robotics Chair for CSL Student Conference 2023