AARYA SUMUK

+1-408-426-6961 | asumuk@stanford.edu | aarya-sumuk

EDUCATION

Stanford University *Expected June 2026*
Master of Science - *Robotics Track* GPA: 4.20*/4.00
Coursework: Principles of Robot Autonomy | Robot Perception | Deep Learning for Computer Vision

Indian Institute of Technology Madras *July 2024*
Bachelor of Technology in Mechanical Engineering CGPA: 9.34/10.00
Coursework: Mechatronics | Pattern Recognition and Machine Learning | Foundations of Data Science

RESEARCH EXPERIENCE AND PROJECTS

Bimanual Robotic Assembly with Contact-Rich Manipulation *Stanford, USA*
Interactive Perception and Robot Learning Lab (IPRL), *Prof. Jeannette Bohg* *May 2025 – Present*
- Built full **teleoperation + data pipeline** for dual Franka arms using **Oculus** and a custom **OSC controller**
- Implemented self and **dual-arm collision avoidance strategies** for safe, reactive bimanual motion
- Trained and deployed **diffusion**, **SERL** and **HIL-SERL** policies for contact-rich assembly
- Investigating **NIST board tasks** with IL + residual RL using **force cues and active perception**

Learning Actionable Affordances from Pairwise Human Preferences *Stanford, USA*
CS329H Machine Learning from Human Preferences, *Prof. Sanmi Koyejo* *Oct 2025 – Present*
- Curating **preference data** on **Grounded-SAM segmentations** to identify grasp-relevant affordances
- Training a lightweight **vision-mask ranker** to score **actionable regions** for robotic manipulation

Lightweight 3D Inpainting for Cultural Heritage Restoration Using Diffusion Models *Stanford, USA*
CS231N Deep Learning for Computer Vision, *Prof. Fei Fei Li* *Apr 2025 - Jun 2025*
- Built a two-stage **vision pipeline** with **2D U-Net mask prediction** and **3D diffusion inpainting**
- Trained a **3D diffusion model** with composite losses (**BCE, L1, perceptual**) for geometry optimization
- Achieved **3× better Chamfer distance (0.0031)** and **55% higher F-score (0.846)**, with **PSNR = 27 dB**

Haptic Interface Design for Robot Proprioception and Control *Stanford, USA*
Collaborative Haptics and Robotics in Medicine Lab (CHARM), *Prof. Allison Okamura* *Sep 2024 – Apr 2025*
- Engineered a wearable **haptic feedback system** with dual linear actuators for **force and motion sensing**
- Developed real-time mapping from **IMU orientation** to actuator response for proprioceptive experiments
- Integrated **motion capture and flex sensors** to benchmark feedback accuracy and latency

Real-Time 6D Pose Estimation for Robotic Assembly (LEGO Case Study) *Odense, Denmark*
Elite Robotics Summer School, University of Southern Denmark, *Prof. Henrik Gordonsson* *Aug 2025*
- Developed **6D pose estimation** pipelines using **YOLO + SAM**, **PnP + ICP**, and deep learning regression
- Trained a **ResNet regression network** on synthetic + real data with translation and rotation losses
- Achieved **30+ brick poses in <3s** with **1.2 cm error**, validated via **ADD/ADD-S** for robotic grasping

RoboDelivery: A Q-Learning Approach to Autonomous Package Distribution *Stanford, USA*
- Implemented **Q-learning** with epsilon-greedy approach for **autonomous warehouse robot** navigation
- Developed a 500-state Markov Decision Process model for dynamic package pickup and delivery tasks

PUBLICATIONS

1. **Sumuk A.**, Khan Q. "A Sensing Device For Real-Time Road Condition Monitoring". In 2023 IEEE Asia Pacific Conference On Postgraduate Research In Microelectronics And Electronics ,India, Nov 2023.
2. **Sumuk A.**, Martinez K. B., Rouhani H. "3D Modelling of Human Hand Using Instrumented Gloves". In 2023 Annual Alberta Biomedical Engineering Conference, Banff, Canada, Oct 2023.

TEACHING & LEADERSHIP

- **Lead TA** for **Principles of Robotic Autonomy I**, managed ROS2-based labs and mentored 200+ students
- TA for **Robot Dexterity**, supported **manipulation, impedance control, and tactile sensing** modules

TECHNICAL SKILLS

1. **Robotics Control:** ROS2, MuJoCo, Gazebo, Franka FR3; trained + deployed IL+RL policies on real robots
2. **ML & Vision:** PyTorch, OpenCV, YOLO, SAM, Grounded DINO, Diffusion Models, SERL
3. **Programming Languages:** Python, C/C++, Bash