RAUNAQ BHIRANGI

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EDUCATION

Carnegie Mellon University - School of Computer Science 2018 - present
PhD in Robotics *(Expected 2025)* GPA: 4.06 / 4.33
MS in Robotics *(Graduated 2020)*

Relevant Coursework: Probabilistic Graphical Models (10-708), Deep Reinforcement Learning (10-703), Computer Vision (16-720), Advanced ML (10-716), Planning and Decision-Making in Robotics (16-782)

Indian Institute of Technology Bombay 2014 - 2018
B.Tech (Hons) in Mechanical Engineering; Minor in Computer Science GPA: 9.45 / 10.00

Relevant Coursework: Systems Theory (SC625), Nonlinear Dynamics and Chaos (PH542), Analytical and Geometric Dynamics (SC618), Design Optimization (ME782)

RESEARCH INTERESTS

Robot Learning, Tactile Sensing, Graphical Models, Representation Learning, Robot control

My objective is to become a proficient full-stack roboticist, equally adept at understanding both the hardware and software algorithms that synergistically create remarkable robots.

PUBLICATIONS

Bhirangi, R., et al., 2023, October. All the Feels: A Dexterous Hand with Large-Area Sensing. To appear in *IEEE Robotics and Automation Letters 2023* (RA-L 2023).

Bhirangi, R., Hellebrekers, T., Majidi, C. and Gupta, A., 2021, November. Reskin: versatile, replaceable, lasting tactile skins. In *2021 Conference on Robot Learning* (Oral presentation: **Top 6.2%**).

Bhirangi, R., 2020, August. Learning Families of Behaviors for Legged Locomotion using Model-Free Deep Reinforcement Learning. Master's Thesis.

Sundaram, V., H., **Bhirangi, R.**, Rentschler, M., Gupta, A. and Hellebrekers, T., 2023, April. DragonClaw: A low-cost pneumatic gripper with integrated magnetic sensing. In *2023 IEEE International Conference on Soft Robotics* (RoboSoft 2023).

Whitman, J., **Bhirangi, R.**, Choset, H. and Travers, M., 2020, February. Modular Robot Design Synthesis with Deep Reinforcement Learning. In *Thirty Fourth AAAI Conference on Artificial Intelligence*.

Kent, N., **Bhirangi, R.**, Travers, M. and Howard, T., 2020, May. Inferring Task-Space Central Pattern Generator Parameters for Closed-loop Control of Underactuated Robots. In *2020 IEEE International Conference on Robotics and Automation (ICRA)*. IEEE.

Bhirangi, R., & Sangwan, V. (2018, November). Motion Planning for Handspring Maneuver Using a Two Link Robot. In *ASME International Mechanical Engineering Congress and Exposition* (Vol. 52033). ASME.

Skills

Programming Languages Python, C/C++
Software and Frameworks PyTorch, TensorFlow, JAX, ROS, Mujoco, PyBullet, MATLAB, CAD

Research Experience

CMU-FAIR AI Mentorship Program, Meta AI May 2022 - present
Visiting Researcher
Mentor: Tess Hellebrekers

Analyzing tactile data across various systems and tasks to learn effective tactile and visuotactile representations, and benchmark performance along different axes: neural architectures, sensors, supervision etc

Visual and Robot Learning Lab, Carnegie Mellon University Aug 2020 - present
Graduate Research Assistant
Advisors: Prof. Abhinav Gupta and Prof. Carmel Majidi

Designing hardware and learning algorithms for ReSkin: a magnetic elastomer-based tactile skin (CoRL 2021, Oral). Currently focusing on large area sensing and representation learning for manipulation using ReSkin. The D'Manus – an open-sourced 3D printable hand with large area ReSkin sensing (RA-L, 2023).

Biorobotics Lab, Carnegie Mellon University Sep 2018 - Aug 2020
Graduate Research Assistant
Advisors: Prof. Howie Choset and Prof. Matthew Travers

Legged Robots: Embedded stable oscillator vector fields in neural network policies to enable end-to-end learning of frequency-modulated families of behavior using deep reinforcement learning. Applied graphical inference to condition robot locomotive behavior on sensory measurements of surrounding terrain.

Modular Robot Design: Used deep Q networks (DQNs) to direct a best-first graph search over the space of serial robot designs for workspace-constrained design of modular robots

Teaching Experience

Carnegie Mellon University

Teaching Assistant, *Probabilistic Graphical Models (10-708)* Spring 2021
Head Teaching Assistant, *Underactuated Robots (16-748)* Fall 2020

Indian Institute of Technology Bombay

Teaching Assistant, *Microprocessors and Automatic Control Lab (ME 310)* Spring 2018
Teaching Assistant, *Linear Algebra (MA 106)* Spring 2017

Mentorship and Service

SCS Graduate Application Support Program Fall 2021
Department Lead

Organized a mentoring program matching existing students to students applying to the graduate programs at the Robotics Institute for feedback on their applications

CMU AI Mentorship Program 2021 - present
Student Mentor

Reviewer 2021 - present
IROS, ICRA, RA-L, CoRL, Soft Robotics, NeurIPS

CMU SCS Dean's Advisory Committee 2020 - 2021
Committee Member

Served on a committee reporting to Dean Martial Hebert to discuss challenges faced by graduate students in the School of Computer Science. Drafted an open letter "Towards Anti-Racist Change in the School of Computer Science" aimed at improving representation from underrepresented groups as part of the Anti-Racism Group.

Student Mentorship Program, Indian Institute of Technology Bombay 2016 - 2018
Student Mentor

Mentored 24 freshmen and sophomores to facilitate their transition to college life and help address academic issues. Conducted and contributed to Basic Computer Learning sessions for freshmen new to computers