RAUNAQ BHIRANGI

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EDUCATION

Carnegie Mellon University - School of Computer Science 2018 - present
PhD in Robotics *(Expected 2024)*
MS in Robotics *(Graduated 2020)* GPA: 4.06 / 4.33

Relevant Coursework: Probabilistic Graphical Models (10-708), Deep Reinforcement Learning and Control (10-703), Computer Vision (16-720), Advanced Machine Learning (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)

AREAS OF INTEREST

Robot Learning, Tactile Sensing, Graphical Models, Representation Learning, Optimization, Dynamical Systems

PUBLICATIONS

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

Bhirangi, R., et al. (2023, May). All the Feels: A Dexterous Hand with Large-Area Sensing. Submitted to IEEE International Conference on Robotics and Automation (ICRA 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.

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.

SKILLS

Programming Languages Python, C/C++
Software and Frameworks PyTorch, TensorFlow, ROS, Gazebo, Mujoco, PyBullet, MATLAB, AutoCAD, SolidWorks, MAPLE

Research Experience

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

Developing learning algorithms for human-to-robot policy transfer using ReSkin tactile data from sensorized wearable gloves to robotic grippers

Visual and Robot Learning Lab, Carnegie Mellon University
Graduate Research Assistant Aug 2020 - present
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 focused 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 submitted to ICRA 2023.

Biorobotics Lab, Carnegie Mellon University
Graduate Research Assistant Sep 2018 – Aug 2020
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

Indian Institute of Technology Bombay Aug 2017 – May 2018
Undergraduate Researcher
Advisor: Prof. Vivek Sangwan

Implemented a shooting method for motion planning of handspring maneuvers of a two-link robot in simulation

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 SCS Dean's Advisory Committee 2020 - 2021
Committee Member

Served on a committee reporting to Dean Martial Hebert to discuss problems and challenges faced by graduate students in the School of Computer Science

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