

RAUNAQ BHIRANGI

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EDUCATION

Carnegie Mellon University - School of Computer Science

2018 - present

PhD in Robotics

MS in Robotics

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), Convex Optimization (10-725), 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, Probabilistic Inference, Representation Learning, Deep Reinforcement Learning, Optimization, Dynamical Systems

PUBLICATIONS

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

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.

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

RESEARCH EXPERIENCE

Visual and Robot Learning Lab, Carnegie Mellon University

Graduate Research Assistant

2020 - present

Advisors: Prof. Abhinav Gupta and Prof. Carmel Majidi

Developing 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.

Biorobotics Lab, Carnegie Mellon University

Graduate Research Assistant

2019 - 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

2017 - 2018

Undergraduate Researcher

Advisor: Prof. Vivek Sangwan

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

Dynamics and Acoustics Laboratory, Ohio State University

Summer 2017

Summer Research Intern

Advisors: Prof. Rajendra Singh, Dr. Luke Fredette

Developed an experimental identification scheme for high frequency characterization of vibration isolators using the Spectral Element Method in conjunction with Timoshenko beam theory for flexural dynamics

Multiscale Robotics Automation Laboratory, Purdue University

Summer 2016

Summer Research Intern

Advisors: Prof. David Cappelleri, Dr. Daniel McArthur

Built AgBug, a centimeter-scale agricultural surveillance robot prototype capable of data transmission and control over Wi-Fi with a ROS-based code framework for differential drive and multi-sensor interfacing

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

ROLES OF RESPONSIBILITY

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

Mood Indigo, Indian Institute of Technology Bombay

Fall 2015

Coordinator – Web, Creatives and Assistance

Contributed to the development and management of the official website, which had over 5 million hits

SKILLS

Programming Languages C/C++, Python

Software and Frameworks PyTorch, TensorFlow, ROS, Gazebo, Mujoco, PyBullet, MATLAB, AutoCAD, SolidWorks, MAPLE

OTHER INTERESTS

Hiking, reading, debate, cultural and political history, and sports