



Department of Computer Science

Robot Learning with Sparsity and Scarcity

Jingxi Xu
Columbia University

Hosted by: Kasthuri Jayarajah

Date: Wednesday, January 29, 2025
Coffee: 2:15 PM – 2:30 PM
Time: 2:30 PM – 3:30 PM
Location: GITC 4402 (4th floor Seminar Lecture Hall)

Zoom Link: <https://njit-edu.zoom.us/j/91363947764?pwd=bjbvksq2YlJ5hqErxWf1v4F27DhkiY.1>

Meeting ID: 913 6394 7764
Passcode: 981752

Abstract:

Unlike in language or vision, one of the fundamental challenges in robot learning is the lack of access to vast data resources. We can further break down the problem into (1) data sparsity from the angle of data representation and (2) data scarcity from the angle of data quantity. During my Ph.D., I have been working extensively on two domains: (1) tactile sensing and (2) rehabilitation robots, which are exemplars of data sparsity and scarcity, respectively. Tactile sensing is an essential modality for robotics, but tactile data are often sparse, and for each interaction with the physical world, tactile sensors can only obtain information about the local area of contact. I will discuss my work on learning vision-free tactile-only exploration and manipulation policies through model-free reinforcement learning to make efficient use of sparse tactile information. On the other hand, rehabilitation robots are an example of data scarcity to the extreme due to the significant challenge of collecting biosignals from disabled-bodied subjects at scale for training. I will discuss my work in collaboration with the medical school and clinicians on intent inferral for stroke survivors, where a hand orthosis developed in our lab collects a set of biosignals from the patient and uses them to infer the activity that the patient intends to perform, so the orthosis can provide the right type of physical assistance at the right moment. My work develops machine learning algorithms that enable intent inferral with minimal data, including semi-supervised, meta-learning, and generative AI methods.

Bio:

Jingxi Xu is a fifth-year Ph.D. in Computer Science at Columbia University, co-advised by Professor Matei Ciocarlie and Shuran Song. He received his bachelor's degree from The University of Edinburgh, with First Class Honours and Class Medal (overall grade ranks first in class), and he received an MS from Columbia, where he worked closely with Professor Peter Allen. At Columbia, he is a recipient of the CA fellowship and the Andrew P. Kosoresow Memorial Award for Excellence in Teaching and Service. He also spent some time as a research intern at Boston Dynamics AI Institute and as a visiting student at MIT and the University of Pennsylvania (GRASP Lab). His research develops autonomous systems with novel hardware and efficient machine-learning algorithms that understand humans, work efficiently and reliably with humans, or are part of humans. Jingxi has published at many robotics conferences/journals, including RA-L, ICRA, CoRL, IROS, CASE, L4DC, VR, and BioRob, including a best paper finalist award at BioRob 2022.