



JOHNS HOPKINS
BIOMEDICAL ENGINEERING

BME Virtual Seminar Series

Elham Azizi, PhD

Assistant Professor
Columbia University

Monday, November 15th, 2021
1:30 p.m.
Held via Zoom

Faculty host: Jean Fan



Machine Learning for Modeling Dynamics in the Tumor Microenvironment

Abstract: Cancer therapies succeed only in a subset of patients partly due to the heterogeneity of cells across and within tumors. Recent genomic and imaging technologies that measure features at the resolution of single cells and in the context of the tissue, present exciting opportunities to characterize unknown cell types in the complex tumor microenvironment, and elucidate their circuitry and role in driving response to therapies. However, analyzing and integrating single-cell data across patients, time-points, and data modalities involves significant statistical and computational challenges. I will present a set of machine learning methods developed to address problems such as handling sparsity and noise, distinguishing technical variation from biological heterogeneity, inferring underlying circuitry, and tackling limitations of clinical experimental design. I will also present novel biological insights obtained from applying these methods to multiple cancer systems. These results include continuous phenotypic expansion of immune cells when interfacing with breast tumors, and detecting key T cell subsets with divergent temporal dynamics that define response to immunotherapy in leukemia.

Bio: Elham joined Columbia in January 2020 as the Herbert and Florence Irving Associate Professor of Cancer Data Research in the Irving Institute for Cancer Dynamics and an Assistant Professor of Biomedical Engineering. She is also affiliated with the Department of Computer Science, Data Science Institute, and the Herbert Irving Comprehensive Cancer Center. Elham holds a BSc in Electrical Engineering from Sharif University of Technology, and an MSc in Electrical Engineering and a PhD in Bioinformatics from Boston University. She was a postdoctoral fellow in the Dana Pe'er Lab at Columbia University and Memorial Sloan Kettering Cancer Center. Her multidisciplinary research utilizes novel machine learning techniques and single-cell genomic and imaging technologies to study the dynamics and circuitry of cells in the tumor microenvironment. She is a recipient of the the Tri-Institutional Breakout Prize for Junior Investigators, NIH NCI Pathway to Independence Award, and an American Cancer Society Postdoctoral Fellowship.