



Department of Mathematics
香港城市大學
City University of Hong Kong

DEPARTMENT OF MATHEMATICS

City University of Hong Kong

Multiscale spatiotemporal reconstruction of single-cell genomics data

by



Professor Qing NIE

*Department of Mathematics
Department of Developmental and Cell Biology
NSF-Simons Center for Multiscale Cell Fate Research
University of California, Irvine*

Date: 10 May 2023 (Wednesday)

Time: 4:00 – 5:00 pm

Venue: Y5-305 (Yeung Kin Man Academic Building)

ABSTRACT

Cells make fate decisions in response to dynamic environments, and multicellular structures emerge from multiscale interplays among cells and genes in space and time. The recent single-cell genomics technology provides an unprecedented opportunity to profile cells. However, those measurements are taken as static snapshots of many individual cells that often lose spatiotemporal information. How to obtain temporal relationships among cells from such measurements? How to recover spatial interactions among cells, such as cell-cell communication? In this talk I will present our newly developed computational tools that dissect transition properties of cells and infer cell-cell communication based on nonspatial single-cell genomics data. In addition, I will present methods to derive multicellular spatiotemporal pattern from spatial transcriptomics datasets. Through applications of those methods to several complex systems in development, regeneration, and diseases, we show the discovery power of such methods and identify areas for further development for spatiotemporal reconstruction of single-cell genomics data.

~ALL ARE WELCOME~

Short Bios

Dr. Qing Nie is a Chancellor's Professor of Mathematics, Developmental and Cell Biology, and Biomedical Engineering at University of California, Irvine. Dr. Nie is the director of the NSF-Simons Center for Multiscale Cell Fate Research jointly funded by NSF and the Simons Foundation – one of the four national centers on mathematics of complex biological systems. In research, he uses systems biology and data-driven methods to study complex biological systems with focuses on single-cell analysis, multiscale modeling, cellular plasticity, stem cells, embryonic development, and their applications to diseases. Dr. Nie has published more than 200 research articles. In training, Dr. Nie has supervised more than 50 postdoctoral fellows and PhD students, with many of them working in academic institutions. Dr. Nie is a fellow of the American Association for the Advancement of Science, a fellow of American Physical Society, and a fellow of Society for Industrial and Applied Mathematics.