



## Systems Learning of Single Cells



Professor Qing Nie  
Department of Mathematics  
Department of Developmental and Cell Biology  
The NSF-Simons Center for Multiscale Cell Fate Research  
University of California, Irvine

Date : 24 March 2026 (Tuesday)  
Time : 2:30 pm  
Venue : Room 1122, William M W Mong Engineering Building, CUHK

### **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. While single-cell omics data provides an unprecedented opportunity to profile cellular heterogeneity, the technology requires fixing the cells, often leading to a loss of spatiotemporal and cell interaction information. How to reconstruct temporal dynamics from single or multiple snapshots of single-cell omics data? How to recover interactions among cells, for example, cell-cell communication from single-cell gene expression data? I will present a suite of our recently developed computational methods that learn the single-cell omics data as a spatiotemporal and interactive system. Those methods are built on a strong interplay among systems biology modeling, dynamical systems approaches, machine-learning methods, and optimal transport techniques. The tools are applied to various complex biological systems in development, regeneration, and diseases to show their discovery power. Finally, I will discuss the methodology challenges in systems learning of single-cell data.

### **Biography**

Dr. Qing Nie is a University of California Presidential Chair and UCI Excellence in Teaching Chair, and a Distinguished Professor of Mathematics and Developmental & Cell Biology at University of California, Irvine. In research, Dr. Nie 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 260 research articles, with more than 50 articles in CNS journals. In 2025, Dr. Nie was ranked #1 based on the data analytics of publications and citations by ScholarGPS in the Highly Ranked Scholar list for two areas: Single-cell Transcriptomics and Transcriptomics Technologies, for the prior five years. In training, Dr. Nie has supervised more than 60 postdoctoral fellows and PhD students, with many of them working in academic institutions now. Dr. Nie is a fellow of the American Association for the Advancement of Science (AAAS), a fellow of American Physical Society (APS), a fellow of Society for Industrial and Applied Mathematics (SIAM), and a fellow of American Mathematical Society (AMS).

\*\*\* ALL ARE WELCOME \*\*\*

*For enquiries, please contact Ms. Joyce Chan, Department of Biomedical Engineering at 3943 8278*