2024 MYRA SAMUELS MEMORIAL LECTURE

MODELING COMBINATORIAL GENE REGULATION FROM SINGLE-CELL MULTI-OMICS DATA

Professor Wing Hung Wong holds the Stephen R. Pierce Family Goldman Sachs Professorship in Science and Human Health, as well as professorships in Statistics and Biomedical Data Science at Stanford University. Renowned for his groundbreaking contributions to theoretical statistics, Bayesian statistics, and bioinformatics, Professor Wong has illuminated numerous fields with his research. He has received numerous honors and awards, including membership in the National Academy of Sciences USA in 2009, the COPSS Award in 1993, the COPSS Distinguished Achievement Award and Lectureship in 2021, and the Grace Wahba Award and Lectureship in 2023. Additionally, he has been a founding member of the Academy of Sciences of Hong Kong since 2015 and an Academician of Academia Sinica since 2010. Professor Wong has guided the academic journey of over 45 Ph.D. students and mentored nearly 30 postdoctoral scholars.

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Advances in single-cell technology have enabled the generation of a amount of single cell omics data covering many different cellular states. The systematic analysis of this data should help to clarify the gene regulatory networks governing different cell types and cellular states. Nonetheless, prevailing methods often fail to account for the combinatorial co-regulation by multiple transcription factors (TFs). In this talk, we introduce an approach to model TF combinatorial regulation based on single-cell data on gene expression and chromatin accessibility. Our method can identify distinct TF combinatorial modules along with their associated regulatory elements as well as target genes. These modules can be regarded as the re-usable functional modules that are components of the cell type-specific gene regulatory networks.

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