



Stanford Center for Cancer Systems Biology
2025 Seminar Series

DECODING CANCER HETEROGENEITY THROUGH MULTI-MODAL BIOMEDICAL DATA

WITH

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Cancer is a highly heterogeneous disease. Despite recent advancements in therapeutic strategies, clinical responses vary significantly among patients. In non-small-cell lung cancer, for instance, the objective response rate to immune checkpoint inhibitors ranges from 15% to 45%, indicating that only a subset of patients benefits from these treatments. Identifying reliable biomarkers to predict treatment response can optimize healthcare resources, reduce unnecessary exposures to side effects, and improve patients' quality of life. Current available methods have enabled us to measure cancer heterogeneity through multi-modal and multi-omics biomedical data. However, harnessing the complementary strengths of these datasets still represents a challenge due to their high dimensionality and the presence of missing data modalities. To tackle these challenges, our research focuses on developing bioinformatics tools and AI models to identify clinically relevant disease phenotypes. Key contributions include: (1) SEQUOIA (Nature Communications, 2024), a vision transformer model that predicts transcriptomic profiles from H&E-stained whole-slide images across 16 cancer types; (2) GBM360 (Nature Communications, 2023), a deep-learning framework that integrates spatial transcriptomics and H&E-stained histology images to elucidate spatial cellular architectures associated with glioblastoma prognosis; and (3) EpiMix (Cell Reports Methods, 2023), a bioinformatics tool for population-level analysis of DNA methylation and gene expression data. This talk will further cover our insights derived from spatial molecular technologies, including multiplex imaging (CODEX), Visium and CosMx. By driving computational advancements, we harness the power from (epi)genomics, transcriptomics and medical imaging data to decode tumor heterogeneity at molecular, tissue and patient levels.

Friday, April 18, 2025

Clark Center, S360, 3rd Floor

11:00 AM - 12:00 PM

Refreshments will be provided

