

# Kevin Lin

*Postdoctoral Researcher*

*University of Pennsylvania  
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**Thursday,  
January 12, 2023**

**In Person**

**Olmsted Hall Rm 1429**

*D.V. Gokhale Classroom*

**@3:45pm-4:45pm**

*Light Refreshments will be provided  
in Olmsted Hall Rm 1331 @ 3:15pm*

*Hybrid Option Available via [Zoom](#)*

*Meeting ID: 965 7109 4889*

*Passcode: 913463*

**Department of Statistics  
Special Colloquium**



**“TILTED-CCA: QUANTIFYING  
COMMON AND DISTINCT INFORMATION  
IN MULTI-MODAL SINGLE-CELL DATA  
VIA MATRIX FACTORIZATION”**

# Abstract

Recently, multi-modal single-cell data has been growing in popularity in many areas of biomedical research and provides new opportunities to learn how different modalities coordinate within each cell. Many existing dimension reduction methods for such data estimate a low-dimensional embedding that captures all the axes of variation from either modality. While these current methods are useful, we develop the Tilted-CCA in this talk to perform a fundamentally different task. This method is a novel matrix factorization that estimates low-dimensional embeddings separating the axes of variation shared between both modalities (i.e., "common geometry," capturing the coordination between both modalities) from axes of variation unique to a particular modality (i.e., "distinct geometry"). Methodologically, Tilted-CCA achieves this by combining ideas from Canonical Correlation Analysis (CCA) and density clustering. Our method first uses the nearest-neighbor graphs from each modality to infer the common geometry between both modalities and decomposes the canonical scores from CCA to approximate this geometry. Biologically, Tilted-CCA unveils the cellular dynamics in developmental systems based on the proportion of variation between the common and distinct embeddings. More broadly, Tilted-CCA invites new theoretical questions regarding dimension reduction and can be applied to any domain beyond single-cell genomics.

# Biography

Kevin Lin is a current Postdoctoral Researcher at the University of Pennsylvania's Wharton Department of Statistics & Data Science with Dr. Nancy Zhang. He completed his Ph.D. at Carnegie Mellon University's Department of Statistics & Data Science under Dr. Kathryn Roeder and Dr. Jing Lei. His research focuses on studying cellular mechanisms from single-cell data. He develops novel methods using ideas from matrix factorization, network modeling, and changepoint detection to derive new theoretical and biological insights.