**University of California, Irvine**
**Statistics Seminar**

*Investigating Spatial Omics Data*
*with StarTrail and STimage-1K4M*

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**6011 Donald Bren Hall**

Spatial omics technologies revolutionize studies of tissue functions. However, existing methods fail to capture localized, sharp changes characteristic of critical events such as tumor development. We present StarTrail, a gradient based method that powerfully defines rapidly changing regions and detects "cliff genes", genes exhibiting drastic expression changes at highly localized or disjoint boundaries. StarTrail, filling important gaps in current literature, enables deeper insights into tissue spatial architecture. We also introduce STimage-1K4M, a comprehensive dataset designed to bridge this gap by providing transcriptomic features for sub-tile images. STimage-1K4M contains 1,149 images and 4,293,195 pairs of sub-tile images and gene expressions. STimage-1K4M offers unprecedented granularity, paving the way for a wide range of advanced research in multi-modal data analysis.