UCRIVERSITY OF CALIFORNIA STATISTICS DEPARTMENT SEMINAR

Dr. Kathryn Roeder

Departments of Statistics & Data Science and Computational Biology Carnegie Mellon University

Tuesday November 28th, 2023

REMOTE SEMINAR

Talk: 3:45-4:45pm

Zoom Option Meeting ID: 980 1514 3936 Passcode: 186649



"INFERENCE AND MODELING FOR SINGLE-CELL CRISPR SCREENS"

<u>Abstract</u>

CRISPR is a genome engineering technology that has enabled scientists to precisely manipulate and perturb human genomes. Single-cell CRISPR screens combine genome

engineering and single-cell sequencing to survey the effects of DNA alterations in individual cells. These experiments have generated substantial interest in recent years, promising advances such as gene editing to accelerate medical research. However, single-cell CRISPR screens pose considerable statistical challenges, currently limiting the power and interpretability of conclusions drawn. These statistical challenges include high dimensionality and non-Gaussianity of the data, which arise even for two-sample contrasts. We develop methods for performing valid statistical tests in the single-cell data settings. In addition to developing reliable pairwise gene comparisons, we also investigate high-dimensional tests that compare the whole transcription profile simultaneously. In the statistical literature, most effort has been spent on enhancing the power of tests, but we find interpretability is an important component, which is especially crucial because single-cell sequencing involves hundreds or thousands of genes. Our methods provide the users with rigorous results and also a sparse estimate of how each gene contributes to a positive rejection.

Biography

Dr. Kathryn Roeder is currently the UPMC Professor of Statistics and Life Sciences in the Departments of Statistics & Data Science and Computational Biology. She earned her Ph.D. in statistics at Pennsylvania State University, after which she was on the faculty at Yale University for the six years before joining CMU in 1994. In 1997 she received the COPSS Presidents' Award for the outstanding statistician under age 40 and the Snedecor Award for outstanding work in statistical applications. In 2020 she was awarded the COPSS Distinguished Achievement Award and Lectureship. She is an elected fellow of the American Statistical Association and the Institute of Mathematical Statistics. In 2019 she was inducted into the National Academy of Sciences.

