Séminaire de Probabilités et Statistique

Mardi 19 septembre 2023 à 14h00
Salle de conférences

Franck Picard
ENS Lyon

Kernel-Based Testing for Single-Cell Differential Analysis

Single-cell technologies have provided valuable insights into the distribution of molecular features, such as gene expression. However, comparing these complex distributions in a controlled and powerful manner poses methodological challenges. Here we propose to benefit from the kernel-testing framework to compare the complex cell-wise distributions of molecular features in a non-linear manner based on their kernel embedding. Our framework not only allows for feature-wise analyses but also enables global comparisons. By using a classifier to discriminate cells based on the variability of their embedding, our method uncovers heterogeneities in cell populations that would otherwise go undetected. We show that kernel testing overcomes the limitations of differential analysis methods dedicated to single-cell. In this presentation we will introduce the basic concepts of kernel methods and kernel-based inference, with a particular emphasis on the maximum mean discrepancy and the kernel Fisher Discriminant analysis. Kernel testing is applied to investigate the reversion process of differentiating cells and also to identify a subpopulation of untreated breast-cancer cells that exhibit an epigenomic profile similar to post-chemotherapy resistant cells.