

Séminaire de Probabilités et Statistique

Mardi 17 avril à 14h00

Laboratoire Dieudonné

Salle de Conférences

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*Statistical learning of disease progression models : discovering
the dynamics of neurodegenerative pathologies*

The increasing availability of large collections of medical data offers a tremendous opportunity for improving the understanding of neurodegenerative disorders, as well as for better prediction and quantification of the pathology in unseen individuals. To this end, we need novel statistical approaches for the joint modelling of the relationship between brain imaging, biological, and clinical biomarkers across the disease evolution. In this talk I will give an overview of recent statistical analysis methods for the integration and analysis of heterogeneous information in Alzheimer's disease, with an application to disease progression modeling. I will illustrate a probabilistic approach for the estimation of the long-term evolution of biomarkers from short-term time-series of individual's measurements in clinical trials. Thanks to this method we can provide a biologically plausible statistical description of the evolution of the pathology across the whole disease time-span, as well as remarkable diagnostic performances when testing on large clinical cohorts in a clinical trial setting. Moreover, I will discuss the problem of translating complex learning methods in natural science, to provide interpretable solutions. To this end I will propose a novel methodology for constraining the solution of a learning framework to plausible dynamics, represented for example by monotonicity constraints, or by mechanistic behaviours introduced by systems of ordinary differential equations.