Séminaire de Probabilités et Statistique

Mardi 21 novembre à 14h00

Salle de conférences

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Koopman operator paradigm for data-driven dynamical systems: bridging linear algebra statistical machine learning and neuroscience

In recent years the Koopman operator paradigm has emerged as a powerful framework for analyzing and understanding complex dynamical systems across various fields. This talk will delve into the key concepts and applications of the Koopman operator in the context of data-driven dynamical systems, and show the recent progress in developing statistical learning theory for the problem of estimating Koopman operators from data. In particular we will illustrate how powerful concepts from linear algebra give spark to novel methods in machine learning, and how both could transform research in other scientific fields, such as neuroscience.

We will begin by introducing the Koopman operator and its spectral decomposition highlighting how it can be used to interpret the underlying dynamics of nonlinear systems. Next we will explore the integration of machine learning techniques such as kernel methods and deep learning into the Koopman framework for data-driven modeling and prediction. Finally, in the second part of the talk will focus on how Koopman based models can be employed to study neural systems, decode brain dynamics and gain insights into cognitive processes.

This talk aims to inspire collaborative research efforts and foster a deeper understanding of data-driven dynamical systems in the context of complex biological and mathematical phenomena.