Programme des Leçons Jacques-Louis Lions 2020 données par Dejan Slepčev du 2 au 5 juin 2020 (tel que prévues avant leur report dû à l'épidémie de Covid 19)

La sixième édition des Leçons Jacques-Louis Lions aura lieu du 2 au 5 juin 2020.

Données par Dejan Slepčev (Université Carnegie Mellon, Pittsburgh), les Leçons Jacques-Louis Lions 2020 comprendront :

– **un mini-cours**
Variational problems on random structures: analysis and applications to data science
mardi 2, mercredi 3 et jeudi 4 juin 2020 de 11h30 à 13h
(la salle sera précisée ultérieurement),

– **et un colloquium**
Machine learning meets calculus of variations
vendredi 5 juin 2020 de 14h à 15h
(la salle sera précisée ultérieurement).

Résumé du mini-cours
Variational problems on random structures: analysis and applications to data science

Many machine learning tasks, such as clustering, regression, classification, and dimensionality reduction, are commonly described as optimization problems. Namely these tasks are modeled by introducing functionals, defined using the available random sample, which specifies the desired properties of the object sought.

While the data typically lie in a high dimensional space, they usually have an intrinsic low-dimensional structure that makes the learning tasks feasible. The intrinsic geometric structure is often encoded by a graph created by connecting the nearby data points.

The lectures will discuss a mathematical framework suitable for studies of asymptotic properties of variational problems posed on random samples and related random geometries (e.g. proximity graphs). In particular we will discuss the passage from discrete variational problems on random samples to their continuum limits. We will also consider approaches based on dynamics on graphs and connect these with the evolution equations describing the continuum limits.

Résumé du colloquium
Machine learning meets calculus of variations

Modern data-acquisition techniques produce a wealth of data about the world we live in. Extracting the information from the data leads to machine learning tasks such as clustering, classification, regression, dimensionality reduction, and others. These tasks

are often described as optimization problems by introducing functionals that specify the desired properties of the object considered. The functionals take as the input the available data samples, yet we seek to make conclusions about the true distribution of data.

To compare the outcomes based on finite data and the ideal outcomes that one would have if full information is available, we study the asymptotic properties of the discrete optimization problems based on finite random samples. We will discuss how the tools of the calculus of variations and partial differential equations provide tools to compare the discrete and continuum descriptions for many relevant functionals. Furthermore, we will highlight how the connection between the discrete and continuum functionals can be used to improve the modeling of learning tasks on finite data.

Adresse de la page web des Leçons Jacques-Louis Lions 2020 (Dejan Slepčev) :

https://www.ljll.math.upmc.fr/lecons-jacques-louis-lions-2020-dejan-slpecev