

Mirimanoff Lectures 2018

Thursday, October 18 2018



Ronald Coifman (Yale University)

Sciences III (1S 081)
(Quai Ernest-Ansermet 30, Geneva)

16h00-16h50: **High dimensional data Organization and Analysis.**

We'll describe a range of ideas and mathematical tools needed for the analysis and processing of complex data and data transformations, whether in physical situations, such as in acoustic scattering or in the context of massive biological or medical data files. In particular, the construction of various geometries that enable efficient intrinsic data representations. These topics are at the heart of machine learning, mathematical analysis, geometry and statistics. In particular we will illustrate applications to molecular dynamics, cryo EM, image processing.

16h50-17h10: Coffee break

17h10-18h00: **Harmonic Analytic Geometry on subsets in high dimensions "Empirical models" of dynamics.**

Our goal here a recent evolution of Harmonic Analysis to generate analytic tools for the combined geometric organization of the of subsets of \mathbb{R}^n , with the analysis of functions and operators restricted to these subsets. In this analysis we establish a duality between the geometry of functions and the geometry of the space. The methods are used to automate various analytic organizations, as well as to enable informative data analysis. These tools extend to higher order tensors, to combine dynamic analysis of changing structures. In particular we view these tools as necessary to enable automated empirical modeling, in which the goal is to model dynamics in nature, {ab initio}, through observations alone. We will illustrate applications in mathematics, such as natural dual geometries of eigenvectors, or automated analysis of integral operators (generalizing Calderon Zygmund theory), followed by scientific applications to psychological questionnaires , physical dynamical systems, as well neuronal dynamics.

18h00-19h00: Reception