NOMATEN SEMINAR

Tuesday, FEBRUARY 8th 2022 13:00 (1.00PM CET)

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Functional Data Analysis of DNA Molecular Dynamics

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Abstract:

An important problem in contemporary biophysics is that of understanding the mechanical/dynamical properties of DNA strands, and linking them to base-pair sequence composition. Since moving DNAcannot (yet) be reliably "video recorded" experimentally, scientists rely on molecular dynamics simulations obtained by numerically solving atomic level interaction models. These are extraordinary in their computational and mathematical complexity, and often are not amenable to the extraction of interpretable dynamics in some idealised smooth limit. The following statistical challenge presents itself: can one infer qualitative informationby empirical observation of a molecular dynamics DNA trajectory, and indeed link it to the DNA base-pair sequence composition by means of some quantification of its statistical significance? Can this be done with minimal or no structural assumptions on the nature ofthe dynamics (such as linearity or Gaussianity)? We will attempt to answer some of these questions by means of a functional time series framework, where one is precisely interested in probing the dynamical structure of sequences of random curves on the basis of a realisation of a finite stretch of such a sequence (based on joint work with S. Tavakoli).

Bio:

Victor Michael Panaretos (born 1982) is a Greek mathematical statistician. He is currently Professor and Director at the Institute of Mathematics of the EPFL, where he holds the Chair of Mathematical Statistics.

Panaretos received his PhD from the University of California, Berkeley in 2007, advised by David R. Brillinger. His doctoral thesis was awarded the Erich Lehmann Award. Upon graduation he took up a faculty position at EPFL, becoming the youngest person ever to be appointed to a Chair at the

institution. He is an Elected Member[6] of the International Statistical Institute and a Fellow [7]of the Institute of Mathematical Statistics. He was a recipient of an ERC Starting Grant Award in 2010, and the 2019 Bernoulli Society Forum Lecturer.

An active member of the Bernoulli Society and its parent organization, the International Statistical Institute, Panaretos has served the probability and statistics community from several posts, notably as the Editor of Bernoulli News, a member of the ISI Council,[11] and as President-Elect of the Bernoulli Society.