



North-East and Midlands Stochastic Analysis Seminar
supported by the London Mathematical Society

Organisers:

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Department of Mathematical Sciences, Durham University
Online Seminar-Zoom ID: 7424753864, 13 January 2021

Talks

9:15-10:15: **Terry Lyons (Oxford)**

Structure theorems for information in streamed data

10:15-10:30: Break

10:30-11:30: **Sarah Geiss (TU Berlin)**

Sharpness of Lengart's domination inequality and a sharp monotone version

11:30-11:45: Break

11:45-12:45: **Shige Peng (Shandong)**

Distributional uncertainty of data and the corresponding limit behaviours under nonlinear expectations

All are welcome and please use your real name with affiliation when joining the Zoom. If you have any queries, please contact Chunrong Feng (chunrong.feng@durham.ac.uk) or Huaizhong Zhao (huaizhong.zhao@durham.ac.uk)



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Terry Lyons (Oxford)

Title: Structure theorems for information in streamed data

Abstract: A basic question is to understand the space of real valued functions on the space of unparametrized path segments. I will explain that there are atomic ways to uniquely factor the space of "polynomial" functions on streams into two parts, a potentially expensive to compute information tensor, and a space of quick to compute polynomial functions on this informative tensor. The approach is atomic in the sense that the information in an atom from the tensor can be computed from the data without having to compute the full information. This makes the result of great potential value for situations where dimension is critical. The proofs are pure algebra.

We explain that hall integrals, and hall areas are examples of uniquely informative tensors.

This work is primarily that of Cris Salvi with support from Joscha Diehl, Terry Lyons, Rosa Preiß, Jeremy Reizenstein.

Sarah Geiss (TU Berlin)

Title: Sharpness of Lenglart's domination inequality and a sharp monotone version

Abstract: We prove that the best so far known constant c_p of a domination inequality, which originates to Lenglart, is sharp. In particular, we solve an open question posed by Revuz and Yor in "Continuous Martingales and Brownian Motion" (1999). Motivated by the application on maximal inequalities, like e.g. the Burkholder-Davis-Gundy inequality, we also study the domination inequality under additional assumptions. In this special case, we can considerably improve the constant c_p . The talk is based on joint work with Michael Scheutzow.

Shige Peng (Shandong)

Title: Distributional uncertainty of data and the corresponding limit behaviours under nonlinear expectations

Abstract: The notion of nonlinear i.i.d. (independent and identically distributed) can be widely applied to calculate and quantitatively analyze probabilistic and distributional uncertainty hidden behind a real world (possibly high-dimensional) data sequence. Two fundamentally important nonlinear distributions are maximal and nonlinear normal, naturally associated to the 1st and second order (fully nonlinear heat equation). The corresponding nonlinear law of large numbers and central limit theorem are crucial and fundamental in this research domain. A typical application is a basic algorithm named " ϕ -max-mean".

This new theoretical framework is a natural extension of the axiomatic probability theory founded by Kolmogorov (1933). The key point is the nonlinearity of the operator of expectations. It is the nonlinearity that allows us to quantitatively measure the uncertainty of probabilities and probabilistic distributions inhabited in the data.