Professor Peter Imkeller

title:

A Fourier analysis based new look at integration

The stochastic approach of Kolmogorov's equation by Itô created a new type of integral not covered by classical theory. The concept had to take into account the erratic structure of the trajectories of stochastic processes of diffusion type. Lyons' rough path analysis led to a pathwise understanding of this challenge. In 1961, Ciesielski established a remarkable isomorphism of spaces of Hölder continuous functions and Banach spaces of real valued sequences. It is mediated along Fourier type expansions of (rough) Hölder continuous **functions in terms of the Haar-**Schauder wavelet. In our approach of rough integration we use Schauder representations for a pathwise approach of the integral of one rough function with respect to **a**nother one. In a more general and analytical setting, this pathwise approach of rough path analysis can be understood in terms of Paley-Littlewood decompositions of distributions, and Bony paraproducts in Besov spaces. It allows a smooth approach of formal products of singular distributions, and consequently of SPDE with rough and multiplicative noise. This talk is based on work with M. Gubinelli (U Bonn) and N. Perkowski (FU Berlin).