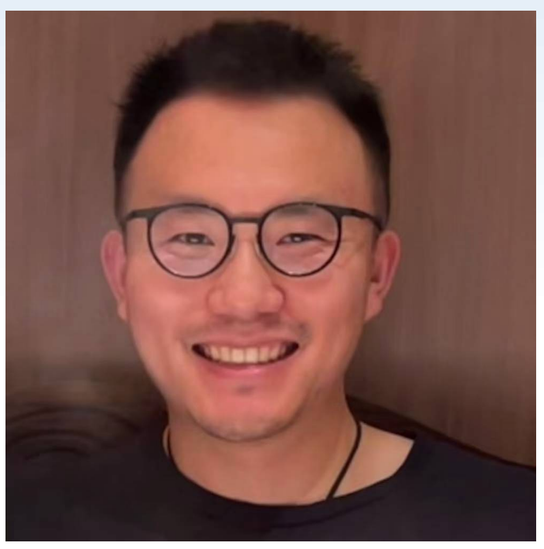
Stochastic Webinar

Nonlinear PDEs with modulated dispersion - regularization by noise

Guopeng Li （Beijing Institute of Technology）



Guopeng Li joined the Beijing Institute of Technology (China) as a tenure-track Assistant Professor in October 2024. He completed his PhD at the University of Edinburgh in 2022 and subsequently held a postdoctoral position at the Maxwell Institute for Mathematical Sciences. His research interests lie at the intersection of stochastic analysis, probability, and dispersive partial differential equations.

Abstract: We study dispersive equations with a time non-homogeneous modulation acting on the linear dispersion term. In this talk, we consider the Korteweg-de Vries equation (KdV) and related equations such as the Benjamin-Ono equation (BO) and the intermediate long wave equation (ILW). By imposing irregularity conditions on the modulation, we demonstrate phenomena known as regularization by noise in the following three ways:
(i) For sufficiently irregular modulation, we establish local well-posedness of the modulated KdV on both the circle and real line in settings where the unmodulated KdV is ill-posed. In particular, we show that the modulated KdV on the circle with a sufficiently irregular modulation is locally well-posed in Sobolev spaces of arbitrarily low regularity. By combining the -method (from dispersive PDEs) and the sewing lemma (controlled rough paths), we also prove global well-posedness in negative Sobolev spaces.
(ii) While equations like BO and ILW exhibit quasilinear behavior, we show that sufficiently irregular modulations semilinearize these equations by proving their local well-posedness via a contraction argument.
(iii) Finally, we show nonlinear smoothing for these modulated equations, where we show that a gain of regularity of the nonlinear part becomes (arbitrarily) larger for more irregular modulations.
This talk is based on joint work with Khalil Chouk (formerly UoE), Massimiliano Gubinelli (Oxford), Tadahiro Oh (UoE), and Jiawei Li (UoE).

讲座时间：
2024.12.12 周四上午10:00-11:00
会议地点：ZOOM会议室会议ID：3541437366密码：123456

主办单位：
中科院数学与系统科学研究院应用数学所
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