

Scaling limits of disordered systems and critical stochastic PDEs: tools and result

Francesco Caravenna
U Milano-Bicocca (I)

Rongfeng Sun
National U of Singapore

Nikos Zygouras
U Warwick

— Minicourse given for —
IRTG 2544: "Stochastic Analysis in Interaction"

Content

- Part 1 (Rongfeng Sun): *Polynomial chaos, directed polymers and stochastic PDEs*
 - Introduction to Directed Polymers, Stochastic Heat Equation (SHE) and the Kardar-Parisi-Zhang Equation (KPZ)
 - The $1d$ case: Convergence of polymer partition function to the solution of SHE
 - ▷ Key tools: Chaos expansions (discrete and continuum), Lindeberg principle, Hypercontractivity
- Part 2 (Francesco Caravenna): *Gaussian limits for $2d$ subcritical polymers, SHE, KPZ*
 - The $2d$ case: logarithmic divergence and marginal relevance
 - A unified approach to Gaussian limits:
 - (1) Log-normality of partition functions and one-point solution of SHE
 - (2) Edwards-Wilkinson fluctuations for averaged partition functions and for the solution of SHE
 - (3) Edwards-Wilkinson fluctuations for averaged log-partition functions and KPZ solution
 - ▷ Key tool: concentration of measure
- Part 3 (Nikos Zygouras): *$2d$ polymers and SHE at criticality*
 - Second moment asymptotics via the Dickman subordinator
 - Third moment asymptotics via combinatorial bounds
 - Higher moments via operator bounds