Universität Bielefeld | Fakultät für Physik & Fakultät für Mathematik

Kolloquium Mathematische Physik

Stefan Adams

University of Warwick

Random field of gradients - Critical Phenomena and Scaling limits

Random fields of gradients are families of highly correlated random variables arising in the studies of e.g. random surfaces & interfaces and discrete Gaussian Free Fields (GFFs), random geometry, field theory, and elasticity theory. Recently their study has attained a lot of attention. There are several reasons for that. On one hand, these are approximations of critical systems and natural models for a macroscopic description of elastic systems as well as, in a different setting, for fluctuating phase interfaces. In addition, over continuum, the level lines of the GFF are connected to Schramm's SLE (an active field of modern mathematics for understanding critical phenomena) and the fields are natural space-time analog of Brownian motions and as such a simple random object of widespread application and great intrinsic beauty. Gradient fields are likely to be an universal class of models combining probability, analysis and physics in the study of critical phenomena, and these mass-less fields are also a starting point for many constructions in field theory. A more recent connection are mathematical models for the Cauchy-Born rule of materials, i.e., a microscopic approach to nonlinear elasticity. The latter class of models requires that interaction energies are non-convex functions of the gradients. Open problems over the last decades include unicity of Gibbs measures and strict convexity of the free energy as well as scaling limits to the Gaussian Free Field and the decay behaviour of two-point correlation functions. After giving a broad introduction to this recently active field of research we present in the talk Gaussian decay of correlations and the scaling to the Gaussian Free Field for a class of mass-less fields with non-convex interaction using a recent renormalisation group approach.

Freitag, 02.06.2017, 16:15 Uhr
Ort: V2-210/216