Seminar/Talk

A random walk approach to high-dimensional critical phenomena

Romain Panis
University of Lyon

Host: Laszlo Erdös & Jan Maas

One of the main goals of statistical mechanics is to understand critical phenomena of lattice models. This can be achieved by computing the so-called critical exponents, which govern algebraic scaling near or at the critical point. This task is generally impossible due to the intricate interplay between the specific features of the models and the geometry of the graphs on which they are defined. A striking observation was made in the 20th century: above the upper critical dimension d_c, the geometry becomes inessential and critical exponents adopt their mean-field values (as on Cayley trees or complete graphs).Classical approaches—renormalization group, differential inequalities with reflection positivity, and the lace expansion—are powerful yet model-specific and technically heavy. We revisit the study of the mean-field regime and introduce a unified, probabilistic framework that applies across perturbative settings, including weakly self-avoiding walk (d>4), spread-out Bernoulli percolation (d>6), and one- and two-component spin models (d>4).Based on ongoing works with Hugo Duminil-Copin, Aman Markar, and Gordon Slade.

Monday, January 12, 2026 04:00pm - 05:00pm
Central Bldg / O1 / Mondi 2a (I01.O1.008)

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station. Please find a schedule of the ISTA Shuttle on our webpage: https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.