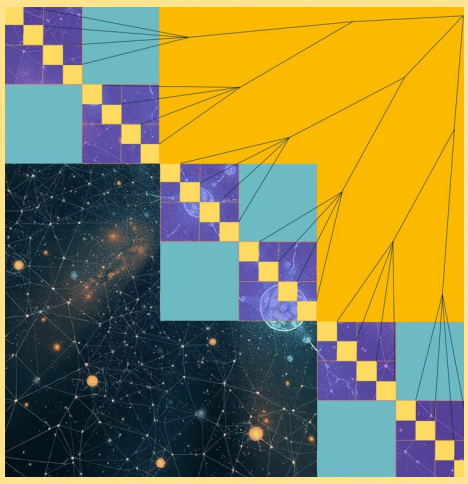
hausdorff center for mathematics

UNIVERSITÄT BONN

Hausdorff School | June 16-20, 2025



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Statistical mechanics of spin glasses, neural networks and learning

Organizers:

Anton Bovier (University of Bonn), Véronique Gayrard (CNRS, Aix Marseille University/Bonn Research Chair), Giulia Sebastiani (University of Bonn)

Venue: Lipschitz lecture hall · Mathematics Center · Endenicher Allee 60 · 53115 Bonn

This Hausdorff School aims to present, in four mini-courses, some of the recent mathematical developments in the field of statistical mechanics of spin glasses, in particular in view of its applications to the mathematical understanding of the functioning of machine learning. While this connection dates back to the 1980s, many spin glass-inspired methods have been applied to machine learning problems in recent years, often pushing the boundaries of the state-of-the-art. The main topics to be covered in the school are Hebbian neural networks and their generalisations, learning dynamics and non-convex optimisation on high-dimensional landscapes by stochastic gradient descent. All of these are related to the problem of understanding the topological complexity of high-dimensional random landscapes.

This school offers PhD and postdoctoral students in probability theory and mathematical physics the opportunity to gain in-depth knowledge from leading researchers.

Lecture Series by:

- Elena Agliari (Sapienza University of Rome)
- Gérard Ben Arous (CIMS, New York University)
- Aukosh Jagannath (University of Waterloo, Canada)
- Andrea Montanari (Stanford University)

Call for participation: Participation is free. If you are interested in participating, please fill out the application form: **https://math-events.uni-bonn.de/event/50/abstracts/#submit-abstract**. Successful applicants are selected based on research background. To be considered for financial support, please submit a CV and research overview. To encourage the participation of researchers facing increased financial burden, such as many researchers from developing countries, a small number of fully funded places are available (including support for travel, accommodation). You can indicate in the application form, for which type of financial support you would like to be considered. Additional participants are welcome to join at their own cost.

The deadline for applications to participate in the school is January 27, 2025 (CET).