

Aktuelle Veranstaltungen

Kolloquium

Thema: Intelligente Energieversorgungsnetze

Datum: 08.11.21

Uhrzeit: 16:15

Ort: H4

Vortragender: [Prof. Jens Haubrock](#)

FH Bielefeld

Inhalt:

Ansprechpartner: [W. Pfeiffer](#)

Kolloquium Mathematische Physik

Thema: [Random matrices, spin glasses, and machine learning](#)

Datum: 23.07.21

Uhrzeit: 16:15

Ort: ZOOM/Konferenzschaltung

Vortragender: [Jon Keating](#)

Oxford University

Inhalt: I will describe some problems relating to machine learning and their connections to random matrix theory and spin glasses. These connections give a mathematical framework for understanding in qualitative terms the effectiveness of certain algorithms that are important in machine learning, but developing them into precise models remains a major challenge. I will reflect on the different roles played by models in computer science and physics, focussing on those involving random matrices.

Ansprechpartner: [G. Akemann](#)

Seminar Hochenergiephysik

Thema: [Phenomenological Aspects of Axion-Like Particles in Cosmology and Astrophysics](#)

Datum: 09.11.21

Uhrzeit: 14:15

Ort: D6-135

Vortragender: Ahmed Ayad

Bielefeld University

Inhalt: Cosmology and particle physics are closer today than ever before, with several searches underway at the interface between cosmology, particle physics, and field theory. The mystery of dark matter (DM) is one of the greatest common unsolved problems between these fields. It is established now based on many astrophysical and cosmological observations that only a small fraction of the total matter content of the universe is made of baryonic matter, while the vast majority is constituted by dark matter. However, the nature of such a component is still unknown. One theoretically well-motivated approach to understanding the nature of dark matter would be through looking for light pseudo-scalar candidates for dark matter such as axions and axion-like particles (ALPs). Axions are hypothetical elementary particles resulting from the Peccei-Quinn (PQ) solution to the strong CP problem in quantum chromodynamics (QCD). Furthermore, many theoretically well-motivated extensions to the standard model of particle physics (SMPP) predicted the existence of more pseudo-scalar particles similar to the QCD axion and called ALPs. Axions and ALPs are characterized by their coupling with two photons. While the coupling parameter for axions is related to the axion mass, there is no direct relation between the coupling parameter and the mass of ALPs. Nevertheless, it is expected that ALPs share the same phenomenology of axions. In the past years, axions and ALPs regained popularity and slowly became one of the most appealing candidates that possibly contribute to the dark matter density of the universe. In my talk, I will show that the phenomenology of axions and ALPs

interactions with photons can be used to constrain some of their properties and explain several astrophysical phenomena.

Ansprechpartner: [D. Schwarz](#)

Seminar Kondensierte Materie

Thema: [Numerical Studies of Kitaev Materials at finite Temperature and Field](#)

Datum: 19.11.21

Uhrzeit: 14:15

Ort: D5-153

Vortragender: [David Kaib](#)

Goethe-Universität Frankfurt am Main

Inhalt: In this talk I present various theoretical efforts that have gone into understanding the physics of the Kitaev candidate material α - RuCl_3 . In such materials, both conventional linear spin-wave theory as well as Kitaev's exact solution break down. Therefore, the more reliable theoretical methods have been exact diagonalization techniques like the finite-temperature Lanczos method. By applying these methods to ab-initio guided spin models, we have found good agreement with many experiments and gained insight into the relevant phases.

Ansprechpartner: [FOR2692/Jürgen Schnack](#)

Seminar Mathematische Physik

Thema: [On Non-Hermitian Beta-Ensembles](#)

Datum: 14.10.21

Uhrzeit: 16:00

Ort: D5-153

Vortragender: [Patricia Päßler](#)

Universität Bielefeld

Inhalt:

Log-gases with inverse temperature β are systems with many applications in physics, for example in the theory of superconductors or the fractional quantum Hall effect. For some specific values of β a correspondence to random matrix theory (RMT) is well established. The advantage of this connection is the usage of the RMT methods in the study of those systems. The goal of this talk is the discussion of Log-gases in two dimensions, i.e. in the non-Hermitian case, for more general values of the inverse temperature. Therefore, we study in the first part a model of normal 2×2 matrices with β in $[0,2]$ and discuss whether we find a surmise for the nearest-neighbour spacing distribution of large matrices. In the second part of the talk we introduce the study of symmetry classes in non-Hermitian RMT. We conjecture that the classes of complex symmetric and complex quaternion matrices can be effectively described by Log-gases in two dimensions with non-integer inverse temperatures.

Ansprechpartner: [Gernot Akemann](#)

Seminar Bielefeld-Melbourne Zufallsmatrizen

Thema:

[Planar symplectic ensembles: from scaling limits to Wronskian structures](#)

Datum:

27.10.21

Uhrzeit:

09:00

Ort:

ZOOM / Konferenzschaltung

Vortragender:

[Sungsoo Byun](#)

Korea Institute for Advanced Study

Inhalt:

In this talk, I will discuss complex eigenvalues of non-Hermitian random matrices with symplectic symmetry, which are known to form Pfaffian point processes. In particular, I will present various scaling limits of symplectic ensembles and explain their unified integrable structure of Wronskian form. Examples include edge scaling limits of the Ginibre ensemble (with boundary confinements) and bulk/edge scaling limits of the elliptic Ginibre ensemble in the almost-Hermitian regime. Beyond standard universality classes, I will also introduce scaling limits of the Mittag-Leffler ensemble at the singularity. Furthermore, for symplectic ensembles with general external potentials, I will present the characterization of translation invariant scaling limits by virtue of

rescaled mass-one and Ward's equations. This talk is based on two joint works: one with Gernot Akemann and Nam-Gyu Kang and the other with Markus Ebke and Seong-Mi Seo.

Ansprechpartner: [Gernot Akemann](#)