Upcoming Events

Colloquium

Topic: Antrittsvorlesung: Magnetic energy materials

Date: 08.10.18

Time: 14:15

Place: H6

Guest: JProf. Dr. Luana Caron

Universität Bielefeld

Magnetic materials can be used for far more than simple magnets. By exploring the coupling between magnetic and structural lattices applications such as sensors, actuators and even refrigerators and nanoparticles for medical use may be realized. My research focuses in understanding how the coupling between different degrees of freedom gives rise to physical phenomena which are useful for applications. In this presentation I will talk about my previous work on transition metal based materials where several different types of magneto-elastic phase transitions give rise to large entropy changes which can be used for magnetocaloric refrigeration applications. Finally I will give an outlook of what I intend to do in the future, both as a continuation of my current research as well as new topics I would like to explore.

Contact person: Dekan

Colloquium Mathematical Physics

Upper and lower Lipschitz bounds for the perturbation of edges of the essential spectrum

Date: 01.06.18
Let $A$ be a selfadjoint operator, $B$ a bounded symmetric operator and $A+tB$ a perturbation. I will present upper and lower Lipschitz bounds on the function of $t$ which locally describes the movement of edges of the essential spectrum. Analogous bounds apply also for eigenvalues within gaps of the essential spectrum. The bounds hold for an optimal range of values of the coupling constant $t$. This result is applied to Schrödinger operators on unbounded domains which are perturbed by a non-negative potential which is mostly equal to zero. Unique continuation estimates nevertheless ensure quantitative bounds on the lifting of spectral edges due to this semidefinite potential. This allows to perform spectral engineering in certain situations. The talks is based on the preprint https://arxiv.org/abs/1804.07816

Contact person: G. Akemann

Seminar High Energy Physics

Topic: tba

Date: 23.10.18

Time: 12:15

Place: D6-135

Guest: Stephan Huber

Univ. of Sussex, Brighton

Abstract:

Contact person: D. Bödeker
Joint work with Viorel Barbu (Romanian Academy of Sciences, Iasi) It is a classical problem to present a solution of a PDE as the density of the time marginal distributions of a stochastic process. If the PDE is a linear Fokker-Planck equation, then by classical stochastic analysis this is known to be true under very general conditions. For nonlinear Fokker-Planck equations the situation is much more difficult and only known to be true under very restrictive assumptions on the regularity of the (nonlinear) dependence of the coefficients in the Fokker-Planck equations on the solutions. In this talk a new general concept is presented, how to find the desired stochastic process (similarly as in the linear case) through solving a corresponding stochastic differential equation (SDE), whose coefficients, however, depend on the marginal distributions of its solution (DDSDE). The point is that this new general concept does not require strong regularity assumptions on the coefficients (as e.g. fulfilled for McKean-Vlasov type equations) and thus does not rule out a lot of other nonlinear Fokker-Planck equations of interest in Physics. As an example it will be shown that it can be applied to the case, where the nonlinear Fokker-Planck equation is a generalized porous media equation on d-dimensional Euclidean space (with d arbitrary), perturbed by a transport term. So its solution is the density of the time marginal distributions of a (tractable) stochastic process solving a corresponding DDSDE. Apart from its conceptual interest this result could lead to new numerical approximations of solutions to nonlinear Fokker-Planck equations through numerically solving the corresponding DDSDE. In the first part of the talk we shall recall the general connection between stochastic differential equations and (both linear and nonlinear) Fokker-Planck equations. Reference: arXiv:1801.10510 and SIAM J. Math. Anal. 50 (2018), no. 4, 4246–4260. arXiv:1808.10706
Symmetry transitions of systems have been always of particular interest in physics. There are only few real systems, that are pure and ideal yielding the desired results predicted by simplified, analytically feasible models. This is also the case for the spectral statistics of linear operators corresponding to such realistic systems, which are usually described by random matrices. Especially the global symmetries can be well-captured by random matrices, since the local spectral statistics on the level of the mean level spacing is extremely sensitive to these symmetries. Therefore, the question arises what the statistics would look like when a symmetry transition takes place to compare these results efficiently with physical measurements. Exactly this has been the goal of my joint work with Takuya Kanazawa when we studied an interpolation between the Gaussian unitary ensemble (GUE) and the chiral Gaussian unitary ensemble (chGUE) while protecting the chirality of the matrix. This transition is motivated by several QCD applications. Particularly the protection of the chirality leads to surprising effects. I am going to report on these results which comprise finite matrix size as well as the limit of large matrix dimensions.

Contact person: Gernot Akemann

Seminar AG Zufallsmatrizen

Topic: Symmetry Transition from GUE to chGUE protecting Chirality
Symmetry transitions of systems have been always of particular interest in physics. There are only few real systems, that are pure and ideal yielding the desired results predicted by simplified, analytically feasible models. This is also the case for the spectral statistics of linear operators corresponding to such realistic systems, which are usually described by random matrices. Especially the global symmetries can be well-captured by random matrices, since the local spectral statistics on the level of the mean level spacing is extremely sensitive to these symmetries. Therefore, the question arises what the statistics would look like when a symmetry transition takes place to compare these results efficiently with physical measurements. Exactly this has been the goal of my joint work with Takuya Kanazawa when we studied an interpolation between the Gaussian unitary ensemble (GUE) and the chiral Gaussian unitary ensemble (chGUE) while protecting the chirality of the matrix. This transition is motivated by several QCD applications. Particularly the protection of the chirality leads to surprising effects. I am going to report on these results which comprise finite matrix size as well as the limit of large matrix dimensions.

Contact person: Gernot Akemann