MP 13: Gitterfeldtheorie 2

Zeit: Donnerstag 14:45–16:00 Raum: HS 8

MP 13.1 Do 14:45 HS 8

Costratified Hilbert space structure for lattice gauge models — •Matthias Schmidt — Universität Leipzig, Institut für Theoretische Physik, Brüderstr. 16

The reduced phase space of a system with symmetries, like e.g. gauge theory, is stratified by orbit types. To examine hypothetical quantum effects of the stratification, one has to construct the associated costratification of the Hilbert space of the corresponding quantum theory, proposed by Huebschmann. The method will be explained for the adjoint quotient of SU(2), which can be interpreted as SU(2)-lattice gauge theory on a single plaquette, and attempts to generalize it to larger lattices and larger gauge groups will be discussed.

MP 13.2 Do 15:10 HS 8

Information loss along the renormalization flow — •Cedric Beny and Tobias Osborne — Leibniz Universität Hannover

Our ability to probe the real world is always limited by experimental constraints such as the precision of our instruments. It is remarkable that the resulting imperfect data nevertheless contains regularities which can be understood in terms of effective laws.

The renormalization group (RG) aims to formalize the relationship between effective theories summarizing the behaviour of a single system probed at different length scales. An important feature of the RG is its tendency to converge to few universal effective field theories at large scale.

We explicitly model the change of resolution at which a quantum lattice system is probed as a completely positive semigroup on density operators, i.e., a family of quantum channels, and derive from it a renormalization “group” on effective theories. This formalism suggests a family of finite distinguishability metrics which contract under the RG, hence identifying the information that is lost on the way to universal RG fixed points.

MP 13.3 Do 15:35 HS 8

Elementary (quasi)particles with braided statistics — •Pieter Naaijkens — Leibniz Universität Hannover, Deutschland

Quantum mechanical systems with (quasi)particles or excitations that have braided (or anyonic) statistics (as opposed to the usual Bose/Fermi alternative) have received a lot of attention in recent years. Such (quasi)particles are also called anyons. In this talk we will discuss how these excitations and their properties can be obtained from first priciples. The focus will be on models defined on a plane, for example Kitaev’s toric code. The latter can be interpreted as a lattice gauge theory with local $\mathbb{Z}_2 \times \mathbb{Z}_2$ gauge symmetry. Starting from the algebra of observables of this model, given in a ground state representation, all properties of the anyons in this system (such as braiding and fusion) can be recovered. The results match with one expects from known properties of the model when defined on a torus.

We will also comment on recent work, relating the number of equivalence classes of such (quasi)particles to the Kosaki-Longo (or Jones) index of certain inclusions of observable algebras.