Topological Aspects of Condensed Matter Theory

Rapport sur les contributions

https://indico.math.cnrs.fr/e/14894

ID de Contribution: **1** Type: **Non spécifié**

Local perturbations of Toeplitz matrices

jeudi 25 septembre 2025 15:10 (50 minutes)

This talk is about the asymptotic spectral theory of tridiagonal Toeplitz matrices with matrix entries, with periodicity broken on a finite number of entries. Varying the ranks of these perturbations allow to interpolate between open boundary and circulant Toeplitz matrices. While the continuous parts of the limit spectrum only depends in a crucial manner on these ranks and no other aspect of the perturbation, the outliers of the spectrum depend continuously on the local perturbation. The proof is essentially based on a generalized Widom formula for the characteristic polynomial. The mathematical results are illustrated by numerics. Joint work with Lars Koekenbier.

Orateur: SCHULZ-BALDES, Hermann (FAU Erlangen)

ID de Contribution: **2** Type: **Non spécifié**

Many-body spectral flow index and the Quantum Hall Effect

jeudi 25 septembre 2025 11:40 (50 minutes)

We define a many-body topological index to classify invertible and U(1)-symmetric states over the CAR algebra of interacting electrons on an infinitely extended two-dimensional lattice. The definition relies on a magnetic flux insertion through the origin in a quasi-adiabatic way and on the properties of short range entangled states. The index is integer-valued and invariant under charge-preserving locally generated automorphisms. Application to Integer Quantum Hall Effect and analogy with the single particle picture is discussed as well. This talk is based on a joint work with Sven Bachmann and Jacob Shapiro.

Orateur: TAUBER, Clément (Université Paris Dauphine)

ID de Contribution: **3** Type: **Non spécifié**

Zero-modes from tensor-monopoles

jeudi 25 septembre 2025 14:20 (50 minutes)

Monopoles can be induced by band crossing points that generate a gauge-invariant vector field, the Berry curvature, whose flux is quantized. For instance, in 3D space, this flux corresponds to the first Chern number. In turn, the value of this topological invariant gives the number of unidirectional modes, or spectral flow, of the system. In this talk, I would like to show that certain confined zero-energy modes seem to be related to another topological invariant generated by the flux of a tensor-monopole. While this invariant was recently proposed in 4D lattices, I would like to discuss its relevance in 2D inhomogeneous continuous media with direct applications in astrophysical fluid models.

Orateur: DELPLACE, Pierre (ENS Lyon)

ID de Contribution: **4** Type: **Non spécifié**

Bulk-edge correspondence in a hydrodynamic model, and its violation

jeudi 25 septembre 2025 09:30 (50 minutes)

Orateur: GRAF, Gian-Michele (ETH Zürich)

ID de Contribution: **5** Type: **Non spécifié**

The K-theory of Temperley—Lieb subproduct systems

jeudi 25 septembre 2025 10:20 (50 minutes)

Subproduct systems arising from Temperley–Lieb combinatorics provide a rich class of quantum structures that interpolate between algebraic and topological features of noncommutative spaces. These systems naturally generate Cuntz–Pimsner algebras, which can be viewed as noncommutative analogues of function algebras on quantum homogeneous spaces or algebraic subsets of noncommutative spheres.
In this talk, we investigate the K-theory of these C*-algebras, focusing on duality phenomena in the spirit of KK-theory. Our approach generalizes classical results of Kaminker and Putnam on Cuntz–Krieger algebras to a quantum setting, where the underlying symmetry is encoded by Temperley–Lieb polynomials.
Based on joint work with D. Gerontogiannis and S. Neshveyev.

Orateur: ARICI, Francesca (Leiden University)