ICTS Seminar

Title : Dulmage-Mendelsohn Percolation

Speaker : Kedar Damle

Date : Tuesday, August 17, 2021

Time : 03:00 pm (IST)

Abstract : The classic combinatorial construct of *maximum matchings* probes the random geometry of regions with local sublattice imbalance in a site-diluted bipartite lattice. We demonstrate that these regions, which host the monomers of any maximum matching of the lattice, control the localization properties of a zero-energy quantum particle hopping on this lattice. The structure theory of Dulmage and Mendelsohn provides us a way of identifying a complete and non-overlapping set of such regions. This motivates our large-scale computational study of the Dulmage-Mendelsohn decomposition of site-diluted bipartite lattices in two and three dimensions. Our computations uncover an interesting universality class of percolation associated with the end-to-end connectivity of such monomer-carrying regions with local sublattice imbalance, which we dub *Dulmage-Mendelsohn percolation*. Our results imply the existence of a monomer percolation transition in the classical statistical mechanics of the associated maximally-packed dimer model and the existence of a phase with area-law entanglement entropy of arbitrary many-body eigenstates of the corresponding quantum dimer model. They also have striking implications for the nature of collective zero-energy Majorana fermion excitations of bipartite networks of Majorana modes localized on sites of diluted lattices, for the character of topologically-protected zero-energy wavefunctions of the bipartite random hopping problem on such lattices, and thence for the corresponding quantum percolation problem, and for the nature of low-energy magnetic excitations in bipartite quantum antiferromagnets diluted by a small density of nonmagnetic impurities.

Venue : Please click on the below link to join the meeting

https://us06web.zoom.us/j/83008991175?pwd=NEtLdzFNTlMwb1FqRmRNaWt4VDk2QT09
Meeting ID: 830 0899 1175
Passcode: 974997