Algebraic graph theory and quantum walks

Krystal Guo

University of Amsterdam

The interplay between the properties of graphs and the eigenvalues of their adjacency matrices is well-studied. Important graph invariants, such as diameter and chromatic number, can be understood using these eigenvalue techniques. In this talk, we bring these classical techniques in algebraic graph theory to the study of quantum walks.

A system of interacting quantum qubits can be modelled by a quantum process on an underlying graph and is, in some sense, a quantum analogue of random walk. This gives rise to a rich connection between graph theory, linear algebra and quantum computing. In this talk, I will give an overview of applications of algebraic graph theory in quantum walks, before focussing on recent results on discrete-time quantum walks and strong cospectrality of vertices.

Korteweg-De Vries Institute for Mathematics, University of Amsterdam, Amsterdam, The Netherlands.
k.guo@uva.nl