Spectral Graph Theory - Part I

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AIDA ABIAD, Eindhoven University of Technology
Neumaier graphs with few eigenvalues

A Neumaier graph is a non-complete edge-regular graph containing a regular clique. In this talk we will discuss some recent progress on Neumaier graphs with few eigenvalues. This is joint work with B. De Bruyn, J. D'haeseleer and J.H. Koolen

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KRYSTAL GUO, University of Amsterdam
Entanglement of free Fermions on distance-regular graphs

Many physical processes evolving over time on an underlying graph have led to problems in spectral graph theory, including quantum walks. These problems provide new graph invariants and also new applications for theorems about the eigenspaces of graphs. In this talk, we will consider free Fermions on vertices of distance-regular graphs are considered. Using concepts from Terwilliger algebras, we study the entanglement Hamiltonian. This is based on joint work with Nicolas Crampé and Luc Vinet.

FERDINAND IHRINGER, Ghent University
Strongly regular graphs satisfying the 4-vertex condition

A graph satisfies the 3-vertex condition if and only if it is strongly regular. A graph of order v satisfies the v-vertex condition if and only if it is rank 3, so the most symmetric kind of strongly regular graph. We show that the family of strongly regular graphs $NO_n^\varepsilon(q)$, defined on the non-zero square points of a non-degenerate quadric with two points adjacent if they span a tangent, satisfies the 4-vertex condition. These graphs have rank $(q+3)/2$. We also discuss some other families of strongly regular graphs satisfying the 4-vertex condition.

Joint work with A. E. Brouwer.

JEPHIAN LIN, National Sun Yat-sen University
The strong spectral property for graphs

A symmetric matrix A is said to have the strong spectral property if $X = O$ is the only symmetric matrix satisfying $A \circ X = O$, $I \circ X = O$, and $AX - XA = O$. Here the operation $\circ$ is the entrywise product. If a matrix has the strong spectral property, one may perturb the matrix slightly to create more nonzero entries without changing its spectrum. This behavior has been used widely for constructing matrices in the inverse eigenvalue problem of a graph. In this talk, we show that if the nonzero pattern of the matrix is described by certain graphs, then it always has the strong spectral property.