Matrix stability from bipartite graphs

Murad Banaji (Portsmouth)

To what extent is the spectrum of a matrix determined by its "structure"? For example, what claims can be made simultaneously about all matrices in some qualitative class (i.e. with some fixed sign pattern)? Qualitative classes are naturally associated with signed digraphs or signed bipartite graphs, and some nice theory relates matrix spectra to structures in these graphs. But there are more exotic ways of associating matrix-sets, not necessarily qualitative classes, with graphs (perhaps directed, signed, etc), and extracting information from the graphs. In applications, a quick graph-computation may then suffice to make surprising claims about a family of systems. I'll talk about some recent results and open problems in this area, focussing in particular on the use of compound matrices.