Title: Inequalities for Trees and Matroids

Abstract: In their 1971 study of telephone switching circuitry, Graham and Pollak designed a novel addressing scheme that was better suited for the faster communication required by computers. They introduced the distance matrix of a graph, and used its eigenvalues to bound the size of the addresses in their scheme. We continue their investigation, obtaining more precise spectral information about tree distance matrices. These results, combined with the theory of Lorentzian polynomials, allow us to prove some conjectural inequalities about graphs and matroids that are very easy to state but have taken decades to prove. Along the way we uncover a surprising appearance of Lorentzian polynomials in optimization and economics.

This is joint work with Sergio Cristancho, Graham Denham, Chris Eur, June Huh, and Botong Wang. The talk will assume no previous knowledge of these topics.