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Title: Networks of optimal synchronizability

Abstract: In a network of dynamical elements, one of the most fundamental issues concerns the relationship between the network structure and the collective dynamics of the system. Attracting particularly much attention recently is the relationship between the network structure and the synchronizability of an oscillator network. In this talk, I will consider the problem of maximizing the synchronizability of oscillator networks. I will first establish that the optimality condition can be expressed solely in terms of the Laplacian eigenvalues. We will then discuss properties of the class of optimal networks characterized by this condition, such as symmetry, robustness to structural perturbations, and the existence of a large subclass of networks with well-defined directionality.