Sampling methods for large adjacency matrices

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Abstract

The adjacency matrix of a graph is a construction that plays an important role in network analysis. Important global properties of a network, and of stochastic processes that take place on the network, can determined by properties of the adjacency matrix, like the magnitude of its Perron eigenvalue. Also, matrix functions evaluated on the adjacency matrix can provide important information about global communicability, as well as the centrality of nodes and edges.

In applications, the networks of interest can be very large. If that is the case, the adjacency matrix is large as well, and computations involving it can become onerous. Furthermore, it can be difficult or impractical to collect the data to form the full adjacency matrix. In these cases, the strategies used to collect a subset of the network data become crucial, as well as the methods for computing approximate eigenvalues, eigenvectors, and/or matrix functions of the adjacency matrix from a partial submatrix.

In this talk we describe some sampling strategies and computational approaches to perform computations with partially known adjacency matrices. We show some simulations, and discuss an application involving the spread, detection, and control of infectious diseases.

Keywords: Matrix functions, network sampling

References

1. Al Mugahwi, M., De la Cruz Cabrera, O., Noschese, S., Reichel, L.: Functions and eigenvectors of partially known matrices with applications to network analysis, Appl. Numer. Math. 159 (2021) 93–105.