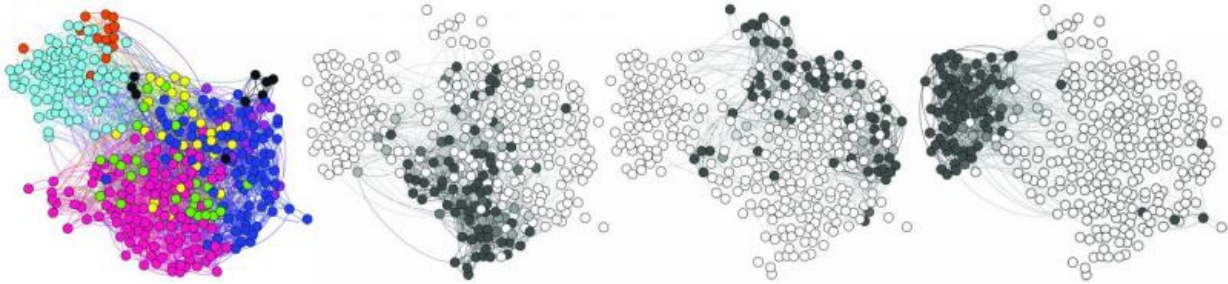


A new tool for multilayer networks

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Credit: Santa Fe Institute

Sophisticated network analysis means finding relationships that often aren't easy to see. A network may have many layers—corresponding to different types of relationships in a social network, for example—but traditional approaches to analysis are limited. They tend to flatten networks into single layers, or treat layers independently of the others.

A new algorithm from an interdisciplinary team at SFI identifies relationships not only within individual layers, but also across [multiple layers](#). It's the product of a recent project involving an anthropologist, a mathematician, a physicist, and a computer scientist.

SFI Omidyar Fellow Eleanor Power, the anthropologist, says the [model](#) is broadly applicable to a variety of network types. "It can also predict missing information," says SFI Postdoctoral Fellow Caterina De Bacco, the physicist of the group.

Power and De Bacco collaborated with SFI Omidyar Fellow Daniel B. Larremore, a mathematician, and SFI Professor Cristopher Moore, a computer scientist and polymath. The group published their work April 24 in the journal *Physical Review E*.

They tested the model on two datasets. The first came from Power, who spent two years collecting data on social networks in two villages in rural India. In her work, layers correspond to relationships like friends, babysitters, or people who would loan money to each other. The model successfully predicted missing connections in her data both within and between layers.

The researchers then analyzed Larremore's genetic data on the malaria parasite, in which the links of the [network](#) correspond to shared genetic substrings and layers represent different locations within the parasite genome. In that case, the model's predictive power worsened with more layers—likely because parasites with more genetic diversity can better evade a host's immune system.

De Bacco says the collaborators built the model to be broadly applicable to researchers—in physics and other fields—and have released the code, in a user-friendly format, to anyone who wants it.

More information: Caterina De Bacco et al. Community detection, link prediction, and layer interdependence in multilayer networks, *Physical Review E* (2017). [DOI: 10.1103/PhysRevE.95.042317](https://doi.org/10.1103/PhysRevE.95.042317)

Provided by Santa Fe Institute

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