Scilight

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An evolving fitness network model shows promise for mapping COVID-19

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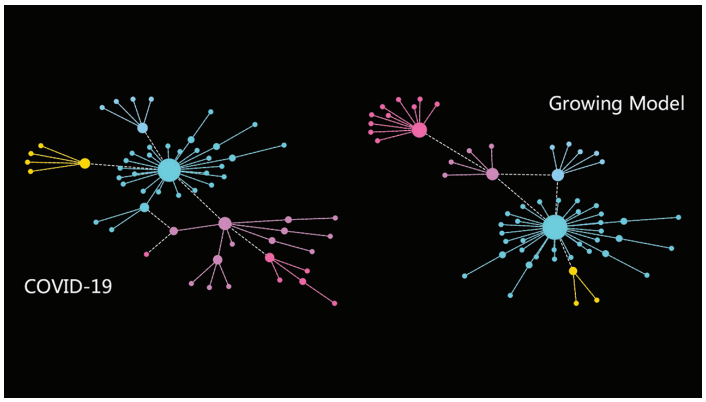
Researchers present a method to model evolving community networks which may have applications in mapping social interaction in real and online communities.



Evolving fitness network models can be used to map virtual interactions like Twitter posts, social and community interactions and water distribution networks. Shang et al. developed a dynamic distributive link model such as this, which they use to map community growth and which they believe can be used to model the genetic structure of COVID-19.

“By providing an explanation for the origin of common network structures, we can computationally simulate equivalent alternative scenarios, such as the genetic model of COVID-19,” said author Michael Small.

The authors combine network evolution and new communities to track the growth of a network of communities. They begin with individual communities as the nodes on the model and trace how this initial system may or may not expand into new communities.

Unlike previous models of the same type, the authors’ model of community structure naturally evolves new communities or nodes in a tree-like format with preferential attachment. The new nodes exactly correspond with the formation of new community groups.

“The results in the paper show that the evolution rule we propose does a good job of creating networks that mimic the structure in the genetic structure of virus – and in particular, the public data available for COVID-19,” said Small. “We anticipate that networks produced via the process we describe here could also provide a good proxy for contact networks for infectious disease transmission.”

In a predictive sense, this model can offer a collection of scenarios of what growth might look like, and likewise, what growth structures are unlikely. The authors noted their model can also be applied to economic scenarios which explain the mechanisms behind wealth and power.

Source: “Growing networks with communities: A distributive link model,” by Ke-ke Shang, Bin Yang, Jack Murdoch Moore, Qian Ji, and Michael Small, *Chaos* (2020). The article can be accessed at https://doi.org/10.1063/5.0007422.