

Cyberwarfare, conservation and disease prevention could benefit from novel network model

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Computer networks are the battlefields in cyberwarfare, as exemplified by the United States' recent use of computer viruses to attack Iran's nuclear program. A computer model developed at the University of Missouri could help military strategists devise the most damaging cyber attacks as well as guard America's critical infrastructure. The model also could benefit other projects involving interconnected groups, such as restoring ecosystems, halting disease epidemics and stopping smugglers.

"Our model allows users to identify the best or worst possible scenarios of network change," said Tim Matisziw, assistant professor of geography and engineering at MU. "The difficulty in evaluating a networks' resilience is that there are an [infinite number](#) of possibilities, which makes it easy to miss important scenarios. Previous studies focused on the destruction of large hubs in a network, but we found that in many cases the loss of smaller facilities can be just as damaging. Our model can suggest ways to have the maximum impact on a network with the minimum effort."

Limited resources can hinder law enforcement officers' ability to stop criminal organizations. Matisziw's model could help design plans which efficiently use a minimum of resources to cause the maximum disruption of trafficking networks and thereby reduce flows of drugs, weapons and exploited people. In a similar fashion, [disease outbreaks](#) could be mitigated by identifying and then blocking important links in

their transmission, such as airports.

However, there are some networks that society needs to keep intact. After the breakdown of such a network, the model can be used to evaluate what could have made the disruption even worse and help officials prevent future problems. For example, after an [electrical grid](#) failure, such as the recent blackout in the eastern United States, future system failures could be pinpointed using the model. The critical weak points in the electrical grid could then be fortified before disaster strikes.

The model also can determine if a plan is likely to create the strongest network possible. For example, when construction projects pave over wetland ecosystems, the law requires that new wetlands be created. However, ecologists have noted that these new wetlands are often isolated from existing ecosystems and have little value to wildlife. Matisziw's model could help officials plan the best places for new wetlands so they connect with other natural areas and form wildlife corridors or stretches of wilderness that connect otherwise isolated areas and allow them to function as one ecosystem.

Matisziw's model was documented in the publicly available journal *PLoS ONE*. Making such a powerful tool widely available won't be a danger, Matisziw said. To use his model, a network must be understood in detail. Since terrorists and other criminals don't have access to enough data about the networks, they won't be able to use the model to develop doomsday scenarios.

More information: The paper "Robustness Elasticity in Complex Networks" can be viewed online in the journal *PLoS ONE*:

[dx.plos.org/10.1371/journal.pone.0039788](https://doi.org/10.1371/journal.pone.0039788)

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