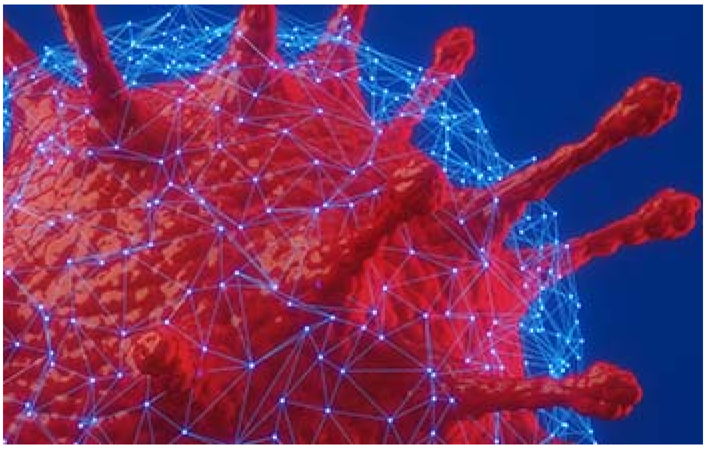
Research News

New mathematical model can more effectively track epidemics

Model could allow leaders to evaluate the effects of countermeasures to epidemics



A new model improves tracking of epidemics by accounting for mutations in diseases.
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As COVID-19 spreads worldwide, leaders are relying on mathematical models to make public health and economic decisions.

A new model developed by National Science Foundation <https://www.nsf.gov/awardsearch/showAward?AWD_ID=1813637&HistoricalAwards=false> -funded researchers at Princeton (/cgi-bin/good-bye?https://engineering.princeton.edu/news/2020/03/25/new-mathematical-model-can-more-effectively-track-epidemics) and Carnegie Mellon (/cgi-bin/good-bye?https://engineering.cmu.edu/news-events/news/2020/03/01-yagan-pnas.html) improves tracking of epidemics by accounting for mutations in diseases. Now the researchers are advancing their model to allow leaders to evaluate the effects of countermeasures to epidemics -- before they deploy them.

"We want to be able to consider interventions like quarantines, isolating people, etc., and see how they affect an epidemic's spread, when the pathogen is mutating as it spreads," said H. Vincent Poor, one of the researchers on the study.

The models currently used to track epidemics use data from doctors and other health workers to make predictions about a disease's progression. Poor said the model most widely used today is not designed to account for changes in the disease being tracked.

This inability can make it more difficult for leaders to counter a disease's spread. Knowing how a mutation could affect transmission or virulence could help them decide when to institute isolation orders or dispatch additional resources to an area.

"In reality these are physical things, but in this model, they are abstracted into parameters that can help us more easily understand the effects of policies and of mutations," Poor said.

If the scientists can correctly account for measures to counter the spread of disease, they could give leaders critical insights into the best steps they could take in the face of pandemics.

The researchers are building on work published in *Proceedings of the National Academy of Sciences (/cgi-bin/good-bye?https://www.pnas.org/content/117/11/5664)*. They describe how the model can track changes in epidemic spread caused by mutation of a disease organism. The investigators are working to adapt the model to account for public health measures to stem an epidemic.

"This research is important given the threat COVID-19 represents," says Phillip Regalia, a program director in NSF's Directorate for Computer and Information Science and Engineering. "Recent events have brought epidemiology into the spotlight. Its underlying mathematical models are, in many ways, similar to the concepts that have moved forward wireless, sensor and other networks. NSF funds such foundational networking research because it provides the backbone that connects the country."

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