Statistical physics shows new approach to fighting viruses

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Computer viruses pose an ongoing threat and their neutralization calls for new strategies, researchers at Tel Aviv University say. Eran Shir and colleagues propose a solution that helps an 'antivirus' program reach an at-risk computer faster than the virus itself.

Current computer virus immunization strategies -- such as antiviral software -- are static. But the need to respond to cyber-attacks in real time has spurred efforts to create artificial immune systems that can autonomously identify viruses and develop immunizing agents. In such schemes, the vaccine would spread to other computers in the same epidemic fashion as the virus, but it would reach most computers later than the virus.

The team suggests there is a way to counteract the head start of the virus. Using network theory -- a branch of statistical physics -- the authors show the design of a computer network can be slightly modified to have just a handful of extra connections open only to the vaccine.

That, the researchers said, would be enough to enable the vaccine to outrun the virus and spread to other computers, immunizing them before the virus arrives, thereby preventing a cyber-plague.

The research is reported in the December issue of *Nature Physics*.