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PhD student Tanim Taher and graduate student Kunal Sunil Rele at the Illinois Institute of Technology work on identifying household devices that interfere with wireless networks and developing new ways to get around them.

Wireless devices turn up the chatter

by [Ryan Mark](#)
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Like too many guests at a cocktail party, wireless devices can't talk to each other because of all the chatter.

Inside an old copper-screened cage in the basement of a building at the Illinois Institute of Technology, two students are working on identifying and solving some of the problems of the interfering wireless electronic chatter.

The cage is designed to block radio waves and, inside it, Ph.D. student Tanim Taher and graduate student Kunal Sunil Rele use an array of circuit boards, oscilloscopes and antennas to analyze the way wireless radio signals from different devices interact.

They have a microwave oven, too. And it's not for popcorn.

“We did these neat demonstrations in the lab where we would send a video over WiFi to the laptop and turn on the microwave and the video would stop playing,” said Dr. Joseph L. LoCicero, professor of electrical and computer engineering at IIT and adviser to Taher and Rele. “[Microwave ovens] cause a substantial amount of interference and cause a problem with WiFi.”

Microwave ovens, designed in the age of 8-track tapes, put out radio waves in the same spectrum that is used by the WiFi radios in laptops. The IIT team is identifying sources of interference and developing new ways to get around them.

- Too many devices using the same radio band
- Other devices that have unintended transmissions
- Other nearby countries or states that have different uses for the same radio bands

Those are the three major sources of interference identified by Amr Abdelmonem, chief technology officer of ISCO International, an Elk Grove Village-based company that produces interference-reducing technology for cell phone service providers.

Many household wireless devices use or emit radio waves in the same few limited swaths of open spectrum set aside by the FCC, and all have the potential to interfere with each other. This unlicensed spectrum is called the industrial, scientific and medical radio band, and doesn't require permission from the FCC for use.

- Devices that use the open spectrum include:
 - Cordless telephones
 - Bluetooth headsets



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Taher demonstrates the signal that microwave ovens emit, a source of interference for wireless networks.

Ways to identify and reduce WiFi interference

If you are having difficulty with your WiFi network or cell phone, here is a quick list of things to look for that might be causing you problems.

What's between you and the WiFi access point or cell tower?

Attenuation, or the weakening of the wireless signal as it travels, occurs no matter what the signal travels through. Materials including glass, metal, and brick cause a larger weakening of the signal than air does, but even plasterboard walls and wood floors will cause a problem. Keep in mind that everything interacts with a wireless signal, including furniture and pictures hanging on the walls.

How close are you to your neighbors?

If you live in an apartment or town house, you might notice a lot of wireless networks when you power up your computer. All of those wireless networks and the computers attached to them can interfere with your network. What you can't see are your neighbor's microwave ovens, cell phones, cordless phones and baby monitors. All of them can cause interference too.

Having problems with Bluetooth?

If you have a Bluetooth enabled phone, computer or headset, keep in mind that these devices use a very weak signal because they only need to reach from your phone in your pocket to the headset on your ear. The low-powered signal can be easily drowned out by other devices. The new Version 2 of Bluetooth is much more resilient.

- Baby monitors
- Microwave ovens
- Electric drills or anything with an electric motor

The most common WiFi access points use the 2.45Ghz range of the open spectrum. There are 11 different channels that subdivide this part of the unlicensed radio band. The bigger the difference between the channel numbers the wireless networks operate in, the less overlap there is likely to be. Between channels 1,6 and 11 there is little overlap while, between 1 and 2, there is significant overlap.

However many people are not aware of this and use whatever channel comes standard when they setup their WiFi network. In areas with many laptops and access points, this causes interference which slows down the speed of the wireless networks, especially when many of the networks are operating on the same channel.

Instead, people could pick an alternate channel instead and instruction manuals that come with their devices tell them how to do just that.

WiFi and other wireless computer technologies such as Bluetooth are designed to be resilient and will work in the presence of other devices, but there's is a limit. Too many devices that use or generate radio waves in a small area will cause problems.

“If you put a thousand wireless access points [allowing network access] in a room it would not be possible to connect a laptop to any one of them,” said Rajit Gadh, a professor at UCLA and Director of a wireless consortium of many major technology companies.

ISCO International develops equipment for cell phone providers that allow cell towers to listen for and avoid wireless interference.

“A problem that has always existed in the wireless world is interference where you have a number of service providers or carriers communicating with their handheld devices through the same medium,” said Abdelmonem, “So, as a result of that, they all start to interfere with each other.”

Abdelmonem said that when dropped calls or poor call quality occur in areas where there should be decent reception, interference is most likely the culprit.

Rick Estes, proprietor of the online WiFi equipment store Quickertech, answers many questions from customers who are trying to set up wireless networks at home or at work.

“Wireless devices are not televisions. Not only do they have to pick up the signal from an access point or cell tower, they also have to transmit a signal back,” Estes said.

Wireless signals will travel through walls, but it will lose 25 percent of their strength. Estes said some people do not realize this as they are trying to figure out why something doesn't work.

“There is a tremendous amount of misinformation about this stuff,” Estes said. “It is truly magic to most individuals.”

While knowledge of the how wireless works will definitely help someone get their home network up and running, experts and manufacturers want to make the technology as convenient as possible.

“From a customer’s standpoint, they really shouldn't have to care because wireless will win out because it is the most convenient,” said Gordon Richard, CEO of ISCO. Wireless service providers should be responsible for making the technology work, he said.

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