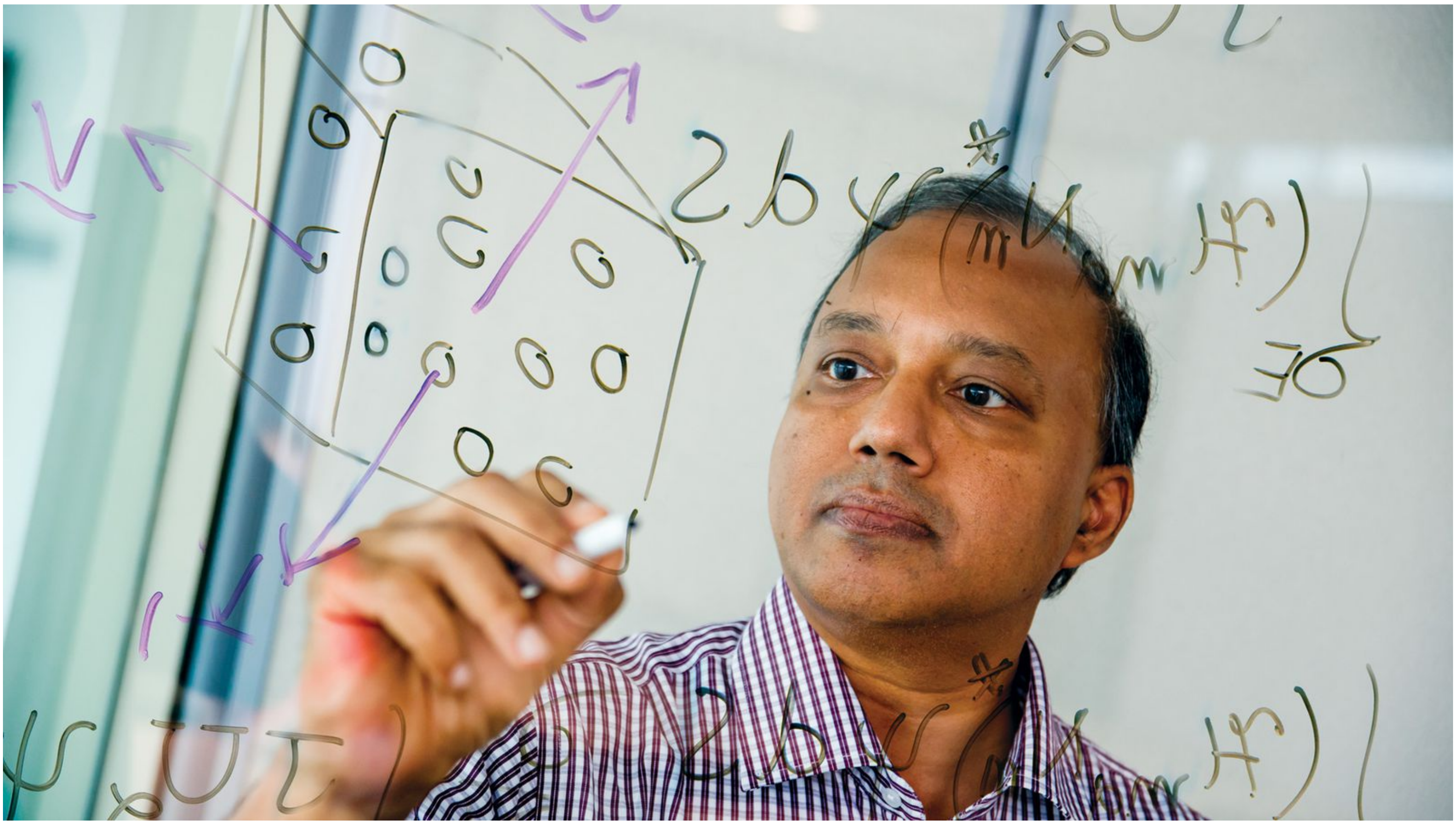
NEWS / **HEALTH**

After a sneeze, 6 feet may not be enough to keep you safe from coronavirus

The familiar recommended distance is based on decades-old science. University of Florida researchers are working on an equation that can help keep people safe.



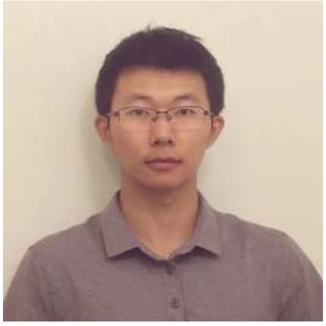
University of Florida scientist Sivaramakrishnan Balachandar is leading an international team of researchers working to develop better recommendations for social distancing. [University of Florida]

By **Megan Reeves**

Published Earlier today

GAINESVILLE — As a doctoral engineering student, Kai Lui had never really thought about what the invisible spray of a human sneeze looks like. But that's what he spends most of his time analyzing lately.

Working from his apartment, he punches numbers into a program linked to a supercomputer at the University of Florida. He follows a list of equations developed by an international team of researchers, tweaking measures to simulate how saliva particles move through the air.



Kai Lui [Courtesy of Kai Lui]

A single model can take as long as 12 days to process — and Lui and others led by UF professor Sivaramakrishnan Balachandar plan to run hundreds of them. Their goal is to determine just how far people should distance in various settings to avoid transmission of the coronavirus.

The work is founded on the theory that 6 feet, the recommendation by health officials for social distancing, is too close in some instances and based on science that is decades old. Recent data show saliva droplets can travel much further in some settings, even up to 21 feet, researchers found.

They're used to working in the background, analyzing rockets and volcanoes and industrial processes. But now they're in the spotlight as communities grapple with reopening schools, restaurants and other public spaces amid the pandemic.

"We know a lot of things about small drops," said Alfredo Soldati, a professor at Vienna University of Technology in Austria who is working with UF. "But this is the first time we have decided to apply it to the world."

This image is one of many from a team of University of Florida researchers showing simulations of how particles from a human sneeze disperse. The simulations are being used to help scientists develop a formula that can be used to tell people how far they should stay apart to avoid the coronavirus and other viruses that come along in the future. [University of Florida]

The group will use their data to develop a simple online tool that hospitals, airlines, concert halls, theme parks and other facilities can use to determine what distances are safe for each situation, Balachandar said. He said he's confident that will serve the public better than the one-size-fits-all guideline of 6 feet — for the COVID-19 pandemic as well as future viruses.

While the researchers can't analyze every person's sneeze, they can consider a slew of other factors, like the general size, speed and duration of a sneeze, the angle at which it happens, and the ambient conditions, like the size of the surrounding space and the quality and movement of the air the sneeze travels through.

"It's multilayered, and that's what makes it very fascinating problem," said UF professor Nadim Zgheib, a former student of Balachandar's. "It's important for people not to see magic numbers appear but to be able to see the science behind it."

Nadim Zgheib [Courtesy of Nadim Zgheib]

The study of how saliva droplets travel started in 1897. In 1930, a study found that the particles could be large or small, but scientists didn't have the technology to analyze the latter. More studies were done a few decades later, but the tools needed to observe the smallest particles, called aerosols, are just being developed.

"We noticed that there was a very big hole in the knowledge about this," said Jorge Salinas, a UF researcher and another former student of Balachandar's. "Science evolves and guidelines need to be updated. … We can't afford to wait for the next pandemic to start understanding."

While gravity forces larger saliva particles to the ground within 6 feet of their source, smaller ones can stay suspended in the air for hours, and even float from room to room. If a space is small or the surrounding air is humid, for example, they will survive longer and travel farther, said Ahmadi Goodarz, a professor at Clarkson University in New York who is an expert in aerosols.

Jorge Salinas [Courtesy of Jorge Salinas]

That means a student potentially could catch the virus from another kid sitting on the other side of a classroom. Someone in an office building could infect a coworker from much further than 6 feet away, Goodarz said.

It all depends on factors like room size and ventilation, Balachandar added. The amount of space needed between people is fully dependent on the environment they're in, and those are the parameters Lui and fellow doctoral student Majid Allahjari are electronically manipulating.

Ahmadi Goodarz [Courtesy of Clarkson University]

They're able to see particles that are invisible to the naked eye, Allahjari said. They can see how saliva droplets move differently when they change certain conditions. Eventually, they will have run enough models to develop a simple mathematical equation the average person can use by plugging in the dimensions of the space they're in among other measures.

"The goal is to make an equation to put out there so people can study their own scenarios and come up with intelligent ways to solve their specific air problems," Balachandar said. For example, schools might find that if they add better ventilation to classrooms, the space between students could decrease.

Majid Allahjari [Courtesy of Majid Allahjari]

Alfredo Soldati [Courtesy of Alfredo Soldati]

Already, public health officials in Italy have taken interest in the study, and soon will meet with Soldati, the Vienna University of Technology professor, to learn more, he said. Salinas said he expects leaders elsewhere to follow as researchers try to answer the questions doctors are raising.

Meanwhile, the students involved feel a new sense of pride in the work, Lui said. He's used to working on problems that feel far from people's everyday lives.

"In this project, though, I feel that what I learn can help the whole world fight against coronavirus," Lui said. "That's a problem everyone around us has."

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