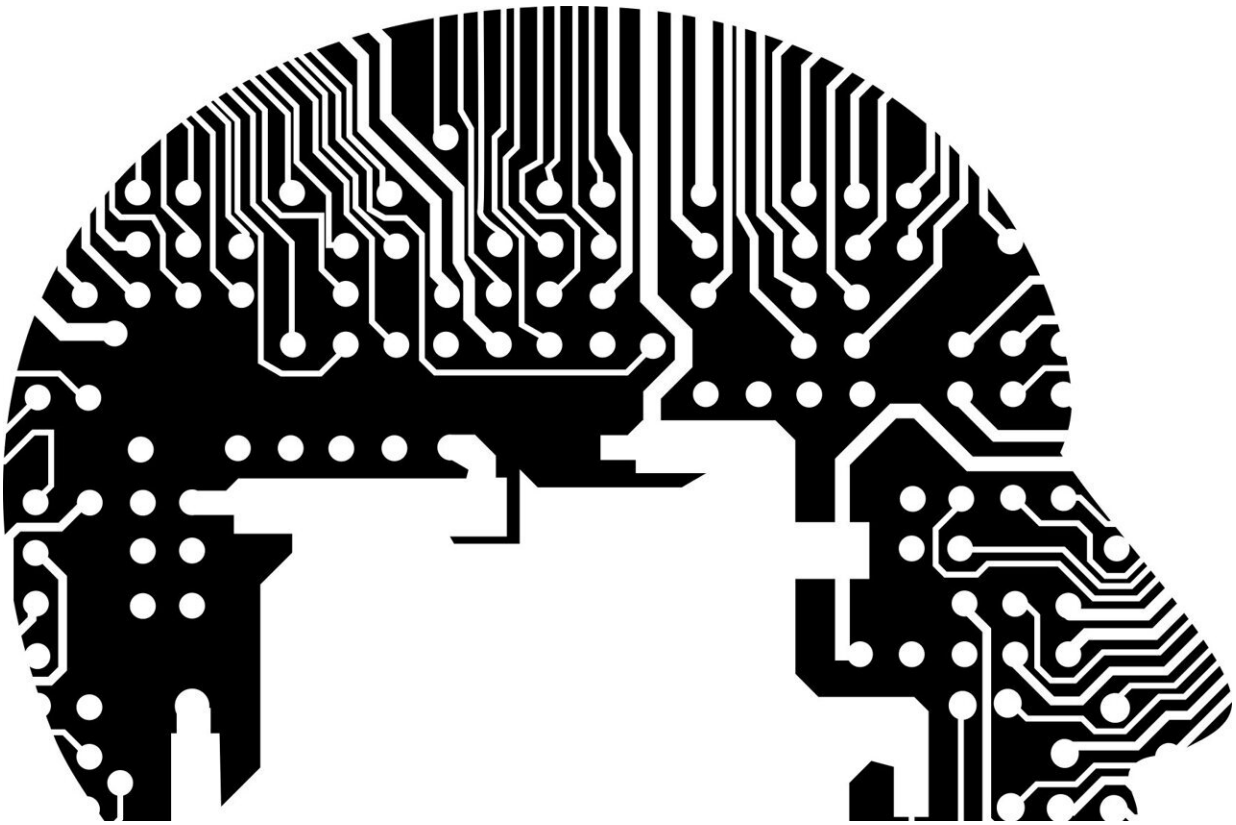


Researchers say AI could help reduce disparities, improve access in health care

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Cervical cancer, like many illnesses, is treatable if it's caught early, but each year millions of women miss out on getting routine Pap smear screening for the disease, which kills a disproportionate number of Black

women.

During the pandemic, [cervical cancer](#) screening rates got even worse, especially for lower-income women and women of racial and ethnic minority groups.

A group of recent graduates from Johns Hopkins Carey Business School think a solution to this problem could be rooted in artificial intelligence. For a class they took last fall, they developed a concept for a "smart tampon," an at-home cervical test they hope would make screening for the disease more accessible and ultimately decrease disparities.

They're not the only ones who have high hopes for the role artificial intelligence and machine learning technology will play in the future of health care.

A growing number of researchers in Maryland and across the country see the technology as something that will change the way patients are treated, making it possible to diagnose them earlier and with more accuracy, and better spot signs that they may be at risk for developing an illness or condition.

Just in the past few months, Johns Hopkins University and the University of Maryland have started centers to further incorporate artificial intelligence into medicine.

Beyond health care, the market for artificial intelligence technology is booming, reaching into environments as diverse as the courtroom and the classroom. By 2030, the market is expected to be valued at well over \$1 trillion, according to market researchers.

But a cloud of worry has followed the technology's growing prominence.

Just like people, artificial intelligence algorithms—and the large data sets they rely upon—can be biased. If used irresponsibly, the technology can reinforce ways that systems already discriminate against marginalized groups, and possibly worsen them.

But in medicine, some researchers believe that if the technology is advanced thoughtfully—and physicians are educated about its limitations—it could make health care more affordable and accessible, while mitigating disparities.

"Artificial intelligence is likely to be a transformational technology in the practice and delivery of medicine," said Ritu Agarwal, the co-director of the Center for Digital Health and Artificial Intelligence at the Carey School. "But there's a lot that needs to happen before we fully realize its potential."

A different kind of diagnostic

Like a lot of college projects, the idea for the smart tampon started with a group of students seated around a friend's living room.

For a class they were taking with Tinglong Dai, a professor at the business school, the students' assignment was to choose a challenge in health care and figure out a way to address it using artificial intelligence technology.

As the group brainstormed, someone asked: "What's one thing in health care that's just awful? That everyone dreads?"

For Hayley Hoaglund and Madeline Howard, the two women in the group, the answer came quickly: Pap smears, the often uncomfortable procedure used to diagnose cervical cancer by scraping cells from a person's cervix.

In the following weeks, the group—which also included Charlie Acosta and Tomas Delia—developed a concept for a device that would be inserted like a tampon and scan a person's cervix, much like an iPhone scans a user's face.

The scan would be uploaded to an app that would use artificial intelligence software to compare it with other cervical scans in a database. If the software detected cell abnormalities in the patient's photos, it would notify the provider or patient to seek additional testing.

The tests could be administered every three years, the group believes, perhaps during routine medical examinations or even at home. Its ease of use could help bridge gaps in disadvantaged communities where cervical cancer death rates are higher. One recent study found that Black women are 41% more likely to develop cervical cancer than white women and are 75% more likely to die from it.

Cervical cancer kills about 4,000 people a year.

Ultimately, Hoaglund said, the goal is to encourage more people with cervixes to be screened for cervical cancer—especially those who otherwise wouldn't be able to make it to the doctor's office for a Pap smear, and those who have been sexually assaulted or violated, making the current procedure a potentially triggering one.

The "smart tampon" is far from being on pharmacy shelves. The students don't have a prototype, and although Hoaglund said they're interested in finding investors, the project has been on the back burner since they graduated.

Elsewhere in Baltimore, researchers already are investing big money into launching a test that uses artificial intelligence to screen a patient's blood for signs of tumors.

Delfi Diagnostics—a biotechnology company started in 2018 by Dr. Victor Velculescu, a professor at the Hopkins School of Medicine—brought in \$225 million in its latest round of fundraising.

The technology that scientists at the company are developing uses a type of artificial intelligence called machine learning to analyze fragments of DNA to sense the presence of cancer and determine where the tumor is located in a patient's body.

Delfi is currently running large clinical trials across the country for technology to detect lung cancer, Velculescu said. Next, the company's scientists hope to put similar technology that can detect liver cancer through similar tests.

Like cervical cancer, the earlier lung and liver cancer are caught, the easier it is to treat the diseases. But unlike the more invasive procedures now required to test for these types of cancer, Delfi's tests will be able to be conducted on blood samples drawn at a doctor's office, Velculescu said.

"The goal is to develop tests that are very inexpensive and very accessible," Velculescu said, "so that everybody—regardless of socioeconomic levels and so forth—can be screened."

Computing for better outcomes

In early November, on a rooftop in North Bethesda, officials from a consortium of educational and medical institutions in Maryland announced the creation of a center that will study the use of artificial intelligence in medicine and support advancements in the field.

The University of Maryland 3—Institute for Health Computing will use patient data from the University of Maryland Medical System that has

been stripped of identifying information in an array of projects, with the goal of improving treatment statewide, said Dr. Mark Gladwin, dean of the University of Maryland School of Medicine in Baltimore.

Along with the University of Maryland Medical System, the partnership includes the University of Maryland, Baltimore, and the University of Maryland, College Park.

Laboratory and office space for the center is under construction in North Bethesda, and is expected to open in 2028, the University of Maryland, Baltimore, said in news release. But Gladwin said he expects scientists will be hard at work six months from now in rented office space.

Officials hope the institute can use artificial intelligence to track how newly approved drugs perform among diverse populations, and to spot patterns in electronic health care records that will help doctors catch diseases early.

Researchers also hope to use technology developed at the center to train surgeons and medical students, and eventually run clinical trials.

Gladwin said he is well aware of how artificial intelligence algorithms can leave members of marginalized communities behind, or disadvantage them. But, he said, the University of Maryland Medical System has one of the most diverse patient populations in the world.

"We're hoping that by having a more inclusive, diverse group of patients, we're going to help ensure that the advances in AI are inclusive of all populations," he said. "That's really important."

The Center for Digital Health and Artificial Intelligence at Hopkins also wants to develop artificial intelligence technology that works for everybody.

It's part of the center's broader mission, Agarwal said, to find new ways to use artificial intelligence to improve health care outcomes, whether in quality, [patient safety](#), equity, access or cost.

Another Hopkins business professor, Goudong Gao, is co-director with Agarwal for the center. He described some of its ongoing projects, including one that will use a type of artificial intelligence to study the clinical notes of physicians to determine whether race and socioeconomic factors influence which breast cancer treatments they recommend.

The center also wants to work on a way to remove stigmatizing language from clinical notes, deleting phrases—like calling a patient "difficult"—that are more often used to describe members of marginalized communities.

It's going to take a lot of hard work—and likely a few years—to fully understand how to create value from [artificial intelligence](#) technology in health care, Agarwal said.

"Taking these technologies and diffusing and implementing them within a system that has been rather rigid for decades?" she said. "That's going to be challenging."

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