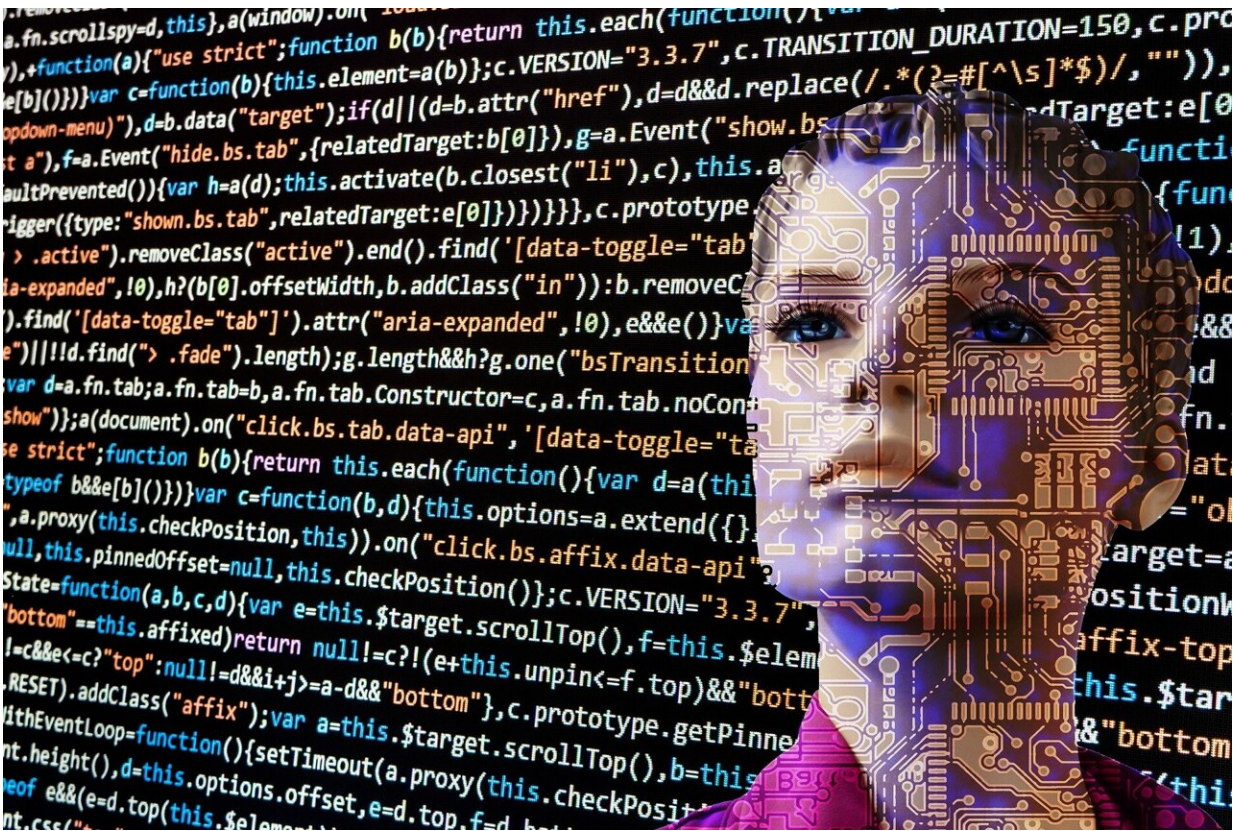


AI and medicine: Digital twins will be able to help us diagnose and treat diseases

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Artificial intelligence is also revolutionizing the world of medicine. In the future, we will be able to create digital twins that simulate various processes in our body. These digital representations of ourselves will be

able to help us diagnose and treat diseases.

They will know us better than we know ourselves. Our digital twins will collect near-live data on our bodies while we go about our daily lives—working, exercising, going out for drinks or visiting the doctor. "Digital twins will be our partners. They will be by our side and advise us," says physician Claudia Witt.

Witt, professor and co-director of the Digital Society Initiative (DSI) at UZH, has been involved in a strategic project at the DSI that focuses on [artificial intelligence](#) in medicine. The goal of the project was to develop future scenarios of how AI might be used in the field. One of the applications of AI concerns the use of digital representations of persons—their digital twins. This technology exemplifies key issues of the future use of AI in medicine, according to the DSI researchers.

Fibers and fitness

Digital twins combine two of the benefits of digitalization in medicine: personalized [data collection](#) and [big data analytics](#). Both are used in [digital twin](#) technology. A digital twin is a [virtual model](#) that combines a person's individual data, for example information about their [blood pressure](#) or [heart rate](#), with models of the respective body function.

The models, which are based on the collective data of a large number of people, describe key vital functions such as our respiratory or cardiovascular system, our digestion or our metabolism. The purpose of these models is to simulate how our body responds to external factors, including our diet, physical exercise or medication.

"The more comprehensive the data, the better the model will be able to mimic the human body," says Witt. This goes for body functions in general, but also at an individual level, provided a digital twin has been

created for us.

Thanks to this information, our digital doppelgangers can predict our body's response and make recommendations. "For example, we could take a picture of a meal and our twin will tell us how many calories it contains and whether it has enough fiber," the UZH professor says.

Or it knows when we've been sitting in our office all day long and can then recommend that we get some exercise. The ingenious part is that our digital twins know what kind of exercise we enjoy and is most beneficial for us.

"That's the advantage digital twins have over more general health recommendations on exercise or diet," says Witt. "A digital twin can identify our individual response to different kinds of behavior and give us recommendations based on this information."

In other words, our twin can help us lead healthier and fitter lives. And they can help us prevent diseases, as our lifestyle influences whether and how diseases such as cancer or diabetes develop.

My buddy, my bodyguard

Digital twins could thus become our buddies in disease prevention. But they will also be able to help us when it comes to diagnosing and treating diseases. Thanks to the real-time data on our body, our digital twin can help identify health conditions at an early stage. And it can improve predictions on how these might progress. Last but not least, digital twin tech also helps physicians treat diseases by enabling them to simulate whether a treatment will work and how effective it might be.

In a way, our twins will be our bodyguards, testing out a treatment for us to see if it works so that we can then decide whether to go through with

the real thing. If it doesn't work for our twin, we can look for alternative treatment options.

So the future, as described in the DSI researchers' paper, sounds bright. After all, who wouldn't want to be healthier and stay in good shape? However, as is often the case when new technologies emerge, the use of digital twins raises a number of thorny questions. On data protection and data usage, for example. Or on whether people will be forced to have a digital twin if they want to be able to seek medical treatment.

As for making decisions, Witt's message is clear: "Decisions will be left to the people. What's important is that we ourselves get to decide how our personal twins are designed and the purposes for which our data may be used." This is where the government needs to take action by introducing and enforcing new legislation. Doing so will be a fundamental part of fostering trust in [digital services](#) such as twins, which are very likely to be developed and operated by private sector providers.

To be in a position to develop decent models, these providers will require as much access to (anonymized) health data as possible. This means that each provider will have to share their data. It will be interesting to see how the different lobbies will attempt to sway discussions in their favor when it comes to enshrining open data principles in Swiss law.

Competition and trust

Another important question is whether people will be forced to have at least one digital twin if they want to access medical services or take out health insurance, for example. According to the DSI's position paper, health care must continue to be available to individuals even if they reject digital twin technology. How good these services will or can be

remains to be seen.

In any case, they won't be as effective as for people with digital doppelgangers by their side for the simple reason that less up-to-date and reliable information will be available. It will also be much more complicated to procure this information, for example in cancer treatment. Initial findings of a representative survey carried out by the DSI show that almost two-thirds of Swiss people would welcome having a personal digital twin to help them lead healthier lives.

The success of digital twins will depend on the quality of their underlying programs, but it will also be a question of whether users will trust the new technology. The former will require good, reliable providers and as much high-quality, publicly available and anonymized health data as possible, says Witt.

When it comes to building up trust, there needs to be effective laws and transparency concerning how the data is collected and used, she adds. "And we have to increase and spread our knowledge of [digital twins](#) so that we can make well-informed decisions about what happens to our personal data."

Provided by University of Zurich

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