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Japanese tech giant NTT is making a \$230 million bet on upending healthcare with ‘digital twins,’ an exact virtual replica of a person that can be used with AI to explore new treatments without risking the patient

Jeff Elder

- Japanese telecommunications company NTT is pouring \$230 million into new Silicon Valley research labs, set to open this summer.
- One health-focused lab is working on a “digital twin” project that would create a virtual version of a person that doctors could try experimental treatments on.
- The labs were announced with a short film by Steven Spielberg’s cinematographer showing the vision of the digital twin.

In a high-budget, longterm, futuristic project almost unimaginable in the COVID-19 recession era, Japanese tech giant NTT has announced new labs in Silicon Valley where it will build hyper-realistic digital twins of people for medical research.

The concept of “digital twins” – exact digital replicas of something that exists in the physical world for research purposes – has been applied broadly across industries. For example, in aeronautics, companies create virtual versions of massive engines that are hugely expensive to build in real life so that they can thoroughly test them at a fraction of the cost of continual development of a physical engine. While digital twins are common in industrial research, the development of human digital twins is in much earlier stages.

NTT, the 300,000-employee Japanese telecommunications company, launched the research labs with a \$230 million budget in July. NTT says that it’s aiming to create digital replicas of people “which medically-guided supercomputing and artificial intelligence can then examine, diagnose and treat as a roadmap to caring for a human.”

So far, NTT Research has hired around 20 scientists from top universities, plans to hire 30 more, and is moving into a \$50 million campus in Sunnyvale, California this summer. The organization is made up of three labs: One studies cryptography and information; one studies quantum physics; and the lab working on digital twins focuses on medicine and health.

NTT Research recently debuted a short film made by Janusz Kamiński, the Oscar-winning cinematographer of “Schindler’s List,” which shows off its ultimate vision: A little girl mirrored on a computer screen by an exact replica of herself who is transparent, her organs visible for the benefits of medical research.

Granted, we’re a long, long way from seeing that goal become reality:



NTT Research

Japanese tech giant NTT has launched new Silicon Valley labs building digital twins of people that can be experimented on.

The medical lab will start by creating a digital twin of a human heart which could be built in the next year or two, says Dr. Joe Alexander, who was named head of the project on Thursday.

Alexander joins NTT Research after 18 years at biomedical firm Pfizer, where he was most recently senior medical director of global medical affairs. The author of 94 medical papers, he says he joined NTT after “fighting to do this kind of research earlier in my career.”

Once the heart is complete, scientists will be able to experiment on it to explore cures for disease or potential ways to improve health. While creating a full human digital twin is a long ways off, it’s not merely a sci-fi fantasy, Alexander says.

“As someone who has been in the industry working on pure research, I need to envision some product pretty clear at the end,” he told Business Insider. “I need to have some image of that at the end.”

Three stages to build a human digital twin

Alexander says the project will evolve in three stages.

First, the lab will develop the initial cardiovascular model focused on acute care. Next comes a more sophisticated, dynamic model that includes multiple body systems and is more suited for chronic care. That will probably be in two to three years, Alexander says. After that, the lab will develop its complete digital twin, which will be associated with wellness in general. That will initially require



NTT Research

NTT Labs is spending \$50 million on Silicon Valley office space for its new labs.

continuous modeling with a human in the lab, he says, and he believes that a human digital twin can be achieved in five to 10 years.

“Five years would be optimistic,” he said. “Ten years might be more realistic.”

Medical tests could be run on your digital twin in a hospital or lab while you were living your life. Let’s say you were dealing with an on-going medical issue and wanted to test some experimental treatments: They could be administered to your digital twin. If the medication worked, you could take it, too. If it didn’t, your twin could be reverted to replicate you again: “Like a flight simulator for an airplane,” Alexander says.

The medical lab is also pursuing research in nanosensors: tiny electrodes that can be implanted in the body long-term. If it finds success with that technology, it could allow the digital twins to be automatically updated to reflect someone’s physical self, without having them to come in for new scans. They could be used for other forms of human-machine collaboration as well.

What happens when the human twin dies?

Because a digital twin will be regularly updated to reflect changes in the human being it’s modeled after, Alexander describes it as a “living model” (even though it’s not technically alive).

“There’s no true sense of this ever finishing until the patient comes to end of life,” he says.

That being the case, what happens when the person linked to the digital twin dies?

“The twin exists to improve the patient’s existence and help others realize the possibilities and get involved in this work, but



NTT Research

The short film ‘Upgrade Reality’ made for the launch of NTT Research, commemorates the Wright Brothers.

that patient is captured digitally. Afterward, you could run clinical trials virtually, without using actual people,” Alexander says.

The digital twin could “live” on, digitally, making the human progenitor a kind of ultimate organ donor, Alexander says, in that he or she provided an entire digital body for research.

\$3.6 billion R&D budget

If all of this sounds lofty - and expensive - keep in mind that there is significant budget behind the labs: The lab’s parent company has a \$3.6 billion research and development budget. While the research lab has \$230 million in its coffers for now, the company has indicated the the labs will be the home of its prize projects. (The medical lab is focused solely on health-related research on digital twins, but parent company NTT has also hinted at commercializing them for market research and advertising.)

Meanwhile, NTT isn’t the only institution contributing to research at NTT Research: It’s signed a partnership with nearby UC Berkeley, set up joint research agreements with top research universities CalTech, Cornell, Michigan, MIT, Stanford and Swinburne), and signed another deal with the Technical University of Munich.

Already, the NTT Research seems willing to spend heartily: In March the labs showcased the highly polished two-minute film by Kamiński, a cinematographer known for his collaborations with Steven Spielberg on “Saving Private Ryan” and “Lincoln,” as well as “Schindler’s List.”

Kazuhiro Gomi, president and CEO of NTT Research, says the labs provide a unique opportunity to do this level of research.