Samantha Richter
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University of Miami Medical Researchers Accelerate Future of Personalized Wellness with the MILBox

Groundbreaking study supported by Amazon Web Services and Open Health Network uses data from wearables and in-home sensors to create "digital twins"

The MILBox project

University of Miami Miller School of Medicine researchers today announced a research project designed to create an individual's "digital twin" using health and environmental data collected from in-home and on-body sensors. Once created, health care practitioners could apply artificial intelligence (AI) to an individual's digital twin to virtually test and evaluate various treatment options and potential outcomes before applying them in the physical world.

Stemming from the Media and Innovation Lab (The MIL) recently launched at the Miller School, and in conjunction with Amazon

Web Services (AWS) and Open Health Network, the MILBox project represents a major step toward a new paradigm in health and wellness to deliver precise, personalized medicine based on data collected directly from an individual and their local environment.

Azizi Seixas, Ph.D., founding director of the Media and Innovation Lab (The MIL), and associate director for the Translational Sleep and Circadian Sciences Program at the Miller School of Medicine, and one of the nation's leading experts on sleep health, is partnering with Girardin Jean-Louis, Ph.D., director of the Translational Sleep and Circadian Sciences Program and professor of psychiatry and behavioral sciences, on the project.

Starting with Sleep

Azizi Seixas, Ph.D

The first phase of the project, based on Dr. Seixas' earlier research funded by the National Institutes of Health (NIH), will study the link between poor sleep including conditions such as sleep apnea, and serious health disorders, including heart disease and dementia. The project will use patient-worn and home-based sensors and test kits, to gather biological, clinical, behavioral and environmental data to assess sleep

patterns, weight, air quality and stress levels. The MILBox contains a host of devices to capture and catalog these data, such as an ambulatory blood pressure monitor, an actigraph to measure sleep and wake cycles, a smart scale, an air quality device, and a mobile phone to securely transmit data to the cloud.

“We want to demonstrate that this kind of individualized data capture can spur a new line of research and personalization in health care,” Dr. Seixas said. “With the capacity to discover everything we can about the individual, we can change the relationship between people and their health.”

Data through the MILBox project will be securely managed and analyzed using cloud-based technology, such as machine learning (ML), powered by AWS. Subject matter experts at The MIL and AWS will develop a cloud-based platform for remote patient monitoring that includes a health care data lake integrated with an Electronic Health Records (EHR) system to power personalized care.

“We are excited to collaborate with The MIL and health care innovators at the University of Miami Miller School of Medicine to build a medical innovation ecosystem focusing on academic medicine, including medical education, clinical care, research, and community outreach,” said Andreia Pierce, Ph.D., M.B.A., head of AWS Research. “AWS will support the development of technology infrastructure, training workshops and other activities that can help improve health outcomes.”

Participants in the research program will receive a single kit, the MILBox, containing all the necessary sensors and devices required to measure and transmit their health and environmental data, including a mobile phone that will serve

to tether all the devices and transmit data to the cloud. The project, which enrolled its first participants late last year, is seeking to include a diverse group of 1,500 participants in its first phase, with an emphasis on traditionally underserved communities or communities of color in Florida and the New York tri-state area.

Creating a Digital Twin

The sensors will gather longitudinal data over seven consecutive days for each participant. The results of those measurements will then be combined to create a "biological health algorithm" unique to that individual. This algorithm will act as a "digital twin" of the individual, allowing researchers to employ AI and other techniques to determine the connection between poor sleep and other health conditions.

Eventually, such "digital twins" could comprise sufficient detail about an individual so that a computer could test different treatment or wellness options against that model to predict which are most likely to produce the best outcomes for that person. Instead of prescribing treatments based on a statistical model of outcomes across a large population, this new approach would provide each patient with a personalized recommendation calculated to produce the best outcome for them.

The work of managing, processing, and protecting the privacy of so much data relies on the PatientSphere 2.0 technology platform from Open Health Network of Mountain View, California. PatientSphere 2.0 is a personalized, HIPAA-compliant, care coordination management system that integrates health and medical data from a wide range of sources and supports seamless communication between the patient and a

broad-based care team. Using blockchain technology and big data techniques, the Open Health platform will support the MILBox app on the user's smartphone, maintain the cloud-based data acquisition system, manage the data analysis and construct the "digital twin" algorithm.

"The MILBox is going to revolutionize the digital health landscape, and to do that requires the kind of advanced, flexible and powerful technology that is at the heart of Open Health Network and PatientSphere 2.0," said Tatyana Kanzaveli, founder and CEO of Open Health Network. "Our company will work with Dr. Seixas to create the advanced platforms and apps that enable this kind of innovation in health care while also protecting valuable and sensitive personal data."

While the initial MILBox contains an assortment of the best sensors available from known brands, the underlying technology is device agnostic, so that different and improved sensors can be substituted over time. The data gathered can also be expanded to include additional real-time biological, digital, behavioral, clinical, psychosocial and environmental data to expand the ability of the "digital twin" to model an individual's overall health.

"You will be able to add and subtract different devices based on the use case," Dr. Seixas said. "We've designed this to be future-proof and support our larger mission of creating a new kind of personalized health care."

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