INNOVATIVE DATA SHARING TO SPUR MEDICAL COLLABORATION

An innovator in China is building A PRIVACY-PRESERVING COMPUTING (PPC) ECOSYSTEM that enables data sharing and computation to help research collaborations and spur discovery, while protecting patient privacy.

Colorectal cancer is the third most common cancer globally, and in 2020 accounted for nearly 11% of all diagnoses. With significant diversity in patient populations, disease stages and treatment options, it is not always straightforward to pick the optimal course of treatment.

Artificial intelligence (AI) could help predict which treatment plan might offer the greatest benefits, but it is difficult for researchers to apply these benefits because AI requires huge volumes of data, and sharing and pooling medical data isolated in different institutions is complicated.

"Medical data is sensitive, and countries have strict regulations in place to protect privacy," says Shuang Wang, co-founder of Nuowei, a PPC service provider based in Hangzhou, China.

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Wang is a former assistant professor at the University of California San Diego's school of medicine, and a co-founder of the renowned iDASH competition. Established in 2019, Nuowei has grown into a team of around 100 staff, most of whom have more than a decade of experience in PPC, AI, and biomedicine.

Nuowei's PPC platform uses technologies such as Trusted Execution Environment, Multi-Party Computation, Homomorphic Encryption and Federated Learning, which allows data to be encrypted and shared for collaborative analysis without revealing the data.

"We are connecting data users and providers, such as researchers, pharmaceutical companies and hospitals through our PPC platform, for them to work together to discover effective therapeutics and innovative drugs more securely, efficiently, and at lower cost," explains Wang.

In cross-institutional studies, one challenge is controlling how shared medical data is used. A user could make an unauthorized copy or use data for purposes beyond what was agreed upon. These difficulties and the high stakes of a data breach mean most institutions are highly reluctant to share medical data.

By installing Nuowei's PPC node, data providers and users can connect with each other in a PPC data network, where the raw data won't be exposed when performing computation. Only insights will be shared based on the data use agreement enforced by blockchain technology. Researchers within the network can initiate privacy-preserving queries across federated data nodes for cohort identification.

The query criteria, the data — such as patient medical records, multi-omic data, and imaging data — and the results are protected. Users can then use annotation tools and AI models provided in Nuowei's PPC marketplace to perform a wide range of collaborative studies.

"Our proprietary PPC technology can support hundreds of concurrent participants in a single study," says Wang. Now Nuowei is supporting a series of large-scale studies, one of which is called PICOTEE, focused on colorectal cancer.

"Powered by Nouwei's PPC ecosystem along with Intel SGX technology, our PICOTEE project has connected patient data from more than 60 hospitals across 24 provinces in China, aiming to compare the effectiveness of various treatment options for different patient cohorts, with the goal of helping clinicians rapidly identify the best course of treatment," says Zhongtao Zhang, deputy president of Beijing Friendship Hospital and National Clinical Research Center for Digestive Diseases.

"The researchers involved are working to expand the project and include participants from Europe, Japan and South Korea based on our domestic research," says Hongwei Yao, chair of international research at the hospital's Department of Gastrointestinal Surgery.

"We hope with our PPC technology, patients can truly benefit from powerful computational techniques," says Wang. ∎

▲ (Left)Shuang Wang, co-founder of Nuowei, a PPC service provider based in Hangzhou, China. (Right) Clever technology allows sensitive medical data to be encrypted and shared between institutes without ever revealing the source information.

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