ICFO researchers participate in the project QuantaGenomics

The project is aimed at safeguarding the sharing of medica records for collective genomics medicine

March 19, 2024

Genomic medicine is a recent clinical discipline that involves using this genomic information about an individual as part of their clinical care, for the diagnosis of a disease for example, or a possible treatment. It is important not to confuse Genetics with Genomics. While the former refers to the study of genes, the latter focuses on the study of a specific person's genes.
In recent studies, clinicians have found that personalized **genomic medical treatments** may be a very viable alternative to fighting very aggressive illnesses and diseases. Thus, in moving into this new path within the medical arena, clinicians have realized that analyzing the data from multiple patients with similar medical records and studying a larger volume of data would allow them to have more information and find new medical treatments and solutions that could change the way we are currently diagnosing and detecting, basically based on individual cases.
Even though this new approach could help advance medicine considerably in the future,

sharing medical records of patients, not only at a local but at a national and even international level, would need to be done in the utmost private and confidential conditions. With the advent of innovative technologies, the security of our data against hackers is of major importance and a critical issue that governments are addressing.

QuantaGenomics is a European project that aims to develop a quantum-enabled secure multiparty computation service for **collaborative genomic medicine**. As ICFO predoctoral researcher Paula Alonso, partner of the project, mentions, i¿½QuantaGenomics has be n envisioned to help protect the data of patients. There are major ethical concerns about h w data is going to be shared since it often involves the analysis of data from multiple patient , and privacy needs to be strictly assured. If we consider a global scenario, with differe t regional legislations, this becomes particularly complex.i

?½ Bearing this in mind, the consortium will explore different quantum strategies to impl ment a secure multiparty computation (SMC) protocol with the ultimate goal of safegua ding medical records. It will seek to define viable quantum and classical cryptographic proto ols, validate applications of these protocols in the lab supported by a quantum-enabled fas and secure generic multiparty computation framework, integrate this system on a software-defined optical network in a coexistence scenario, and finally, move from the l b to the medical field as a use-case by doing a field demonstration of a genomic med cine ser

ice. Renowned institutes in Europe, including the **Instituto de Telecomunicacoes** (coordinators of the project), **ICFO**, **Universidad Politecnica de Madrid** (UPM), **Sorbonne Universite** (SU), **French National Institute for Research in Digital Science and Technology** (INRIA), and the start-up **Ophiomics**, have joined forces, expertise, and know-how to tackle this challenge and achieve the expected goals and milestones.

As experts in the field of quantum communication, ICFO will be responsible for implementing the entanglement-based cryptographic schemes proposed within the project. **Luis Trigo, ICFO postdoctoral researcher, and member of the consortium** points out that, i¿½in secu e multiparty computation protocols multiple users can collaborate to perform calculation , gaining access to the common final result, but without revealing their data, that remai s private. By using quantum communication techniques, we can ensure a higher degree f security with respect to conventional systems. This is especially relevant in scenarios li e genomic medicine, where information needs to remain private for several decades¿

? QuantaGenomics will prove that Quantum technologies will play a major role in solving t e problem between the privacy of data and the collection and mining of huge amounts of da a of individuals' dat

"We acknowledge the support of the QuantaGenomics project funded within the QuantERA II Programme that has received funding from the European Union's Horizon 2020 research and

innovation programme under Grant Agreement No 101017733, and with funding organisations, The Foundation for Science and Technology - FCT (QuantERA/0001/2021), Agence Nationale de la Recherche - ANR, and State Research Agency - AEI."