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Thorsten Klein

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Computer and Medical Scientists jointly researching on more secure processing of patient data

Across the world, researchers collect patient data to develop novel treatments for widespread diseases such as dementia, strokes, or tumor diseases. This data is extracted from blood samples or x-ray images is combined from different sources to multimedia contents. Researchers are faced with the challenge to evaluate this wealth of biomedical data efficiently without intruding on patients' privacy. Two Helmholtz centers in Saarbruecken and Bonn now founded the new "Helmholtz Medical Security and Privacy Research Center (HMSP)" with a joint agenda to develop trustworthy and privacy-preserving techniques to process medical data.

Patient data collected from tissue samples, CT scans, or genome sequencing is analyzed in many biomedical research projects worldwide. Meanwhile, numerous types of health data are also collected by international companies via fitness apps and similar tracking methods.

"Collecting, analyzing, and processing these enormous datasets provides completely new perspectives and insights. Ideally, this allows for an improvement of medical treatment plans. However, this process also harbors risks: the data could be used to draw conclusions about individuals whose data was collected. This could, for example, lead to a disclosure of patients' diseases," says Professor Michael Backes, founding director and CEO of the Helmholtz Center for Information Security (CISPA) in Saarbruecken. The legal requirements for processing highly sensitive data are strict –for a good reason. At the same time, this makes it difficult for medical scientists to process this data efficiently. "IT-Security research can make a major contribution to this problem. We develop efficient methods to process medical datasets securely and efficiently for a multitude of different medical application scenarios," Michael Backes declares.

Research groups at CISPA want to collaborate with researchers from the German Center for Neurodegenerative Diseases (DZNE) in Bonn, which is represented at nine other locations within the Helmholtz Association. Their research will be combined in the "Helmholtz Medical Security and Privacy Research Center", jointly funded by both Helmholtz centers and open for additional partners. "In Bonn, we are researching on different types of dementia and exploring similarities to other brain diseases. Our main goal is to develop both new preventative and therapeutic approaches," says Professor Pierluigi Nicotera, Scientific Director of the German Center for Neurodegenerative Diseases.

His center entertains a close collaboration with clinical research and conducts comprehensive population studies itself, such as the Rhineland Study. "Over the course of several decades and based on up to 30,000 participants, we are exploring how genetic factors, lifestyle, and environmental impacts interact and how they influence participants' health. As you can imagine, this results in gigantic volumes of data, requiring highly efficient algorithms that need to strictly guarantee the privacy of every single participant. This necessitates novel and secure methods that we want to develop jointly with IT-Security researchers from Saarbruecken", Pierluigi Nicotera explains.

The new research center HMSP currently consists of 13 renowned researchers including their research groups. “We want to jointly develop mechanisms that equally protect and preserve the interests of patients and physicians, research and industry. Even today, we have already established a strong expertise in information security and medical analytics in both centers, albeit without any strong interaction. Currently, we aim to gradually intertwine both research areas,” Michael Backes underlines. He adds: “Particularly with respect to medical data, the Helmholtz Association owns huge quantities of data. We want to contribute to unearthing these treasures.” The researchers also want to examine, how trustworthy current medical software and system components are, and how potential security vulnerabilities can be mitigated.

Tobias Hans, Minister-President of Saarland, sees a lot of potential in this new collaboration, also for Saarland itself. On the opening of the Helmholtz Medical Security and Privacy Research Center, Tobias Hans says: “This collaboration demonstrates how cutting-edge technology can directly benefit the people.”

wissenschaftliche Ansprechpartner:

Professor Michael Backes
Founding Director and CEO of the Helmholtz Center for Information Security (CISPA)
Spokesperson of the Helmholtz Medical Security and Privacy Research Center (HMSP)
Tel. 0681/302-3249
Mail: director@cispa.saarland

Originalpublikation:

https://hmsp.center

Pierluigi Nicotera, German Center for Neurodegenerative Diseases and Michael Backes, Helmholtz Cispa
DZNE

Professor Michael Backes, Speaker of Helmholtz Medical Security and Privacy Research Center Cispa