Website address:
https://www.gesundheitsindustrie-bw.de/en/article/press-release/artificial-intelligence-helps-physicians-make-precise-heart-diagnoses

Artificial intelligence helps physicians make precise heart diagnoses

Researchers from the University of Heidelberg have published a study on more than 60,000 patients in the renowned journal Lancet Digital Health, demonstrating the potential of AI in cardiac medicine.

Heart failure is a growing problem, affecting up to 2.5 million people in Germany alone. In order to optimise treatment, it is important to determine what has triggered the disease and which medication will have the best effect on each patient. To do this, doctors use various tests and measure important heart parameters during cardiac catheterisation.

Scientists from several German research institutions have now developed new AI methods that enable differentiated diagnoses and functional measurements based on MRI images of the heart. They report in Lancet Digit Health.

The last author, Prof. Benjamin Meder from the University Hospital in Heidelberg (UKHD, Prof. Dr. N. Frey), is the spokesperson of Informatics for Life and a scientist at the German Centre for Cardiovascular Research (DZHK). Teams from the University Hospital in Ulm (Prof. Dr. W. Rottbauer) and the Robert Bosch Hospital in Stuttgart (Prof. Dr. R. Bekeredjian) were also involved.

Invasive examinations could become superfluous in the future

"Our AI can bring the knowledge and experience of experts who treat many heart failure patients into the clinical arena. In the future, doctors will have much more machine support to diagnose heart failure accurately and in time," says Meder. For example, AI can use MRI images to determine the filling pressure in the heart chambers, which could make certain invasive tests unnecessary in the future. A more accurate diagnosis allows for more targeted treatment and could reduce healthcare costs.

"We are researching diagnostic solutions that are very challenging," says David Lehmann, an AI researcher in Meder's team. Among other things, the team has ensured that the AI only needs a single MRI image to make an accurate diagnosis, rather than many different sequences. Such fast examinations could overcome bottlenecks in MRI diagnostics and make the method accessible to many more patients. AI can improve workflows by reducing the time spent by specialists and medical technicians in the diagnostic process, making the examination more accessible to the patient, and enabling the reading of critical physiological parameters based solely on non-invasive imaging.

Heterogeneous data from real applications desired

The research team attached great importance to the generalisability of the AI, so that it would work not only in Heidelberg but also in other clinics. Accordingly, heterogeneous data, i.e. data from different devices and examination protocols, were taken into account by means of a multi-centre study design. "It is important that clinical centres work together on such issues. The DZHK provides the appropriate infrastructure for this," says Prof. Norbert Frey, Medical Director of the Department of Cardiology, Angiology and Pneumology at the UKHD. Subgroup analyses have been carried out to ensure that AI works regardless of the age or sex of the patient.

AI made in Germany

Health data is subject to strict data protection laws in Germany. All data analysis was performed on local servers in Heidelberg. The research work on AI has been completed, but the software still needs to be certified under the Medical Devices Act before it can be distributed. The researchers working with Meder also plan to apply their AI to other problems, such as recording additional parameters from an electrocardiogram (ECG). "In Germany, we can develop state-of-the-art AI systems and integrate them into everyday life while protecting privacy. I like to call this 'healthy AI', which enables good things without compromising safety," Meder adds.

***Informatics for Life**

is an interdisciplinary alliance of cardiovascular physicians and computer scientists from the University of Heidelberg, the Heidelberg University Hospital and the Heidelberg Institute for Theoretical Studies. The initiative, which is funded by the Klaus Tschira Foundation, aims to combine applied medicine with digital medicine and machine learning in its projects.

Publication:
Lehmann DH, Gomes B, Vetter N, et al. Prediction of diagnosis and diastolic filling pressure by AI-enhanced cardiac MRI: a modelling study of hospital data. Lancet Digit Health. 2024;6(6):e407-e417. doi: 10.1016/S2589-7500(24)00063-3

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Further information

- German Centre for Cardiovascular Research (DZHK)