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Press release
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Atherosclerosis: Forecasting tools for early detection of disease Artificial intelligence as the basis for comprehensive prevention

Graz, 15 February 2022: Cardiovascular disease is the most common cause of death worldwide and often enormously limits patients' quality of life. Prevention and early detection are particularly important, not least to ease the burden on the healthcare system. Med Uni Graz researchers in cooperation with the Styrian Hospital Association (KAGes) as well as international colleagues are exploiting artificial intelligence (AI) methods to enhance high-end risk forecasting tools and make them more widely available.

Atherosclerosis: "Silent" disease with far-reaching consequences

Atherosclerosis is the most common pathological change to the arteries, and it is characterized by chronic progression as well as hardening, thickening, loss in elasticity and narrowing of the blood vessels. "Since atherosclerosis does not cause symptoms for a long time, it often remains undiscovered and can cause severe cardiovascular events such as heart attacks or strokes," explains Peter Rainer from the Division of Cardiology at Med Uni Graz. Early identification of people at high risk of developing atherosclerosis is very important so that preventive measures can be taken. "Since healthy and symptom-free people often do not have access to standard methods of risk prediction, atherosclerosis may remain undiscovered for a long time," says Peter Rainer, describing the situation.

Prognosis: Artificial intelligence for risk forecasting

The new international research project "**Predicting Cardiovascular Events Using Machine Learning (PRE-CARE ML)**" aims to use the large amount of available yet unexploited health data to predict cardiovascular events. As digitization increases, this data is becoming more extensive, but it cannot be sufficiently analyzed and exploited using conventional methods. The remedy for this may be risk forecasting tools based on artificial intelligence, which should be enhanced and made more widely available. Coordinated by Peter Rainer (Med Uni Graz), a top-level international consortium has been formed that is working on developing easy to use, reliable risk forecasting tools. The consortium includes Diether Kramer, Stefanie Jauk (KAGes) and Werner Ribitsch (KAGes/Med Uni Graz) as well as scientists from Karolinska Institutet in Stockholm, the Hasso Plattner Institute in Potsdam, the Icahn School of Medicine at Mount Sinai, New York, the University of Sao Paulo, Brazil, and the University of Maribor, Slovenia.

Research goal: Forecasting tools with comprehensive coverage

Medical information is becoming increasingly digitized, which means gigantic amounts of electronic health data are available for risk prediction. Standard approaches fail to process this data completely and make it available for medical problems and forecasting. "In the PRE-CARE ML project, our joint goal is to use artificial intelligence methods to develop modern risk forecasting tools for early detection of people at a high risk for cardiovascular disease," says Peter Rainer. Scientists are falling back on their prior experience in using machine learning algorithms for risk prediction in order to enhance them as part of a multidisciplinary consortium and to validate and enhance models of different hospital networks and population groups.

"In our project, we work closely with hospitals to integrate our models into their information systems and evaluate the impact on daily hospital routines," explains the Med Uni Graz expert. For example, the data science team of Diether Kramer (KAGes) is doing important preliminary work and the application of AI-based risk prediction is currently being tested at Murtal State Hospital. Finally, the researchers will look into effective communication strategies in order to change patient behavior and especially to ensure acceptance of a risk prediction tool by treating physicians at hospitals and in private practices.

The project will run for 36 months, and the total project volume is EUR 924,000. The researchers have clearly defined the target: to reduce both mortality from the leading cause of death worldwide as well as loss of healthy life years and quality of life due to cardiovascular events.

Research team profile

Peter Rainer is a clinical cardiologist at Med Uni Graz who leads a translational research group that conducts heart attack and heart insufficiency research. He coordinates several international research projects in this area and is the head of the cardiac insufficiency program at University Heart Center Graz.

Stefanie Jauk and Diether Kramer are data scientists at the Styrian Hospital Association (KAGes) who are concerned with training, implementation and validation of machine learning-based individual risk assessment of clinical operations. Werner Ribitsch is a nephrologist at University Hospital Graz who works on risk prediction of vascular and renal diseases.

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