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SPECIAL

Smart Hospital

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Interview with Gerald Sendlhofer

How a Hospital Becomes Smart

We spoke with Gerald Sendlhofer, Head of Quality and Risk Management at the University Hospital of Graz, about the concept of a "Smart Hospital" and asked him to provide insights into this exciting future-oriented topic.

Mr. Sendlhofer, how do you define a "Smart Hospital"? What core aspects truly make a hospital smart?

Fundamentally, with a Smart Hospital I associate mainly two aspects. First, the ability to digitize processes. Second, the ability to think about workflows in a „smart" way, regardless of the level of digitalization. In my view, hospitals become more efficient in this manner, ultimately evolving into a „Smart Hospital."

How has the concept of Smart Hospitals developed in recent years, and what trends do you currently see?

Before the pandemic, most of our patient safety projects were of „analogue" nature: meetings were held in person, paper-based checklists were created, different risk assessment scores were manually calculated and we used hand written hospital records or diabetes charts. Nowadays, nearly all projects of the Department for Quality and Risk Management are almost of digital nature and are carried out in cooperation with many outstanding partners within and outside the Styrian Hospital Association Ltd.

The introduction of the digital fever chart at the University Hospital of Graz was, in my view, the pivotal point for further digitalization initiatives. By now, the diabetes chart has been almost entirely replaced by the decision-support system called Glucotab. Patient wristbands have been equipped with barcodes, enabling scanning for certain safety reasons. The paper-based surgical safety checklist has been digitized and was interactively linked to the digital fever chart. Prediction tools are under development or have already been implemented. Meanwhile, a delirium prediction tool is used, displaying the individual risk for delirium on the day of admission of the respective patient.

Further digitalization projects together with the Medical University of Graz, such as "SiMED – Safe Medication through AI" or "CoPilot-Gesundheit", a Patient Journey App for elective hip surgeries, are further innovative digital solutions.

How do you successfully integrate new digital solutions into existing hospital structures? Where do you see the biggest challenges?

Integrating new solutions into everyday operations is sometimes a mix of "curiosity and resistance". On the one hand, employees hope for work simplification through digitalization. On the other hand, there is always a certain fear of the unknown. What does the new tool do better? Is it even safe and reliable? These are legitimate concerns. However, once a digital solution is implemented and initial problems and operational uncertainties are resolved, acceptance prevails.

We also recognized that the integration of new solutions works better and is more beneficial, when the future "users" are involved from the very first day. Therefore, the University Hospital of Graz and the Medical University of Graz try to develop ideas and become development partners in some digitalization projects. This has the advantage that specific needs can be identified with future users, which are then implemented iteratively with the development partners. This guarantees that users receive practical and user-friendly tools.

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„Digitalization enhances both patient and employee safety."

Gerald Sendlhofer

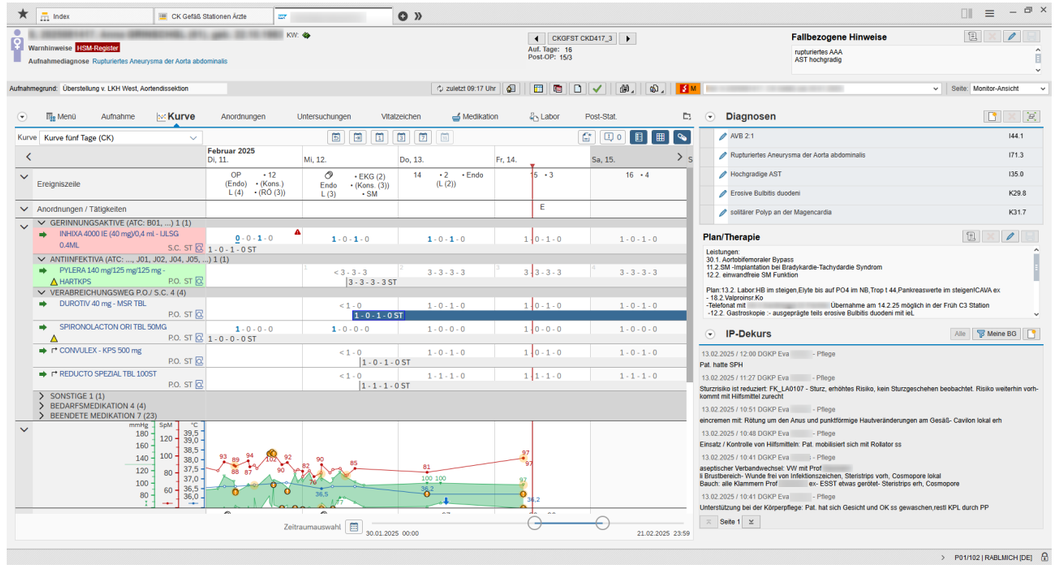
Are there best-practice examples of Smart Hospitals that could serve as models?

I only have an overview of a small part of these rapidly evolving market and their developments. This is why I decided to organize the conference „Bits & Bytes – The Hospital of the Future" for the University Hospital of Graz together with the Medical University of Graz. Leading experts from Austria and abroad will provide insights into many topics and developments. We will also discuss relevant topics such as ethics, patient safety, IT security or legal aspects in the AI context.

For example, the Chief Information Officer from Aarhus University Hospital, a hospital which is often mentioned as one of the leading „Smart Hospitals," will present how they address digitalization topics. Additionally, companies such as Microsoft, CANCOM, Infineon or Merkur Versicherung will showcase their developments and provide an outlook on the near future. The event in late September 2025 will also offer opportunities to engage with leading IT companies and start-ups.

How do patients specifically benefit from a Smart Hospital? Are there measurable improvements in care?

Digitalization enhances both patient and employee safety. First, verification possibilities to increase safety are created—such as patient identification before a certain procedure, or prior diagnostic steps, transportation, or medication administration. Second, certain tasks can be delegated to AI tools, such as decision-support systems, prediction tools or chatbots. Patients will in some occa-



Screenshot of a digital fever chart
Quelle: FMI, KAGes

sions no longer need to visit a hospital, as this can be conveniently conducted via teleconference from home, or using a patient journey APP.

How is the role of medical personnel changing with smart technologies?

Healthcare roles are evolving. Certain tasks, such as follow-up examinations, will be digitally managed and outsourced from the hospital without losing sight of the patients. New job profiles, such as care managers who use patient journey apps to guide individual patient needs, will be created. Traditional consultation discussions will increasingly take place via teleconference, with consulting doctors working from home. Decision-support systems will play a critical role in diagnostics and treatment planning. Interpretation services will no longer rely on human interpreters but on digital translation tools. Patient mix-ups will be eliminated with the widespread implementation of barcode technology. However, safety and data protection remain paramount in all these developments.

What does the hospital of the future look like? Do you have a vision for the next 10 to 20 years?

Digitalization will increase rapidly and will become indispensable in many areas of diagnosis, prognosis, and personalized treatment of patients. Robotics in surgery is already in place, and it will become even more sopisticated. Perhaps robots will not only handle cleaning tasks but also assist in various occasions in an operating theatre. Telemedicine will expand further. “Digital Applications“ will be prescribed by doctors, allowing patients or caregivers to manage certain tasks or therapy recommendations through apps. Logistics processes will become even more automated, and HR departments will intensify the use of AI for skill management, workforce planning, recruitment, and personnel development.

CANCOM Austria

Customer flow management solution for Feldkirch state hospital: **self-check-in, HIS integration, data security.**

Digital queue management systems such as CANCOM PatientFlow ensure greater efficiency and higher administrative security in the complex everyday hospital life. The digitization experts at CANCOM Austria developed and implemented a future-proof solution from a single source for the Feldkirch state hospital.

Vorarlberg state hospitals: top-level inpatient care for Vorarlberg.

Around 5,000 employees work in the Vorarlberg state hospitals for 450,000 patients. In addition to the state hospital in Feldkirch as a key facility and teaching hospital, the network includes sites in Hohenems, Bregenz, Rankweil and Bludenz, including two nursing schools. The core task is guaranteeing inpatient care with top specialists and the best medical-technical infrastructure.

The starting point.

A series of renovation measures were carried out at Feldkirch state hospital to improve patient well-being, efficiency and comfort. For example, several counters for patient admissions were brought together in one place. The aim was to avoid long queues and orientation problems for patients "with appointments" and "without appointments". CANCOM Austria was therefore involved as a technology partner at an early stage to ensure that operations would run smoothly immediately.

The solution.

One of the challenges was to get the various IT service providers together. The PatientFlow solution enables waiting tickets to be issued and patient calls to be made in an orderly manner via a screen display. To optimize the exchange of patient data and appointments, the solution was integrated into the existing hospital information system (HIS). Patients "with appointments" can check in via an eCard terminal and are directed straight to the relevant department. A total of four ticket counters with a large user interface and eCard reader are available at the main entrance, as well as a small ticket counter at the Infopoint. Patient calls are made via eight information screens in the waiting area.

The solution and services provided by CANCOM Austria such as comprehensive consulting, conception of the solution and delivery of hardware and software as well as the integration of the existing infrastructure resulted in having personal waiting numbers, better utilization of waiting areas, efficiency, avoidance of queues and guaranteed minimum distances as well as patients know now when it is their turn. This ensures more quality in patient interaction.

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JOANNEUM RESEARCH

"Smart Hospital": Intelligent Software Meets Intelligent Processes

The vision of the Smart Hospital is far more than the mere adoption of cutting-edge technologies—it is the seamless fusion of „intelligent software" and „intelligent processes." Software should not exist as an end in itself but should enhance interdisciplinary collaboration within the hospital and integrate seamlessly into existing workflows. At JOANNEUM RESEARCH and within our research group „Digital Healthcare Solutions," we pursue this goal with a consistent bottom-up approach.

From Concept to Intelligent Processes

Our approach begins with the involvement of those who design and execute the processes—the healthcare staff. As part of a design-thinking process, we first identify the needs and challenges of various professional groups and patient-centred objectives. Co-creation and iterative methods are crucial to developing solutions that meet real-world requirements.

Challenges and Success Factors

Apps and digital solutions in healthcare often fail due to a lack of alignment with workflows. Our experience shows that involving the end users from the very beginning is essential. Field observations, focus groups, and workshops provide the foundation for a deep understanding of processes and problems. Based on this, we create mock-ups, prototypes, and conduct usability tests before deploying a solution in live operations. This iterative process enables us to respond to feedback and tailor the software precisely to users' needs.

We also place great emphasis on integration and interoperability. Intelligent software must not operate in isolation but should seamlessly communicate with existing IT systems. Our projects demonstrate that the combination of technical excellence and user-centred design is key to successful healthcare innovation. We firmly believe that the success of a Smart Hospital does not rely solely on technology but on the people who use it. Our focus on co-creation and bottom-up approaches ensures that the solutions developed truly address the needs of healthcare professionals and patients.

Conclusion

A „Smart Hospital" is not an end in itself. It is realised through the seamless combination of intelligent software and intelligent processes. This is achieved through close collaboration with end users, iterative development processes, and consistent integration into existing systems. Only in this way can we overcome the challenges in healthcare and sustainably improve the quality of care.

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LKH-Univ. Klinikum Graz / KAGes Steiermärkische Krankenanstaltenges.m.b.H.

First “Autonomous Mobile Robot” in the logistics tunnel at Graz University Hospital

Fig. 1: The AMR in a test run as part of the network integration v.l.n.r.: Dipl. KHBW M. Kazianschütz, MBA MSc und FH-Hon.Prof. DI (FH) DI Dr. M. Grasser, MBA MPA

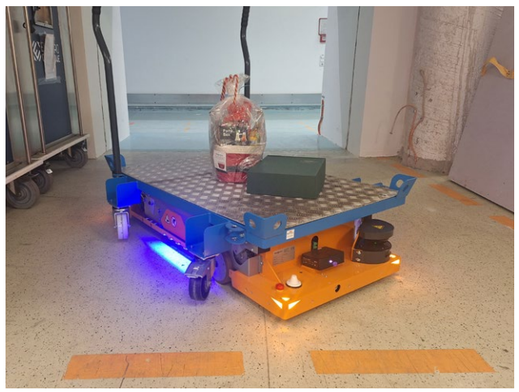

Fig. 2: First transport test drive (with Christmas package from the works council)

In December 2024, the first autonomous mobile robot (AMR for short) was put into test operation in the logistics tunnel and supply center at Graz University Hospital. From February 2025, the AMR will assist with the transportation of pallets between the tunnel entrance area and the central storage area, thereby relieving the workload on employees in the business/logistics department. This will not only make work on site more innovative, but also more ergonomic.

The new flat robot also complements the existing “robot family” at Graz University Hospital within the business/logistics department. Two autonomous cleaning robots are already being used successfully to clean corridors and hallways, as well as a window cleaning robot, which means that cost-intensive industrial climbers can be dispensed with in certain areas. Valuable experience has already been gained with the two cleaning robots christened “Franzi 2.0” (which, incidentally, is dressed in a doctor‘s coat and is used in surgery) and “Horsti” (a robot dressed as a clown in the children‘s center). This was also of great added value during the commissioning of the new and first driverless transport system in a Styrian hospital.

The new AMR was christened “Gertschi 2.0” - by the staff on site. Why? As a tribute to a colleague with (almost) the same name who is going into semi-retirement - even if the robot can never completely replace the colleague, of course.

The implementation of the AMR was the result of a feasibility study in which the usefulness and cost-effectiveness of a comprehensive automated guided vehicle system (AGV) in the approximately 2 km long logistics tunnel was evaluated. As a result of this study, further simulations and corresponding risk assessments, the automation of defined sections was deemed to be the best solution and has now been piloted.

In addition to the supplier STILL and the Business/Logistics department (Supply Chain Management staff unit), numerous other departments were also involved in the design and piloting, including the IT Infrastructure department, STBU, CISO, Technology department and TOS staff unit.

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KNOW-Center

AI-Powered Communication Training: How Chatbots Enhance Medical Education

Effective communication between healthcare professionals and patients is essential for diagnosis, treatment adherence, and patient care. Traditionally, students refine these skills through actor-based simulations, but such training is costly and limited. To address this, the Know Center develops AI-driven solutions that enable scalable and flexible learning.

AI as a Training Partner for Medical Students

Under the lead of Viktoria Pammer-Schindler and Elija Dentler, the Know Center has created AI-based training systems that allow students to practice patient interviews in a structured and adaptive environment. These systems use generative AI to simulate interactions, providing realistic, context-aware dialogues.

Digital Patient Simulations in Medical Education

In collaboration with the Carinthia University of Applied Sciences (Daniela Krainer, Sabine Murbacher, Sabine Walgram, Laura-Nadine Kroll), researchers explored how AI chatbots can support anamnesis training. Built on real-world case vignettes, this system simulates different patient personas. Students often report a lack of training opportunities—this AI-based approach enables them to practice anytime, anywhere. Pilot studies with students training to be occupational therapists showed promising result, and high satisfaction of educators and students with the AI-based simulated patient.

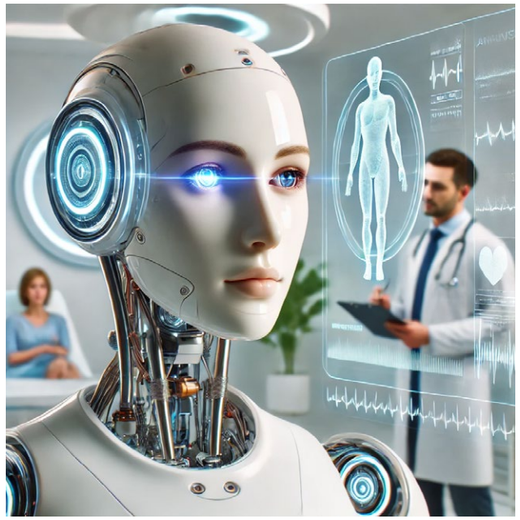
Beyond Text: Interactive AI for Therapeutic Training

In collaboration with the Medical University Innsbruck (Stefan Höfer, Alexandra Huber), ongoing work includes developing an avatar- and speech-based chatbot to train therapeutic communication even more realistically. This is currently tested in a feasibility study with medical students, using qualitative and quantitative methods to assess user experience and coherence.

Advancing Human-Centered AI in Education

While initial results show that such AI-based training can effectively complement traditional methods, further research is needed to optimize these systems. Next steps include larger field studies, generalizing from selected sample conversation types, and investigating the sweet spot between engineering effort and usefulness for training.

By integrating AI into training, the Know Center demonstrates how human-centered AI can help extend human capabilities, in this case by becoming an interactive learning partner - helping future healthcare professionals develop essential communication skills in a scalable and accessible way.



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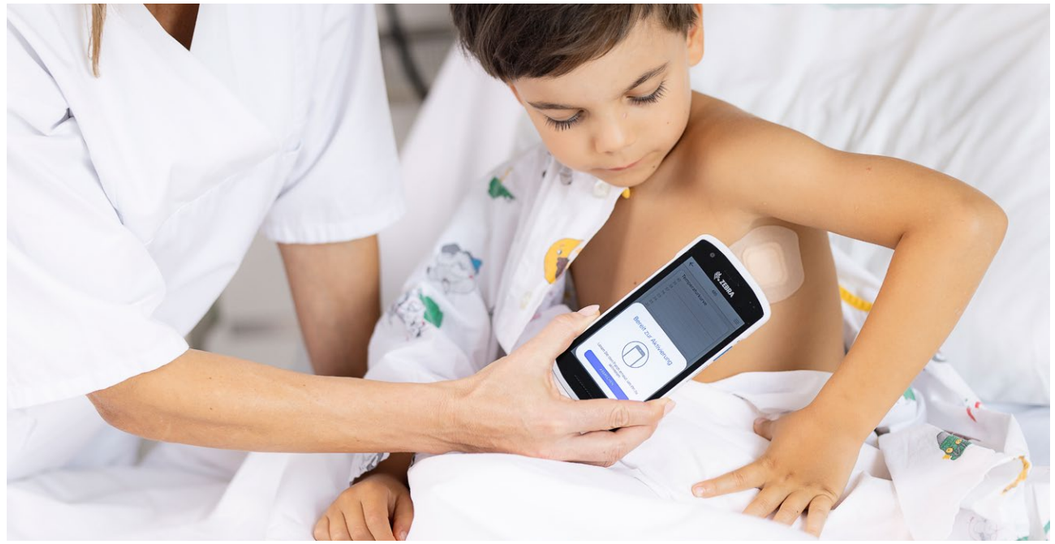

SteadySense

Continuous Temperature Monitoring:
A Vital Tool in Medical Units

Continuous temperature monitoring is a crucial element in modern healthcare, enabling real-time detection and response to temperature fluctuations. This practice enhances patient care and minimizes complications across various medical units. Needless to say, that the captured temperature data need to be transferred automatically to the Hospital Information System (HIS) to off-load nursing staff.

One primary advantage of continuous temperature monitoring is the early detection of fever and infections, allowing for timely medical intervention. Identifying fever promptly helps prevent complications and improve patient outcomes.

Critically ill patients in intensive care units (ICUs) benefit significantly from continuous monitoring since years. Even minor temperature changes can indicate deterioration, requiring immediate medical attention. With new wearable products like SteadyTemp® such benefits can be easily, and cost efficiently transferred to normal wards in the hospital, e.g. to the following departments:

- **Surgical Units**: Post-operative patients require close monitoring to detect signs of infection or complications for a smooth recovery.
- **Pediatric Units**: Pediatric care relies heavily on continuous temperature monitoring, as infants and young children are highly susceptible to temperature fluctuations.
- **Oncology Units:** Supports managing fever and side effects in chemotherapy or radiation therapy patients.
- **Transplant Units:** Transplant recipients are also at high risk of infection due to immunosuppressive therapy. Continuous temperature monitoring plays a crucial role in early detection of infection, which is critical for preventing serious complications and improving transplant outcomes.

Continuous temperature monitoring with wearable wireless solutions like SteadyTemp® relate to a better treatment and faster recovery of the patient and therefore shorter hospital stays. Compared to other non-invasive thermometers the temperature data are much more reliable because the sensor stays always on the same location. They lead also to a higher operational efficiency because the automated tracking minimizes manual checks and allowing healthcare providers to focus on critical tasks. The seamless integration to the HIS ensures real-time data accessibility. These solutions support even more effective and optimized patient care and hospital management.

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Telbiomed

KITGuideMe –
Decision support for guideline-directed medical therapy for heart failure patients in a telemedicine care program

HerzMobil has been implemented as a telemedical telemonitoring system for patients with heart failure in 5 federal states in Austria. In order to improve the care of patients, an add-on software module, named KITGuideMe, has been developed by the AIT Austrian Institute of Technology and certified as a medical product of class IIa, according to the MDR.

KITGuideMe is a software solution for decision support for the guideline-compliant, drug-based treatment of heart failure patients by health professionals. The focus is on the guideline-directed medical therapy for the indication "Heart Failure with reduced Ejection Fraction" (HFrEF), targeting the following relevant drug groups from the ESC guidelines: renin-angiotensin system inhibitors (RAASi), beta blockers (BB), mineral corticoid receptor antagonists (MRA), diuretics and SGLT-2 inhibitors.

The module supports health professionals to prescribe a more targeted medication dosing and is integrated into HerzMobil, giving the care team the opportunity to compare the current medication dosage with the guideline recommendation.

With the exception of diuretics, all active substances of the individual groups within the ESC guidelines for heart failure are provided with dedicated starting and target dose values. The module takes into account possible contraindications according to the ESC guidelines and intends to help patients to reach the guideline-compliant target dose of the respective drug group during the course of treatment. A graphical user interface displays the current status of the prescribed dose compared to the target dose, according to the guidelines for the different groups of active ingredients. Therefore, it is necessary to separate the prescribed medications into their active ingredients and set them in relation to the current guideline. This makes it possible to see what percentage of the dose has already been reached for each active ingredient.

To make the results of the module usable, it is planned to integrate them into the telemonitoring episode report via the ELGA infrastructure. In order to be able to scientifically prove the benefits of the module, a block-randomised clinical trial is currently being launched in Tyrol and Styria. The new software module KITGuideMe is being implemented as part of the ADAPT project. The project is funded by the Styrian Health Fund (Gesundheitsfonds Steiermark) as part of the "Digital!Healthcare" funding call.

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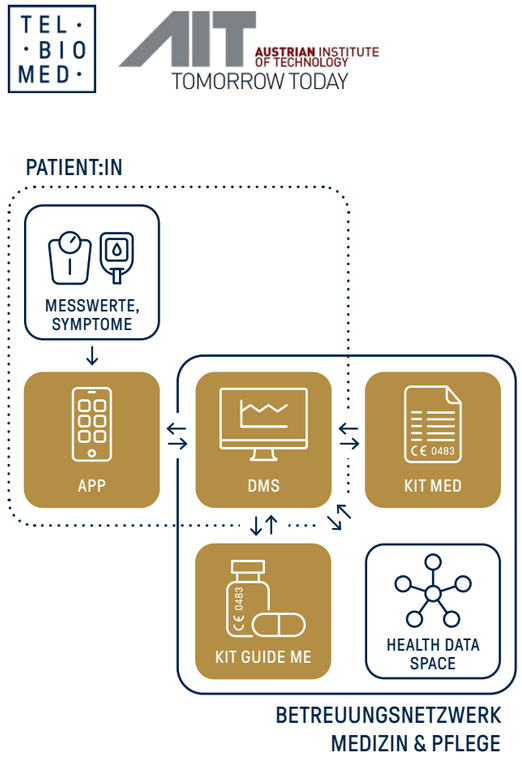

TU Graz

Better MRI Videos Thanks to New Machine Learning Method

Researchers at Graz University of Technology (TU Graz) generated precise real-time images of the beating heart from just a few MRI measurement data using neural networks.

Medical imaging using magnetic resonance imaging (MRI) is very time-consuming: An image has to be compiled from data from many individual measurements. Thanks to the use of machine learning, imaging is also possible with less MRI measurement data. However, the prerequisite for this is perfect images that can be used to train the AI models. Such perfect training images do not exist for certain applications, such as real-time MRI, as such images are always somewhat blurred. An international research team led by Martin Uecker and Moritz Blumenthal from the Institute of Biomedical Imaging has now succeeded in generating precise live MRI images of the beating heart even without such training images and with very little MRI data with the help of smartly trained neural networks.

The researchers used self-supervised learning methods to train their machine learning model. Moritz Blumenthal explains: "We divided the measurement data provided by the MRI device into two portions. From the first, larger data portion, our machine learning model reconstructs the image. It then attempts to calculate the second portion of the measurement data withheld from it on the basis of the image." If the system fails to do this or does so poorly – according to the underlying logic – the previously reconstructed image must have been incorrect. The model is updated, it creates a new improved image variant and attempts to calculate the second data portion again. This process runs for a number of rounds until the result is consistent. In this training process, the system learns from a large number of such reconstructions what good MRI images should look like. Later, during the application, the model can then directly calculate a good image.

The research results are the result of an international and interdisciplinary collaboration of the Institute of Biomedical Imaging. Participants included Christina Unterberg (cardiologist at the University Medical Centre Göttingen), Markus Haltmeier (mathematician at the University of Innsbruck), Xiaoqing Wang (MRI researcher at Harvard Medical School) and Chiara Fantinato (Erasmus student from Italy). The algorithms and MRI data are freely available so that other researchers can reproduce the results directly and build on the new method.

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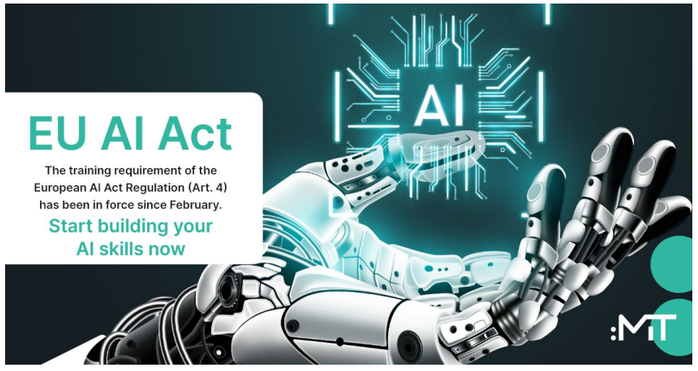

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M.I.T e-Solutions

SMART Hospitals: Digital Competence for Healthcare

The digital transformation is revolutionizing the healthcare sector. From connected medical devices to AI-supported diagnostics – SMART Hospitals represent patient-centered, efficient, and future-proof healthcare. However, digitalization is not only about technological innovations but also about targeted training for employees. This is where M.I.T e-Solutions GmbH comes in.

M.I.T e-Solutions: Your Partner for Digital Training in Healthcare

As one of the market leaders in e-learning in Austria, M.I.T provides innovative digital learning solutions for various industries – including healthcare. Our interactive training courses help meet new regulatory requirements, utilize digital processes efficiently, and provide employees with targeted education.

A current example is our training on the NIS-2 Directive, which is crucial for hospitals and healthcare organizations. Additionally, our e-learning contents covers the new EU AI-Act, which is becoming increasingly relevant for the use of AI in medical applications. With this, we support SMART Hospitals on their path to secure and compliant digitalization.

Exclusive Offer for HTS Members: Free e-Learning Platform

As a long-standing member of Human. technology Styria (HTS), we at M.I.T e-Solutions are honored to contribute to the HTS network. We are happy to actively support the new HTS service under the motto "Member4members."

As an HTS cluster member, you receive exclusive and free access to our HTS learning platform via hts.lona.eu.

Our extensive course catalog offers a broad selection of current and relevant topics, such as NIS-2 Directive, EU AI Act, Digitalization, ESG, Workplace Safety, Stress and Burnout Prevention, and many more. You can access these courses flexibly and at your convenience. The offer is valid for up to three employees per company.

If you would like to provide the platform and its learning content for your entire company, you benefit from a 15% HTS discount on all M.I.T services and products. Simply use the code "hts-25".

With this, we offer an attractive opportunity to build knowledge efficiently and flexibly – a key factor for the success of SMART Hospitals.

Digitalization Requires Knowledge

A SMART Hospital is only as effective as its employees. Through targeted training, medical institutions can shape their digital transformation sustainably. M.I.T e-Solutions is your competent partner – offering practical e-learning solutions that establish knowledge and shape the future.

Interested?
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The RoboticScope from BHS Technologies

FFG Promoting Innovation.

Funded by

Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

The ICT project PRESENT supports the development of smart hospitals

Today, data is created in almost all areas of life. This data can be used to create economic, scientific, and social opportunities. PRESENT (PREdictions for Science, Engineering N' Technology) solves problems in the professional use of this data. These problems include a lack of specialist knowledge and interface problems. PRESENT solves these problems with a new software architecture. It is a new way of designing security that works for even the most sensitive data. It meets the highest security requirements and is so easy to use that no statistics or IT experts are needed to operate it.

The project consortium, led by Fraunhofer Austria, includes the organizations AIT Austrian Institute of Technology, Joanneum Research Forschungsgesellschaft mbH, Innsbruck Medical University and Graz University of Technology.

Here are two examples from the healthcare sector that show how PRESENT helps with specific problems.

CANCOM Austria

As part of the FFG project „PRESENT," CANCOM Austria is studying how patients move between healthcare service providers. Modern data standards like FHIR and the processing of large amounts of data in suitable systems are central to this. CANCOM handles the transformation and selection of FHIR stores to ensure an optimal basis for analyses. By working with other scientific project partners in different sectors, we can use the data provided to find patterns or problems. This also helps predict how much of the healthcare system will be used, so it can be prepared for high demand.

BHS Technologies

The RoboticScope from BHS Technologies is a device that uses head gestures to control 3D images during microsurgery. It provides high-resolution 3D images in real time, allowing the surgeon to see everything clearly. This improves precision, efficiency, and ergonomics during surgery. In the PRESENT project, we are studying how the RoboticScope is used. We are looking at data that shows the time, the robot's position, how much the zoom level is changed, and what functions are selected. We are also looking at how the operations are classified. The goal is to identify the current surgical step and suggest specific steps to take to the surgeons. These findings help make surgical procedures more precise and efficient.