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The Magazine – 2019 Issue
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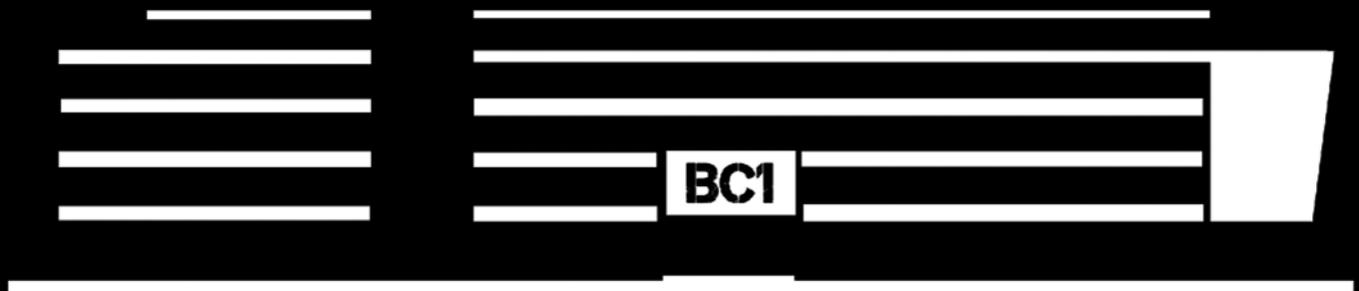
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Photo: JKU

Univ. Prof. Dr. Meinhard Lukas
*President of Johannes Kepler University
 and Head of Softwarepark Hagenberg*



Photo: SWPH

Dr. Sonja Mündl
*Manager of Softwarepark
 Hagenberg*

Welcome to the digital health revolution

Digital transformation influences and penetrates every field of knowledge as well as the day-to-day running of society. With their digital health innovations in the medical sector, Johannes Kepler University Linz and Softwarepark Hagenberg have their finger firmly on the pulse. An example of this is the research being done in the field of virtual anatomy. Projects like this are forward-looking and reaffirm Upper Austria's place at the pinnacle of research and business – we're not part of the pack, we're leading it. The future means digital health. ►

Digital health – the future of our health!

Current trends in technology and digitalisation have a major impact on the world of health and have a lasting impact on healthcare. Areas such as health, healthcare, life and society should be linked by means of digital technologies in order to improve and individualise the efficiency of healthcare. In 2019, Softwarepark Hagenberg is giving the topic of digital health centre stage and it will be exploring the challenges and opportunities that it presents. I'm looking forward to an exciting year and seeing you again at Softwarepark Hagenberg – stay healthy! ►

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Photo: FH OÖ

Dipl.-Ing.(FH) Thomas Kern

*FH Upper Austria, Hagenberg Campus,
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Photo: STIWA Group

Dipl. Ing. Thomas Führer, MSc

Chairman of the SWPH company network

Technical innovations as a boost for medicine

The FH Upper Austria TIMed CENTER develops interdisciplinary solutions at the interface between technology and medicine. It is one of the key junctions in "Medical Upper Austria" (MED UP), an initiative run by the State of Upper Austria which promotes cooperation in research and economics within the field of medical technology. Through its companies, research and educational institutions, Softwarepark Hagenberg provides an ideal breeding ground for digital health innovations. Completely new methods for providing medical education and training to ensure patient safety are being developed as part of the flagship project "MEDUSA", for instance. ▶

At the interface between digitalisation and medical technology

At Softwarepark Hagenberg, more than 75 companies, as well as training and research organisations collaborate on IT issues. In the spotlight here is the increasing digitalisation of all spheres of life and work. Networked processes and new technologies bring challenges with them too. This applies to medical technology in particular. The greatest possible degree of transparency and security is crucial in this area. Softwarepark Hagenberg is perfectly equipped to take on these future trends: its research institutions, leading companies and training opportunities make it a centre of excellence for innovative research and development. ▶



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Your good health!

by DI (FH) Thomas Kern
FH Upper Austria, Hagenberg Campus, Center Director - TIMed Center

The widespread use of digital technologies will have a lasting impact on the field of medicine. Their contribution should allow everyone to have guaranteed access to excellent medical care and support as well as making this care efficient and affordable. Digital solutions can help motivate people to get to know more about their own health, which help ensure a faster recovery through the appropriate drugs and therapy.

History shows that as well as creating many opportunities, new technology presents risks and challenges too – this is also true in healthcare. That's why Softwarepark Hagenberg's event series – now in its third year – is dedicated to the central topic of "digital health".

For us, this term refers to all the technologies that will be used increasingly in the practice of medicine and in medical research, as well as in medical devices and healthcare in the future. This includes **machine learning, artificial intelligence, robotics, virtual, augmented and mixed reality, internet of things, highly sensitive detection technology, biosensors and wearable devices**. They promise improved diagnostics, new, personalised therapies (precision medicine), connected health systems, as well as more modern medical training and remote surgery.

These are the issues which we'll be investigating today with eminent experts and your good selves. The launch event on 14 March 2019 is dedicated to the topic of "digital transformation in healthcare".

The Softwarepark Hagenberg expert team: Thomas Führer, Theodorich Kopetzky, Josef Küng, Sonja Mündl and myself, Thomas Kern, are looking forward to your visit. ▶

Women in technology

Woman power in Softwarepark Hagenberg

Softwarepark Hagenberg is putting female technicians in the spotlight! Our new “successful women” campaign aims to link up and strengthen ties between female technicians. We will be proudly presenting strong women, their careers as well as their current projects in future issues of the Softwarepark Hagenberg magazine, “4232”.

Tell us about your career, in particular, at Softwarepark Hagenberg (SWPH).

SWPH has been my “professional home” for many years now. I began teaching in the Software Engineering program at the University of Applied Sciences more than 20 years ago. In 1999, following my doctorate at the Johannes Kepler University (JKU), I started full-time at the Software Competence Center Hagenberg (SCCH), where I worked my way up to become head of the database technology area. I was responsible for scientific and economic success – it was an exciting and full-on time. In 2012, after my second maternity leave, I switched to work part-time under Prof. Josef Küng at the JKU Institute for Application-oriented Knowledge Processing (FAW), where I focus on research. There was one exception, when I assisted Prof. Erich Peter Klement in his year as the interim head of the SWPH, which allowed me to get to know and understand SWPH even better.

What activities and projects are you working on at the moment?

Research projects form the core of my work – from the initial idea all the way through conducting research to scientific exploitation. Since I often work at the exciting interface between science and industry, I’ve been fortunate to gain interesting insights into various domains such as carpentry, small-scale hydroelectric plants, agriculture, transport and logistics, and even ministries and patent law firms. Besides the technical challenges, I especially like this heterogeneity. In the last few years, I’ve been focusing on knowledge-intensive business processes, cooperation and complementary security issues, as well as aspects of data management and analysis. I’m currently concluding a research pro-

ject in the field of data analytics with an Austrian transport and logistics company. Directly after that I’ll be working with the SCCH on a project regarding security in the context of knowledge-intensive business processes. Besides my research activities, I also provide assistance in subsidy applications, drawing up contracts and reports, as well as presenting our work at events like the “Lange Nacht der Forschung” (“Long Night of Research”). Moreover, I’ve been teaching algorithms and data structures, programming and business process modelling and implementation for many years. Passing on knowledge and experience brings me a lot of pleasure. The SWPH has offered me many opportunities to further myself in terms of research and teaching through close contact with the economy in a vital network.

Why did you choose a path in tech/IT? Has technology always excited you?

Technology has always been an essential part of my life. Mathematics and my deep interest in working with and for people led me to software engineering.

What advice would you give to young women who are pursuing a career in IT?

Choose a relevant program at a respected university or University Of Applied Sciences, e.g. JKU or the FH Upper Austria in Hagenberg, and use your time, both professionally and personally, to build a good network. ▶



Dagmar Auer Photo: SWPH

contact ▶

Dr. Dagmar Auer

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Connecting technology and medicine

Digital transformation in healthcare is the topic of the launch event on 14 March 2019. FH-Prof. DI Dr. Martin Zauner MSc is Professor of Medical Informatics and Computer Science, Head of Studies of the Bachelor's and Master's degree programmes in Medical Engineering as well as the Master's degree programme Applied Technologies for Medical Diagnostics and Dean of the FH Upper Austria School of Medical Engineering and Applied Social Sciences. In the following interview, he explains why medicine is no longer imaginable without technology and IT, and how advancing digitalisation will continue to shape healthcare.

How is the increasing use of digital technologies affecting medicine? Don't these advances in technology also harbour dangers?

Digitalisation is a crucial feature of innovation, and when used properly it can improve the quality of patients' treatment and make the life of staff easier by relieving them of routine tasks and administrative duties. It has an impact on software products, medical devices and interconnected systems locally and remotely. As always, the benefits of using new technology also present challenges, such as IT security or providing adequate training for medical staff.

In your opinion, which specific technologies have the potential to be game changers in healthcare?

We have to look more closely at health technologies in general, and not focus only on specific medical devices. This is important because it enables us to cover the fields of medical diagnostics and therapy, as well as prevention and care. Examples of this include: smart sensors in linked smart-devices and wearables, assisting robotics and precision devices, care technology and transport systems, but also the use of mixed reality and 3D holography in telemedicine, the compiling and personal-

ised evaluation of large data sets, training systems in preoperative planning and 3D printing.

In addition to these examples of pioneering technology, there are other less remarkable, but nonetheless, exciting potential developments which could ease the burden on medical practitioners, such as assistance with the increasing amount documentation and automated translation technology.

Will intelligent robots provide care for residents in nursing homes and perform medical operations in the future?

The skills required to take care of people and provide medical support are skills which are reserved to humans. In order to put human skills to the best possible use in the face of increasing time pressures, the best technological aids will – as in the past – be used in situations where they can give people relief.

Though other key technological issues, such as "Integrating the Healthcare Enterprise" (IHE), the electronic health record (EHR) and telemedicine are just crossing the valley of disillusionment since they still have ethical, political or technical hurdles to overcome. How do you see this situation?



Image: everything possible/Shutterstock.com

True innovations always go through phases of hype and disillusionment before reaching a stage where they become socially acceptable products. Overly high expectations are often followed by disappointment. Therefore, along with promoting a product's functional benefits, it is important to cultivate trust in a product's safety, effectiveness and sustainability. The more actors and different regulatory aspects involved, the more drawn-out the projects become. With EHR and the draft concept for the telemedicine infrastructure platform, Austria is leading the way.

What opportunities does digital health offer medical staff? What new challenges do doctors and nurses have to face? Does their training have to change in any way?

Most significant for medical and care staff is the potential for reducing workloads by using machines for routine tasks, which they can perform better, or simply faster, than people on account of their higher level of precision and repeatability. Such tasks might include preparing large and scattered data sets or lifting and transporting objects and people. There are also examples from precision medicine, such as minimal surgical interventions in computer-navigated surgery and preoperative plan-



ning. Training and a basic understanding of how the respective technology works are crucial factors in using new technologies effectively.

What specific framework requirements should manufacturers of medical devices and the people who use them be aware of?

The production, placement on the market and use of medical devices is currently regulated in EU member states by the Medical Devices Directives (MDD) and will be regulated in the future by the Medical Device Regulation (MDR). Specifically, the new European MDR will bring about changes to software and to the networking of medical devices. Changes include how medical software products are classified and how product safety and efficiency is determined before and after release on the market. A duly authorised Notified Body must be involved in regulatory, and it is advisable for contact to be established early on. If manufacturers wish to sell medical devices outside the European Union, the respective prerequisites for authorisation in these target markets must be taken into account.

Due to the stringent requirements concerning product safety and product effectiveness, medical technology is a rather conservative sector. That being said, we also have the highest number of new patent applications and more than half of the products are less than three years old. When we realise that we, in the medical technology sector, can still learn a lot from industry 4.0 and logistics 4.0, will it mean there are limitless possibilities?

The developments in individual areas of technology and the new ways of bringing them together create new perspectives in medical and health technologies for personalised precision medicine, reducing staff workloads and increasing efficiency in healthcare. The limiting factors here lie in understanding the technology and how to use it practically. The idea of humanoid lawnmower robots was troubling 20 years ago, yet today we're happy if the technology used in a practical product leaves us with a bit more free time. ▶



Photo: UAS OÖ

FH-Prof. DI Dr. Martin Zauner MSc
 Professor of Medical Informatics and Computer Science, Head of the Medical Engineering Bachelor's programme and the Applied Technologies for Medical Diagnostics and Medical Engineering Master's degree courses, Dean of the FH Upper Austria Faculty of Medical Technology and Applied Social Sciences
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Soft tissue augmentation in x-ray imaging

A joint research project at Softwarepark Hagenberg

In cooperation with the Varian Medical Systems Imaging Laboratory GmbH (Switzerland) and the radiooncological department of the Ordensklinikum (OKL), Barmherzige Schwestern Linz a joint research project has been realized in the Softwarepark Hagenberg in 2018. The JKU Department of Knowledge-Based Mathematical Systems (FLLL), the RISC Software GmbH, the Software Competence Center Hagenberg (SCCH) and the MATTES Medical Imaging GmbH joined forces in bringing together and combining their mutual expertise in the fields of intelligent image processing, machine learning and artificial intelligence.

This first collaborative project focused on developing new concepts for improving x-ray imaging of soft tissue (augmentation and contrast improvement) using cone beam computed tomography images and so-called triggered x-rays. Expert knowledge and **artificial intelligence** methods were used to extract and fuse information from generated radiography images; by machine **learning methods** by machine learning methods models for improved image contrasts in soft tissue imaging were trained; original images augmented by superimposing learnt image contrast models taking into account possible patient movements and changes of position. ▶

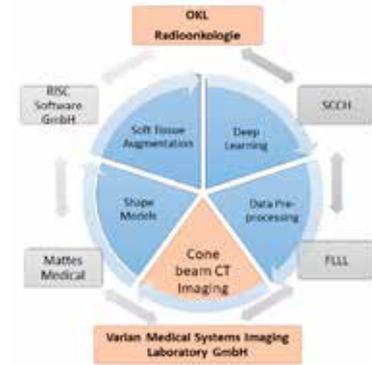


Image: Department of Knowledge-Based Mathematical Systems - Johannes Kepler University Linz

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Department of Knowledge-Based
Mathematical Systems (JKU)
www.flll.jku.at

Intelligent technologies improve modern medicine

Image processing, modelling and simulation of medical data using artificial intelligence

Change is underway in the health care sector: Alongside understood societal challenges such as ageing, security of supply and resource scarcity, digitization is a key driving factor. The **research area MIMAS** (Medical Image processing, Modelling And Simulation) of the Department Medical Informatics at RISC Software GmbH focuses on **image processing, modelling and the simulation of medical data**. These topics are closely connected. Here, medical image data forms the basis for models which are subsequently used to simulate processes in the human body.

Although medical image data is used in large quantities in clinics every day, using

it in automatic analysis methods is often difficult since it doesn't include additional information (such as the shape and position of the aorta, localisation of the tumour etc.). The manual creation of such additional information is very time-consuming and publicly accessible data sets are rare. In the research area MIMAS, it is thus necessary to investigate automatic methods that enable this additional information to be produced quickly.

For example, the abdominal aorta was extracted from computer tomography data of the KUK MCIII. A **deep neuronal network** developed specifically for **3D image segmentation** was used to achieve this. 3D vascular models which simulate blood flow



Image: RISC Software GmbH

are produced based on these segmentations. The 3D model and simulation can then extract meaningful attributes which can assist doctors in assessing and selecting the correct method of treatment. ▶



The STIWA laboratory automation "showroom" in Hagenberg: testing laboratory, training room and presentation area for customers Photos: STIWA Group

High performance meets medical technology

The automation specialist STIWA, together with the medical technology company, Greiner Bio-One, is making international headlines through its digitalisation of laboratory processes. We asked STIWA division manager Roland Wingelhofer how industrial high-performance automation works in sensitive areas like laboratories.

Mr Wingelhofer, STIWA is well known at Hagenberg, in particular for software development in the field of automation. What has that got to do with medical technology?

Quite a lot actually. Our core operations focus on the production of high-performance equipment and automotive components, but we can also apply this expertise to medical technology. We've been working on automating and digitalising processes in medical laboratories at Hagenberg for more than 20 years now. Our expertise in the field of automation and industrial production thus helps us a great deal.

How can a laboratory be automated?

Laboratory testing is the most commonly used method in diagnostics. Every day, hundreds of thousands of blood and tissue samples are processed in laboratories and analysis results are sent out to doctors and patients. By developing intelligent mechanics, logistics and organisational concepts and using standardised software, we allow samples to be processed in fully automated operations.

Where is your technology being used?

We've been working with Greiner Bio-One and gspag, the Upper Austrian hospital owner, since the summer of 2017 for

example. In the past, medical staff had to label sample tubes by hand. Using ID arm-bands and barcodes, patient data is now stored anonymously on the sample tube. Laboratory orders are automatically initiated on this basis, so the whole process – from diagnosis to reliable results – is automated by us.

The medical and laboratory field is a conservative domain where security, accuracy and reliability are crucial. Is there a certain reluctance or even scepticism towards new technologies?

Quite the opposite. The transition into the digital age is already well underway in the field of medical technology and it offers many advantages: it makes mix-ups virtually impossible, since at any point it's clear who the sample belongs to, where it is and what the next step is. This improves security for patients, saves valuable treatment time, and also results in far quicker processing times. What's more, it also helps us to bring down costs for our customers.

An exciting domain for all the software developers in Hagenberg!

Absolutely. We are dedicated to new technologies, networked processes and innovative research. So, we're always on the look-out for creative minds and are inter-

ested in pursuing cooperative ventures with the University of Hagenberg and, as of autumn 2019, we're setting up our own apprenticeship training. ▶

"We want to bring laboratories into the digital age with new technologies. Today alone, more than 500,000 samples will be processed by our systems – and we can do that on a daily basis."



STIWA Group

Ing. Roland Wingelhofer, Head of Laboratory Automation
www.stiwa.com

FH Upper Austria as a driver of innovation

Technological innovation in medicine by research and education

Digital health has long been a hot topic in education and research at the FH Upper Austria School of Informatics, Communications and Media in Hagenberg. Back in the founding years of the first software engineering course, which started in 1993, pioneering work was already being done in research projects with a medical background and software was being developed to facilitate the work of eye and accident surgeons.

Education at the highest level

The Medical and Bioinformatics Bachelor's degree programme, which includes wide-ranging education in informatics, data science and natural sciences, has been offered at Hagenberg since 2006. It has produced informatics specialists whose ability to find solutions to complex problems in collaboration with medical scientists and biologists has put them in demand around the world. Their expertise helps to find causes of disease, develop medicines, and provide assistance in examinations and surgery.

The Master's degree programme in Data Science and Engineering enables students to explore biomedical data analysis in more depth. Data science methods can filter and link relevant information from large data sets, which, in turn, enables new,

unexpected and valuable knowledge to be extracted. Being able to find patterns and dependencies also means being able to make quicker and more sound decisions in medicine, make processes more effective and it brings down costs.

Furthermore, the departments of Software Engineering, Mobile Computing, Embedded Systems Design, Digital Media, Secure Information Systems and the Human-Centered Computing programme provide essential complementary expertise which drives digitalisation in healthcare and the development of modern medical products.

Cutting-edge research

FH Upper Austria staff at Hagenberg campus carry out intensive, application-oriented research with partners in medicine, research and industry. Along with many

renowned national and international universities and companies, there are institutions and companies based in "Medical Upper Austria" too, such as Kepler University Hospital, the health institutions of Gspag and Upper Austria hospitals run by religious orders, various institutes at Johannes Kepler University and Upper Austrian medical product manufacturers.

Members of the "Bioinformatics" research group develop algorithms which automatically identify patterns in medical data as well as biological and vegetable samples, and present the relationships between them in a comprehensible way. In order to do so, they combine biomedical data analysis with machine learning and image processing. Specially developed software is used to make significant advances in the early detection and treatment of diseases such as cancer, diabetes and Alzheimer's, in pursuit of providing the best possible healthcare.

The IT support of the integrated care approach (e-Health) is one of the focuses of the "Advanced Information Systems and Technology" (AIST) research group. It concentrates on communication, assistance and analysis systems, and their integration to provide people with comprehensive help and care. It focuses on IT-supported health and fitness systems, using technologies such as autonomous devices, virtual/augmented reality and mobile systems, and factors in technical standards and standard components.

The "Human Interfaces & Virtual Environments" (HIVE) research group has extensive and long-standing expertise in human computing interaction, data visualisation,

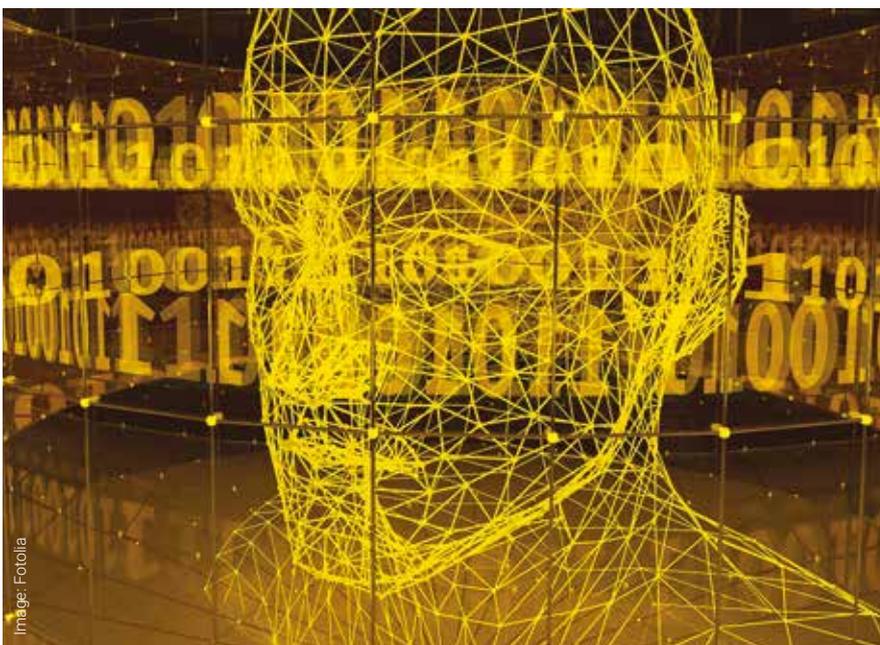


Image: Fotolia



and virtual and augmented reality. Of particular interest are applications in bioinformatics, which are often used to analyse and display large, complex volumes of data (e.g. phylogenetic relationships, identification of proteins or parts of DNA).

The "Playful Interactive Environments" (PIE-lab) and "Knowledge Media & Engineering" research groups also use similar technologies to HIVE. Their projects which focus on digital health include "Intergenerational Games" (e.g. InterPlayces) and interactive game systems which are used in neurorehabilitation applications.

Together with staff from the School of Medical Engineering and Applied Social Sciences in Linz, the "Media Interaction Lab" in Hagenberg develops concepts and prototypes for prostheses which provide users with sensory feedback through a combination of smart textiles and portable actuators. Sensors such as these have great potential to be used as wearable devices, bandages or bed sheets for patients.

Center of Excellence

In Hagenberg, collaborative work with the other Schools of the FH Upper Austria in Linz, Wels and Steyr is actively encouraged. With the establishment of the inter-faculty Center for Technological Innovation in Medicine (TImed CENTER) in 2016, the FH Upper Austria took an important step towards pooling the strengths of its four schools to develop interdisciplinary solutions at the interface between technology and medicine.

While Hagenberg brings important IT know-how to the table, the researchers from Linz provide expertise in high-resolution imaging, nanolithography, medical simulators and movement measurement. With colleagues from Wels campus, research into active substances is being advanced by quantifying protein-protein interactions and characterisation techniques. Associates in Steyr are contributing their skills towards the advancement of clinical core processes and risk-adjusted benchmarking in healthcare.

With its core facilities, which opened in 2018, the TImed CENTER offers access to high-end instruments, cutting-edge technologies, state-of-the-art methods and services. At present, more than 30 researchers from the FH Upper Austria TImed Center are working on over 25 application-oriented projects and vital research activities.

Due to its interdisciplinary nature, this Center of Excellence at FH Upper Austria is a central pillar of the Upper Austrian initiative Medical Upper Austria (MED UP).

All information on the TImed CENTER can be found on www.timed-center.at. ➤

contact

FH Upper Austria, Hagenberg Campus

www.fh-ooe.at/campus-hagenberg

TImed CENTER

www.timed-center.at

Meet-up at the Security Forum 2019

Hagenberg as a centre of information security

The Security Forum provides information on the latest topics in the field of information security and also gives experts the opportunity to share expertise, exchange perspectives and make contacts.

On 11 and 12 April 2019, the Security Forum will explore the subject "Digital Health" among others. Specifically, they will be focusing on digital technologies in the healthcare sector. Whether in the diagnosis or treatment stage or when handling confidential health data, in each case we rely on systems whose security has to be verified. An especially high level of security should be ensured in the case of life-support systems, for example. A

hacked pacemaker is just one of many possible scenarios.

Over both days of the event, technical and management-oriented lectures will be held by national and international representatives from business, research and public administration. Among other questions, we will be asking on the first day, "how security-related is deep learning?" and we'll discover why trust is bad and why checks are essential. The series of lectures on the second day will cover topics such as the NIS Directive, incident handling and the protection of business secrets. Furthermore, companies will be given the opportunity to put on presentation exhibitions and to exchange experiences through networking.

Information security is constantly changing, because technology continues to evolve too, which is why being up-to-date is so important. Sign up for the Security Forum 2019 to stay abreast of the latest knowledge on current events and developments in security. We'd love to see you there! ▶

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Hagenberger Kreis
Security Forum
www.securityforum.at

TeleTrust – IT Security Association

IT Security Association Germany (TeleTrust) is a competence network that includes domestic and foreign members from industry, administration, consulting and science as well as related partner organisations.

Thanks to its broad membership and partner organisations, TeleTrust embodies the largest competence network for IT security in Germany and Europe. TeleTrust offers forums for experts,

organises events and participation in events, and comments on current IT security issues.

TeleTrust holds the "TeleTrust European Bridge CA" certification (EBCA, PKI trust network) the expert certificates "TeleTrust Information Security Professional" (T.I.S.P.) and "TeleTrust Professional for Secure Software Engineering" (T.P.S.S.E.). ▶



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TeleTrust
IT Security Association Germany
Hagenberg regional office
www.teletrust.de

Every company has a duty!

IT security top-down

The obligation of top management

Almost daily media report on hacker attacks, data theft or unauthorized publication of secret company information. Many of the prominent media cases of this kind relate to large, international companies, but in reality hundreds of information security incidents occur every day, regardless of size or business area - mostly undetected and hidden. Information security forms the basis for competitiveness for every company and is essential to long-term success. Though the increasing threat (through advanced persistent blackmail, extortion, social engineering, etc.) is not the sole driving force behind information security, compliance plays an important role too. The General Data Protection Regulation (GDPR) and the *Netz- und Informationssystemsisicherheitsgesetz* (NISG) oblige the top management of companies to ensure information security. It is not sufficient to only consider technical measures, but a holistic, tailor-made implementation of information security is required, which includes the entire company with regard to human behaviour and business processes.

The first steps towards information security

At the outset, many companies face the challenge of identifying and implementing the necessary technical and organisational measures for the protection of information and IT systems without overshooting the mark. A first major step towards success is when top management commits to an information security guideline and provides the associated resources needed to implement it. It's also essential to identify the minimum necessary measures to guarantee the requisite level of information security. This might be achieved by means of a GAP analysis. Using the results as a basis, organisational and technical information security measures are derived and prioritised for implementation, guidelines and regulations are introduced, and training measures are adopted. In many cases, proven best-practice standards can be used under experienced supervision, which can save resources.

Operations of essential services have a special need for action

In addition to the responsibility arising from the various legal provisions, operators of essential services are required to make appropriate security precautions and report security incidents to a central body. With the NIS Directive (EU) 2016/1148, which was implemented in Austria by the NISG at the end of 2018, there are comprehensive requirements and regulations in the area of critical infrastructure for the first time in order to ensure a high level of security of network

and information systems in Europe. Operators of essential services have meanwhile been informed by the Ministry of the Interior and are now faced with the task of implementing the necessary security measures accordingly. UNINET supports the Association of Austrian Electricity Companies and has developed an industry-specific security standard for energy network operators (B3S) on behalf of "Österreichs Energie". This provides a guideline for the effective and legally compliant implementation of the required security measures. This expertise enables UNINET to offer competent support for other KRITIS sectors and their service providers.

Skilled support from Hagenberg

Information security and the technical measures required to ensure it are among our specialisations. We provide professional support as IT security consultants and investigators (auditing, social engineering). In addition to carrying out security analyses (based on ISO/IEC 27001, NISG, DSGVO, BSI IT-Grundschutz, audit requirements) and penetration tests (white/grey/black box tests) our portfolio also ranges from organising and implementing security measures and processes to awareness measures to e-learning training based on our own training platform.

Due to the scientific expertise of our CEO FH-Prof. DI Robert Kolmhofer, who runs the Department of Secure Information Systems with its three security degree programmes and a security course at the FH Upper Austria, Campus Hagenberg (Bachelor's and Master's in Secure Information Systems, Master's in Information Security Management, ASICT course), and our consultants experienced in research projects, we are able to guarantee information and ICT security consulting at the highest level and according to the state of the art and science! ▶

contact 

UNINET it-consulting GmbH

www.uninet.at

Improved cancer diagnosis using AI systems

Together with the St. Anna Children's Cancer Research Institute in Vienna, which is leading the VISIOMICS project, Software Competence Center Hagenberg (SCCH) is carrying out research to improve tumour diagnosis techniques for detecting neuroblastoma, a special tumour type which is particularly prevalent among infants.

The genetics of cancer cells play a major role in diagnosing the disease. In so-called "liquid biopsies", the tumour's gene material is obtained from blood or bone marrow. This data will be utilized to estimate the tumor relapse probability as early as possible. To cope with and analyze the huge amount of data produced by such approaches, bioinformatic methods and artificial intelligence (AI) are used.

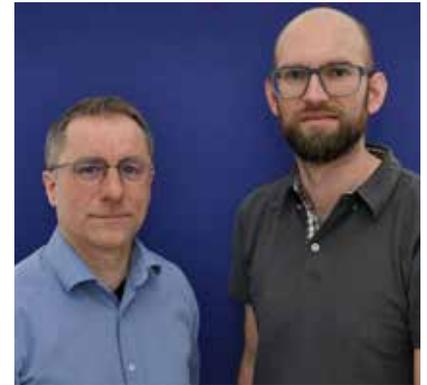
Private lecturer Dr. Bernhard Moser and his team are responsible for developing AI approaches at SCCH. Typically data from genetic analyses where the cells' DNA for example are captured by HD-SNP arrays comprise approximately 2.8 million values. Pathological changes are studied using statistical methods, which, in this

context, can point to potential relapses.

The deviations from "normal" DNA consist, among others, of numerical or structural changes in certain sections of the DNA.

The semi-automated method of detecting these changes, which was used until, now turns up a large amount of false positives, which the researchers have to sort through manually. One aim of VISIOMICS is to develop a semi-automated method, which improves detection accuracy.

The approach developed in the project initially divides the genomic data into sections, each comprising 40,000 values. The system was trained to distinguish data windows with a "breakpoint" – locations in the DNA where changes in DNA might begin or end – from those without. However, this does not mean that the specific position

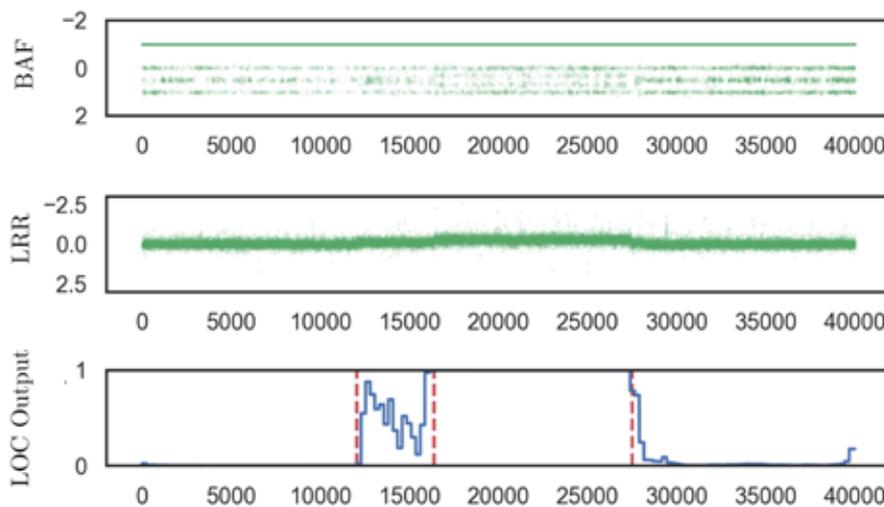


SCCH VISIOMICS Team, Priv. Doz. Dr. Bernhard Moser (left) and Lukas Fischer, PH.D. Image: SCCH

within the data window is already determined. To do that, the researchers used an approach based on attention mechanisms. The inspiration for the implemented neuronal network came from computer based music analysis, which is a research topic of Prof. Dr. Gerhard Widmer at the Institute of Computational Perception at Johannes Kepler University. "The system finds the breakpoints, without us having to show it where they are during its training," explains Dr. Moser. "It comes up with its own reasons for choosing the right position." (see image)

Whilst the conventional recognition rate is around 40 %, and in previous machine learning methods it was around 75 %, the experts of St. Anna, JKU and SCCH were able to identify at least 85 % of the markers.

The project partners are: St. Anna Children's Cancer Research Institute (CCRI), VRVIs Zentrum für Virtual Reality und Visualisierung Forschungs-GmbH, Platomics GmbH, University Hospital Erlangen - Dermatology clinic, Research Studios Austria, cogvis software und consulting GmbH, and the SCCH. ▶



Example of the implemented neuronal network (DeepSNP) for an HD SNP array with 40,000 values. The first two lines represent the input values (BAF - "B-Allele frequency", LRR - "Log-R ratio") for the algorithm. In the third line, the "breakpoint" is a prediction probability (blue) and the manually sorted groundtruth (red). Image: SCCH - published in the Journal of Computational Biology

contact ▶

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“MEDUSA” receives funding grant as a lead project

Simulator for neurosurgeons

The “Medical EDUcation in Surgical Aneurysm clipping” project (MEDUSA) was selected from four submissions as a flagship project in medical technology. The cooperative project, which was allocated 2.3 million euros in funding, aims to strengthen the federal state of Upper Austria as a location for medical technology and put the Upper Austrian MedTech branch in the international spotlight.

MEDUSA creates an innovative training and planning platform for neurosurgeons. The hybrid neurosurgical simulator connects the real and virtual worlds. It helps the surgeons to feel the artificial image of the patient haptically as well and see anatomic structures via virtual holograms.

Synergies between Upper Austrian core competencies

MEDUSA was developed by a consortium of 14 partners from science, medicine and business. In terms of the education-research-industry innovation chain, this key project transfers existing research skills – such as those of the synthetic material institutions at the JKU – to the field of medical technology. The finished tool is intended to allow companies and Start-Ups to simulate their suitability in the early stages of product development.

MED UP – Medical Upper Austria

The invitation to tender for the key project in medical technology was made on behalf of the State of Upper Austria as part of the “MED UP – Medical Upper Austria” initiative, which is coordinated by the medical technology cluster of the regional development agency Business Upper Austria. The initiative is part of the strategic economic and research programme “Innovatives OÖ 2020” (Innovative Upper Austria 2020). The project ideas were submitted to the Austrian Research Promotion Agency (FFG). ▶



Photo: Upper Austrian Research GmbH und RISC Software GmbH



Photo: State of OÖ

“Digital technologies change healthcare by providing accurate solutions for diagnosis, therapy and care, and administration. Digital health reduces costs and enables a shift from a cure approach towards preventive care for patients. Our goal is to fully exploit the enormous potential of digital health technologies in Upper Austria.”

Markus Achleitner Minister of Economy, State of Upper Austria

Crawl before you walk, walk before you run

The “arrival” of artificial intelligence over the last few years as a hyped tech trend has led to no end of speculation over both the potential benefits and the potential dangers of AI. Realising realistic AI benefits in healthcare is a function of the extent to which AI can be used as an engine for realistic growth, not just a technology add-on.

Think and pay for itself

As for hype, healthcare is no exception, and we are told that algorithms will replace nurses and Doctor Pepper will be in a surgery any day now. But in my opinion, before anyone starts replacing doctors with robots, there are “mundane” functions which are most likely to precede AI-driven clinical care. Rather than worrying about the hype, healthcare organisations should look for a realistic starting point so that AI can both think and pay for itself. In doing so, it will earn the trust of clinicians and healthcare administrators – and support improved health outcomes. Instead of positioning AI as something that will get healthcare providers running like Usain Bolt, having backend systems walking around with a comfortable gait seems more realistic. The potential benefits are anything but mundane.

While these functions require the application of some intelligence, they aren't difficult or controversial in technical, ethical or political terms. Here are three examples I'd present (in some cases, these are intelligent automation leveraging the more narrowly defined “pure AI”):

Appointment scheduling: In the UK, patients missing their appointments cost the

health service £1bn last year (the equivalent of a million more cataract operations or 250,000 hip replacements). In addition, nearly half of patients who have missed a hospital appointment say their absences were due to issues with appointment letters. Patients also show a preference for digital interaction. If a patient needs to reschedule an appointment due to sudden unavailability, or requires an urgent appointment for something that doesn't require the presence of a specific clinician for the sake of continuity...such matters could be solved by employing AI in combination with text messages, voice calls and online booking systems. This could be done 24x7 – so no need to wait for reception opening hours.

Operating Theatre Optimisation: An AI system might look at a scheduled procedure and ensure that the correct support personnel, equipment and consumables are available at the right time and in the right operating theatre—improving both efficiency and quality of care while reducing costs by eliminating wasted time and resources.

Finance: Healthcare providers process millions of invoices from suppliers each year—with all the associated queries and processing. Using a chat or email bot to analyse queries and emails and answer them. This can be highly effective, for example the Ac-

centure Intelligent Email Advisor can detect 55 languages and classify emails with over 90 percent accuracy and increased customer satisfaction.

Virtuous AI investment circle

AI does not have to be overly complex, initially, but can deliver immediate benefits. This can result in a virtuous circle of savings delivering capital for future investments. If this is done right, using modular, interoperable systems that can be scaled systematically—who knows where it could go.

Don't go running before you can walk—but do get started. Scan your health organisation for early opportunities to derive benefits from AI—opportunities that provide a benchmark for future activities, and will help you earn the trust of administrators, clinicians and patients long before Pepper makes her appearance.

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Im Leben zu Hause

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Technology and innovation in the Champions League

GRZ IT Center GmbH is part of the Raiffeisen Group and employs approx. 450 staff in Linz, Innsbruck and Salzburg. We plan, develop and operate a multi-layered IT infrastructure for our customers.

In addition to a modern data center, our portfolio includes a complex network, over 10,000 workstations and the infrastructure for operating banking and business applications.

Our teams of dedicated specialists actively shape the IT future of our customers. The regional added value – i.e. Upper Austrian quality, performance and efficiency – is a decisive success factor.



highlights 2019

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14 March 2019
Opening event in the
IT expert series "Digital Health"
FH Upper Austria, Hagenberg Campus



27 June 2019
2nd event in the
IT expert series "Digital Health"
amsec IMPULS

2

14 November 2019
3rd event in the
IT expert series "Digital Health"
Hagenberg Castle

3

04 July 2019
Softwarepark Hagenberg IN-Breakfast
Softwarepark Hagenberg Management Office



SF



11-12 April 2019
Security Forum 2019
FH OÖ Campus Hagenberg

01-02 October, 2019
Location Event Upper Austria
Palais Kaufmännischer Verein Linz

KU

15-17 July, 2019
KidsUni Hagenberg
FH Upper Austria, Hagenberg
Campus

>>next

17 October 2019
FH career fair >>next for IT and media
FH OÖ Campus Hagenberg

softwarepark
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