RESEARCH AND DEVELOPMENT

at Softwarepark Hagenberg

About this book

This book highlights some examples of the state-of-the-art research and development activities in the fields of software development, artificial intelligence and prescriptive analytics at Softwarepark Hagenberg. It describes research projects at FH OÖ and JKU as well as research activities at selected innovative companies at Softwarepark Hagenberg.

How it started...

Since its initiation 35 years ago, Softwarepark Hagenberg has gained regional, national and international acclaim as a centre of expertise in research, teaching, and the application of computer science techniques.

In 1989 Prof. Bruno Buchberger founded Softwarepark Hagenberg in a revitalised castle in the rural community of Hagenberg im Mühlkreis as a branch of the Johannes Kepler University with the goal of combining basic research and applying scientific findings in mathematics and software development. Softwarepark Hagenberg developed from this by forming a cluster of excellence for research, training and business focused on software. Soon afterwards, the Hagenberg ecosystem was expanded in the training and research domains when the Hagenberg Campus of the newly founded University of Applied Sciences Upper Austria was established. It has by now become the most successful University of Applied Sciences in Austria (in terms of research). This academic basis established the foundations for a continuously growing number of companies operating at Softwarepark Hagenberg. Today, these institutions form the internationally recognised trigon of synergistic interaction between research, business and training. To this day, it underpins Hagenberg's innovative strength and distinguishes Softwarepark Hagenberg from other technology centres.

FH-Prof. PD DI Dr. Stephan Winkler
Scientific Head of Softwarepark Hagenberg

... & how it´s going

Softwarepark Hagenberg today, in 2024, 35 years after its foundation, has seen tremendous growth. Located in a village with a population of around 3000, Softwarepark Hagenberg is the academic home for 1700 students and provides workplaces for 1500 employees of the companies and the academic institutions at SWPH.

Supported by Softwarepark's management, the Softwarepark Hagenberg has become Austria's most important location for key interaction between top leaders in science and business and young top talents from all over the world in the field of software. A flood of scientific, technological and economic innovations and actions, as well as echelons of highly trained, motivated and socially responsible young scientists, technologists, developers and managers for Upper Austria, Austria and the world have emerged and continue to emerge from this.

The most important key to Softwarepark Hagenberg's success is close collaboration between the individual institutions and companies. Numerous FH OÖ and JKU students start their careers as interns, developers, or researchers with one of the companies or research institutes. Many company experts are also lecturers at FH OÖ Campus Hagenberg; and last but not least, there are large numbers of joint research and development projects in which Softwarepark Hagenberg companies and research institutions join forces.

Beyond this, we are aware at Softwarepark Hagenberg that we have to disseminate our knowledge to others on the one hand, but also require input from outside on the other. This is the reason why we regularly organise expert events at which researchers from both inside and outside of Softwarepark Hagenberg discuss state-of-the-art research and development topics. These expert event evenings are organised by an interdisciplinary group of Softwarepark Hagenberg researchers.

Our promise to society:
- Softwarepark Hagenberg researches into and develops solutions that change the world and is therefore a pioneer for the future
- Softwarepark Hagenberg is a talent factory for the IT and high-tech industries and leverages the fertile ground of research, teaching and development
- Softwarepark Hagenberg offers work opportunities with first-class and international industry leaders directly on campus and beyond and supports innovators right through to founding a company and beyond

Internationally Renowned Research

Softwarepark Hagenberg · · · · · **Research and development**

Image: Karl Artmann
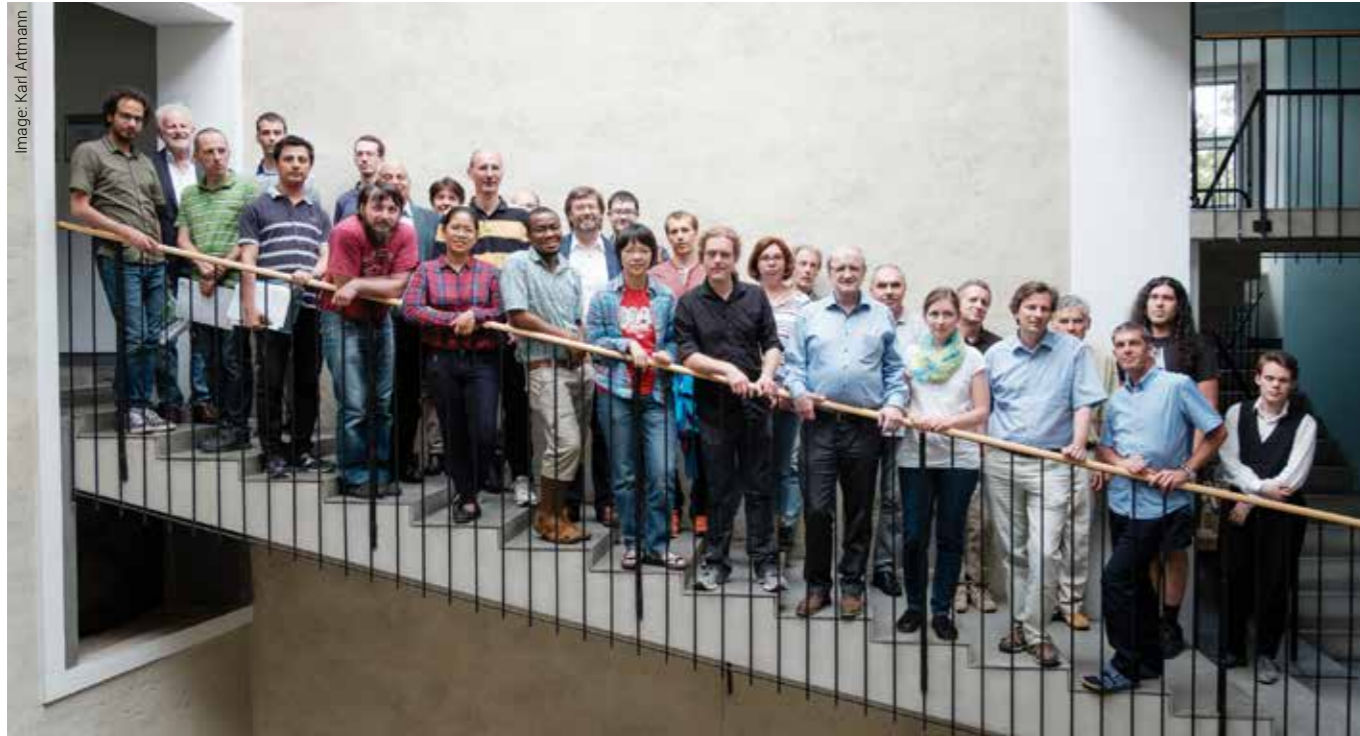
The RISC family

The Research Institute for Symbolic Computation (RISC)

The Research Institute for Symbolic Computation (RISC), situated in Hagenberg castle and its extension building, is an institute of the Johannes Kepler University Linz (JKU). As the founding institute of the Softwarepark Hagenberg, the RISC Software Company and the Fachhochschule Hagenberg, it is a key component for the on-going development of the Softwarepark today. In particular, it contributes significant innovative impulses in the fields of research, teaching and application. Currently comprising around 30 members from 11 different countries, RISC is a strongly international institution which has produced more than 120 PhD theses by post graduate students from 25 countries. On the basis of

numerous international evaluations (FWF-SFB, FWF-DK, FWF individual projects, EU projects, etc.), it is evident that RISC is a lighthouse institute of the JKU and Softwarepark with global acclaim in algorithmic mathematics and non-trivial applications. Some of these exciting research areas from combinatorics, number theory, elementary particle physics, and AI tools such as automatic/formal proving are briefly presented below.

Logic - the backbone of computer science
Computational logic is one of the areas of RISC's expertise. Compu-

tational logic plays a crucial role in various aspects of computer science and technology, providing, among other things, the theoretical framework for reasoning about computation. At RISC, we develop and in-

Unranked representation of code pieces:

```
if(>=(a, b),
    then(=(c, +(d, b)),         if(>=(m, n),
        =(d, +(d, 1))),            then(=(y, +(x, n)),
    else(=(c, -(d, a))))                =(z, 1),
                                        =(x, +(x, 5))),
                                   else(=(y, -(x, m))))
```

An interesting generalization:
```
        if(>=(y1, y2),
            then(=(y3, +(y4, y2)),
                Y,
                =(y4, +(y4, y5))),
            else(=(y3, -(y4, y1))))
y1 ↦ a,  y2 ↦ b,  y3 ↦ c,  y4 ↦ d,  y5 ↦ 1,  Y ↦ ().
y1 ↦ m,  y2 ↦ n,  y3 ↦ y,  y4 ↦ x,  y5 ↦ 5,  Y ↦ =(z,1).
```

Image: RISC

vestigate techniques that play a fundamental role in automating reasoning tasks. Our work has significantly advanced the state of the art in the solution of symbolic constraints for both exact and approximate reasoning. These mathematical methods developed by Kutsia and his group have been used in different subareas of computer science and artificial intelligence, such as, e.g., rule-based programming, neuro-symbolic machine learning, or software analysis. Moreover, these methods have found successful applications in industry, being used, for example, in state-of-the-art automated program repair tools at Bloomberg, Facebook, and Microsoft.

Computer assisted generation of formulae for computing the digits of π
In 1914 Ramanujan published 17 different series formulas for the computation of π. It was not until 1987 that all of these formulas were rigorously proven. They are based on the theory of modular forms,

Formula used by Gosper in 1985 for the computation of 17 million digits.

$$\pi = \frac{99^2}{2\sqrt{2}} \left[\sum_{n=0}^{\infty} \frac{(4n)!(26390n + 1103)}{n!^4 \, 396^{4n}} \right]^{-1}$$

Formula used by the Chudnovsky brothers in 2011 for the computation of 10 trillion digits of π.

$$\pi = \left[12 \sum_{n=0}^{\infty} \frac{(-1)^n (6n)!(545140134n + 13591409)}{(3n)!(n!)^3 (640320)^{3n+3/2}} \right]^{-1}$$

Image: RISC

with one of them producing about 8 additional digits for every further term. This formula was used by Gosper to compute a world record of more than 17 million digits of π in 1985. At RISC, Hemmecke, Paule, and Radu worked on the problem of having a computer automatically derive these formulae. They based their work on a general theory by Sato on series for π, developing algorithms which compute several formulas for the computation of π using a given modular form and a given modular function as input. The main achievement is that these algorithms are constructed such that their output is automatically a proven formula for π.

Symbolic computation in mechanical engineering
If you gently press the blue bar connected to the right endpoint of the grey segment on the first coordinate axis, the depicted mechanism will start to move and bounce so that the red dot traces an ellipse. The classical theorem (Kempe 1876) states that any curve with a polynomial equation can be traced by a linkage of this nature. However, this classical conclusion is impractical due to complexity issues. Researchers at RISC and RICAM (Austrian Academy of Sciences) developed a general algorithm
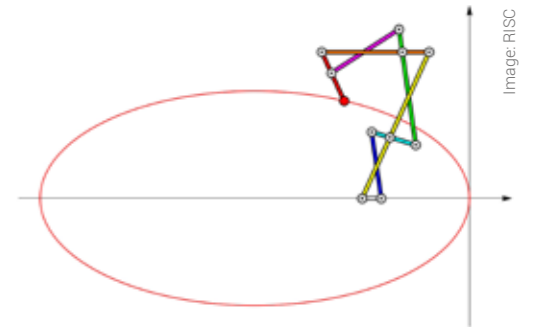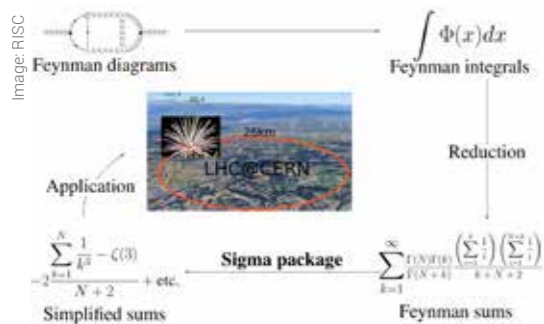

Image: RISC

that efficiently designs a drawing linkage for a large class of curves.

Symbolic computation for particle physics
In the scope of a long-term cooperation with DESY (Deutsches Elektronen-Synchrotron: Johannes Bluemlein and Peter Marquard) RISC is developing symbolic algorithms to tackle highly complicated Feynman integrals that describe the interaction of elementary particles. In one successful approach, these Feynman integrals can be transformed to (what are still) complicated multiple sums (up to several GB of memory) that can be simplified further with Schneider's Sigma summation package to compact expressions in terms of special functions which can be printed out on just a few pages. All these calculations will be utilised, for example, in experiments involving the Large Hadron Collider at CERN in order to answer exciting questions about our universe on a small scale.

Feynman diagrams / Feynman integrals / Application / LHC@CERN / Reduction / Sigma package / Simplified sums / Feynman sums

$$\text{Image: RISC}$$

Formal verification
of mathematical theories and algorithms

RISCAL is a software tool developed at RISC for the formalisation and automated analysis of mathematical theories and algorithms. Mathematical theories are abstract models of aspects of the real world; algorithms are methods that describe how we can use these models to compute from given objects new objects with desired properties. RISCAL allows such models and algorithms to be formulated in a way that enables the software to automatically detect any errors. This, in turn, gives us the ability to verify the correctness of our mathematical constructions. A recently published book, "Concrete Abstractions" by Schreiner, demonstrates the application of RISCAL to theories and algorithms related to computer science, discrete mathematics, propositional logic, and also mathematical puzzles and games.

Proving -
the backbone of mathematics

The aim of the Theorema system developed by RISC's Formal Methods and Automated Reasoning group is to provide computer-support to mathematicians in their every-day work. In contrast to the popular understanding that "mathematics=computation", higher mathematics is devoted

to building up theorems, which consist of statements whose validity is guaranteed by mathematical proofs. In this sense, the understanding is more like "mathematics=proving". This is why the Theorema system focuses on automated reasoning, that is, providing computer-support for building correct mathematical proofs. One of the key features that distinguishes Theorema from other automated proving systems is its capability to generate proofs in a "natural style", that is as mathematicians would write a proof. This allows the system to be used in teaching mathematics.

Proving software to be correct
with the help of automated reasoning

Proving software to be correct is becoming increasingly essential in various areas. Testing alone is not capable of ensuring that a specific program will also behave in the intended way. Generally speaking, formal verification is the act of mathematically proving the correctness of a program with respect to a certain formal specification. At RISC, we are interested in generating verification conditions – that is, logical statements which correspond to a program and its specification. Proving the statements be true implies that the program is correct with respect to the given

specification. Moreover, if one of the statements is evaluated as false, this provides an exact trace of where the "bug" in the program is. A large share of the research is carried out within the framework of the Theorema system, a mathematical software system of RISC which aims to support the entire process of mathematical theory exploration.

Proving / Proposition (First Test, 2014) / $\forall_x P[x] \vee Q[x]) \wedge (\forall_x P[y] \Rightarrow Q[y])) \Rightarrow \forall_x Q[x]$ / Proof of ((P or Q ∧ if P then Q) ⇒ Q) #1: Show... / Theorema 2.0

$$\text{Image: RISC}$$

JKU JOHANNES KEPLER UNIVERSITÄT LINZ

RISC RESEARCH INSTITUTE FOR SYMBOLIC COMPUTATION
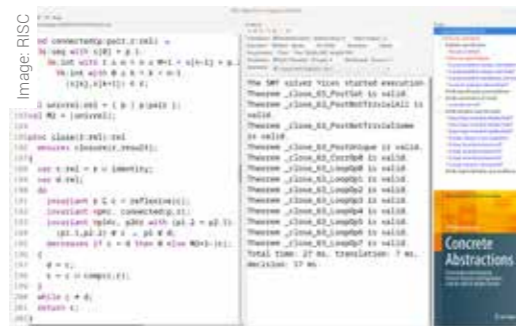
Research Institute for Symbolic Computation (RISC)

Management: Univ.-Prof. Dr. Carsten Schneider
Owner: Johannes Kepler University Linz
Founded: 1987
Relocated to SWPH: 1989
www.risc.jku.at

Concrete Abstractions

$$\text{Image: RISC}$$

Institute for Application-Oriented Knowledge Processing (FAW)

General description of work

Research and teaching (Bachelor, Master and PhD level) in the field of Information and Knowledge-based Systems, Data Analytics, and in Artificial Intelligence; research cooperations with national and international universities and research institutes, e.g.: TU Vienna, TU Graz, Tallin Technical University, Ho Chi Minh City Technical University, TU Prague, SCCH, Pro2Future, Primetals. FAW commenced activities at Softwarepark Hagenberg in 1992, as the second institute from the JKU.

Application domains

Application-oriented research and cooperation with industry and public administration; activities in a wide range of fields, such as mechatronics, iron- and steel production, dynamic disaster or volunteering management.

Research focuses

Computational Data Analytics, Data Mining and Knowledge Discovery, Rule Learning and Interpretability, Machine Learning in Games, Preference Learning and Multi-Label Classification, Knowledge-based Systems and Knowledge Representation, Security and Trust in Information Systems, Process-aware Information Systems, Similarity Queries, Information Retrieval & Extraction, Natural Language Processing, Web Search and Mining, Web Engineering und Web Science, Information Integration (Semantic-based, Ontologies), Data Modeling, Data Quality, Data Profiling, Data Catalogues

Current research projects

LIT Secure and Correct Systems Lab: The collaboration between several JKU com-

puter science institutes to scientifically address the topic of secure IT systems in its entire range, from design to implementation, operation, up to decommissioning. The lab has entered its second funding period where the overarching focus is now on supply chain security. More specifically, the institute is working on the topic of data and information access control.

DANTE: By applying high quality standards to data and machine learning models, this research project aims to enable and support the development and maintenance of explicable, trustworthy and justifiable AI models. Research is carried out in cooperation with SCCH.

SyMSpace: A development and design framework for a wide range of simulations and optimisations in the field of mechatronics is being set up. FAW is working on the database and software architecture for this major project by the LCM (Linz Center of Mechatronics).

PreMoBAF: Data analysis, visualisation and interaction with a rule-based system in the iron and steel industry; cooperation with Pro2Future and Primetals.

Civilunteer: Digital platform for networking and bundling volunteer engagement such that the goals and competencies of volunteers can be synergistically aligned with the activity requirements for strengthening critical infrastructures; cooperation with the Cooperative Information Systems department at the JKU Institute for Telecooperation and other partners.

Goals and orientation

The FAW (Institute for Application-oriented Knowledge Processing) is an institute of Johannes Kepler University (JKU) Linz. It is a part of the Department of Computer Science, which belongs to the Faculty of Engineering and Natural Sciences (TNF) of the JKU. It was founded by Prof. Dr. Roland Wagner in 1991 with the intention of fostering cooperation and technology transfer with business, industry and administration in addition to basic research. Involvement in and promotion of Softwarepark Hagenberg was a natural consequence. The institute is now headed by Prof. Dr. Johannes Fürnkranz and the ties to Softwarepark will continue to be enriched by the expertise he contributes.

FAW

Institut für anwendungsorientierte Wissensverarbeitung (FAW – Institute for Application-oriented Knowledge Processing)

Management: Univ.-Prof. Dr Johannes Fürnkranz
Number of researchers: 15
Owner: Johannes Kepler University Linz
Founded: 1991
At SWPH since: 1992
www.faw.jku.at

Image: FHOOE

Image: FH OOE

Image: FH OOE

Research Center Hagenberg of the University of Applied Sciences Upper Austria (FH OÖ)

The University of Applied Sciences Upper Austria has been one of the strongest Universities of Applied Sciences in the German-speaking world for years. At the Hagenberg campus, the focus is on computer science, communication and media – also in research. For more than 20 years, numerous projects have been carried out in collaboration with industry partners, other research institutes and public institutions. Our research activities focus on topics such as artificial intelligence, data analysis, human-machine interface, cyber security, digital media and software development.

With many years of experience and a highly qualified team of academic staff and professors at the faculty, Research Center Hagenberg is an important player

in the Austrian research landscape. One specific focus is on interdisciplinary co-operation and transferring research results into practice. Innovative solutions which directly generate added value for the economy and society are developed through close cooperation with companies and research institutions, but also with the other faculties of the University of Applied Sciences Upper Austria in Wels, Steyr and Linz.

The Research Center Hagenberg has state-of-the-art infrastructure and laboratories that enable researchers to work at the cutting edge of technology. The Doctoral College of the University of Applied Sciences Upper Austria and some special funding programs are available to doctoral candidates to support them in their scientific careers.

An overview of our research groups

- Advanced Information Systems and Technology
- Assistive Technology Lab
- Bioinformatics
- Digital Media Lab
- Embedded Systems
- Heuristic Methods and Evolutionary Algorithms Laboratory
- Human Interfaces & Virtual Environments
- Knowledge Media & Engineering
- Mobile Interactive Systems
- Networks and Mobility
- Personalised Environments and Collaborative Systems
- Secure Information Systems
- Work, Education and Life in a Digital World
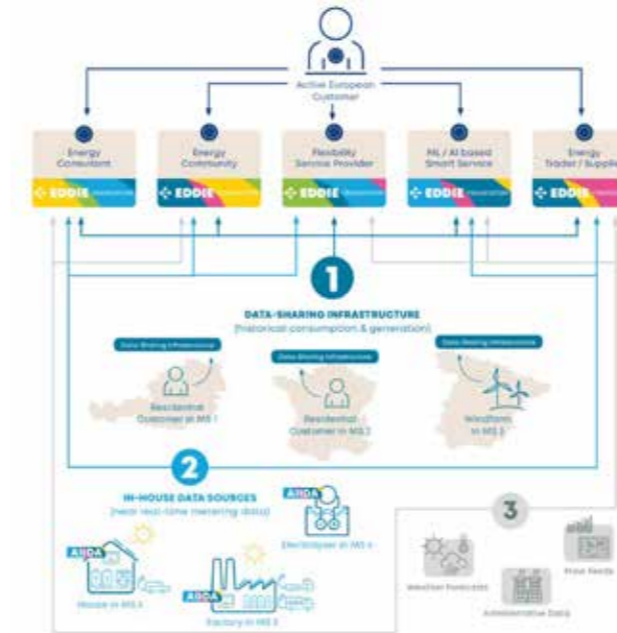
Selected projects and research results

"Smart Textiles" Patent

The Embedded Systems research group – comprising researchers Josef Langer, Florian Eibensteiner and Phillip Petz – has been awarded a European patent in the field of "Smart Textiles" for an innovative process that offers decisive advantages for communication between sensors integrated into textiles.

The process makes it possible to identify and locate distributed sensor and microprocessor modules on smart textiles. This patented technology opens up a wide range of potential applications, such as T-shirts that can record movement patterns of the human body and detect incorrect posture. Thanks to the innovative process from Hagenberg, considerable time and configuration savings can be achieved during production and launch to further boost the efficiency and flexibility of these smart textiles.

Project "X-Pro: Research and development of user-centric methods for cross-virtuality analytics of production data"

The research project aims to achieve a completely new quality of human-computer interaction in the interactive visual analysis of large volumes of data from the production environment. These methods include both new types of visualisation and interaction techniques as well as new methods for algorithmic data preparation, analysis and modelling.

Further potential applications of the new technology can also be found in medicine – for example in the representation of organs such as the human heart on the screen or as three-dimensional objects with virtual reality glasses; this in turn enables more precise examinations in preparation for heart surgery.

The research project involves the faculties Hagenberg, Steyr and Wels of the University of Applied Sciences Upper Austria.

Project "EDDIE: European Distributed Data Infrastructure for Energy"

The EU-wide exchange of energy data is currently still failing due to the lack of standardised data exchange procedures. The EDDIE project introduces a decentralised, distributed, open-source Data Space, in alignment with the efforts of the EU Smart Grids Task Force on Implementing Acts on Interoperability and other European initiatives. The European Distributed Data Infrastructure for

Energy (EDDIE) significantly reduces data integration costs, allowing energy service companies to operate and compete seamlessly in a unified European market. Additionally, an Administrative Interface for In-house Data Access (AIIDA) ensures secure and reliable access to valuable real-time data based on customer consent.

Research Center Hagenberg – University of Applied Sciences Upper Austria

Management: Mag. Gabriele Traugott
Owner: FH OÖ Management GmbH
Founded: 2003
Relocated to SWPH: 2003
www.fh-ooe.at/en/research/research-center-hagenberg

Josef Ressel Centre for Artificial Intelligence on Resource Limited Devices

Artificial intelligence (AI) is already in place in many smart devices in our everyday lives and in industrial settings. At the core of all those applications are small, energy-efficient microcomputers, precisely tailored to the specifics of how the applications work. The requirements placed on such systems in terms of their size, energy consumption, and timing constraints, go hand in hand with limits on their resources.

AI relies on a training process in which it learns to identify patterns in data to make decisions. If an AI encounters patterns dur-

ing application that were not present in its training data, such as a new workpiece for an industrial robot, it fails to identify and process them. Furthermore, changes in conditions such as exposure, user habits, or sensor characteristics can lead to discrepancies between the patterns observed at runtime and those learned during training. In industrial applications, it is essential to periodically update AI models in order to address these mismatches and adapt to new conditions or requirements – a challenge often referred to as concept drift or model drift.

Currently, learning new workpieces or updating outdated models requires a new model to be trained from scratch, with new data being recorded and transferred to the cloud for processing. This model is then downloaded back to the robot via the internet.

The Josef Ressel Center is researching into methods that allow retraining of microcomputers with local data, as well as into metrics for monitoring model performance and detecting deviations that trigger automatic retraining. These metrics also determine the optimal point at which to stop

the retraining process, and assess potential improvements or limits to model enhancement. Additionally, the research includes strategies for managing, versioning, and distributing models, along with their training metadata. To manage computational demands, techniques from federated learning are adapted to distribute and parallelise learning across a decentralised network of microcomputers, which may consist of inhomogeneous or asymmetric nodes.

The Josef Ressel Center, managed by the Christian Doppler Research Association, is operated by the University of Applied Sciences Upper Austria and includes partnerships with Danube Dynamic Embedded Solutions GmbH (DDES) and Fronius International GmbH (Fronius). This cooperation is funded by the Federal Ministry of Labour and the Economy and co-financed by the corporate partners.

DDES develops hardware and software for industrial embedded systems with a focus on robotic applications and human robot collaboration. In the scope of these activities, DDES develops camera-based solutions in combination with machine learning algorithms for object recognition. DDES plans to integrate the optimisation methods and retraining algorithms into its own software framework, which will enable DDES to develop a more flexible visual sensor system for collaborative robots.

Fronius manufactures products in the fields of welding, solar energy, and battery charging, although the activities planned at the Josef Ressel Centre are limited to solar energy. Fronius is also currently researching on the topic of optimisation of energy flows within complex buildings with a view to minimising energy costs. White-box models such as symbolic regression trained with historical system data are being used to achieve this. At the Josef Ressel Centre, Fronius plans to optimise the models for use on embedded devices with limited resources and to retrain the models directly on
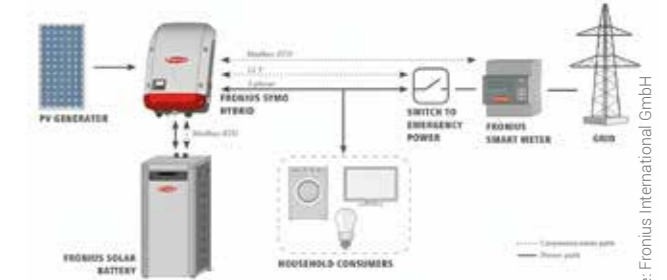
Energy manager connected to generators, battery, consumers and the grid.

the device to allow them to adapt to seasonal influences and minor system changes without requiring retraining in the cloud.

A production robot in a collaborative environment learning to work with new objects.

Josef Ressel Centre for Artificial Intelligence on Resource Limited Devices

Management: FH-Prof DI(FH) Dr. Florian Eibensteiner
Owner: University of Applied Sciences Upper Austria
Founded: 1 April 2024
**Relocated to SWPH:** 2024
www.embedded-ai.fh-hagenberg.at

Josef Ressel Centre adaptOp – Adaptive and smart optimisation algorithms for production and logistics

Making the best possible decisions in the operation of complex production and logistics systems is a challenging task. Many influencing factors and dependencies, which are often difficult for planning staff to fully keep track of, need to be taken into account. Improvements on one side of the system might lead to detrimental effects on the other side. Dynamic effects occur frequently and often unexpectedly – such as machine breakdowns, changes in customer orders, missing or delayed material, fluctuating quality of the product, employee absences – and require continuous changes and adaptions of the plan.

Traditional planning and optimisation algorithms for production and logistics systems do not adequately react to such disruptions. The algorithms are not capable of appropriately adapting existing plans but instead need to recompute an entire plan from scratch after a change. Researchers at the University of Applied Sciences Upper Austria (FH Oberösterreich) in Hagenberg and at the University of Vienna joined forces to overcome these limitations. They collaborate at the Josef Ressel Center for Adaptive Optimization in Dynamic Environments (JRC adaptOp) located at Softwarepark Hagenberg where they work on the combination of optimisation algorithms and machine learning.
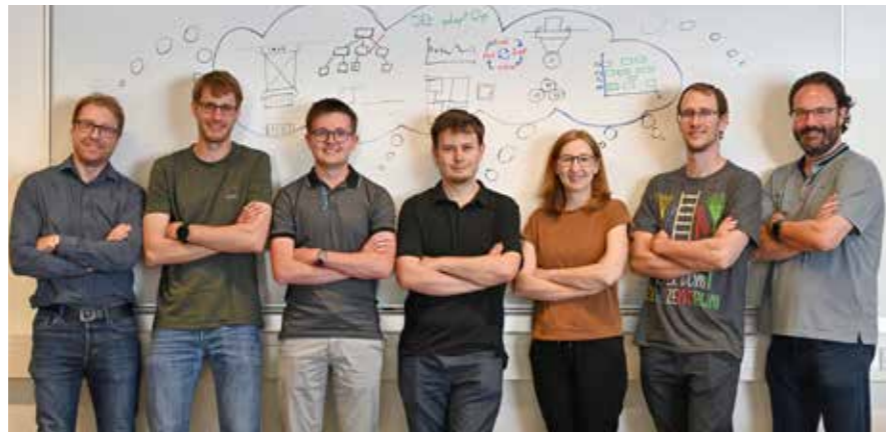
JRC adaptOp team at FH Oberösterreich and located at Softwarepark Hagenberg

Adaptive and open-ended optimisation

The optimisation of production and logistics systems is understood as ongoing and open-ended process here. Based on a messaging system, it is connected to the enterprise information systems and continuously receives updates on any changes that happen during the production and transportation of goods. These change messages need to be taken into account by incorporating updates into the current solution; this, in turn, requires optimisation and planning algorithms capable of handling changes in the problem data, solution qualities, and constraints.

Furthermore, only responding to these changes only after they occur is not the best strategy to follow. If such changes can be foreseen

Adaptive optimisation methods improve the crane efficiency in the steel slab production process.

Machine learning and heuristic optimisation help to proactively steer dynamic processes in the production of windows.

by applying prediction models, decisions that need to be taken at the present can already consider future events. This can lead to paradox situations where a poorer decision has to be accepted today to bring about a more favourable situation in the future. This is why JRC adaptOp's goal is to transform planning and optimisation algorithms from reactive, through proactive, to adaptive optimisation where the optimisation algorithm monitors the production and logistics process, automatically builds prediction models by applying machine learning, and uses these models to evaluate and explore possible future scenarios in order to appropriately adapt its optimisation strategy. This kind of optimisation process is therefore also more similar to the behaviour of human decision makers who continuously monitor a process and use their experience and expertise to prepare for and learn from different potential change events.

Applied in the steel and glass industry

Simulation experiments are used to examine how the developed methods perform with evaluation under realistic conditions by the company partners involved at JRC: voestalpine Stahl, Industrie-Logistik-Linz, LogServ, and LiSEC Austria. Besides developing a software environment for adaptive optimisation, other key milestones also include formulating new dynamic problem models and defining suitable benchmarks. For the latter purpose, the team of JRC adaptOp also organises the Competition on Dynamic Stacking Optimization in Uncertain Environments at the GECCO conference each year. This is where researchers from all over the world can benchmark and compare their solvers on hard and realistic stacking problems.

Josef Ressel Centers promote long-term R&D cooperations at research-active Universities of Applied Sciences with mostly regional company partners. These

Algorithms developed in the scope of JRC adaptOp optimise crane travel for the storage and retrieval of steel coils.

centres are technical-scientific research institutions that can be established at Austrian Universities of Applied Sciences since 2000 and are equally funded by the public sector and the participating companies. JRC adaptOp is already the fourth Josef Ressel Center located at Softwarepark Hagenberg and financial support by the Austrian Federal Ministry of Labour and the Economy, the National Foundation for Research, Technology and Development and the Christian Doppler Research Association is gratefully acknowledged.

Center for Technological Innovation in Medicine (TIMed CENTER)

The constantly growing and aging population poses major challenges for the healthcare system. It is essential to use new technologies and medical products to prevent or treat illnesses and contribute to an overall improvement in quality of life. This is where the Center for Technological Innovation in Medicine, or TIMed CENTER for short, at the University of Applied Sciences Upper Austria comes in.

This cross-faculty center of excellence was established in 2016 to address key issues in the fields of medicine, care, and rehabilitation. More specifically, researchers work in the fields of biomedical data analysis, biomimetics and material development, biomedical sensor technology, high-resolution imaging, medical simulators, and drug characterization. In addition to interdisciplinary collaboration with other research institutions, the focus is on practical relevance and direct application.

Some of the ongoing research projects are presented below to give an insight into the diverse and exciting research work at the TIMed CENTER on the Hagenberg Campus.

Project "Train Your Brain Optimizer"

The DEMETA study from 2018 and additional psychological tests carried out show that around 86% of care home residents have moderate to severe cognitive impairments. As a result of these findings, the MAS-Alzheimerhilfe (Alzheimers Aid) association developed an active program, with tailored training being offered at several dementia service points. Based on a tried-and-tested training pool, a model is being developed using artificial intelligence and machine learning to automatically generate optimal training plans for the various stages of the disease. At the same time, the project will be accompanied and evaluated by social scientists throughout the entire development process to tailor the application ideally to the user group and to ensure that it really does make things easier for the trainers. (Head: Susanne Schaller)

Image: University of Applied Sciences Upper Austria

Image: University of Applied Sciences Upper Austria

Project "Smart Care Assist"

Existing care staff are under great pressure due to the shortage of skilled personnel and the challenging activities. Assistance systems can relieve the burden on care staff, provided the systems are well adapted to the needs of all those involved. Smart Care Assist is looking for answers to the question of how care beds need to be equipped (e.g., with smart textiles) to relieve the burden on care staff and at the same time support the best possible patient care. (Head: Martina Zeinzinger)

Project "LICA Ried"

Caring for an aging population, and the desire to be cared for at home for as long as possible, present society with major challenges. To support family caregivers and lay carers, the Ried region is being turned into a "living lab" involving care partners at all levels (at home, mobile care/therapy, primary and secondary healthcare). As part of the LICA Ried research project, LICA Lifecare GmbH, Krankenhaus der Barmherzigen Schwestern Ried, FH Gesundheitsberufe, Gesundheitszentrum Ried-Neuhofen, Zorn-Fachbach-Ertl-Auzinger Allgemeinmediziner GmbH, OÖ Hilfswerk and the Vinzenz Gruppe are working on a solution in cooperation with the TIMed research team AIST at the FH Upper Austria Hagenberg Campus. (Head: Barbara Traxler)

Project "LeiVMed III"

"LeiVMed" stands for "Leistungsvergleich Medizin" (medical performance comparison) and deals with processing administrative and medical data and computing performance indicators for hospitals based on this data. The extraction of electronic routine data supplemented with manually recorded data provides a valid data basis with numerous expert system-supported administrative and medical plausibility checks. Analytical models, in particular risk adjustment, ensure fair results. (Head: Gerhard Halmerbauer)

Project "Treetop Medical"

Treetop Medical develops medical knowledge models to make them available for patient care using digital applications. The aim of the project is to implement digital, machine-readable target treatment paths as part of digital medical guidelines and machine-readable mapping of medical semantics. (Head: Christoph Praschl)

PhD Program "PLFDoc – Precision Livestock Farming"

Precision Livestock Farming (PLF) means the use of digital technologies to support herd and health management in animal husbandry. A multidisciplinary consortium is developing new tools for predicting birth problems in pigs and cows and using explicable artificial intelligence and automated analysis of video data to improve the health of dams and their offspring. (Head: Stephan Winkler)

Image: Textile.

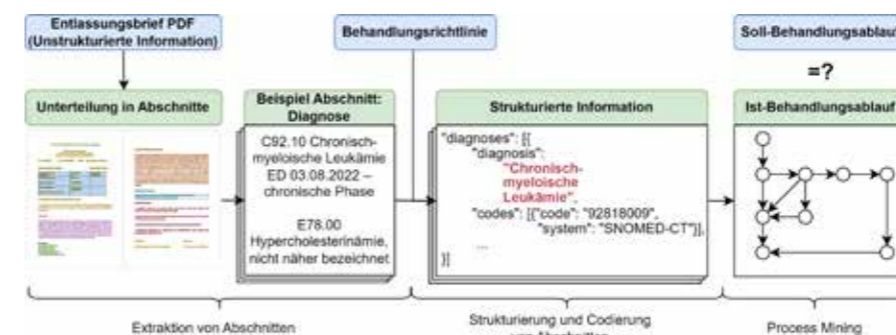*Image: University of Applied Sciences Upper Austria*

Center of Excellence for Technological Innovation in Medicine (TIMed CENTER)

Management: Thomas Kern
Owner: University of Applied Sciences Upper Austria
Founded: 2016
Located at SWPH: University of Applied Sciences Upper Austria, Hagenberg Campus
www.timed-center.at

Secure Prescriptive Analytics (SPA) - Smart decision making

Prescriptive analytics is the fourth stage of the business analytics process and builds on the first three business analytics steps: descriptive analytics (What happened?), diagnostic analytics (Why did it happen?), and predictive analytics (What will happen?). Prescriptive analytics is tasked to answer the next logical question: "What should be done?". In other words, prescriptive analytics deals with best practices, methods, and tools for providing recommendations and supporting business decision-making.

In essence, prescriptive analytics employs simulations and machine learning (ML) algorithms to create and analyse digital representations of business or manufacturing processes. These digital representations are utilised by optimisation algorithms, to examine and compare different possibilities, and to quickly select the most beneficial alternative. This is why prescriptive analytics requires capable methods and tools to create digital representations of real-world processes.

In the current FTI project "secure prescriptive analytics (SPA)", funded by the Federal Government of Upper Austria within the scope of the #upperVision2030

program, the partners University of Applied Sciences Upper Austria, RISC Software GmbH, and SCCH GmbH, are collaboratively developing novel solutions to achieve the fourth stage of business analytics in a form that can be used in industry and practice.

Hierarchical decomposition

One challenging aspect in the past has been the development and maintenance of large, monolithic simulation models. Creating these models is time- and resource-intensive as they represent state-of-the-art, complex business processes. In SPA, we rely on a divide and conquer approach (hierarchical decomposition) to divide simulation models into smaller, interconnected parts to manage complexity.

To achieve this kind of decomposition, the SPA software and methodology stack offers a custom-built domain specific language (DSL) that allows domain experts to describe their business processes as connected graphs. The nodes represent smaller business units or sub-processes, which are represented by simulations or existing (external) knowledge bases. Each node declares input messages, the information that is required to simulate or to execute the individual business step, and communicates the outcome of the step as an output message. The messages represent the edges of the graph.

Image: SPA, Jan Zenisek
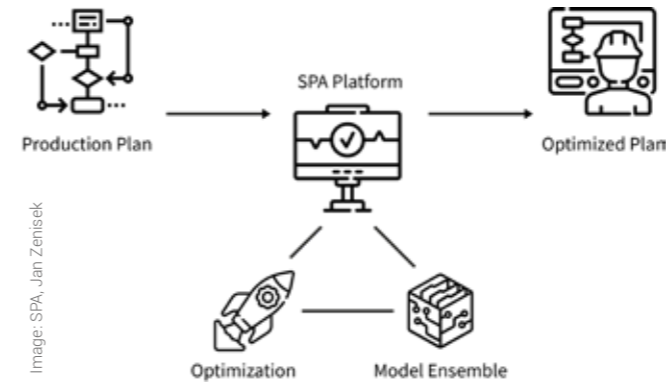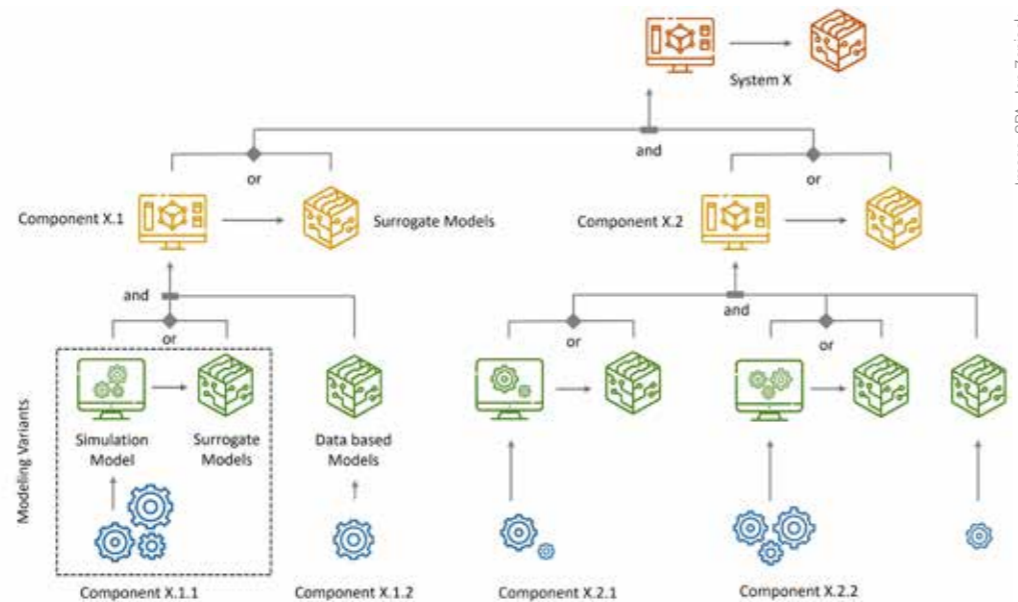
In this way, the development of complex simulations can be simplified, as they are broken down into smaller units that are subsequently easier to develop and maintain or can be easily extended or rearranged. Additionally, our DSL exclusively focuses on the actual business logic and can therefore be used by the domain experts themselves. The simulation experts or data scientists only need to provide the individual sub-processes as nodes. We rely on containerisation here to support heterogeneous runtime environments for each node.

Surrogate modelling

Having supported the definition of complex simulation models, the optimisation component of prescriptive analytics benefits from the short execution time of individual nodes, as each simulated alternative can cumulate to potentially lengthy runtimes. Execution times of individual nodes, or even multiple connected sub-graphs, can be improved by training ML models on past data and thereby creating prediction models that approximate the decomposed simulation model.

All told, the project focuses on the domain expert as the key user by integrating ML algorithms that can leverage prior knowl-

edge. One example of an ML algorithm class is shape-constrained regression; this involves integrating knowledge as interval bounds on the image of the prediction function or any of its partial derivatives. Doing this ensures that the models exhibit (physically) plausible extrapolation and interpolation behaviour, and are especially useful when limited training data is available. In the context of SPA, this is useful as models are potentially required to estimate performance for previously unseen but similar data regions.

A real-world example

The modelling and simulation of energy grids is one prototypical application. This is a particularly appropriate application scenario as individual nodes are often similar and can be reused (think individual households, transformers, or power stations), but complexity arises from the connections between these nodes. Prior to SPA, creating simulations of these networks was labour intensive.

Individual nodes are simulated using existing simulation software, e.g., pandapower. The node behaviour is defined by models. These models can, for example, depict historical behaviour, but also anticipated future behaviour using forecast models. Combining different nodes (consumers, generators, storage) allows complex systems to be mapped and analysed. The aim is simulation-based optimisation, which allows quantitatively verifiable decisions to be made, e.g., regarding the dimensioning of storage units

or photovoltaic systems. This is of both economic and social interest, especially with respect to energy communities.

Outlook

For the follow-up project phase of SPA, we envision the topic of AutoOpt, think AutoML, for fully automated creation and subsequent optimisation of digital representations. The idea is to improve and build on SPA results, by aiming for a higher level of automation and the resulting continuous learning and solution improvements. AutoOpt forecasts a transformative landscape where real-world problems of high complexity will be solved with unprecedented speed and accuracy.

RISC Software GmbH

The best of both worlds: research meets application

Since its foundation at Softwarepark Hagenberg, RISC Software has been an extra-university research institute and a central player at the interface between research and practical application. It is a reliable partner, shaping the knowledge transfer from university research to the economy with the goal of strengthening the competitiveness of the Upper Austria region.

With more than 30 years of experience in professional software development, RISC Software uses its know-how for customer-specific solutions and dedicates itself to knowledge transfer from basic research, applied research, and development to market readiness.

Profound expertise

RISC Software's experts are active in the fields of artificial intelligence and machine learning, data and information management, modelling, simulation and design, intelligent systems and energy management, and digital processes and infrastructure, offering comprehensive solutions that combine technological innovation and practical application.

Bridge builders between research and applications

All this knowledge is used by RISC Software for its customers in healthcare, industry, the energy sector, business and society. It connects academic research with market-ready products by paving the

Image: RISC Software GmbH

way from theory to application and helping customers to succeed in a rapidly changing world.

Customer focus

RISC Software has many years of experience in developing software systems for technical applications. These systems are often very complex and face strict requirements in terms of robustness, reliability, and innovation. RISC Software has long-standing development partnerships with well-known companies such as Airbus, WFL, DS-Automotion and many others. The range of services extends from the development of new systems and the re-engineering of existing systems to consulting and training.

RISC Software GmbH

Management: DI Wolfgang Freiseisen
Owner: 80% Johannes Kepler University Linz, 20 % Upper Austrian Research GmbH
Founded: 1992
Established at SWPH: 1992
www.risc-software.at

MEDUSA – Medical EDUcation in Surgical Aneurysm clipping

The goal of the MEDUSA consortium is to develop a revolutionary training and planning platform for neurosurgeons to simulate complex brain surgery in a detailed and holistic manner. MEDUSA's top priority is to protect patients' lives. Simulating complex medical procedures qualitatively and quantitatively in a realistic environment creates optimal training and education opportunities that enhance patient safety. To this end, a hybrid surgical simulator for neurosurgeons has been developed, where aspiring surgeons can both learn complex surgical techniques and train for specific medical cases (tomorrow's patient).

MEDUSA is a research project involving 13 institutions and companies from Upper Austria. This project is funded by the Strategic Economic and Research Program "Innovatives OÖ 2020" by the Province of Upper Austria. Video:
https://medusa.health/

POWERCAST: Optimising energy load with AI models

POWERCAST is a flagship project by RISC Software for integrating renewable energies into the power grid. An adaptive AI model combines various information sources for precise forecasts, ensuring grid stability despite volatile energy sources such as wind and solar. It serves the efficient management of energy flows and promotes the acceptance and spread of photovoltaic systems. By revolutionising load forecasting, POWERCAST makes a significant contribution to the energy transition and actively supports Austria's renewable energy strategy. Through the consortium, which combines expertise from the energy sector, data management, and AI, POWERCAST sets new standards for the future energy supply.

EU Project Platform-ZERO: Improving production quality of photovoltaics

The EU project Platform-ZERO aims to increase the production quality of photovoltaic devices through zero-defect manufacturing while minimising production costs. RISC Software leads the work package that deals with data management and develops AI-based control software. This software optimises the manufacturing of third-generation solar technology.

generated with Midjourney

Project POWERCAST: increase the cost and supply efficiency of electricity grids by predicting and optimizing electricity loads using AI-supported forecasting models

These technologies offer greater efficiency, lower costs, and adaptability to integrated applications.

The budget of over €10 million and the multidisciplinary consortium of 12 European partners reflect the commitment and importance of this initiative. Funded by the Horizon Europe program, Platform-ZERO represents a significant advancement in sustainable energy generation and Industry 4.0.
https://www.platform-zero-project.eu/

SafeRoadWorks: Safe Highway Construction sites

The main goal of this project is to improve safety on motorway construction sites for both drivers and workers.
RISC Software is playing a central role in this endeavour by coordinating the project and being responsible for project management. One significant contribution by RISC Software lies in data analysis, particularly in object detection from video data. To this end, deep learning models with meth-

Image: AdobeStock/Halfpoint

Image: Joanneum GmbH MedUni Graz

Improved brain tumour diagnosis and treatment

ods and tools for efficient annotation of video and image data are implemented. Additionally, the team deals with the processing of biometric signal data to ensure a comprehensive understanding of safety challenges at construction sites.

Secure Prescriptive Analytics (SPA)

The project "Secure Prescriptive Analytics" aims to develop a new modeling strategy that quickly and accurately partitions complex systems, such as industrial plants, into sub-models and accelerates these with surrogate models. An open-source platform is being created to enable the linking of models and optimisation components. The goal is to develop a prescriptive analytics strategy for the rapid generation of actionable recommendations for complex optimisation problems. The project is funded by the Province of Upper Austria as part of a programme designed to stimulate future-oriented research fields by 2029.
Researchers from institutions at the Softwarepark Hagenberg (FH OÖ Forschungs- und Entwicklungs GmbH - HEAL researchgroup, RISC Software and Software Competence Center Hagenberg) are involved in this project.

Research Project nARvibrain: Improved Brain Tumour Diagnosis and Treatment

The project nARvibrain ("Augmented Reality supported Functional Brain Mapping for Navigated Surgery Preparation and Education") aims to improve brain tumour diagnosis and treatment, increase patient awareness of the disease, and enhance the quality of medical education by combining modern methods of artificial intelligence (AI) and extended reality (XR).
The cornerstone of the project is the development of a holistic digital representation of a patient. This model represents all relevant structural and functional imaging data, functional test results, and predictive simulation results. A semi-automatic, AI-supported image processing pipeline is being developed to transform medical imaging data into customised input for augmented reality rendering, simulation, and prediction packages. The research project benefits both medical professionals in their daily clinical practice as well as patients and students in medical and health programs.

Implementation projects

Airbus:
Multidisciplinary structural optimisation

The Lagrange structural optimisation system, developed by Airbus Defence and Space, is significantly advanced by RISC Software. This long-standing cooperation has led to a system that enables the optimisation of geometry and material use for aircraft structures as early as in the design phase. This not only minimises weight and maximises performance, it also improves production efficiency and aerodynamic properties. With a focus on parallel and distributed computer architectures, RISC Software contributes to the efficient calculation of complex structural designs, revolutionising the aerospace industry.

Image: iStock/teekid

DS Automotion:
Driverless Transport Systems

For more than two decades, RISC Software GmbH has been developing software for DS Automotion for the modelling, simulation, and control of driverless transport systems that automate logistics and production.

The control technology software is both flexibly configurable and powerful in order disposition and collision-free vehicle control.

The integration of an extensive simulation environment enables the creation of realistic simulation models for driverless transport systems and enables virtual commissioning and testing of adjustments or expansions. The solutions optimize the material flow in industries and

Image: iStock/romaset

An integrated software system for modeling, simulating and controlling driverless transport systems.

hospitals, significantly increasing efficiency.

WFL Millturn: NC machining simulation

The many years of constructive cooperation, characterized by excellence, perseverance and trust, have so far resulted in two software products that have hardly any competition on the international market: CrashGuard Studio and CrashGuard Online Collision Avoidance. The combination of an extensive, detailed and optimally adapted offline simulation in the CAD/CAM area and a high-performance, memory-optimized and integrated real-time simulation for collision avoidance supports customers of WFL Millturn Technologies GmbH & Co. KG in the use of their

Image: WFL

Simulation and collision avoidance for computer-controlled, multifunctional complete machining centers

complete machining centers. In close cooperation with experts from RISC Software GmbH, software innovation in mechanical engineering fundamentally improves both resource conservation and error prevention in order to increase productivity and competitiveness and thus also underpin market dominance.

CrashGuard Studio is a 3D simulation software for multifunctional CNC turning, drilling and milling centers, which enables machines with their complex kinematics and extensive machining and expansion options to be simulated very realistically. An important milestone in the course of the continuous further development of CrashGuard Studio was the material removal simulation. Analogous to the real machine, the ongoing removal of material can be followed in the 3D visualization in real time. At the end of the machining process, a 3D model of the finished part is available as an additional option for verifying the NC program.

The CrashGuard machine extension for online collision avoidance, another product developed in cooperation between WFL Millturn Technologies GmbH & Co. KG and RISC Software GmbH. This is a real-time collision avoidance system integrated into the machine control system, the aim of which is to avoid collisions between machine parts of complete machining centers at all times and under all circumstances.
This cooperation emphasises RISC Software GmbH's strong focus on resource conservation and productivity through continuous software and algorithmic improvements that support WFL's market-leading position. With over 200 machines already benefiting from the CrashGuard system, this product has become essential for WFL and its customers.
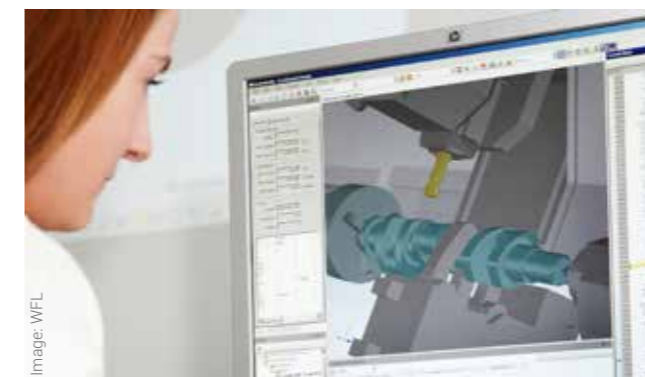
SCCH – Competence Center for Integrated Software- and AI-Systems

The Software Competence Center Hagenberg (SCCH) is an independent COMET K1 research centre that has fostered excellence in application-oriented research within the fields of data science and software science for 25 years. This dedicated focus enables the effective implementation of projects in the domains of digitalisation, Industry 4.0, and artificial intelligence.

Artificial Intelligence, quantum computing and beyond

In the new COMET funding period, SCCH is evolving into a competence centre for integrated software and AI systems, named "INTEGRATE". The goal is a holistic technological approach to application-orientated research.

While artificial intelligence is powerful, it cannot solve every problem; tradition-al software remains indispensable but is reaching its limits. INTEGRATE combines the best of all approaches, integrating them to find the best possible solution for each problem, rather than the most popular one.

As one of the first application-oriented research centres, SCCH also works on quantum and neuromorphic computing, transitioning from basic research to application in the coming years. Companies, society and our planet face challenges that cannot be resolved with a single technological approach. INTEGRATE sees SCCH make the full spectrum of modern digitalisation accessible to its partners.

Focus on various stakeholders

Research focuses on company partners, society and the planet earth. All technologies, methods and developments are analysed with a view to their social and ecological impacst. Through INTEGRATE, SCCH is developing into an "Open Research Centre" making research results available to its partners and society as key knowledge.

SCCH's partners include companies with international activities, such as voest-alpine Stahl GmbH, TRUMPF Maschinen Austria GmbH, ENGEL AUSTRIA GmbH, STARLIM Spritzguss GmbH and FRONIUS International.

scch {
software
competence
center
hagenberg
}

Software Competence Center Hagenberg (SCCH)

Management: Dipl.-Umweltwiss. Mag. Markus Manz (CEO), Prof. Dr. Robert Wille (CSO)
Owner: Johannes-Kepler-Universität Linz (JKU), Upper Austrian Research GmbH (UAR), Verein der Partnerfirmen (association of partner companies)
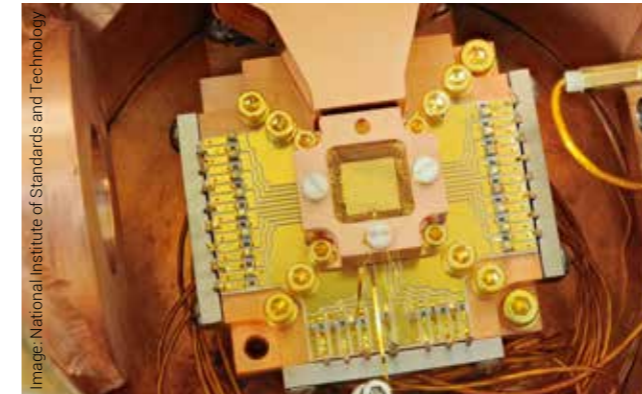**Founded:** 1999
Established at SWPH: 1999
www.scch.at

Image: SCCH

QuantumReady – entanglement with the future

Quantum computers have the potential to revolutionise the digital world, with the first promising applications making the transition from basic research to industrial use. In the "QuantumReady" project, part of the "Emerging Technologies" research field at the Software Competence Centre Hagenberg (SCCH), SCCH researchers collaborate with researchers from the Johannes Kepler University Linz and industrial partners to prepare domestic companies for the opportunities and challenges of the upcoming quantum computing era.

Quantum computing on the brink of commercialisation

Quantum computers can solve certain tasks far faster than conventional hardware ever could. This technology will demonstrate its advantages in the near future. To maintain a competitive edge, small and medium-sized enterprises (SMEs) in particular need to build up knowledge now in order to assess whether quantum computers can benefit them. QuantumReady provides knowledge and technology transfer in both directions – from research to application and back again.

Image: National Institute of Standards and Technology

Ion trap: Traps charged particles using electric and magnetic fields in order to precisely influence their states.

Contact: Prof. Dr. Robert Wille, Dr. Stefan Hillmich; robert.wille@scch.at, stefan.hillmich@scch.at
Areas of application: optimal allocation of robots to workpieces on an assembly line; maximising the profit of a hydro-electric power plant.

Neuromorphic-Computing – the next step in digitalisation

In contrast to standard models of artificial neurons, such as convolutional neural networks, biological neurons code and process information in an event-oriented manner with impulses (known as spikes): this represents a paradigm shift in signal processing. Traditional theories of digitalisation are no longer valid and need to be reconsidered.

This shift has lead to the development of new algorithms for signal processing, including chip design, and can improve energy efficiency by orders of magnitude. However, the human brain, with its exascale computing power and energy consumption of around 20 watts, is still out of reach. Neuromorphic computing based on spike-based signal processing and neural networks (spiking neural networks, SNNs) is moving closer to this goal. In cooperation with the Institute for Signal Processing at the Johannes Kepler Universität Linz and Prof. Robert Legenstein from the Technical University Graz (Computational Neuroscience), SCCH is researching into its own highly energy-efficient neuromorphic mixed-signal chip with initial applications in smart sensor networks for environmental monitoring.

Image: pixabay.com/geralt

Neuromorphic computing will change the digital world.

SNNSys = Spiking Neural Network Systems

Contact: Assoc. Prof. Dr. Michael Lunglmayr (JKU), Priv.-Doz. Dr. Bernhard A. Moser (SCCH, JKU)
Areas of application: Monitoring of environmental factors, smart sensors, IoT, wearable devices, very low energy sensors

AI improves plastics recycling

Millions of tons of plastic waste are produced every year, but only a small fraction is recycled. Recycling is crucial for a circular economy that aims to preserve the value of products and minimise waste.

Recycling plant from EREMA

Contact: Dr. Volkmar Wieser, volkmar.wieser@scch.at
Areas of application: Process industry, manufacturing, waste management

The Software Competence Center Hagenberg (SCCH) is collaborating with EREMA Engineering Recycling Maschinen und Anlagen Ges.m.b.H., to explore how digitalisation and artificial intelligence (AI) can enhance the efficiency of mechanical plastic recycling processes. The challenge lies in obtaining high-quality recycled materials from heterogeneous plastic waste streams, enabling their reuse.

Data-driven assistance systems provide valuable insights into the recycling process, ensuring product quality, and enabling process optimisation while giving timely warnings in the case of process anomalies.

SCCH's expertise in data analysis, machine learning, and process optimisation supports digital networking along the entire value chain and the traceability of material flows with the ultimate goal of improving the recycling rate and enhancing the overall recyclability of plastics.

Image: EREMA Engineering Recycling Maschinen und Anlagen Ges.m.b.H.

AI enhances understanding

Large Language Models (LLMs) like ChatGPT optimise numerical values to predict the next word based on probabilities. While this may seem trivial compared to human cognitive processes, billions of calculations are performed in the background.

Human intelligence is far more diverse and encompasses linguistic, formal and technical competences far beyond what LLMs minimally reflect. Having said this, these models will continue to evolve.

At SCCH, LLMs are being adapted for various applications, such as niche programming languages. Efforts are underway to explore other models with LLMs and to develop retrieval augmented generative systems for business-relevant data.

LLMs boost productivity in software development and empower non-developers to interact with software. However, they do not replace software developers, as

Image: freepik.com/rawpixel

abstract problem-solving and structured solution-finding remain the programmer's key skills.

AI expands our understanding of cognition, yet raises questions about our expectations from these systems, as human behaviour remains fundamentally unchanged despite AI advancements.

Contact: Dr. Volkmar Wieser volkmar.wieser@scch.at, Mag. Michael Moser michael.moser@scch.at
Areas of application: Support for reporting, chatbots, automatic image content description, simplification of complex documents, knowledge management

eknows – software analysis platform for complex software systems

The development of the eknows software platform illustrates how application-oriented research in software analysis can lead to new products and services. For instance, eknows serves as the technical backbone for the innovative Linz-based start-up Sysparency, which focuses on the automated documentation of customer-specific enhancements to SAP®-systems.

Software documentation plays a pivotal role in the maintenance and evolution of software. Inadequate or outdated documentation, coupled with a lack of program comprehension, presents significant challenges. Automation is often the only viable approach to efficiently documenting large software systems comprising millions of lines of source code. However, the development of the required software tools (e.g., documentation generators and reverse engineering tools) is time-consuming.

eknows – language-independent software analysis platform

eknows supports the rapid development of analysis tools by reusing components for parsing source code, static and dynamic analysis and visualisation. While the platform's development was initially driven by domain-specific requirements from various research projects, its architecture was conceived and designed to enable cross-technology analysis of software systems from the outset. Cur-

Image: pexels.com/sora-shimazaki

rently, eknows supports the analysis of 16 programming languages and technology stacks.

The extensibility and successful application of eknows in various application-oriented research projects raised interest in commercial utilisation. Sysparency was founded for this purpose in 2021. The start-up developed a complete SAP® technology connector for eknows, which enables end-to-end documentation of SAP® enhancements based on different perspectives (e.g., data, user interfaces, use cases, system communication, etc.).

Contact: Mag. Michael Moser michael.moser@scch.at
Areas of application: Static program analysis, development of reverse engineering tools, support for software migration, automated software documentation, automated software documentation for SAP enhancements (Sysparency)
www.sysparency.com

TRUSTIFAI –
Seal of quality for artificial intelligence

The TRUSTIFAI joint venture is Austria's first AI testing and qualification hub, which tests and certifies AI applications and supports companies in implementing trustworthy AI.

TRUSTIFAI relies on scientifically based testing methods and transparency boosting extensive expertise in AI certifications for applications and the implementation of AI management systems in alignment with international standards and the EU AI Act.

The current test catalogue includes over 300 test criteria covering functional requirements, secure development, ethics and data protection, ensuring the mitigation of potential usage risks subsequent damage and potential discrimination against individuals and the environment.

Machine learning as the foundation

Since 2020, TÜV AUSTRIA, the JKU's Machine Learning Institute and SCCH have collaborated to integrate scientific methodologies from foundational machine learning research into quality testing and certification. This methodology entails rigorous statistical testing of the ML models employed, shared with the wider AI community across Austria and Europe by TRUSTIFAI.

Extensive expertise

Positioning itself as a leading AI testing and qualification hub with a global footprint, TRUSTIFAI possesses all the requisite skills, testing competencies, and capacities to assist companies in meeting the compliance demands of the EU AI Act.

Serving a global clientele spanning a variety of sectors including automotive, healthcare, critical infrastructure, mechanical engineering, finance, ICT, and public administration, TRUSTIFAI delivers a wide range of comprehensive services encompassing training, consulting, and testing. These services focus on AI safety & security, governance, and compliance, aligning with the latest standards, a landscape it has actively contributed to shaping.

Contact: Andreas Gruber, MSc
andreas.gruber@trustifai.com,
Dipl.-Ök. Thomas Doms
thomas.doms@trustifai.com,
Managing Directors TRUSTIFAI
Areas of application: AI applications and implementation
www.trustifai.at

From left to right: Dr. Bernhard Nessler (SCCH), Dipl.-Umweltwiss. Mag. Markus Manz (CEO SCCH), State Councillor for Economics and Research Markus Achleitner, Governor Mag. Thomas Stelzer, DI Dr. Stefan Haas (CEO TÜV Austria), Dipl.-Ök. Thomas Doms (TRUSTIFAI)

AI CERT-B: AI-Engineering & Certification Center, Phase B

The "AI Engineering & Certification Centre" project focuses on developing reliable and secure AI applications, especially for machine learning (ML), deep learning (DL) and large language models (LLMs). A mathematically based approach to statistical testing serves as the cornerstone of testing and is key to certification. As an interdisciplinary project, CERT-B integrates both technical and legal expertise to align these methods with the European Union's regulatory framework (AI Act) and current developments in European (CEN/CNCLEC) and international standards (ISO).

The key question revolves around what is known as the alignment problem: how can we ensure AI/ML/DL systems operate in the way that developers and users envisaged within the framework of their desired but formally undefinable generalisation capability? This goes beyond the purely mathematical perspective of machine learning and also concerns the subjective understanding of people and their previously used methods of objectively regulatory behaviour through natural language laws and regulations. The interdisciplinary approach is based on the collaboration with the ML Institute of the JKU Linz and also includes legal and ethical aspects as well as topics of neuroscience and cognitive science. The new methods of "Functional Trustworthiness" and "Application Domain" are key research milestones.

From basic research to the economy

The "AI Engineering & Certification Centre" project serves as both a local catalyst and scientific driver. It aims to enhance our understanding of AI and promote its efficient and safe use in the domestic economy. Companies, start-ups and institutions benefit from cutting-edge scientific expertise through lectures, workshops and collaborative projects.

Regulatory challenges

The EU AI Act creates significant legal uncertainty for AI developers and users due to its vagueness. Collaboration with LIT Law Lab melds technical and legal expertise, offering an interdisciplinary approach to analysing the AI Act and integrating research findings into policies and standard development.

Contact: Dr. Bernhard Nessler
bernhard.nessler@scch.at,
Dr. Volkmar Wieser
volkmar.wieser@scch.at
Areas of application: large language models, chatbots, information systems, AI applications in all fields
www.scch.at/data-science/projekte/detail/cert-b

From left to right: Mag. Gregor Aichinger, Michal Lewandowski MSc, Patrick Mederitsch MSc, Mag. Alexander Aufreiter, DI Dr. Bernhard Nessler, Simon Schmid MSc. A team of six lawyers and researchers support AI projects at SCCH.

Pioneering Software Development

Softwarepark Hagenberg   Research and development

The project team: bluesource and University of Applied Sciences Upper Austria

BLUESOURCE – mobile solutions GmbH

Virtual advisor - KI-supported matching of the app user's investment behaviour with financial products and a personalised approach and presentation

In a cooperation project with the FH Upper Austria Campus Hagenberg, we are developing a tool that analyses the investment behaviour of users in a playful way and offers personalised recommendations for banking and insurance products. The virtual advisory tool relies on state-of-the-art artificial intelligence (AI) technologies to find the most suitable banking and insurance products for bank customers. The aim is to increase the probability of the customer opting for a banking or insurance product. The AI algorithm is based on data from various sources that were previously not available to banks and insurance companies in this form. In the scope of the project, this data was brought together in a joint data pool.

First, a psychologically validated method was developed that uses gamification to classify the value base and investment behavior of users. For this purpose, users are assessed in terms of their willingness to take risks, perception preference, value base, meaningfulness and striving for sustainability. The classification data, the product data and all other available data serve as the basis for the AI algorithm.

An AI algorithm is used to create a classification from the product information provided by banks and insurance companies; this then allows a statement to be made about the relevance of the products for the target group clusters. The greater the relevance, the higher the expected probability of closing a deal. The advisory dashboard provides product managers with information on the size of the target group; if necessary, they can then adjust the product to improve its reach or relevance. Our goal is

to make decision-making easier and clearer for users. At the same time, we want to show users the best options in the area of banking and insurance products.

bluesource - mobile solutions gmbh

Management: DI (FH) Wolfgang Stockner and DI (FH) Roland Sprengseis
Owner: DI (FH) Wolfgang Stockner and DI (FH) Roland Sprengseis
Founded: 2001
Established at SWPH: 2001
www.bluesource.at

Aim of the project

The aim of the project is to develop a tool for banks and insurance companies to playfully analyse the investment behaviour of users, identify a person's habits and life circumstances and, with the help of intelligent algorithms, recommend the right banking and insurance products at the right time in a highly individualised way. At the same time, the tool is also a communication platform.

Selected milestones

- Development of a user dashboard for displaying the calculated results with the option for users to change these settings. To ensure complete transparency for users, the results can be viewed and adjusted by the user at any time.
- Maximum variability in the presentation of the different products: As the system is aware of the different perceptual preferences of users, de-

The smartphone is not only an important everyday companion, but will also provide advice on financial security in the future

scriptions of banking and insurance products are stored in different forms. In this way, the banking or insurance product is presented to each user in the best possible way and most suitable way.

- Development of a dashboard for configuring and proposing banking and in-

surance products: a program interface enables advisors to create banking and insurance products with the required metadata, validate the target group calculated from this and track the success of a product. The metadata is determined from the image and text data provided using AI and is also transparent and configurable at any time.

Awards/added value

Individual recommendations and the simplification of banking and insurance products offer users considerable added value. Recommendations mean that the algorithm makes tailored suggestions for banking and insurance products based on a user's individual preferences and previous behaviour. This means that users receive offers for products that are optimally tailored to their financial and personal situation. Ranking helps users to make the best decisions for themselves without losing their way in complex financial details.

Image: iStock/Jae Young Ju
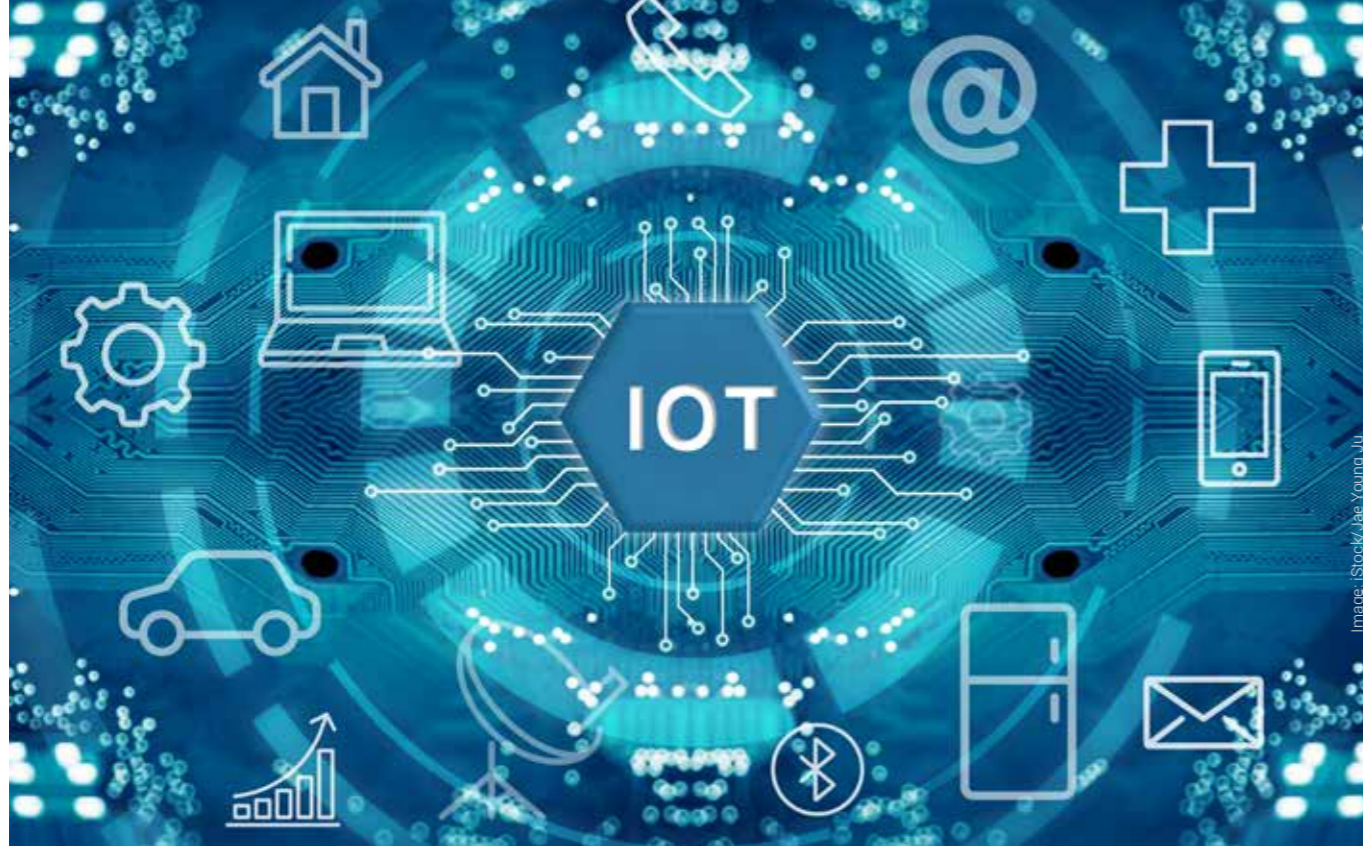
blue-zone GmbH – customized software for embedded systems and IoT

We develop tailored software and IoT solutions for product manufacturers - from idea to final product. With more than 20 years of experience in the areas of embedded systems, PC software and web/cloud applications, we help companies to make their products smarter, to further develop or modernize them.

About us
Founded in 2001 and formerly known as CDE GmbH, blue-zone GmbH has established itself as an expert in software development for Embedded Systems and the Internet of Things (IoT). With locations in Hagenberg and Vienna and a dedicated team of around 30 employees, we are specialised in sophisticated software solutions for industry and medical products. Our mission is to drive the digital transformation of our customers through customised embedded software and innovative IoT and cloud solutions.

We offer comprehensive support in software development and advise our customers in workshops and personal conversations on the possibilities, use cases, and business models that IoT enables. Additionally, we show best practices for the development of software products, including the review and setup of the appropriate architecture and necessary tools.

Our core competencies
- Embedded systems & security: Development of secure and reliable software for critical applications.

- Interfaces: Integration of various interfaces for seamless communication and connection between systems (e.g., NFC, WiFi, Ethernet, BLE, Matter, Modbus, OPC-UA).
- Cloud & Web solutions: Visualization and management of device data in real-time, including integration into existing systems.
- Data analytics: In-depth analyses for strategic decision-making.
- Medical product software: Development at the highest level – we are ISO 13485 certified.

Special expertise
With our comprehensive expertise and deep industry knowledge, we support our customers not only to handle current technological challenges but also in actively generating future opportunities. Our team has many years of experience and specialist knowledge in the following areas:
- IoT applications: From sensor integration to data processing and integration of existing systems.
- Embedded security: Development of secure embedded systems (hardware and software) focusing on data protection and security protocols.
- Device update & bootloader: Secure and efficient solutions for updating software on end devices.
- Low-power Design: Optimisation of the energy consumption of mobile devices.
- Cyber Resilience Act-compliant solutions: Ensuring compliance and data security for the future.

Project Highlights
SensorProbe for GE Healthcare
GE Healthcare, a global provider of medical technology and pharmaceutical products, develops ultrasound devices for various medical applications. The probes of these devices are equipped with highly sensitive sensors as part of a project with blue-zone to expand the functionality of the ultrasound probes and adapt them to specific requirements. blue-zone's services included evaluating possible sensor solutions, hardware development of prototypes, and implementing firmware for analysing and processing sensor data.

Image: KI-generated/blue-zone GmbH

Condition monitoring for special machines
A leading special machine manufacturer develops components for large systems. In cooperation with blue-zone, a condition monitoring solution was developed to monitor the condition of these components, thus preventing potential failures or even damage. The solution enables remote access and OTA updates, thereby increasing operational efficiency and safety. In addition to condition monitoring, the OPC UA machine-to-machine communication protocol was implemented; this protocol is considered a standard interface in the Industry 4.0 context.

Image: KI-generated/blue-zone GmbH

blue-zone GmbH

Management: DI (FH) Andreas Oyrer
Owner: All for One SE (Filderstadt near Stuttgart)
Founded: 2001
Relocated to SWPH: 2003
www.blue-zone.at

Image: BMW Group

The BMW Group – our new partner at Softwarepark Hagenberg

The BMW Group has been a strong driving force behind Austria's economy for more than 40 years. With investments of more than 8.8 billion euros since 1977, the company has made a significant contribution to the economic stability and prosperity of our country for decades. Today, the BMW Group employs around 8,000 people in Austria. In 2023, the Austrian companies of the BMW Group generated sales of approximately 8.9 billion euros. This makes the BMW Group in Austria one of the top-selling companies in the country. With 17.922 newly registered BMWs and 2.232 MINIs, it was the leading manufacturer of premi-

um cars in Austria in 2023. BMW Motorrad recorded 1.853 new registrations in 2023. BMW Austria GmbH, based in Salzburg, is responsible for sales of the BMW, MINI and BMW Motorrad brands in Austria. BMW Vertriebs GmbH, the headquarters for the Central and South-Eastern Europe region, serves a total of twelve European countries from here. Salzburg is also the headquarters of BMW Group Financial Services for Central and Southeastern Europe.

In Steyr, more than 4,700 employees produce more than one million petrol and diesel engines per year at the BMW Group's

largest engine plant in the world. It is also home to an important development centre for the research and development of new drive systems - with a focus on e-mobility and, in the spirit of technological openness, also on the exploration of other drive options. Today, BMW Motoren GmbH in Steyr is one of the strongest industrial companies in Austria in terms of sales and exports. In June 2022, the company announced the start of production of electric drives. In parallel with the continued high production capacity for diesel and petrol engines, including V8 engines, the Steyr plant will start producing electric motors in 2025.

In 2022, the BMW Group decided to establish its own office at Business Campus One, in addition to existing successful cooperation with the University of Applied Sciences Hagenberg.

IT support for engine production: efficiency and innovation

BMW Group Plant Steyr uses innovative IT solutions to facilitate and accelerate the management and monitoring of engine production. The use of cutting-edge technologies and services ensures efficient, high-quality production that can adapt to changes over time. These solutions are developed worldwide, including Softwarepark Hagenberg.

The software developed by the BMW Group IT teams at the Steyr and Hagenberg sites optimises and monitors a wide range of production processes. It continuously collects and analyses data from various sources and uses it to generate real-time information for flexible and stable production of the highest quality. As part of a global network, this software is used worldwide, from China, through Europe, to the USA, and is constantly adapted to changing requirements. In this way, it supports the plants in working as efficiently as possible and ensures smooth production of vehicles with state-of-the-art software, "Made in Upper Austria", which runs in the cloud 24/7. The expertise of the specialists from Hagenberg is a reliable component for this.

BMW Group Plant Steyr works closely with Softwarepark Hagenberg and the University of Applied Sciences Hagenberg to develop innovative solutions. Interested students have the opportunity to complete internships, study projects and in some cases dissertations in cooperation with the BMW Group. This gives students an exclusive insight into the working world of the BMW Group and enables them to gain valuable experience for their future careers. In ad-

Image: BMW Group

dition to software development, the BMW Group also offers an exciting environment in the area of IT security, where the BMW Group plant in Steyr works closely with colleagues around the world to identify and immediately respond to cyber threats.

The students and graduates of the University of Applied Sciences Hagenberg are globally recognised IT experts and represent a great asset for the BMW Group – the BMW Group Plant Steyr is therefore delighted to have them as part of the team, helping to successfully and actively shape the mobility of the future, whether at the Hagenberg location or at countless other exciting opportunities within the BMW Group.

BMW Group Werk Steyr

Management: Klaus von Moltke
Owner: BMW Group
Founded: 1979
www.bmwgroup-werke.com/steyr/en.html

COUNT IT – your business is our business.

We are consultants, accountants, engineers and take businesses to the next level. Our services include advisory, accounting, payroll and HR support, tax consulting, individual software solutions, ERP and ECM business solutions, IT & cloud services as well as consulting, outsourcing or support in all areas. With 30 years of experience and broad professional expertise, we will find the perfect solution for your company. From our offices in Hagenberg, Linz, Vienna, Ybbs/Danube, and Munich, we support and accompany your corporation on its way to a digital and successful future. The COUNT IT Group consists of several companies, each of which has a specific area of expertise. In that lies our added value,

because by acting as a unit and in close collaboration within our group, we can do what we do best: provide other companies with holistic services.

Our service areas
- Accounting
- Tax
- Payroll | HR
- Advisory
- Software engineering
- ERP
- ECM
- IT outsourcing
- Cloud solutions
- IT consulting
- AI

We take our corporate responsibility very seriously and treat people with respect and kindness. CSR and sustainability are not just buzzwords at COUNT IT, but are firmly anchored in our corporate philosophy and history. We attach great importance to the well-being of our employees, to in-depth on- and off-the-job education, and long-term cooperation. In doing so, we act in a family-friendly and health-conscious manner. Long-term, benefit-oriented cooperation is also important to us when it comes to our services. This allows our customers to focus on their core business.

Image: COUNT IT Group

COUNT IT Group

Management: Maximilian Wurm (CEO), DI (FH) Peter Berner (CEO), StB Nikolaus Raus LL.B (WU), Elke Nowak MSc, Markus Szöky BSc MA, Mag. Daniel Braden, Mag. Wolfgang Schenk, Maximilian Kruschewsky
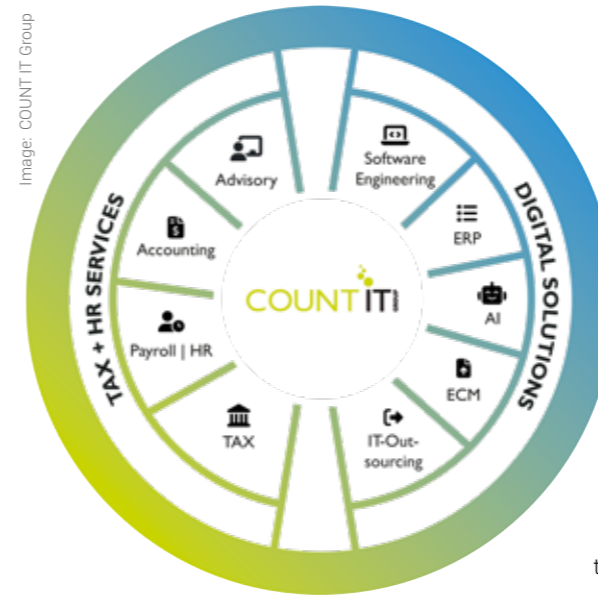**Owner:** Maximilian Wurm (CEO), DI (FH) Peter Berner (CEO)
Founded: 1995
Relocated to SWPH: 2006
www.countit.at

Image: COUNT IT Group

COUNT IT Digital Solutions
Whether individual software, business software or other IT solutions, our clear focus is on customer satisfaction and result-oriented cooperation, and on solutions at the highest quality level. We invest 30 years of experience to find the perfect solution for your business. Our specialities are software engineering based on state-of-the-art technologies like Angular, .NET (incl. Blazor) and Azure, software for financial accounting & enterprise resource planning (ERP), digital document management (ECM), IT outsourcing and artificial intelligence (AI). With an agile way of working, broad technical know-how and high standards of quality, we guarantee to elevate your workflow.

One of our core competencies is taking on your IT spectrum. Outsource your infrastructure to software engineering with a professional IT service provider is both efficient and effective. Whether consulting, hosting, outsourcing of the infrastructure or for software development and main-

tenance – as a reliable partner, COUNT IT offers the flexibility required to provide the best possible solution. Our portfolio includes two standard software systems that we customise to your requirements: d.velop documents and Microsoft Dynamics 365 Business Central (formerly Dynamics NAV).

We have also set ourselves the goal of introducing young people to programming and coding. That's why we created the digital dojo, a virtual practice room for young people who are enthusiastic about learning programming skills.

COUNT IT TAX & HR services
As a tax consultancy we offer temporary support or outsourcing for accounting, annual financial statements, tax issues, payroll accounting at the office and abroad as well as consulting on strategy and business. Digital and personal consultation are not a contradiction; in fact, the opposite is the case as we have proved through our proactive attitude in ongoing support. With our assistance, companies can concentrate on their core business and development. Our

many years of industry experience make us the perfect partner in the area of corporate services relating to finance and accounting.

CUBE49 event location
Our new building in Softwarepark Hagenberg is also home to a unique event location: CUBE49 - a place of innovation and encounters, where modern design and technical sophistication create wonderful experiences. Whether birthday parties, corporate events or seminars - there are no limits to your imagination. The centrepiece of our event location is the outdoor stage, which gives our event area its name due to its cube shape - www.cube49.at

Image: COUNT IT Group
CUBE49 events area

Image: COUNT IT Group
From left to right: DI (FH) Peter Berner, Elke Nowak MSc, Mag. Daniel Braden, StB Nikolaus Raus LL.B (WU), Markus Szöky BSc MA, Maximilian Wurm

Image: AdobeStock/James Thew

Image: Porsche Informatik

HQ **Porsche Informatik – Salzburg (AT)**
(Headquarters)

01 **POI France– Paris (F)**
(Deployment Hub)

02 **Porsche Informatik – Vienna (AT)**
(Development Hub)

03 **Porsche Informatik lab:hagenberg– (AT)**
(Development Hub)

04 **DASOF– Ljubljana (SI)**
(Development Hub)

05 **POI Development Hub Romania– Iaşi (RO)**
(Development Hub)

06 **POI Development Hub Romania– Bucharest (RO)**
(Development Hub)

07 **DigiLab Italia – Verona (IT)**
(Deployment Hub)

Porsche Informatik – powering smart mobility solutions

At Porsche Informatik, we combine decades of expertise in IT and the car trade with a holistic vision for the digital transformation of our industry. Across eight international locations, nearly a thousand employees design, develop and run IT solutions that millions of users rely on daily. Porsche Informatik is a subsidiary of Porsche Holding Salzburg, the largest and most successful car trading company in Europe. With more than 180 individual solutions, in-depth expertise and cutting-edge technologies, Porsche Informatik works with its customers to digitalise their processes and develop solutions that help them move forward.

Hagenberg's Softwarepark and the campus of the University of Applied Scienc-

es Upper Austria offer a unique fusion of academia and industry that is unparalleled in Austria. This is why the Porsche Informatik office at this location is part of a dynamic network that offers us many opportunities for cooperation, exchange and joint projects. In partnership with the university's skilled students and alumni, who specialise in those areas, Porsche Informatik is actively shaping the future of mobility.

AI in Dispo 4.0
The Parts Distribution Centre (TVZ) supplies original spare parts to workshops in 18 countries. To ensure high parts availability, Dispo 4.0 supports the TVZ in ordering the right quantity of the right parts at

PORSCHE INFORMATIK

Porsche Informatik lab:hagenberg

Management: MMag. Irmgard Gmachl
Owner: Porsche Holding GmbH
Founded: 1976
Additional location in SWPH: 2021 Business Campus One
www.porscheinformatik.com

the right time. The backbone of the solution is an AI-based model that uses the latest scientific findings from time series forecasting to predict the individual demand for 270,000 different spare parts. Dispo 4.0 is the result of research collaboration with universities.

IT Security
"My Information Security team plays a crucial role in providing global security for the Porsche Holding Salzburg Group. That is why we are constantly improving our standards and keeping them up to date. Our tasks include creating and implementing policies, controlling processes, handling incidents, and identifying and minimizing risks." says Stefan Jäger, MSc, information security manager.

Image: Porsche Informatik

Image: AdobeStock/EmmaStock/KI-generiert/STIWA

STIWA – data science research: Knowledge-based visual data analysis

For more than 30 years, STIWA has worked intensively on networked product and high-performance automation to gradually move closer to the vision of the digital production of tomorrow. Intensive cooperations promote further future-oriented developments. One of many promising cooperations takes place at the Josef Ressel Center in the scope of the KAVA project. This is where future production processes are optimised with the help of knowledge-based visual data analysis.

Data analysis at STIWA – progress and future perspectives

STIWA data analysis constantly develops and plays a central role in the mission of creating the production processes of the future. With a clear focus on innovation and quality, STIWA continuously pushes the limits of technological possibilities. The implementation of progressive analysis methods and machine learning enables significant process efficiency and product quality improvements. By optimising data acquisition and analysis, STIWA solutions are not only capable of making more precise predictions, but also able to develop proactive maintenance strategies, minimise downtimes and boost productivity.

The KAVA project: innovative in knowledge-based visual data analysis

The KAVA project ("Knowledge-Assisted Visual Analytics") arose from the endeavour to further develop data analysis skills and maximise the effectiveness of production processes. This innovative project, which is based at the Josef Ressel Center, represents the progressive approach of STIWA to both collect and semantically connect data, and gain deeper insights into the invisible patterns and the implicit knowledge which are generated during user interactions. The KAVA project relies on cutting-edge techniques of visual data analysis to extract and interpret information from different data sources (explicit knowledge) and practical knowledge (implicit knowledge) and convert this to machine-processable formats. The information is connected with production data to create a knowledge graph.

One specific approach of the KAVA project is the systematic extraction and analysis of artifacts (e.g., machine/process errors connected with the defined measures) which are recorded by a ticketing system and documented in plain text. This information is combined and visualised in an expert system to generate actionable solution proposals.

This process includes the development of algorithms that are able to recognise and interpret complex data patterns which would otherwise be inaccessible to human analysts. With this data, decision makers can better understand how different factors have an influence on production performance which, in turn, leads to more profound and precise decision making.

The KAVA project was established in close cooperation with industrial partners such as Greiner Packaging and Welser Profile. This cooperation enables to directly approach industry-specific challenges and develop customised solutions that are tailored to the requirements of the production environment in question.

Image: Rita Newman
Senkey diagramm in the scope of the KAVA project

Progressive data analysis: STIWA partner in many projects

In cooperation with a network of internal and external specialists, STIWA strives to continuously develop innovative solution approaches for the implementation of new, future-oriented technologies and processes. Another ongoing project in this context is the FFG project ZERO3, which aims to increase ecological, economic and social sustainability in the production processes of manufacturing companies in Austria. Furthermore, there is intensive exchange with research institutions such as SBA Research and universities such as TU Vienna, TU Graz or TU Magdeburg.

Partnership with SCCH from the very beginning

As one of the first companies at Softwarepark Hagenberg, STIWA has maintained close contact with the Hagenberg University of Applied Sciences from the outset and with the Competence Center Hagenberg (SCCH) since it was founded in 1999. The focus of joint projects is currently on machine learning. In the scope of the "INTEGRATE AISYS" project, we are developing robust algorithms for predicting machine failures in industrial series production (predictive maintenance).

Image: STIWA Group
For more than 30 years, STIWA has worked intensively on networked production and high-performance automation

STIWA AMS GmbH

Management: Peter Sticht
Owner: STIWA Group
Founded: 1990
Established at SWPH: 1992
www.stiwa.com

Networking

Softwarepark Hagenberg   **Research and development**

Image: Christian Schütz

bytewerk Hagenberg

In June 2014, the "bytewerk" coworking space was established at the Meierhof. Until 2021, it was part of the then-existing pre-incubator akostart oö. bytewerk's aim is to provide students, graduates, and employees of the University of Applied Sciences Upper Austria with support in founding companies by providing infrastructure, know-how, and personal networks. The aim is to offer a suitable environment and interdisciplinary collaboration to prepare products and companies for the market. Founders are provided with a free workspace to work on their business ideas, network with other founders, leverage existing know-how, and ultimately benefit from networks and events. In short, the idea is to minimise the early-stage risk of initial high costs. The usage period is limited to two years, with the option of annual extensions.

Interested individuals are warmly invited to learn about the startups and bytewerk (contact person: Ms. Anna Höflinger) themselves. Since 2021, bytewerk has been fully funded by FH OÖ Studienbetriebs GmbH, whose intention is to continue promoting successful companies nationally and internationally. No monetary funds are directly distributed to startups. Support includes covering the costs for low-budget furniture, rent, support, mentoring, and internet.

Since 2014, approximately 50 startups have been supported at bytewerk Hagenberg, more than half of which have successfully established themselves on the market. Examples include Drip, Carployee, triply, and Tonestro. Currently, seven startups are working in the 100 m² coworking space on

various business ideas, ranging from AI applications to digital services. winkk.ai is one promising AI application.

A small insight into what the winkk do and who they are follows.

winkk's journey started in Hagenberg, where the founders Jakob, Kevin, and Hannes met during their university studies. The name "winkk" was inspired by their first encounter during the yearly summer campus party when Jakob and Kevin waved (German: "winken") at Hannes, leading to their first in-person conversation. Their first major success came with the GreenPass app, which achieved 1.5 million downloads during the COVID-pandemic. Following this achievement, more companies began to take notice of the talented freelancers. In the following months, Jakob, Kevin and Hannes continued to undertake more projects together and built a broad network of freelancers. In May 2023, they founded winkk with the goal of developing more software that connects people and meets very high technical and design standards. In their first year, they already implemented major projects, including the new app for OÖNachrichten (Upper Austria news) and a membership app for farmers' association Bauernbund OÖ. In addition to app development, winkk is deeply engaged with the current hype around Artificial Intelligence.

Besides their daily agency business, winkk has developed winkk AI, a software that helps companies navigate their document jungle in an efficient way while generating new insights from existing knowledge. Since June 2024, winkk has been enrolled in an incubator program by tech2b to further boost product development and sales strategies. Today, the team consists of the three founders and four additional employees who actively contribute to both agency work and product development. From a chance encounter at a summer party, winkk has evolved into a small but passionate software company, connecting people and businesses through innovative solutions.

Image: Christian Schütz

Founders of winkk, from left: Kevin Händel, Hannes Wolfmayr, Jakob Stadlhuber

bytewerk Coworkingspace

Management: FH-Prof. Dr. Gerold Weisz
Owner: FH OÖ Studienbetriebs GmbH
Founded: Juni 2014
Located at SWPH: IT Centre
www.fh-ooe.at/karriere/startup-center

Softwarepark Hagenberg

International Hagenberg

Since its foundation in 1989, Softwarepark Hagenberg has been a very international place. The Research Institute for Symbolic Computation (RISC) was the first institution that moved to Hagenberg – with English as its official language and more than 50% international researchers.

Since back then, much has changed and Softwarepark Hagenberg has grown. Research and teaching at Softwarepark has always been very international, attracting talents from around the world who, in turn, contribute their unique skills and knowledge. From the outset, international recognition was crucial for the foundation of Softwarepark Hagenberg; having an international community with a vibrant international spirit is imperative for its future growth and scientific advancements.

Today, there are more than 150 international University of Applied Sciences Upper Austria and JKU students in Hagenberg; English lectures are offered by several departments, and there are two study programmes, Artificial Intelligence Solutions and Interactive Media, that are offered entirely in English. For several years, the International School of Informatics organised by Prof. Buchberger has attracted more than 100 students from all over the world to Hagenberg.

Of course, there are not only international students in Hagenberg – currently, there are more than 100 people from abroad that are currently working at Softwarepark.

For Softwarepark Hagenberg to succeed in attracting and retaining international talent it needs to create a vibrant local environment for all aspects of life, one that pulses with energy and an international spirit. It is crucial to create an attractive setting for intense personal interactions on-site, where a creative exchange and innovation can take place. This, in turn, also enhances the location's appeal to young talents from Austria. This international community of talents is instrumental in building up local research and business.

The **International Talents Community Hagenberg** consists of all students and employees at Softwarepark and essential to succeeding in embracing and contributing to current technological waves, being open to the next waves and even generating new ones. Innovation not only involves identifying and following trends but also cultivating an environment where new, un-

planned ideas can emerge. The community is becoming even more important with a view to mentoring young people so that they can succeed in any trend.
Providing an environment of this nature is a pillar of Softwarepark Hagenberg's ongoing success and future expansion. This dynamic ecosystem, enriched by international talent and collaboration, will ensure that the Softwarepark remains at the forefront of technological and scientific advancements.

Image: Erwin Pils

The Business Upper Austria team at Softwarepark Hagenberg is led by Frederic Hadjari, who serves as both the Manager of the IT-Cluster and the Office Manager of Softwarepark Hagenberg, alongside Stephan Winkler, the Scientific Head of Softwarepark Hagenberg.

So, where do we go from here?

Softwarepark Hagenberg is thrilled to announce that the IT-Cluster Upper Austria has now made Hagenberg its home, further enhancing our position as a leading technology hub. The team featured in the image represents this exciting collaboration, bringing together top talent and expertise to drive innovation forward. Our mission remains to cultivate a community of top leaders and emerging talents, with a focus on research, education, and business in software development and artificial intelligence. The integration of the IT-Cluster Upper Austria at Softwarepark Hagenberg strengthens our capabilities and expands our reach, enabling us to foster even greater advancements in these critical areas. In partnership with the Management of Softwarepark Hagenberg, we are committed to leveraging synergies and maximizing our collective potential. This collaboration ensures that we not only excel

in scientific and technological domains but also integrate economic and social aspects to develop a modern living space. Our goal is to create an environment that positively impacts the region, Austria, and Europe by combining cutting-edge technology with a high quality of life.

We aim to make Softwarepark Hagenberg a community of top leaders and top talents with a large proportion of young people from all over the world, which all focus on research, education and business in software development and artificial intelligence. We will go beyond scientific, technological and economic expertise to develop a modern living space and lifestyle that includes the entire region. This community shall create a high level of regional, national and international attractiveness and, in turn, have an impact on the region, the

federal state, the country of Austria, Europe and the whole world. At Softwarepark Hagenberg we not only take into account the scientific, technological and economic aspects of software, but also think about the social aspects and make suggestions and gather experience.

In addition, the Softwarepark Hagenberg shall be an attractive living and experience space for everyone; Hagenberg shall thus develop into a model location for the future and integrating social and technological innovation.

IN SUMMARY, THIS IS OUR VISION:
WE WILL DEVELOP THE SOFTWAREPARK HAGENBERG INTO AN INTERNATIONAL NETWORK, LIVING SPACE AND IMPACT PROVIDER FOR SCIENCE, TRAINING AND BUSINESS IN SOFTWARE DEVELOPMENT AND ARTIFICIAL INTELLIGENCE.