RANGE OF SERVICES

ACHIEVE MORE
THROUGH RESEARCH & DEVELOPMENT

forschung.fh-ooe.at
Since 2003, the University of Applied Sciences Upper Austria has taken an innovative approach to applied research and development in ten Centers of Excellence and research focal areas. Today, the University of Applied Sciences Upper Austria is in an outstanding position in the field of research and development. In 2019, around 250 professors and 230 full-time employees were responsible for €20.88 million in R&D turnover. In addition, ten members of the research staff completed their dissertations while three were awarded a habilitation degree. This ensures that practical, high-level research and development with a clear orientation towards economic and social needs will continue. The University of Applied Sciences Upper Austria is not only the clear leader among Austria’s universities of applied sciences but also one of the most research-intensive universities of applied sciences in the German-speaking world!

For all R&D-related news of the University of Applied Sciences Upper Austria please see our website at forschung.fh-ooe.at.
Research and development is particularly important for our economy and society. Businesses must innovate and be creative in order to remain competitive at an international level. Only innovative processes, products and services can secure existing jobs and create new ones. The University of Applied Sciences Upper Austria is a strong and flexible partner, ready to effectively master the challenges of the future.

Mag. Thomas Stelzer
State Governor of Upper Austria

With its new strategic economic and research programme #upperVISION2030, the State of Upper Austria has adopted specific measures and priorities in order to continue Upper Austria’s success as an industrial, export and technology region. In doing so, we deliberately rely on the proven innovative strength of the University of Applied Sciences Upper Austria and support its activities in research and development, which continue to provide Upper Austria with cutting-edge, innovative know-how.

Markus Achleitner
Minister of Economy of Upper Austria

Our researchers are dedicated to studying the latest and most important topics of the twenty-first century in future-oriented areas of research. The Centers of Excellence and research focal areas are aligned with the thematic areas of the strategic programme, which also paved the way for the implementation of these interdisciplinary Centers of Excellence. The University of Applied Sciences Upper Austria thereby makes a significant contribution to achieving Upper Austria’s strategic objectives.

Dr. Gerald Reisinger
President, University of Applied Sciences Upper Austria

Close cooperation with the business community ensures that research results will be put directly into practice, strengthening competitiveness. Thanks to the researchers’ exceptional work, internationally-recognised companies—including BMW, Borealis, Airbus, FACC, Fronius, KTM, MIBA, Rosenbauer, Siemens and voestalpine—have sought out partnerships with the University of Applied Sciences Upper Austria, creating a win-win situation for both sides.

Prok. Prof. Priv.Doz. DI Dr. Johann Kastner
Vice President, FH OÖ Forschungs & Entwicklungs GmbH
Customised R&D Solutions

International recognition and a hands-on academic education are the factors that distinguish a university of applied sciences as an educational institution. Qualified graduates from a university of applied sciences strengthen business activities through their outstanding performance. Curricula are continuously fine-tuned according to the needs of business, and internships and research projects further strengthen cooperation with industry.

With 68 degree programmes at the four schools in Hagenberg, Linz, Steyr and Wels, and over 5,800 students enrolled in the academic year 2019/2020, the University of Applied Sciences Upper Austria has become a driving force in education and research in the State of Upper Austria, offering courses in fields ranging from engineering and business to health care and the social sciences.

Moreover, the University of Applied Sciences Upper Austria focuses its R&D activities on achieving innovative results that benefit industry and society. The University of Applied Sciences Upper Austria’s research and development programmes converge in the FH OÖ Forschungs & Entwicklungs GmbH, which was specifically founded to coordinate research projects. All R&D projects that have been commissioned or received funding are administered by the FH OÖ Forschungs & Entwicklungs GmbH.

Innovative Solutions for Industry & Society

In close coordination with the areas of competence in teaching, a total of ten Centers of Excellence and research focal areas have been established within the framework of the degree programmes offered at the four schools.
The University of Applied Sciences Upper Austria is a fixture of the Upper Austrian research landscape and cooperates closely with industry and academic institutions. In order to manage this collaboration strategically and efficiently, the University of Applied Sciences Upper Austria is a shareholder in the following initiatives:

» TCKT – Transfercenter für Kunststofftechnik GmbH
» RECENDT – Research Center for Non-Destructive Testing GmbH
» tech2b Inkubator GmbH
» FFoQSI GmbH – K1-Austrian Competence Centre for Feed and Food Quality, Safety and Innovation
» Digitrans GmbH – Test region Austria-North for automated driving with a focus on freight mobility and logistics

TCKT – Transfercenter für Kunststofftechnik GmbH
TCKT stands for application-oriented research and development in all areas of plastics engineering. TCKT develops solutions to diverse challenges within the scope of research projects. However, its range of services is also available on a contract basis, whether for individual material tests or longer-term studies.

RECENDT – Research Center for Non-Destructive Testing GmbH
The range of services offered by the Research Center for Non-Destructive Testing GmbH (RECENDT) covers the entire R&D process chain from applied basic research to the development of state-of-the-art technologies for industrial applications. RECENDT implements client-specific, tailor-made high-tech solutions in the field of materials characterisation and non-destructive material testing.

tech2b Inkubator GmbH
tech2b supports, guides and accelerates the development of innovative technology-oriented, knowledge-intensive and design-oriented start-ups. Admission to the tech2b support programme (AplusB) opens the way to developing business ideas in a structured and targeted manner and implementing them in the marketplace.

FFoQSI GmbH – K1 Competence Centre for Food Research
The Austrian Competence Centre for Feed and Food Quality, Safety and Innovation—FFoQSI for short—is the first COMET Competence Centre to safeguard feed and food production. Research is concentrated in areas 1 and 2 of the research programme on selected topics along the value chain of plant-based feed and food as well as foodstuffs of animal origin. Area 3 involves strategic research and is an innovation platform for technology development.

Digitrans GmbH
DigiTrans aims to develop a test region for automated and networked driving in north-central Austria, taking into account the requirements of industry and infrastructure managers and focusing on user- and impact-driven implementation within a sustainable operating model.
Center of Excellence for Smart Production

With the Internet enabling things to communicate with each other, products and machines have become ‘intelligent’. The principal goal of the Center of Excellence for Smart Production is to research different models in order to optimise the use of distributed intelligence. The development of innovative modelling, simulation and optimisation approaches is equally important for enabling holistic process evaluation and fully realising the potential for optimisation and includes, of course, business model innovation. Moreover, new fields of application in 3D printing/rapid prototyping—of metal components in particular—are being researched.

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Center of Excellence Energy

Research is focused on industrial production processes and systems engineering as well as management, simulation and optimisation of (renewable) energy technologies. Work is being done on topics such as decentralised systems, load management and integration of thermal and electrical energy storage. In the bioenergy sector, researchers are addressing the development of production processes of advanced biofuels (bioethanol from straw) and the optimisation of biogas processes.

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Center of Excellence Medical Engineering/TIMed CENTER

Researchers at the TiMed Center focus their scientific work on biomedical data analysis, biomimetics and materials development, biomedical sensors, high-resolution imaging, medical simulators and drug characterisation. In order to develop interdisciplinary, technical solutions to problems in the field of medicine with its cooperation partners, the TiMed Center combines the strengths of the four University of Applied Sciences Upper Austria campuses in Hagenberg, Linz, Steyr and Wels at the interface between technology and medicine. The Center’s Core Facilities make shared resources available in order to facilitate collaboration.

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Center of Excellence Food Technology | Nutrition

The Center of Excellence Food Technology and Nutrition focuses on bioactive compounds and the formulation of functional food and feed products. Therefore, various in vitro and in vivo test systems are implemented to unravel the mode of action of the compounds on a molecular and cellular level. Another topic is food quality control through various measuring procedures.

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Center of Excellence Automotive | Mobility

The University of Applied Sciences Upper Austria is pursuing an interdisciplinary and holistic approach in the automotive and mobility sector that aims to achieve more efficient, safer and user-friendlier as well as more socially and environmentally compatible transport of people and goods. Topics such as automotive engineering, new drive technologies, vehicle communication, lightweight design and new composite materials are being explored intensively.

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#upperVISION2030
Strategic Economic & Research Programme for Upper Austria
Key Financial Figures 2019

The FH OÖ Forschungs & Entwicklungs GmbH is not only active nationally but also ‘exports’ its research know-how worldwide:

In 2019, the State of Upper Austria supported the University of Applied Sciences Upper Austria’s R&D activities with €1.4 million, providing the basis for applied and practical research and development. Numerous other projects were realised with the State of Upper Austria’s support as well.

A total of 546 projects were concluded in 2019. Moreover, 110 new, mostly multi-year projects with a total volume of €19.08 million were acquired. More than 630 partners from industry and society cooperated with the University of Applied Sciences Upper Austria in research and development. Approximately 60% of all business partners are small and medium-sized enterprises.

Scientific Output

- Publications in 2019: 487
- Conference presentations and scientific publications: 261
- Books: 38
- Articles in scientific journals: 164
- Other publications: 20
- Patents: 4
- Dissertations: 10
- Habilitations: 3

The publication of research results is of great importance for the further development of R&D at the University of Applied Sciences Upper Austria. Unless subject to non-disclosure agreements, research results are presented at national and international conferences as well as in relevant journals. In 2019, a total of 487 publications appeared in international journals or were presented at scientific conferences, including conference papers, books and journal articles. The support of dissertations and habilitation degrees (a postdoctoral qualification) in cooperation with university partners, such as the Johannes Kepler University Linz or the TU Wien, is a primary aim of the University of Applied Sciences Upper Austria. In 2019, ten employees completed their dissertations and three received a habilitation degree.

R&D Turnover of the University of Applied Sciences Upper Austria

Success is also reflected in R&D turnover growth, which is expected to reach €21.6 million in 2020. The grey bars represent the consolidated turnover of the University of Applied Sciences Upper Austria’s shareholdings.
In 2018 the State of Upper Austria and the Austrian Research Promotion Agency jointly launched the University of Applied Sciences Upper Austria’s dissertation programme. This programme supports excellent junior researchers at the University of Applied Sciences Upper Austria in the implementation of their dissertation projects.

**R&D Staff (FTE)**

R&D staff members carry out research and development projects together with the University of Applied Sciences Upper Austria’s approximately 250 professors. The University of Applied Sciences Upper Austria has seen a steady increase in research staff with the number of full-time employees (annual average) rising from 160 in 2012 to 244 in 2019.

**Number of Scientific Publications**

Publications document the results of R&D projects. In 2012 researchers published 361 articles in journals, conference proceedings, books and reports. By 2019 this figure had increased to 487.

**Completed Dissertations/Habilitation Degrees of University of Applied Sciences Upper Austria Researchers**

In 2018 the State of Upper Austria and the Austrian Research Promotion Agency jointly launched the University of Applied Sciences Upper Austria’s dissertation programme. This programme supports excellent junior researchers at the University of Applied Sciences Upper Austria in the implementation of their dissertation projects.
Research and development at the University of Applied Sciences Upper Austria Hagenberg Campus is centred on computer science, communications and media. Thirteen research groups and two Josef Ressel Centres are working on innovative solutions for the digital future.

**Medical Engineering/TIMed CENTER**

*Bioinformatics*

The bioinformatics research group at the University of Applied Sciences Upper Austria explores and develops algorithms for the analysis of molecular biological data, such as mass spectrometry data, microscopy images of cells and DNA sequences. The programs developed on this basis are then used to explore the causes of illnesses as well as to develop appropriate treatments and simulate biological processes.

**Smart Production**

*Symbolic Regression*

At the Josef Ressel Centre for Symbolic Regression, methods and algorithms for data-based, semi-physical modelling are researched and developed. The newly developed methods are used to improve the modelling, design and control of powertrains and friction systems.
Adaptive Optimisation
The Josef Ressel Centre for Adaptive Optimisation in Dynamic Environments (adaptOp) researches and develops predictive and adaptive optimisation algorithms that can anticipate changes in dynamic production processes and enable proactive responses. These new processes are used in operational process control in the manufacture of steel and flat glass in order to improve the efficiency of production, storage and in-house transport.

Automotive & Mobility
Networks and Mobility
The research group NEMO is primarily concerned with research into mobile and wireless radio systems and the analysis of how methods for influencing private transport affect the use of resources. Communication amongst vehicles and between vehicles and road infrastructure makes new approaches in the management of private transport possible.

ICT – Information and Communications Technology
Embedded Systems
Modern computer technology is found in countless devices today and is what makes these systems intelligent. The Embedded Systems research group is engaged in the professional development of combined hardware/software solutions with a special focus on sensor systems. In addition, research in digital radio frequency communications is carried out in order to find new methods for expediting the design process of integrated circuits for application in the next generation of broadband mobile communications.

Secure Information Systems
The protection of know-how and resources plays an ever-increasing role in our interconnected society. The University of Applied Sciences Upper Austria conducts research in the following areas: critical infrastructure, computer forensics, improvement of cryptographic methods, early recognition of malicious software and threats from the Internet as well as risk management and the establishment of a secure corporate organisation.

Human Interfaces & Virtual Environments
The Human Interfaces & Virtual Environments (HIVE) group has extensive and long-standing expertise in research and development in the field of human-computer interaction, data visualisation and virtual and augmented reality. The research group deals with the design and technical implementation of novel digital tools for the visualisation, exploration or manipulation of data and processes. For this purpose, natural interaction techniques and intuitive presentation methods for a wide variety of applications are developed and evaluated—e.g. production data visualisation on interactive walls, visualisation of biological or logistic networks in virtual reality or new media for digital teamwork.

Knowledge Media & Engineering
The main areas of research encompass the conceptualisation of learning and working environments for cooperative knowledge generation and communication as well as their implementation in the field of organisational learning, taking into account flexible working models. Additional research activities are concerned with the development of collaborative and adaptive systems, the interaction between

TECHNICAL INFRASTRUCTURE:
Outstanding research in the field of information technology requires the use of state-of-the-art infrastructure. The latest hardware and modern software tools are available for use in our research projects to enable cutting-edge research.
humans and machines and the creation of knowledge banks as well as the targeted application of semantic technologies for the networking, processing and extraction of knowledge. The research activities can be summed up under three areas of focus: Web-based Media and Online Communication, Learning and Working in the Digital Age, and Personalised Human-Computer Interaction.

**Media Interaction Lab**
The Media Interaction Lab (MIL) is one of the leading Austrian research laboratories in the area of human-computer interaction. The lab is part of the Department of Digital Media and combines technical know-how with creative expertise and a fundamental understanding of users and their needs. Focal points are the research and development of tomorrow’s computer interfaces. The COMET project ‘TextileUX’ is currently working together with the Johannes Kepler University Linz on smart pressure-sensitive textiles (fabrics, knits, etc.), which are currently used primarily in the automotive industry. The Beyond Europe project ‘Innovation Playground’ develops innovative workspaces that support in-house innovation processes by combining flexible room concepts, smart furniture and digital tools.

**Playful Interactive Environments**
The Playful Interactive Environments (PIE) research group examines the interface between computer games and animation with a special focus on new forms of natural and playful interaction. In doing so, approaches using eye tracking, group-driven games, audio-reactive interaction as well as augmented and virtual reality are being developed and evaluated for possible industrial, social, health and artistic applications.

**Assistive Technology Lab**
New interactive concepts and technologies facilitate the development and utilisation of natural user interfaces for workstations as well as for people with physical or mental disabilities. For these areas of application, assistive systems and aids are developed by the research group using design thinking and interaction design methods in order to make work processes and daily activities easier.

**Advanced Information Systems and Technology**
The aim of the research is to improve the availability of IT-assisted systems through the application of up-to-date software technologies and standards as well as by taking user-centric development into account. Research activities include the integration and development of software components and algorithms in the field of modern information systems for virtual and augmented reality applications, autonomous devices and mobile systems as well as medical software.

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**YOUR POINTS OF CONTACT FOR RESEARCH & DEVELOPMENT**

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Heuristic Methods and Evolutionary Algorithms
This research group models and optimises tasks, especially in the areas of production and logistics. Simulation-based approaches are used in combination with heuristic optimisation methods and various data mining approaches. A special research focus in the field of intelligent data analysis is on explainable data analysis (white-box data mining).

Mobile Interactive Systems
The focus of this group is on the interaction between mobile devices and the surrounding infrastructure (e.g. displays, embedded systems, interactive tables). In addition to developing novel interaction techniques, applications and services, evaluating their usability is a research priority.

PERsonalized Environments and Collaborative Systems
The research group focuses on topics of personalisation on the Web and the analysis and computer-based support of collaboration processes between humans as well as humans and machines. Personalisation includes, for example, content recommendations, the individual adaptation of presentation forms and the individualisation of interaction methods as well as the underlying modelling of relevant information (e.g. individual preferences and user goals). The analysis and facilitation of collaboration is a topical issue, especially in the context of the current trends towards flexible working conditions and international cooperation in geographically distant teams.

Digitise the world with a degree in IT or media studies from Hagenberg!
The University of Applied Sciences Upper Austria Hagenberg Campus offers eight bachelor’s and twelve master’s degree programmes to choose from. About 290 professors and lecturers impart practical knowledge to currently 1,600 students. More than 6,200 graduates have already laid the foundation for their careers here.

PARTNERS
We have successfully completed and are actively conducting research projects for and with a wide variety of companies, institutions and scientific cooperation partners.

- AVL List
- Banner
- Bene
- BMW
- DICE
- Erema
- Fronius
- Johannes Kepler University Linz
- Kepler University Hospital
- University of Art & Design Linz
- LIFEtool
- LiSEC
- Medical University of Vienna
- Miba
- Primetals
- Profactor
- RISC Software
- Rosenbauer
- Rübig
- TGW
- University of Vienna
- Voestalpine
‘Systems & Technologies for Humans’ is one of the three priority areas for action in the new Upper Austrian research, technology and innovation strategy ‘#Upper Vision 2030’. Together with the Johannes Kepler University Linz, the University of Applied Sciences for Health Professions Upper Austria, non-university research institutions and Upper Austrian health care institutions—such as the Kepler University Hospital, hospitals operated by religious orders and Upper Austria’s health care holding company OÖG—the Timed CENTER makes a significant contribution to excellence in medical (technology) research in Upper Austria. At its Core Facilities, opened in 2018, the Timed CENTER offers access to shared high-end instruments, cutting-edge technologies, state-of-the-art methods, experts and services to tackle complex issues in the fields of research, development and innovation. To this end, the researchers in Linz draw first and foremost from their expertise in the areas of high-resolution imaging, nanolithography, motion measurement, biomechanics, electronics, materials and software engineering. This makes it possible to continuously expand and upgrade the medical engineering infrastructure at the Linz Campus in order to facilitate applied research and development in the manufacture of medical devices and in vitro diagnostics and to support our partners in the development of their medical devices in compliance with applicable standards.
High-Resolution Imaging for Molecular Diagnostics
Complementing conventional imaging methods, new microscopy environments are being developed to solve molecular biological problems. They include highly sensitive detection techniques and methods for diagnostics, nanoscopic characterisation of biomedical samples with real-time analyses, and surface analysis and manipulation in the μm and nm range.

Biomimetics & Materials Development
New 3D printing technologies enable lithographic structuring and biomolecular analysis on a nanometre scale, the production of organ-like support structures for medical research and the imitation of mechanical and chemical properties of biological systems.

Hybrid Surgical Simulators/Model Building and Simulation
Development and validation of hybrid surgical simulators for medical education and training, product development and approval as well as preoperative planning.

Motion Analysis/Biomechanics
Research is focused on 3D motion measurement of the musculoskeletal system, analysis of muscle strength, use of accelerometry to classify physical activities and posturographic methods for analysing the balance system.

Prosthetics/Sensors
The use of intelligent sensors improves the interface between devices and people in the fields of rehabilitation technology and prosthetics.

Medical Device Software
The increasing digitalisation of the medical field requires secure software, especially for software medical devices and embedded software components. Participation in relevant standardisation bodies will make a contribution in this regard.

OUR LABS ARE FULLY EQUIPPED WITH STATE-OF-THE-ART EQUIPMENT AND SOFTWARE TOOLS:

- High resolution imaging: super-resolution, 3D-localisation, high-speed atomic force, confocal and single-molecule fluorescence microscopy, spectroscopy
- 3D nanolithography for biomimetics and materials development
- Hybrid surgical simulators consisting of artificial anatomical structures, computer models and virtual reality
- Biomedical sensors for motion analysis and activity measurements
Societal Transformation and Social Innovation

Researchers at the Linz Campus are concerned with phenomena such as demographic change, migration, changes in health care and social services, social aspects of digitalisation and social innovations. With their expertise, they contribute to innovative concepts in the social and health care sectors as well as in public management. Research projects in the field of social work critically reflect on social problem areas and evaluate the work of social service providers. This forms the basis for further practice-oriented development of concepts and methods of social work.

Diversity
The growing proportion of older people in the population poses new challenges to health care and social systems. The research projects at the Linz Campus aim to develop new concepts for outpatient, semi-inpatient and inpatient services. They focus among other things on the following questions: How can new technologies be integrated into the care and support of older people for the benefit of older people and carers alike? To what extent do different care concepts and institution-specific conditions influence the perceived workload of carers? How can the social planning of cities be adapted to demographic changes and the increasing heterogeneity of the population? Social diversity is also at the centre of research projects that examine how different groups are disadvantaged in digital media, at school, on the job market or in public spaces.

Social Innovation
Which social innovations are needed to solve the societal challenges of tomorrow? Researchers at the University of Applied Sciences Upper Austria are examining this question at the interface of social issues, business and technology. The innovation potential of established providers as well as new ‘social businesses’ is analysed. A central issue is how to recognise social innovation and measure its impact.
PARTNERS
We have successfully completed and are actively conducting research projects for and with a wide variety of companies, institutions and scientific cooperation partners.

A Selection of Our Partners:
- Linz General Hospital
- Federal Association of Austrian Nursing and Foster Homes
- Caritas Upper Austria
- g.tec
- GE Healthcare
- gespag OÖ
- Hospice Austria
- John Hopkins University
- State of Upper Austria
- Med-EL
- Otto Bock
- Paracelsus Medical University Salzburg
- City of Wels
- University of Wisconsin, Milwaukee
- University of Michigan
- Volkshilfe Upper Austria
- x-tention Informationstechnologie GmbH
- Yerevan State University

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Make the world a better place with a degree in medical engineering and applied social sciences from Linz!

The University of Applied Sciences Upper Austria Linz Campus offers four bachelor’s and four master’s degree programmes to choose from. About 260 professors and lecturers impart practical knowledge to currently 900 students. Around 2,400 graduates have already laid the foundation for their careers here.
Research and development at the Steyr Campus is centred on management and digitalisation. Researchers examine in particular diverse aspects of digitalisation from a management and business perspective in order to support practical decision-making and operational processes.

Logistics

Innovative logistics and supply chain management solutions provide companies with the keys to success in a complex and volatile environment. As a cross-cutting issue, logistics affects all components of the value chain. For this reason, companies in the Upper Austrian market have been cooperating continuously and closely for more than 10 years with the institutions clustered under the Center of Excellence Logistics and the University of Applied Sciences Upper Austria’s areas of expertise. The Logistikum, as the largest national research and education institution in the discipline of logistics is known, composes the Center of Excellence together with its (inter)national partner institutes and research groups from Hagenberg and Wels. Cross-faculty and multidisciplinary projects are currently focused on strategically relevant topics of the future in the following four fields of research: supply chain management, transport logistics, logistics management and supply chain innovation.

Josef Ressel Centre for Real-Time Value Network Visibility (LIVE)

The goal of LIVE is to develop a widely applicable method for almost real-time visualisation in value creation networks. To this end a generic knowledge graph is created which is then set up as a control tower for the purpose of monitoring criticality within the global multi-level value creation networks of our two industrial partners—BMW AG and HOFER KG. The visibility achieved thereby facilitates the earlier detection of disruptions and faster reactions in order to reduce possible negative effects.
Logistikum.RETAIL
Logistikum.RETAIL is pursuing the vision of establishing a leading international innovation and competence centre for the retail logistics sector of the future. Logistikum.RETAIL addresses the thematic intersection of SCM, logistics and retail management. Logistikum.RETAIL consists of four competence areas (data analytics & foresight, customer centricity & servitisation, retail logistics & last mile as well as omnichannel & PoS) and aims to create an international competence network encompassing research projects, networks of experts, training and continuing education as well as international knowledge exchange.

Austrian Logistics Indicator
The Austrian Logistics Indicator was created as part of the logistics initiative of the Federal Ministry for Transport, Innovation and Technology (BMVIT) to study the logistical performance of Austria’s regions. The University of Applied Sciences Upper Austria’s Logistikum is now developing a user-friendly, interactive data cockpit that will make the results of the ALI publicly available and individually evaluable. Currently, the data for the ALI 2020 survey is being collected. The data cockpit will initially be available with the 2017 data and will be expanded to include the 2020 data after the new results are published (expected in autumn 2020). For the first time, it will be possible to trace chronological developments, which considerably improves the transparency of the measures taken to strengthen regional logistics performance.

Smart Production
Intelligent production processes result in intelligent products. Such products are not only

HIGHLIGHTS OF OUR TECHNICAL INFRASTRUCTURE:

• Smart Factory Lab: Investigate the possibilities of mixed reality, e.g. as an assistance system for Industry 4.0.
• Business Interaction Lab: Conduct innovation meetings and examine group dynamic processes using numerous multimedia components.
• Eye-Tracking Lab: Perform eye-tracking studies with mobile and stationary eye trackers.
making, and partly automated recommendations for action can be derived from them.

**Business Model Innovation**
The changes brought about by smart production have also made a transformation of value creation possible. New revenue models such as usage-based payment or additional services (predictive maintenance) are made possible by digitalisation. Companies can create value networks and reduce system boundaries. Such a transformation can be designed and steered using appropriate means. In the area of business model innovations, the Center of Excellence for Smart Production has created a closed loop of services surrounding intelligent production.

**Digital Transformation**
Hardly any other phenomenon in business, science, politics and society has sparked so much interest and brought about as many changes in recent years as digitalisation, prompting discussion on many new concepts, including Industry 4.0, big data, cloud computing, Internet of things and artificial intelligence. However, the concrete implementation of digitalisation projects in the business world is progressing much slower, especially because of a knowledge deficit among decision-makers regarding benefits and concrete options for implementation. Research projects in the field of digital transformation examine and investigate a wide variety of aspects of digitalisation from a management and business perspective in order to support practical decision-making and action processes.

**FWF Project Technostress**
The creation of an environment for the efficient use and broad acceptance of new technologies is of central importance in light of the trend towards digitalisation. It has become apparent that those companies that actively manage the phenomenon of ‘technostress’ will benefit the most from digitalisation in the future. The aim is to support companies in measuring and analysing technostress in order to develop and implement organisation-specific digital stress management activities.

**EU-Project Perform**
In this four-year Horizon 2020 project, a European network for training the next generation of digital retail managers is being established. The research project focuses on creating a coherent customer experience for digital retail by combining online and stationary offline retail through integrated omnichannel systems. PERFORM pursues four research goals: (1) developing sustainable business models; (2) improving customer experience; (3) using new technologies to build innovative services; and (4) developing new methods for the implementation and analysis of omnichannel processes.

**Digital Accounting – The Human Element**
Accounting is also facing a digital upheaval. Research and praxis should not be confined to consideration of technological possibilities and rationalisation potential, however, but must increasingly focus on employees. The project team therefore focuses on people in the midst of this digital development. In order to deal...
with digital change and the complexity of technology in the future, social, cognitive-analytical and IT skills are required in addition to technical knowledge. As part of the project, a well-founded vision of the future entitled ‘Digital Accounting 2030’—including new tasks, skills and occupational fields—is being developed in cooperation with select companies in Upper Austria and their employees.

Medical Engineering/
TIMed CENTER

With the convergence of technology with health care and medicine, the development, manufacture and operation of innovative medical technology products are becoming increasingly important. It is therefore essential that businesses, R&D organisations and health care institutions pull together to strengthen innovation in the health care industry. Together with medical and technical staff, significant progress can be achieved in the development of future-oriented medical technology products, processes and procedures for the best possible patient care and safety.

With its interdisciplinary structure, the TIMed CENTER is geared towards preparatory and targeted basic research at the interface of technology and medicine and thus facilitates the acquisition of additional third-party funding from research promotion initiatives at the national and EU levels as well as contract research. Together with the JKU, the University of Applied Sciences for Health Professions Upper Austria, non-university research institutions and Upper Austrian health care institutions—such as the Kepler University Hospital, hospitals operated by religious orders and Upper Austria’s health care holding company OÖG—the TIMed CENTER makes a significant contribution to excellence in medical (technology) research in Upper Austria.

**Benchmarking Programme for Hospitals: PERFORMANCE COMPARISON (LeiVMed)**

Hospital costs are constantly increasing, which makes further efforts to control costs appear inevitable. At the same time, there is a growing need for even better patient quality of care. The primary task of management control systems in the medical field is to ensure that medical services are provided effectively and efficiently. However, it is difficult to compare variable costs in the provision of medical services such as surgeries or to assess on a case-by-case basis whether the treating physicians and nursing staff have not only chosen the medically ‘best’ diagnosis and therapy but also the most economically feasible. LeiVMed is a web-based benchmarking system that enables participating hospitals to compare their core clinical processes. At the centre of the research activities is the risk-adjusted comparison (benchmarking) of clinical outcomes, processes and costs.
Intelligent production processes result in intelligent products. Such products are not only the guarantors but also the prerequisites for the competitiveness of companies in the future. The main focus of the Wels Campus within the CoE for Smart Production is on advanced manufacturing and additive manufacturing: The increasing shortage of resources, shortening of product life cycles and individualisation of products means shorter development cycles and increasing competition for raw materials. More and more component variants with smaller quantities and shortened innovation cycles have made additive manufacturing processes (3D printing, additive manufacturing) key technologies. Another important pillar in this area is the integration of additive manufacturing in automated and intelligent processes as well as products and tools.

At the heart of the Center of Excellence for Smart Production is our industry-oriented teaching and research laboratory for smart manufacturing, the Center for Smart Manufacturing, which features a flexible production and assembly system (FMAS). Five stations are connected by a transfer system with integrated RFID for workpiece carrier tracking. Complex products are manufactured fully automatically at the processing stations using seven robots (four of which are collaborative), image processing systems, automatic
screwing units, CNC processing centres and other components. The system’s configuration allows for the production of items from a lot size of one. A SCADA system is used to operate and monitor the FMAS. Research projects include the full digitalisation of the system for simulation and virtual commissioning (virtual planning and optimisation – real production) purposes.

Automotive & Mobility

The CoE Automotive and Mobility primarily focuses on lightweight construction and lightweight materials as well as smart drive and vehicle technologies. Research in the field of lightweight construction and lightweight materials is primarily concentrated on plastics, composites (especially carbon composites) and metals as well as hybrid materials and structures for the automotive and aerospace industries. Giving due consideration to the processing of these materials and materials testing is also crucial. Our activities therefore focus on plastic, composite and metal processing processes, surface technology for lightweight construction, connection technology and recycling of plastics, composites and metals on the one hand, and on materials testing and characterisation, including the non-destructive testing methods of X-ray computer tomography and active thermography, on the other.

In the field of smart drive and vehicle technologies, the CoE addresses current topics ranging from powertrains, power generation, energy sources, energy storage, energy management, power and control electronics, control units, model-based algorithms and simulation to sensors. Thus work can be carried out on a wide range of complex topics—such as the design, simulation and optimisation of (hybrid) powertrains from power generation to the road or model development and optimisation of, for example, hydrogen-based drive concepts or the development of functions for control unit software in the vehicle, HIL (hardware in the loop) simulation development, including real-time models and testing.

Energy

Current research at the Wels Campus CoE Energy focuses primarily on renewable energy technologies (especially solar technology and wind), heating technology, energy storage and energy management issues. Other projects deal with life cycle considerations of energy-optimised buildings, quality assurance in building technology and heating and combustion technology as well as methods, processes and products for increasing energy efficiency in production facilities.

The focus in the field of electric energy technology is on smart grids, the development of components for electric energy technologies, protective technology for electrical storage and DC systems, powertrains for electric mobility, test generators for cost-effective simulation of DC power supplies and the integration of large electrical storage systems in the grid. Work is also done on energy-related issues, legal and regulatory aspects of energy grids and electricity market design.

A large area of research is concerned with the development of algorithms and the implementation of optimal controls of energy flows in building and industrial applications, taking into account load and weather forecasts, as well as the development of (renewable) energy communities.

TECHNICAL INFRASTRUCTURE:

The facilities that we have available for research and development are as multifaceted as our research topics and make it possible to conduct internationally recognised, cutting-edge research in the fields of engineering and applied natural sciences. Our laboratories are fully equipped with state-of-the-art hardware and software tools, which ensures that all research incorporates the latest available technological advances.
The biosciences research area deals with the development of production processes of, inter alia, advanced biofuels, such as bioethanol from modified cyanobacteria, the development of integrated biorefinery concepts and the production of active substances and valuable products from microalgae.

In the field of environmental technology, the focus is on the (further) development and optimisation of processes and systems for exhaust gas cleaning, dust measurement, development/optimisation of exhaust air filters and scrubbers, optimisation of composting processes and biofilter materials, recycling of residual materials and environmental analysis.

**Food Technology and Nutrition**

An extensive portfolio of substances and herbal ingredients can be found in nature. Relevant natural extracts and plant substances with a measurable biological effect are increasingly being used in modern medicine and nutrition for the prevention or treatment of diseases and may in future represent a potential alternative to conventional active substances. For targeted use, it is important to know and be able to describe the basic molecular mechanisms of action. Our work therefore focuses on the identification and characterisation of phytochemicals and research into their biological effects in suitable in vitro, in vivo, in ovo and in silico test systems.

In addition to basic research, we work together with innovative partners from industry for the development of functional foods, phytogenic feed additives and highly effective natural pharmaceuticals and nutraceuticals. Moreover, research is conducted into a wide variety of materials in the food sector, such as functional ‘smart packaging’, bioplastics, self-composting ‘green packaging’, condition indicators (warehouse indicators), etc. Other topics include food quality assurance (food inspection) using various measuring methods, such as imaging and sensors, and new production technologies. Almost 30 staff members work in six fully equipped cell and molecular biology as well as chemical analysis laboratories. A key issue is the detection of bioactive substances in plant raw materials and toxic or undesirable by-products that occur in food production. Austria’s only experimental and teaching brewery complements the research opportunities of this focal area.

**Materials**

The optimised, materials-specific processing and testing of polymers, composites and metals takes centre stage in this focal area. Research in this focal area is devoted to the following areas: polymer processing and composites, forming technology, heat treatment technology, surface technology, metallurgy and alloy development, additive manufacturing and rapid tooling.

The field of polymer technology is focused on extrusion technology, thermoforming and processing of composites, with special focus on the tribological and rheological interactions in plastics processing machines and tools. In the field of metallurgy, the focus is on the
improvement of properties of tool steels and modern steels for lightweight design. A working group is addressing the production of surface coatings for metallic components as well as plastics, glass and textiles. State-of-the-art equipment is available to carry out research, including systems for additive manufacturing—selective laser melting (SLM), fused deposition modelling (FDM), stereolithography—scanning electron microscopes, quenching and forming dilatometers, high-pressure capillary rheometers, film extrusion systems, compounders, thermoforming systems, thermal analysis methods (DSC, DMA), etc.

In addition to the materials themselves, materials testing is an important research area that focuses on the non-destructive testing of materials and components. Here 3D X-ray computed tomography (CT) and active thermography play a central role. CT inspection captures the interior of 3D structures (metals, plastics, etc.) non-destructively and characterises materials three-dimensionally with a resolution of up to 250 nm. Active thermal measuring processes are fast imaging methods using infrared cameras for examining heat flow in previously stimulated test specimens. They provide information about defects in the interior of the object or material properties. In addition, projects are carried out using optical measurement technology, sound and vibration technology and industrial image processing, and our own test setups and test beds are being developed.

Digital Transformation

Innovation and technology management is at the forefront of digital transformation at the Wels Campus. This interdisciplinary field is focused on the further development and application of methods and tools for increasing the performance of early innovation phases. A current research project is devoted to design thinking in organisations with the aim of increasing employee creativity as well as increasing the level of collaboration and motivation of those involved, thereby achieving better and more radical innovations.

The activities at the so-called front end of innovation have a profound effect on the success of an innovation project. For this reason the sprint> (Systematic Product Innovation Transfer Center) research and transfer centre has been established at the Wels Campus, which covers the areas of expertise along the entire front end process—from value assessments of product concepts using multivariate statistical methods, the conception and implementation of acceptance tests for product ideas and concepts and trend monitoring to strategy and idea workshops as well as design, rapid and virtual prototyping and the design of commercialisation processes.
A FIXTURE OF UPPER AUSTRIA’S RESEARCH LANDSCAPE

R&D Advisory Board

The R&D Advisory Board ensures the optimal strategic alignment of all R&D activities of the University of Applied Sciences Upper Austria in coordination with other R&D institutions. It is currently composed of the following members:

- **DI Dr. Wilfried Enzenhofer, MBA, CEO, Upper Austrian Research GmbH**
- **Ing. Franz Hammelmüller, Managing Director, SKF Österreich AG, Steyr**
- **Ing. Karl Kletzmaier, Chairman of the Supervisory Board, KEBA AG**
- **DI Harald Plöckinger, CEO, RÜBIG Gruppe**
- **Mag. Sok-Kheng Taing, Managing Director, Blue Value GmbH**
- **Univ.-Prof. Prim. Dr. Josef Thaler, Department Head, Department of Internal Medicine IV, Klinikum Wels-Grieskirchen**
- **o.Univ.-Prof. Dipl.-Ing. Dr.techn. A Min Tjoa, Chief Scientific Officer, SCCH**

University of Applied Sciences Upper Austria Research Award

To honour the outstanding work of its research staff, the University of Applied Sciences Upper Austria’s most successful researchers were once again distinguished in 2019.

The recipients of the University of Applied Sciences Upper Austria Research Award for 2019 are:

- **Prof. DI Dr. Gernot Grabmair**  
  School of Engineering, Wels
- **Prof. DI Dr. Stefan Wagner**  
  School of Informatics, Communications and Media, Hagenberg
- **Prof. Dr. Julian Weghuber**  
  School of Engineering, Wels

The three Young Researcher Awards were awarded to:

- **Assistant Professor Oliver Krauss BSc MSc**  
  School of Informatics, Communications and Media, Hagenberg
- **Sascha Senck Dipl.-Biol. PhD**  
  School of Engineering, Wels
- **DI Mag. Dr. Josef Wolfartsberger**  
  School of Business and Management, Steyr

In just over a year, the six recipients published a total of 63 articles at academic conferences or in international journals and acquired more than €5.6 million in R&D project funds.
COOPERATION MADE EASY

The University of Applied Sciences Upper Austria as a Partner in R&D

The University of Applied Sciences Upper Austria is a flexible and reliable partner for businesses and institutions from industry and society that stands ready to assist them with research and development.

Target Audience
The University of Applied Sciences Upper Austria’s R&D portfolio is aimed at businesses and institutions from industry and society. This includes on the one hand businesses that lack personnel resources or have limited financial resources for their own research and development activities (e.g. small and medium-sized enterprises). On the other hand, solutions are also developed for companies that need specialised support (e.g. in the form of special equipment). The University of Applied Sciences Upper Austria’s services are relevant not only to traditional businesses but also associations and institutions, especially in the social sector.

Know-How
The University of Applied Sciences Upper Austria offers up-to-date know-how in ten Centers of Excellence and focal areas, making available the expertise and many years of (inter)national experience of more than 500 professors and academic staff. Project leaders are well versed in the methods of project management. If necessary, and depending on the requirements, students and interns may be involved as well. Moreover, modern equipment and well-equipped laboratories provide the basis for innovative R&D solutions.

Financing
In addition to complete financing provided by clients, support is available through numerous state, federal and EU funding programmes, some of which are linked to specific thematic areas. Projects that receive money from research funding programmes must be in line with the respective programmatic objectives and meet all criteria. The University of Applied Sciences Upper Austria’s internal R&D controlling unit ensures that the projects stay on budget. Partners contribute personnel and/or financial resources as well.

Advantages for the University of Applied Sciences Upper Austria’s Partners
Joint projects are first and foremost a financially straightforward and efficient undertaking for the University of Applied Sciences Upper Austria’s partners. Innovative solutions are tailored to the needs of the client and can be put directly into practice.

The First Steps towards Cooperation
Interested parties should contact the head of the respective Research Center or University of Applied Sciences Upper Austria professors working in fields relevant to the client. The specific needs and goals of the client as well as the parameters of the potential collaboration are clarified in preliminary discussions.

Opportunities for Cooperation:
- Applied R&D projects with business partners
- Academic research projects
- International R&D projects
- Symposia and workshops
- Bachelor’s and master’s theses

Project time frames can range from a few months to up to five years.
RESEARCH & DEVELOPMENT
AT OUR 4 SCHOOLS

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HAGENBERG CAMPUS

MEDICAL ENGINEERING AND APPLIED SOCIAL SCIENCES
LINZ CAMPUS

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STEYR CAMPUS

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WELS CAMPUS

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