

Research Activities at the Carinthia University of Applied Sciences

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1 Introduction

CUAS is a university of applied sciences with regional roots and an international orientation. It is active in the priority fields of health and social affairs, business and various technology topics of engineering and constructions. Its core tasks are in the areas of study and teaching, applied research, knowledge transfer and training courses. More than 165 researchers with around 250 cooperation partners and a research volume of 8 mio € in 2022 bring new insights and impulses from science for business, industry, politics and society. Four research centers and 19 research groups conduct research with the aim of addressing socially and industrially relevant topics. The establishment of a doctoral program fosters junior scientists and provides overall carrier paths. The deliberate interweaving of teaching and research gives students the opportunity to become scientifically involved in projects up to the doctorate level at an early stage. Research and teaching are seen as necessary complements to each other. Outstanding quality in one area is only conceivable through outstanding quality in the other.

In addition to the classic task of research, namely to increase the prosperity of society, society and most funding institutions expect, above all, effective solutions to the global challenges we face due to various causes and effects. CUAS with its pillars of teaching, continuing education and research, contributes to the development of the necessary, multi-layered resilience in each of these core areas. In this context, research is reserved for bringing forward new concepts, ideas, approaches to solutions, pilot activities and implementations, for trying them out and for carrying them forward into teaching and further education. Applied research is oriented towards the issues of the future and is closely interwoven with regional, national and international partners. It represents a core competence of CUAS. In order to remain fit for the future, CUAS is growing thematically and structurally with the global issues in research and development. Concrete projects are continuously adapted to the dynamically changing environment through a rolling strategy process.

With its research, CUAS aims to contribute to increasing the resilience of society, business and industry. The R&D as well as education ambitions are based on the principles of sustainability and inclusion, with a focus on reasonable digital solutions.

2 The Research Landscape

Research topics at CUAS are thematically clustered within 4 research centers and 19 research groups, which guarantee competence and know how, high quality research connected to transfer of knowledge, as well as any capacity needed. The topics are allocated within the meta themes human beings – technology – environment - economy and are application oriented by default. Innovation and technology management characterize all research approaches of CUAS. Particular emphasis shall be given to research designs including accompanying topics, guaranteeing an holistic view on research issues, as well as new methods, new technologies and participative approaches. Citizen science research is interwoven with thematic research by involving citizens, stakeholders, students and pupils in R&D projects. CUAS' research is locally effective and collaborates on pan-European issues, networks and European projects.

CUAS' research unit FH Kärnten Research bundles all expertise for project submission, administration, monitoring, financial reporting, management and science communication. Each R&D project is guided by a R&D support of FH Kärnten Research, who takes care of financial monitoring and reporting, evidence of the audit trails and compliance with eligibility rules. Separate cost centers and an R&D project database guarantee clear cost assignment, spot-on financial monitoring, transparency and overview.

Own financial contributions of co-funded R&D projects are covered by an annually coordinated R&D budget. CUAS is based on public funding by federal, province and municipal grants. CUAS is experienced in project coordination of international R&D projects with up to 12 partners, and 2 mio € project volume. In 2022 a research volume of 8 mio € of co-financed projects was managed, comprising 120 R&D projects. Between 2013 and 2022 a total of 80 EU co-financed projects were successfully implemented.

CUAS strives to establish horizontal as well as vertical interconnections of its research landscape. Horizontal interconnections are represented by reflections on a research topic from different point of views (scientific disciplines), e.g. ageing in research center IARA, constructions and nature in research group CONNA, environmental health and geoinformation in research group EnHeGi. Permeability of cross cutting issues like digitalization, sustainability and resilience of society, nature and economy represents vertical interconnections.

3 Outstanding Research

Outstanding research is particularly bundled within CUAS' research centers. Each research center is led by a renowned researcher in the respect scientific field, constitutes of international team members and performs cutting edge research in the topics of:

3.1 Additive Manufacturing- Center ADMIRE

ADMIRE is specializing in additive manufacturing, intelligent robotics, sensors, and engineering. The research focuses on the topics of Material, Design, Process, and Application, with a strong emphasis on sustainability. ADMIRE aims to push additive manufacturing as a fabrication technology towards the Green Deal and which enables easy access to everybody in need. Current application fields include: sensor integration into smart wearable systems, smart medical phantoms, development of smart prosthesis and orthosis systems with future prospects toward exo-skeletons, robotic path planning for 3D printing, sensor and system simulation for environmental perception and interaction based on tactile and proximity sensing, sensor signal processing and AI, robotic gripper design of multi-material and soft robotic systems.

3.2 Integrated Electronic Systems- Center CIME:

CIME is a competence center for research and development of integrated electronic systems. Integrated Circuits (ICs) became a key technology for modern electronic systems embedded in almost any application of daily life ranging from data processing, telecommunications, medical electronics, automotive and power electronics to any kind of miniaturized sensing networks. The monolithic integration of billions of transistors on a single silicon chip with an area of a few cm² enables nowadays reliable and cost-efficient electronic platforms with enormous computing and signal processing power for future electronics. CIME is a competent research partner, with strong alignment to industry needs and the clear focus on research excellence with international visibility. The main topics are:

- Modelling and Design of Integrated Systems and Circuits
- Radio Frequency Front-Ends
- Sensor Integrations in Mechatronics Systems
- System-on-Chip Design Automation

3.3 Smart Materials – Center CISMAT:

CiSMAT is a Green Transition Competence Center, dedicated to the research and development of innovative solutions based on Smart Materials, for the industry and society of the future. CiSMAT works closely with a network of local and international companies, which it also supports in their transformation efforts towards a more efficient, more secure and greener industry. CiSMAT offers advanced trainings for R&D professionals and conducts research in the fields of:

Integrated piezoelectric sensors

Smart and meta-materials for improved acoustics and vibration mitigation

Phase-changing materials

3.4 Applied Research on Ageing – Center IARA:

At IARA research on the topic of ageing is networked across disciplines in order to take account of the challenges and potential of an ageing society. The main interests are laid on the changing living environments of older people, the technical support possibilities and on the economic framework conditions. Current findings and trends about ageing processes are collected, analysed and processed so that this knowledge can be made available to politics, business and civil society. IARA promotes in particular application-oriented and transdisciplinary approaches through its own projects. Research focuses on the topics of:

- Demographic change and regional development
- Social inclusion and participation until old age
- Socio-technological innovation

Outstanding research in CUAS' research centers is characterized by research volumes exceeding 2 Mio € p.a., research topics that are crossing the boundaries of different scientific disciplines and involvement of a variety of researcher of different backgrounds and carrier stages.

Apart from research centers CUAS' R&D activities are bundled within 19 research groups, each dedicated to a particular research focus. The research groups cover the topics of:

- Active & Assisted Living - Research group AAL
- Advanced Battery Management System – Research Group ABML
- Additive Manufacturing in Agile Virtual Systems for Design - Research Group AMAVIS
- Construction Needs Nature – Research Group CONNA
- Digital Transformation Modelling – Research Group DTMO
- Environmental Health and Geoinformation – Research Group EnHeGi
- Future Concrete Solutions – Research Group FuCoSu
- Innovation Research and Transformation – Research Group IRaT
- Spatial Informatics for Environmental Applications – Research Group SIENA
- Online & Pocket Labs – Research Group OuPL
- Modelling and Design of Integrated Systems and Circuits – Research Group OuPL
- 5G Use Case Integrations – Research Group ROADMAP 5G
- Smart Materials for a Greener Industry – Research Group SMGi
- Sensor Integrations in Mechatronics Systems – Research Group SIMS
- TRANSformative Societal and Political Cultural Engagement – Research Group TRANS SPACE
- Entrepreneurship & Entrepreneurship Education – Research Group TRIPLE E
- Management of Conservation Areas – Research Group MCA
- Interprofessional treatment approach for patients with osteoarthritis – Research Group PEREZOSO
- Sustainable Innovation Research and Development – Research Group SIRAD

4 From Research to Innovation

R&I at CUAS is applied by default and closely interwoven with regional, national and international partners from public and private sectors. Bringing research and innovation back to the market is our main intention. We pursue this intention by a) cooperating with partner from industry and private sector, b) fostering the start-up and spin-off scene by providing entrepreneurial starter support. A dedicated funding cooperation between CUAS and the Carinthian Economy Funding Agency supports young founder by financial, infrastructural and know-how matters. The elaborated educational program “Scientrepreneur – Basic knowledge for founder” was initiated and implemented by experienced innovation manager of CUAS’ research group TRIPLE-E (see section 3 – Outstanding research). It covers topics from entrepreneurship thinking & strategy, innovation & business modelling, founding & financing and marketing & exploitation and brings together interested persons with external experts from each topic.

5 Involvement of Students

CUAS routinely involves students in research activities by providing topics for Bachelor or Masters Theses as well as research collaborations in R&D projects. PhD positions and a docotoral program provide continuous academic career paths and foster young talents.

6 The vision of ATHENA research-based cooperation

As an institution, Carinthia University of Applied Sciences (CUAS) is always eager to further its research and teaching excellence, as well as to increase its visibility and involvement on the European level.

CUAS sees itself as an integral part of the network in the area of R&D, and thus strives to increase its participation in the European Research Area through the Alliance. CUAS is willing to share its expertise, research laboratories and equipment with the ATHENA universities and is ready to learn from them in return. CUAS vision of research is that cooperation between people from different backgrounds, be it in disciplines, focuses or cultures, allows for richer and more fruitful results. Hence, the research-based cooperation between ATHENA and CUAS will enrich our institutions’ fields of research, while also offering our researchers opportunities to gain experiences within ATHENA.

