
OUR
RESEARCH
SHAPES
THE FUTURE
FZI

— Table of Contents

6 Who We Are. What We Do.

8 Research Focuses

8 Applied Artificial Intelligence
14 Climate Action Innovation
18 Digital Participation and Democracy
22 Intelligent Transportation Systems and Logistics
28 Safety, Security and the Law

– Selected Projects

10 AI4OD
11 EDIH-AICS
12 ROUTINE
16 GreenEdge-FuE
17 MDZ KND
20 SOSEC
21 VIRTUS
24 HELIOS
25 Shuttle2X
26 TEMPUS
30 ANYMOS
31 InnoSecBW
32 UNCOVER

34 Working with Us

36 What We Offer

38 Our Fields of Application

- Education, Research and Administration
- Services and Commerce
- Buildings and Public Space
- Healthcare
- Information and Communication Technology
- Mobility, Transportation and Logistics
- Production
- Supply and Disposal

40 What We Stand For

42 Our Values

44 What Makes Us Tick

- Our Team
- Sharing Knowledge

48 Figures. Data. Facts.

50 The FZI in Figures

52 Organization

- Board of Excecutive Directors
- Divisions
- Board of Scientific Directors
- Board of Trustees

61 Legal Notice and Photo Credits

– Research

Independent. Interdisciplinary. Cross-Industry.

6 **Who We Are. What We Do.**

– Research Focuses

8 Applied Artificial Intelligence

14 Climate Action Innovation

18 Digital Participation and Democracy

22 Intelligent Transportation Systems and Logistics

28 Safety, Security and the Law

– Selected Projects

10 AI4OD

11 EDIH-AICS

12 ROUTINE

16 GreenEdge-FuE

17 MDZ KND

20 SOSEC

21 VIRTUS

24 HELIOS

25 Shuttle2X

26 TEMPUS

30 ANYMOS

31 InnoSecBW

32 UNCOVER


ROS
Velodyne
zentrum Informatik

— Who We Are. What We Do.

The FZI Research Center for Information Technology is an independent non-profit foundation for applied cutting-edge research and technology transfer. For over 35 years, the FZI has been researching and developing innovations for the common good and bringing the latest scientific findings in information technology as practical solutions to companies and public institutions alike. In doing so, the FZI qualifies people for an academic career, a professional start in business or even the leap into self-employment. For its partners from industry, business, science and the public sector, the FZI is therefore an institution for research, training and transfer.

In their role as Scientific Directors at the FZI, 25 professors from various universities pass on impulses from university research to industry and society via research projects. They provide scientific supervision of the interdisciplinary research groups at the FZI, in which the FZI scientists explore innovative concepts, as well as software, hardware and system solutions for a variety of clients and implement the developed solutions as prototypes. Scientific excellence and interdisciplinarity are firmly anchored in the organization of the FZI.

Among the Board of Scientific Directors, 20 members teach at the Karlsruhe Institute of Technology (KIT) in one of the four faculties of Informatics, Electrical Engineering, Mechanical Engineering, and Economics. This adds a special dimension to the innovation partnership between the FZI and KIT in the field of Information and Communication Technologies.

As a non-profit foundation under civil law, the FZI works independently for and in cooperation with companies and public institutions of all sizes: small businesses and corporations as well as regional administrations, federal states, the federal government and the EU.

The FZI headquarters are located in Karlsruhe. The FZI also has a branch office in Berlin, strengthening the supraregional position of the FZI and promoting direct contact with policy-makers and associations at the federal level as well. In the state of Baden-Württemberg, the FZI assumes the function of an innovation hub in the field of information technology. As a neutral interface between science and industry, the FZI brings together university research and practical application.

The FZI is also a member of the innovation alliances innBW and Karlsruhe TechnologyRegion. In the region, the FZI is active, among other things, as a shareholder of the Karlsruhe TechnologyRegion and innoWerft - Technologie- und Gründerzentrum Walldorf Stiftung GmbH. Furthermore, the FZI is involved in the European Center for Information and Communication Technologies – EICT GmbH.

After successful initiation of the entrepreneur association DIZ I Digital Innovation Center by the CyberForum e.V. together with the FZI, two additional shareholders, the Karlsruhe Institute of Technology (KIT) and KIT Innovation gGmbH, were added to stabilize and expand the activities. As a neutral and independent contact and coordination point, the DIZ promotes digital transformation in the state of Baden-Württemberg and especially supports small and medium-sized enterprises (SMEs) in their digitalization efforts by providing specific services. Moreover, the DIZ cooperates closely with business, science and the public sector – in the form of joint projects such as KI-Transfer BW, the network of digital hubs in Baden-Württemberg (Digitales Hubnetzwerk BW) and the digital hub for applied AI (Digital Hub für Angewandte KI) – to promote digitalization all over the state.

Our Fields of Application

In their research divisions, the researchers at the FZI are dedicated to eight application fields of computer science:

- Education, Research and Administration
- Services and Commerce
- Buildings and Public Space
- Healthcare
- Information and Communication Technology
- Mobility, Transportation and Logistics
- Production
- Supply and Disposal

"Innovations strengthen the way people live together and interact. I think it's great that I can drive the shaping of digital change at the FZI and do so in a wide variety of application areas."

Jana Deckers

Department Manager in the Intelligent Systems and Production Engineering research division

— Applied Artificial Intelligence
AI Solutions for the Benefit of Society

The intelligent analysis of sensor data is a particular strength of Artificial Intelligence (AI). It helps toward understanding and interpreting situations and contexts. For example, we experience AI in self-driving shuttles or in connection with mobile robots. At the FZI, we develop generative AI technologies in our research focus Applied Artificial Intelligence to recognize anomalies and evaluate the flood of information on the Internet. We use our interdisciplinarity to consider and include safety as well as ethical and legal aspects. We are well connected internationally in this area – especially in Europe. Together with our partners, we support the development lifecycle of embedded AI technologies – from the initial concept phase to testing and safeguarding.

Generative AI systems like ChatGPT engender great media interest. However, in addition to the fascination, the media coverage may also stir up worries. At the FZI, we can critically accompany these developments, thanks to our interdisciplinary expertise. We help assess both the risks and potentials for companies, institutions and society regarding technical, legal and social aspects. For example, we research language models and their use for intuitive interaction with humans. Besides, we are working on other generative AI architectures to develop assembly sequences for robots or to recognize anomalies in large data sets. The latest AI technologies hold great potential for entirely new applications.

In the area of healthcare, AI systems detect mental stress from camera images. The AI system can infer emotions from facial muscle movements, record the heart rate, and provide an overall picture of someone's stress level. Different profiles and action recommendations can be derived in interaction with other sensors. In the domestic context, AI systems are used to record human activities and provide assistance. With the unique real-world laboratory ROUTINE – a lab for transferring digital health applications and AI to the healthcare sector –, we offer a secure framework for testing new developments and supporting product approval studies.

The availability and creation of training data remain one of the biggest challenges for many AI applications. Especially in public spaces – as in the context of autonomous driving –, many data protection guidelines must be considered when collecting new data. Here, we promote to create and publish privacy-compliant AI training datasets. Alternatively, we also develop new methods requiring less training data. These methods can be used to plan cooperative, interactive driving maneuvers in dense traffic or interpret complex traffic scenarios. Other approaches utilizing machine learning methods also focus on the data assignment to specific classes of traffic scenarios – pedestrian, car, or bicycle. These, in turn, require large amounts of training data, which shows that such data continue to be essential for AI research.

At the FZI, we work on safety aspects for automated driving at night. In the AI4OD project, the FZI and its partners from research and industry aim to develop improved object detection at night based on camera images. For this purpose, AI is trained to detect headlight cones and their reflections and ascertain the associated vehicles' position, for example at road crossings.

The area of cybersecurity is also a crucial topic for us in connection with AI. The European Digital Innovation Hub applied Artificial Intelligence and Cybersecurity (EDIH AICS), which we coordinate, aims to support institutions and organizations – especially SMEs – in implementing processes and methods of AI and cybersecurity.

In the field of energy, we also use AI systems for building management. For this, data-driven approaches are used based on a hybrid twin of the buildings to save energy as early as the building planning stage. The developed AI systems are mainly used to optimize and process decision-making situations. However, saving energy is not only an essential topic in building management but also in mobility, logistics, and production. In the project Delfine, for example, we develop energy-flexible AI-based production planning methods for small batch production applications.

AI solutions are also suitable in the area of logistics for the recognition of goods on pallets. The developed AI approach uses a simple camera and can still reliably estimate the number of boxes on a pallet that is only visible from one direction. After all, logistics is more than just about transporting goods: It also concerns the optimal provision of resources – like when using car-sharing solutions. The intelligent, anticipatory positioning of vehicles in a city can significantly reduce waiting times for the users of such mobility-on-demand systems.

Mobile robots face similar challenges when finding safe paths to a destination in an unknown environment. In this context, we work on AI approaches that allow various walking robots to self-assess risks in their environment and their own current capabilities. This risk and self-awareness can significantly increase the autonomy of complex robots – even in demanding environments like a lunar-like surface. As part of the international ESA-ESRIC Space Resources Challenge, a team of three FZI robots – ANYmal, Spot, and Husky – took advantage of this autonomy on a moon-like tests site. The robots were able to distribute the tasks of exploration, mapping, resource search and chemical analysis among themselves, make intelligent decisions, and thus won the competition thanks to the high level of autonomy. The collaboration with the robotics group of ETH Zurich played a decisive role in this and will be continued in this field.

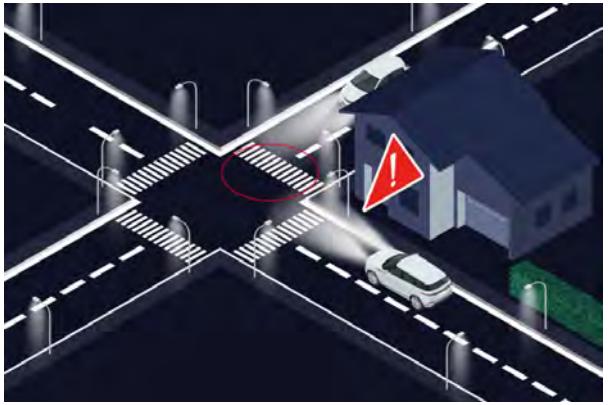
Similarly, we develop hardware architectures for the energy-efficient use of AI. To date, most AI solutions are trained and run on powerful GPU processors or clusters with very high energy and memory requirements. The local use of AI systems is limited by these requirements, especially in mobile or small embedded systems. In project DoRiE, AI accelerator architectures are being developed that enable local, near-sensor AI deployment on the Edge with significantly less data transmission. In project ThinKIsense we study whether alternative AI network structures, such as so-called Spiking Neural Networks, could be used as energy-efficient Edge AI solutions. The project goal is to design new and efficient AI technologies inspired by neuronal brain structures based on these neuromorphic architectures. The advantage of such system architectures is their low energy consumption, which – notwithstanding – also poses some challenges for modeling, training, and performance.

Together with our partners, we compare and evaluate the use of neuromorphic hardware versus classical AI hardware in practical applications at the FZI.

– Triggered by impressive advances in the field of generative AI architectures, we are currently observing a change in the range of uses and the role of AI solutions in technical applications. At the FZI, we address these potentials – as well as the risks and challenges.

— Applied Artificial Intelligence
Selected Projects

AI4OD
Higher Safety for Automated Driving at Night



Funding:
Federal Ministry for Economic Affairs and Climate Action

Partners:
Dr.-Ing. h.c. F. Porsche AG, Hochschule Mittweida/ University of Applied Sciences, Quality Match GmbH

Runtime:
01/2021 – 12/2023

It is dark, visibility is poor, and the driver is tired. Factors like these lead to an above-average risk of accidents at night. Advanced Driver Assistance Systems (ADAS) are a possible solution to tackle these challenges. ADAS already provide a significant contribution to increased road safety during daytime. However, when driving at night, there is still room for improvement as far as the perception of other vehicles by the sensors and thus the safety of the road users is concerned. The aim of project AI4OD is to develop improved object detection at night based on camera images. To this end, Artificial Intelligence (AI) will be used to detect the headlight cones and their reflections in the camera images and then derive the position of the associated vehicles.

Together with three renowned partners from industry and research under the consortium leadership of Dr.-Ing. h.c. F. Porsche AG, the project contributes to make driving at night safer through Artificial Intelligence. At the FZI, we are responsible for the integration and qualification of the AI function and developing tools and methods for the required data management.

More at
https://www.fzi.de/2021/06/28/start-ai4od

European Digital Innovation Hub applied AI and Cybersecurity (EDIH AICS)

Strengthen and Advance AI Cybersecurity across Europe

EDIH AICS.
EUROPEAN DIGITAL INNOVATION HUB
Artificial Intelligence & CyberSecurity

Co-funded by the European Union

Funding:
Co-funded by the European Union

Partners:
DIZ | Digital Innovation Center, Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB, Karlsruhe University of Applied Sciences, Karlsruhe Institute of Technology, Center for Solar Energy and Hydrogen Research Baden-Württemberg, Wirtschaftsförderung Nordschwarzwald (Economic Region Northern Black Forest), Karlsruhe TechnologyRegion, Steinbeis Europa Zentrum, CyberForum e.V.

Runtime:
02/2023 – 01/2026

The project European Digital Innovation Hub applied AI and Cybersecurity (EDIH AICS), coordinated by the FZI and co-financed by the European Union, aims to support institutions and organizations – especially SMEs – in implementing Artificial Intelligence and cybersecurity processes and methods through a variety of offerings. The EDIH AICS consortium is composed of research institutions, transfer organizations, regional economic agencies, business networks and clusters. It builds on many years of experience with digital technologies and is deeply rooted in the regional, national and European ecosystem. Thus, it brings together the existing Digital Hub Applied AI (Karlsruhe) in conjunction with the IT Security Region Karlsruhe (KA-IT-Si), further developing both as central components and connecting them with the other initiatives and projects from the Karlsruhe region. This enables the EDIH AICS to promote the vision of a secure and sustainable European AI technology in the areas of production, mobility, energy, trade and services as well as public administration in order to strengthen their competitiveness while benefiting society as a whole.

— Applied Artificial Intelligence
Selected Projects

ROUTINE
Living Lab for the Transfer of Digital Health Applications and AI into Healthcare

Funding:
Ministry of Social Affairs, Health and Integration of Baden-Württemberg

Partners:
Robert Bosch Society for Medical Research, Diakonisches Werk der Evangelischen Landeskirche in Baden e.V. (social welfare organization of protestant churches in Baden-Wuerttemberg), Philips GmbH Market DACH, Koordinierungsstelle Telemedizin Baden-Württemberg an der Universität Heidelberg (coordination unit telemedicine Baden-Wuerttemberg at Heidelberg University), corvolution GmbH, movisens GmbH, NMI Natural and Medical Sciences at the University of Tübingen

Runtime:
10/2022 – 12/2024

Whether intelligent image recognition in cancer diagnostics, analyses and recommendations from fitness trackers or autonomous care robots – the ideas for using Artificial Intelligence in healthcare are diverse. With the living lab for the transfer of digital health applications and AI into healthcare (ROUTINE), the FZI Research Center for Information Technology offers a space for future research and supports companies in the transfer of digital health applications and AI into healthcare. The real laboratory offers both a safe framework for testing new developments and support for approval studies.

In addition to providing support with technical expertise and real-world health data, the focus is on identifying and overcoming barriers to transferring science and research into practice. For example, projects can be adapted to the legal or technical framework conditions at an early stage. Insights into active research provide opportunities for the public and the healthcare sector, such as hospitals, practices or health insurance companies, to expand their knowledge of AI in healthcare and learn about its potential.

More at
https://www.fzi.de/2022/10/24/startschuss-fuer-ki-labor-im-gesundheitswesen

"We are currently seeing a huge leap in the use of Artificial Intelligence methods in the most diverse fields of application. The FZI is well equipped to meet the resulting challenges and is an excellent technology partner – especially for small and medium-sized enterprises."

Prof. Dr.-Ing. Dr. h. c. Stefan Jähnichen

Director at the FZI

— Climate Action Innovation

Advancing climate protection with IT innovations and creating sustainable solutions in the fields of energy, mobility, and production

Climate change is one of the most significant societal challenges we must confront. Therefore, we are consolidating and intensifying our research activities in this field this year. Within the Climate Action Innovation research focus, we explore intelligent responses and measures against climate change. Our focus is not only on advancing the energy system but also on increasing resource efficiency. Two main streams are of central importance for us in this context: on one hand, digital innovations that actively promote climate protection as well as sustainable development in the fields of energy, mobility, production, and supply and disposal (Green by IT); on the other, IT, which is designed and used throughout the entire lifecycle in terms of resource-efficient and climate-friendly utilization (Green IT).

Climate neutrality and sustainability are gaining increasing importance in various application areas within our society. This is not only due to the ever-tightening legal and regulatory requirements, such as the Climate Protection Act and European climate goals. Therefore, we are consolidating and intensifying our research activities in this field under the newly aligned Climate Action Innovation research focus in 2023. In the development of this new research focus, the high level of interdisciplinarity and the close integration of knowledge at the FZI from fields such as energy, mobility, production, transportation, logistics – as well as cross-cutting areas such as safety, security, and the law – are invaluable in exploring and developing holistic, cross-application solutions.

For example, we are particularly focused on critical and central infrastructures, ranging from manufacturing industries to smart neighborhoods and energy-intensive data centers. We are also continuing to develop sustainable solutions for transportation and mobility, such as electric mobility (e-mobility). The demands for optimizing networks and intelligent energy management have grown significantly due to the energy transition. Therefore, our research, with its profound methodological and domain expertise, contributes to advancing intelligent energy management by further developing the ecosystem of smart metering systems (smart meters, smart meter gateways) and enhancing supply reliability through solutions for greater grid resilience. Our expertise in energy management spans from modeling and simulation to optimizing energy systems. Our regulatory knowledge is based on a deep understanding of IT architecture of systems and the control of hardware components, such as electric vehicle charging infrastructure or CLS (Controllable Local System) management. With a focus on climate neutrality, efficiency improvements, both in terms of energy consumption and resource utilization, are essential tools in our research. This includes considering the consumer perspective in the commercial, industrial, and residential sectors. For instance, we explore approaches for energy- and resource-efficient production planning, which can not only help companies produce more efficiently and sustainably but also enable more targeted and extensive use of renewable energy sources.

The interconnection of facilities and stakeholders plays a significant role in achieving climate and sustainability goals. At the same time, the increasing interconnectivity – particularly in the field of supply and disposal – makes open societies vulnerable and requires a holistic approach in the development of innovative technologies. The FZI leverages its deep knowledge of IT security to enhance the resilience of critical infrastructures. In addition to various energy management issues, we also focus on innovative Green IT concepts for climate-neutral and resource-efficient use of ICT technologies throughout their entire product lifecycle. One of our focal points, for example, is the GreenEdge project, which aims to reduce the energy demand of

future mobility infrastructure via Green Edge Computing. To motivate and support small and medium-sized enterprises (SMEs) on their path to climate neutrality, the FZI collaborates as one of the five consortium partners in the Mittelstand-Digital Zentrum Klima. Neutral.Digital (SME Digital Center Climate.Neutral.Digital). The FZI's technical expertise contributes, among other things, to the training of climate coaches as part of a comprehensive support program for SMEs.

– In the Climate Action Innovation research focus, we conduct interdisciplinary and holistic research on digital innovations that actively advance climate protection and sustainable development in the fields of energy, mobility, production, supply and disposal (Green by IT). We also address the IT itself, which must be designed and used in an environmentally friendly and resource-efficient manner throughout its entire lifecycle (Green IT).

Research at the FZI in the field of Climate Action Innovation has already reached a high "Technology Readiness Level", particularly in the field of energy informatics. This not only contributes to the development of effective practical solutions but also – as it relates to knowledge and technology transfer – benefits the demonstration of innovative concepts and solutions in real-world laboratories. Today, the FZI Living Lab smartEnergy at the FZI House of Living Labs showcases numerous demonstrators on intelligent energy management. This demonstrator landscape will be expanded in 2023, with a specific focus on innovations for optimized and bidirectional electric vehicle charging development and testing. The FZI Living Lab Industrial Intelligence is also enhancing its demonstrator landscape with an interactive production demonstrator. This demonstrator, supported by a digital twin, strives to illustrate the potential of energy- and resource-flexible production, considering fluctuating energy availability and dynamic electricity prices. Furthermore, we are advancing knowledge and technology transfer in other publicly accessible real-world laboratories, such as the Karlsruhe residential and commercial quarter Smart East, SynergieQuartier Walldorf, and flexQgrid. These geographically distributed labs provide ideal spaces for the development of comprehensive, innovative solutions tailored to industrial customers.

Also, virtual spaces like the virtual showroom of the Digital Hub Karlsruhe Applied Artificial Intelligence provide additional opportunities to inform a broader audience about the current innovations in this crucial area for businesses and society. These activities in real-world laboratories are complemented by other participatory formats to engage and exchange ideas with stakeholders, including the Smart East user group. Besides our own formats, we foster stakeholder engagement by actively participating in expert committees, such as the Forum Netztechnik/Netzbetrieb in VDE, specifically in the "Coordinated Control via Smart Metering Systems" working group and in the VDI Committee for Guidelines on Information and IT Security of Operational Management Systems in the Energy Industry.

Startups play a crucial role in bringing innovations focused on climate neutrality into practice. Therefore, we maintain a close collaboration with the energy accelerator AXEL to stay in regular contact with current start-ups and support them on their journey. Additionally, in early 2023, our own InnoCharge spin-off emerged from the Climate Action Innovation research focus, focusing on charging optimization.

— Climate Action Innovation
Selected Projects

Green Infrastructure with Resource-Efficient Edge Devices (GreenEdge-FuE)
Climate-friendly, Neuromorphic, and for a Sustainable Transport Infrastructure of the Future

Funding:
Federal Ministry of Education and Reseach (BMBF)

Partners:
consider it GmbH, Forschungszentrum Jülich, intel Corporation, NXP Semiconductors

Runtime:
10/2022 – 09/2025

Future smart cities will need (partially) autonomous, electrified vehicles – in both private and public transportation. Therefore, a large number of vehicles will be guided through complex traffic scenarios. This will generate enormous amounts of data that must be processed and reliably transmitted via vehicle-to-everything communication (V2X), which involves considerable energy consumption.

At the Green ICT innovation contest funded by the German Federal Ministry of Education and Research (BMBF), the energy-saving potential from using Edge devices for smart cities was calculated and analyzed using the example of transportation infrastructure. This was the starting point of project GreenEdge, which aims to reduce the energy demand of future infrastructures caused by the transmission of sensor data to cloud servers and computation on generic CPU/GPU clusters.

The consortium aims to migrate AI algorithm-based data processing to the source location – the sensor environment –, and to save energy by combining classical and neuromorphic AI hardware and sensor technology. Especially neuromorphic computing approaches for data analysis and interpretation, as well as event cameras combined with classical AI algorithms, promise great potential. They allow the emergence of systems with a potential of reducing energy demand by up to 95 percent. The project innovations will be tested in real, urban environments – at the Test Area Autonomous Driving Baden-Württemberg (TAF BW) and the Test Track for Automated and Connected Driving (TAVF-HH). The GreenEdge research and development project, which is part of the OCTOPUS research projects, is coordinated by the FZI.

More at
https://www.fzi.de/project/greenedge

Mittelstand-Digital Zentrum Klima.Neutral.Digital

Taking and Active Approeach to the Challenges Posed by Climate Change and Using Them as an Opportunity for the German Economy

Funding:
Federal Ministry for Economic Affairs and Climate Action

Partners:
Hahn-Schickard Gesellschaft für angewandte Forschung e.V., Softwarezentrum Böblingen/Sindelfingen e.V., Center for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW), Mikrosystemtechnik-Cluster microTEC Südwest e.V.

Runtime:
08/2022 – 05/2025

Mastering the energy system transition while meeting politically set climate goals is a significant challenge for small and medium-sized enterprises (SMEs) and craft businesses. Funded by the Federal Ministry for Economic Affairs and Climate Action, the Mittelstand-Digital Zentrum Klima.Neutral.Digital (SME Digital Center Climate.Neutral.Digital) guides them in taking concrete steps towards climate neutrality by 2035 via digitization. Climate coaches, AI trainers and experts from the center serve as the central point of contact for SMEs and craft businesses, providing free assistance in their transformation towards climate neutrality. Initial information and quick checks are used to identify potential courses of action, which are then implemented in specific digitalization projects within the business context when needed. As one of the five project partners, we contribute to the project with extensive research expertise in the areas of IT security, Artificial Intelligence, energy-flexible production processes, smart energy management, and knowledge and technology transfer. We contribute to the center's portfolio with climate neutrality roadmaps, digitalization projects, informational events, workshops, and tours of the FZI House of Living Labs.

Within the Mittelstand-Digital Zentrum Klima.Neutral.Digital we also co-chair the work group for IT security together with the Mittelstand-Digital Zentrum Chemnitz (SME Digital Center Chemnitz).

More at
https://www.fzi.de/project/mittelstand-digital-zentrum-klima-neutral-digital

— Digital Participation and Democracy

Tackling the Challenges of Digital Democracy with Participatory Approaches

In the early 2010s, the Internet was praised for its deliberative power: a place that enabled the organization of protests and resistance – even against authoritarian regimes. More than ten years later, we see that digital space does not necessarily lead to more democratic structures, as right-wing populist and extremist movements can undermine democracy and build their networks using digital tools and social media. Therefore, it is of utmost importance to enable both the political sphere and civil society to deploy and develop their own tools for digital participation.

Democracy in the context of digital society has a design problem. Therefore, there is an urgent need to study the mechanisms that drive social polarization in the digital space, as well as to answer the question of how these polarization tendencies in turn affect social realities. Furthermore, it is crucial not only to analyze the current state of (digital) society, but also to identify and explore alternative platforms to foster a more democratic future.

With the House of Participation, we have created a center of excellence to address the challenges of Digital Democracy, and to research and develop respective solutions. Areas of activity include analyzing social polarization trends, researching and combating disinformation, and developing platform solutions for participation projects. At the same time, the House of Participation provides advice within and outside the FZI on the development of participatory technology, since the design of user-oriented digital platforms always requires the consideration of all stakeholders' needs.

Digital citizen participation in cities and municipalities also offers many advantages: early detection of problems, conflict avoidance, and increased social acceptance of political action. In cooperation with partners such as Liquid Democracy and Zebralog, we research and promote such digital participation processes. Our work is not only aimed at citizens and potential users: it also strengthens companies and city and municipal administrations via collaborative research. At the same time, digital participation offers the opportunity to shape work processes together with the team members concerned. We research innovative participation and collaboration formats, take into account technical, organizational and ethical issues, and involve employees in the development process.

Another research area is Digital Citizen Science. Participatory approaches enable citizens to participate in and shape research, such as by contributing data, questions and hypotheses. How do such approaches compare to paid participation from CrowdX? For this purpose, the FZI House of Participation is developing an interactive taxonomy in 2023 that helps differentiate between various digital participation methods.

Since the COVID-19 pandemic and the Russian war of aggression in Ukraine, the challenges that misinformation and disinformation campaigns pose to democracy have become particularly clear. We are dedicated to identifying and combating misinformation, with a focus on using technological solutions – such as Explainable AI components – to strengthen citizens' media literacy. For populist movements, especially

those of the extreme right, online social networks have become powerful tools for self-organization, as demonstrated by the attack on the German Bundestag (2020), the storming of the U.S. Capitol (2021), and the attack on the Brazilian seat of government (2023). Phenomena such as filter bubbles and the spread of disinformation have real impacts on societies. A critical examination of the mechanisms that drive social polarization in the digital space, as well as research on how these polarization tendencies in turn impact social reality, is therefore urgently needed.

The House of Participation is a competence center and scientific consultancy. As a contact point for decision-makers from politics, society, business and science, it ensures an intensive exchange on the pressing issues of our time and explores solutions. In addition to our own podcast (HoPcast), our Berlin branch organizes roundtables and participates in public events.

Spotify

Apple Podcast

HoPcast: Podcast on Democracy and Participation in the Digital Age

– Tackling the challenges of digital democracy with participatory approaches.

Technology is political. Technology development and use must therefore be critically discussed and analyzed. This requires more than a classification of technological innovations as damaging or promoting democracy. What is needed is a dialog about how we imagine more democratic alternatives. Digitalization is changing the public and politics alike. The FZI competence center House of Participation (HoP) wants to contribute to the search for solutions to actively shape digital democracy by working together with politicians, scientists and activists. That's why we launched the first FZI podcast, the HoPcast: It brings together decision-makers from science, politics, business and society and discusses topics of digital democracy in public.

— Digital Participation and Democracy
Selected Projects

SOSEC
Innovative Research Design for Resilient Democracies

Social Sentiment in Times of Crises

Funding:
Alfred Landecker Foundation

Partner:
Karlsruhe Institute of Technology (KIT)

Runtime:
10/2022 – 09/2023

Which sentiments prevail within our societies? What are the drivers of polarization? Where do the dividing lines run? An innovative research design will make it possible to capture the mood of a society and to anticipate resulting, potentially negative tipping points. This way, possible developments and threats to democracy in our society can be illustrated and predicted. As a result, effective countermeasures for future crises can be developed. Using representative panel surveys and agent-based models of opinion dynamics, "Social Sentiment in Times of Crises" (SOSEC) continuously monitors and evaluates how developments unfold in critical situations. It is a quantitative social sentiment survey that is a methodological novelty in this form. Simple and low-threshold, the same questions were addressed to participants (4,500 participants, of which 1,500 in Germany and 3,000 in the U.S.) once a week via an app between November 2022 and April 2023.

More at
https://www.socialsentiment.org

— Digital Participation and Democracy
Selected Projects

VIRTUS
Bringing People Together with Virtual Reality

Funding:
Federal Ministry of Education and Research

Partners:
World of VR GmbH, Zebralog

Laufzeit:
08/2021 – 07/2024

In project VIRTUS, the question is being addressed as to how immersive systems (AR and VR) can be used for digital participation. If the Metaverse should become the "next big thing" – how can we ensure the democratic and deliberative nature of this space? How could, for example, cities and municipalities use immersive systems for citizen participation? In project VIRTUS, a communicative real-time participation platform for participative urban planning is being developed using virtual reality applications. Traditional participation formats face the challenge of making draft planning tangible for all parties concerned and depend on their physical presence. VIRTUS implements a concept that enables people to experience urban spaces and 3D models onsite as well as digitally, and creates spaces for personal interaction. Interested parties can participate in analog VR tours or do so from the comfort of their own homes. With digital space exploration, planners can present planned areas or urban development designs and hold variant discussions with stakeholders. The aim of VIRTUS is to test and explore a cross-media immersive participation design that reaches as many participants as possible.

More at
https://virtus-beteiligt.de

— Intelligent Transportation Systems and Logistics
Research for the Mobility of the Future

We at the FZI are researching automated and interacting mobility systems for future mobility – from autonomous vehicles to AI-supported concepts for public transit and inner-city logistics. In our application research, we cover the entire design and processing chain of networked, automated mobility and logistics systems. Thanks to our excellent equipment with living labs and test vehicles, we conduct participatory research on safe concepts for intelligent and networked cities of the future.

Based on cooperation with companies, we bridge the gap between basic research and practical application and contribute to implementing tailor-made solutions for small and medium-sized enterprises, industry, and society. In this way, we form the interface between science and industry.

Our mobility research is characterized by the broad range of existing technological competencies and the deep domain knowledge of the applications. The focus is on topics related to the research and implementation of automated, cooperative, and networked mobility concepts. To this end, four technology fields established at the FZI are of overriding importance: highly automated driving functions, applied Artificial Intelligence in vehicles and traffic infrastructure systems, sensor technology and electronic platforms, and verification and validation.

In mobility research, we are a sought-after cooperation partner for technology-driven companies and the public sector. Our expertise, recognized both in Germany and abroad, is based on the fact that we at the FZI study all aspects of the topic and can answer both fundamental and practice-oriented questions with solutions tailored to the needs of our customers. Within the research focus Intelligent Transportation Systems and Logistics, we are working on several main topics in the context of direct assignments and publicly funded projects – a decisive role in our research work plays, for example, the symbiotic mobility between humans and vehicles as well as between vehicles and traffic infrastructure. Here, for instance, the smooth transition between piloted and autonomous driving is being further thought through and brought to the road, including real-time information from the intelligent traffic infrastructure and its interconnected use.

In addition, the seamless transition and changeover between passenger mobility and freight transport is being researched and further advanced. For example, the hardware and software of the automated FZI shuttles were expanded for use as automated cargo minibuses and used in real traffic within a trial in the Test Field Autonomous Driving Baden-Württemberg (TAF BW). The simultaneous transport of people and goods is intended to relieve the pressure on city centers and offer unused local public transit capacities for logistics. The combination of local public transportation and freight transport is also the focus of the lighthouse projects of the regioKArgo initiative. Here, a prototype implementation of a new type of freight light rail will be created, for which projects such as LogIKTram have been paving the way with ICT solutions since 2021. The RegioKargoTramTrain project is intended to roll out the ICT platform and bring it into long-term real-world testing and use in the Karlsruhe Transport Authority (KVV) network area.

The use of AI, in particular, is in demand for future mobility. This refers not only to automated mobility systems but also to supporting functions such as the development and optimized operation of automotive electronic components like the vehicle electrical system. In particular, highly automated driving and the use of AI drive each other, for example in efficient safeguarding strategies for automated vehicles or robust sensor data fusion for perception and prediction. The safety and evaluability of AI are always considered with particular attention at the FZI, as well as the preservation

of privacy – the keyword here is Privacy Preserving AI Federated Learning. To drive automation in mobility systems, AI must increasingly take over tasks previously performed by humans. To this end, researchers at the FZI are developing new algorithms and processes. These can be used to obtain even better and more reliable, probability-based predictions as to the behavior of people and objects, and to plan safe, interactive trajectories.

Inherent in all application fields of AI systems is the need for increased efforts in their verification and validation, such as in interpreting and responding to sudden unknown scenarios – especially when interacting directly with humans in the environment. Scene interpretation and decision-making are continuously being improved. With foundational AI expertise and strength in the fields of simulation and safety, we at the FZI are well-positioned to address this challenge. Machine-learning systems are tested for their reliability and practicality in an interdisciplinary exchange. The technical equipment available at the FZI is at the highest international level. Our researchers have prototype vehicles approved for automated operation on the road as well as state-of-the-art test laboratories such as the FZI Living Lab Future Mobility and the Test Area Autonomous Driving Baden-Württemberg (TAF BW) at their disposal. With their help, findings can be advanced towards application and expanded simultaneously. This excellent equipment enables us to conduct application-oriented research on efficient, future mobility concepts for the networked smart cities of the future.

At the FZI, we also focus on the legal aspects of intelligent transportation systems. For example, as part of the project TreuMoDa, funded by the Federal Ministry of Education and Research, a concept for a trust center for mobility data was developed together with stakeholders and is now ready for application. Using data from the TAF BW as an example, the data protection research, processing, and evaluation of legal requirements and framework conditions for the design and operation of a mobility data trust center were developed. Technology-driven anonymization approaches play a central role, as does data and rights management in the form of an access and data usage plan. Founded in November 2022 under the coordination of the FZI, the competence center ANYMOS focuses – in cooperation with selected partners – especially on the task of mobility data anonymization.

– Application-oriented research for the viable, digital mobility system of the future..

For knowledge transfer, we attach great importance to the exchange with our strong network of municipalities, companies, associations, other scientific institutions and politics. Thus, in this research focus we are not only involved in standardization (for example, for the standardization of simulation interfaces and networking data within the Car2Car consortium) but also in higher-level activities such as the Strategiedialog Automobilwirtschaft Baden-Württemberg (strategy dialog of automotive industry in Baden-Wurttemberg) or in committees of the clusters Electric Mobility South-West (ESW) and Fuel Cell BW. In this way, new approaches for future mobility meet with social acceptance and fulfill industrial requirements from day one. As a co-initiator and core partner, we support the newly formed Network Intelligent Move, in which digitalization topics for mobility are addressed with partners from industry, science, and society. In this context, we are ambassadors for the topic area of digital infrastructure.

— Intelligent Transportation Systems and Logistics
Selected Projects

HELIOS
Highly Automated Cargo Bike for Symbiotic Mobility in Urban an Suburban Environments

Funding:
Federal Ministry for Digital and Transport (BMDV)

Partners:
IAV, City of Karlsruhe, BGV Badische Versicherungen, FSQ Functional Safety & Quality Experts GmbH, Automotive Engineering Network e. V. (aen)

Runtime:
04/2021 – 12/2023

The joint project HELIOS aims to develop a new form of mobility between humans and vehicles. The researched solution of a highly automated cargo bike enables a symbiotic mobility and thus a compelling, shared task solution between humans and machines. Based on this idea, HELIOS realizes a solution approachfor the ever-growing city traffic due to the steady growth in the service and logistics sectors. The use of automated electric cargo bikes helps reduce the number of motor vehicles necessary for delivery and other services, decongest roads, and safe hazardous greenhouse gases. Additionally, the regarded services are accelerated due to the cooperative approach that supports the human service provider.

More at
https://helios-project.de

— Intelligent Transportation Systems and Logistics
Selected Projects

Shuttle2X
Safe Use of Automated Shuttle Vehicles in Urban Traffic through Supporting Infrastructure Networking

Funding:
Federal Ministry for Economic Affairs and Climate Action (BMWK)

Partners:
Robert Bosch GmbH, Heilbronn University of Applied Sciences, Reusch Rechtsanwaltsgesellschaft mbH, Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut (HHI), Keysight Technologies Inc., SONAH GmbH

Runtime:
07/2022 – 06/2025

The Shuttle2X project researches methods for the safe operation of automated shuttle buses in urban traffic by integrating a Car2X mobility infrastructure. In order to reliably integrate the intelligent infrastructure, Car2X functions are developed by means of a hybrid system concept, considering the functional safety requirements.

The project will be implemented within three different target areas around the Test Area Autonomous Driving Baden-Württemberg (TAF BW), taking into account open standards, modularity and data security as well as the legal framework. Shuttle2X researches, expands and tests a safe deployment of automated vehicles within an intelligent urban transportation network, promoting the application of intelligent infrastructures and thereby demonstrating the first stage for automated operation on city center routes.

More at
https://www.fzi.de/project/shuttle2x

— Intelligent Transportation Systems and Logistics
Selected Projects

TEMPUS
Automated and Connected Driving for Tomorrow's Safe and Efficient Mobility

Funding:
Federal Ministry for Digital and Transport (BMDV)

Partners:
BMW Group, EBUSCO, Karlsruhe Institute of Technology, Landesbaudirektion Bayern (Bavarian State Building Authority), Landeshauptstadt München (state capital city of Munich), PTV Planung Transport Verkehr GmbH, SWM, Trafficon GmbH, Traffic Technology Services Europe GmbH (TTS), TUD Dresden University of Technology, Technical University of Munich, Yunex Traffic, 3D Mapping Solutions GmbH

Runtime:
01/2021 – 06/2023

The TEMPUS project focuses on the implementation of new mobility concepts for urban transportation in Munich. We are participating in a sub-project for the conceptual design and prototypical implementation of a bus platoon. The goal is to replace conventional diesel buses equipped with drawbar trailers with electric buses and to operate them in an automated manner in a platoon system.

The tasks include the development and implementation of an intelligent sensor and communication infrastructure. This will allow the e-buses to communicate with each other and perform precisely coordinated driving maneuvers, enabling driverless operation of the following bus. We are developing the platooning function in collaboration with the Karlsruhe Institute of Technology (KIT).

More at
https://tempus-muenchen.de

"Software doesn‘t have to be as bad as it currently is in many cases. This is why I work on methods, techniques and tools for the constructive development of reliable and secure software."

Prof. Dr.-Ing. Ina Schaefer

Director at the FZI

— Safety, Security and the Law
Secure Digitalization by a Cross-System Approach

In the research focus Safety, Security and the Law (SSL), we at the FZI support the development of secure digitalized and networked products. To this end, our researchers take a cross-system-level approach that encompasses various views of safety and security, from the hardware level through the software level to the networked system-of-systems. New research findings on topics such as Artificial Intelligence (AI) or post-quantum cryptography are adapted for practical and efficient security solutions. In addition to technical aspects, legal requirements and framework conditions are also considered.

To increase the security in the Internet of Things (IoT) in regards to information security and operational safety, we in the SSL research focus develop different methods and tools to secure and evaluate networked hardware/software-systems. To increase the information security of individual IoT systems, compiler-based methods for tool-based hardening of embedded software against time-based side-channel attacks are being researched, among others. We are also working on new approaches to improve the detection and fixing of security vulnerabilities in IoT products. For example, one approach is to use AI to make fuzzing of applications more efficient. Fuzzing has proven to be an effective technique for detecting specific security vulnerabilities.

To ensure operational safety, in particular to prove the highest safety integrity levels, we are researching methods for static hardware/software co-verification. The developed tools enable the specification of software verification by taking hardware properties into account. Reliable and secure communication as well as high system security are the most important key technologies to leverage the added value of digitalization through networked systems. We therefore develop cross-system concepts for establishing trust chains with end-to-end isolation in hardware and software. To achieve the broadest possible impact of the developed security technologies, we rely on the open RISC-V architecture for hardware components. The domain-specific language CHIPS can be used to verify assumptions about the hardware, within the framework of a generator-based design framework for RISC-V.

We are also developing mechanisms for continuous monitoring and reconfiguration of hardware platforms, as well as hardware accelerators for near-sensor processing to preserve privacy. These technologies have multiple applications in medical wearables, such as smartwatches and fitness trackers that constantly measure the wearer's vital signs, in industrial IoT-pump applications, and driving functions for connected and autonomous driving.

Another focus of our research is post-quantum cryptography. With the advent of quantum computers, conventional encryption methods are becoming vulnerable to attacks. Therefore, our experts are studying new cryptographic methods that will endure in a post-quantum world. A particular challenge is currently the prevention of side-channel attacks. In this case, it is not the cryptographic method itself that is attacked, but rather the associated hardware and software solutions of the system.

The key driver of the digital transformation is the new connection of people, organizations and machines via the Internet. This requires mechanisms for trustworthy interaction between diverse actors – especially if they are to

remain fully or partially anonymous. We are developing and testing concepts for secure digital identities in the SSL research focus area, notably for decentralized ecosystems. In research projects like SDIKA, we look at different actors such as individuals, companies, public administration, and the state. In the process, technical and legal issues are discussed across all areas.

Algorithm-driven systems and business models often require data that is not held by a single actor but distributed in an ecosystem. Building on trust-based networking, data trust models are a research topic. At the FZI, we are examining methods to securely design the use of data across organizational boundaries and are considering this together with issues from business informatics and data science.

– Making digitalization (legally) secure in all areas of application at the FZI.

Data analysis is another aspect that receives attention in this research focus and which holds new opportunities in human resources management ("People Analytics"). For employees in particular, this potential use must be weighed against risks to privacy; employers are in turn faced here with questions of lawful use. The situation is similar in areas where it is difficult for those affected to object to the use of surveillance methods and where the use must be legally secure, such as in public spaces or in prisons. In SSL, we look into data protection law as well as the ethical and social implications for those affected.

In this research focus, a process-oriented view is taken for a number of issues. For example, process mining methods are being extended to analyze issues of data protection and information confidentiality. Furthermore, anonymization in the application domain mobility is scrutinized. In this context, specific challenges have to be solved with regard to the preservation of data utility and the guarantee of anonymization.

Finally, we deal with the forward-looking information law analysis of new ICT systems and applications and develop proposals for the legally consistent further development of the relevant statutory and regulatory framework in each case. In this respect, the fields of application at the FZI are also examined from a jurisprudential perspective. Technical innovations give rise to a wide range of legal issues, above all in information law, so that technical issues in particular are examined with regard to laws governing data protection, contracts, liability, procedures, copyrights, competition and criminal behavior. At the same time, however, not only does law influence technology, but technology also influences law. In many cases, technical systems are also to be increasingly used for finding and shaping law. However, the requirements arising for this must first be identified and then processed in a comprehensible manner. Close cooperation between legal experts and IT experts and a holistic understanding of the issues has proven to be a success factor towards adequately addressing the problems confronting various disciplines.

— Safety, Security and the Law
Selected Projects

ANYMOS
Competence Cluster Anonymization for Interconnected Mobility Systems

Funding:
Federal Ministry of Education and Research (BMBF), European Union (NextGenerationEU)

Partners:
AVL Deutschland GmbH , DResearch Fahrzeugelektronik GmbH, Fraunhofer Institute for Systems and Innovation Research ISI, Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB, Karlsruhe Institute of Technology (KIT) - KASTEL and TRIANGEL, Karlsruhe Transport Authority (KVV), init innovation in traffic systems SE

Runtime:
11/2022 – 11/2025

The long-term goal of ANYMOS is to establish anonymization as an enabling technology. The aim is to reduce uncertainties surrounding the need to apply data protection regulations when sharing and using data – while preserving Germany's strong position in data-driven innovations for the automotive and public transport sectors.

As an instrument to reduce uncertainties, ANYMOS will develop and establish a procedure model that helps organizations identify their anonymization needs and opportunities for mobility applications, select suitable anonymization methods reflecting the latest in research and technology, apply them correctly, and to systematically identify and address re-identification risks. All research will be application-oriented by developing and demonstrating use cases for anonymization in the topic areas of autonomous driving and public transport while taking into account the data protection requirements.

More at
https://www.fzi.de/project/anymos

InnoSecBW
Cybersecurity for Innovative SMBs in Baden-Wuerttemberg

Funding:
Ministry of Economy, Labour and Tourism Baden-Wuerttemberg

Runtime:
12/2022 – 01/2024

Cybersecurity will change fundamentally for small and medium-sized enterprises within the next years. Great advances are expected in the application of Artificial Intelligence (AI) methods for the detection of attacks, but also regarding the automated detection of security vulnerabilities. However, at the same time, attacks on AI are also creating new risks for enterprises that want to use this key technology in their products.

Moreover, groundbreaking advances in quantum computing are creating entirely new threats to enterprise security. Many of the cryptographic procedures currently in use will need to be replaced by new post-quantum secure procedures in the coming years to continue ensuring data security. With the InnoSecBW project, we support enterprises in Baden-Wuerttemberg by offering Cybersecurity-Checkups and Cybersecurity-Booster to unveil risks in their products and IT infrastructure and identify innovative, security-enhancing technologies.

More at
https://innosecbw.de

— Safety, Security and the Law
Selected Projects

UNCOVER
Enhanced security through continuous monitoring of incidents in autonomous vehicles

Funding:
Federal Ministry of Education and Research (BMBF)

Partners:
RISA Sicherheits-analysen GmbH, Berlin, EnCo Software GmbH, Munich, ERNW Research GmbH, Heidelberg, Karlsruhe Institute of Technology (KIT), Karlsruhe

Runtime:
06/2021 – 11/2023

For autonomous vehicles to be introduced and tested, functions, systems and services must interact reliably. During vehicle development, measures are taken at an early stage through regular testing to prevent as many security risks as possible. Particularly with the use of technologies such as Artificial Intelligence or connected driving, vulnerabilities and security gaps that are difficult to foresee can only be uncovered during operation.

The aim of the UNCOVER project is to develop methods and tools that record such incidents in autonomous driving functions in a systematic and structured manner. In doing so, findings from incidents in driving operations will be transferred back to model-based development. Subsequently, concepts for a re-design can be developed that consider the identified vulnerabilities and their impact on the vehicle architecture. A flexible monitoring platform is being developed to provide a tool for identification and detection that considers both cybersecurity standards and data protection aspects.

The project results are highly relevant for the German automotive industry, but can also be transferred to other safety-critical areas such as Industry 4.0, critical infrastructures or medical technology.

More at
https://www.fzi.de/project/uncover

"I want to reconcile the use of data with its protection. The FZI is excellently positioned for this as part of the Karlsruhe IT security initiative IT-Sicherheitsregion as a major player in the field of IT security."

Prof. Dr. Jörn Müller-Quade

Director at the FZI

– Transfer

Practical. Methodical. Competent.

34 Working with Us

- What We Offer
- Our Fields of Application
  - Education, Research and Administration
  - Services and Commerce
  - Buildings and Public Space
  - Healthcare
  - Information and Communication Technology
  - Mobility, Transportation and Logistics
  - Production
  - Supply and Disposal


KEYNOTE
Software is eating the world – und was macht Deutschland?
Christine Regitz
Präsidentin
der Gesellschaft für Informatik
FZI
OPEN
HOUSE
WC
PROGRAMM
Veranstaltungsfläche

— What We Offer

Promoting the energy revolution. Reducing the nursing shortage. Avoiding hacker attacks. Optimizing resource-saving processes. Making mobility safe and environmentally sustainable. As diverse as the current challenges are, they all have one thing in common: They can only be tackled together and through cutting-edge research that benefits society!

In doing so, we rely on trusting research collaborations. Together with our partners, we develop software and system solutions as well as concepts in collaboration or on a direct contract basis and turn these into innovative solutions and services. In 2022, we at the FZI carried out around 220 projects for and together with companies.

Research on behalf of companies

In contract research, our researchers at the FZI develop a goal-oriented scientific solution – usually for a concrete application problem – and thus help the client to find innovative solutions that put latest scientific findings successfully into practice. Technology scouting, feasibility studies and training for new technologies are further short-term forms of contract research we run to support companies in their innovation processes.

Research in collaboration

In collaborative research projects, a group of partners works on a defined research task. Knowledge transfer does not take place exclusively from the research partner to the commissioning party, but all project partners support each other with their competencies to achieve a common research goal. Even before the actual project begins – in the application phase – the participants work out a common vision for the innovation being developed. Once the research funding has been approved, this transfer of knowledge and technology, which began in the application phase, continues along the lines of the actual research question being addressed. Often, the joint work within the research network also gives rise to new collaborations as well as ideas for innovations.

Sponsored SME research

To support the innovative capacity and growth orientation of small and medium-sized enterprises, funding programs at European, federal and state level promote the commissioning of research institutions to research and develop new products and services. The projects carried out within this framework are tailored to the high-risk innovation needs of the industrial partners, who contribute their own share of the project costs.

The joint work within the research network also gives rise to new collaborations as well as ideas for innovations.

— Our Fields of Application

The basic idea and goal of our research: prepare technology transfer with foresight and thereby trigger innovative impulses. For over 35 years, we have provided support to companies and public institutions in their effort to transfer new information technology findings in the fields of computer science, engineering and economics into cutting-edge products, services, business and production processes. Our research is dedicated to eight application fields of informatics – in the process, our work is always characterized by a pragmatical, interdisciplinary, methodical, competent and cross-sector approach.

Education, Research and Administration

Services and Commerce

Buildings and Public Space

Healthcare

Information and Communication Technology

Mobility, Transportation and Logistics

Production

Supply and Disposal

"We have to face up to the challenges of digital democracy. With the House of Participation, we have created the necessary infrastructure to raise awareness among the population – such as over the potential for manipulation in social media."

Prof. Dr. Achim Rettinger

Director at the FZI

– People

Conviction. Values. Enthusiasm.

Through innovative research at the highest level and open-mindedness towards technical novelties, we would like to continue to inspire with new ideas and solutions in the future, thus shaping the future with major responsibility.

At the FZI, we are happy to make our contribution to the common good. We do so out of conviction and with a view to the generations that will follow.

42 What We Stand For

– Our Values

44 What Makes Us Tick

– Our Team

– Sharing Knowledge


Was wir tun: Informatik-Anwendungsforschung
und Technologietransfer
FZI
UNSERE
FORSCHU
GESTALTE
ZUKUNFT

— Our Values

Anyone who wants to shape the future needs clear orientation. In our daily collaboration – with each other and our partners – we are guided by clear values and convictions.

The Code of Ethics developed jointly by the Board of Executive Directors, the Board of Scientific Directors and the employees summarizes the convictions the FZI as a whole stands for. We live and protect these values every day – today and in the future.

For us, lawful and value-oriented conduct creates the basis of trust for our cooperation, both with our partner companies and public institutions as well as within the FZI team.

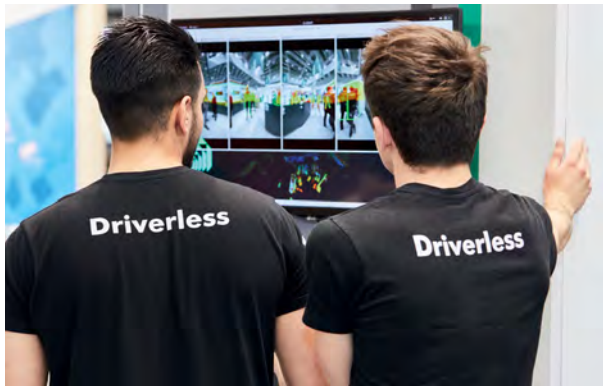
More about our guiding principles at
https://www.fzi.de/das-fzi/leitprinzipien

Research and knowledge for the common good

We explore the potential of digital technologies and develop innovative applications for business and society at the highest international level. In doing so, we attach great importance to high ethical standards, good scientific practice and the forward-looking consideration of possible consequences of our research. We are committed to acting sustainably in environmental, social and economic terms. With each of our innovations, we strive to add value to society.

Professional excellence, interdisciplinarity and creativity

As an enthusiastic team of problem-solvers, we shape the digital world of tomorrow and build bridges between science, business, politics, administration and the public-at-large. The highest scientific standards, combined with interdisciplinarity and diversity, are the basis for our innovative capacity and performance. Thanks to the latest methods and technologies, state-of-the-art laboratories and test fields, as well as our network of innovative partner institutions, we can test creative ideas directly in practice. This research and working environment offers our employees ideal conditions for a professional future in specialist and management positions as well as in their own start-up company.



Independence, initiative and responsability

As a non-profit foundation under civil law, we are committed to the common good. We maintain our legal, economic and moral independence and rely on the initiative and integrity of all FZI team members. We accept our responsibility: We play an active role in shaping debates on the opportunities and risks of technological innovations and back up our words with actions.

Transparency, openness and trust

We communicate with each other and our partners on an equal footing, focusing on openness and willingly accepting constructive criticism. For us, transparency means that decisions are understandable. Cooperation at the FZI is characterized by trust, commitment and readiness to help and is geared towards clearly defined goals. Team spirit is actively lived at our company: We can rely on and stand up for each other.

Appreciation, respect and fairness

We show respect and appreciation equally to our FZI team members, partners and clients, and are guided by the principles of equal opportunity and fairness. We are united by our enthusiasm for digital technologies of the future. For individual professional and personal development, we rely on a flexible and family-friendly working environment.

— Our Team

For more than 35 years, we have recruited most of our team members during their time as students or shortly after graduation. In the course of their work, our scientific staff members, with the support of the directors, are given the opportunity to conduct research for their own scientific career and to pursue a doctorate at the faculties of the professors of KIT and other partner universities who are engaged at the FZI.

The successful execution of research projects in close cooperation with companies in the free economy, public clients and other research institutions requires a high degree of independence, sense of responsibility and professional knowledge from the scientific staff. Our management structures are consistently geared towards providing our researchers with the necessary support and structure for excellent research, while leaving sufficient room for the development of their respective scientific, professional and organizational skills.

We see ourselves as a qualification factory for outstanding experts who combine scientific issues with practical activities in their work. Further training and qualification of our scientific staff is just as important to us as the excellence of our research, which is ensured by our proximity to outstanding research partners and universities like our innovation partner, the Karlsruhe Institute of Technology. With modern, spacious laboratory equipment and the FZI House of Living Labs as a unique research environment, FZI researchers can develop and extensively test new technologies.

At the FZI, you will meet an intercultural and motivated team. A flexible, family-friendly work culture is just as much a matter of course for us as participation in international conferences and competitions or the promotion of individual further education and training for our team members.

FZI alumnus Dr. Manuel Lösch
presents his spinoff InnoCharge within his
FZI Open House lecture

Working, doing research for your doctorate and establishing a startup all at the same time. Not possible? Sure, it is! At the FZI.

The wide range of opportunities available to scientific employees at the FZI means that they do not have to focus on just one aspect of their career but can pursue several goals at the same time.

– The special thing about FZI projects: Specialists from the fields of computer science, electrical engineering, mechanical engineering, economics, mathematics, psychology, law and many other areas work closely together on an interdisciplinary basis.

Through scientific publications and participation in conferences, and via close contact with the directors, our scientists are strongly integrated into the university research community. At the same time, they develop IT solutions for practice at the FZI at a high scientific level together with our partners from industry, associations and administration. Direct practical relevance and a high scientific level are therefore not contradictory.

Already during their time at the FZI, our employees make valuable contacts with exciting employers for future career steps.

Employees also have the possibility to gain management experience in specialist leadership roles and a variety of management roles with personnel responsibility. We support our employees on their way with onboarding training courses and a wide range of continuing and further education programs.

Promoting IT innovations via startups

During research work, new and exciting technologies as well as business models are constantly emerging that are worth testing. In order to bring these IT innovations to society, we work with our partner organizations to support our employees with their spin-offs – amongst others in the areas of coaching, marketing, and funding.

We also support researchers who want to start their own business by offering flexible employment models that allow them to remain integrated in the team structure and research work at the FZI while taking care of the first steps towards self-employment on a part-time basis. To this end, we also provide the premises and infrastructure needed by the employees during the start-up period within the framework of funding programs. Our FZI directors advise the founders or provide valuable contacts to established companies that also set off as startups at the FZI. On this way, we have already accompanied the founding of more than 60 startups.

— Sharing Knowledge

We have made it our goal to shape the transfer of knowledge from research to practice, politics and society by qualifying the experts and leaders of tomorrow. Therefore, we specifically prepare our scientific employees for a job in academia or the private sector.

We pass on the knowledge generated at the FZI to our scientists and students. In 2022, a team of 255 motivated full-time employees worked across disciplines on 219 national and international projects, supported by over 150 assistants.

A large number of student assistants, interns, Bachelor and Master students as well as doctoral candidates from various disciplines constantly brings new impulses to our research and development.

Thanks to application-oriented research and close cooperation with partner institutions, the scientific staff at the FZI gains valuable experience for future tasks in research, development and management. We support capacity building as well as personal and professional development with a customized offer of continuing education and in-house training.

Besides science, business also benefits from our interdisciplinary research work. Many FZI employees continue their professional career at a company they got do know in the course of an FZI research project.

– Innovation and transfer are our core tasks addressed in each of our research projects and through numerous events and activities. In addition, it is important to pass on the knowledge gained – within the FZI, but also to existing and new partners from science, business, politics and civil society.

"Working at the FZI is characterized by personal responsibility, flexibility, and teamwork – plus a huge chunk of passion. As a department manager, I provide for the necessary conditions and the freedom for visionary ideas, so that my team can work in a motivated and fulfilled manner and ultimately obtain their doctorate."

Dr.-Ing. Stefan Schwab

Department Manager in the research division

Embedded Systems and Sensors Engineering

– Things to Know

Figures. Data. Facts.

50 The FZI in Figures

52 Organization

- Board of Executive Directors
- Divisions
- Board of Scientific Directors
- Board of Trustees

61 Legal Notice and Photo Credits


FZI

Scientific Achievements

10 Dissertations

18 Magazine/ Newspaper Articles

3 Books

4 Book Contributions

108 Conference Contributions

1 Technical Report

14 Training Courses and Workshops

8 Popular Science Publications

Economic Achievements

219
Projects in Total

92 Direct Orders

127 Pubicly Funded Projects

Range of FZI Revenues from Projects

€2,500 – €3,689,703

Range of Project Runtimes

0.5 – 63
Months

Total Sales Revenue

€26.5
Million

2022

The FZI in Figures

Staff

255
Employees in Total

152 (Research) Assistants

7 Guest Scientists

6 Interns

3 Scholarship Holders

Changes in Full-Time Staff

40 New Colleagues

31 New Alumni

Full-Time Staff

30% Female Employees

70% Male Employees

— Board of Executive Directors

The FZI is managed by the Board of Executive Directors consisting of three members: two professors from the FZI Board of Scientific Directors – who perform their duties on a part-time basis – and one full-time board member.

– Jan Wiesenberger

Full-time member of the FZI Board of Executive Directors

– Prof. Dr.-Ing. J. Marius Zöllner

Karlsruhe Institute of Technology, Institute of Applied Informatics and Formal Description Methods, Applied Technical-Cognitive Systems

– Prof. Dr. Stefan Nickel

Karlsruhe Institute of Technology, Institute for Operations Research, Discrete Optimization and Logistics

— Divisions

COM
Communications

ESS
Embedded System and Sensors Engineering

IPE
Information Process Engineering

IST
Innovation, Strategy and Transfer

ISPE
Intelligent Systems and Production Engineering

RAD
Research Administration

SE
Software Engineering

TIS
Technology and Infrastructure Services

The research divisions Embedded Systems and Sensors Engineering, Information Process Engineering, Innovation, Strategy and Transfer, Intelligent Systems and Production Engineering, and Software Engineering cover informatics application research across the entire innovation cycle. The central divisions Communications, Research Administration and Technology, and Infrastructure Services and their organizational units create the framework for efficient and effective research at the FZI.

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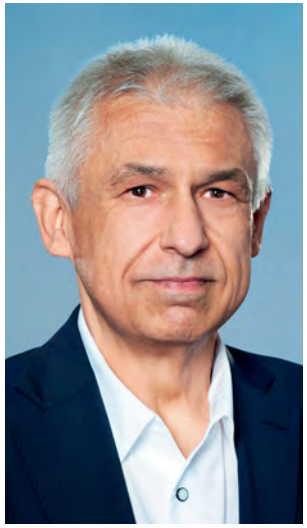

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Ada Streb

Director of the FZI Capitol Office in Berlin

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