GERMAN RESEARCH CENTER FOR ARTIFICIAL INTELLIGENCE

DFKI NEWS 01 2019

DFKI at HANNOVER MESSE

Baton Passes to Professor Koehler

New DFKI Shareholders

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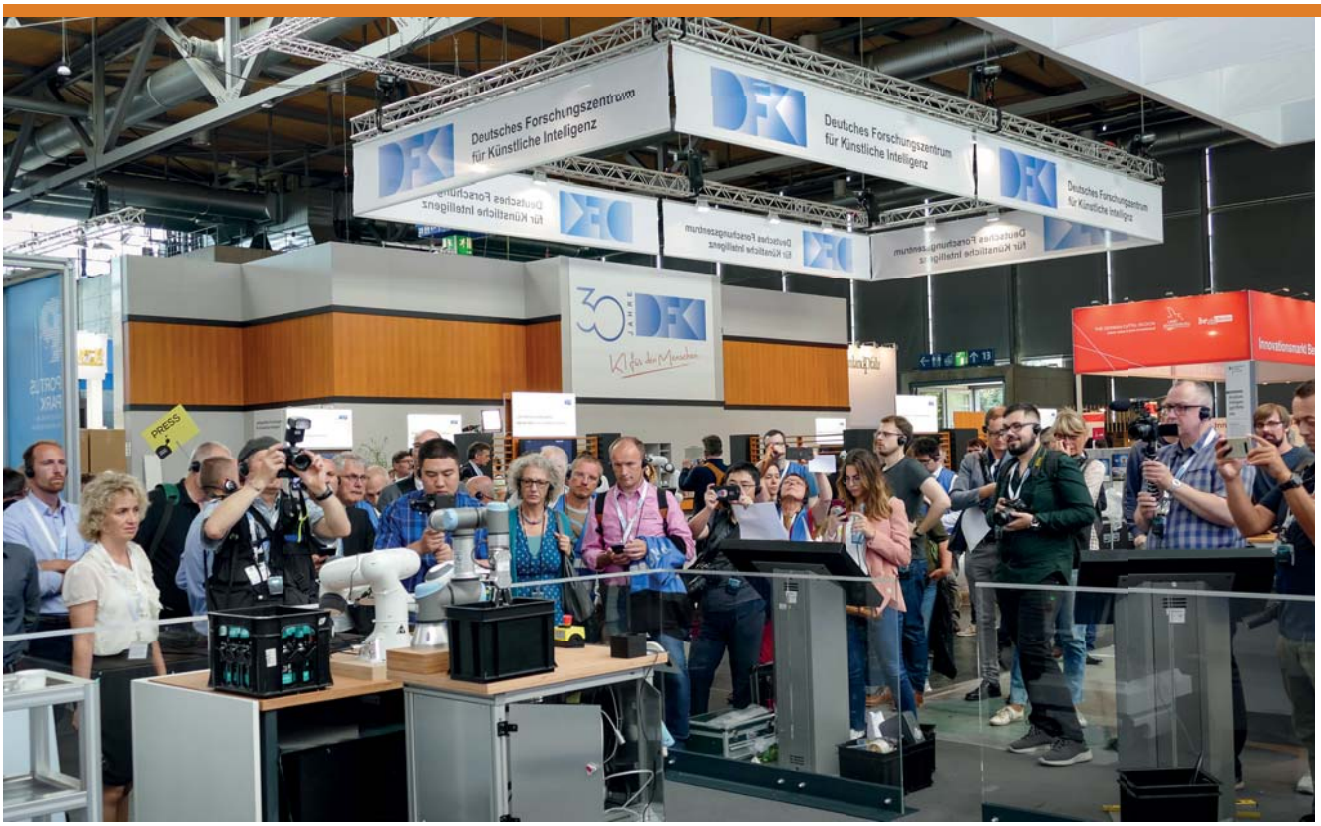

DFKI at Hannover Messe 2019

Pioneering approaches to the implementation of intelligent software solutions for industrial applications in INDUSTRIE 4.0 are the subject of DFKI exhibits at the Hannover Messe from April 1-5, 2019.

▶ DFKI is presenting **current industry-related research results from the spectrum of IT topics** in the main theme area "Research & Technology" in **Hall 2, Stand C59**, including: human-robot collaboration (HRC), explainability of AI systems, digitization and Internet of Things in the construction industry, workplace health through wearables, autonomous robots for space, self-verifying computer systems, and adaptive interactive teaching and learning systems.

In **Hall 8, Stand D18**, SmartFactoryKL and DFKI will show a scalable solution for **industrial intelligence applications**.

With a focus on SMEs, INDUSTRIE 4.0 is also the subject of the training demonstrator of the Mittelstand 4.0 Competence Center Kaiserslautern on the stand of the Federal Ministry of Economics and Energy **(Hall 2, C28)**. This is a playful demonstration of how **digitization works in production**.

In the 5G Arena in **Hall 16, D38**, DFKI will present research approaches for the **development of a unified industrial 5G communication system** that integrates fifth generation mobile radio networks and industrial communication networks.

As a research partner of DB Systel, DFKI will be represented at the VDI stand (**Hall 2, C40**). A cross-sector service platform from the joint project **Smart Data for Mobility (SD4M)**, which integrates data from different mobility providers and social media data into an early reporting system for travel planning, will be on display.

INFORMATION ABOUT ALL DFKI EXHIBITS, EVENTS AND KEYNOTES AT THE HANNOVER MESSE 2019
www.dfki.de/en/hm19

We are looking forward to your visit at the Hannover Messe!

You can register as a trade visitor for free under the following QR-code.

ROBOTICS

EXPLAINABLE AI

Photo: DFKI/Oliver Dietze

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DEEP LEARNING

EUROPEAN VISION FOR AI

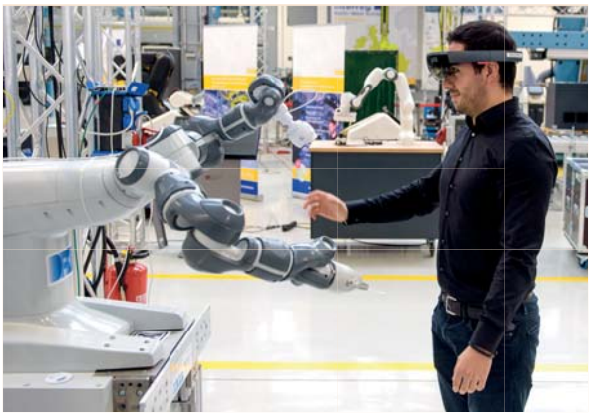

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Photo: DFKI/Oliver Dietze

Handover Ceremony of AI Chair and DFKI from Professor Wahlster to Professor Koehler

The change in management from Professor Dr. Wolfgang Wahlster to Professor Dr. Jana Koehler was marked at Saarland University and DFKI with an academic symposium. The ceremony, held at the Saarland Informatics Campus in Saarbrücken on February 25, 2019, included international contributions from the DFKI sphere of interest. Professor Koehler assumed duties as Chair of the Department of Artificial Intelligence in Saarbrücken and, simultaneously, as the new CEO of DFKI on February 1, 2019. She will lead DFKI together with the current CFO Dr. Walter Olthoff, who has been the business director since 1997. Professor Wahlster continues his service as Chief Executive Advisor to DFKI.

▶ The German government began investing in AI research as early as the 1980s, as did the federal states of Saarland and Rhineland-Palatinate. In 1982, Prof. Dr. Wahlster was appointed Chair of the Department of Artificial Intelligence at Saarland University in the city of Saarbrücken. He became deeply involved in the establishment of DFKI in 1988 and served from the start as science director and since 1997, as CEO.

Now, Prof. Wahlster is retiring from the company management after more than 20 years at the helm. The appointment of Prof. Dr. Koehler as successor to Prof. Wahlster at Saarland University and as CEO of DFKI is the culmination of an international search process that began in 2017.

The main focus of the festive symposium was to honor Prof. Wahlster's scientific and business achievements and acknowledge the transfer of responsibility to Prof. Koehler.

Three keynote speeches featured the future outlook of AI, international AI strategies and the opportunities of AI. Prof. Dr. Randy Goebel, Chair of Computing Science, University of Alberta, Edmonton, addressed the Canadian perspective. Prof. Dr. Hans Uszkoreit, Scientific Director, Artificial Intelligence Technology Center (AITC), Beijing, spoke about longstanding and current experience with China. Prof. Dr. Oliviero Stock, Head of AI Research, Center for ICT, Trento provided an analysis of the European perspective.

Saarland's Minister President Tobias Hans thanked Professor Wahlster for his extraordinary engagement:

"Your contributions are singularly responsible for the development of DFKI as a research institute of international acclaim and have ensured that it can compete internationally with other outstanding Centers of Excellence.

For decades, you have contributed in a special way to the development of Artificial Intelligence as a field of research in Germany and are undoubtedly among the most respected computer scientists in the world.

Over many years, you have been a force of progress and an important partner to the government with your sense of the importance of scientific topics and their potential for society and the need for innovation in the economy."

Photo: DFKI/Oliver Dietze

Photo: DFKI/Oliver Dietze

"In light of the recent transfer of office, the continuation of the very successful path followed to date, and the further strengthening of the close and productive cooperation at this location is of equal importance to the University and to DFKI. We welcome Professor Jana Koehler as an outstanding scientist, who brings an impressive resume to the location – highlighted by a university background, far-reaching insight, and a vision for AI cooperation among university and non-university research.

At the departure of Professor Wolfgang Wahlster, I express my appreciation on behalf of the entire university. Our university and the center as a whole are losing an individual who played an enormous role in the successful development of the Saarland Informatics Campus. An outstanding thought leader and visionary, he has shaped generations of students and scientists at our university – and beyond – and fascinated and inspired many young people to study computer science."

Prof. Dr. Manfred Schmitt,
President of Saarland University

Photo: DFKI/Oliver Dietze

The Chair of the DFKI Supervisory Board, Prof. Dr. h.c. Hans-Albert Aukes, praised the service and the cooperation so well demonstrated over the past two decades:

"Today's event marks a milestone in the exciting history of DFKI. Prof. Wahlster, as Chair of the Executive Management Board, has been the driving force behind the scientific as well as the corporate development of DFKI for more than 20 years. New topics with worldwide resonance have been developed while new research areas, new Living Labs, and new locations have been opened.

This was a very eventful and very successful period. As Chair of the Board of Supervisors, I thank Prof. Wahlster on behalf of all shareholders and wish Prof. Koehler good luck and success in her new role. I am certain that Prof. Wahlster's relationship with DFKI and with me personally will remain amicably close."

Commenting on the future of AI and her agenda as DFKI CEO, Prof. Jana Koehler said:

"The work of DFKI has flowed into many of our industry solutions and has facilitated the transfer of many innovative AI technologies. We have also taken exciting practical problems as inspiration for application-oriented basic research, which we developed in collaboration with our university partners. These are outstanding achievements by the DFKI staff and also very personal successes for Prof. Wahlster.

I express my sincerest appreciation for the intensity and energy he has invested in the development and management of DFKI. In research and innovation, DFKI has developed successful formats like the different Living Labs and various competence centers (Centers of Excellence) as well as the new Transfer Labs, in which we work with industry partners over a longer term on fundamental technological breakthroughs in AI.

Germany is one of the Top 5 most innovative countries in the world today. To keep it that way, we have to continue to reinforce the innovative and adaptive capabilities of the economy and put the issue of operational excellence high up on our agenda. Today, AI enables intelligent systems that recognize patterns, make deliberative decisions, and optimize processes. The consequence is a better use of resources and more flexible and efficient technical solutions. However, the source of value creation is, and always will be, human. As DFKI CEO, my goals are to facilitate through sound research AI applications that we can be proud of and that do good in the world: i.e., intelligent products and processes, new markets, and new business models that strengthen Germany as an economic center."

DFKI CFO Dr. Walter Olthoff stated:

"DFKI has been a remarkable success for over thirty years, both scientifically and economically. In 2018, we were able to set a new record for our financial volume, expand the circle of industry partners, and welcome our 1000th employee.

I would like to thank Prof. Wahlster for more than 21 years together with him in executive management! We are on the right path and I look forward to working with Prof. Jana Koehler."

Prof. Wolfgang Wahlster remembered:

"I am pleased that the generational change I was aiming for at the top of DFKI coincides with a new growth phase in my field of research, which made the transition easier because of the tremendous worldwide interest in Artificial Intelligence.

Other federal states have expressed an interest in establishing a DFKI presence, and many companies from Germany and abroad want to become industry partners with DFKI. The German government is increasing the support for basic research at the AI centers and 100 new AI professorships will be announced. These are the best indicators for a continuation of the DFKI success story under the new leadership of my colleague Prof. Jana Koehler, whom I wish good fortunes and success in a very complex management position.

Photo: DFKI/Oliver Dietze

Without the excellent teamwork with our supervisory board chairperson, Prof. Aukes, our CFO, Dr. Olthoff, the more than 20 DFKI professors, and the 1000 member DFKI staff, our many successes over the past 30 years – with sales doubling every 10 years – would not have been possible. The support of the federal and host state governments and our industry partners (to whom I express my sincere appreciation again here today) was also crucial. The chance to accompany DFKI from the beginning was a great honor and pleasure for me. I would be very happy to offer my advice and assistance if asked by DFKI and its shareholders at any time in the future."

Prof. Dr. Jana Koehler was a professor for Computer Science at the Lucerne University of Applied Sciences and Arts in Lucerne, Switzerland. The focus of her teaching and research there was on the methods of Artificial Intelligence and the subject of business process management. From 1990 to 1996, she was a research assistant at DFKI Saarbrücken and completed research visits at the universities of Linköping (Sweden), Maryland (USA), Berkeley (USA), and Freiburg (Ge). Other career positions were with the Schindler company and IBM's research lab in Rüschlikon, Switzerland. She co-authored one of the most important standards in the area of Business Process Management and published in 2011 (BPMN 2.0). Her current research efforts are directed at AI for INDUSTRIE 4.0 and architectures for intelligent planning and scheduling systems.

Prof. Dr. Wolfgang Wahlster retired from Saarland University effective on December 31, 2019 and handed over his positions as CEO, Science and Technology Director, and Chair of the Executive Board (which he held for more than 20 years), to Prof. Koehler on February 1, 2019. Prof. Koehler is also now serving as the Chair of Artificial Intelligence at Saarland University.

MORE INFORMATION
dfki.de/en/web/news/detail/News/academic-handover-dfki-management-board

Prof. Philipp Slusallek, Co-Initiator CLAIRE at the 2nd Symposium in February 2019 in Rome
Photo: CLAIRE

CLAIRE – A European Vision for Artificial Intelligence

CLAIRE is a European initiative in the field of Artificial Intelligence to bring research, industry, and civic partners closer together, to represent common interests, and to make policy proposals at the European and national levels. CLAIRE has grown rapidly since its establishment last summer and now relies on a strong network of supporters and research institutes across Europe.

The next steps include transitioning the initiative to an organization with the appropriate structures to better meet the challenges expressed in the CLAIRE vision: "Excellence across all of AI — for all of Europe — with a human-centred focus." In addition to headquarters, several CLAIRE offices, national and regional competence centers for AI as well as a CLAIRE hub, as central point of contact in Europe, should be established. The cooperation of research and industry is very important for the further development of the initiative. Consequently, we invite the industry partners of DFKI to learn about the cooperation opportunities with CLAIRE and look forward to your visit with us at Stand C59, in Hall 2 at the Hannover Messe.

▶ The fact that Artificial Intelligence (AI) is exerting more and more influence as a global game-changer can no longer be denied. It is already fundamentally changing the way we live and work and, as an engine of innovation, driving future growth and competitiveness.

"AI Made in Europe"
To prevent Europe from falling behind in the global AI race, the CLAIRE initiative (Confederation of Laboratories for Artificial Intelligence Research in Europe) was launched in June 2018. The starting point was the development of "A European Vision for AI," which involved more than 600 leading scientists and the major stakeholders in the field of AI. Prof. Philipp Slusallek, site manager at DFKI Saarbrücken and head of DFKI's Agents and Simulated Reality department, is one of the three founding members and has ensured that DFKI has remained part of the core team since the beginning.

The essential focus of the initiative is on ensuring that Artificial Intelligence puts people first. The aim of CLAIRE is to create a network that brings together the major stakeholders in research, industry, government, and society across Europe to jointly produce "AI made in Europe" based on the scientific and industrial excellence of Europe. Of critical concern from the start was the need to consider basic European values to facilitate building trust in a technology still viewed with much skepticism.

CLAIRE has since gained well over 2,700 individual supporters, while at the same time providing a growing media presence. CLAIRE is meanwhile the central contact partner – both for the European Commission and for the national governments. More than 240 research institutes from all over Europe are now partners and together with supporters, form the ever-expanding CLAIRE network (🌐 *claire-ai.org/network*).

Major Goals of CLAIRE

The CLAIRE network offers partners an ideal forum for defining the fundamental issues for AI research, discussing the most promising approaches, and then taking them on together through appropriate collaboration and joint projects. The CLAIRE Competence Centers will be strategically located across Europe to provide members of the network with a central contact point in their region. In contrast, the CLAIRE Hub will be the central facility and provides a tangible center of activity within the network. The best researchers at all career levels will be able to work for defined periods, for example, as part of a research project with partnering organizations from the scientific and business communities or to participate in scientific exchange. The aim is not only to create a large AI community, but also a "trademark" for AI made in Europe (similar to the very successful CERN in physics). With adequate conference space and a unique data and computing infrastructure along with well-equipped test labs, Europe will be well-positioned to tackle even the major challenges of AI.

The first steps have already been taken in the transition from an informal initiative to an organization with legal standing. The headquarters in Den Haag is currently under construction; two additional locations are operating in Saarbrücken and Oslo. Additional offices and staff will be gradually established in other European cities.

An important component in promoting the vision of the network and ensuring an initiative that serves the best interests of the public are the semi-annual CLAIRE symposia. The basic themes and the main components of CLAIRE were agreed at the first symposium in Brussels. The participants were enthusiastic about the opportunity to be a part of the common effort and the comprehensive strategic concept for AI in Europe (claire-ai.org/symposium). The second CLAIRE Symposium was held in Rome on February 27, 2019. Discussions centered on the further elaboration of the organization, the selection criteria for the regional competence centers and the CLAIRE hub, in addition to how to best integrate industry in the network.

In addition, a workshop attended by the best AI researchers in Europe was held with the European Space Agency (ESA) on the topic "Earth-Observation," where the challenges and joint solutions in this area of application were discussed. Other topics of interest to the industrial and social communities will be the subject of future

Industry's key role

The Industry is an important cooperation partner and a key element in the effort to make the vision of "AI made in Europe" a reality. Top notch research alone is not sufficient to successfully establish innovations in the market. New technologies will only serve to benefit humankind if they are tailored to the specific needs of the respective target group. In this process, government, society and, in particular, businesses all have a pivotal role to play. The sooner these stakeholders are involved in the discussion and the development of new research subjects and technologies, the more fitting the solutions will be later down the line.

Philipp Slusallek, Silke Balzert-Walter, Morten Irgens (Oslo Metropolitan University), Alexa Kodde (Leiden University) and Holger Hoos (Leiden University). Photo: CLAIRE

Together for Europe

Every new project poses challenges for its members. Members with many different roles will be needed to implement the project, if it is one as visionary as CLAIRE. Only if research, industry, government, and society are all pulling in the same direction and cooperating with one another, can we be sure that human-centric AI will be based on European values and norms and contribute to prosperity throughout Europe.

The participation of CLAIRE at the Hannover Messe 2019 presents an excellent opportunity for research and industry to gather information and make new contacts. Become part of the CLAIRE network at an early stage and make a significant contribution to shaping the future of human-centric AI for Europe. We look forward to welcoming you at the DFKI stand C59 in Hall 2!

MORE INFORMATION

claire-ai.org

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Munich Re Is a New Shareholder in DFKI

Munich Re has acquired shares of DFKI. The sales contract signed by representatives of both companies marks another important step in the cooperation among the world's leading representatives of industry, science, and government in the area of artificial intelligence.

▶ Both parties have agreed not to release any information about the purchase price. The final transaction is expected to close in 1QTR 2019 and is subject to the formal approval of all current shareholders.

Munich Re is a global leader in reinsurance, primary insurance, and insurance-related risk programs. The group business units are reinsurance along with ERGO and MEAG, an asset management company.

Munich Re has a worldwide presence and is active in all insurance sectors. Established in 1880, Munich Re continues to stand out for its exceptional risk management know-how and financial stability. Clients can rely on financial protection even in the event of exceptionally high damage – from the San Francisco earthquake in 1906 to the series of Atlantic hurricanes in 2017. Equipped with outstanding innovation power, Munich Re is well positioned to handle even extraordinary risk situations like rocket launches, alternative energies, cyber-attacks, or pandemics.

The company pursues a leading role in driving the digital transformation within the branch and is actively expanding its risk evaluation capabilities and its range of services. Individual software solutions and close client relationships are the reason Munich Re is a globally sought-after risk partner for businesses, institutions, and private individuals.

"Artificial Intelligence is one of the most important key technologies of our time. It is enabling entirely new products, for example, policies for networked factories or damages sustained from cybercrime, but it is also bringing many new challenges. Our cooperation with DFKI underlines our claim of taking a leading role in Artificial Intelligence for the insurance industry. The partnership facilitates not only our development of the latest, most effective, and best processes for our clients, but also makes the most up to date research available to our staff while driving the research itself."

Torsten Jeworrek, Executive board member at Munich Re

"The Munich Re decision to partner with DFKI represents tremendous innovation potential for our development of Artificial Intelligence methods. Outstanding application opportunities present themselves as a consequence of Munich Re's real time requirements for Big-Data analytics, in particular, at our Deep Learning Competence Center, our systems for language and image recognition, and for explaining learning results and sensor fusion. Our previous cooperation in aerial imagery analysis of storm damage in consideration of socio-economic parameters returned very positive results. It was clear after my first presentation of DFKI last July to the executive board of Munich Re that a true win-win situation could be created by the entry of Munich Re into our circle of shareholders: I am pleased that this could be implemented so quickly."

Prof. Dr. Wolfgang Wahlster,
CEO and Scientific Director of DFKI until January 31, 2019

MORE INFORMATION
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DFKI is Partner in the ZF Technology Center for Artificial Intelligence and Cybersecurity

ZF is establishing a Technology Center for Artificial Intelligence (AI) and Cybersecurity in Saarbrücken. In a worldwide network, the technology group is already developing application possibilities with AI to make systems and components as well as production and services more intelligent, efficient and safer. With the new "ZF AI & Cybersecurity Center," ZF is now expanding its activities in the area of AI research in order to coordinate and control the company's AI activities from here in the future.

▶ On March 12, 2019, Wolf-Henning Scheider, CEO of ZF Friedrichshafen AG, gave the go-ahead for the Technology Center in the presence of Saarland Minister-President Tobias Hans. Scheider also announced that ZF, as shareholder of the German Research Center for Artificial Intelligence (DFKI) and strategic partner of the Helmholtz Center for Information Security (CISPA), will cooperate closely with these leading research institutions in the future. The completion of the accession to the circle of currently 27 DFKI shareholders is expected for the second quarter of 2019 and is subject to formal approval of all current shareholders.

Minister-President Tobias Hans considers the establishment of this first industrial center for AI and cybersecurity in the Saarland region to be a confirmation of his digitalization policy:

"The new ZF center strengthens the Saarland as industrial location with some thousands of jobs. With this, we build a bridge from Saarland's scientific-technological IT/AI competence to the technological excellence of a worldwide leading automotive supplier company."

Saarbrücken is a logical choice for ZF as the location for its new competence center: "Under the moniker 'Digital Saarland,' the region has become the hub for digitalization, artificial intelligence and cybersecurity. We are very pleased that, with DFKI and CISPA, we can now build on the high level of expertise of two of the world's leading research institutions in our partner network," said Wolf-Henning Scheider.

(l.to r.): Prof. Michael Backes (Founding Director CISPA), Tobias Hans (Minister President of Saarland), Wolf-Henning Scheider (CEO ZF Friedrichshafen AG), Prof. Jana Koehler (CEO DFKI) and Prof. Wolfgang Wahlster (Chief Executive Advisor DFKI). Photo: ZF

Prof. Dr. Jana Koehler, Chairwoman of the Board of DFKI, explained: "For several years now, ZF has been an outstanding practical partner for DFKI in the field of Industry 4.0 – both in joint research in national reference projects and as a client for services. We are currently using a DFKI High-Performance Optimization System in a pilot project that supports online version control at the ZF plant in Saarbrücken. ZF provides us with deep, comprehensive insight into the production domain, allowing us to carry out tasks such as certifying the efficiency of AI systems for specific planning tasks. This early grounding in the real world of production is crucial for successfully accelerating demandoriented research transfer."

ZF is a global leader in driveline and chassis technology as well as active and passive safety technology. The company has a global workforce of 146,000 with approximately 230 locations in some 40 countries. In 2017, ZF achieved sales of €36.4 billion and as such, is one of the largest automotive suppliers worldwide.

MORE INFORMATION

www.zf.com

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Federal German Science Minister Anja Karliczek Visits DFKI Saarbrücken

The minister participated with journalists from dpa, ZDF, FAZ, Süddeutsche Zeitung, Handelsblatt, Wirtschaftswoche and the Funke Media Group, Bayerischer Rundfunk, and Saarländischer Rundfunk in an expert panel discussion covering the current issues and application areas in the field of AI.

▶ The visit on February 5, 2019, was the minister's first to a DFKI location since Prof. Dr. Jana Koehler assumed her new chief executive position.

The new CEO and Prof. Dr. Wolfgang Wahlster, who since February 1, 2019 has held the position of Chief Executive Advisor to DFKI, introduced the research institute in a short presentation. Prof. Dr. Philipp Slusallek, site manager at DFKI Saarbrücken, presented the European AI Initiative called CLAIRE. The initiative brings stakeholders from research, industry, government, and social institutions across Europe together and invites discussion of new research subjects, technologies, and solutions. From the start, CLAIRE has promoted "AI made in Europe" while considering core European values.

Seated at the discussion table were DFKI experts from the areas of AI and healthcare, AI in stationary (offline) trade, Human-Robot Collaboration (HRC), INDUSTRIE 4.0, AI in manufacturing, autonomous driving, human-centric AI, and representatives from a DFKI spin-off.

The visit focused not only on the European projects like CLAIRE, but also on bi-national efforts by Germany and France regarding a planned Franco-German Center for Artificial Intelligence. DFKI is of central importance in establishing larger structures, said the Minister. A coordinating structure for four French institutes in Paris, Nancy, Toulouse, and Nantes has been suggested. Anja Karliczek reiterated the plans of her Ministry to first build up a national infrastructure for Artificial Intelligence and then to subsequently network them. DFKI's role as a major partner in the planning of this merger is also because of its proximity to France.

DFKI and INRIA discuss next steps for German-French AI Cooperation

The potential for joint research and the first concrete steps for an innovative partnership between INRIA research center (Institut national de recherche en informatique et en automatique) and DFKI were the topics of discussion at a meeting on the following day which was attended by Bruno Sportisse, Director of INRIA, Bruno Lévy, Director of the Nancy-Grand Est INRIA, Marc Schoenauer, Scientific Director INRIA Saclay, and Marie-Hélène Pautrat, European Affairs Officer.

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International Workshop on Augmentation & Amplification – Expanding the Cooperation With Japan

"Expanding and strengthening human cognitive skills," was the scientific theme of a workshop held in mid-January for approximately 80 researchers at DFKI in Kaiserslautern. The "International Workshop on Intelligence Augmentation and Amplification – IAA 2019" focused on the subject of AI and the related exchange and networking between researchers in the two countries. The high-profile event was supported by the Federal Ministry of Education and Research (BMBF), the German Research Foundation (DFG), and the Japan Science and Technology Agency (JST).

▶ The desire for collaborative research projects was the motivation for the international meeting. Comparable to the BMBF programs and the special research areas of the DFG, the JST also has a competition research fund called CREST, which currently operates three programs involving artificial intelligence, intelligent information processing, and symbiotic interaction.

The direct benefit of the workshop to Germany and Japan and their respective research landscapes derives from the synergy of the transnational cooperation. Under the motto "United we stand – divided we fall," networking and collaborative research can be seen as a useful tool, to be jointly applied in winning the global competition.

"Artificial intelligence has a unique potential to solve complex problems that are beyond human capabilities. It can enhance human cognitive skills and is an ideally matched assistant. The Japanese vision of human-centric AI is very similar to the German one. Japan is an ideal partner to explore the joint development of technologies, establish international standards, define ethical norms and, in the process, ensure competitiveness with China and the USA."

Prof. Dr. Andreas Dengel, Site Director for DFKI Kaiserslautern and organizer of the workshop

Dr. Yoshimasa Goto, Executive Director at JST: "In research related to AI, in particular, many problems exist, such as (1) safety and reliability, (2) vulnerability, (3) response to unknown events, (4) labor and cost reduction for data maintenance and machine learning – challenges that have to be overcome."

Dr. Herbert Zeisel, Deputy Director General in the area "Key Technologies for Growth" at BMBF: "The German government's AI strategy is intended to safeguard Germany as a research and business center and to promote the many potential applications of AI for tangible social progress in all sectors in the public interest. Our ideal vision for AI is one that includes a human centric approach and concerns itself with cultural and ethical framework conditions. The international cooperation with Japan and other like-minded states in the EU and beyond is a vital counterbalance to the companies and countries that are pursuing AI development without regard to data protection and privacy rights."

MORE INFORMATION
www.dfki.de/sds

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Photo: DWIH Tokyo

First Japanese-German-French AI Symposium in Japan

What is the potential of Artificial Intelligence – how is it changing our everyday lives – and what kind of social and ethical challenges does it present? How can Germany, France, and Japan cooperate more closely to compete more effectively in the global competition?

The German Academic Exchange Service (DAAD), which oversees the German Science and Innovation Association (DWIH) in Tokyo, invited high-level experts from research, government, and business to participate in the first Japanese-German-French Symposium for Artificial Intelligence in the Japanese capital on November 21-22, 2018.

▶ A professional conference with the title "Artificial Intelligence – International Research and Applications," attracted more than 350 prominent experts from research institutes, universities, government, and business in Japan, Germany, and France. The purpose of the conference was to discuss the current issues and the potential of Artificial Intelligence. The interdisciplinary conference focused on the current state of AI technologies and outlined future scenarios in the areas of sustainable Smart Cities, autonomous vehicles, and innovation in the fields of industrial production and healthcare.

The two-day symposium was opened by Prof. Dr. Andreas Dengel, site director of DFKI Kaiserslautern. In his keynote address "Augmented Intelligence – Towards Self-Learning Machines," he provided an impulse to the ideas of Artificial Intelligence as a cognitive performance enhancer that can extend human senses and cooperate as a co-creative partner.

"We have to set international standards and rules regarding the use of AI. Alliances are equally important for defining the technological standards and norms. France and Japan are just the right partners necessary to compete with the USA and China."

Prof. Dr. Prof. h.c. Andreas Dengel,
Site director DFKI Kaiserslautern

Philipp Slusallek, site director for DFKI Saarbrücken and co-founder of the CLAIRE initiative served as chair for the session called "AI Applications in Mobility and Autonomous Driving" and gave a talk on the subject "Understanding the World with AI: Training and Validating Smart Machines Using Synthetic Data."

"Unless we understand AI systems and make them explainable, we will not be able to establish people's trust in AI. Before we let a pilot fly an airplane, we let them prove that they can master critical situations."

Prof. Dr. Philipp Slusallek,
Site director DFKI Saarbrücken

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The symposium concluded with the participants from Japan, France, and Germany agreeing to work more closely together on the subject of AI in the future. To solidify this agreement, the experts authorized a joint declaration of intent:

JOINT STATEMENT OF THE GERMAN, JAPANESE AND FRENCH PARTICIPANTS ON INTENSIFIED COLLABORATION IN AI

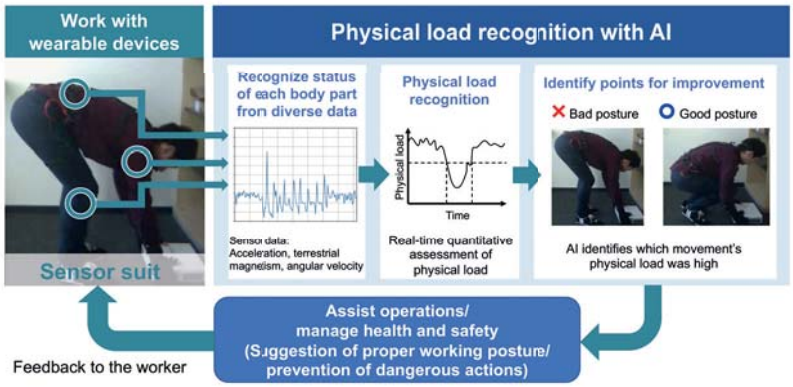
"On the occasion of the first Japanese French and German Symposium on Artificial Intelligence, organised by the DWIH Tokyo and the Embassy of France in Japan, the participants from the fields of research, policy, and fanding organisations express their willingness to intensify their future collaboration in AI research and innovation. The cooperation will be carried out in the spirit of shared ethical values for the common good of our societies. At the centre of this collaboration we put a human-centred approach which will set common standards and a joint anderstanding of the potential of Artificial Intelligence.

We strongly support the creation and reinforcement of networks of individuals as well as networks of institutions. Based on the respective national strategies of Artificial Intelligence we see the need and the scope for intensified exchange of researchers, ideas and perspectives to face challenges in areas such as health care, mobility, environment, connected industries, or disaster risk reduction. The ultimate aim of Artificial Intelligence is to serve people and contribute to the improvement of the quality of life for the individual as well as for society as a whole."

Tokyo, November 22, 2018

AI Technology Detects Physical Strain at the Workplace

Hitachi, Ltd. and DFKI have jointly developed an AI-based technology to measure the physical strain of workers with a sensor suit. The system detects and quantifies physical stress in real time and informs users of incorrect posture and unergonomic movement patterns. DFKI and Hitachi will present the technology at the Hannover Messe in Hall 2, Stand C59.



▶ In a society in which skilled labor is in shortage and in which recruiting new workers is becoming increasingly difficult, the preservation of the workforce is an urgent concern. Issues such as preventive risk avoidance and health protection, especially for workers in manufacturing and maintenance, are moving more and more into the spotlight.

An analysis of the extent of their physical strain helps to increase the safety of employees and protect their health. Traditional approaches use stationary cameras to detect and record worker activity. However, this approach does not ensure a quantitative and stable assessment of physical stress: Cameras are limited in their measuring range, and when taking pictures in production facilities or outdoor facilities, there are often blind spots in which the worker's movement profiles are not recorded or only partially recorded.

DFKI and Hitachi are developing a new AI-based technology that records a worker's movement data directly on the body using wearables, recognizes the physical load and evaluates it. The combination of Hitachi's activity detection technology and DFKI's AI technology is a unique feature:

Direct measurement of body movements during various activities and quantification of the physical load
Sensors in wearables measure the movements of more than 30 body parts directly on the body. The AI has already learned status recognition models for every part of the human body in advance. Now it analyzes the collected data and recognizes the characteristics of certain action steps by combining the body part positions. This allows a quantification of the physical load using a time series analysis based on Deep Learning.

Real-time estimation of physical stress and representation of differences between correct and incorrect working posture
By automatically comparing the movement data of an actual worker with that of a model worker, specific differences in the movements are identified. The operator is then shown an evaluation of his movement sequences, which indicates body parts with increased load.

Hitachi and DFKI will use the newly developed AI solution to support production employees in operations and training. In addition, the partners want to create a more efficient and safe working environment by improving productivity through the use of already developed AI for activity detection.

Other applications of AI technology developed for the manufacturing and logistics industries include sports, fitness, and games.

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HITACHI
Inspire the Next

Launch of BIONIC-Project – An Intelligent Sensor Network Designed to Reduce the Physical Demands at the Workplace

▶ Many workers complain of symptoms caused by physical strain suffered in the workplace. The common causes for this are incorrect loading of the musculoskeletal system, monotonous movements, or an ergonomically unfavorable body posture. Older workers, in particular, often suffer from disorders of the musculoskeletal system or other limitations as a cumulative effect of their many years on the job.

DFKI, as coordinator of the EU-funded BIONIC project, is working with ten international partners to develop intelligent solutions that will reduce such health concerns.

Body Sensor Network (BSN) for real-time analysis of loads and correction of misalignments
Using a network of different sensors worn on the body, we are developing a system that measures the state of the worker's health based on movements over the course of the workday. The analysis is performed by an intelligent chip directly on the body, so that raw data can be preprocessed directly at the 'source,' enabling the real-time calculation of the data flows. Innovative risk analysis methods provide direct feedback about loads and misalignments. Playful applications and a training app motivate the user to counteract unilateral stress while also providing individualized and medical support for a home workout.

Further development of project EASY-IMP applications
Several partners have successfully worked on the development of a BSN as part of the EU sponsored and DFKI-managed EASY-IMP project. The predecessor project used small inertial measurement sensors (IMUs) attached to the clothing or affixed to the skin for the analysis of body movements. BIONIC is further developing the lightweight and modular design of the system to facilitate easier integration.

Biomechanical models and "Deep Learning" for ergonomic risk assessments
Algorithms for ergonomic risk assessment of physical loads are developed using biomechanical models of age-related and chronic impairments. Among the input parameters are things like posture, forces, and torques as well as physiological parameters like heart frequency and body temperature.

Project partners:
- ACCIONA Construcción S.A. – Spain
- Federal German Institute of Occupational Safety and Health (BAuA), Dortmund
- German Research Center for Artificial Intelligence (DFKI) (Project coordination)
- Fandación Laboral de la Construcción – Spain
- Hypercliq IKE, Greece
- Instituto de Biomechanica de Valencia, Spain
- Interactive Wear GmbH, Munich
- Roessingh Research and Development, University of Twente, Netherlands
- Rolls-Royce Power Systems AG – Friedrichshafen
- Kaiserslautern University of Technology – wearHEALTH Group
- University of Piraeus – Systems Security Lab, Greece

Project volume: approx. 4 million euros.
Project term: 01/2019 – 01/2022
Financial sponsor: European Union

Objective and subjective data form the basis of procedures that are then complemented by personalized algorithms for further use in Deep Learning methods. All generated data are stored in accordance with the EU Data Protection Directive.

"BIONIC – Personalized Body Sensor Networks with Built-In Intelligence for Real-Time Risk Assessment and Coaching of Ageing workers, in all types of working and living environments" is an interdisciplinary research project with eleven partners from medicine, biotechnology, electronics, information technology, and artificial intelligence. The project results will be validated in pilot tests with construction and factory workers.

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Coyote III climbing the rocky hills of Utah.

Mobile, Robust, and Adaptable – New Generation of Autonomous Space Robots

Space robots today are mostly passive observers and controlled by people back on Earth. Soon, however, they will be operating independently under extreme conditions for long periods. The DFKI Robotics Innovation Center develops innovative hardware and software concepts and tests them in a framework of analog missions here on Earth to ensure the demanding requirements on these systems can be met in space. Researchers are presenting their research findings at the DFKI stand (Hall 2, C59) at the Hannover Messe 2019.

▶ In future space missions, robots will be asked to perform ever more complex tasks: on alien planets, they are to explore hard-to-reach areas such as caves and craters, build infrastructure for future base camps, perform orbital maintenance and repair work on satellites, or remove orbiting space debris. Earth-based remote control of the systems is impractical simply because of the communication delay to distant celestial objects. Future space robots must therefore be capable of independent actions.

Pioneering design:
autonomy and multifunctional morphologies based on AI

The Robotics Innovation Center develops autonomous robotic systems that can fully perceive their surroundings for space applications using a variety of different sensors. To perform environmental detection, localization, and motion planning for the system, researchers in Bremen rely on artificial intelligence processes and algorithms, for example, machine learning methods. This results in robots that can decide and operate independently and, more importantly, learn from their own behavior. Only in this way, are deployments in the context of planetary and orbital missions over long periods and without human intervention possible.

Inspired by biology, scientists are developing innovative, highly complex mobility and morphology concepts for use on alien planets, specifically, for difficult terrain or terrain with some special scientific interest: these include multi-legged walking robots, hybrid systems that have leg-wheel designs, walking rovers with active drives, and upright and climbing systems in human-like forms. These reconfigurable systems have a modular design that can adapt flexibly to various conditions and tasking situations. These systems have the ability to perform challenging space missions, either alone or in robotic teams, or in combination with people.

Intuitive teleoperation systems
and Human-Robot Collaboration (HRC)

Control over autonomous robots should also be possible remotely from Earth or the spacecraft. Human intervention may be necessary, especially, when tasks require a high degree of flexibility. Researchers at DFKI are developing innovative teleoperation systems that are known for intuitive operation. Such systems can be remotely controlled, for example, from a control station using a portable exoskeleton that enables a force feedback circuit. The human operator has the feeling of being part of the action and can sense when the system encounters an obstacle.

In the near future, robots and astronauts will work together in space, for example, in constructing infrastructure. The DFKI research lab tests various grades of autonomy: the robot acts more or less autonomously depending on the complexity of the tasking. The astronaut intervenes by teaching a new behavior if the robot gets stuck. To achieve successful HRC, scientists study the latest methods of intention recognition and analysis, which includes taking physiological data into account, for example, by integrating the operator's emotions and state of mind in the planning or optimization of the robot action.

Out of the lab: Test for autonomous space robots

New systems are tested in so-called analog missions under realistic conditions outside the lab to ensure they will work as planned in the harsh environments of Mars or the Moon. Scientists from DFKI and the University of Bremen traveled to the Mars-like desert of the state of Utah in the American west at the end of 2016, to simulate a complete mission sequence and test the capabilities of the rovers SherpaTT and Coyote III. The purpose of the mission was to use a heterogeneous robot team to build a logistical chain that supports the autonomous exploration of the environment and taking of soil samples. Scientists used a mission control station located in Bremen, where a communication link was established via satellite to the robots in Utah. The operator was able to intuitively control the system at a distance of more than 8,300 km by means of the exoskeleton system.

In November 2017, DFKI researchers traveled to Tenerife (Canary Islands) for two-weeks of field testing of newly developed algorithms. The algorithms made it possible for the CREX and Asguard IV robots to explore the lava caves on the island of most interest to space exploration. More recently – from November to December 2018 – the researchers went to the Moroccan desert to test software developed together with European partners for use in space. They used SherpaTT, the DFKI hybrid walking and driving rover, as the robotic test platform. Thanks to the new software, it traversed a distance of more than 1.3 km through a landscape characterized by wide plains as well as steep slopes and deep ravines.

Technology transfer:
Space technologies for hostile environments on Earth

Robotic systems in space have a tremendous transfer potential: These systems are designed for use in rough terrain and are well-suited for use in extreme and hostile surroundings on Earth. For example, they can be deployed in deep undersea or contaminated areas. The robotic specifications to provide the necessary autonomy and manageability are very similar in such places, especially, in terms of their mobility, adaptability, and sturdiness. Bremen scientists have succeeded in further developing the SherpaTT robot for deployment in a deep sea scenario: it can also be used now as an autonomous underwater rover for sustainable resource extraction or for monitoring and inspection of deep-sea facilities. Also, they have equipped the micro-rover Coyote III with a gas sensor, which allows it, independently and without endangering human life, for example, to explore a hard-to-access building and detect any gas leaks after a disaster event.

CREX, the six-legged walking robot independently explores a lava cave on Tenerife.

Thanks to new software, the DFKI rover SherpaTT crossed the Moroccan desert autonomously, covering a distance of more than 1.3 km.

MORE INFORMATION

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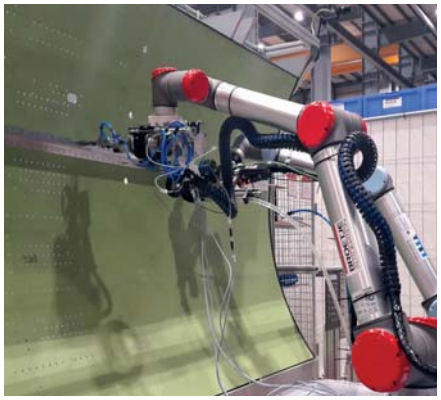
Riveting, Screwing, Gluing in Aircraft Construction – Smart Human-Robot Teams Master Agile Production

DFKI, together with partners Airbus Operations, Broetje Automation, EngRoTec, and The Captury, developed a technology demonstrator for scenarios in hybrid manufacturing in the aircraft construction industry. The demonstrator represents the results of Project "Hybr-iT – Hybrid and intelligent human-robot collaboration," which was funded by the Federal Ministry of Education and Research (BMBF).



Robots seating, clamping, and sealing rivet collars on aircraft components.
Photo: Broetje-Automation

▶ Partners at the DFKI stand (Hall 2, C59) are exhibiting how two people and six robots jointly master manufacturing tasks as a hybrid team. The robots perform the jobs that are non-ergonomic, repetitive, or physically strenuous for people, for example, the seating and sealing of rivets in an aircraft body or the assembly of the cable channels in the wings. The robots "organize around the humans," achieving the freedom and flexibility to complete their production schedule.

Humans perform the tasks that require higher cognition or sensory motor skills, such as fine adjustments and quality controls. Support is provided by means of an AR application and HoloLens glasses. The demonstrator is based on a controllable service-based infrastructure for INDUSTRIE 4.0 production systems, supplemented and enhanced by a resource-oriented architecture (ROA). The ROA enables the deployment of distributed components and sensors and access to them. Existing and new elements can be integrated with the ROA using Web standards.

Via the ROA, the integrated components supply information – conditions, sensor data, etc. (as "providers"), while they can also retrieve information from other components (as "consumers"). Subsequently, mobile and stationary robotics, sensor systems, environment detection, and tracking systems can be linked together and new services based on them can provide new capabilities (as "prosumers").
Semantically enriched, existing systems can also be encapsulated and approached in a homogeneous way, which ensures fast interchangeability. Such decentral deployment allows the local transfer of information without going through a central control unit. For example, the worker can be informed at all times about a status change of the workpiece or workflow, and sensor information from different sources can also be bundled and provided. The ROA supports a dynamic and adaptable implementation of Human-Robot Collaboration (HRC).

Hybr-iT is also researching and developing methods in 3D simulations from HRC scenarios. These methods provide a virtual safeguard for planned workflows and ensure a seamless transition from planning to initial operations. In addition, the processes are also modeled and the interplay between worker and robot actions are checked in advance for practical feasibility.

MORE INFORMATION
hybr-it-projekt.de

In the future, machines will perform manufacturing tasks that strain human capabilities.

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XAI 4.0 – Explainable Artificial Intelligence for INDUSTRIE 4.0

Leveraging Manufacturing Execution Systems (MES) for AI in production

▶ AI-based decision aids help subject matter experts as they make judgments in the context of their operational activities, especially, when complex information and systems are involved. The targeted use of data-driven decision making can lead to significant productivity gains in the manufacturing sector – assuming a successful operationalization and embedding of the cognitive insights into the business processes takes place. Such integration requires a change management process, which builds trust in the actions, inference mechanisms, and results provided by the deployed AI systems.

Although AI models are becoming increasingly precise, their "black-box-character" still poses a major obstacle for practical acceptance and use: So far, they provide little explanation to the experts about how the results and recommendations are reached. However, for a smooth deployment of the AI systems and their acceptance by the experts, it is essential that results be comprehensible, in other words, explainable. Explainability is seen as a way to increase user confidence in the models. Nevertheless, explainability is not a clearly defined term: it encompasses many different dimensions and goals. The quality and adequacy largely depend on the situational context of the decision and the characteristics of the user.

Findings from the cognitive sciences seem to confirm that while promoting understanding of the internal mechanisms of ML models for data scientist/engineers is very important, it is also accompanied by high cognitive stress even to the point of excessive demands. Post-hoc approaches to explanations rarely clarify how the model arrived at a conclusion, but they do provide useful information for the user and end customer of the ML systems.

XAI 4.0 demonstrates numerous machine learning post-hoc explanations for industrial use cases such as explanations with local and global surrogate models or case-related visual as well as counterfactual explanations where the target audience consists of subject matter experts.

Model-agnostic – as well as model-specific approaches to explanations – are presented, and hidden layer activations in deep neural networks are used to gain an understanding of the decisions of deep learning systems.

XAI 4.0 will be presented at the DFKI stand in Hall 2, C59 at the Hannover Messe.

MORE INFORMATION

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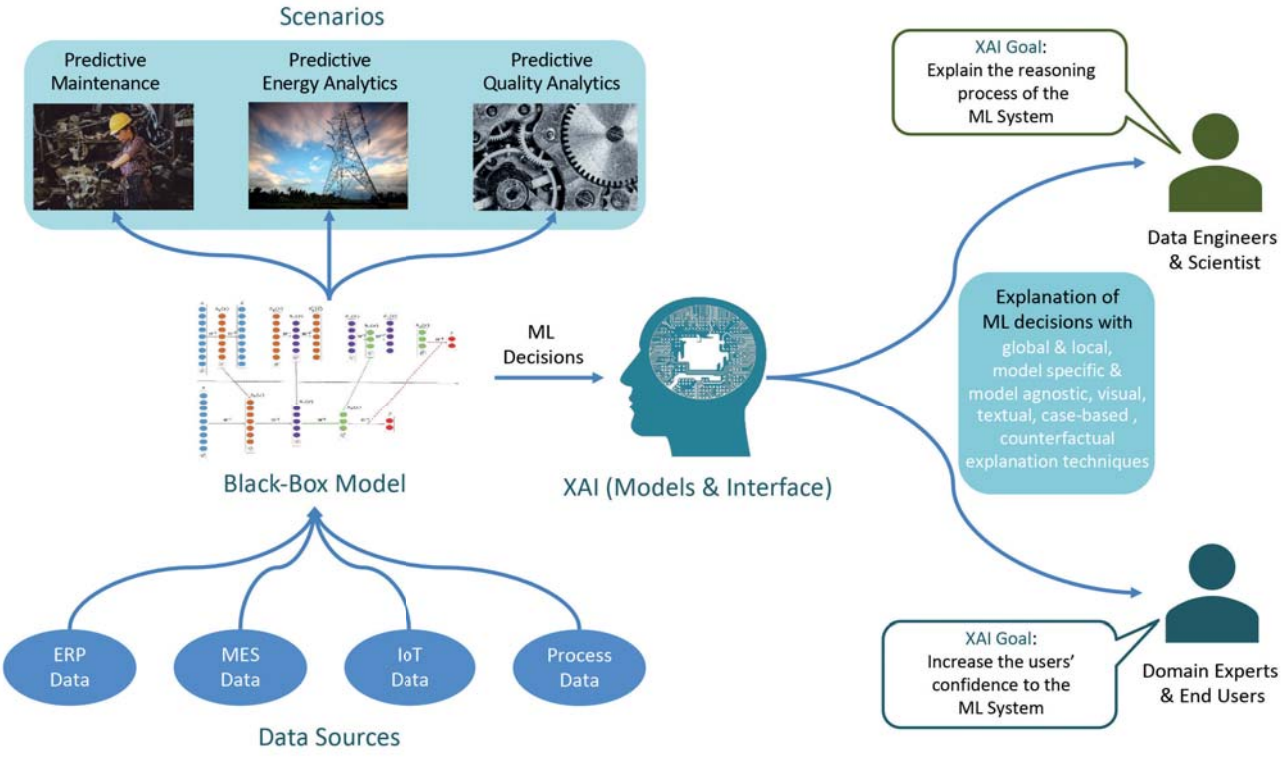

Artificial Intelligence in Manufacturing – Human-Centric Support

Smart factories that can touch, hear, see, and speak.

"Integrated Industry – Industrial Intelligence" is the theme of Hannover Messe 2019 and Artificial Intelligence is to be showcased there as the next logical step in the context of INDUSTRIE 4.0," said Prof. Dr. Martin Ruskowski, Head of Innovative Factory Systems research department at DFKI. This is the topic of the presentation by SmartFactory^{KL}, DFKI, and 15 partner firms at the Hannover Messe in Hall 8, D18.

▶ The aim is to show a range of entirely new possibilities in the field of manufacturing in the future based on data from networked machines. "As knowledge bearers, people will still play the key role in the future because, while AI collects and evaluates huge data volumes, a person is ultimately responsible for deciding the outcomes," said Ruskowski while adding: "The deployment of AI enables replication of the human senses in ways that facilitate better cooperation between machines and operators."

The partner consortium developed several use cases showing how AI can assist people in a production environment and will present these at the INDUSTRIE 4.0 demonstrator set up at the Hannover Messe. For example, condition monitoring is performed with the aid of algorithms. AI "hears" defective scraping noises or "feels" any undesirable vibrations and reports these anomalies (anomaly detection) to the operator.

The ERP system can automatically generate the predictive maintenance job order. A service technician receives the information via tablet, smartphone, or even via the display in data glasses. The potential of remote maintenance is facilitated by the use of AR, for example, the engineer back at the office can support the technician on site.

Prof. Dr. Detlef Zühlke, CEO of *SmartFactory*^{KL}, emphasized the potentials of AI applications: "Today, we can manage huge amounts of data and we can process complex algorithms. Enormous computing power for very little money is precisely "the Enabler," that AI needs to get rolling. Whether pattern recognition for the field of autonomous driving or augmented reality in the manufacturing sector – the market is meeting a technology that is suddenly cheap and available – also for SMEs."

The partners in the INDUSTRIE 4.0 Demonstrator 2019 at *SmartFactory*^{KL} are: B&R Automation, Bosch Rexroth, EPLAN Software & Service, Festo, HARTING, Huawei, IBM, KIST Europe, METTLER TOLEDO, MiniTec, PHOENIX CONTACT, Pilz, proALPHA, TÜV SÜD, and Weidmüller.

Information about the status of the machine is easily transferred, for example, using augmented reality in data glasses.
Photo: *SmartFactory*^{KL} / A. Sell

MORE INFORMATION

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AI is an important partner for people in the manufacturing sector. It performs fast and reliable evaluations of large amounts of data and returns filtered relevant information. Photo: *SmartFactory*^{KL} / A. Sell

Training Demonstrator for INDUSTRIE 4.0 – Hands-on Digitalization

The training demonstrator at the Mittelstand 4.0 Competence Center Kaiserslautern illustrates, in an entertaining way, how digitalization works in manufacturing. Visitors to the BMWi stand (Hall 8, C28) at Hannover Messe can produce an individual game cube in batch size 1.

▶ Supported by modern assistance systems, the demonstrator guides the visitor through the individual processing steps of the cube. The aim is to point out the different possibilities of networked production and make it a tangible experience. The demonstrator was developed for the training program at Competence Center Kaiserslautern and provides ideas about how to approach digitalization in a production environment step by step with the aid of assistance systems like 3D printers and RFID.

The Mittelstand 4.0 Competence Center (SME 4.0) Kaiserslautern is composed of four partners: The technology initiative *SmartFactory*^{KL} (coordinator), the German Research Center for Artificial Intelligence (RD Innovative Factory Systems and Institute for Information Systems), Kaiserslautern University of Technology, and the Institute for Technology and Labor, ITA (German: Institut für Technologie und Arbeit).

MORE INFORMATION
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Federal Ministry for Economic Affairs and Energy
on the basis of a decision by the German Bundestag

Project TACNET 4.0 – 5G as a Pioneer for INDUSTRIE 4.0

The Intelligent Networks research department introduces its research on 5G network optimization, self-healing, security, and performance gained in the project "TACNET 4.0 – Highly reliable and real-time capable 5G networking for INDUSTRIE 4.0." The tactile Internet for production, robotics, and digital transformation in industry will be presented in the 5G Arena (Hall 16, Stand D38).

▶ The Federal Ministry of Education and Research (BMBF) funds the TACNET 4.0 project with the goal of developing a standard industrial 5G communication system that comprehensively integrates a 5G network with industrial communication networks. This implies an expansion of the 5G concept with innovative industry-specific approaches, the development of inter-network adaption mechanisms as well as open interfaces between industrial and wireless systems.

One of the crucial aspects of TACNET 4.0 is the secure local and cross-location data transfer with minimal latency. An illustrative example would be the remote control of mobile machines or robots deployed to dangerous environments or in other cases where no local operators are available.

In addition to DFKI and Nokia Bell Labs as overall coordinators, the core partners in the TACNET 4.0 consortium are: ABB Research Center, Ascora GmbH, Robert Bosch, CommSolid, Götting, Institute for Industrial IT (inIT) of the OWL University of Applied Sciences in Lemgo, MECSware, NXP Semiconductors Germany, OTARIS Interactive Services, TU Dresden (Vodafone Chair for Mobile Communications Systems and Deutsche Telekom Chair for Communication Networks), and the University of Bremen.

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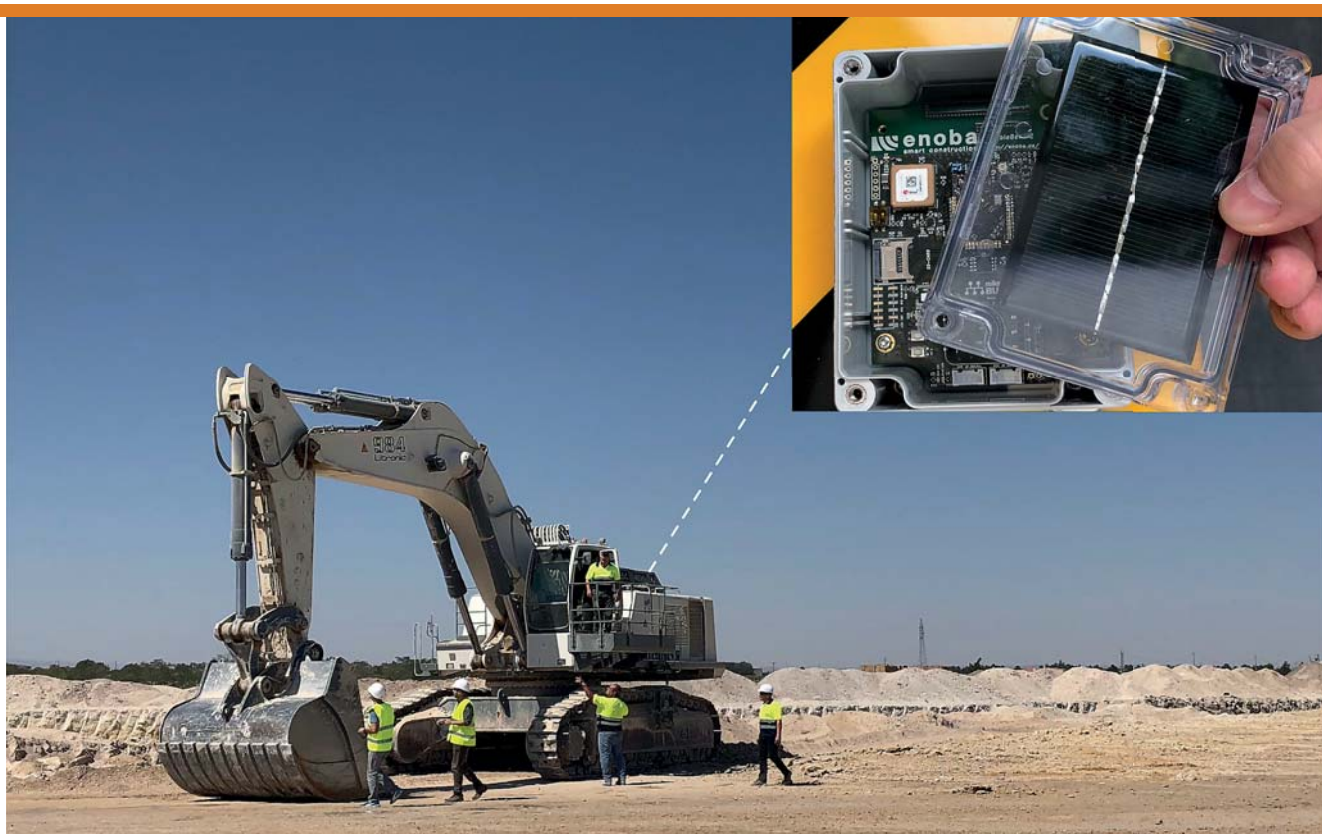

Spin-off project ENOBA integrates intelligent sensors for recording construction vehicle activity data. Photo: ENOBA

ConWearDi – Internet of Things at the Digitalized Building Site

At this year's Hannover Messe, the Embedded Intelligence department presents ways in which automated condition monitoring, remote management, and predictive maintenance may be implemented at a construction site. Intelligent networked sensors in construction materials, in the vicinity of the building site, or in the machines support the deployed AI systems.

▶ The ConWearDi project develops innovative, technology-based services driven by digital construction processes and connects different value chains in the context of the construction industry.

We have a lot of catching up to do in the construction and energy sectors in terms of digitalization. While BIM systems (Building Information Modeling) and modeling or simulation tools are used in building planning, the construction work, that is, the value-creating work performed at the construction site with its various trades, is still dominated by analog media and processes.

Using INDUSTRIE 4.0 technology, the project will develop a web-based platform that enables a digital information exchange between all involved in the construction process as well as intelligent planning and control services in addition to continuous quality assurance and documentation processes. If the implementation is successful, it will be possible in the future, to use real-time construction data for intelligent, on-site monitoring and control of the process flow.

The specific applications shown at the exhibit were developed in close collaboration with our partners in ConWearDi, for example, the detection of wear on attachments and material consumption at the tooling machines, or documentation of processes through activity detection. The system assists the local operator via context-relevant usage instructions and automated, optimal settings for the machines. Intelligent algorithms for long term analyses of automated internal temperature and humidity measurements of the building materials provide useful support for energy management and enable anomaly detection to identify possible construction deficiencies and predictions about the condition of an object.

Furthermore, practical findings from the "Enoba - Smart Construction" project funded by EIT Digital are demonstrated along with advanced developments achieved at the spin-off company of the same name. These include innovative, AI-driven services for construction and building trades and digitalization support across the entire value chain. The exhibit shows a system that records the activities of construction vehicles with integrated optimization of resources and routes.

Funding for the system is provided under the umbrella program "Innovations for the production, service, and work of tomorrow" by the Federal Ministry of Education and Research (BMBF).

MORE INFORMATION

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enoba.eu

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Teaching and learning processes are analyzed and modeled in the Immersive Quantified Learning Lab (iQL).

The activity detection function of HyperMind analyzes the user's position and direction of gaze and provides explanations if required.

HyperMind – The Anticipating Textbook

The anticipatory textbook from project HyperMind at the Immersive Quantified Learning Lab (iQL) is a dynamic-adaptive, personal textbook that helps enable individual learning. The static structure of conventional books is broken down, the book content divided into portions and, ultimately, the resulting knowledge blocks are associatively linked.

▶ Digital systems have long since become a part of daily life, including learning at schools, universities, or in further education courses. Traditional textbooks, on the other hand, are slow media. Books limit the learning possibilities and are based on assumptions about the best or the average learner. What is lacking is an adaptive system to turn an interactive textbook into an intelligent book that responds to the demands of individual learning, individual skills, and the needs of the learner.

While reading, data from sensor systems such as eye-tracking systems or electro-dermal bracelets are used to analyze the progress being made by the learner and what state of mind they are in. For example, the strain on the learner can be determined by measuring the temperature of the face with infrared cameras. In the case of reading difficulties, individual learning assistance or additional useful information is provided.

Combining data sources with intelligent algorithms such as those found in deep learning methods enables new insights into individual and group dynamic learning processes. All this data and insight leads to recommended teacher responses.

In the follow-on step, teachers analyze the data in detail to draw conclusions about learning behavior and learning progress.

"The system can help in the early identification of students that may, for example, need extra help in understanding a subject."

Prof. Dr. Andreas Dengel, Head of DFKI's Smart Data & Knowledge Services research department

The system also helps identify any special interests of the learner. "For example, if there is a frequent focus on a certain word, the system provides further information about it, similar to an Internet browser," said Professor Jochen Kuhn, head of the Didactics of Physics working group at the Kaiserslautern University of Technology.

An effort has been underway for a long time at TU Kaiserslautern and DFKI to make the latest technologies useful in training and education as well as for classroom instruction. HyperMind is a subproject of the "U.EDU project: Unified Education – Media education for teacher training," which is part of the federal and state "Quality offensive in teacher training" funded by the Federal Ministry of Education and Research (BMBF). Professor Dr. Norbert Wehn, Vice President for Programs and Teaching, has overall project management responsibility at the TU.

HyperMind will be presented at DFKI's Hannover Messe booth in Hall 2, C59.

MORE INFORMATION

www.iql-lab.de

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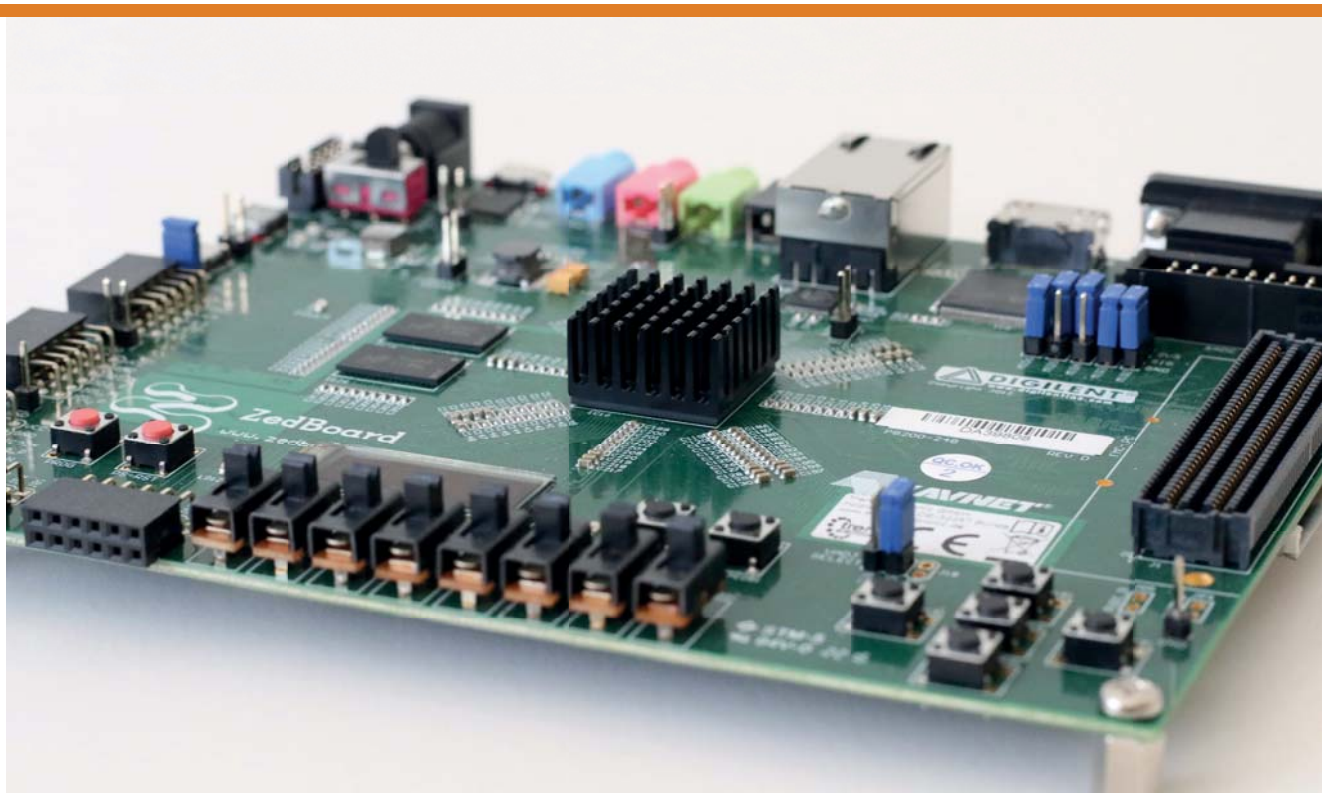

The prototype of a self-verifying system based on a ZedBoard as introduced at Hannover Messe.

Self-Checking Systems – Anomaly Detection and Correction With SELFIE

Computer systems need to be checked for correctness prior to market launch. However, because of time constraints and the complexity of today's computers, a full verification is often not possible. In the SELFIE project at DFKI's Cyber-Physical Systems department, headed by Prof. Dr. Rolf Drechsler, a fundamentally new approach is being developed that allows systems to self-verify after production and delivery. Researchers are presenting the prototype of a self-verifying system at the Hannover Messe.

▶ Today, embedded and cyber-physical systems are in use in the form of microchips in nearly all areas of everyday life – in smartphones, coffee machines, and electrical toothbrushes as well as in essential safety applications for trains, airplanes, and medical implants. To ensure the correctness of these increasingly complex systems, they are checked for errors during the design phase by various verification procedures. The problem: The growing complexity and ever-shorter product launch cycles force engineers to complete the verification process even though no assurance of full functional correctness can be given at that point. Consequently, errors in the final product often remain undetected.

In Project SELFIE, scientists at DFKI are breaking new ground in how to approach system verification. Equipping devices with additional hardware and software enables them to complete all unfinished verification tasks while in use by the end users. The checks can be accomplished much faster subsequent to delivery since they can be limited to the actual functionality, whereas the verification performed in the design phase must take all possible use scenarios into account. The manufacturer can react quickly if the self-check reveals errors in the system, either with updates, the disabling of certain functionalities, or if necessary in the worst case, a recall.

The method is based on a comprehensive formal design process. Based on the specifications, a model of the system is created that serves as the basis for implementation. In parallel, the characteristics to be verified are prepared in a format that can be detected during operation of the target system. The prerequisite for success in proof of correctness check is having advance knowledge of as many operating parameters as possible. For example, the various sensor controls of a smart home (light, movement, door sensors) and actuators (light, heat, or blinds) can be linked together using certain rules – e.g., "When it gets dark, and a person is in the room, switch on the light. If no one is in the room, the light must remain off." By defining specific use scenarios, checking all possible combinations of sensors and actuators becomes superfluous and the calculation time is much faster. Scientists will demonstrate the new method using a Smart Home System at the Hannover Messe: The user configures the system and then initiates the self-verification. Only if this check returns a successful result, the application is started.

MORE INFORMATION

www.dfki.de/cps/research/projects/SELFIE

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Intelligent Value-Adding Services for Everyday – Guided AL Research Project Successfully Completed

Guided AL
Guided Autonomous Locations

More and more intelligent buildings are being equipped with future-oriented digital technologies with extensive sensor and control possibilities. However, existing systems are often not compatible or are limited to only one building. Guided AL (Guided Autonomous Locations) makes the leap from language assistant to "Smart Service" (intelligent value-adding services) by developing an integrated automated solution for everyday needs (health, work, living, shopping). On February 4-5, 2019, the final project symposium was held at DFKI's Innovative Retail Laboratory (IRL) in St. Wendel.

"Artificial Intelligence (AI) reaches the mass market through applications like Alexa, Google Search, and Smart Living – things that affect people directly and provide the topic with a broader base of interest."

Prof. Dr. Philipp Slusallek,
Head of DFKI's Agents and Simulated Reality department

▶ The project integrates separate systems based on established web standards into a system-independent service platform for Smart Services that proactively provides faster, safer, and smarter support to people. The goal was to develop simple, useful operational prototypes. Data protection and data security are important additional design components. Non-functional applications like IT-security and physical access controls were also implemented. Only a platform designed with the security-by-design principle can satisfy the high demands of critical environments.

The team around Prof. Slusallek created "autonomous locations software" for use in building automation. The focus was on the safety mechanisms and the use of public-key infrastructure (PKI). Several different application scenarios were designed in collaboration with the Innovative Retail Laboratory (IRL).

The final symposium featured expert presentations on interoperability, standardization issues, and the general importance to business and society. In the second part of the symposium, participants learned about the individual stations in Guided AL-Smart Services. The prototypes provide digital assistants that support people, for example, in finding a parking space or when shopping.

The assistant integrates system- and format-independent data from various sources when searching for a parking space.

The German Federal Ministry for Economic Affairs and Energy (BMWi) sponsored the collaborative project in the context of the technology competition "Smart Service World – Internet-based services for businesses." Project term was three years and ended on February 28, 2019. Project sponsor was the German Aerospace Center (DLR).

Project partners:
- banbutsu GmbH
- German Research Center for Artificial Intelligence, DFKI
- Hager Electro GmbH & Co. KG
- Institute for Communication Technology at the University of Applied Sciences, Dortmund
- Scheer GmbH (lead manager)

MORE INFORMATION
guided-al.de

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Supported by:

Federal Ministry for Economic Affairs and Energy

on the basis of a decision by the German Bundestag

SmartMobi Project Launch – Modular System for Mobile INDUSTRIE 4.0 Apps

▶ The 4th Industrial Revolution (INDUSTRIE 4.0) and a general trend towards digital automation in many business sectors are leading to the increasing use of mobile devices in manufacturing enterprises. Many lightweight development environments exist today for the development of desktop applications. In contrast, mobile apps for smartphones or VR glasses are scarce – especially, in the area of flexible, dynamic production environments where such applications are often costly and time-consuming individual solutions. Consequently, small and medium-sized enterprises are hindered in the effort to take innovative leaps and try novel business models, particularly, because such mobile apps are unaffordable. Innovative development platforms for mobile applications are required to respond to the increasing use of mobile devices on the shop floors and the need for faster and more cost-effective development of appropriate applications in the area of INDUSTRIE 4.0. Such development platforms for INDUSTRIE 4.0 apps have special requirements related to the large number of linked components (e.g., sensors, actuators, computers) as well as the large number of heterogeneous data sources that have to be processed (enterprise resource planning, production planning and control systems, human resources, accounting, merchandise management, all with various databases, sensor data, etc.).

DFKI partnered with Incloud, HELLA, and Brabant & Lehnert to create a modular-based, development platform for mobile apps. In the new system, pre-assembled modular components can be bundled together by means of standard interfaces via a graphic user web and then released as a mobile device or a web application. The modular system significantly reduces the development time and effort for mobile, INDUSTRIE 4.0 apps and facilitates innovation advances at manufacturing companies.

An initial scenario, implemented in cooperation with HELLA, demonstrates a locating service that can locate a mobile magazine with circuit boards on the production site in real time and monitor these with respect to various quality parameters via a mobile device. Brabant & Lehnert sets its priority on machine availability management. They develop mobile applications to support the service technician with the maintenance of the machine park. Further application scenarios will be defined after a process evaluation and then developed as a function module.

Project partners:
- Brabant & Lehnert, Wadern
- German Research Center for Artificial Intelligence, DFKI
- Incloud Engineering, Darmstadt (project coordination)
- HELLA, Lippstadt

Total volume: approx. 1.5 million euros
Project term: 01/2019 to 06/2021
Financial sponsor: Federal Ministry of Education and Research (BMBF)

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MORE INFORMATION
www.dfki.de/iwi

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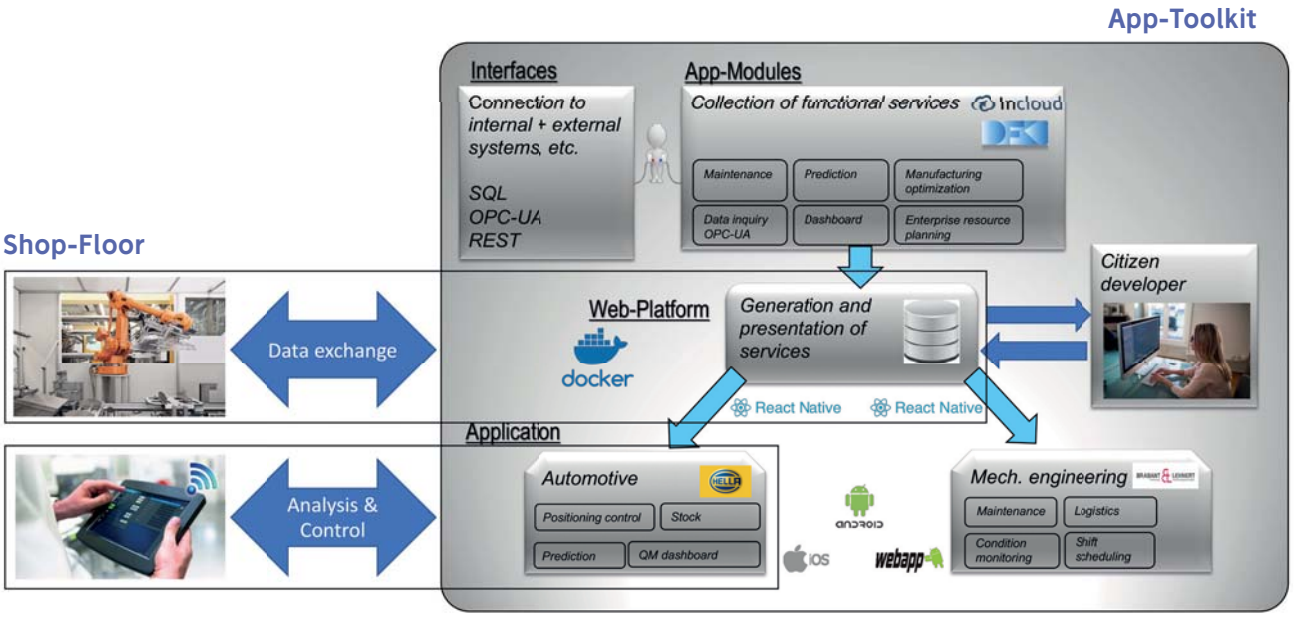

Photos: HELLA, Sigmatek

Smart Data for Mobility SD4M – Intelligent Data Management for Travel Planning

Smart Data

▶ DFKI is represented at the Hannover Messe as a research partner of DB Systel at the VDI Stand (Hall 2, C40). The exhibit features a presentation of the joint Smart Data for Mobility (SD4M) project being developed by DB Systel, DFKI, and other partners. In SD4M, researchers are working on a cross-sector service platform that integrates, edits, and shares data from different mobile service providers and social media data. SD4M is funded by the German Federal Ministry for Economic Affairs and Energy (BMWi) for a term of three years.

DB Systel used the results of the project to further develop the internal "Early Bird" early warning system, which has been in operation now for several months. Future-oriented, joint research topics will also be presented, including the recently launched SIM3S (Smart Inclusive Multi-Modal Mobility Service) project, which is funded by the Federal Ministry of Transport and Digital Infrastructure (BMVI) and aims to develop a user-centered mobility platform, specially designed for people with physical disabilities.

Speakers Ingo Schwarzer from DB Systel, Fellow Chief Digitalist and head of operations in Berlin, and Dr. Sven Schmeier are making presentations on Tuesday, April 2, 2019 and Thursday, April 4, 2019, each at 2:40 - 3:00 p.m. at the VDI Speakers Corner. (Hall 2, C40).

The SD4M demonstrator aggregates data and informs about possible delays along the planned route of travel.

MORE INFORMATION

www.sd4m.net

Supported by:

Federal Ministry for Economic Affairs and Energy

on the basis of a decision by the German Bundestag

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DFKI Participates in New Special Research Field "Foundations of Perspicuous Systems"

▶ Saarland University, the Max Planck Institutes for Informatics and for Software Systems, and the Technical University of Dresden are partners in a new transregional collaborative research center called "Foundations of Perspicuous Software Systems." Researchers want to better understand and provide a scientific foundation for computer-aided systems that self-explicate their functionalities and behaviors. Scientists call these new types of software "perspicuous systems." DFKI is involved in one of the 15 sub-projects of the special research area, namely the subject "Safe Handover of Control."

The handover of control between humans and machines is critical, particularly, in autonomous driving or in the mixed human-robot teams in industrial production. To ensure these proceed without incident, scientists at DFKI's Cognitive Assistants department must consider the technological sub-aspects of the handover situation. They will use various methods of human-computer interaction and natural language generation to develop solutions for a safe and seamless handover and to explain the relevant situational aspects to the user. Descriptive logic-ontologies and a standard basic vocabulary will be used to characterize user- and situational aspects. Ultimately, their aim is to make the human factors of human-machine systems more accessible for formal analysis and contribute to overall safety.

MORE INFORMATION

www.perspicuous-computing.science

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Joint research on AI for higher education (l. to r.): Prof. Christoph Igel, Dr. Milos Kravcik, Dr. Xia Wang (all DKFI), Christina Gloerfeld, Prof. Claudia de Witt and Silke Wrede (all FernUniversität). Photo: FernUniversität in Hagen

AI.EDU Research Lab Together With FernUniversität in Hagen

▶ FernUniversität in Hagen and the German Research Center for Artificial Intelligence (DFKI) are cooperating on research into the use of Artificial Intelligence in university education. Within the framework of the focus of research at FernUniversität, "Diversity, digitalization, and lifelong learning," the two institutions have agreed on a close exchange and consultancy services on current research, development and transfer topics associated. The aim is to identify topics for joint projects. As an initial cooperation project, the "AI.EDU Research Lab" is being set up on the premises of FernUniversität, and will be jointly supported by the Educational Technology Lab of the DFKI, led by Professor Christoph Igel, and the Education Theory and Media Didactics subject area at FernUniversität, led by Professor Claudia de Witt.

Employees of both institutions are working together across disciplines to research and test Artificial Intelligence methods and applications in both studies and teaching at FernUniversität. Machine learning methods and knowledge-based expert systems are being used to assist individual learning and study organization. "With the DFKI we have won over one of the leading research establishments in the field of Artificial Intelligence," says Professor Ada Pellert, Rector of FernUniversität. "The Federal Government has just positioned AI as the central building block of its digitalization strategy for Germany. We believe that together with the DFKI we can make a substantial contribution here to the university education area."

Scientist Claudia de Witt adds: "Artificial Intelligence is going to substantially change teaching, studying and the way studies are organized at the university. So, we are greatly interested in deploying knowledge-based expert systems and machine learning in university education together with the experienced DFKI. We are also eager to design models for intelligent supporting systems for teaching and learning." Also, scientist Christoph Igel reiterates: "With its wide-ranging data from more than 75,000 students, FernUniversität has the potential to become a model institution in the use of AI in studying, teaching and further education in Germany and worldwide." Researching the effectiveness of AI for a varied student population while taking account of ethical guidelines is also on the agenda for both cooperation partners.

MORE INFORMATION

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EdTec

Designing Personalized Learning Environments for Students

▶ The central question is: "What should design concepts that make the proven quality of individual mentoring scalable for the acquisition of competencies look like?". Eight project partners throughout Germany have formed a consortium managed by Leipzig University which will operate until March 2022, researching concepts for personalized learning environments and mentoring for the students of today and tomorrow.

The joint project "Personalized competence development through scalable mentoring processes – tech4comp" was launched in October 2018 and is funded by the Federal Ministry of Education and Research under the "Innovation potential of digital higher education," funding line with a total budget of € 7.4 million for the next 42 months. There is an extension option until September 2024; which will be funded with a further € 5.2 million in the case of approval.

„The project is a response to the changed realities of, and access to, learning in the digital age. We also want to take account of the diversity of our students, and use technology to enable individual accesses to study."

Prof. Dr. Heinz-Werner Wollersheim,
Manager of the joint project and holder of the professorship for General Pedagogy at Leipzig University

Scientists at the Faculty of Education at Leipzig University are working with colleagues from the Technische Universität Dresden (TU Dresden), the Educational Technology Lab of the German Research Center for Artificial Intelligence (DFKI), Martin Luther University Halle-Wittenberg, Chemnitz University of Technology (TU Chemnitz), Leipzig University of Applied Sciences (HTWK Leipzig), Freie Universität Berlin and RWTH Aachen University to research how students' learning processes can best be supported. The project focusses on technology-enhanced mentoring and mentoring tools.

„The interdisciplinary focus of the project enables us to access the area of student learning from a variety of directions: thus, we are opening up not only different study disciplines but also broad access to the way the various faculties approach methods and research."

Prof. Dr. Christoph Igel, Scientific Director of the Educational Technology Lab at DFKI

The latter's experience in supporting training, qualification and education processes with innovative software technologies and artificial intelligence applications will also be used during the project. The test area comprises subjects that involve different amounts of structure: mathematics at HTWK Leipzig, mathematics-related subjects at the TU Chemnitz, and in terms of teacher training, the educational sciences at Leipzig University and the TU Dresden.

„In order to be able to establish technology-supported mentoring in the universities on a sustainable basis, we must examine the effectiveness of the offers and provide concepts for structural anchoring in order to support teachers as well as the staff of the university administrations in coping with the associated challenges."

Prof. Dr. Thomas Köhler, TU Dresden

This project will also have a significant impact on the further development of digitally supported university teaching in Saxony in general, with a total of four Saxon universities participating in the joint project.

MORE INFORMATION
edtec.dfki.de

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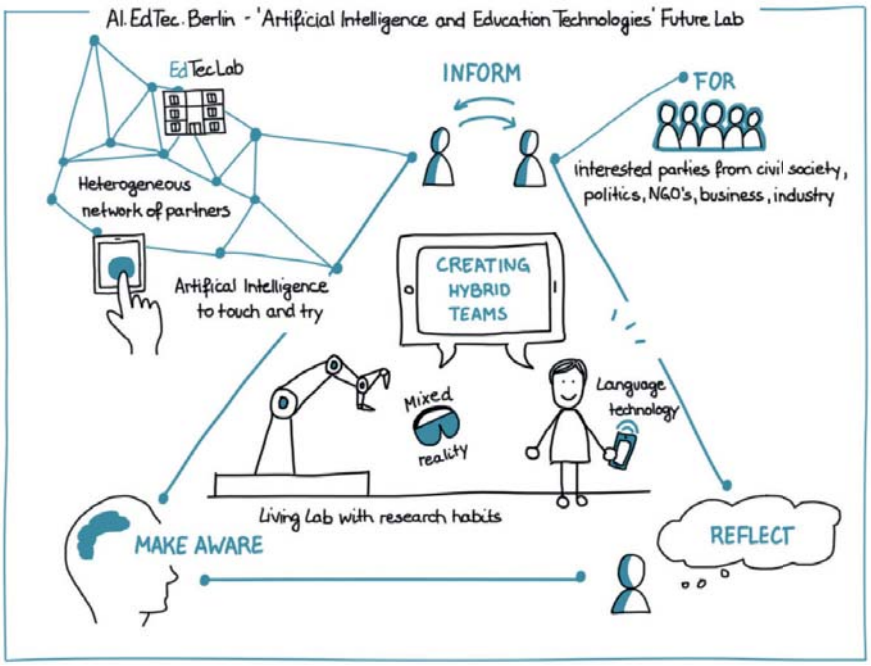

Robots and Language Technologies for Clinical Health Education

Good friends take good care of each other and, sometimes, offer suggestions and give advice. The goal of an EU project called PAL "Personal Assistant for a Healthy Lifestyle" was to develop artificial "pals" in the form of a NAO robot to assist children that have chronic illnesses to self-manage medications and to live a healthy lifestyle.

▶ The final project event was held in Amersfoort (The Netherlands) and Milan (Italy) on February 6, 2019 where partners presented the PAL research results and the integrated system developed in the project in a series of lectures and discussion forums with clinical professionals, stakeholders, and the public.

The PAL project was designed to provide an innovative, interactive learning system that minimizes future health risk for patients with a chronic illness, increases their autonomy in dealing with the illness, and facilitates an overview of the condition for medical personnel. It is primarily intended to support children with Type 1 diabetes age 7 to 14, their parents, and the attending healthcare staff (diabetologists, nutritionists, caregivers, psychologists).

The applications rely on social contact between the virtual assistant and the young patients to establish a long term affinity to the content to be conveyed. PAL mentors the user in acquiring the required knowledge and the daily measurements and treatments. The system analyzes the data and interactions over time and uses a variety of different motivation methods like positive reinforcement and gamification to encourage patient autonomy.

NAO robots act as personal assistants for a healthy lifestyle.
Photo: TNO

The training system for patients with chronic illnesses developed in PAL was displayed at the closing event in Amersfoort.
Photo: Delf University of Technology / Rifca Peters

Research and development efforts at eleven research institutes, businesses, and medical facilities over a four-year period in four EU countries flowed into the development of this integrated system. The result is a cloud-based platform for use in mobile health apps that consists of a social robot and its virtual Avatar. Various web applications provide status information to patients, parents, and healthcare staff in a concise and compact panel format. Experimental testing of PAL was conducted with more than 40 long term volunteers in a 3-month series of practical tests.

DFKI developed the multimodal communication function with the robot or avatar for the user, specifically, the voice and dialog capabilities. The use of the system over a long period of time posed a special challenge. To win acceptance of the virtual assistant as a trustworthy companion that can react to past interactions and events required intelligent storage of all data to enable drawing conclusions based on developments over time. DFKI also provided this technology in the form of a specialized knowledge base that allows efficient deductive algorithms that use time-varying data.

MORE INFORMATION
www.pal4u.eu

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DFKI INTERVIEW – **DR. ALJOSCHA BURCHARDT**


Photo: Oliver Strasse

Aljoscha Burchardt is responsible for strategic communications at DFKI Berlin. These duties include interviews, panel discussions, and lectures at public events, at association gatherings, and other political venues in the capital city.
He also serves as an expert member of the rcently formed Study Commission for AI (German: Enquete-Kommission) of the German Bundestag. In addition, he works as lab manager and provides content, administrative, and project acquisition assistance to the head of the Speech and Language Technology department, Prof. Sebastian Möller.

What do you see as the potential applications of your research?

When I began to study the quality of machine translation (MT) almost ten years ago, research had completely bypassed the needs of the industry. The quality assessments were automatically based on comparing the output of the MT system to a human "reference translation," which resulted in the assignment of a numerical value. Researchers loved it, but it was of minimal practical use. In several collaborative projects with language industry partners since that time, we have developed a detailed error metric, which is called Multidimensional Quality Metrics (MQM). It is currently being standardized in the USA. The Directorate-General for Translation (DGT) of the European Commission is contributing to the process. Many translation tools in use throughout the industry today are already using MQM.

When did your interest in Artificial Intelligence begin and how have AI processes changed since that time?

I started studying computer linguistics in 1995. We have witnessed a paradigm change since then. Initially, we attempted to grasp the structure and meaning of language using symbolic knowledge representations, such as in the form of attribute structures, syntax trees, or logic equations. However, language is very flexible and filled with exceptions, and these approaches never returned a dividend. Today we work with data-based probabilities and statistical models, where words have practical meaning only in context, that is, together with the surrounding words. This approach is driving the ongoing cutting edge research into neural networks and deep learning.

What are the greatest challenges and opportunities for AI systems?

The systems are gradually filtering into the society and it is important to help people recognize the potential, as well as the limitations. The emotionally loaded term "AI" is, unfortunately, somewhat counterproductive. Automation and AI actually give us the chance to reset to the zero hour, at which time we can reassess and redesign many processes and practices.

What are your favorite interests outside of your work as a research scientist?

My family and when they let me, my record collection.

Do you see any parallels to your professional work?

Most of the time, things revolve smoothly. Once in a while, however, there may be a scratch, but that doesn't push things out of the groove.

What are your current work projects?

One project involves the integration of people with impaired vision. Another is about providing knowledge and document management support to major industrial projects along with sample process comparisons; basically, projects covering a wide range of issues.

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Teaching excellence – Team around Prof. Dr. Rolf Drechsler receives Berninghausen Prize 2018

Prof. Dr. Rolf Drechsler and his team were awarded the Berninghausen Prize 2018 in category "Outstanding and innovative teaching" in December 2018. The team was selected because of its innovative course "BugRunner," a bachelor degree project in the Computer Science department that focused on an automated search for errors in hardware-related software. The annual prize is an endowment from the Berninghausen Family Foundation to recognize outstanding programs in university level teaching since 1991. The award is made by University of Bremen and the "unifreunde" Association (Friends of the University of Bremen and International University Bremen).

(l. to r.) Prof. Dr. Oliver Keszöcze (formerly DFKI, currently Friedrich-Alexander University Erlangen-Nürnberg), Dr. Kenneth Schmitz (formerly DFKI, currently OHB), Prof. Dr. Rolf Drechsler (University of Bremen/DFKI), Dr. Jannis Stoppe (formerly DFKI, currently DLR), Dr. Cornelia Große (University of Bremen) Photo: University of Bremen / Harald Rehling

Prof. Dr. Rolf Drechsler elected dean

At the ninth meeting of the faculty council in December 2018, Prof. Dr. Rolf Drechsler was unanimously elected Dean of Faculty 3, Mathematics and Computer Science at the University of Bremen. He succeeds Prof. Dr. Kerstin Schill. The term of office for Professor Drechsler runs until the committee elections in 2019.

GI-FBKI statement for Digital Summit 2018 on the German government's AI strategy

The Artificial Intelligence department of the German Informatics Society (GI-FBKI) released an extended statement on the government's AI strategy at the Digital Summit in Nuremberg on December 3, 2018. The spokesperson for the department is Dr. Matthias Klusch, Senior Researcher at DFKI's Agents and Simulated Reality department.

The GI-FBKI position demands specifics about implementation and coverage of all sub-areas of AI, not just machine learning and data science.

The challenge of AI research is not so much perfecting individual areas of AI, as it is their methodical integration for efficient problem solving in a non-discriminatory and easily clarified form for people and suitable for reuse in other, related cognitive tasks. At the same time, AI research itself must be more active and visible to the public in important critical societal debates over the risks and opportunities of its application.

More information
gi.de/meldung/digital-gipfel-gi-veroeffentlicht-stellungnahme-zur-ki-strategie-der-bandesregierung

"Smart Pants" at CES 2019 in Las Vegas

The Japanese manufacturer of smart textiles Xenoma, together with DFKI and spin-off wearHEALTH has developed a practical motion-capturing solution for the lower body.

The "Smart Pants" system consists of seven, six-axis sensor units (IMUs) and is dressed and ready for use in a just few seconds. A variety of diverse applications are useful in the areas of rehabilitation, sports, occupational safety, and anywhere a detailed and robust motion detection system may be required.


Photo: Xenoma

EIT announces new network for innovation in the manufacturing sector

DFKI's Innovative Factory Systems department and the Institute for Information Systems at DFKI are part of the European consortium which consists of 50 partners that recently won the EIT Manufacturing competition of the European Innovation and Technology Institute (EIT). The new EIT Manufacturing network is to be headquartered in Paris with an additional five Innovation Centers, so-called, Co-location Centers (CLC), to be established across Europe. DFKI represents, together with eight other German partners, the Innovation Hub CLC Central, which is based in Darmstadt and also covers The Netherlands and Belgium. DFKI is now involved in two EIT partner networks, the first being EIT Digital.

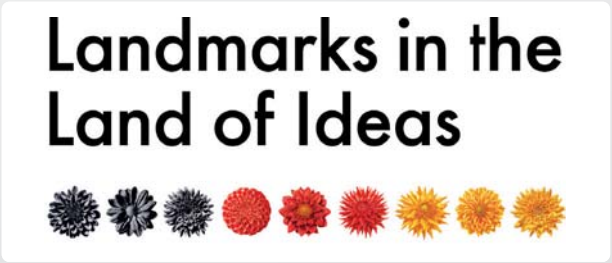
More information
eit.europa.eu/eit-community/eit-manufacturing

Prof. Dr. Antonio Krüger is new head of Cognitive Assistants research

Effective on February 1, 2019, Prof. Dr. Antonio Krüger became the new head of the Cognitive Assistants department (formerly Intelligent User Interfaces), taking over from Dr. Wolfgang Wahlster.

The new CEO, Prof. Dr. Jana Koehler, has set a priority focus on “INDUSTRIE 4.0” and “Energy Informatics” and will lend her support to this work.

Selected Places in the Land of Ideas – Reception for winners at Bremen City Hall and Rhineland-Palatinate State Chancellery



In June 2018, two DFKI projects were selected among the 100 innovative winners of the “Selected Places in the Land of Ideas” competition. The projects are “Entern – Autonomous Robots for Planetary Exploration” at the DFKI Robotics Innovation Center and the University of Bremen and “AlterEgo – Digital Twins for Interactive Training” at DFKI Kaiserslautern.

On November 9, 2018, Dr. Carsten Sieling, the mayor of Bremen received the state's winners – including Steffen Planthaber, DFKI scientist and the project leader of “Entern” – in a festive celebration at the Bremen City Hall. The permanent representative of the Chief of State Chancellery, Inge Degen, received the winners from Kaiserslautern Alter Ego and Digital Cities, along with Upcycling-Center from Neunkirchen on November 29, 2019 at the State Chancellery in Mainz.

Dr. Carsten Ullrich awarded DFKI Research Fellowship

In recognition of his outstanding scientific contributions and innovative implementation, Dr. Carsten Ullrich was named as a distinguished DFKI Research Fellow on November 22, 2018.

Carsten Ullrich received his Ph.D. from the Department of Computer Science at Saarland University in 2008. His thesis subject was the formalization of pedagogical knowledge using AI applications for the automatic generation of learning materials. During his research stay at the Shanghai Jiao Tong University in Japan, he focused on web-based and mobile learning in adult education.

As the deputy head of the Educational Technology Labs at DFKI Berlin, he was responsible for a number of research projects in which the architectures for assistance and knowledge services were developed and deployed. He has written more than 100 publications about learner assistance, adaptivity, modeling didactic knowledge, and personal learning environments (PLE).


Kaiserslautern Site


Saarbrücken Site


Bremen Site


Project Office Berlin

German Research Center for Artificial Intelligence

Company Profile

- **Established**
  1988, non-profit organization (public-private partnership)
- **Executive Board**
  - Prof. Dr. Jana Koehler, CEO
  - Dr. Walter Olthoff
- **Supervisory Board**
  - Prof. Dr. h.c. Hans-Albert Aukes, Chair
  - Dr. Susanne Reichrath, Representative of Saarland's Minister President for Higher Education, Science and Technology, Vice Chair
- **Locations**
  Kaiserslautern (registered office), Saarbrücken, Bremen, Berlin (project office). Further operating sites in Osnabrück and St. Wendel
- **Shareholders**
  Accenture, Airbus Group, BMW AG, CLAAS KGaA mbH, Daimler AG, Deutsche Börse AG, Deutsche Messe AG, Deutsche Telekom AG, Empolis Information Management GmbH, Fraunhofer Gesellschaft e.V., Google Inc., HARTING AG & Co. KG, Intel Corporation, John Deere GmbH & Co. KG, KIBG GmbH, Microsoft Deutschland GmbH, Nuance Communications Deutschland GmbH, RICOH Company Ltd., Robert Bosch GmbH, SAP SE, Software AG, University of Kaiserslautern, Bremen University, Saarland University, Volkswagen AG, VSE AG
- **Equity Holding**
  - GraphicsMedia.net GmbH, Kaiserslautern
  - Groand Truth Robotics GmbH, Bremen
- **Key Figures 2018**
  - Annual Budget: ca. 49 Mio. Euro
  - Total Assets: ca. 114 Mio. Euro
  - Professional staff: 567
  - Graduate student staff: 452

Intelligent Solutions for the Knowledge Society

The German Research Center for Artificial Intelligence (DFKI) was founded in 1988 as a non-profit public-private partnership. It has research facilities in Kaiserslautern, Saarbrücken and Bremen, a project office in Berlin, and branch offices in Osnabrück and St. Wendel. In the field of innovative commercial software technology using Artificial Intelligence, DFKI is the leading research center in Germany.

Based on application oriented basic research, DFKI develops product functions, prototypes and patentable solutions in the field of information and communication technology. Research and development projects are conducted in seventeen research departments and research groups, eight competence centers and eight living labs. Funding is received from government agencies like the European Union, the Federal Ministry of Education and Research (BMBF), the Federal Ministry for Economic Affairs and Energy (BMWi), the German Federal States and the German Research Foundation (DFG), as well as from cooperation with industrial partners. Twice a year, a committee of internationally renowned experts (Scientific Advisory Board) audits the progress and results of state-funded projects. In addition, BMBF evaluates DFKI regularly. The most recent assessment was again very successfully concluded in 2016.

Apart from the state governments of Rhineland-Palatinate, Saarland and Bremen, numerous renowned German and international high-tech companies from a wide range of industrial sectors are represented on the DFKI supervisory board. The DFKI model of a non-profit public-private partnership (ppp) is nationally and internationally considered a blueprint for corporate structure in the field of top-level research.

DFKI is actively involved in numerous organizations representing and continuously advancing Germany as an excellent location for cutting-edge research and technology. Far beyond the country's borders DFKI enjoys an excellent reputation for its academic training of young scientists. At present, 567 highly qualified researchers, administrators and 452 graduate students from more than 65 countries are contributing to more than 250 DFKI research projects. DFKI serves as a stepping stone to leading positions in industry and successful careers as founders of spin-off companies. Over the years, more than 140 staff members have been appointed professors at universities in Germany and abroad.

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Research & Development

Research Departments and Research Groups

Kaiserslautern Site
- Prof. Dr. Prof. h.c. Andreas Dengel: Smart Data & Knowledge Services
- Prof. Dr. Paul Lukowicz: Embedded Intelligence
- Prof. Dr. Martin Ruskowski: Innovative Factory Systems
- Prof. Dr. Hans Schotten: Intelligent Networks
- Prof. Dr. Didier Stricker: Augmented Vision

Saarbrücken Site
- Prof. Dr. Josef van Genabith: Multilinguality and Language Technology
- Prof. Dr. Antonio Krüger: Cognitive Assistants
- Prof. Dr. Peter Loos: Institute for Information Systems
- Prof. Dr. Wolfgang Maaß: Smart Service Engineering
- Prof. Dr. Philipp Slusallek: Agents and Simulated Reality

Bremen Site
- Prof. Dr. Rolf Drechsler: Cyber-Physical Systems
- Prof. Dr. Dr. h.c. Frank Kirchner: Robotics Innovation Center (RIC)
- Prof. Dr. Joachim Hertzberg: Plan-Based Robot Control, RIC Branch Office Osnabrück

Project Office Berlin
- Prof. Dr. Christoph Igel: Educational Technology Lab
- Prof. Dr. Gesche Joost: Interactive Textiles
- Prof. Dr. Volker Markl: Intelligent Analytics for Massive Data
- Prof. Dr. Sebastian Möller: Speech and Language Technology

Living Labs

Testing, evaluation, and demonstration of innovative technologies in comprehensive application scenarios

Advanced Driver Assistance Systems Living Lab, Bremen Ambient Assisted Living Lab, Immersive Quantified Learning Lab (IQL), Innovative Retail Lab, Robotics Exploration Lab, Smart City Living Lab, SmartFactory-KL, Smart Office Space Living Lab

Competence Centers

Coordination of research activities in particular areas

Ambient Assisted Living, Autonomous Driving, Deep Learning, Emergency Response and Recovery Management, Semantic Web, Safe and Secure Systems, Smart Agriculture Technologies, Wearable AI

Scientific Excellence and Transfer

International Scientific Advisory Board

Bi-annual evaluation of publically funded projects
- Prof. Dr. Andreas Butz, Ludwig-Maximilians-Universität, München, Chairman

Leading-Edge Research

DFKI is the only German institute for computer science to participate in each of the three leading-edge research clusters:
- Cluster of Excellence "Multimodal Computing and Interaction" funded by the German Research Foundation (DFG)
- Leading-Edge Cluster "Software Innovations for the Digital Enterprise" funded by BMBF
- European Institute of Innovation & Technology (EIT Digital & EIT Manufacturing)

Research Associations

Campus Automatisierung und Digitalisierung, FIWARE, Science & Innovation Alliance Kaiserslautern and others

Promoting Young Talent

DFKI is a founding member and core partner of the Software Campus to promote managerial talent in the IT industry

Academic Chairs

More than 140 former staff members have been appointed professors at universities in Germany and abroad

Spin-offs

92 spin-off companies have created more than 2.500 highly skilled jobs

Committees and Academies

DFKI is represented by its scientific directors on numerous committees and academies:

Scientific and Government Committees

Big Data Value Association, Brazilian Institute of Robotics (BIR), Center of Innovation Program des Japanese Ministry of Education (COI), Feldafinger Kreis, Informationstechnische Gesellschaft (ITG), Münchner Kreis, National Institute of Informatics (NII, Tokio), Program Committee of the National Aeronautics and Space Research Centre DLR, Steering Committee of the German Informatics Society (GI), Präsidium des Verbandes der Elektrotechnik, Elektronik and Informationstechnik e.V. (VDE), Management Board of the International Computer Science Institute in Berkeley, and others

Business Committees

Digital Stationery Consortium, Flexible Factory Partner Alliance (FFPA), 5G Alliance for Connected Industries and Automation (5G-ACIA), and others

Scientific Academies

Academy of Sciences and Literature, Berlin-Brandenburg Academy of Sciences, National Academy of Science and Engineering, German National Academy of Sciences Leopoldina, European Academy of Sciences, Royal Swedish Academy of Sciences, and others

As of March 7, 2019

HUMAN CENTRIC AI

- INDUSTRIE 4.0 and Innovative Factory Systems
- Smart Data – Intelligent Analytics for Massive Data
- Wearable Computing and Interactive Textiles
- Knowledge Management and Document Analysis
- Softbots, Digital Assistants, and Chatbots
- Educational Technologies
- Development of Provably Correct Software
- Smart City Technologies and Intelligent Networks
- Information Extraction and Intelligent Web Retrieval
- Deep Learning
- Multiagent Systems and Agent Technology
- Multimodal User Interfaces and Language Understanding
- Visual Computing and Augmented Vision
- Mobile and Collaborative Robotic Systems
- Autonomous Systems
- Shopping Assistance and Intelligent Logistics
- Semantic Product Memories and Digital Twins
- Safe and Secure Cognitive Systems and Intelligent Security Solutions
- Ambient Intelligence and Assisted Living
- Driver Assistance Systems and Autonomous Driving
- Cyber-physical Systems
- Multilingual Technologies

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