CRITICAL
INFORMATION
INFRASTRUCTURES
RESEARCHGROUP

KIT Karlsruhe Institute of Technology

aifb

ANNUAL REPORT

2021

PREFACE

Dear Friends,

After the sudden move to a hybrid working mode in 2020, virtual lectures, meetings, and seminars have almost become the norm this year. While everything is somehow different, fortunately, performance and work spirit of my research group have reached new heights. Many challenges but even greater accomplishments characterized 2021, including awards for excellent teaching and research. Looking back, I am very proud of all the members of my research group—the way we worked together as a team in a mostly virtual setting all over the year 2021 is just incredible.

By now, we are a proud member of the Institute for Applied Informatics and Formal Description Methods (AIFB) at the Karlsruhe Institute of Technology (KIT) for exactly four years. In addition, we joined KASTEL Security Research Labs in January 2021 to participate in the computation and communication (C&C) research group.

In 2021, we made several mentionable contributions to research, teaching, and innovation at the KIT. We published several research papers that were very well received by the academic community. We also presented and discussed our research at the leading scientific conferences like ICIS, NeurIPS, ACM CHIL, HICSS, etc.. Many of these conferences were held virtually.
For me personally, a highlight was my recognition as an AIS Distinguished Member – Cum Laude by the Association for Information Systems (AIS).

A significant milestone for teaching was organizing our first and second „Blockchain Hackathon“. The courses were a great success and taught students the basics of developing socio-technical information systems in the context of blockchain and distributed ledger technology (DLT) in a practical way. However, we contributed in many ways to the excellent teaching program of the KIT: We further improved the tutorials of the lecture „Applied Informatics – Internet Computing“ with new and innovative case studies. We also virtually offered master lectures (e.g., „Digital Health“, „Emerging Trends“, and „Critical Information Infrastructures“), seminars, and practical courses for our students. We are very encouraged by the highly positive feedback from the students and are looking forward to our classes in 2022.

In terms of innovation, I would like to highlight our new research projects Digital Health Work, DIRECTIONS, FLAIROP, GaMeIT, ISH, KASTEL, NephroCAGE, SDM4FZI, and SPECK. The DFG-funded project Digital Health Work investigates how the digitization shapes work in the healthcare sector. The aim of the

PREFACE

project DIRECTIONS (Data Protection Certification for Educational Information Systems) is the conceptual design, exemplary implementation, and testing of a sustainable, applicable data protection certification for school information systems. In the FLAIROP (Federated Learning for Robotic Picking) project, different stakeholders from Canada and Germany aim to develop an international federated learning system in the domain of robotic picking and placing of unknown objects. The GaMeIT (Data-driven Gamification to Improve Quality in Medical Image Annotation Tasks) project will address the problem of poor label quality of surgical image data by augmenting the annotation process with persuasive technology. In the ISH (Intelligent Security Handwerk) project we will develop and test an intelligent IT Security assistant for German handicraft businesses. Within KASTEL Engineering Secure Systems, we will focus on designing secure decentralized information systems. The project NephroCAGE (Nephrology Disease Cooperation between Canada and Germany for Applied AI) applies the latest advances of learning systems to address a multi-national healthcare challenge in nephrology. In the project SDM4FZI (Software-defined Manufacturing for the vehicle and supplier industry), we aim to make the factories of the vehicle and supplier industry more adaptable. Our solution approach is to define production purely via software and thus make it dynamically adaptable. The SPECK project aims to enhance a chain by developing and embedding digital tools (e.g., based on distributed ledger technology) and developing a digital application for optimized, animal-specific traceability and for continuous process diagnostics and process control along the value chain.

Last, but most importantly, I am very happy to have welcomed new PhD students in my research group in 2021—Shanshan Hu, Philipp Danylak, David Jin, Florian Leiser, Sascha Rank, and Simon Warsinsky. Welcome again and great to have you on board !

Many more information and exciting highlights of equal importance regarding our team, research projects, talks, teaching activities, publications, and memberships can be found on the following pages of this annual report of the research group critical information infrastructures. I hope you will enjoy reading the report and gain some interesting insights into our activities in 2021.

I am looking forward to the year 2022 !

Very Best

Ali Sunyaev

INTRODUCTION

Critical information infrastructures are sociotechnical systems comprising essential software components and information systems with pivotal impact on individuals, organizations, governments, economies, and society. We work on research challenges concerned with the design, development, and evaluation of reliable, secure, and purposeful software and information systems. Our research features a strong domain focus, in particular, on internet and health care industries. The principal goal of our research is theorizing on and designing the applications and methods required for creation and innovation of sociotechnical systems with auspicious value propositions. In our studies, we rigorously employ a variety of interdisciplinary methods and build on theories from information systems and related disciplines. Our work accounts for the multifaceted use contexts of information and communication technologies with research on human behavior affecting critical information infrastructures and vice versa. This enables us to rigorously generate strong theoretical insights while simultaneously producing research outputs of relevance to practical audiences.

TABLE OF CONTENTS

5 TEAM

15 RESEARCH PROJECTS

42 TALKS & HIGHLIGHTS

48 TEACHING & RESEARCH

51 SELECTED PUBLICATIONS

55 COMMITTEES AND MEMBERSHIPS

56 IMPRINT

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RESEARCH PROJECTS

AUDITOR

The objective of the research project European Cloud Service Data Protection Certification (AUDITOR) is the conception, exemplary implementation and testing of an enduring EU-wide data protection certification for cloud services. The certification in accordance with the EU General Data Protection Regulation (GDPR) is in the interests of everyone involved: the cloud customers, who are only permitted to work with cloud providers that can guarantee a sufficient level of data protection, the cloud providers, who can offer just this security with such a certification, the auditing and certification bodies, for whose business area the GDPR stipulates strict laws, and the end-user, potentially affected by the data usage, the protection of whose personal data is in the focus of certifications of cloud services. The highly political project is led by our research group and already enjoys highest attention internationally. AUDITOR is carried out in cooperation with numerous partners from large, medium-sized and small companies (e.g. IBM, Salesforce, Microsoft, Fujitsu, Deutsche Telekom, and SAP), several major ministries and authorities (e.g. the Deutsche Akkreditierungsstelle), and a large number of German data protection authorities. We are awaiting national approval for our certification in the end of 2021.

Project Title: European Cloud Service Data Protection Certification (AUDITOR)

Contact Persons: Sebastian Lins, Heiner Teigeler

Funded by: Federal Minister for Economic Affairs and Climate Action

Project Partners: CLOUD&HEAT Technologies GmbH; datenschutz cert GmbH; DIN-Normenausschuss Informationstechnik und Anwendungen (NIA), DIN e.V.; ecsec GmbH; EuroCloud Deutschland_eco e.V., eco – Verband der Internetwirtschaft; University of Kassel

Website: *www.auditor-cert.eu*

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Trusted Cloud

EuroCloud DEUTSCHLAND | eco

CLOUD & HEAT

DIN

datenschutz cert

Gefördert durch:

Bundesministerium für Wirtschaft und Klimaschutz

aufgrund eines Beschlusses des Deutschen Bundestages

DLR Projektträger

auditor

BISE Student

The BISE Student project will provide an innovative open access platform for publishing excellent student dissertations, like Bachelor, Master, and Diploma theses. Typically, after a thesis has been handed in and graded, it simply disappears into a non-public university archive or desk drawer, never to be seen again. However, many of these theses are being carried out with great thoroughness and present results of high practical and scientific value for other students, researchers, and practitioners. Following the open knowledge idea, which is to allow anyone to freely access, use, modify, and share knowledge, BISE Student will make the publication of excellent student theses much easier for students and universities as well as provide an open and highly visible platform revealing the real worth of Bachelor, Master, and Diploma theses.

BISE Student will utilize the innovative potential of distributed ledger technology to archive the system's three primary design goals: ease-of-use, openness, and content excellence. The entire submission process will be transparently documented and safeguarded by the bloxberg blockchain (https://bloxberg.org). In order to create a truly open publication platform, BISE Student will store the theses and accompanying research data (e.g., interview transcripts, statistical data, program code) using a public decentralized storage solution – the InterPlanetary File System (IPFS).

Project Title: BISE Student – An Open Access Dissertation Library

Contact Persons: Ali Sunyaev, Benjamin Sturm

Funded by: -

Project Partner: -

Website: *www.bise-student.io*

bloxberg

BISE

MAX-PLANCK-GESELLSCHAFT

BISE Student

BloG3

Members of the BloG3 project intent to design, develop, and evaluate a blockchain-based system for the management of health data. The system enables oncology patients leaving the Charité hospital in Berlin to manage access rights to their data. This allows patients to grant data access to other doctors, hospitals, and nursing services in the context of follow-up care conveniently via a smartphone app. In order to consolidate scattered records form different institutions, the blockchain-based system integrates different health information systems and builds a bridge between different electronic data sources.

The project consortium comprises partners from IT services, healthcare, and research. The main objective of this project is to investigate tangible benefits of blockchain technology for the German healthcare system from a technical, economic and social perspective. Within this project, KIT particularly works on the design of the system architecture, the perception of the system by different user groups, and the development of incentive mechanisms for the continuous use of the platform.

Project Title: Blockchain-basiertes Gesundheitsdatenmanagement für gesamtheitliche Gesundheitsprofile (BloG3)

Contact Persons: Shanshan Hu, Scott Thiebes

Funded by: Bundesministerium für Bildung und Forschung

Project Partners: Forschungszentrum Informatik; FU Berlin; Charité Berlin; Pflegewerk Berlin; C&S Computer und Software GmbH; nubedian GmbH; easierLife GmbH; CircularTree GmbH; ITK Engineering AG

Website: *www.blog3.de*

COOLedger

Over the past decade, various application areas have been identified for the use of Distributed Ledger Technology (DLT), including concepts such as blockchains. These application areas have specific requirements for DLT characteristics (e.g., fast consistency or high availability). However, trade-offs between these characteristics prevent the development of universally applicable distributed ledgers that can simultaneously address all requirements. Instead, a large number of distributed ledgers exist (e.g., Bitcoin, Ethereum, or IOTA), each optimized to meet requirements of a specific application area. Since the retroactive switch out an underlying DLT design is hardly possible, developers need to ponder suitability of DLT designs for their use cases before implementing.

In order to support the selection and configuration of a suitable distributed ledger, the COOLedger research project develops a model that identifies the dependencies between DLT characteristics and presents them in an understandable way. The model will be embedded in a process and implemented as software, which facilitates finding the optimal configuration of distributed ledgers for specific applications.

Project Title: COOLedger

Contact Person:
Niclas Kannengießer

Funded by: Helmholtz Association and the Russian Science Foundation

Project Partner: Higher School of Economics

Website: *cii.aifb.kit.edu/english/110_119.php*

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

RSF Russian Science Foundation

HIGHER SCHOOL OF ECONOMICS NATIONAL RESEARCH UNIVERSITY

COOLedger

DaWID

Information is a fundamental component of services, platforms, and new business models within today's IT landscape. Consequently, digital service providers collect data on a large scale whenever someone uses their applications. This has led to a situation where citizens seized to be the sovereigns of their data.
The DaWID project aims to develop a metaplatform that makes it possible for citizens to ensure their data sovereignty on the one hand and creates cross-platform mechanisms to link previously siloed services and platforms on the other hand. As a result, data can be collected and refined by an orchestrated sequence of IT services in a data-driven value chain.
The DaWID consortium consists of industry and research partners who investigate economic, ethical, and sociotechnical issues in data-driven value chains. The cii group focuses on the development of methods and mechanisms for (re-)establishing citizens' data sovereignty. We will enable citizens' to trace and influence the flow of their data across the platforms involved. Citizens' preferences for data usage will be stored in a machine-readable manner, matched with the respective data flows, and made enforceable across all platforms.
The DaWID project started in February 2020 and will run until January 2023.

Project Title: DaWID: Data-Centered Value Creation

Contact Persons: Jan Bartsch, Tobias Dehling

Funded by: Federal Ministry of Education and Research (BMBF; funding reference number: 16SV8383)

Project Partners: Fraunhofer Institute for Software and Systems Engineering (ISST); Institute for Digital Transformation in Healthcare (idigiT); Fraunhofer Center for International Management and Knowledge Economy (IMW); T-Systems International GmbH - IoT Data Analytics

Website: *www.dawid-projekt.de*

VDI|VDE|IT

universität Witten/Herdecke Institute for Digital Transformation in Healthcare

Fraunhofer IMW

Fraunhofer ISST

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DaWID

Datenzentrierte Wertschöpfungsplattform für Interaktive, assistierende Dienstleistungssysteme

digilog@bw

Digitalization is changing social coexistence in a variety of ways, some of which are fundamental. The aim of digilog@bw is to analyze the influence of digitalization on people and the resulting social changes in an interdisciplinary way. The digilog@bw project develops scientifically sound decision bases for politics and society in order to enable digitalization to be designed for the benefit of people. This design task requires orientation towards critically reflected values, norms and framework conditions. The collaborative projects „Autonomy“, „Knowledge“ and „Participation“ will be carried out in an interdisciplinary and cross-location basis and will focus on the question of criteria for a promising and responsible digital society. To this end, the Research Network brings together Baden-Württemberg expertise from university and non-university research in the humanities, social sciences, law, economics, media and communication sciences, ethics, computer science and interdisciplinary technology assessment at the highest scientific level.

Project Title: digilog@bw – Digitalisierung im Dialog

Contact Persons: Ali Sunyaev, Benjamin Sturm

Funded by: Ministerium für Wissenschaft, Forschung und Kunst Baden-Württemberg

Project Partners: Eberhard Karls Universität Tübingen; Internationales Zentrum für Ethik in den Wissenschaften (IZEW); Leibniz-Institut für Wissensmedien (IWM); Karlsruher Institut für Technologie (KIT); Universität Mannheim; Leibniz-Zentrum für Europäische Wirtschaftsforschung (ZEW); Zentrum für Kunst und Medien (ZKM)

Website: *www.digilog-bw.de*

Digitalisierung im Dialog

Digital Health Work

One of the most striking examples of digital transformation, with supposedly profound societal and organizational impacts, is the field of personalized medicine. The impact of new technology is huge in healthcare, for example, because genomic data will certainly reach the clinical routine and thus make personalized medicine available for everybody. However, digitization does not only have the potential to offer benefits. For example, the changing care model due to personalized medicine is also expected to dramatically change the work practices and the economics of healthcare professionals. Entire medical professions may become obsolete or see their work practices turned upside- down. Even though we are facing striking and massive changes in healthcare due to digital transformation, we currently lack theories to guide us and help us to understand, describe, explain, and predict this phenomenon. The project Digital Health Work investigates how the digitization shapes work in the healthcare sector. To do so, we draw on the Theory of the Smart Machine, seeking to test the theory within the healthcare domain. Moreover, we develop a new explanatory theory for the phenomenon of digital transformation in healthcare by means of a qualitative research design.

Project Title: Digital Health Work

Contact Person: Scott Thiebes

Funded by: German Research Foundation (DFG)

Project Partners: University of Cologne; University Hospital Cologne

Website: *gepris.dfg.de/gepris/projekt/442171588*

Universität zu Köln

UNIKLINIK KÖLN

DFG Deutsche Forschungsgemeinschaft

digital healthwork
DIGITIZATION OF WORK IN HEALTHCARE

DIRECTIONS

The aim of the research project Data Protection Certification for Educational Information Systems („DIRECTIONS“) is the conceptual design, exemplary implementation and testing of a sustainable, applicable data protection certification for school information systems. In order to achieve the project goal, two expansion stages of DIRECTIONS are envisaged: First, a quality seal will be designed and tested, which will then be further developed and applied to become an approved and recognized data protection certification. By developing a quality seal of approval in the first stage of development, a means can be created in the short term that providers of school information systems can use to communicate their data protection practices. This can create transparency and comparability on the market at an early stage and reduce potential uncertainties. However, a quality seal is not sufficient to demonstrate compliance with the GDPR. For this reason, it is planned in the second stage to develop the seal of approval into a data protection certification in accordance with Art. 42 of the GDPR and to have it formally approved. The multi-year project has just started in December 2021.

Project Title: DIRECTIONS – Data Protection Certification for Educational Information Systems

Contact Persons: Ali Sunyaev, Sebastian Lins

Funded by: German Federal Ministry for Education and Research (BMBF)

Project Partner: Prof. Dr. Gerrit Hornung, University of Kassel; Dr. Maseberg and Dr. Karper, datenschutz cert GmbH

Website: *www.directions-cert.de*

datenschutz cert

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DLT4Life

Modern life sciences with their highly sensitive omics data sets face several challenges with regard to data storage and sharing.
On the one hand data must be protected in order to preserve the privacy of those individuals who contributed their data to research.
On the other hand, the true value of omics data can only be realized if shared with as many researchers as possible.
In an ideal world, data subjects (i.e., patients) should be able to control access to their data directly.
However, granting and revoking access to data is a slow and tedious process within the current life sciences research paradigm, where most data is either stored on central controlled-access data repositories or kept locally within the respective research groups.
Distributed ledger technology (DLT; e.g., blockchain) enables immutable transactions between untrustworthy parties, which are kept in a consistent state through automated, algorithm-based consensus building mechanisms, thus eliminating the need for third-party trust enforcement. Applications of DLT within the life sciences promise to enable data subjects granting and revoking access rights flexibly, independent of intermediaries, and on an individual basis, giving way for data subjects' direct control over who may access their data for what purposes.

Project Title: Distributed Ledger Technology for Life Sciences

Contact Person: Ali Sunyaev

Funded by: Helmholtz Gesellschaft

Project Partner: Deutsches Krebsforschungszentrum

Website: *www.hidss4health.de*

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HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

dkfz. DEUTSCHES KREBSFORSCHUNGSZENTRUM IN DER HELMHOLTZ-GEMEINSCHAFT

dlt4life.

FLAIROP

Artificial Intelligence (AI) has proven to enable large economic efficiency gains in the context of the recent digital revolution. AI-based systems typically need large amounts of data to provide good results. As many industrial manufacturing companies are small or medium sized, picking items are highly individual. This results in a small amount of data for a specific task. Sharing data across factories and companies is a promising approach toward gaining more data for industrial use cases. However, sharing data has proven to be challenging in real world applications, as companies do not like to exchange their critical production data with other companies. Federated learning is an emerging approach toward distributed, privacy-preserving machine learning. The training of AI-based systems is done locally and only AI model parameters are then uploaded to a central cloud server which is shared by multiple stakeholders. All stakeholders then benefit from an aggregated AI model, without violating data privacy of the participating companies. In this project, we aim to develop an international federated learning system in the domain of robotic picking and placing of unknown objects. The goal is to boost current AI solutions with more data while preserving privacy regulations.

Project Title: FLAIROP

Contact Person: Ali Sunyaev

Funded by: Federal Minister for Economic Affairs and Climate Action

Project Partners: KIT IFL; University of Waterloo; Festo SE & Co. KG; Darwin AI

Website: www.flairop.com

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FESTO

Gefördert durch:

Bundesministerium für Wirtschaft und Klimaschutz

aufgrund eines Beschlusses des Deutschen Bundestages

UNIVERSITY OF WATERLOO

FLAIROP

GAIA-X

Within the GAIA-X project, the foundations for the development of a networked, open data infrastructure based on European values are being developed. The data infrastructure will be merged into a homogeneous, user-friendly system in which data can be made available and shared securely and confidentially.
To further support the GAIA-X project, the Federal Ministry of Economic Affairs and Energy has, in a first step, awarded research funding under the project name “GAIA-X Federation Services”, which is coordinated by eco e.V. The cii research group is supporting the “Compliance” work package as a subcontractor. In particular, the research group supports the following activities:

(1) Design of a process for the onboarding of services, providers and data assets into the GAIA-X ecosystem based on the existing certification concept of GAIA-X.
(2) Description of governance and policy rules.
(3) Development of a basic framework for the implementation of a continuous monitoring.

The research group supports the development of a socio-technical monitoring concept for three selected controls (e.g. geolocation, availability and encryption).

Project Title: GAIA-X Federation Services

Contact Person: Sebastian Lins

Funded by: Federal Minister for Economic Affairs and Climate Action

Project Partners: EuroCloud Deutschland_eco e.V.; eco – Verband der Internetwirtschaft and many more

Website: *www.bmwi.de/Redaktion/DE/Dossier/gaia-x.html*

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aufgrund eines Beschlusses des Deutschen Bundestages

GAIA-X
daten-infrastruktur.de

GaMeIT

Cognitive surgical assistance systems, such as surgical robots require image-based scene understanding to perceive the surgery context, comprehend the surgery procedure, and eventually generate safe trajectories to assist during the surgery. To achieve such scene understanding, recognition and semantic segmentation of different surgery aspects (e.g., shown organs, used surgical tools, different surgery stages) are necessary preconditions. Machine Learning (ML) approaches are a promising technology for semantic segmentation of images. To train robots with ML methods, annotated image data (e.g. in the form of videos) is required. Image annotation of surgical images and videos is often manually conducted by healthcare professionals. This is necessary since a certain level of medical expertise is required. The process of manual annotation is prone to human errors since it can be tedious, monotonous, and exhausting. As a consequence, poor label quality is a common problem. However, for surgical robots to improve surgical procedures, sufficient data quality of annotated images is a decisive factor. If ML models for surgical robots are trained based on poorly labeled image data, this may negatively influence patients' health since the robots cannot be utilized to their full potential. In this project, we address the problem of poor label quality of surgical image data by augmenting the annotation process with persuasive technology. In particular, we design, implement, and evaluate a data driven ML-based gamification concept to foster annotators engagement and, thereby, ensure high quality data labeling. By drawing on ML methods, the gamification concept is able to adapt to individual user preferences and overcome the weaknesses of one-size-fits-all gamification approaches.

Project Title: Data-driven Gamification to Improve Quality in Medical Image Annotation Tasks (GaMeIT)

Contact Person: Simon Warsinsky

Funded by: Helmholtz Association

Project Partners: University Hospital Heidelberg

Website: *www.hidss4health.de/#projects*

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HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

GaMeIT

ISH

The digital transformation of German small and medium sized craft businesses is creating IT security challenges. The project Intelligent Security Handwerk as part of the BMWi initiative “IT-Sicherheit in der Wirtschaft” will address those challenges by sensitizing craft SME for IT security and technically and organizationally enabling businesses to improve their IT security.

To this end, the cii research group led by Prof. Dr. Ali Sunyaev will develop and test an intelligent IT security assistant for German craft businesses. The assistant will capture the business IT infrastructure and IT security preferences to recommend an tailored course of actions. This will enable craft SME to make competent and independent IT security decisions. An interactive application will allow for an easy and intuitive use which will be tested and evaluated in multiple lab and field studies.

The project consortium consists of the University of Kassel, the Berufsförderungswerk des Handwerk, and the KIT. The project started in August 2021 and will run until July 2024.

Project Title: Intelligent Security Handwerk

Contact Persons: Felix Morsbach, Benjamin Sturm, Tobias Dehling

Funded by: Federal Ministry for Economic Affairs and Climate Action

Project Partners: University of Kassel; Berufsförderungswerk des Handwerk (BFH)

Website: *intelligent-security-handwerk.de*

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BFH Berufsförderungswerk des Handwerks gemeinnützige GmbH

Gefördert durch: Bundesministerium für Wirtschaft und Klimaschutz

aufgrund eines Beschlusses des Deutschen Bundestages

INTELLIGENT SECURITY HANDWERK

KASTEL

Within KASTEL Engineering Secure Systems, the research group cii focuses on the design of secure decentralized information systems (IS). In the application context of networked mobility, we focus on implications for consumers emanating from different degrees of decentralization of IS. Decentralization of IS can increase data sovereignty for users in IS but requires also that users take on new tasks and roles when processing information. For example, users of decentralized IS need to make efforts to operate their own data repositories. Moreover, the degree of decentralization of an IS is not a constant property but changes over time due to economic, political, social, and technical dynamics. These dynamics make it difficult to design decentralized IS in such a way that they continue to meet user needs while allowing them to harness the benefits of decentralized IS (e.g., increased data sovereignty). To better understand the design of decentralized IS, the research group cii focuses in particular on the following research topics:

(1) Dynamics influencing decentralization of IS
(2) Choosing appropriate degrees of decentralization to meet application-specific requirements of IS
(3) Implications of different degrees of decentralization for users of IS

Project Title: KASTEL Engineering Secure Systems

Contact Persons: Niclas Kannengießer, Tobias Dehling

Funded by: Helmholtz-Association

Project Partners: KASTEL Security Research Labs

Website: zentrum.kastel.kit.edu.com

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KASTEL

LitSonar

A rigorous literature review is essential for any high-quality research endeavour. However, collecting the necessary literature base, i.e. conducting a rigorous literature search, is a highly complex and difficult task, especially for students and novice researchers. The LitSonar project tries to facilitate this process. The project follows a design oriented research approach that iteratively develops, evaluates, and refines technical solutions for conducting systematic and rigorous literature searches. The main goals of the developed solutions are to make systematic literature searches more comprehensive, transparent, and efficient, which, eventually, improves the quality of the entire literature review. A current prototype system allows a first glance on how such systems might look like. The prototype's user-friendly web interface supports the entire literature search process by providing, for instance, meta-access to multiple literature databases, innovative publication filters, and extensive search reports. The current prototype system can be found here: http://litsonar.com

Project Title: LitSonar

Contact Person: Benjamin Sturm

Funded by: University of Cologne, University of Kassel

Project Partners: University and City Library Cologne; Kassel University Library

Website: *www.litsonar.com*

UNIKASSEL VERSITÄT

Universitäts- und Stadt Bibliothek Köln

NEPHROCAGE

The NephroCAGE consortium applies the latest advances of learning systems to address a multinational healthcare challenge in nephrology. We aim to combine medical and technical innovations to build and evaluate a real-world demonstrator incorporating the expertise of two leading nations in the fields: Canada and Germany. Combining clinical data from both nations through a secure federated learning platform enables access to a unique multi-national pool of clinical nephrology data for the first time. This clinical data pool forms the foundation for applying selected Machine Learning (ML) methods to train models, which help to predict the probability for selected clinical outcomes (i.e., kidney transplant success rates) in advance. However, the use of ML methods requires access to clinical data, which are highly protected through data protection regulation. Especially multinational projects are hindered due to different data protections regulations and data formats at each site. Therefore, we propose the use of a federated learning infrastructure, where data resides at their original locations and ML algorithms and aggregated data are exchanged instead of raw data. ML algorithms are executed on local data pools and gained insights from local data analysis are added to statistical models, which are exchanged between partners sites for iterative learning. If the consortium outcomes prove to be successful, the developed platform and methods will be applicable to address additional medical indications and chronic diseases. Furthermore, the results would be applicable to other multinational projects, e.g. industry cooperation in automotive construction, transportation, or renewable energies.

Project Title: NEPHROCAGE

Contact Person: Ali Sunyaev

Funded by: Federal Minister for Economic Affairs and Climate Action

Project Partners: Hasso Plattner Institute; Charité; University of British Columbia; Centre hospitalier de l'Université de Montréal; McGill University; Pirche AG

Website: *www.nephrocage.org*

THE UNIVERSITY OF BRITISH COLUMBIA

McGill

Gefördert durch:

Bundesministerium für Wirtschaft und Klimaschutz

aufgrund eines Beschlusses des Deutschen Bundestages

HPI Hasso Plattner Institut

Digital Engineering · Universität Potsdam

CHARITÉ

UNIVERSITÄTSMEDIZIN BERLIN

NephroCAGE

Canada and Germany for Applied AI in Health

PANDIA

Today's privacy notices of interactive assistance systems in the health care domain are usually too long and not informative for lay users due to their legal jargon. As a consequence, consumers remain unaware of the specific terms of use and how their information is used. The PANDIA project aims to develop a platform and innovative tools that enable consumers and companies in the health care domain to automatically check and understand information processing in interactive assistance systems (e.g., electronic health records, mHealth apps). By applying natural language processing (NLP) algorithms, the information essential for consumers will be extracted from privacy notices. Legal and complicated formulations will be simplified, enriched with visualizations, and communicated in an informative way. How consumers' information is used in the health care domain will be abstracted from various sources (e.g., apps, websites). Within the scope of PANDIA, the cii research group develops personalized solutions that inform all interested stakeholders about what information is stored, transmitted, or processed, in which way, by whom, and for what purposes in interactive assistance systems.

The PANDIA project runs from March 2020 to February 2023.

Project Title: PANDIA: Platform for the Analysis of Privacy Notices of Interactive Assistance Systems in the Health Care Domain—Consumer-centered Privacy Communication

Contact Persons: Mandy Goram, Tobias Dehling

Funded by: Federal Ministry of Education and Research (BMBF)

Project Partners: Snoopmedia GmbH; Ascora GmbH; AI4BD GmbH; OFFIS e.V. Institut für Informatik; FIZ Karlsruhe Leibniz Institut für Informationsinfrastruktur

Website: *www.pandia-projekt.de*

VDI|VDE|IT

OFFIS INSTITUT FÜR INFORMATIK

FIZ Karlsruhe Leibniz-Institut für Informationsinfrastruktur

ASCORA Consulting · Development · Research

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ai4bd

PANDIA

Patient Pal

In hospitals, patients go through numerous processes for both medical and legal reasons, sometimes even before the actual treatment can begin. Today, many of these processes are still paper-based and extend across different hospitals. In some cases, sub-processes require high personnel expenditure, which is often not reimbursed separately. In some cases, such processes even lead to disruptions in the operating procedure. It is therefore essential for hospitals to use process data to identify new possibilities and improve processes continuously. However, different hospitals often use different systems, so-called isolated applications, and a holistic and patient-centric process view is not generated.
The goal of this project is to create the basis for hospitals to digitally support patient workflows that run across different clinics and to generate and use process data. This goal is to be achieved in several stages, the first of which is being carried out as part of this strategic project.

Project Title: Patient Pal

Contact Person: Manuel Schmidt-Kraepelin

Funded by: Research alliance ForDigital

Project Partners: Prof. Dr. Amin Heinzl, University of Mannheim

Website: *cii.aifb.kit.edu*

UNIVERSITY OF MANNHEIM

ForDigital

ReDiBlock

The data generated along the product life cycle serves as basis for many decisions. Both the upstream areas of production and distribution and the downstream areas of collection, reuse and recycling could benefit from this information.

An information exchange forms the basis for effective design and control of resource-efficient recycling management and economy. Flows of materials and goods must be analyzed over the entire product life cycle so that it can be controlled from each phase.

Since this is not (or partially) the case in practice, the approach of a Distributed Ledger Technology (DLT) platform offers the possibility to improve the data basis for all actors in value-added and recycling management networks.

Sharing access to this information would significantly increase the effectiveness and efficiency of the entire system.
This information is indispensable in the course of societal expectations of climate protection and in the course of a sustainable industrial society with efficient, environmentally compatible flows of energy and materials.

The project's goal is to clarify technical approaches and prerequisites, analyze correctness guarantees of transfers of real data into the digital system, develop a DLT system concept, as well as build and test a platform with real data from participating companies.

Project Title: ReDiBlocK

Contact Person: Ali Sunyaev

Funded by: Ministerium für Umwelt, Klima und Energiewirtschaft Baden-Württemberg

Project Partners: Institut für Angewandte Geowissenschaften (AGW); Institut für Industrial Ecology (INEC); iPoint-systems gmbh

Website: *cii.aifb.kit.edu/110_929.php*

iPoint

PTKA Projektträger Karlsruhe im Karlsruher Institut für Technologie

KIT Karlsruher Institut für Technologie

INEC INSTITUTE FOR INDUSTRIAL ECOLOGY PFORZHEIM

THINKTANK INDUSTRIELLE RESSOURCEN-STRATEGIEN

ReDiBlock Blockchain-based Circular Economy

SDM4FZI

The challenge in the vehicle and supplier industry today is to produce economically despite highly volatile markets and under dynamic conditions. The decisive competitive factor here is the adaptability of production systems. In order to achieve maximum adaptability, a strict separation must be created between the hardware of the production systems and the controlling software. The SDM4FZI project therefore deals with the new method: software-defined manufacturing (SDM). Analogous to solutions from information and communication technology, non-predefined functions are also to be realised by automatically generated software. The basic prerequisite is the abstraction of the existing hardware through digital twins with the help of which the software can be automatically derived and distributed. For this purpose, the existing production OT (Operational Technology) must be rethought in order to make the control and communication infrastructure SDM-capable. SDM creates the basis for innovative applications and business models that use digital twins as their core to optimise adaptable production systems.

Project Title: SDM4FZI - Software-defined Manufacturing for the vehicle and supplier industry

Contact Persons: Sebastian Lins, Heiner Teigeler

Funded by: Federal Minister for Economic Affairs and Climate Action

Project Partners: ABB; Audi; Bosch; HOMAG; University of Stuttgart and many more

Website: *www.sdm4fzi.de/*

Universität Stuttgart

Gefördert durch: Bundesministerium für Wirtschaft und Klimaschutz aufgrund eines Beschlusses des Deutschen Bundestages

HOMAG GROUP

BOSCH

Audi ABB

Software Defined Manufacturing

Security & Compliance Automation

The research group cii has worked together with SAP SE to take on the challenges of an ever-increasing number of certifications that cloud services have to fulfill. The project 'Security & Compliance Automation' supported this process and explored ways to automate compliance management processes and certification procedures, which, in the long run, should help reducing the effort needed to comply with diverse certification requirements. The project can be regarded as follow-up of the Next Generation Certification (NGCert) project and applies learnings and insights into practice. Throughout the project, we analyzed and validated the compliance master data management approach, proposed suitable data visualizations, and defined requirements on a self-audited compliance system. The goal was also to define automated test procedures and audit rules, and accompany a proof of concept for compliance automation. The project ended in 2021.

Project Title: Security & Compliance Automation

Contact Persons: Sebastian Lins, Malte Greulich

Funded by: SAP SE

Project Partner: SAP SE

Website: *www.aifb.kit.edu/web/Security_and_Compliance_Automation*

Security & Compliance Automation

Social Comparison in mHealth

Mobile Health (mHealth) technology, such as mobile applications and activity trackers, have been identified as promising tools for increasing physical activity. However, a majority of users are not using mHealth frequently and over a sustained period of time. To overcome the problem of decreasing use and engagement in mHealth, research and practice increasingly draws on gamification. We propose that social comparison is a driving mechanism for how gamification elements affect users and technology use outcomes. When data, such as one's position on a leaderboard, number and type of badges, and points for completing activities, are mutually shared with other users, it allows user's the opportunity to compare their physical activity behavior with other users' behaviors and evaluate their standing in relation to others. However, it is unclear if including such features in mHealth results in positive or negative user reactions and how this impacts the subsequent behavior. This project aims to understand how and why the design of social comparison features can result in positive and negative reactions and empirically evaluate how this impacts subsequent physical activity behavior.

Project Title: Social Comparison in mHealth: Negative and Positive Reactions and Impacts on Physical Activity Behavior

Contact Person: Manuel Schmidt-Kraepelin

Funded by: Research alliance For-Digital

Project Partners: Prof. Dr. Amin Heinzl, University of Mannheim

Website: *cii.aifb.kit.edu*

UNIVERSITY OF MANNHEIM

ForDigital

SPECK

Agriculture, and particularly animal husbandry, is currently facing major challenges, such as ensuring food quality and creating sustainable value chains. Regional and global food security, animal welfare, efficient use of raw materials, climate and environmental protection, and their interactions play a prominent role in addressing these challenges.

To address the challenges regarding food quality and sustainable value chains, the digitization of food supply chains seems necessary in order to generate and analyze associated data. Digitization harnesses the potential of novel technologies, such as Artificial Intelligence and Distributed Ledger Technology (DLT), to improve the productivity, quality, and sustainability of food supply chains. For example, DLT has the potential to increase productivity and ensure quality by improving food traceability. The research project SPECK (Systemic optimization of the meat value chain using the example of pig farming through the development and embedding of digital tools), aims to improve the meat value chain by developing and embedding digital tools (e.g., DLT) and developing a digital application for optimized, animal-specific traceability and for continuous process diagnostics and process control along the value chain.

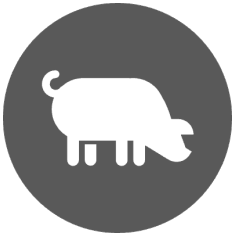
Project Title: SPECK

Contact Person: Ali Sunyaev

Funded by: Federal Office for Agriculture and Food

Project Partners: University of Kassel, Chair of Agricultural and Biosystems Engineering; Karlsruhe Institute of Technology, Institute for Industrial Production

Website: *cii.aifb.kit.edu/110_1019.php*



Toward better Smart Contract Development

During the emergence of Distributed Ledger Technology (DLT) over the past decade, various applications on DLT have been proposed, implemented, and even patented. In the course of the development of such applications, new challenges arose from the inapplicability of extant programming paradigms to application development on DLT. Since these new challenges have not been fully identified and only barely solved, various incidents have already shown how devastating the effects of faulty applications on DLT can be (e.g. the loss of 50 million US dollars in The DAO Hack). The research project has not only synthesized existing development challenges related to smart contracts but has also provided solutions and software design patterns that help developers making DLT applications perform, secure, and maintainable. Results of the research project have been recently published at the prestigious journal IEEE Transaction on Software Engineering.

Project Title: Toward better Smart Contract Development

Contact Person: Niclas Kannengießer

Funded by: EnBW

Project Partner: EnBW

Website: *cii.aifb.kit.edu/english/110_133.php*

Unblackboxing IT Certifications

In the course of this project, three main goals have already been achieved: (1) the structural differences between IT certificates and their impact on customers' and platform providers' perception (opening the "black box"), (2) the linkage of customers' and platform providers' perception of IT certificates, and (3) the design of IT certificates and how they can be presented most effectively on web sites.

Based on these initial results, there is still a lack of empirically validated findings and research models explaining how factors in the certification ecosystem can influence consumers' and platforms providers' perception of IT certificates. In electronic markets, particularly on online platforms in e-commerce, two influencing factors in the certification ecosystem are of utmost importance: First, the certification authority as an independent third-party and, second, complementary or competing information signals on an online platform. Moreover, in previous research, it still remains unclear how IT certificates will be perceived by customers in the long term. Thus, this research project next seeks answers to the following questions: (1) how a certification authority as an independent third-party impacts the perception of IT certificates, (2) which effects different information signals have on the perception of IT certificates, and (3) what the long-term effects of IT certificates are (if customers interact several times with a certified online platform).

Project Title: Unblackboxing IT Certifications

Contact Persons: Sebastian Lins, Maximilian Renner

Funded by: German Research Foundation (DFG)

Project Partner: Technische Universität Darmstadt

Website: *cii.aifb.kit.edu/english/110_208.php*

TECHNISCHE UNIVERSITÄT DARMSTADT

DFG Deutsche Forschungsgemeinschaft

XAIOmics

As it is becoming progressively challenging to wholly analyze the ever-increasing amounts of generated biomedical data (e.g., CT scans, X-ray images, omics data) by means of conventional analysis techniques, researchers and practitioners are turning to artificial intelligence (AI) approaches (e.g., deep learning) to analyze their data. Extant AI approaches are often inaccessible and non-transparent to humans, thus limiting us in fully understanding and therefore trusting the produced outputs. Explainable AI (XAI) addresses this opacity issue by producing (more) interpretable AI models whilst maintaining high levels of performance and accuracy. The objective of the XAIOmics research project is to design, develop, and evaluate XAI approaches to biomedical (i.e., omics) data. In particular, we will identify biomedical use cases and current, viable approaches in the domain of XAI and apply and adapt them to the identified use cases. With regards to the highly interdisciplinary field, a central research hurdle will be the development of an understanding for the different kinds of biomedical data and the subsequent feature engineering in the context of the design of the AI algorithms. In doing so, this project will not only aid researchers and physicians in obtaining a better understanding of the outputs of contemporary AI approaches for biomedical data but also create more transparency, which will support the building of trust in AI-based treatment and diagnosis decisions in personalized medicine.

Project Title: Explainable Artificial Intelligence in Life Science: An Application to Omics Data

Contact Person: Ali Sunyaev

Funded by: Helmholtz Gesellschaft

Project Partner: Deutsches Krebsforschungszentrum

Website: *www.hidss4health.de*

UNIVERSITÄT HEIDELBERG ZUKUNFT SEIT 1386

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

dkfz. DEUTSCHES KREBSFORSCHUNGSZENTRUM IN DER HELMHOLTZ-GEMEINSCHAFT

XaiOmics

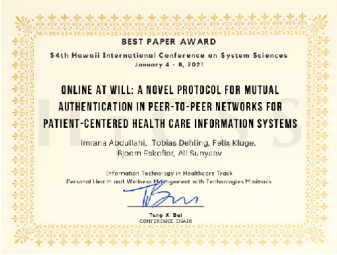
TALKS & HIGHLIGTS

cii Joined the KASTEL Security Research Labs

Since January 1, 2021, the cii research group has joined the KASTEL Security Research Labs.
In KASTEL, the cii research group will participate in the mobility lab and the computation and communication (C&C) research group. The cii research group will primarily investigate the influence of system designs with different degrees of decentralization on the usefulness of those systems from the perspective of consumers.

Best Paper Award @HICSS-54

The paper „Online at Will: A Novel Protocol for Mutual Authentication in Peer-to-Peer Networks for Patient-Centered Health Care Information Systems“ by Imrana Abdullahi Yari, Tobias Dehling, Felix Kluge, Bjoern Eskofier and Ali Sunyaev has been awarded with the Best Paper Award at the 54th Hawaii International Conference on System Sciences (HICSS-54).

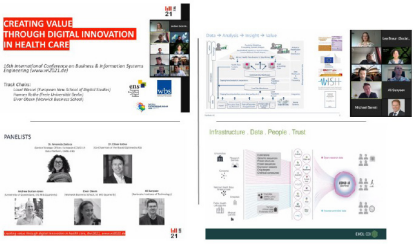

BEST PAPER AWARD
54th Hawaii International Conference on System Sciences
January 4 - 8, 2021
ONLINE AT WILL: A NOVEL PROTOCOL FOR MUTUAL AUTHENTICATION IN PEER-TO-PEER NETWORKS FOR PATIENT-CENTERED HEALTH CARE INFORMATION SYSTEMS
Imrana Abdullahi, Tobias Dehling, Felix Kluge, Bjoern Eskofier, Ali Sunyaev
Information Technology in Healthcare Track
Personal Health and Wellness Management with Technologies & Methods
Tung X. Bui
CONFERENCE CHAIR

First and Second cii Blockchain Hackathon

From March 25 to April 1, as well as September 1 to October 17, 2021, the cii blockchain hackathon offered KIT students the opportunity to design and implement blockchain-based solutions for current challenges in practice. Together with the EnBW Energie Baden-Württemberg AG, the Office for IT & Digitization of the City of Karlsruhe and Stadtwerke Karlsruhe GmbH, students got exciting insights into the potential of blockchain in various fields for a decentralized future.

Prof. Dr. Ali Sunyaev Gave a Talk at WI Conference

At a panel discussion concerning value creation from digital data in health care, Prof. Dr. Ali Sunyaev gave insights into the digital transformation of health care. The panel discussion “Creating value through digital innovation in health care” was part of the 16th International Conference on Businesss & Information Systems Engineering.

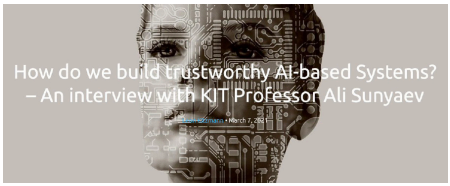


TALKS & HIGHLIGHTS

How Do We Build Trustworthy AI-based Systems? — An Interview with Prof. Dr. Ali Sunyaev

In an interview with KIT Link, Prof. Dr. Ali Sunyaev talks about how trustworthy AI-based systems can be built.
KIT Link is a transatlantic network for the future of work. The mission of the network is to build a bridge between the Karlsruhe Institute of Technology (KIT), and the USA, especially the San Francisco Bay Area (SFBA).

Here, you can find the complete interview:
https://kit-link.com/how-do-we-build-trustworthy-ai-based-systems-an-interview-with-kit-professor-ali-sunyaev/



„Datenschutz am Mittag“—Certification of Cloud Services

On April 16, 2021, the status of the AUDITOR project‘s work was presented and an outlook on upcoming practices was given at „Datenschutz am Mittag“. The AUDITOR research project is developing an EU-wide data protection certification for cloud services. In particular, AUDITOR has developed certification criteria to validate the compliance of an cloud service with the requirements of the EU GDPR. The certification resulting from the AUDITOR project will be called „GDPR Compliant Cloud“ and will soon be able to be awarded by accredited certification bodies.

COMMUNITY DAYS “Governance, Risk, Compliance in IT” on April 29 & 30, 2021

On April 4, 2021, Sebastian Lins presented the AUDITOR project in his talk “AUDITOR – Development of a new data protection certification for cloud services” during the COMMUNITY DAYS. This two-day online event was about “IT outsourcing, managed services and cloud computing: IT-GRC in the context of external IT services”.

COMMUNITY DAYS
DEIN IT-NETZWERK

Prof. Dr. Ali Sunyaev and Dr. Benjamin Sturm at Digiloglounge Digital

On May 20, 2021, Prof. Dr. Ali Sunyaev and Dr. Benjamin Sturm talked about how blockchains could democratize processes of knowledge creation, dissemination and further development, as part of the discussion series „Digiloglounge Digital“.
Watch the entire talk on YouTube:
https://www.youtube.com/watch?v=VDAnw4QxOBM

Special Seminar: Selected Issues WS21/22

The cii research group offered a special seminar for Masters Students. The COVID-19-Pandemic has had a significant impact on teaching at the KIT, as all attendance classes had to switch to online teaching. While online classes are working better and better, this pandemic did show one thing very clearly: There is a need for innovative, digital teaching concepts to ensure effective remote learning. Therefore, the cii research group tackled these new teaching formats in collaboration with students from the KIT as part of this seminar.

3rd PANDIA Consortium Meeting

On June 23, 2021, the third consortium meeting in the PANDIA project took place as an online event.
In the consortium meeting, the project partners presented their latest results and invited all participants to discuss them. We presented preliminary results from our study on consumer preference detection for privacy communication. Despite the current Corona situation, we were able to achieve all work objectives.

Sebastian Lins Interviewed by Ute Häußler: When is Gaia-X Coming?

In an Interview with Ute Häußler from WEKA FACHMEDIEN GmbH Sebastian Lins talks about the data infrastructure Gaia-X and its hopes and fears. The cii research group has been dealing with the Gaia-X ecosystem since its beginning and has played a key role in the specification for the Federation Service ‚Compliance'.

Read the article online:
https://www.elektroniknet.de/automation/industrie-40-iot/wann-kommt-gaia-x-aufden-shopfloor.187453.html

Association for Information Systems Recognized Prof. Dr. Ali Sunyaev as an AIS Distinguished Member - Cum Laude

Prof. Dr. Ali Sunyaev was recognized as an AIS Distinguished Member - Cum Laude by the Association for Information Systems (AIS).

A complete list of AIS Distinguished Members can be found here:
https://aisnet.org/page/DistinguishedMemberList

Faculty Partner Award for our Team Project in SoSe 2021

Our team project group has achieved 1st place this semester, in the Faculty Partner Award of the event „Team Project Business and Technology", on the topic „Innovative Designs for mHealth Privacy Assistants".

TALKS & HIGHLIGHTS

The award was given to team projects that distinguished themselves through their methodology and solution to current societal or business challenges, and were able to clearly communicate this in a short presentation of their results.

Congratulations to our students Franzisca, Simon, Frederic, and Lukas!

cii Summer Excursion 2021

On August 4, 2021, the cii research group took a day trip hiking from the AIFB building up to the Turmberg. Afterwards they ended the day with a tasty dinner at Trattoria & Pizzeria Pulcinella in Durlach.

Four Papers Accepted at the Hawaii International Conference on System Sciences (HICSS) 2022

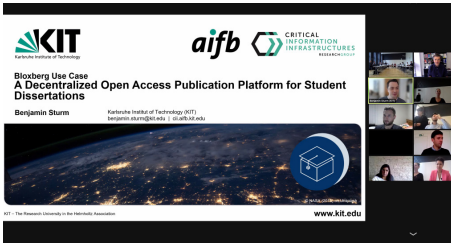
At the 55th Hawaii International Conference on System Sciences (HICSS) four papers from the cii research group were accepted. The Conference took place from January 4 to 7, 2022.

Prof. Dr. Ali Sunyaev Gave a Talk at University St. Gallen (HSG)

On September 6, 2021, Prof. Dr. Ali Sunyaev presented results of the cii research group about Blockchain Technologies on the subject of “Design Trade-Offs, Viability, and Management of Applications on Distributed Ledger Technology”. Examples from practice in which DLT technology is already being used today were also shown.

Presentation of BISE Student at the Bloxberg Summit 2021

On September 30, 2021, Benjamin Sturm presented the BISE Student project as showcase application for the Bloxberg blockchain at the annual Bloxberg Summit. BISE Student is an open access publication platform for student theses that is developed by the cii research group in cooperation with the BISE Journal.



Prof. Dr. Sunyaev Gave a Talk During the KIT Welcome Week

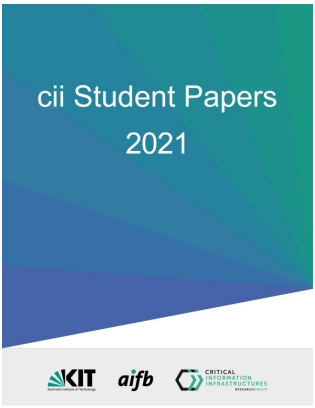
On October 11, 2021, the welcome week of the KIT department of economics and management took place. On this occasion, Prof. Dr. Ali Sunyaev welcomed the approximately 500 new

freshmen of the industrial engineering and management study program at KIT. Prof. Dr. Ali Sunyaev providedfirst-hand insights into the daily routine of teaching and studying by holding a lecture on the topic of DLT and Blockchain.
In this sense, a warm welcome to all freshmen at KIT.

cii Student Papers - 2021 Collection Published

A selection of nine student papers supervised by the cii research group are presented in „cii Student Papers - 2021“ for the first time. The papers in this collection deal with the design, development and evaluation of critical information infrastructures.

It is freely available online via KITOpen:
https://doi.org/10.5445/IR/1000138902



Project Kick-Off „ISH: Intelligent Security Handwerk“

On October 26, 2021, the kick-off meeting for the new research project „ISH: Intelligent Security Handwerk“ took place at the University of Kassel. The research project is funded by the Federal Ministry of Economic Affairs and Energy for three years, from August 2021 to July 2024.The aim of the project is the needs-based development and testing of an intelligent IT security assistant, the exploration of viable business models for the IT security assistant and accompanying training concepts to increase IT security in the German craft sector. The cii research group focuses on the development and testing of the intelligent IT security assistant.

Institute AIFB is 50 Years Old

On October 22, 2021, the Institute AIFB celebrated the „50 Years of the Institute of Applied Informatics and Formal Description Methods“.

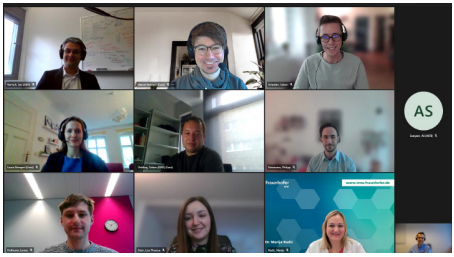
TALKS & HIGHLIGHTS

Sascha Rank Gave a Talk at the AIxIA Conference 2021

On November 18, 2021, at the French-German conference on the application of AI, Sascha Rank presented how the cii research group applies the concept of federated learning in two international research projects, FLAIROP and NephroCAGE. In these projects, cii aims to improve machine learning models for robotic picking and the prediction of kidney transplantation outcomes without exchanging private data.

DaWID Consortial Meeting 2021

On November 29, 2021, the consortium of the DaWID project gathered digitally.
During the meeting, new insights and findings emerged how citizens can participate in data-driven value creation while still maintaining their data sovereignty. The cii research group was represented by Prof. Dr. Ali Sunyaev, Tobias Dehling, and Jan Bartsch.



New Research Project DIRECTIONS Announced on German Television

The new research project DIRECTIONS - Data Protection Certification for Educational Information Systems, started in December.
Together with the University of Kassel and the datenschutz cert GmbH, the KIT is developing and testing a sustainable data protection certification for school information systems. Before its official start, the new project has already been announced on German television.

Paper at the International Conference on Information Systems in Austin, Texas (ICIS'21)

Maximilian Renner from the cii research group presented a paper at the International Conference on Information Systems (ICIS), held in Austin, Texas, from December 11 to 15, 2021. The paper "Achieving Trustworthy Artificial Intelligence: Multi-Source Trust Transfer in Artificial Intelligence-capable Technology" was co-authored by Sebastian Lins, Matthias Söllner, Scott Thiebes and Prof. Dr. Ali Sunyaev.

The article is now freely available via open access:
https://aisel.aisnet.org/icis2021/hci_robot/hci_robot/15/

TEACHING & RESEARCH

LECTURES

Applied Informatics - Internet Computing (Bachelor)
The lecture Applied Informatics – Internet Computing provides insights into fundamental concepts and future technologies of distributed systems and Internet computing. Students should be able to select, design and apply the presented concepts and technologies. The course first introduces basic concepts of distributed systems (e.g., design of architectures for distributed systems, internet architectures, web services, middleware). In the second part of the course, emerging technologies of Internet computing will be examined in depth. These include, among others: cloud computing, fog computing, internet of things, blockchain, artificial intelligence. Practical topics are discussed in tutorials.

Critical Information Infrastructures (Master)
The course critical information infrastructures introduces students to the world of complex sociotechnical systems that permeate societies on a global scale. Students learn to handle the complexities involved in the design, development, operation, and evaluation of critical information infrastructures. In the beginning of the lecture, critical information infrastructures are introduced on a general level. The following sessions focus on an in-depth exploration of selected cases that represent current challenges in research and practice.

Digital Health (Master)
The course Digital Health introduces master students to the subject of digitization in health care. Students learn about the theoretical foundations and practical implications of various topics surrounding the digitization in health care, including health information systems, telematics, big health care data, and patient-centered health care. After an introduction to the challenge of digitization in health care, the following sessions focus on an in-depth exploration of selected cases that represent current challenges in research and practice. Students work (in a group of 3-4) on a selected topic and have to write a course paper. Students can choose a topic from a variety of topics. To answer the research questions, students use literature reviews but also interviews, surveys, programming tasks, and other research methods.

TEACHING & RESEARCH

SEMINARS

Seminar Emerging Trends in Internet Technologies (Bachelor/Master)
The seminar aims at providing insights into current topics in the field of Information Systems with a focus on fundamental and innovative Internet technologies. There are short introductions and corresponding seminar paper topics for different topics around the lectures and research topics of Prof. Sunyaev‘s research group “Critical Information Infrastructures” including distributed ledger technologies (e.g. blockchain), cloud computing, green IT, artificial intelligence, security, and privacy. Students can also propose their own topics within the framework of the given topic areas. The seminar aims to provide insights into current topics in the field of business informatics and to offer students the opportunity to write a scientific paper in a group of students for the first time.

Seminar Emerging Trends in Digital Health (Bachelor/Master)
The seminar aims at providing insights into current topics in the field of Information Systems with a focus on innovative digital healthcare systems. There are short introductions and corresponding seminar paper topics for different topics around the lectures and research topics of Prof. Sunyaev‘s research group “Critical Information Infrastructures” including genomics, distributed ledger technologies (e.g. blockchain), artificial intelligence, and gamification in healthcare. Students can also propose their own topics within the framework of the given topic areas. The seminar aims to provide insights into current topics in the field of digital health and to offer students the opportunity to write a scientific paper in a group of students for the first time.

Seminar Selected Issues in Critical Information Infrastructures (Master)
The seminar aims at introducing master students to innovative, digital and scientifically based teaching concepts. In groups of up to five, they independently develop and analyze a teaching concept for KIT courses. Existing teaching units (e.g. basic lectures, seminars, or ILIAS learning modules) are used as examples and prototypically reviewed. Modern teaching concepts, such as interactive learning modules, gamification, serious gaming, or flipped classrooms, are examined and critically discussed with regard to their applicability and usefulness. Furthermore, students have the opportunity to integrate their own ideas and concepts based on current scientific knowledge. In a final session, the teaching concepts will be applied as examples and discussed within the group.

Research Seminar: Critical Information Infrastructures (PhD Students)
The cii research seminar, aims to strengthen rigor and relevance of the research conducted in the cii research group. In weekly sessions, PhD students present their ideas for and challenges with their current research to the entire research group to obtain feedback. The cii research seminar fosters the exchange of ideas and knowledge within the research group, enables the effective mastering of arising challenges, and improves the overall quality of the research conducted in the cii research group.

PRACTICAL COURSES

Practical Course Blockchain Hackathon (Bachelor/Master)
The practical course „Blockchain Hackathon“ aims to teach students the basics of developing sociotechnical information systems in the context of blockchain or distributed ledger technology (DLT) in a practical way. To this end, students are introduced to DLT and the development of DLT applications in a kick-off event. Subsequently, students work in groups to implement a software artifact (e.g., desktop application, mobile app, or web application) that solves a given problem. The practical course is held in the form of a 1-week hackathon. The hackathon also focuses on quality assurance (e.g. by implementing tests) and documentation of the implemented software artifact.

Practical Course Sociotechnical Information Systems Development (Bachelor/Master)
The goal of the practical course is to understand the fundamentals of developing sociotechnical information systems for different application areas. Within the scope of the course, students learn to identify a suitable solution strategy for a given problem, define requirements and implement them in form of a working software product (e.g., web platforms, mobile apps, desktop applications). Students also learn to test the quality of the developed sociotechnical system and document it in accordance with established standards.

TEAM PROJECTS

Team Project Economy and Technology (Bachelor)
The team project course „Economics and Technology“ is conducted in cooperation with colleagues from the Institute of Information Systems and Marketing (IISM). It aims to prepare students for working in heterogeneous teams. The course implements the concept of research-oriented teaching and fosters students’ problem-solving competencies. In teams of four or five, students work on defined interdisciplinary problems at the intersection of economics and technology. Potential results of the projects include artifacts, such as methods, algorithms, models, software, or components. Each team writes a final report and presents their findings to their supervisors and fellow students. Each semester, our research group offers interesting topics in the areas of digital health and information privacy.

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COMMITTEES AND MEMBERSHIPS

Prof. Ali Sunyaev is assigned to specific committees and is a member of various associations.

Gesellschaft für Informatik (GI)

Co-speaker of the GI Department of Information Systems

Association for Information Systems (AIS)

Deutsche Gesellschaft für Medizinische Informatik, Biometrie und Epidemiologie e.V. (GMDS)

Editorial Board Journal of the Association for Informtion Systems (JAIS)

Editorial Board Journal of Information Technology (JIT)

Editorial Board Electronic Markets (EM)

Member of the Scientific Advisory Coucil of the Anwenderverein Fujitsu NEXT e.V. („Network of Experts“)

Verband der Hochschullehrer für Betriebswirtschaft (VHB)

Founder and Spokesperson of the “Digital Health” section in the German Informatics Society (GI)

Chairman of the examination board for the course of studies “Information Systems” at the KIT

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