

2020

# ANNUAL REPORT



CRITICAL  
INFORMATION  
INFRASTRUCTURES  
RESEARCHGROUP

# PREFACE

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Dear Friends,

The past year was marked by many challenges but also some great successes. As we all know, 2020 started as usual but a few months later we were faced with a previously unknown situation. COVID-19 changed pretty much everything. Handling of both private and professional aspects changed for almost all of us. Looking back, I am very proud of all the members of my research group—the way they adapted to the new situation and the way they handled it makes me proud. It looks like the quality and the quantity of our teaching and research was not dramatically affected by this unexpected situation. The consequences of the pandemic will probably be seen during the next few years. I am somehow quite sure that our research “pipe” definitely looks different by now because of the situation we face. As expected, with this report we will focus on the bright side of our work. We got awards for excellent teaching and research and had some great successes you may see on the next pages.

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 three years now.

In 2020, we made several contributions to research, teaching, and innovation at the KIT. We published several research articles that were very well received by the academic community. We also presented and discussed our research at the leading conferences in our field. Many of these conferences were held virtually. One of the highlights of 2020 was the Best Theory Paper Award that we received at the IS in Healthcare track of the International Conference on Information Systems. A significant milestone for research and teaching was publishing of the textbook entitled „Internet Computing—Principles of Distributed Systems and Emerging Internet-Based Technologies“ at Springer Nature. Another highlight was definitely to receive the faculty teaching award for outstanding interactive and practice-oriented courses on current topics such as „cloud computing, blockchain, or IoT.“ We contributed in many ways to the excellent teaching program of the KIT. We had to change the format of the lecture “Applied Informatics – Internet Computing” due to COVID-19. Thereby, we were able to give as many students as possible the opportunity to continue their courses of study. We also virtually offered master lectures (e.g., “Digital Health” and “Critical Information Infrastructures”), seminars, and practical courses to our students. We are very encouraged by highly positive feedback from the participants and are looking forward to our classes in 2021.

# PREFACE

In terms of innovation, I would like to highlight our new research projects GAIA-X, PANDIA, BloG3, DaWID, and Digital Health Work. Within the GAIA-X project, the foundations for the development of a networked, open data infrastructure based on European values, is to be developed and tested. The BMWi funded project gains worldwide attention and is one of the most prominent European projects in 2020. 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). In the BloG3 project, we will design, develop, implement, and evaluate a blockchain-based system for the management of health data. This system will enable oncology patients leaving the Charité hospital in Berlin to manage access rights to their data via a smartphone app. The BMBF-funded project DaWID aims to develop a metaplatform that allows citizens to ensure their data sovereignty and creates cross-platform mechanisms to link previously siloed services and platforms. As a result, data can be collected and refined by an orchestrated sequence of IT services in a data-driven value chain. The Digital Health Work project funded by the German Research Foundation (DFG) aims to investigate how the digitization shapes work in the healthcare sector. I am extremely happy and excited to be part of these and all our ongoing research projects.

Last but most importantly I am very happy to have welcomed new PhD students in my research group—Mandy Goram, Jan Bartsch, Maximilian Renner, Philipp Toussaint, and Felix Morsbach. Great to have you on board ! My congratulations go to Dr. Jens Lansing and Dr. Benjamin Sturm, who both successfully finished their PhD last year.

There are many more information and exciting highlights of equal importance regarding our team, research projects, talks, teaching activities, publications, and memberships that 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 2020.

I am looking forward to the year 2021 !

Very Best  
Ali Sunyaev

# INTRODUCTION

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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.



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# RESEARCH PROJECTS

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# 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, Federal Ministry of the Interior, Federal Office for Information Security), and a large number of German data protection authorities. In February 2020 the project consortium has submitted the certification for approval on a national level.

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

**Contact Persons:** Sebastian Lins, Heiner Teigeler

**Funded by:** Federal Ministry for Economic Affairs and Energy

**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](http://www.auditor-cert.eu)

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für Wirtschaft  
und Energie



DLR Projektträger

aufgrund eines Beschlusses  
des Deutschen Bundestages



auditor

# BloG3

Over 3 years, members of the BloG3 project design, develop, implement, 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 via a smartphone app. This allows patients to grant data access to other doctors, hospitals, and nursing services in the context of follow-up care. The blockchain-based platform integrates different health information systems and builds a bridge between different electronic data sources. The main objective of this project is to investigate to what extent the benefits of this technology can be transferred to real applications in the German health care system from a technical, economic and legal point of view.

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. The project consortium comprises partners from health care, computer science research, and industry.

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

**Contact Persons:** Konstantin Pandl, 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, Circular-Tree GmbH, ITK Engineering AG

**Website:** [www.blog3.de](http://www.blog3.de)

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# COOLedger

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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 imple-

mented as software, which facilitates finding the optimal configuration of distributed ledgers for specific applications.

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**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](http://cii.aifb.kit.edu/english/110_119.php)

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HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

**RSF** Russian Science Foundation



NATIONAL RESEARCH UNIVERSITY

# 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 metaplatfrom 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.

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**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](http://www.dawid-projekt.de)

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**DaWID**

Datenzentrierte Wertschöpfungsplattform für Interaktive, assistierende Dienstleistungssysteme

# digilog@bw

Digitalization is changing social co-existence 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.

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**Project Title:** digilog@bw – Digitalisierung im Dialog

**Contact Persons:** 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](http://www.digilog-bw.de)

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**Digitalisierung  
im Dialog**

# Digital Health Work

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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 Zuboff's (1988)

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.

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**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](https://gepris.dfg.de/gepris/projekt/442171588)

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# DLT4Life

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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 datasubjects 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.

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**Project Title:** Distributed Ledger Technology for Life Sciences

**Contact Persons:** Mikael Beyene, Scott Thiebes

**Funded by:** Helmholtz Gesellschaft

**Project Partner:** Deutsches Krebsforschungszentrum

**Website:** [www.hidss4health.de](http://www.hidss4health.de)

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IN DER HELMHOLTZ-GEMEINSCHAFT



# GAIA-X

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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 sociotechnical monitoring concept for three selected controls (e.g., geo-location, availability and encryption).

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**Project Title:** GAIA-X Federation Services

**Contact Person:** Sebastian Lins

**Funded by:** Federal Ministry for Economic Affairs and Energy

**Project Partners:** EuroCloud Deutschland\_eco e.V., eco – Verband der Internetwirtschaft; and many more

**Website:** [www.bmwi.de/Redaktion/DE/Dossier/gaia-x.html](http://www.bmwi.de/Redaktion/DE/Dossier/gaia-x.html)

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# LitSonar

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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>

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**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](http://www.litsonar.com)

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U N I K A S S E L  
V E R S I T Ä T



# 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.

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**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; funding reference number: 16SV8398)

**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](http://www.pandia-projekt.de)

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 **PANDIA**



# Patient Pal

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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.

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**Project Title:** Patient Pal

**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](http://cii.aifb.kit.edu)

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# PEER

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The PEER 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, PEER 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.

PEER 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 safe-guarded

by the bloxbergblockchain (<https://bloxberg.org>). In order to create a truly open publication platform, PEER 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).

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**Project Title:** PEER – Open Dissertations Library

**Contact Persons:** Ali Sunyaev,  
Benjamin Sturm

**Funded by:** -

**Project Partner:** -

**Website:** [cii.aifb.kit.edu/english/110\\_132.php](http://cii.aifb.kit.edu/english/110_132.php)

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**bloxberg**



MAX-PLANCK-GESELLSCHAFT

# ReDiBlock

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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.

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**Project Title:** ReDiBlock

**Contact Persons:** Scott Thiebes, Konstantin Pandl, Mikael Beyene

**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](http://cii.aifb.kit.edu)

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# Security & Compliance Automation

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The research group cii is working 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' supports this process and explores ways to automate compliance management processes and certification procedures, which, in the long run, should help reduce 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 will analyze and validate the compliance master data management approach, propose suitable data visualizations, and define requirements on a self-audited compliance system.

The goal is also to define automated test procedures and audit rules, and accompany a proof of concept for compliance automation.



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**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/en](http://www.aifb.kit.edu/web/Security%20and%20Compliance%20Automation/en)

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**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.

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**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](http://cii.aifb.kit.edu)

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# Toward better Smart Contract Development

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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).

To address existing challenges, the research project aims to provide software design patterns that help developers make DLT applications perform, secure, and maintainable. Such software design patterns should support developers in avoiding predominant programming mistakes and to identify potential vulnerabilities in their code.

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**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](http://cii.aifb.kit.edu/english/110_133.php)

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# Trusted Blockchain

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Distributed Ledger Technology (DLT) has received growing attention in recent years as an innovative method of storing and updating data within and between organizations.

Blockchain technology is one of the most well-known uses of DLT, in which the ledger (i.e., a computer file used for recording and tracking transactions) comprises 'blocks' of transactions. It is becoming apparent that Blockchain holds the potential for major opportunities across several sectors, including finance, education, and health. Nevertheless, issues related to an immaturity of the technology, ensuring security and privacy, and interoperability of emerging platforms will become more pressing, ultimately hampering use of Blockchain technology by organizations.

Establishing standards and certifying adherence to these standards to address prevalent concerns related to Blockchain technologies gains high importance as it helps to ensure security and resilience of the Blockchain technology and to facilitate trust.

The objective of the research project Trusted Blockchain is to develop a standard for Blockchain technology and a corresponding certification approach that verifies adherence to the standard through a third-party-attestation.

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**Project Title:** Trusted Blockchain

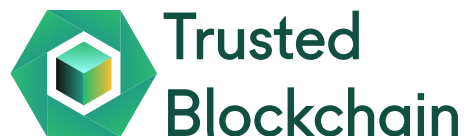
**Contact Persons:** Sebastian Lins, Niclas Kannengießer

**Funded by:** Metamorphoses Braun GmbH

**Project Partner:** University of Kassel

**Website:** [www.blockchain-center.eu](http://www.blockchain-center.eu)

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# Unblackboxing IT Certifications

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The project 'Unblackboxing IT Certifications' focuses on providing essential insights about certification structuring, customers' and online vendors' perceptions about certifications, and finally certification design. We aim to identify and measure how different certification configurations influence both customers' and online vendors' perceptions and thus IT certifications' effectiveness.

As a second objective of the research project, we aim to compare and analyze the perceptions of customers and online vendors to resolve emerging conflicts, and thereby increase certification effectiveness. Finally, various research has argued and shown that customers tend to have a limited understanding of certification assurances or even misunderstand them altogether, thus resulting in calls for innovative and informative certification designs. To address this gap, the research project analyses how to design and display certifications to foster their effectiveness.

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**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](http://cii.aifb.kit.edu/english/110_208.php)

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# XAIOmics

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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 an XAI approach 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.

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

**Contact Persons:** Philipp Toussaint, Scott Thiebes

**Funded by:** Helmholtz Association

**Project Partner:** German Cancer Research Center

**Website:** [www.hidss4health.de](http://www.hidss4health.de)

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IN DER HELMHOLTZ-GEMEINSCHAFT

The logo for XAIOmics, featuring a stylized DNA double helix icon in green and blue, followed by the text 'XaiOmics' in a green-to-blue gradient font.

# TALKS & HIGHLIGHTS

## „AUDITOR“ will be further developed into a European data protection certification

Prof. Dr. Ali Sunyaev has headed the research project „AUDITOR“ (European Cloud Service Data Protection Certification) since 2017. In the first project phase (2017-2019), the project team developed a conceptual design, exemplary implementation, and tested the sustainable and applicable national data protection certification of cloud services. However, since cloud services are offered on a cross-border basis, national certification procedures only offer limited benefits. Cloud providers would have to undergo a national certification procedure in each of the EU member states in which they operate if they wanted to have the GDPR conformity of their service confirmed by a certificate. In the second project phase (November 2019 to October 2021), the focus is therefore on the recognition of the AUDITOR certification procedure as a European certificate by the European Data Protection Committee.



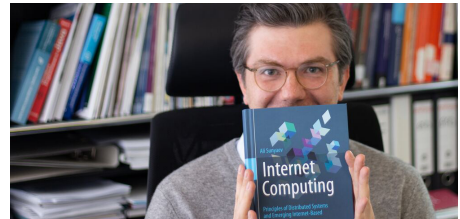
**cii Research Group at the 53rd Hawaii International Conference on System Sciences (HICSS)**



The cii research group of Prof. Ali Sunyaev presented four papers at the 53rd Hawaiian International Conference on System Sciences (HICSS), which took place at the Grand Wailea, Wailea, HI, USA from January 7-10, 2019.

## New textbook „Internet Computing“ published

The cii research group of Prof. Dr. Ali Sunyaev has published a new textbook entitled „Internet Computing - Principles of Distributed Systems and Emerging Internet-Based Technologies“ in Springer Nature.



## Project Kick-Off „DaWID: Data-Centered Value Creation“

The Kick-Off meeting for the research project „DaWID: Data-Centered Value Creation Platform for Interactive, Supportive Services“ took place on February 25, 2020 at the Fraunhofer Institute for Software and Systems Engineering in Dortmund



# TALKS & HIGHLIGHTS

## Hands-On: Experience „Blockchain and Distributed Ledger Technology“ in Our New Seminar

The team around Prof. Dr. Ali Sunyaev offered students the chance to practically experience topics in the field of „Blockchain and Distributed Ledger Technology“ in a new seminar. For this purpose, various socially and technically relevant topics were prepared (e.g. property management), which can be worked out jointly by students within the scope of a programming project. This is part of the research group’s strategy, which aims to diversify the range of available learning methods. „Genuine understanding emerges in a personal process. An intensive, individual engagement with problems offers an optimal breeding ground for this“, says Prof. Sunyaev. Further implementations of this strategy are to follow in the following semesters with innovative course concepts and learning offerings.

## Cii Research Group at the 15th International Business Informatics Congress

On March 9-11, 2020, the Cii research group of Prof. Ali Sunyaev presented a paper at the 15th International Business Informatics Congress in Potsdam.

More than 400 scientists, practitioners, and students took part in the largest German-language conference on Information Systems. The student paper “Challenges of Vehicle-to-Everything Communication. Interviews among Industry Experts” was the continuation of a seminar paper of the lecture “Critical Information Infrastructure” and was presented by Maximilian Renner.



## PANDIA: “Platform for the analysis of privacy notices of interactive assistance systems in the health care domain— Consumer-centered privacy communication”

On March 23, 2020, the kick-off meeting for the research project “PANDIA: Platform for the analysis of privacy notices of interactive assistance systems in the health care domain— Consumer-centered privacy communication” took place in form of a video conference.

## Kick-off of the project BloG3 - Blockchain-based health data management for holistic health profiles

On March 23, 2020, the kick-off meeting for the research project BloG3 took place in form of a video conference. Over 3 years, members of the BloG3 project design, develop, implement, 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 via a smartphone app. This allows patients to grant data access to other doctors, hospitals, and nursing services in the context of follow-up care. The blockchain-based platform integrates different health information systems and builds a bridge between different electronic data sources. The main objective of this project is to investigate to what extent the benefits of this technology can be transferred to real applications in the German health care system from a technical, economic and legal point of view.



# TALKS & HIGHLIGHTS

## Faculty Teaching Award 2020 - Prof. Ali Sunyaev receives the teaching award of the KIT Faculty Economics and Management.

Prof. Ali Sunyaev receives the teaching award of the KIT Faculty „Economics and Management“ for outstanding interactive and practice-oriented courses on current topics such as „Cloud Computing, Blockchain, or IoT.

Video: [https://www.youtube.com/watch?v=Glp\\_FAq9-7k](https://www.youtube.com/watch?v=Glp_FAq9-7k)



## GAIA-X publishes new documents on the status quo of the project - The research group CII contributed to the Technical Architecture

With GAIA-X, representatives from politics, business and science from France and Germany, together with other European partners, create a proposal for the next generation of a data infrastructure for Europe: a secure, federated system that meets the highest stan-

dards of digital sovereignty while promoting innovation. This project is the cradle of an open, transparent digital ecosystem, where data and services can be made available, collocated and shared in an environment of trust.



## GAIA-X: Technical Architecture

### AI meets Distributed Ledger: building marketplaces, sharing data and breaking silos – Interview with Prof. Ali Sunyaev

In an interview published on June 10, 2020, Prof. Ali Sunyaev talks about the convergence of Artificial Intelligence (AI) and Distributed Ledger Technology to create systems with trustworthy AI.

Read the entire interview online: [www.servicemeister.org/2020/07/10/ki-trifft-distributed-ledger-marktplaetze-aufbauen-daten-teilen-und-silos-sprengen](http://www.servicemeister.org/2020/07/10/ki-trifft-distributed-ledger-marktplaetze-aufbauen-daten-teilen-und-silos-sprengen)

### Congratulations to Jens Lansing for his successful doctoral examination

On September 2, 2020 Jens Lansing successfully defended his PhD thesis! His dissertation is entitled „IS Certifications: Structure, Evaluation Process, and Impact on Trust and Decisions“. During his doctoral studies, Jens Lansing has published numerous outstanding scientific



# TALKS & HIGHLIGHTS

papers in leading information systems journals, such as „The Journal of the Association of Information Systems“ or „The Journal of Strategic Information Systems“. We say congratulations, Jens!

## New DFG Project to Research Digitization in Health Care

The German Research Foundation (DFG) is funding a new research project on digitization in the healthcare sector as part of its priority program „Digitization of the Workplace“.

Funded by



## The research group is participating in the new research project to develop Federation Services for 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.

## Presentation at the SIGBD annual meeting (ICIS 2020)

Prof. Dr. Ali Sunyaev gave a talk about the (Re-)Decentralization of the Internet at this year's Special Interest Group on Big Data (SIGBD) annual meeting at the ICIS 2020.



## Paper and Awards at the Pre-ICIS Workshop on Information Security and Privacy (WISP 2020)

Malte Greulich presented a paper at the Pre-ICIS Annual Workshop on Information Security and Privacy (WISP), which was held virtually as a pre-ICIS event on December 12, 2020. The paper "Toward Conceptualizing Perplexity in Cybersecurity: An Exploratory Study" was co-authored by Sebastian Lins, Daniel Pienta, Jason Thatcher, and Ali Sunyaev. The Special Interest Group on Information Security and Privacy (SIGSEC) of the Association of Information Systems (AIS) also awarded Malte Greulich with a doctoral student award for the quality of the paper. Additionally, Manuel Schmidt-Kraepelin and Mikael Beyene both won best reviewer awards.



### Toward Conceptualizing Perplexity in Cybersecurity: An Exploratory Study

Malte Greulich, Sebastian Lins, Daniel Pienta, Jason Thatcher, and Ali Sunyaev

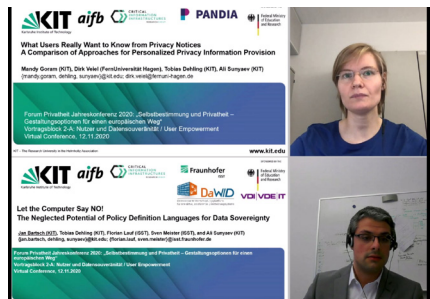


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## Presentations of the cii research group at „Forum Privatheit“ 2020

The two accepted abstracts from the cii research group were presented at this year's annual conference „Forum Privatheit“ 2020.







# TEACHING & RESEARCH

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## LECTURES

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### **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 course, 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 will be a short introduction 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 will be a short introduction 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.

### **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

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## **Blockchain and Distributed Ledger (Bachelor/Master)**

The practical course „Blockchain and Distributed Ledger Technology“ aims to teach the development of sociotechnical information systems in the context of Blockchain or Distributed Ledger Technology (DLT) in a practical way. Topics include validation of document authenticity, management of real-world asset ownership, monitoring tools for software clients of distributed ledgers, machine learning for blockchain security, and trusted execution environments for confidential smart contracts. In addition to the given main topics, students can also propose their own topics. Students are expected to develop a suitable solution strategy for their problem alone or in group work, elicit requirements, and implement a software artifact (e.g., web platform, mobile apps, desktop application) based on these requirements. Another focus of the practical course is the subsequent quality assurance and documentation of the implemented software artifact.

## **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.

## **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.

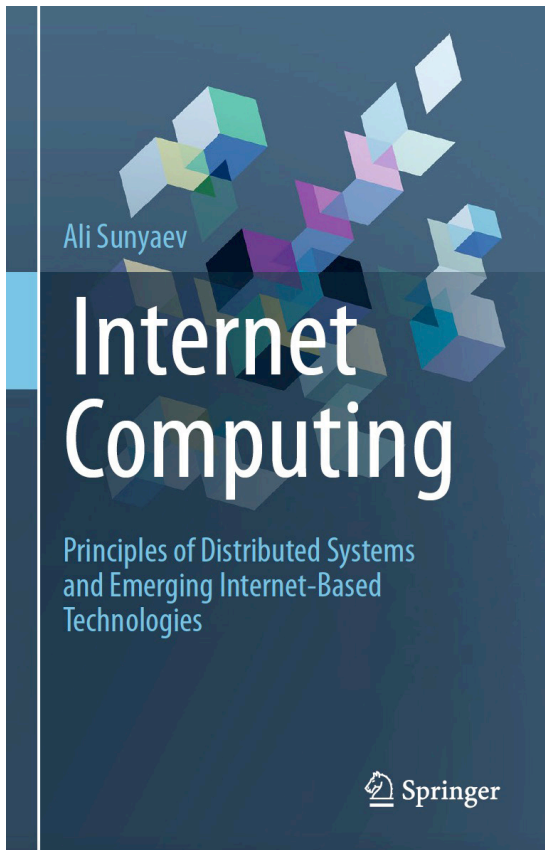
# SELECTED PUBLICATIONS

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**Sunyaev, A. (2020)**

*Internet Computing – Principles of Distributed Systems and Emerging Internet-Based Technologies.*

Springer International Publishing.



This book introduces the reader to the fundamentals of contemporary, emerging and future technologies and services in Internet computing. It covers essential concepts such as distributed systems architectures and web technologies, contemporary paradigms such as cloud computing and the Internet of things, and emerging technologies like distributed ledger technologies and fog computing. The book also highlights the interconnection and recombination of these Internetbased technologies, which together form a critical information infrastructure with major impacts on individuals, organizations, governments, economies, and society as a whole. Intended as a textbook for upper undergraduate and graduate classes, it features a wealth of examples, learning goals and summaries for every chapter, numerous recommendations for further reading, and questions for checking students' comprehension. A dedicated author website offers additional teaching material and more elaborate examples. Accordingly, the book enables students and young professionals in IT-related fields to familiarize themselves with the Internet's basic mechanisms, and with the most promising Internet-based technologies of our time.

# SELECTED PUBLICATIONS

**Bartsch, J.; Dehling, T.; Lauf, F.; Meister, S.; Sunyaev, A. (2020)**

*Let the Computer Say NO! The Neglected Potential of Policy Definition Languages for Data Sovereignty.* Proceedings Forum Privatheit. doi:10.13140/RG.2.2.19673.54885

**Ermakova, T.; Fabian, B.; Kornacka, M.; Thiebes, S.; Sunyaev, A. (2020)**

*Security and Privacy Requirements for Cloud Computing in Healthcare: Elicitation and Prioritization from a Patient Perspective.* ACM transactions on management information systems, 11 (2), Art.-Nr.: 6. doi:10.1145/3386160

**Fallon, M.; Schmidt-Kraepelin, M.; Warsinsky, S.; Thiebes, S.; Sunyaev, A. (2020)**

*Social Comparison in mHealth: The Role of Similar Others and Feelings of Envy.* Proceedings of the 41st International Conference on Information Systems.

**Gräbe, F.; Kannengießer, N.; Lins, S.; Sunyaev, A. (2020)**

*Do Not Be Fooled: Toward a Holistic Comparison of Distributed Ledger Technology Designs.* Proceedings of the 53rd Hawaii International Conference on System Sciences, Maui, Hawaii, ScholarSpace. doi:10.24251/HICSS.2020.770

**Greulich, M.; Lins, S.; Pienta, D.; Thatcher, J.; Sunyaev, A. (2020)**

*Toward Conceptualizing Perplexity in Cybersecurity: An Exploratory Study.* Proceedings of the Pre-ICIS Workshop on Information Security and Privacy, AIS eLibrary.

**Greulich, M.; Lins, S.; Sunyaev, A. (2020)**

*Toward Uncovering Patterns of Certification Internalization.* Proceedings of the 41st International Conference on Information Systems.



**Kannengießer, N.; Lins, S.; Dehling, T.; Sunyaev, A. (2020)**

*Trade-offs between Distributed Ledger Technology Characteristics.* ACM computing surveys, 53 (2), Art. Nr.: 42. doi:10.1145/3379463

# SELECTED PUBLICATIONS

**Kannengießer, N.; Lins, S.; Sunyaev, A. (2020)**

*Uncertainties toward permissioned distributed ledgers: a multi-actor uncertainty conceptualization.* Proceedings of the 28th European Conference on Information Systems 2020, AIS eLibrary.

**Kannengießer, N.; Pfister, M.; Greulich, M.; Lins, S.; Sunyaev, A. (2020)**

*Bridges Between Islands: Cross-Chain Technology for Distributed Ledger Technology.* Proceedings of the 53rd Hawaii International Conference on System Sciences, Maui, Hawaii, ScholarSpace. doi:10.24251/HICSS.2020.652

**Lins, S.; Kromat, T.; Löbbers, J.; Benlian, A.; Sunyaev, A. (2020)**

*Why Don't You Join In? A Typology of Information System Certification Adopters.* Decision sciences. doi:10.1111/dec.12488

**Löbbers, J.; Lins, S.; Kromat, T.; Benlian, A.; Sunyaev, A. (2020)**

*A multi-perspective lens on web assurance seals: contrasting vendors' intended and consumers' perceived effects.* Electronic commerce research. doi:10.1007/s10660-020-09415-2

**Lücking, M.; Kannengießer, N.; Kilgus, M.; Riedel, T.; Beigl, M.; Sunyaev, A.; Stork, W. (2020)**

*The Merits of a Decentralized Pollution-Monitoring System Based on Distributed Ledger Technology.* IEEE access, 8, 189365–189381. doi:10.1109/ACCESS.2020.3028430



**Pandl, K. D.; Thiebes, S.; Schmidt-Kraepelin, M.; Sunyaev, A. (2020)**

*On the Convergence of Artificial Intelligence and Distributed Ledger Technology: A Scoping Review and Future Research Agenda.* IEEE access, 8, 57075–57095. doi:10.1109/ACCESS.2020.2981447

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**Renner, M.; Münzenberger, N.; Hammerstein, J. von; Lins, S.; Sunyaev, A. (2020)**

*Challenges of Vehicle-to-Everything Communication. Interviews among Industry Experts.* 15th International Conference on Wirtschaftsinformatik, 1831–1843, GITO Verlag. doi:10.30844/wi\_2020\_r12-renner

**Roßnagel, A.; Sunyaev, A.; Maier, N.; Lins, S.; Teigeler, H. (2020)**

*AUDITOR-Kriterienkatalog : Fassung 0.99.* Karlsruher Institut für Technologie (KIT). doi:10.5445/IR/1000105506

**Smetanin, S.; Ometov, A.; Kannengießer, N.; Sturm, B.; Komarov, M.; Sunyaev, A. (2020)**

*Modeling of Distributed Ledgers: Challenges and Future Perspectives.* Proceedings 2020 IEEE 22nd Conference on Business Informatics. Volume 2 - Research-in-Progress and Workshop Papers. Ed.: W. Guédria, 162–171, Institute of Electrical and Electronics Engineers. doi:10.1109/CBI49978.2020.00025

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*Archetypes of Gamification: Analysis of mHealth Apps.* JMIR mhealth and uhealth. doi:10.2196/19280

**Schmidt-Kraepelin, M.; Warsinsky, S.; Thiebes, S.; Sunyaev, A. (2020)**

*The Role of Gamification in Health Behavior Change: A Review of Theory-driven Studies.* Proceedings of the 53rd Hawaii International Conference on System Sciences, Maui, Hawaii.

**Sunyaev, A. (2020)**

*Vertrauenswürdige Systeme mit künstlicher Intelligenz.* Wirtschaftsinformatik & Management, 12 (2), 111–113. doi:10.1365/s35764-020-00250-6



**Thiebes, S.; Lins, S.; Sunyaev, A. (2020)**

*Trustworthy artificial intelligence.* Electronic markets. doi:10.1007/s12525-020-00441-4

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Journal of  
Medical Internet  
Research



**Thiebes, S.; Toussaint, P. A.; Ju, J.; Ahn, J.-H.; Lyytinen, K.; Sunyaev, A. (2020)**

*Valuable Genomes: Taxonomy and Archetypes of Business Models in Direct-to-Consumer Genetic Testing.* Journal of medical internet research, 22 (1), Article: e14890. doi:10.2196/14890

**Thiebes, S.; Kannengießer, N.; Schmidt-Kraepelin, M.; Sunyaev, A. (2020)**

*Beyond Data Markets: Opportunities and Challenges for Distributed Ledger Technology in Genomics.* Proceedings of the 53rd Hawaii International Conference on System Sciences, Maui, Hawaii, 3275–3284, ScholarSpace. doi:10.24251/HICSS.2020.400

# COMMITTEES AND MEMBERSHIPS

---

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

Gesellschaft für Informatik (GI)

Since 2015, Auditor of Gesellschaft für Informatik (GI)

Association for Information Systems (AIS)

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

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

Editorial Board Communications of the Association for Information Systems (CAIS)

Editorial Board Electronic Markets (EM)

Member of the Scientific Advisory Council 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

# IMPRINT

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Karlsruhe Institute of Technology  
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## **Download**

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