TECHNISCHE UNIVERSITÄT DRESDEN

tu-dresden.de/ing/informatik

FACULTY OF COMPUTER SCIENCE

WELCOME!

Lucas Vogel

We are pleased to present to you one of the most attractive academic sites in Germany that is offering outstanding opportunities to study computer science and to graduate in this most innovative field.
Moreover, innovation in academia and industry is being triggered here. Our Faculty excels in research, it is trend-setting in teaching, and it disposes of an outstanding industrial network. Various national and international rankings are giving evidence of these merits.

Our research is devoted to developing future technologies: the Internet of Services, Fog and Cloud Computing, Data Security in Social Networks, new forms of Human-Computer Interaction, Big Data, and Interactive Visual Computing are only some examples of our research fields that have a high relevance for our society and industry. Computer scientists from Dresden provide key technologies for all areas of life.

Constantly, our research projects are adding new aspects to teaching: Most modern internship programs and virtual reality labs, research-oriented Master's theses, and internationally networking professors are providing perfect conditions for university studies of our students and will ensure an early and close link of our graduates with requirements of their future working fields.

We are committed to transfer new technologies to industry and are maintaining a multitude of contacts to members of the industrial network "Silicon Saxony". Interdisciplinary projects, collaboration in numerous working groups, lecture series on topics relevant to industry, and our Faculty's event OUTPUT.DD are the foundations of close contacts between graduates and companies.

In April 2017 Dresden's initiative "Smart Systems Hub – Enabling IoT (Internet of Things)" was included in the group of the twelve German future Digital Hubs. Here, competencies from the areas of hardware, software, and connectivity will be bundled in order to create intelligent systems for the era of digital industry.

We would like to invite you to come to Dresden and to benefit from this rich range of opportunities.

Uwe Aßmann

NUMBERS
6 institutes
25 professors, 3 senior professors
300 employees
2000 students
More than 200 current research projects
More than EUR 8.3 million
third-party research funds in 2015
200 graduates 2016
241 doctoral students 2016
28 dissertations 2016

DEGREES
Diplom
Bachelor of Science
Master of Science
State examination
Dr.-Ing. / Dr. rer. nat. / Ph.D.

STUDY PROGRAMMES
Computer Science
Media Computer Science
Information Systems Engineering
Computer Science Teacher Training
Computer Science and Engineering
Computational Modeling and Simulation
(from 2018 onwards)
Distributed Systems Engineering
Computational Logic

Silvia Kapplusch

FACULTY OF COMPUTER SCIENCE

Saxony's largest educational institution for computer science has been moulded by its history of sixty years of research and study as well as by its early international orientation. The Faculty's research triggers the development of future technologies as numerous areas of research are giving impacts to teaching. In the framework of Silicon Saxony, research on software and software development is opening up new dimensions. The Faculty of Computer Science plays an essential role within the Dresden University of Excellence and within the research alliance Dresden concept. This becomes evident by the involvement of Dresden computer scientists in cutting-edge projects: The excellence cluster "Center for Advancing Electronics Dresden" (cfaed), where chips for future applications are being constructed, research on cyber-physical systems in collaboration with the School of Engineering Sciences, or the collaborative research centre "Highly Adaptive Energy-Efficient Computing" (HAEC), which is developing foundations for energy-efficient servers.

Research of the Faculty's six institutes encompasses a wide range starting from basic to application research projects. The Faculty excels in outstanding scientific competencies and high performance in the areas of software engineering, human-computer interaction, operating systems, privacy and data security, computer systems, intelligent systems, and formal methods. In addition to classical computer science and media computer science, there are eight more courses of studies to choose from, including two master's programmes in English. Extremely modern technical equipment, a practical focus of studies and teaching, internationally networked professors, interesting research focuses and worldwide academic and industrial cooperations are providing excellent conditions of studies.

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Silvia Kappluscb

INSTITUTE OF

APPLIED COMPUTER SCIENCE

The institute concentrates on research topics from the areas human-computer interaction, real-time communications, building and industrial automation. Aspects of user integration – especially in the context of mobile systems – are addressed, as well as design and optimization processes in flexible, networked automation systems applied to building automation, semiconductor manufacturing, process and factory automation.

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CHAIR OF HUMAN-COMPUTER INTERACTION
Prof. Dr. rer. nat. habil. Gerhard Weber

- User-centred development of multimodal and haptic user interfaces
- Navigation and new services to improve mobility of people with special needs
- Adaptation and adaptivity in time-dependent media for blind, low vision, deaf and dyslexic people

CHAIR OF INDUSTRIAL COMMUNICATIONS
Prof. Dr.-Ing. habil. Martin Wollschlaeger

- Industrial communication systems – Ethernet-based systems, fieldbus systems, management of heterogeneous networks
- Information models in automation, device and interaction models in Life Cycle, semantic annotations, continuous description methods
- Industrial Internet – integration of IT solutions and automation systems, web technologies in automation

CHAIR OF TECHNICAL INFORMATION SYSTEMS
Prof. Dr.-Ing. habil. Klaus Kabitzsch

- Distributed, linked automation systems, field-buses, applications in plants and buildings, ambient assisted living
- Wireless sensor networks
- Process identification, advanced control, predictive maintenance
- Design, test and diagnosis tools for automation systems, PLC, embedded systems
- Reference asset for smart buildings and smart homes

DIRECTOR OF INSTITUTE
Prof. Dr.-Ing. habil. Martin Wollschlaeger

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INSTITUTE OF

ARTIFICIAL INTELLIGENCE

The institute focuses on artificial intelligence in research and teaching. Using knowledge-based systems, applications are developed that help to find and eliminate errors in technical systems or to diagnose diseases, based on formalized knowledge and logical conclusions. Computer vision supports, for example, the recognition of faces, objects and scenes or industrial quality control using pattern analysis and pattern recognition. Another objective is to develop novel computational methods primarily used for biological questions.

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DIRECTOR OF INSTITUTE
Prof. Dr. rer. nat. habil. Steffen Hölldobler

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CHAIR OF COMPUTER VISION
Prof. PhD Carsten Rother

- Computer Vision (scene understanding, object tracking, interactive segmentation, stereo, image and video enhancement, 3D reconstruction).
- Machine Learning (graphical models, deep learning, bayesian inference, large scale optimization)
- Bio Imaging (tracking, registration, deconvolution)

CHAIR OF SCIENTIFIC COMPUTING FOR SYSTEMS BIOLOGY
Prof. Dr. sc. techn. Ivo F. Sbalzarini

- Scientific computing and numerical analysis
- Computer simulation of biological processes
- Particle methods for simulation and image analysis
- Bio-inspired algorithms
- Image analysis and processing for microscopy
- Parallel high-performance computing for numerical simulations
- Computational biology

CHAIR OF COMPUTATIONAL LOGIC
Prof. Dr. rer. nat. Sebastian Rudolph

- Semantic technologies
- Logic-based knowledge representation (in particular description logics and rule-based approaches)
- Decidability and complexity analysis of logic formalisms
- Ontological modeling
- Formal concept analysis
- Theory of databases
- Computational linguistics

CHAIR OF KNOWLEDGE REPRESENTATION AND REASONING
Prof. Dr. rer. nat. habil. Steffen Hölldobler

- Logic and Logic Programming
- Knowledge Representation and Inference
- Connectionist Systems
- Human Reasoning
- Cognitive Science

SENIOR CHAIR OF COMPUTATIONAL LOGIC
Sen.-Prof. Dr. rer. nat. habil. Horst Reichel

- Formal methods based on induction and coinduction
- Partial First-Order Logic

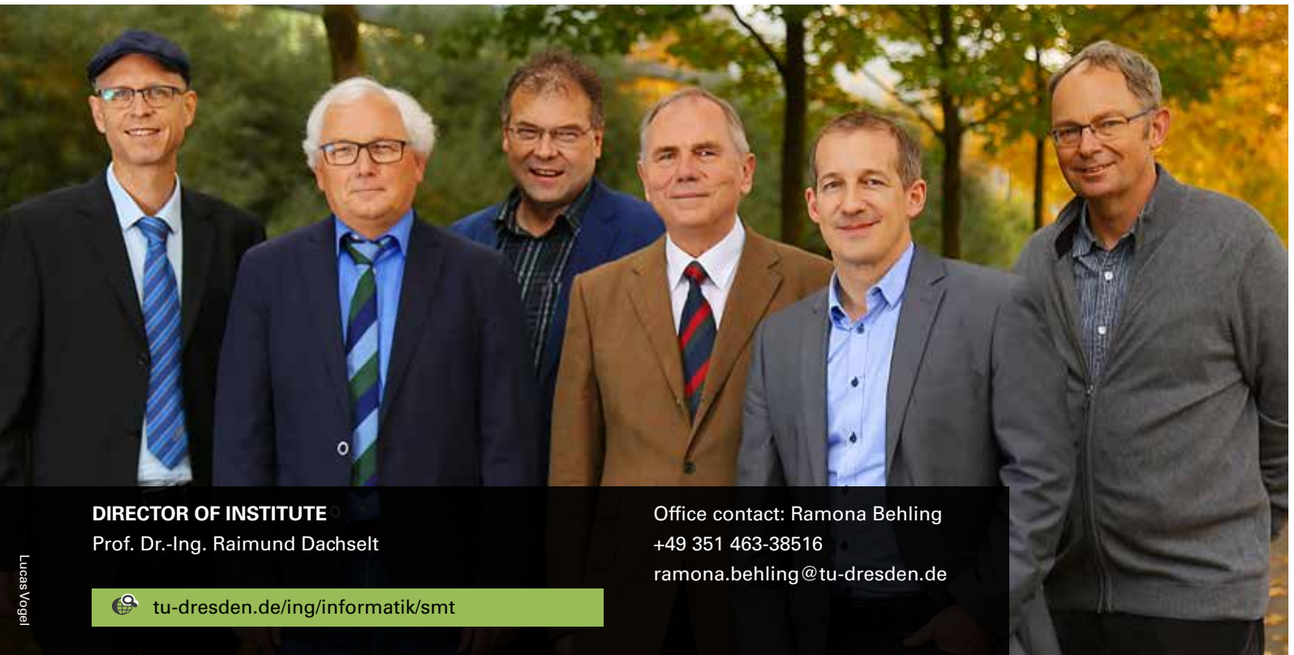
SENIOR CHAIR OF APPLIED KNOWLEDGE REPRESENTATION AND REASONING
Sen.-Prof. Dr.-Ing. habil. Uwe Petersohn

- Intelligent Agents, Search Algorithms, Discrete Optimization, Planning
- Case-Based Reasoning, Making Complex Decisions

INSTITUTE OF

SOFTWARE AND MULTIMEDIA TECHNOLOGY

Our research and teaching activities are focused on important aspects of the analysis, design, implementation and usage of complex applications and multimedia systems. In our increasingly digital world software must be highly flexible, context-aware, adaptable, powerful, usable and a pleasure to use. Among the research topics we are interested in are topics like automated software development, composite web applications, Visual Computing, interaction design, visualization, human-computer interaction and didactics of informatics. Our institute makes significant contributions in the study programmes Media Computer Science, Computer Science, Information Systems Engineering and also coordinates the Computer Science Teacher Training.



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CHAIR OF COMPUTER GRAPHICS AND VISUALIZATION
Prof. Dr. rer. nat. Stefan Gumhold

- Scientific Visualization and visual analysis
- Acquisition and processing of 3D models
- Scene understanding from image data

CHAIR OF MULTIMEDIA TECHNOLOGY
Prof. Dr.-Ing. Raimund Dachselt

- Natural User Interfaces: combining multiple interaction modalities and displays
- Interactive information retrieval and visualization & exploration of big information spaces
- Human collaboration at ultra-high resolution wall-sized displays

CHAIR OF DIDACTICS OF INFORMATICS
Deputy: Dr. phil. Sven Hofmann

- Teaching methodology of ICT / ICT teaching
- Didactical aspects of e-learning
- Educational standards of ICT at schools

CHAIR OF SOFTWARE TECHNOLOGY
Prof. Dr. rer. nat. Uwe Aßmann

- Software reuse
- Model-driven development and language engineering
- Construction of software product lines
- Semantic technologies in software engineering

CHAIR OF MEDIA DESIGN
Prof. Dr.-Ing. habil. Rainer Groh

- Concept and design of interactive systems
- 3D-Projection principles according to human perception
- Design methods of Human-Computer Interaction

SENIOR CHAIR OF MULTIMEDIA TECHNOLOGY
Sen.-Prof. Dr.-Ing. Klaus Meißner

- Development methods and system architecture for distributed, adaptive, multimedia applications in mobile and web scenarios
- Advanced rich media user interface techniques for web service oriented applications
- Collaboration and communication techniques in virtual teams, communities and organizations

INSTITUTE OF

SYSTEMS ARCHITECTURE

The institute focusses on research activities of scalable, trustworthy, and privacy preserving software systems in distributed environments. The bouquet of research activities ranges from operating systems via database management systems to complex distributed application systems from the perspective of programmability, reliability as well as privacy and data protection. The institute is integrated in all structured research projects of the department. In addition to pushing the envelope in terms of computer science basic and applied research, the goal is also to convey research ideas to students and actively integrate them in research projects as early as possible.

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CHAIR OF
OPERATING SYSTEMS
Prof. Dr. rer. nat. Hermann Härtig

- Microkernel-based Operating Systems
- Systems für High Performance Computing
- Real-Time Systems, Embedded Systems
- Secure System Architectures
- Virtual-Machine Technology
- Interaction of HW/SW Architectures

CHAIR OF
DATABASES
Prof. Dr.-Ing. Wolfgang Lehner

- Modeling and architecture of database systems to analyze very large databases (Big Data platforms)
- Database technology exploiting modern hardware infrastructures (e.g. in-memory computing, NVRAM, ...)
- Generation and querying of structured web content (WebTables)

CHAIR OF
PRIVACY AND DATA SECURITY
Prof. Dr.-Ing. Thorsten Strufe

- Privacy Enhancing Technologies, anonymous communication, darknets and anonymous services
- User- and data analysis, inference attacks on the privacy in social media
- Network security and resilient networking

CHAIR OF
COMPUTER NETWORKS
Prof. Dr. rer. nat. habil. Dr. h. c. Alexander Schill

- Mobile Computing
- Internet of Things
- Distributed Systems
- Delay-Tolerant Networks
- E-Learning

CHAIR OF
SYSTEMS ENGINEERING
Prof. Dr. Christof Fetzer

- Secure and dependable cloud computing
- Secure microservices
- Distributed computation
- Trusted execution technologies

DIRECTOR OF INSTITUTE
Prof. Dr.-Ing. Wolfgang Lehner

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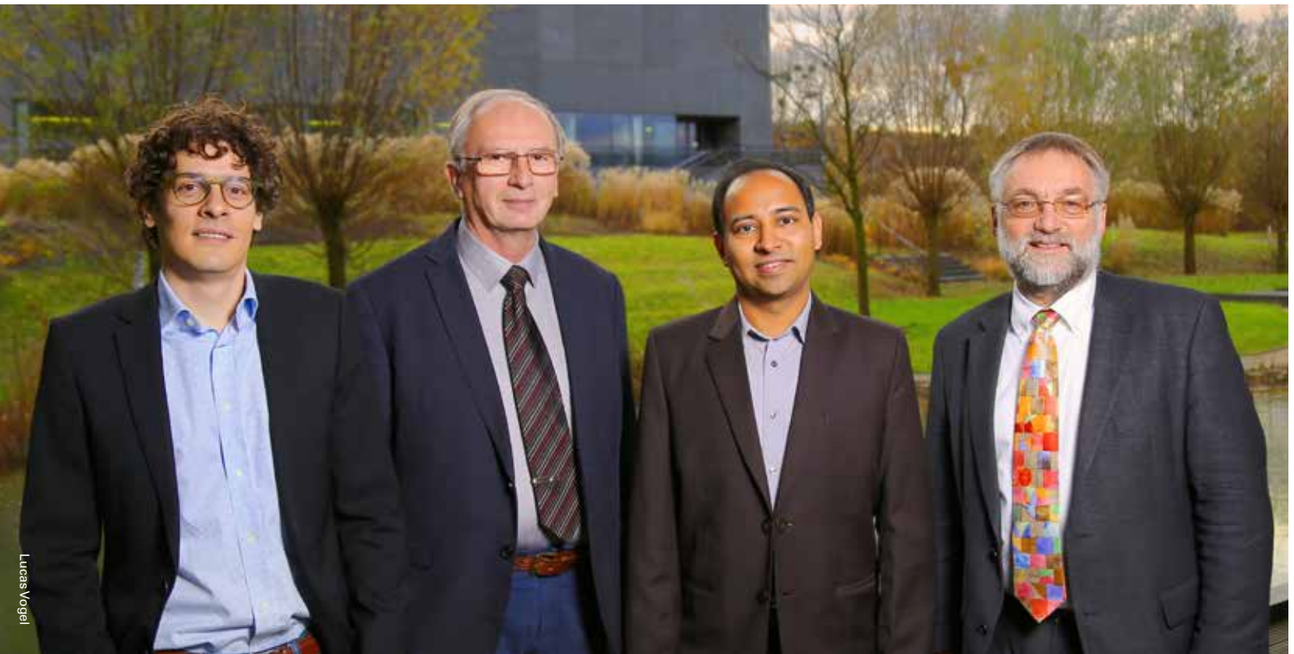
INSTITUTE OF

COMPUTER ENGINEERING

The institute focusses on architectural design, realization, evaluation and operation of computer systems and embedded systems, both in the domain of low-level system software as well as on hardware. Through a wide range of courses the institute addresses the technical aspects of computer science. These aspects often lead to innovative solutions, especially for tasks of high complexity and tasks relevant to economics. Additionally, the institute is strategically involved in major research projects such as HAEC and cfaed. Within the framework of the competence centre ScaDS Dresden/Leipzig it addresses the important field of Big Data.



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CHAIR OF
ADAPTIVE DYNAMIC SYSTEMS
Prof. Dr.-Ing. Diana Göhringer

- Reconfigurable application-specific multi-core architectures
- Network-on-Chip
- Simulators / virtual platforms
- Hardware-software-codesign and runtime systems

CHAIR OF
COMPUTER ARCHITECTURE
Prof. Dr. rer. nat. Wolfgang E. Nagel

- Software tools for the support of programming and optimization
- Programming methods and technologies for high-performance computers
- Grid-computing
- Architecture and performance analysis of high-performance computers

CHAIR OF
COMPILER CONSTRUCTION
Prof. Dr.-Ing. Jerónimo Castrillón

- Programming methods for heterogeneous multi-processor systems
- Domain specific languages and compilers
- Optimization algorithms for code performance and energy efficiency

CHAIR OF VLSI DESIGN,
DIAGNOSTICS AND ARCHITECTURE
Prof. Dr.-Ing. habil. Rainer Spallek

- Circuit, Processor and System Design
- Modeling and Simulation of Electronic Systems
- Test and Diagnosis of Complex Systems
- Dependability and Heterogeneous System Architectures

CHAIR OF
PROCESSOR DESIGN
Prof. Dr. Akash Kumar

- Reconfigurable approximate computing systems
- Designing reliable and energy-efficient multiprocessor systems
- Thermal-aware design for 3D architectures

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DIRECTOR OF INSTITUTE
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INSTITUTE OF

THEORETICAL COMPUTER SCIENCE

The institute investigates various theoretical aspects of Computer Science, with a special focus on formal modeling of artificial (i.e., man-made) systems. Together with its comprehensive teaching program, the institute covers all the important aspects of Theoretical Computer Science. In addition to its foundational research, the institute also bridges the gap between theory and practice through its cooperation in large collaborative research projects such as the collaborative research centre HAEC and the centre of excellence cfaed. It is active in the education of young scientists by its participation in the DFG Research Training Groups QuantLA and RoSI.

Lucas Vogel

CHAIR OF ALGEBRAIC AND LOGICAL FOUNDATIONS OF COMPUTER SC.
Prof. Dr. rer. nat. Christel Baier

- Modeling
- Specification and analysis of reactive systems
- Model checking
- Coordination languages
- Probabilistic systems
- Verification of quantitative properties

CHAIR OF AUTOMATA THEORY
Prof. Dr.-Ing. Franz Baader

- Knowledge Representation (in particular, Description and Modal Logics)
- Automated Deduction (in particular, Term Rewriting, Unification, and Constraint Solving)
- Automata Theory (in particular its applications in logics)

CHAIR OF FOUNDATIONS OF PROGRAMMING
Prof. Dr.-Ing. habil. Heiko Vogler

- Automata theory
- Formal models for natural language processing
- Functional programming

CHAIR FOR KNOWLEDGE-BASED SYSTEMS
Prof. Dr. rer. pol. Markus Krötzsch

- Intelligent Systems
- Knowledge Management on the Web
- Artificial Intelligence
- Knowledge Representation and Reasoning

DIRECTOR OF INSTITUTE
Prof. Dr.-Ing. Franz Baader

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HONORARY PROFESSORSHIPS

ADJUNCT PROFESSOR FOR AUTOMOTIVE SOFTWARE ENGINEERING
Prof. Dr. rer. nat. Bernhard Hohlfeld
Dr.-Ing. Mirko Conrad (Lecturer)

· Methods for developing complex and reliable software systems for vehicle functions
· Software development process as part of function development
· Model based development
· Testing methodology
· Functional safety (ISO 26262)
· AUTOSAR (Automotive Open System Architecture)

ADJUNCT PROFESSOR FOR COMPUTATIONAL MOLECULAR BIOLOGY
Prof. Dr. Eugene W. Myers

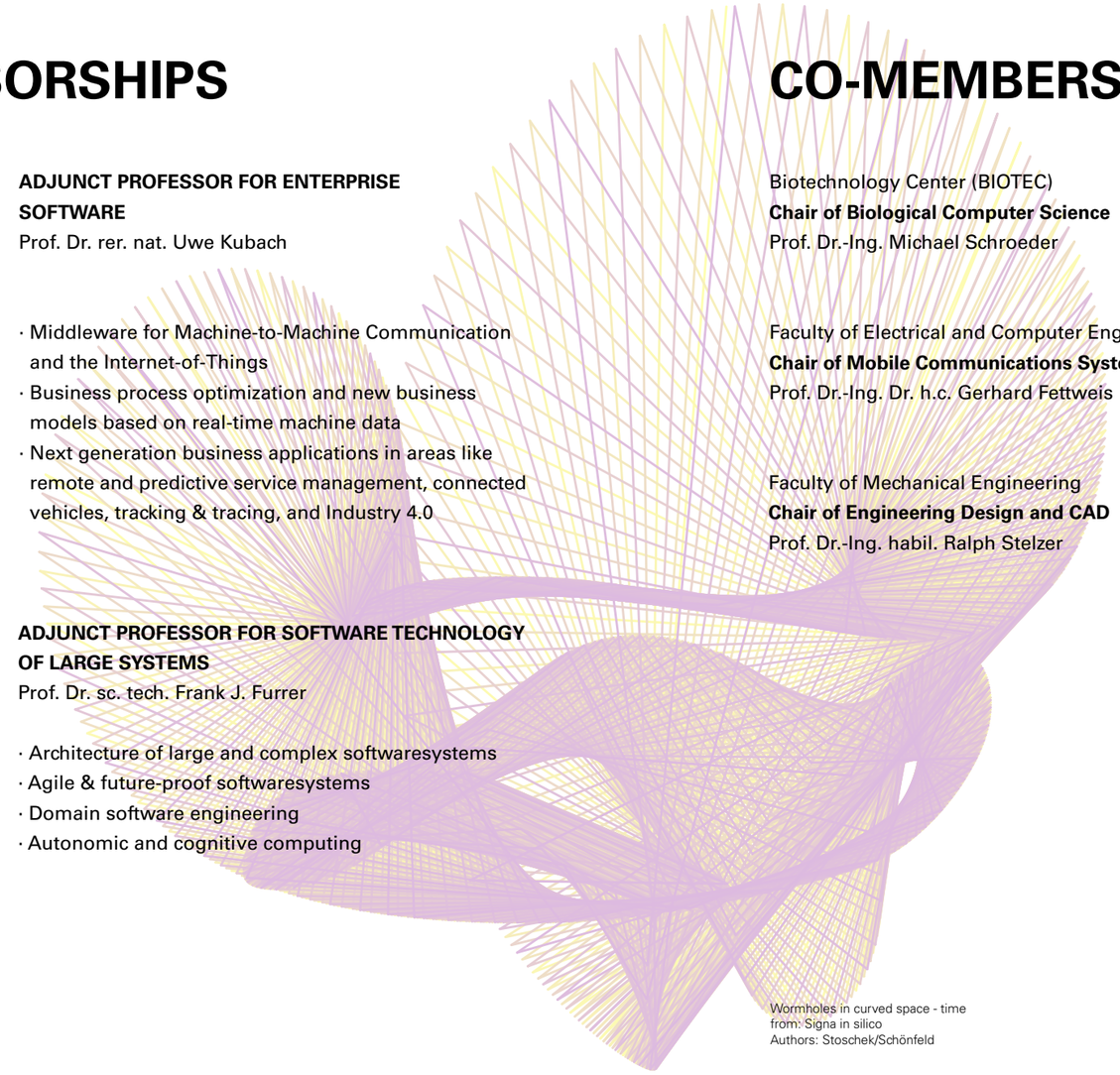
· Simulation and inversion of light optical phenomenon
· High performance, robotically controlled microscopy
· Segmentation and Tracking in the life sciences
· Digital models of development and their analysis
· DNA sequencing and assembly

ADJUNCT PROFESSOR FOR ENTERPRISE SOFTWARE
Prof. Dr. rer. nat. Uwe Kubach

· Middleware for Machine-to-Machine Communication and the Internet-of-Things
· Business process optimization and new business models based on real-time machine data
· Next generation business applications in areas like remote and predictive service management, connected vehicles, tracking & tracing, and Industry 4.0

ADJUNCT PROFESSOR FOR SOFTWARE TECHNOLOGY OF LARGE SYSTEMS
Prof. Dr. sc. tech. Frank J. Furrer

· Architecture of large and complex softwaresystems
· Agile & future-proof softwaresystems
· Domain software engineering
· Autonomic and cognitive computing



Wormholes in curved space - time
from: Signa in silico
Authors: Stoschek/Schönfeld

CO-MEMBERSHIPS

Biotechnology Center (BIOTEC)
Chair of Biological Computer Science
Prof. Dr.-Ing. Michael Schroeder

Faculty of Electrical and Computer Engineering
Chair of Mobile Communications Systems
Prof. Dr.-Ing. Dr. h.c. Gerhard Fettweis

Faculty of Mechanical Engineering
Chair of Engineering Design and CAD
Prof. Dr.-Ing. habil. Ralph Stelzer

Faculty of Mathematics and Natural Sciences
Project group Discrete Structures
apl. Prof. Dr. rer. nat. habil. Ulrike Baumann

Faculty of Business Management and Economics
Chair of Business Informatics, esp. Information Systems in Trade and Industry
Prof. Dr. rer. pol. Susanne Strahringer

RESEARCH FOCUS

The Faculty of Computer Science is covering a wide range of research topics – from theory to applied and practical computer science. This involves fundamental research on a high international level as well as application-focussed research with an interdisciplinary perspective involving multiple partners.

Numerous research activities and projects are the basis for the following six strategic research areas in our Faculty of Computer Science:

- Software Technology and its Applicability in Cyber-physical, Mobile, and Hardware-oriented Systems
- Internet of Things, Cloud Computing and Internet Security
- Data-intense Computing and Big Data, Knowledge Extraction
- Human-Computer Interaction and Visual Computing
- Formal Modeling and Analysis of Artificial Systems
- Modeling, Machine-Learning, and Simulation of Natural Systems

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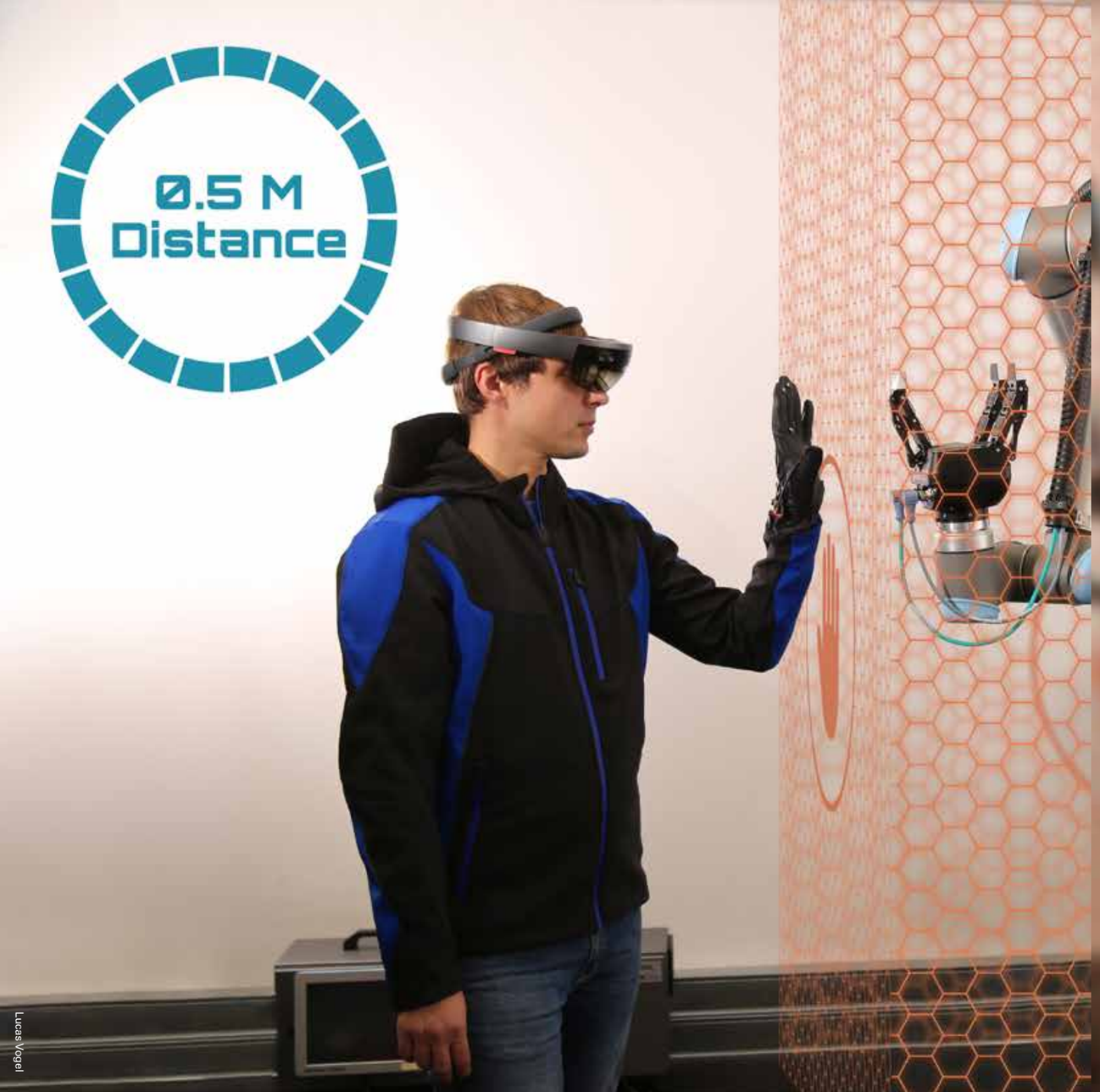

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EXAMPLE PROJECTS

- Research training group RoSI (DFG GRK 1907, p. 55)
- Exzellence cluster cfaed (p. 39)
- CyPhyMan – Cyber-Physical Manufacturing Facility Management (ESF InnoTeam)
- T-RoX – Teaching Software Engineering for Service Robots in Saxony
- EXPLOIDS – Explicit Privacy-Preserving Host Instrusion Detection System (BMBF)
- OpenLicht – Open Source Open Source for intelligent light and lighting systems (BMBF)
- IPCC – Intel Parallel Computing Centre Dresden (Industry)

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SOFTWARE TECHNOLOGY

AND ITS APPLICABILITY IN CYBER-PHYSICAL, MOBILE AND HARDWARE-ORIENTED SYSTEMS

Software is not only a central element of traditional computer systems but rather the centrepiece of distributed applications, and to an increasing extent part of products and devices. In this main research area, the development of architectures, technologies, complex software systems, and applications for distributed and also hardware-related systems is investigated. Topics of research are, amongst others, software as a service, engineering of product-lines, component-based and model-driven software-engineering, methods of developing context-sensitive, adaptive systems, internet of things, mobile computing, mobile embedded systems, and optimization of energy efficiency.

THE INTERNET OF SERVICES

CLOUD COMPUTING AND INTERNET SECURITY

A continuously growing amount of data, services and virtualized computer resources and business processes are transferred to the internet, thus being ubiquitous and retrievable from anywhere. Manifold research activities of this strategic central research area comprise the development of methods, processes and applications in fields like service and cloud computing, mashups and composition, rich internet applications, context adaptation, multi-facetted data security, and management of heterogeneous nets.

EXAMPLE PROJECTS

- ServiceFlow (BMBF joint research project)
- SERECA – Secure Enclaves for Reactive Cloud Applications (EU H2020)
- SecureCloud – Secure Big Data Processing in Untrusted Clouds (EU H2020)
- TOPAs – Tools for Continuous Building Performance Auditing (EU H2020)
- SELIS – Shared European Logistics Intelligent Information Space (EU H2020)

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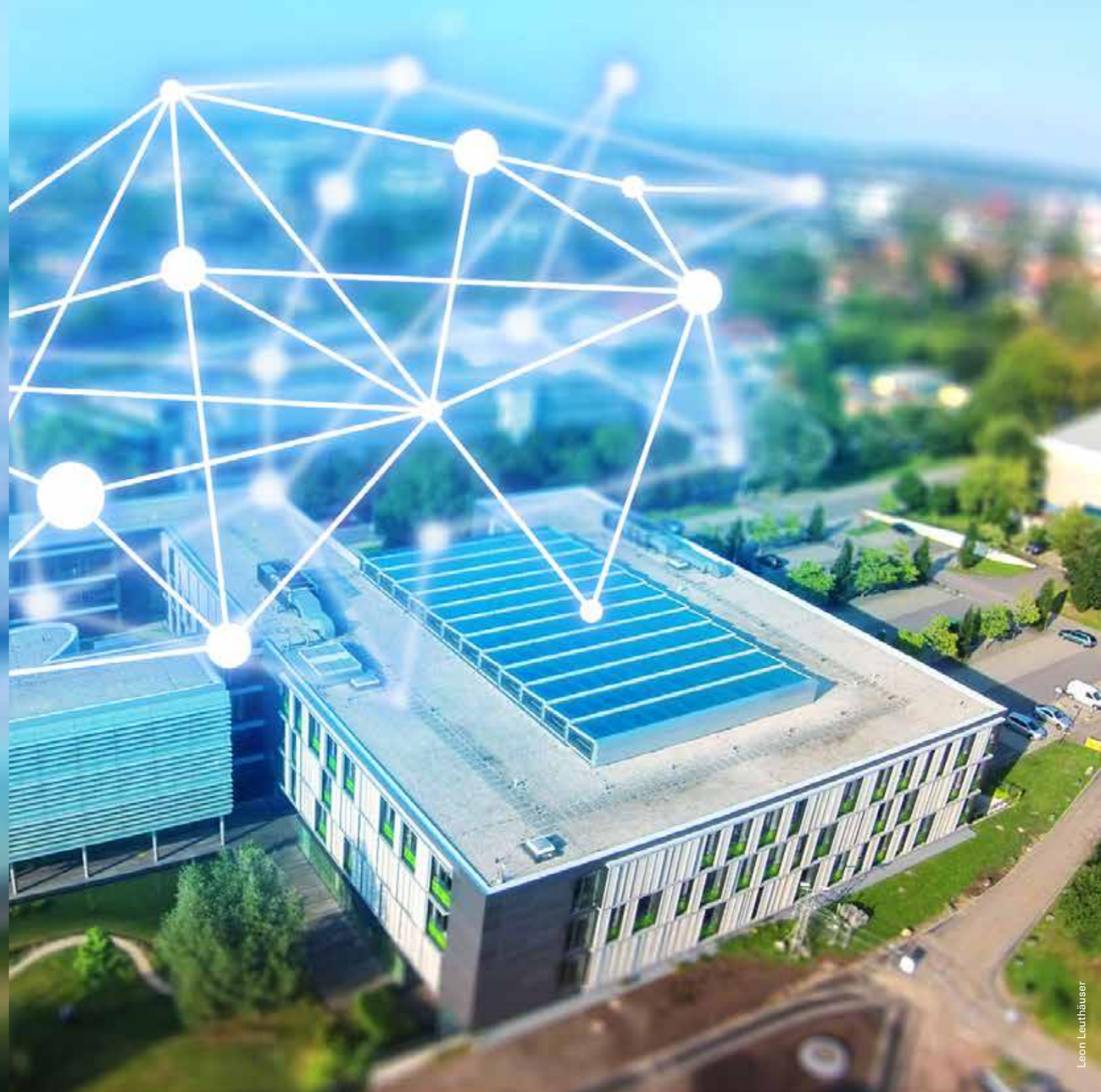

Leon Leuthäuser

Torsten Pross

EXAMPLE PROJECTS

- ScaDS Dresden/Leipzig (BMBF competence centre, p. 41)
- HAEC (DFG SFB 912, p. 38)
- SecureCloud – Secure Big Data Processing in Untrusted Clouds (EU H2020)
- VAVID – Dynamic bile flow modeling and pressure sensing in primary sclerosing cholangitis (BMBF)
- NEXTGenIO – Next Generation I/O for Exascale (EU H2020)
- READEX – Runtime Exploitation of Application Dynamism for Energy-efficient eXascale Computing (EU H2020)
- GeRDI – Generic Research Data Infrastructure
- FFQ – Flash Forward Query Framework (DFG)

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DATA-INTENSIVE COMPUTING

AND BIG DATA, KNOWLEDGE EXTRACTION

Nowadays, data in the web and in social networks have to be categorized into structured data, partly structured data (e.g. documents), and unstructured data (e.g. pictures, videos). Additionally, dynamic data flows are increasing, e.g. those from sensor networks that require real-time processing and analysis. Providing access to these data is one of the „Big Data“ challenges, associated with boosting research fields like internet information retrieval, extraction of knowledge and information, data clustering, and data analysis. All this requires new, intelligent ways of recognizing, processing, and analyzing data, which then have to scale on flexible IT-infrastructures, making use of the necessary resources.

HUMAN-COMPUTER INTERACTION

AND VISUAL COMPUTING

Our vision is to provide human beings with intuitive access to computer technology that is an increasingly ubiquitous part of all areas of human activity. This includes research on mobile devices, new input and display technologies, and interaction with digitally augmented or enhanced objects of everyday life, which we call „everywhere interaction". For this, fundamental questions concerning interaction design, usability, accessibility, user experience, and technical applicability have to be answered. Research focusses on natural and multimodal human-computer interaction with interactive surfaces in mobile/ubiquitous contexts, barrier free IT and accessibility for all, and also addresses related didactic questions. In the field of visualization, computer graphics, and image processing modern methods for data exploration and analysis, for perception-oriented visualization of complex scientific data, for information visualization, for 3D scene understanding, interactive learning, or interactive picture segmentation are being thoroughly investigated.

EXAMPLE PROJECTS

- CollabWall: Understanding Collaborative Work with Interactive Display Walls in Multi-Device-Environments (DFG)
- Smart Workbench – Graphical Aissistance System for Production Technology (ESF)
- Rich Scene Model (ERC Consolidator Grant)
- Mosaik – Accessible graphics for blind users (BMAS)
- MOOCAP – MOOCs for Accessibility Partnership (Erasmus+)
- GEMS 2.0 – Visual Editing and Comparison of Multivariate Graphs using Multiple Interactive Displays (DFG)
- VANDA – Visual and Analytics Interfaces for Big Data Environments (EFRE)

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Professur Multimedia Technologie

Tino Winkler

EXAMPLE PROJECTS

- Research training group QuantLA (DFG GRK 1763, p. 54)
- Excellence cluster cfaed (p. 39)
- Collaborative Research Centre HAEC (p. 38)
- HYBRIS – Hybrid Reasoning for Intelligent Systems (DFG FOR 1513)
- DIAMOND – Data Integration and Access by Merging Ontologies and Databases (DFG Emmy-Noether Junior Research Group)

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FORMAL MODELING

AND ANALYSIS OF ARTIFICIAL SYSTEMS

In this main research area, artificial systems are defined as systems being set up by humans. These systems are either software-systems by definition or they are fully or partially being operated by software. In computer science, the formal modeling of systems like these is a fundamental step during the transition from an informal task description to a formal approach of the problem to be solved. Using formal models with a well-defined semantics facilitates the exchange of models and allows for automatic analysis of models. This analysis encompasses the proof of functional attributes of the system (e.g. verification of correctness) as well as the investigation of non-functional attributes (e.g. response period, quality of output). The development of and research on modeling languages is in the centre of this research focus. Furthermore, the development and implementation of methods of analysis for formal models by using methods of algebra, artificial intelligence, theoretical computer science, and probability methods are being investigated.

MODELING

MACHINE LEARNING AND SIMULATION OF NATURAL SYSTEMS

The process of understanding natural systems, e.g. from biology, our physical environment, or medicine, is advanced by the computer-assisted analysis of complex data as well as by modeling and simulation of natural systems. Thus, restrictions concerning controllability and observability can be overcome. Picture processing and picture understanding (computer vision), computer simulation of continuous and discrete system models (computational science) are in the focus of this research topic. Numerical optimization – both discrete and continuous – as well as machine learning of these complex and frequently structured models, are crucial aspects in this field of research. In an interdisciplinary process, new theories and methods are being developed and implemented. Applications range from systems biology (Centre of Systems Biology Dresden) to human-machine interaction and robotics up to engineering (Centre for Advancing Electronics Dresden). Efficient algorithms and the use of high-performance parallel computers allow for managing huge amounts of data and model complexities.

EXAMPLE PROJECTS

- Rich Scene Model (ERC Consolidator Grant, S. 43)
- Parallel high-performance computing for systems biology
- Simulation of biological processes in complex 3D geometries
- Redivia: New leads. new targets. (BMWi)
- Materials for tissue regeneration within systemically altered bone (DFG SFB/TRR 79)
- DYNAFLOW – Dynamic bile flow modeling and pressure sensing in primary sclerosing cholangitis (BMBF)

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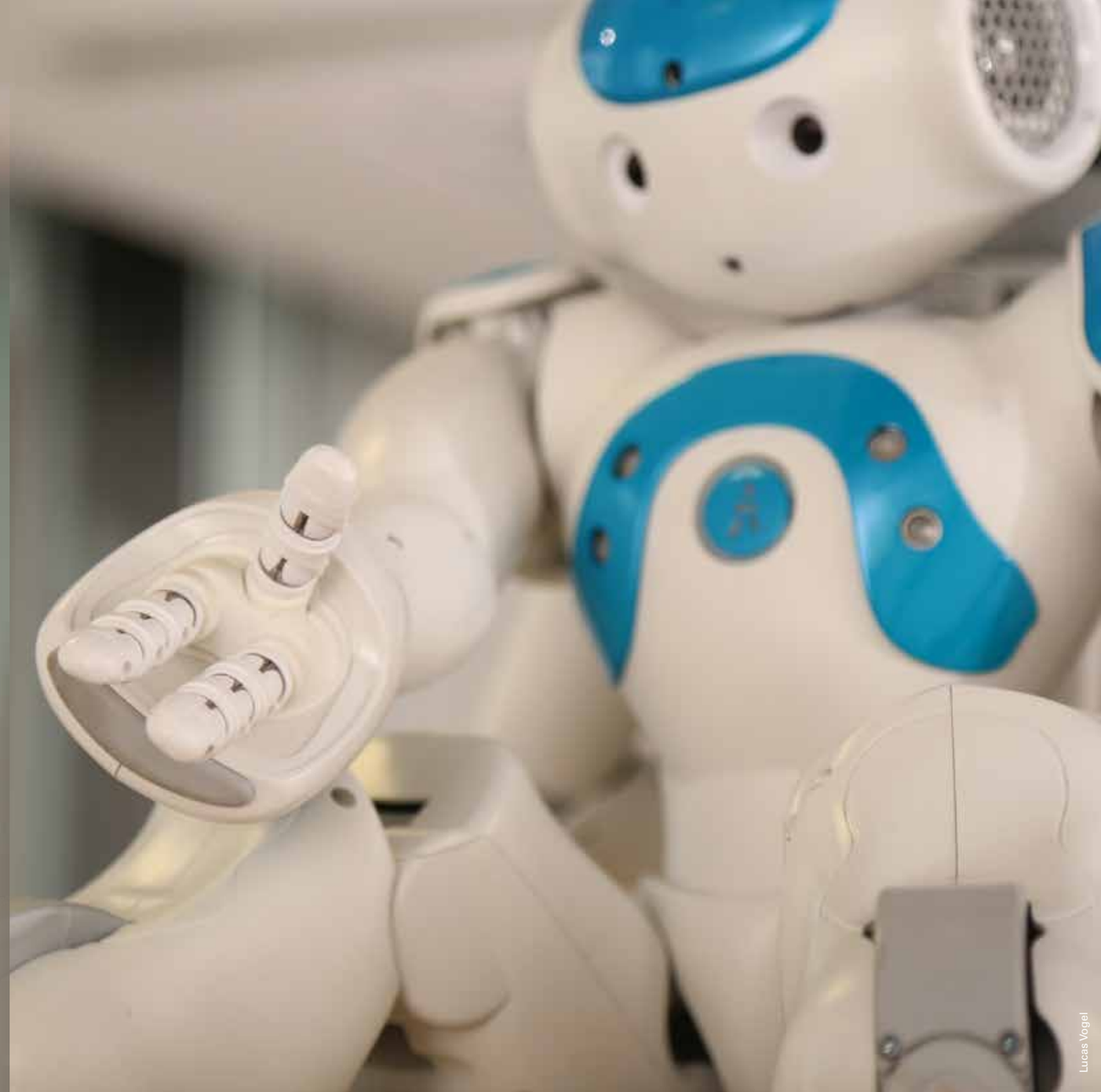


Lucas Vogel

SELECTED

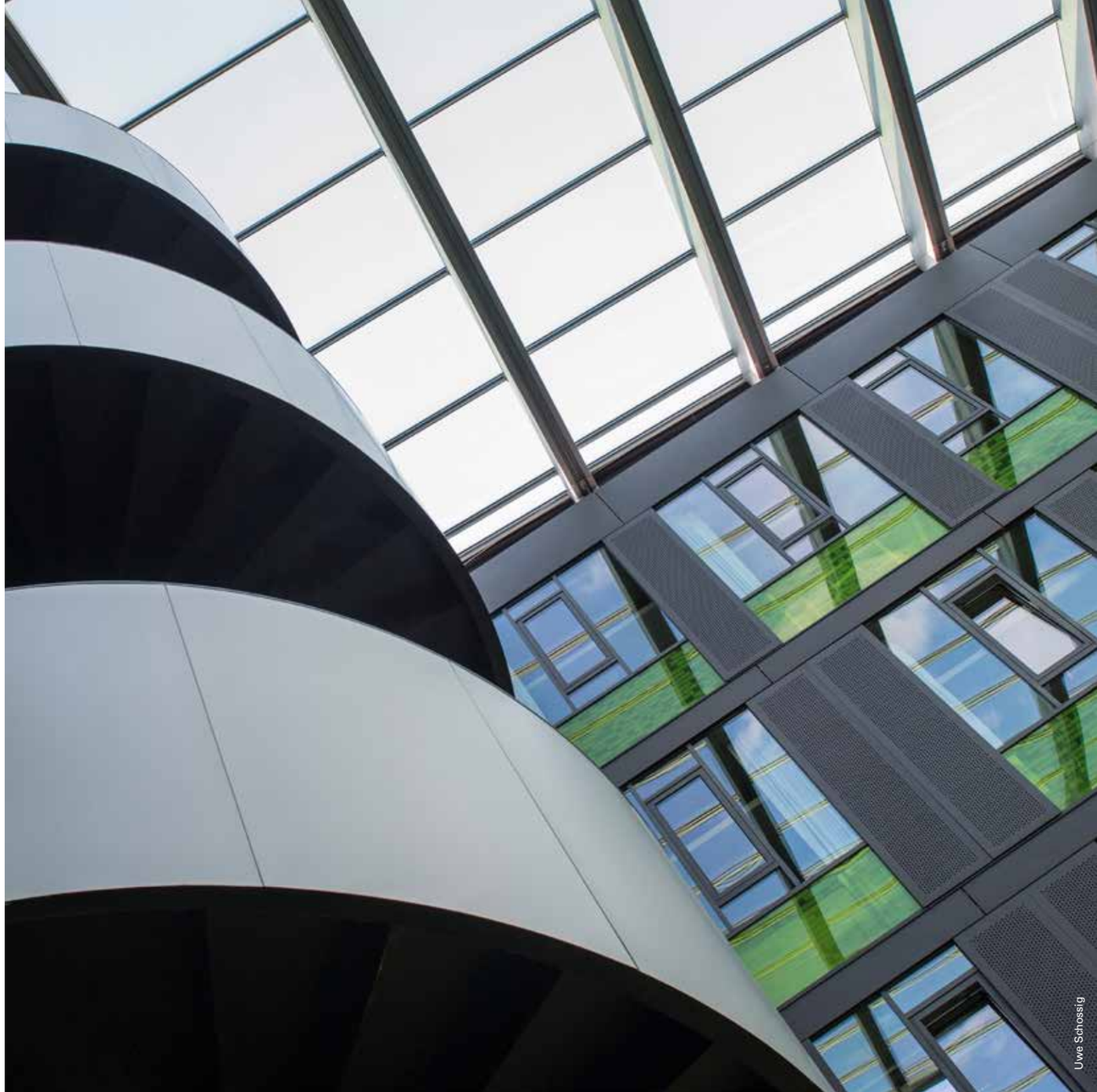
MAJOR PROJECTS OF THE FACULTY

Our Faculty is involved in numerous, interdisciplinary major projects that are being financed by a third party in an EU-context. The Faculty of Computer Science and the Faculty of Electrical and Computer Engineering are joined synergetically within the School of Engineering Sciences. They are closely cooperating with local partners from industry and business. In this, they are supported by a growing collaboration with the Faculty of Mechanical Science and Engineering that is providing excellent research and design in materials science as well as by joint projects in research focuses of the School of Engineering Sciences.

The successful application for the cluster CoolSilicon in 2008 has bundled the collective efforts towards "energy-efficiency in IT" by joining university and non-university researchers with partners from regional industry and business.

More recent examples are the collaborative research centre 912 "HAEC – Highly Adaptive Energy-efficient Computing" and the cluster cfaed "Centre for Advancing Electronics Dresden" which was constituted within the excellence initiative of TU Dresden. In cfaed, a multitude of partner institutions with an interdisciplinary focus are researching jointly on developing new materials in electronics – thus relating closely to the strategic development of methods that are applied in computer science.

Furthermore both, the national Big Data Competence Centre ScaDS Dresden/Leipzig (Scalable Data Services and Solutions) with its broad interdisciplinary field of research and the 5G-Lab, which was founded in 2014, display the vast potential of our site.



Uwe Schossig

COLLABORATIVE RESEARCH CENTRE

HAEC

HIGHLY ADAPTIVE ENERGY-EFFICIENT COMPUTING

Prof. Dr.-Ing. Dr. h.c. Frank H. P. Fitzek

Energy consumption in modern IT systems is not only a significant cost factor; it also approaches a level where it limits further performance improvements. If we take for example the servers that comprise the Internet, we will see an energy consumption comparable to about a quarter of the total annual energy consumption in Germany. At the same time, we find many components of an IT system already operating at an optimal energy/performance point.

The mission of the collaborative research centre HAEC is to create highly adaptive systems, which achieve high energy-efficiency without sacrificing performance. HAEC is a joint project between the Faculty of Electrical and Computer Engineering, the Department of Mathematics and the Faculty of Computer Science of the TU Dresden.

The main goal of HAEC is to build the so-called HAEC Box, an integrated hardware/software system optimized for high adaptivity and energy efficiency without compromising in performance. This comprises the following three major goals:

· HAEC-Hardware: Energy-adaptive computing platform (HAEC Box), being a major innovation towards low-power computing without compromising performance.

· HAEC-Architecture: Energy-adaptive computing and network architecture, being a major innovation for energy-adaptive computing and communication with the HAEC Box.

· HAEC-Software: Energy-adaptive computing management, being a major innovation in low-energy computing management enabling to build and deploy highly energy-efficient networked applications.

During Phase I, we already have achieved remarkable progress in the area of highly adaptive energy-efficient information processing, both, at the hardware as well as the software levels. Moreover, the HAEC-Software group already developed a very first joint demonstrator called HAECubie.

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Period: July 2015 - June 2019
Coordinator: Prof. Dr.-Ing. Dr. h.c. Gerhard Fettweis
Financing institution:
German Research Foundation (DFG)
External cooperation partners:
Globalfoundries, IBM, Amazon Web Service
Research topics:
Microelectronics, Information Technology

tu-dresden.de/ing/forschung/sfb912

cfaed / Jürgen Lösel

EXCELLENCE CLUSTER

CFAED

CENTER FOR ADVANCING ELECTRONICS DRESDEN

CMOS so far has been the driving force behind the continued success of the information and communication technology. However, the transistor size is reaching the physical limits soon and it is foreseeable that the CMOS roadmap will end by then. In the DFG funded Cluster of Excellence cfaed, computer scientists, electrical engineers, material scientists, physicians, chemists, and biologists from TU Dresden, TU Chemnitz and nine non-university institutes have joined forces to explore promising new materials and technologies, which bear the potential to complement and partially replace the CMOS technology.

In addition to selected research activities in the five materials-inspired paths and the discovery path Biological Systems, the Faculty of Computer Science drives the research of the two system-oriented paths Resilience and Orchestration and is involved in the associated Collaborative Research Centre HAEC (CRC 912). Resilience investigates techniques for the reliable execution of applications on increasingly more erroneous hardware. The goal is to limit the overheads of these techniques to the critical application parts. The mission of the Orchestration Path is to prepare today's software for the integration of novel materials and devices. It aims on automatically adapting applications and their runtime environments to the wildly heterogeneous systems that are expected from this integration. At the same time, the focus is on the programmability of these future systems.

The close interrelationship between the Faculty of Computer Science and cfaed is also reflected in the fact that 15 of the Excellence Cluster's investigators belong to the Faculty. This includes Prof. Markus Krötzsch (Chair of Knowledge-Based Systems) who was appointed by the Cluster in 2016 and thus occupied the first cfaed Open Topic Professorship.

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Period: November 2012 – October 2017
Coordinator: Prof. Dr.-Ing. Dr. h.c. Gerhard Fettweis
Financing institution:
German Research Foundation (DFG)
External cooperation partners:
TU Chemnitz, nine non-university research institutions inter alia Max Planck Society, Helmholtz Association, Leibniz Association and Fraunhofer Society
Research topics:
Microelectronics, Information Technology

cfaed.tu-dresden.de

5G LAB GERMANY

AT TU DRESDEN

CHAIR OFSoftwaretechnologie, TUD

Robert Gommlich

The upcoming fifth generation (5G) of mobile communication systems will impact our life more than any other wireless technology in the past.
The disruptive changes are the introduction of the Tactile Internet introducing latencies of 1ms, massive increase of security and resilience, as well as massive increase in throughput. It will enable tackling new markets such as Industry 4.0, transportation systems including secure driving, smart grids, health care, and many more disruption in markets as agriculture and construction industry.

The new technical requirements must be carefully extracted from a deep understanding of the Tactile Internet applications. New key technologies in network architecture, air interface, and cloud systems will achieve the requirements. This holistic 5G view is the core theme of the 5G Lab Germany, which is organized in four different technology tracks. With more than 20 professors from TU Dresden, almost 600 researchers and our cooperation partners from industry we are well prepared for the upcoming research challenges in the 5G world.

One third of the 5G Lab members are from the Faculty of Computer Science at TUD and contribute their knowledge and research potential in the areas of Networks and Clouds as well as Tactile Internet Applications.

Period: Beginning September 2014
Coordinator: Prof. Dr.-Ing. Dr. h.c. Frank H. P. Fitzek
Prof. Dr.-Ing. Dr. h.c. Gerhard Fettweis
Financing institution:
Initiative of currently 23 professors of the TU Dresden
External cooperation partners:
Bosch, Claas, Deutsche Telekom, Ericsson, Global Foundries, IDT, National Instruments, NEC, Nokia, Racyics, Rohde&Schwarz, Telemotive, Vodafone

5glab.de/

ScaDS DRESDEN/LEIPZIG

COMPETENCE CENTER FOR SCALABLE DATA SERVICES AND SOLUTIONS

The efficient and intelligent handling of large, often distributed and heterogenous data sets increasingly determines the scientific and economic competitiveness. The Competence Center for Scalable Data Services and Solutions Dresden/Leipzig (ScaDS Dresden/Leipzig) is dedicated to a holistic development of methods for using application scenarios for working on huge and complex data sets by using aligned computer architectures, intelligent data life cycle management, knowledge extraction, visual analysis, and methods for data integration.

The close cooperation of the two research sites of Dresden and Leipzig with multiple partners from industry and economy focuses Saxon expertise in this field and connects internationally leading Big Data experts.

The competence centre is covering a broad range of scientific and business applications in the fields of Life Sciences, Material Sciences, Environmental and Transport Sciences, Digital Humanities and Business Data.

Solutions and services for the respective application area are being developed by interdisciplinary groups of researchers, who address specific scenarios.

Period: October 2014 – October 2018
Coordinator TUD: Prof. Dr. rer. nat. Wolfgang E. Nagel
Financing institution:
Federal Ministry of Education and Research (BMBF)
Project partners:
Technische Universität Dresden, Universität Leipzig, Max Planck Institute of Molecular Cell Biology and Genetics, Leibniz Institute of Ecological Urban and Regional Development

scads.de

VISUAL ENGINEERING

SELECTED PROJECTS

Visual Engineering is an applied and interdisciplinary research field established at the Faculty of Computer Science of Technische Universität Dresden. The research addresses the rapid development of hardware and software systems by establishing novel kinds of interfaces between human and computer. The focus is on user and situation aware visualization of data with the help of innovative technologies such as gestural interaction, autostereoscopy, and gaze tracking. Visual Engineering has three main objectives: theoretical foundations, prototyping, and teaching methodologies.

Lucas Vogel

VANDA
Visual and Analytics Interfaces for
Big Data Environments
Financing: EFRE-Project
Period: 01.08.2016 – 31.01.2019
Industry partners:
Mercateo Services GmbH, Leipzig, Alfred Jacob GmbH, Dresden Chemmedia AG, Chemnitz

SMART WORKBENCH
„Graphical assistance system for the interdisciplinary development of production-technical systems“
Financing: ESF Collaborative-Project
Period: 01.10.2016 – 30.09.2020
Partners: 6 partners at TU Dresden, Fraunhofer IVV, Symate GmbH, neongrau OHG, Hydrive Engineering GmbH, Facilityport GmbH, FAD Fertigungs- und Automatisierungstechnik GmbH, Sandstein Neue Medien GmbH

SPEAKING MACHINE
„Fascination speaking machine: Technological change of speech synthesis over two centuries“
Coordination: Jun.-Prof. Dr.-Ing. Peter Birkholz
Period: 01.12.2016 – 31.05.2019
Financing: Federal Ministry of Education and Research (BMBF)
Partners: 4 project partners at the TU Dresden, Dresden art collections, Royal Cabinet of Mathematical and Physical Instruments

mg.inf.tu-dresden.de/forschung-technische-visualistik

RICH SCENE MODEL

ERC-CONSOLIDATOR-GRANT

Lucas Vogel

Prof. Carsten Rother, Professor of Image Processing and Head of Computer Vision Lab Dresden, received an ERC Consolidator Grant from the European Research Council (ERC). The funding programme was created for excellent scientists who are researching groundbreaking topics. The aim of his research team is to provide a comprehensive and detailed 3D presentation from only a few individual recordings of a scene. For this, physical and semantic factors have to be taken into account: for example, which depth and movement a pixel has or which object it is assigned to.

So far, these individual aspects were treated separately or in a rather simple way. One of the goals of the funded project „Rich Scene Model“ is to work on synergy effects between these different aspects.

For this, a new approach in the area of „Deep Structured Learning“ with physical rules and laws is developed.

Methods from the field of artificial intelligence are used, which consider millions of parameters and influencing factors and subsequently put them into relation to each other. This is achieved by the use of enormous amounts of data and massive computing capacity. In the future, practical applications in various fields will be achieved from theoretical investigations, e.g. in transport, robotics, graphics, and human-computer interaction. Jointly with the 6D Vision Group of Daimler AG, algorithms are developed to make future autonomous driving safer even under extreme weather conditions. A further field of application is biology, for example in the evaluation of microscopic images.

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cvlab-dresden.de/erc-grant

INTERNAL AND EXTERNAL RESEARCH CENTRES

International Center for Computational Logic

The International Center for Computational Logic (ICCL) is an interdisciplinary centre of competence in research and teaching in the field of Computational Logic, with special emphasis on algebra, logic, and formal methods in computer science.

It is essentially run by the Artificial Intelligence Institute and the Institute of Theoretical Computer Science at the Faculty of Computer Science as well as by the Institute of Algebra at the Faculty of Science.

ICCL coordinates the European Master's Program in Computational Logic, one of the very few programs of study supported by Erasmus Mundus.

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computational-logic.org

Biotechnology Center (BIOTEC)

The Biotechnology Center of the Technische Universität Dresden is a unique interdisciplinary centre focusing on research and education in molecular bioengineering. The BIOTEC hosts top international research groups dedicated to genomics, proteomics, biophysics, cellular machines, molecular genetics, tissue engineering, and bioinformatics.

The BIOTEC has some 230 members from 35 countries from Eastern and Western Europe, Asia, Australia, and America that work in the fields of biology, medicine, physics, chemistry, computer science, and engineering.

The BIOTEC provides excellent lab facilities and an infrastructure which enables collaboration with other companies residing in the same building.

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biotec.tu-dresden.de

Katrin Boes

Center for Systems Biology Dresden

The centre is a joint initiative of the Max Planck Institute (MPI) for Molecular Cell Biology and Genetics, the MPI for the Physics of Complex Systems, and the TU Dresden. At the centre, an interdisciplinary team of physicists, computer scientists, mathematicians, and biologists develops novel theoretical and computational approaches to biological systems.
Starting from primary observations of spatiotemporal phenomena, computer models are used to understand the inner workings of the system and predict reactions to perturbations. In order to understand the fundamentals of biological information processing, the centre combines modern bioinformatics and automated microscopy with computer vision, computational science, and theoretical physics.

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csbdresden.de

Silvia Kapplusch

STUDYING COMPUTER SCIENCE

Job opportunities for computer scientists are diverse and ample. Moreover, there is a strong demand – currently there are around 41,000 vacancies for IT experts in Germany. More and more mixed disciplines are evolving in all areas: researchers in bioinformatics, medical informatics, and systems biology are analyzing the way organisms are processing information and how cells are working. Construction informatics experts are developing calculation and simulation methods for energy-efficient buildings. Scientific computing allows for fast and parallel processing of huge amounts of data. Business economists are optimizing business processes. IT automotive is designing modern security systems and active driving assistants in networked cars. The Faculty of Computer Science is providing an optimal training for a wide range of careers by providing the necessary foundations. Also, future experts are educated in Master's and Diplom courses of study that will meet the challenges of the future.

UNDERGRADUATE DEGREE PROGRAMMES

Silvia Kapplusch

Computer Science (Diplom)

Uniquely in Germany, the Faculty of Computer Science offers a 5-year study programme through which students may obtain the degree „Diplom". It comprises 300 ECTS points including a comprehensive catalogue of minor subjects, a mandatory 1-semester internship abroad as well as involvement in research projects at an early stage of study. The studies are attractive for young people especially mathematically-scientifically gifted and highly motivated ones. Graduates are typically being employed in executive positions where they design, implement, and deploy complex IT systems throughout various application areas.

Computer Science (Bachelor)

This study programme offers profound and broad training in the scientific foundations of computer science. It includes the analysis, design and implementation of data processing systems. Students gain knowledge of static structures and dynamic behavior of those systems by means of basic concepts such as algorithms, information, complexity, and efficiency. They are being empowered to satisfy specific requirements through application, adaptation as well as further and new developments of methods and concepts. Courses with a focus on teamwork and foreign languages prepare the students for their career start.

Media Computer Science (Bachelor)

Comprehensively, this study programme teaches the scientific basics of computer science and digital media. It is characterized by an interdisciplinary approach with a focus on applied computer science, especially multimedia and software technology. Further topics throughout the studies include media theory and economy, pictorial and culture science, communication as well as psychology. In this way, students are prepared for a wide range of tasks. This includes the design of multimedia applications and user interfaces, electronic publication, digital video production, 3D graphics programming, telemedicine, or e-commerce.

MASTER'S PROGRAMMES

Florian Schneider

Julia Koppenhagen

ENGLISH MASTER'S PROGRAMMES

Computer Science (Master)

The comprehensive range of fundamental and applied research of our Faculty is the basis for a diverse choice of studies and provides specialist competencies for both an academic career and a challenging research-oriented industrial career.

Theoretical, technical, practical, or applied computer science are potential areas of specialization – employment areas are almost unlimited: For example energy-efficiency, green IT and the development of error-free, dynamic, secure, complex systems – just to name a few. The aim of this training is to educate competent all-rounders, who adapt flexibly to changing requirements and dispose of application expertise for solving problems in specific scenarios.

Media Computer Science (Master)

The main focus of this course of study is the design of multimedia applications and systems in research and development. Successful graduates of this course are able to study and optimize the interaction between persons and computer systems in interdisciplinary teams.

The application field ranges from adaptive web applications to learning environments up to computer games. During their studies, students have the possibility to design multimedia communication and information systems in richly equipped special labs and to develop the required design methods as well as the relevant tools, frameworks, and product lines. Our interdisciplinary education also provides insights into psychology, didactics, communication science, and architecture as well as media economics and media technology.

Computational Science and Engineering (Master)

The Master's degree program CSE is an inter-university program which is offered jointly by TU Dresden and the TU Bergakademie Freiberg. Computer science with a focus on the high performance computing at TU Dresden is the starting point of engineering in this program. At TU Bergakademie Freiberg, the methods of computer science and scientific computing are analyzed in the exemplary application field of numerical thermofluid dynamics.

Thus, specialist expertise, especially for numerical simulations in aviation industry, automotive industry, process engineering, and chemical industries is generated.

Computational Logic (Master)

Considering that artificial intelligence will likely be the most important technology of the future, the program aims at teaching students profound theoretical and practical knowledge required for professional practice in the field of logic-based artificial intelligence while developing the ability to work according to scientific methods. Based on a sound background in mathematical logic, theoretical computer science and artificial intelligence, students learn the engineering aspects of logic-based artificial intelligence or computational logic. Integrated study periods at partner universities in Italy, Austria and Portugal are offered with the objective to obtain a joint degree.

Distributed Systems Engineering (Master)

The international Master's programme in Distributed Systems Engineering is a new 2-year programme preparing students for a future career in the very broad field of distributed systems and their practical applications in realistic scenarios. Therefore, the programme structure ensures that students first acquire the necessary theoretical knowledge and expertise before they will get the opportunity to apply their skills in practice in the context of an internship, various practical courses and in their Master's thesis. Students will be taught highly valuable knowledge in design of software systems, distributed systems and in Middleware technologies.

All students are encouraged to spend at least one semester abroad, either at one of our partner universities or at another research or industrial institution of their choice.

Computational Modeling and Simulation (Master)

This interdisciplinary, international Master's programme integrates courses from the areas of computational science and data science.

Graduates will be able to model complex systems and processes by computational data analysis, and to use these models to computationally predict the behavior of a system. Various application-oriented specialization tracks are offered, including energy systems and energy markets, technical systems, biological and medical systems, mathematical models, visual computing and virtual reality.

The programme is jointly hosted by the Faculty of Computer Science, the department of Mathematics, and the Biotechnology Centre BIOTEC.

FURTHER PROGRAMMES

Computer Science Teacher Training - Middle Schools/ Vocational Schools/Gymnasium (State examination)
The aim of these courses is to prepare students for the requirements of their future teaching profession. For this, they acquire the knowledge, abilities, and skills necessary for educating and teaching. University studies are complemented by the subsequent preparatory service in schools.

Studies combine various aspects of computer science with didactics. The core areas of computer science are taught and presented in their respective context. The core areas include algorithms and data structures, computer structures and organization, introductory aspects of theoretical computer science, as well as the basics of media computer science, databases, operating systems, and computer networks.
Students will be equipped with a profound knowledge on the foundations of computer science. Thus, they will be able to prepare lessons didactically with solid technical foundations for the respective type of school.

The necessary competencies for the use of computer science applications, computer systems, the development of E-learning scenarios and software projects, as well as methodical skills in the field of computer science are acquired. During this course of study, practical experience in the design of teaching-learning processes is collected.

Information Systems Engineering (Diplom)
This interdisciplinary course, which is offered jointly with the Faculty of Electrical and Information Sciences, combines electrical engineering and computer science. Due to this connection, more and more functions that were previously performed solely by hardware can now be implemented by microprocessors and software, thus helping to save energy, improve comfort and reliability, and reduce the risk of accidents. Software and engineering sciences that are necessary for the development of embedded systems are taught at both faculties. Potential fields of specialization are software engineering, system-oriented computer science, distributed systems architecture, and technical computer science.

Hydrodynamic field
from: Signa in silico
Authors: Stoschek/Schönfeld

DOCTORAL STUDIES AND HABILITATION

To continue successful academic studies after graduation, the Faculty of Computer Science offers opportunities for doctoral studies (structured Ph.D. programmes) as well as postdoctoral lecture qualifications (Habilitation).
The doctoral studies focus on independent research and scientific advances in the area of Computer Science. The Faculty consists of two graduate schools that offer qualifying research programmes. Within these programmes, Ph.D. students learn from the beginning how to independently conduct scientific research. The doctoral studies conclude with the conferral of the academic degree ‘Dr.-Ing.’, ‘Dr. rer. nat.’, or the anglictic ‘Ph.D.’.

The postdoctoral lecture qualification (Habilitation) is the highest academic degree conferred by German universities. Scientists demonstrate their ability to teach and research in the entirety of their research area. At the end, the university confers independent teaching and examination authorisation upon the scientist. In general, this authorisation is subject to continuous participation in the university’s curriculum as a member of the teaching staff. Postdoctoral lecture qualifications are only open to scientists holding a German doctorate in one of our Faculty’s programs. They must have broad and successful teaching and research experience covering several years.


Nils Eisfeld

DOCTORAL PROGRAMMES

Information Technologies for Business Intelligence Doctoral College (IT4BI-DC)

TU Dresden is one of the five European partner universities involved in the Erasmus Mundus Joint Doctorate in Information Technologies for Business Intelligence – Doctoral College (IT4BI-DC). The curriculum is delivered by the Faculty of Computer Science of TU Dresden in cooperation with universities in Belgium, Denmark, Spain, and Poland. The programme has been designed to develop research excellence in data warehouses, data mining, content analytics, business process management, and visual analytics.

Partner universities:
· Université Libre de Bruxelles (Belgium)
· Aalborg Universitet (Denmark)
· Universidad Politècnica de Catalunya (Spain)
· Poznan University of Tehcnology (Poland)

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it4bi-dc.ulb.ac.be/

European PhD Programmes in Computational Logic (EPCL)

Jointly with three leading European universities, TU Dresden has founded a doctoral training programme that provides high-level education and research opportunities in the area of "Computational Logic (CL)". Members of this programme may choose from two paths of education that are distinct regarding basic and application-oriented research. During the programme, PhDs will research at two of the three partner universities and additionally at one non-European research institution or in industry.

Partner universities:
· Free University of Bozen-Bolzano (Italy)
· Technische Universität Wien (Austria)
· Universidade Nova de Lisboa (Portugal)

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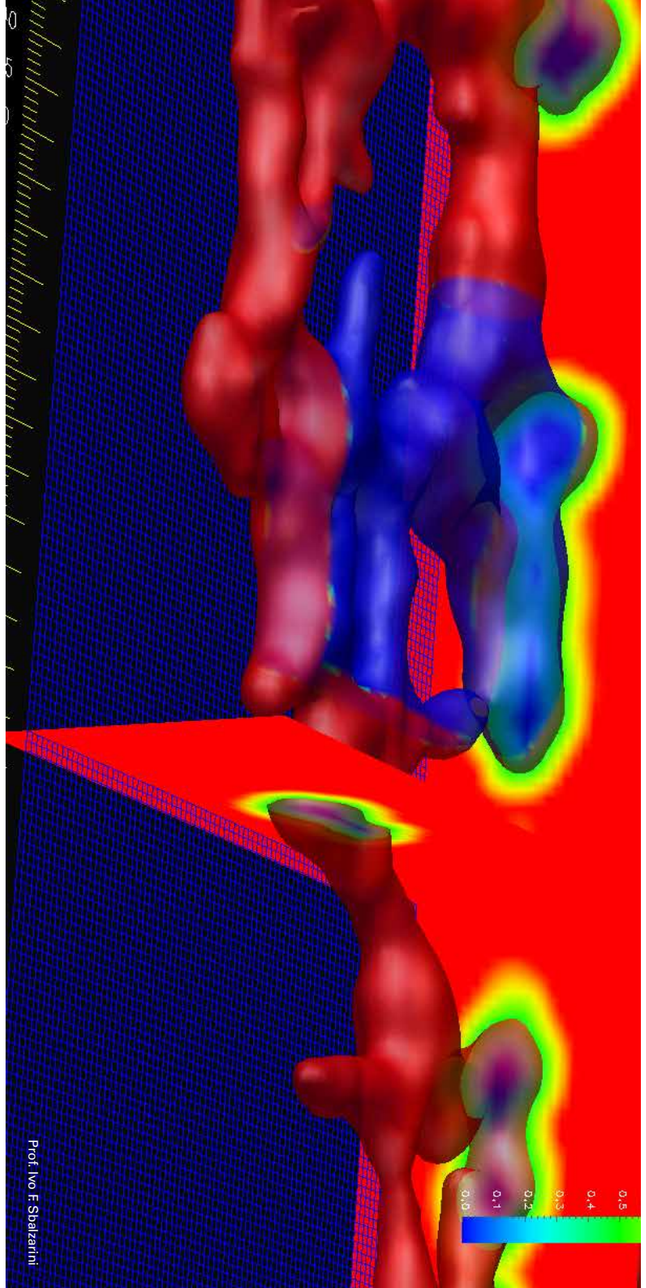
epcl-study.eu



International Max Planck Research School for Cell, Developmental and Systems Biology

The International Max Planck Research School for Cell, Developmental and Systems Biology (IMPRS-Cell DevoSys) is an elite doctoral programme that integrates biology, physics, and computer science. Housed at three sites in Dresden, the PhD students work with top scientists from over 50 nations to ask: How do cells form tissues and organisms? At the forefront of the computational track are interdisciplinary collaborations and innovative research approaches to machine learning, bioinformatics, visual computing, data science, high-performance computing, and computer simulations.

Partner institutions:
· Max Planck Institute of Molecular Cell Biology and Genetics
· Max Planck Institute for the Physics of Complex Systems
· Dresden International Graduate School for Biomedicine and Bioengineering (DIGGS-BB)

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imprs-celldevosys.de

RESEARCH TRAINING GROUP QuantLA

QuantLA - Quantitative Logics and Automata

The Research Training Group „Quantitative Logics and Automata“ has started in 2012 and is funded by the German Research Foundation (DFG) for overall 9 years at TU Dresden and the University of Leipzig. It offers 10 doctoral students at a time the opportunity to study quantitative logics and automata as well as their connection on the highest scientific level and to obtain their doctoral degree by working on a challenging topic in this area. The Research Training Group is run by 10 professors and young scientists from the areas Theoretical Computer Science, Artificial Intelligence, and Algebra at both universities.

Both logics and automata are used as modeling approaches in various areas of Computer Science and are of importance in many application domains. One example for such an application domain is verification of hardware and software systems, i.e., the automated proof that the system satisfies certain requirements. Using verification techniques, errors in large and complex systems with safety-critical applications can be detected and corrected during development time. The relevant properties of such complex systems cannot solely be represented using qualitative means of expressiveness. It is also important to represent quantitative phenomena, such as duration of events or the probability with which they occur. The aim of the research training group is to investigate quantitative logics and automata, their connection, as well as their application in verification and other areas of Computer Science in a thorough and complete manner.

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lat.inf.tu-dresden.de/quantla/

RESEARCH TRAINING GROUP RoSI

RoSI - Role-based Software Infrastructures for continuous-context-sensitive Systems

Modern software has to cope with ever changing contexts that are caused by complementing new functionalities or error correction, by support of new technical platforms, or by changing business rules.

This complex problem is the basis of the research of RoSI. Members of this research training group that is funded by the German Research Foundation (DFG) investigate the implementation of roles as a universal and consistent concept. Consistency means that roles are used systematically for context modeling on all levels of the modeling process. This includes concept modeling, language modeling, and modeling on the application and software system level.

The concept of role modeling has been introduced in different fields and at different times in order to model context-sensitive information. Up to now, roles have mainly been used in an isolated way for context modeling in programming languages, in database modeling or to specify access control mechanisms. Never have they been used consistently over all levels of abstraction within the software development process. This challenge is the core mission of the research training group RoSI. Scientific excellence is the aim of this programme. At the same time a strong emphasis is laid on an individual mentoring and qualification programme. Therefore, advisor tandems and thesis advisory boards were introduced, seminars on extra-curricular skills complement the scientific qualification and an international programme for visiting scientists introduces an international perspective. Currently, 25 doctoral students, nine professors and several junior researchers of TU Dresden are members of the research training group.

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db.inf.tu-dresden.de/rosi


Lucas Vogel

LABORATORIES

Interactive Display Wall

The Interactive Media Lab Dresden – a laboratory situated on the premises of the Chair of Multimedia Technology – is equipped with a high-resolution interactive display wall. It spans a surface of 10 square meters with 25 million pixels. For an interaction with the 12 nearly frameless displays multitouch as well as pens and markers (i.e. with tangibles) can be used. The display wall disposes of ample space for presenting large information spaces and applications with multiple possibilities of interaction (pictures on pages 30 and 58).

Holodeck

Within the Holodeck, researchers study the use of large displays for computer graphics and visualization of three dimensional scenes. The 133 inch rear projection wall enables stereoscopic rendering for exploration, analysis, and presentation of complex data. Research topics range from the study of perceptual effects over efficient rendering approaches to interactive visual analysis techniques (picture above).

RoboLab

Research on a multitude of different robotic platforms is performed in the robot laboratory of the chair of software technology. Beside mobile robots like the „turtlebot“ also robotic arms and their integration in intelligent rooms are researched on. The focus is on the development of self-adaptive applications in the field of cyber-physical systems.

Intelligent House

The smart building laboratory of the Chair for Technical Information Systems hosts the research on interoperable networked components. Main objective is a tool platform for knowledge based design and test of building automation, usable by experts and consumers. This platform connects tools from different vendors and will give input to international standards.


Katrin Boes

Usability Laboratory

The usability laboratory of the Chair of Human-Computer Interaction is an institution providing education of students from computer science and media computer science by teaching and supervising minor theses and diploma theses as well as by research in the area of usability and accessibility. In this specially equipped laboratory, the usability of interactive systems, accessibility of websites and different products can be analyzed and evaluated.

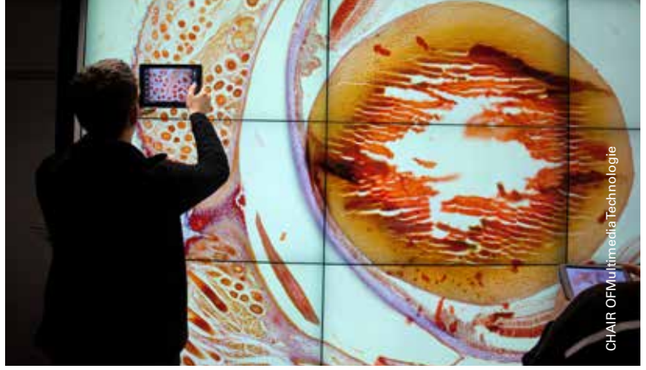
Virtual Factory

By combining a physical factory model and a simulation model of this factory, the Chair of Technical Information Systems is investigating new concepts for the virtual operation of real factories and their operating systems. The real-time ability of coupling of plant models with real machine operations enables the automized testing of control software under real-life conditions.

3D Virtual Reality CAVE

In the Centre for Systems Biology Dresden, the Chair of Scientific Computing for Systems Biology operates a 3D visualization room for virtual reality. This room has four projection surfaces and a real-time multi-camera system. This allows immersive viewing of biological and medical 3D images. The lab is used to develop the necessary software systems, image-processing methods, and novel user interfaces for interacting with biomedical image data.
(picture above)

LATEST EQUIPMENT FOR RESEARCH AND STUDIES



The Faculty of Computer Science is providing 190 computer workstations in 10 PC-Pools as well as 30 virtual desktops. A broad range of software is available within the operating systems Windows and Linux. A comprehensive equipment with multimedia hard- and software is complemented by special workstations for video and audio cut, and virtual reality. A comprehensive Wireless LAN network is providing perfect working conditions within the complete building and its adjacent green areas.

This IT-infrastructure is operated by the interdisciplinary focussed Centre for Information Services and High Performance Computing (ZIH). The competence centre for parallel and data intensive computing is closely linked to the Faculty by its research programme and it is integrated into the Faculty's teaching programme by the chair of computer architecture.

The High Performance Computing and Storage Complex (HRSK-II) is providing key technology for research, thus constituting a vital element of the IT-concept and the institutional strategy of TU Dresden and representing an integral part of the research landscape of Saxony.

The Faculty's infrastructure meets the highest requirements regarding security and availability. Moreover, ZIH is planning to extend its HRSK-concept by adding special data analytics and by expanding storage capacitities according to the needs of users. This will involve nodes that are designed especially for data analytics and it covers new technologies, for example in the field of non-volatile storage technologies and computer architectures as well as software licenses for the administration of complex data infrastructures of this size.

AWARDS 2016

Heinz Maier-Leibnitz-Award 2016
Prof. Dr. rer. pol. Markus Krötzsch

Innovation Award of the Industry Club Saxony
Dr.-Ing. Robert Lübke

SAP-Dissertation-Award
Dr.-Ing. Christoph Seidl

Carl-Zeiss-Diploma-Award
Dipl.-Medieninf. Julia Böhnke

Woman Award
M.Sc. Luisa Herrmann

Amazon-Award
M.Sc. Benjamin Worpitz

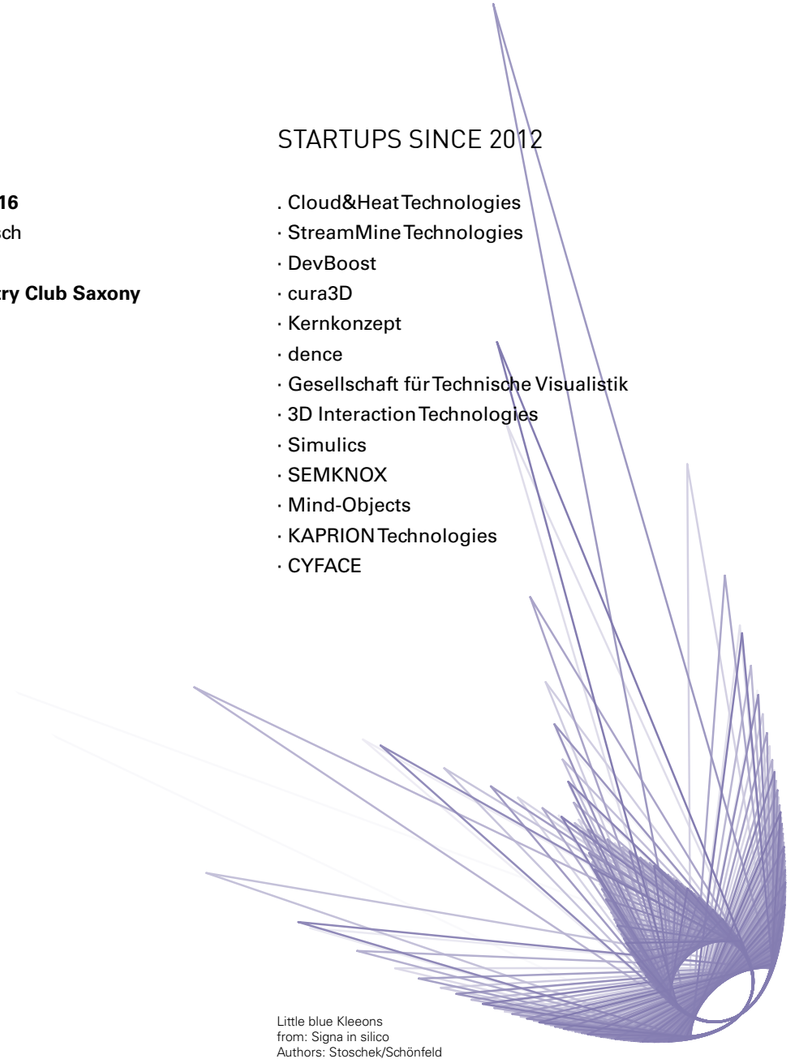
Devboost-Award
Timo Schick

T-Systems Multimedia-Award
Tino Noeres

German mobility award
Startup Cyface

STARTUPS SINCE 2012

. Cloud&Heat Technologies
· StreamMine Technologies
· DevBoost
· cura3D
· Kernkonzept
· dence
· Gesellschaft für Technische Visualistik
· 3D Interaction Technologies
· Simulics
· SEMKNOX
· Mind-Objects
· KAPRION Technologies
· CYFACE



Little blue Kleeons
from: Signa in silico
Authors: Stoschek/Schönfeld

Silvia Kapplusch

DIVERSITY

The task force „studies for blind and visually handicapped persons“ (AG SBS) is part of the chair of Human-Computer Interaction under the direction of Prof. Gerhard Weber and is commited in teaching and research the field of accessibility. The workstation for blind and visually impaired is open to all students of TU Dresden with a visual impairment. The working group transcribes for these students teaching materials and creates scripts in accessible HTML.

Within the research in the field of inclusion of persons with disabilities haptic displays were developed to improve the mobility of these persons, for example for the barrier-free guidance system of TU Dresden. The working group SBS offers a comprehensive consulting about studies for blind and visually handicapped persons also within peer-to-peer counseling.

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elvis.inf.tu-dresden.de

Creating a family friendly environment that values gender equity and inclusion, the TU Dresden is dedicated to equal opportunities for all members of the university community.

Prof. Rainer Spallek as commissioner for students with disabilities and chronic diseases and speaker of the „Interessengemeinschaft Studium und Behinderung“ aims to support a study under optimal conditions for all students. Young handicapped people will get support and consulting for overcoming the difficulties at the way to and through the study.

Goals of the work of the equality opportunity commissioner are reducing obstacles for women in academic careers, supporting women and men with children or developing part-time academic programmes. There you will find an open ear for gender problems, support for the reconcilability of family and career and consulting about the career re-start after parental leaves.

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COMPUTING CENTRE FOR PUPILS

Schülerrechenzentrum

The „Schülerrechenzentrum Dresden“ wants to support pupils who are interested in computer science and electronics and to help them develop their personal talent in these areas. Our extracurricular activities provide a deeper understanding and higher level of knowledge about certain aspects of computer science and using electronics. Participants study and consolidate knowledge about methods of scientific working and enrich their competences for studying or working in these fields later on/after school.

A central focus of computer science education provided by SRZ Dresden is software development/programming (coding). Topics of electronics education are the functions and possible applications of electronic components. On the one hand, our activities offer basic knowledge in these areas; on the other hand, they provide an opportunity to learn about new and diverse topics like algorithms and data structure, which the pupils can use to create 3D models, to program apps or to control robots.

Local companies working with us enable joint projects with our pupils and provide them with an opportunity to gain deeper insight into professional practice.
SRZ Dresden supports projects within schools and competitions between schools like Jugend forscht Contest and Sächsischer Informatikwettbewerb.

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OUTPUT.DD

Once a year OUTPUT.DD is showcasing the research results of the Faculty's students and members of staff to the public. Installations, demos, workshops and project presentations provide perfect conditions to interactively perceive research results by touching, clicking, or gaming.

OUTPUT.LIVE is the perfect platform for experts and also for laypersons in order to understand latest research findings and creative student projects. Visitors can test innovative applications on modern multitouch-computers. Also, interested audience can participate in interactive installations, thus merging the real and the virtual world.

OUTPUT.ACADEMIC organizes the official opening of OUTPUT.DD and the bestowal of awards to authors of excellent theses of the Faculty of Computer Science. Moreover, it is presenting an invited talk which focusses on computer science from a different point of view.

OUTPUT.CONTACT is an event for mutual contacts and exchange between business and academia. Regional companies are presenting their portfolio thus enhancing communication between visitors and staff.

output-dd.de

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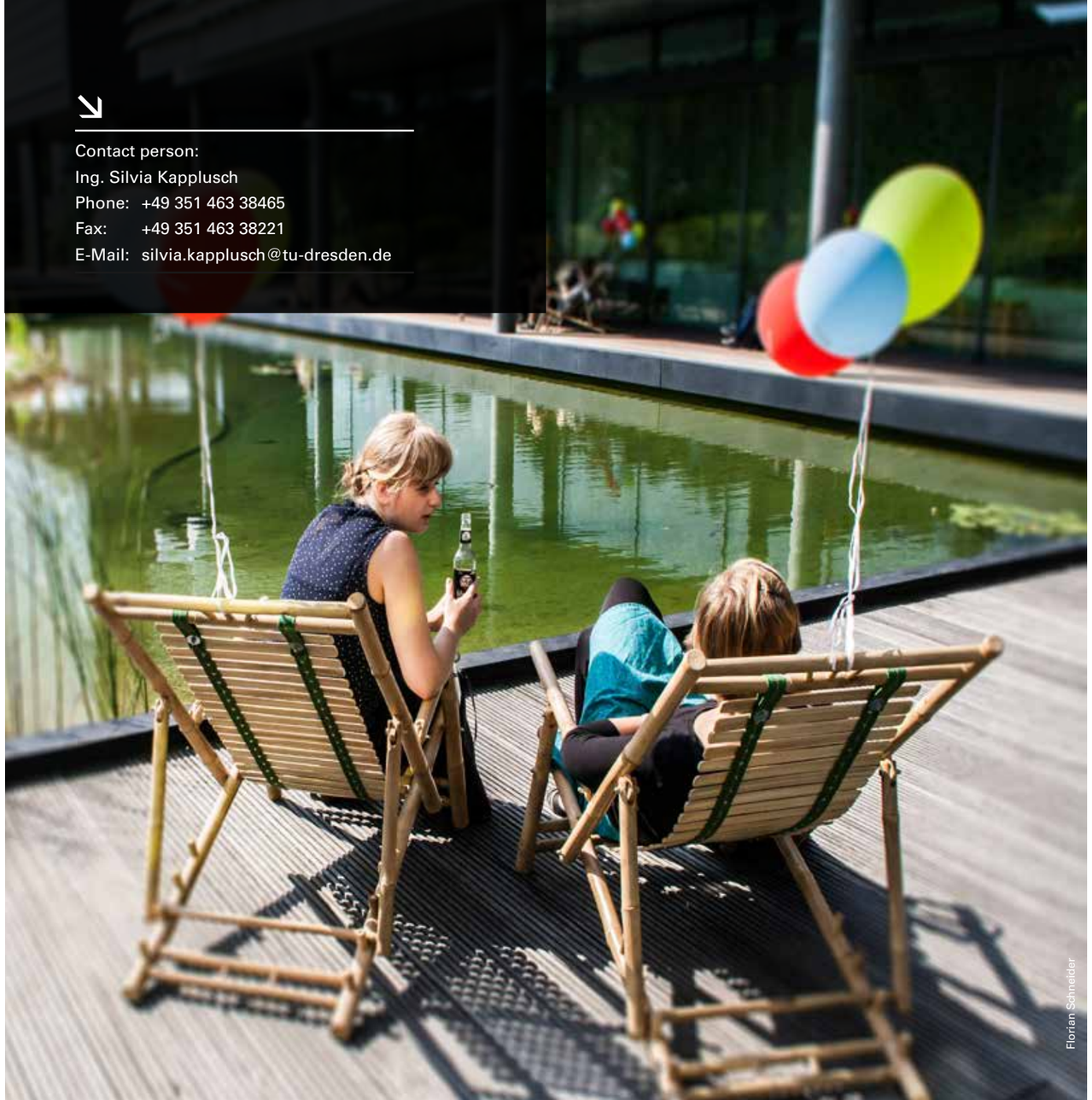

Florian Schneider

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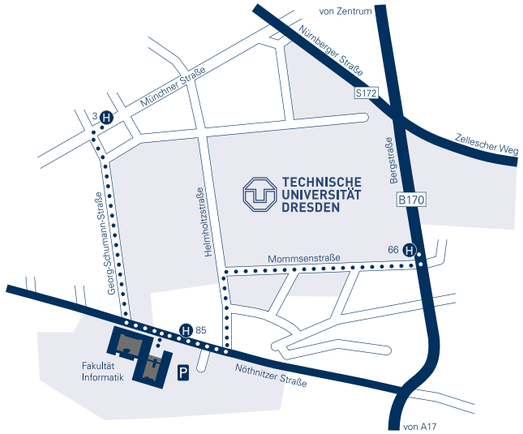

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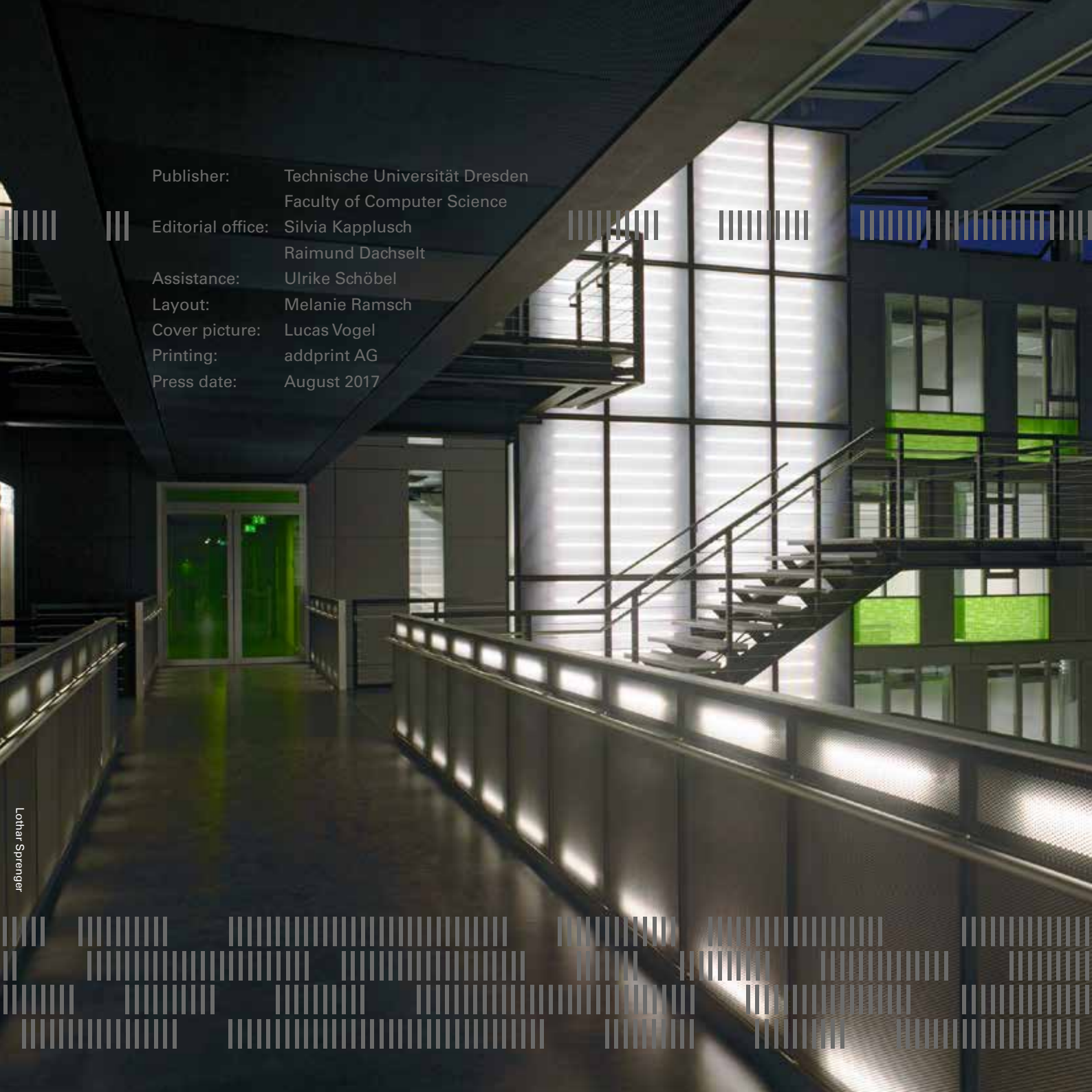

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