

SECAI: School of Embedded Composite AI

# Annual Report 2022

A DAAD Konrad Zuse School of  
Excellence in Artificial Intelligence







Markus Kröttsch  
SECAI Director

## DEAR READER,

2022 has been an exceptional year for SECAI, as is already evident from the fact that it started in July rather than in January. Indeed, the decision for SECAI to become a *DAAD Konrad Zuse Schools of Excellence in AI* was only announced in May. At the AI School's sites in Dresden and Leipzig, the news triggered a flurry of activities in order to make most of this opportunity.

Looking back, it is fair to say that the first (half) year was indeed very successful: SECAI became alive, as a center of research and teaching, and as a hub for exchange. This "being alive" is most clearly marked by the arrival of the first SECAI-funded members – students and researchers who each bring in their unique ideas and talents.

This first annual report of SECAI gives an overview of the rich activities of the school and recounts the main achievements of 2022. Most recent updates and announcements of new application rounds can always be found on our web portal <https://secai.org>.

Have a good read!



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*SECAI*

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## ***SECAI ADVANCES EXCELLENCE IN AI RESEARCH***

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We view AI as an interdisciplinary long-term challenge that requires experts from many areas. SECAI's foundational research brings together computer scientists, mathematicians, electrical engineers, and experts in law and society; our applied research in digital health and medical informatics ensures practical relevance.

## ***SECAI EDUCATES THE NEXT GENERATION OF AI EXPERTS***

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Our structured training programs foster new AI talents from undergraduate studies to completed PhD. Studying in SECAI comes with priority access to leading AI experts and attractive funding programs.

## ***SECAI BUILDS RESEARCH-ORIENTED AI NETWORKS***

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Our extensive national and international research network creates synergies and fosters collaboration. From student exchange to joint research projects, being part of SECAI is being part of a global academic community.

## ***SECAI IS VISIBLE***

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We believe that AI research is a concern to all of research and a fundamental societal concern. By taking part in the public discourse, we foster transparency and establish SECAI as a label for excellence in AI.

## ***SECAI MAKES A LASTING IMPACT***

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Our activities are designed to create lasting effects on the research and teaching at our host institutions and in German AI in general. We work closely with the universities to build sustainable structures.

# SECAI AT A GLANCE

A SHORT INTRODUCTION TO THE ZUSE SCHOOL IN AI

The School of Embedded Composite Artificial Intelligence (SECAI) is a joint project of TU Dresden and Leipzig University that fosters AI research and higher education. SECAI integrates university studies, academic research, and industrial applications by sponsoring students, improving teaching, funding researchers, and supporting exchange.

## RESEARCH

SECAI is distinguished by its inclusive view on AI that encompasses foundational research – especially in symbolic and statistical AI methods – as well as applied research – especially in the medical domain. **Learn more on page 9.**

## EDUCATION

SECAI educates future AI professionals and researchers on many levels. It supports a number of AI-related MSc study programs in Dresden and Leipzig (**see page 11**) and runs an own Graduate School for doctoral researchers (**see page 12**).



### THE DAAD KONRAD ZUSE SCHOOLS OF EXCELLENCE IN AI

SECAI is part of a targeted funding program that aims to boost AI research and education in Germany. Announced by DAAD in July 2021, the Zuse Schools of Excellence in AI are conceived as national centers for innovative education of outstanding young AI researchers at MSc and PhD level. Applications were required to bring together several German universities that can demonstrate an excellent standing in AI research and a forward-looking concept for future university education.

In a multi-stage reviewing process, three proposals were selected for funding, with the new Zuse Schools starting in July 2022. More information about the Zuse School program:

[www.daad.de/en/the-daad/zuse-schools/](http://www.daad.de/en/the-daad/zuse-schools/)

## SECAI FACTS AND FIGURES

**Title:** School of Embedded Composite AI

**Participating organizations:**

TU Dresden (coordinator), Leipzig University, University Hospital “Carl Gustav Carus” Dresden

**Current funding period:** 07/2022–12/2027

**Funding volume:** 13.2 M EUR

**Funding bodies:**

Ministry of Education and Research (BMBF) via German Academic Exchange Service (DAAD)



## TU DRESDEN

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Technische Universität Dresden is one of Germany's leading research universities and among the eleven Universities of Excellence nationwide. TU Dresden unites the natural and engineering sciences with the humanities and social sciences, as well as medicine. This wide range of disciplines, which is unique in Germany, brings with it the obligation for the university to promote interdisciplinarity and to contribute to the integration of science and society.



TU Dresden is leading the SECAI consortium, with participation of the faculties of Computer Science, Electrical and Computer Engineering, and Arts, Humanities and Social Science, as well as the Center for Advancing Electronics Dresden (cfaed). Markus Krötzsch of the Chair for Knowledge-Based Systems is the project leader and current director of SECAI.



## LEIPZIG UNIVERSITY

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Founded in 1409, Leipzig University is one of Germany's largest universities and a leader in research and medical training. With around 31,000 students and more than 5000 members of staff across 14 faculties, it is at the heart of the vibrant and outward-looking city of Leipzig. Leipzig

University offers an innovative and international working environment as well as an exciting range of career opportunities in research, teaching, knowledge and technology transfer, infrastructure, and administration.

Leipzig University is a partner in SECAI with participating fellows affiliated with the Department of Mathematics and of Computer Science, Faculty of Medicine, the Max-Planck-Institute for Mathematics in the Sciences and the Fraunhofer Institute for Cell Therapy and Immunology. The SECAI co-director in Leipzig is Peter F. Stadler, head of the Bioinformatics Research Group in the Institute for Computer Science.

## UNIVERSITY HOSPITAL CARL GUSTAV CARUS DRESDEN

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The University Hospital Dresden commits to excellence in medical care, medical research and training, and health services for patients throughout the region. As an internationally outstanding academic-medical center, it is playing an important role in medical AI research.

In SECAI, the University Hospital is particularly involved via the Else Kröner Fresenius Center for Digital Health (EKFZ), which has its topical focus in research areas of high relevance for AI, including robotics and coworking, sensors and medical devices, as well as connected care. SECAI co-director Stefanie Speidel is a professor at the National Center for Tumor Diseases (NCT) in Dresden and member of EKFZ.

# WIDENING THE VIEW

MAKING THE CASE FOR A BROADER PERSPECTIVE ON ARTIFICIAL INTELLIGENCE

**As with any major progress in research or technology, we like to attribute breakthroughs in AI to single causes: brilliant concepts that fundamentally enable computers to be intelligent. In reality, however, practical AI systems are the result of combining ideas and methods from many sources, making them work together through careful engineering. In all of this, the human user and the needs of the application must be taken into account.**

SECAI therefore pursues an approach that conceives AI as a broad endeavour that brings together foundational and applied research from a wide range of topics. To organise this breadth in a productive and beneficial way, SECAI research is centered around five Research Focus Areas. These areas communicate intensely, and many SECAI researchers contribute to more than one of them, but they also provide topical fields that encourage researchers to go deep into the field where they can contribute most.



## COMPOSITE AI

**Hybrid methods and algorithms that combine strengths of distinct AI techniques**

While traditional AI was driven by the search for one single paradigm to create intelligent behavior, most modern AI success stories embody a synergistic

combination of multiple paradigms, known as hybrid or composite AI. While “pure” methods achieve a certain success, recent composite approaches accomplish similar performance at much lower cost. As widespread as hybrid approaches are in AI today, the combination of methods is often a feat of engineering, whereas a principle understanding of composite methodologies and their effective use is lacking. In SECAI, we assemble internationally recognized experts across a broad spectrum of hitherto segregated AI approaches, ranging from symbolic methods (especially knowledge representation and logical modeling) to machine learning (especially neural network and statistical learning).



## AI COMPUTE PARADIGMS

**Fundamentally new computing hardware and its effective use in AI**

The recent leaps of AI have been inextricably connected to the advancement of computing hardware. The present wave of AI breakthroughs started with the insight that graphics hardware (GPUs) can be harnessed to scale known machine learning (ML) methods to much larger data sizes, and AI has since been associated with massive computation usage. Specialization is now a major trend in microelectronics: CPUs and GPUs today compete with field-programmable gate arrays (FPGAs) and application-specific integrated circuits (ASICs). The success of

innovative hardware crucially depends on embedding: (1) the physical embedding of the hardware in intelligent devices and (2) the logical embedding of AI algorithms in the computational framework of the underlying hardware. SECAI aims at dealing with both aspects by developing future AI compute paradigms.



## INTELLIGENT MEDICAL DEVICES

Cyber-medical AI systems and clinical embedded AI applications

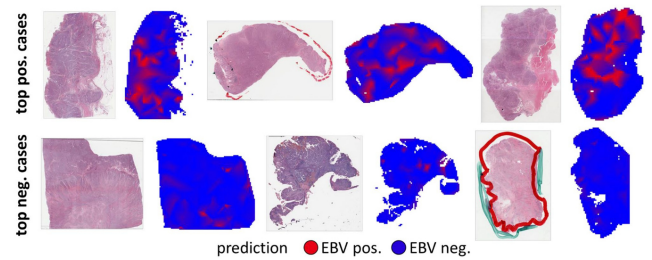
Looking at prominent AI breakthroughs as well as failures, it is apparent that the guidance and specificity of a relevant application domain is at least as essential as hardware and algorithms. This scope is provided by the multitude of exciting and prospering uses of AI in life science and medicine. The field's demanding requirements for hardware (small, energy-efficient, real-time capable) and methods (robust, scalable, trustworthy) make it an ideal testbed for interdisciplinary AI solutions.



## AI METHODS FOR HEALTH

AI for bio-medical data analysis and knowledge management

With the growing amount and complexity of data in healthcare, AI methods become increasingly prevalent in biomedical research, promising to generate new insights by revealing latent patterns hidden in the data. Applications range from computer-aided drug design and medical image analysis to diagnostic expert systems and cyber-medical systems. As the success of the employed methods is very sensitive to the quality of the input data, solutions for large-scale data management are required.



AI-based detection of the Epstein-Barr virus (EBV) in gastric cancer. Figure reproduced from Saldanha et al. [Gastric Cancer 2022, doi:10.1007/s10120-022-01347-0], one of the first SECAI-supported research works (in collaboration with Fellow Kather and SECAI Graduate School member and Clinician Scientist Veldhuizen)



## SOCIETAL FRAMEWORK FOR AI

Cross-cutting research on wider societal concerns and policies

Technological breakthroughs can only unfold their practical benefits if they are aligned with the broader frameworks that govern societal acceptance, legal approval, and economic viability. The European Commission's 2021 proposal for an Artificial Intelligence Act has drawn attention to the formidable difficulty of regulating AI in a way that protects citizens from risks like discrimination and still fosters innovation and economic growth. Through its focus on medicine and health care, SECAI deliberately connects to a field that – like AI – is inseparable from far-reaching questions of ethics, law, and societal acceptance. This allows SECAI to build on the substantial experience in topics like data protection and regulatory affairs in medical contexts from both, TU Dresden and Leipzig University. We are also going to focus on aspects of political aspects and philosophy.

# “WHERE CAN I STUDY AI?”

THE AI TEACHING PORTFOLIO AT TU DRESDEN AND LEIPZIG UNIVERSITY

The acute shortage of AI professionals is met by a huge interest among students to study “AI” (see page 24). Their choice, however, is not always easy: AI is a vast area that requires many different skills, and technology often changes faster than study plans. SECAI therefore supports several targeted MSc training programs, which cover a breadth of skills and focus on methods and concepts of lasting relevance. Scholarships are available (see page 15).

The following master-level programs each have a two-year curriculum. In addition, SECAI also supports selected students in broader study programs, such as Computer Science, if they have chosen AI-related specialization during their studies.

## AI @ TU DRESDEN

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### COMPUTATIONAL MODELING AND SIMULATION

This innovative, international study program spans several faculties and a range of foundational and applied topics in data science, symbolic AI, bioinformatics, and applications. Students of CMS enroll for a specific track that defines their topical focus. Curricula with a strong foundational AI focus can be found in the tracks *Logical Modeling* and *AI Engineering* (starting in 2023). Applications of AI technologies play an important role in tracks *Computational Life Science* and *Visual Computing*.

### NANOELECTRONIC SYSTEMS

Dresden, the center of the European semiconductor

industry, is an ideal location for studying cutting-edge electronics. The international MSc program Nanoelectronic Systems endows students with key skills related to the fundamental technologies, design, and applications of today’s increasingly miniaturized computing systems. In particular, this also includes modules on AI-specific hardware accelerators and novel compute paradigms.

## AI @ LEIPZIG UNIVERSITY

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### DATA SCIENCE

Students of this MSc program focus on recent topics in data analytics, scalable data management, and data mining. This builds a bridge between fundamental AI methods and applications, e.g., in bioinformatics. An undergraduate education in computer science or biology is ideal for pursuing this specialization.

### BIOINFORMATICS

This program brings together computer science and biology to focus on one of the most important and successful interdisciplinary fields in AI. Students acquire knowledge in the sciences, computing, and mathematics, and learn to combine their skills in relevant application fields.

### MEDICAL INFORMATICS

This interdisciplinary program incorporates many aspects of digital health and medical information systems. The interface of computer science and medicine defines the methodological center of the training, and also touches upon applications.

# STARTING A CAREER IN AI

THE GRADUATE SCHOOL AS A PATH FOR TALENTS TO DEVELOP THEIR RESEARCH

**The research-oriented graduate program is an integral part of the activities in SECAI. In a fully-funded 3-year training program, researchers have a chance of obtaining their PhDs under the guidance of renowned AI researchers in Dresden and Leipzig.**

## PHD STUDENTS AND CLINICIANS

Due to the specific interdisciplinary profile of the school, the graduate program includes both doctoral students and clinician scientists. The latter is a training model at university clinics that allows physicians to conduct research in parallel to their specialist training (German Facharztausbildung), enabled by a reduction of their medical service duties. At the end of this structured academic pathway, clinician scientists do usually not obtain an (additional) doctorate but a visible research output and have an optimal preparation for a research-oriented career in their field.



Newly joined members in January 2023

## RESEARCHING TOGETHER

SECAI is taking in graduate researchers in yearly cohorts, starting in autumn for a smooth transition from the MSc programs. Over the course of the first three years, the Graduate School will grow to a total of over 30 researchers. Together with additional associated members at similar career stages, SECAI will therefore bring together around 50–60 young researchers – a highly inspiring environment.

## A ROAD TO SUCCESS

The school favors three-year model for completing doctoral theses, but also understands that this plan may need adjustment due to interdisciplinary differences (e.g., clinician scientists often finish in two years), personal circumstances (e.g., family planning), and professional causes (e.g., unforeseen developments in the research area). Each doctoral student and clinician scientists is supervised by a primary supervisor and at least one second supervisor, typically a SECAI Fellow from the same research focus area. The list of Graduate School members who joined SECAI by early 2023 is found on page 22.

## FAST TRACK TO RESEARCH

A dedicated Fast-Track PhD program supports the transition from MSc student to doctoral researcher. The program blends the final MSc semester with the first half year of doctoral studies by aligning MSc topic and future PhD topic, and providing financial support. For the latter, the SECAI scholarship programmes have proven to be very effective.

# A REVIEW OF 2022

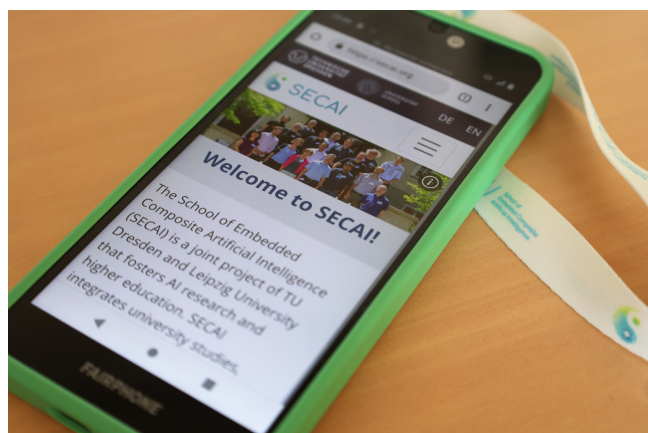
## THE LAUNCH OF A NEW AI SCHOOL

On May 18th, 2022 the German Academic Exchange Service (DAAD) announced the three winning proposals that should be funded to establish Germany's new *Konrad Zuse Schools of Excellence in AI*. For SECAI, this marked the start of a short but busy first year. The key events during the months from July through December give an impression of the many facets of activity in the newborn School of Embedded Composite AI.

## JULY

### ONLINE ON TIME

Public visibility is key to many objectives of SECAI, and it was therefore clear that the launch of a web portal would be a major early effort in the project. The not-so-modest set of requirements included that it should be informative, accessible, capable of holding different types of content, and of course good looking. Through a focused effort, the whole



Looking good on any screen: [secai.org](https://secai.org)

work from design to public launch could be completed in under six weeks, and the new portal went online right on time in June, and has been the central information platform for all of SECAI since. We leave it to the reader to decide if the ambitious goals have been achieved: <https://secai.org>

### GETTING TOGETHER

Early June also saw the first face-to-face meeting of SECAI's Academic Fellows, who represent the research groups that will develop the profile of SECAI in research and education in the years to come.



SECAI Kick-Off at TU Dresden

The meeting took place at the rectorate of TU Dresden, and involved both strategic decisions and informal scientific networking. In particular, the afternoon was used for the first **SECAI.Connect** event, an activity for establishing connections across topics and locations within the AI School.

### A DEMOCRATIC BASIS

The kick-off also served as a constituting meeting for the SECAI as a formal institution. In the first **General Assembly**, the Fellows voted upon the new **by-**

**laws of SECAI** (online at <https://secai.org/aboutus/organization>). These statutes govern the internal affairs of the School, establishing democratic principles and a structured governance with a **Board of Directors** and a **Steering Group**. The General Assembly elected representatives to serve in these roles, thereby laying the foundations for all further activities. The current composition of the governing bodies of SECAI is shown on page 19 of this report.

## AUGUST

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### WE ARE HIRING!

One of the first and most urgent activities of the school was to publish the call for applications for the **first cohort of graduate school researchers**. All positions were required to embody a collaboration of multiple Academic Fellows, which required intense exchanges across research groups to develop suitable research topics. It was therefore no small achievement to have official job adverts published at the start of August.

### BIG NUMBERS AND FINE PRINT

August was also a busy time the legal departments of TU Dresden, Leipzig University, and the University Clinics "Carl Gustav Carus" in Dresden. The success of SECAI depends on the activities of all three, and this requires that funds are effectively distributed. Legal details need to be worked out and aligned with the requirements of the funding body. Thanks to highly professional staff at all sites, these formal **financial agreements** could soon be signed.

### A NEW FORUM FOR MEDICAL AI

August also marked the start of the new **EKFZ Lecture Series "Focus on AI"**, as a regular event at the SECAI partner site EKFZ at the Dresden University Clinics. Organized by SECAI Fellow Jakob Kather, the lecture series brings together international experts and researchers from Dresden and

Leipzig around our research focus area AI Methods for Health. Guest speakers in 2022 included Saskia Haupt (Interdisciplinary Center for Scientific Computing, Heidelberg), Hugo Horlings (Netherlands Cancer Institute), and Sandy Engelhardt (University Hospital Heidelberg), with topics centering around AI in oncology and cardiovascular medicine.

## SEPTEMBER

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### THE OFFICE IS OPEN

One of the first hirings in SECAI concerned the scientific coordinator Philipp Hanisch, who takes a leading role in the **SECAI office** at TU Dresden. Together with SECAI secretary Kati Domann, he facilitates the manifold organisational and administrative processes within the AI School. The SECAI office is located at the research group Knowledge-Based Systems of SECAI director Markus Krötzsch, and is generally overseeing all activities within the project.



SECAI Officials Kati Domann and Philipp Hanisch

## OCTOBER

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### NOT AN EASY CHOICE

With the end of the Graduate School application phase, the major task for early October was the selection of candidates. With a total of 98 applicants, the first recruiting round had been extremely successful, but this did not make the task of the Fellows any easier. After all, only twelve candidates

could be admitted to as **PhD students** in 2022. In SECAI, some of these positions are also given to **clinician scientists** – a special scheme that lets medical doctors dive into research while continuing their specialist clinical training. In the end, however, all twelve decisions had been made (see page 22) and hiring processes could commence. And some of the best applicants who could not be funded through SECAI could still be offered additional positions in SECAI-related research groups as well.

### COFFEE CONNECTIONS

With the start of the winter semester in Dresden and Leipzig, it was also time to focus on the work of SECAI in Master-level AI education. As one of the first activities, the first **SECAI.Café** opened at the International Center for Computational Logic (ICCL) of TU Dresden. The idea of this activity is to provide a space for students to connect to teachers and researchers. Other major ingredients are an informal atmosphere and free coffee. For fresh students, especially those who just came to Germany, this yields an opportunity for asking questions and establishing contacts. For more advanced students,



Inspired discussions over coffee

it is a place to discuss thesis topics and opportunities for extracurricular research. The concept of SECAI.Café is to have focussed events for smaller student groups, united by a common study path or specialization. The SECAI.Café at ICCL attracted up to 10–20 students and researchers, and was the place of some welcoming and mentoring sessions at the beginning of the winter semester.

## NOVEMBER

### STIPENDS FOR STUDENTS

Another major instrument of SECAI's teaching support is the awarding of scholarships to talented students in AI-related programs. To prepare this, the SECAI Steering Group has developed and published scholarship regulations that detail the requirements and application process (online at <https://secai.org/students/scholarships>). A first call for applications has been published in November. Thanks to a fast selection process and an efficient administration, the first scholarships could start within the same month. Due to the short timeline in 2022, scholarships now mostly cater towards outstanding local students. In 2023, the first wider calls for scholarship applicants who have not started their studies yet will follow.

### ON THE FAST TRACK

Scholarships also provide an excellent instrument for supporting talented students who plan to continue for a PhD after finishing their M.Sc. SECAI's **PhD Fast Track** scheme combines financial support (chiefly through scholarships) with targeted mentoring towards a position in research. The additional funding allows students to focus on their research work, which is especially valuable during the final semester's thesis work. Promising students are integrated into SECAI research groups, both physically (at a work place in a group lab or office) and organizationally (in meetings and group activities).



## DECEMBER

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### NEW PARTNERSHIP: CARNEGIE MELLON UNIVERSITY

International collaboration with leading institutions in AI research and teaching is another central objective in SECAI. A number of such collaborations are planned for the following years, yet SECAI also aims at establishing additional partnerships. In December, one such new collaboration to Carnegie Mellon University (CMU) has been put on track. In particular, it is planned to foster exchanges and joint research of PhD students in machine learning and mathematical statistics. In SECAI, these activities are coordinated by Fellows Sayan Mukherjee and

Max von Renesse. At CMU, the efforts are planned by Dejan Slepčev of the Department of Mathematical Sciences.

### WELCOMING OUR NEW MEMBERS

The end of 2022 was also the time when more and more of the newly hired team members first arrived at their new groups. With the typically international hires in SECAI, the unavoidable delay for international removal and obtaining all necessary documents often amounts to two to three months. Accordingly, most new team members have actually started their work in January 2023. For SECAI, the first year therefore closes with great expectations and a very optimistic outlook for the year to come.

## AWARDS AND SUCCESSES

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2022 has also been a very successful year for many of the SECAI Fellows. Here we recall some of their most notable achievements since July. Congratulations to all involved!

- Markus Krötzsch receives the Best Research Paper Award at the *International Semantic Web Conference 2022* (CORE Rank A)
- Carsten Lutz becomes *Fellow of the Asia-Pacific AI Association* (AAIA)
- Carsten Lutz announced as winner of Distinguished Paper Award at the *AAAI Conference for Artificial Intelligence 2023* (CORE Rank A\*)
- Carsten Lutz receives Test of Time Award at *ACM Conference on Principles of Database Systems PODS 2023* (CORE Rank A\*)
- Christian Mayr wins the first round of *New Computing Concepts Challenge* of the *Bundesagentur für Sprunginnovationen (SPRIND)*
- Christian Mayr and SECAI industry partner SpiNNcloud System GmbH win prestigious *Transition Grant* for AI start-ups from *European Innovation Council*
- Thomas Mikolajick recognized as *Highly Cited Researcher 2022* by Clarivate
- Thomas Mikolajick appointed *IEEE Fellow* for his contributions to non-volatile memory
- Thomas Mikolajick receives *George E. Smith Award* of the Electron Devices Society
- Stefanie Speidel's group wins *P2ILF@MICCAI Liver Registration Challenge 2022*
- *Training Alliance for Computational Systems Chemistry* (<https://tacsy.eu/>) to start as EU Marie-Sklodowska-Curie Joint Doctoral Network in 2023, with Peter Stadler as co-PI
- The DFG Collaborative Research Center *Foundations of Perspicuous Software Systems* CRC/TRR 248 was successfully reviewed and extended until Dec 2026 (participating SECAI Fellows: Christel Baier, Markus Krötzsch, and Anne Lauber-Rönsberg)



# A LOOK AHEAD

## OBJECTIVES AND PLANS FOR 2023

There is a lot more to do to accomplish our goals for this Zuse School of AI – 2023 brings another whole set of tasks and challenges for SECAI. We are already at it.

### CONNECTED RESEARCH

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Most SECAI-funded researchers have only just started, and the primary task of SECAI is to foster their scientific progress and provide for an inspiring environment. This will involve vivid interaction at research seminars and exchange meetings, but also the mentorship by SECAI's experienced researchers. Moreover, additional researchers will be associated to the SECAI Graduate School. An important visible outcome of these efforts will be the first publications produced by our new members.

### MSC SCHOLARSHIPS IN AI

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2023 will also see the first large call for scholarship applications as part of the MSc application rounds. By announcing scholarship opportunities in time for (international) applications, we expect to attract even more talented students to our programs. The application time will be in Spring 2023, to be announced on [secai.org](https://secai.org).

### A RICHER AI CURRICULUM

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We are busy developing new teaching offers for students who want to specialize in AI-related topics. At TU Dresden, a new track *AI Engineering* will enrich the available study profiles in the MSc program *Computational Modeling and Simulation*. It will focus on skills related to the development of AI algorithms and systems. Moreover, a Summer School will allow students to dive into state-of-the-art research in a specific Research Focus Area of SECAI.

### GRADUATE SCHOOL GROWTH

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Another major milestone in 2023 will be the admissions for the second round of Graduate School researchers. We intend to fill ten fully-funded PhD positions for the new cohort starting from September 2023. Applications will be open as early as April 2023, with details to be announced on [secai.org](https://secai.org).

### INTERNATIONAL EXCHANGE

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SECAI has several distinguished international academic partner organizations with whom joint projects, teaching exchange, and research activities are planned. 2023 will see increased activities in this space, building upon the work done in 2022,

and integrating the new members who have joined SECAI since. We are looking at internships for MSc students and at joint workshops that involve graduate researchers.

## OPPORTUNITIES IN INDUSTRY

SECAI plans to develop exchanges with its industry partners. This has some natural ramp-up time, since students and researchers first need to arrive at their Zuse School of AI before taking up projects or internships with industry. Nevertheless, we expect that the first such exchanges will be possible already during 2023, which will be the basis for the

work with the growing number of students in years to come.

## BUILDING VISIBILITY

SECAI will further increase awareness of its work among our chief target groups: researchers, (prospective) students, and the general public. Each requires separate activities. For example, SECAI is planning to take part in a public debate on the societal ramifications of AI in May 2023 at Futurium, Berlin. Other activities include the support of research events and participation in research exhibitions and fairs.

## KEYNOTES AND OUTREACH

SECAI values outreach, both towards scientific communities and towards the wider society. The following provides a short overview of our most important activities in 2022.

- Press contributions on AI computing, incl. Physics Today, c't, Spiegel (Christian Mayr)
- Research workshop "Artificial Intelligence & Intellectual Property" 2022 for German and French Postdocs (Anne Lauber-Rönsberg)
- Invited lecture "Smartness and Freedom. Two Forms of Government" at HU Berlin (Sabine Müller-Mall)
- Invited speaker at Wikimedia Research Showcase (Markus Krötzsch)
- SECAI prominently supports several international research events: Int. Conf. on Principles of Knowledge Representation and Reasoning 2023, Greece; Int. Conf. on Logic Programming 2023, London; Declarative AI 2023, Oslo; Eurographics/IEEE Symposium on Visualization 2023, Leipzig

### KEYNOTES (07/2022 – 12/2022)

- 21st Int. Semantic Web Conf. 2022 (M. Krötzsch)
- NSF Int. Conf. on Neuromorphic Systems (C. Mayr; invited plenary speaker)
- CERN compute accelerator forum (C. Mayr; invited presentation)
- IEEE 52nd Europ. Solid-State Device Research Conf. (C. Mayr; session keynote)
- 5th Int. Conf. on Memristive Materials, Devices & Systems 2022 (T. Mikolajick, R. Teztlaff; two keynotes)
- 80th Device Research Conf. (DRC) 2022 (T. Mikolajick)
- Int. Conf. on Information Geometry for Data Science (IG4DS) 2022 (G. Montufar)
- 35th Description Logic Workshop (S. Rudolph)
- SPIE Emerging Topics in Artificial Intelligence (ETAI) 2022 (I. Sbalzarini)
- Workshop "Medical Imaging meets NeurIPS", NeurIPS 2022 (S. Speidel)
- Robotics Festival Saxony 2022 (S. Speidel)
- 15th Brazilian Symp. on Bioinformatics (P. Stadler)
- Int. Conf. on Modern Circuits and Systems Technologies (MOCAST) 2022 (R. Teztlaff)

# GOVERNANCE

## DECISION MAKING IN A DAAD ZUSE SCHOOL OF AI

### THE SECAI BOARD

The SECAI Board is responsible for the operational management of the School and is elected by the Fellows at the General Assembly. The Board consists of a director and two deputy directors, with at least one person from Dresden and one from Leipzig. Currently, the Board consists of the director Markus Krötzsch and the two deputy directors Stefanie Speidel and Peter Stadler. The Board makes operational decisions, organizes meetings, and develops proposals for action.

**Contact:** [secai-board@groups.tu-dresden.de](mailto:secai-board@groups.tu-dresden.de).



**MARKUS KRÖTZSCH**

Chair of Knowledge-Based Systems, TU Dresden



**STEFANIE SPEIDEL**

Chair of Translational Surgical Oncology, National Center for Tumor Diseases Dresden



**PETER STADLER**

Chair of Bioinformatics, Leipzig University

### THE SECAI STEERING GROUP

The Steering Group makes decisions on the practical implementation of the School and planned measures. In addition to the members of the Board, the group consists of four more Fellows. Two Graduate Representatives will be added in 2023. Other Fellows, Associated Fellows and further guests may be involved in decision-making processes.



**MARTIN BOGDAN**

Chair of Neuromorphic Information Processing, Leipzig University



**SEBASTIAN RUDOLPH**

Chair of Computational Logic, TU Dresden



**CHRISTIAN MAYR**

Chair of Highly-Parallel VLSI Systems and Neuro-Microelectronics, TU Dresden



**STEPHANIE SCHIEDERMAIR**

Chair of European Law, Public International Law and German Public Law, Leipzig University

# ACADEMIC FELLOWS

THE RESEARCHERS AND TEACHERS BEHIND SECAI

SECAI is the effort of a group of Academic Fellows, who are jointly responsible for the research goals and educational activities of the School. In addition to the members of the SECAI Board and Steering Group, the following researchers were Academic Fellows in 2022.



**BJOERN ANDRES**

Chair of Machine Learning for  
Computer Vision, TU Dresden



**ANNE  
LAUBER-RÖNSBERG**

Chair of Civil Law, Intellectual  
Property, Media and Data Protec-  
tion Law, TU Dresden



**CHRISTEL BAIER**

Chair of Algebraic and Logical  
Foundations of Computer Sci-  
ence, TU Dresden



**JENS LEHMANN**

Principle Scientist Amazon Alexa  
AI, Amazon



**FRANK H.P. FITZEK**

Deutsche Telekom Chair of Com-  
munication Networks,  
TU Dresden



**CARSTEN LUTZ**

Chair of Knowledge Representa-  
tion, Leipzig University



**JOCHEN HAMPE**

Chair of Internal Medicine and  
Gastroenterology, TU Dresden



**JENS MEILER**

Humboldt Professor and Director  
of the Institute for Drug Discovery  
Leipzig University



**JAKOB KATHER**

Chair of Clinical Artificial Intelli-  
gence, TU Dresden



**THOMAS MIKOLAJICK**

Chair of Nanoelectronics,  
TU Dresden

**GUIDO MONTÚFAR**

ERC Group Leader for Mathematical Machine Learning, MPI of Mathematics in the Sciences

**IVO SBALZARINI**

Chair of Scientific Computing for Systems Biology, TU Dresden

**SAYAN MUKHERJEE**

Humboldt Professor in AI, Leipzig University

**BERND STURMFELS**

Director of the Max Planck Institute for Mathematics in the Sciences

**SABINE MÜLLER-MALL**

Chair of Legal and Constitutional Studies with Interdisciplinary Relations, TU Dresden

**RONALD TETZLAFF**

Chair of Fundamentals of Electrical Engineering, TU Dresden

**KRISTIN REICHE**

Deputy Head Department of Diagnostics, Fraunhofer Institute for Cell Therapy and Immunology IZI

**MAX VON RENESSE**

Chair of Stochastics, Leipzig University

# SECAI GRADUATE SCHOOL

THE PHD STUDENTS AND CLINICIAN SCIENTISTS OF SECAI

The following doctoral students and clinician scientists started as the first cohort of the SECAI graduate school (see page 12).



**RAJAB AGHAMOV**

supervised by Christel Baier and Markus Kröttsch



**TIM LANGER**

supervised by Christian Mayr and Stefanie Speidel



**MAX BEINING**

supervised by Jens Meiler and Christian Mayr



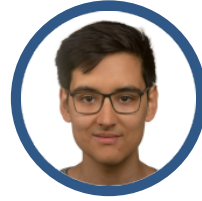
**CAROLIN SCHIMMELPFENNIG**

supervised by Kristin Reiche



**MAX BRAUNGARDT**

supervised by Martin Bogdan and Thomas Mikolajick



**JOHNNY ALEXANDER JIMENEZ SIEGERT**

supervised by Jens Meiler and Christian Mayr



**DEIANIRA FEJZAJ**

supervised by Thomas Mikolajick and Martin Bogdan



**GREGORY VELDHUIZEN**

supervised by Jakob Kather



**SIMON HOSEMANN**

supervised by Carsten Lutz and Sebastian Rudolph



**DANUSH KUMAR VENKATESH**

supervised by Stefanie Speidel and Bjoern Andres



**RADHIKA JUGLAN**

supervised by Jakob Kather and Sayan Mukherjee



**YITING WANG**

supervised by Frank H.P. Fitzek and Stefanie Speidel

# SECAI PARTNERS

OUR NATIONAL AND INTERNATIONAL NETWORK CREATES OPPORTUNITIES FOR STUDENTS AND RESEARCHERS

## ACADEMIC PARTNERS

The following international universities and research institutions are part of the SECAI network.

- École normale supérieure, PSL, France
- TU Wien, Austria
- Uniwersytet Wrocławski, Poland
- King's College London, United Kingdom
- University of Cape Town, South Africa
- Centre for Artificial Intelligence Research (CAIR), South Africa
- Carnegie Mellon University, USA

## INDUSTRY PARTNERS

The following industry partners are part of the SECAI network.

### COMPANIES

- Global Foundries, Dresden
- IBM Deutschland, Research & Development, Böblingen
- IBM Deutschland, AI & Analytics, München
- Infineon, Dresden
- Siemens, RDA Business Analytics and Monitoring, München
- Siemens Healthcare, Technology and Innovation Management, Erlangen
- Unite Network SE, Leipzig
- Zeiss, Innovation Hub, Dresden

### START-UPS

- CampusGenius, Dresden
- Cell.Copedia, Leipzig
- CO.DON, Leipzig
- MediaInterface, Dresden
- Meshmerize, Dresden
- Mimetic, Dresden
- Navigo Proteins, Halle
- SpiNNcloud Systems, Dresden
- Wandelbots, Dresden

## INDUSTRIAL FEDERATIONS

- Silicon Saxony, Dresden
- Smart Systems Hub, Dresden



# STUDY PROGRAMS

SECAI'S MASTER-LEVEL PROGRAMS COVER A BROAD RANGE OF AI TOPICS

A detailed description of the stud programs in SECAI can be found on page 11. Below is an overview of relevant statistics on the applications and admissions to these programs for the study year 2022/2023, starting in October 2022.

Study Program	Site	Applications	Registrations
Nanoelectronics Systems	TU Dresden	312	79
Computational Life Science (CMS Track)	TU Dresden	35	15
Logical Modelling (CMS Track)	TU Dresden	76	12
Visual Computing (CMS Track)	TU Dresden	115	25
	<b>TU Dresden</b>	<b>538</b>	<b>131</b>
Data Science	Leipzig University	91	29
Bioinformatics	Leipzig University	57	10
Medical Informatics	Leipzig University	37	17
	<b>Leipzig University</b>	<b>185</b>	<b>56</b>
	<b>Total</b>	<b>723</b>	<b>187</b>

*CMS* stands for *Computational Modeling and Simulation*. We only specify statistics for the study tracks that have a close relationship to AI. Students in CMS must select a single track when applying to the program. The track is part of their registration and will be shown on the final certificates. Changing the track is possible at most once, pending approval by the responsible teachers and commissions.

The column *Registrations* specifies the total number of students who have eventually registered as students in the respective programme. This number is typically lower than the number of admissions, since not all accepted students will always decide for the programme, and since international students may also be prevented from doing so because of delays in obtaining their visa.

# IMPRINT

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## IMAGES AND GRAPHICS

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- P. 17, AI surgery: NCT/UCC/André Wirsig

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