

Annual Report 2024

b-it Bonn-Aachen
International Center for
Information Technology



Gonca Türkeli-Dehnert
*State Secretary at the
Ministry of Culture
and Science of the
German State of North
Rhine-Westphalia.*
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Foreword by the Chair of the b-it Foundation

As we look back on a successful year for the Bonn-Aachen International Center for Information Technology (b-it), I applaud the accomplishments of this institution. The research and innovative educational programs at b-it continue to push the boundaries of knowledge and shape the future of information technology.

The academic excellence of b-it is evident in the numerous honors and awards bestowed upon its faculty and students. The b-it-bots team has once again secured an impressive standing in the RoboCup@Work competition and was recognized with the prestigious Open Source Award.

The induction of Professor Stefan Wrobel, scientific director of b-it, into the prestigious North Rhine-Westphalian Academy of Sciences, Humanities and the Arts stands as a testament to his pioneering contributions to the field of artificial intelligence.

b-it's commitment to remaining at the forefront of innovation is reflected in the introduction of the new Master of Science program in Human-Centered Intelligent Systems. This timely program addresses the rapidly evolving field of intelligent interactive systems, blending artificial intelligence, human-computer interaction, and system design. By equipping students with the skills to shape the future of human-AI interaction, b-it ensures its graduates lead in this transformative technology.

Furthermore, the report highlights the strong industry and research collaborations that b-it has fostered, exemplified by the visits of Life Science Informatics students to Bayer AG and the insightful visit of alumna Enuo He. These partnerships are invaluable in bridging the gap between academia and industry, ensuring that b-it's programs remain relevant and impactful.

As we look to the future, I am confident that b-it will remain a leading force in the advancing of information technology, driving innovation, cultivating talent, and contributing to the positive development of society. The

unwavering support of the German federal government, the state of North Rhine-Westphalia, and our partners has been instrumental in b-it's success, and I am grateful for their continued commitment.

On behalf of the b-it Foundation Council, I extend my sincere congratulations to the faculty, staff, and students of b-it for their outstanding achievements this year. Together, we will continue to shape the future of information technology and create positive impact on the world.

Gonca Türkeli-Dehnert

State Secretary, Ministry of Culture and Science NRW
Chair of the b-it Foundation Council

b-it Mission Statement

The b-it is a leading international center for research and education in computer science and artificial intelligence in the high-tech region of Bonn-Rhein-Sieg-Aachen, combining academic excellence with industry-relevant applications. Through our international Master's degree programs, our research-oriented teaching and our collaborative network, we prepare the next generation of experts for top positions in research and industry.

We combine the expertise of the Excellence Universities of Bonn and Aachen, the application-relevant research of the Fraunhofer-Gesellschaft and the Hochschule Bonn-Rhein-Sieg. In our three exclusive degree programs – Human-Centered Intelligent Systems, Life Science Informatics and Autonomous Systems – we qualify students for leading positions in an increasingly digitalized world.

As a condensation point for regional cooperation, we offer a diverse network of competent partners for research and development issues. Our aim is to drive innovation and actively shape sustainable technological progress in the region through the integration of computer science and artificial intelligence in research and teaching as well as through unique practical laboratory internships at Fraunhofer institutes.

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Report by the Scientific Directors

As the scientific directors of the Bonn-Aachen International Center for Information Technology (b-it), we are delighted to present this annual report showcasing the achievements and milestones of the past year. b-it continues to uphold its reputation as a pioneering institution, driving innovation and excellence in the field of information technology.

This year also marked an important milestone for b-it, as we unveiled our new mission statement that will guide our endeavors in the years to come: "Shaping the future of information technology through excellence in education, research, and innovation for the betterment of society." This statement encapsulates our commitment to pushing the boundaries of knowledge, fostering collaboration, and leveraging the power of information technology to create positive and lasting change.

Several developments exemplified our dedication to this mission. The introduction of the new Master of Science program in Human-Centered Intelligent Systems addresses the changing needs of industry and society. By equipping students with a deep understanding of artificial intelligence, human-computer interaction, and system design, we are shaping the future of intelligent interactive systems.

Our faculty and students brought great honor to b-it. The success of the b-it-bots team demonstrate exceptional talent and dedication. Research remains pivotal, highlighted by Professor Lucie Flek's cancer genomics work, the IAIS-BRS AI cooperation, and the new DKZ.2R data literacy center – tackling complex challenges through interdisciplinary collaboration. Our alumni continue making significant impacts across sectors, inspiring us to continually enhance the quality of b-it's education and training.

Looking ahead, nurturing talent, interdisciplinary synergies, and pioneering research will propel us towards our mission of shaping information technology for society's betterment. Our partners' support remains invaluable, and we are very grateful for it. Together, we will continue innovating and creating lasting technological impacts aligned with our new mission.



Prof. Dr. Stefan Decker
*RWTH Aachen University
and Fraunhofer FIT*



Prof. Dr. Sascha Alda
Hochschule Bonn-Rhein-Sieg



Prof. Dr. Stefan Wrobel
*University of Bonn and
Fraunhofer IAIS*

Stefan Decker

*RWTH Aachen University
and Fraunhofer FIT*

Prof. Dr. Sascha Alda

Hochschule Bonn-Rhein-Sieg

Stefan Wrobel

*University of Bonn
and Fraunhofer IAIS*

b-it in Profile

The southwest of North Rhine-Westphalia (NRW) is one of the largest, most vibrant locations in the European media and telecom industry. It is also one of the most innovative and fast-growing biotech regions in Germany, and there is much interest in the emerging fields of mechatronics and robotics. To make it the optimal place to study for professional work in these fields, the Bonn-Aachen International Center for Information Technology (b-it) has been established as a joint venture of RWTH Aachen University, University of Bonn, Hochschule Bonn-Rhein-Sieg (H-BRS) and the research institutes of the Fraunhofer Institute Center Birlinghoven Castle.

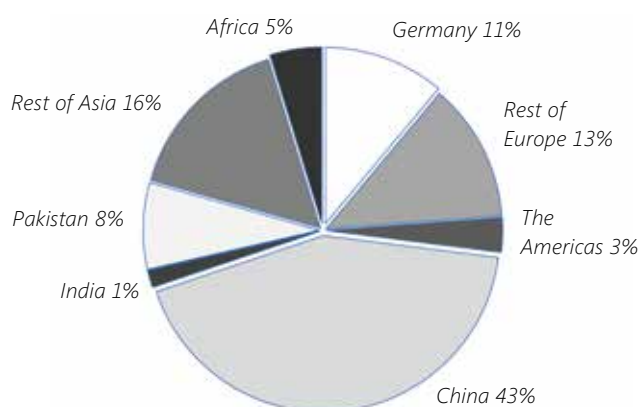
b-it offers highly selective international master's programs in Applied IT, as well as summer / winter schools for qualified undergraduate computer science students. The b-it Research School offers doctoral training. Since 2018, most courses take place in the newly erected b-it building on the Poppelsdorf Campus for Mathematics and Computer Science of Bonn University. Admission to the b-it master's programs is linked to, and conditioned upon, placement

in research lab courses at the participating Fraunhofer institutes. Students in good standing are offered financial support during these lab courses.

The b-it Universities Institute offers English language Master of Science (M.Sc.) programs in Media Informatics and Life Science Informatics, while the b-it Applied Science Institute offers a Master of Science in Autonomous Systems. The Master Programs prepare students for successful international careers that require technical excellence and leadership, creativity and the ability to innovate. b-it master programs are distinguished by their international orientation, structured according to the European Credit Transfer System (ECTS) standard, their focus on IT competence, and the deep integration of teaching and research.

For the participating universities, the b-it programs have also helped pave the way towards a smooth transition from the traditional German diploma system to the Bachelor-Master system following the Bologna accord; for example, the b-it master programs were the first to be accredited within the participating universities in 2004-2005. A comprehensive external evaluation in 2019 confirmed the very positive developments and stimulated a few new accents. The success of the b-it programs is also demonstrated by a very good placement record, both in academia and industry.

b-it is financially supported by a 56 M € Foundation initiated through the Bonn-Berlin program of the German federal government, as well as by matching NRW state funds.



Home countries of new b-it students.

Addressing new Challenges

The new study program Human-Centered Intelligent Systems (HIS)

The Master program in “Media Informatics”, which did successfully run for almost 25 years, will be renewed with a new Master of Science (M.Sc.) program in “Human-Centered Intelligent Systems” starting from Winter term 2025/2026. The new program targets at an in-depth understanding and hands-on experience in the rapidly evolving domain of intelligent interactive systems, blending artificial intelligence, human-computer interaction, and system design. It is a response to several key developments and needs in the field:

- **Advancements in AI:**

Recent advancements in AI, particularly in areas like deep learning, have revolutionized the capabilities of interactive systems, from image recognition and natural language processing to generating content across text, image, audio, and video. Central to this are foundational models and a mix of learning methods that incorporate simulation and informed learning. Moreover, the practical aspects, including the deployment and ongoing learning of AI-based systems, are also addressed.

- **Human-Computer Interaction:**

How to shape the interaction with AI-infused systems has opened new frontiers in HCI research and practice. From conversational user interfaces (CUIs) like voice-controlled assistants and generative AI systems using large language models to avatars in virtual and augmented reality, the way we interact with digital systems is changing profoundly. These technologies bear the promise of more intuitive and accessible interfaces for a more inclusive digital world, but they also carry the potential of a future full of annoying, biased, inhumane systems surrounding us if we do not pay attention to their interaction design.

- **Social impact and ethics:**

Allowing AI systems into our lives has profound implications for society at large. Technologists can no longer build and release products without considering the impact of these systems on their users and society.

- **Industry demand and skill gap:**

Industry demand for professionals with expertise in both AI and HCI is skyrocketing. However, there is a notable gap between the skills needed and the expertise available in the workforce. This program aims to bridge that gap by equipping students with both the technical and methodological knowledge, skills, and competencies to work at the intersection of AI and HCI and help shape a desirable future of living with intelligent interactive systems. It combines a strong academic university education with practical labs at participating Fraunhofer institutes.

This course requires a strong background in computer science and is ideal for those who are looking to specialize in the rapidly evolving field of human-centered interactive systems. It is structured in two main areas “Artificial Intelligence and Machine Learning” and “Human Centered and Interactive Technologies”, each being introduced with a compulsory introductory module. These areas of study are complemented by an area “Use and Social Impact” containing modules from psychology, social studies and ethics. To allow students to additionally follow their own specific interests, a fourth area allows the students to select additional modules from a full spectrum offered in the various computer science programs at RWTH Aachen University and University of Bonn. However, this fourth area is restricted to ensure the desired specialization of the students completing the program.



*Professor
Lucie Flek...*



*... and Professor
Rafet Sifa,
pushing HIS
in the future.*

Honors and Awards

Professor Stefan Wrobel inducted to the North Rhine-Westphalian Academy of Sciences, Humanities and the Arts



Professor Stefan Wrobel.

The North Rhine-Westphalian Academy of Sciences, Humanities and the Arts welcomed ten new members to its ranks at its annual ceremony in May 2024. Among them is b-it Director Professor Dr. Stefan Wrobel. He is one of the top researchers in his field and has been honored by the German Informatics Society as a "GI Fellow" and as one of the formative minds in the history of German AI. Professor Wrobel focuses on conducting excellent research and exploring paths that may only become relevant later. At the same time, he centers on putting research outcomes into practice. The Academy was founded in 1970. Only excellent researchers and artists are admitted. Only those who have "distinguished themselves through scientific or artistic achievements" according to the statutes can be elected. The Academy currently has around 280 full members and almost 130 corresponding members.



b-it-bots team.

Another successful year for the b-it-bots team in the RoboCup@Work competition

After last year's victory at the RoboCup World Championship, the b-it-bots team had another successful season in the @Work league. At the RoboCup German Open 2024, the team was victorious once again. Then, in the @Work World Championship at RoboCup 2024 in Eindhoven, the team finished third. Problems with the robot's camera in the final run cost the team the victory, but a podium place could still be secured. This successful participation in this year's RoboCup season was due to the dedication of several team members (in alphabetical order): Akhilan Ashokan, Gokul Chenchani, Chaitanya Gumudala, Vamsi Kalagaturu, Harley Nelson Lara Alonso, Vivek Mannava, Anudeep Sai Sajja, Shubham Shinde, Santosh Thoduka, and Djordje Vukcevic.



Obituary for Professor Matthias Jarke

We mourn the loss of its long-time director Prof. Dr. Matthias Jarke, who passed away on March 21 at the age of 71. With his passing, the Com-

puter Science community has lost a visionary and exceptional personality who significantly shaped and advanced the development of Computer Science in Germany and beyond. As one of the three Founding Directors, he was largely responsible for the establishment of b-it as one of Europe's leading institutions for cutting-edge research and higher education in Computer Science as well as for helping to shape digital change in collaboration with business and society.

After his studies in Computer Science and business administration and his doctorate in business informatics in Hamburg, Jarke held the professorship for business informatics at the Stern School of Business at New York University. In 1986, he was made Professor of Dialog-oriented Systems at the University of Passau, after which he took up the Chair of Information Systems at RWTH Aachen University in 1991, which he held until his retirement in 2021. From 2000 to 2021, he was also Director of the Fraunhofer Institute for Applied Information Technology FIT in Sankt Augustin, Aachen and Bayreuth and, between 2010 and 2015, he additionally chaired the Fraunhofer ICT Group – one of the largest organizations for research in applied Computer Science in Europe.

In 2002, with the aim of creating top-level English language master's programs in applied IT for top international bachelor graduates, he founded the Bonn-Aachen International Center for Information Technology together with Professor Armin B. Cremers and Professor Kurt-Ulrich Witt. Only three years after the Bologna Declaration and the creation of the internationally comparable Bachelors/Masters system, a joint scientific institution of the University of Bonn, RWTH Aachen University, Bonn-Rhein-Sieg University of Applied Sciences and the Fraunhofer-Gesellschaft was established, which has since enabled excellent IT training at Masters level with its internationally highly regarded degree courses.

Thanks in great part to Prof. Dr. Matthias Jarke's efforts and expertise, b-it has been able to successfully and sustainably position the courses both nationally and internationally. Our graduates are highly valued by many global players as well as medium-sized companies and academic institutions.

We are grateful for his expertise, vision, direction and overall commitment.

Events and Visits



© Georg Mogk, Bayer AG

b-it LSI students visit Bayer Campus

A group of b-it Life Science Informatics students visited the pharmaceutical and agro-chemical company Bayer AG and its Campus in Leverkusen on April 26, 2024. They were presented an outstanding program by Dr. Georg Mogk, Principal Expert Applied Mathematics at Bayer. After a comprehensive tour through Chempark Leverkusen, the students had the opportunity to meet with researchers of the Process & Technology Development (PTD) department. Company visits are a great opportunity to see how Research and Development (R&D) works in practice and may be a first step linking science to industry.

The group was first given a tour through the impressive Chempark Leverkusen, a real chemical park with companies from across the chemical industry (not only Bayer). The production facilities of the individual companies at the Chempark are interconnected via material and energy flows and thus benefit from each other. The Chempark has its own Rhine port and its own railway network, which are used to transport raw materials and finished products.

After the more than one hour Chempark tour, they had the opportunity to meet researchers of the Process & Technology Development (PTD) department who work in the field of

Chemoinformatics, more specifically in the field of molecular simulation with quantum computers, hybrid modelling, retrosynthesis and early drug discovery. Further insights were provided into Computer Vision to monitor crops and seedlings. All this was complemented by two lab visits. This was an excellent visit tailored to the students' wishes and it was delivered in an outstanding fashion.

The group included more than 30 current Life Science Informatics students from 13 different countries and two staff members, Professor Holger Fröhlich from Fraunhofer SCAI and Dr. Daniela Treutlein from the Transfer Center enaCom, establishing important links to Dr. Georg Mogk, Principal Expert Applied Mathematics at Bayer and the b-it (Bonn-Aachen International Center for Information Technology) Life Science Informatics program.

Visit of Alumna Enuo He

Enuo He is a Life Science Informatics (LSI) alumna. She visited b-it in early July 2024. Enuo joined the LSI program in 2005 and graduated from it in 2008. During her studies at b-it she had research stays at the European Bioinformatics Institute (EBI) in Hinxton near Cambridge (GB) and at the California Institute of Technology (Caltec) in Pasadena (USA). After graduating for the Life Science Informatics program Enuo completed her PhD at Oxford University (GB). Then she joined the pharmaceutical company GlaxoSmithKline (GSK) in London. She worked for GSK in London, Japan and China. Until recently she was Head of Medical Operations for GSK in China. Enuo's career exemplifies two hallmarks of education in LSI: excellence in research and a focus on industry. b-it members and alumni talk about current trends in science and in the improvement of education regarding the challenges of our times. b-it members and alumni form a vast network to think the future. Thank so you much for your visit, Enuo! It was a pleasure for us all.



Professor Bajorath (head of the LSI program), Enuo He, Alexandra Reitemann (LSI study advisor), Professor Hofmann-Apitius (deputy head of the LSI program).

Research @ b-it



Professor Lucie Flek.

Professor Lucie Flek (b-it) received funding from the TRA “Modelling” for cutting-edge research on detecting patterns in cancer-driven gene regulation disruptions using LLMs

Trans-disciplinary areas (TRAs) receive their funding as a part of the Excellence Strategy in Germany. There are 6 TRAs at the University of Bonn. They provide spaces for innovation in research and teaching that are tackling the interdisciplinary scientific, technological and societal challenges of the future. Professor Flek received a seed funding for one year by the TRA Modelling (TRA's full name: Mathematics, Modelling and Simulation of Complex Systems) for a project titled: “Automatic construction of gene regulatory networks from scientific literature with LLMs”. The project will be conducted in consultation with Dr. Christiane Hellweg (DLR, German Aerospace Centre) and Prof. Dr. Holger Fröhlich (b-it). Prof. Fröhlich conducts research in statistical data mining and machine learning with specific focus on applications in biomedicine. Dr. Hellweg's research focuses on the effects of radiation on organisms, its possible uses in cancer therapy and the disruption of gene regulation it causes.



Pepper robot.

Gene regulatory networks describe the interactions of genes in proteins in living organisms. Disruption of those networks can cause a plethora of health problems. The most prevalent one being cancer, which is always based on a disruption of gene regulation. The biomedical community does a tremendous amount of research about cancer and the underlying genetic causes, which can differ strongly between cancer types. So many papers are published that it becomes impossible to keep an overview. Furthermore, many papers explore connections between only a few genes under specific experimental conditions and not full networks. Leveraging the text comprehension ability of LLMs, the goal is to extract and then combine the

partial networks described in papers based on matching experimental conditions.

Fraunhofer IAIS and H-BRS deepen cooperation in the area of artificial intelligence

Fraunhofer IAIS and H-BRS have decided to build a long-term research agenda in the area of artificial intelligence. To this end, Sebastian Houben, currently Professor for Robot Vision and Machine Learning in the master's program in Autonomous Systems, additionally holds a position as a Team Lead in the NetMedia department at Fraunhofer IAIS. The new research group investigates the use of foundation models for multi-modal sensor processing, a field at the intersection of media processing and autonomous systems. The group is funded by the Fraunhofer-Gesellschaft via the program FH KOOP, which provides an initial budget for the coming five years. H-BRS and Fraunhofer IAIS also cooperate in the new BMBF-funded project Rhine-Ruhr Center for Scientific Data Literacy (DKZ.2R). Here, Prof. Houben cooperates with Dr. Johannes Levelling, who is the responsible PI from NetMedia.

H-BRS part of newly founded Rhine-Ruhr Center for Scientific Data Literacy (DKZ.2R)

The Institute for Artificial Intelligence and Autonomous Systems (A2S) at H-BRS is part of the new project Rhine-Ruhr Center for Scientific Data Literacy (DKZ.2R), which started in January 2024 and is funded by the Federal Ministry of Education and Research (BMBF). The main objective of the project is to offer consulting and coaching of scientist in data-related fields that need help in designing data acquisition, processing, and maintenance pipelines for their projects. The project consortium consists of 9 universities within North Rhine-Westphalia. Prof. Sebastian Houben is the project PI at H-BRS.



Media Computing Group Fights Dark Patterns

Have you ever accidentally accepted cookies although you didn't mean to? The b-it chair for Media Informatics and Human-Computer Interaction, headed by Prof. Dr. Jan Borchers, has started a research initiative to combat such malicious user interface design practices that try to manipulate users into decisions against their best interests. These practices are known as "Dark Patterns" or, more appropriately, "Deceptive Designs", and they have been spreading in apps and online. The chair has studied how deceptive designs affect adults and vulnerable groups like children and has begun to develop and evaluate technical countermeasures that could lead to, e.g., browser extensions that remove or flag these deceptive designs in a UI (see picture). This year, the lab successfully published archival papers on this topic at three conferences, including ACM CHI'24, the premier international venue in HCI research, and co-organized an international workshop on the topic at CHI. The work has also led to fruitful collaborations with colleagues in IT security and learning technologies.

MigrAVE project finishes

The MigrAVE project, which was concerned with the development of a robotic assistant to support the therapy of children with Autism Spectrum Disorder (ASD), was completed at the end of 2023. In the project, H-BRS cooperated with Münster University of Applied Sciences and RH Köln University of Applied Sciences. One major highlight of the project was a field study during which children with ASD interacted with the robot while performing a variety of learning programs.

As part of its legacy, MigrAVE leaves numerous publications and many open-source components.

VR Bank Rhein-Sieg donates a Pepper robot to H-BRS

The Institute for Artificial Intelligence and Autonomous Systems (A2S) at H-BRS welcomes a new addition to the robot squad: a Pepper robot that was previously used by the VR-Bank Bonn Rhein-Sieg was donated to the institute. Prof. Teena Hassan, head of the institute, intends to use the robot primarily in student projects, where students will develop and test software that utilizes Pepper's sensors and mobility, but will also teach the robot new skills.



Prof. Teena Hassan.



ZAT Rhein-Ruhr project kicks off

A new project has started in the Institute for Artificial Intelligence and Autonomous Systems (A2S) at H-BRS: the Rhine-Ruhr Center for Assistive Technologies (ZAT Rhein-Ruhr), funded by the North Rhine-Westphalian Ministry of Culture and Science (MKW). Together with the Rhine-Waal and Lower Rhine universities and the University of Duisburg-Essen, the project addresses the question of how assistance systems can be adapted to human needs, with the aim of advancing the development of personalized assistance systems that exhibit intelligent behavior and are based on artificial intelligence. Another objective of the project is to set up a centralized Internet-based platform that creates transfer opportunities, such as enabling the networking of researchers and associations. Prof. Teena Hassan is the project PI at H-BRS.



Prof. Dr. Jan Borchers,
Media Computing



Prof. Dr. Thomas Rose,
Media Processes

List of employers of MI Alumni

(Universities & Research):
Airport Research Center GmbH,
b-it, b-it Research School, Centro
Nacional de Investigaciones
Cardiovasculares, CErTH, Charité
Berlin, Chinese Academy of Science,
COSBI, Czech Technical, ETH Zurich,
Fraunhofer FGAN, FIT, FKIE, FOKUS
and IAIS, FSU Jena, Hasso-Plattner-
Institut, HHI Berlin, Imperial College,
INRIA, Institute of Molecular
Medicine, Karlsruhe Institute of
Technology (KIT), K. U. Leuven, Max
Planck, Microsoft Research (Cairo),
National University of Computer &
Emerging Sciences, National Univer-
sity of Ireland Maynooth, National
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gy, Research Center Jülich, Robert
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Aachen, Uniklinikum Bonn, Uni-
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ties of Agder, Arab American Jenin,
Asia and the Pacific, Atma Jaya Yo-
gyakarta, Augsburg, Bahria, Bonn,
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den, Duisburg-Essen, Edinburgh,
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Oldenburg, Ireland, Maynooth,
Johannes Kepler, Kiel, Leipzig, Mainz,
Münster, Paris, Rotterdam, Sud,
Stuttgart, Tilburg, Tirana, Toronto,
Trento, Tübingen, Washington,
Waterloo, Western Australia, West
Indies, Zurich; TU Darmstadt, TU
Dresden, TU Eindhoven, TU Munich.

b-it Programs

Master Program in Media Informatics

Computer scientists with an applied focus have been in great demand in the past, and this is expected to continue for the foreseeable future. Graduates of the Master Program in Media Informatics will be well-prepared for the challenges faced when working in computer systems engineering and for creative work with audio-visual media. The Aachen – Bonn – Cologne region is home to many prospective employers, including global players such as Philips, Microsoft, Telekom, Vodafone, Bertelsmann Group, as well as many television stations including RTL, WDR etc.

While a Bachelor degree in Computer Science typically qualifies to participate in large software projects, the Master degree provides the qualifications for project leadership. Graduates of the program in Media Informatics can be expected to be technically innovative, to work as system architects, and to manage large projects. Students who excel during their master program will also have the necessary qualification to pursue a doctoral degree in Germany or abroad.

The Master Program in Media Informatics educates the students to successfully meet the novel technical and economic challenges at the intersection of computer science, software engineering, next-generation communication systems, and the media. It is offered as a joint program of RWTH Aachen University and University of Bonn.

The program is characterized by a significant portion of lab courses embedded in research of the participating Fraunhofer Institutes for

Applied Information Technology FIT and for Intelligent Analysis and Information Systems IAIS. The degree is conferred by RWTH Aachen University. Cooperation partners from industry and research contribute to a rich teaching program.

The course contents are structured according to the ECTS (European Credit Transfer System) and consist of three main blocks: Computer Science and its mathematical foundations, Multimedia Technology, and Media Science and business aspects. Major topics include: Internet Infrastructures, Data Communication, Digital Interactive Media, Management of Information, Computer Graphics, Animation, Visualization, Speech / Image / Video Processing, Game Design, Security and Cryptography, Designing Interactive Systems, Cooperative Work Environments, E-Business, Knowledge Management, Virtual and Augmented Reality, and Software Engineering.

A total of 9 Media Informatics students have completed their master's degrees in the academic year of 2023-2024. The graduates quickly found interesting positions either as doctoral students in German or foreign universities/institutes or in top IT companies. The incoming class of 2024 comprises 14 students selected from 109 applications from 5 different countries, where 20% of students are females and 80% are males.

The program has been rejuvenated under the label of Human-centered Intelligent System as presented on page 5. The official start of classes is planned for the next winter term.

MI Success Stories

Monica Verma



Monica is a hacker turned CISO, who graduated from RWTH Aachen University and received the best master thesis awards for her work in web application security. Since then,

she went on to become a hacker at Siemens, moving on to leadership roles, leading risk management in companies like Allianz. Her career took an amazing turn when she joined the Oil Fund in Norway, where she continued her leadership journey as a Chief Information Security Officer (CISO) for various critical infrastructure companies in the finance, healthcare and digital services space. In 2020, she also launched her own brand Monica Talks Cyber. For her work and contribution, she also received various award such as Top No. 3 CISO in entire EMEA in 2023, along with Top 50 Women in Tech, and others. Today, she lives in the U.K. and continues on her journey to serve professionals, leaders and businesses globally.

Nicola Poell



I joined the MI program directly following my Bachelor's Degree in Computer Science at RWTH Aachen University, which allowed for a smooth transition to a

flexible degree with a focus on interactive media in an internationally diverse environment. The cooperation with Fraunhofer in Sank Augustin enabled me to additionally gain more practical experiences. As a student research assistant at the Virtual Reality and Immersive Visualization Group of RWTH, I also had the chance to get first insights into the work in software engineering and science. I was fortunate enough to receive a MOGAM stipend for a research stay in South Korea at Sungkyunkwan University. Back in Aachen, I then extended this work into a master's thesis.

Irina Weiß-Avetisyan



b-it has been a pivotal institution in shaping the careers of many individuals, particularly through its MI program – and I am no exception. For

professionals like myself, the program has been more than just an academic endeavor; it has been a career-defining journey. The program's emphasis on IT proficiency, combined with the integration of teaching and research, has provided a solid foundation for developing an innovative mindset, technical skills, and a strong mathematical base. This encouraged me to initiate the Cologne Chapter of Women in AI, a community focused on empowering women in the field. Moreover, the b-it experience has inspired graduates to give back to the community by fostering the growth of AI at a regional level. This includes mentoring roles, such as supporting female EXIST-Founders at the Bonn-Rhein-Sieg University of Applied Sciences.

Srijeet Roy



I am currently working in the fields of Computer Vision at RWTH Aachen University, under the supervision of Prof. Leibe as a Master's thesis student, and in Natural Language

Processing with Large Language Models (LLMs) at Fraunhofer FIT, under the guidance of Prof. Rose as a student research assistant. As part of my Master's thesis at the Computer Vision group at RWTH Aachen, I am conducting research on interactive video object segmentation. My work has been highly complemented by the MI program. It offers a flexible curriculum that strikes a fine balance between broad exploration across several computer science disciplines and an intensive deep dive into a specific area of interest. Overall, the MI program has not only broadened my technical expertise but also fostered a multidisciplinary approach that continues to shape my research and practical work.

List of employers of MI

Alumni (Business):

4tree GmbH, Ableton, Adecco Engineering & IT, Adecco Phaholyothin Recruitment Ltd., Adidas, Agfa Healthcare, Airbus, Alcatel-Lucent, Ancud IT Beratung, Ansaldo STS, ANSR Source, AOL, ARC International, ArcSoft, Avedas, Avid Technology, awato Software GmbH, Bank of Mexico, Bayer Technology Services, BCA Auctions, BCA Europe, Bertelsmann, Bertrand Ingenieurbüro GmbH, BESA GmbH, Blimp.Mx, Bombardier Inc., Brainloop, BTC Business Technology Consulting, Cagimini, Capitaworld Platform Pvt. Ltd., CAS, CBC Cologne Broadcasting Center, Cellent AG, CGI, CIGNA, Cloudberrytec, CMLabs Simulations, Cognizant Technology Solutions, COMNEON, Contentteam, Crytek, CSC India, Dae-dalic Entertainment, Daimler, Deloitte AG, Delta Engine, Demax, Deutsche Bank AG, Deutsche Telekom, devolo AG, Dolby Laboratories, DP IT Services GmbH, Dynevo (Bayer), Ericsson, Euro-money Institutional Investors, European Computer Telecoms, Evimed Online, Exact Software, Facebook, Famous Group, Finantix Srl, Forth corporation, Fox Chase, Game Analytics ApS, GIVE.sg, Global Crop Diversity Trust, Goodyear, Google, Grandcentrix, GTT Technologies, Hewlett Packard Enterprise, HITS, Huawei, Humance, i22 internetagentur, IBM, IdeaObject Software, Illypsys, IMC BV, IMC Financial Markets, Infineon, Inforcent Networks, Internet Company, IP Labs, iPharro Media, ISRA Surface Vision GmbH, ITBrainiacs, IVU Traffic Technologies, IW-One, Johnson Controls, Keynote SIGOS, Kisters, Kuveyt Turk Participation Bank, Lakshmi Technology and Engineering Industries, LHS Telekommunikation, Ligatus GmbH, Lufthansa Systems, Lycos, MarAnCon, Merck, Mastercard, MeVis Medical Solutions AG, Microsoft, Mobilab Solutions, moneymeets GmbH, Monsanto, Movilizer, NAVTEQ, Nato Communications and Information Agency, Nemetschek AG, NeuroSky, Inc., Nexcom IT Services, Next Level Integration, Novartis, NTT Data, NVIDIA, Oando Plc, Oracle, Patersons, PCI Geomatics, Pepsi, Philips, Plinga, PricewaterhouseCoopers, Qiagen, Qosmotec Software Solutions, QSC, ReadSoft, Recognizer Group, Recommend, Roamworks Research & Development GmbH, Robert Bosch GmbH, Roche, S&P Capital IQ, Samsung Electronics, SAP, SD Inspiring Travel, sd&m, SE Consulting, Secat, Shell, SHS VIVEON, siCAT, Siemens, Siemens Healthcare, SIGOS, Simfy, Sogou Inc., Solnista, Solutions 4 Media, Sony, Steinberg Media Technologies, Sytel Reply, T-Systems, TeamViewer, Teleca, Telemotive, Tessella, Texas State - Health and Human Services (HHSC) Agency, Thomson Reuters, TravelTainment, Turk Telekom, Twitter, Vantage Labs, Viacom, vmware, Vodafone, Wacom Europe, Werum Software & Systems, Westwing Home and Living GmbH, Whowish, Widespace AB, Wieden+Kennedy, Workplace Systems, World Bank, Xerox Research Centre Europe, Yahoo!, Yieldlab AG, Zalando



Prof. Dr. Jürgen Bajorath,
Life Science Informatics



Prof. Dr. Martin Hofmann-
Aptius, Life Science Informatics

List of employers of LSI Alumni

(Business): @Wise (Estonia), 3B Pharmaceuticals, 4GATC Biotech, AbbVie, Accenture, Accura Gen, Alcimed, Aldi Süd, Arbern GmbH, ARBERN L.L.C-FZ, Asahi Kasei, ASI Data Science, Astra Seneca, atai Life Sciences AG, BASF SE, Bayer, Bayer Monsanto, BenevolentAI, bigspark, BiosolveIT, blue BEYOND GmbH, Boehringer Ingelheim, Bristol Myers Squibb, carpooling.com GmbH, Centene Corporation, Centogene, Clade Therapeutics, Clariant, Clue Points, Coca Cola HBC, Comma Soft AG, Comuny GmbH, ConfigCar GmbH, Coty Germany, Curetis, Dairy Data Warehouse, Dassault Systèmes, Deutsche Post, DFind Science and Engineering, DHL, Diapharm, DuPont, ecSeq Bioinformatics, Edelweiss Connect, Enhanc3d Genomics Ltd, Ennovation VC, Enveda Biosciences, epitome GmbH, Ericsson, Esprit, ESSEC & MANNHEIM EXECUTIVE EMBA, Evotec, Fast Focus BV, Finsbury Glover Hering, Freeletic, Fresenius Kabi, F-Star Therapeutics Inc., G42, Galileo Press, GAMOMAT Development GmbH, Gamomat GmbH, GATC Biotech, Generali Deutschland AG, Genestack, Genome Biologics, Germany Market Vector Indexes, Germany Smart4Diagnostics, Glaxo Smith Kline, Glover Hering, Hamilton Medical, Health-Care Global, Hearts & Science, Heraeus, Hoffmann-La Roche, Hype Innovation, IBM, IIT Bangalore, Interpretomics, IQVIA, ITTM S.A., Johnson & Johnson, KWP Inside HR, LabVantage Solutions Inc., Land O'Lakes Inc., Lead Berlin, Lead Discovery Center, Leaf Bioscience, LHS Telecommunications, LinkTechnica, L'Oréal, Luftansa Cargo, MackKinsey, MarAnCon, Mastercard AG, Max Dellbrück Center Berlin, MBition, McKinsey, Mediengruppe RTL, Medsciences Biotech, Medtronic, Merck, Micro biolytics, Miltenyi Biotec, Mimacom Flowable, Molecular Connections Private Limited, Molecular Devices, Molecular Health GmbH, Monsanto, msg systems ag, Nestlé Institute of Health Science, Netceera Software matters, Novartis, Novo Nordisk, numa, Nuvisan ICB GmbH, Octapharma, ok future, Omnicom Media Group, parlamind GmbH, Perkin Elmer Inc., Pfizer, Philips Research North America, Phillips, Postbank, PQE Group, ProfileXpert, Protagen AG, Publicis Group, quintly Inc., Rancho BioSciences, real.digital, Recognizer, Rewe, REWE Digital, Revvity Signals, Roche, RTL, SAATHI, Schlumberger, Scix, Seasoon Information Technology, Siemens Digital Industries Software, Smart-4Diagnostics GmbH, SOPHiA GENETICS, Statista, StepStone, SumUp, Syneos Health, Synchro Ltd., Syngene Ltd., Synthego Corporation, The Janssens Pharmaceutical Company, Tubs System LLP, UAE Omnicom, UBS, Union Chimique Belge (UCB Pharma), United Brands Marketing, Zerogravity

b-it Programs

Master Program in Life Science Informatics

The Master's Program in Life Science Informatics (LSI) is offered by the University of Bonn and RWTH Aachen University in cooperation with the Fraunhofer Institutes of Scientific Computing (SCAI) and Applied IT (FIT). The degree is conferred by the University of Bonn. This interdisciplinary program educates the participants to successfully master the novel technical and economic challenges at the crossroads of biotechnology, medicine, pharmaceuticals and computer science. The curriculum consists of three main blocks: Computer Science and Mathematics for life scientists; Basic principles of Life Science Informatics; Biology of the cell and systems biology.

Major topics include biomedical database systems, data mining and machine learning, statistical genetics, drug design, medical imaging and visualization, computational neuroscience, computational modeling of regulatory and metabolic networks, cheminformatics, bioinformatics, molecular modeling, molecular biology, pharmaceutical chemistry, biotechnology and systems biology. The program emphasizes a profound understanding of biological structures (such as proteins, nucleic acids, genes, metabolic, neural networks and organisms) as well as the appropriate application of methods of computer science to this field. It also includes training designed to sensitize students to the ethical implications of emerging biotechnologies. This combination will enable the successful students to understand biological or medical problems and to find appropriate and valid solutions that bioinformatics

can offer. The program is characterized by a significant share of research lab courses embedded in both basic and applied research of the participating Fraunhofer Institutes as well in labs of CEMBIO (Center for Molecular Biology) and LIMES (Life and Medical Sciences Research Biocenter Bonn). The final six months of the program are dedicated to the Master thesis which can be done in cooperation with industry.

Graduates of the program are well prepared for the typical professional tasks in applied data analysis, systems biology and data modeling, in industrial functional genomics, drug design and pharmacology. The Aachen-Bonn-Cologne-Düsseldorf region is home to many prospective employers, including excellent academic institutes and research driven companies. The regular and well attended meetings of the LSI Series "The ABC of Life Science Informatics" in the last years have contributed to strengthen ties with scientists of the region. Several interesting Master thesis have been carried out in collaboration with them. LSI students were also instrumental in this process. This has increased the visibility of the program considerably, also on a larger geographical scale.

This year more than 350 students applied to the Master program of Life Science Informatics (2023: 320 applications). Twenty five students will start their studies in October. Twenty five students graduated from the program this year.

LSI Success Stories

Phuong Thanh Nguyen



Phuong joined the LSI program in 2022 with a double degree in Applied Life Sciences / Life Sciences from Hochschule Bonn-Rhein-Sieg and HAN University of Applied Sciences, the Netherlands. During

her time at HAN University, she won scholarships from 2018 to 2022. She joined the group of Professor Thomas Schultz in 2024 for the Master thesis project in collaboration with the German Centre for Neurodegenerative Diseases (DZNE) working on a thesis on the "Tracking of dendritic spines in in-vivo two-photon microscopy", in collaboration with Professor Martin Fuhrmann, department of Neuroimmunology and Imaging at DZNE. Phuong is a student tie in Bonn linking the expertise from the field of Life Science Informatics / Image Analysis at b-it to research of the German Centre for Neurodegenerative Diseases (DZNE).

Dan-qi Wang



Before joining b-it, Dan-qi graduated with a Master's degree from Tsinghua University in Beijing, China, and gained eight years of wet-lab research experience in clinical proteomics.

In 2022, she joined Professor Holger Fröhlich's group at Fraunhofer SCAI, where she carried out her Master's thesis within the LSI program that she had joined in 2020. During this period, she also contributed to the Franco-German research project AIOLOS (Artificial Intelligence Tools for Outbreak Detection and Response), focusing on constructing ALERT models for the COVID-19 pandemic. After completing her Master's thesis, she continued working in Professor Fröhlich's group as a data scientist. After Fraunhofer SCAI, she joined Big Data Center, affiliated Hospital of Jiangnan University in China in November 2023. Her research currently focuses on AI-powered omics biomarker discovery and the

investigation of single-cell spatial landscapes to better understand cellular processes and tumor biology.

Selina Vossen



Selina entered the LSI program in 2022 as a graduate of the Maastricht University in Biomedical Sciences. In 2024, she joined the group of b-it Professor Jürgen Bajorath with for her Master's thesis

work focusing on manipulation and analysis of chemical databases in the context of exploration of biological information and data for pattern analysis. She is also part of Lamarr Research Institute as well as LIMES Institute at the University of Bonn. This example shows how b-it can provide an inviting research environment that also attracts women into the field of AI which is still dominated by men. Selina continues her work at b-it / Lamarr with PhD studies in the context of a collaboration between the interdisciplinary research area AI in the Life Sciences of the Lamarr Institute, and the TüCADD2 academic drug discovery center at the University of Tübingen.

Lisa Marie Krapp

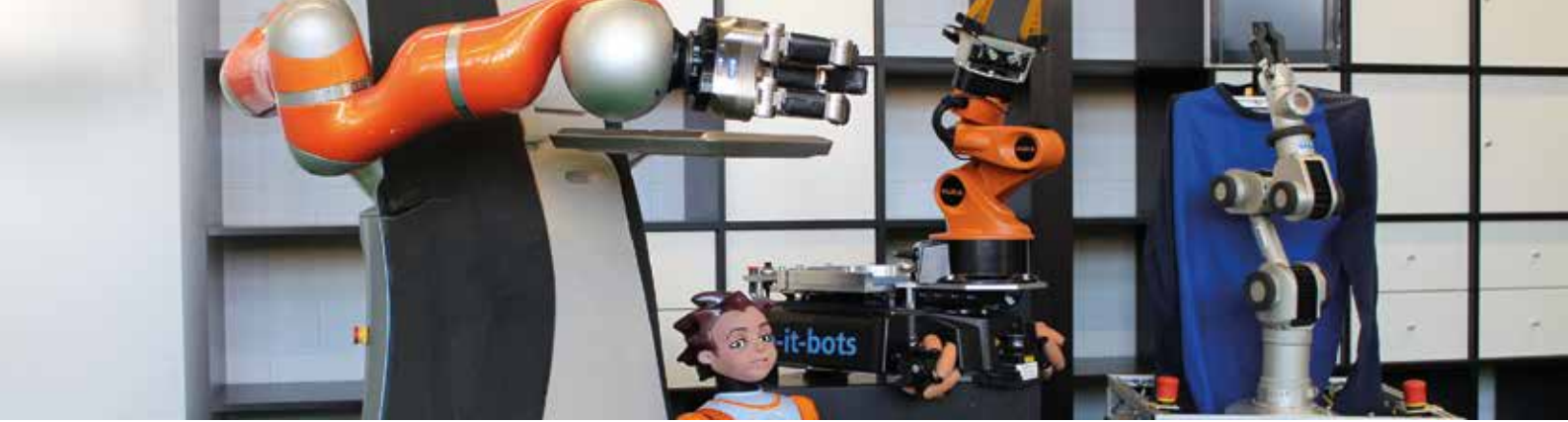


Lisa Marie joined the LSI program in October 2022 as a Bachelor-Biology graduate of the University of Bonn. For her Master's thesis she entered the group of Professor Thomas

Schultz in 2024 working on a foundation model-based analysis of multimodal retinal images for detecting and tracking signs of age-related macular degeneration (AMD), an eye disease, in collaboration with the Department of Ophthalmology of the University of Bonn. So, Lisa is one of the several b-it student ties to the university clinic of Bonn, supporting and enabling the use of artificial intelligence in medicine.

List of employers of LSI Alumni (Universities

& Research): Alan Turing Institute, Berlin Institute of Health, Biotech Research & Innovation Centre (BRIC), b-it Research School, Boston Children's Hospital, Centre for Molecular and Biomolecular Informatics (CMBI), Centro Nacional de Investigaciones Cardiovasculares, Centre for Molecular and Biomolecular Informatics (CMBI), Charité Berlin, Children's Cancer Research Hospital, Christian-Albrechts-Universität Kiel, Czech National Centre for Biomolecular Research, DKFI, ELI Beamlines, European Molecular Biology Laboratory, ETH-Domain, ETH Zürich, European Bioinformatics Institute, European Bioinformatics Institute, Fraunhofer FIT, Fraunhofer IAI, Fraunhofer IME, Fraunhofer ITMP, Fraunhofer SCAI, Fundación Centro Nacional de Investigaciones Cardiovasculares, German Center for Cancer Research (DKFZ), German Center for Neurodegenerative Diseases, German Institute of Human Nutrition, Harvard Medical School, Hasso Plattner Institute, Heidelberg Institute of Theoretical Studies (HITS), Helmholtz Centre for Infection Research, Helmholtz Zentrum München, Hertie Institute for Clinical Brain Research, Hospital of the University of Bale, Hotkiss Brain Institute, IFOM, IIT Jodpur, Imperial College London, India University of Copenhagen, Institut Pasteur, Institute of Physics of the Academy of Science of the Czech Republic, Karolinska Institut, King Abdul City for Science and Technology, King Faisal Specialist Hospital and Research Center, Leibniz Information Center for Science & Technology (TIB), Leibniz Institut für Ostseeforschung, Massachusetts General Hospital, Max Planck Institute for Biophysical Chemistry, Max Planck Institute for Heart and Lung Research, Max Planck Institute for Molecular Biomedicine, Max-Planck-Institute for Molecular Genetics, Max Planck Institute for Neurobiology of Behaviour, Max Planck Institute for Neurological Research, Max Planck Institute for Plant Breeding Research, Max Planck Institute for the Biology of Ageing, Max Planck Institute Tübingen, Microsoft Research-University of Trento Centre for Computational and Systems Biology (COSBI), MPI for Cognitive and Brain Science, MPI for Molecular Genetics, National Center for Advancing Translational Sciences (NCATS), National Centre for Biological Sciences, National Centre for Biomolecular Research, National University of Ireland, National Technical University of Singapore, NIH, Nuvisan Innovation Campus Berlin, Philipps, Princess Nora Bint Abdulrahman University, Radboudumc – University Clinic Centre of the University of Nijmegen, Research Center Jülich, Research Institute for Farm Animal Biology, RWTH Aachen, SCK CEN (Belgian Nuclear Research Centre), South University of Science and Technology of China, Swiss Federal Institute of Aquatic Science and Technology, The Alan Turing Institute, TRON, TU München, Twincore – Centre for Experimental and Clinical Research, University Clinic Gustav Carus Dresden, Universitätsklinikum Schleswig-Holstein, University College London (UCL), University of Nebraska Medical Center, Western University, ZBMed, and the universities of Alberta, Amsterdam, Bonn, Bern, Cambridge, Cologne, Copenhagen, Dresden, Duisburg-Essen, Düsseldorf, Edinburgh, Erlangen-Nürnberg, Ghent, Iowa, Kiel, Leipzig, Leon, Luxemburg, Macquarie, Mainz, Marburg, Münster, Netherlands, Oxford, Sheffield, Tübingen, Utrecht, Western Australia, Vienna, Wageningen, Western Ontario, Würzburg, Zürich.



b-it Programs

Master Program in Autonomous Systems



*Prof. Dr. Paul Plöger,
Autonomous Systems*



*Prof. Dr. Erwin Prassler,
Autonomous Systems*



*Prof. Dr.
Sebastian Houben
Autonomous Systems*



*Prof. Dr.
Teena Hassan
Autonomous Systems*

The master's program in Autonomous Systems is an international program, taught entirely in English, offering multi-faceted training in the fields of artificial intelligence and robotics. The program is offered by the b-it Applied Science Institute (b-it AS) in the Department of Computer Science at Hochschule Bonn-Rhein-Sieg (H-BRS). b-it AS cooperates closely with Fraunhofer IAIS in implementing the program, which started in the winter of 2002. Two dual degree programs exist, with the University of New Brunswick in Canada and the German-Jordanian University in Jordan. In addition to the accreditation certificate from the German Accreditation Board, the program has the special ASIIN accreditation label and the Euro Inf Label from the European Quality Assurance Network for Information Education (EQANIE).

The focus of the program is on enabling and integrating the necessary intelligence necessary for human-centered robot autonomy in dynamic environments, rather than on the hardware-related aspects of robotics. Students take a number of core courses in the first semester, as well as compulsory seminars and practical courses throughout their studies; through this, students get a solid theoretical background in autonomous mobile robots, machine learning, probabilistic reasoning, and human-robot interaction. The courses are combined with research work, often conducted at the Fraunhofer Institute for Intelligent Analysis and Information Systems (IAIS) and other partner institutions. Numerous robot platforms are used for educational and research purposes, including the Toyota Human Support Robot (HSR), QTrobot, NAO, Pepper, and the KUKA youBot.

The MAS program has always attracted the interest of students from all over the globe, as can be seen from the long list of countries from which the students have come from. In the academic year 2023/24, 24 students joined the program from an applicant pool of 725 candidates.

The program is managed by four professors (Teena Hassan, Sebastian Houben, Paul G. Plöger, and Erwin Prassler), two research associates (Iman Awaad and Dr. Alex Mitrevski) as well as researchers who have been recruited through various projects, namely: Center for Assistive Technologies Rhein-Ruhr (ZAT Rhein-Ruhr), DKZ.2R center for data literacy, GARRULUS, INNERVATE, METRICS, SESAME, MigrAVE, and E2x (E-Assessment). These researchers are Iman Awaad, Tim Metzler, Alexandra Mielke, Dr. Alex Mitrevski, Minh Nguyen, Natalia Quiroga, Michal Stolarz, Ludovico Scarton, Jordan Schneider, Sven Schneider, Santosh Thoduka, Djordje Vukcevic, Mohammad Wasil, and Youssef Mahmoud Youssef.

The faculty and staff are actively involved in many scientific activities, including: memberships in technical committees of IEEE; reviewing activities for various journals, such as IEEE Transactions on Robotics, IEEE Transactions on Cognitive and Developmental Systems, IEEE RA-L, and Autonomous Systems; workshop organising committees; as well as numerous program committees of workshops and scientific conferences, such as IROS, ICRA, CVPR, ECAI, ICAPS, and the RoboCup Symposium.

MAS Success Stories

Natalia Quiroga Perez



*Research Associate,
Institute for Artificial
Intelligence and
Autonomous Systems,
Hochschule Bonn-Rhein-
Sieg*

I completed my master's degree in MAS in April 2024. During the time in the MAS program, I had the opportunity to work with a variety of robots in the context of robot-assisted therapy for children with autism (BMBF project MigrAVE) and assistive technologies in the Center for Assistive Technologies Rhein-Ruhr (project ZAT Rhein-Ruhr). In this context, I did my master's thesis, where I developed a framework to generalize learning from demonstration from humans to robots, and used different robotic platforms (QTrobot, NAO, and Kinova arms). After that, I joined the A2S Institute in a new project (ZIM INNERVATE), where I will be working with machine learning to model car dynamics for automating control test for cars. I thank the MAS program for providing a strong foundation and interest in research and machine learning, and look forward to new challenges and apprenticeships.

Preeti Sarin



*Research Assistant,
Fraunhofer INT*

After graduating from H-BRS in July 2024, I joined Fraunhofer INT as a Research Assistant. At INT, I work in the Knowledge Analytics and Technology Innovation (KATI) lab and conduct research on data-driven foresight. The MAS program offered an excellent opportunity to focus on cutting-edge research on robotics, artificial intelligence, and machine learning. During my master's thesis, I worked in collaboration with KATI and H-BRS on studying the evolution of human-robot interaction using topic modelling. Now, I am pursuing this further and remain committed to contribute to the advancement of data-driven foresight.

Samuel Andres Parra Gonzalez



*Quality Assurance
Engineer, Magazino*

During my three years of study in the MAS program, I had access to a wide variety of courses on topics related to AI and robotics. This enabled me to mold my academic path in accordance to my professional goals, and allowed me to explore new interests areas within computer science and engineering. Thanks to the opportunities I got during the program, and the support of the MAS professors and staff, I was able to publish multiple scientific papers in different venues and participate in the EU research project SESAME. The experience I gained during the program allowed me to land a role as a Quality Assurance Engineer at Magazino, a robotics company in Germany. I am grateful for all of the opportunities and support that this program and its staff have provided me, and proud of all of the achievements it has allowed me to reach.

Sushant Vijay Chavan



*Senior Software Robotics
Engineer, idealworks
GmbH*

I graduated from H-BRS in 2022. MAS provided me with a perfect blend of theoretical and practical knowledge through informative courses that were complemented by the opportunity to work as a member of the b-it-bots teams, and as a research assistant in the ROPOD project. These learnings, and the support of my mentors and the excellent MAS staff, helped me excel in my master thesis on the topic of indoor semantic navigation, which was awarded second place at the AFCEA Studienpreis 2023. My experiences from the MAS program have been pivotal in kick-starting and accelerating my robotics career. In my current role at idealworks GmbH, I focus on building production-grade, modular software components that are easy to adapt and deploy on a range of industrial logistic robots.

List of employers of MAS Alumni (Business):

Ableton, Aeolus Robotics, Inc., Agile Robots, Amazon, anessa, ANYbotics, ASIMOV Robotics, Banksoft, BitTwister Informationstechnik GmbH, BMW, Bosch, Boston Consulting Group, Boston Dynamics, Cerence Inc., CHRONEXT, cyber:con GmbH, DEUTAWERKE GmbH, Delphi, Wuppertal, Elektrobit, ETAS GmbH, Exciera Technologies, Expleo Germany GmbH, Cologne, Extor GmbH, Faro GmbH, Stuttgart, Fetch Robotics, Gade Autonomous Systems Private Limited, Google/Alphabet, GPS, IBM, Informatica, Ingen Robotics, inmotion Software, Intrinsic (an Alphabet company), idealworks, KBR/NASA, KELO Robotics GmbH, Kuka Robotics, LMX, Locomotec GmbH, Lucid Motors, M-Files Corporation, M2P Consulting, Magazino, MeasX, MHP Management- und IT-Beratung GmbH, MYBOTSHOP GmbH, NavInfo Europe, Neobotix GmbH, Next Kraftwerke GmbH, Köln, NTT Data, Nuance Communications, RabbitAI, Heidelberg, Rapyuta Robotics, RBOT, Recognizer, Rethink Robotics GmbH, Rfrnz GmbH, Robert Bosch GmbH, RoBoTec PTC GmbH, Robots Alive Consulting, Shadow Robot Company, Siemens, Systemantics India, TBA Group, The MathWorks, TomTom, Trivago, Düsseldorf, Ubica Robotics, VMware, Wingcopter, xIndustry AI

List of employers of MAS Alumni

(Universities & Research): Hochschule Bonn-Rhein-Sieg – Autonomous Systems Group – Graduate Institute, DFKI, DLR, FAST-NUCES, Fraunhofer FKIE, Fraunhofer IAIS, Fraunhofer SCAI, Freie Universität Berlin, Heriot-Watt University, Instituto Superior Técnico (IST) – Universidade de Lisboa, Jacobs University, KU Leuven, LAAS-CNRS, National University of Computer and Emerging Sciences, Norwegian University of Life Sciences, Örebro University, Osnabrück University, Rhine-Waal University of Applied Sciences, RWTH Aachen, TU Delft, TU Wien, TUBITAK-UZAY Space Technologies Research Institute, Universidad Autónoma de Mayab, University Jaume I, University of Bielefeld, University of Bonn, University of Groningen, University of Hertfordshire, University of Western Australia

b-it Universities Institute

ABC – three letters that stand for a veritable “magic triangle”: the region between Aachen, Bonn and Cologne, which is not only economically strong, but also a leader in science, education and research. The large number of research establishments based here make the area one of Europe’s biggest and most important science landscapes. Almost 10 percent of all German students – around 130,000 people – are studying at the Rheinisch-Westfälische Technische Hochschule in Aachen, the Rheinische Friedrich-Wilhelms-Universität Bonn and the Universität zu Köln, which together constitute one of the most important higher education locations in Europe. The three ABC institutions are closely linked and collaborate in many fields of teaching and research.

University of Bonn

The University of Bonn is a research-oriented university with currently about 31,500 students. Its research tradition of 200 years is closely linked to the names of Hermann von Helmholtz, Heinrich Hertz and Friedrich August Kekulé who carried out seminal work at the University of Bonn. This strong academic tradition has been continued until present with the more recent Nobel laureates Wolfgang Paul and Reinhard Selten. Bonn cooperates with numerous other universities and research institutions around the globe. The specializations it has developed enjoy worldwide recognition. More than 4,500 students from foreign countries are enrolled in Bonn. Their presence underlines the international character of the university and enriches both academic and social life in Bonn. Living up to its long tradition as a classical university with a full range of academic disciplines, the University of Bonn offers 200 different subjects and degrees. In 2019, the University of Bonn was elected as one of

the 11 “elite universities” within the German excellence program, after having already received the record number of six “Excellence Cluster” grants in 2018.

RWTH Aachen University

RWTH Aachen University was founded as a Polytechnic in 1870 with considerable support from local industry. In 1948 it was established as Rheinisch-Westfälische Technische Hochschule Aachen (RWTH), the Institute of Technology of the State of North Rhine-Westphalia. Today, RWTH is one of the most renowned technical universities in Europe with around 45,000 students. RWTH offers 173 courses of study (undergraduate and postgraduate). The RWTH master programs educate engineers who are keen to engage in R & D, innovation, and entrepreneurship. Since 2007, RWTH Aachen was elected and re-elected three times as one of the “elite universities” within the German excellence program. In the current Times Higher Education Ranking, RWTH Aachen University is placed 90th among the several thousand evaluated universities.



The spacious Hofgartenwiese is a major summer attraction on the University of Bonn campus.



Entrance of Birlinghoven Castle.

The Birlinghoven Castle campus is one of the largest and most influential computer science research sites in Germany. About 600 researchers work in the IZB institutes. That represents a quarter of the Fraunhofer ICT Group, Europe's largest IT research organization. The institutes collaborate closely with the European ERCIM network of national IT research centers as well as with leading research establishments in the USA, Eastern Europe and Asia. Three IZB institutes contribute to the b-it master programs Media Informatics and Life Science Informatics:

Fraunhofer FIT

For about 40 years, the Fraunhofer Institute of Applied Information Technology Fraunhofer FIT has been conducting R&D on applying computer science to the digital transformation of society with main locations in Birlinghoven, Bayreuth and Aachen. Methodologies developed in FIT combine the two areas Human-Computer centric research and Data centric research and applying them to areas of societal importance such as Digital Energy, Digital Health, and Digital Business – with a special focus on infrastructure and applications of data spaces as an emerging corner stone of the digital society. FIT is housing the NRW Blockchain Center, the Fraunhofer W3C representation, the Fraunhofer Personnel Certification Authority, and playing a leading role in the Fraunhofer Center for Digital Energy.



Fraunhofer SCAI

The Fraunhofer Institute for Algorithms and Scientific Computing SCAI contributes to the Life Science Informatics curriculum at b-it through the Department of Bioinformatics at SCAI. Two professors teaching at b-it are leaders in this department: Prof. Dr. Martin Hofmann-Apitius and Prof. Dr. Holger Fröhlich. Both are experienced in translational research with a focus on scientific challenges in the pharmaceutical and biotechnology industry. Therefore, research in the department represents the entire data- and knowledge-based value chain of translational biomedical research.

Semantic technologies, including Natural Language Processing and information extraction based on Large Language Models, help to represent biological and medical knowledge in rich, disease-specific knowledge graphs. These graphs represent, e.g., neurodegenerative diseases such as Alzheimer's or Parkinson's or neuro-psychiatric diseases such as Major Depression or Schizophrenia in computable cause-and-effect models. AI and Data Science technologies are applied applications, including models for improving treatments for patients (precision medicine) and drug discovery.

SCAI involves students from the LSI curriculum early on in collaborations with industry partners. This gives students a first glimpse of industrial research.

Birlinghoven Castle campus: One of its strategic goals is helping to shape the development of 5G applications and their ecosystems for SMEs. Companies can use our 5G campus network that implements the latest network standards to test the viability of innovative services based on 5G functionality before wider roll-out of 5G technology. We work closely with our clients in the iterative processes of developing and testing 5G infrastructures. The application fields we focus on include production and remote maintenance, BIM processes in construction, mobile edge computing, the Internet of Things, and mixed reality.

b-it Applied Science Institute

Hochschule Bonn-Rhein-Sieg

Hochschule Bonn-Rhein-Sieg (H-BRS) was founded in 1995 and has around 9,000 students, 150 professors and 400 research associates. The university campuses are located in Sankt Augustin, Hennef and Rheinbach.

The Department of Computer Science has a young and modern character. The technical equipment, the individual support for students, the good IT infrastructure and the excellent general study situation provide an optimal basis for successful studies. Research and teaching are closely linked in all courses. Thus, students not only benefit from the know-how of the individual research projects and professors, but can also actively participate in the successful projects.

The Autonomous Systems program (MAS) is offered by the Applied Sciences Institute at b-it which is a cooperative partnership between two renowned German centers of excellence: the Department of Computer Science at H-BRS and the Fraunhofer Institute for Intelligent Analysis and Information Systems (IAIS). The Autonomous Systems Group conducts cutting-edge interdisciplinary research to enable the intelligence necessary for the autonomy of robots in dynamic environments they share with humans. To meet the challenges of such environments, they develop reliable systems and ensure their safety by combining research from the fields of artificial intelligence, human-robot interaction, and intelligent manipulation.

Fraunhofer IAIS

The Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS, based in Sankt Augustin/Bonn and Dresden, is one of the leading scientific institutes in the fields



Hochschule Bonn-Rhein-Sieg.

of Artificial Intelligence (AI), Machine Learning and Big Data in Germany and Europe. Around 350 employees support companies in the optimization of products, services, as well as in the development of new technologies, processes and new digital business models. Fraunhofer IAIS is shaping the digital transformation of our working and living environments: with innovative AI applications for industry, health, and sustainability, with forward-looking technologies such as large-scale AI language models or Quantum Machine Learning, with offers for training and education or for the testing of AI applications for security and trustworthiness.

As one of four leading partners, Fraunhofer IAIS conducts cutting-edge research in the "Lamarr Institute for Machine Learning and Artificial Intelligence", which is part of Germany's AI strategy and is permanently funded by the Federal Government and the State of North Rhine-Westphalia. The direct transfer of research results is ensured, among other things, by the "Competence Platform KI.NRW", which is also led by Fraunhofer IAIS. Furthermore, Fraunhofer IAIS coordinates the "Fraunhofer Big Data and Artificial Intelligence Alliance", which bundles the expertise of more than 30 Fraunhofer institutes and provides specialists from enterprises with an established training program in data science and AI. In addition, there are many years of close cooperation in research with the University of Bonn and b-it.

General Information

General Admission Requirements

- A first university-level degree (B.Sc., B.Eng.), as specified for the individual programs, with grades well above average is required. The Graduate Record Examination (GRE) is strongly recommended;
- All courses are held in English, thus fluency in English is vital. Depending on the particular b-it program, a proficiency level of B2 or B2+, per the Common European Framework of Reference for Languages, is required.
- Working knowledge of German is necessary to take up some of culture that the Aachen – Bonn – Cologne region has developed over the last 2,000 years. Therefore, a basic German language course is offered before start of the program and during the first year.
- Admission is coupled to placement in the Fraunhofer lab courses and therefore strictly limited. Application deadline has been March 1 for Fall admission but may change from year to year; check www.b-it-center.de for current admission details.

Fees and Finances

Semester fees of around 310 € per semester covers student activities, subsidized meals, and free public transportation in the whole state of North Rhine-Westphalia.

A student's monthly expenses, including study material, will be about 930 Euro. b-it does not offer formal scholarships but several student assistantships are available on a competitive basis. For information on funding from German sources please contact the DAAD – German Academic Exchange Service www.daad.de.

Studying in Bonn

Most of the teaching in b-it is concentrated in Bonn and its eastern neighbor, Sankt Augustin. Newcomers to Bonn soon grow very fond of the city – a fact confirmed by thousands of students and academics, German and foreign, who have come here to learn, teach or research. Since the German Bundestag moved its seat and parts of the Federal Government to Berlin in 1999, Bonn has attracted a number of international organizations, especially United Nations bodies, and some major corporations. Among others, Deutsche Telekom and Deutsche Post have their headquarters there. Now Bonn is evolving into an internationally recognized science region – with the university as one of the dynamic forces driving this change. In addition, Bonn offers a wide variety of attractions and amenities. The city's most famous son, Ludwig van Beethoven, is the star attraction of a lively and varied arts and culture scene. The city boasts an opera house, several theatres, concert halls and other venues, as well as a range of fascinating museums.





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