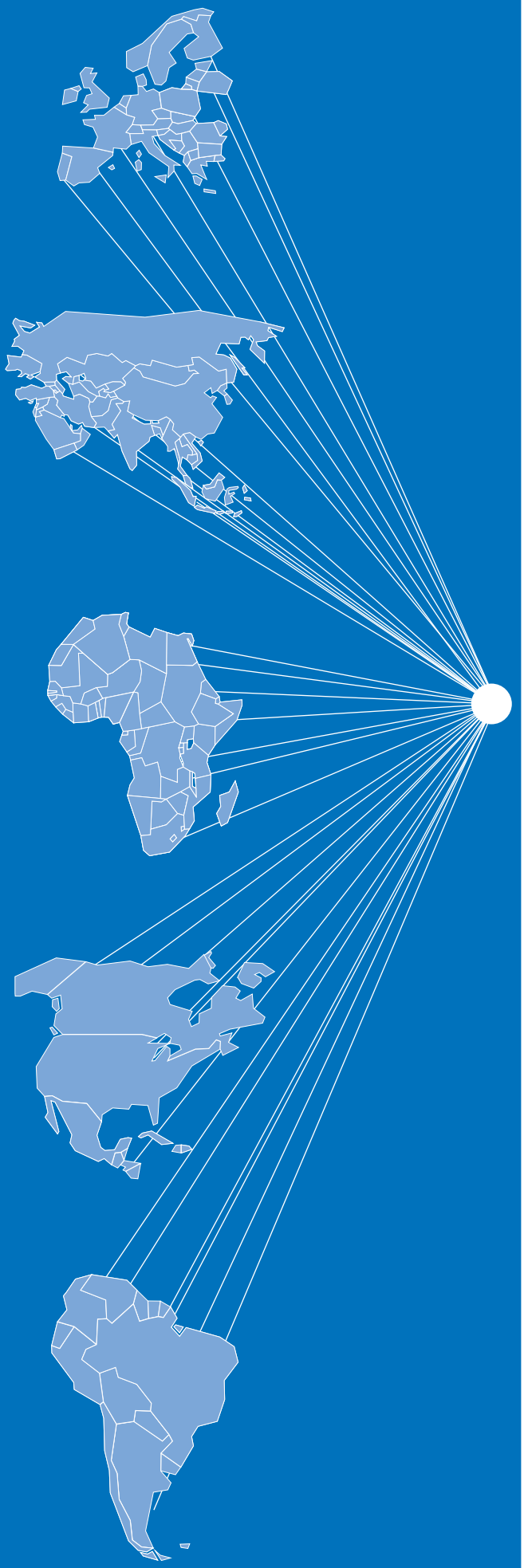

b-it

Bonn-Aachen
International Center for
Information Technology

Annual Report 2016

Dr. Thomas Grünewald

Foreword by the Chairman of the b-it Foundation

The European Union has recognized digitalization as a key enabler with great impact on all major societal challenges. In its digitalization strategy, North Rhine-Westphalia places a special emphasis on graduate education and research training in interdisciplinary fields relevant to these challenges. With three international Master Programs, and accompanying activities from Bachelor to Doctoral level, the Bonn-Aachen International Center for Information Technology (b-it) has pursued this vision since its founding in 2003:

- Media Informatics focus on multimedia Internet, novel user interfaces and social media, IT security, and big data integration for a secure and inclusive society,
- Life Science Informatics with strong scientific impact in healthcare, biomedical and biochemical research,
- Autonomous Systems advance the robust design of interacting distributed systems which assist humans under everyday conditions.

b-it has productively used the positive external 2015 evaluation results, to derive strategic measures for further. One key element is a closer linkage to industry and the thriving Bonn-Aachen region, another one is a strengthening of data science which is a common foundation of all three b-it master programs and much of the b-it partner's research. To accompany this evolution, the b-it Foundation has expanded its International Advisory Board by four prestigious additional members: Dame Wendy Hall (UK), leading researcher in the semantic web field and until recently the first-ever European president of the ACM; Bonn-based serial IT entrepreneur and investor Dr. Jörg Haas; Dr. Christian Illek, responsible for Human Resources in the Board of Deutsche Telekom; and Dr. Simone Rehm, CIO of Stuttgart University and former board member of the internationally known engineering company Trumpf. The present report demonstrates once again the success of b-it in research and teaching. I would like to congratulate b-it researchers and teachers to at least five best paper awards at important national and international conferences, and especially Prof. Bajorath for receiving the Fujita Award in chemo-informatics. A special highlight this year can be found in the field of cognitive robotics: While retired b-it Founding Director received the AAAI Classic paper award for the most influential robotics paper in 1998, all three b-it partner universities won disciplinary gold and silver medals within the RoboCup World Championship 2016, in one case already for the third time in a row.

Finally, I would like to thank b-it Professor Joachim von zur Gathen who retired this year, for his valuable contribution to teaching IT security not just to the b-it students, but also getting several thousand highschool students excited through his compact courses and exercises at b-it.

Dr. Thomas Grünewald
Vice Minister of Innovation, Science and Research NRW, Chairman, b-it Foundation Council

b-it Mission Statement

b-it is an international center for information technology. It is jointly carried by the leading universities and research institutes of the information technology region Bonn-Aachen. At b-it, a team of excellent scientific leaders attracts the best students from all over the world. At the same time, b-it is a strategic partner of the regional economy.

At b-it, research and teaching form an integrated unit at the highest level. International orientation and diversity are a particular asset and strength of our institution. In our teaching, we build on the complementary strength of our participating institutions.

Graduates of b-it are sought after as specialists and experts, regionally and internationally. They transport know-how and innovation into science and economy.

We are shaping the digital change in a dialog between economy and society. Our focus is Data Science in the application areas Media, Life Sciences and Autonomous Systems.

Officers

Scientific Directors

Prof. Dr. Matthias Jarke, RWTH Aachen University, Fraunhofer FIT
Prof. Dr. Kurt-Ulrich Witt, Bonn-Rhein-Sieg University of Applied Sciences
Prof. Dr. Stefan Wrobel, University of Bonn, Fraunhofer IAIS

Coordinators b-it Study Programs

Prof. Dr. Jan Borchers, RWTH Aachen University, Media Informatics
Prof. Dr. Jürgen Bajorath, University of Bonn
Prof. Dr. Gerhard K. Kraetzschmar, Bonn-Rhein-Sieg University of Applied Sciences, Autonomous Systems

Assistant Directors/Study Advisors

Iman Awaad, M.Sc., Bonn-Rhein-Sieg University of Applied Sciences
Dr. Thomas Bode, University of Bonn
Dr. Jürgen Rapp, RWTH Aachen University
Dr. Alexandra Reitelmann, University of Bonn

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Prof. Dr. Thomas Lengauer, Max-Planck Institute for Informatics, Saarbrücken
Dr. Simone Rehm, University of Stuttgart

b-it Foundation Council

Dr. Thomas Grünewald (Chairman), Vice Minister of Innovation, Science and Research NRW
Hans Stender (Secretary), Chancellor, Bonn-Rhein-Sieg University of Applied Sciences
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Sebastian Schuster, County Chairman, Rhein-Sieg-Kreis
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Prof. Dr. Michael Hoch, Rector, University of Bonn
Prof. Dr. Hartmut Ihne, Rector, Bonn-Rhein-Sieg University of Applied Sciences
Wolfgang Grießl, President, Bonn / Rhine-Sieg Chamber of Commerce

Report by the Scientific Directors

The new b-it mission statement complements b-it's traditional emphasis on international academic excellence (just confirmed by the 2017 Times Higher Education Ranking which places Aachen's and Bonn among the top Computer Science departments worldwide) with an additional focus on industrial innovation. We are very happy to add three experienced IT industry leaders to our International Advisory Board. Joint activities with the Chambers of Commerce included the event "Starting a Startup", and the Digital Hubs Bonn and Aachen.

Data engineering and analytics are a common underlying theme for b-it's international master programs in Media Informatics, Life Science Informatics, and Autonomous Systems. We have decided to dedicate a b-it Endowed Chair to the field, and welcome Dame Wendy Hall from this area to our International Advisory Board. The academic year 2015-2017 saw the graduation of several more doctoral candidates from the NRW-funded b-it Research School. Several of them have now achieved faculty positions nationally and internationally, e.g. at the Universities of Trento, Zurich, and Tartu, Estonia. We congratulate our over 60 new master graduates, and welcome the new students. Once again, our study advisors do a great job in supporting the students not just in the formal coursework but also in getting involved in our highly multi-cultural environment.

The generation change in the b-it leadership continues. We are grateful to Professor Joachim von zur Gathen, one of the leading German Cryptography researchers, who retired in May after 13 successful years as b-it Endowed Chair. We should also like to express our gratitude to Hans Stender for his 14-year very successful tenure as manager of the b-it Foundation. The b-it Foundation Council under the strong leadership of State Secretary Dr. Thomas Grünewald remains an essential support for our activities for which we are very grateful.

Matthias Jarke,
RWTH Aachen University and Fraunhofer FIT
Kurt-Ulrich Witt,
Bonn-Rhein-Sieg University of Applied Sciences
Stefan Wrobel,
University of Bonn and Fraunhofer IAIS

Prof. Dr. Matthias Jarke
RWTH Aachen University and Fraunhofer FIT

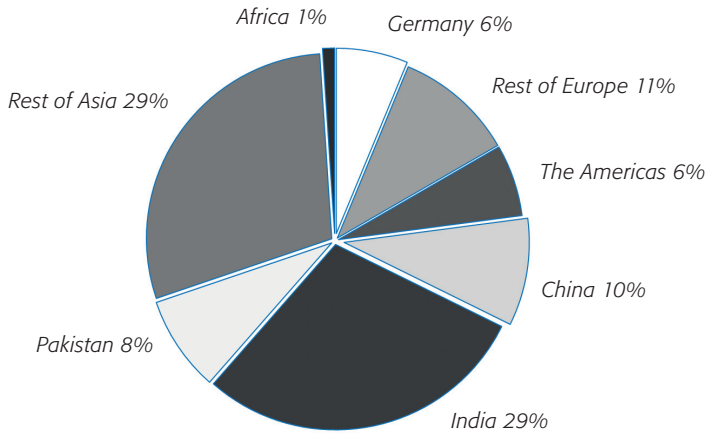
Prof. Dr. Kurt-Ulrich Witt
Bonn-Rhein-Sieg University of Applied Sciences

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

b-it in Profile

The southwest of North Rhine-Westphalia 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, Bonn-Rhine-Sieg University of Applied Science (BRSU) and the research institutes of the Fraunhofer Institute Center Birlinghoven Castle.

b-it offers highly selective International Master Programs in Applied IT, as well as summer / winter schools for qualified undergraduate computer science students. Most courses take place in the beautiful b-it building next to the former office of the German Chancellor on the banks of the River Rhine in Bonn. Admission to the b-it Master Programs is linked to, and conditional upon, placement in research lab courses at the participating Fraunhofer institutes. Students in good standing are offered financial support during these lab courses.



Home countries of new b-it students.

The b-it Universities Institute offers English language Master of Science (M.Sc.) programs in Media Informatics and Life Science Informatics, whereas the University of Applied Sciences offers a Master Program 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 ECTS standard), their focus on IT competence, and the deep integration of teaching and research.

A second goal of b-it is the optimization and acceleration of existing undergraduate computer science curricula at Bonn University and RWTH Aachen University for selected top students. b-it's International Program of Excellence (IPEC) pursues this goal by compact course modules delivered in summer and winter schools during the semester breaks. The b-it Research School offers doctoral training.

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, and re-accredited in 2010-2011. A comprehensive external evaluation in 2015 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 science 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.

Honors and Awards

AAAI Classic Paper Award for Prof. Armin B. Cremers

The Interactive Museum Tour-Guide Robot, coauthored by Armin B. Cremers and his former students (in alphabetical order: Wolfram Burgard, Dieter Fox, Dirk Hähnel, Gerhard Lakemeyer, Dirk Schulz, Walter Steiner and Sebastian Thrun) has been selected for the 2016 American Association for Artificial Intelligence (AAAI) Classic Paper Award. The award was established in 1999 to honor the author(s) of paper(s) deemed most influential, chosen from a specific conference year. The 2016 awards are being given for the most influential papers from the Fifteenth National Conference on Artificial Intelligence, held in 1998 in Madison, Wisconsin. The award was presented at AAAI-16 at the Phoenix Convention Center in Phoenix, Arizona on Sunday, February 14, 2016.

Best Paper Award at CAiSE 2016

In 2016, the award for the Best Paper among the 211 submissions to the 28th International Conference on Information Systems Engineering (CAiSE '16) was presented to Petru Nicolaescu, Mario Rosenstengel, Michael Derntl, Ralf Klamma, and Matthias Jarke for their paper "View-Based Near-Real-Time Collaborative Modelling for Information Systems Engineering". In addition, one more full paper (Neulinger et al.) and one forum paper (Hai and Quix) from Informatik 5 were also accepted for this leading IS engineering conference which had an acceptance rate of only 16.5%. The conference was held in Ljubljana, Slovenia, June 2016.

BUSTECH Paper Award & Young Researcher Award for Can Sun

In her doctoral research, b-it Media Informatics graduate Can Sun studies the support of supply chain processes in the semi conductor industry. Her particular focus is the complexity assessment of changes to operational supply chain processes. After the Best Paper Award at BUSTECH in 2015 with her supervisor Thomas Rose, Can Sun won in the reporting period a Young Researcher Award for cooperative research with her supervisor and industrial collaborators at the 8th IFAC Conference on Manufacturing Modelling, Management and Control in Troyes, June 2016, France. In this paper she reported the results on her studies on complexity assessment for supply change processes and the particular impact of changes of master data on the entire process.

Best Paper Award at the 20th RoboCup Symposium

Alexander Hagg, Frederik Hegger and Prof. Paul Plöger won the Best Scientific Paper Award at the RoboCup Symposium 2016 in Leipzig. Their work suggests various ways in which robots can use built-in 2D or 3D cameras to correctly recognize and pinpoint transparent or shiny objects. While transparent objects are common in our everyday surroundings, their visual perception by autonomous systems is one of the most difficult unresolved problems there is. The team has developed methods for evaluating measurement points with unknown depth information.

Prof. Bajorath Receives the Inaugural Fujita Award 2016

He has received the award of the Hansch-Fujita Foundation, USA, for "life-time contributions in the field of cheminformatics, applied to virtual screening, chemical similarity, immunology, and drug discovery". The winner was selected from a poll of nominees, of age 45 years and beyond, who are recognized senior investigators in the field of chemoinformatics and Quantitative Structure-Activity Relationships (QSAR) research. The award ceremony was held on September 7 at the 21st European Symposium on Quantitative Structure-Activity Relationship (EuroQSAR) 2016 Congress, Verona.

Alexander Hagg.

Prof. Jürgen Bajorath.

Events and Visits

Poster session IAV 2016: AS students with Prof. Manuela M. Veloso of Carnegie Mellon University, USA.

MuC 2016: Mateusz Dolata (middle), former b-it Media Informatics graduate, received the best paper award from Prof. Prinz (left) and Prof. Schwabe, University of Zurich.

Panel participants of the Bonn Cyber Dialog (from left): Dirk Kunze, NRW State Office of Criminal Investigations; Christian Schülke, schuelke.net; Volker Kozok, The Bundeswehr; Prof. Dr. Michael Maier, Fraunhofer FKIE and University of Bonn.

Prof. Plöger Organized the IFAC Symposium on Intelligent Autonomous Vehicles (IAV) 2016

The Symposium presented methods and representative techniques to either solve typical problems or to document successful test cases and applications. Together with his colleges Paul Rojas of the Freie Universität Berlin und Giuseppe Oriolo of the University of Rome, Prof. Paul Plöger was chair of this year's IAV International Program Committee. The conference took place from 29 June to 1 July 2016 at Leipziger Messe. International experts for autonomous vehicles meet at the event that has been taking place every three years since 1993, and now has taken place for the first time in Germany. The Symposium took place in parallel to the 20th World RoboCup Championship.

In an effort to raise gender-awareness, a special poster session was organized at the symposium. Thanks to the generous support of the Fördergesellschaft Hochschule Bonn-Rhein-Sieg (H-BRS) and the H-BRS Equal Opportunity Commission, seven junior researchers (among them four AS students) were sponsored and could participate.

Industry Workshop With Vertex Phamaceuticals

On 12 and 13 April Dr. Pat Walters, Vertex Pharmaceuticals, Boston, USA, gave an industry workshop focus on two main subjects: "From Data to Decisions – How can Computation Drive Drug Discovery?" and on "A Career in Drug Discovery – How Did I Get There? How Can You Get There?". The workshop was very well attended and received rave reviews from attendees. The part of the workshop focusing on career opportunities was very well received by the students. They took the opportunity to interact with Dr. Walters and ask the lecturer many questions about career opportunities in industry.

70 student volunteers, many of them b-it Media Informatics students, supported the MuC 2016 Conference.

MuC 2016 Conference in Aachen

Professors Jan Borchers, Matthias Jarke, Wolfgang Prinz (all teaching at b-it), and Professor Martina Ziefle organized the largest annual European conference in human-computer interaction, "Mensch&Computer 2016", in Aachen, 4-7 September 2016, supported by 70 student volunteers, many of them b-it Media Informatics students. Almost 750 participants, equally distributed among science and usability professionals, attended presentations around mobile systems such as wearables and augmented reality. Keynotes addressed computer music based on tangible user interfaces (Martin Kaltenbrunner), validated approaches to achieve user excitement and acceptance for new technologies (Tomer Sharon), and a small-scale IoT computer called micro:bit being rolled out to hundred thousands of British highschool students (David Crellin).

During a memorable social event in the historic Aachen city hall (1200 years ago palace of emperor Charlemagne), Mateusz Dolata, a Ph.D. student from the University of Zurich, received the best paper award. Mateusz is a 2012 b-it Media Informatics alumnus.

7th Bonn Cyber Dialog: Darknet – Boone and Bane

On 20 April 2016 b-it hosted the Bonn Cyber Dialogue, a joint event organized by the Alliance for Cyber Safety, Deutsche Telekom, Fraunhofer FKIE, the City of Bonn and the Chamber of Industry and Commerce of Bonn-Rhein-Sieg. The event focused on "Darknet: Boone and Bane" and was very well attended.

Research @ b-it

b-it Research School Graduate Starts Professorship in Zürich

In June 2016, Dr. rer. nat. Chat Wacharamanotham joined the People and Computing Lab at the University of Zurich as Assistant Professor of Interaction Design, after completing his doctoral thesis "Drifts, Slips, and Misses for Touch Surfaces" within the b-it Chair of Prof. Jan Borchers at RWTH Aachen University. After his Bachelor degree from Chulalongkorn University, Thailand, Chat joined b-it Media Informatics within its Erasmus-Mundus double degree master program "European Master of Informatics" with the University of Edinburgh, and then accepted a scholarship of the b-it Research School to support his Ph.D. Research. During his time at Prof. Borchers' b-it Chair he contributed to numerous internationally visible human-computer interaction projects, such as the Silhouettes interactive shadow game on the walls of the German Pavillion, used by ten thousands of visitors (including then-German President Horst Köhler) in EXPO 2010 (Shanghai), and the official interactive location-aware city guide for Aachen visitors, AixPlorer II. His publications during the Ph.D. studies include four full papers at the worldwide leading international conference CHI. In his new position, Chat focuses on HCI technologies that make it easier for people to interpret complex statistics correctly.

New Teaching Focus Blockchains

Blockchains provide a distributed database technology, based on novel consensus-finding approaches for the validation of transactions. They have prevailingly been used for assuring the persistence of electronic transactions in the context of crypto currencies such as Bitcoin. However, blockchains now become a general approach to replace central supervisory organizations by a peer-to-peer structure of cooperating agents, thus promising disruptive change in many eBusiness and Media Informatics domains. b-it students learn the concepts of blockchain technology in eBusiness and CSCW interactive lectures, and explore different blockchain implementations and applications in practical lab courses.

b-it Partners Excel at RoboCup World Championship 2016

In June 2016, the RoboCup World Championships were held in Leipzig, Germany. All three b-it partner departments in Bonn, Aachen, and Sankt Augustin reached the winner's podium with two first places and one second place, making b-it the most successful group within this worldwide largest competition with over 3.000 participants in 17 categories. The NimbRo team from the Autonomous Systems group (Prof. Sven Behnke) of Bonn University won the title in the Teen Size Humanoid Robot Soccer League. They scored 29:0 in their five games! The RoboCup Logistics League was won for the third time – second in a row – by the Carologistics team led by Prof. Gerhard Lakemeyer from RWTH Aachen's Informatik 5 Chair (Prof. Matthias Jarke / Prof. Stefan Decker). The b-it bots team of Bonn-Rhein-Sieg University of Applied Sciences achieved second place in the RoboCup@Work League. Over 35.000 spectators joined the event which was coordinated by b-it Prof. Gerhard Kraetschmer (Bonn-Rhein Sieg University of Applied Science) as RoboCup 2016 General Chair. Full details about RoboCup 2016 can be found under www.robocup2016.org.

First place in the Teen Size Humanoid Robot Soccer competition. Photo: Leipziger Messe / Stefan Hoyer

Master Program in Media Informatics

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 University of Ireland Maynooth, National University of Sciences and Technology, Research Center Jülich, Robert Bosch Foundation, RWTH Aachen, Suez Canal University, Swiss Federal Institute of Technology, Uniklinik Aachen, Uniklinikum Bonn, Universidad Tecnologica de Panama, Universitätsspital Basel, University Clinic Carl Gustav Carus; Universities of Agder, Arab American Jenin, Asia and the Pacific, Atma Jaya Yogyakarta, Augsburg, Bahria, Bonn, Cambridge, Düsseldorf-Essen, Dresden, Duisburg-Essen, Edinburgh, Engineering & Technology Peshawar Pakistan, Ghent, Göttingen, Hamburg, Hasselt, Heidelberg, Houston, Oldenburg, Ireland, Maynooth, lenes 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*

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 Excellence Research Cluster "Ultra-Highspeed Mobile Information and Communication (UMIC)" offers an exceptional research environment for the students.

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, Visualisation, 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.

Thirty two Media Informatics students have completed their degree in the academic year 2015-2016. The graduates quickly found interesting positions either as doctoral students in Germany and abroad, or in attractive companies. The incoming class of 2016 comprises 39 students, selected from 274 applications. The new students come from 12 countries, and include 31% females and 69% males.

News from Media Informatics Alumni

SARAH AGHAIE

Software Developer/ Research Engineer, Robert Bosch GmbH, Hildesheim, Germany

During my study time at b-it, I had the opportunity to take interesting courses in the area of computer vision and image processing under instructions of qualified professors at University of Bonn, RWTH Aachen and Fraunhofer. After this, I worked as a student assistant in the computer vision group of RWTH (Prof. Leibe) and also at the Helmholz Institute. Those jobs provided me a practical knowledge of what I have learnt during my study. All of these mentioned worthy knowledges and experiences supported me for finding a job inside the corporate research group of Bosch GmbH.

ANKUR SRIVASTAVA

Lead Big Data / Backend Developer, Recogizer Group GmbH, Bonn Germany

Being interested in machine learning / pattern recognition I decided to apply in MI program of b-it. With my previous software engineering experiences mixed with the excellent courses at b-it, I got a job as student developer at Recogizer Group and started working on very interesting machine learning problems. I pursued my thesis in the same company under supervision of Prof. Bauckage and Prof. Wrobel. Towards the end of my master's thesis, Recogizer Group offered me a position as Lead Developer. I would like to emphasize that the MI courses equipped me for this new challenge. I would also like to thank all the professors, especially Prof. Rapp who had always been there to solve student's confusion in every aspect during entire duration of study program.

MASOOD AZIZI

Employee, GTT Technologies, Aachen, Germany

I would like to also express my sincere gratitude for giving me this opportunity to study at b-it / RWTH Aachen University and supporting me during my master studies. At the moment, I work in at GTT Technologies, focusing on thermochemistry software, since one year ago. Previously I worked here as student part-time job, and after the graduation I could start here immediately as a full-time employee.

EMIL STEFANOV ATANASOV

Own Company: IT Consultant, Sofia, Bulgaria

I've started my own IT company. One of the latest IT projects which I was involved was to give UX (user experience) consulting to a Swiss startup. They decided to work with me, because of my deep knowledge in the UX field which I had gained when studying for the following subjects – "User Centered Design" and "Design Interactive Systems" back at b-it MSc program.

SHEKOUFEH GORGI ZADEH

PhD, University of Bonn, Germany

I always was fond of applied mathematics and computer science. Studying in MI let me to choose the courses that fulfilled this interest the most, and consequently I was able to have a very smooth and easy transition from master to the next step. My master thesis was on vessel enhancement using higher order diffusion tensors and now I'm continuing the same topic as a PhD student in the computer science department of University of Bonn.

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, Bertrandt Ingenieurbüro GmbH, BESA GmbH, Blimp.Mx, Bombardier Inc., Brainloop, BTC Business Technology Consulting, Capgemini, Capitaworld Platform Pvt. Ltd., CAS, CBC Cologne Broadcasting Center, Cellent AG, CGI, CIGNA, Cloudberrytec, CMLabs Simulations, Cognizant Technology Solutions, COMNEON, Contentteam, Crytek, CSC India, Daedalic Entertainment, Daimler, Deloitte AG, Delta Engine, Demax, Deutsche Bank AG, Deutsche Telekom, devolo AG, Dolby Laboratories, DP ITServices GmbH, Dynevo (Bayer), Ericsson, Euromoney 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 Softwares, Ilypsys, IMC BV, IMC Financial Markets, Infineon, Inforcept 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, Recogizer Group, Recommind, 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

Master Program in Life Science Informatics

Prof. Dr. Jürgen Bajorath, Life Science Informatics

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

The Master 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, pharmaceutics 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. The collaboration with companies could be extended to companies such as Merck KGaA. 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 17 students successfully graduated from the program. Top students received excellent placements again. They were, for example, accepted into PhD Research Schools of TU Munich, German Cancer Research Center Heidelberg or University of Amsterdam and in industry such as Genestack, UK, or L'Oréal, France. About 30 new students from countries ranging from A (like Armenia) to U (like USA) from a total of 16 different countries will take up their studies in Winter Semester 2016/2017 selected from 138 applications.

List of employers of LSI Alumni (Business):
4GATC Biotech, Accenture, Asahi Kasei, ASI Data Science, Astra Seneca, Bayer, Ericsson, carpooling.com GmbH, Clue Points, Comma Soft AG, Coty Germany, ecSeq Bioinformatics, Galilleo Press, GATC Biotech, Genestack, Glaxo Smith Kline, Hamilton Medical, HealthCare Global, Heraeus, Hoffmann-La Roche, Hype Innovation, IBM, IIT Bangalore, Interpretomics, Land of Lakes Inc., Leaf Bioscience, LHS Telecommunications, L'Oréal, MarAnCon, Max Dellbrück Center Berlin, Medtronic, Molecular Connections Private Limited, Merck, Novartis, Pfizer, Postbank, Philips Research North America, ProfileXpert, United Brands Marketing, Tubs System LLP

LSI Success Stories

THOMAS BLASCHKE

obtained a Bachelor in Molecular Biomedicine from the University of Bonn. He then joined the Master Program of Life Science Informatics at b-it. In the course of his studies he joined Professor Bajorath's group where he is currently completing his Master thesis in the field of Chemoinformatics. He will continue PhD studies and is currently being considered for collaborative doctoral research with the pharmaceutical industry.

DANIEL FERNANDEZ-DOMINGO

started his studies in life Science Informatics in September 2014. Daniel obtained a Bachelor's Degree in Biotechnology of the University of Leon, Spain. In his time as an undergraduate student he spent an exchange year at the University of Wisconsin-Green Bay in the United States. During his studies at b-it he joined the research group of b-it Professor Martin Hofmann-Apitius. Daniel is currently carrying out his Master thesis in the same group with a focus on a new approach: "NeuroMMSigDB: a Dementia Mechanism Enrichment Server".

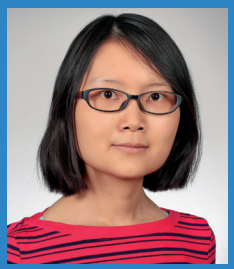
MEEMANSA SOOD

obtained a Bachelor's degree in Bioinformatics from Jaypee University of Information Technology, India. After her degree from Jaypee University she first gained work experience as an associate software engineer at Accenture PVT, Ltd., Bengaluru, India. In 2014 she joined b-it. Here she entered the group of b-it Professor Martin Hofmann-Apitius where she is currently working on her Master Thesis that focuses on the analysis of biomarker trajectories relevant for the monitoring and prediction of progression of Alzheimer's disease.

SEPEHR GOLRIZ KHATAMI

joined b-it in fall 2014. He obtained a Bachelor's Degree in Food Science and Technology Engineering from Islamic Azad University, Khorasgan Branch, Isfahan, Iran and a Master of Science Degree in Technology and Management Engineering from Amirkabir University, Teheran, Iran. At b-it he soon joined b-it Professor Martin Hofmann-Apitius' the research group where he is currently carrying out his master thesis in an approach to functionally link genetics and neuro-imaging in the context of Alzheimer's dementia.

XIAOXIAO ZHANG



joined the Master Program of Life Science Informatics in fall 2014 with a Bachelor's Degree in Biotechnology from Harbin Medical University, Harbin, China. Xiaoxiao completed her Master Thesis this year under the supervision of Professor Andreas Weber (Department for Computer Science of the University of Bonn) entitled "Cancer Dynamics: Insights from Epidemiological and Genetic Data". She will pursue her PhD thesis at Technical University of Munich on a position funded by the German Research Centre for Cancer (Deutsches Krebsforschungszentrum, DKFZ).

List of employers of LSI Alumni:

Universities & Research: b-it Research School, Charité Berlin, Boston Children's Hospital, Centro Nacional de Investigaciones Cardiovasculares, ETH-Domain, ETH Zürich, European Bioinformatics Institute, European Bioinformatics Institute, Fraunhofer FIT, Fraunhofer IAIS, Fraunhofer SCAI, German Center for Cancer Research (DKFZ), German Center for Neurodegenerative Diseases, German Institute of Human Nutrition, Hasso Plattner Institute, Heidelberg Institute of Theoretical Studies (HITS), Helmholtz Centre for Infection Research, Hospital of the University of Bale, Imperial College London, Max Planck Institute for Biophysical Chemistry, Max Planck Institute for Molecular Biomedicine, 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), National Centre for Biological Sciences, National Centre for Biomolecular Research, National University of Ireland, National Technical University of Singapore, Princess Nora Bint Abdulrahman University, Radboudumc – University Clinic Centre of the University of Nijmegen, Research Center Jülich, RWTH Aachen, Swiss Federal Institute of Aquatic Science and Technology, TU München, Twincore – Centre for Experimental and Clinical Research, University Clinic Gustav Carus Dresden, and the universities of Amsterdam, Bonn, Bern, Cambridge, Cologne, Dresden, Düsseldorf, Ghent, Kiel, Leipzig, Luxemburg, Mainz, Münster, Oxford, Sheffield, Tübingen, Utrecht, Western Australia, Vienna, Wageningen, Würzburg, Zürich.

Master Program in Autonomous Systems

Prof. Dr. Gerhard Kraetzschmar, Autonomous Systems

Prof. Dr. Paul Plöger, Autonomous Systems

Prof. Dr. Erwin Prassler, 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 robotics and artificial intelligence. Various robot platforms are used for educational and research purposes, including the Care-O-Bot 3, and the youBot. The focus is on enabling and integrating the necessary intelligence behind the autonomous behavior of artificial agents rather than on the hardware-related aspects of robotics. Students get a solid theoretical background in autonomous mobile robots, advanced control methods, robot manipulation, learning and adaptivity, hardware-software co-design of embedded systems, probabilistic reasoning, and planning and scheduling. The courses are combined with research work conducted at the Fraunhofer Institute for Intelligent Analysis and Information Systems (IAIS) and other partner institutions.

Students take a number of core courses in the first semester as well as compulsory seminars, and practical courses throughout their studies. The Winter Semester 2012 saw the first students study under the new curriculum, which received ASIIN accreditation in April 2012. In addition to the accreditation certificate from the German Accreditation Board, the program got the special ASIIN accreditation label and the Euro Inf Label from the European Quality Assurance Network for Information Education (EQANIE). Students now choose one of two tracks to specialize in at the end of their first semester: the Intelligent Robots track and the Robot Systems Design track.

In the academic year 2015-2016, 28 students joined the MAS program from an applicant pool of 446 candidates. The MAS program has always attracted the interest of students all over the globe. The 13 different nationalities of the 28 students who joined the program in the 2015-2016 academic year is proof of this fact.

The program is offered by the b-it Applied Science Institute (b-itAS) in the Department of Computer Science at the Bonn-Rhein-Sieg University of Applied Sciences (BRSU). b-itAS cooperates closely with the Fraunhofer IAIS in implementing the program, which started in the winter of 2002. Two dual degree programs exist with both the University of New Brunswick in Canada and the German-Jordanian University in Amman, Jordan.

The program is managed by three professors (Gerhard Kraetzschmar, Paul Plöger and Erwin Prassler), four teaching and research associates (Iman Awaad, Frederik Hegger, Nico Hochgeschwender, and Anastassia Küstenmacher) and researchers, who have been recruited through the XPERO, BRICS, RoCKIn, EmoRobot and Echord Edufill projects, namely Björn Kahl, Rhama Dwiputra, Matthias Füller, Jan Paulus, and Azamat Shakhimardanov.

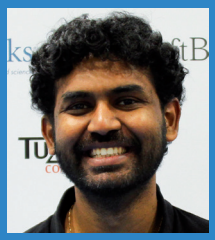
The faculty and staff are actively involved in many scientific activities, including memberships in technical committees of IEEE or in the RoboCup Federation trustee board, the euRobotics aisbl board, numerous program committees of workshops and scientific conferences such as IROS, ICRA, ICAR, ICMA, and AAMAS.

MAS Alumnus Successfully Defends his PhD Thesis

In November 2015, MAS alumnus AZAMAT SHAKHIMARDANOV successfully defended his thesis. He joined the MAS program from Uzbekistan in the WS 2004/05 as a research associate after completing his master's degree where he worked on a number of EU-projects such as ROSTA and BRICS. His PhD thesis is titled "Composable Robot Motion Stack: Implementing Constrained Hybrid Dynamics using Semantic Models of Kinematic Chains" and was supervised by Prof. Bruyninckx of the University of Leuven in Belgium, Prof. Kraetzschmar and Prof. Prassler from the Bonn-Rhein-Sieg University of Applied Sciences.

MAS Success Stories

ALEXANDER HAGG obtained his bachelor's degree in Computer Science from H-BRS having written his thesis while at the Fraunhofer IAIS in computer vision for robotics. He joined the AS program in the summer semester 2013. During this time, he was a teaching assistant for the course on autonomous mobile robotics and furthered his specialization in computer vision with an R&D project on recognition of transparent objects in household robotics, with which he was awarded the Best Paper for Scientific Contribution at the RoboCup 2016 world championships in Leipzig, Germany. His interest in machine learning and evolutionary optimization grew, inspired by cooperative work with Adam Gaier (another AS student, currently pursuing a PhD). Using his master's thesis to try a proof of concept on hierarchical surrogate modelling for evolutionary aerodynamic structural optimization, he is now continuing this work for his PhD in surrogate modelling for explorative optimization.



DEEBUL NAIR obtained his bachelor's degree in Electronics and Telecommunication from Mumbai University, India in 2009. After completing a post-graduate diploma in Embedded Systems, he worked at Rockwell Collins in India as an embossed software developer for 4 years. He joined the AS program in 2014. He is an active member of the AS community, volunteering as study buddy for numerous semesters, tutoring incoming students, and serving as a teaching assistant for a number of courses as well as being a valued member of the b-it-bots RoboCup team. He is currently working on his master's thesis titled Predicting Object Locations using Spatio-Temporal Information by a Domestic Service Robot: A Bayesian Learning Approach.

SVEN SCHNEIDER joined the AS program in winter semester 2009 having completed his bachelor's in Computer Science at H-BRS. After completing his master's degree in 2013 with an award-winning master's thesis, he joined the program as a research associate and has been an active member of the b-it-bots teams. In 2014 he was awarded a PhD scholarship by the Graduate Institute of H-BRS and is currently working on his PhD titled "Solving Robot Grasping Problems With Constraint-Based Optimization Methods" under the supervision of Prof. Dr. Gerhard Kraetzschmar and Prof. Herman Bruyninckx, KU Leuven, Belgium.

List of employers of MAS Alumni *(Business):*
Ableton, ASIMOV Robotics, Banksoft, BMW cyber:con GmbH, Delphi, Exciera Technologies, Faro GmbH, Gade Autonomous Systems Private Limited, Google/ Alphabet, GPS, IBM , Ingen Robotics, Kuka Robotics, M2P Consulting, MesaX, RBOT, Robots Alive Consulting, Shadow Robot Company, Siemens, Systemantics India, The MathWorks, Trivago,VMware

List of employers of MAS Alumni *(Universities & Research):*
DLR, Fraunhofer FGAN, Fraunhofer IAIS, Freie Universität Berlin, Heriot-Watt University, Hochschule Bonn-Rhein-Sieg, Hochschule Bonn-Rhein-Sieg (Graduate Institute), Hochschule Bonn-Rhein-Sieg (Institut für Sicherheitsforschung), Instituto Superior Técnico (IST) - Universidade de Lisboa, Jacobs University LAAS-CNRS, Örebro University, Osnabrück University, Rhine-Waal University of Applied Sciences, RWTH Aachen, TU Wien, TUBITAK-UZAY Space Technologies Research Institute, Universidad Anáhuac Mayab in Mérida, University Jaume I, University of Erlangen, University of Hertfordshire, University of Louvain, University of Western Australia

International Program of Excellence in Computer Science

Prof. Dr. Joachim von zur Gathen, Computer Security

Prof. Dr. Stefan Kowalewski, Embedded Systems

Prof. Dr. Christian Bauckhage

Farewell Lecture of Prof. von zur Gathen.

The International Program of Excellence in Computer Science (IPEC) at b-it offers compact courses primarily during the semester break and at the highest educational level. This results in faster studies and advanced quality in selected subject areas. These courses apply to a limited number of highly qualified students of the University of Bonn, the RWTH Aachen University and, in the future, other German or foreign universities. Undergraduate IPEC courses are planned in a way that the time required for the bachelor degree will be reduced up to one year.

Additionally there are cross-cutting courses that accelerate the master studies at the b-it as well as regular summer and winter schools that are designated for selected topics of computer science. These courses are held in cooperation with international guest scientists. Applications of foreign students are welcome.

The expected impact of the Program of Excellence is not limited to a significant acceleration of undergraduate and graduate studies in conjunction with an international visibility. It also brings together outstanding students with internationally noted scientists and with fellow students from abroad and activates new forms of encouraging competition among students. The IPEC courses usually comprise a mix of lecture classes, seminars, and lab courses, such that students can make best use of the compressed time schedule. Currently, this part of the program is being restructured as to provide an „honors class“ supplement to the top 10% bachelor students in Aachen and Bonn, loosely linked to the NRW public-private scholarship programs the Ministry of Innovation has initiated for this group of students.

Farewell Lecture of Prof. von zur Gathen

In February 2016, b-it Professor Joachim von zur Gathen delivered his farewell lecture in a well packed b-it lecture hall providing an impressive overview about the field of cryptography. In his lecture, entitled: “Back to the future”, he presented the essence of his scientific work, gave a short review of the past and addressed the future of his research area.

Before joining b-it, he held other positions in Germany and abroad. Joachim von zur Gathen first received a Diplom in Mathematics from ETH Zürich, and later graduated as Dr. phil. from University of Zurich in 1980. In 1981, he took up a postdoc position in the Department of Computer Science at the University of Toronto, eventually becoming a Full Professor. In 1994, he moved to the Department of Mathematics at Paderborn University, Germany. Since 2004, he has been a professor at b-it and the Department of Computer Science at the University of Bonn.

Von zur Gathen is a highly successful researcher and scientist who shaped his scientific area in general and at b-it in Bonn in particular. He held a chair in cryptography at b-it and was a member of Fachgruppe Informatik at the Department of Computer Science at the University of Bonn. He substantially contributed to the scientific reputation of Computer Science in the Bonn area. Besides his research contributions in many scientific journals, he is also the author of two very successful scientific books about computer algebra and cryptography.

He remains scientifically active as a Professor Emeritus at b-it. b-it thanks Professor von zur Gathen for his contributions.

Schüler-Krypto 2016

On two days in March 2016, 105 high school students as well as 7 teachers met for the fifteenth Schüler-Krypto to learn@bit on secret messages, encryption and decryption. They came from Andernach, Bedburg, Bonn, Bornheim, Düren, Mönchengladbach, Neunkirchen, Neustadt an der Weinstraße, and Troisdorf.

After an introduction to the topic by Michael Nüsken the students got to the nitty-gritty. Everybody was asked to take up the role of James Bond and program RSA on the laptop built-in to Bond's BMW Z8. We used Sage on it, a free open-source computer algebra system which among many other things is capable of calculating with arbitrarily large numbers. The students sent emails to Moneypenny and decrypted answers from her, set up a public-key infrastructure and exchanged encrypted messages with each other. As a sidetrack, in a game-like setting the students could experimentally find out how the main step in the encryption and decryption of RSA, namely the modular exponentiation, can be executed in a jiffy. And finally, thanks to the assistance of the teachers, everybody could take home his/her personal visual cryptogram.

Other glimpses of computer science were presented in the lunch break. The laser and light show again presented by Matthias Frank from the laser and light lab fascinated pupils and teachers.

In the outro Neal Walfield from g10code, the company that produces the public-domain tool GnuPG, and Marcel Zimmer from EnBITCon GmbH, a Bonn startup for IT security solutions, gave highly contrasting insights into real world business.

crypt@b-it 2016

The b-it hosted the summer school crypt@b-it 2016. In its pleasant atmosphere students and researchers from all over the country and beyond took the opportunity to crypt a bit. The summer school was organized jointly with the Ruhr-Universität Bochum as a UbiCrypt Summer School, in cooperation with the IACR (International Association for Cryptologic Research) and the GI (Gesellschaft für Informatik). It took place on July 25-29, 2016, at the b-it and invited to exploration of some fundamental areas of cryptography:

- Internet and cloud. About TLS, outsourcing and reductions by Markulf Kohlweiss
- Analysis and design of symmetric crypto systems by Christian Rechberger
- The Enigma machine by Max Gebhardt

The enthusiastic speakers presented fascinating lectures from the basics to the front of research in their area of expertise. The courses were accompanied by tutorials and hands-on exercises to deepen the understanding and allow discussion of the topics with the world-class lecturers in an informal way. Finally, the participants could touch and test a real World War II Enigma.

Starting a Start-up in Bonn!

Stefan Sauerborn, Office for the Promotion of Economy of the City of Bonn, joined by Thomas Poggenpohl of the City of Bonn, delivered the talk about "Starting a Start-up in Bonn" and discussed particular options for participants of the event on 14th January. A well packed audience (more than 70 students) in b-it lecture hall learned about new opportunities for students to start an own business in Bonn.

Bond's Thursday crew.

World War II Enigma.

crypt@b-it 2016 excursion to the BRONX ROCK high ropes course.

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 35,000 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 5,000 students from 130 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 nearly a hundred different first degree programs. Students can choose from a wide and modern spectrum of subjects that allows a multiplicity of combinations.

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 44,000 students. RWTH offers 152 courses of study (undergraduate and postgraduate). The RWTH master programs educate engineers who are keen to engage in R & D, innovation, and entrepreneurship. In 2007, RWTH Aachen was elected as one of nine "elite universities" within the German excellence program. In the current Times Higher Education Ranking, RWTH Aachen University is placed 78th among the several thousand evaluated universities. Aachen's Computer Science department, as the direct partner in b-it, even achieved rank 29 worldwide.

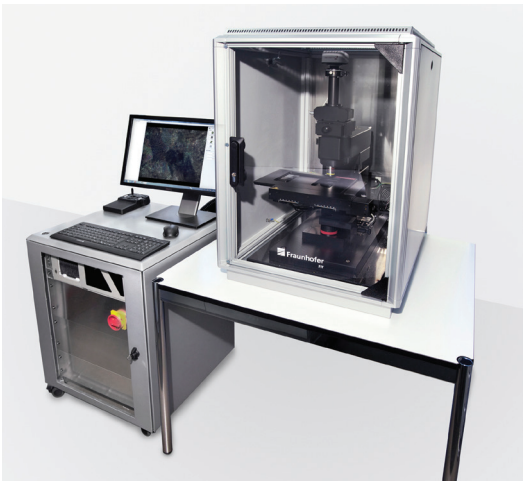
The spacious Hofgartenwiese is a major summer attraction on the University of Bonn campus.

Entrance of Birlinghoven Castle.

The Birlinghoven Castle campus is one of the largest and most influential computer science research sites in Germany. About 500 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

FIT, the Fraunhofer Institute of Applied Information Technology, investigates human-centered computing in a business or engineering process context. The usability and usefulness of information and cooperation systems is optimized in their interplay between human work practice, organization and process. In Life Science Informatics the institute focuses on protein analysis, visual support for navigation in micro surgery, and assistive information technology. In Media Informatics innovative information visualization systems, mixed and augmented reality environments for industrial planning, pervasive gaming applications, and value chains for public-sector information services are main research topics.



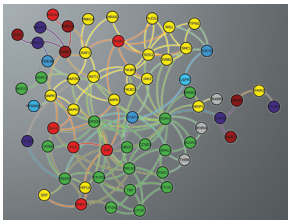
TopoScan microscope of Fraunhofer FIT: TopoScan is a modular hardware-software platform for the automated high content analysis of biological samples. Its unique software-driven architecture combines two properties within one system: Streamlined workflows with minimal intervention for the reproducible acquisition and analysis of high content assays.

Fraunhofer SCAI

The Fraunhofer Institute for Algorithms and Scientific Computing SCAI conducts research in the area of computational science and is a valued corporate partner for industry and academia. SCAI designs and optimizes industrial applications, implements custom solutions for production and logistics, and employs high-performance computers. The Department of Bioinformatics at Fraunhofer SCAI carries out applied research and development in three areas:

1. Techniques for information extraction in the life sciences, including recognition of named entities and relationships in text as well as large-scale, automated information extraction.
2. Integrative biology, with a particular focus on modeling neurodegenerative diseases.
3. eScience, Grid and Cloud Computing as well as technologies for the operation of HPC (Clusters) with a focus on SLA, security, and license management.

The Department of Bioinformatics is partner in major funded projects at national and EU level. Software tools for information extraction developed at SCAI BIO are used in the vast majority of pharmaceutical companies worldwide.



Fraunhofer SCAI: A hormonal network underlying dementia and Alzheimer's disease.

b-it Applied Science Institute

Bonn-Rhine-Sieg University of Applied Sciences (BRSU)

Founded in 1995, the Bonn-Rhine-Sieg University of Applied Sciences significantly extends the range of applied research and teaching in the greater Bonn area. It specializes in business administration, natural sciences, engineering and computer science, strongly encouraging cooperation with industrial partners and a focus on use-driven and interdisciplinary research and teaching.

The three campuses at Sankt Augustin, Rheinbach and Hennef are well equipped with modern laboratories, studios, workshops and facilities for cooperative research. By 2016, the different departments accommodate more than 8,000 students.

The Department of Computer Science offers a Bachelor and a Master program in Computer Science and in cooperation with the Departments of Business Administration a Bachelor program in Business Information Systems. The Master program Autonomous Systems is offered by the b-it Applied Science Institute, a cooperation between the Department of Computer Science and the Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS.

Campus of the Bonn-Rhine-Sieg University of Applied Sciences.

Fraunhofer IAIS

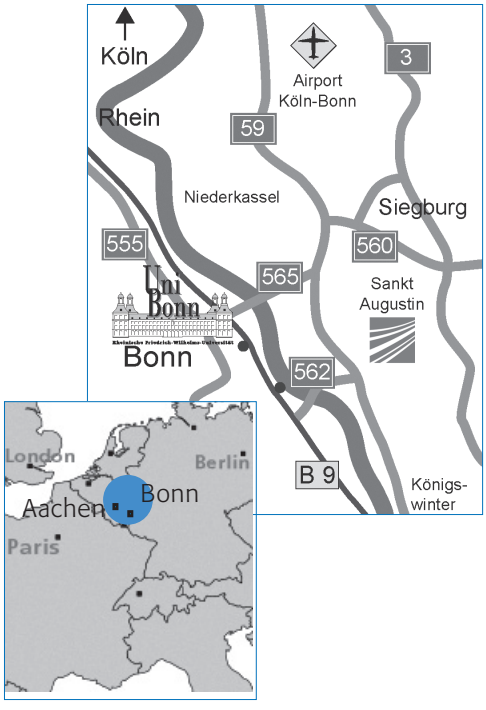
The Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS develops tailor-made IT solutions to support companies and organizations optimize products, services and processes, as well as to implement intelligent information management. There is a particular focus on the analysis, access and targeted use of Big Data, new media technologies and solutions for innovative business and security processes.

In order to support customers in their information management and decision-making processes, the scientists use innovative technologies such as knowledge extraction, visual analytics and data mining to provide them with holistic analyses of large amounts of data. Semantic and adaptive media applications open up new possibilities for linking data and knowledge and for making them accessible via the Internet. By utilizing business intelligence solutions the Fraunhofer IAIS team is able to optimize its customers' business, IT and security processes and so improve their business success. The institute's research and development activities are defined by the business areas Big Data Analytics, Business Modeling & Analytics, Content Technologies & Services, Enterprise Information Integration, Image Processing, Intelligent Media & Learning, Marketing, Market Research & Media Analysis and Preventive Security. Fraunhofer IAIS and its 230 strong team combine in-depth industry knowledge with expertise in a full range of technical disciplines, most notably computer science but also mathematics, natural sciences, business management, geo sciences and social sciences.

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 in vital. It is evaluated on the basis of TOEFL 550 paper-based, 213 computer-based, or IELTS 6.0;
- 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

A student union fee of ca. 270 € 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 800 €. 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 attracted a number of international organiza-tions, 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.

b-it Bonn-Aachen International Center for Information Technology

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53113 Bonn
Germany

Scientific Directors

Prof. Dr. Matthias Jarke,
RWTH Aachen University
Fraunhofer FIT

Prof. Dr. Kurt-Ulrich Witt, Bonn-Rhine-Sieg
University of Applied Sciences

Prof. Dr. Stefan Wrobel, University of Bonn
Fraunhofer IAIS

Programs

Media Informatics

msc-mi@b-it-center.de

Life Science Informatics

msc-lsi@b-it-center.de

Autonomous Systems

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