ANNUAL REPORT / 2023

BRNO UNIVERSITY OF TECHNOLOGY
FACULTY OF INFORMATION TECHNOLOGY

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photo front side: FILMONDO

Table of Contents

Introduction

The year 2023 is over. In 2022, we hoped that it would not be a negative part of history like 2020 and 2021 marked by the COVID-19 pandemic. Unfortunately, it didn't turn out that way, and the year 2022, overshadowed by the tragic Russian invasion and war in Ukraine, sadly etched into the annals of humanity. The war is not over in 2023. On the contrary, the battles have become even more brutal and tragic, with prospects still bleak. And although it may seem that there's a prevailing „bad mood" in society, from a professional standpoint, 2023 was largely a positive year for our faculty. And I am convinced that our faculty has been moving in the right direction. It's unfortunate that I can not pass on the leadership of the faculty to the new dean, who begins their tenure on January 16, 2024, after my eight-year term as dean, in better times.

At the end of 2023, FIT has over 2 700 students, mostly motivated, who are one of the main purposes of our work. The faculty is very successful in research and creative activities. It's positively evaluated both in the Czech Republic and abroad, fulfilling its role in knowledge development and dissemination.

In 2023, we successfully resumed the well-established international exchange of students, teachers, and researchers from the pre-COVID-19 era. We've returned to a sense of normalcy, although it's not the same as before. It has been shown that travel can be effectively replaced by teleconferencing in some cases. We are pleased with the increasing interest in Master's studies in English and the continuing interest of foreign, especially Ukrainian, students in studying in Czech.

In the future, we want to strengthen the position of our faculty as world-renowned and sought after for collaboration in educational and research projects. To build an institution full of enthusiastic and proud students and staff and to live and work in a welcoming atmosphere with quality services. I think we were very close to that ideal in 2023. Please let's work to make our faculty the best it can be in the future.

Pavel Zemčík, Dean of FIT BUT

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photo: Jan Prokopius

Faculty Profile

The Faculty of Information Technology is a modern, internationally recognised university and a centre of excellence for research in various areas of information technology – from hardware to intelligent systems to multimedia. In a modern campus with unique facilities, it offers students a highly valued IT education at all levels of study: three-year Bachelor's, two-year Master's and four-year Doctoral.

Tradition

The faculty has had a tradition in teaching information technology since 1964, when the Department of Automatic Computers of the Faculty of Electrical Engineering of BUT was founded, which gradually developed and became an independent faculty in 2002. Today, over 2,500 students study there.

Science and research

The faculty hosts twenty research groups, many of which celebrate significant successes not only domestically but also internationally. FIT is involved in national and international scientific projects – independently and in collaboration with other universities, research institutes and renowned companies and institutions. The faculty also includes the Information Technology Research Centre. This is part of the IT4Innovations Centre of Excellence, which includes the National Supercomputing Centre.

Teaching and experience

The faculty emphasizes quality theoretical preparation corresponding to university studies in the technological field. However, we are also aware of the importance of the link with experience. The faculty has its own industry council through which it maintains regular contact with industry leaders and thus brings the latest knowledge from experience into its courses of study. Another source for acquiring such knowledge is the partnership programme. That is why FIT graduates are in great demand on the labour market and have the highest starting salaries of all BUT graduates.

Campus

The faculty campus is a unique combination of a sensitively reconstructed historic site of a former Carthusian monastery from the 14th century and new modern buildings. The reconstruction and completion took place between 2006 and 2013, and leading Brno architects used the latest knowledge about the creation of university teaching spaces. The campus includes not only excellently equipped lecture halls, laboratories with the latest technology, facilities for rest and relaxation and catering facilities, but also facilities for cultural and leisure activities.

Management

prof. Dr. Ing. Pavel Zemčík, dr. h. c.

Dean

Ing. Bohuslav Křena, PhD

Vice-Dean for Efficiency
and Academic Affairs

doc. Ing. Vítězslav Beran, PhD

Vice-Dean for External Relations

Ing. Jaroslav Dytrych, PhD

Vice-Dean for Bc. Study
and Information support

doc. Ing. Richard Růžička, PhD, MBA

Vice Dean for Msc. Study

prof. Ing. Tomáš Vojnar, PhD

Vice Dean for Science and Research

Ing. Petr Hajduk

Financial Officer

Heads of departments and centres

doc. Dr. Ing. Dušan Kolář

Department of Information Systems

doc. Dr. Ing. Petr Hanáček

Department of Intelligent Systems

prof. Dr. Ing. Jan Černocký

Department of Computer Graphics and Multimedia

prof. Ing. Lukáš Sekanina, PhD

Department of Computer Systems

prof. Ing. Tomáš Hruška, Csc.

Research Centre of Information Technology

Ing. Rudolf Čejka

Computer Centre

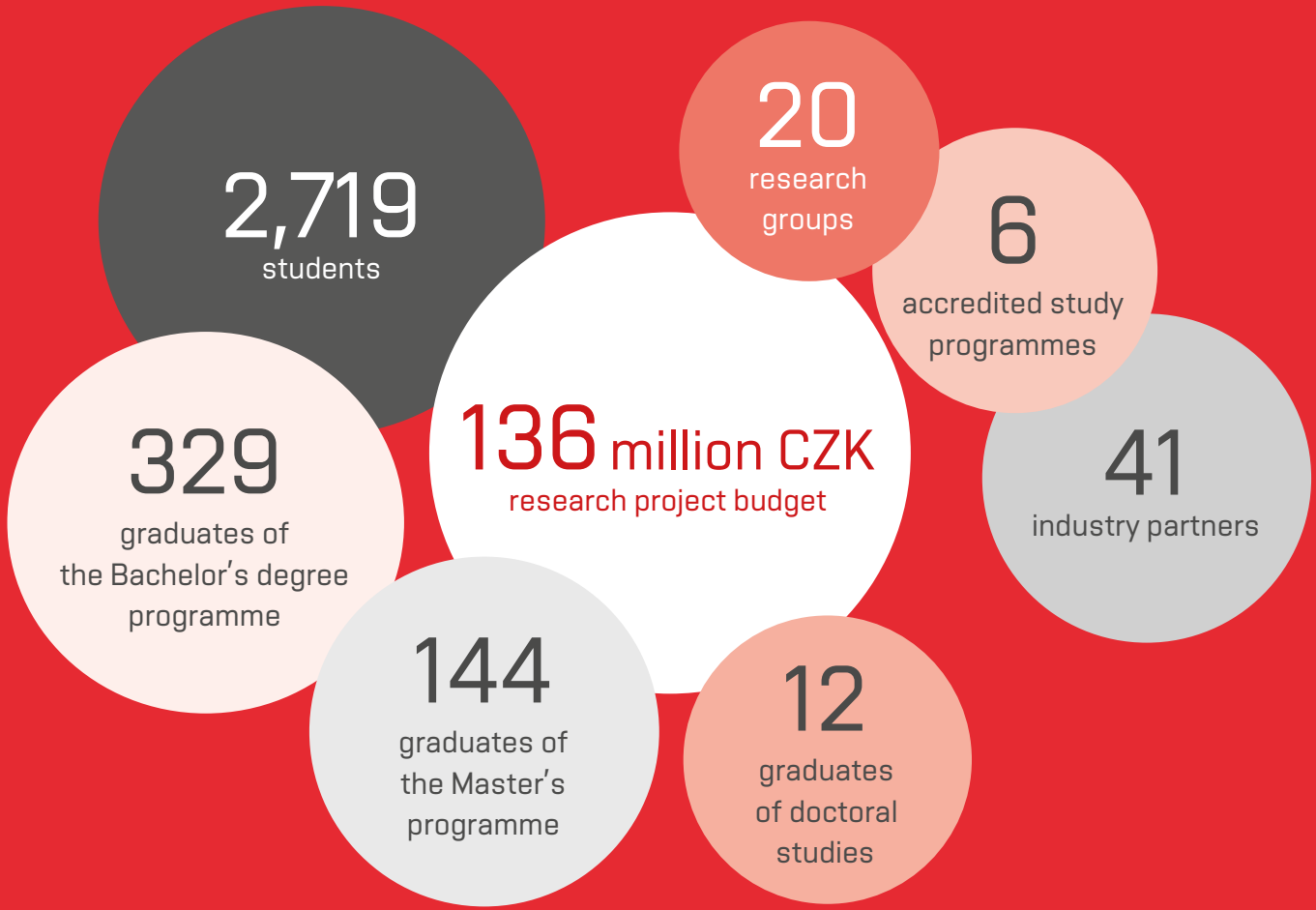
Employees

total number of employees	**288**
academic staff and researchers	188
other employees	100

photo: Jan Prokopius

2023 at FIT

FIT in 2023 in numbers



Associate Professor Petr Hanáček was elected as a candidate for appointment as Dean of FIT

On 31 October 2023 at the regular meeting of the Academic Senate of the FIT BUT, doc. Dr. Ing. Petr Hanáček was elected a candidate for appointment as dean. Petr Hanáček is the head of the Department of Intelligent Systems, chairman of the Academic Senate of BUT and performs other functions within FIT and the entire BUT.

His goal is to contribute to the development of the faculty as an important and recognized educational and research center that is open to cooperation with other faculties, Czech and foreign universities, research institutions, companies and the public sphere.

His team is composed as follows:

- **prof. Dr. Ing. Pavel Zemčík, dr. h. c.** – Vice-Dean for Research, Development, and Foreign Affairs
- **Ing. Bohuslav Křena, PhD** – Vice-Dean for Efficiency and Academic Affairs
- **doc. Ing. Richard Růžička, PhD, MBA** – Vice-Dean for Msc. Study
- **doc. Ing. Radek Burget, PhD** – Vice-Dean for Bc. Study
- **doc. Ing. Vítězslav Beran, PhD** – Vice-Dean for Marketing and External Relations
- **Ing. Jaroslav Dytrych, PhD** – Vice-Dean for Information Support
- **Ing. Petr Hajduk** – Financial Officer

People

In 2023, a total of 6 doctoral graduates received their diplomas

The ceremonial doctoral graduation took place on June 7 in the Neo-Baroque auditorium of the rectorate of the Brno University of Technology. During this event, the following individuals received their diplomas:

- **Ing. Michal Dvořák, PhD**
- **Ing. Lukáš Semerád, PhD**

photo: Jan Prokopius

We congratulate all the new PhD holders and look forward to presenting diplomas to the next graduates in 2024.

During the ceremony held on December 6, the following individuals received their diplomas for successful completion of doctoral studies:

- **Ing. Marta Jaroš, PhD**
- **Ing. Jakub Lojda, PhD**
- **Mgr. Julia Rudnitckaja, PhD**
- **Ing. Petr Klepárník, PhD**

photo: Jan Prokopius

5 persons from the Faculty of Information Technology can use the title of Associate Professor from 2023

On May 31, the Rector of the Brno University of Technology Ladislav Janíček presented appointment decrees to the new associate professors in the field of Computer Science and Informatics, who are:

- **doc. Ing. Petr Motlíček, PhD from FIT BUT in Brno, and**
- **doc. Ing. Radek Ošlejšek, PhD from FI MU.**

photo: Jan Prokopius

On November 29, the Rector presented diplomas to the following newly appointed associate professors from FIT:

- **doc. Ing. Vítězslav Beran, PhD**
- **doc. Ing. Michal Bidlo, PhD**
- **doc. Ing. Tomáš Martínek, PhD**

photo: Václav Koníček

Congratulations to everyone!

Awards

At the 24th Academic Assembly, the Rector acknowledged significant figures of the Brno University of Technology

At the 24th Academic Assembly, the Rector of the Brno University of Technology awarded honors to prominent figures at Brno Technology. This year's assembly took place on September 19th, coinciding with the founding date of BUT on the same day in 1899. The Academic Assembly was not only an opportunity to award those whose contribution raises the prestige of BUT, but also a reminder of the anniversary of the founding of our university.

From the Faculty of Information Technology, the following individuals were honored with the Silver Medal:

- **Ing. Radek Kočí, PhD** – for outstanding results in teaching, creative, organizational and management activities at the Faculty of Information Technology of Brno University of Technology,

photo: Václav Koníček

- **Ing. Bohuslav Křena, PhD** – for outstanding achievements in teaching and scientific activities and for significant contribution in the field of information technology at the Faculty of Information Technology of Brno University of Technology.

photo: Václav Koníček

The commemorative medal was awarded to:

- **Ing. Rudolf Čejka** – for outstanding professional results and professional activities in the field of computer technology at the Faculty of Information Technology of Brno University of Technology,

photo: Václav Koníček

- **Marie Jandová** – for outstanding professional results and long-standing professional activity at the Faculty of Information Technology of Brno University of Technology.

photo: Václav Koníček

For outstanding academic achievements, the following individuals were honored:

- **Bc. David Chocholatý** – for Master's studies
- **Dalibor Králik** – for Bachelor's studies

photo: Václav Koníček

In 2023, the first-ever Rector's Awards for exceptional scientific achievements and artistic outputs were awarded to the following recipients from FIT:

- **doc. Ing. Lukáš Burget, PhD**
- **Mr Federico Nicolás Landini**
- **Ms Mireia Diez Sánchez**

photo: Václav Koníček

The Rector's Award for Outstanding Conference Contribution was awarded to

- **prof. Ing. Adam Herout, PhD**

For the book publication with an extraordinary response of

- **prof. RNDr. Alexandr Meduna, CSc.**

photo: Václav Koníček

The most popular educators according to the evaluation of FIT students are Dana Hliněná and Milan Češka

In May, the rector announced a competition for the best educator based on student evaluations at BUT. The winners for the Faculty of Information Technology, awarded during the Academic Assembly held on 19 September 2023, were Dana Hliněná for Bachelor's studies and Milan Češka for Master's studies.

Barbora Šmahlíková received the VCLA International Student Awards

Barbora Šmahlíková, a student of the Faculty of Information Technology at Brno University of Technology received the Vienna Center for Logic and Algorithms (VCLA) Award on Tuesday, September 26th. The VCLA is a part of the Vienna University of Technology (TU Wien). She received the prestigious award for her bachelor thesis "Next Generation of Rank-Based Algorithms for Omega Automata", in which she deals with the optimization of algorithms for Büchi automata, which help to determine the behavior of systems running continuously for a long time, such as operating or control systems.

Barbora Šmahlíková has received other awards for her research. She is also the first recipient of the Government Prize for Talented Students, and at the Academic Assembly in 2022, she also received the Rector's Award for outstanding results in her Bachelor's studies. Talented student continues her studies at FIT in the follow-up Master's program in Information Technology and Artificial Intelligence with a specialization in Mathematical Methods.

photo: Jan Prokopius

Award ceremony of the FIT commemorative medal

On Friday, December 15, 2023, the ceremonial presentation of the commemorative medals took place, with the medals being awarded by the Dean of the Faculty of Information Technology, Pavel Zemčík. The medals were awarded to academics and other faculty members for exceptional projects, dedicated service, enthusiasm, long-standing loyalty, and support.

The gold medal was awarded to:

- **Jan Černocký** – Head of the Department of Computer Graphics and Multimedia
- **Dušan Kolář** – Head of the Department of Information Systems
- **Lukáš Sekanina** – Head of the Department of Computer Systems

The silver medal was received by:

- **Petr Gaďorek** – system integrator of the Computer Centre
- **Vlasta Krupková** – Assistant Professor, Department of Mathematics, FEEC
- **Zbyněk Křivka** – Assistant Professor, Department of Information Systems
- **Petr Peringer** – Assistant Professor, Department of Intelligent Systems

The bronze medal went to:

- **Markéta Doskočilová** – lawyer, FIT Dean's Office
- **Dana Hliněná** – Associate Professor at the Department of Mathematics, FEEC
- **Petra Kůdelová** – Officer for Master's Studies, FIT Dean's Office
- **Aamir Saeed Malik** – Principal Investigator at the Cognitive and Neural Engineering Research Group of the Department of Computer Systems
- **Svatava Nunvářová** – Science and Research Officer, FIT Dean's Office

The Dean of FIT BUT honored significant figures for their contributions to the advancement of information technologies

On Thursday, November 16, the Dean of the Faculty of Information Technology at Brno University of Technology, Pavel Zemčík, honored three individuals for their contributions to the development of IT. The medal was received by Dalibor Dědek, co-founder of JABLOTRON, Vladimír Kovář, founder of the software company Unicorn and Jiří Zlatuška, Founding Dean of the Faculty of Informatics of Masaryk University and subsequently also Rector of MU.

The Medals for Merit in the Development of Information Technology have been awarded since 2018. The Dean of FIT BUT awards them to individuals who significantly, consistently, and systematically contribute to the field of IT, and whose work has not only economic but also societal implications.
The medals bear the motifs of Brno, the faculty and IT elements. They were created in the medal workshop of Petr Kazda according to the design of medal maker and sculptor Michal Vitanovský. The ceremony took place in the beautiful Villa Löw-Beer.

photo: Jiří Salik Sláma

Events

January

- 24. – 26. 1. Gaudeamus Prague 2023
- 27. 1. Representation Ball of FEEC and FIT

March

- As part of the library's „March, Readers' Month" event, staff and students can borrow a „mystery book"

May

- 4. 5. Excel@FIT: student projects conference

July

- 10. – 25. 7. BISSIT: International Summer School of Information Technologies

September

- 14. – 17. 9. Start@FIT: Welcome event for freshmen
- 27. – 28. 10. Night at FIT: night program with a fire show, feature film screening, tea room, board games and other activities

November

- 10. 11. We live IT: innovation technology conference

February

- 3. 2. Open day for study applicants
- 1. – 4. 2. High Visual Computing 2023: Seventh meeting of Czech and Slovak experts in computer graphics and vision
- 17. 2. FIT Student Ball

April

- 12. – 14. 4. EvoStar 2023: The Leading European Event on Bio-Inspired Computation

June

- 16. – 18. 6. Community Conference DevConf. cz 2023
- 26. – 28. 6. Academic programme for students of Strathmore University, Nairobi, Kenya

August

- 28. 8. – 1. 9. Summer school IT for girls

October

- 13. 10. AI 4 Talents: introduction to the basics of AI for high school students
- 6. 10. Night of Scientists at FIT: A pan-European popular science event

December

- 18. 12. Open day for study applicants

December Open Day attracted over 600 applicants to the faculty

On 18 December, the gates of our faculty were opened to applicants from among secondary school students. More than 600 students from various parts of the Czech Republic and Slovakia came to the Open Day, organised by the FIT Student Union. In addition to a lecture about studies and guided tours of the campus, they were also treated to a taste of science and research at FIT. They had the opportunity to get acquainted with student projects, look into specialised laboratories, or meet with representatives of corporate partners. We are pleased with the interest in studying at our faculty and the positive feedback.

photo: Vít Staniček

A meeting with representatives of partner companies was held at FIT. The issue of linking teaching with practice was addressed

In February, a regular meeting of representatives of partner companies and faculty management took place as part of the FIT partnership programme. This is one of the many events and activities prepared annually to support the education of the faculty's students.

More than 35 colleagues from 23 companies accepted the invitation. The agenda included an inspiring discussion, where opinions were divided on the question „What professional areas does the IT industry need graduate engineers to know?". We very much appreciate the valuable insights from practice. They will be used to the maximum extent possible in selected courses to motivate students.

During this period, we also worked with partner companies on the preparation of summer internships and topics for bachelor's and master's projects. Both activities support the acquisition of practical experience and knowledge by students while also serving as opportunities to secure interesting job opportunities after completing their studies.

From Mendel to deep neural networks: FIT hosted the EvoStar 2023 conference

Evolutionary algorithms in programming, their application, optimization and use in art. All of this was part of the EvoStar 2023 conference, held from April 12th to 14th, 2023, at FIT BUT in Brno. This inspirational event, organised by the international scientific society SPECIES, brought together the world's leading experts in evolutionary algorithms. We are very proud that our faculty was chosen as the venue for this prestigious event. We are warmed by the feeling of a superbly executed event and by the fact that we shone brightly in the scientific realm as an educational institution, whose researchers rank among the world's elite.

We welcomed a significant number of acclaimed researchers, with some travelling literally halfway around the world to join us. EvoStar is different from other conferences. "It works a bit like a family, newcomers, especially students, are integrated through various activities. Every year, a prize is awarded for contribution to the development of the field (this year it was awarded to prof. Mengjie Zhang from New Zealand). We organised a discussion between students and the holders of this award, of which 12 were present in Brno," says Prof. Lukáš Sekanina, who together with his colleague from FIT doc. Jiří Jaroš, as the main organisers of the event, contributed to its smooth running.

The whole event was fully hybrid, broadcast simultaneously from 4 rooms. The highest number of attendees came to Brno from the UK, followed by Spain, the Netherlands, Portugal and Germany and other European countries. However, experts from significantly distant destinations such as Japan, the USA, New Zealand, Canada, and Brazil also didn't miss the opportunity to attend the event.

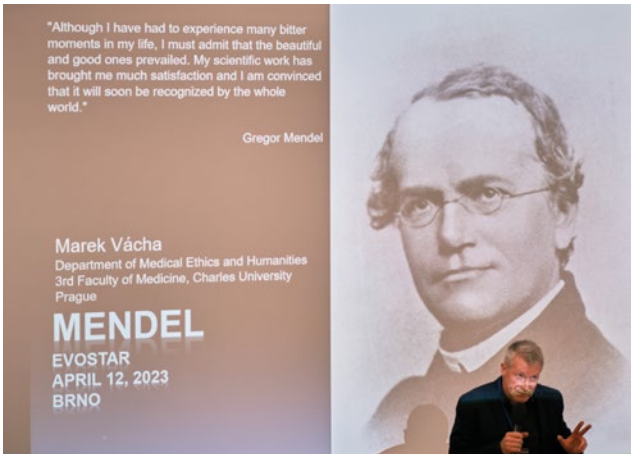
The opening lecture on Mendel captured the absolute attention of Marek Vácha, a Roman Catholic priest, scout, and expert in medical and environmental ethics as well as evolutionary biology. He fit into the faculty's former monastery space like a pea in a pod.

Czech scientific (and faculty) colours were defended by prof. Sekanina with his lecture: Genetic Programming with Associative Memory. His work was created within the project GA ČRwhich addresses the problem of using machine learning methods in battery-powered devices, where the emphasis is on reducing energy and resources on the chip. "The most important thing at conferences is feedback, the possibility of discussion with experts and the possibility of arranging further research collaboration. I have confirmed that the topic we have started is worth developing," Sekanina adds.

Professor Sekanina opens the EvoStar conference. 3x photo: FILMONDO

Here's a look back at EvoStar 2023 in numbers:

- 136 researchers from 22 countries attended in person,
- 61 participants joined online,
- 3 lectures from the Czech Republic (FIT BUT, FME BUT and FI MU),
- over 30 people visited the Mendel Museum as part of an optional event,
- countless inspiration,
- and an overwhelming sense of belonging in the scientific community.



Marek Vácha lectures on Mendel. photo: FILMONDO

This year's Researchers´ Night attracted the highest number of visitors in recent years

This year's edition of the nationwide event Researchers´ Night on the theme „Secrets" exceeded all expectations. The program of our faculty attracted over 850 visitors. At 13 stations, they had the opportunity to become drone pilots and overcome fear through virtual reality, try 3D printing, penetrate the secrets of password cracking and the unexplored reaches of the dark web. They found out how not to leave traces in the web browser, got acquainted with the phenomenon of deepfakes and bothered their heads during quizzes and competitions. And they also found out that you can have a lot of sophisticated fun with our experts.

The programme of the Researchers´Night at FIT BUT is available here: https://www.fit.vut.cz/fit/press/3545/.cs

2x photo: Václav Koníček

Excel@FIT 2023 conference presented a record number of innovative student projects

On May 4, 2023, the 9th annual student conference of innovation, technology and science in IT Excel@FIT took place at the Faculty of Information Technology. This traditional showcase of student projects was attended by over 80 students with their work, which competed for the favour of academics, corporate partners and the professional public.

Right at the beginning, 8 selected works were presented. This was followed by a panel discussion between representatives of the partner companies and the students. The students were also introduced to the possibilities of practical internships. Visitors had the opportunity to see all the works through a poster show and have discussions with the authors of the projects.

Among the works presented were a number of inspiring projects that were appreciated by the expert panel, industry partners and the professional public. You can read the complete results of Excel@FIT 2023 here:

https://excel.fit.vutbr.cz/2023/vysledky/

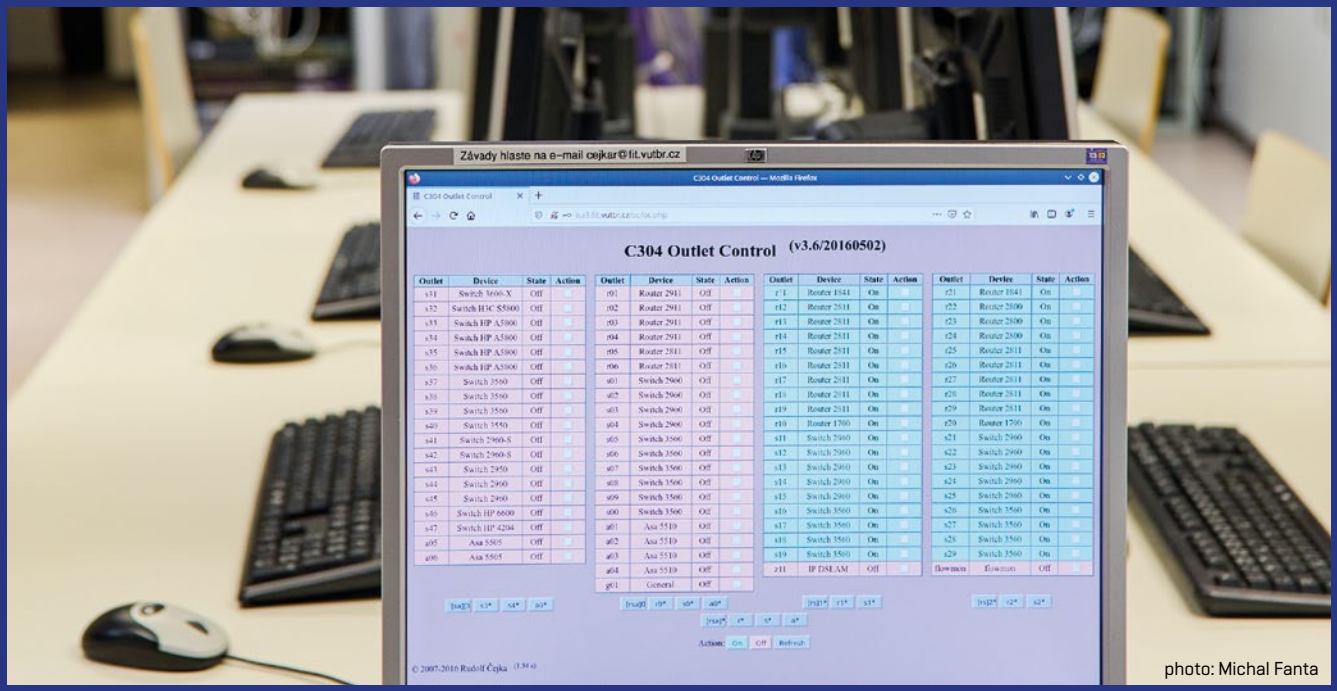
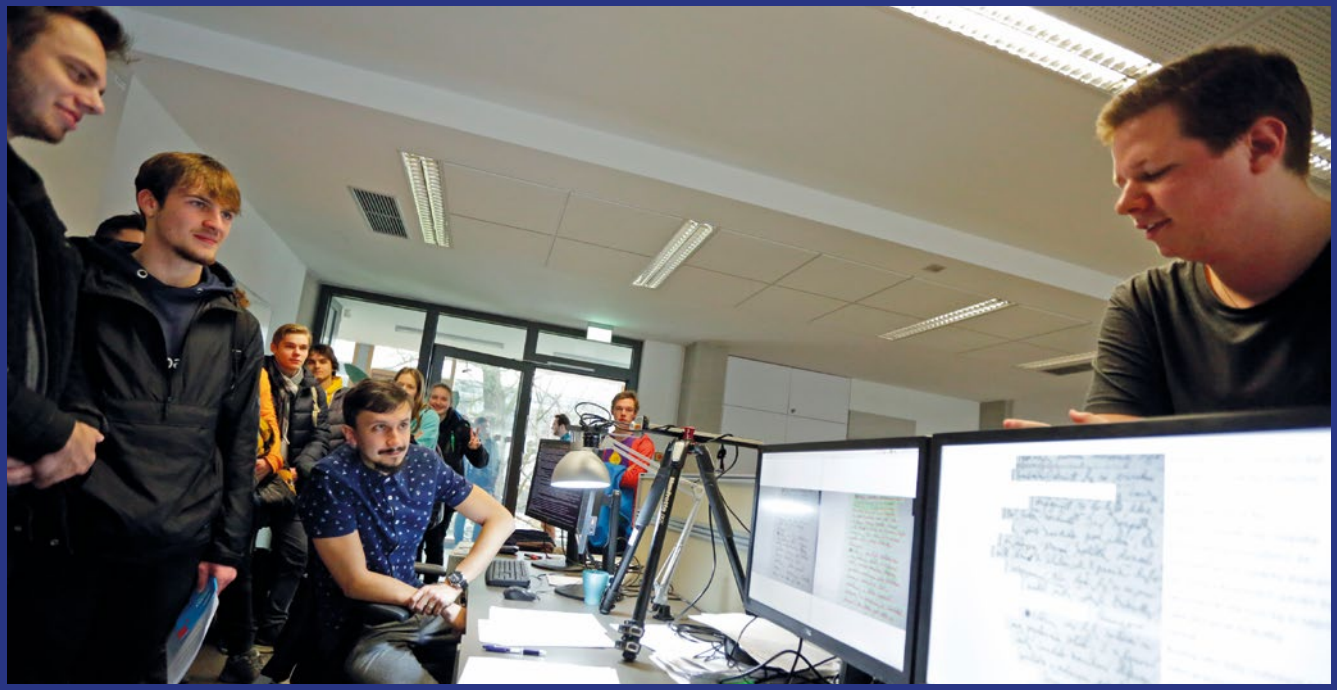


photo: Michal Fanta



Research, Development and Innovation

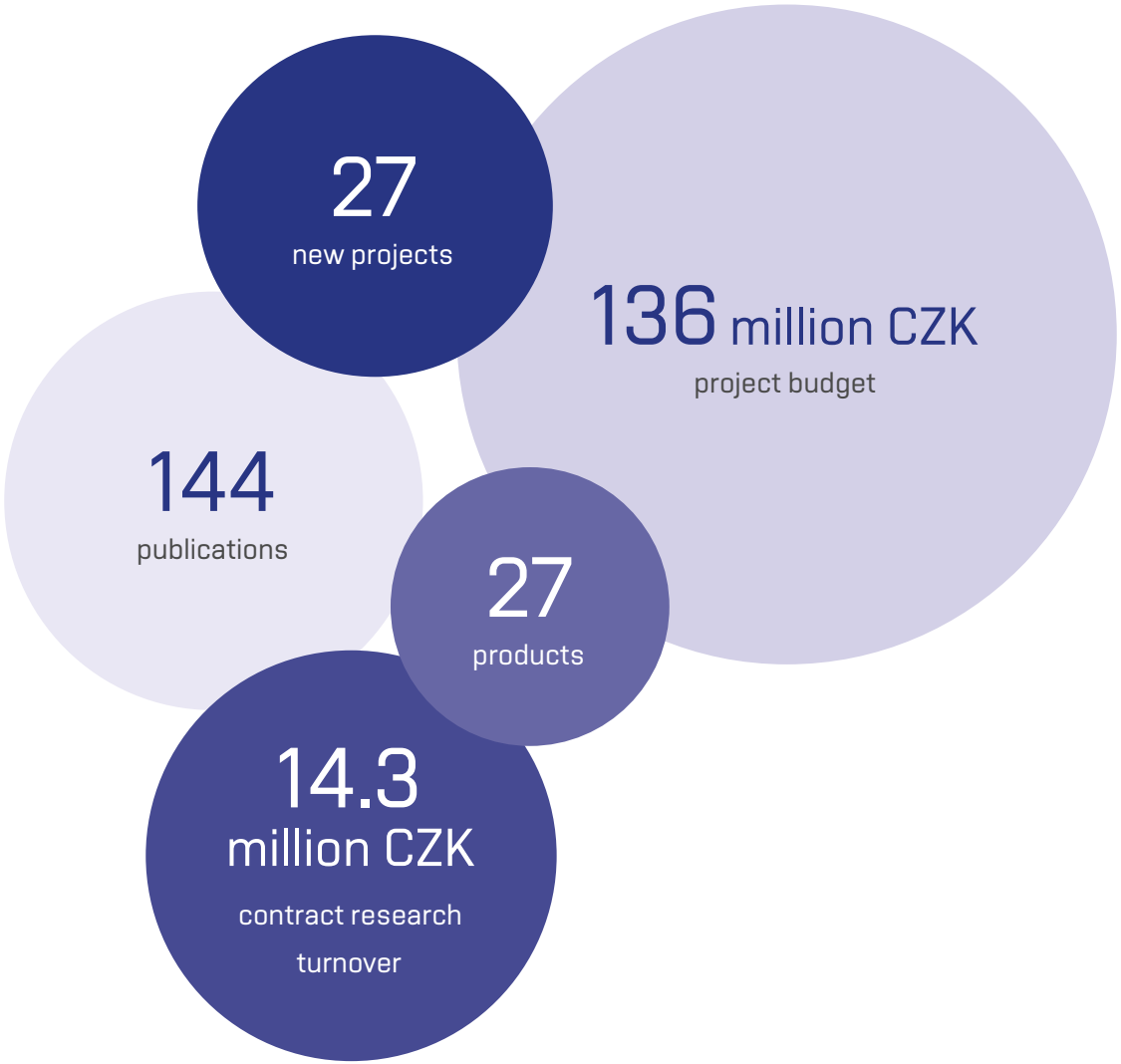
The key areas of science and research at the Faculty of Information Technology are:

- Cyber security
- Artificial Intelligence (AI) and Machine Learning (ML),
- Automation of information linking,
- Hardware security,
- Smart device collaboration, including document digitisation,
- Network security
- Theoretical foundations of computer science
- Verification, synthesis and automata and logic
- Evolutionary hardware
- Robotic and cyber-physical systems
- Embedded computing and supercomputing technologies
- Knowledge acquisition, automation of information linking, smart device collaboration, document digitization
- and more.

These areas are followed by other important activities in the field of infrastructure and applications, including their use in industry (Industry 4.0, Internet of Things), in transport (smart cities, autonomous vehicles), but also in healthcare (challenges of an ageing population, personalised healthcare), in the service of society (digitisation of cultural heritage). We are also interested in the sustainable development of humanity (carbon footprint, smart agriculture) and other human activities affected by information technology (eGovernment, GDPR).

Many of the local start-ups and spin-offs are now world leaders. The school also promotes its quality in international scientific projects, either independently or in cooperation with other universities, research institutes and renowned companies and institutions.

Research at FIT in 2023 in numbers



Research groups, departments and centres

The Faculty has 20 research groups, many of which have achieved great success abroad.

- AeroWorks
- NES@FIT – Networks and distributed systems research group
- Security Technology Research and Development (STRaDe)
- Evolvable Hardware Research Group (EHW)
- Dependable Digital Systems Research Group (DEPSYS)
- Supercomputing Technologies Research Group SC@FIT (SC@FIT)
- Accelerated Network Technologies Research Group (ANT)
- Automated Analysis and Verification Research Group – VeriFIT (VERIFIT)
- IT Security Research Group (Security@FIT)
- Speech Data Mining Research Group BUT Speech@FIT(SPEECH)
- Formal Models Research Group (FM)
- Information and Database Systems Research Group (IS)
- Intelligent Systems Research Group (INTSYS)
- Cognitive and Neural Engineering Research Group (CANE)
- Management of software engineering Research Group (MSWI)
- Computer Graphics Research Group (GRAPH)
- Robo@FIT Robotics Research Group (ROBO)
- High Performance Computing Research Group (HPC)
- Computational Photography Research Group -(CPHOTO@FIT)
- Knowledge Technology Research Group (KNOT)

Department of Information Systems FIT BUT

The Department of Information Systems provides teaching of courses of the Master's degree in Information Systems and Databases. The research activities of the institute include database technologies, implementation of information systems, software project management, theory of formal languages and compilers.

Year 2023 in numbers:

- 70 subjects taught in the academic year 22/23
- 21 publications
- 12 products

Overview on the FIT website:
https://www.fit.vut.cz/units/uifs/.cs

Department of Intelligent Systems FIT BUT

The Institute of Intelligent Systems provides teaching of courses in three master's specialisations: Cybersecurity, Intelligent Systems and Mathematical Methods. The scientific research activities of the institute are mainly focused on intelligent systems, especially biometric systems and robotics, but attention is also paid to systems for specific applications, communication systems and sensor networks.

Year 2023 in numbers::

- 60 subjects taught in the academic year 22/23
- 43 publications
- 8 products

Overview on the FIT website:
https://www.fit.vut.cz/units/uits/.cs

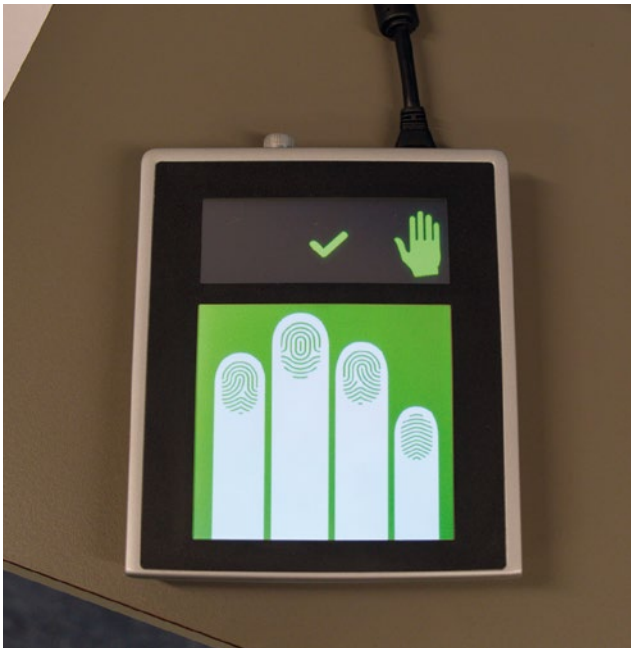


photo: Vít Staníček

Department of Computer Graphics and Multimedia FIT BUT

The Department of Computer Graphics and Multimedia is dedicated to research and teaching in the areas of human-computer interaction, multimedia and multimodal data mining, image and video processing, computer graphics, speech information mining, modern approaches to automatic systems control, knowledge-based technologies and big data processing. It builds on a solid foundation of mathematics, physics, theoretical computer science, signal processing, automation and machine learning.

Year 2023 in numbers:

- 47 subjects taught in the academic year 22/23
- 47 publications
- 5 products

Overview on the FIT website:
https://www.fit.vut.cz/units/upgm/.cs


photo: Václav Koníček

Department of Computer Systems FIT BUT

The Department of Computer Systems provides teaching of mainly hardware-oriented courses in all study programmes accredited at FIT. In the follow-up Master's degree programme Information Technology and Artificial Intelligence, it guarantees the specialisations Bioinformatics and Biocomputing, Embedded Systems and Supercomputing. The scientific research activities of the institute include HW/SW architecture of computing systems at the levels of digital circuits, single- and multi-processor systems (incl. GPUs), embedded systems, application-specific integrated circuits, reconfigurable field gate array (FPGA) systems, computer clusters and supercomputers.

Year 2023 in numbers:

- 49 subjects taught in the academic year 22/23
- 33 publications
- 2 products

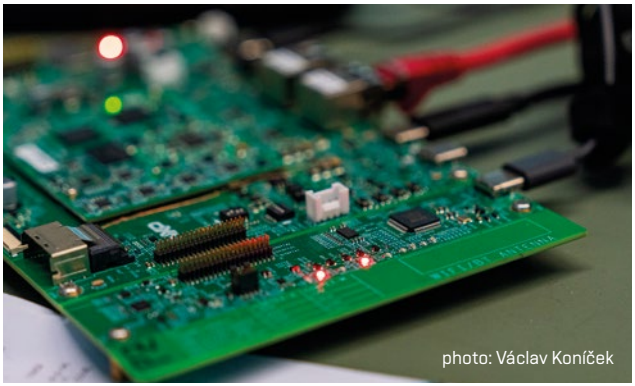


photo: Václav Koníček

Overview on the FIT website:
https://www.fit.vut.cz/units/upsy/.cs

Centres

Research Centre of Information Technology

The IT4I Science Centre is a unique project that combines the function of a research centre for academic purposes with research for the needs of the application sphere and interaction with commercial entities in the form of contractual cooperation. The main research areas are information recognition and presentation from multimedia data and secure and reliable architectures, networks and protocols. There are very good opportunities for students – they can learn about cutting-edge projects and non-academic ways of working.

Computer Centre

The Computer Technology Centre ensures the operation of computer laboratories, computer technology, faculty computer network, servers and information systems. Computer laboratories located in the centre are used for scheduled teaching as well as for projects, theses and research tasks. Outside of scheduled classes, the laboratories are freely accessible to all students of the Faculty of Information Technology.

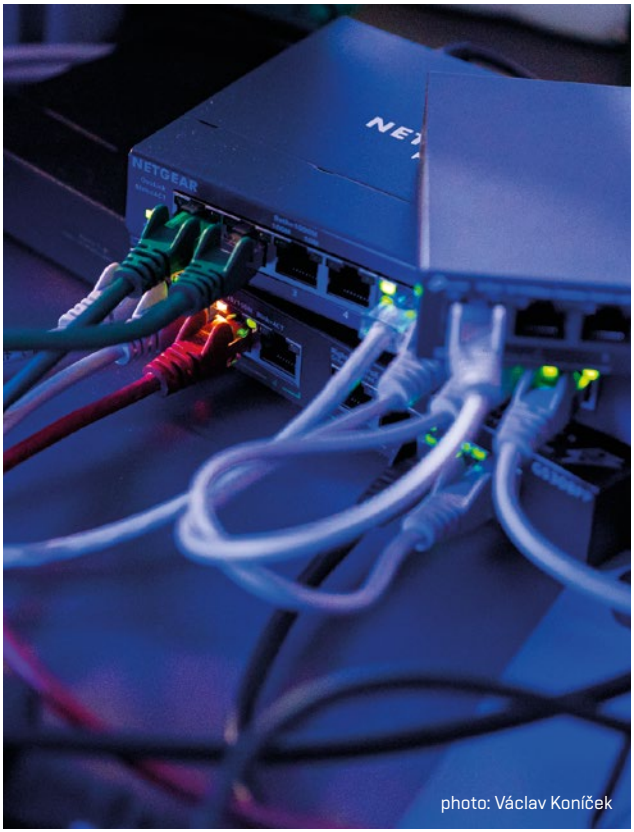
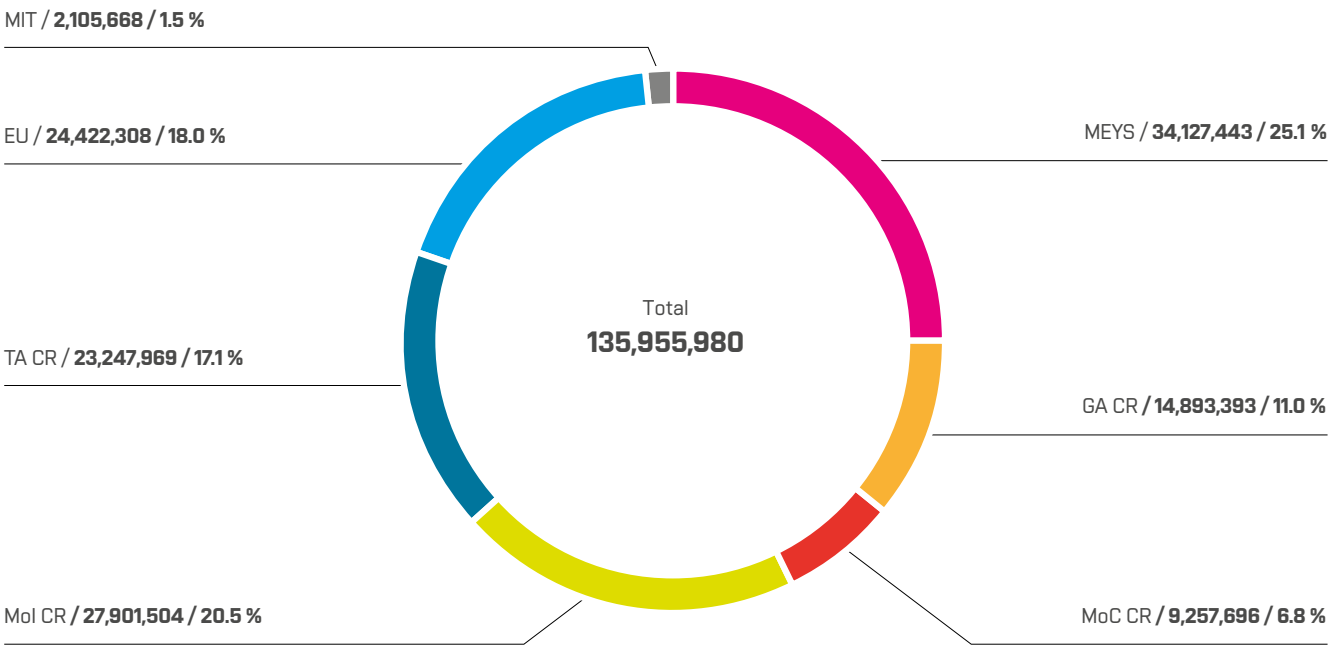


photo: Václav Koníček

Overview of projects and their funding

Project support by provider



Projects that started at FIT in 2023

Title	Research leader	Provider
Linguistic memory of the regions of the Czech Republic. Machine Learning Methods for Preservation, Documentation and Presentation of Czech Dialects	Ing. Martin Karafiát, PhD	MoC CR
Orbis pictus – reviving the book for the cultural and creative industries	Ing. Michal Hradiš, PhD	MoC CR
semANT – Semantic explorer of textual cultural heritage	Ing. Michal Hradiš, PhD	MoC CR
Smart digilink – Machine Learning for Digitizing Printed Heritage	Ing. Michal Hradiš, PhD	MoC CR
Cyber-security Excellence Hub in Estonia and South Moravia	prof. Ing. Tomáš Vojnar, PhD	EC
High Performance, Safe, Secure, Open-Source Leveraged RISC-V Domain-Specific Ecosystems	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	KDT JU
Long Life Power Platforms for Internet of Things	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	KDT JU
Professional equipment for postgraduate students	prof. Ing. Tomáš Hruška, Csc.	MEYS
Qinfo – Detection and statistical evaluation of subjective attitudes over time	prof. Ing. Adam Herout, PhD	TACR
Cybersecurity Innovation Hub	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	EC
EMIR – 5G-enabled embedded intelligence for robot autonomy and smart city monitoring applications	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	TACR
MIXER: Building a community on the issue of cryptocurrency mixers	Ing. Vladimír Veselý, PhD	MoI
Road quality monitoring based on embedded intelligence with 5G support	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	TACR
NGIO Entrust Hop On	doc. RNDr. Pavel Smrž, PhD	EC
Planning and registration of improvised shelters	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	MoI
Advanced analysis and verification for advanced software	prof. Ing. Tomáš Vojnar, PhD	GACR
Practical verification of the possibility of integration of artificial intelligence for receiving emergency calls using a voice chatbot developed within the research project BV No. VI20192022169 with the technology for receiving emergency communication 112 and 150 in the Czech Republic (TCTV 112)	Ing. Petr Schwarz, PhD	MoI
Representation of Boolean functions using an adaptive data structure	Ïng. Ondřej Lengál, PhD	GACR
RoSuM – Localization of horizontal and vertical traffic signs, quality control and regular passporting with 5G support	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	TACR
VESCAA: Verifiable and efficient controller synthesis	doc. RNDr. Milan Češka, PhD	GACR
DynaCount	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	TACR
Activity B (FSI) – Support for the creation of new study programmes in progressive fields	doc. Ing. Peter Chudý, PhD MBA	MEYS
Application-specific HW/SW architectures and their applications	prof. Ing. Lukáš Sekanina, PhD	BUT
Smart information technologies for a resilient society	doc. Ing. Petr Matoušek, PhD, M.A.	BUT

Title	Research leader	Provider
Reliable, Secure, and Intelligent Computer Systems	prof. Ing. Tomáš Vojnar, PhD	BUT
Modern methods of multimedia and 3D data processing, analysis and display	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	BUT
PGine: Py/Bioconda software package for calculation of polygenic risk score in plants	Ing. Martin Hurta	BUT

Other projects at FIT in 2023

Title	Research leader	Provider
Framework of key enabling technologies for safe and autonomous drones´ applications	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	ECSEL JU
Neural Representations in multi-modal and multi-lingual modelling	doc. Ing. Lukáš Burget, PhD	GACR
Alliance for developing, teaching and training Digital Forensics and Incident Response students and practitioners	doc. Ing. Ondřej Ryšavý, PhD	EU
Deep learning in psychotherapy: Machine analysis of recordings of therapy sessions	Ing. Pavel Matějka, PhD	TACR
EmIC – Embedded intelligence for smart cameras with computer vision applications in transport and industry	doc. RNDr. Pavel Smrž, PhD	TACR
International Mobility of Brno University of Technology Researchers II	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	MEYS – OP R&R
Multi-linguality in speech technologies	prof. Dr. Ing. Jan Černocký	MEYS
Multiple Intelligent Conversation Agent Services for Reception, Management and Integration of Third Country Nationals	prof. Dr. Ing. Jan Černocký	EC
Next Perception	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	ECSEL JU
Next generation integration of atomic force microscopy and electron microscopy	prof. Ing. Adam Herout, PhD	TACR
Verification and Validation of Automated Systems' Safety and Security	Ing. Aleš Smrčka, PhD	ECSEL JU
Encrypted traffic analysis based on contextual analysis using flow data	doc. Ing. Ondřej Ryšavý, PhD	TACR
Automated design of hardware accelerators for computational resource-aware machine learning	prof. Ing. Lukáš Sekanina, PhD	GACR
BUTCube – small satellite technology demonstrator development	Ing. Petr Gaďorek	MEYS
Laser sensor for autonomous truck driving	doc. Ing. Peter Chudý, PhD, MBA	TACR
International cooperation in the forensic analysis of fingerprints and facial images for the Criminal Police Service	Ing. Jan Pluskal, PhD	MoI
Nanoradar for autonomous truck driving and its industrialisation 4.0	doc. Ing. Peter Chudý, PhD, MBA	TACR
Universal telemedicine software libraries	Ing. Petr Sadovský, PhD	MIT

Title	Research leader	Provider
WIM Latin America	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	MIT
Next generation safe transport systems	doc. Ing. Vítězslav Beran, PhD	MoI
Intelligent sensors for traffic monitoring	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	MIT
Non-invasive and safe identification of objects and products	prof. Ing. Adam Herout, PhD	TACR
Development of an autonomous monitoring centre	prof. Ing. Martin Drahanský, PhD	MIT
PGine: Py/Bioconda software package for calculation of polygenic risk score in plants	Ing. et Ing. Jana Schwarzerová, MSc	BUT
AppNeCo: Approximative neural calculations	prof. Ing. Lukáš Sekanina, PhD	GACR
Activity A2 – Transformation of the form and content of education at Brno University of Technology	doc. Ing. Richard Růžička, PhD, MBA	MEYS
Activity A1 – Transformation of the form and content of education at Brno University of Technology	doc. Ing. Richard Růžička, PhD, MBA	MEYS
TENACITy: Travelling intelligENce Against CrIme and Terrorism	Ing. Vladimír Veselý, PhD	EC
A suite of forensic analytical tools for image and video processing for the Criminal Investigation and Police Service	Ing. Jan Pluskal, PhD	MoI
Protecting aviation from low-energy lasers	doc. Dr. Ing. Dušan Kolář	TACR
Encrypted traffic analysis using network flows	doc. Ing. Ondřej Ryšavý, PhD	MoI
AISEE – AI Software Expert Search Engine for Videos and Photos	doc. RNDr. Pavel Smrž, PhD	MoI
Eyes for Information, Communication, and Understanding	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	EC
Closed-loop Individualized image-guided Transcranial Ultrasonic Stimulation	doc. Ing. Jiří Jaroš, PhD	EC
AI enabled artistic solutions for sustainable food systems	doc. RNDr. Pavel Smrž, PhD	EC
5G-ERA – 5G-Enhanced Robot Autonomy	doc. RNDr. Pavel Smrž, PhD	EC
System for diagnosis and protection of bridge structures using WIM	prof. Dr. Ing. Pavel Zemčík, dr.h.c.	TACR
Multilingual assistant for information search, analysis, processing and decision support	doc. RNDr. Pavel Smrž, PhD	TACR
Distributed Artificial Intelligent Systems	doc. RNDr. Pavel Smrž, PhD	ECSEL JU
AI-augmented automation for efficient DevOps, a model-based framework for continuous development At RunTime in cyber-physical systems	doc. RNDr. Pavel Smrž, PhD	ECSEL JU
Exchanges for SPEech ReseArch aNd TechnOlogies	Ing. Radim Kudla	EC
HumanE AI Network	prof. Dr. Ing. Jan Černocký	EC
Efficient finite automata for automatic inference	doc. Mgr. Lukáš Holík, PhD	MEYS
Bio-inspired methods for resource aware computer system design	prof. Ing. Lukáš Sekanina, PhD	COST
Robust recording processing for operations and security	Ing. Martin Karafiát, PhD	MoI
Development of an application for the automated registration of hunted wild game on the basis of the individuality of the structure of the skin tissue of the external nose	prof. Ing. Martin Drahanský, PhD	MoA

Selected projects

Think about it, if you're having lunch

Whenever you get hungry, you get up and open the fridge – worst case scenario, you order food through the app – that's all you have to worry about. But behind every bite is a much longer chain that starts months before your lunch and certainly doesn't end with throwing the leftovers in the trash. How can we help agriculture operate more sustainably, more organically and provide the best possible nutrition for people? These are not the only questions that scientists from the BUT, artists and, last but not least, artificial intelligence are asking together in the Hungry EcoCities project.

How to simply describe an unconventional combination of disciplines with perhaps not entirely tangible outcomes? Maybe as a debate about the future of innovative agriculture, thanks to the opinion of people who think about other topics and in other ways. The aim is to gather even seemingly crazy ideas that can take food production, distribution and consumption to a new level. The idea of vertical gardens first appeared only twenty years ago and today tomatoes grown in hanging pots in sheds without natural light are common in the Czech Republic. So why not try letting your imagination run wild?

We don't have to immediately address issues such as hunger in poorer countries on the other side of our comfortable lives, but rather focus on topics such as soil degradation, biodiversity loss, declining nutritional value of food, or civilization diseases like obesity.

Where does Brno technology come into it? „We are also coordinating and cooperating with KU Leuven. Both teams are working on artificial intelligence, but they may focus more on the ethics of using large language models, while we are, for example, working on explainability

Consortium meeting in September 2022

of artificial intelligence decisions and processing data from sensors. These sensors might monitor individual plots and plants or measure the amount of water in the soil and similar things," calculates Pavel Smrž from the Faculty of Information Technology at BUT.

„The European project we are coordinating is very rewarding. In other projects, we meet mostly technical experts who work in related fields and think similarly to us. Hungry EcoCities is exceptional because it has managed to invite world-class art studios and people who make a difference in art and architecture to the consortium." Smrž points out that in addition to universities and interest associations, renowned design and architectural studios such as Carlo Ratti Associati, the designers behind the Italian pavilion at the Dubai EXPO, Berlin's Studio Other Spaces, or Dutch architectural historians Stephan Petermann and Rem Koolhaas have also been involved.

We are looking for artists/technicians/data analysts

All the aforementioned, including Mendel University, are not the only participants in the project. Artists from all over Europe also play an important role, submitting their ideas to the project. „The first challenge is already behind us and it was very successful, there was a lot of interest. We had a strict limitation, only relevant candidates applied, even so there were more than sixty," says Pavel Smrž, satisfied with the level. One of the conditions was that the artists must also deal with the technological component of the idea and work with data.

„The selected art projects focus on sustainable use of local raw materials and on improving people's diets, improving the whole process from growing to distribution and sales," explains Smrž, showing me the presentation of the ten selected artists.

Plants under stress and a low-carbon cookbook

For example, an idea called Acoustic Agriculture is dedicated to measuring the impact of city sounds on plant growth. Another participant is investigating the symbiosis of plant roots with fungi in the soil and its possible use to enhance plant resistance. The authors of the Future Protein project want to be able to calculate the maximum yield when growing mussels and at the same time suggest other uses for mussels, for example. Another interesting topic is the Symbiosis.AI project – it wants to record plant stress using sensors, understand it and ideally turn it into a positive outcome.

But more artistic ideas have also succeeded, such as a low-carbon cookbook that takes into account ingredients available at home, an engaging AI-generated documentary on food logistics, or a project to map different cultural customs around food and design new utensils and other tools.

Don't just stay on paper

„The projects are now going through what's called a residency, which means the artists spend time with the art studios. Some studios prefer short-term visits, others longer stays. The residency lasts nine months and the artists are paid during that time. The contribution also covers their travel and living expenses and the materials they need," explains Pavel Smrž, noting that the competition did not end with the announcement of the winning designs. In addition, each of the selected artists received money just to try to turn their idea into reality.

And it is not only universities and professional studies that help, but also modern technology. AI – artificial intelligence – is woven through the entire project like a thread. Today, we see it as a chatbot that we ask what to wear in a given weather, or have generate profile pictures for social networks. But for scientists, artificial intelligence is something they have been working with for a long time, albeit under the term machine learning. Pavel Smrž draws attention to another modern aspect of art and research projects: „All, or at least most, of the results should be available as open data, and we try to make as much as possible available with a Creative Commons license. We want it not to end with just showcasing projects but for them to be accessible and for projects from the second call to build upon them."

Drones and harvesters

The next round of the Hungry EcoCities project will go one step further, this time inviting smaller and medium-sized agricultural entrepreneurs themselves. „We already have some initial interest from drone operators; we have artists who would like to work in the field of satellite monitoring and propose landscape development in countries such as the Netherlands. There, they rightly feel threatened by climate change, as the majority of the country is below sea level," project coordinator Pavel Smrž looks to the future.

In the second phase of the competition, planned for 2024 and 2025, 10 more winners are to be selected. This time it should be more tangible projects, ideally culminating in the creation and verification of prototypes of new technologies. But the idea remains the same – to get people to think, at least for a moment, about what we take for granted, when it is a huge and enjoyable part of our lives. Bon appetit.

Tereza Cinka

FIT speakers cross borders and find understanding

The twenty-four-member BUT Speech@FIT team at the BUT Faculty of Information Technology consists of experts from eleven nationalities. In their offices, you will encounter English as often as Czech. And the very thing that may at first sight divide researchers unites them all – a common passion for language and languages in all their forms.

Call centres, psychologists and secret services – these are all customers of the so-called FIT speakers. "We are in the business of mining data from speech. Some would say we are in the speech recognition business, but that narrows our scope quite a bit. We are simply trying to get the maximum possible data from it," says Jan Černocký, the head of the research group. In the office of a world-class expert lies a clarinet on the table, an overwhelming amount of documents, and a scooter leaning against the door. Just a moment ago, Jan Černocký was zooming around the institute's corridors on the scooter to invite one of his colleagues for the interview.

"Speech processing has recently come very close to natural language processing. Santosh here is involved in this; he's one foot in speech and the other in text processing," smoothly hands over the conversation to another member of the research group. Santosh Kesiraju came to FIT eight years ago. We all speak English together, but the speakers, as time goes on, convince me more and more, care little about the specific language.

It doesn't matter how many languages you speak

"Let me give you an example. Somewhere in the world a disaster happens, and it is, for example, in an area where people speak Somali or Bengali, languages for which language technology is not available. You need to find out what's going on there and if they need help," Kesiraju explains one of his projects. The source of the data is, for example, local TV news, which needs to be automatically translated into English. And ideally very quickly. "Now I'm working on translating speech into text. That is, one speaks in one language, but the text is already in another language. It can be used for example as an automatic subtitling not only for movies," continues Santosh Kesiraju.

It focuses primarily on translations of languages that have little or no written record. Kesiraju excitedly explains: "One of them is Tamasek, which is spoken by about one million people in North Africa. Linguists have managed to translate some of the recordings of the local news into French. So we have spoken speech in Tamashek and written translation in French, and we don't know what the writing in the original language looks like." This will not result in a perfect translation, but the general information and the topic of conversation can be obtained without much difficulty.

How we played drug dealers

Generally speaking, Brno researchers can find out whatever they want from the available recordings. "We can identify the language, the particular speaker and partly the stress. In one of our projects we are trying to develop technologies together with psychotherapists that will improve the quality of psychotherapy sessions," Jan Černocký names a few examples and talks more about the last one: "A good therapist wants to improve. Sometimes the recording of the session is analysed by a mentor who finds out who is talking more, if the session is flowing, if there are any problems. But most of the time, these tasks fall directly on the therapist and it is difficult to perform the role of analyst well." The DeePsy project is created in cooperation with psychotherapists from Masaryk University.

The work of speech researchers in Brno certainly doesn't end up in a drawer. Thanks to collaborations with universities, intelligence agencies, or air traffic controllers, algorithms from BUT are actually being used and making a difference. When the work is also fun, one understands what the international success of BUT Speech@FIT is based on. Jan Černocký confirms: "We are in the ROXANNE project, which is a large European security project that is trying to link speech processing and criminal network analysis. In it, we try to uncover the behavioural patterns that are the basis of communication between these people. We also have real police officers working with us, but because we don't have access to "hot" cases and data, we had to create the data ourselves. We played drug dealers and called each other in different languages."

Researchers are also currently working on simplifying the answering of calls to the 112 emergency line, which would help emergency responders in situations such as mass disasters and call overload. Another project in progress aims to simplify communication between air traffic controllers and pilots. Informaticians from Brno Technology have also completed a project of mining information from the voices of people calling call centres. And I could go on forever.

“Hello, who’s calling? And are you human?”

“I’m not afraid that artificial intelligence will enslave us or robots will start shooting at us, but deepfakes are already very real and it will get worse and worse,” Jan Černocký says when asked about artificial intelligence and synthetic voices. Today, anyone can not only create a robot that speaks with his or her voice, but thanks to the vast amount of recordings and data, it can mimic almost any public figure very easily. So the speakers, in collaboration with computer security experts from a neighbouring institute, submitted a proposal for a project to help verify who is actually speaking and whether it is a human or an artificial voice.

“The quality of the deepfakes is already very good and will get better. The tools will be freely available to everyone, so it is to be expected that crime committed in this way will increase. Older people will be very vulnerable, and not only them. We now know what spam looks like in an email or mailbox, but if someone calls you from a number you know – that can already be done today – and they’re speaking in your loved one’s voice, they can do a lot of bad things.”

What other areas are still challenging for scientists in speech processing? According to Santosh Kesiraju, it is the determination of emotions: “It’s very hard to recognize them just by their voice. For example, when a person laughs, we cannot say for sure that he is happy or excited. We can say that it is a rather positive emotion, but sometimes it can be laughter from stress.” And Jan Černocký nods: “How do you want a computer to know how a person is feeling by their voice when even we humans can’t agree?”

Events at BUT 04/2022-2023/

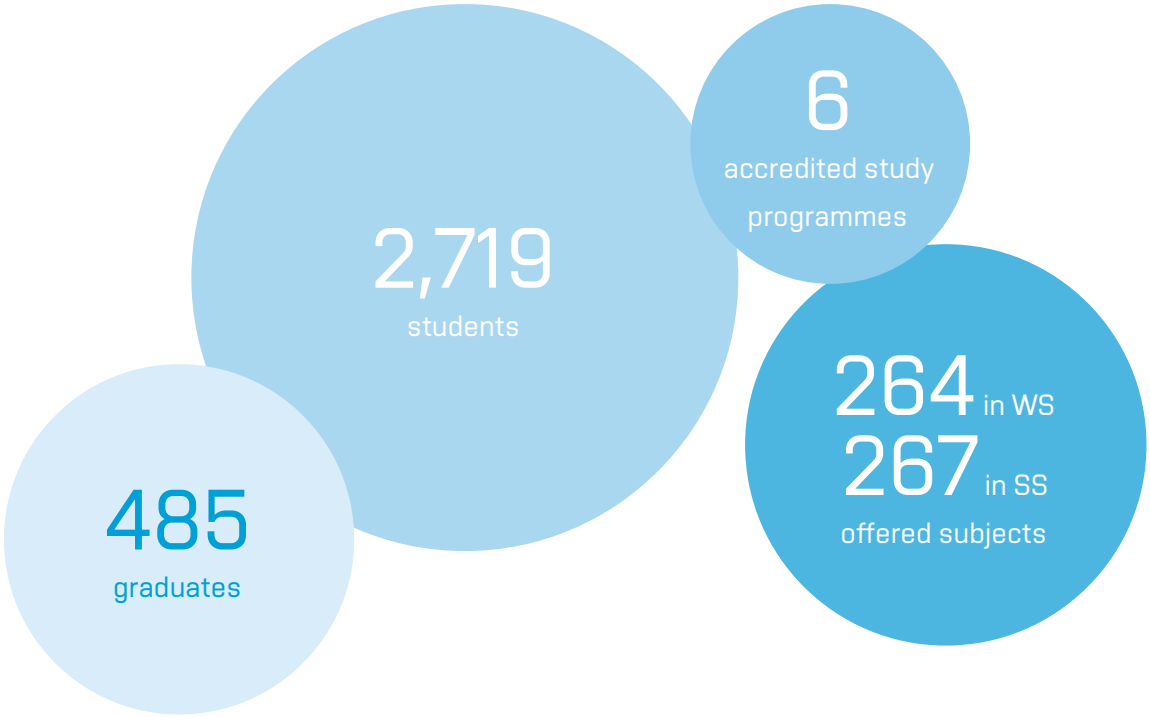
photo: Jan Prokopius

Education and Study

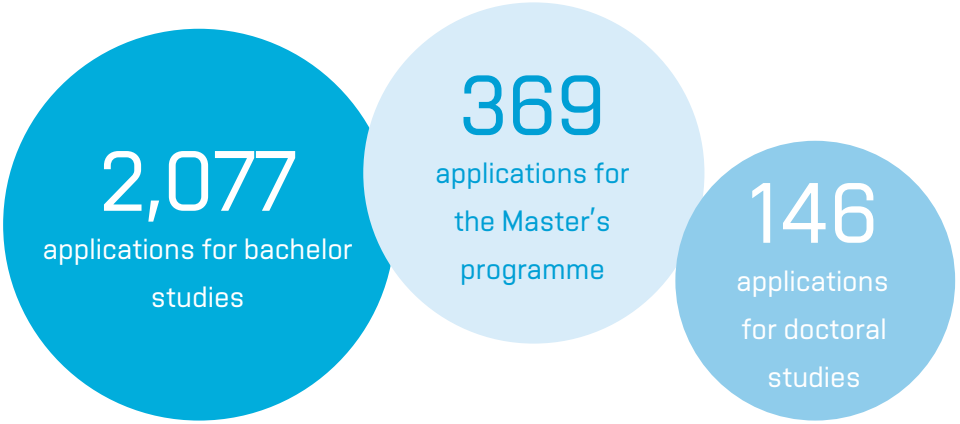
Currently, the Faculty of Information Technology provides education of professionals with the qualification of Bachelor (B.Sc.) in a three-year Bachelor's degree programme, Engineer (Ing.) in a two-year follow-up Master's degree programme and Doctor (PhD) in a four-year doctoral programme.

photo: FILMONDO

Academic year 2022/2023 in numbers



Interest in studying at our faculty



Selected achievements of our students

Barbora Šmahlíková from FIT BUT is the first laureate of the Government Award for a Gifted Student

Barbora Šmahlíková from the Faculty of Information Technology of Brno University of Technology is the winner of the first year of the Government Award for a gifted student for her contribution in the field of development of algorithms, so-called omega automata. The award for 2022 was presented to her by the Minister for Science, Research and Innovation Helena Langšádlová on 8 June at the Hrzánský Palace in Prague.

Barbara Šmahlíková's name has been resonating among experts in her field for the last few months, as she is the first person to have managed to improve the algorithm of Büchi automata. The results of her research have resulted not only in several publications, but also in many awards. In addition to the Government Prize for a gifted student, she also won the Rector's Award at the Academic Assembly, received the Zdena Rábová Award and was in the final line-up of 8 competitors from BUT.

Barbora Šmahlíková has been involved in research since the beginning of her bachelor studies. Her work in the field of algorithm development, so-called omega-automata, soon resulted in publications at international conference forums, which are mostly reserved for PhD students. The algorithm for complementation, which she was instrumental in creating, is currently one of the world's best. "It's basically an abstract model that is used in theoretical computer science, and I'm involved in their complementation. It is used as a test system that monitors and verifies the properties of a system," explains Šmahlíková.

Based on the faculty recommendations and her academic performance to date, Barbora is a truly exceptional student with a great aptitude for science and research. She is currently studying a Master's degree in Information Technology and Artificial Intelligence with a specialization in Mathematical Methods. "Although this is not the first award I have received for my research, it is certainly the most meaningful for me. I see it as a confirmation that what I do is meaningful and that people outside my field can appreciate it. At the same time, it is a great responsibility for me because I think there are a lot of young people here who are doing very interesting and beneficial things. And

Barbora Šmahlíková received the award from the Minister for Science, Research, and Innovation, Helena Langšádlová.

the fact that I was chosen is something that gives me another wave of motivation. And I want to prove not only to others, but also to myself that I deserve the award," Šmahlíková said.

"It is a great honour for BUT to have our student become the winner of this award in the first year. There were many students who entered the competition and all these young people give us hope that our society is doing well. Because we can expect these talents to open doors for others. This is not the first award for Barbara. She has already received numerous awards at the university and at conferences for her excellent theoretical research, study results, as well as other contributions that exceptionally increase the prestige of FIT and BUT. It is a miracle that this young woman with humility is able to devote herself to a field that is very difficult and many students, even in doctoral studies, have not achieved the results she has achieved in publishing," says Iveta Šimberová, Vice-Rector for Internationalisation of the BUT.

The award is being presented for the first time in history. A total of 20 students were nominated. The award is decided by the Government on the proposal of the Council for Research, Development and Innovation. Together with the prize, the laureate will receive a reward of CZK 50,000. The new government prize is an opportunity to award a talented high school or university student each year with the aim of promoting research activities and attracting young hopefuls for a future career as a scientist.

Two PhD students from FIT succeed in the Joseph Fourier Prize competition

For the 13th time, Atos, in cooperation with the Embassy of France, recognized the work of young scientists in the framework of the Joseph Fourier Prize for Computer Science and Informatics. Two students from FIT BUT were among the winners. Ladislav Mošner secured the second place for his work titled „Far-Field Speaker Verification Incorporating Multi-channel Processing," while Jiří Matyáš claimed the third position for his work on „Applications of Formal Methods in Approximate Computing."

Ladislav Mošner's work focuses on the verification of human identity from speech recordings made with remote microphones in acoustically difficult conditions. It mainly focuses on exploring the possibilities and usefulness of microphone arrays and combining information from multiple channels (microphones) using machine learning. Through his research, he found that compared to results obtained using only single microphone recordings, the accuracy of verification can be significantly improved in this way. The results of his work can be used, for example, to provide personalised responses and reactions to smart home assistants or to improve access control systems.

Ladislav Mošner secured the 2nd place in the Joseph Fourier Prize.

Jiří Matyáš, in his project, focused on enhancing the performance of computer systems through the utilization of approximate computation. This approach aims to accelerate calculations and enhance efficiency by tolerating acceptable inaccuracies. Specifically, the project concentrated on search algorithms for the approximate design of hardware arithmetic circuits. The presented results significantly improve the performance of search algorithms for approximating arithmetic circuits. This allows us to obtain approximations of large bit-width circuits with complex internal structure (e.g., 32-bit multipliers or 128-bit adders) that provide the best known approximation error-to-power consumption ratio to date.

The third prize of the Joseph Fourier Prize was awarded to Jiří Matyáš

The method proposed by Jiří Matyáš uniquely combines optimization algorithms based on genetic programming and formal verification methods for automated proof of system properties and has interesting practical applications. Streamlining computations at the cost of acceptable inaccuracies allows to increase the performance of small devices (e.g. mobile phones) while reducing their power consumption. This allows us to have more powerful mobile phones with a significantly longer battery life.

Two students were awarded in the Brno PhD Talent program and will receive a three-year scholarship for postgraduate studies

Tibor Kubík and Alexander Polok from the Faculty of Information Technology impressed the jury of the Brno PhD. Talent program and will receive a three-year scholarship worth CZK 330,000 to enable them to focus more on science.

Tibor Kubík, under the supervision of his advisor Ing. Michal Španěl, PhD, aims to focus on Graph Neural Networks for 3D Shape Analysis. „3D shapes are coming to the forefront in medicine, enabling precise analysis of complex geometric details in dental treatment planning or brain analysis. Digitization came with new manual tasks such as 3D segmentation, annotation and others. Analyzing 3D shapes by machine learning is more complex than analyzing image data, and in the medical field even more so. My goal is to design new specialized 3D deep learning approaches to automate critical processes in 3D digital medicine," Kubík explains his scientific goal.

Alexander Polok has set Holistic Dialogue Modeling as his scientific goal. The project is motivated by the limitations of currently used neural conversation systems, specifically their component-based architecture. While these systems excel at simple task-oriented interactions, they often fail at providing truly natural and context-aware dialogue experiences. The project aims to explore the area of jointly training these models to improve predicted outputs, reduce internal information loss and reduce system latency. His supervisor is prof. Dr. Ing. Jan Černocký.

Filip Macák placed 3rd in the elite IT SPY 2023 diploma thesis competition

IT SPY is an elite competition for the best diploma thesis in the field of computer science and information technology. Every year, 20 Czech and Slovak universities participate in the competition and up to 1,500 defended papers are submitted. Filip Macák from FIT BUT with his work Improvement of synthesis of finite state controllers for POMDP under the supervision of Milan Češka took 3rd place in a record number of competitive projects.

The award ceremony took place in the refectory of the Faculty of Mathematics and Physics at Charles University in Prague on 22 November. The quality of the competition entries is judged by an academic jury in terms of research, research, evaluation of solutions and implementation.

Promoting student entrepreneurship in 2023

Star(t)up@FIT is a programme that helps students to break into the world of business. It brings together and educates interested students from the Faculty of Information Technology interested in developing their own IT projects, supports the development of these projects to the product stage, offers consultations from industry experts, and helps to establish business cooperation and start-ups. The programme is for all students who have an idea but don't know how to develop it, for those who have already started and want to take it commercially, and for those who still „don't know how to do it".

Thanks to this program, students can learn to think and act like entrepreneurs, acquire important business and project skills, advance their ideas, fine-tune their technological solutions, learn from the inspiring experiences of successful companies, meet similarly minded and enthusiastic colleagues, and gain basic know-how for their own commercial activities.

photo: Václav Koníček

Winners of the Booster Challenge 2023

First place and a prize of 60,000 CZK went to Mário Havran and Dominik Klement with their project VOLTEEK. Their startup offers a modular BCS (Battery Control System) for a wide range of applications from small construction machines using low voltage to storage systems reaching MWh capacities and hundreds of volts of voltage.

The evaluation committee was impressed by the good technical processing of the project and its great market potential. It also appreciated the level of work that the award-winning students did on the project since entering the competition, as well as the readiness of the solution for production and market deployment.

Second place went to Jakub Mašek and Martin Zelenák with their project Wireless timer for fire attack. Marko Poľanský with his project Bazoš bot was also among the winners.

The Booster Challenge is part of the project Star(t)up@FITwhich offers support to startups. It helps students think and act like entrepreneurs, learn business and project skills and, most importantly, move their ideas into commercial implementation.

photo: Václav Koníček

Creative ideas from students in 2023

Student Matúš Nosko came up with an original ecosystem for smart homes. His equipment sells by the dozens

Matúš Nosko designed his own IoT ecosystem that connects various devices to smart homes, such as pumps or solar panels, thereby saving money and the planet. With the support of the faculty, he founded a successful startup and also utilized his idea as the topic of his bachelor's thesis.

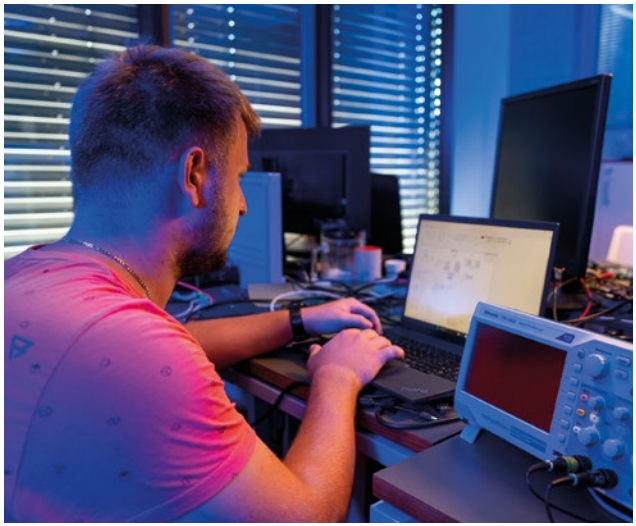


photo: Václav Koníček

Matúš had already been developing a smart home product for a year before completing his bachelor's degree. So when he was faced with the choice of a topic for his bachelor's thesis, he thought he would take the opportunity to look at the whole thing more scientifically. „I focused on a wireless sensor network with the intention of incorporating the results of my work and academic findings into a commercial product in the future. I bridged both worlds," he confirms.

Specifically, Matúš is dedicated to developing devices that can turn household appliances „smart". " Simply put, our product is a box that connects to another box. In the final phase, it is then connected to systems such as smart home or smart garden," describes Nosko and continues: „At the moment we are using it to control the pump motors through a device called a frequency converter. We have a partner from Slovakia who supplies us with frequency converters, and we use our product to connect them to the smart home system."

Thanks to this, Matúš says, it is possible to optimise operations, save money and the planet, and detect possible malfunctions. „The ultimate goal is for the user to have an overview of what's going on with their house. In this case, with his pump. He needs to know what the pressure is, whether there is a fault in the water system and whether he is leaking water, for example," Matúš says.

Another great advantage of its equipment is that service centres can connect to it. „They can detect a fault so remotely. Alternatively, if they send an inexperienced technician to the house, for example, they can just connect the pump to our equipment and the service centre can then assist them and tell them what to do," Matúš explains. Some people will also gradually realise that they have chosen a relatively complex technology and will probably not be able to do without service technicians even in a smart home. „The pump is not easy for the average user to understand and operate. There's a lot of technical knowledge, physics. We therefore show users the basic functions. They can see if the pump is running, if everything is okay, what the pressure is. But they can't, for example, change the motor current," he points out.

What is interesting about his solution is that it is not just about the device itself. Matúš Nosko has combined many existing and proven technologies together to create his own ecosystem, in which this first product should be just one component in the future. „Even when I was writing my bachelor's thesis, I was thinking about continuing it, because this thesis set some foundation for the whole ecosystem. However, many problems and more advanced features are not solved

there. For example, how devices across the network will be updated. In my thesis I want to develop the topic further. There's still a lot to deal with," says the student, adding that he plans to do things like monitor his home solar power plant in the future.

They can't keep up due to high demand

According to Matúš Nosek, the fact that the product from Nosek's company MaNoSens is now used mainly for pumps is more of a coincidence. „It's a universal device, so we can replace firmware and use it elsewhere. We also have a lot of ideas and suggestions where we could use them, but at the moment we are so absorbed in our work with pumps that we can't keep up," he says, adding that even now they are selling their boxes by the dozen. „Within a fortnight, several dozen devices were sold, and the gardening season is already over," Nosko adds.

The MaNoSens company now consists of Matúš as the main programmer, his brother who is in charge of administration and sales, and a friend who takes care of marketing. It plans to expand it in the future. He would also like to establish cooperation with the faculty. „We are debating some options. But the faculty helped us a lot overall. Our business was basically started by the Booster-Challenge@FIT competition. The organizers provided us with 3D printers and then helped us with the start-up of the company and advice, which we appreciate very much," says Matúš Nosko in conclusion.

A team of FIT students created an app for board game lovers. Board Aid offers more fun when playing

In the beginning, there was interest in mobile apps and frustration over the user-unfriendly specifics of some board games. The result is a fully functional and already widely available Board Aid application, which was created in the course Creating Applications for Mobile Devices, in the hands of members of The Board Aid Team under the supervision of Adam Herout from FIT.

The Board Aid Team is a four-member group of talented students from the Faculty of Information Technology consisting of: Petr Šilling, David Holas, František Maštera and Vojtěch Čoupek. "We assembled a team out of our interest in mobile apps and were looking for a topic for a project. Since we have 2 board game lovers in our team, we thought of doing something for them. The specific idea then came from frustration over some special dice and related problems if, for example, such dice were lost", explains Petr Šilling, one of the creators of the app.

From a five-credit course to a user-friendly app

Subject Mobile application development (TAMa), led by Adam Herout and Vítězslav Beran from FIT, is designed to develop an idea into a functional application on a chosen mobile device during the semester. "The development takes place throughout the semester and there are several workshops where the progress of the development is gradually presented," adds Petr Šilling. Despite their dedication to their work, these promising IT enthusiasts had to face several difficulties on their way to the final product. "It was quite difficult to reconcile our ideas about AI with the users' ideas we got from testing. For example, we found several times that we make some of the buttons in the app too small. It was also a problem to unify the look of the user interface, especially with regard to supporting both light and dark, as is common today", one of the authors outlines a few minor obstacles. However, they were not discouraged, and in addition to the five credits for the course, they were able to claim authorship of an app that allows for a better gaming experience when playing board games.

The Board Aid app is a tool that makes playing your favourite board game much easier and allows you to focus purely on the experience. Don't you have a dice, a timer, a counter? Never mind, this app will replace them. Don't you want to keep re-entering settings or doing complicated searches? That's what Board Aid is for.

Cooperation with secondary schools

In 2023, the faculty organised and undertook a series of activities aimed at high schools:

- Summer school (F)IT for girls, designed for female students of secondary schools, in cooperation with partner companies on 28. 8. – 1. 9. 2023 (workshops, seminars, demonstrations, excursions, meetings with successful IT graduates)
- Lectures, panel discussions, workshops and presentations by faculty research groups at AI4Talents in VIDA science center 13. 10. – in cooperation with JIC, partner companies and FI MU
- Excursion to FIT of students from Dobruška Secondary School and Gymnasium Brno, Vídeňská
- Presentation of FIT studies by our students at selected vocational secondary schools and grammar schools for 4th year students, as well as at mini-fairs of IT faculties at secondary schools in the Czech Republic and Slovakia (Brno, Blansko, Opava, Židlochovice, Třebíč, Pardubice, Banská Bystrica).
- Open days for prospective students 3. 2. and 18. 12.
- Participation in the Gaudeamus trade fairs for post-secondary education in the Czech Republic and Slovakia (Bratislava, Brno, Nitra, Košice, Prague).
- Specification and offer of SOT topics for interested students from secondary schools
- Offer of participation to students of Brno secondary schools at the conference of student projects Excel@FIT 2023 (4. 5.) and at the conference of new IT technologies We Live IT 2023 (10. 11.).
- Collaboration with selected secondary schools and grammar schools in a working group (Brno, Opava, Olomouc, Pardubice, Zlín, Ostrava) – school principals and IT teachers.

.

Gymnasium Vídeňská excursion to FIT

Excursion to Dobruška Secondary School at FIT

Students Jakub Facálek and Marek Fadrný presented their studies at FIT at the Academic Day in Pardubice.

Professor Adam Herout discussed with applicants from SPŠT Třebíč.

Programming, virtual reality, biometrics and meetings with IT professionals. All this was on the agenda of the 17th IT Summer School for Girls

The last week of August at the Faculty of Information Technology was dedicated to the Summer School of IT for Girls, an event for all high school girls who are interested and attracted by the world of IT. 35 participants from different parts of the Czech Republic came to the 17th edition. The programme of the summer school is designed to give participants a fun and creative way to experience what IT involves. And maybe even get inspired about where to direct their future careers. What did the high school girls with a passion for IT expect?

Within the framework of a busy programme, they were introduced to a wide range of topics and areas that can be studied at FIT. They could try how to program a robot, design their own mobile app and create a prototype on a 3D printer, and delve into the secrets of virtual reality and biometrics. In a workshop under the auspices of Karol Rástočný from Micro-Epsilon Inspection, they learned how to solve the problems of automatic tyre quality control using computer vision and artificial intelligence. Representatives of our partner companies Honeywell and Seacomp presented the cutting-edge technologies developed by their companies and outlined the possibilities of cooperation with FIT students.

The final meeting with professionals from leading technology companies was a great success, where Veronika Bartoňová from Kyndryl, Nikol Svobodová from Kinalisoft and Kateřina Kočendová from SAP came to share their experiences and careers in IT.

Where did the idea of the IT Summer School for Girls come from?

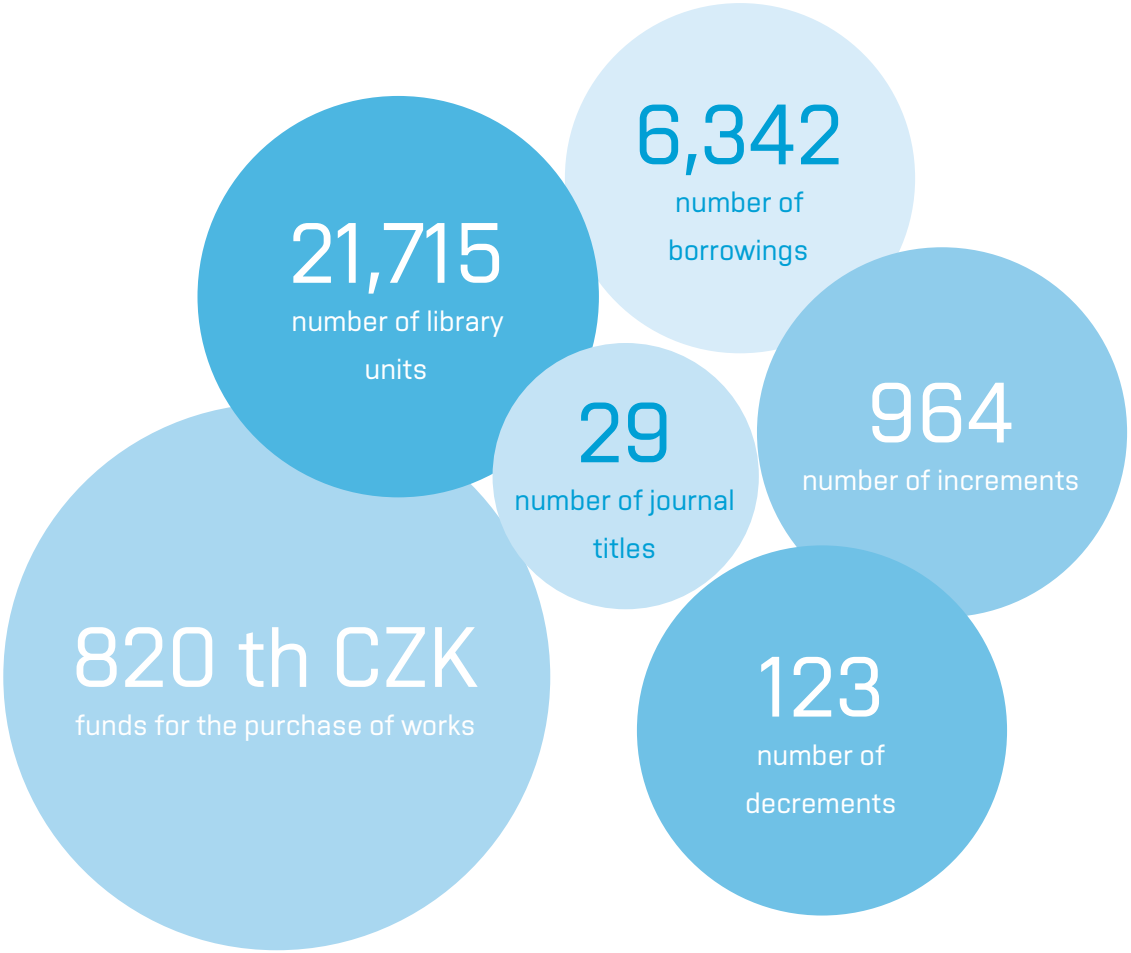
Currently, approximately 10% of students at our Faculty of Information Technology are female out of a total of approximately 2 700 students.

This percentage is not the highest and certainly does not correspond to the distribution of men and women in society. Aware of the underrepresentation of women in the IT field, Professor Jan M. Honzík, who served as the Dean of the Faculty of Electrical Engineering and Computer Science at the Brno University of Technology in the 1990s, founded the tradition of the Summer School of IT for Girls in 2005. He saw this underrepresentation as a major problem. He was and is convinced that the lack of women is detrimental to the industry, while the IT industry has a lot to offer women.

The organizer of the Summer School Ing. Šárka Květoňová and her participants during an interview for Hit radio.

Library

Over 21 thousand library items, 100 study places and 20 places with computers and terminals are available 55 hours a week in the Faculty library. Its 688 m2 of space in the oldest and most historically valuable rooms of the monastery can be used by students as a study room for independent study and a place for group collaboration.



In March (the month of readers), the Faculty Library held an event called Mysterious Borrowing, where library users could borrow one of the „mysterious books". The books were wrapped in wrapping paper so that the title was not visible; users could only orient themselves based on a small hint – the genre.

In April and October 2023, it held a non-selling exhibition of foreign literature in two runs. Employees and students had the opportunity to see new books in the field of IT. Titles that interested them could then be suggested for purchase for the library collection.

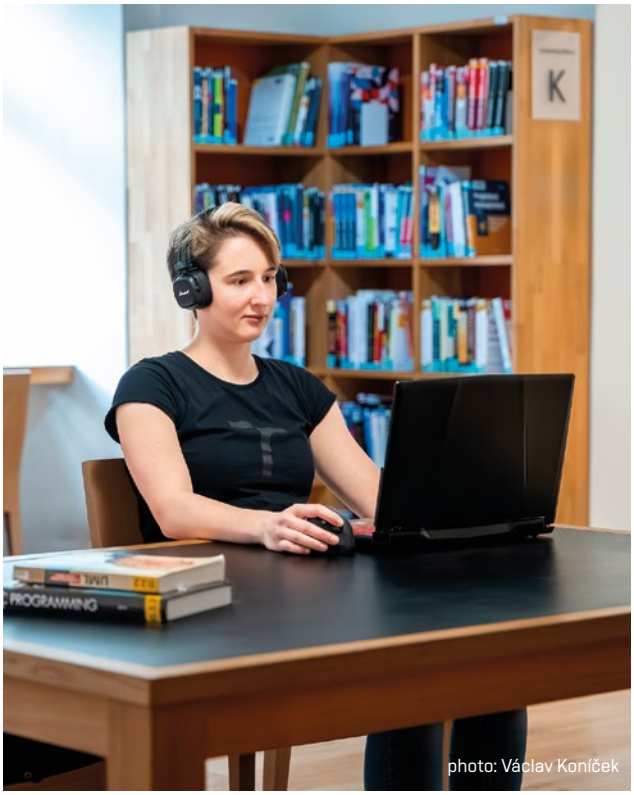


photo: Václav Koníček


photo: Václav Koníček

Internationalisation

To our great delight, the year 2023 in the field of international relations completely returned to pre-COVID-19 pandemic state, and there was a bustling activity between the Faculty of Information Technology and partner universities regarding both outbound and inbound exchanges.

FIT is very lively in the summer. Academic programme and BISSIT

At the end of June, a group of students from Strathmore University in Kenya came to our Academic Programme to acquire theoretical and practical knowledge in the field of computer security and for the fourth year, the International Summer School of Information Technology, BISSIT, took place on 10. – 26. 7. 2023. Thirty students, this time mostly from Kenya, came to the event. In addition to expert lectures, they also had practical seminars, excursions to leading technology companies and the preparation and presentation of a team project.

What did international students appreciate most about us?

Joseph: „I study IT at home. I wanted to know how this field is taught abroad. At FIT I appreciate the quality of the teaching and the great approach of the lecturers, who are able to explain the subject perfectly."

Nicholas: „I was intrigued by the content of the machine learning courses. I am working on my thesis on this topic. That's why I came to your place for summer school. And I am very pleasantly surprised by the high level of expertise of your teachers. Summer school at FIT gave me a lot."

Martin: „I'm interested in computer security. The seminars are also of a high standard in this area. Plus, you have well-equipped computer labs. Everything you need is available here. If I have the opportunity, I will definitely come to FIT again."

Paul Ochieng, Dean of Strathmore University, came to see the students at the summer school.

Foreign cooperation

Partner universities

At FIT, we are aware that on the path to perfection and in expanding the horizons of our faculty and its students, we must look beyond the borders of our country. We have long been striving to find inspiring foreign universities with whom we share similar technical focuses, specialized fields, and an emphasis on collaboration with the industrial sector. We choose our foreign partners carefully. In 2023, we were able to establish partnership cooperation with these two foreign universities:

name of institution	state	type of contract
Universidade Federal de Santa Catarina	Brazil	MINI
University of Oviedo	Spain	Erasmus

*MoU = Memorandum of Understanding

A complete list of partner universities is available on the website:

We also do not forget to develop and deepen already established partnerships, such as collaboration with the Finnish Lappeenranta University of Technology within the Double Degree program:

A Delegation from Finnish Lappeenranta University of Technology visited FIT BUT

In Prague on 14. – 15 February 2023, our faculty welcomed a delegation from the Finnish Lappeenranta University of Technology (LUT). We were visited by the coordinators of the joint Double Degree in the Master's degree program in Computer Vision. Together with them, four students, potential applicants for the Double Degree program at the Faculty of Information Technology, arrived to become more acquainted with the local environment and studies here.

On Wednesday, February 15, an informal meeting took place at the Kachnička Student Club for students from FIT who have applied to study in the Double Degree program in Finland with Finnish students. Currently, two FIT students are studying in Finland as part of the Double Degree program. student club.

Foreign visits

We also manage to maintain contact with foreign countries andd the global scientific research community through foreign visits to our faculty. These meetings are enriching for our academics and students both professionally and culturally. We firmly believe that it is important, even in today's highly technical age, to meet in person.

In 2023, our faculty welcomed:

- Aftab Kiran, Agha Khan University, Pakistan – Head of the Artificial Intelligence Division at Agha Khan University, Pakistan visited FIT for training,
- Antichi Gianni, Queen Mary University in London, UK – Consultation on joint research projects and PhD internships,
- Araujo Da Silva Joao, Universidade Nova de Lisboa, Portugal – Erasmus lecture,
- Barchi Ricardo Germán, Argentina – research internship within the EU project MSCA-RISE-ESPERANTO: Exchanges for SPEech ReseArch aNd TechnOlogies
- Bashir Shahid, Saudi Arabia, Harvard Medical School – seminar series on non-invasive brain stimulation methods,
- Debord-lazaro Véronique, French Institute in Prague – meeting of the Joseph Fourier Prize 2023 Evaluation Committee,
- Esparcia Alcazar Anna, Universidad Politécnica de Valencia, Spain – preparation of the EvoStar 2023 conference at FIT,
- Estienne Lautaro, Universidad de Buenos Aires, Argentina – research internship within the EU project MSCA-RISE-ESPERANTO,
- Evelina Selina, Strathmore University, Kenya – accompanying and assisting students from Strathmore University who participated in the BISSIT2023 summer school,
- Fura Łukasz, Polish Academy of Sciences, Poland – participation in the defence of the dissertation of Ing. Peter Klepárník,
- Guan Hong, Beijing Institute of Technology, China – establishing cooperation, exchange of students, meeting with the Vice-Rector,
- Chen Yu-Fang, Academia Sinica, China – Discussion of collaborative research in the areas of string theory decision making and quantum program verification, talk,
- Joseph Mungai, Strathmore University, Kenya – Accompanying and assisting students from Strathmore University who attended the BISSIT 2023 Summer School,
- Kalkreuth Roman, Technische Universität Dortmund, Germany – discussion of the forthcoming paper and continuation of joint research,
- Kälviäinen Heikki, Lappeenranta University of Technology, Finland – establishing cooperation with Lappeenranta-Lahti University of Technology LUT, Erasmus lectures, presentation of studies at LUT and Double Degree, cooperation in the field of EULIST, joint research,
- Klejch Ondřej, University of Edinburgh, UK – lecture as part of VGS Invited Talks
- Lefevre Sébastien, Université Bretagne Sud, France – Erasmus+ lectures,
- Liu Hao, Beihang University, China – establishing cooperation, summer school for students,
- Lodagala Vasista, Indian Institute of Technology Madras, India – scientific research internship within the Czech-Indian project: Multilinguality in speech technologies,
- Mahmood Tariq, Korea University of Technology – teaching seminars,
- Meza Martin Bernardo, Universidad de Buenos Aires, Argentina – research internship within the EU project MSCA-RISE-ESPERANTO,

- Nidal Kamel, Vinuniversity, Vietnam – invited lecture,
- Ochieng Paul, Strathmore University, Kenya – monitoring visit in the framework of the participation of students from Strathmore University at BISSIT 2023, negotiations on the expansion of co-operation,
- Ondel Yang Lucas Antoine Francois, France – Presentation of current work in machine learning, speech processing and natural language processing,
- Pepino Leonardo Daniel, Argentina – research fellowship within the EU project MSCA-RISE-ESPERANTO,
- Quang Loc Le, University College London, UK – Discussion of joint research in the areas of separation logic, string theory decision making and verification of quantum programs,
- Ramabhadran Bhuvana, Google, Inc., USA – Invited talk at the event: 2. Czech speech/NLP day,
- Reichow Fajardini Juliana, Brazil – presentation Embarking on a Cybersecurity Journey with Suricata
- Steininger Andreas, Technische Universität Wien, Austria – defence of the dissertation Ing. Jacob Lojda,
- Umesh Srinivasana, Indian Institute of Technology Madras, India – research stay within the Czech-Indian project: Multilinguality in speech technologies,
- Witkowski Marcin, Poland – research internship on: "neural signal processing and machine learning techniques applied to speech processing",
- Wu Zhilin, Chinese Academy of Sciences, China – Discussion of joint research with the VeriFIT group in solving string theory formulations,
- Yudilevitch Gil, Technion, Israel – lectures and teaching within the Erasmus international credit mobility,
- Zwilling Moti, Ariel University, Israel – meeting with colleagues, discussion of projects, lecture, support for cooperation with Brno.

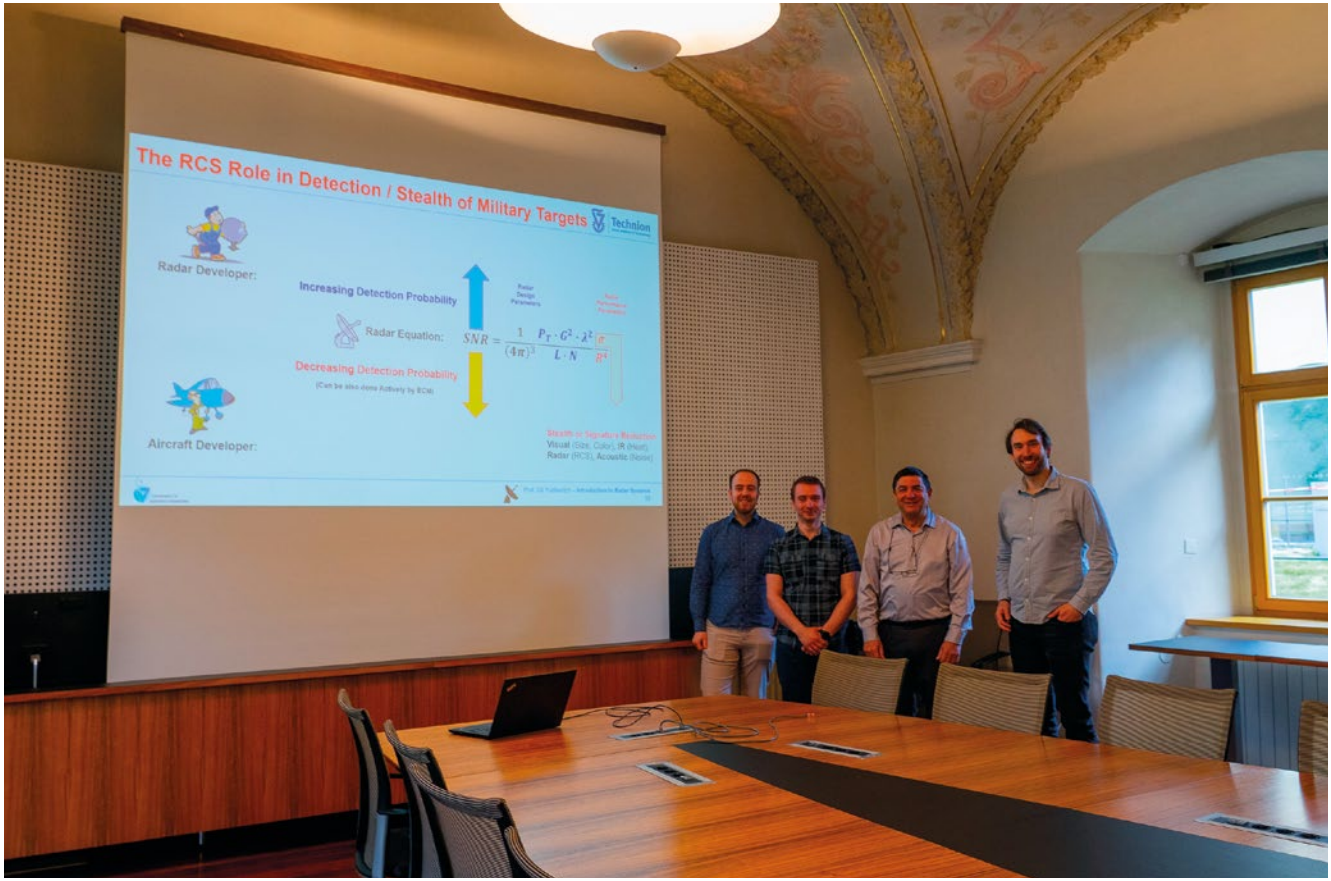
Selected lectures of invited guests

Professor Gil Yudilevitche from the Israeli Institute of Technology (Technion) gave two lectures at FIT on 20 and 21 March: RADAR measurement methods of range, velocity and angles a Target detection and false alarm probabilities in the presence of noise for various RCSs.

A presentation entitled Embarking on a Cybersecurity Journey with Suricata by experts: Juliana Fajardini, Shivani Bhardwaj and Lukáš Šišmiš addressed the topic of cybersecurity in the context of the open-source tool Suricata.

Tom Barbette from UCLouvain, Belgium, presented at FIT on 29 November: High-speed stateful packet processing. The presentation addressed the challenges of effectively implementing stateful network functions, the basic building blocks for high-speed network functions such as load balancing, traffic management and monitoring.

Professor Yudilevitch from the Technion University of Israel gave a lecture at FIT.



VGS Invited Talks @ FIT: Invited Talks on Vision, Graphics, and Speech

VGS-IT is a lecture series on Vision, Graphics, and Speech Invited, hosted by the Institute of Computer Graphics and Multimedia. The aim is to foster inter-institutional relations and cooperation, to share their ambitions and to discuss current topics in the field.

In May, the series of VGS Invited Talks kicked off with Jiří Mekyska presenting on the topic of „Acoustic analysis of speech and voice disorders in patients with Parkinson's disease.". Jiří Mekyska is from the Laboratory for Brain Disease Analysis at Brno University of Technology, where he leads a multidisciplinary team of researchers with a special focus on the development of new digital technologies.

In June, FIT was visited by Sébastien Lefèvre, professor at the University of South Brittany. His main research topics are image analysis/processing, pattern recognition and indexing, machine learning, deep learning and data mining with applications in remote sensing for earth observation.

After a long and varied professional journey, one of the world's gurus in the field of automatic speech recognition, Hynek Heřmanský, is back at BUT. In his talk held at FIT on November 22, he discussed his views on current speech recognition and machine learning in general in the context ofVGS Invited Talks @ FIT.

The VGS Invited Talks@FIT series was closed on 14 December by Ondřej Klejch with his talk Deciphering Speech – a Zero-Resource Approach to Cross-Lingual Transfer in ASR. Ondřej Klejch talked about speech recognition in languages where we have very little data and where it is difficult to even evaluate the results. Ondřej holds a PhD from the University of Edinburgh (UK) and is a senior researcher at the Centre for Speech Technology Research (CSTR).

Student mobility

In the academic year 2022/2023, 62 students traveled abroad.

Countries of departure

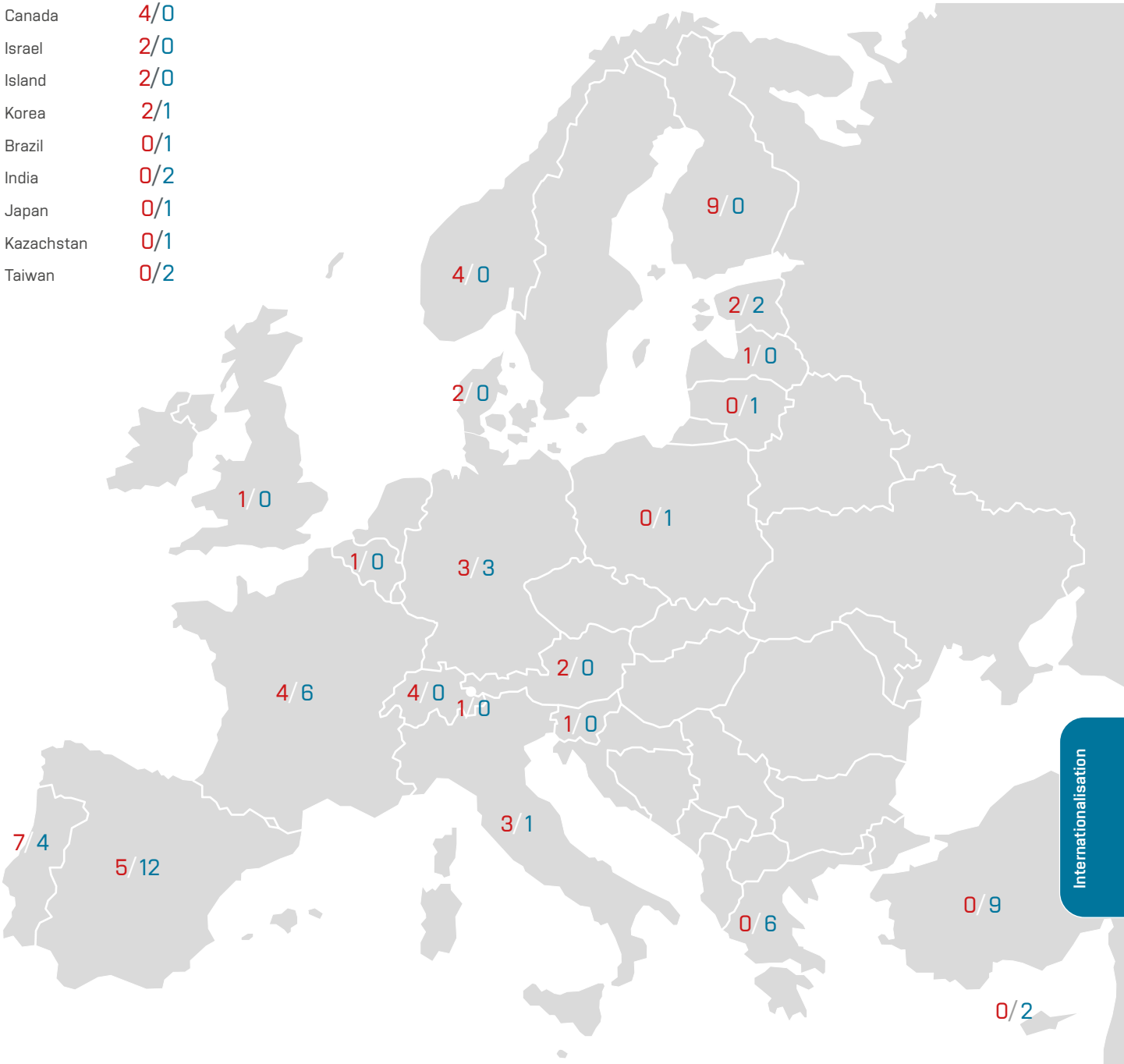
Austria	2
Belgium	1
Canada	4
Germany	3
Denmark	2
Estonia	2
Spain	5
Finland	9
France	4
United Kingdom	1
Switzerland	4
Israel	2
Island	2
Italy	3
Korea	2
Liechtenstein	1
Latvia	1
Norway	4
Portugal	7
Slovenia	1

55 international students arrived at FIT in the academic year 2022/2023.

From countries

Brazil	1
Cyprus	2
Germany	3
Spain	12
Estonia	2
France	6
Greece	6
Italy	1
India	2
Japan	1
Korea	1
Kazakhstan	1
Lithuania	1
Portugal	4
Poland	1
Turkey	9
Taiwan	2

Canada	4/0
Israel	2/0
Island	2/0
Korea	2/1
Brazil	0/1
India	0/2
Japan	0/1
Kazachstan	0/1
Taiwan	0/2



International staff mobility

In the academic year 2022/23, a total of 36 faculty employees traveled abroad under the Erasmus+ program.

Their destinations were the following countries:

Estonia	1
Finland	6
France	2
Ireland	2
Island	2
Italy	3
Malta	2
Poland	2
Portugal	1
Austria	1
Greece	2
Slovakia	5
Germany	1
Spain	6

Cooperation with Industry

Brno is often referred to as Europe's Silicon Valley. The Faculty of Information Technology, located in its centre, is as close to global companies, promising start-ups and top research teams as it can get. We work with partners with whom we find a common professional interest in a number of areas:

- joint preparation of national and international research projects
- contracts, services and licences in the field of information technology
- hosting of laboratories and research facilities
- research topics with possible student participation
- cooperation in student teaching
- support for faculty events, conferences and competitions
- promotion of a partner on the faculty premises

At FIT, we believe that in addition to a solid theoretical foundation, contact with the private sphere is an essential prerequisite for a successful career in IT. We are therefore happy to let our corporate partners teach selected subjects in the form of seminars or lectures, upon agreement with the teacher or subject guarantor.

In 2023, our cooperation with companies took this concrete form:

- 16 companies participated in the Excel@FIT 2023 student project conference
- 24 companies presented their technologies and products at the Live IT 2023 conference, which also featured 18 interesting lectures
- involvement of 8 companies in the implementation of the Summer School of IT for Girls in the form of workshops, seminars, excursions in companies and participation of FIT graduates in meetings with the participants of the Summer School
- participation in the implementation of summer professional schools for foreign students in the form of excursions in the company (International Summer School in IT and Cyber Security lecture series)
- assignment of bachelor's and master's thesis topics – 48 defended, of which 12 were awarded exceptional scholarships
- summer internship offers from 14 companies
- job offers for graduates
- preparation and organization of professional competitions and hackathons for students
- participation of companies in Open Days for prospective students

photo: FILMONDO

The Live IT Conference is a place for new career beginnings and meeting old friends

On Friday, November 10, in the early evening, our faculty was even busier than usual. Over 250 students, academics and representatives of FIT's partner companies attended the seventh edition of the innovative technology conference Live IT. The programme included panel discussions, lectures and company presentation stands. The event is organised by FIT in cooperation with its industry partners with the aim of presenting practical professional topics.

The motivation of Live IT is to connect academia and practice and to show how and with which companies the faculty cooperates. For many students, this is their first, but often not their last, contact with their chosen company. „For me, it is a great event because it offers the opportunity to meet two worlds – the corporate and the academic. I also present company theses here, which is a huge benefit for both parties. Students gain invaluable experience and companies see what skilled students we produce. I can say for Gen that many students then go on to join the team. And these stories begin at such events," confirms Dominika Regéciová, PhD student at FIT BUT and Senior Researcher at Gen.

Discussions with FIT graduates, now successful IT professionals, were very inspiring. They love to return to their alma mater and share their career paths. And the path is not always without obstacles. But as IT experts across the industry agree, it is important not to be discouraged and to pursue your goal with a dose of motivation and humility. A good example of such perseverance is Gabriela Nečasová, a PhD student at FIT BUT and a Technical Writer at Red Hat. As a graduate of an art-oriented high school with ambitions to be a professional pianist, she did not act as a prototype of a piano player. And he admits that the first year was definitely not easy: „I knew how to solve the problem, but I had absolutely no idea how to write it in a programming language, in C, because I had never done any programming before. The hardest part was learning to understand the brief and apply the ideas."

photo: FILMONDO

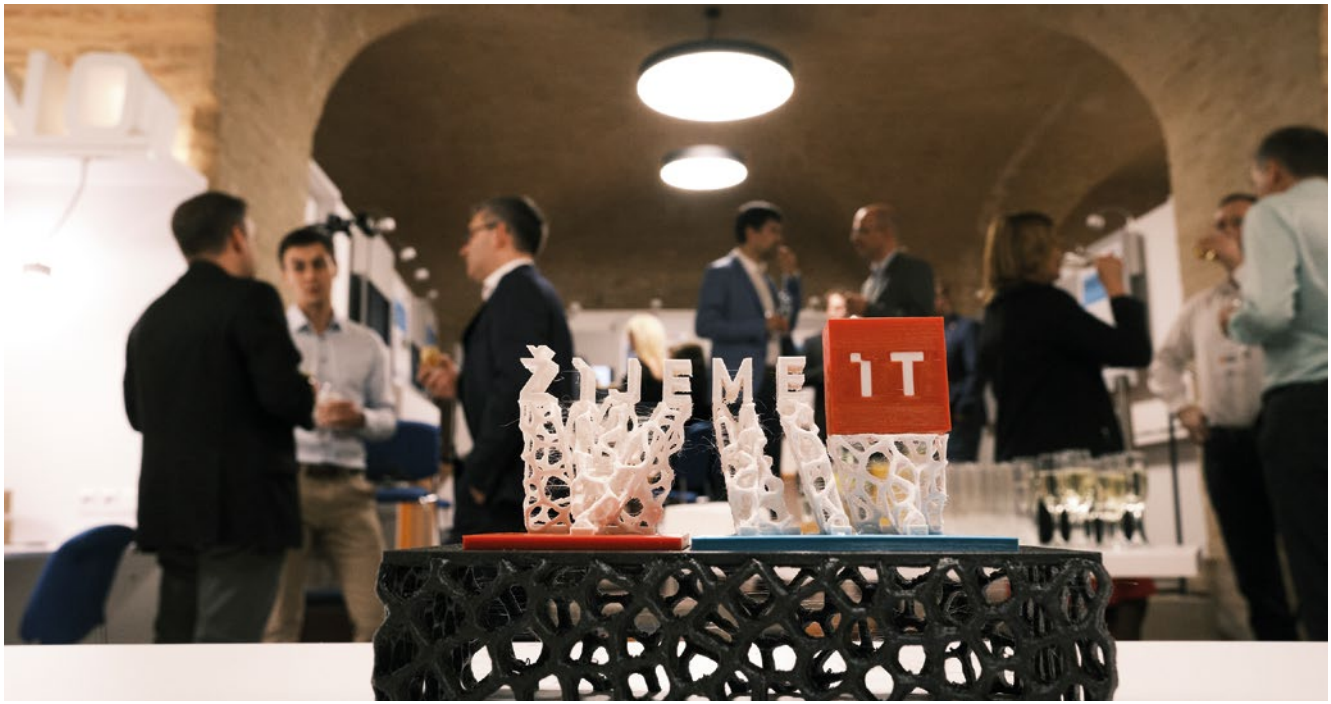
At FIT, they don't teach you a crash course on how to be an IT guy in a few months. It's not just about acquiring knowledge and skills; graduates also leave with a set of soft skills that enable them to excel in the private sector. „When supervising a bachelor's or master's thesis, what I consider to be crucial is a certain level of systematic approach." I'm more concerned about that than I am about solving the problem itself. I think that's what IT companies are standing on now – agile development," adds Marta Jaroš, a recent PhD holder working at the Institute of Computer Systems.

Readiness for the work environment and the ability to think IT is why FIT graduates are so popular among companies and why technology companies see the value in attending this conference. Students have the opportunity to talk directly with the experts and get a better idea of what the companies deal with and, if interested, arrange some form of cooperation.

„What makes a good IT professional is personality. The fact that they are interested in going the extra mile and moving forward, the desire to solve problems. We need people with the mindset of an engineer, not necessarily someone who can program perfectly. We appreciate that at the undergraduate level students experience the full breadth of the field, which helps them to work effectively in a team," concludes FIT graduate Bronislav Přibyl from Thermo Fisher Scientific.

Aftermovie We live IT 2023:

photo: FILMONDO



FIT partners

Golden Partners

- Honeywell, spol. s r.o.
- Gen
- Red Hat Czech s.r.o.

Silver partners

- AT&T Global Network Services Czech Republic s.r.o.
- CAMEA, spol. s r.o.
- SAP ČR, spol. s r.o.
- ŠKODA AUTO a.s.
- Thermo Fisher Scientific Brno s.r.o.

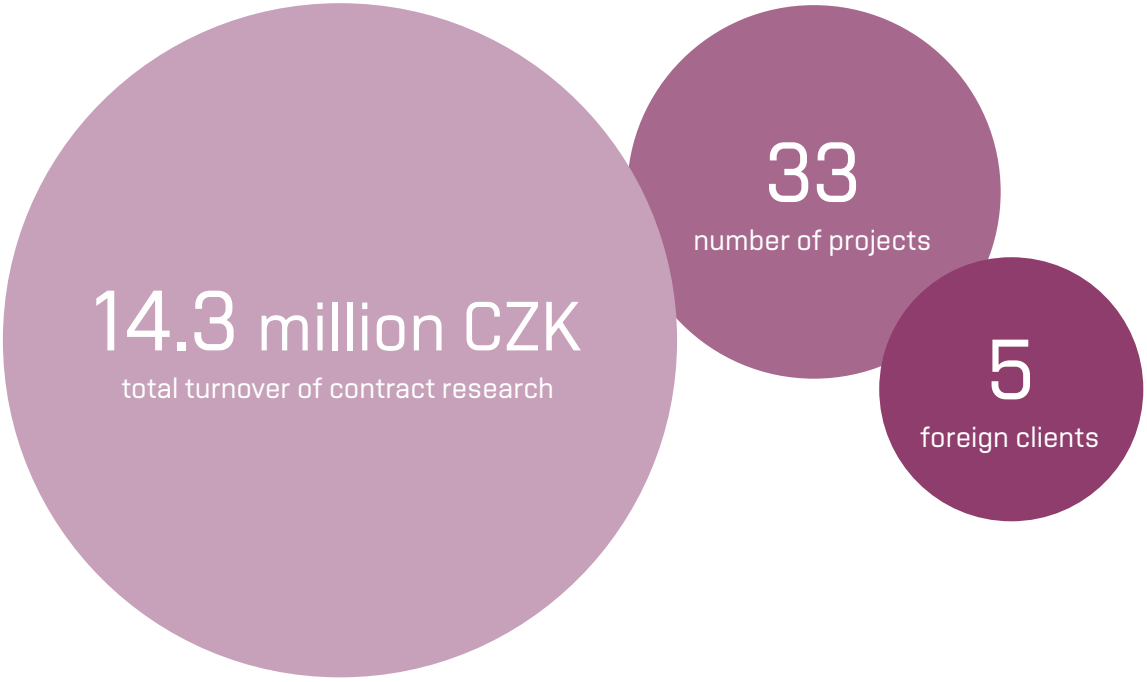
Bronze partners

- Phonexia s.r.o.
- TESCAN 3DIM, s.r.o.
- NXP Semiconductors Czech Republic s.r.o.
- Allium, s.r.o.
- FNZ (UK) Ltd – Czech Branch, odštěpný závod
- Intel Czech Tradings, Inc
- SolarWinds Czech s.r.o
- ARTIN, spol. s r.o.
- Edhouse s.r.o.
- GINA Software s.r.o.
- ChyronHego Czech s.r.o.
- Kyndryl Client Center, s.r.o.
- Innovatrics, s.r.o.
- Kinalisoft s.r.o.
- Mavenir s.r.o.
- Micro-Epsilon Inspection s.r.o.
- Seznam.cz, a.s.
- Oracle Czech s.r.o.
- Smartlook.com, s.r.o.
- TESCAN Brno, s.r.o.
- Y Soft Corporation, a.s.
- CROSS Zlín, a.s.
- SEACOMP s.r.o.
- Sewio Networks s.r.o.
- Bender Robotics s.r.o.
- STAPRO s.r.o.

Start partners

- ReplayWell, s.r.o.
- COGNITECHNA s.r.o.
- BringAuto s.r.o.
- World from Space s.r.o.
- netsearch s.r.o.
- Zaitra s.r.o.

Contract research at FIT in 2023 in numbers



Cooperation with other institutions

The AI theme attracted over 280 high school enthusiasts to VIDA

On Friday, 13 October, the VIDA Centre in Brno hosted an event aimed at high school students interested in the topic of artificial intelligence, organized by FIT BUT in cooperation with FI MU. More than 280 students accompanied by their teachers came to the event from different parts of the Czech and Slovak Republic. And they didn't have to regret the long journey. A packed program directed by the greatest AI experts awaited them.

Right at the beginning, they listened to an inspiring lecture entitled "My and maybe your life with AI" by the world-renowned Professor Jan Černocký from the BUT Speech Data Mining Research Group Speech@FIT.

He took the audience through the basic terms and outlined the benefits and possible risks of artificial intelligence. He also discussed the democratization of AI, how to build a career in IT, and how AI and the IT sector is doing in Brno.

The pull of the knowledge economy is omnipresent in the Brno region and this is evidenced by the AI 4 Talents event, which brought together experts from the academic and corporate sectors and future IT professionals. "Modern technologies are pulling and the opportunity to communicate current trends with high school students and potentially future colleagues is always beneficial. A positive benefit is also a great opportunity to exchange experiences with other exhibitors, whether research teams of partner universities or industrial partners", describes Daniel Bambušek from the research group Robo@FITwho presented an interactive demonstration of drone control through augmented reality at the event.

Thanks to the representatives of the project, our faculty PERO demonstrated how machines learn to read and understand handwritten script. One of them is Michal Hradiš, who together with his colleague Anton Firc, who is involved in Security@FIT the phenomenon of deepfakes, defended the imaginary faculty colours in a panel discussion.

The interest in the topic of deepfakes was huge. "Many high school students visited our stand. We had three samples. Students could try out the latest technologies in the field of deepfakes. They were mainly interested in how these tools are created and the process behind them. Their teachers have also shown interest, especially in terms of spreading awareness of this technology among students. Primarily they were interested in the tools they could use to try it out, and some of them even considered visiting our faculty or organizing a lecture at their school," adds Filip Pleško, a PhD student at FIT BUT.

Workshops led by companies Honeywell, Phonexia and SolarWinds as well as a lecture on the use of AI in space technologies by Martin Javorka from Zaitra, were also well attended, as was a presentation of current trends and practical applications of AI companies by Skoda Auto, NXP Semiconductors and Kyndryl. AI 4 Talents was part of the interactive AI Days festival.

Professor Jan Černocký lectures on the basics of AI

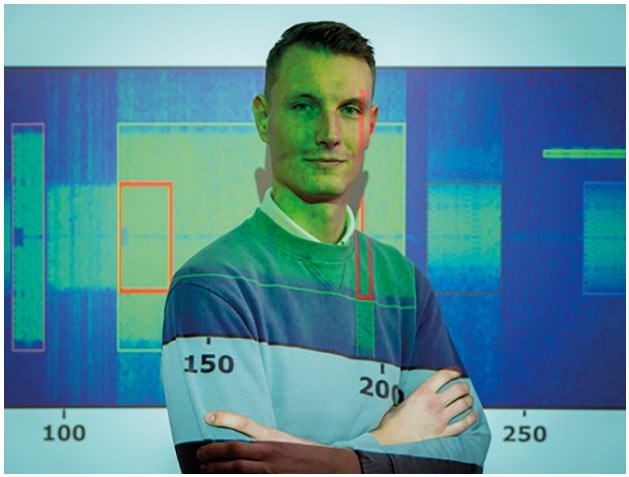
photo: Lea Králová

Cybersecurity beckons even in the run-up to Christmas. Anton Firc lectured at the Faculty of Business at BUT

On December 13th, a conference on cyber security was held at the Faculty of Business at BUT. Our faculty was represented by Anton Firc with his presentation Deepfakes: We can no longer trust what we see and hear. At the lecture, he introduced different types of Deepfakes to the audience of hundreds, showed methods of their creation and detection, evaluated their consequences for IT security and answered many questions. Visitors to the conference left enriched with practical insight into the issue and strategies for identifying and mitigating their risks. FIT BUT was also represented by students Milan Šalko and Filip Pleško.

FIT BUT hosted a Cybersecurity Workshop

On 23 6. 2023, a cybersecurity workshop was held at the Faculty of Information Technology in cooperation with the National CyberWatch Centre and Masaryk University. The event was designed for students, academics and practitioners and was attended by a 15-member delegation from the USA.



Voice deepfakes can't be detected by humans or security systems, attacks on the rise

Spreading alarm messages or disclosing confidential company or bank information. Artificial intelligence is developing rapidly and almost anyone can create deepfake voice recordings at home in high quality. Neither humans nor biometric systems can reliably distinguish artificial speech from real speech. Researchers from FIT BUT together with commercial system developers now want to design more reliable testing and more accurate detection of deepfakes. They are responding to a call from the Ministry of the Interior.

Anton Firc from FIT BUT first started to deal with the problem of deepfakes in his master thesis, in which he investigated the resistance of voice biometrics to deepfake voice. The same issue was followed up by Daniel Prudky's research, which sent 31 respondents voice messages and investigated their ability to recognize deepfakes in ordinary conversation. "People got the cover story that they were testing the user-friendliness of voicemails. He also included one deepfake recording in the test conversations and monitored respondents' reactions. The results showed that none of them detected the fraudulent deepfake message," Firc explains.

However, in the same experiment, when respondents were told that one of the voicemails was a fake, they were able to identify it with

almost 80% accuracy. "But research has shown that although a deepfake recording is easily identifiable among real ones, no one can detect it in a normal conversation," Firc adds. Part of the reason, he says, is that they did not expect the questioning in that context, and that is what the creators of the deepfake recordings can exploit in reality.

"People don't expect to encounter a deepfake voice and are thus able to ignore even mistakes or poorer quality recordings. All phone and social network users are at risk. This opens up the possibility of vishing attacks, which is a combination of deepfake voice and phishing, on a large number of people," the researcher adds, pointing out that raising general awareness can be an appropriate protection.

According to him, everyone who uses a phone, computer or has a social media account is at risk. A common case of a social engineering attack is, for example, the disclosure of internal company information via a phone call. "The phone rings and it's your colleague from another branch. He knows the right phrasing and words and pretends his computer is not working and he needs you to look into the system for him and perhaps give him access data," Firc says.

Deepfakes expand the possibilities of these social engineering attacks. Today, even people without much technical knowledge can create synthetic recordings in high quality at home. And voice biometrics systems that verify the identity of callers to banks or call centres cannot reliably distinguish synthetic recordings from real human speech. "I have tested two commercially available voice biometrics systems and it has been confirmed that even they cannot distinguish a real recording from an artificial one," says the researcher.

According to him, the biggest problem is that even the developers of biometric systems do not have a methodology to test the resistance of systems against deepfake attacks. "There are models, deepfakes detectors, based on neural networks that are able to detect if there are anomalies in the recording that are not found in normal speech and evaluate whether it is genuine or synthetic. But it is very difficult to explain what these models are really deciding on. The only thing that experts have discovered so far is that deepfake recordings have more energy in the higher frequencies, whereas human speech has a more linear distribution of energy," the researcher points out, adding that detecting and properly testing deepfakes is still in its infancy.

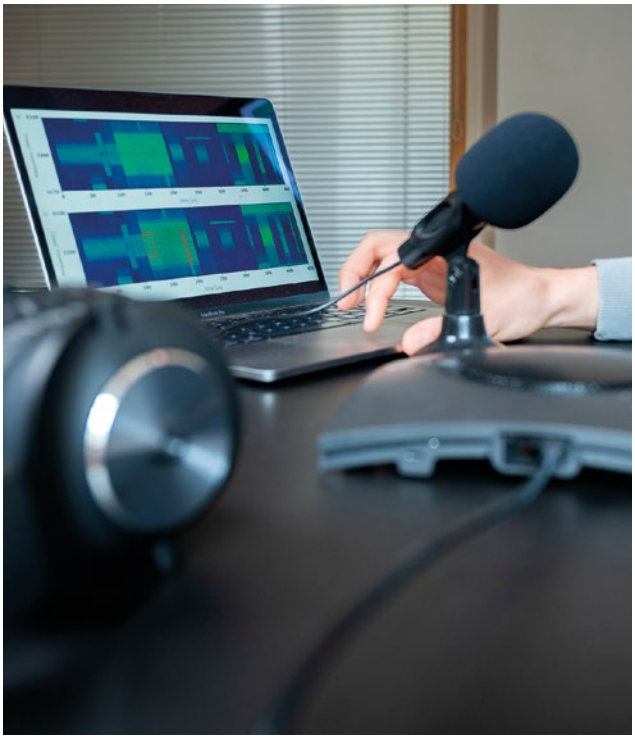
While banks and private companies are currently the main targets of attacks, in the future, ordinary people may also pay for the holes in cyber security.

"One Slovak bank is only willing to issue you a credit card based on voice verification. Since data leaks are common and it's not a problem to buy someone's personal information, it will be very easy to apply for another person's credit card using deepfake voice recordings. What's more, artificial intelligence is evolving so rapidly that we will soon be able to automate these attacks and incorporate language models like ChatGPT. In a worst-case scenario, this could create an army of artificial telemarketers who will call elderly people and pretend they are, for example, family members, have been in a car accident and need to send money immediately," Firc outlines possible scenarios for the misuse of deepfake recordings in the future.

The issue of deepfakes in cybersecurity has also been taken up by the Ministry of the Interior, which has launched a call for security research, on which Anton Firc (for the Security@FIT group) is collaborating with the Speech@FIT group and Phonexia. The goal is to develop tools that can reliably identify artificially created recordings.

(mar)

photo: Václav Koníček



How can artificial intelligence help the 112 emergency line?

Is artificial intelligence a threat or can we use it to save lives? A project aimed at developing a voicebot for the 112 call centre was presented during the AI Days festival. It helps with the reception of emergency calls, conducts a dialogue with the caller and passes the information obtained to the dispatcher. This will speed up the response of emergency services to crisis situations. Voicebot uses technologies such as speech recognition, natural language understanding, dialogue guidance, voice biometrics, speech synthesis and IP telephony. The Speech@FIT research group and the Brno-based Phonexia company, one of the world leaders in the development of speech technologies, worked together on the development and deployment of the voicebot for the emergency line.

The Faculty of Information Technology welcomed a delegation from Ukraine. The topic of cyber security was addressed

On the last day of November, the Faculty of Information Technology welcomed a delegation from Ukraine. The management of the Faculty of Information Technology (FIT) and experts on the topic from our faculty discussed possibilities of collaboration in the field of cyber security, including research, joint projects, and mutual exchange of students, with representatives from the Ukrainian State Service of Special Communications and Information Protection of Ukraine, Ukrainian Cybersecurity Cluster, USAID Cybersecurity for Critical Infrastructure in Ukraine Activity, and National Aerospace University.

CPhoto@FIT research group helped with information panels on the Jakobínka tower

Visitors can find out what views Rožmberk Castle offers on the panoramic map that stands atop the newly reconstructed Jakobínka tower. It was on the list of endangered monuments and in recent years it has been restored in a way for which it received an honourable mention from the jury in the prestigious Europa Nostra competition. Since last year, however, visitors have been able to enjoy views of the landscape around the castle with information panels. They also include panoramic photographs, including descriptions of significant peaks on the horizon. This was helped by researchers from the CPhoto@FIT group, who „ran" the photos through their software, which can estimate the orientation of the camera and project a range of information into augmented reality – for example, the names of peaks or elevations.

„This task has become more difficult than it seemed. Normally, only intuition is available when working with a map, or the statements of old-timers about which landmark in the background is which. However, there were often disagreements in the circle of those who solved this task and there was a risk that fatal errors would be introduced in the educational material. Therefore, we searched the internet for the possibility to

determine what is in the surrounding landscape. Fortunately, this was successful and the outcome was surprising. For example, the local dominant peak, Kraví hora (796 meters above sea level), is barely visible from the tower. On the other hand, an unnamed hill with a height of 775 meters stands out significantly, which everyone mistook for Kraví hora for years. There are more examples like this. Thanks to visual geolocation, we know exactly where everything is located, and we won't mislead visitors. I highly recommend this method to all other viewpoint owners," says David Říha from the National Heritage Institute.

photo: FILMONDO

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