BRNO UNIVERSITY OF TECHNOLOGY
FACULTY OF INFORMATION TECHNOLOGY

ANNUAL REPORT
2019

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Contents

Pavel Zemčík, dean FIT BUT

The right place for study and research in the area of IT

For a long time, we have been building the Faculty of Information Technology to be the "right place for study and research in the area of IT." We are therefore happy that the Faculty of Information Technology of BUT is the best IT school in Czechia and Slovakia according to some rankings. These days, more than two thousand students study at the faculty and the interest in our study programmes, especially on the Bachelor's level, is constantly increasing. "The faculty participates in a number of research projects, both domestic and international, including the most demanding ones, and the overall quality of creative activity is very good. Nevertheless, the Dean and the faculty management are going to have a difficult task leading the faculty forward because the 'world moves forward' and we cannot just maintain the status quo, we need to work intensively on the development of the faculty," says Dean Pavel Zemčík. In 2019, he was re-elected as the head of the faculty.

So what are some of the challenges the faculty will face in the future?

The task of the new management is likely to be different from the task of the current one as it will have to work in an environment that can change rapidly, especially when it comes to evaluation and financing of educational institutions. We will see what the future holds. Primarily, we want to focus on supporting the improvement of quality of research and education and promotion of sound economic conditions of the faculty's operation.

In 2019, Brno University of Technology celebrated 120-year anniversary of its foundation. What do you think about the position of the faculty and the university as a whole?

The Faculty of Information Technology is the youngest faculty of the oldest university in Brno. It is great that the faculty is recognised as a quality, strong and stable component of the Brno University of Technology and we are very glad that the field of information technology is being further developed at BUT. Being a part of a university with a long historic tradition together with the fact that our faculty reached "maturity" by celebrating 18 years of its existence this year means that we are bound to responsibly care about the future operation and development of the faculty and creating and maintaining the good reputation of BUT as a whole.

How do you wish the faculty to develop in the future?

I wish the Faculty of Information Technology were a faculty educating ever more ingenious students, employing professional and helpful teachers and research workers achieving scientific results of ever growing quality. It would be great if we were able to increase the faculty's renown on a global scale both in terms of its academic results and its reputation and if it became an attractive partner for both pedagogical and research projects. Students of our faculty should be proud of their work and results and the overall faculty life should be supported by pleasant atmosphere, sound economic background and quality services for both the students and the employees. I would also like to see the faculty as a community of people connected in co-operation, working hard on their own self-improvement as well as willing to "go the extra mile" to support the faculty and promote its good name. In fact, I believe that we are very close to meeting all these goals. But no matter how close we are to fulfilling this vision, maintaining the current level of quality or even further improving upon it is still a very difficult task. We can never really stop working in this direction.

So what are your priorities for 2020?

The priority for 2020 is the support of the improvement of research, ensuring and maintaining the quality of education and promotion of sound economic conditions required for the faculty's operation.

FIT profile

The Faculty of Information Technology is a modern, internationally renowned university institution, and a centre of top quality research in various areas of IT – from hardware, through intelligent systems to multimedia. At its modern and uniquely equipped campus, the faculty offers to its students highly valuated education in IT at all levels of studies: the three-year Bachelor's programmes, the two-year follow-up Master's programmes, and the four-year Doctoral studies.

BRNO UNIVERSITY OF TECHNOLOGY
FACULTY OF INFORMATION TECHNOLOGY

Faculty in numbers

No. 1

the best IT faculty in the Czech Republic according to the Times Higher Education (THE) ranking.

TOP 10

FIT is ranked among the top 10 faculties in the Czech Republic.

2 300

students studying in 5 accredited programmes.

40

students from 40 countries

35

industrial partners

21

research groups

67

projects in 2019

Faculty Management

prof. Dr. Ing. Pavel Zemčík
Dean

Ing. Bohuslav Křena, Ph.D.
Vice-dean for Efficiency and Academic Affairs

Ing. Vítězslav Beran, Ph.D.
Vice-dean for External Relations

Ing. Jaroslav Dytrych, Ph.D.
Vice-dean for Bc. Study

doc. Ing. Richard Růžička, Ph.D., MBA
Vice-dean for MSc. Study

prof. Ing. Tomáš Vojnar, Ph.D.
Vice-dean for Science and Research

Ing. Petr Hajduk
Secretary

Number of Employees

(recalculated to full-time employments)

Dean's Office	30 employees
Departments	170 employees
Centres	25 employees
Campus Maintenance	16 employees

Departments and Centres

The Department of Information Systems

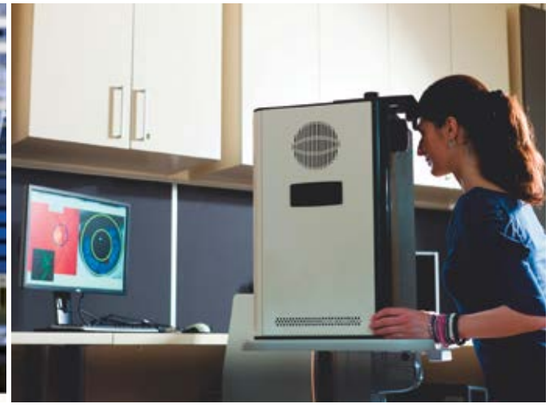
is responsible for teaching the courses within the Information Systems Master's study programme. Scientific and research activities of the Department focus on security, computer networks and the internet, database technology, implementation of information systems, management of software projects, and the theory of formal languages and compilers.

Head of the Department:
doc. Dr. Ing. Dušan Kolář

The Department of Intelligent Systems

is responsible for teaching the courses comprising three Master's specialisations: the Information Technology Security, Intelligent Systems, and Mathematical Methods in Information Technology. The research activity of the Department is focused primarily on intelligent systems, especially the biometric systems and robotics, but attention is also paid to systems for specific applications, communication systems and sensor networks.

Head of the Department:
doc. Dr. Ing. Petr Hanáček



The Department of Computer Graphics and Multimedia

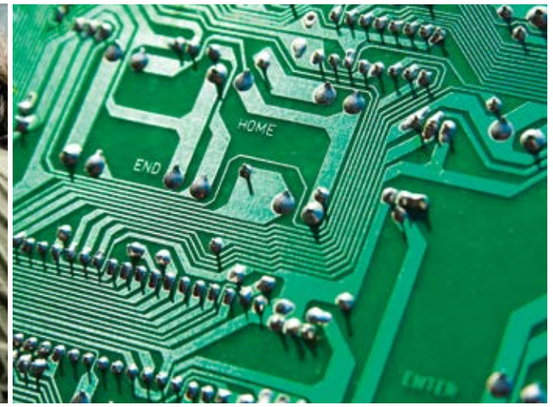
deals with research and education in human-computer interaction, multimedia and multimodal data mining, image and video processing, computer graphics, speech data mining, advanced approaches to automatic control, knowledge technologies and big data processing. It builds on the solid foundations of mathematics, physics, theoretical informatics, signal processing, automation, and machine learning.

Head of the Department:
doc. Dr. Ing. Jan Černocký

The Department of Computer Systems

is mainly responsible for teaching hardware-oriented courses in all study programmes accredited at FIT. The Department serves as a guarantor of the specialisations Bioinformatics and Biocomputing, Embedded Systems, and High Performance Computing within the newly accredited follow-up Master's study programme of Information Technology and Artificial Intelligence. Scientific and research activities of the Department are focused on HW/SW architecture of computer systems at the levels of digital circuits, single- and multi-core processors (including GPUs), embedded systems, application-specific integrated circuits, reconfigurable systems based on field-programmable gate arrays (FPGA), computer clusters and supercomputers.

Head of the Department:
prof. Ing. Lukáš Sekanina, Ph.D.



The IT4I Research Centre

is a unique project combining the function of a research centre for academic purposes, with research for the purposes of the industry and co-operation with business subjects by the means of contractual co-operation. The main areas of research are the identification and presentation of information from multimedia data, and safe and reliable architectures, networks and protocols. The centre offers some excellent opportunities for the students — they can acquaint themselves with top projects, and also with how the work is done outside the academia.

Head of the Department:
prof. Ing. Tomáš Hruška, Csc.

The Computer Centre

provides for the operation of computer laboratories, computer technology, the faculty computer network, servers and information systems. Computer laboratories located in the centre are used both for scheduled teaching and for working on projects, theses and research tasks. Outside scheduled teaching, the laboratories are freely available to all students of the Faculty of Information Technology.

Head of the Department:
Ing. Petr Lampa

Research, Development and Innovation

There are over twenty research groups working at the faculty, many of them being successful not only in the Czech Republic, but also abroad. FIT is participating in both national and international projects – whether on its own or in co-operation with other universities, research centres, or renowned companies and institutions. The faculty also operates its own Research Centre of information technology. The centre is part of the IT4Innovations centre of excellence, the owner of the national supercomputing centre.

Research in 2019 in numbers

53

academics

188 271 600 CZK

project budget in 2019

29

products in 2019

205

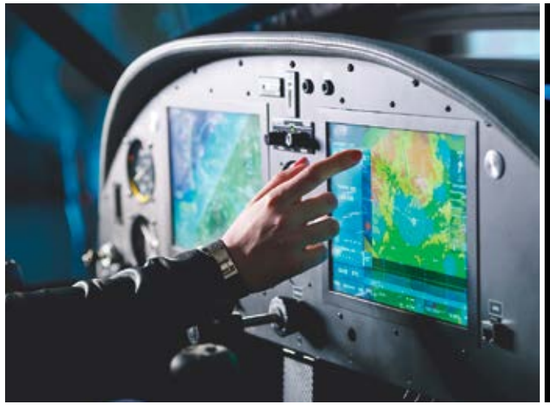
publications in 2019

23 600 000 CZK

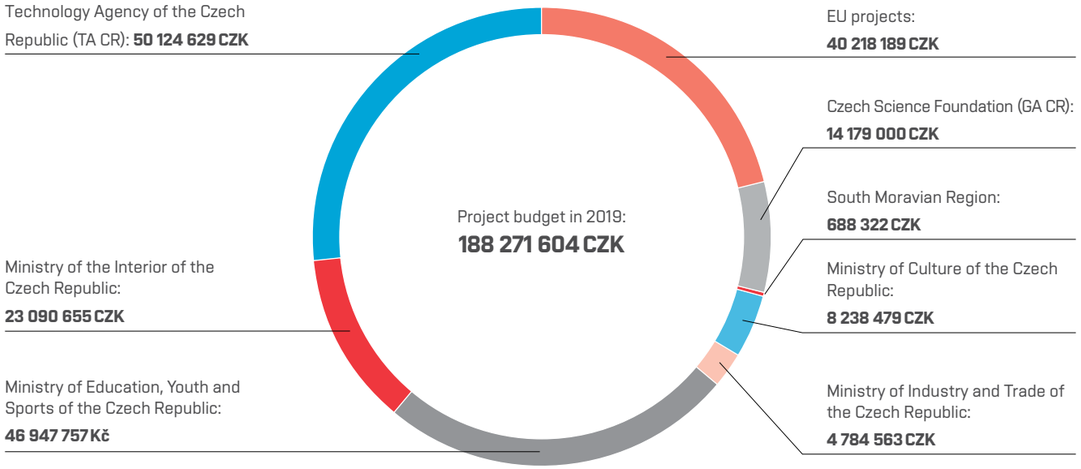
total volume of finances for projects of contractual research in 2019

35

industrial partners



Projects



Name of the project	Agency	Research leader
AQUAS: Aggregated Quality Assurance for Systems	ECSEL JU	prof. Vojnar
Arrowhead Tools for Engineering of Digitalisation Solutions	ECSEL JU	prof. Vojnar
Framework of key enabling technologies for safe and autonomous drones´ applications	ECSEL JU	prof. Zemčík
From the cloud to the edge – smart IntegraTion and OPtimisation Technologies for highly efficient Image and VIdeo processing Systems	ECSEL JU	prof. Zemčík
MegaModelling at Runtime – scalable model-based framework for continuous development and runtime validation of complex systems.	ECSEL JU	doc. Smrž
Product Security for Cross Domain Reliable Dependable Automated Systems	ECSEL JU	doc. Smrž
Assessing and Enhancing Emotional Competence for Well-Being (ECoWeB) in the Young: A principled, evidence-based, mobile-health approach to prevent mental disorders and promote mental well-being	EC EU	doc. Smrž
Automatic collection and processing of voice data from air-traffic communications	EC EU	doc. Černocký
Cross-CPP – Ecosystem for Services based on integrated Cross-sectorial Data Streams from multiple Cyber Physical Products and Open Data Sources	EC EU	doc. Smrž
OCR, ClassificAtion & Machine Translation	EC EU	doc. Smrž
Photoacoustic/Ultrasound Mammoscopy for evaluating screening-detected lesions in the breast	EC EU	doc. Jaroš
Real time network, text, and speaker analytics for combating organized crime	EC EU	doc. Černocký
Robust End-To-End SPEAKER recognition based on deep learning and attention models	EC EU	dr. Lozano
Robust SPEAKER DIariazation systems using Bayesian inferenCE and deep learning methods	EC EU	dr. Sánchez
SAUCE – Smart Asset re-Use in Creative Environments	EC EU	doc. Smrž
TEchnology TRAnsfer via Multinational Application eXperiments	EC EU	dr. Palkovič
Machine Translation for English Retrieval of Information in Any Language (MATERIAL)	IARPA	Dr. Karafiát
Low Resource Languages for Emergent Incidents (LORELEI)	DARPA	Dr. Glembek
Automata for Decision Procedures and Verification	GA CR	dr. Holík
Designing and exploiting libraries of approximate circuits	GA CR	prof. Sekanina
Neural Representations in multi-modal and multi-lingual modeling	GA CR	doc. Burget

Name of the project	Agency	Research leader
ROBUST – veRificatiOn and Bug hUnting for advanced SofTware	GA CR	prof. Vojnar
Improving Robustnes in Automatic Speaker Recognition	GA CR	dr. Glembek
Sequence summarizing neural networks for speaker recognition	SM Region	Dr. Rohdin
CPK – Using Semantic Technologies to Access Cultural Heritage Through The Central Portal of Czech Libraries	MC CR	doc. Smrž
Advanced content extraction and recognition for printed and handwritten documents for better accessibility and usability	MC CR	doc. Smrž
Test-it-off: Robotic offline product testing	MIT CR	dr. Materna
Validated Data Storage	MIT CR	dr. Rychlý
Development of indoor software for cycling – Rouvy AR	MIT CR	prof. Herout
Research and development of diagnostic unit for forming machines	MIT CR	doc. Smrž
Research and development of the monitoring part of forging presses	MIT CR	doc. Smrž
Infrastructure for modern study of IT	MEYS CR	doc. Růžička
IT4Innovations excellence in science	MEYS CR	prof. Hruška
International mobility of researchers at the Brno University of Technology	MEYS CR	prof. Zemčík
MuSiC – Multi-level Security for Critical Services	MEYS CR	prof. Zemčík
MOST (Modern and open studies in technology)	MEYS CR	doc. Růžička
Advanced Methods of Nature-Inspired Optimisation and HPC Implementation for the Real-Life Applications	MEYS CR	prof. Sekanina
Distant Reading for European Literary History	MEYS CR	doc. Smrž
Large-Scale Information Extraction and Gamification for Crowdsourced Language Learning	MEYS CR	doc. Smrž
Deep-Learning Approach to Topographical Image Analysis	MEYS CR	doc. Čadík
BUT Opportunity	MEYS CR	dr. Sadovský
Security monitoring of ICS communication in the smart grid	MI CR	doc. Ryšavý
Information mining in speech acquired by distant microphones	MI CR	doc. Černocký
Flexible probe for lawful interceptions	MI CR	doc. Kořenek
Integrated platform for analysis of digital data from security incidents	MI CR	dr. Matoušek
Tools and methods for video and image processing to improve effectivity of rescue and security services operations	MI CR	prof. Zemčík

Name of the project	Agency	Research leader
Smart Application Aware Embedded Probes	MI CR	doc. Kořenek
Employment of artificial intelligence into an emergency call reception	MI CR	doc. Černocký
Artificial Intelligence Driven Autonomy	TA CR	doc. Chudý
AuFoVer – Automated Formal Verification	TA CR	prof. Vojnar
Colour Image in "Realtime Embedded Computing"	TA CR	prof. Zemčík
V3C – Visual Computing Competence Center	TA CR	prof. Zemčík
Decentralized collection, analysis, visualization and interpretation of large data in an artistic practice.	TA CR	Ing. Jeřábek
IotCloud – Intelligence for IoT systems	TA CR	doc. Kořenek
IRONSTONE – IoT monitoring and forensics	TA CR	dr. Matoušek
KYPO4Industry	TA CR	dr. Smčka
Possibilities for creation of communite genealogical database with semantic information and uncertainty	TA CR	dr. Rozman
National Centre of Competence in Cybersecurity	TA CR	doc. Ryšavý
Neural networks for signal processing and speech data mining	TA CR	Ing. Žmolíková
Computer-Aided Analysis and Prediction of the Child Growth and Development	TA CR	prof. Zemčík
Progressive Image Processing Algorithms	TA CR	prof. Zemčík
Survey and education of citizens of the Czech Republic in the field of biometrics	TA CR	prof. Drahanský
SECUre SENsors and data	TA CR	prof. Zemčík
TRACTOR: TRaffic Analysis and seCuriTy OpeRations for ICS/SCADA	TA CR	doc. Ryšavý
SMARTCarPark – Surveillance Monitoring, Analysis and Re-identification of Traffic for Enhanced Car Parking	TA CR	prof. Herout
Flight Training Evaluation Software	TA CR	doc. Chudý
Collaborative robot 2.0: cognition of the work environment, augmented reality-based user interface, simple deployment and reconfiguration	TA CR	dr. Materna
AI for Traffic and Industry Vision	TA CR	dr. Bařina
Device for automatic scanning of eye retina	TA CR	prof. Drahanský

New Challenges

National Competence Centre for Cybersecurity

NCK Centre was created in response to the high demand for practically applicable products and solutions for ensuring cybersecurity of both the critical and the non-critical information infrastructure. The Centre associates leading research workplaces and representatives from the industry working in the area of cybersecurity with the aim to implement a collaborative research and develop technical solutions for cybersecurity at hardware and software levels, as well as to develop mechanisms for certification of security features of technological products. In co-operation with its industrial partners, the Centre will strive to apply the developed solutions to the ever growing cybersecurity market. This will strengthen the importance of the Czech industry and R&D on both the European and the global levels.

The National Competence Centre for Cybersecurity aims at unifying the research activities of participating partners so that the individual research institutions can co-operate in research while taking into consideration the interdisciplinarity of the cybersecurity issues and collaborate with the industry in order to produce high quality research results with practical application and a significant market potential. The Centre associates workplaces of three important research organisation with a long-term orientation towards cutting-edge research in the area of cybersecurity approaching it from different perspectives; apart from Brno University of Technology, the Centre also involves Masaryk University and CESNET.

National Cybersecurity Competence Centre

Topographic image analysis using the methods of deep learning

The objective of the new Czech-Israeli research co-operation is to find new methods for visual geo-location or estimation of depth from an image. The research grant was awarded to the team of Martin Čadík from FIT and the team of Professor Yosi Keller from Bar Ilan University. Together, the two teams will use the convolution neural networks to develop a new registration algorithm and descriptor of 2.5D and 3D models, a new method for localisation of cameras in the natural environment and a multimodal dataset for training networks predicting depth from a single image.

If the researchers manage to develop these new methods, the results of the joint research could advance the development of computational photography and could also be of some use in medicine or security.

The project focuses on the topical problems of computer vision, especially on visual localisation in a natural environment. Visual localisation of cameras in an outdoor environment is a problem that has not been solved yet, although the solution could be used in a number of attractive applications from automatic analyses of images, through applications of augmented reality to navigation of autonomous vehicles and aircrafts. The goal of the project is to research new methods for localisation of cameras based on registration of multimodal data, including photographic information, synthetic images, information on depth and terrain models using current methods of machine learning, in particular the deep neural networks (DNN). Apart from using terrain data in form of graphic models, an alternative for prediction of depth information based on an input photograph will also be researched.

Neural representations in multimodal and multilingual modelling

The NEUREM3 project combines basic research in speech processing (SP) and natural language processing (NLP) with a particular focus on multilingualism and multimodality (speech and text processing supported by the use of visual information). The current methods of deep machine learning are based on continuous vector representations that are created by the neural networks during the training process. Although empirically, the results of neural networks are often excellent, our knowledge and understanding of such representations are insufficient. NEUREM3 has the ambition to fill this gap and to study the neural representations for speech and text units of different scopes (from individual phonemes and letters to whole speeches and written documents) and the representations acquired both for isolated tasks and multi-task setups. NEUREM3 will improve the architectures and training techniques of neural networks, so that they can be trained using incomplete or incoherent data sets.

A systematic study of neural structures for modelling of speech and texts in multimodal and multilingual environments. Research into the hierarchies of neural representations, the comprehensibility of these representations to human users and the training in realistic conditions using imperfect and incoherent data.

Automata for Decision Procedures and Verification

Research into finite automata is a traditional discipline that has been for a long time producing a number of results potentially applicable to various areas, e.g. verification, natural language processing, databases or web technologies. However, the practical use of these results is limited by the insufficient scalability of the automata technology. Because the underlying causes of this ineffectiveness concern the most basic techniques and concepts of the automata technology, any possible progress in the area requires application of new approaches to the solution of classic problems. In this project, researchers propose to use a combination of traditional automata technology with techniques that proved successful in verification and automated reasoning, e.g. lazy evaluation, symbolic representation, abstraction and SAT/SMT solvers, in order to find a path leading to new solutions. Subsequently, the strength of the new automata methods will be demonstrated on several specific application domains including shape analysis programs, string manipulating programs and source and liveness/termination analysis.

Real-time network, text and speech analytics for combating organised crime

The aim of the ROXANNE project is to create an effective tool for uncovering organised crime and identification of suspicious persons using the state-of-the-art speech analysis technology and visual and data link analysis. ROXANNE will significantly accelerate crime investigation processes and improve identification of persons based on their speech in situations in which it is necessary to analyse large volumes of legally obtained recordings that can even be in various languages.

The project output will be an easy-to-use platform for security forces serving for collection of evidence and other important information based on technologies processing video, speech and linguistic data. The final version of the platform will utilise NLP technology and relation analytics for providing a clear overview of criminal activities in charts. ROXANNE will meet all relevant legal and ethical standards on the treatment of sensitive data of both the European Union and INTERPOL.

Research groups at FIT

Department of Information Systems FIT BUT

- Networks and Distributed Systems Research Group (NES@FIT)
- Hardware-Software Codesign research group (LISSOM@FIT)
- Formal Model Research Group (FM@FIT)
- Information and Database Systems Research Group (IS@FIT)
- Management of Software Engineering Research Group (MSWI@FIT)

Department of Intelligent Systems FIT BUT

- Brno University Security Laboratory (BUSLAB@FIT)
- Security Technology Research and Development (STRaDe@FIT)
- Automated Analysis and Verification Research Group (VeriFIT@FIT)
- Intelligent Systems Research Group (INTSYS@FIT)
- System Modelling and Optimization Research Group MODSIM@FIT)
- High Performance Computing Research Group (HPC@FIT)

Department of Computer Graphics and Multimedia FIT BUT

- Speech Data Mining Research Group (SPEECH@FIT)
- Computer Graphics Research Group (GRAPH@FIT)
- Knowledge Technology Research Group (KNOT@FIT)
- Computational Photography Group (CPHOTO@FIT)

Department of Computer Systems FIT BUT

- Evolvable Hardware Research Group (EHW@FIT)
- Unconventional Digital Circuits Research Group (POLY@FIT)
- Dependable Systems Research Group (DIAG@FIT)
- Supercomputing Technologies Research Group (SC@FIT)
- Accelerated Network Technologies Research Group (ANT SC@FIT)

Interdepartmental

- Robotic research group Robo@FIT (ROBO)

Patent

Medical device for localization of solitary pulmonary nodes in lung tissue

- Authors: Votruba Jiří, Drahanský Martin, Goldmann Tomáš, Kolář Radim, Brůha Tomáš
- The invention relates to a device for locating solitary pulmonary nodes in lung tissue, the use of which ranges from diagnostic to therapeutic use. The device uses infrared radiation with low radiation power, therefore it is not harmful to human tissue.

Products

- Big Data Containerized Cluster, software: Jeřábek Kamil
- DeMixer, software: Veselý Vladimír, Anton Matyáš
- EvoApproxLib – a comprehensive collection of low-level approximate implementations of arithmetic operations: Mrázek Vojtěch, Vašíček Zdeněk, Sekanina Lukáš
- FireProt-ASR, software: Musil Miloš, Štourač Jan, Damborský Jiří, Bednář David
- HTTP Keylogger, software: Letavay Viliam, Pluskal Jan, Veselý Vladimír, Grégr Matěj
- Immersive Trip Reports – Demo, specimen: Brejcha Jan, Čadík Martin, DiVerdi Stephen, Chen Zhili, Lukáč Michal
- BCS Segmentation Algorithm Implementation for FitLayout Framework, software: Lengál Tomáš, Burget Radek, Zelený Jan
- Mobile criminalistic electronic unit, specimen: Malaník Petr, Drahanský Martin, Pernický Radim
- Multisensoric board usable on drone, prototype: Malaník Petr, Goldmann Tomáš, Drahanský Martin
- Tool for Distributed Extraction of Timestamped Events from Files, software: Rychlý Marek, Burget Radek
- Official implementation of BUT-FIT's solution from Rumoureval2019 competition, software: Fajčík Martin, Burget Lukáš, Smrž Pavel
- PlCoSo: An SMT Solver for String Constraints, software: Janků Petr, Turoňová Lenka
- Full automatic retinal acquisition device, specimen: Drahanský Martin, Malaník Petr, Pokorný Jaroslav
- VeriFIT Static Analysis Plugins, software: Marcin Vladimír, Harmim Dominik, Pavela Ondřej, Vojnar Tomáš, Fiedor Tomáš, Rogalewicz Adam
- Semi-automatic Network Application Protocols Diagnostics by Using Network Traces, software: Holkovič Martin
- proof_platform: Platform for automated analysis and archiving of data from the web, software: Kocman Tomáš, Polčák Libor
- Speech enabled pilot/operator – agent interaction, software: Chudý Peter, Černocký Jan, Grézl František, Vlk Jan, Kašpárek Tomáš, Prustoměrský Milan, Karafiát Martin, Veselý Karel, Pomikálek Jiří, Ruta Dominik, Blašková Barbora, Borůvka Michael, Gamba Ivo
- A set of modules for smart services and features, software: Tisovčík Peter, Nečasová Klára, Kořenek Jan
- System for enrichment of bibliographic data based on full-text analysis, software: Otrusina Lubomír, Smrž Pavel
- Vehicle Re-Identification Software, software: Špaňhel Jakub, Bartl Vojtěch, Juránek Roman, Herout Adam
- Software to control a fully automatic retina acquisition device, software: Malaník Petr, Drahanský Martin
- Automatic document quality assessment software module, software: Bako Matúš, Buchal Petr, Hradiš Michal
- Software module for automatic enhancement of digitized documents, software: Hradiš Michal, Kodym Oldřich
- Lawful Interception L7 Probe for 10 Gbps networks, specimen: Dražil Jan, Fukač Tomáš, Košař Vlastimil, Polčák Libor, Vrána Roman, Kekely Lukáš, Korček Pavol, Kořenek Jan
- Collaborative Robot 2.0: Interaction, software: Juránková Markéta, Kapinus Michal, Materna Zdeněk
- Tensorflow implementation of speaker recognition with x-vector topology, software: Zeinali Hossein, Burget Lukáš, Rohdin Johan A., Stafylakis Themos, Černocký Jan
- Trau: SMT solver for string constraints, software: Abdulla Parosh A., Atig Mohamed F., Bui Phi Diep, Holík Lukáš, Chen Yu-Fang, Rezine Ahmed, Rummer Philipp
- Fingerprint Quality Visualizer, software: Kanich Ondřej, Oravec Tomáš, Dejmal David
- Winit, software: Kocman Tomáš, Polčák Libor

Selected results

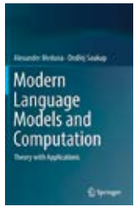
* Projects evaluated by marks 1 or 2 on the scale within the Module 1 of the Methodology 2017+

Scientific report:
Robust Automatic Transcription of Speech

Author: Pavel Matějka

The report summarises the results of the "Robust Automatic Transcription of Speech" (RATS) project implemented for Raytheon BBN. It is a summary report on the involvement of a BUT team into the international RATS project financed by the US Defense Advanced Research Projects Agency (DARPA). Apart from this report, the participation in the project also yielded several other publications published on international fora.

Specialist textbook:
Modern Language Models and Computation



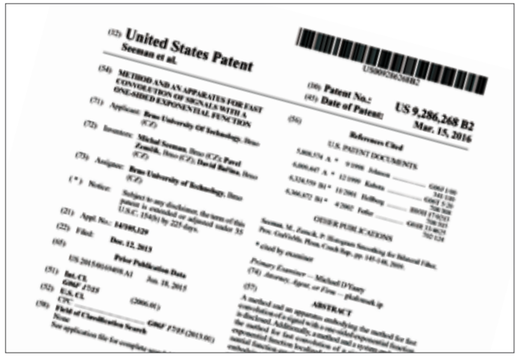
Authors: Alexander Meduna, Ondřej Soukup

The monograph titled Modern Language Models and Computation gives a systematised and compact summary of the most essential types of modern models for languages and computation together with their properties and applications. The publication represents the first systematic approach to modern language models and computation. It covers all necessary theoretical areas that include these models. In terms of practice, the book describes various concepts, methodologies, algorithms, techniques and software units that are based on these models. The book was published by the Springer publishing house.

Patent:
Method and an apparatus for fast convolution of signals with a one-sided exponential function

Authors: David Bařina, Michal Seeman, Pavel Zemčík

Signal, image and video processing are extraordinarily important areas of application of computer technology in practice. The speed of operations required in these applications is also extremely important. Signal filtrations using Gauss or Gabor functions, which are the subject of this patent, are one of the most frequently used operations in the areas of signal and image processing and computer vision. With the use of the existing methods, the increasing sizes of filters made the convolution too demanding in terms of computing power and memory. This could become an obstacle for example in real-time signal processing. This patent helped to remove this obstacle and its use leads to significant improvement of the processing speed.



Functional sample:
Probe for Lawful Interception on the Level of Application Protocols

Authors: Jan Dražil, Tomáš Fukač, Lukáš Kekely, Jan Kořenek, Vlastimil Košař, Libor Polčák

Thanks to the use of the FPGA technology and specially designed hardware architecture, the probe allows to precisely capture network communication not only based on identifiers from the network layer but also using identifiers from the application layer. The results of this project serve primarily to the police and other State security forces as a tool in the fight against cyber criminality.

Research report
KFC230 Turbulence Simulation

Author: Peter Chudý

The summary report introduces the KFC230 Turbulence Simulation research project and describes the extensive works performed which consisted in the analysis of usability of a modern user interface combined with touchscreen in the area of aeronautical equipment, specifically the autopilot system. The Faculty of Information Technology operates a full motion aircraft simulator capable of performing precise simulations accounting for various atmospheric turbulence effects.

Recognition and awards

Vojtěch Mrázek of FIT received the Česká hlava award

Vojtěch Mrázek of the Faculty of Information Technology of BUT received the most prestigious Czech award for science and research, the Česká hlava award. On Sunday, he accepted the award for his research into intentional errors in integrated circuits.

Even an error can lead to progress, particularly if the error is made intentionally. That is one way to summarise the work of Vojtěch Mrázek of the Department of Computer Systems at FIT BUT. He has studied the use of machine learning for optimisation and approximation of digital circuits for several years. Simply put, he is looking for errors that can simplify a circuit and thus save energy. The results can be utilized in mobile phones, wearable electronics or intelligent sensors, to name a few areas of application.

"These devices are technically more and more complex and the power sources available are limited despite the fact that the consumption of the circuits increases due to the complexity. This is where the technique called approximate calculation is used because it allows to significantly reduce the power input of circuits for the price of inserting a small mistake into the calculation. For example, if we tolerate a small error in a 2-bit multiplier, such as that 3 x 3 = 7 instead of 9, we can save 26% of power," explained Vojtěch Mrázek.

In some applications, users do not need to obtain perfect output – for instance in image processing, these small errors cannot even be detected by human eye. However, the complex integrated circuits contain hundreds of different elements – how do the developers know where they can make errors that are useful without compromising the whole system?

Together with his colleagues, Vojtěch Mrázek created a kind of a "guide" dealing with this problem. They published thousands of circuit designs containing various compromises between the error, power output and efficiency so that other researchers can use these designs directly in their applications without having to design these circuits themselves.

"We used evolution algorithms that gradually modify the circuit in such a way that its error and consumption improve. There are thousands of such steps, which we subsequently need to evaluate. To do that, we use mathematical methods for calculation of error, heuristic estimates of the consumption and all the data are processed using a supercomputer. We thus managed to design circuits with errors described on various levels – from transistors, through basic logic gates to combination of larger functional elements," Mrázek explains.

Mrázek's solution combines two fields – evolutionary optimisation and electronics design – and thanks to the use of machine learning, the results surpassed existing designs created by humans. For his work, Mrázek already received the Joseph Fourier Prize this year, presented by the Nobel Prize winner Jean-Marie Lehn, as well as the bronze medal in the HUMIES award in Japan. On Sunday, Vojtěch Mrázek received the highest award for Czech authors of patents and new technologies – the Česká hlava award in the Doctorandus of technical sciences category.

"I very much appreciate the Česká hlava award. I hope this success will help to popularise our field and encourage other people to follow in our footsteps in order to further advance the research in this area," said Mrázek.

Other awarded researchers included Jan Brábek, who focuses on migrastatics, a brand new cancer therapy described by world leading scientists as the biggest discovery since the introduction of anti-cancer immunotherapy; Miroslav Bárta, Egyptologist and archaeologist; Daniel Bím, who described the nature of the uneven bond of carbon and hydrogen which enables for new ways of production of medication; and Ciur, a company that created a new waste polymer-based ingredient to asphalt mixtures which can improve the quality of roads in our country.

Lukáš Holík and Petr Janků awarded for the best paper

An article titled "Chain-Free String Constraints" and its authors Lukáš Holík and Petr Janků from the VeriFIT research group won a prestigious Best Paper Award at the ATVA'2019 conference in Taipei. Their contribution introduces an algorithm for the solution of the satisfiability problem for string constraints that can be used, for example, to verify programmes manipulating the strings, such as web applications, or to verify the absence of certain kinds of security vulnerabilities, such as the Cross Site Scripting.

The Best Paper in DCNET 2019

Martin Holkovič, Ondřej Ryšavý and Libor Polčák received the award for the best paper in DCNET 2019 for the paper titled "Using Network Traces to Generate Models for Automatic Network Application Protocols Diagnostics".

The VeriFIT group was awarded the Best Paper Award at the CADE 2019 conference

Vojtěch Havlena, Lukáš Holík, Ondřej Lengál and Tomáš Vojnar of the VeriFIT group received the award for the best paper at the prestigious CADE 2019 conference dealing with the subject of automated verification in formal systems. The article titled "Automata Terms in a Lazy WSkS Decision Procedure" deals with decision-making on formulae for the WSkS logic using symbolic techniques for work with finite-state (tree) automata. The WSkS logic is used e.g. to describe infinite sets of charts in formal assessment and search for errors in programs with dynamic data structures. In addition, the Programme Committee awarded Vojtěch Havlena with the student Woody Bledsoe Award for an extraordinary contribution in the area of automated assessment.

Martin Kišš received an award for the best scientific poster in Sydney

Martin Kišš of the Department of Computer Graphics and Multimedia won the award for the best poster at the 15th ICDAR conference in Sydney. ICDAR is the largest and most prestigious international assembly for scientists and experts engaged in document analysis and recognition. Martin Kišš participated in the conference with an article describing the creation of a B-MOD dataset, which he presented at the event using the poster for which he subsequently received the Best Poster Award.

The speech group won VoxCeleb Speaker Recognition Challenge

The Speech@FIT group achieves another great success in an international competition. Its members, Shuai Wang and Hossein Zeinali, received award certificates for the first place in the VoxCeleb Speaker Recognition Challenge (VoxSRC) at workshop in Graz. Its aim is to evaluate how well can contemporary methods be used for recognition of speakers in various environments; the participants in the competition were tasked to recognise speakers in the audio track of certain recordings. The VoxCeleb database contains several hundreds of thousands of videos including several thousand recordings of celebrities; the videos range from professionally edited recordings to informal videos containing laughter or noise in the background.

Projects in the spotlight

Faculty of Information Technology developed a unique system for ŠKODA AUTO

In co-operation with the ŠKODA AUTO automobile plant in Mladá Boleslav, the Aeroworks research group from the Faculty of Information Technology of BUT developed a unique system enabling the company's technical development staff to design various user interfaces.

"Thanks to the system we created, technical development staff can easily design the appearance of the interface and the information that will appear not only on the dashboard, but also in the infotainment module or head up display. This allows us to easily adapt everything to the customer's preferences," explains Peter Chudý from the Aeroworks research group.

The automobile plant will now be examining in customer tests what type of displays is the most attractive, clear and safe for the users. Petr Štěpánek, the Rector of BUT, also tested the car that will serve as a mobile laboratory at the Faculty of Information Technology last week.

The unique system is a result of two-year research co-operation between ŠKODA AUTO and the faculty. "The project of the prototyping framework will serve for designing and verifying new user interfaces of future vehicles. Thanks to this framework, we can shorten the development cycle and thus agilely respond to the latest trends in the area of HMI, specifically the human – car interface. We would like to continue our co-operation with experts from FIT BUT in the future, especially in the area of innovations for autonomous mobility," said Vít Neruda of ŠKODA AUTO.

Scientists from FIT co-operate on development of an app aiming to make psychological care more effective

To develop a mobile app capable of recognising mental condition based on voice and image and, at the same time, enabling physicians to be in touch with their patients more frequently – for the past several months, this has been the goal of scientists from the Faculty of Information Technology of BUT co-operating with other foreign experts on the EcoWeB (Emotional Competence Well-Being) EU project. Its aim is to utilise the potential offered by mobile technologies to make psychological care more accessible to young people.

The mobile app should make psychological care for teenagers and young people more effective and intensive and, at the same time, it should serve as a prevention of occurrence of mental disorders. "People are often coming to scheduled check-ups with their psychologists when it is not necessary and when they are not aware of any acute issues. At other times, they would need more frequent consultations, but that is not possible as the psychologist just cannot schedule any more people for the given day. A video call cannot replace meeting in person, but it can help in certain situations. Furthermore, the psychologist will also gain the advantage of seeing the patient's environment and mental condition," described Pavel Smrž, who co-operates on the development together with his other FIT BUT colleagues.

Apart from arranging video calls between physicians and patients, the app also motivates its users to regularly record their feelings and mood. It can also evaluate the emotional state of a patient based on his/her speech. If the patient grants his/her consent, the app can monitor the non-verbal attributes of speech, such as voice frequency and dynamics, even during normal usage of the phone. Thanks to this, it can recognise if a person has been upset or emotionally unstable during the day. A psychologist can then get a more comprehensive overview of the patient's state and the development of his/her condition and has the option to adjust therapy accordingly.

While experts from the German company Audeering focus on analysis of speech within the ECoWeB project, experts from FIT BUT focus on recognition of emotions from video recordings. "We have plenty of experience from previous projects in which we focused on recognition of human emotions from a video recording using machine learning. Based on micro-movements of the facial muscles – mouth, eyes, eyebrows or lips – our algorithm is able to identify the current emotional state of person or even if the person is saying something that is at variance with his/her attitude and feelings based on micro-movements of the facial muscles," added Smrž.

According to Pavel Smrž, the aim of the app is not to replace personal contact between a patient and a physician but to use mobile technology to make the contact even deeper. "Our motivation is to guide the expert's work so that he/she has information about the patient even when they lack personal contact. Thanks to voice or image-based detection, the app can notify the physician that the patient has recently experienced emotional shock; the physician can then ask about that," he clarified. Another possible advantage is making psychological care more accessible and affordable so that it can also focus on the much-needed prevention of occurrence of mental disorders in young people.

Development of the app should be completed by the end of April. The app will be subsequently tested by teams of psychologists on nearly a thousand volunteers from Germany, Belgium, United Kingdom, Spain, Greece, Denmark and Switzerland. Following the testing, it should be available to psychologists and their patients.

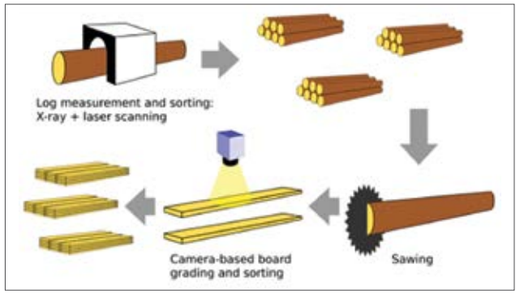
Czech algorithms from FIT aid digitalisation of Finnish timber industry

Automatic wood quality recognition and choosing of an appropriate manner of further processing. In brief, that is the plan of Tuomas Eerola from the Finnish Lappeenranta University of Technology who is currently visiting the Faculty of Information Technology of BUT and uses the algorithms and experience of his Czech colleagues in his research. The purpose of the DigiSaw project is to help modernising the timber industry and make the use of harvested wood as effective as possible.

At a glance, wood and computer technology do not have anything in common. Yet, Finnish researcher Tuomas Eerola aims to use the latest technology and finding in the area of image processing in wood processing. "The focus of the DigiSaw project is visual inspection of wood for timber product manufacturing. Thanks to automation, sawmill owners can cut boards in a manner that maximises their quality," described Eerola. This increases both the effectiveness of processing of felled trees and profits of sawmills. Gradual digitalisation and performance of checks of the wood has already increased profits by 24 per cent.

Inspection is carried out both on felled trees and subsequently on boards. "First, we record the trunks using a camera or a roentgen. Then we search for wood defects in the pictures. Those are for example knots, rot and many other things. A decision on how the wood is going to be cut and what will it be used for is then made based on the findings. After the wood is cut, it is inspected using standard cameras," clarified the Finnish researcher.

At the moment, Finnish sawmills are examining boards using two different devices. The goal of Tuomas Eerola and the DigiSaw project is to combine the data from these two devices. This will significantly increase the effectiveness and speed of wood quality evaluation. In his work, he also uses algorithms which were previously developed by experts from FIT BUT. "We have been co-operating with the Lappeenranta University for a long time. We exchange students and researchers and we create joint publications. That is one of the reasons why Tuomas Eerola decided to work on his project here. We have rich experience with detection of defects and detection of objects in a video. Furthermore, we can use neural networks for image processing," noted Pavel Zemčík, the Dean of the Faculty of Information Technology of BUT. It is thanks to some of the algorithms from FIT BUT the real-time assessment of the properties of wood is possible. "First, we had to show them tens of thousands of photographs of healthy wood and of wood with defects, or mark the defects for them if appropriate. Our algorithms then learned to recognise defects themselves," added Zemčík, who then continued by saying that the experts from FIT BUT use these algorithms for example in projects dealing with assessment of car detection and many other areas.



According to Pavel Zemčík, DigiSaw is not the first timber industry-related project the faculty participates in. "Even though we have so far not worked on other projects that dealt directly with cutting the wood, we co-operated with out Finnish colleagues on research related to further processing of wood. In particular, we have dealt with the production of pulp; we monitored production processes and used imaging methods to search for air bubbles in solutions used in production. That is because the quality of the given solution is assessed based on the size of these bubbles," said Zemčík.

Tuomas Eerola will be working on improving the effectiveness and bringing innovation to the timber industry in Brno until June; he will then present the results to his Finnish partners involved in the project. However, he does not know when the improved software will be put to use in practice. "The path leading from an idea to implementation in the industry is always fairly long," added the researcher, who also employs his knowledge of automatic image processing for example in a project studying the behaviour and movement of seals. "We have a rare species of seal in Finland that is found nowhere else in the world. They have unique patterns on their skin that work just like a fingerprint and thanks to these patterns, we can detect specific individuals on photographs sent to us by biologists. In effect, the biologists can easily monitor how seals move along the shore and so on," concluded Eerola.

Researchers at FIT work on effective interconnection of data from smart cars and buildings

When the batteries of an electric vehicle are almost drained, the vehicle sends a request to any smart buildings in the area that are equipped with solar panels and powerful chargers. According to the predicted energy consumption, the building will decide whether it has the capacity for the approaching vehicle and will guide it to the nearest charging station. This is one of the examples of co-operation between smart devices on which experts from FIT BUT are currently working within the Cross-CPP project, which was also joined by Volkswagen, the automobile manufacturer, and the Czech branch of Siemens, specialising in smart buildings.

"The Cross-CPP project connects and evaluates data from cyber-physical devices, which in this case are cars and smart buildings. These devices have various sensors, readers, cameras and radars, which continuously collect large amounts of data. We try to find ways of obtaining the most useful information from these data," said Pavel Smrž, who leads the team of experts from FIT BUT. Together with his colleagues, he is in charge of processing, analysing, encrypting data and creating classification and predictive models based on such data.

Experts now use hundreds of common cars equipped with intelligent sensors and cameras to collect, design and test data infrastructure. "Volkswagen announced that it would manufacture only electric cars from 2025 on. Other applications will then be related to pairing of information on a specific electric vehicle – its current battery level and remaining mileage estimation – with smart buildings and stops that host charging stations," described Smrž. "Smart buildings will be equipped with models predicting how much solar energy will be produced in the following hours and how the buildings will consume it – for example depending on how many people there are in the building and whether they are using heating or air conditioning. The excess energy can then be actively offered to passing electric vehicles," Smrž added.

Meteorology specialists are also involved in the project. They are creating an application for hyperlocal weather forecasts using data obtained from cars and their locations. "It is possible to obtain more than just information on the outdoor temperature from the vehicles. If we know that the drivers switched on fog lights or wipers, it is very likely that there is a fog or rain at the given location. We can evaluate its intensity on the basis of the wiper speed," says Smrž, outlining the sources thanks to which experts are creating very accurate meteorological models that are currently being experimentally tested in Germany. These models will be able to predict weather with accuracy of one hundred metres. Drivers can thus get a tip on where to go in order to avoid fog.

Excess energy in smart buildings can be offered to passing electric vehicles
Author: Archive of the Cross-CP project

From the data obtained from the GPS and sensors located in the car suspension, it is also possible to create useful maps of potholes on roads. However, data protection and privacy are the main priorities of the project. Any sharing of data is protected by strict legislation concerning personal data protection. "Drivers will thus have full control over what they want to share and when they want to share it. There would probably be no one interested in stealing information on the load of car suspension, but information on the location from which people can see that I am not at home or information on speeding could be more sensitive," Smrž described some of the risks included.

If a driver of a smart car decides to share data on his/her journey and have them evaluated, he/she can obtain various benefits. In addition to accessing applications with information about weather conditions and the traffic situation and a map of charging stations, insurance companies can also participate in the Cross-CPP project. "Drivers without any accidents recorded over a longer period of time could obtain benefits in the form of insurance discounts," explains Smrž. The data collected should also be extended by information from smart stops. There are dozens of such stops in the South Moravian Region, measuring not only the ambient temperature, but also recording information on the passage of public transport vehicles.

For experts from FIT BUT, the biggest challenge of the project was to devise machine learning algorithms that can effectively process large volumes of data, thus managing situations where a large number of cars start to share their data at the same time. "We are dealing with filtering and encryption of all the data so that they meet all the requirements for anonymity and, at the same time, can be classified and processed using neural networks used by machine learning. Alternatively, we want to enable service users to share data on different bases. For example, I am willing to share my vehicle position only when there are four other cars in the close vicinity – so that it cannot be inferred that the only vehicle that could measure the temperature at a certain place was mine," described Smrž.

Although IT experts will be able to anonymise the data, it will be very important to explain in detail the possibilities of data sharing to the users of smart cars. "In Cross-CPP applications, people will always be able to choose whether they want to share their data and it will be possible to completely disable data sharing at any time. However, the ways in which people perceive sharing of their data might change over time. And so, even if we have fully automated smart cars available, some drivers might prefer manual driving so as to maintain anonymity," said the expert.

The Cross-CPP project is part of the Horizon 2020 European Research and Innovation Programme and should continue until the end of 2020. International teams of experts, including scientists from FIT BUT, now aim to test whether the proposed technologies for integration and analysis of data flows are functional. "In the eighteen months after the completion of the pilot project, we plan to work with the aforementioned companies to introduce the technologies into practice on a broader scale," concluded Smrž.

Contractual research

35

industrial partners

31

projects as a part of the contractual research

23 600 000 CZK

total volume of finances for projects of contractual research in 2019

146

number of opened Bachelor's / Master's theses topics in co-operation with partners

Partners of the faculty

Golden:

- Honeywell
- Thermo Fisher Scientific Brno

Silver:

- Red Hat
- ŠKODA AUTO
- Unicorn Systems

Bronze:

- B + R automatizace
- Alvao
- ARTIN
- CAMEA
- CAMVISION
- Codasip
- Edhouse
- Flowmon Networks
- Innovatrics
- InvaSys
- Kinalisoft
- Kiwi.com
- KOMIX
- Master Internet
- Mautilus
- Mavenir
- NXP Semiconductors ČR
- Phonexia
- RCE systems
- RehiveTech
- ReplayWell
- Seacomp
- Sewio Networks
- SolarWinds Czech
- Solitea Česká republika
- TESCAN 3DIM
- TESCAN Brno
- TTTech Computertechnik AG
- UNIS
- Y Soft

New partnerships

SAP became faculty's new industrial partner

The Faculty of Information Technology gained a new partner. Near the end of 2018, Dean Pavel Zemčík signed a co-operation agreement with SAP. SAP is one of the global leaders in the area of software development. Together with research workers and students from the FIT, SAP will be working on projects focusing on this area. SAP thus became one of more than 40 industrial partners with whom the faculty intensively co-operates in research and development.

FIT will co-operate with Honeywell on navigation system research

The Faculty of Information Technology of BUT has initiated a new co-operation with Honeywell in the area of aviation navigation system research. By doing so, it follows the memorandum signed by the Rector of Brno University of Technology in January 2019. The ceremonial signature of a new co-operation agreement between FIT and Honeywell on 16 April 2019 was attended by the Dean of the faculty, Pavel Zemčík, Petr Sadovský from the Research Centre of Information Technology of FIT, president of Honeywell Technology Solutions Scott Zhang and General Manager or Honeywell Technology Solutions Czech Republic Oliver Stucky.

Selected contractual research projects

CZ.NIC

Accelerating the DNS collector, using the DPDK system and then using the available hardware platform with the powerful NXP network processor and the FPGA chip.

AVAST

Methods for extracting and detecting patterns in the program code

NTT

Speech enhancement front-end for robust automatic speech recognition with large amount of training data

HONEYWELL

Auto-Navigation for Urban Air Mobility – an extension of the navigation system using visual sensors

ARTIN's Jan Najvárek:

When we were starting, artificial intelligence was still in its infancy, but we believed that it would soon become a part of our everyday lives

Their RoboAuto is parked in the FIT's garage; now the developers from the partner company ARTIN work on the development of a robotic train and a prototype of virtual receptionist.

When Jan Najvárek, a BUT FEEC graduate, founded his company in 1990s, he chose the name "ARTIN" as a combination of the words "artificial intelligence". He is still focusing on artificial intelligence, automation and software development and he employs three hundred people whom he wants to provide with the best possible working conditions. They successfully worked on the development of self-driving means of transport and now they work on a prototype of virtual receptionist.

How will the virtual receptionist work?

It should perform the same functions as a human receptionist with the only difference that you cannot ask it out. You approach the reception desk and the device will recognise your image. It will be able

to recognise that you are talking to it and answer your questions. Your question is then transcribed and uploaded to a cloud where it is processed and your intention – the information you are asking about – is evaluated. If the receptionist knows the required information, it will give you the answer. All this is possible thanks to artificial intelligence. For now, we are only testing the concept of our virtual receptionist, Rony. Visitors can see her face on a screen but in the final version we want to project her on a glass from below so that she looks more like a real person. The resulting hologram will look very much like a living being. In a couple of months, we are going to relocate our company to a new building in the Czech Technology Park and you will be able to meet Rona there.

What are the advantages in comparison to an ordinary receptionist?

It probably is not better than a human receptionist. However, receptionists are rarely busy during their entire working time so it is not economically feasible to employ a full-time worker on this position. Especially these days, when there is so few people on the labour market. Moreover, visitors usually want the same things from the receptionist time and time again– to call someone or to take over the mail – which is something we can teach the virtual receptionist. These are some of the arguments in favour of automation. That is also why we develop chatbots for customer contact points. Many people use chat platforms in e-shops to ask the same questions over and over again. Employees do not like answering the same questions all the time and such ineffective work is also not profitable for the employer. That is why we want to create a solution providing automated answers to up to a third of the questions asked – some of these questions will be answered by a chatbot. You will only be put through to a human operator if the chatbot is unable to answer your question.

You also use artificial intelligence in autonomous vehicles, right?

Yes, we have managed to create a prototype of an autonomous car that uses neural networks. Our RoboAuto is parked in the garages at the FIT. We use a similar technology in a robotic train that we are currently developing for the Czech Railways company. We are facing similar challenges as we did during the development of the car. The artificial intelligence must be able to identify obstacles on the track and distinguish for example a stone from a child. But unlike car, train is not able to avoid the obstacle and its braking distance is in some cases up to 800 meters long. Therefore, we need to make sure that the train is able to see a long way ahead. Or even around the bend. We want to place cameras along the tracks which will be able to detect possible problems and communicate with the approaching train.

What are some of the challenges of the development of devices using artificial intelligence?

In AI applications, understanding the broader context is generally a problem. The way the AI understands the world. We can programme the RoboAuto's system to stop if it detects an obstacle in its way. But how can we teach it what to do when it passes near a crowd of people, e.g. in case of some protest gathering? In such situation, the car can move on but has to go very slowly and carefully react to the people. And how should we explain to the AI that such a gathering of people is different than a traffic accident when it has to stop? For AI, both situations are detected as a certain number of people moving on the road in some way. So there is about 1% of situations that cannot be completely covered. In practice, the car system usually calls an operator who takes over and drives the car manually for a moment. You see, together with my colleague Tomáš Ondráček, who is a graduate of the FIT BUT, we have been working in the field of artificial intelligence since the 1990s when we founded our company. Back then, artificial intelligence was still in its infancy, but we believed that it would become a part of our everyday lives in the future. And it turns out that we were right about that. But we do much more than just that in ARTIN…

What else do you do?

We also do classic software development and customer support, outsourcing and consultancy services. These activities may not sound cool, but they are necessary. Our customers include large insurance companies, banks and mobile services providers, not only in Czechia, but also in Romania, Germany and Poland. We are a large group of developers who provide IT services according to our clients' needs. By the way, about a half of our employees probably graduated at the FIT BUT.

You also actively co-operate with the FIT BUT, you support various educational events…

We consider it our alma mater, even though its name was different at the time of my studies. All our offices are cleverly spread around so that we surround the FIT campus and students cannot slip under our radar. (laughing) No, really. In fact, we support the development of IT education not only at higher education institutions but also at secondary and elementary schools. In our company, we organise a training course for children where they can learn the basics of programming. We also organise open programming hackathons with the participation of higher education institution teachers and their students. Last time, we had a competition of who can write the best code for races of small toy cars using artificial intelligence. We want the students and employees to have a good time and learn something at the same time.

Education and Students

The Faculty of Information Technology currently offers education of professionals in the following degree programmes: three-year Bachelor's degree programme (Bc.) Information Technology, innovated two-year follow-up Master's degree programme (Ing.) Information Technology and Artificial Intelligence and the previously accredited Master's programme Information Technology, and a doctoral degree programme (PhD.) Computer Science and Engineering.

The faculty emphasises high quality theoretical preparation corresponding to university studies in the field of technology. However, we realise the importance of the studies being interconnected with practical experience. The faculty has its own Industrial Board through which it maintains regular contact with the industry leaders. That allows the faculty to bring the latest findings from practice into its study programmes. As a result, FIT graduates are highly demanded at the labour market, and have the highest starting salaries from all BUT graduates.

Study at FIT in 2019 in numbers

2 274

students

5

accredited study programmes

466

graduates from 30 countries

100 %

success rate of the graduates finding a job

195

subjects taught at FIT in ac. year 2018/2019

The Faculty of Information Technology will offer seventeen new specialisations. By doing so it reacts to the needs of the market

In the future, the Faculty of Information Technology of BUT wishes to accommodate the needs of the fastest-developing field. As from the next academic year, the faculty plans to prepare seventeen new specialisations for students who wish to earn the Ing. academic degree from a follow-up Master's programme. The faculty has already applied for the relevant accreditation. It also aims to prepare its graduates for new trends that will emerge in this field in the future.

Today, information technology is a very sought-after field, but it is also very specific in terms of the speed of its development. New technologies and related professions and specialisations are emerging at a very rapid pace. "It seems that programmers with knowledge of current technology will experience no shortage of work opportunities in the coming years. Nevertheless, this might not be enough. In order for IT professionals to retain the ability to react to new or even currently unknown trends which emerge all the time in this field, they need a broader and more general set of knowledge and skills that will enable them to keep up with technological developments," said Pavel Zemčík, the Dean of FIT BUT.

Keeping up with technological development at any point of their careers

The students should acquire such skills in the Master's programme which is currently being prepared and which will offer seventeen specialisations. The aim of the programme is to provide a solid set of general skills and knowledge, allow the students to specialise and, at the same time, to react to current trends in the fields of information technology and artificial intelligence. This allows graduates to acquire deep knowledge in the given specialisations but also provides them with general skills, competences and way of thinking that will stand the test of time. "Thanks to this, the graduates will be able to keep up with technological development and to find jobs in creative positions at any point of their careers and anywhere in the world," added Pavel Zemčík, the Dean of FIT BUT.

Newly prepared specialisations of the IT and AI Master's programme

- Bioinformatics and Biocomputing
- Information Systems and Databases
- Intelligent Systems
- Intelligent Devices
- Cyberphysical Systems
- Cybersecurity
- Mathematical Methods
- Computer Graphics and Interactions
- Computer Networks
- Computer Vision
- Software Engineering
- Machine Learning
- High Performance Computing
- Software Verification and Testing
- Embedded Systems
- Application Development
- Speech and Natural Language Processing

Among other things, the faculty prepares various activities to support its students, such as the support of individual creative activities in technical and scientific fields or support of founding start-up companies. For example, all successful solvers of laboratory tasks will receive an embedded computer but students also have access to fully equipped laboratories.

Practical experience

In preparing this change to the study programme, the Faculty of Information Technology also based its work on the experience of a number of its industrial partners with whom it co-operates in the areas of research and development and education. In its application, the faculty utilised the institutional accreditation of BUT The Brno University of Technology acquired the institutional accreditation in 2019 as the first technology-oriented higher education institution in the Czech Republic – the accreditation enables it to approve its own study programmes and thus better respond to educational needs and the needs of the labour market.

Applicants for Ing. degree studies may enrol in the Master's programme until 15 April. "As the accreditation process for the new Master's programme is still ongoing, the admission procedure is open for the current Master's programme. Nevertheless, we will allow the newly accepted students to transfer to the new programme as soon as it is approved in the academic year 2019/2020," explained Pavel Zemčík, the Dean of the faculty. New students will have the unique opportunity to choose between the current and the new study programme.

Going abroad with BUT

Photographs of FIT students from their study abroad

Jan Velecký, Russia

Lukáš Kúšik, Denmark

Julia Rudnitckaia, Norway

Magdalena Urmínová, Portugal

International student mobility

Students coming to FIT in the academic year 2018/2019

Total: 48

- Turkey 7
- Spain 6
- Greece 6
- Portugal 5
- France 5
- Brazil 4
- Finland 2
- Italy 2
- Cyprus 2
- Austria 2
- Poland 2
- Bulgaria 1
- China 2
- India 2

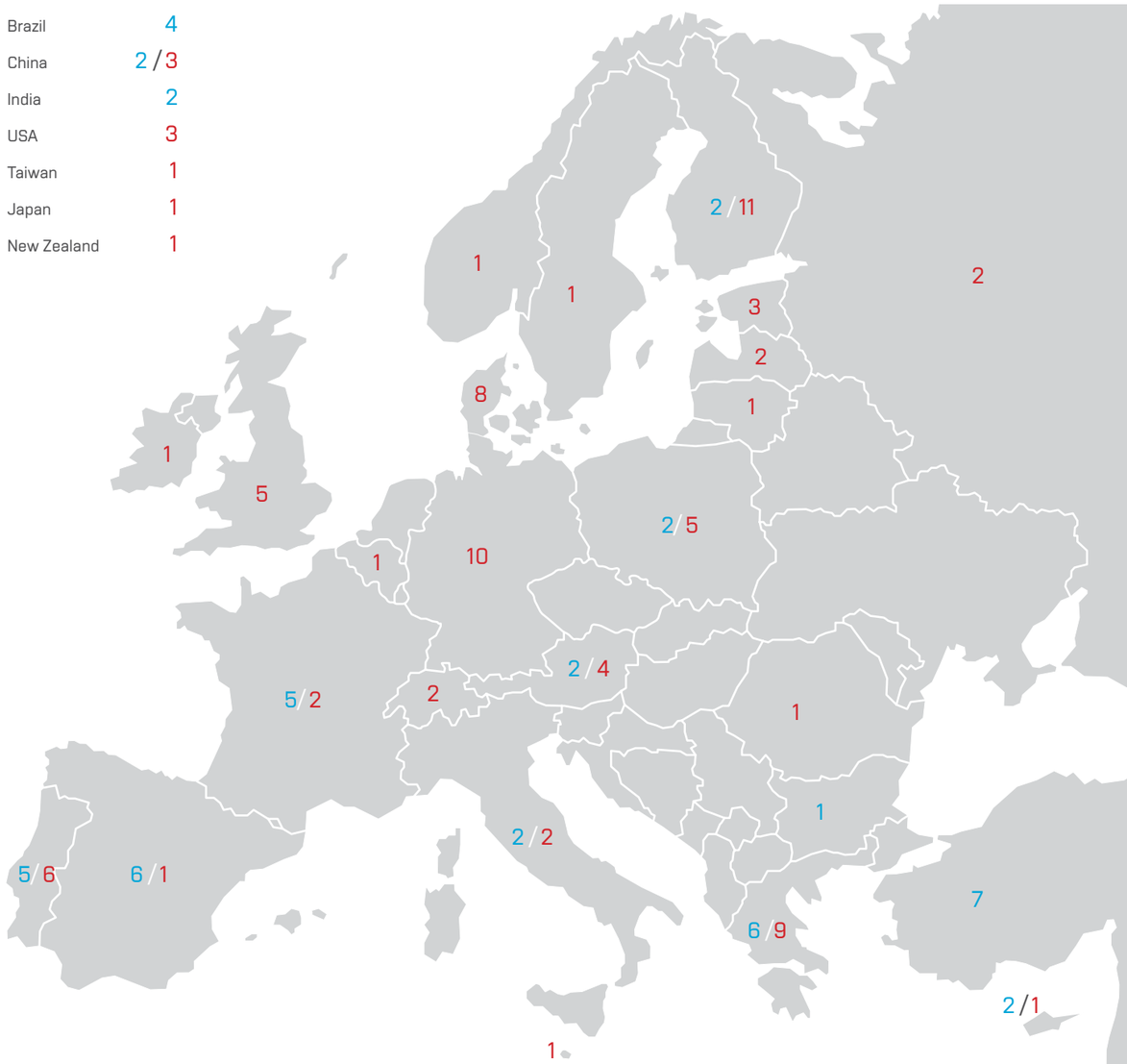
Number of FIT students going for a study stay abroad in the academic year 2018/2019

Total: 89

- Finland 11
- Germany 10
- Greece 9
- Denmark 8
- Portugal 6
- Great Britain 5
- Poland 5
- Austria 4
- USA 3
- China 3
- Estonia 3
- France 2
- Italy 2
- Latvia 2
- Switzerland 2
- Russia 2
- Belgium 1
- Ireland 1
- Cyprus 1
- Lithuania 1
- Malta 1
- Norway 1
- Romania 1
- Spain 1
- Sweden 1
- Taiwan 1
- Japan 1
- New Zealand 1

10,1 % proportion of graduates who participated in a stay abroad during their studies

- Brazil 4
- China 2 / 3
- India 2
- USA 3
- Taiwan 1
- Japan 1
- New Zealand 1



International studies

Computer Graphics and Multimedia

In the 2018/2019 academic year, the Faculty of Information Technology started to teach the Mater's study programme Computer Graphics and Multimedia in English.

The aim of this programme is to teach the students the theory, technology, procedures and skills used in the area of computer graphics and multimedia. Students will learn to process data from cameras and microphones, obtain information from video and audio recordings or design user interfaces. Within their study, they will be experimenting in laboratories for example with robotic sensors or with a flight simulator.

For more information, see here.

FIT organises an international summer school and offers students from all over the world courses in various areas of IT

In the second half of July, the first year of the international BISSIT summer school (Brno International Summer School in Information Technology) took place at the Faculty of Information Technology. The summer school offered people from all over the world courses in the area of interactive applications, machine learning and robot programming. From 15 to 31 July, the participants were able to attend both theoretical and practical seminars, join organised visits to technology companies and undertake informal trips to interesting places nearby. na zajímavá místa.

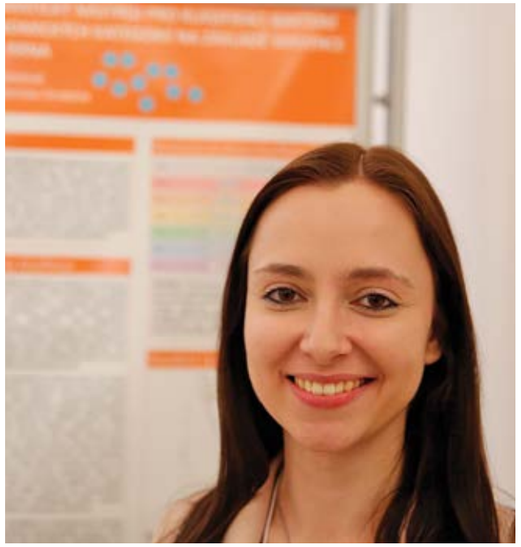
For more information, see here.

Creative activity and students' successes

Excel@FIT 2019: Student designed new method for bacteria classification

The fifth annual Excel@FIT IT conference organised by the Faculty of Information Technology of BUT introduced nearly sixty student works with the potential to considerably influence the world of information technology in the future. For example, on Thursday 25 April 2019, students introduced a new method for bacteria classification, a tool for placing graphical elements to live video broadcast or an app for measuring objects in space using a mobile phone.

"For a long time, the only way to analyse bacteria was to cultivate them. Nevertheless, many species of bacteria cannot be cultivated and for this reason, they were undetectable. My tool strives for automatic sample classification using 16S rRNA gene sequencing.



Processing and classification of individual sequences is a complex issue, that is why I designed a new method based on the taxonomic tree structure," said Nikola Valešová, an information technology student, describing her work.

Bacteria can be approached as "big data" whose thorough analysis helps us understand chronic diseases or drug functionality. But once a bacteria sample is removed from the host body to be observed under laboratory conditions, they must be cultivated in some way and the vast majority of bacteria will perish during the process. Therefore, it is sometimes necessary to load data from the sample straight to the computer, but this might mean loading up to several gigabytes of data for a single sample. The task of IT specialists is then to find ways of sorting this large amount of data and thus correctly and automatically classify bacteria. According to the evaluators, the work of Nikola Valešová shows significant research potential despite dealing with a complex experimental issue.

Other interesting projects which experts and general public could see in the premises of the Carthusian monastery in Královo Pole included functional application for automatic measurement of objects in space using Augmented Reality by Miroslav Karásek. The user only needs to point a mobile phone at the measured object to immediately receive information on the dimensions of a three-dimensional object. "Thanks to the AR measure app, you can easily measure dimensions without having to carry a measuring tape or a ruler. It can be useful for example for measuring furniture, luggage or when the user needs to determine postage based on the dimensions of the parcel," said Karásek, the author of the handy app which can be downloaded on Android for free via Google Play.

The committee has also shown interest in the work of Son Hai Nguyen who focused on the issue of inserting 2D graphics to live broadcast, for example logos or flags to broadcasts of sports matches. The committee composed of IT experts and representatives of industrial partners could grant prizes to up to twenty IT projects which, in its opinion, bring significant contribution to research or an interesting

technical solution. The general public voted for five best exhibited projects; corporate sponsor partners could also decide on the best projects.

"The aim of the Excel@FIT conference is to introduce interesting student works and ideas, give students the opportunity to share their thoughts not only with their classmates but also with researchers, people from the industry and general public and also to motivate them to present their work. This conference is dedicated to the memory of a renowned teacher Jiří Kunovský who was a great personage of the Faculty of Information Technology and an exemplary teacher thanks to his approach to students," concluded Vice-Dean Vítězslav Beran, the main organiser of the Excel@FIT conference.

Panel of experts gave prizes to a total of 18 students' works. The Jiří Kunovský Award was awarded by the public to five projects based on over 900 votes. Another nine prizes were awarded by the industrial partners. The award-winning authors received stipends in the total value of 161 thousand Czech crowns. Almost sixty contestants entered the fifth year of the event; the presentation and exhibition of works along with the panel discussion with industrial partners sponsoring this conference were visited by about 400 participants from among students, teachers and representatives of companies, as well as high school students and teachers.

Star(t)up@FIT

Star(t)up@FIT is a new series of informal meetings of the owners of future technology companies that have the ambitions to change our world. The programme of the Faculty of Information Technology provides to the students an opportunity to meet like-minded people, as well as people who had already achieved success, the chance to work and relax in the Creative IT Showroom, or get professional and business consultations and receive expert help with moving their projects forward.

In his diploma thesis, Dušan Drevicky taught computers to recognise the correct X-ray images – now he received an award for his work

As part of the work on his diploma thesis, Dušan Drevický created and tested an algorithm which can determine the degree of certainty of its conclusions when examining dental X-ray images. He received an award for his work. In the IT Spy, the official competition of Czech and Slovak universities striving to identify the best theses in the field of computer science and information technologies, Drevický won the third place.

Artificial intelligence is gradually becoming a part of the medicine of the 21st century. Nowadays, algorithms using deep learning are already being used in radiology. In diagnostics, these methods are very successful, often even more successful than the physicians themselves. Broader deployment of artificial intelligence applications in medicine is therefore hindered only by a single thing – the lack of reliable information on whether the conclusions adopted by the algorithm are correct. This is the topic Dušan Drevický focused on in his thesis.

In the future, his project should help dentists mark X-ray images that are correct and thus avoid errors and extra work. "Deep-learning models are achieving great results in various areas of computer vision. However, they generally do not provide enough information on how sure the model is about its prediction," says Drevický.

Deep-learning models learn on their own from vast amounts of data so that they are able to give their users a qualified prediction. In X-ray images, they can subsequently mark key points that are important for the dentists, such as "suspicious" places, e.g. tooth decay or even a tumour. "This information alone is not sufficient for the physicians because they do not know how much they can rely on the prediction. If the image is similar to the data that was used to train the model, the prediction is very likely to be reliable. However, the models can sometimes arrive at wrong conclusions and mark an error as a correct answer," Dušan explains.

Algorithms can create a certain assumption but they cannot work entirely on their own. They should provide the physicians with a lead that will support their decision-making. "My task was to evaluate the metrics that would tell to the physicians which models are reliable and can be trusted and which are not. Physicians using this system will know on which conclusions they can rely and which data is not reliable and needs to be checked manually," adds Drevický.

He believes that this solution could significantly help both the physicians and the patients. "Mistakes in medicine are expensive and severe. This system markedly improves the physician's efficiency and his certainty in terms of the use of artificial intelligence in medical practice. It is great to have at your disposal a model that was trained on thousands of pieces of data and checks your work. For physicians, these models are real time-savers and enable them to focus more on activities that require expert decisions. This is especially important in the case of dentists, as there is not enough of them in this country," states Dušan Drevický. He further adds that similar systems could be very valuable in the third-world countries where there is a critical lack of qualified physicians in all fields.

"This is a significant trend in modern medicine. Artificial intelligence is not going to replace physicians for sure, but it can significantly facilitate parts of their jobs that can be automated. Physicians can then spend more time with their patients or focusing on more difficult cases. Moreover, artificial intelligence can be used to check their work," adds Drevický.

His project should be soon implemented in practice. Drevický's diploma thesis was created in co-operation with Tescan 3DIM, which should implement his system into their newly developed medical diagnostic software. "That may be the thing that got the attention of the jury in the IT SPY competition. My work has a scientific publishing potential but the research was not carried out to remain just on paper. From the very beginning of our co-operation, there was a clear intention to implement the results in practice," explains Drevický.

After successfully defending his thesis last year, he concluded his studies at the Faculty of Information Technology. However, he is still interested in the field of artificial intelligence and deep learning models and now works in a start-up focused on processing of speech. He also keeps in touch with the faculty. "There are top-quality teams conducting great research as well as new study programmes focusing on these areas. People interested in this field consider FIT an important point of interest," he concludes, admitting that he considers returning to the FIT for his doctoral studies.

IT SPY is an official competition of Czech and Slovak universities in the field of computer science and information technologies striving to identify the best theses. Last year, which was the 10th year of the competition, the expert panel of judges was assessing almost 1,600 theses from Czech and Slovak faculties; Dušan Devický's work ended the third best.

"The role of automatic learning and computer assistance is growing every year. It is becoming increasingly clear that learning mechanisms must also be balanced out with correction mechanisms. The aim of the thesis was to implement these in an environment with no room for errors – i.e. in medicine – and it produced very convincing results," said Prof. Mária Bieliková from Slovak Technical University in Bratislava, the academic guarantor of the competition.

Academic experts concur that the quality of both Czech and Slovak students of IT faculties is on par with the global level. In the current year of the competition, the jury was assessing a record number of works implementing methods of artificial intelligence, i.e. one of the key elements of the future technology development. "The growing international feedback regarding the diploma projects of our students is also very positive and some students are given a chance to present their research at scientific conferences abroad," adds Bielíková. The same applies to Dušan Drevický who was presenting the results of his work at the conference Bioimaging in Malta.

An award-winning application of a FIT graduate saves eyesight

On Thursday, 7 November, an award ceremony of Atlas Copco and Edwards Awards took place at Atlas Copco's Sky Club. It was a great success for students of BUT. The Edwards Award rewards theses focusing on technical topics. This year, a total of 37 diploma theses applied for the recognition. Pavel Hřebíček, a FIT BUT graduate, whose Eye Check application caught some attention earlier this year at the Excel@FIT conference, won the second place. The application enables detection of an eye disease leukocoria. "Leukocoria is the whiteness of the pupil that may appear in a photograph taken with a flash. Early detection of this symptom can save the patient's eyesight," explained Pavel Hřebíček, adding that his application works with a 98% accuracy. Learn more about the mobile app detecting leukocoria from a photo of a patient's face on the website of Eye Check or in this article.

8 of BUT: FIT and FA students wrote the best Bachelor's diploma theses

The presentation contest 8 of BUT has found its two winners. A shared first place was awarded by the jury to Magdaléna Buzová, a student of the Faculty of Architecture, and to Son Hai Nguyen, a student of the Faculty of Information Technology. The FIT student managed to explain the intriguing topic of his thesis "Insertion of 2D Graphics into a Scene Captured by a Stationary Camera" to general public through an attractive presentation sparkled up by his charm and humour. His work attracted some attention earlier this year at the student conference Excel@FIT where he received praise from the jury, partners and the public.

8 of BUT is a presentation competition of the best Bachelor's theses wrote by the students of all faculties of BUT in the last academic year. The theses and their authors are nominated by the management of individual faculties.

Three students who created the Nepanikař application received the Zdena Rábová and Angelina University awards

Students of the Faculty of Information Technology of BUT Tomáš Chlubna and Aleš Řezáč and their colleague Veronika Kamenská from FEEC received the Zdena Rábová award from Pavel Zemčík, the Dean of FIT. This award is presented to prominent personalities from among the faculty students for their active participation in science and research and for their overall contribution to the faculty's prestige. Three students created the Nepanikař (Don't Panic) mobile application, which can provide immediate assistance to people with panic attacks or people thinking of suicide. In addition to the undisputed social benefit, the mobile application also gained considerable media attention. The student also succeeded with their project in the finals of the Angelina University Award competition, where they won second place.

Veronika Kamenská, a bio-medicine student at FEEC BUT, came up with the idea to create an app which would provide support to people suffering from mental illnesses two years ago. At that time, she was suffering from post-traumatic stress disorder which led to anxiety and depression and culminated in a suicide attempt. "I was looking for something that would help me manage the condition. But all available mobile apps were in English and were missing contact information for relevant aid in the Czech Republic. Furthermore, they were narrowly focused either on depression, panic, or anxiety. Yet these disorders are often interconnected," explained the student who has decided to assist in de-stigmatisation of mental disorders.

A year ago, she created the Mlčení není řešení (Silence Is Not the Answer) project which can be used by people to share their own experience with managing mental illness. On social media, they will learn what happens during a visit to the psychologist or hospitalisation at a psychiatric department. "This information is not easy to find. People are scared because they have no idea what will happen to them after hospitalisation," Kamenská explained. The project also includes the Nepanikař mobile app which was co-developed by FIT BUT students Aleš Řezáč and Tomáš Chlubna.

The Nepanikař app offers five basic modules containing instructions on what to do in the event of severe anxiety, depression or thought patterns leading to self-harm or suicide. "Breathing exercises are effective when dealing with anxiety. Solving mathematical problems has proven effective when dealing with a panic attack as it draws one's attention away from the feelings of suffocation or imminent fainting," she added. In case of depression, the app attempts to motivate the user to plan and do some activities. "Drawing up an emergency plan while the person is stable is also very effective. If the person starts having suicidal thoughts, the plan will remind him/her to contact a close person or a crisis centre," she pointed out.

During development, Kamenská co-operated with psychologists and psychiatrists. During a pilot survey, the app was tested by twenty people, most of whom have been diagnosed with some kind of mental illness. The feedback was positive. Apart from the simple activities method and creation of an emergency plan, the users could also use a list of contact information of verified helplines and crisis centres. "We tried to design the app for young people who find it difficult to tell their parents about their problems. For them, the idea of telling a stranger is much more bearable," explained Kamenská.

The mobile app has been downloaded by over eight thousand people and it is available for Android and newly for iOS phones. Its introduction on the market was also supported by the Nevypusť duši (Don't give up the ghost) non-profit organisation who introduces it to teachers and high school students during its workshops aimed at raising awareness of mental disorders. "However, the application is also used by people who do not suffer from any mental illness. Its handy tips can help them to manage stressful situations or anxiety," added the student who wants to expand the app in the future so that it can also help people suffering from eating disorders or obsessive-compulsive disorder.

Veronika Kamenská, a bio-medicine student at FEEC BUT came up with the idea to create the application two years ago | Author: Oto Janoušek

Student Union

The Student Union of the BUT FIT is a students' organisation at the Faculty of Information Technology. Its mission is to mediate and facilitate communication between the faculty and the students, defend students' rights and organise extracurricular activities.

SU FIT in 2019

58 members

(co)hosting of 45 events

Student Union presented a new logo

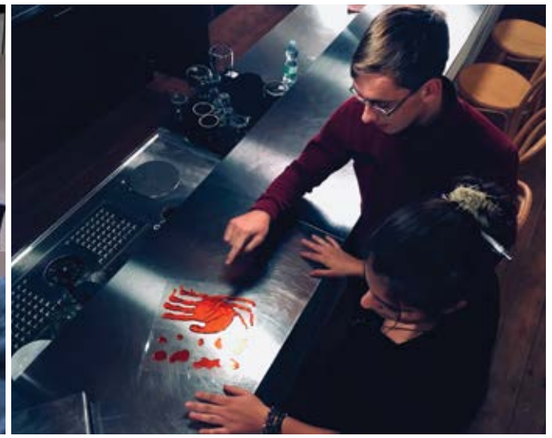
The Student Union of the FIT presented its new logo. The logo was chosen from among thirty different proposals submitted to a selection procedure. In the end, the design proposed by Aneta Helešicová was most liked by the representatives of the SU FIT. "The logo symbolises three students of the FIT represented via the symbol that developers use most frequently – semi-colon. Three signs represent a group and the SU FIT strive to represent all students without any difference," explained the author of the new logo.

Aneta Helešicová elected to lead the Student Union

The SU FIT has elected its new president. In the last election, Aneta Helešicová was elected the president of the management board of the Student Union. She replaced Ivo Juráček who held the office in the last academic year. As her priority, Aneta wants to make sure that the voices of faculty students are heard and she will also continue to develop the inter-university and inter-faculty co-operation. Martin Škorupa and Richard Bureš were elected vice-presidents.

The Rock@FIT festival was visited by three hundred people

The Rock@FIT music festival and the Closed Doors Day event attracted almost three hundred visitors. The visitors could attend seven concerts, visit the faculty roof or basements, compete in screaming contest or keyboard assembling contest, escape from an escape room, debug the faculty or visit the museum, chapel or server room.



Graduates

Statistics of FIT graduates in 2019

466

total number of graduates

290

number of graduates of Bachelor's study programmes

170

number of graduates of Master's study programmes

6

number of graduates of doctoral study programmes

174

number of foreign graduates

40 938 CZK

average graduate starting salary

89 %

of graduates would choose FIT again for their studies

It is still difficult to look for business thinking in the Czech Republic. Access to a great technology is not enough, says investor Karel Obluk

The decision to dedicate his life to the IT field, whether as CTO and CEO of the Czech antivirus company AVG or as an investor, is not one that Karel Obluk regrets. The graduate of a doctoral programme at FIT BUT recommends that anyone seeking an investor should first and foremost gather facts and provide convincing answers. At the same time, he believes that university education is still very important even at the time of rapid increase in the number of start-ups and young entrepreneurs. In his opinion, millionaires such as Bill Gates and Steve Jobs who never completed their university studies tend to be the exceptions proving the rule.

If he was a student today, Karel Obluk would be interested in data science and machine learning | Author: archive of Karel Obluk

Karel Obluk, an IT expert, member of Evolution Equity Partners, a venture capital investment company, and the co-founder of the free association of angel investors Garage Angels, believes that university education is an important preparation for life. "I don't say that people cannot achieve success with just secondary education. At the same time, I believe that university studies are of fundamental importance for life. They provide people with formal foundations in the given field and prepare people for real life. When my two daughters studied at a university and complained about some of the courses or duties, we always told them that this was also part and actually one of the important aspects of the university studies. It will teach you to deal with stress and sometimes do something you do not really enjoy or in which you cannot see any sense. This is something that Czech and foreign companies have been encountering for a long time," said Karel Obluk.

As an experienced investor, he is also interested in the education of employees in companies in which he is to invest. "I focus primarily on investments in IT companies. In these companies, the number of employees with a PhD degree may sometimes be a certain metric increasing the value of the company. This does not mean that people

with PhDs will automatically yield better results. However, it is a good sign for the investor that experts who have spent many years studying and have a relatively deep theoretical knowledge in the given area want to work for the given company. This shows that they believe that there is something interesting with a future potential," explains Obluk, stating that some people argue with names such as Bill Gates and Steve Jobs, who are known for not completing their university studies. In his opinion, however, these are mere exceptions proving the rule. "Not to mention the fact that people should be educated continuously throughout their lives," added Obluk.

If he could return to the point where he was deciding on where to study, the life of Karel Obluk might now be completely different. "Information technology has changed significantly since the time of my studies. I studied courses that were dealing with classic electrical engineering. Today, I would probably be more interested in studying data processing and machine learning. However, from a practical point of view, I would certainly choose IT again," said Karel Obluk.

Obluk thinks that the IT field experiences enormous growth. "Of course, I am somewhat biased because we invest exclusively in information technologies within the fund. In my personal investments, the area of focus is wider, but I still invest primarily in IT companies. I can see that there is a growing number of technologies with an impact on our lives. While they used to be developing special software or hardware in the past, many technology start-ups are focused nowadays on products connected with everyday life," Obluk pointed out that it is increasingly difficult to delineate what is and what is not an IT company. "IT processes, technologies and equipment are also used in a number of other areas, from the automotive industry to environmental protection and medical sciences. It is then difficult to say where to put them," he adds.

While Evolution Equity Partners invest primarily in established companies in America and Europe and Karel Obluk and his colleagues monitor such parameters as financial performance, number of customers and potential for growth, he also decided to return a part of his knowledge and finances to Moravia. Together with important Czech investors, including Jiří Hlavenka, he established an informal group of angel investors called Garage Angels. This group may be approached by people who do not have any experience with operating a business and have not yet turned their idea into a profitable company. "In Evolution Equity, we help to manage companies as a whole and help them move forward; we provide assistance to already existing teams to succeed on global markets. On the other hand, I can help new companies with the absolute basics regarding the launch of their business. I have seen many businesses in their infancy. Some of them succeeded, some failed," said Karel Obluk.

According to him, the founders of Garage Angels primarily wanted to boost the business ecosystem in Moravia and support people in the region in running their businesses. Although the group only works for a short time, dozens of applications for investments have already been submitted. "We are not a fund with clearly defined rules, we really are just a free association of individual investors and that gives us the opportunity to share experience and discuss the ideas presented by people. We have a colleague who goes through the applications, divides them and presents them to us with some basic information. Once every two months, we invite representatives of five or six projects over for half a day. The more people are prepared, the better. They do not have to have a complete business plan, but even a simple table with specific numbers will help in the discussion. We then have something to discuss. The most important thing is to be able to explain who will buy the given product or service and why. Why should someone want to pay for it. Indeed, people often have a great technology, but they completely lack any sense of business. In commercial terms, their idea makes no sense at all," said Obluk.

He sees this as a general problem of the Czech business environment. "There is not enough people who are able to use their entrepreneurial spirit to establish their own companies. A number of great businesspeople will never establish a company of their own. On the other hand, a number of great technologists are unable to properly sell their ideas," he said adding that Europeans are still unable to present their ideas and lack the assertiveness and self-confidence of Americans. Unfortunately, according to Obluk, there is still not enough room for business education at higher education institutions in the Czech Republic. "Especially technical fields often underestimate this side of education. I like to occasionally participate in discussion panels with other guests because it is always more interesting and instructive for students when they can hear about various opinions and learn from the experience of others. For example, Jiří Hlavenka or Václav Muchna see education and business differently and this makes debates with them much more stimulating and interesting," said Karel Obluk.

BUT graduates have developed an algorithm that can find start-ups all over the world. It gained the interest of some of the largest companies in the world

Large foreign companies and investment companies who want to find prospective start-ups and innovative technologies are increasingly turning for help to the Czech Leadspicker project. The project employs a smart algorithm based on machine learning and artificial intelligence. It can search the Internet and find just the start-ups the client is looking for. Leadspicker was developed by two BUT graduates – Vlastimil Vodička from the Faculty of Business and Management and Jan Skácel from the Faculty of Information Technology.

The idea to create an automatic tool which can search for start-ups was conceived in Vienna, four years ago. Vlastimil Vodička, an FBM BUT graduate, worked for an Austrian company which helped its clients to discover prospective technologies. "The World Bank tasked us with finding start-ups in the Balkans where there was no database at that time and nobody even knew the word "start-up". Our analysts were manually searching through all databases and commercials registers and I got an idea that it would be possible to automate some of the processes," stated Vodička. He shared his idea with his friend Jan Skácel who previously worked as developer for Seznam.cz and was in the natural language research group at FIT BUT. "I started developing a software which would make searching easier. We found out it was working very well and we could base our business on it," added Skácel, who was motivated by these results to found the Leadspicker project with Vodička.

The algorithm works on the machine learning principle which utilises certain elements of artificial intelligence. It uses selected keywords to search through Internet-based data ranging from websites and databases of companies or start-ups to social networks. Then it calculates how much the found start-up matches the requirements and how would the given technology be useful for the specific client. Leadspicker analysts then re-check the sample and, based on their feedback, the neural network refines its calculation model until it is able to accurately determine which technology companies are most suitable for the client.

"We have managed to minimise the amount of labour required and we are very fast. Our classifier can even find garage-based start-ups fou

The algorithm works on the principle of machine learning Author: Leadspicker archive

nded by some enthusiasts which are not even listed in any database or register yet. We can discover future "Googles" and "Microsofts." And we can do it before anyone else," said Vodička. The quality of the start-up database created by Leadspicker is also based on the fact that it is not static. Start-ups are not only quickly formed but they also quickly cease to exist. For this reason, Leadspicker detects number of visits and activity on websites and social networks and removes start-ups which ceased to exist or changed their focus.

According to the Leadspicker founders, large companies found out it is no longer profitable to invest only into their internal research and development which can take up to several years to come up with its own innovation. "Companies are interested in immediate and effective supply of several dozen new technologies per month. Speed is crucial, they need to innovate their own processes or place new product on the market sooner than their competitors," explained Skácel. That is why companies from many different areas approach Leadspicker – from automotive industry through energy industry, healthcare and financial services to software or consulting companies. Their clients include brands such as PricewaterhouseCoopers, Axel Springer, Vodafone or Swiss Post.

During four years of its existence, Leadspicker grew from its two founding members to a team of fifteen and is still accepting new co-workers. So far, it co-operated with over 150 clients from thirty countries all over the world. "We are growing fast. During the past three years, we have managed to triple our turnover; last year, we have exceeded five hundred thousand dollars," noted Vodička. Both Leadspicker founders also want to use the data collected on start-ups to make investments. "We are in contact with the largest companies in the world and we know what technologies they are looking for. But these companies not always want to buy a start-up in its infancy. That is why we feel it is logical to fill the empty space and make some smart investments at the right time," concluded Vodička who is currently also working on founding of a new investment fund.

FIT graduates' life-saving technology deployed in emergency scenarios was awarded the SDGs Award

GINA company became the absolute winner of the SDGs Award for projects implementing the sustainable development goals set by the UN. The company was founded ten years ago by three students of the FIT. Since then, their unique mapping technology, which connects rescue workers, volunteers and other necessary bodies in provision of help in difficult terrains, gained a strong position on the global market and it is used in UN missions, search and rescue operations and emergencies caused by natural disasters.

Mapping of the effects of drought in cities using satellite data

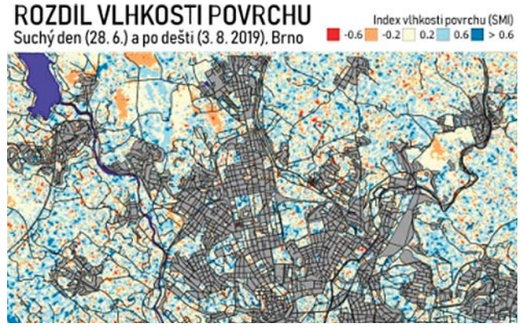
The World from Space start-up provides a bird's-eye view of the world. Every couple of days, it makes accessible and interprets satellite images of the Earth's surface. Government officials as well as citizens can easily find out which areas in their cities are threatened by droughts or what is the current state of urban vegetation and quality of air. Moreover, photos captured from outer space can be put to great use in agriculture and forestry. Roman Bohovic, the founder of this start-up company and graduate of FIT BUT, wants to support protection of the environment by spreading relevant up-to-date information.

Satellite images from the European Copernicus programme, which uses several satellites for monitoring of the Earth's surface, are available to everybody, free of charge and in full resolution. However, the interpretation of the data is a tough nut to crack. "You have to know your way around this type of images and be able to work with them. Correct understanding of the processes occurring on the Earth's surface and the ability to distinguish possible errors from natural phenomena requires knowledge from the areas of informatics, cartography and geography. On top of that, we are working with big data. Literally. We are receiving terabytes of data from the satellites every day which we have to process and analyse," explains Roman Bohovic, the founder of World from Space.

In the start-up company focusing on the interpretation of satellite images, Bohovic makes use of the knowledge he gained throughout his university studies of informatics at the Faculty of Information Technology of BUT and geography at the Faculty of Science at Masaryk University. He co-founded the start-up with his friend, Jan Labohý, when he realised that nobody in the Czech Republic was offering a job position he would really be interested in. "I have always been interested in protection of the environment and I like combining natural sciences with technology. I saw a great opportunity in the use of freely available satellite images. I wondered how to make the data available so that it can be used in practice by both the general public and private enterprises," said the young researcher about the beginnings of World from Space, his company seated in Brno in the South Moravian Innovation Centre.

At first glance, satellite images look a lot like aerial photographs. However, the territory captured in such image is much larger and the data is more up-to-date since the satellites send images approximately every four days. Dispatching aircraft to take picture this often would be too expensive. "Imagine an ordinary photograph of land surface, only these images are not made in three RGB layers, as we know from our computer screens. Instead, these images consist of 13 colour bands, including the infrared band. We then select the specific layers relevant for our monitoring – for example the vegetation, humidity or temperature indexes," Bohovic explains.

These three quantities are the ones that the analysts decided to make available to the public via their web application, which was tailor-made for the city of Pilsen. People can see how much urban greenery there is as well as what are the hottest areas in the city. "Heat maps of the city processed based on our data clearly show that large industrial parks and areas with no green spaces are overheating more than any other areas in the city. The situation is not as critical in streets at least partially lined with trees," said Bohovic noting that the temperature differences measured in one city ranged up to 10 degree Celsius during the summer heat waves. Prague and Brno have started to use the monitoring of their territories based on satellite data as well.



The difference in the city surface humidity between two summer days – the first measured after a heatwave lasting several days, the second after a heavy rainfall | Author: World from Space Archive

"The climate change is real and we are trying to show both citizens and municipal self-governments that our satellite data can be used to propose effective measures that would help areas threatened by droughts and excessive heat. Temperature is going to rise in the future and we need to start preparing for it right now," warned Bohovic. The start-up company offers to cities not only an analysis of the current situation but also proposals for adequate strategic solutions.

The Copernicus satellites provide more than just up-to-date satellite images. They have been gathering data about the Earth's surface for four years and thus enable the analysts to monitor the development of individual territories and perform year-by-year comparisons. "Last year, there has been a lot of press concerning droughts at the end of summer. However, it is often difficult to say precisely how severe a particular dry spell is. We can compare and quantify data on a year-by-year basis for example from the perspective of a farmer or urban architect. We can see that the dry spell occurring at the end of last summer was by far the most severe over the four-year period for which we have our data. We can also see that there is a relatively high number of droughts over different periods of the year. This year, we observed a marked agronomic drought at the beginning of the spring, which most of the people did not notice due to lower temperatures. However, it had strong impacts on agriculture production," explained Bohovic.

Farmers may benefit from satellite data and use it to plan their harvests and crops. The analysts from World from Space offer reference material for "smart farming", which include not only monitoring of the current condition of fields and vegetation, but also analyses of the development of drought combined with current condition of the crops in the fields. Satellite images can also be used in forestry. "We can monitor the scope of dead and withered trees as well as the course of the bark beetle crisis," added Bohovic.

Satellite images are useful for urban architects and city planners in preparation of land-use plans. "If a city plans an investment, it should know the current situation at the given place. However, cities often use older data or only the general data layers. This problem also concerns green spaces. Sometimes, there are simply no trees to see in the streets. However, we can see from the satellite images that there actually is enough urban greenery in the given area – mainly the trees and lawns on private properties and in the inner courtyards. Therefore, the microclimate of the street is quite good despite the fact that the city does not have many trees in the area. In situations like this, it is beneficial to invest and extend green areas in different parts of the city," noted Bohovic.

Currently, the experts from the start-up company are developing an automated web application that would serve in the Czech Republic as a widely available reference material helping people to adapt to the climate change. Even small municipalities, which administer small territories and expert custom-made analyses are too expensive for them, could use it. But the founder, Roman Bohovic, plans to go even further: "In co-operation with FIT BUT, we are preparing a project in which we want to test an AI algorithm for analysis of the satellite data. Thus, the evaluation of such data could be much more effective and more deeply automated. At the same time, since we have been incubated by the European Space Agency, we want to focus on projects extending beyond the borders of the Czech Republic."

FIT for secondary schools

1 575

number of applicants

741

number of registered students

Open Doors Day for prospective students attracted about five hundred applicants

Almost five hundred prospective students visited the FIT during the Open Doors Day. The visitors could see an exhibition of human-robot interaction, examples of supercomputing technology and try to forge a historic document and see how easy it is. Apart from the exhibitions of technology and publications from the FIT, prospective students could also see the campus during the tours of the faculty grounds organised by the Student Union or take an IQ test provided by Mensa and perhaps ensure a priority admission to the faculty. Moreover, the visitors could attend lectures to learn more about the study and the potential employment of graduates. The next Open Doors Day for the prospective students will take place on Friday 31 January in the morning.

High school students tried what it is like to study at the faculty for three days

Last week, about 20 students from all corners of the Czech Republic had the chance to try what it feels like to study at the Faculty of Information Technology thanks to the MiniErasmus programme. This programme makes it possible for high school students to experience the life of college students for three days. At FIT, the participants had the opportunity to attend a practical seminar led by Viktor Konupčík, a FIT student, several lectures for first- and second-year students and even one class from the Master's programme, to look around the campus, chat with the faculty students and to enjoy a music evening at U Kachničky.

The best secondary school Students' Professional Activities was supervised by a doctoral student of the FIT

A project supervised by a FIT doctoral student won the state round of Students' Professional Activities (SOČ) competition in the category of Engineering, Metallurgy, Transport and Industrial Design. Vít Vecheta from Katolické gymnázium Třebíč under the supervision of Lukáš Semerád from the Department of Intelligent Systems won the competition with his project called "3D-printed loud speaker". The student performed theoretical calculations, designed and constructed an 18 W loud speaker offering 360° sound and Bluetooth connectivity with the battery life of around 8 hours. He plans to further improve his design by reducing power consumption, adding Wi-Fi connectivity and improving the parameters of the electronic part of the device. Next year, Vít Vecheta would also like to start his studies at BUT.

Summer school (F)IT for girls is taking place for the thirteenth time

The participants of the Summer School (F)IT for girls had the opportunity to programme a LEGO robot, try hacking using a gummy bear, create their own chatbots or learn to edit photographs. Having the longest history in the Czech Republic, the event was organised for the thirteenth time this year in the period from 26 to 30 August 2019. It is intended primarily for students aged 12 to 19 who are interested in IT. With the FIT fits girls (FIT slouží dívkám) project, the faculty strives to support young girls so that they do not fear the IT fields. For more information, go to the Summer School website.

Women can bring fresh winds to the world of ones and zeros and change the field of IT

At the Faculty of Information Technology, Šárka Květoňová is active in teaching and research in the area of project management, economics of information products and strategic management of information systems. Moreover, she has also led the Summer School (F)IT for girls for thirteen years. A week long course for elementary and secondary school students, where the girls can learn the basics of programming, will be introduced to graphics and photography editing, as well as LEGO robots and chatbots, but will also visit IT companies where they can meet women professionals working in IT. "It is important for young girls to see that information technologies are not just a domain of men and that this can be an interesting and creative occupation for the future," says Šárka Květoňová.

IT fields are among the most popular fields today. According to statistics, however, they also belong among fields with the least balanced ratio of the number of men and women employees. Why do you think that is the case?

There are several causes. For girls who are not seriously interested in computers, this field of study is often hard to delineate, unspecific and rather distant. They cannot picture what they would actually do. There is also the prevalent idea, for example, that mathematics is much more difficult in this field than in other technical or natural science fields. However, this is not actually quite true. In addition,

girls are often discouraged by the people around them – parents and sometimes, sadly, even by teachers at primary and secondary schools – and they are told that IT is primarily a men's field. This is a pity and it certainly does not help the girls nor the IT field as such, because it loses the very significant potential girls can bring to IT.

So it is not because girls just "do not have what it takes" to work in IT?

Definitely not, the basic prerequisites are the same for men and women. "The average percentile of female applicants to the Faculty of Information Technology is often even higher than in the case of male applicants. The fact is that girls usually have a "different mode of thinking" than boys. While boys enjoy more computer "surgery" – they like to deal with the inner components of computers or programmes – in practice, women mostly use their other advantages and take part in positions using predominantly soft skills such as project management, quality management and organisational activities, which men working in teams often do not really enjoy. They often have better communication skills, which plays a key role especially in dealing with conflicts and looking for compromises. This is a common practice in companies. However, this certainly does not mean that women are not present in IT "per se". To the contrary, they are often the ones who are better programmers, graphics, analysts, etc.

Currently at FIT BUT, about nine percent of students are women. Is that enough?

This is certainly not enough and still far from what would be satisfactory However, we must bear in mind that this is still a five-fold increase when compared to the period more than ten years ago when we started to host the summer school. If we look at this issue in more general terms, the representation of women in IT fields in the Czech Republic is very poor. We are among the countries with the lowest representation of women in IT in Europe – about seven per cent – and this percentage has not increased significantly in the long term. For this reason, it is necessary, amongst other things, to motivate girls in a suitable manner from young age to enter the IT fields and study them. And also gradually remove all the established stereotypes related to this issue. It is certainly a long-term objective, but it is worth pursuing. I believe that making maximum use of the potential of women in IT will ultimately contribute to a more dramatic development of the field.

Can these numbers be affected by the young generations that have access to technology since birth, regardless of whether they are girls or boys?

That would be a bit like trying to gaze to a crystal ball to learn the future. In schools where IT tends to be a tool for other disciplines, such as economics, social sciences, natural sciences, etc., the number of women sitting behind computers won't probably change that much, i.e. there will be many of them. IT studied at a technical school is about as interesting for most girls as mechanical engineering or electrical engineering. This needs to be changed, which again brings us to the motivation and necessary increase of IT awareness among girls from the elementary school level, when they begin to profile for the future.

In your opinion, what can women bring to the field?

First, we must bear in mind that women form half of the population and this half is also using and will be using computers. To say the very least, it would be unwise for only men to be involved in the process of design, development and implementation of both technical or software components of IT. Women have better communication skills, they are more reliable in meeting deadlines, observing the employer's culture and they are more loyal. They can make teams stick together, which often helps them to achieve better results.

Did you always want to work in IT? What was your journey to this occupation?

My journey was rather complicated. When I was a child, I wanted to devote myself to a number of various activities, areas and professions. I was never focused on one area in particular. I liked numerous different things. So I would say about myself, with a bit of exaggeration, that I am kind of "multidisciplinary-oriented" person. After secondary school, I decided to purse procedural studies and went to the University of Defence in Vyškov. I only got into IT as part of my doctoral studies at FIT, where I focused, amongst other things, on the links between procedural/project management and the Petri net.

Have you ever encountered any doubts or surprised reactions regarding your choice to work in IT as a woman?

I have to admit that I have. However, I would say that it is crucial not to be afraid to show, or rather sell my professional competences, knowledge, skills and experience, and then wait for the well-earned success. I do not take it lightly – largely, it always depends, and it always will depend, on the kind of people around you, your colleagues in particular. Whether they are even willing to accept someone new, let alone a woman, in their own team predominantly consisting of men. And whether they are able to look at her and perceive her without any prejudice.

Your Summer School has the longest history in Czech Republic – the 13th year will take place this year. How many girls completed the programme in the past years? And do you know how many of them actually decided to engage in IT?

Over the 12 years of existence of the Summer School (F)IT, over 350 participants attended, not only from the Czech Republic, but also from Slovakia. The second part of the question is not easy to answer. Several of these great girls started their studies at FIT so we know about them. Some of them help us organise the Summer School, which is probably the best reward for me personally. But whether the other girls enrolled at different universities or whether they are working in IT in a different way – we don't know. In any case, I consider any activity increasing awareness of girls regarding the area of IT to be great from the social point of view, whatever the results are.

What would you tell girls who are considering entering the world of IT and have not yet found courage to do so?

IT is currently one of the fastest developing sectors with a persisting lack of great IT experts. Therefore, an opportunity presents itself for us, girls and women, to change this situation and bring a gust of fresh wind to this "dry" world of ones and zeros and to prove that women belong to IT. Let us overcome all the stereotypes which the current IT world is still facing, and let us show that we can do this!

Events

Honorary awards

Rector awarded prizes to great personages of BUT. The gold medal was presented to Professor Dvořák

At the Academic Assembly on Thursday, 14 November, the Rector Petr Štěpánek awarded prizes to selected personages of Brno University of Technology. The ceremony took place on the occasion of the 120th anniversary of BUT, the 30th anniversary of the Velvet Revolution and the 80th anniversary of the closure of Czech universities during the Protectorate. He also awarded prizes to a number of FIT personages.

Professor Václav Dvořák received a gold medal for his contribution to the development of computer technology and international co-operation at FIT. Professors Lukáš Sekanina and Tomáš Vojnar received silver medals for their work in the areas of teaching, research and development. A commemorative medal was awarded to Associate Professor Vladimír Drábek and to Torsten Meisner, who co-operates with the faculty.

The Rector also presented awards to the winners of the student poll for the best teacher. The students of FIT have chosen Tomáš Milet in the Bachelor's programmes category and Milan Češka Jr. in the follow-up Master's studies category.

Professor Václav Dvořák:

The field of computer technology has undergone revolutionary advances and I am glad to have been there from the beginning

His career lasting more than fifty years, Václav Dvořák became immersed in computer technology already at a time when there was only one computer at BUT; he was involved in the development of the first operating memories, greatly contributed to the fact computer science became an independent field of study at the Faculty of Electrical Engineering and Computer Science and promoted development of the Institute of Computer Systems at the Faculty of Information Technology. He is also the author of more than two hundred publications and four patents. In November, Professor Václav Dvořák received a gold medal from the Rector of BUT, Petr Štěpánek, for his contribution to the development of computer technology and international co-operation within FIT.

At the beginning of the 60's, a new field of study – computer technology and informatics – started to gain prominence on a global scale. At BUT, the Faculty of Energy was divided into the Faculty of Mechanical Engineering and the Faculty of Electrical Engineering. Václav Dvořák, then a second-year student, chose the study of weak current and the newly opened specialisation – automatic computers. This pretty much sums up the beginning of his academic career.

As a research assistant, Václav Dvořák gained his first practical skills in digital electronics under the tuition of Prof. Jan Blatný, who was then a leading expert in the field. "Computers were then available only at a very few research centres. There was a brand-new LGP-30 at the faculty – a small mainframe computer, but we were mostly just looking at it. This, however, didn't stop us from learning our first programming languages. We were a group of about twenty people who had the same specialisation and enthusiasm for the new field of study. Those were very exciting times," Václav Dvořák recalls.

In 1963, he was temporarily transferred to the Research Institute of Mathematical Machines in Prague, where he participated in the development of the first Czechoslovak operating memories. "We created them based on ferrite cores. We had to build all supporting circuits and then test and them and put them into use. And so I sometimes spent my whole working day sitting by the oscilloscope, looking out for impulses. IT professionals probably don't do that anymore," Václav Dvořák laughs.

Václav Dvořák then returned to Brno in 1968 to defend his doctoral thesis. He, however, didn't stay for long. In autumn, he was supposed to go to a long-term research scholarship in Canada, accompanied by his new bride, a ballet dancer at the Brno National Theatre. The Warsaw Pact invasion of Czechoslovakia almost made that impossible. "We were afraid that we wouldn't be able to get there, but we managed to leave in the end – although not from Prague, but from Vienna," Václav Dvořák recalls.

While Czechoslovakia began to close to the world, living in Canada opened all the doors for Václav Dvořák. "It was a wonderful time. I could do my research, visit conferences, make new contacts and gain experience. It was difficult to decide whether to return to the normalisation-era Czechoslovakia after two and a half years. But we didn't want our broader family to suffer in Czechoslovakia," he says.

Together with his wife and their first-born son, Václav Dvořák returned to Brno and lost contact with research carried out beyond the closed borders for a while. Science was subject to State assignments in those times and research was conducted as a secondary economic activity. He was trying to publish his papers both at home and abroad, but the trips to the western conferences were, in his words, a nuisance. "It was very demanding because of all the bureaucracy, especially for a person who was not a member of the Communist Party. It was necessary to obtain the consent of three levels of the Communist Party committees and it was often impossible to attend the conference due to the lengthy procedure. Sometimes, a trip to a conference would be cancelled without any explanation," he describes.

In the normalisation era, he ultimately managed to travel with his family as an expert of Polytechna company for a longer stay in Malta and Libya. In 1982, the American company AMF Electronics purchased his programme for analysis of the delay lines and Václav Dvořák was thus allowed to go to the United States for six weeks to introduce the programme. Shortly before the fall of the Iron Curtain, he returned to Canada for two years, after which he worked in New Zealand, Australia and Tenerife – Spain. In total, he worked at universities abroad for more than eight years. Václav Dvořák benefited from his contacts abroad especially after 1989 – he managed to establish a co-operation with numerous universities and get the faculty involved in several EU projects aimed at modernisation of teaching.

"Contact with foreign countries has always been very important for me. I started studying at a time when new knowledge could only be gained abroad, while working with the latest computer technology. The field of information technology was developing extremely quickly and to keep up, it was necessary to follow what was happening around the globe. This, I think, holds true even now, when we have access to state-of-the-art technologies also in the Czech Republic," he says.

After the Velvet Revolution, Václav Dvořák became the head of the Institute of Computer Science and Technology (which was then at the Faculty of Electrical Engineering and Information Technology) and held this post for six years. He contributed to innovation of teaching and the fact that computer science could be studied as an independent specialisation from the first year of studies. For three years, he also headed the Department of Computer Systems at the Faculty of Information Technology. As a university teacher, he devised, introduced and taught around twenty courses. Students have always appreciated his efforts to provide simple and comprehensible explanations illustrated by many examples.

He retired three years ago, after more than 50 years in science and teaching. But, as he says, his life is not boring at all. "I enjoy spending time with the grandchildren and hiking and I have more time for reading. However, I still meet my colleagues at the FIT Scientific Board meetings and keep an eye on new developments in computer technologies. The field has undergone revolutionary advances and I am glad to have been there from the beginning," says the award-winning scientist.

Ralph Ford received an honorary doctorate of BUT. Has been co-operating with FIT for 20 years

In the 120 years of history of Brno University of Technology, only 69 persons received the honorary degree of doctor honoris causa (dr. h. c.). These include, for example, Tomáš G. Masaryk, Nikola Tesla, Tomáš Baťa and Eva Jiřičná. As of yesterday, this list also includes Ralph Ford, Professor of Electrical Engineering and Computer Technology and Chancellor and Dean of the University of Pen State Behrand, Pennsylvania. A nomination for the award of the doctorate was submitted by the Faculty of Information Technology, which has been closely co-operating with Ford for twenty years.

Ralph Ford authored over 40 publications and he is Dean and Chancellor of Pen State Behrand, distinguished scientist and now also a holder of the honorary degree of doctor honoris causa awarded by BUT. He received the degree during the ceremonial meeting of the Scientific Board of BUT. He has been co-operating with BUT, specifically with the Faculty of Information Technology, for over 20 years.

"All this began in the 1990s when Otto Fučík from FIT came to work with us at Penn State Behrand," recalls Ralph Ford. They soon became co-workers and good friends and began working on new classroom curricula, technologies and even the establishment of a new company. "I started to associate a number of qualities with Czech people – they are extremely intelligent, curious and innovative people who are interested in moving the world around them forward. When my wife and I visited the Czech Republic in 2000, we confirmed our admiration for the Czech people and culture," said Ralph Ford.

In 2005, he received a prestigious Fulbright scholarship, which allowed him to return to Brno and work at the Faculty of Information Technology. "It was a very productive period for me. I managed to complete my first book and was appointed professor. We also deepened the co-operation with my home university, which led to many academic and student exchange stays and successful research projects," he recalls.

After his return, he became the Director of the School of Engineering and held this office for ten years. During this time, the university became one of the top 50 faculties according to the ranking published by U.S. News & World Report, the number of study applications increased significantly, and new programmes and research centres were opened. In 2013, Ralph Ford was appointed Vice-Dean for Industry and External Relations. He created a new model of co-operation between industry and the university, in which he harmonised the needs of the academic staff, students and companies in the area of applied research, advanced development as well as experience-based learning. He is the man behind the origin of the "open laboratory" and the partnership with Knowledge Park – a technology incubator which connects innovator companies, students and academia. Today, the incubator includes almost 20 companies employing more than 500 people. In 2016, he was appointed Chancellor of Penn State Behrand.

"I have always believed in the power of education and critical thinking. Although it may often seem, based on news reports and political proclamations, that our world is falling apart, the opposite is true. Humanity progresses in almost all areas, there are fewer diseases, famine and wars. This is a result of the expansion of knowledge, critical thinking and scientific methods. The aim of universities should be to support and share this development," says Ralph Ford and adds that he is very honoured by the award.

"I don't take it lightly. Receiving this award, I would like to promise to continue promoting the ideals of university education and strive for deepening of the relationships between our universities," he concludes.

The honorary degree of doctor honoris causa is awarded at BUT to both Czech and foreign personalities who have substantially contributed to the development in an area that stands in the focus of the university's long-term efforts. Decisions on awarding these degrees are made by the Scientific Board of BUT; nominations are submitted by the Rector, the Scientific or Artistic Boards of university institutes, or members and permanent guests of the Scientific Board. Together with Ralph Ford, Professor Ulrike Diebold of TU Wien also received the honorary doctorate (based on a nomination submitted by CEITEC).

The Dean of the Faculty of Information Technology of BUT has awarded Merit Medals as a recognition to personalities that contributed to the development of IT in Brno

One of them was responsible for building the largest Red Hat development centre in the world and the other was able to create an international holding from a small company in Brno. The Dean of the Faculty of Information Technology, Pavel Zemčík, acknowledged two persons for their contributions to the development of IT in Brno. Merit Medals were presented by the Dean to Radovan Musil, former head of the Red Hat development centre in Brno, and Martin Cígler, co-owner and Chairman of the Board of Directors of the Solitea holding.

Merit Medals for contribution to the development of information technologies were awarded for the very first time last year. This year, following a meeting with his Committee, the Dean decided to recognise persons that significantly contributed to the development of IT in Brno.

"In the past few years, Brno has become one of the top European cities in the area of information technologies. Schools, universities and especially innovative companies active in the region make a significant contribution to this development. It is thus important to acknowledge people standing behind those companies. By awarding these medals, we would like to fulfil our social obligation and put the spotlight on their work, which has had a great benefit for both the economy and society. We cannot appreciate all such people, but I think that the recipients of this year's awards are good examples and a symbol of gratitude for all such personages," said Pavel Zemčík, the Dean of the Faculty of Information Technology of Brno University of Technology.

The medals awarded by the Dean to Martin Cígler and Radovan Musil during yesterday's ceremony were created in the workshop of Petr Kazda and, bearing the motifs of Brno, the faculty and IT elements, they are based on the design by medallist and sculptor Michal Vitanovský.

"I believe that everyone, whether an individual or a company, should positively influence the ecosystem in which they operate. Therefore, I tried to develop programmes that would lead to improvement of the education system in the long term. This award is very important for me because it proves to me that I have chosen the right path," said Radovan Musil.

"I very much appreciate the award and consider it especially in the context of the connection between education and business. Both spheres need each other and for me personally this represents an obligation to strive to further improve the mutual co-operation in the future," said Martin Cígler.

Brno hosts an ideal combination

As they both agree, it is precisely the combination of higher education institutions and IT companies that help Brno grow in this field. "Nowadays, Brno has high-quality universities and dozens of important IT companies are headquartered here. This is the reason why there are many excellent IT experts here and, of course, this combination attracts further important IT companies. In Brno, there are also several high-quality start-up incubators and this ecosystem is supported by a number of venture capital investors who have a historical relationship to the city," says Martin Cígler.

As noted by Radovan Musil, Brno is not the only right place for development of information technologies. "However, there was an almost optimal combination of talented people, high-quality universities, leading companies, beautiful locations and pleasant and safe places for life, where many people from abroad found new homes," says Radovan Musil.

Radovan Musil worked as the head of the Red Hat development centre in Brno for over ten years. Under his leadership, the Brno centre grew from a hundred to more than a thousand employees and became the most important and largest engineering branch of this American multinational company, which is the global leader in the development and services of the open-source Linux software. In addition, Radovan Musil contributed to creation of a programme for support of talented people and close co-operation with local universities. He is currently on parental leave.

In 1990, **Martin Cígler** founded Cígler Software, a company developing corporate and accounting systems. His company grew rapidly every year – not only due to its own development, but also thanks to acquisitions. Today, this company served as the foundation for Solitea holding, which was established in 2013 and currently includes dozens of companies both in the Czech Republic and abroad. Thanks to the co-operation of companies in the holding, Solitea is now the largest developer of accounting and information systems in the Czech Republic and an internationally important company operating in 15 countries.

Martin Cígler

Radovan Musil

Brno City Award for Jan Černocký

A total of fifteen laureates received the Brno City Award for 2018 from the Mayor Markéta Vaňková. In the area of technical sciences, the city honoured Jan Černocký, head of the Department of Computer Graphics and Multimedia at the Faculty of Information Technology. The award was also received by other important people who are connected to BUT, for example architect Aleš Burian who is a co-author of the reconstruction and completion of our faculty.

Dean of the FIT presented Merit Medals for the contributions to the development of the faculty. The ceremony was attended by guests from all around the world

At the invitation of the Faculty of Information Technology, more than twenty guests from abroad attended the celebrations of the 120th anniversary of BUT. Representatives of universities from Europe, the USA, Africa and China as well as important industrial partners also attended today's Merit Medals award ceremony, where the Dean Pavel Zemčík awarded prizes to 26 personages of FIT who contributed greatly to the development of the faculty. Gold medals were awarded to Petr Hanáček, Zdeněk Kotásek, Jan Maxmilián Honzík and Jiří Kunovský (in memoriam).

Golden medails: doc. Dr. Ing. Petr Hanáček, prof. Ing. Jan Maxmilián Honzík, CSc., doc. Ing. Zdeněk Kotásek, CSc., doc. Ing. Jiří Kunovský CSc.

Silver medals: Ing. Vítězslav Beran, Ph.D., doc. Ing. Lukáš Burget, Ph.D., prof. Ing. Adam Herout, Ph.D., doc. Ing. Jiří Jaroš, Ph.D., doc. Ing. Jan Kořenek, Ph.D., Ing. Pavel Mikula, doc. Mgr. Adam Rogalewicz, Ph.D, doc. Ing. Zdeněk Vašíček, Ph.D.

Bronze medals: Ing. Michal Bidlo, Ph.D., doc. Ing. Martin Čadík, Ph.D., Sánchez Mireia Diez, M.Sc., Ph.D., Ing. Marie Gaďorková, Mgr. Lukáš Holík, Ph.D., Zdeněk Juříček, Ing. Martin Karafiát, Ph.D., Ing. Lukáš Kekely, Ph.D., Ing. Tomáš Martínek, Ph.D., Ing. Pavel Matějka, Ph.D., Ing. Vojtěch Mrázek, Ph.D., Sylva Otáhalová, Mgr. Jana Skokanová, Ing. Aleš Smrčka, Ph.D.

International visits

15 January 2019

Guest lecture of Itshak Lapidot: Speaker Diarisation and a Bit More

"Diarisation" may seem as a simple task at the first glance – to find and mark segments in a record where only one speaker is speaking. However, to make this process automatic is much more difficult, especially if we have no information about the speakers. Diarisation is important in speech analytics for both civil applications (i.e. distinguishing between an agent and a client in call-centre recordings) and for security applications (distinguishing between a criminal and the "other one(s)" in wiretaps). This and much more was covered in the lecture of Itshak Lapidot of Tel-Aviv AFEKA College; the lecture was held on 15 January as part of the VGS-IT lecture series.

24 January 2019

Guest lecture of Liu Hao of Beihang University on the regulation of systems of unmanned aerial vehicles

Unmanned aerial vehicles (UAV, drones) form an ever-growing part of both the civil and the military air traffic. Should their operation be regulated in any way? And what is the impact of their use on our privacy, safety or our economy? The Faculty of Information Technology welcomed one of the leading experts on international aviation law. Professor Liu Hao, Deputy Director of the Chinese National Research Centre of Air Traffic Management Law and Standard and the Director of the Institute of Aviation Law and Standard at Beihang University, gave lecture titled "Regulation of Systems of Unmanned Aerial Vehicles"

18–29 March 2019

Professor Neil C. Rowe gave four lectures at the FIT

From 18 to 29 March, the FIT hosted professor Neil C. Rowe of U.S. Naval Postgraduate School, Monterey, California, an expert on data mining, digital forensic analysis and cyberwarfare. At the FIT, professor Rowe gave some of his opened lectures:

- Research on the Information Security in the Computer Science Department, U.S. Naval Postgraduate School
- Empirical Digital Forensics for Drive Associations
- Research on Empirical Digital Forensics at the Naval Postgraduate School
- Machine Learning and Big Data Research on Anomaly Identification

5 April 2019

While visiting the FIT, Professor Marta Kwiatkowska of Oxford University gave a guest lecture on the safety of deep neural networks

In 2018, professor Marta Kwiatkowska of Oxford University received the prestigious Royal Society Milner Award for the advances in verification of deep neural networks and she gave a lecture on the same topic while visiting at the FIT. The lecture was held on Friday 5 April.

5 June 2019

Guest lecture at the FIT given by Hugh Brock of Red Hat Research

On 5 June, Hugh Brock, Research Director in Red Hat, presented the newest projects that his section is working on, as well as possible options for co-operation with university researchers and students. At the same time, doctoral students Viktor Malík and Tomáš Fiedor presented their research projects at the lecture that are being created in co-operation with Red Hat and focus on the area of static analysis and automated testing of programme performance.

13 September 2019

Lecture "India-Centric R&D Efforts in Artificial Intelligence"

Nowadays, India has a population of 1.3 billion, 300 million smartphone users and 600 million users of the Internet. This also means, that it is a country with many opportunities and vast experience in the area of information technology, artificial intelligence as well as research and development. If you are interested in this topic, make sure to attend a lecture by doctor Pratibha Moogi titled "India-Centric R&D Efforts in Artificial Intelligence".

31 October 2019

Guest lecture by Barbara Schuppler: Automatic Speech Recognition and What We Can Learn from Human Talk Interaction

Applying automatic speech recognition (ASR) to an ordinary human spoken interaction is much more challenging than using it for dictation or transcription of a lecture. On the other hand, it can involve and use knowledge about human communication. Barbara Schuppler of Technische Universität Graz gave a lecture about her work as part of the VGS-IT lecture series.

4 November 2019

Guest lecture of Michal Sedlák of Slovak Academy of Sciences on Quantum Cryptography

Although devices using quantum phenomena have already become a part of our everyday lives (lasers, LED lights, magnetic resonance imaging), quantum physics remain an area that is for many people difficult to comprehend. Michal Sedlák's popular-science lecture titled "Peeping into the Quantum Cryptography World" was a unique opportunity for people to look under the lid of quantum computers and quantum cryptography.

5 and 7 November 2019

Guest lectures of Ulrich Drepper focusing on the area of machine learning and systems engineering

Ulrich Drepper, a developer from Red Hat who participates on the development of the Linux kernel and is especially known as the administrator of the GNU C Library (glibc), gave two lectures in one week. On Tuesday 5 November, he gave a lecture titled "Introduction to Machine Learning and its Application in Systems Engineering" which was primarily addressed to students. On Thursday 7 November, Drepper added second lecture titled "Software-Configured Compute Environments" which was intended for research workers and academic staff, as well as for students.

19 December 2019

Ilya Oparin's guest lecture at the FIT on work at Apple and on Siri

In his lecture at the FIT, Ilya Oparin talked about connecting and comparing language model interpolation techniques, as well as about his work in the Siri team and the work at Apple in general. Ilya did part of his doctoral study at the FIT; today he is the head of a team focusing on language modelling.

Other:

- Abdulla Barazanchi Waleed H. – University of Auckland
- Delcroix Marc – NTT Corporation
- Derawi Mohammad O. – Norwegian University of Science and Technology
- Champod Christoph – Université de Lausanne
- Chen Yu-Fang – Academia Sinica
- Kälviäinen Heikki – Lappeenranta University of Technology
- Malinin Andrey – The University of Cambridge
- Meister Torsten – Touchless Biometric Systems AG
- Stafylakis Themos – Omilia
- Turunen Esko – Tampere University of Technology
- Vincze Markus – Technische Universität Wien
- Yakaryilmaz Abuzer – University of Latvia
- Ozianyi Vitalis – Strathmore university
- Breitinger Frank – University of Lichtenstein
- Pezé Mauro – Università della Svizzera italiana
- Kuppusamy Lakshmanan – VIT University, India

News from the faculty

25 January 2019

Eighteenth year of the Representative Ball of FIT and FEEC

Eighteenth year of the joint representative ball of Faculty of Information Technology and Faculty of Electrical Engineering and Communication took place on 25 January. Marek Kolář, a member of the Brno City Theatre company, has been the host of the evening in Voroněž hotel. Guests were able to enjoy theatrical and dance shows, the performance of the bands Kolorez and Jaroslav Čech Cimbalom Band, and a raffle.

25 – 27 January 2019

DevConf at FIT

The eleventh year of the DevConf conference was held from Friday 25 to Sunday 27 January. FIT welcomed around 1,500 attendees and over 300 speakers from all around the world. They talked about current hot issues of the open source world, such as development of cloud-based applications and solutions, scalable applications or container technologies but also about artificial intelligence, machine learning and more.

30 January – 1 February 2019

Meeting of the HiVisComp experts

Over one hundred experts specialising in computer graphics and computer vision travelled from all corners of Europe to meet in Šumava, where the 6th year of the HiVisComp meeting took place. The event is organised by the Faculty of Information Technology together with the Faculty of Mathematics and Physics of Charles University. The goal of the meeting is to support the exchange of knowledge and experiences between researchers and experts. For example, this year, the event addressed the topics of computer photography, visual localisation, photorealistic rendering in the film industry (Weta Digital) or measuring the reflective properties of materials.

20 February 2019

Business Plan – Why and How to Create It? (Business plán aneb proč a jak ho vytvořit?) lecture

Why do you need a business plan today? Isn't Lean Canvas better? How do you create it and what should be in it? On Wednesday, 20 February, Vojta Krmíček from the South Moravian Innovation Centre answered all of these questions and more at one of the lectures of the "Idea to Finished Product" (Od nápadu k produktu) series. The course is aimed at aiding students in finishing their own creative ideas and projects in the field of information technology during their studies at the faculty.

22 February 2019

We Live IT (Žijeme IT) conference of 2019 – I

The second year of the We Live IT conference held on Friday, 22 February, attracted over one hundred guests. The visitors could enjoy 16 lectures and workshops, learn what Boeing 747 and an iPad app have in common, what are the benefits of virtual containers, what properties are necessary in a chip that is controlling a spaceship or how globally successful and unsuccessful projects come to existence; they could also meet experts from leading tech companies or arrange for an internship, Master's or Bachelor's thesis.

28 February 2019

First digital mobile laboratory in the Czech Republic has found its way to schools. FIT also supported it

The Faculty of Information Technology together with other faculties supported the involvement of BUT in the South Moravian innovation centre project – FabLab Experience which is the first digital mobile laboratory in the Czech Republic. Specially fitted semi-trailer equipped with a laser cutter, 3D printer, robotic arm and other instruments will now visit pupils and students directly in schools.

28 February – 1 March 2019

Embedded World technological fair in Nuremberg for FIT students

At the Embedded World 2019 fair, the students of FIT could see the latest products of different global technology brands and talk to the representatives of these companies but also witness the real-world application of the things that they learn at the faculty. The fair was held in the German city of Nuremberg and thanks to a free trip organised by the faculty, its students could visit the fair from 28 February to 1 March. Fans of embedded systems certainly enjoyed the fair and those interested in machine learning or computer vision, graphics, security and other fields were not disappointed either.

19 March – 22 March 2019

Amper 2019: Augmented Reality for Programming of Collaborative Robots

How to easily program a robot in augmented reality? Why is it not more widespread in the industry yet? What is ARCOR and how does FIT benefit from it? Those are only some questions answered by Vítězslav Beran during his lecture Augmented Reality for Programming of Collaborative Robots (Rozšířená realita pro programování kolaborativních robotů). The lecture took place on Wednesday, 20 March, at the AMPER 2019 Fair in Brno. From 19 to 22 March, the exhibition area in hall V saw series of lectures on the subject of Prospects and Issues of Digitalisation (Perspektivy a úskalí digitalizace).

20 March 2019

Idea to Finished Product: How Did I Found a Tech Company?

The "Idea to Finished Product" (Od nápadu k produktu) course aimed at aiding students in finishing their own creative ideas and project in the field of information technology during their studies at the faculty has given rise to a new lecture: How did I Found a Tech Company? (Jak jsem založil technologickou firmu?) On Wednesday, 20 March, the guests invited to speak at the lecture – founders of successful tech companies –shared their experience and answered questions. The invitation was accepted for example by Igor Potúček (Camvision), Jan Kořenek (Flowmon Networks) or Roman Bohovic (World from Space).

28 March 2019

Students and employees of FIT lighted candles in memory of Jiří Kunovský

Flowers, candles and a moment of silence served as a reminder for the FIT students and employees of the sad anniversary of the death of Jiří Kunovský, assistant professor. He died last year from injuries suffered in a tragic accident. At FIT, his name is connected to the Department of Intelligent Systems where, among other, he dedicated his time to modelling and simulation using analog, hybrid and digital computers. He had a unique way of passing his knowledge on to Bachelor's, Master's and Doctoral students as well as senior citizens at the University of the Third Age which was under his supervision. The students have elected him their most favourite teacher several times and a number of very successful graduates remember him to this day as an excellent educator who knew how to make the class fun and at the same time pass along a lot of information.

8 April 2019

Rock@FIT 2019

For more information see page 64

12 April 2019

UnIT Brno 2019: 24-hour hackathon at FIT

Hackathon is organised by students for students in co-operation with the faculty and industry leaders. The UnIt Brno 2019 that was held on 12 April at FIT is exactly this type of an event. Attendees could try and solve a real-life problem within 24 hours and they could do so in one of four categories: big data, image processing, backend and augmented reality.

25 April 2019

Excel@FIT student conference

For more information see page 57

25 May 2019

120 years of BUT at FIT: Open Day

Visitors to the Open Day at the Faculty of Information Technology could see the faculty laboratories. For example, they could visit a biometric or robotic laboratory, see what it is like to be under a cyber-attack, try working with an interactive sand box or experience the way in which photographs can be viewed in virtual reality. The Museum of Computer Technology, which maps the development of computer technology with exhibits of memories from the first computers, was also opened and the visitors could likewise attend an exhibition of students' photographs. A lecture was held at 11 a.m. and 1 p.m., describing how the faculty changed over the 55 years from the establishment of the Department of Automatic Computers and how it looked today. At 12 noon, visitors were taken for a tour of the faculty with one of the authors of the reconstruction, architect Aleš Burian. The celebrations of the 120th anniversary of BUT continued in the afternoon with a music festival held at the Pod Palackého vrchem campus.

29 May – 31 May 2019

Quantum Computing Workshop at FIT

From 29 to 31 May, about twenty FIT students participated in the Quantum Computing Workshop. The three-day international workshop on quantum programming was organised by the Faculty of Information Technology together with the QLatvia research group of the University of Latvia. At the workshop, the participants were introduced to quantum calculations and learnt how to write simple quantum programmes

29 May – 31 May 2019

FIT introduced itself at the IDET Fair

Brno University of Technology was a part of the International Defence and Security Technologies fair (IDET). At the BUT booth the visitors could see exhibits from the Faculty of Information Technology, Faculty of Electrical Engineering and Communication and also CEITEC BUT research centre. At the Brno Exhibition Centre, the STRaDe research group team presented use of drones for security purposes (drone and processing of drone video, drone sensor board, solution for anti-drone protection using the Adalm Pluto module) and algorithms for generating, detecting and recognising faces and weapons in the scene.

15 – 31 July 2019

First Brno Internatioal Summer School in IT at FIT

Fore more information see page 56

26 – 30 August 2019

(F)IT Summer School for Girls

Fore more information see page 73, 74

3 September 2019

Faculty of Information Technology is launching a new website

With the start of the new semester, the Faculty of Information Technology launched a new website. The website is more responsive and adapts for better viewing on mobile phones and tablets; at the same time, its new structure reflects modern trends in the area of communication.

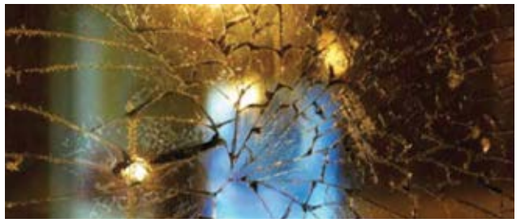
"The new website aims to bring the faculty closer to the public – especially people interested in studying at the faculty and applicants, companies interested in establishing co-operation with the faculty, as well as to the general public, which can use the website to learn more about the research and development at FIT. At the same time, we focused on ensuring that the new structure provides easy orientation to the current students and that information is always easy to find and up-to-date," said Vítězslav Beran, Vice-Dean for External Relations.

The design of the website is part of the unified visual communication of Brno University of Technology and is now used by all component parts of BUT. The faculty Computer Centre, the External Relations Department and other component parts of FIT participated in the creation of the new website of the Faculty.

5 September – 29 November 2019

Exhibition of the University of the Third Age's photo club

Photography exhibition of the Brno photo club which is based at the University of the Third Age of BUT unveiled pictures of various genres taken by ten authors. The exhibition showcasing an overview of recent works of several photographers was hosted by Galerie U Rudého vola at the Kobližná street in Brno city-centre, from 5 September to 29 November. The photo club's exhibition was part of the 120th anniversary of BUT.



9 – 11 September 2019

13th Alpine Verification Meeting – AVM'19

The Faculty of Information Technology of BUT in co-operation with the Faculty of Informatics of Masaryk University organised the 13th Alpine Verification Meeting – AVM'19 which took place from 9 to 11 September. This is a meeting of people interested in current research in the area of automatic verification (as well as some other areas) from the Alpine region and the surrounding countries. At the meeting, mainly doctoral students were presenting their results, however, there were also three lectures given by prominent experts in the given area: J. Esparza of TU Munich, M. Pezze of Universita della Svizzera italiana and Universita degli studi di Milano Bicocca and N. Gorogiannis from Facebook. For more information, see HERE.

19 – 22 September 2019

Start@FIT 2019

Lectures which aim to acquaint the students with the FIT, matriculation, team game, barbecue, Tour de Pub or a meeting with the academics. That is how Start@FIT, traditional annual introduction of FIT BUT first-year students to the faculty and academic community, kicked off at the beginning of the new academic year.

23 September 2019

The faculty gave out almost two hundred microcomputers to first-year students in Master's study programmes

The Faculty gave out almost two hundred small single-plate Raspberry Pi 3B+ computers to first-year students enrolled in the new Master's programme Information Technology and Artificial Intelligence. Since this academic year, the programme has been offering seventeen new specialisations with curricula responding to the current trends and needs in the rapidly developing field of IT.
The microcomputers were handed over to the first batch of students by the Faculty Dean Pavel Zemčík and his colleagues today at the introductory lecture of the AVS course (Architektury výpočetních systémů – Computational Systems Architecture). "With this step, we want to motivate the students and provide them with an impulse to obtain a positive relationship, or even 'love' towards hardware," said Pavel Zemčík.

Raspberry Pi will enable students to work on school projects but its use is much broader – students can connect small electronic devices to it, they can create a multimedia video or music player, control camera surveillance systems, build a robot or automate their households.

27 September 2019

Science Night attracted almost 500 visitors to FIT

A rescue robot, quadcopter, virtual reality and interesting lectures attracted almost five hundred visitors to Friday's Science Night at FIT. Amongst other things, the visitors had the opportunity to see the robotic workplace of the future, try solving simple mathematical logic tasks, programme a LEGO-robot, visit Nepal via virtual reality or see in the museum the development of computer memories from the first computers to the present time. Libor Polčák and Jiří Jaroš gave lectures where the visitors could learn about security aspects of the Internet of Things and other areas and explore neurosurgery using a computer-controlled ultrasound, respectively.

Science Night is the largest national event aimed at popularisation of science which engages the general public in the inspiring environment of science. A total of 9 component parts of BUT participated this year (faculties, scientific centres and university institutes).

1 October 2019

Awarding of the Information Technology Development Merit Medals

For more information see page 82

2 October 2019

Star(t)up@FIT: Programme to support student technology start-up companies

The Faculty of Information Technology launched a new Star(t)up@FIT programme intended for everyone who has an interesting idea, wants to achieve something significant or dreams of starting a technology company.

7 – 11 October 2019

FIT presented a robotic workplace of the future at the International Engineering Fair

A table on which a projector projects the user interface. A robot is attached on one side of the table and the worker sitting on the other side can control the robot using a touch layer on the table. That is one possible design of a robotic workplace of the future developed by researchers at FIT.

In October, they also presented the mobile version of the ARCOR system at the International Engineering Fair in Brno. You could see this presentation as part of the CzechTourism.

18 – 19 October 2019

Biometrics and Computational Photography Researchers from FIT introduced their work at the Prototype festival

The Prototype festival which connects the worlds of art, science and technology was opened, among other, by Martin Drahanský from the Department of Intelligent Systems. At the Brno fairgrounds, he talked about the development of biometric systems in the last 30 years.

The next day, other researchers from the FIT presented their research. During his lecture, Tomáš Goldmann introduced the basic biometric properties and available options for face recognition to the visitors. The questions regarding computational photography and the most interesting methods it employs were answered in a popularising lecture by Martin Čadík.

2. – 3 November 2019

OpenAlt conference at FIT

As usual, the annual OpenAlt conference was held at the Faculty of Information Technology on the first weekend of November. The conference connects the world of open source and topics from software, hardware, data processing and computer security, as well as the topics of open data in public administration and in the private sector and open access to scientific information.

6 November 2019

We Live IT: Conference presenting innovative technology for all who enjoy IT

The We Live IT conference was held for the second time in one year. Visitors could learn, for example, how to use artificial intelligence in the fight against criminal activities, in football, or in robotics. The conference was held on Friday, 6 November at FIT and it was meant for all who enjoy IT and who wish to learn about new trends in the field or about the equipment used by large companies and small start-ups as well as the direction they are heading. It welcomed about 130 visitors. They could look forward to such topics as software prototyping, automated UI tests, agile management, programming or imaging of microscopic samples.

13 November 2019

Awarding of the Merit Medals for the contributions to the development of the faculty

For more information see page 85

27 November 2019

The European Institute of Innovation and Technology held a presentation acquainting students with the Design Thinking method

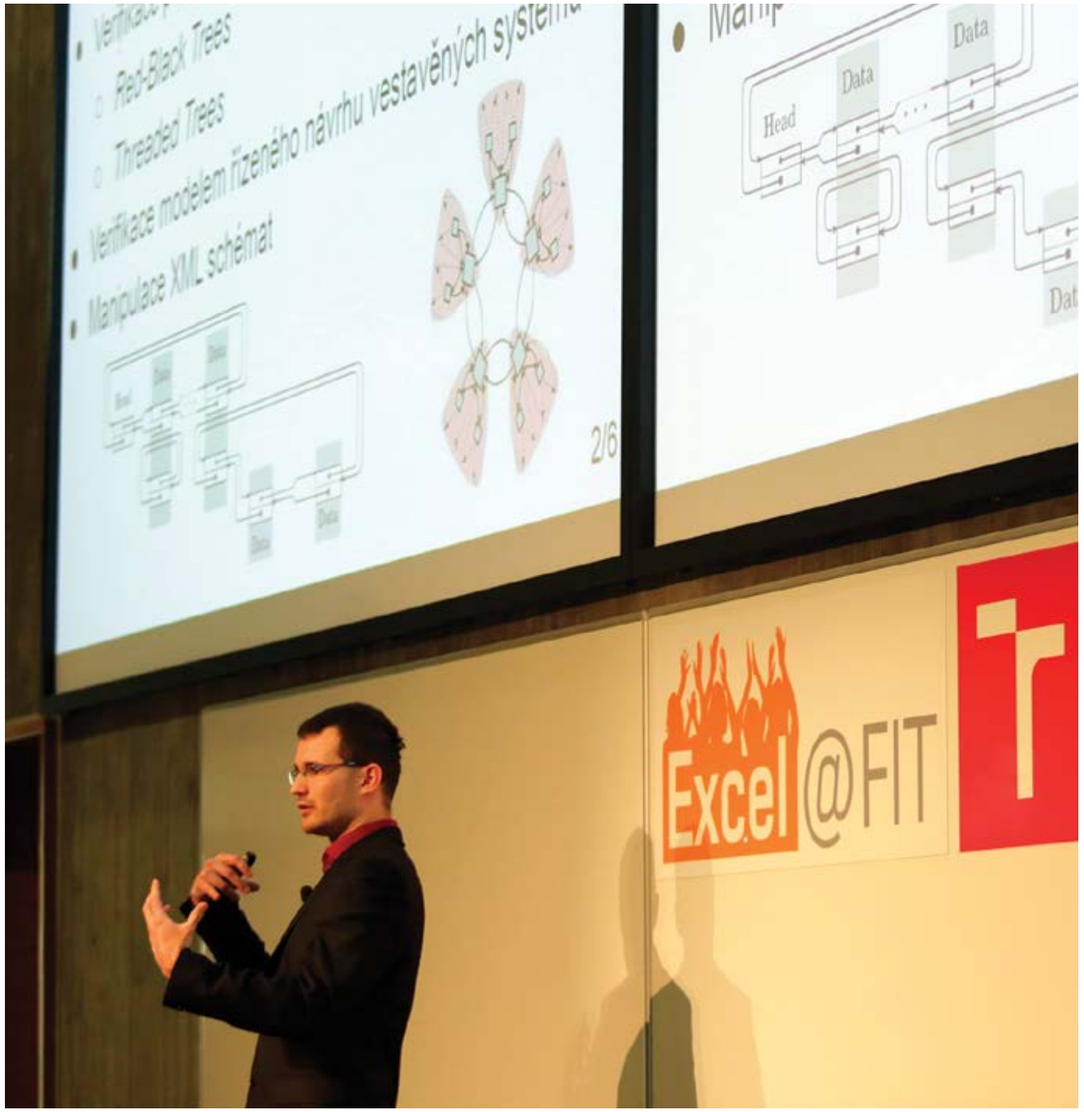
How to develop a business idea by making a game or playful simulation out of it? Our students had the opportunity to find out under the supervision of international experts from the area of business modelling at EIT Digital – within this interactive workshop, Márton Bélik, a lecturer from EIT Digital, helped the participants to create and develop their own ideas using the Design Thinking method.

10 December 2019

Pavel Zemčík to keep the post of the Dean of FIT

The Faculty of Information Technology will continue to be led by its current Dean Pavel Zemčík. It was decided on Tuesday by the members of the Academic Senate of FIT who elected him in a secret ballot by ten out of eleven votes. Pavel Zemčík, who was the only candidate in the election, served as the Dean of the FIT for the past four years.

In his upcoming term of office 2020–2024, he plans to focus primarily on supporting the improvement of quality of research and education and promotion of sound economic conditions of the faculty's operation.



Campus

How does it feel to study future technologies in a 14th century monastery? The campus is a unique combination of carefully reconstructed historical premises and new, modern buildings.

The renovation and construction works were carried out between 2006 and 2013, giving the leading Brno architects an opportunity to utilise the most recent findings on creating university teaching areas. The premises consist not only of lecture rooms and laboratories equipped with state-of-the-art technology, but also provide space to relax and rest in, dining areas, and a space for cultural and leisure activities.

Not many universities can say that its premises are listed as a chateau and are used meaningfully. The base, as well as its dominant feature, is the reconstructed Carthusian monastery whose south wing was replaced by a modern compound of lecture rooms. An extensive library with other facilities, offices of the software departments, faculty management and the Museum of Information technology are placed in the historical core. Significant scientists and teachers can now be accommodated in the rooms where the Carthusians used to live. The over-ground footbridge connects the monastery with the premises of individual departments which house classrooms, laboratories, teachers' offices, and underground parking. The premises are connected to the reconstructed monastery brewery, which now includes catering facilities (restaurant, canteen), student club, theatre hall, exhibition space and accommodation. The newest building is the Research Centre of Information Technology. The Centre provides space for the supercomputer access point technology and a high-quality work environment for researchers with access to state-of-the-art technology. The centre is then connected to a small castle with offices for doctoral students and for science and research co-operation. There are also the monastery gardens surrounding the historical enclosure and the park with a café, both accessible to public.

History

The Carthusian monastery was founded in the second half of the 14th century and since then its buildings have undergone extensive development. After the reforms imposed by Joseph II at the end of the 18th century, the monastery was owned by the army who used it until 1962, which was when the Brno University of Technology got hold of it and located its Faculty of Electrical Engineering there. After the faculty split in 2002, which led to establishment of the Faculty of Electrical Engineering and the Faculty of Information Technology, the then unsuitable facility was assigned to FIT. The renovation and construction works were carried out between 2006 and 2013, giving the leading Brno architects an opportunity to utilise the most recent findings on creating university teaching areas. Thanks to the extensive reconstruction and construction, Brno University of Technology now has one of the most beautiful facilities complying with the most demanding functioning criteria for modern, technically oriented university.

Biggest investments made in 2019

roof repair	1 451 000 CZK
peripheral wall repair	937 000 CZK
documentation of existing condition regarding the site humidity defects as a reference material for future repairs	400 000 CZK
flooring renovation	325 000 CZK

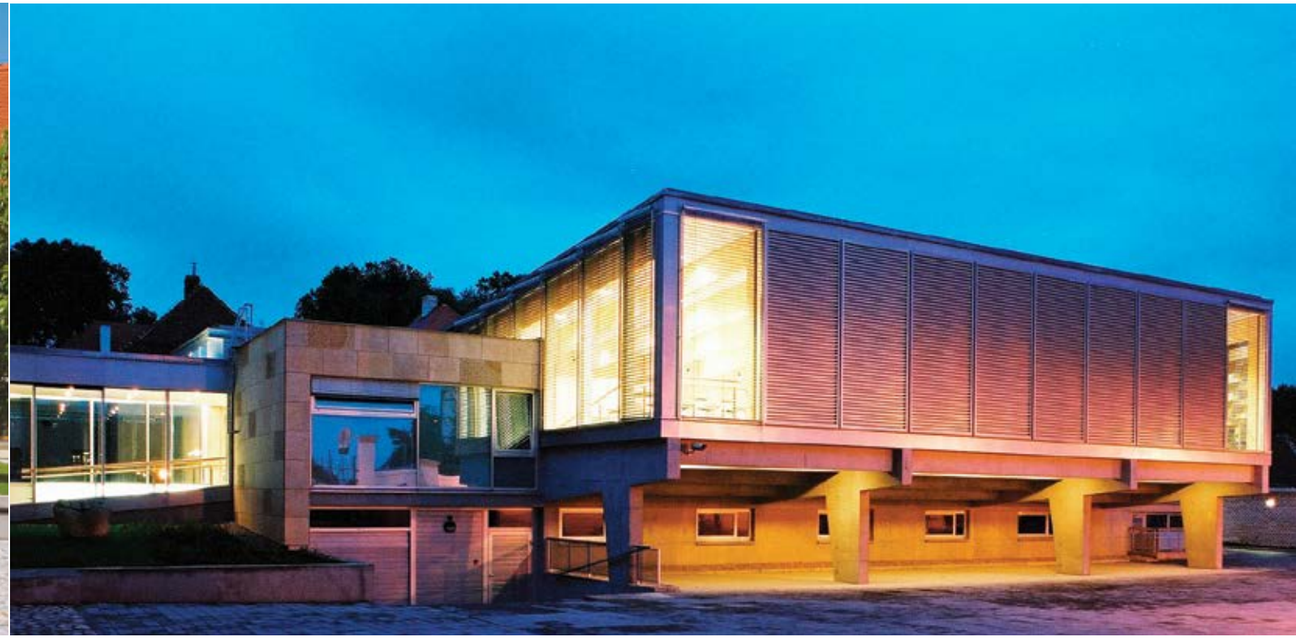
Following the modernisation of the AV technology in lecture halls and laboratories, the faculty is now fully digital

From the beginning of the semester, all lecture halls, laboratories and conference and seminar rooms at the FIT are equipped with a new audio-visual technology – projectors, screens, signal components and cabling. The faculty thus completed the second stage of modernisation of the technology and equipment in teaching premises.

The first stage of the modernisation took place last year, when almost all the AV technology in lecture halls was replaced. The modifications mostly concerned the lecture halls in building E, where the faculty also had the floors, teachers' desks and lighting replaced – the original lighting was replaced with more cost-effective LED lighting.

This year, the AV technology was also replaced in the laboratories, conference and seminar rooms. "The modernisation of AV technology included primarily digitalisation of signal transmission and transition to Full HD resolution or higher, both in terms of projection and recording of lectures. Signals are transmitted between the devices either via HDMI or HDBaseT technology using classic UTP cabling, which is cheap, easy to install and durable; moreover, it was possible to use the existing cabling at some places. Sound is sent between lecture halls and technical rooms via the computer network using the Dante protocol," explains Jana Skokanová from the FIT Computer Centre.

Further changes are planned for the next year, in particular in lecture hall D where floors and furniture will be repaired and lighting replaced, just like in the other lecture halls.



Creative IT ShowRoom

At the end of 2019, the Creative IT ShowRoom was created in the premises of a former gallery. It is a new open exhibition space, which is intended for presentations of the results of research and development performed at the FIT, results of student creative activities and it also serves as an open-space office for creative activities of the FIT students. The space can also be used for creative activities, organising of seminars, professional lectures and meetings or networking. Creative IT ShowRoom also includes other detached workplaces and workshops where students can put mechanical (and other) parts of their projects into practice.

Library

The faculty's library is open 55 hours a week, and offers almost 21 thousand library units, study area for 100 students, and 20 computers and terminals. The students can use the library's area of 688 m^2 located in the oldest and most valuable part of the monastery as a study room, both for studying individually and for groups.

2019

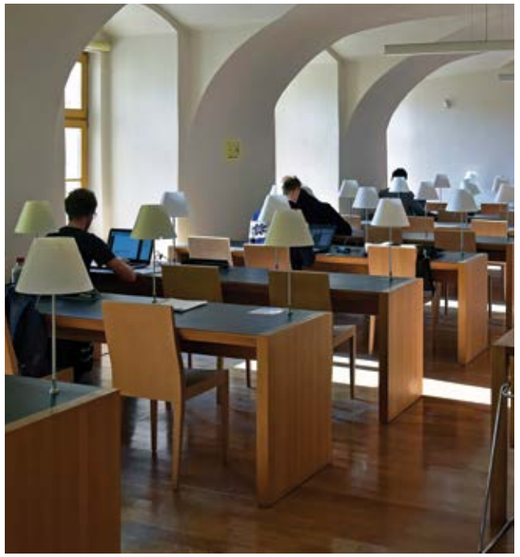
20 960 – library units

1 333 – active users

523/919 – number of new / removed items

8 968 – number of loans

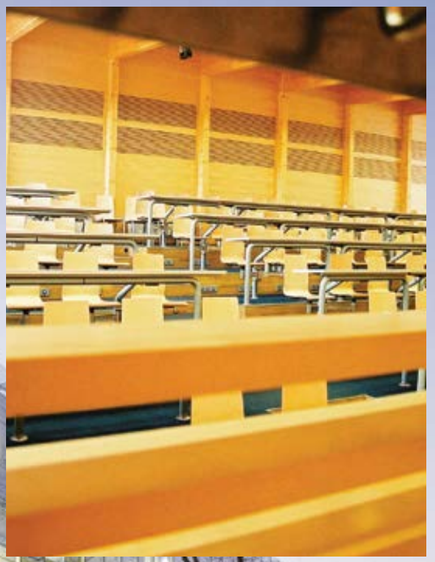
600,000 CZK – funds for purchases toward the collections



Museum

The Information Technology Museum was established at the Faculty of Information Technology's campus seven years ago. Today, the collection includes almost fifty various, mostly personal computers accompanied by about thirty peripheral devices. The collection displayed is the partly the property of the faculty, however, various exhibits are there on a long-term loan from private collectors and faculty employees.

Exhibition is open to public every first business day Wednesday from 1 p.m. to 5 p.m.



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