

**Faculty of Informatics
and Information Technologies**

www.fiit.stuba.sk

ANNUAL REPORT 2018

© 2019, Mária Bieliková, Pavel Čičák, Daniela Chudá, Ladislav Hudec,
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CONTENTS

CONTENTS	3
MESSAGE FROM THE DEAN	5
FACULTY	7
I. FACULTY MANAGEMENT BODIES	7
<i>Academic Senate of the Faculty.....</i>	7
<i>Dean.....</i>	7
<i>Scientific Board of the Faculty</i>	8
<i>Disciplinary Commission for Students.....</i>	9
II. INSTITUTES	9
<i>Institute of Computer Engineering and Applied Informatics</i>	9
<i>Institute of Informatics, Information Systems and Software Engineering</i>	9
III. CENTRES	11
<i>Slovak Informatics Library</i>	11
<i>Computing and Communication Services</i>	11
<i>Center for Further Education</i>	12
<i>Networking Academy</i>	12
<i>Center of Industrial Research.....</i>	13
STUDY.....	15
I. UNDERGRADUATE STUDY (Bc)	15
II. MASTER STUDY (ING)	16
III. DOCTORAL STUDY (PHD).....	16
IV. STUDENT CONFERENCES AND COMPETITIONS.....	18
RESEARCH.....	19
I. RESEARCH AREAS	21
<i>DATA ANALYSIS.....</i>	19
<i>INFORMATION PROCESSING: INTELLIGENT METHODS.....</i>	20
<i>INFORMATION PROCESSING: SPREADING AND PRIVACY</i>	23
<i>KNOWLEDGE ACQUISITION AND DISCOVERY</i>	24
<i>REPRESENTING AND REUSING SOFTWARE KNOWLEDGE</i>	25
<i>SOFTWARE COMPREHENSION AND QUALITY.....</i>	26
<i>COMMUNICATION NETWORKS</i>	27
<i>INFORMATION AND CYBER SECURITY.....</i>	28
<i>EMBEDDED SYSTEMS.....</i>	29
<i>COMPUTER VISION AND COMPUTER GRAPHICS</i>	30
II. SCIENTIFIC ACTIVITIES	31
III. PUBLICATIONS.....	33
IV. RESEARCH PROJECTS	33
APPENDICES	35
I. THESES.....	37

	<i>Bachelor (Bc.) Theses</i>	<i>35</i>
	<i>Master (Ing.) Theses.....</i>	<i>38</i>
	<i>Doctoral (Phd.) Theses</i>	<i>41</i>
II.	IIT.SRC.....	43
III.	TP CUP COMPETITION	45
IV.	SELECTED PUBLICATIONS	45
V.	RESEARCH PROJECTS	48
VI.	RESEARCH LABORATORIES	54
VII.	MEMBERSHIP	56
FIIT PERSONNEL	61	

MESSAGE FROM THE DEAN



Informatics and information technologies became during several last decades extremely important for the whole society. IT specialists are needed everywhere, in industry, services, and also in academy. Slovak industry reports critical shortness of IT specialists. Faculty of Informatics and Information Technologies STU is for quite a long time recognized as one of the places where the best IT specialists rise. We are proud of this.

Even though the shortness of IT specialists originated a big discrepancy also in academic staff, we as one of the best IT faculties in Slovakia work on our continual improvement. This results in attracting the best secondary school students to become our FIIT students. In 2018 we reported that 76% of accepted applicants for bachelor study selected our university and the faculty for study. Considering every applicant has 3 applications in average (as stated by independent testing agency Scio), we can conclude that our faculty is the first choice for most of interested high school students (last year 68.8% applicants selected our faculty).

In July 2018 we received formal approvement of successful international accreditation by the Institution of Engineering and Technology (IET) for all bachelor and master study programmes for next five years. The IET and Engineering Council UK databases were updated to reflect the accreditation status of all FIIT study programmes. The decision on accreditation was preceded by preparing all required documentation, hours of

discussion on the processes and the accreditation panel visit, which took place in September 2017. The Panel highlighted a number of commendable aspects in the programmes, in particular the high level of industrial collaboration, the annual student research conference, communication with students including the Askalot online question answering system.

Our research was continually influenced by rapid changes in the world. Last years we strengthened our activities in the fields of artificial intelligence and information security along with software engineering, computer engineering, computer science and information systems. We reflected this advancement also in education. In 2018 we have prepared several

new study courses specialized to information security and artificial intelligence. Moreover, we have started preparation for new master study programme Information Security in the field of Applied Informatics, which is planned for admitting the students from academic year 2019/20.

In 2018 we submitted 18 project proposals (H2020, APVV, VEGA, KEGA, COST, ERDF). Even though we were not successful in H2020, it is important that ranging of the projects get higher, so I believe we will be successful while continuing this effort.

As we well remember, the year 2016 was a year when important changes in the faculty organizational structure were provided including establishing the Center for Industrial Research. Research supported by industry primarily executes in research labs (e.g., ESET lab, Siemens lab, Molpir lab, User Experience and Interaction Lab, Embedded Systems Lab or Computer Networks Lab). In year 2018 we continued in developing and applying the new strategy for collaboration academia and industry established in 2016. This endeavor resulted into further increase of FIIT and industry collaboration. In 2017 we established industrial partnerships on three levels of intensity – platinum, gold and silver. The number of partners increased from 11 to 14 including three platinum (AT&T, Eset, Sfera), four gold (Accenture, ČSOB, Softec, Unicorn) and

seven silver partnerships (Asseco, Continental, Exponea, QBSW, Kistler, Siemens Healthineers, Tempest) and several more supporters. We continued in 2018 with CISCO Academy, which is part of the Center for Further Education.

In year 2018 we continued also our efforts in improvements of our environment, and our building in particular. Our building serves along its primary educational purpose also for the community meeting purposes including various workshops serving for developing new skills in changing technologies. In 2018 we covered 71 external events primarily specialized to informatics and information technologies, among them well known events such as Night of Chances, Pycon, Junior Internet, Softecon, Openslava, MeasureCamp, Bratislava OpenCamp or Annual Digital Coalition meeting.

Current situation at the Slovak universities is influenced by a decreasing number of students in basic and secondary schools. Declining demographic curve delivers a lower number of secondary school students, who continue their studies at universities. This is exponentiated by still increasing number of young leaving Slovakia for study abroad, especially in Czech Republic where they can study in similar culture and in home language (Slovak). We devote great effort to present our university and faculty as quality

institution and also to help applicants to make right decision regarding selected study programme – 3 years or 4 years according their level of knowledge (particularly in math) as we aim at constantly decrease students failure rate in bachelor study. In academic year 2017/18 we further decreased number of failed freshmen by 10% (to 29%). We believe that by continuously improving quality of education and research, our presence in public, and by increasing required level for acceptance, we can further decrease the number of failed students.

To the next period we should concentrate on gaining well motivated applicants for study, keep our students to study challenging, as well as work hard for acquiring research grants, especially in frame of Horizon 2020 programme, all with aim to continue providing the quality education and research in informatics and information technologies, to generate new knowledge and educate professionals capable to take leading industry and research positions.



Prof. Mária Bieliková
Dean of the FIIT STU

FACULTY

I. FACULTY MANAGEMENT BODIES

According to the Act No. 131 of February 21, 2002 (the University Code and Amendments and Supplements to some Acts and subsequent acts that have amended them), the faculty management is to be formed out of its academic community members. It is composed of lecturers and research workers (representing the employee part of the academic community of the faculty) and of students (representing the student part of the academic community of the faculty).

According to the University Code, academic management bodies of a faculty are the following:

- a) the Academic Senate of the faculty,
- b) the Dean,
- c) the Scientific Board of the faculty,
- d) the Disciplinary Commission of the faculty for students.

Academic Senate of the Faculty

The Academic Senate of a faculty is a representative body of the faculty. It comprises of the employee part and the student part.

I.1 Members of the Academic Senate

Presidium of the Academic Senate

presidium@as.fiit.stuba.sk

Chair

Peter Lacko, Assoc. Professor

Chairman of the employee section

Peter Trúchly, PhD.

Chairman of the student section

Gabriela Hózová

Secretary of the Academic Senate

Viera Danišová

Members

Anna Bou Ezzeddine, PhD.

Peter Kapec, PhD.

Ivan Kotuliak, Assoc. Professor

Peter Lacko, Assoc. Professor

Jakub Šimko, PhD.

Peter Trúchly, PhD.

Jozef Tvarožek, PhD.

Valentino Vranič, Assoc. Professor

Members of the student section

Peter Bakonyi

Jaroslav Erdelyi (since December 2018)

Ľubomír Fischer (till December 2018)

Marek Galinski (till December 2018)

Gabriela Hózová

Michaela Kolesíková (since December 2018)

Activities of the Academic Senate

The Academic Senate of the Faculty of Informatics and Information Technologies in 2018

- discussed the proposal of Rules for forming study plans, conditions for continuation of study and for regular completion of study, and took note of the proposed recommended study plans for each study programme as presented by the Dean,
- approved the additional conditions for admission to the study programmes offered by the faculty, presented by the Dean,
- approved the budget of the Faculty,
- approved the annual report on activities and annual financial report of the Faculty,
- submitted the annual report on its activity to the academic community of the Faculty,
- approved new members of the Disciplinary Commission of the Faculty,
- elected the chairman of the student section,

Dean

The Dean is the representative of the Faculty who manages, represents and acts on behalf of the faculty. The current Dean was elected by the Academic Senate of the Faculty in its meeting held on October 20, 2015 and appointed by the Rector to his office on December 2, 2015 for a four year office term. Vice-Deans were approved by the Academic Senate in December 2015.



Mária Bielíková, Professor



Daniela Chudá, Assoc. Professor



Peter Pišteň, PhD.



Pavol Návrát, Professor



Viera Rozinajová, Assoc. Professor



Marián Šimko, Assoc. Professor

Dean and Vice-Deans

Dean

Mária Bielíková, Professor

Vice-Deans

Human Resources and International Cooperation

Pavol Návrát, Professor

Research, Projects and Cooperation with Industry

Viera Rozinajová, Assoc. Professor

Doctoral Studies and Coordination of Mobilities

Daniela Chudá, Assoc. Professor

Bachelor Studies and Study Advertising

Peter Pišteň, PhD.

Master Studies and Collaboration with Alumni

Marián Šimko, Assoc. Professor

Advisors

Faculty Development and Information

Technologies

Tibor Krajčovič, Assoc. Professor

Cooperation with Industry

Ivan Kotuliak, Professor

Scientific Board of the Faculty

Members of the Scientific Board

Chair of the Scientific Board

Mária Bielíková, Professor

Deputy chair of the Scientific Board

Pavol Návrát, Professor

Members from the academic community of the Slovak University of Technology

Mária Bielíková, Professor

Pavel Čičák, Professor

Ladislav Hudec, Assoc. Professor

Daniela Chudá, Assoc. Professor

Gabriel Juhás, Professor

Ivan Kotuliak, Professor

Tibor Krajčovič, Assoc. Professor

Mária Lucká, Assoc. Professor

Radko Mesiar, Professor

Oliver Moravčík, Professor

Pavol Návrát, Professor

Miloš Oravec, Professor

Gregor Rozinaj, Assoc. Professor

Viera Rozinajová, Assoc. Professor

Valentino Vranič, Assoc. Professor

External members

Ladislav Hluchý, Assoc. Professor

- *Institute of Inf., Slovak Academy of Sciences*

Emil Kršák, Assoc. Professor

- *University of Žilina*

Daniel Olejár, Assoc. Professor

- *Comenius University in Bratislava*

Jiří Šafařík, Professor

- *University of West Bohemia in Pilsen*

Pavel Tvrdík, Professor

- *Czech Technical University in Prague*

Liberios Vokorokos, Professor

- *Technical University in Košice*

Pavel Zemčík, Professor

- *Brno University of Technology*

Activities of the Scientific Board

The Scientific Board of the Faculty of Informatics and Information Technologies in 2018:

- evaluated the level of the Faculty regarding its educational activity and activities in the field of science and technology,
- discussed and approved the proposal of the study programmes for the academic year 2018/19 offered by the Faculty,
- endorsed other experts with the right to conduct Final examinations in the study programmes offered by the Faculty (in accordance with the University Code),
- endorsed members of the Board of Specialists for doctoral study programmes,
- endorsed supervisors for doctoral study programmes (in accordance with the University Code),
- endorsed habilitation committees,
- endorsed professor nomination committee.

Disciplinary Commission for Students

The Disciplinary Commission of a faculty according to the University Code shall discuss misdemeanours of students and submit the proposal to the Dean who will resolve on it.

Chair

Ladislav Hudec, Assoc. Professor

Members

Anna Bou Ezzeddine, PhD.

Ján Hudec, PhD.

Ivan Kapustík

Members - students

Jozef Filipek – doctoral degree programme (till May 2018)

Marek Drgoňa – bachelor degree programme

Veronika Žatková – bachelor/master degree programme

Marko Ondruš – master degree programme

II. INSTITUTES

Institute of Computer Engineering and Applied Informatics

Director of the Institute

Katarína Jelemenská, PhD.

e-mail: katarina.jelemenska@stuba.sk

Deputy Director:

Ivan Kotuliak, Professor

e-mail: ivan.kotuliak@stuba.sk

Ladislav Hudec, Assoc. Professor

e-mail: ladislav.hudec@stuba.sk

Secretary of the Institute:

Tatiana Šípková

Tel: +421 2 210 22 506

The Institute of Computer Engineering and Applied Informatics contributes through its research to development of knowledge in science and technologies in the areas related to computer engineering and applied informatics. It offers undergraduate and graduate study programmes covering a broad range of courses that are built on sound theoretical fundamentals and are oriented towards developing independent creative thinking and ability to design solutions or to solve complex problems in the field of engineering expertise.

These courses cover basics and principles of mathematics, physics, basics of computing and programming, and they concentrate mostly on the following domains: computer architecture, distributed systems and computer networks, digital and embedded systems design, cyber security, computer graphics and vision.

The institute is responsible for education in the accredited degree programmes at two levels of university education:

- Information Security (bachelor degree),
- Internet Technologies (bachelor degree),
- Internet Technologies (master degree).

The institute has been active and successful in research and reflects in its research the current development of computer engineering and applied informatics in the world. The dominant research interests of the institute include:

- Communication networks,
- Information and Cyber Security,
- Computer Vision and Computer Graphics, and
- Embedded Systems.

Institute of Informatics, Information Systems and Software Engineering

Director of the Institute

Pavol Návrát, Professor

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Deputy Director:

Peter Lacko, Assoc. Professor
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Alena Martonová, PhD.
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Secretary of the Institute:

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Assistant of the Director

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The main mission of the Institute of Informatics, Information Systems and Software Engineering is to contribute to the mission of Slovak University of Technology and to the mission of the Faculty of Informatics and Information Technologies in the range of its competencies, in areas bounded by and related to informatics, information systems and software engineering. Among the related areas, it is oriented especially to artificial intelligence in research of knowledge approaches in solving problems of informatics, information systems and software engineering, and to information systems respecting their close relation to typical problem domains in software engineering.

Within the mission, the institute especially

- contributes through its research to development of knowledge in the areas of science and technologies belonging to the mentioned areas,
- provides successful and high-quality study programmes in areas of its competencies at each of the three levels of university education, in which
 - bachelor study graduates are excellently prepared for both the national and international labour market and are able to take care of themselves in their own business and also to create employment opportunities to others,
 - master study graduates acquire competencies and abilities to be leaders of specialist teams with deep expert knowledge and ability of high creativity,
 - doctoral study graduates are able to bring new original and innovative solutions of complex problems.

The Institute is responsible for education in the following accredited degree programmes:

- Informatics (bachelor degree),
- Information Systems (master degree) - ending,
- Software Engineering (master degree) - ending,

- Intelligent Software Systems (major in Software Engineering, minor in Artificial Intelligence)
- Intelligent Information Systems (doctoral degree).

The Institute fulfills the mission through the research activities relevant both in a national and international context and by extending, deepening and improving the offer of courses provided to students at all the three levels of university studies. Currently, main areas of research are

- Data analysis. The area includes Data Streams and Batch Data, Data Clustering, Anomaly Detection, Prediction, Big Data, Specific kinds of data, e.g. those generated in bioinformatics research
- Information Processing: Intelligent methods. The area includes Recommender Systems, User Modelling and Personalization, User Experience and Interaction, Human Computing, Information Retrieval and Exploratory Search, Natural Language Processing
- Information Processing: Spreading and privacy. The area includes Web of People, Human Web Interaction, Opinion Sharing, Information Reliability and Trustworthiness, User Identification and Privacy, Behavioral Biometric, Visualization
- Knowledge acquisition and discovery. The area includes Data Mining, Machine Learning, Neural Networks, Nature and Biology Inspired Computing
- Representing and reusing software knowledge. The area includes Interrelating and Visualizing Heterogeneous Software Knowledge, Multidimensional Software Modeling, Agile and Lean People, Organization, Software Processes, Social Connotations, Software Product Lines and Variability, Software Patterns
- Software Comprehension and Quality. The area includes Intent Comprehensibility, Use Case Driven Modularization, Advanced/Aspect-Oriented Modularization, Software Quality, Refactoring, Automated Testing and Continuous Revisions, Software Modeling Beyond Software Development, Education for Software Development and Supported by Software Development, Visualization of Software Properties

The Institute endeavours actively to cooperate. It includes interdisciplinary research and studies at other similar institutes, institutions and departments of its Faculty, its University, in Slovakia, in Europe and throughout the world. In particular, the Institute is part of the international consortium of research institutions devoted to Web Intelligence. The Institute represents Slovakia in the consortium

and contributes to promoting research in Web Intelligence worldwide. In 2009 the Institute has become partner of European Network of Excellence on Aspect-Oriented Software Development, AOSD-Europe, which integrates and co-ordinates research, education and dissemination activities of its members in the area of aspect oriented development of software. Originally, it has been a 7th Framework Programme project.

The Institute aims at becoming the leading Slovak institution in the areas of its competencies with ambitions to positively influence their development. The Institute is conscious of its high responsibility to the public and it provides expert services to it, thus improving life of the town, the region, the country and the mankind. The Institute looks for synergies with industry and enterprise community, and jointly tries to raise research and education quality in the areas of informatics and information technologies.

III. CENTRES

Slovak Informatics Library

Academic Senate of the faculty approved on April 9, 2010 the incorporation of the Slovak Informatics Library in the organizational structure of the faculty as a faculty department. Dean subsequently established the Slovak Informatics Library using the certificate of incorporation with effect from May 1, 2010.

Slovak Informatics Library was established at the Faculty of Informatics and Information Technologies, Slovak Technical University in Bratislava in response to the faculty needs for research and training of experts in the field of informatics and information technologies for knowledge-based economy and for building an inclusive information society in Slovak Republic. The library is the central library to work with the scientific and professional literature in computer science and information technologies in the Slovak Republic. This library extends the scope of previous library at FIIT STU from faculty level to nationwide level. Library:

- stores and registers qualification theses,
- is a workplace for central evidence of faculty publications and their references,
- provides acquisition services, books lending services and interlibrary loans,
- offers research consultation service to faculty, staff, and students.

The library catalogue contains more than 10 000 items, which are freely available in the Library. The catalogue can be found on kis.cvt.stuba.sk/arl-stu/. The Library purchased and acquired thanks to donation 20 titles of professional journals in various languages (5 out of them are in Slovak). Journals are located in the Study Room. Electronic services are available mainly through these databases: ACM Digital Library, IEEE/IET Electronic Library, Springer Link, Science Direct, Scopus, ISI Web of Knowledge, Wiley Online Library, which are the part of a national project NISPEZ.

The Library cooperates with other faculty libraries of the Slovak Technical University, and with Slovak Centre of Scientific and Technical Information.

Computing and Communication Services

The Centre for Computing and Communication Services at the Faculty of Informatics and Information Technologies provides the following services for educational and research purposes at FIIT STU:

- functioning of the faculty central servers and services,
- functioning of the faculty system and network infrastructure,
- functioning of the information systems,
- new servers, computers, printers, scanners etc. installation,
- virtual desktops and virtual servers installation,
- operating systems and specialized software installation,
- upgrading and maintenance of computers,
- user support,
- services for faculty wire and wireless access points to the Internet,
- functioning of the faculty audio and video systems,
- functioning of the camera security system,
- functioning of the access and attendance system,
- functioning of the IP telephony system.

The Centre for Computing and Communication Services also provides full service for educational computer laboratories and full or partial service for research laboratories of the institutes.

The faculty is connected into the Internet through the SANET (Slovak Academic Network) with 10 Gbps transfer speed. The faculty computer network is based on a structured cable system and it is using 1 Gbps transfer speed.

The current computer facilities consists of approximately 230 personal computers and notebooks of the faculty staff and PhD. students, 250 personal computers and workstations in the education and research laboratories and 30 specialized servers. In 2015 was put into operation the cloud computing system that consists 766 processor cores, 11 TB operation memory and 115 TB disk array.

All students of the FIIT have access to the computers in the education laboratories. In addition, students have access to selected education and research laboratories outside the educational process in order to solve individual or team projects.

All students of the FIIT have access to the Internet by the wire or wireless connections. All areas of the faculty are covered by the WiFi signal. On the floor 1 are freely accessible computer kiosks with Internet connection.

Center for Further Education

Center for Further Education has been established at the Faculty of Informatics and Information Technologies of Slovak University of Technology in Bratislava in 2016. It aims to provide students of not only Slovak University of Technology but other universities and faculties as well by other additional education and trainings to obtain certification from various industrial areas of expertise. It is ready to establish the Academies of worldwide companies. There were established independent financially self-supporting part of FITT to provide education. The first and essential part of the Center for Further Education is Networking Academy.e-mail: info@cisco.fiit.stuba.sk

Networking Academy

e-mail: info@cisco.fiit.stuba.sk

Web: www.cisco.fiit.stuba.sk

Tel: +421 2 210 22 224

Fax: +421 2 654 20 587

In 2011 the former Regional Networking Academy (RCNA FIIT STU) was transformed into the Networking Academy (NA FIIT STU) and the Instructor Training Centre (ITC FIIT STU) was established. This centre consists of three multipurpose research and pedagogical laboratory facilities designated for education in the field of computer networks at two degrees of study programme Internet Technolo-

gies and for education of courses related to Computer Networking of the study programs Informatics and Information Security.

Besides filling study programs, Networking Academy provides complete courses and study programs in the field of computer networks as a part of Cisco Networking Academy Program NetAcad. Throughout these courses students gain the necessary knowledge and practical skills to successfully pass Cisco Certified Networking Associate (CCNA) and Cisco Certified Networking Professional (CCNP) certification exams. These exams are well known and highly recognized by the industry. Education that is part of the Academy offers complete spectrum of courses, starting with basic principles of how computer networks work and continuing with modern networking technologies such as IP Telephony and Wireless Communication based on IEEE 802.11 standards (WiFi). Laboratory facilities are equipped with modern communication technology including hardware routers, hardware switches, hardware firewalls, PCs with connection to the Internet and other necessary components for the purpose of practical education in the field of computer networks.

NA FIIT STU offers technological environment for research in the field of modern methods of communication in the computer networks. It creates quality conditions for solving research grants in the field of methods and resources for creating security and management of communication and mobile computer systems. Pedagogical process is greatly enhanced by providing the necessary support for practical learning during the education of courses related to computer networking throughout the two degrees of study program Internet Technologies. Within the education process ITC FIIT STU prepares instructor trainings and prepares students for CCNA and CCNP certification exams.

Staff

Director:

Pavel Čičák, Professor, CCNA

Administrative Department:

Marušincová Zuzana

Instructor Staff

Andrej Binder, CCNA, CCNP, ITQ

Martin Čechvala, CCNP, CCIE

Pavol Helebrandt, PhD., CCNA

Katarína Jelemenská, PhD.

Ján Lúčanský, CCNA

Dominik Macko, PhD., CCNA, ITQ
Ján Skalný, CCNA, CCNA Security, CCNP, ITQ
Viktor Šulák, CCNA

Engineering Staff

Dušan Bernát
Roman Stovíček, PhD.

Study programmes

- Study program for preparation for certification exam CCNA (200-125 CCNA)
- Study program for preparation for certification exam CCNP (300-101 ROUTE, 300-115 SWITCH, 300-135 TSHOOT)
- Study program for preparation for certification exam CCNA Security (210-260 IINS)

Cooperation

- Academy Support Centre, Faculty of Electrical Engineering and Information Technology, Technical University in Košice
- Instructor Training Centre, Faculty of Management Science and Informatics, University of Žilina
- DATALAN, Ltd.
- CISCO Systems Slovakia, Ltd.
- SOITRON, Ltd.
- DITEC, Ltd.
- Tempest, Ltd.
- Hewlett-Packard Slovakia, Ltd.
- IBM Slovakia, Ltd.
- Microsoft Slovakia, Ltd.
- Cisco Networking Academy, Czech University of Technology, Prague, Czech Republic

- Cisco Networking Academy, Faculty of Information Technologies, Technical University in Brno, Czech Republic

Center of Industrial Research

Center of Industrial Research is a newly created unit, which coordinates all activities associated with industrial cooperation. The main focus is on the research and innovation projects, which are solved jointly with companies. Other forms of collaboration have been also evolved – recently we have prepared the process of partnership establishment. The center coordinates the sponsorship of faculty events (student research conference, dean's award, programming competitions, etc.) and thus ensures their good progress. The activities of the center include also organizing of conferences as well as interesting lectures about new IT trends for the students.

Several research labs operate within the Center of Industrial Research:

- Eset Lab
- Siemens Lab
- Molpir Lab
- UXI Research Center

This year we have started the preparation of other labs in cooperation with industry – with companies Anasoft, Exponea and Syncular.io.

STUDY

I. UNDERGRADUATE STUDY (Bc)

In the academic year 2017/2018 three accredited study programmes with regular length three or four years were offered:

Informatics

The study programme leads to a complete undergraduate level university education in Informatics/Computer Science in an engineering profession oriented chiefly to software systems and processes. The graduate will acquire deep knowledge from theoretical foundations of Computer Science, data structures, programming languages, analysis and design of software systems and their management, and architecture of computer systems and networks. The graduate is able to analyse, design, implement and verify software systems, to work effectively as a member of a development team, to work with tools used in developing and documenting of software. The graduate is prepared for a possible postgraduate study or for a direct entry into the labour market. The graduate is able to assume responsibility as a software system designer, programmer or maintenance specialist of information technologies systems. The graduate is aware of the social, legal and economical context of the profession.

Information security

The study programme leads to a complete undergraduate level university education in Informatics/Computer Science with a narrower specialization in information security in an engineering profession oriented chiefly to information and software systems. The graduate will acquire deep knowledge from theoretical foundations of Computer Science and information security, security of information technologies and their management, analysis and design of software systems and their management, and architecture and organization of computer systems and networks and web technologies. The graduate is able from the topic of information security view to analyse, design, implement and verify software systems, to work effectively as a member of a development team, to work with tools used in developing and documenting of software. The graduate is prepared for a possible postgraduate study or for a direct entry into the labour market. The graduate is able to assume

responsibility as a software system and secure information technologies designer, programmer or maintenance specialist of secure information technologies systems. The graduate is aware of the social, legal and economical context of the profession.

Internet Technologies

The graduate masters various skills in the field of Computer Engineering. During the study he gains theoretical knowledge, practical abilities and skills in the field of Internet Technologies, and much additional knowledge, capabilities and skills within the similar branches. The graduate is able to work as expert in the field of computer systems and networks and its components, expert on deployment and installation of modern information technologies, system expert creating configuration, realization of installation of computers and computer networks, the member of team performing support activities for complex design and projecting of control and information systems and its implementation environment, manager, consultant, dealer or distributor in the information technologies market network, educational position in non university institutions aimed on informatics. The graduate is also prepared for possible second level university study.

In June 2018 the students defended their bachelor theses and passed the final examination.

The following students were conferred awards for their excellent study results:

- *Rector's Award*: Veronika Žatková, Matej Groma
- *"Magna cum laude"*: Veronika Žatková, Matej Groma
- *"Cum laude"*: Patrik Blanárik, František Ďurana, Andrej Fúsek, Martin Hradňanský, Andrej Hucko, Adam Kňaze, Kamil Janeček, Kristína Macková, Peter Pavlík, Adam Puškáš, Martin Redžepovič, Jakub Sedlár, Štefan Šebeň, Jakub Veselý, Martin Žák
- *Dean's Award for Excellent Bachelor Thesis*: Andrej Fúsek, Martin Hradňanský, Jakub Veselý
- *Dean's Commendatory Letter for Bachelor Thesis*: Matúš Barnabás, Zsuzsana Bernáth, Martin Činčurak, Dominika Dolná, Daniel Gábriš, Pavol Hlavatý, Andrej Hucko, Adam Kňaze, Dávid Kubík, Ľudovít Popelka, Adam Puškáš, Martin

Staňo, Andrej Ščasný, Štefan Šebeň, Adam Talian, Nikolas Virostek, Andrej Zaťko

II. MASTER STUDY (Ing)

In the master degree we have two study programmes: Intelligent Software Systems and Internet Technologies.

Two study programmes, which we have offered earlier (Software Engineering and Information Systems) are in the closing phase.

Intelligent Software Systems (ISS) – major in Software Engineering, minor in Artificial Intelligence

Building upon two highly successful study programmes of SI and IS, a new programme has been designed by blending the essential strengths of both programmes and by enhancing it with focused Artificial Intelligence topics.

The new study programme leads to a complete graduate level university education in the area of Computing and Information Technologies in an engineering profession dealing with analysing, designing, developing and maintaining large software systems or computer information systems. The graduate will be able to apply advanced methods of Artificial Intelligence. The graduate will acquire deep knowledge enabling to manage teams, to lead independently large projects and assume responsibility for complex solutions. The graduate is able to devise and present own solutions, develop, modify or implement contemporary information technologies. The graduate will work efficiently individually and also as a member or a leader of a software team. The graduate is able to analyse critically and apply a whole range of concepts, principles and practices of software engineering. The graduate is aware of the social, moral, legal and economical context of the profession. The graduate is also prepared for a possible doctoral study.

Internet Technologies (IT)

The study program leads to a complete graduate level university education in the field of Information Technologies focused mainly to digital computer systems, communication networks and security. The study program provides a possibility to gain the deep knowledge in communication networks and computer systems architecture, as well as the knowledge in design, development and maintenance of advanced hardware and software tools for standard and

specific applications, using advanced information technologies and taking in account security aspects as well. The graduate also acquires experience in team management and knowledge in applied mathematics, management and entrepreneurship, and gets prepared to broader understanding of social, moral, legal and economics context of his/her future profession. The study program provides the preparation for carrying out research and development works with high rate of creativity and selfreliance.

In these study programmes the students graduated in June 2018.

The following students were conferred awards for their excellent study results:

- *Rector's Award*: Veronika Gondová, Martin Ilavský
- *"Magna cum laude"*: Veronika Gondová
- *"Cum laude"*: Zuzana Bobotová, Norbert Danišik, Mária Dragúňová, Martin Ilavský, Sandra Kostova, Miroslav Laco, Martin Mocko, Martin Olejár, Jakub Ondik, Matúš Salát, Matej Vítaz
- *Dean's Award for Excellent Master Thesis*: Zuzana Bobotová, Miroslav Laco, Martin Olejár
- *Dean's Commendatory Letter for Master Thesis*: Norbert Danišik, Pavol Gočál, Tomáš Juhaníak, Michal Král, Martin Mokrá, Martin Nemček, Jakub Ondik, Miriama Pomffyová, Matúš Salát, Jozef Sitarčík, Jozef Zaťko

III. DOCTORAL STUDY (PhD)

Quality and number of doctoral students significantly influence the results obtained in research. We still observe an insufficient number of motivated doctoral students in the fields of informatics and information technologies. The graduates have excellent opportunities in finding positions in the labour market, therefore, even if they are interested in further studies they often prefer to be admitted as part-time students.

This trend has been slightly reversed in recent years. Number of applicants increased 2 times compared to year 2008 and for several years we maintain a stable number of accepted applicants. We worked towards motivating students to finish their theses. This resulted in increased number of defended dissertation theses – 10 this year (most doctoral students who finished their study this year started doctoral study more than three years ago).

In 2018 two accredited study programmes were offered:

Applied Informatics

Study programme Applied Informatics in the third (doctoral) level of university education creates for students a space to build up and to profound knowledge and abilities of methods and tools of informatics and their applications in a broad spectrum of areas. It is built up on study programmes where students get basic methods and tools of informatics from specification of problems, through design and implementation of their algorithmic and non algorithmic solutions, analysis of solution properties, up to properties of program and technical tools of informatics. The methods of scientific work, current state of research in a particular area, looking for open problems and research work is a part of the study as well. The graduate is able to solve scientific problems in a broad scale of applied informatics areas independently, utilize advance methods and tools of design and development of information technologies applications creatively. The graduate can enter trade market directly as well.

Intelligent Information Systems

Doctoral studies in Intelligent Information Systems lead towards the highest university education in the area of Computing and Information Technologies particularly in the field of Intelligent Information Systems, dealing with analysing, designing, developing and maintaining large software systems. The study programme Intelligent Information Systems is a continuation of the programme Software and Information Systems which has been offered before. Students can orient in their research towards any of open research problems related to the concept of software system in general, its properties and methodology of its development. In particular, research concentrates on such software systems that embody some information system, whereas the information systems themselves are usually designed for an environment of heterogeneous information sources, including internet. The graduate is able to solve independently difficult scientific problems of its field, having acquired its theoretical principles and methodology.

Regular length of all doctoral study programmes is 3 years for full-time study and 4 years for part-time study.

Numbers of the full-time students (B – bachelor programmes, I* – master programmes, PhD – doctoral students).*

	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
B-IB3	-	-	-	22	37	41
B-IB4	-	-	-	16	20	45
B-INFO3	577	607	620	560	462	453
B-INFO4	145	208	199	195	154	195
B-IT3 (B-PKSS3)	179	164	124	99	71	54
B-IT4 (B-PKSS4)	61	32	51	46	23	38
I-IS2	95	143	156	156	89	24
I-IS3	3	4	1	2		
I-IIS2	-	-	-	-	143	258
I-ISS3	-	-	-	-	-	1
I-IT2	72	73	51	-	50	80
I-IT3	2	1	1	-	-	4
I-SI2	115	74	117	141	66	13
I-SI3	-	1	1	4	-	-
PhD	49	52	47	46	39	39
Sum	1298	1359	1368	1287	1154	1245

Numbers of students in all studies.

	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Bachelor study	962	1011	994	938	767	826
Master study	287	296	327	303	348	382
Doctoral study	57	52	47	46	39	39
Sum	1306	1359	1368	1287	1154	1154

IV. STUDENT CONFERENCES AND COMPETITIONS

The Faculty organised and supported in 2018 several student competitions and conferences. The importance of involvement of the students in such events is very high. Students took active participation in various technical and research activities (co)organised by the Faculty. We are proud to list also successes of our students in national and international competitions organized outside our university.

IIT.SRC 2018

- Informatics and Information Technologies Student Research Conference (to be mentioned in the following section in more detail)

ACM SPY – Student Project of the Year Czech and Slovak Competition

- Veronika Gondová – finalist in the competition with diploma project User modeling in the domain of e-commerce. (supervised by M. Bieliková)

TP Cup

- Best Team of the year 2018 winners: Matúš Čičman, Peter Bakonyi, Peter Kaňuch, Gergely Abelovsky, Michaela Nguyenová, Patrik Beka, Tomáš Lach, Jakub Kazimír: Behametrics (supervisor K. Burda)

Assoc. Prof. Daniela Chudá
Vice-Dean for doctoral study and mobility
coordination

Dr. Peter Pištek
Vice-Dean for bachelor study and study
promotion

Assoc. Prof. Marián Šimko
Vice-Dean for magister study and alumni
cooperation

RESEARCH

I. RESEARCH AREAS

In academic environment, the research is an activity of key importance. Nowadays, new ways of research cooperation, including collaboration with industry, are being opened up. Therefore we focus not only on various national and international grant schemes, but we aim to establish research and innovation partnerships with commercial sector.

Informatics has developed to be an autonomous scientific area, which supports success not only in the branch of information technologies, but it also has wide consequences for the lives of individuals and society. All scientific areas are influenced by new methodological base due to the progress in IT research and innovation. It is not a mere coincidence that research in the informatics and information technologies (IIT) has become the priority among the research topics in the European Union.

Research at FIIT STU is in line with new trends in our field, which are also supported by EU,

There are several research areas, which are being developed at FIIT STU:

- Data Analysis,
- Information Processing: Intelligent Methods,
- Information Processing: Spreading and Privacy,
- Knowledge Acquisition and Discovery,
- Representing and Reusing Software Knowledge,
- Software Comprehension and Quality,
- Communication Networks,
- Information and Cyber Security,
- Embedded Systems,
- Computer Vision and Computer Graphics.

DATA ANALYSIS

The main directions of our research include predictive modeling, cluster analysis, anomaly detection and resembling tasks, whereby we focus on intelligent adaptive approach. The methods range from statistics to machine learning methods, for some kind of problems we have also used biologically inspired computing. We work with static as well as with stream data, in both cases our datasets meet the requirements of Big Data. Currently we perform experiments in the domain of energy and with datasets generated in bioinformatics re-

search. In 2017, we started to work on common research project with Technical University Košice "Knowledge-based Approach to Intelligent Big Data Analysis" (APVV-16-0213).

Researchers

Rozinajová, Viera - covers by her research interests data science in broader sense, in particular she concentrates on advanced methods of predictive modeling, cluster analysis, anomaly detection and optimization.

Lucká, Mária - focuses in her research on efficient algorithms and processing of big data sets, with applications in bioinformatics and energy data. Intelligent data analysis methods include clustering of big data, parallel methods and high performance computing.

Bou Ezzeddine, Anna - explores bio-inspired optimization methods, intelligent data processing techniques with a focus on stream data, self-adapting methods.

Bieliková, Mária - aims her research to human interactions on the Web with special emphasis on user modelling and personalization, context awareness, collaborations and usability. This includes research of methods for automated analysis and modelling user feedback, and its evaluation by (multi/group) user studies employing eye trackers.

Grmanová, Gabriela - her research is oriented on the field of Data mining. She explores mainly advanced methods of clustering and predictive modeling.

Lacko, Peter - his research interests include artificial intelligence, neural networks and parallel and distributed computing.

Ševcech, Jakub - focuses in his research on time series data analysis, specifically on representation and feature extraction from time series data for various tasks of data analysis such as classification, anomaly detection or forecasting.

Srba, Ivan - covers by his research interests the area of web-based systems, which utilize concepts of collaboration and collective intelligence, in particular he focuses on knowledge sharing (mainly in Community Question Answering systems) and computer-supported collaborative learning.

Selected recent publications

- [1] BLŠTÁK, Miroslav - ROZINAJOVÁ, Viera. Machine Learning Approach to the Process of Question Generation. In *TSD 2017, 20th International Conference, Text, Speech and Dialogue 2017*, Springer, 2017, pp. 102-110.
- [2] BOU EZZEDDINE, Anna - LÓDERER, Marek - LAURINEC, Peter - VRABLECOVÁ, Petra - ROZINAJOVÁ, Viera - LUCKÁ, Mária - LACKO, Peter - GRMANOVÁ, Gabriela. Using biologically inspired computing to Effectively Improve Prediction Models. In *International Journal of Hybrid Intelligent Systems*. Vol. 13, no. 2 (2016), pp. 99-112. ISSN 1448-5869.
- [3] GRMANOVÁ, Gabriela - LAURINEC, Peter - ROZINAJOVÁ, Viera - BOU EZZEDDINE, Anna - LUCKÁ, Mária - LACKO, Peter - VRABLECOVÁ, Petra - NÁVRAT, Pavol. Incremental Ensemble Learning for Electricity Load Forecasting. In *Acta Polytechnica Hungarica*. Vol. 13, No. 2 (2016), pp. 97-117. ISSN 1785-8860.
- [4] LÓDERER, Marek - PAVLÍK, Peter - ROZINAJOVÁ, Viera. Improving Time Series Prediction via Modification of Dynamic Weighted Majority in Ensemble Learning. In *Intelligent Data Engineering and Automated Learning – IDEAL 2018, 19th International Conference*, Madrid, Spain, Springer, 2018, pp. 651-660. ISBN 978-3-030-03492-4.
- [5] LOEBL, Jaroslav - POSCH, Helmut - ROZINAJOVÁ, Viera. Multi-objective Optimization for Power Load Recommendation Considering User's Comfort. In *DARE 2017, 5th ECML PKDD Workshop, DARE 2017, Skopje, Macedonia, Revised Selected Papers*. Springer, 2017, pp. 26-32.
- [6] ROZINAJOVÁ, Viera - BOU EZZEDDINE, Anna - LÓDERER, Marek - LOEBL, Jaroslav - MAGYAR, Róbert - VRABLECOVÁ, Petra. Computational Intelligence in Smart Grid Environment. In *Computational Intelligence for Multimedia Big Data on the Cloud with Engineering Applications*. Elsevier, 2018, pp. 23-59.
- [7] SRBA, Ivan - BIELIKOVÁ, Mária. Why is Stack Overflow Failing? Preserving Sustainability in Community Question Answering. In *IEEE Software*. Vol. 33, no. 4 (2016), pp. 80-89.
- [8] ŠEVCECH, Jakub - BIELIKOVÁ, Mária. Repeating Patterns as Symbols for Long Time Series Representation. In *Journal of Systems and Software*. Vol. 127, (2017), pp. 179-194.
- [9] VRABLECOVÁ, Petra - BOU EZZEDDINE, Anna - ROZINAJOVÁ, Viera - ŠÁRIK, Slavomír - SANGAIAH, Arun Kumar. Smart grid load forecasting using online support vector regression. In *Computers and electrical engineering*. Vol. 65, iss. January (2018), pp. 102-117. ISSN 0045-7906.
- [10] VRABLECOVÁ, Petra - ROZINAJOVÁ, Viera - BOU EZZEDDINE, Anna. Incremental Adaptive Time Series Prediction for Power Demand Forecasting. In *DMBD 2017. Data Mining and Big Data Second International Conference, DMBD 2017, Fukuoka, Japan*. Springer, 2017, pp. 83-92.
- [11] VRABLECOVÁ, Petra - ROZINAJOVÁ, Viera - BOU EZZEDDINE, Anna. Incremental Time Series Prediction Using Error-Driven Informed Adaptation. In *Proceedings 16th IEEE International Conference on Data Mining Workshops (ICDMW 2016)*, IEEE, 2016, pp. 414-421.

Industry collaboration

- ATOS Research and Innovation, Madrid, Spain (Tomas Pariente Lobo)
- Predictive modeling of power load demands using real datasets from Slovakia (common project with ATOS IT solutions and services, Ltd., Sfera, Inc.)

Academy collaboration

- Faculty of Electrical Engineering and Informatics, Technical University Košice (prof. Ján Paralič)
- University of Minho, Portugal (Prof. Isabel Ramos)
- University of J.J. Strossmayer, Osijek, Croatia (Prof. dr.sc. Snjezana Rimac-Drlje)
- City University Dublin (Dr. Gabriel-Miro Muntean)
- National Technical University of Ukraine, Applied Mathematics (Assoc. Prof. Yevgeniya Sulema)

INFORMATION PROCESSING: INTELLIGENT METHODS

Researchers cover topics of new trends in design, development and usage of adaptive social web-based systems including analysis of user logs and user's behaviour prediction. We explore novel recommenders design and application. Hand by hand with the user generated content increase, we explore the sentiment analysis and various methods for discriminative keyword extraction with focus on neural networks. We research novel methods

for information extraction by incorporating natural language processing. The UX is one of the essential sources of information about user's behavior, thus studies examining the user's behaviour and experience during the use of information systems, web/mobile applications and multimedia support our research outputs.

Researchers

Bieliková, Mária - aims her research to human interactions on the Web with special emphasis on user modelling and personalization, context awareness, collaborations and usability. This includes research of methods for automated analysis and modelling user feedback, and its evaluation by (multi/group) user studies employing eye trackers.

Chudá, Daniela - covers by her research interests the area of information systems, quality of information systems, security and privacy, user modelling, in particular she focuses on similarity of texts and behavioral biometric authentication.

Kompan, Michal - aims his research at problems in the recommender systems and users' behavior prediction.

Barla, Michal - covers by his research interests an area of clickstream data analysis for user modeling with a special focus on unsupervised methods, including neural networks.

Kuric, Eduard - dedicates his research to user modelling, user experience and web personalization. In particular, he focuses on user characteristics acquisition based on (semi)automatic analysis of user's feedback, research of methods for automatic identification of usability problems, designing qualitative/quantitative usability studies, online/remote usability testing, and designing user interfaces.

Móro, Róbert - covers by his research interests the area of user modelling, eye tracking and personalization. He is particularly interested in applying machine learning methods to infer user characteristics (personality traits, cognitive abilities, etc.) using features based on advanced analysis of gaze data and in researching adaptation strategies tailored to individual user differences.

Tvarožek, Jozef - is particularly interested in applying intelligent approaches and creating online learning experiences for students mainly via active problem solving and collaborative approaches. Additionally, he is using eye tracking for research in program comprehension.

Šimko, Jakub - dedicates his research to the intersection of fields of human computation, eye-tracking and user modeling. In particular, he is interested in automatic assessment of quality of user (study participant) work using eye trackers. He is also interested in user experience studies conduction and support.

Šimko, Marián - focuses on information extraction and knowledge discovery from text-based content, by employing ontology engineering and natural language processing. His interests include processing of resources in Slovak language.

Srba, Ivan - covers by his research interests the area of web-based systems, which utilize concepts of collaboration and collective intelligence, in particular he focuses on knowledge sharing (mainly in Community Question Answering systems) and computer-supported collaborative learning.

Selected recent publications

- [1] BERGER, Patrik - KOMPAN, Michal. User Modeling for Churn Prediction in E-commerce. In *IEEE Intelligent Systems*. First online. ISSN 1541-1672.
- [2] BIELIKOVÁ, Mária - KONÔPKA, Martin - ŠIMKO, Jakub - MÓRO, Róbert - TVAROŽEK, Jozef - HLA-VÁČ, Patrik - KURIC, Eduard. Eye-tracking en masse: Group user studies, lab infrastructure, and practices. In *Journal of eye movement research*. vol. 11, no. 3 (2018), 1-15. ISSN 1995-8692.
- [3] DRAGÚŇOVÁ, Mária - MÓRO, Róbert - BIELIKOVÁ, Mária. Measuring Visual Search Ability on the Web. In *ACM IUI 2017, Companion Proceedings of IUI '17 Companion the 22nd International Conference on Intelligent User Interfaces*. New York: ACM, 2017, pp. 97-100.
- [4] GAŠPAR, Peter - ŠIMKO, Jakub. Linking Multimedia to Microblogs for Metadata Extraction. In *ENIC 2016. Third European Network Intelligence Conference*, IEEE, 2016, pp. 90-97.
- [5] KAŠŠÁK, Ondrej - KOMPAN, Michal - BIELIKOVÁ, Mária. Acquisition and Modelling of Short-Term User Behaviour on the Web: A Survey. In *Journal of Web Engineering*. Vol. 17, no. 5 (2018), 23-70. ISSN 1540-9589.
- [6] KAŠŠÁK, Ondrej - KOMPAN, Michal - BIELIKOVÁ, Mária. Personalized Hybrid Recommendation for Group of Users: Top-N multimedia recommender. In *Information Processing and management*. Vol. 52, no. 3 (2016), pp. 459-477. ISSN 0306-4573.

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- [9] KONÔPKA, Martin - TVAROŽEK, Jozef - TALIAN, Adam - NÁVRAT, Pavol. Data flow metrics in program comprehension task. In EMIP 2018. Proceedings of the Workshop on Eye Movements in Programming. New York : ACM (2018), pp. 1-6.
- [10] KRÁTKY, Peter - CHUDÁ, Daniela. Recognition of web users with the aid of biometric user model. In *Journal of Intelligent Information Systems*. Vol. 51, iss. 3 (2018), 621-646. ISSN 0925-9902.
- [11] KRÁTKY, Peter - TVAROŽEK, Jozef - CHUDÁ, Daniela. Big Five Personality in Online Learning and Games: Analysis of Student Activity. In *International Journal of Human Capital and Information Technology Professionals*. Vol. 7, iss. 3 (2016), pp. 33-46. ISSN 1947-3478.
- [12] KRCHŇAVÝ, Rastislav - ŠIMKO, Marián. Sentiment Analysis of Social Network Posts in Slovak Language. In *SMAF 2017*. Proceedings 12th international workshop on semantic and social media adaptation and personalization, IEEE, 2017, pp. 20-25.
- [13] MAČINA, Jakub - SRBA, Ivan - WILLIAMS, Joseph Jay - BIELIKOVÁ, Mária. Educational Question Routing in Online Student Communities. In *RecSys 2017*. Proceedings of the Eleventh ACM Conference on Recommender Systems, New York: ACM, 2017, pp. 47-55.
- [14] SRBA, Ivan - BIELIKOVÁ, Mária. A Comprehensive Survey and Classification of Approaches for Community Question Answering. In *ACM Transactions on the Web*. Vol. 10, iss. 3 (2016), Article 18 [18:1-18-63]. ISSN 1559-1131.
- [15] ŠIMKO, Jakub - VRBA, Jakub Benjamín. Screen recording segmentation to scenes for eye-tracking analysis. In *Multimedia Tools and Applications*. First online, s. 1-25. ISSN 1380-7501.
- [16] TRIGLIANOS, Vasilejos - LABAJ, Martin - MÓRO, Róbert - ŠIMKO, Jakub - HUCKO, Michal - TVAROŽEK, Jozef - PAUTASSO, Cesare - BIELIKOVÁ, Mária. Experiences Using an Interactive Presentation Platform in a Functional and Logic Programming Course. In *UMAP 2017: Adjunct Publication of the 25th Conference on User Modeling, Adaptation and Personalization*. New York: ACM, 2017, pp. 311-316.
- [17] TVAROŽEK, Jozef - JURKOVIČ, Peter. Student-Generated Content Improves Online Learning of Programming. In *International Journal of Human Capital and Information Technology Professionals*. Vol. 7, iss. 4 (2016), pp. 79-92. ISSN 1947-3478.
- [18] VIRIK, Martin - ŠIMKO, Marián - BIELIKOVÁ, Mária. Blog Style Classification: Refining Affective Blogs. In *Computing and Informatics*. Vol. 35, no. 5 (2016), pp. 1027-1049. ISSN 1335-9150.
- [19] VRABLECOVÁ, Petra - ŠIMKO, Marián. Supporting Semantic Annotation of Educational Content by Automatic Extraction of Hierarchical Domain Relationships. In *IEEE transactions on learning technologies*. Vol. 9, iss. 3 (2016), pp. 285 - 298. ISSN 1939-1382.

Industry collaboration

- Personalised recommendation for a discount portal
- TV User behavior analysis for a telecom company
- Platform for TV program recommendation (in collaboration with a media agency and a telecom company)
- News recommendation for major Slovak newspaper (scalability for the real-time, heavily dynamic environment)
- Studies examining user behaviour and user experience during the use of information systems, web/mobile applications and multimedia for several Slovak banks and an e-shop
- Sentiment analysis on a social network in cooperation with a communication and PR agency serving as their customers' business analysis tool (comprehensive language models employing specifics of social content were trained)

Academy collaboration

- Askalot - the first educational and organizational CQA system; deployed in collaboration with Harvard University as a part of MOOC system edX (a course with more than 5000 students); used on the additional three universities Europe-wide (Slovak University of Technology in Bratislava; University of Lugano, Switzerland; University of Novi Sad, Serbia)
- Adaptive and collaborative learning platform ALEF (1500 students as users to date, Special

prize of the Minister of Education, Science, Research and Sport of the Slovak Republic)

- Programming learning platform Turing (more than 2000 freshmen students to date)
- Faculty of Arts, Comenius University (Prof. Jela Steinerová, Prof. Jaroslav Šúšol, Assoc. Prof. Milica Schraggeová, Assoc. Prof. Anton Heretik, Jr.)
- Faculty of Electrical Engineering and Informatics, Technical University Košice (Prof. Ján Paralič)
- Faculty of Informatics, Lugano University (Prof. Cesare Pautasso)
- School of Information Sciences, University of Pittsburgh (Prof. Peter Brusilovsky)
- Faculty of Mathematics and Physics, Charles University in Prague, Czech Republic (Prof. Peter Vojtáš)
- Faculty of Science, University of Novi Sad (Prof. Mirjana Ivanovic)
- Department of Computer Science, Bar Ilan University (Prof. Sarit Kraus)
- Department of Computer Science, University of British Columbia (Prof. Cristina Conati)
- Information Systems Department, University of Haifa (Prof. Tsvika Kuflik).

INFORMATION PROCESSING: SPREADING AND PRIVACY

People are ever more connected to Web. Their communication takes place in a digital space in human - Web interaction. We investigate how people spread information in Web environment by passing, sharing, commenting etc. either in original or similar form. Research focuses on trustworthiness of the spreaded information and respect for human privacy. Spreading, sharing of information should be dependable. Information, which has an inherently interactive behaviour, should be as comprehensible as possible to people - users (new interaction and visualization metaphors).

In 2018, we started to work on common research project with Technical University Košice Faculty of Electrical Engineering and Informatics and Comenius University in Bratislava - Faculty of Philosophy “/Automated Recognition of Antisocial Behaviour in Online Communities/” (APVV-17-0267).

Researchers

Návrát, Pavol - his research interests range from information interactions of people on the Web as manifested by information recommendation or spreading within social networks, to social insect

inspired computing and to modelling of software artifacts.

Chudá, Daniela - her research interests are in the area of information systems, quality of information systems, security and privacy, user modelling, in particular she focuses on similarity of texts and behavioral biometric authentication.

Martonová (Kovárová), Alena - her research interest is human computer interaction including new or unusual devices/interfaces. Recently deals with beacons, which bring to the web and their users new dimension of interaction and information-gathering.

Malkin Ondik, Irina – her current research interests include disinformation spreading detection, but also topics from computer modelling of processes.

Selected recent publications

- [1] BURDA, Kamil - CHUDÁ, Daniela. Influence of Body Postures on Touch-Based Biometric User Authentication. In *SOFSEM 2018: Theory and Practice of Computer Science*, 44th International Conference on Current Trends in Theory and Practice of Computer Science, Krems, Austria. Springer, 2018, pp. 459-468.
- [2] FILÍPEK, Peter - KOVÁROVÁ, Alena. Indoor Localization Based on Beacons and Calculated by Particle Filter. In *CompSysTech 2016. Proc. of the 17th International Conference on Computer Systems and Technologies 2016*, ACM, 2016, pp. 269-276.
- [3] KOVÁROVÁ, Alena - KONÔPKA, Martin - SEKERÁK, Lukáš - NÁVRÁT, Pavol. Visualising Software Developers' Activity Logs to Facilitate Explorative Analysis. In *Acta Polytechnica Hungarica*. Vol. 13, No. 2 (2016), pp. 159-178. ISSN 1785-8860.
- [4] KRÁTKY, Peter - CHUDÁ, Daniela. Recognition of web users with the aid of biometric user model. In *Journal of Intelligent Information Systems*. Vol. 51, iss. 3 (2018), pp. 621-646. ISSN 0925-9902.
- [5] LISKOVEC, Matej - KOVÁROVÁ, Alena. Beacon Based Localization Refined by Outputs from Mobile Sensors. In *CompSysTech 2016. Proceedings of the 17th International Conference on Computer Systems and Technologies 2016*, ACM, 2016, pp. 277-284.
- [6] MAZÁN, Filip - KOVÁROVÁ, Alena. Optimizing Artificial Neural Network for Beacon Based Indoor Localization. In *CompSysTech 2016. Proceedings*

of the 17th International Conference on Computer Systems and Technologies 2016. ACM, 2016, pp. 261-268.

- [7] PETRÍK, Juraj - CHUDÁ, Daniela. Source code authorship approaches natural language processing. In *Proceedings of the 19th International Conference on Computer Systems and Technologies*, Ruse. ACM, 2018, pp. 58-61.
- [8] SABO, Štefan - NÁVRAT, Pavol. Bee inspired detecting and tracking of currently developing news stories from the web. In *Journal of Theoretical and Applied Information Technology*. Vol. 96, no. 10 (2018), s. 3086-3101. ISSN 1992-8645.

Academy collaboration

The consortium of 65 university departments from across Europe, joined the European project Future Education and Training in Computing: How to support learning at anytime anywhere (FETCH). In particular, closer cooperation with:

- Assoc. Prof. Emeritus Stoyanka Smrikarova, University of Ruse, Bulgaria
- Prof. Leon Rothkrantz, Delft University of Technology, Nederland
- Prof. Mirjana Ivanovic, University of Novi Sad, Faculty of Sciences, Serbia
- Dr. Janusz Jabłonowski, Warsaw University, Poland

KNOWLEDGE ACQUISITION AND DISCOVERY

Nature provides a very valuable source of inspiration for computer science. We are adopting algorithms (e.g. evolutionary) and principles from biology and nature (e.g. bee hive) to achieve better results in various computational problems. Artificial neural networks model brain structures and neural networks of living beings, providing excellent results in classification, prediction and regression tasks. As a part of data mining, we also focus on text mining and knowledge discovery from text-based resources, including topics such as opinion mining.

Researchers

Návrat, Pavol - his research interests range from information interactions of people on the Web as manifested by information recommendation or spreading within social networks, to social insect inspired computing and to modelling of software artifacts.

Bieliková, Mária - aims her research to human interactions on the Web with special emphasis on user modelling and personalization, context awareness, collaborations and usability. This includes research of methods for automated analysis and modelling user feedback, and its evaluation by (multi/group) user studies employing eye trackers.

Lucká, Mária - focuses in her research on efficient algorithms and processing of big data sets, with applications in bioinformatics and energy data. Intelligent data analysis methods include clustering of big data, parallel methods and high performance computing.

Rozinajová, Viera - covers by her research interests data science in broader sense, in particular she concentrates on advanced methods of predictive modeling, cluster analysis, anomaly detection and optimization.

Barla, Michal - covers by his research interests an area of clickstream data analysis for user modeling with a special focus on unsupervised methods, including neural networks.

Bou Ezzeddine, Anna - explores bio-inspired optimization methods, intelligent data processing techniques with a focus on stream data, self-adapting methods.

Grmanová, Gabriela her research is oriented on the field of Data mining. She explores mainly advanced methods of clustering and predictive modeling.

Kompan, Michal - aims his research at problems in the recommender systems and users' behavior prediction.

Lacko, Peter - his research interests include artificial intelligence, neural networks and parallel and distributed computing.

Šimko, Marián - focuses on information extraction and knowledge discovery from text-based content, by employing ontology engineering and natural language processing. His interests include processing of resources in Slovak language.

Selected recent publications

- [1] BLŠTÁK, Miroslav - ROZINAJOVÁ, Viera. Machine Learning Approach to the Process of Question Generation. In *TSD 2017, 20th International Conference, Text, Speech and Dialogue 2017*, Springer, 2017, S. 102-110.
- [2] BOU EZZEDDINE, Anna - LÓDERER, Marek - LAURINEC, Peter - VRABLECOVÁ, Petra - ROZINAJOVÁ, Viera - LUCKÁ, Mária - LACKO, Peter -

- GRMANOVÁ, Gabriela. Using biologically inspired computing to effectively improve prediction models. In *International Journal of Hybrid Intelligent Systems*. Vol. 13, no. 2 (2016), pp. 99-112. ISSN 1448-5869.
- [3] GRMANOVÁ, Gabriela - LAURINEC, Peter - ROZINAJOVÁ, Viera - BOU EZZEDDINE, Anna - LUCKÁ, Mária - LACKO, Peter - VRABLECOVÁ, Petra - NÁVRAT, Pavol. Incremental Ensemble Learning for Electricity Load Forecasting. In *Acta Polytechnica Hungarica*. Vol. 13, No. 2 (2016), pp. 97-117. ISSN 1785-8860.
- [4] HALAŠ, Peter - LÓDERER, Marek - ROZINAJOVÁ, Viera. Prediction of Electricity Consumption using Biologically Inspired Algorithms. In *INFORMATICS 2017. Proceedings of IEEE 14th International Scientific Conference on Informatics*, IEEE, 2017, pp. 98-103.
- [5] CHOVAŇÁK, Tomáš - KAŠŠÁK, Ondrej - KOMPAN, Michal - BIELIKOVÁ, Mária. Fast Streaming Behavioural Pattern Mining. In *New generation computing*. Vol. 36, no. 4 (2018), 365-391. ISSN 0288-3635.
- [6] JARÁBEK, Tomáš - LAURINEC, Peter - LUCKÁ, Mária. Energy Load Forecast Using S2S Deep Neural Networks with k-Shape Clustering. In *INFORMATICS 2017. Proceedings of IEEE 14th International Scientific Conference on Informatics*, IEEE, 2017, pp. 140-145.
- [7] KAŠŠÁK, Ondrej - KOMPAN, Michal - BIELIKOVÁ, Mária. Student behavior in a web-based educational system: Exit intent prediction. In *Engineering Applications of Artificial Intelligence*. Vol. 51, no. May (2016), pp. 136-149. ISSN 0952-1976.
- [8] LACKO, Peter. From perceptrons to deep neural networks. In *SAMI 2017: IEEE 15th International Symposium on Applied Machine Intelligence and Informatics*, IEEE, 2017, pp. 169-172.
- [9] LAURINEC, Peter - LÓDERER, Marek - VRABLECOVÁ, Petra - LUCKÁ, Mária - ROZINAJOVÁ, Viera - BOU EZZEDDINE, Anna. Adaptive Time Series Forecasting of Energy Consumption using Optimized Cluster Analysis. In *Proceedings 16th IEEE International Conference on Data Mining Workshops (ICDMW 2016)*, IEEE, 2016, pp. 398-405.
- [10] LAURINEC, Peter - LUCKÁ, Mária. Interpretable multiple data streams clustering with clipped streams representation for the improvement of electricity consumption forecasting. In *Data mining and knowledge discovery*. Vol. 19, no. 2 (2019), 413-445. ISSN 1384-5810.
- [11] PECÁR, Samuel - FARKAŠ, Michal - ŠIMKO, Marián - LACKO, Peter - BIELIKOVÁ, Mária. NL-FIIT at IEST-2018: Emotion Recognition utilizing Neural Networks and Multi-level Preprocessing. In *Proceedings of the 9th Workshop on Computational Approaches to Subjectivity, Sentiment and Social Media Analysis : Proceedings of the Workshop*. Stroudsburg : Association for Computational Linguistics (ACL) (2018), pp. 217-223.
- [12] RYBÁR, Metod - BIELIKOVÁ, Mária. Automated Detection of User Deception in On-line Questionnaires with Focus on Eye Tracking Use. In *SMAP 2016. Proceedings of the 11th International Workshop on Semantic and Social Media Adaptation and Personalization*, 2016, pp. 24-28.
- [13] ŠAJGALÍK, Márius - BARLA, Michal - BIELIKOVÁ, Mária. Searching for Discriminative Words in Multidimensional Continuous Feature Space. *Computer Speech and Language*. First online. <https://doi.org/10.1016/j.csl.2017.10.002>
- [14] TVAROŽEK, Jozef - KONÔPKA, Martin - NÁVRAT, Pavol - BIELIKOVÁ, Mária. Studying various source code comprehension strategies in programming education. In *Eye movements in programming: models to data: proceedings of the third international workshop*. University of Eastern Finland, Joensuu. 2016, pp. 25-26.
- [15] VRABLECOVÁ, Petra - ROZINAJOVÁ, Viera - BOU EZZEDDINE, Anna. Incremental Time Series Prediction Using Error-Driven Informed Adaptation. In *Proceedings 16th IEEE Int. Conference on Data Mining Workshops (ICDMW 2016)*, Barcelona, Catalonia, Spain. IEEE, 2016, pp. 414-421.

Industry collaboration

- TV User behavior analysis for a telecom company
- Conversion prediction for major business platform for digital media (behavioral models for predicting conversions of readers info paying customers)

REPRESENTING AND REUSING SOFTWARE KNOWLEDGE

Enormous intellectual efforts are being invested into producing software in its executable form. Part of our research is devoted to software product lines and variability and software patterns. We explore how this heterogeneous software knowledge contained in various artifacts produced during software development can be efficiently represented

and reused. For this, we search for a way to inter-relate and visualize this knowledge employing multidimensional software modeling. We also seek for a way to make the knowledge of agile and lean people organization and software processes in general more accessible and explore its wider social connotations.

Researchers

Vranić, Valentino - has a long-term interest in interconnecting human and realization aspects of software development.

Návrát, Pavol - his research interests range from information interactions of people on the Web as manifested by information recommendation or spreading within social networks, to social insect inspired computing and to modelling of software artifacts.

Polášek, Ivan - explores refactoring and preserving intent comprehensibility in software artifacts using multidimensional modeling and visualization.

Rástočný, Karol - explores the possibilities of determining source code properties by tracking developer activity, using advanced software modeling and visualization for change management, and new ways of software testing.

Gábrišová, Henrieta - focuses on the information environment in the context of scholarly communication and digital literacy, as well as on digital humanities from the perspective of visual arts.

Falbová, Lucia - is interested in the connections between arts, information science, and computer science.

Selected recent publications

- [1] FERENC, Matej - POLÁŠEK, Ivan - VINCÚR, Juraj. Collaborative Modeling and Visualisation of Software Systems Using Multidimensional UML. In *Proceedings of 2017 IEEE Working Conference on Software Visualization, VISSOFT 2017*. Shanghai, China, IEEE, 2017.
- [2] KOSTOVA, Sandra - VRANIĆ, Valentino. Applying Aspect-Oriented Change Realization in the Mobile Application Domain. In *2nd Workshop on Programming Across the System Stack, PASS 2018, Proceedings Companion to the 2nd International Conference on the Art, Science, and Engineering of Programming, <Programming> 2018*, Brussels, Belgium, ACM, 2018.
- [3] LACKO, Peter - KAJSA, Peter - NÁVRAT, Pavol. Design Pattern Instances within Model Driven Development Based on Abstraction, Concretization

and Variability. In *Computing and Informatics*. Vol. 36, no. 1 (2017), pp. 55-85. ISSN 1335-9150.

- [4] SULAIMAN KHALIL, Waheedullah - VRANIĆ, Valentino. Treating Pattern Sublanguages as Patterns with an Application to Organizational Patterns. In *Proceedings of 22nd European Conference on Pattern Languages of Programs, EuroPLOP 2017*. Kloster Irsee in Bavaria, Germany, ACM, 2017.
- [5] VINCÚR, Juraj - POLÁŠEK, Ivan - NÁVRAT, Pavol. VR City: Software Analysis in Virtual Reality Environment. In *2017 IEEE International Conference on Software Quality, Reliability and Security Companion, QRS-C 2017*. Prague, Czech Republic, IEEE, 2017.

Industry collaboration

- Common international research project proposals with software industry partners including Engineering Ingegneria Informatica S.p.A., Atos Spain SA, Verum Software Tools B.V., and Turkcell Technology
- Research and development projects with Gratex International and Continental Automotive

Academy collaboration

- Common international research project proposals with numerous academic partners including Politecnico di Milano (Prof. Elisabetta Di Nitto), Unisannio (Prof. Massimiliano Di Penta), SINTEF, University of Turin (Prof. Rossana Damiano), and Politechnika Warszawska (Prof. Michał Śmiełtek)
- Research collaboration with Chalmers and Gothenburg University (Prof. Michel R. V. Chaudron) and University of West Bohemia (Prof. Přemysl Brada)

SOFTWARE COMPREHENSION AND QUALITY

Software is not only difficult to create, but it is also difficult to understand. We explore the ways of preserving the comprehensibility of the intent with which software has been developed and how to achieve this directly in the corresponding code and model artifacts. Part of the solution to this problem lies in establishing and maintaining appropriate modularization. We focus on use case driven modularization and advanced (aspect-oriented) modularization. From the perspective of software quality, we explore using refactoring, automated testing, continuous revisions, and visualization of

software properties. We also explore applying software development techniques beyond software development, in particular in education.

Researchers

Vranić, Valentino - has a long-term interest in interconnecting human and realization aspects of software development.

Polášek, Ivan - explores refactoring and preserving intent comprehensibility in software artifacts using multidimensional modeling and visualization.

Lang, Ján - explores extending and adapting techniques of software development to other areas with a particular interest in education.

Rástočný, Karol - explores the possibilities of determining source code properties by tracking developer activity, using advanced software modeling and visualization for change management, and new ways of software testing.

Kapc, Peter - research interests lie in the visualization of software and its properties, as well as in information visualization in general, including virtual and augmented reality, visual analytics, and novel interaction techniques in visualization.

Selected recent publications

- [1] BERTA, Peter - KREMPASKÝ, Michal - BYSTRICKÝ, Michal - VRANIĆ, Valentino. Employing Issues and Commits for In-Code Sentence Based Use Case Identification and Remodularization. In *Proceedings of 5th European Conference on the Engineering of Computer Based Systems, ECBS 2017, Larnaca, Cyprus, ACM, 2017*.
- [2] BYSTRICKÝ, Michal - VRANIĆ, Valentino. Preserving Use Case Flows in Source Code: Approach, Context, and Challenges. In *Computer Science and Information Systems*. Vol. 14, no. 2 (2017), pp. 423-445. ISSN 1820-0214.
- [3] ONDÍK, Jakub - OLEJÁR, Martin - RÁSTOČNÝ, Karol - BIELIKOVÁ, Mária. Activity-Based Model Synchronization and Defects Detection for Small Teams. In *Proceedings of IEEE International Conference on Software Quality, Reliability and Security, QRS 2017, Prague, IEEE, 2017*.
- [4] RÁSTOČNÝ, Karol - MLYNČÁR, Andrej. Automated Change Propagation from Source Code to Sequence Diagrams. In *Proceedings of 44th International Conference on Current Trends in Theory and Practice of Computer Science, SOFSEM 2018: Theory and Practice of Computer Science, Krems, Austria, Springer, 2018*.

- [5] VRANIĆ, Valentino - LASLOP, Milan. Aspects and Roles in Software Modeling: A Composition Based Comparison. In *Computer Science and Information Systems*. Vol. 13, no. 1 (2016), pp. 199-216. ISSN 1820-0214

Industry collaboration

- Common international research project proposals with software industry partners including Engineering Ingegneria Informatica S.p.A., Atos Spain SA, Verum Software Tools B.V., and Turkcell Technology
- Research and development projects with Gratex International and Continental Automotive

Academy collaboration

- Common international research project proposals with numerous academic partners including Politecnico di Milano (Prof. Elisabetta Di Nitto), Unisannio (Prof. Massimiliano Di Penta), SINTEF, University of Turin (Prof. Rossana Damiano), and Politechnika Warszawska (Prof. Michał Śmiałek)
- Research collaboration with Chalmers and Gothenburg University (Prof. Michel R. V. Chaudron) and University of West Bohemia (Prof. Přemysl Brada)

COMMUNICATION NETWORKS

Research in the area of communication networks should develop following areas:

- Wired communication networks, which are the core of the networks including Internet. The main interest here is to Ethernet technologies, Optical communication, but also routing and switching
- Wireless technologies going from WiFi through Internet of Things technologies (e.g. LoRa) to mobile networks. The latest submitted project is oriented to 5G networks.
- Architecture for efficient content delivery - Content Delivery networks - CDN and advanced architectures based on Software Defined Networking - SDN and IP Multimedia Subsystem - IMS. The delivery in efficient manner includes virtualization using Network Function Virtualization - NFV.

The topic along whole research is security, which is omnipresent in ICT. Formal approach used for research includes mainly graph theory and Petri Nets.

Researchers

Kotuliak, Ivan - research interest lies at network performance, including NGN architecture, wireless and mobile networking, Internet of Things and Future Internet, security. In his research, he focuses on architecture approach and system performance using Markov Chains and Petri Nets. He has been an author and co-author of more than sixty scientific papers and leads and participates on several international and national research projects.

Trúchly, Peter - research interest lies at Software Defined Networking and its application in IoT, transport protocols performance in wireless (and satellite) networks, and traffic routing optimisation in IoT.

Macko, Dominik - research interest lies at digital-systems design automation, system-level specification, power optimization and estimation, and low-power communications connected with the Internet of Things.

Helebrandt, Pavol - Research interest lies at software defined networking, routing, design and management optimization in communication networks, network security, primarily focuses on utilization of blockchain and secure management of networks.

Selected recent publications

- [1] HELEBRANDT, Pavol - BELLUS, Matej - RIES, Michal - KOTULIAK, Ivan - KHILENKO, Vladimir. Blockchain Adoption for monitoring and management of enterprise networks. In *Proceedings of 2018 IEEE 9th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON)*. Vancouver, BC 1-3 November 2018, pp. 1221-1225.
- [2] KOVÁČIK, Tomáš - BENČEL, Rastislav - MAŤO, Ján - BRONIŠ, Roman - TRÚCHLY, Peter - KOTULIAK, Ivan. Enhanced Hybrid TV Platform with Multiscreen, Advanced EPG and Recommendation Enablers. In *Journal of Electrical Engineering*. Vol. 68, no. 3 (2017), pp. 224-234. ISSN 1335-3632.
- [3] LEVY, David - KOTULIAK, Ivan. WLAN Power Saving using Packet Overhearing Reduction. In *Telecommunication Systems*. Vol. 61, iss. 1 (2016), pp. 43-57. ISSN 1018-4864.

Selected research projects

- Methods and algorithms for improving efficiency and multimedia content delivery in IP networks (VEGA 1/0836/16) (I. Kotuliak), Duration: 2016 - 2018

- Cloud Based Human Robot Interaction (APVV-15-0731) (I. Kotuliak), Duration: 2016 - 2020

Industry collaboration

- Pilot implementation and integration. Example is Virtual Customer Premises Equipment (vCPE) - SDN based CPE pilot project with telecommunication operator designed and proof-of-concept solution by the team of FIIT STU (including professors, PhD students and master students).
- Courses usually based on latest research (SDN, NFV), but also on CISCO Networking Academy courses.

Academy collaboration

- Joanna Tomasic, SUPELEC France
- Robert Bestak, FEL CVUT, Czech republic
- Yevgenij Koutcheriavy, University of Tampere, Finland

INFORMATION AND CYBER SECURITY

Information and cyber security is the collection of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, actions, training, best practices, assurance and technologies that can be used to protect the cyber environment and organization and user's assets. Organization and user's assets include connected computing devices, personnel, infrastructure, applications, services, telecommunications systems, and the totality of transmitted and/or stored information in the cyber environment. Cybersecurity strives to ensure the attainment and maintenance of the security properties of the organization and user's assets against relevant security risks in the cyber environment. The general security objectives comprise the following: Availability, Integrity (which may include authenticity and nonrepudiation) and Confidentiality.

Researchers

Hudec, Ladislav - research interest lies at security in mobile ad-hoc networks, risk analysis and security evaluation, computational intelligence in web and network security.

Kotuliak, Ivan - research interest lies at network performance, including NGN architecture, wireless and mobile networking, Internet of Things and Future Internet, security. In his research, he focus on architecture approach and system performance us-

ing Markov Chains and Petri Nets. He has been author and co-author of more than sixty scientific papers and leads and participates on several international and national research projects.

Krajčovič, Tibor - research interest lies at embedded systems, based on monolithic processors and one-chip microcomputers, increasing of embedded systems reliability, and real-time embedded systems.

Chudá, Daniela - her research interests are in the area of information systems, quality of information systems, security and privacy, user modelling, in particular she focuses on similarity of texts and behavioral biometric authentication.

Pištek, Peter - research interest lies at security in applications for automotive industry with focus on passenger transportation as a partial problem of Smart cities.

Laštinec, Ján - Research interest lies at security in embedded systems and networks, automotive communication systems, and network security monitoring.

Selected recent publications

- [1] FILIPEK, Jozef - HUDEC, Ladislav. Advances in Distributed Security for Mobile Ad Hoc Networks. In: *CompSysTech 2016*. Proceedings of the 17th International Conference on Computer Systems and Technologies 2016, ACM, 2016, pp. 89-96. ISBN 978-1-4503-4182-0.
- [2] FILIPEK, J., HUDEC, L.: Security architecture for the mobile ad hoc networks. In *Journal of ELECTRICAL ENGINEERING*, VOL 69 (2018), NO3, 198–204. DOI: 10.2478/jee-2018-0026, Print (till 2015) ISSN 1335-3632, On-line ISSN 1339-309Xc 2018 FEI STU.
- [3] CHUDÁ, Daniela - KRÁTKY, Peter - BURDA, Kamil. Biometric Properties of Mouse Interaction Features on the Web. In *Interacting with Computers: The Interdisciplinary Journal of Human-Computer Interaction*. Vol. 30, iss. 5 (2018), pp. 359-377. ISSN 0953-5438.
- [4] LAŠTINEC, Ján. Comparative Analysis of TCP/IP Security Protocols for Use in Vehicle Communication. In *ICCC 2016: 17th International carpathian control conference*. Tatranská Lomnica, Slovak Republic. Danvers: IEEE, 2016, article 32.
- [5] PIŠTEK, Peter - POLÁK, Martin. Multimedia System for Taxi Services with Awareness of Malicious Behavior as a Part of Smart Transportation. In *Smart City 360°* [elektronický zdroj] : 2nd EIA

International Summit, 2016, Bratislava. EAI, 2017, online, 7 p.

Selected research projects

- Security in distributed computer systems and mobile computer networks. Grant Agency VEGA 1/0722/12
- Methods and algorithms for improving efficiency and multimedia content delivery in IP networks. Grant Agency VEGA 1/0836/16
- Secure communication in car using TCP/IP. Grant STU for young researchers, 2016

Industry collaboration

- ESET, s.r.o., Bratislava
- ESET Research Lab - common lab with ESET, Slovak University of Technology in Bratislava and Comenius University in Bratislava
- Molpir, s.r.o., Bratislava, common lab

Academy collaboration

- Martin Danko, Faculty of Law, Comenius university in Bratislava
- Ondrej Rysavy, FIT VUT Brno, Czech republic

EMBEDDED SYSTEMS

Due to the increasing number of IoT devices and its future estimations, the question of their reliability and safety, as well as the necessity of their mutual communication is gaining importance. For effective functioning, IoT devices must have sufficient bandwidth (typically slower transmission rates), but extremely energy-efficient. The research infrastructure allows to solve these issues for different platforms, on which the embedded systems for IoT devices are implemented.

The aim of research laboratory for the Embedded Systems is to increase the reliability and security of embedded systems, design and testing of embedded systems on various platforms (monolithic processors and microcontrollers, programmable hardware) and with different requirements (with the critical response time, without standard operating system). We also pay special attention to the research of designing energy efficient IoT devices, focusing mainly on the power management of IoT devices, automation of power management and energy efficient mutual communication.

Researchers

Krajčovič, Tibor - research interest lies at embedded systems, based on monolithic processors and

one-chip microcomputers, increasing of embedded systems reliability, and real-time embedded systems.

Čičák, Pavel - Research interest lies at digital control systems design, new methods of computer communications, real-time systems, means of hardware (and software) specification, as well as other topics in Computer Engineering.

Jelemenská, Katarína - research interest lies at digital systems specification, design and verification.

Macko, Dominik - research interest lies at digital-systems design automation, system-level specification, power optimization and estimation, and low-power communications connected with the Internet of Things.

Hudec, Ján - research interest lies at digital system design, testing and verification, algorithms for functional testing systems on chip (SoC) in the devices of Internet of Things.

Selected recent publications

- [1] HUDEC, Ján. Automatic Software-Based Self Test Generation for Embedded Processors. In *IFAC-Papers OnLine*, Vol.51, Is-sue 6, 2018, pp. 125-130. ISSN 2405-8963.
- [2] MACKO, Dominik - JELEMENSKÁ, Katarína - ČIČÁK, Pavel. Simplifying Low-Power SoC Top-Down Design Using the System-Level Abstraction and the Increased Automation. *Integration*. vol. 63, no. September (2018), pp. 101-114. ISSN 0167-9260.
- [3] MACKO, Dominik - JELEMENSKÁ, Katarína - ČIČÁK, Pavel. Verification of Power-Management Specification at Early Stages of Power-Constrained Systems Design. In *Journal of Circuits Systems and Computers*. Vol. 26, iss. 8 (2017), [23 p.]. ISSN 0218-1266.
- [4] PEREŠÍNI, Ondrej - KRAJČOVIČ, Tibor. More Efficient IoT Communication through LoRa Network with LoRa@Fiit and STIOT Protocols. In *AICT 2017. 11th IEEE International Conference Application of Information and Communication Technologies 2017*, Moscow, Russia. Conference proceedings. 1. vyd. Piscataway: IEEE, 2017, pp. 32-37.
- [5] VOJTKO, Martin - KRAJČOVIČ, Tibor. Semi-automated Process of Adaptation of Platform Dependent Parts of Embedded Operating Systems. In *Journal of Electrical Engineering*. Vol. 68 (2017), No.2, pp. 87-98. ISSN 1335-3632.

Important recent research results and research projects

- Intelligent Embedded Systems
- Robust MPC for Hybrid Systems (RPHS)
- Optimization of low-power design of digital and mixed integrated systems
- Manufacturable and Dependable Multi-core Architectures at Nanoscale
- Methods for the design and verification of digital systems with low power consumption using formal specification languages

COMPUTER VISION AND COMPUTER GRAPHICS

Computer vision is a science discipline with an ultimate goal to perceive, to interpret and to understand the natural images or other type of visual data. The research in the field of computer vision is focused mainly on:

- Medical image processing: CT and MRI radiological data processing, detection of anatomical anomalies, segmentation and 3D image registration.
- Prediction of visual human attention: development of model of human visual attention, generation of visual saliency map.
- Visual object detection and object recognition: development of novel methods of object detection and object recognition using 2D and 3D visual data.

In the area of information visualisation are the key research topics: novel interaction techniques in visualization, data visualization in virtual reality and augmented reality.

Research task in computer graphics are mainly photorealistic visualization, real-time rendering, light-field capture and manipulation.

Researchers

Benešová, Vanda - research interest lies at the fields of computer vision, image processing, signal processing and human-computer interaction.

Kapec, Peter - research interest lies at information and big data visualization, software visualization, graph visualization, visual analytics, novel interaction techniques in visualization, data visualization in virtual reality and augmented reality, source code analysis, software metrics and software representation via graph structures.

Selected recent publications

- [1] AYUGUN, R.S. - BENEŠOVÁ, Vanda. Multimedia Retrieval that Works. 2018 IEEE Conf. Multimed. Inf. Process. Retr., 2018, pp. 63–68.
- [2] FOGELTON, Andrej - BENEŠOVÁ, Vanda. Eye blink Detection Based on Motion Vectors Analysis. In *Computer Vision and Image Understanding*. Vol. 148, (2016), pp. 23-33. ISSN 1077-3142.
- [3] HUDEC, Lukáš - BENEŠOVÁ, Vanda. Texture Similarity Evaluation via Siamese Convolutional Neural Network. 2018 25th International Conference on Systems, Signals and Image Processing (IWSSIP), pp. 1-5, 2018.
- [4] MARTÁK, Lukáš Samuel - ŠAJGALÍK, Mário - BENEŠOVÁ, Vanda. Polyphonic Note Transcription of Time-Domain Audio Signal with Deep WaveNet Architecture. 2018 25th International Conference on Systems, Signals and Image Processing (IWSSIP), pp. 1–5, 2018.
- [5] POLATSEK, Patrik - WALDNER, Manuela - VIOLA, Ivan - KAPEC, Peter - BENEŠOVÁ, Wanda. Exploring Visual Attention and Saliency Modeling for Task-based Visual Analysis. In *Computers & Graphics*, Vol. 72, 2018, pp. 26-38, ISSN 0097-8493.
<https://doi.org/10.1016/j.cag.2018.01.010>.
- [6] POLATSEK, Patrik - BENEŠOVÁ, Vanda - PALETTA, Lucas - PERKO, R. Novelty-based Spatiotemporal Saliency Detection for Prediction of Gaze in Ego-centric Video. In *IEEE Signal Processing Letters*. Vol. 23, iss. 3 (2016), pp. 394-398. ISSN 1070-9908.

Industry collaboration

- Siemens Healthcare - research in the area of medical imaging
- QBSW - feasibility study of methods in video broadcasting (advertising detection)

Academy collaboration

- FEI STU - Prof. Polec
- Faculty of Mathematics, Physics and Informatics, Comenius University in Bratislava - Dr. Elena Šikudová, Dr. Zuzana Černeková
- TU Wien - Assoc. Prof. Ivan Viola, Manuela Waldner

II. SCIENTIFIC ACTIVITIES

The activities are based on regular scientific seminars:

- User Experience@Personalized Web,

- Datalys@Personalized Web,
- Big Data Analytics,
- Bioinformatics,
- People on the Web,
- Neural Networks,
- Advanced Software Development Research,
- Vision and Computer Graphics,
- Embedded Systems,
- Computer Networks,
- Information Security.

The Faculty takes part in providing technical and scientific programmes, especially through serving in programme committees of many conferences, mostly international – among others:

- ADBIS – East-European Conference on Advances in Databases and Information Systems,
- AIMSA – International Conference on Artificial Intelligence> Methodology, Systems, Applications,
- BCI – Balkan Conference in Informatics,
- CD-MAKE – International IFIP Cross Domain (CD) Conference for Machine Learning and Knowledge Extraction (MAKE),
- CompSysTech – International Conference on Computer Systems and Technologies,
- DDECS – IEEE Symposium on Design and Diagnostics of Electronic Circuits and Systems,
- DISA – World Symposium on Digital Intelligence for Systems and Machines,
- DSAA – International Conference on Data Science and Advanced Analytics,
- EMIP – International Workshop on Eye Movements in Programming,
- ENIC – European Network Intelligence Conference,
- ETRA – ACM Symposium on Eye Tracking Research and Applications,
- EWDTS - East-West Design & Test Symposium,
- HT – ACM Conference on Hypertext and Hypermedia,
- ICALT – IEEE International Conference on Advanced Learning Technologies,
- ICCCI – International Conference on Collective Intelligence Technologies and Applications,
- ICETA – International Conference on Emerging E-Learning Technologies and Applications,
- ICSLE – International Conference on Smart Learning Environments,
- ICWE – International Conference on Web Engineering,
- ICWL – International Conference on Web Based Learning,
- IDA – International Symposium on Intelligent Data Analysis,

- ISMIS – International Symposium on Methodologies for Intelligent Systems,
- ITAT – Workshop on Information Technologies – Applications and Theory,
- JCDL – Joint Conference on Digital Libraries, Knoxville,
- KDWEB – International Workshop on Knowledge Discovery on the Web,
- PAD – Czech and Slovak Seminar on Computer Architectures and Diagnostics,
- PALE – International Workshop on Personalization Approaches in Learning Environments,
- PRASAE – International Workshop on Peer Review, Peer Assessment, and Self Assessment in Education,
- RecSys – ACM Conference on Recommender Systems,
- SCLIT – Symposium on Computer Languages, Implementations and Tools,
- SQAMIA – Workshop on Software Quality Analysis, Monitoring, Improvement, and Applications,
- SMAP – International Workshop on Semantic Media Adaptation and Personalization,
- SOFSEM – International Conference on Current Trends in Theory and Practice of Informatics,
- TPDL – International Conference on Theory and Practice of Digital Libraries,
- UMAP – ACM International Conference on User Modelling, Adaptation and Personalization,
- The Web Conference – International Conference on the World Wide Web (former WWW),
- WIKT – Workshop on Intelligent and Knowledge oriented Technologies,
- WMNC, IFIP Wireless and Mobile Networking Conference.

In 2018, FIIT STU organised or co-organised several events aimed at exhibition of students' research work. Above all, the most important event was the 14th Informatics and Information Technologies Students Research Conference – IIT.SRC 2018, which was held on April 18, 2018.

The conference was organized in seven sections:

- Web Science and Engineering
- Intelligent Information Processing
- Software Engineering
- Computer Networks, Computer Systems and Security
- Computer Graphics, Multimedia and Computer Vision
- Computer Science and Artificial Intelligence
- Innovative Applications.

The Conference was opened by a keynote of Cristina Conati (University of British Columbia, Canada) titled: "The Eyes Are the Windows to the Mind: Implications for Intelligent User Interfaces".

The excellent student papers were awarded. The best paper award was conferred to:

- *category of doctoral students* – Lukáš Marták (Polyphonic Note Transcription of Time-domain Audio Signal with Deep WaveNet Architecture, supervisor: V. Benešová)
- *category of master students* – Tomáš Juhaniak (Automatic Detection of Cognitive Load from Pupil Dilation in Real world Scenarios, supervisor: M. Bielíková)
- *category of bachelor students* – Peter Pavlík (A New Scheduling Algorithm for Real-time Networks, supervisor: V. Rozinajová)

Dean's award was the highest appreciation. It was conferred to:

- Andrej Hucko (Diacritics Restoration using Deep Neural Networks, supervisor: P. Lacko)
- Kristián Košťál (802.11 Seamless Handover using Common SDN Control Channel, supervisor: I. Kotuliak)
- Matúš Salát (User Segmentation for Personalization of Newsletters in CQA Systems, supervisor: I. Srba)
- Jakub Ondík (Visualization of Modifications in Software Models, supervisor: K. Rástočný)
- Miroslav Laco (Depth in the Visual Attention Modeling from the Egocentric Perspective of View, supervisor: V. Benešová)

Besides the papers presented at the conference in two poster sessions were organized several accompanied events

- *TP-Cup Showcase*, where eleven teams presented their projects; TP-Cup is a competition of master students' teams aimed at excellence in development information technologies solutions within two semester long team project module in master study programs.
- *FiitaPixel* – photo contest best pictures exhibition,

FIIT STU initiated in 2010 a join of two student competitions ACM CZ Student Research Competition organized by Czech ACM Chapter and Czech and Slovak Universities and Diploma Thesis Competition organized by IT company Profinet, which resulted in establishment of

- Czech ACM Chapter & Slovakia ACM Chapter Student Project of the Year Competition – ACM SPY

The ACM SPY 2018 Finals were organized in December 2018 in Prague. The finalists' projects were selected by the judges from the best thesis submitted by Czech and Slovak universities based on successfully defended master thesis in 2017/18.

The project

- User Modeling in the Domain of E-commerce by Veronika Gondová (supervisor M. Bieliková) was finalist our faculty.

In September 2018 we actively participated in "The Night of Researcher", event supported by European Commission and organized in more than 150 European cities. Researchers in many countries prepared presentations from the field of science and research for the general public.

We are also proud of our FIIT STU student teams, which realized interesting projects. Two of them were presented in media:

- Smart Parking
- Edu Virtual

III. PUBLICATIONS

Results of our research were published in 82 publications. 52 scientific contributions were published in conference proceedings, 37 out of which were published in reviewed proceedings of international conferences. 25 scientific contributions were published in scientific journals (11 Publications in Web of Science Current Contents Connect Database).

FIIT STU is a co-publisher of the international scientific journal "Computing and Informatics" (until 2001 Computers and Artificial Intelligence). Two

faculty staff members, P. Návrát and V. Kvasnička were active in the editorial team in 2018 – P. Návrát as an Associate Editor and V. Kvasnička as a member of Editorial Board. Moreover, the faculty participates in editorial and advisory boards of eleven other scientific journals.

IV. RESEARCH PROJECTS

Research projects constitute an important basis for research realization and research funding. Faculty research takes place in several directions, recently the growing segment is industrial research, which provides an increasing percentage of funding.

Projects of national grant agencies (the Scientific Grant Agency of the Ministry of Education and the Slovak Academy of Sciences (VEGA) and Slovak Research and Development Agency (APVV) formed an essential form of research organisation and scientific projects funding at the FIIT STU. In the previous year we were active in preparation of number of projects in the calls from ERDF (European Regional Development Fund).

We have succeeded to receive international projects in grant schemes Scopes and Cost and an international research bilateral APVV project SK-IL-RD-18-0004 with Israel "Misinformation Detection in Healthcare Domain". Our endeavour is to be successful in European research grants H2020, however, at present we just cooperate on solving H2020 project "Newton" with Faculty of Electrical Engineering and Information Technology STU.

<i>Number of publications</i>	UIIS ¹	UPAI	FIIT
Books and parts of books published by international/national publisher	1/2	-/-	1/2
Scientific works published in international/ national scientific journals	11/5	4/5	15/10
Scientific works published in international conference proceedings	28	10	38
Scientific works published in national or local conference proceedings	6	9	15
Conference proceedings editors	2	0	2

¹ UIIS – Institute of Informatics, Information Systems and Software Engineering
UPAI – Institute of Computer Engineering and Applied Informatics

Number of projects funded	UI SI	UP AI
VEGA ²	4	2
KEGA	2	1
APVV	5	2
International projects	2	-
Others /Tatra banka, grants for young scientific researchers	11	7
FIIT STU	24	12

Overview of funds (in Eur)	UI SI	UP AI	SUM
VEGA	41 101	15 259	56 360
KEGA	15 354	4 022	19 376
APVV	108 995	19 931	128 926
International projects	15 126	-	15 126
Others	14 100	16 322	16 530
FIIT STU	194 676	55 534	250 210

The projects are realized in our research laboratories (description can be found in the parts devoted to individual institutes). In 2018 the following laboratories were operated:

- Advanced Software Development Laboratory (I. Polášek)
- Communication Technologies Laboratory (I. Kotuliak)
- Digital Systems Design Laboratory (K. Jelemská)
- Embedded Systems Laboratory (T. Krajčovič)
- ESET Research Centre (L. Hudec)
- FIIT – Molpir, Ltd. Laboratory (P. Pišteň)
- Grid Computing Laboratory (L. Hudec)
- Intelligent Systems Laboratory (P. Návrat)
- Networks Technology Laboratory I and II (P. Trúchly)
- Laboratory of Computer Graphics, Vision and Interaction (University scientific park) (V. Benešová)

- Siemens Research Laboratory (V. Benešová)
- User Experience and Interaction Research Center (M. Bieliková)
 - Engelbarts's Laboratory of User Experience Research (UX Lab)
 - Simon's Laboratory of personalized learning (UX Group)

FIIT STU recognizes as part of its mission to serve the broader academic community in Slovakia and also internationally in promoting cooperation in relevant fields. In 2018 FIIT STU supported the Slovak ACM Chapter activities. FIIT STU supported also the publishing Bulletin "Information Sciences and Technologies" – a web based scientific journal, activity initiated and executed by the ACM Slovakia Chapter.

Assoc. Prof. Viera Rozinajová
Vice-Dean for Research

² VEGA – Scientific Grant Agency of the Ministry of Education of Slovak Republic and the Slovak Academy of Sciences, KEGA – Cultural and Educational Grand Agency of the Ministry of Education of Slovak Republic, APVV – Slovak Research and Development Agency

APPENDICES

I. THESES

Bachelor (Bc.) Theses

Study Programme Informatics

- *Antal, Ján*: Interactive Whiteboard. (A. Fogelton)
- *Balážová, Michaela*: Customer Behaviour Prediction in an E-shop. (M. Kompan)
- *Barabás, Matúš*: Training of Simulated Robotic Football Player. (I. Kapustík)
- *Bari, Ladislav*: Layered Model of Software Knowledge Interrelating. (V. Vranić)
- *Bekeš, František*: Online Library Catalog for Children. (N. Andrejčíková)
- *Bende, Tomáš*: Grid and Symmetric Graphs Coloring. (M. Nehéz)
- *Bernáth, Zsuzsanna*: Biometric User Identification based on their Body Movements. (K. Burda)
- *Blanárik, Patrik*: Prediction of Project Success on Crowdfunding Portals. (I. Srba)
- *Brandýs, Patrik*: Impact of Usability Problems on Identifying Key Objects on the Web. (M. Svrček)
- *Brečka, Matej*: Usability Testing of Android Applications. (E. Kuric)
- *Bujna, Tomáš*: Functional SBST Processor Testing on Chip with using Genetic Algorithms. (J. Hudec)
- *Buranský, Dávid*: Software Servers Equipment for Temporary Record Image Data. (D. Bernát)
- *Cák, Milan*: Identification of Suitable Candidates for user Experience Studies. (E. Kuric)
- *Csengődy, Zoltán*: Automated Evaluation of a Network Device Configuration. (D. Macko)
- *Csomor, Dávid*: What can Eye Tracking Reveal about a Filled out Electronic Questionnaire? (A. Martonová)
- *Činčurak, Martin*: Informatic Support for the Processing of big Data Files in Biomedicine. (M. Lucká)
- *Daněk, Libor*: Interactive Data Visualization in Augmented Reality. (P. Kapec)
- *Dolhá, Dominika*: Software Development and Virtual Reality. (J. Vincúr)
- *Domian, Jakub*: Interactive Tutorials in Machine Learning. (P. Laurinec)
- *Drahoš, Marek*: Application of Neural Networks for Data Generation. (J. Ševcech)
- *Đurana, František*: Vehicle Detection using Sensors. (P. Pištek)
- *Đuriš, Adam*: Data Analysis and Anomaly Detection. (A. Bou Ezzeddine)
- *Fabiš, Michal*: Management of Unit Tests. (K. Rástočný)
- *Franko, Marián Ján*: Optimizing the use of Electricity in the Local Power Grid. (V. Rozinajová)
- *Fúsek, Andrej*: Embedded System for Smart Building Management in IoT Environment. (T. Krajčovič)
- *Galeštok, Richard*: Personalized Recommendation of Interesting Places. (M. Kompan)
- *Gedera, Samuel*: Scanpath Analysis. (R. Móro)
- *Graf, Lukáš*: Software Development and Virtual Reality. (J. Vincúr)
- *Groma, Matej*: Embedded Building Automation System using IoT. (T. Krajčovič)
- *Hamran, Nikolas*: Visualization and Simulation of the Flow of Gases and Liquids in Three Dimensional Space. (P. Drahoš)
- *Hanko, Ján*: The Relation of Gaze Fixations and User's Skill in the Digital Space. (P. Hlaváč)
- *Hlavatý, Pavol*: Knapsack Problem. (M. Galinski)
- *Hlavatý, Peter*: Learning Tool for Security Technology Host based IDS. (L. Hudec)
- *Hradňanský, Martin*: Software Engineering in Questions and Answers Ebook. (M. Šimko)
- *Hroš, Roman*: Generating Subgraphs of Finite Grids. (D. Bernát)
- *Hubert, Jakub*: Support of Website Usability Testing. (E. Kuric)
- *Hucko, Andrej*: Diacritics Restoration using Deep Neural Networks. (P. Lacko)
- *Chodúr, Christian*: Securing Communication on UART Interface. (V. Kunštár)
- *Janeček, Dušan*: Real-time Recognition and Classification of Objects. (F. Kudlačák)
- *Janeček, Kamil*: Customer's Satisfaction Prediction by means of Data from Customer Support. (I. Srba)
- *Jendrejčák, Tomáš*: Prediction of Website User Churn Rate. (O. Kaššák)
- *Jurkáček, Peter*: Bumps Detector - Mobile Application for Automatic Detection of Bumps on the Roads. (T. Kováčik)
- *Kalafut, Matúš*: Purchase Prediction in Eshop. (O. Kaššák)
- *Kamenský, Jozef*: Creating Explanations for Recommender Systems. (P. Návrat)

- *Karaffa, Ján*: Semantic Data Processing using Machine Learning Methods. (M. Šurek)
- *Karelová, Natália*: Protection of End Stations by Checking DNS Queries. (J. Laštinec)
- *Kasáš, Matúš*: Dynamic Management and Simulation of Movement of Automated Guided Vehicles in Production Halls. (Š. Krištofik)
- *Knapová, Kristína*: Using Virtual Reality in On-line Education. (G. Rozinaj)
- *Kňaze, Adam*: Text Generation with Neural Networks. (M. Pikuliak)
- *Kohút, Radovan*: Support for Domain-specific Expression. (J. Lang)
- *Komarová, Ľubica*: Merging Source Code Relating to Use-case. (M. Bystrický)
- *Končál, Matej*: Purchase Prediction in Eshop. (O. Kaššák)
- *Koprla, Ľubomír*: Interpretability and Explainability of Machine Learning Models. (J. Ševcech)
- *Kováč, Alan*: Control of Smart Building Devices in IoT Domain. (T. Krajčovič)
- *Kováč, Daniel*: Query Editor over Internet of Things Events. (K. Rástočný)
- *Krajčoviechová, Júlia*: Prediction of User Return to Website. (O. Kaššák)
- *Križan, Peter*: Who Wrote this Code? (J. Petřík)
- *Kubanyi, Jakub*: The Relation of Gaze Fixations and User's Skill in the Digital Space. (P. Hlaváč)
- *Kubík, Dávid*: Application to Determine the Suitability of using a Photovoltaic Module in a Household. (J. Loebli)
- *Kubík, Richard*: Automatic Question Generation. (M. Blšták)
- *Kubiš, Matúš*: Learning Tool for Security Technology Host based IDS. (L. Hudec)
- *Kulbak, Daniel*: Web Application Used for Sharing and Management of IP Cores. (L. Kohútka)
- *Kužma, Matej*: The Impact of Shape on Visual Attention. (P. Polatsek)
- *Lackanič, Jakub*: Expansion of the Multimedia System in Remote Buses. (P. Pištek)
- *Lagin, Filip*: Methods to Recognize Type of Packet Loss for Transport Protocols. (P. Trúchly)
- *Lam, Tuan Dung*: User's Behaviour Prediction in Eshop. (M. Kompan)
- *Lipovská, Denisa*: Learning Tool for Security Technology Network IDS. (L. Hudec)
- *Lipták, Peter*: Usability Testing of User Experience of Web Forms. (E. Kuric)
- *Macková, Kristína*: Software Development and Virtual Reality. (J. Vincúr)
- *Majerčák, Dávid*: Innovative Application within an International Competition. (J. Šimko)
- *Majerech, Juraj*: Time Series Prediction. (P. Lacko)
- *Malík, Peter*: Real-time Recognition and Classification of Objects. (F. Kudlačák)
- *Maňák, Michal*: Application of Neural Networks for Data Generation. (J. Ševcech)
- *Maronová, Viera*: Dana Analysis in Libraries. (N. Andrejčíková)
- *Melicherík, Patrik*: Reviewing UML Models. (K. Rástočný)
- *Mikolášek, Adam*: Generating Subgraphs of Finite Grids. (D. Bernát)
- *Mikuš, Matej*: Segmentation of Anomalies in Volumetric Medical Data. (M. Tamajka)
- *Mocák, Richard*: Image Quality Evaluation of Images Captured by Mobile Device. (V. Benešová)
- *Mrva, Jakub*: Dynamic Processes and their Optimization. (A. Bou Ezzeddine)
- *Nagyová, Kitti*: Time Series Prediction. (P. Vrabecová)
- *Naništa, Boris*: Analysis of Scanpaths. (R. Móro)
- *Neupauer, Štefan*: Dynamic Processes and their Optimization. (A. Bou Ezzeddine)
- *Ocelík, Peter*: Text Reconstruction for Slovak Language. (M. Šimko)
- *Orlovský, Krištof*: A Support Tool for the Development of Digital Electronics. (L. Kohútka)
- *Ostrodický, Michal*: Short-term Forecast of Spot Electricity Prices. (R. Magyar)
- *Otruba, Marek*: Simulation of Usage Large-capacity Battery in Smart Home Network. (P. Vrabecová)
- *Pacher, Marek*: Mixed Integer Linear Programming and its Application in the Context of Smart Grids. (I. Malkin Ondik)
- *Pajkoš, Alexander*: Impact of Movement on Visual Attention. (P. Polatsek)
- *Pápay, Peter*: Product Recommendation in E-Shop using Deep Neural Networks. (M. Krupa)
- *Pavelka, Dávid*: Interactive Manipulation of Visualization in Augmented Reality. (P. Kapec)
- *Pavkovček, Filip*: Mixed Integer Programming and its Use in the Environment of Smart Grids. (I. Malkin Ondik)
- *Pavlik, Peter*: Dynamic Weighted Majority in Ensemble Learning. (V. Rozinajová)
- *Pejchalová, Lenka*: Personalized Recommendation of Interesting Places. (M. Kompan)
- *Pénzes, Zoltán*: Non-negative Matrix Factorization (NMF) and its Applications. (M. Bečka)
- *Perbecký, Tomáš*: Prediction of Time Series. (P. Lacko)

- *Petrik, Miroslav*: Tracking and Collecting of Web Page Visitor Data for a Recommendation System based on Deep Neural Network. (M. Krupa)
- *Pisarčík, Andrej*: Publishing Bibliographic Data on the Semantic Web. (N. Andrejčíková)
- *Pixová, Viera*: Biologically Inspired Algorithms. (A. Bou Ezzeddine)
- *Pohl, Tomáš*: Biometric user Identification via Body Movement. (K. Burda)
- *Popelka, Ľudovít*: Informatics Support for Large Datasets Processing in Biomedicine. (M. Lucká)
- *Poperník, Adam*: Vehicle Model Managed by a Mobile Application. (L. Kohútka)
- *Procházka, Matej*: Simulated Usage of High Capacity Battery in Household Smart Grid. (P. Vrablecová)
- *Puškáš, Adam*: Application for Determining the Appropriateness of using Photovoltaic Modules in Household. (J. Loeb)
- *Rafčíková, Katarína*: Automatic Evaluation of User Interface based on Aesthetic Features. (E. Kuric)
- *Redžepović, Martin*: Interactive Graph Visualization. (P. Kapec)
- *Revaj, Marcus*: Interactive Support for Teaching Subject AZA. (M. Lucká)
- *Sedlář, Jakub*: Simulator of Abstract Machines. (D. Chudá)
- *Schneider, Jozef*: Source Code Marking. (K. Rás-točný)
- *Schvanter, Jaroslav*: Training of a Player of Simulated Robotic Soccer. (I. Kapustík)
- *Sitárová, Daniela*: Innovative Application within an International Competition. (J. Šimko)
- *Slaninka, Andrej*: Innovative Application within an International Competition. (J. Šimko)
- *Slíž, Boris*: Stitching Images with Different Shooting Angles and Distances. (G. Rozinaj)
- *Sojka, Matej*: Presentation of Recommendation Output. (P. Gašpar)
- *Sojka, Michal*: Analysis of Solving Interactive Logic Games. (J. Tvarožek)
- *Smolová, Alexandra*: Virtual Reality in Online Learning. (G. Rozinaj)
- *Staňo, Martin*: Object Recognition using Computer Vision Methods. (V. Benešová)
- *Šašíková, Kristína*: Detection of Web Application Vulnerability. (L. Hudec)
- *Ščasný, Andrej*: Software Engineering in Questions and Answers E-book. (M. Šimko)
- *Šebeň, Štefan*: Simulation of the Spread of Light in Virtual Scene. (P. Drahoš)
- *Ševčík, Adam*: Visualization and Editing of Multi-dimensional UML Diagrams. (I. Polášek)
- *Šimová, Ivana*: Transformations of Dynamic UML Models. (I. Polášek)
- *Širka, Stanislav*: Object Recognition with Computer Vision Methods. (V. Benešová)
- *Števlík, Dominik*: Generating Documentation from Source Code. (P. Kapec)
- *Talian, Adam*: Source Code Reading Analysis. (J. Tvarožek)
- *Tran, Duc David*: Interaction and Visualization of Graphs in Virtual Reality. (P. Drahoš)
- *Trimel, Ján*: User Experience with Web Browsing and the Usage of Control Devices. (P. Krátky)
- *Trnavská, Ľubomíra*: Image Processing and Computer Vision Methods Applied to Medical Data. (V. Benešová)
- *Tundér, Andrej*: Transformations of Dynamic UML Models. (I. Polášek)
- *Tundér, Matúš*: Analysis of Source Code Reading. (J. Tvarožek)
- *Varga, Filip*: Learning of Simulated Robotic Soccer Player. (I. Kapustík)
- *Varga, Jozef*: Source Code Tagging. (K. Rás-točný)
- *Vaško, Milan*: Automated Distribution and Testing of Software Packages. (P. Drahoš)
- *Vašš, Maroš*: Automated Pre-processing of Large Cytometric Data. (M. Lucká)
- *Včelková, Veronika*: Impact of Usability Problems on Identifying Key Objects on the Web. (M. Svrček)
- *Veselý, Jakub*: Analysis of Source Code Writing Process. (J. Tvarožek)
- *Vidiečanová, Dominika*: Prediction of Users' Behaviour. (M. Kompan)
- *Vnenčák, Ján*: Scanpath Visualization. (R. Móro)
- *Vrabľová, Jana*: Support Tool for Development of Digital Electronics. (L. Kohútka)
- *Zaťko, Andrej*: The Impact of Images on User's Behavior on Web. (P. Gašpar)
- *Žák, Martin*: Innovative Application within an International Competition. (J. Šimko)
- *Žatková, Veronika*: Customer's Intent Prediction based on Help-desk Data. (I. Srba)
- *Židuliak, Patrik*: Natural Language Processing using Neural Networks. (P. Lacko)
- *Žikla, Richard*: Memory Management in Real-time Operating Systems. (L. Kohútka)

Study Programme Internet Technologies

- *Andráš, Radovan*: Simulations of Mobile Ad Hoc Networks in Terms of Routing Protocols Layer. (J. Filipek)
- *Beňovičová, Adriana*: Optimization of Image Processing Methods on FPGA. (K. Jelemenská)
- *Búcsiová, Veronika*: Scheduling Tool for Deterministic Network Communication. (L. Kohútka)
- *Gábriš, Daniel*: Visualization of Network Traffic in Software-defined Networks. (R. Grežo)
- *Fischer, Ľubomír*: Optimization Methods for Image Processing on FPGA. (K. Jelemenská)
- *Horváth, Matej*: Monitoring of Unwanted Traffic from the Internet. (J. Laštinec)
- *Chlepková, Michaela*: Design Special Function of Network Adapter. (J. Hudec)
- *Kasperkevič, Adrián*: Hardware Task Scheduler. (M. Vojtko)
- *Kováč, Rastislav*: Visualization of Communication Flows in the SDN. (T. Boros)
- *Labát, Igor*: Visualization of MPTCP Flows in SDN. (T. Boros)
- *Lauko, Juraj*: Acceleration of Cryptographic Algorithms on FPGA. (K. Jelemenská)
- *Mazák, Dominik*: Advanced Network Monitoring. (I. Hucková)
- *Petráš, Ján*: Simulation of Mobile Ad Hoc Networks from a Routing Protocol Layer View. (J. Filipek)
- *Sabo, Miroslav*: Low Power Air Quality Sensors with Communication over LoRa. (O. Perešíni)
- *Sklárová, Ivana*: Hardware Implementation of the Selected Part of Operating Systems. (L. Kohútka)
- *Snopko, Jakub*: Analysis of the Environment Impact to the GPS Signal. (P. Pištek)
- *Starý, Filip*: The Visualization of MPTCP Flows in the SDN. (T. Boros)
- *Trenčanský, Ján*: Virtual Car Lock. (P. Pištek)
- *Uhnáková, Veronika*: Automatic Management and Vulnerability Assessment of Computer System. (L. Hudec)
- *Valach, Alexander*: Utilization of the LoRa Technology in Healthcare IoT Devices. (D. Macko)
- *Virostek, Nikolas*: Low Power Measuring Device for Air Quality Communicating via LoRa Technology. (O. Perešíni)
- *Voroňák, Martin*: Forensics Tools for Collecting Digital Evidences in Mobile Devices. (P. Pištek)

Master (Ing.) Theses

Study Programme Information Systems

- *Balážová, Veronika*: Prediction of users' Personality Traits based on Task Solving on the Web. (R. Móro)
- *Belai, Peter*: Clustering of Big Time Series. (P. Laurinec)
- *Bendík, Jakub*: Modeling in an Environment of Intelligent Networks. (M. Lucká)
- *Berger, Patrik*: Predicting User Retention in Online Environment. (M. Kompan)
- *Blažíček, Jozef*: User Representation and Interaction in Virtual Reality Focusing on Presence. (P. Drahoš)
- *Bobotová, Zuzana*: Processing of Three-dimensional Medical Data using Computer Vision Methods. (V. Benešová)
- *Bobovský, Peter*: Prediction of Time Series with Deep Neural Networks. (P. Lacko)
- *Buček, Boris*: Detection of Plagiarism in Program Codes. (D. Chudá)
- *Bystričan, Július*: Interactive Visualization of Big Data. (A. Martonová)
- *Černák, Martin*: Personalized Recommendation Taking into Account Visual Impacts. (M. Kompan)
- *Červenka, Matej*: Analysis of Eye Movement Patterns Depending on Task in the Web Environment. (J. Tvarožek)
- *Čičkán, Ondrej*: Comment Classification in Community Question Answering. (M. Šimko)
- *Dekrét, Šimon*: Effect of High-level Factors on Human Visual Attention. (P. Polatsek)
- *Dragúňová, Mária*: Identifying Users' Characteristics by Eye Tracking Analysis. (J. Tvarožek)
- *Fašánek, Michal*: Advanced Processing of Sequential Data by Artificial Neural Networks. (M. Barla)
- *Filipčíková, Monika*: Detection of Inappropriate Comments on Web. (M. Šimko)
- *Flamík, Juraj*: Recognition of Similarities in User Behavior in Data Stream. (O. Kaššák)
- *Gajdošík, Patrik*: Eye Tracking using Deep Neural Networks. (V. Benešová)
- *Gondová, Veronika*: User Modeling in the Domain of E-commerce. (M. Bielíková)
- *Gulis, Ivan*: Similarity Detection of Game-playing Software. (D. Chudá)
- *Hagara, Lukáš*: Adaptive Multifactor Authentication with Keystroke Dynamics. (D. Chudá)
- *Hnojčík, Tomáš*: Disambiguation Entities by Using Ontologies. (N. Andrejčíková)

- *Juhaniak, Tomáš*: Cognitive Load Evaluation as a Part of User Studies. (M. Bieliková)
- *Kislan, Matúš*: Automatic Testing and Evaluation of SQL Queries in Solving of Interactive Tasks. (M. Barla)
- *Kmeťko, Jakub*: Big Data in Energetic. (A. Bou Ezzeddine)
- *Kostova, Sandra*: Automatic Assessment of User's Curiousness based on Behavior on the Web. (J. Šimko)
- *Košťan, Viktor*: Facial Engagement Recognition using Sequential Analysis. (V. Benešová)
- *Kovalenko, Maryna*: Electricity Price Forecasting in Smart Grids. (M. Lucká)
- *Kren, Michal*: Ensuring Robustness against Changes in Web Sites during Data Extraction. (I. Srba)
- *Krchňavý, Rastislav*: Aspect-based Sentiment Analysis. (M. Šimko)
- *Kučera, Peter*: User Model of Biometric Characteristics under the Smartphone Platform. (D. Chudá)
- *Laco, Miroslav*: Generating a Saliency Map with Focus on Different Aspects of Human Visual Attention. (V. Benešová)
- *Lang, Roland*: Collaborative Visualization of Data in Virtual and Augmented Reality. (P. Kapec)
- *Liščák, Tomáš*: Ambiguity in Semantic Search. (N. Andrejčíková)
- *Makan, Branislav*: Automatic Completion of Missing Parts of a 3D Scene. (V. Benešová)
- *Matlovič, Tomáš*: Providing Feedback in the Domain of Programming. (J. Tvarožek)
- *Matula, Marek*: Prediction of Electricity Consumption by Ensemble Learning. (M. Lóderer)
- *Mocko, Martin*: Anomaly Detection in Transaction Data. (J. Ševcech)
- *Mokrý, Martin*: Identification of the User Skill on the Web based on Patterns in Eyetracking Data. (R. Móro)
- *Moravčík, Oliver*: Clustering Analysis of Cytometry Data for Purpose of Cell Population Identification. (M. Lucká)
- *Moravčíková, Zora*: Automatic Adaptation of Game Mechanics based on a Player Status. (M. Nagy)
- *Nemček, Martin*: Density based Downsampling of Cytometry Data and Clinical Outcome Prediction using Clinical Data. (M. Lucká)
- *Pallo, Miloš*: Detection and Objects Recognition using 3D Sensors. (M. Jakab)
- *Papp, Dániel*: Visual Attention and Saliency Mapping on Web Page Elements. (J. Šimko)
- *Pavlíková, Barbora*: Designs and Patterns Identification of Encephalogram Data. (J. Petřík)
- *Pomffiová, Miriama*: Intelligent Data Analysis in an Environment of Energetics. (V. Rozinajová)
- *Prekala, Martin*: Electric Energy Usage Optimization. (V. Rozinajová)
- *Rác, Miroslav*: Prediction of User's Action based on Work with Control Devices. (P. Krátky)
- *Rafajdus, Adam*: Weather Forecast by Generative Adversarial Networks. (M. Bieliková)
- *Redajová, Martina*: Automatic Recognition of User's Characteristics based on Eye-tracking Data. (J. Šimko)
- *Roštár, Marek*: Personalized Recommender with taking into Account Visual Inputs. (M. Kompan)
- *Salát, Matúš*: User Segmentation for Personalization of Newsletters in CQA Systems. (I. Srba)
- *Sitarčík, Jozef*: DNA Sequence Mapping. (M. Lucká)
- *Slovík, Michal*: Identification of Users during Usage of Mobile Devices based on Behavioral Biometrics. (K. Burda)
- *Šidlo, Martin*: Identifying Usability Problems in the Web using Eyetracking. (E. Kuric)
- *Šimek, Lukáš*: Evaluation of Orientation on Page and the Type of Visitors based on Work with Mouse. (P. Krátky)
- *Šimko, Igor*: Generating Category Titles for Text Documents. (M. Holub)
- *Šrank, Martin*: Improving Diversity and Freshness of Newsletters in Community Question Answering Systems. (I. Srba)
- *Vantuch, Michal*: Web Systems Security Increase by Honeypot Technology. (L. Hudec)
- *Vítaz, Matej*: Automatic Identification of Usability Problems on the Web from Eye-tracking Data. (E. Kuric)
- *Vozár, Filip*: Sentiment Analysis from Text about Given Object. (M. Šimko)
- *Vrban, Anton Ján*: Learning Content Modelling and Generating. (J. Tvarožek)

Study Programme Software Engineering

- *Baránek, Tomáš*: Authentication based on Biometrics on Android Platform. (P. Pištek)
- *Blaško, Adam*: Application of Organisational Patterns to Solve Problems of Agile and Lean Software Development. (T. Frtala)
- *Brecht, Ján*: Simulation of Highly Dynamic Networks. (D. Bernát)

- *Bruchatý, Marek*: Regression Testing with Test Selection and Test Prioritization. (K. Rástočný)
- *Buhaj, Dávid*: Smart Traffic. (I. Hucková)
- *Černák, David*: Energy Efficient Implementation of Security Protocol for Low Power IoT Devices. (J. Brenkuš)
- *Číkoš, Marek*: Application of Program Flow Control for Malicious Software Detection. (T. Krajčovič)
- *Daabousová, Rania*: Consistency between Software Requirements and Source Code. (P. Návrat)
- *Danišík, Norbert*: Processing of Big Data Acquired by Sport Activity. (P. Lacko)
- *Dulovič, Martin*: Increase Security of Home Networks. (L. Hudec)
- *Findura, Jakub*: Telemetry for Vehicles with OBD-II Interface. (O. Perešíni)
- *Frkáň, Maroš*: Time Series Forecasting using Deep Neural Networks. (P. Lacko)
- *Gáspár, Matúš*: Rules of Writing Source Code - A Must or a Fetish? (M. Konôpka)
- *Ginter, Jakub*: Mobile Application for Health Segment. (M. Baláž)
- *Gočál, Pavol*: Energy-efficient Communication of Internet of Things Devices using Timing Channels. (D. Macko)
- *Grošaft, Maroš*: Predictive Model for Symmetric Game. (P. Lacko)
- *Guráň, Matej*: Interoperability and Compatibility in a Heterogeneous M2M Environment. (P. Čičák)
- *Hamacek, Lukáš*: Automatic Refactoring of Software Systems. (I. Polášek)
- *Haščič, Miroslav*: Refactoring Software Systems with Multi Agent Search of Working Space. (I. Polášek)
- *Hatvani, Dušan*: Increasing Communication Efficiency of IoT Devices by Changing Parameters of a Communication Protocol. (D. Macko)
- *Hunka, Mário*: Scalable Personalized Recommendation. (M. Kompan)
- *Ilavský, Martin*: Simulation of Attack Scenarios in Mobile Ad Hoc Networks. (J. Filipek)
- *Januška, Patrik*: Source Code Similarity Detection on Complex Event Driven Architecture. (J. Lang)
- *Kalužník, Martin*: Malware Analysis with Support of Control Flow Integrity Techniques. (T. Krajčovič)
- *Keszeli, Mário*: Secure Inter-vehicle Communication. (J. Laštinec)
- *Kráľ, Michal*: Identification, Composition and Configuration of Existing Software Components from Text Requirement Specification. (M. Bystrický)
- *Leško, Matej*: Automatic Agent for Pair Trading. (P. Lacko)
- *Mastíľak, Lukáš*: Interoperability and Compatibility in Heterogeneous Communications Environment. (P. Čičák)
- *Michálek, Pavol*: Real-time Mobile Sensor Data Processing Platform. (I. Kotuliak)
- *Neupauer, Adam*: Multidimensional Interrelating Software Model. (V. Vranič)
- *Olejár, Martin*: Semantic Conflict Detection in Software Models. (K. Rástočný)
- *Ondík, Jakub*: Interactive Visualization of Modifications in Software Models. (K. Rástočný)
- *Oravský, Martin*: Data Flow Optimization in Software Defined Networks for Multipath Transport Protocols. (I. Kotuliak)
- *Pánis, Ján*: Interoperability and Compatibility in Heterogeneous Communications Environment of Internet of Things. (P. Čičák)
- *Pastorek, Richard*: Training and Controlling System for Robotic Soccer Player. (I. Kapustík)
- *Pisarovič, Dominik*: Control Algorithms Focused on Unmanned Aerial Vehicle. (F. Kudlačák)
- *Puk, Matej*: Simulator of Distributed Algorithms. (D. Bernát)
- *Račko, Lukáš*: Secure Authorization via Mobile Devices. (L. Hudec)
- *Sokolík, Tomáš*: Distributed System in the Internet of Things aimed at Energy Efficiency. (P. Pišteň)
- *Škultéty, Filip*: Collecting and Visualizing of Data Gathered from Sensors Systems. (G. Gyepes)
- *Štefčák, Miloš*: Software Visualization in 3D Space (P. Kapec)
- *Takács, Miroslav*: Decisions of Player of Simulated Robotic Football. (I. Kapustík)
- *Urban, Tomáš*: IoT Use in Concept of Smart City. (I. Hucková)
- *Vaculčíak, Andrej*: Protection of Application Programs against Malware. (T. Krajčovič)
- *Vaško, Martin*: Data Processing from Sensor Systems in the Field of Sports. (G. Gyepes)
- *Visokai, Lukáš*: Automatic Change of the Position of Flying Wireless Device based on the Dynamic Changes in the Communication Network. (V. Šulák)
- *Vlček, Ondrej*: Safe Data Transmission through Speaker-microphone Channel. (T. Kováčik)

- **Zatko, Jozef:** Page Flow Views on Software. (M. Bystrický)
- **Žlínka, Andrej:** Code Smells Impact on Source Code Comprehensibility. (M. Konôpka)

Doctoral (Phd.) Theses

In 2018 following dissertations were defended:

- **Andrej Fogelton:** Eye Blink Detection (Applied Informatics, V. Benešová)

Abstract: Eye blink detection has many uses, the most common are human computer interaction for disabled people, dry eye monitoring systems, and fatigue detection. In this thesis, we analyze state-of-the-art methods with emphasis on usability. We focus on real-time methods working in the real-world environment and using a common webcam. We introduce two new datasets which are the biggest datasets available. The proposed annotation contains face and eye corners position, so the eye blink detection performance is not influenced either by face or eye detection methods. An evaluation procedure defines True positives with intersection over union metric. Two state-of-the-art methods are introduced. The first method analysis motion vectors using average motion vector with standard deviation. These are the input to the carefully designed state machine. With the second method, we evaluate different features from related work as the input to a Recurrent Neural Network (RNN). The best performing is the combination of motion vectors, time difference, and gradient orientations. This method achieves the best results on the biggest and the most challenging dataset Researcher's night. We introduce the first method which categorizes blinks into complete and incomplete ones. Shifting unidirectional RNN output not only helps to save resources compared to bidirectional RNN, but it even delivers up to 5% better performance.

- **Jozef Filipek:** Security Architecture for the Distributed Environmen (Applied Informatics, L. Hudec)

Abstract: Distributed environments have limited system resources shared between individual nodes in the network. These resources can be understood as memory, computing power, storage and bandwidth. By distributing requests between several nodes, network can effectively manage difficult and challenging operations. Purpose of this work is to analyze security status of

distributed computer systems and mobile computer networks using various security mechanisms with focus on self-organizing mobile ad hoc networks. This work contains overview of known security solutions and architectures used in MANETs and their evaluation. We introduce the concept of our own security architecture for distributed mobile networks, its verification and comparison to existing solutions.

- **Miroslav Blšták:** Automatic Question Generation based on Analysis of Sentence Structure (Information Systems, V. Rozinajová)

Abstract: Information technologies are changing the way of education. With the arrival of Web 2.0 educational encyclopedias based on collaboration and content expansion take the position in the online educational world. However, the learning process also requires verification of knowledge, and there is space for task of automatic question generation from the text, which obtains more and more attention over the last few years. Current question generation systems use hand-crafted set of rules without the possibility of simple expansion. We aimed to design new question generation method based on combination of traditional linguistic approaches and machine learning methods. It will train the model on a set of sentence-question pairs without participation of human expert. This method would be usable in various domains without modification and it can be also continuously improved by adding new data samples.

- **Peter Laurinec:** Improving Forecasting Accuracy through the Influence of Time Series Representations and Clustering (Information Systems, M. Lucká)

Abstract The knowledge extraction and discovery in large databases is a progressive area of computer science and statistical learning thanks to the rapid deployment of data-driven technologies in companies and research institutions. Time series data is one of the many types of stored data. They are created from sources as sensors, economy and power engineering. A smart grid is an ecosystem created from smart meters that can control or monitor electricity load or both load and production, collecting a large amount of time series data. This information can be used to make important decisions for the regularisation of production, and forecasting future states and monitoring. In our work, we focus on improving the data mining workflow for forecasting a large amount of time

series or forecasting the time series with the help of a large amount of time series data. For this task, we are using time series data mining methods as time series representations and clustering for creating more predictable groups of time series. We are taking into account many non-trivial challenges connected with the character of smart meter data such as fast coming data, the highly noisy character and multiple seasonalities. The main contributions of this work are developed new time series representation methods for more efficient processing of seasonal time series and new adaptable forecasting methods.

- **Michal Bystrický:** Use Case Driven Modularization (Information Systems, V. Vranić)

Abstract: Modularity of code strongly affects comprehension and maintainability. Although several attempts have been made to modularize code according to use cases, e.g., Data-Context-Interaction or aspect-oriented software development with use cases, none of these approaches is able to gather all the code related to a use case in one module and to reflect its steps. In this thesis, we propose new use case driven modularization approaches addressing this. We evaluated the approaches based on multiple studies. The results of the studies show that use case driven modularization requires less effort to follow code and to apply a change in code than common object-oriented approach. Simply stated, this means use case driven modularization is better comprehensible and maintainable than object-oriented modularization. In respect of DCI and aspect-oriented software development with use cases, these approaches add more complexity to following a use case flow in code when compared to our approach.

- **Roman Šelmeci:** Application of design patterns in Service Oriented Architecture (Information Systems, V. Rozinajová)

Abstract: Developing system on principles of Service Oriented Architecture (SOA) is not an easy task. Among many techniques used in software development process, Model Driven Development (MDD) is quite popular. When applying this paradigm properly, we are able to write and implement computer programs quickly, effectively and at minimum cost. Sometimes, this can be quite difficult and specific problems may occur, especially in case when we want to know if system meets the requirements of SOA. The objective of this thesis is to investigate whether utilization of informal SOA Design Patterns could

offer a solution to these problems. Patterns are transformed into a machine acceptable form, which enable identification of pattern instances in system models. Object oriented analysis and the theories of categories and graphs are used for (semi)formalization of design patterns. According to our results, the method proposes a better utilization of SOA Design Patterns in the modelling of new or existing systems.

- **Dušan Bernát:** On the Estimation of Number of Routers in an Ad Hoc Network (Applied Informatics, P. Čičák)

Abstract: The aim of this thesis is to give an estimated number of routers in an ad hoc network, assuming its graph model is provided. There are two approaches proposed, both utilising the notion of dominating set of nodes. Firstly it is concerned with theoretical derivation of a new lower bound for the expectation of domination number for random graphs with base graph being a Cartesian product of cycles, such as, e.g. a two-dimensional torus. Evaluation of accuracy and comparison to the lower bound based on the vertex degree counting was realised by simulations. The proposed new lower bound is more precise than the other one in the interval of lower values of the probability parameter p . The second objective was practical realisation of a heuristic algorithm for finding a MDS. We focused on the graphs with power law degree distribution which present a good model of real world networks. Proposed algorithm is based on adding the vertices which have neighbours of minimum degree. On our test sample the worst case increase in dominating set size compared to the minimum one was 15.7% and when the reduction of unnecessary vertices was used, it was below 5%. But the execution time was by few orders shorter than it was in the case of greedy algorithm. This can make significant difference in the case of large graphs and allows for MDS size estimation even when.

- **Rastislav Bencel:** User Management Architecture based on Software-defined Networking (Applied Informatics, I. Kotuliak)

Abstract: The thesis is focused on user management in the IEEE 802.11 standard, containing some identified deficiencies that are analyzed in our research. A new trend in network technology is the use of Software-Defined Networking SDN that allow them to be managed more efficiently. Beyond their primary destination in wired networks, they can also be used efficiently within

wireless networks. This thesis addresses the issue of the current state of IEEE 802.11 standard connectivity with the new trend of Software-Defined Networking. Through their interconnection, they explore the possibilities of resolving a station handover between access points in the network and its impact on mobile connection parameters. Based on the research, an architecture is developed that uses Software-Defined Networking user management networks within the IEEE 802.11 standard. The handover of a station between its access points is performed by a personal virtual access point entity that is controlled by the central control element (SDN controller). Within the architecture, only one control channel for the wired and wireless parts of the network is used. The encryption and decryption functionality is moved from an access point to a separate component. The overall functionality of the architecture is verified by using colored Petri nets and by experimenting with a common control channel in a real-world environment.

II. IIT.SRC

Full papers

- *Kubanyi, J.*: The Relation of Gaze Fixations and User's Skill in the Digital Space. (P. Hlaváč)
- *Pecár, S.*: Opinion Summarization of Customer Reviews: Sentiment Analysis. (M. Šimko)
- *Burda, K.*: Detection of Impostors for Behavioral Biometric Authentication on Mobile Devices. (D. Chudá)
- *Krchňavý, R.*: Aspect based Sentiment Analysis. (M. Šimko)
- *Dragúňová, Mária*: Working Memory Capacity Identification by Eye Tracking: Considering Saliency of AOIs. (J. Tvarožek)
- *Červenka, M.*: Analysis of Eye Movement Patterns Depending on Task in the Web Environment. (J. Tvarožek)
- *Švec, A.*: Modelling the Appropriateness of Text Posts. (M. Bieliková)
- *Pavliková, B.*: Patterns Identification in EEG. (J. Petřík)
- *Hagara, J.*: Comparison of DOP and EPDOP for Beacon Placement. (A. Martonová)
- *Redajová, M.*: Automatic Recognition of users' Characteristics based on Eye-tracking Data. (J. Šimko)
- *Mocko, M.*: Data Simulation - Overcoming the Obstacles of Unavailable Data. (J. Ševcech)
- *Nemček, M.*: Fast Density-based Downsampling of Cytometry Data. (M. Lucká)
- *Juhaniak, T.*: Automatic Detection of Cognitive Load from Pupil Dilation in Real World Scenarios. (M. Bieliková)
- *Gondová, V.*: Abstraction of Users' Footprints in the Domains without Explicit Categories. (M. Bieliková)
- *Puškáš, A.*: Household Load Profile Creation Based on Clustering Time-series Data for a PV System Recommender Application. (J. Loeb)
- *Pohl, T.*: Biometric User Identification via Hand Gestures with Leap Motion Controller. (K. Burda)
- *Kubík, D.*: Mathematical Optimization of Design Parameters of Photovoltaic Module. (J. Loeb)
- *Pikuliak, M.*: Parameter Sharing for Cross-lingual Multi-task Learning. (M. Bieliková)
- *Farkaš, M.*: Linguistic Regularities between Words and their Definitions. (P. Lacko)
- *Balážová, V.*: Prediction of Users' Personality Traits based on Task Solving on the Web. (R. Móro)
- *Danišik, N.*: Processing of Big Data Acquired by Sport Activity. (P. Lacko)
- *Hucko, A.*: Diacritics Restoration using Deep Neural Networks. (P. Lacko)
- *Žatková, V.*: Customer's Intent Prediction Based on Help Desk Data. (I. Srba)
- *Pavlík, P.*: Dynamic Weighted Majority in Ensemble Learning. (V. Rozinajová)
- *Křáze, A.*: Generating More Coherent and Informative Responses with Neural Chatbot. (M. Pikuliak)
- *Loeb, J.*: Gems in Cartesian Genetic Programming - Preliminary Report. (V. Rozinajová)
- *Rafajdus, A.*: WeGAN – Weather Forecast with Generative Adversarial Networks. (M. Bieliková)
- *Belai, P.*: Clustering Algorithm for Large Amounts of Time Series Streams. (P. Laurinec)
- *Slaninka, A., Majerčák, D., Sitárová, D., Žák, M.*: Webable: Way of Giving Eyes to Blind People on the Web. (J. Šimko)
- *Rafčíková, K.*: Automatic Evaluation of User Interface Based on Aesthetic Features. (E. Kuric)
- *Papp, D.*: Visual Attention and Saliency Mapping on Web Page Elements. (J. Šimko)
- *Mokry, M.*: Identification of the User Skill on the Web Based on Patterns in Eye Tracking Data. (R. Móro)
- *Kostova, S.*: Automatic Assessment of User's Curiosity Based on Behavior on the Web. (J. Šimko)

- Šrank, M.: Improving Diversity and Freshness of Newsletters in Community Question Answering Systems. (I. Srba)
- Berger, P.: User Modelling for Churn Prediction in E-commerce. (M. Kompan)
- Gašpar, P.: User Feedback Interpretation for Personalized Recommendation: Visual Bias Analysis. (M. Bieliková)
- Hlaváč, P.: Towards Estimating Web-Navigation Skills by Gaze Metrics. (M. Bieliková)
- Svrček, M.: Detection of Usability Problems on the Web by the Use of Eye Tracking. (M. Bieliková)
- Salát, M.: User Segmentation for Personalization of Newsletters in CQA Systems. (I. Srba)
- Roštár, M.: Personalized Recommender with Taking into Account Visual Input. (M. Kompan)
- Bernád, M.: Is Electronic Identity Needed? (D. Chudá)
- Kren, M.: Improving Robustness against Websites' Changes during Web Data Extraction. (I. Srba)
- Kováč, D.: C-SPARQL Query Editor. (K. Rástočný)
- Fabiš, M.: Automatized Management of Mocks. (K. Rástočný)
- Petřík, J.: NLP Approaches Source Code Authorship. (D. Chudá)
- Januška, P.: Source Code Similarity Detection on Complex Event Driven Architecture. (J. Lang)
- Olejár, M.: Semantic Conflict Detection in Software Models. (K. Rástočný)
- Abelovský, G.: Database Management in Spring using AOP. (J. Lang)
- Ondík, J.: Visualization of Modifications in Software Models. (K. Rástočný)
- Král, M.: Composing Software Based on Detailed Specification in Natural Language. (M. Bystrický)
- Ondík, J.: Extendable Software Modelling Architecture. (K. Rástočný)
- Kislan, M.: Automated Evaluation of SQL Queries in Solving of Interactive Tasks. (M. Barla)
- Zátka, J.: Page Flow Views on Software. (M. Bystrický)
- Bruchatý, M.: Regression Testing with Test Selection and Test Case Prioritization. (K. Rástočný)
- Žlnka, A.: Code Smells Impact on Source Code Comprehensibility. (M. Konôpka)
- Hoang, M.: Cubely: Virtual Reality Block-based Programming Environment. (J. Vincúr)
- Valach, A.: Utilization of the LoRa Technology in Healthcare IoT Devices. (D. Macko)
- Chodúr, Ch.: Securing Communication on UART Interface. (V. Kunštár)
- Hroš, R.: Generating Subgraphs of Finite Grids. (D. Bernát)
- Grežo, R.: Security in Software Defined Networks. (L. Hudec)
- Erdelyi, J.: Communication in the Internet of Things environment. (P. Čičák)
- Ilavský, M.: New Testing Scenarios for MANET Routing Protocols. (J. Filipek)
- Vantuch, M.: Web Systems Security Increase by Honeypot Technology. (L. Hudec)
- Gočál, P.: Energy-Efficient Communication of IoT Devices Using Timing Channels and Prioritization. (D. Macko)
- Košťál, K.: 802.11 Seamless Handover using Common SDN Control Channel. (I. Kotuliak)
- Doubravský, L.: Remote Reprogramming of Embedded Devices. (P. Čičák)
- Visokaj, L.: Automatic Change of the Position of Flying Wireless Device Based on the Dynamic Changes in the Communication Network. (V. Šulák)
- Keszeli, M.: Secure Inter-vehicle Communication. (J. Laštinec)
- Račko, L.: Secure Authorization via Mobile Devices. (L. Hudec)
- Moravčíková, Z.: Automatic Adaptation of Game Mechanics Based on a Player Status. (M. Nagy)
- Tóth, J.: Forecasting of Network Traffic Parameters in Software-defined Networking. (J. Lúčanský)
- Trnavská, L.: Image Processing of MRI Images in Neoadjuvant Treatment of Breast Cancer. (V. Benešová)
- Hudec, L.: Texture Similarity Evaluation via Siamese Convolutional Neural Network. (V. Benešová)
- Nagy, T.: Diagnosis of Alzheimer's Disease by the Analysis of Data Obtained from Cognitive Tests using Machine Learning Algorithms. (M. Tamajka)
- Laco, M.: Depth in the Visual Attention Modeling from the Egocentric Perspective of View. (V. Benešová)
- Grivalský, Š.: Automated Segmentation of Brain Gliomas using Convolutional Neural Networks. (M. Tamajka)
- Marták, L.: Polyphonic Note Transcription of Time-domain Audio Signal with Deep WaveNet Architecture. (V. Benešová)

- *Jakab, M.*: Autoencoder Based Pattern Description and Matching. (V. Benešová)
- *Pallo, M.*: Detection and Objects Recognition using 3D Sensors. (M. Jakab)
- *Gajdošík, P.*: Eye Tracking using Deep Neural Networks. (V. Benešová)

Extended abstracts

- *Jurkáček, P.*: Automatic Detection and Notification of Potholes on Roads to Drivers. (T. Kováčik)
- *Straňovský, Zs.*: Identification of Mobile Devices by their Hardware Characteristics. (T. Kováčik)
- *Hauskrecht, M.*: BananaTV: Presentation System. (D. Bernát)
- *Puk, M.*: Simulator of Distributed Algorithms. (D. Bernát)

III. TP CUP COMPETITION

- *Grotkovský, D., Gulis, M., Janeček, J., Ševčík, M., Tomcsányiová, J., Ungerová, B., Vlha, M.*: OntoSEC: Cloud Service Recognition. (M. Labaj)
- *Babula, L., Balashov, P., Dolnák, M., Hucko, M., Štefancová, E., Valčíčák, M., Vítek, A.*: Votter: A Web Tool for Managing Decisions. (O. Kaššák)
- *Polák, M., Pham Van, N., Selický, M., Števuliak, M., Števuliak, M., Fukas, M., Samotný, L.*: Open Contracts: Linking Open Public Data. (R. Móro)
- *Čelesová, B., Koreň, T., Pullmann, J., Puškáš, M., Sosňák, M., Štofaňák, P., Valko, J.*: Beehives Monitoring using Internet of Things. (T. Kováčik)
- *Babinec, P., Hoang, M., Hučko, J., Karas, M., Lehotský, M., Púčať, S., Mičo, J., Vnenčák, S.*: Smart Parking. (I. Srba)
- *Berta, P., Krempaský, M., Adamov, M., Hamara, O., Pecíková, B.*: DeepSearch: Building Ontologies from Unstructured Biographies. (N. Andrejčíková)
- *Cuper, M., Kaššák, O., Manduch, L., Mujgošová, I., Pazúrik, J., Pitoňák, O., Selecký, O., Schnürer, M.*: ReCommers - Recommendation for E-commerce. (I. Srba)
- *Andrejkovič, I., Broniš, T., Hózová, G., Janec, N., Lišiak, J., Ofčarovič, T., Škuta, M.*: Immersive Web. (J. Vincúr)
- *Gábrš, T., Halajová, M., Hauskrecht, M., Meňhart, L., Mrocek, F., Staškovan, M., Súkeník, F.*: Invest: Investment Portal for Laics. (K. Rástočný)

- *Abelovský, G., Bakonyi, P., Beka, P., Čičman, M., Kaňuch, P., Kazimír, J., Nguyenová, M., Lach, T.*: Behavioral Biometrics on Mobile Devices. (K. Burda)
- *Hurajt, M., Machajdík, D., Nagy, T., Sabatula, S., Valko, P., Války, M., Zigo, J. M.*: MedPix: Simplifying the Analysis of Complex Medical Image Data. (M. Tamajka)
- *Dlhá, M., Grivalský, Š., Hubar, Y., Chodorčuk, E., Juhásová, N., Strásky, A., Williger, R., Žabka, P.*: Distributional System of Questionnaires. (P. Pišteň)
- *Melúch, M., Nagy, A., Písecký, P., Smetana, M., Kleň, J., Mňačko, T., Vrba, L.*: Collab-UI: A Collaborative User Interface Prototyping Tool. (E. Kuric)

IV. SELECTED PUBLICATIONS

- [1] ROZINAJOVÁ, Viera - BOU EZZEDDINE, Anna - LÓDERER, Marek - LOEBL, Jaroslav - MAGYAR, Róbert - VRABLECOVÁ, Petra. Computational Intelligence in Smart Grid Environment. In Computational Intelligence for Multimedia Big Data on the Cloud with Engineering Applications. 1. vyd : Elsevier, 2018, pp. 23-59.
- [2] FOGELTON, Andrej - BENEŠOVÁ, Vanda. Eye Blink Completeness Detection. In Computer Vision and Image Understanding. Vol. 176-177, Nov- Dec 2018, 78-85. ISSN 1077-3142.
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V. RESEARCH PROJECTS

Methods and algorithms for improving efficiency and multimedia content delivery in IP networks (VEGA 1/0836/16) (I. Kotuliak), Duration: 2016 - 2018

Multimedia applications and multimedia provisioning OTT (as Store from Apple) became the moving force of the ICT industry. Telecommunication companies are investigating of novel systems into their core networks to improve flexibility and expenses optimisation. One of the most promising technology belongs SDN. The objectives of this project follow up on 7RP HBB-Next project and on SDN having in mind the proposals for Future Generation Internet in three areas:

- i) to complement architecture proposed within 7FP project HBB-Next with distribution channel based on IP and its verification and evaluation,
- ii) to improve architecture of SDN with controllers interconnection and its verification in SDN to NFV controller

Modeling of human visual attention using automatic scene recognition and object recognition (VEGA 1/0874/17) (V. Benešová), Duration: 2017 - 2019

The tasks of modeling of the human visual attention and creating of saliency maps have a lot of application areas as for example in computer graphics, compression of a video signal, in the visualization of information, but also in an automatic interpretation of the scene captured by the optical sensors. The aim of this project is a research of modeling the human visual attention. Models for modeling the human visual attention are usually developed as models of "bottom-up" and "top-down" or a combination of them. Both approaches will be researched in this project. An important part of the research will be focused on the methods of visual object recognition and automatic scene description with a respect of their possible integration into the proposed model of the human visual attention. Another part of the project will deal with a

design of elements for the visualization of information systems with a goal to propose elements with such visual expressiveness which can properly attract the attention of observers.

Adaptation of Access to Information and Knowledge Artifacts Based on Interaction and Collaboration within Web (VEGA, 1/0646/15)

(M. Bieliková), Duration: 2015 – 2018

During common use of Web (searching, learning and task solving), users are confronted with problems of information overload, loss in information space and insufficient collaboration support. These problems are not novel and were addressed in various specific domains with varying degrees of success. However, new challenges and possible solutions are opening in the form of new types of approaches for interaction of users, new means for gathering feedback and new methods to work with big data and data streams. Based on the results of our research team in this field, in this project we focus on using these means for introducing new methods for adaptation of content, navigation and form of the information space, with the goal of improving orientation and collaboration of users in the information space. We will also research options for supporting information space analysis (metadata acquisition, text analysis) and user's behaviour analysis concerning interaction with information spaces.

Teachers' personality and professional vision related to the dealing with challenging situations in the classroom during the transition into service (VEGA, 1/0409/17) (E. Kuric, P. Hlaváč), Duration: 2017 – 2019

Challenging interpersonal situations and inappropriate behaviour of children at school are the main sources of teachers' stress and concerns of novice teachers entering the profession. A quick and relevant evaluation of the cues to individual behaviour and the dynamics of the class is the basis of competent classroom management and effective dealing with challenging school situations. The term "professional vision" therefore is understood as a teacher's ability to perceive and interpret events in the classroom; it involves selective attention and knowledge-based reasoning. This project aims to research formation and development of professional vision among student teachers related to the perception of and dealing with difficult situations in the classroom,

concerning their personality profiles and the effect of pre-gradual training. Besides the personality inventories and narration analysis, video analysis and eye-tracking methods will be used. This project aims to research the formation of professional vision among student teachers related to the perception of and dealing with challenging situations in the classroom.

Errors and Ambiguity in DNA Sequencing: Algorithms and Models (VEGA, 1/0458/18)

(M. Lucká), Duration: 2018 – 2021

DNA sequencing is an indispensable research tool in contemporary bioinformatics and molecular biology. In this project, we will study ambiguity present in the data produced by the newest sequencing technologies. We will design new algorithms and develop new software tools for analysis of reads with high error rates, either in combination with other technologies or individually at the level of primary data. We will also develop new data structures for more efficient work with such data. The outcome will be new software tools suitable for analysis of real biological data, as well as new algorithms, which can be adapted to other similar tasks. In this project, we will also apply new and well established tools to real biological data in collaboration with life science researchers.

Modelling, prediction and evaluation of user behavior based on the web interaction for adaptation and personalization (VEGA, 1/0667/18) (M. Kompan), Duration: 2018-2021

In nowadays information overload, knowing user behavior and his or her consequent needs is essential for providing relevant information on the web. The first step towards methods for qualitatively improving application usability is the thorough identification and observation of user behavior (based on information leads he produces during interaction). The project is focused on proposing and researching methods for effective analysis and modelling of user behavior patterns, while these are used in the behavior prediction. We analyze the user behavior based on user interaction with software resources. In the same time, we are researching taking advantage of physiological and personal human characteristics (skin conductance, emotions, etc.). The goal is to recognize behavioral patterns, to identify the user and to combine them in order to propose methods for providing relevant and, as a rule, personalized, information.

Applied research on measurement of physiologic parameters of stress and smart wireless biomonitoring using on-chip technologies

(APVV-15-0789) (K. Jelemenská),

Duration: 2016 - 2019

The main focus of the project is applied research for identification human stress using vital function monitoring of the human body by employed modern methods, as well as the progressive alternative methods that would allow final wide use of the application outputs in health care (in acute, outpatient, home care and systems AA-LAmbient Assisted Living), in biomedicine, psychology and other areas of social life such as relaxation physiotherapy or active sports, recreational activities, but also in completely different industries like in criminalistics, in the banking sector and so on. Targeted research on a long-term continuous monitoring of essential and alternative physiological processes of human in terms of his cognitive and emotional functions by measuring selected properties of the skin (measurement of human stress) is necessary step towards improving the quality of health care, and thus the quality of life at home and abroad. Continuous monitoring of selected characteristics providing sufficient information for professionals involved in the identification of stressful situations, as well as its impact on other serious diseases. Non-invasive continual measurement of these parameters directly on the body and target vertical integration of several SW/HW layers requires a specific research for sensor structure design, the development of methodologies for measuring and processing of data and other scientific and research work necessary for a successful project finalization.

Cloud Based Human Robot Interaction (APVV-15-0731) (I. Kotuliak), Duration: 2016 - 2020

Project deals with multimodal Human Robot Interaction. Cloud Computing Technologies inspired a new domain called Cloud Robotics. Development of integrated programming environment for robotic systems in distributed approach give occasions for agent environment with learning abilities, incremental knowledge acquisition sharing for group of robots. The goal of basic research is study of artificial intelligent tools for intelligent robotics, basic research in the area of natural language processing and also the study of innovative software tools for distributive software systems in cloud environment. The focus will be given also to image processing,

virtual reality and speech processing in intelligent robotics.

Human Information Behavior in the Digital Space (APVV-15-0508) (M. Bielíková),

Duration: 2016 –2020

Project is aimed at the basic research of models and methods of acquisition and processing of information, which are primarily used for predicting of behaviour of human in digital space, which are consequently used for improving the work with information. The processed information are especially the implicit feedback signals -- footprints that the human leaves us during his interaction with digital space. In the project, we will work with signals that are nowadays only starting to be considered and researched, for example gaze tracking or tracking of physiological characteristics. In the context of information processing, these signals were (until now) only utilized in static applications. This is due to the difficult technical realization of the signal measurements, which itself imposes challenges like processing of big data. The goal of the project is to acquire remarkable new knowledge about how the human is behaving in the environment of digital information a how does he/she react on information he/she is receiving within, all this from the perspective of interconnected research areas of computer science, social science and behavioural science. This knowledge would enable design and evaluation of models that would uncover connections between individual feedback signals. This will subsequently enable design of new methods of personalization of information, either from the perspective of visualization or navigation in digital space.

Knowledge-based Approaches for Intelligent Analysis of Big Data (APVV-16-0213)

(V. Rozinajová), Duration: 2017-2021

Processing and analysis of big data represent one of the biggest challenges faced by professionals in the field of ICT for several last years. It is becoming important not only the content and volume of such data, but also the context in which this data is generated and used. The proposed project is focused just on research and development of intelligent methods enabling the processing and analysis of big data in the broader knowledge context, which describes and characterizes such an environment. We focus not only on big data with static character, such as

DNA/RNA/protein sequences, but also on dynamically changing data streams, which can be represented by the operation data from the different types of critical network infrastructure, data from social networks or networks of different sensors and smart devices. The main objective of the project is to design and verify new adaptive methods for analyzing big data in a dynamic environment, able to extract new knowledge and to integrate them with the knowledge model of the environment.

Tumor Heterogeneity in Multiple Myeloma: Evolution and Clinical Significance (APVV-16-0484) (M. Lucká), Duration: 2017-2021

Tumor heterogeneity is likely, from a Darwinian-selection perspective, to be the essential feature of clonal evolution, disease progression and relapse. The existence of intra-clonal heterogeneity resulting from clonal selection has been recently reported in multiple myeloma (MM). Multiple myeloma (MM) is a B cell malignancy characterized by clonal proliferation of plasma cells in the bone marrow (BM). It remains incurable despite improved survival after development of novel therapies. The overall objective of this proposal is to better understand clonal architecture of primary patient-derived BM samples during the development of MM and therapy induced intra-clonal dynamics during progression of MM. A central component of these studies is evolution of BM patient samples from premalignant stages to malignant stages by combining genetic, molecular and phenotypic approaches. We also will evaluate the impact of chemotherapy and immunotherapy on the dynamic nature of the clonal composition together with the role of the tumor microenvironment on clonal selection in MM. To reveal insights into inter- and intra-clonal heterogeneity in MM, the study will provide the framework for development of more personalized diagnostic criteria and novel therapeutic strategies against coexisting persistent subclones resulting in a more individualized targeted therapy to either maintain long-term remission or completely eradicate MM disease.

Automated Recognition of Antisocial Behaviour in Online Communities (APVV-17-0267)

(P. Návrát), Duration: 2018-2022

The project is focused on research of new models and methods for automatic recognition of antisocial behavior in online communities. Antisocial behavior in online environment is one

of the most actual and serious problems, which significantly threatens not only the principles, on which the web was built, but also has critical overreach to society. As a typical example, we can take the spread of misinformation through social networks, which influences opinions of people and consequently, their decisions. Another typical example is spread of hate speech or direct attacks on persons in online space. These negative situations have been unintentionally enabled by the rise of information technologies. Now information technologies may become the means for better understanding and dealing with this phenomenon. The successful reaching of this goal requires a multidisciplinary research, which we address by this project. The primary focus of this project is the research of models and methods for automatic identification of antisocial behavior. We will build explicit models based on analysis of integrated datasets, but also on qualitative understanding of malicious content and behavior. The recognition methods will be based on these models and will source from principles of machine learning, advanced automated analysis of natural language texts and user modeling (either of content author or consumer).

Misinformation Detection in Healthcare Domain (APVV, SK-IL-RD-18-0004)

(M. Bieliková), Duration: 2018-2020

False information spreading has been recognized as one of cyber security attack types in the online space. Healthcare domain is not an exception. Health misinformation shared online became a serious concern which has a direct impact on the health condition of misinformed consumers. Misinformation detection and debunking in this domain is unique due to the depth and breadth of knowledge required to spot and argue against false information and the necessity to clearly provide arguments and explain misinformation to the general public. Due to the recent increase in the amount of misinformation, the successful reaching of this goal requires close cooperation between human experts (medical doctors), non-experts (public) and data-driven methods. The primary aim of this project is to propose and verify a set of interconnected models, methods and tools for misinformation detection and debunking. In the proposed approaches, we will pay attention to two novel aspects. Firstly, in contrast to the existing state-of-the-art works, we plan to fully exploit misinformation dynamics (which will

be captured by our domain model), such as misinformation sources and their trust or spreading paths. Secondly, we will attempt to optimally utilize and support the cooperation between human experts (medical doctors) and data-driven methods. In the proposed project, we also tackle the open question of how to effectively deliver the obtained results from the data-driven methods to the expert as well as the non-expert users. For this reason, we will design and implement a crowdsourcing platform built on top of the community question answering concept. The communication in this platform will be handled not only by humans, but also by autonomous intelligent robots (agents). These robots will be able to select automatically from various questioning and answering strategies in order to optimally mediate the knowledge sharing between data-driven models, their results and users in the platform.

Innovative methods of teaching informatics in large groups with support for online education (KEGA, 028STU-4/2017)

(M. Bieliková), Duration: 2017 – 2019

The ability to collaborate is one of the most important skills for today's person and it is crucial to cultivate it during school years. Collaboration in school however is difficult to support with standard tools, which often do not meet the requirements of the educational context, so they can be used only sparingly. The current web communication and social applications work mainly thanks to the community of users who are actively using these applications and thus either explicitly or implicitly share their knowledge and improve learning. The proposed project aims to extend the existing tools and create new tools for supporting collaboration and knowledge sharing in large communities of students and teachers, and to integrate the tools into a common platform to enable students to develop communication and collaboration skills, helping to make education in large groups more efficient. It is the large groups of students in individual courses that create the potential for the use of collective intelligence. The platform will provide tools and features for enabling the power of crowd of students in order to facilitate teaching, and for data collection and data mining in order to better adapt and personalize the tools for the students. We will build web tools for supporting explicit collaboration such as peer grading as-

signments, peer tutoring and peer feedback during solving of programming-related problems, and common solutions for study-related questions. We will also build tools for implicit collaboration that will enable for example the use of collective intelligence of students for identifying errors in educational materials. When designing these tools, we will build upon the existing educational systems that are being developed at our faculty and have been created with the support of KEGA. Within the project, we will create the Virtual community learning environment as a widely available software platform that integrates the created tools. An important part of the project is to open the solution for integration with tools and support systems in other institutions, while this transfer of know-how helps further strengthen the resulting effect on education in our faculty. The created tools will be adapted to portable devices, allowing for increased participation. We will evaluate the platform in computer science courses for programming, database systems and software development principles.

Update of computer networks curricula based on needs of practice (KEGA, 011STU-4/2017)

(P. Čičák), Duration: 2017 – 2019

The objective of this project is to update computer networks curricula at three Slovak technical Universities based on actual needs of practice. A dynamic development in the fields of network technologies and updated needs of industrial certification require a change of the content scope of lecturing and practical trainings. The secondary goal of this project is to create a cooperation platform among FIIT STU, FRI UNIZA, and FEI TUKE for exchanging content bases, knowledge, pedagogues, and students by means of common courses, summer schools, and practically oriented seminars and trainings. The achievement of this project and cooperation is a higher quality product - student with a high level of proficiency, better prepared for practice. The mutual exchanging of pedagogues and PhD students will support mutual ties and will reinforce the possibilities of the future scientific and pedagogical cooperation. This project will establish a new shared educational content for university students, implement into the education new items of multimedia content, collaborative tools and it will improve practical trainings as a precondition of better preparation of graduates for practice.

Integration Process to Mentoring and Coaching in Teaching Process at Technical Universities (KEGA, 019STU-4/2018)

(V. Rozinajová), Duration: 2018-2020

Current trend in European education implies an emphasis on improving the quality of process aspects of teaching at universities. Changes in this area raise the need of professional development of university teachers, especially in new ways such as mentoring and coaching. Stakeholders expect university teachers to have positive, competent behaviour that is constantly evolving, especially in the field of social roles. The fulfilment of this role is connected with implementation of mentoring and coaching. Mentoring and coaching has a direct impact on motivation and satisfaction of mentees/ coaches and mentors/ coach. It is one of the most effective forms of development, which is also not demanding on financial resources. The project aims to deepen existing mentoring, coaching skills and acquire new skills and professional practices that will enable teachers to work effectively with students, provide support and feedback to enhance their self-motivation and initiative, cooperate in their integration into teaching process. To prepare teachers for their new role as mentors, there will be created educational activities and via panel discussions specified detailed ideas for guidelines how to work with talented students. Correctly applied and professionally managed mentoring contributes to spontaneous sharing of knowledge, creating a positive universities' culture and promotion of lifelong learning of teachers at technical universities.

Innovative teaching curricula, methods and infrastructures for computer science and software engineering (SCOPES) (M. Bieliková),

Duration: 2015 – 2018

The main goal of the project is to innovate the teaching infrastructures at partner institutions based on the knowledge and experience of individual partners acquired mostly by the research activities. This goal will be achieved by transferring and integrating content, best practices, methods and existing learning support research infrastructure in the context of selected computer science and software engineering courses. In this project we aim to transfer our know-how embedded in several learning support software systems, and also build a long-term research cooperation through the integration and cross-utilization of these systems, which serve as working

prototypes in research activities in domain of personalized learning. In particular, we include learning support systems that enable interactive lectures that improve focus and engagement of students as well as increase teacher awareness of student progress; automatic assessment systems that enable thorough testing and feedback on student's solutions, and social support systems that enable increased engagement of students with teachers and more in-depth communication. We aim to innovate: teaching methods, material and content used in selected computer science and software engineering courses and transfer best practices in the software infrastructures used at each partner institution. We focus on thematically common courses for programming and software development offered at each institution: introductory programming and programming fundamentals courses, and software and/or web engineering courses.

Methods of Artificial Intelligence for Radiological Data Processing (Tatra banka Foundation, 2017et007) (V. Benešová), Duration: 2018

The aim of this project was to apply artificial intelligence methods, in particular deep learning, to solve selected specific tasks of automatic or semi-automated processing of radiological data from CT, MRI, or three-dimensional ultrasound). These tasks are following: Automatic brain tumor segmentation and monitoring the development of this tumor during a treatment Automatic segmentation of prostate in data obtained by ultrasonic transducer The segmentation of individual organs in the abdominal cavity on CT and/or MRI data Automatic evaluation of neo-adjuvant treatment of breast cancer from three-dimensional mammographic images.

Teaching introductory programming concepts in extended reality (Tatra banka Foundation, 2017et070) (J. Vincúr), Duration: 2018

Within the project we have created several educational games focused on teaching procedural and object-oriented programming in the virtual, augmented and mixed reality environment. By using modern technologies and gamification concepts we have tried to transform learning process to a fun and immersive experience. For the evaluation purposes we have created 4 VR workstations with eye trackers and a customized EEG headset. These devices are also available for

the students to realize their bachelor and master thesis.

Better Utilization of Green Energy through Better Modelling (Bilateral Fund at National Level, BFN16-ENV-010) (M. Lucká), Duration: 2017-2018

Environmental concerns motivate researches to involve more renewable energy resources into smart grid considerations. Because there are very few possibilities to store produced electric power, by building balanced networks it is very important to develop models and algorithms that allow accurate prediction of electricity production and consumption. The goal of this project is to exchange existing knowledge between two mixed (teachers and students) university groups (Slovak and Norwegian) in the frame of a study stay at University of Bergen (UiB). It will focus on methods (especially ensemble learning methods) suitable for electricity prediction of photovoltaic power (PV) plants in dependence on external factors, such as weather and to test them on data sets available at UiB.

VI. RESEARCH LABORATORIES

Networks Technology Laboratory I (P. Trúchly)

The research and teaching laboratory is used in practical lessons within several network courses, as well as for networking courses of Cisco Networking Academy, established at our faculty. The students are involved in design, implementation, and verification of applications for computer networks. They are trained to install, configure and operate local and wide-area networks. The laboratory is also used by the Instructor Training Centre which is a part of Cisco Networking Academy. The available hardware equipment helps students and other staff in their research during practical experiments while working on research projects, bachelor, master, or doctoral thesis. Laboratories are equipped with several network interconnecting devices, like switches and routers. All devices are originated mainly in Cisco company.

Networks Technology Laboratory II (P. Trúchly)

This research and teaching laboratory is dedicated to teaching WAN technologies to undergraduates, communication services and networks and network security to graduates in the study programme Computer and communication systems and networks. Students gain and prove their practical and theoretical skills. The

skills are developed that enable students to design, implement, and troubleshoot scalable local and wide-area networks, create and deploy a global intranet, using routers and switches for multiprotocol client hosts and services. Students are also involved in design, implementation and verification of applications for computer networks and parallel processing. For teaching and testing wireless communication the laboratory is equipped with wire-less access points, wireless network cards are available and necessary software tools.

Embedded Systems Laboratory (T. Krajčovič)

The laboratory is focused on the embedded system research. It is equipped with all necessary equipment for design, implementation and testing of applications for embedded systems based on modern microprocessors, one-chip microcomputers and softcore processors, including real-time applications. It contains specialized equipment, such as development kits based on monolithic microprocessors and one-chip microcomputers with RISC and CISC architectures, FPGA and CPLD development kits, logical analyzers, in-circuit and JTAG emulators, digital oscilloscopes and other development tools. The latest specialized equipment has been obtained with the University Scientific Park project.

Communication Technologies Laboratory (I. Kotuliak)

The research laboratory is intended for perspective research topics in the area of communication networks. These topics cover network routing controlled by software (Software Defined Networking – SDN) that is applied to both fixed and mobile networks, to be more specific. In the area of wireless networks we are engaged in decreasing energy consumption during communications to utilise batteries more effectively. Important research topics are also associated with a delivery of multimedia applications to users. So called Content Delivery Networks (CDN) are raising more and more attention in coming years. The specialized laboratory equipment has been procured in the frame of the University Scientific Park project.

Digital Systems Design Laboratory (K. Jelemenská)

The research and teaching laboratory is predefined for teaching specification means and diagnostics and reliability to undergraduates and digital systems design, to graduates in the study

programme Internet Technologies. Students are to prove their practical and theoretical skills. They are involved in design, description, implementation and verification of small to medium digital systems. Laboratory is equipped with Internet connected computers, several types of FPGA boards and necessary software tools to gain practical skills in the area of digital systems design – FPGA Advantage, Vivado, and Synopsys tools.

FIIT – Molpir, Ltd. Laboratory (P. Pišteň)

The main purpose of the laboratory is research of multimedia applications oriented towards transport. The research is dedicated to the possibility of applying IT in transport and their usefulness and application in practice. Research is conducted using the specialized equipment specially developed for use in cars, buses, trains etc. The aim is to develop the novel applications aimed at leveraging existing hardware that will bring the user new functionality in the specific domain. Technologies such as GPS, ultrasonic sensor, touch screens, dedicated servers for transport etc. are currently available in the lab. With these technologies it is possible to work using various operating systems (FreeBSD, Windows 6.0, Windows XP Embedded, Android 1.5, Android 2.3, Android 4.0). The aim is to create useful applications for passengers, drivers, or owners of means of transport. The laboratory was established as a result of cooperation with Molpir, Ltd. It is also opened to students working on research projects, bachelor, master thesis, and team projects.

Grid Computing Laboratory (L. Hudec)

The research and teaching laboratory is devoted to teaching distributed processing and parallel programming graduate modules and experimental lab for project on Grid Computing and its components. Grid consists of two independent parts. The first part is testing grid equipped 20 CPUs, 1Gb network interconnection, frontend server with UPS, Globus Toolkit software and VMWare software. The second part is production grid equipped 40 CPUs, 1Gb network connection, frontend server with UPS, Globus Toolkit software and VMWare software. Grid is connected to Internet and is going to be as a part of SlovakGrid national grid structure.

Laboratory of Computer Graphics, Vision and Interaction (V. Benešová)

Augmented reality module provides a variety of devices for the research of augmented reality: AR glasses, AR interactive holographic foil, etc. Virtual reality module includes VR glasses, multiple projection for the simulation of immersive VR. Computer vision module includes high-resolution and high-speed cameras, eye tracker glasses, colorimetric devices etc. Computer graphics module offers the possibility of powerful GPU computing. Interaction module consist of several interaction devices like 3D mouse, Leap sensor etc.

Siemens Healthineers Laboratory (V. Benešová)

Siemens research laboratory is a centre of the research of computer vision methods in the area of medical imaging applications. The main focuses of the research in the laboratory are methods of segmentation in the 3D visual medical data data (CT, MRI). Laboratory equipment consists mainly of powerful PCs.

ESET Research Centre (L. Hudec)

The ESET Research Centre is a joint project of ESET Ltd company, Slovak University of Technology and Comenius University. Common workplace allows closer links between university and industry and brings to university interesting problems and allows to create conditions (material, technical, know-how, personnel) for problem solution. Centre differs from others labs in a way that it does not offer only technical equipment, but also know-how in the form of specialized teaching modules. Alongside with lectures Eset will also provide guidance of exercises and consultations. In addition to lectures joint workplace develops other forms of cooperation - experts from ESET, STU and UK lead jointly diploma and bachelor thesis. In the ESET Research Centre Lab the 12 workstations for students, one teacher's workstation, server, and Internet connection is installed. On workstations Windows operating system with applications for carrying out a reverse engineering (machine code analysis) is installed.

Intelligent Systems Laboratory (P. Návrát)

The laboratory is used for research of a wide spectrum of problems that fall into the field of program and information systems mainly in the scope of artificial intelligence. The projects solved are concerned with the methods of knowledge system development with a special

focus on multi-agent systems and their collaboration, as well as intelligent search, delivery, and presentation of heterogeneous information in a distributed environment such as Internet, including categorisation and recommendation of the information. The laboratory is equipped with fairly powerful computer systems and advanced software tools that correspond to the demands of the projects being solved. The equipment is regularly renewed thanks mainly to continuous success in grants including international ones.

Advanced Software Development Laboratory (I. Polášek)

The laboratory is used for research in the area of UML modeling using multidimensional space to support analysis and design of the large software systems. The laboratory is equipped with new powerful computer system and various I/O devices (leap motion, 3D mouse SpaceNavigator and 3 interconnected 3D monitors). Many students in their bachelor, team and diploma projects help us create first prototypes. In the next period, research projects will make use of the facilities available in the laboratory. Collaboration with other research teams with similar laboratories is also envisaged. We shall also seek collaboration with companies from IT sector for validation and deployment our prototypes. We plan to create a working prototype of a CASE system to support the development of software products using 3D UML and offer it to the partners and IT companies.

User Experience and Interaction Research Center (M. Bielíková)

User Experience and Interaction Research Center consists of two labs:

1) Engelbarts's Laboratory of User Experience Research (nicknamed UX Lab). Named after Douglas Engelbart, the creator of a first computer mouse, the lab is primarily focused on detailed monitoring of behaviour of an individual computer user. It is ideal for qualitative user studies. The highly precise sensors, devices and software in the lab are suitable for investigation, what experience the user has, when he interacts with given applications, performs given tasks or even spends his leisure time. The sensors not only track the user's gaze, but also expression of his face, physiology and neuroelectrical activity. The lab consists of multiple rooms connected with semi-transparent glass, which enables observation of the experiment participant's behaviour without disturbances.

2) Simon's Laboratory of personalized learning (nicknamed UX Group). Named after Nobel Prize laureate Herbert A. Simon, the classroom-style lab is designed for simultaneous monitoring of behaviour of groups of users. It especially enables largescaled quantitative user studies. It comprises twenty workstations, each equipped with an eye-tracker and a depth camera. All workstations are connected to a single information system, which is capable of real-time transfer of all necessary data to central storage, from where they can be further analysed.

VII. MEMBERSHIP

Slovak Professional Organisations and Societies

The whole institute is a collective member of Slovak Artificial Intelligence Society.

Michal Barla

- Slovak Society for Computer Science (member, since 2007)

Vanda Benešová

- SUXA- Slovak User Experience Association

Mária Bielíková

- Slovakia Chapter of the Association for Computing Machinery (member, since 2009)
- Slovak Artificial Intelligence Association (member, since 2000)
- Slovak Centre of the IET (member, since 1998)
- Slovak Society for Computer Science (member, since 1998; member of the executive committee, since 2000)

Pavel Čičák

- Slovak Centre of the IET (member, since 1999)
- Slovak Society of Computer Science (member, since 2012)

Daniela Chudá

- Slovakia Chapter of the Association for Computing Machinery (member, since 2009)
- Slovak Society for Computer Science (member, since 2012)

Ladislav Hudec

- Slovak Association for Information Security (member, since 1996; president since 1998, vice-president, since 2006)
- Slovak Chapter of the ISACA (member, since 2002)

Michal Kompan

- Slovak Society for Computer Science (member, since 2012)

Ivan Kotuliak

- Slovak Information Society (member, since 2013)

Tomáš Kramár

- Slovak Society for Computer Science (member, since 2012)

Tibor Krajčovič

- Slovak Commission for UNESCO. Informatics, Information and Communication Technologies (member, since 1994)

Eduard Kuric

- Slovak Society for Computer Science (member, since 2012)

Martin Labaj

- Slovakia Chapter of the Association for Computing Machinery (member, since 2011)
- Slovak Society for Computer Science (member, since 2012)

Peter Lacko

- Slovakia Chapter of the Association for Computing Machinery (member, since 2011)

Mária Lucká

- Slovak Society for Computer Science (member, since 2012)
- Slovakia Chapter of the Association for Computing Machinery (member)
- Slovak Association of Mathematicians and Physicists (member)

Alena Martonová

- Slovakia Chapter of the Association for Computing Machinery (member)
- SUXA- Slovak User Wxperience Association

Ludovít Molnár

- Working Group of the Accreditation Commission of Slovakia for Information Sciences and Technologies (member, since 2003)
- Slovak Commission for UNESCO (member since 1993, chair, since 1996)
- Slovak Society for Computer Science (member, since 1992)
- Technical Standardization Committee (member, since 1992)

Róbert Móro

- Slovakia Chapter of the Association for Computing Machinery (member, since 2016)

Pavol Návrat

- Slovakia Chapter of the Association for Computing Machinery (member, since 2009)
- Slovak Artificial Intelligence Association (since 2000), member of the executive committee and vice chairman (since 2000)
- Slovak Association of Mathematicians and Physicists (member, since 1982)
- Slovak Centre of the IET (member, since 1996)
- Slovak Society for Computer Science (member, since 1992)

Ivan Polášek

- Gratex IT Institute (supervisory board member, since 2008)
- Working Group on Information and Communication Technologies for RIS3 SK (member, since 2015)
- Slovak Gold committee for software products (member/chair, since 2012)

Karol Rástočný

- Slovakia Chapter of the Association for Computing Machinery (member, since 2011)
- Slovak Society for Computer Science (member, since 2012)

Viera Rozinajová

- Slovakia Chapter of the Association for Computing Machinery (member, since 2009)
- Slovak Society for Computer Science (member, since 2012; member of the executive committee, since 2012)

Jakub Šimko

- Slovak Society for Computer Science (member, since 2012)

Marián Šimko

- Slovakia Chapter of the Association for Computing Machinery (member, since 2009)
- Slovak Society for Computer Science (member, since 2012)

Valentino Vranič

- Slovak Society for Computer Science (member, since 2001)

International Professional Organisations and Societies*Vanda Benešová*

- ACM, Association for Computing Machinery (member, since 2013)
- IEEE, Institute of Electrical and Electronic Engineers (member, since 2013)
- IFIP, International Federation for Data Processing (member of Technical Committee TC13 – Human-Computer Interaction)

Mária Bieliková

- IEEE, Institute of Electrical and Electronic Engineers (member, since 1998; senior member since 2003)
- IEEE Computer Society (member, since 1997)
- IET, Institution of Engineering and Technology (member, since 1998)
- ECUK, Engineering Council UK (registered Chartered Engineer, since 1998)
- ACM, Association for Computing Machinery (member, since 1998; senior member since 2009)

- ACM SIGWEB, Special Interest Group on Hypertext the Web (member, since 2007)
- IFIP, International Federation for Data Processing (member of Technical Committee TC2 – Software: Theory and Practice, since 2008)
- ISWE, International Society for Web Engineering (member, since 2007)
- CaSTB, Czech and Slovak Testing Board, a member of ISTQB, International Software Testing Qualifications Board (member, since 2006)
- High Level Expert Group on Artificial Intelligence (European Commission) (member, since 2018)
- ADBIS, Advances in Databases and Information Systems Conference Series, standing Steering Committee (member, since 1998)
- Data and Knowledge – Annual Conference, standing Steering Committee
- SMAP – International Workshop on Semantic Media Adaptation and Personalization, standing Steering Committee (member since 2011)
- UM Inc., User Modeling (member of Directors at Large, since 2017)

Pavel Čičák

- IET, Institute of Engineering and Technology (fellow, since 2000)
- ECUK, Engineering Council UK (Chartered Engineer, since 2000)
- IEEE, Institute of Electrical and Electronic Engineers (member, since 2013)

Ladislav Hudec

- Information Systems Audit and Control Association (member, since 1998)

Viliam Solčány

- ACM, Association for Computing Machinery (member, since 2004)

Ján Hudec

- New York Academy of Sciences, member (member, since 1997)

Daniela Chudá

- ACM, Association for Computing Machinery (member, since 2009)

Katarína Jelemenská

- IEEE, Institute of Electrical and Electronic Engineers (member, since 2013)

Michal Kompan

- ACM, Association for Computing Machinery (member)
- IEEE, Institute of Electrical and Electronic Engineers (member, since 2017)

Martin Konôpka

- ACM, Association for Computing Machinery (member)

Ivan Kotuliak

- IEEE, Communication Society IEEE, IFIP WG 6.8 (member, since 2012)

Martin Labaj

- ACM, Association for Computing Machinery (member, since 2009)
- IEEE, Institute of Electrical and Electronic Engineers (member, since 2007)
- IEEE Computer Society (member, since 2007)

Peter Lacko

- IEEE, Institute of Electrical and Electronic Engineers (member, since 2008)
- IEEE Computer Intelligence Society (member, since 2008)
- ACM, Association for Computing Machinery (member, since 2010)
- ACM SIGHPC, Special Interest Group on High Performance Computing (member, since 2010)
- ACM SIGAI, ACM Special Interest Group on Artificial Intelligence (member, since 2017)

Ján Lang

- ECBS, European Conference on Engineering of Computer Based Systems (member, since 2011)
- IGIP, International Society for Engineering Pedagogy (member, since 2006)

Mária Lucká

- IEEE, Institute of Electrical and Electronic Engineers (member, since 2008)
- ACM, Association for Computing Machinery (member)

Dominik Macko

- IEEE, Institute of Electrical and Electronic Engineers (member, since 2013)

Alena Martonová

- ACM, Association for Computing Machinery (member)

Ľudovít Molnár

- IEEE, Institute of Electrical and Electronic Engineers (member, since 1991)
- ACM, Association for Computing Machinery (member, since 1991)
- UNESCO (Slovak Commission: member of bureau –1993-96, chair – since 1996, Informatics section – chair since 1993. HQ Paris: IIP – member of bureau –1996-98, chair – 1998-2001, IFAP – member of bureau – since 2001. Executive Board – member – since 2001)
- ICETA, member of honorary committee

Róbert Móra

- ACM, Association for Computing Machinery (member, since 2011)

- ACM SIGCHI, Special Interest Group on Computer-Human Interaction (member, since 2017)

Pavol Návrat

- IEEE, Institute of Electrical and Electronic Engineers (member, since 1996; senior member, since 1998)
- IEEE Computer Society (member, since 1996)
- ACM, Association for Computing Machinery (member, since 1998; senior member since 2009)
- IFIP, International Federation for Data Processing (member of Technical Committee TC12 – Artificial Intelligence, since 1998)
- IET, Institution of Engineering and Technology (member, since 1998; fellow, since 1998)
- ECUK, Engineering Council UK (registered Chartered Engineer, since 1998)
- JCKBSE, Joint Conference on Knowledge-Based Software Engineering Series, standing Steering Committee (member, since 1998)
- ECBS, European Conference on Engineering of Computer Based Systems, standing Steering Committee (member, since 2013)

- ADBIS, Advances in Databases and Information Systems Conference Series, standing Steering Committee (member, since 1998)

Viera Rozinajová

- ACM, Association for Computing Machinery (member, since 2009)
- IFIP, International Federation for Data Processing (member of Technical Committee TC8 – Information Systems as national representative, since 2012)

Marián Šimko

- ACM, Association for Computing Machinery (member, since 2009)
- ACM, Association for Computational Linguistics (member, since 2018)

Valentino Vranić

- ACM, Association for Computing Machinery (member, since 2018)
- Hillside Europe (member, since 2017)

FIIT PERSONNEL

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Šípková Tatiana

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Teachers

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Čerňanský, Michal, doc. Ing. PhD. (part-time)

Čičák, Pavel, prof. Ing. PhD. (part-time)

Drahoš, Peter, Ing. PhD. (till June)

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Hudec, Ján, Ing. PhD.

Hudec, Ladislav, doc. Ing. PhD.

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Krištofík, Štefan, Ing. (part-time)

Laštinec, Ján, Ing. PhD. (part-time)

Macko, Dominik, Ing.

Pšeneková Judita, Mgr. (part-time)

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Kazička, Roman, Ing. PhD.

Kováč, Martin, Ing.

Kováčik Tomáš, Ing. PhD.

Kvasnička, Vladimír, prof. Ing. DrSc.

Munka, Juraj, PaedDr.

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Doubravský, Lukáš, Ing.

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Fogelton, Andrej, Ing.

Galinski, Marek, Ing.

Grežo, Rudolf, Ing.

Hucková, Ivana, Ing.

Hudec, Lukáš, Ing.

Jakab, Marek, Ing.

Kompánek, Matej, Ing.

Košťál, Kristián, Ing.

Kudlačák, František, Ing.

Kunštár, Vladimír, Ing.

Lúčanský Ján, Ing.

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Mastíľak, Lukáš, Ing.

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Bou Ezzeddine, Anna, RNDr. PhD.

Grmanová, Gabriela, Mgr. PhD.

Chudá, Daniela, doc. Mgr. PhD.

Kapustík, Ivan, Ing.

Kompan, Michal, Ing. PhD.

Kuric, Eduard, Ing. PhD.

Lacko, Peter, Ing. PhD.

Lang, Ján, Ing. PhD.

Lekavý, Marián, Ing. PhD. (part-time) (till May)

Lucká, Mária, doc. RNDr. PhD.

Malkin Ondik, Irina, Dr.

Martonová, Alena, Mgr. PhD.

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 Móro, Róbert, Ing. PhD.
 Návrát, Pavol, prof. Ing. PhD.
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 Srba, Ivan, Ing. PhD.
 Šimko, Jakub, Ing. PhD.
 Šimko, Marián, doc. Ing. PhD.
 Tvarožek, Jozef, Mgr. PhD.
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Bachratý, Viktor, Ing. (till August)
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 Ševcech, Jakub, Ing. PhD.

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 Frič, Pavol, Ing. PhD.
 Farkaš, Igor, Ing. PhD.
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 Holas, Juraj, Mgr.
 Hošková, Dominika, Ing.
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 Kloska, Matej, Ing.
 Jakubík, Jaroslav, Ing. PhD.
 Kaššák, Ondrej, Ing. PhD.
 Krajčovič, Dušan, RNDr. CSc.
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 Krátky, Peter, Ing. PhD.
 Kramár, Tomáš, Ing. PhD.
 Krammer, Peter, Ing.
 Kučečka, Tomáš, Ing.
 Kuzma, Tomáš, Mgr.
 Lukočka, Robert, RNDr. PhD.
 Major, Marián, Ing.
 Markovič, Lukáš, Ing.
 Marsenič, Alexandra, RNDr. PhD.
 Mazák, Ján, Mgr. PhD.
 Miťková, Veronika, Ing. PhD.
 Nagy, Roman, RNDr.

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 Papula, Jozef, prof. Ing. PhD.
 Pokorný, Jaroslav, prof. RNDr. CSc.
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 Repka, Marek, Ing. PhD.
 Sabo, Štefan, Ing. PhD.
 Skúpa, Katarína, Mgr.
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 Suchal, Ján, Ing.
 Šaloun, Petr, doc. RNDr. PhD.
 Šešera, Ľubor, RNDr. PhD.
 Šoltésová, Danica, Mgr. PhD.
 Šuráb, Marian, doc. ThDr. PhD.
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 Zeman, Jakub, Mgr.
 Železnák, Andrej, Ing.

Doctoral students

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 Konôpka, Martin, Ing.
 Labaj, Martin, Ing.
 Laurinec, Peter, Mgr.
 Loeb, Jaroslav, Ing.
 Lóderer, Marek, Ing.
 Macko, Peter, Ing.
 Magyar, Róbert, Ing.
 Pecár, Samuel, Ing.
 Petrik, Juraj, Ing.
 Pikuliak, Matúš, Ing.
 Pomffyová, Miriama, Ing.
 Rác, Miroslav, Ing.
 Sitarčík, Jozef, Ing.
 Stupavský, Igor, Ing.
 Sulaiman Khail, Waheedullah, Ing.
 Svrček, Martin, Ing.
 Šelmeci, Roman, Ing.
 Vincúr, Juraj, Ing.
 Vrabecová, Petra, Ing.

Center of Computing and Communication Services

Brath, Peter
 Gozora, Dominik
 Gnipová, Marta, RNDr.
 Grell, Peter
 Hauskrecht, Martin, Bc.
 Husár, Patrik, Bc.
 Kanát, Oliver (Since September)

Kollár, Ivan, Ing.
Kollár, Michal (Since September)
Krajčovič, Tibor, doc. Ing. PhD. (part-time)
Malina, Dušan, Ing.
Maliniaková, Karin (Since September)
Pešek, Radovan, Bc. (par-time)
Steinmüller, Branislav, Ing.
Stovíček, Roman, Ing. PhD.

Center of Information and Library Services

Falbová, Lucia, Mgr.
Gábrišová, Henrieta, Mgr. PhD.

Deanship*Faculty Secretary*

Palatinusová, Ľubica, Ing.

Economics

Danišová, Viera, Mgr.
Somogyiová, Mária (Since February)
Švajdlénková, Daniela
Kitanovicsová, Miriam
Lakušová, Anna
Mišíková, Zuzana

Personal Resources

Breznenová, Soňa
Nižnanská, Erika, PhD.
Škorecová, Jarmila, Mgr. (Since September)

Projects

Borđoy, Viera, Mgr. MSc. (Since October)
Gubová, Jana, Mgr.
Mršková, Katarína, RNDr. PhD.

Public Relations

Marušincová, Zuzana
Reis, Martina, Ing.

Secretariat

Kozíková, Zuzana, Mgr.

Study Affairs

Flesarová, Adriána, Ing.
Horniaková, Zuzana, Mgr.
Husková, Ľubica
Tekulová, Zuzana, Mgr.

Center of Industry Research

Rošková, Barbora, Mgr.
Slezáková, Miroslava, Mgr.

Center of Further Learning

Čičák, Pavel, prof. Ing. PhD. (part-time)

Department of Technical Operation and Management

Balšan, Viliam
Balážová, Rozália
Blažková, Katarína
Borsová, Diana
Čičátka, Aurel
Dúbravský, Jozef, Ing. PhD.
Dudák, Vladimír
Figura, Zdenko
Glaczynská, Helena
Kauzlaričová, Emília
Janata, Ján (Since December)
Matejka, Pavol
Mišíková, Jana
Molnár, Oto
Orlovský, František
Potančok, Milan, Ing. Mgr. PhD.
Špička, Ján, Ing.
Toman, Ladislav
Vašinová, Daniela
Vyšvaderová, Júlia (Since June)
Warosch, František

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