

DEPARTMENT OF CYBERNETICS AND ARTIFICIAL INTELLIGENCE

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Head of Department
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1 DEPARTMENT'S PROFILE

The Department (DCAI) is responsible for education in the following bachelor study programs: Cybernetics, Intelligent Systems, and Business informatics; in the following master study programs: Cybernetics and Information-Control Systems, Artificial Intelligence, Business Informatics; and following PhD-study programs: Cybernetics and Information-Control Systems, Artificial Intelligence, and Business Informatics.

The main research topics at the Department are intelligent methods and algorithms for control and modeling of large-scale systems; risk-sensitive diagnosis of uncertain systems; computational intelligence techniques for modeling of intelligent systems and miscellaneous applications; intelligent decision support systems; pattern recognition; knowledge discovery; knowledge technologies for information retrieval and knowledge management and business information systems.



The predecessor of the Department was founded in 1964. Department of Cybernetics and Artificial Intelligence was adapted in 1989. Currently it has 26 staff members, 26 internal and 11 external Ph.D. students. There are 3 research centers within the department: Center of Intelligent Technologies, Center of Applied Cybernetics and Center of Business Informatics (<http://web.tuke.sk/kkui/en/vyskumne-skupiny-a-projekty>). The Department is involved in a number of research and educational projects.

2 STAFF

Professors: prof. Ing. Dušan Krokavec, CSc.
Dr.h.c. prof. Ing. Ladislav Maďarász, CSc.
prof. RNDr. Eva Ocelíková, CSc.
prof. Ing. Ján Paralič, PhD.
prof. Ing. Tomáš Sabol, CSc.
prof. Ing. Ján Sarnovský, CSc.
prof. Ing. Peter Sinčák, CSc.
prof. Ing. Iveta Zolotová, CSc.

Associate Professors: doc. Ing. Anna Filasová, CSc.
doc. Ing. Anna Jadlovská, PhD.
doc. Ing. Ján Jadlovský, CSc.
doc. Ing. Marián Mach, CSc.
doc. Ing. Kristína Machová, CSc.

Assistant Professors: Ing. František Babič, PhD.
Ing. Peter Butka, PhD.
Dr. Ing. Vratislav Hladký
Ing. Rudolf Jakša, PhD.
Ing. Ján Liguš, PhD.
Ing. Jana Ligušová, PhD.
Ing. Martin Sarnovský, PhD.
Dr. Ing. Ján Vaščák

Researchers: Ing. Marek Bundzel, PhD.
Ing. Jozef Wagner, PhD.
Ing. Gabriel Tutoky, PhD.

Technical Staff: Tatiana Baňasová
Jakub Šterbák

Ph.D. Students:

1^{st.}

Internal

Ing. Tomáš Cádrik
Ing. Michal Kopčík
Ing. Tomáš Lojka
Ing. Gergely Magyar
Ing. Ladislav Nyulászai
Ing. Michal Puheim
Ing. Eva Turňová

External

Ing. Miloš Ľos

2nd.	Internal Ing. Radoslav Bielek Ing. Jakub Čerkala Ing. Cecília Havrilová Ing. Pavol Liščinský Ing. Daniel Lorenčík Ing. Peter Michalik Ing. Martina Tarhaničová	External Ing. Ján Adamčák Ing. Ladislav Miženko Ing. Matúš Molčányi
3rd.	Internal Ing. Vladimír Gašpar Ing. Slávka Jadlovská Ing. Alexandra Lukáčová Ing. Martin Paľa Ing. Peter Papcun Ing. Vladimír Serbák Ing. Ján Štofa	External Ing. Mousa Younes Alfitorey Ing. Róbert Fónod Ing. Jan Liguš Ing. Peter Szabó
4th.	Internal Ing. Matej Čopík Ing. Pavol Jasem Ing. Mgr. Peter Koncz Ing. Roman Mihal' Ing. Mária Virčíková	
5th.	Internal	External RNDr. Marcel Kudláč Ing. Stanislav Dvorščák Ing. Peter Kubičko

3 LABORATORIES

- CyberEduCentre - <http://cybereducentre.feit.tuke.sk/cybereducentre/index.html>
- CyberVirtLab - <http://cybervirtlab.feit.tuke.sk/CyberVirtLab/>
- Laboratory of Intelligent Control Network and Software Systems for Control (L-509b), <http://cybereducentre.feit.tuke.sk/L509/>
- Laboratory of Cybernetics (L-513) <http://web.tuke.sk/kybernetika/labaky/L513/>
- Laboratory of Distributed Control Systems - ROCKWELL AUTOMATION LABORATORY (L-536), <http://lara.feit.tuke.sk/en/>
- Center for Intelligent Technologies: Laboratory of Autonomous Systems (LAS-CIT), Laboratory of Humanoid Robots (LHR-CIT) <http://www.ai-cit.sk>
- Research Center of Modern Control Techniques and Industrial Informatics – CMCT_II (<http://kyb.feit.tuke.sk>)
- Laboratory of Production Lines and Image Recognition (V147 - CMCT_II) <http://kyb.feit.tuke.sk/laben/miest/V147.php>
- Laboratory of Process Control (V144 - CMCT_II) <http://kyb.feit.tuke.sk/Laboratoria/miest/V144.php>
- Laboratory of Mechatronics Systems (V142 - CMCT_II) <http://kyb.feit.tuke.sk/Laboratoria/miest/V142.php>

- Laboratory of Robotics (V134 - CMCT_II)
<http://kyb.fe.i.tuke.sk/Laboratoria/miest/V134.php>
- Laboratory of Knowledge Technologies (V-101a)
- Laboratory of Computer Control Systems Design (V101b - CMCT_II),
<http://kyb.fe.i.tuke.sk/lab/en/miest/V101b.php>
- Laboratory of intelligent control systems of aircraft engines (in cooperation with Faculty of Aeronautics) <http://lirslm.fe.i.tuke.sk>
- Laboratory of Business processes (B11)

4 TEACHING

4.1. Undergraduate Study (Bc.)

Subject	Semester	Lectures/exercises (hours per week)	Name of lecturer
Computers and Algorithms	2 nd	2/2	Jadlovská, Jadlovský
Introduction to Business Informatics	2 nd	2/2	Paralič, J.
Elements of Control Systems	2 nd	2/2	Hladký
Artificial Intelligence I.	2 nd	2/2	Machová
Simulation systems in Business Informatics	2 nd	2/2	Jadlovská, Hladký
Foundations of Automatic Control	3 rd	2/2	Madarász
Simulation Systems	3 rd	2/2	Jadlovská
Artificial Intelligence II.	3 rd	2/2	Sinčák, et al.
Knowledge-Based Systems	3 rd	2/2	Machová
Office Information Systems	3 rd	1/2	Zolotová
Applications of Operation Systems in Management	3 rd	2/2	Liguš
Application Programming	3 rd	2/2	Jakša
Analyses and design of Information Systems	4 th	1/2	Sarnovský M., Babič
Control of Technological Processes	4 th	2/2	Liguš
Control and Visualization Systems	4 th	2/2	Zolotová
Identification and Modeling	4 th	2/2	Filasová
Linux I.	4 th	2/2	Jakša
Computer Tools for Technological Systems Control	4 th	2,2	Jadlovský
Applications of Artificial Intelligence	4 th	0/2	Sinčák
Scheduling and Logistics	4 th	2/2	Paralič, J.
Application programming	4 th	0/2	Jakša
Computer (Based) Control	5 th	2/2	Krokavec
Database Management System Applications	5 th	2/2	Ocelíková
Protocols and Interfaces	5 th	2/2	Jadlovský
Project Management	5 th	2/2	Sabol, Babič
Cybernetics and Management	6 th	2/2	Sarnovský, J.
System Analysis and Synthesis	6 th	2/2	Madarász
Artificial Intelligence Languages	6 th	2/1	Mach
Effective and financial management	6 th	2/2	Babič
Heuristic Optimization Processes	6 th	2/2	Mach

4.2. Graduate Study (Ing.)

Subject	Semester	Lectures/exercises (hours per week)	Name of lecturer
Optimal and Nonlinear Systems	1 st	2/2	Jadlovská, A.
Computer Vision	1 st	2/2	Bundzel
Intelligent Control Networks	1 st	2/2	Liguš
Knowledge Discovery	1 st	2/2	Paralič, J.
Information Systems for Business Processes	1 st	2/2	Zolotová
Discrete-time Systems	1 st	3/2	Krokavec, D.
Theoretical Foundations of Artificial Intelligence	1 st	2/2	Sinčák
Symbolic Artificial Intelligence	1 st	2/2	Mach
IT Environment Control	1 st	2/2	Sarnovský M., Furdík
Online Identification	1 st	2/2	Krokavec
Logic Control	1 st	2/2	Liguš
XML Technologies	1 st	1/2	Mach
Distributed Control Systems	2 nd	2/2	Jadlovský
Control and Artificial Intelligence	2 nd	2/2	Jadlovská
Robust Control	2 nd	2/2	Filasová
Evolutionary Algorithms	2 nd	2/2	Mach
Multicriterial Decision Making	2 nd	2/2	Ocelíková
Machine Learning	2 nd	2/2	Machová
Stochastic Systems	2 nd	2/2	Krokavec, D.
Fuzzy Decision Making	2 nd	2/2	Vaščák
Complexity and Decision Making	2 nd	2/2	Madarász
Engineering econometrics	2 nd	2/2	Krokavec
Speech Recognition	2 nd	2/2	Krokavec, D.
Intelligent Sensor Systems	2 nd	2/2	Krokavec, D.
Interactive Systems	2 nd	2/1	Jakša
Integrated manufacturing systems	3 rd	3/2	Madarász
Humanoid Technologies	3 rd	2/2	Jakša
Dynamic Systems Diagnostics	3 rd	2/2	Krokavec, D.
Complex Systems Control	3 rd	2/2	Hladký
Management Information Systems	3 rd	2/2	Jadlovský
Complexity and Decision Making	3 rd	2/2	Madarász
Semantic and Social Web	3 rd	2/2	Machová
Neuro-fuzzy Systems	3 rd	2/2	Vaščák
Cybernetics	3 rd	2/2	Sarnovský, J.
Knowledge Management	3 rd	2/2	Paralič, J.
Philosophic Problems of Cybernetics and AI	4 th	2/2	Sarnovský, J.
Repetition of AI Foundations	4 th	0/2	Sinčák
AI Applications Seminar	4 th	2/2	Sinčák

5 RESEARCH PROJECTS

- ***Cognitive travelling in digital space of the Web and digital libraries supported by personalized services and social networks*** (project lead by FIIT STU Bratislava). Slovak Research and Development Agency, project no. APVV-0208-10, duration: 2011 – 2014, members: Ján Paralič (project leader for TUKE),

Peter Butka, Peter Koncz, František Babič, Gabriel Tutoky. Activities: The metaphor of cognitive travelling in the digital space describes a (curious) user who moves in the web or libraries. Travelers leave traces in digital space – evaluations, recommendations, annotations etc. They communicate with others forming communities of shared interests. Users learn more if the information is suitably presented or visualized. Designed and implemented models and prototypes of web services will make use of descriptions of semantics of a given domain, documents and user profile (ontologies, folksonomies). Methods will include both targeted search (e.g. query enrichment or reformulation before submitting to search engines, discovering users' specific needs) and also an exploratory search (browsing information sources without having a precise goal). This research contributes to shifting from providing documents in response to a query to providing answers.

- **Dynamic hybrid architectures in multiagent network control systems**, Scientific Grant Agency project No. 1/0286/11, duration: 2011 – 2014, members: Ján Sarnovský (project leader), Ján Liguš, Vratislav Hladký, Ján Jadlovský, Anna Jadlovská, Iveta Zolotová, Eva Ocelíková, Jana Ligušová, Peter Karch, Slávka Jadlovská, Peter Papcun, Jakub Čerkala, Štefan Jajčišin and Michal Kopčík. Activities: The project aims to research methods and algorithms for decision making and management of automatic control systems using the paradigm of hybrid approaches to managing complex systems utilizing methods of artificial intelligence. A tighter focus of the project is research, development and implementation of algorithms and methods for managing multi-agent network management systems (MANMS), where particular agents of MASRS cooperate and communicate via Wifi stochastic communication network. Based on MASRS modeling and formalizing of control processes will be further developed specific algorithms for optimal reconfiguration of MASRS architecture, taking into account redundancy to achieve the best quality of control for the selected MANMS configuration. When designing the control algorithms theoretical knowledge of cybernetics and information theory will be used with application of Ashby's law of requisite Variety. The project is also intended to formalize the design of control algorithms and design of dynamic network architectures of industrial network management systems, which will be verified in the lab as well as in practice, in cooperation with the U. S. Steel Košice, Cybernetics Ltd., Košice and MDJ Ltd., Košice.
- **Digital control of complex systems with two degrees of freedom**, Scientific Grant Agency project No. 1/0298/12, duration: 2012 – 2014, members: Ladislav Madarász (project leader), František Adamčík (project vice leader), Rudolf Andoga (project vice leader), Ladislav Főző, Tobiáš Lazar, Jozef Považan, Marián Hocko, Ján Kabát, Jozef Judičák, Ján Kolesár, Milan Seman, Vladimír Gašpar, Vratislav Hladký, Ján Labun, Peter Malatin, Michal Puheim, Ladislav Nyulászi, Maroš Komjáty, Marek Češkovič and Róbert Bréda. Activities: The proposed project is aimed on research of progressive methods of control for complex systems with orientation at the complex systems with several degrees of freedom. In the area of design, the main aim will be the research of situational control methods with the use artificial intelligence (neural networks, fuzzy inference systems, expert systems). The particular methodological contribution of the project will be the expected integration of the proposed control algorithms with modern approaches in modeling of complex systems, intelligent diagnostics and digital measurement - action elements. The proposed methods and their generalization will be tested in

laboratory conditions in the area of aircraft turbo-compressor engines on the particular object of a small turbojet engine MPM-20. The scientific goals of the project can be decomposed into three thematic areas: modeling of complex systems, control of complex systems and diagnostics of complex systems. The real object for application of the proposed methods will be a small turbojet engine MPM-20 as a complex multi-parametric system with two control inputs and several outputs.

- ***Integrated design of reconfigurable control structures and embedded diagnostics***, Scientific Grant Agency project No. 1/0256/11, duration: 2011 – 2013, members: Dušan Krokavec (project leader), Filasová Anna, Hladký Vratislav, and Daniel Gontkovič. Activity: The project is focused on design of fault-tolerant control systems (FTCS). The basic research is fundamental part of the project, which is driven for active FTCS with embedded diagnosis in suitable reconfigurable structures, undertaken in performance of the fault detector embedded in the control loop, and constructed in the framework of the integrated design. The focal scientific points of the project are dedicated to development of new design algorithms guarantying stability of fault-tolerant systems and optimized with respect to conflicting requirements among stability, redundancy, and graceful performance degradation; the terminal scientific objectives are dedicated to residual signals embedded in the control loop, with explicit consideration on residual decoupling and evaluation, reconfiguration control methods, as well as to appropriate procedures associated with decoupling of interacting multiple control structures.
- ***Methods for analysis of collaborative processes mediated by information systems***, Scientific Grant Agency project No. 1/1147/12, duration: 2012 – 2015, members: Ján Paralič (project leader), František Babič, Kristína Machová, Martin Sarnovský, Peter Butka, Karol Furdík, Gabriel Tutoky, Jozef Wagner, Martin Repka, Peter Koncz, Adela Tušanová, Alexandra Lukáčová, Ján Štofa, Cecília Havrilová, Eva Turňová. Activities: This project focuses on research of methods for analysis of collaborative processes, which are mediated by information systems. In these processes collaboration of more people is necessary in order to achieve a common goal. This common goal is usually some kind of artifact (e.g. a product, service, method or new knowledge in explicit form). We focus on the following aspects: 1. *Process aspect* – methods for analysis of sequences of events in these collaborative processes. 2. *Social aspect* – methods for analysis of various types of interactions between actors of collaborative processes, especially: a. Analysis of collaborative networks derived from interactions between process' actors, b. Sentiment analysis in such kind of processes, where (at least some) activities are available in textual form. 3. *Economical aspect* – methods suitable for evaluation of changes in collaborative processes caused by information systems' usage.
- ***CyberLabTrainSystem - Demonstrator and Trainer of Information - Control Systems***. Cultural and Education Grant Agency Project No. 021TUKE-4/2012, duration 2012 – 2014, members: Iveta Zolotová (project leader), Anna Jadlovská, Eva Ocelíková, Ján Jadlovský, Ján Sarnovský, Vratislav Hladký, Ján Liguš, Jana Ligušová, Peter Karch, Roman Mihaľ, Peter Kubičko, Štefan Jajčišin, Slávka Jadlovská, Peter Michalik, Jakub Čerkala, Lukáš Laciňák. Activities: The main project objective is the creation of demonstrational and training laboratory workplace to support teaching within the development and run-time use of information-control systems for different levels of factory control from the physical

processes at the lowest to the visualization and data management at the highest level. Project outputs will support the development of theoretical knowledge of students and its transformation into practical skills through a life cycle of comprehensive 3/17 identifier: 1304075960 CyberLabTrainSystem - demonstrator and trainer of information-control system real project with different access (also web access) and user rights and roles. The project supports the possibility to acquire different approaches and software products intended to promote designing of information-control systems. The project should supplement classical teaching students also with the support of Web-based Training technology, and increase interest of candidates for study in the Cybernetics field.

- ***Progressive methods of education in the area of control and modeling of complex systems object oriented on aircraft turbo-compressor engines***, Cultural and Education Grant Agency Project No. 018TUKE-4/2012, duration 2012 – 2014, members: : Ladislav Madarász (project leader), Rudolf Andoga (project vice leader), František Adamčík, Ladislav Főző, Tobiáš Lazar, Jozef Považan, Marián Hocko, Ján Kabát, Jozef Judičák, Ján Kolesár, Milan Seman, Vladimír Gašpar, Ján Labun, Peter Malatin, Michal Puheim, Ladislav Nyulász, Maroš Komjáty, Marek Češkovič and Róbert Bréda. The project is aimed on use of the small turbojet engine MPM-20 in the area of education in connection with the concluded project KEGA 001-010TUKE-4/2010, “The use of intelligent methods of control and modeling of aircraft engines in educational process”. The global aim of the project is to create grounds for an e-learning application and education by use of virtualization of the „Laboratory of Intelligent Control Systems of Aviation Engines“ and its multiplatform distance use. The upgrade of physical system of sensors, action elements and constructional enhancement of the object MPM-20 will allow students to Access modern Technologies used in control of large scale systems together with realization of a multimedia classroom. The studied area can be directly applied in subjects of university studies dealing with diagnostics, modeling and control of complex systems with perspective use in real-world practice.
- ***Virtual laboratory for business information systems***, Cultural and Educational Grant Agency project No. 065TUKE-4/2011, duration: 2011 -2013, members: Ján Paralič (project leader), František Babič, Kristína Machová, Martin Sarnovský, Karol Furdík, Peter Butka, Peter Bednár, Gabriel Tutoky, Jozef Wagner, Adela Tušanová, Peter Koncz, Alexandra Lukáčová, Ján Štofa, Eva Turňová. Activity: This project focuses on development and implementation of supporting on-line tools for education of selected courses in Business information systems at the Technical University in Košice. For this purpose there were designed and implemented electronic educational materials for particular courses, as well as suitable electronic services for active participation of students in virtual learning environment (including social network support and analysis), as well as methodology for Web based Training.
- ***Development of a Modern University Textbooks for a Core Units of the Newly Trasformed Study Programme Cybernetics and Information Control Systems***, Cultural and Educational Grant Agency project No. 034TUKE-4/2011, duration: 2011–2013, members: Anna Jadlovská (project leader), Ján Sarnovský, Iveta Zolotová, Ján Jadlovský, Vratislav Hladký, Ján Liguš, Jana Ligušová, Marek Bundzel, Ľuboš Popovič, Matej Čopík, Štefan Jajčišin, Slávka Jadlovská, Peter Papcun. Activity: The objective of the project is the preparation, design and

implementation of a number of modern university textbooks, the content of which will be methodically processed using the current level of knowledge in the discipline of "cybernetics" and oriented on the core units of the newly-transformed study program "Cybernetics and information-control systems" at the second (master) study degree. The project research team considers the existence of high-quality textbooks as an important basis for mastering the subjects at the second degree of studies. The textbooks will be accompanied by a set of solved and unsolved problems intended to be processed into functions, program modules and/or application libraries using an appropriately chosen programming environment (Matlab/Simulink, CPN Tools, Microsoft Visual Studio 2008 SQL Developer, Rockwell Automation software). The said problems can be addressed while solving individual tasks, assignments and semester projects, not least in the research, which takes place at the workplace of the project research team.

- **Development of the Centre of information and communication technologies for knowledge-based systems**, project No. 26220120030 supported by the Research & Development Operational Programme funded by the ERDF, duration: 2009 - 2013. Most of the department members have been involved in this project.
- **Center for Nondestructive Diagnostics of Technological Processes Using Standard Software for Control and Communication**, project No. 26220220182 supported by Research and Development Operational Programme funded by the ERDF, duration: 2013-2015, members: Ján Jadlovský (deputy principal investigator of Activity 3.1), Anna Jadlovská, Ján Sarnovský, Ivetta Zolotová, Matej Čopík, Štefan Jajčišin, Slávka Jadlovská, Peter Papcun, Jakub Čerkala, Radoslav Bielek, Michal Kopčík. Project is focused on nondestructive, contactless diagnostics of technological processes. It relies on image recognition systems where images are scanned by grayscale, color or thermovision cameras or by other means of contact-free scanning, such as systems based on eddy currents, ultrasonic devices, laser devices etc. This equipment is integrated into the control systems of technological processes and is interconnected with the mechatronic parts of production lines which include servo systems, manipulator, robots and a variety of actuators such as pneumatic and hydraulic drives. Such systems are supported by a wide range of hardware computing means (microcontrollers, programmable logical controllers, servers) with network connection and software support on all levels. The whole system has been built based on the five-level pyramid scheme (<http://kyb.fe.i.tuke.sk/lab/en/infdsr.php>).
- **IT4KT project (Information Technology for Knowledge Transfer)**, project No. 26220220123 supported by the Research & Development Operational Program funded by the ERDF, duration: 2010 - 2013, members from our department: Ján Paralič, Peter Butka, Martin Sarnovský, Jozef Wagner, Gabriel Tutoky, František Babič, Peter Koncz. Activity: this project is being solved at our Faculty of Electrical Engineering and Informatics as cooperation of researchers and educators from three different departments. We analyzed current learning processes and best practices on a set of 15 different courses from mathematics and computer science. Based on the analysis, crucial processes have been identified, modeled and will be supported by various electronic services – existing ones, which have been enhanced and combined with new types of services. All these activities are based on a common background of semantic technologies, where the shared semantics is modeled by means of an ontology.

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- **Support Patients through e-Services Solutions**, project no. 3CE286P2 supported by Central Europe Programme funded by ERDF, duration: 2011 – 2014, members from our department: František Babič (project leader), Jozef Wagner, Gabriel Tutoky. Activity: this projects implements tele-health, ambient assisted living and entertainment platform in 4 cities: Ferrara, Vienna, Brno and Kosice, focusing on the following target groups: people with serious respiratory problems, people with dementia, handicapped people and social exclusion. The main aim of the Košice pilot is to provide means which can improve social inclusion of older people through suitable ICT solutions designed and developed within this project.
- The Technical University of Košice was accepted as associate member of the **ALICE project** at the European Organization for Nuclear Research (CERN) on October 12th, 2012. On this occasion, the fortnightly newsletter ALICE MATTERS (http://alicematters.web.cern.ch/?q=TUKE_associate) published an article about our University. Members of the Research Center of Modern Control Techniques and Industrial Informatics at the Dpt. of Cybernetics and Artificial Intelligence, TUKE (Ján Jadlovský, Anna Jadlovská, Ján Sarnovský, Štefan Jajčišin, Matej Čopík, Slávka Jadlovská, Peter Papcun, Jakub Čerkala, Radoslav Bielek, Michal Kopčík) participate in implementing tasks related to the project, (<http://kyb.fei.tuke.sk/laboratoria/cern/cern.php>). They started to work on the modernization of the Detector Control System (DCS), focusing on the optimization of the data exchange interface between online and offline databases AMANDA SERVER 3.

6 CO-OPERATION

6.1. Co-operation in Slovakia

- Department of Automatic Control Systems Bratislava, Slovak University of Technology, Bratislava
- Institute of Intelligent Systems, Faculty of Informatics, Slovak University of Technology, Bratislava
- Faculty of informatics and information technologies, Slovak University of Technology in Bratislava
- Institute of Computer Science, Slovak Academy of Sciences in Bratislava
- Department of Biophysics IEP Slovak Academy of Science
- Institute of Computer Science, University of P.J. Šafárik, Košice
- Institute of Experimental Physics, Slovak Academy of Sciences
- Department of applied informatics (Centre for Cognitive Science), Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava
- Košice self-governing region
- The City of Košice
- Tatrabanka, a.s.
- IT Valley Kosice
- US Steel Košice

6.2. International Co-operation

- The Open University, Knowledge Media Institute, United Kingdom
- Helsinki University of Technology, Dipoli, Finland

- Department of Software Engineering and Interactive Systems, Vienna University of Technology, Austria
- University of Regensburg, Germany
- Hearing Research Center and Dept. of Cognitive and Neural Systems, Boston University, USA
- Center for Cognitive Neuroscience and Department of Psychology, Duke University
- Institute of Pathological Physiology, 1st Faculty of Medicine, Charles University, Prague
- Budapest Computational Neuroscience Group, Department of Biophysics, Hungarian Academy of Sciences
- Harvard Medical School – Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Boston, USA
- University of Dortmund, Germany
- Waseda University, Tokyo, Japan
- Technical University of Czestochowa
- Tokyo Institute of Technology, Japan
- Kyushu Institute of Technology, Japan
- Université Joseph Fourier Grenoble, IUT 1 (Institut Universitaire de Technologie 1), Grenoble, France
- Heudiasyc UMR CNRS 6599, UTC, Compiègne, France
- Université Henri Poincaré, Laboratoire CRAN (Centre de Recherche en Automatique de Nancy), Nancy 1, France
- Department of Informatics, Technical University, Ostrava, Czech Republic
- Department of Control Systems and Instrumentation, Faculty of Mechanical Engineering Technical University of Ostrava, Czech Republic
- Department of Cybernetics, Czech Technical University Prague, Czech Republic
- Department of Control Engineering, Czech Technical University, Prague, Czech Republic
- Institute of Information Theory and Automation, Academy of Sciences of Czech Republic, Prague, Czech Republic
- Department of Information Engineering, Faculty of Economics and Management, Czech University of Agriculture, Prague, Czech Republic
- University of Hradec Králové, Czech Republic
- Dept. of Computer Science and Engineering, Faculty of Applied Sciences, University of West Bohemia, Plzeň
- Faculty of Mechanical Engineering, Department of Automation, Institute of Information, University of Miskolc, Hungary
- Óbuda University, Budapest, Hungary
- Budapest University of Technology and Economics, Hungary
- California Institute of Technology, Jet Propulsion Laboratory (Dr. Antal, K. Bejczy), USA, California
- Hungarian Academy of Sciences, Computer and Automation Research Institute, Hungary (prof. Gyorgy Kovács)
- Regional Association of the Hungarian Academy of Sciences, Miskolc, Hungary
- Austrian Academy of Sciences, Acoustics Research Institute (Bernhard Laback)
- Auditory Neuroscience Group, Department of Physiology, University of Sydney

6.3. Membership in International Organizations and Societies

- Jakša, R.: IEEE, Computational Intelligence Society
- Krokavec, D.: Member of the International Federation of Automatic Control IFAC Technical Committee TC 1.4 Stochastic Systems
- Liguš, J.: EAEEIE – European Association for Education in Electrical and Information Engineering
- Madarász, L.: Doctor honoris causa, University of Miskolc (2009)
- Madarász, L.: Honorary professor, Óbuda University Budapest, Hungary (2009)
- Madarász, L.: Honorary Member of the Board of Hungarian Academy of Sciences (2000)
- Madarász, L.: Chairmanship member of the Technical Section, Association of Hungarian Professors (2001)
- Madarász, L.: Honorary Professor, Bánky Donát Polytechnic, Budapest, Hungary (1999)
- Madarász, L.: Membership of Associate Editors, Acta Polytechnica Hungarica, Budapest Tech, Hungary (2004)
- Madarász, L.: Honorary Membership in Hungarian Fuzzy Association, Budapest Hungary (2002)
- Madarász, L.: American Biographical Institute, Gold Record of Achievement, Control of Large Scale Systems, USA (1997)
- Madarász, L.: The American Biographical Institute, The Research Board of Advisors (1996)
- Madarász, L.: Honorary Fellow of microCAD The University of Miskolc (2005)
- Ocelíková, E.; Sinčák, P.; Zolotová, I.: CPRS - Czech Pattern Recognition Society
- Ocelíková, E.: CSSS - Czech and Slovak Society for Simulation
- Machová, K.: ACM – Association of Computer Machinery
- Paralič, J.: ACM – Association of Computer Machinery, IEEE
- Sabol, T.: Information Society Technologies Program Committee (IST PC), 5th Framework Program, Brussels
- Sarnovský, J.: IEEE
- Sarnovský, J.: INES - International Network of Engineers and Scientists for Global Responsibility
- Sarnovský, J.: Principia Cybernetica Web PRNCYB-L
- Sarnovský, J.: SWISS - Supplementary Ways for Improving International Stability
- Sinčák P.: European Society of Neural Networks
- Sinčák P.: IEEE, Computational Intelligence Society
- Vaščák, J.: IEEE, Computational Intelligence Society
- Zolotová, I.: IEEE, Education Society
- Zolotová, I.: EAEEIE – European Association for Education in Electrical and Information Engineering

6.4. Membership in Slovak Organizations and Societies

- The whole Department of Cybernetics and Artificial Intelligence is a team member of:
 - Slovak Society for Cybernetics and Informatics
 - Slovak AI Society
- Filasová, A.: Slovak Society for Cybernetics and Informatics
- Krokavec, D.: Slovak Electrical Engineering Society

- Krokavec, D.: Scientific Grant Agency of Slovak Republic
- Krokavec, D.: Member of the Editorial Board of the Journal AT&P, Bratislava
- Madarász, L.: Member of the Editorial Board of the Journal AT&P, Bratislava
- Madarász, L.: Slovak Society for Cybernetics and Informatics
- Madarász, L.: Member of the Editorial Board of the Journal Transfer Inovácií, Faculty of Mechanical Engineering (2006)
- Madarász, L.: Member of the Editorial Board of the Acta Polytechnica Hungarica, Budapest Tech, Hungary (2006)
- Jadlovská, A; Ocelíková, E.; Sarnovský, J.: Slovak Society for Cybernetics and Informatics
- Paralič, J.: Slovak Society for Computer Science
- Sabol, T.: Board of the Open Society Fund, Bratislava
- Zolotová, I.: Slovak Research and Development Agency

6.5. International Networks and Exchange Programs

- SALEIE, Strategic Alignment of Electrical and Information Engineering in European Higher Education Institutions, Reference number: 527877-LLP-1-2012-1-UK-ERASMUS-ENW. Contact persons: Ján Liguš, Iveta Zolotová, Jana Ligušová.
- Socrates - Erasmus agreement between TU of Košice and Czech University of Life Sciences, Prague, Czech Republic. Contact person: Eva Ocelíková
- Socrates - Erasmus agreement between TU of Košice and Université Henri Poincaré, Nancy 1, France, Contact person: Ján Sarnovský
- Socrates - Erasmus agreement between TU of Košice and University Hradec Kralove, Czech Republic. Contact person: Ján Vaščák
- Socrates - Erasmus agreement between TU of Košice and Univesite de Technologie Compiegne, France, Contact person: Ján Liguš
- Socrates - Erasmus agreement between TU of Košice and Institut Universitaire de Technologie 1 de Grenoble 1, France, Contact person: Jana Ligušová
- OI-Net, European Academic Network for Open Innovation, Reference number: 542203-LLP-1-2013-1-FI-ERASMUS-ENW- Iveta Zolotová

7 THESES

Thesis type	Bachelor	Master	Doctoral
Number	106	134	6

8 OTHER ACTIVITIES

- SAMI 2013 (IEEE 11th International Symposium on Applied Machine Intelligence and Informatics) has been held January 31 - February 2, 2013 in Herľany, Slovakia
- SYMPOSIUM ON EMERGENT TRENDS IN ARTIFICIAL INTELLIGENCE & ROBOTICS has been organized in Kosice, September 15-17, 2013 with special workshop on Japanese robotics and Buddy Paddy competition.
- WIKT 2013 - 8th Workshop on Intelligent and Knowledge oriented Technologies 2013 co-organized by our department has been held November 21. - 22. in

Herľany.

- Znalosti (Knowledge) 2013, a member of our department was co-chairing the program committee of this Czech-Slovak scientific conference, organized in Ostrava, Czech republic, October 13-15, 2013
- Following the decision of the NOVOFER association trustees, foreign degree of Dennis Gabor Nobel Prize winner was awarded to Dr.h.c. prof. Ing. Ladislav Madarász, PhD., on 19th December 2013, during the 25th annual International Dennis Gabor Award ceremony in the Hungarian Parliament in the presence of Speaker of the National Assembly of Hungary Dr. László Kövér, government representatives, scientific institutions, industry and academia, for his achievements in research into methods of management of complex, hierarchical systems, their modelling, diagnosis and design, namely the development of the theory of situational management, design and development of a global strategy or control algorithm, application-specific methodology of situation management in various industries and other areas. Dr.h.c. prof. Ing. Ladislav Madarász, PhD is the first citizen of the Slovak Republic and the former Czechoslovakia to receive this award.
- Prof. Dr. Peter Sinčák was awarded with the title Honorary Professor of Óbuda University for his outstanding and long-term contribution to the scientific activities of Óbuda University on May 31, 2013.
- Mária Virčíková, MSc. was selected the top student personality of the year 2012/2013 and was awarded the Prize of the President of Slovak Republic in the category Informatics, mathematics and physics for her work in the field of artificial intelligence: Human-robot interaction in social robotics.

9 PUBLICATIONS

9.1. Books

- [1] ŽIVČÁK, Jozef - MADARÁSZ, Ladislav - HUDÁK, Radovan - RUDAS, Imre J.: **Methodology, Models and Algorithms in Thermographic Diagnosis** Topics in Intelligent Engineering and Informatics 5/ - [1. vyd.] - Berlin Heidelberg : Springer-Verlag - 2013. - 218 p.. - ISBN 978-3-642-38378-6.
- [2] REPKA, Martin - PARALIČ, Ján: **Company Networks Analysis** Neso-level structural analysis/ - [1. vyd.] - Saabrücken : LAP Lamber Academic Publishing - 2013. - 139 p.. - ISBN 978-3-659-44207-0.
- [3] LAZAR, Tobiáš - MADARÁSZ, Ladislav - GAŠPAR, Vladimír: **Procesná analýza odhadu efektívnosti identifikácie MPM s inteligentným riadením** / - 1. vyd - Košice : Elfa - 2013. - 160 s.. - ISBN 978-80-8086-200-8.
- [4] MACH, Marián: **Evolučné algoritmy** riešenie úloh/ - 1. vyd - Košice : FEI TU - 2013. - 135 s.. - ISBN 978-80-553-1445-7.
- [5] MACHOVÁ, Kristína: **Od adaptívneho k sémantickému webu** / - 1. vyd - Košice : TU - 2013. - 124 s.. - ISBN 978-80-553-1489-1.
- [6] POPOVIČ, Ľuboš - SARNOVSKÝ, Ján: **Princíp nevyhnutnej variety v systémoch riadenia** / - 1. vyd. - Košice : TU - 2013. - 132 s.. - ISBN 978-80-553-1518-8.
- [7] JAJČIŠIN, Štefan - JADLOVSKÁ, Anna: **Návrh algoritmov prediktívneho riadenia s využitím nelineárnych modelov fyzikálnych systémov** / - 1. vyd - Košice : elfa - 2013. - 139 s.. - ISBN 978-80-8086-229-9.
- [8] JADLOVSKÁ, Anna - JADLOVSKÁ, Slávka: **Moderné metódy modelovania a**

- riadenia nelineárnych systémov /** - 1. vyd - Košice : elfa - 2013. - 257 s.. - ISBN 978-80-8086-228-2.
- [9] OCELÍKOVÁ, Eva - LIGUŠOVÁ, Jana - TAKÁČ, Ladislav: **Databázové systémy a jazyk SQL /** - 1. vyd - Košice : FEI TU - 2013. - 165 s.. - ISBN 978-80-553-1266-8.
- [10] PILA, Ján - NEŠTRÁK, Dušan - ADAMČÍK, František - LABUN, Ján - BRÉDA, Róbert - ANDOGA, Rudolf: **Helicopter aerodynamics, structures and systems** Vysokoškolská učebnica/ - 1. vyd. - Košice : TU - 2013. - 410 s. [CD-ROM]. - ISBN 978-80-553-1241-5
- [11] BUNDZEL, Marek - ZOLOTOVÁ, Iveta: **Počítačové videnie v praxi /** - 1. vyd - Košice : elfa - 2013. - 90 s.. - ISBN 978-80-8086-225-1.
- [12] JADLOVSKÝ, Ján - ČOPÍK, Matej - PAPCUN, Peter: **Distribúované systémy riadenia /** - 1. vyd - Košice : elfa - 2013. - 215 s.. - ISBN 978-80-8086-227-5.
- [13] LIGUŠ, Ján - LIGUŠOVÁ, Jana: **Inteligentné riadiace siete /** - 1. vyd - Košice : elfa - 2013. - 199 s.. - ISBN 978-80-8086-226-8.
- [14] SARNOVSKÝ, Ján - HLADKÝ, Vratislav - JADLOVSKÁ, Anna: **Riadenie zložitých systémov /** - 2. dopl. vyd - Košice : Elfa - 2013. - 132 s.. - ISBN 978-80-8086-224-4.

9.2. Book chapters

- [15] REYES, Napoleon H. - SUSNJAK, Teo - BARCZAK, Andre L.C. - SINČÁK, Peter - VAŠČÁK, Ján: **Real-time fuzzy logic-based hybrid robot path-planning strategies for a dynamic environment /** - 2013. In: Efficiency and Scalability Methods for Computational Intellect. - Hershey : IGI Global, 2013 P. 115-141. - ISBN 978-1-4666-3942-3
- [16] ANDOGA, Rudolf - MADARÁSZ, Ladislav - KAROL', Tomáš - FŐZŐ, Ladislav - GAŠPAR, Vladimír: **Intelligent Supervisory System for Small Turbojet Engines /** - 2013. In: Aspects of Computational Intelligence: Theory and Applications. - Berlin Heidelberg : Springer-Verlag, 2013 P. 85-104. - ISBN 978-3-642-30667-9
- [17] ADAMČÍK, František - ANDOGA, Rudolf - MADARÁSZ, Ladislav - KRAJŇAK, Peter: **Elimination of Dynamic Errors of Thermocouples in Aircraft Engines Using Neural Networks /** - 2013. In: Aspects of Computational Intelligence: Theory and Applications. - Berlin Heidelberg : Springer-Verlag, 2013 P. 185-194. - ISBN 978-3-642-30667-9
- [18] TUTOKY, Gabriel - PARALIČ, Ján: **Weights Aging in Social Networks /** - 2013. In: Aspects of Computational Intelligence: Theory and Applications : Revised and Selected Papers of the 15th IEEE International Conference on Intelligent Engineering Systems 2011, INES 2011. - Berlin : Springer-Verlag, 2013 P. 207-218. - ISBN 978-3-642-30667-9 - ISSN 2193-9411
- [19] VAŠČÁK, Ján: **Prostředky umělé inteligence v humanoidní robotice /** - 2013. In: Sborník studijních materiálů ke kurzu Aplikace umělé inteligence : recenzovaný sborník. - Hradec Králové
- [20] SINČÁK, Peter - VIRČÍKOVÁ, Mária: **Ako dávať inteligenciu reálnym a virtuálnym robotom /** - 2013. In: Sborník studijních materiálů ke kurzu teoretické aspekty umělé inteligence. - Hradec Králové : Gaudeamus, Univerzita Hradec Králové, 2013 P. 50-65. - ISBN 978-80-7435-315-4
- [21] VIRČÍKOVÁ, Mária - SINČÁK, Peter: **Umělé emócie /** - 2013. In: Sborník studijních materiálů ke kurzu teoretické aspekty umělé inteligence. - Hradec Králové : Gaudeamus, Univerzita Hradec Králové, 2013 P. 66-78. - ISBN 978-80-7435-315-4
- [22] VAŠČÁK, Ján - REYES, Napoleon H.: **Use and Perspectives of Fuzzy Cognitive**

Maps in Robotics / - 2013. In: Fuzzy Cognitive Maps for Applied Sciences and Engineering : From Fundamentals to Extensions and Learning Algorithms. - Berlin: Springer, 2014 P. 253-266. - ISBN 978-3-642-39738-7

9.3. Journals

- [23] BUTKA, Peter - PÓCS, Jozef: **Generalization of one-sided concept lattices** / - 2013. In: Computing and Informatics. Roč. 32, č. 2 (2013), s. 355-370. - ISSN 1335-9150
- [24] ZOLOTOVÁ, Iveta - MIHAL', Roman - HOŠÁK, Rastislav: **Objects for Visualization of Process Data in Supervisory Control** / - 2013. In: Aspects of Computational Intelligence: Theory and Applications. - Berlin Heidelberg : Springer-Verlag, 2013 P. 51-61. - ISBN 978-3-642-30667-9
- [25] HOŠÁK, Rastislav - ZOLOTOVÁ, Iveta: **EPCics Diagram for Designing of Information Control Systems** / - 2013. In: International Journal of Mechanic Systems Engineering. Vol. 3, no. 1 (2013), p. 36-42. - ISSN 2226-6461
- [26] ŠUSTER, Peter - JADLOVSKÁ, Anna: **Application Results Identification Based on Genetic Algorithm in Nonlinear Control Design of Magnetic Levitation System** / - 2013. In: ElectroScope. Vol. 2013, no. 1 (2013), p. 1-10. - ISSN 1802-4564
- [27] REPKA, Martin - PARALIČ, Ján: **Advanced Analysis of Local Structures in Company Network** / - 2013. In: Journal of Convergence Information Technology. Vol. 8, no. 11 (2013), p. 645-654. - ISSN 1975-9320
- [28] BABIČ, František - HAVRILOVÁ, Cecília - PARALIČ, Ján: **Knowledge Discovery Methods for Bankruptcy Prediction** / - 2013. In: Lecture Notes in Business Information Processing : Business Information Systems. Vol. 157 (2013), p. 151-162. - ISBN 978-3-642-38365-6 - ISSN 1865-1348
- [29] KONCZ, Peter - PARALIČ, Ján: **Active Learning Enhanced Document Annotation for Sentiment Analysis** / - 2013. In: Lecture Notes in Computer Science : Availability, Reliability, and Security in Information Systems and HCI : Proceedings : IFIP WG 8.4, 8.9, TC 5 International Cross-Domain Conference, CD-ARES 2013, Regensburg, Germany, September 2-6, 2013. - Heidelberg : Springer, 2013 Vol. 8127 (2013), p. 345-353. - ISBN 978-3-642-40510-5 - ISSN 0302-9743
- [30] SARNOVSKÝ, Martin: **Application of ontologies and semantic web in it service management according to ITIL framework** / - 2013. In: International Journal of Research in Information Technology. Vol. 1, no. 9 (2013), p. 281-287. - ISSN 2001-5569
- [31] ŠTOFA, Ján - MICHALIK, Peter - ZOLOTOVÁ, Iveta: **Enterprise utilizing social web** / - 2013. In: Lecture Notes in Business Information Processing. Vol. 158 (2013), p. 290-297. - ISSN 1865-1348
- [32] KUBIČKO, Peter - LANDRYOVÁ, Lenka - MIHAL', Roman - ZOLOTOVÁ, Iveta: **Measurement, Classification and Evaluation of the Innovation Process and the Identification of Indicators in Relation to the Performance Assessment of Company's Innovation Zones** / - 2013. In: Advances in Production Management Systems : Competitive Manufacturing for Innovative Products and Services : Part 1. - Heidelberg : Springer, 2013 P. 661-668. - ISSN 1868-4238
- [33] FURDÍK, Karol - LUKÁČ, Gabriel - SABOL, Tomáš - KOSTELNÍK, Peter: **The Network Architecture Designed for an Adaptable IoT-based Smart Office Solution** / - 2013. In: International Journal of Computer Networks and Communications Security. No. 1 (2013), p. 216-224. - ISSN 2308-9830

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- [35] PAĽA, Martin - VIRČÍKOVÁ, Mária - SINČÁK, Peter: **Od priemyselných robotov k servisným a spoločenským robotom** / - 2013. In: ATP Journal. Č. 8 (2013), s. 46-47. - ISSN 1335-2237
- [36] BUTKA, Peter - BEDNÁR, Peter - MACH, Marián - FURDÍK, Karol - SMATANA, Peter: **Integrované softvérové prostredie pre kolaboratívne modelovanie politik** / - 2013. In: Transfer inovácií. Č. 26 (2013), s. 176-181. - ISSN 1337-7094
- [37] MADARÁSZ, Ladislav - LAZAR, Tobiáš - GAŠPAR, Vladimír - ANDOGA, Rudolf: **Komplexný výskum efektívnosti a inovácia technológie skúšok malého prúdového motora (1)** / - 2013. In: ATP Journal. Č. 9 (2013), s. 58-62. - ISSN 1335-2237
- [38] SARNOVSKÝ, Ján: **Autonómnosť a invariantnosť** / - 2013. In: ATP Journal. Roč. 19, č. 2 (2013), s. 11. - ISSN 1335-2237
- [39] SARNOVSKÝ, Ján: **Teória riadenia- nové oblasti** / - 2013. In: ATP Journal. Č. 5 (2013), s. 11-11. - ISSN 1335-2237
- [40] SARNOVSKÝ, Ján: **História teórie regulácie : Aurel Stodola** / - 2013. In: ATP Journal. Č. 8 (2013), s. 9-9. - ISSN 1335-2237
- [41] PAĽA, Martin - VIRČÍKOVÁ, Mária - SINČÁK, Peter: **Od priemyselných robotov k servisným a spoločenským robotom (2)** / - 2013. In: ATP Journal. Č. 9 (2013), s. 46-48. - ISSN 1335-2237
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- [43] MADARÁSZ, Ladislav - LAZAR, Tobiáš - ANDOGA, Rudolf - FŐZŐ, Ladislav - GAŠPAR, Vladimír: **Komplexný výskum efektívnosti a inovácia technológie skúšok malého prúdového motora (2)** / - 2013. In: ATP Journal. Roč. 20, č. 10 (2013), s. 58-61. - ISSN 1335-2237
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- [45] PAĽA, Martin - VIRČÍKOVÁ, Mária - SINČÁK, Peter - GAMEC, Ján: **Od priemyselných robotov k servisným a spoločenským robotom (3)** / - 2013. In: ATP Journal. Roč. 20, č. 10 (2013), s. 54-55. - ISSN 1335-2237
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- [49] BUTKA, Peter - PÓCS, Jozef - PÓCSOVÁ, Jana - SARNOVSKÝ, Martin: **Multiple Data Tables Processing via One-Sided Concept Lattices** / - 2013. In: Advances in Intelligent Systems and Computing. - Berlin : Springer-Verlag Berlin Heidelberg, 2013 Vol. 183 (2013), p. 89-98. - ISSN 2194-5357
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- of Information within Collaborative Policy Modelling Process in OCOPOMO /**
- 2013. In: International Journal of Digital Content Technology and its Applications. Vol. 7, no. 8 (2013), p. 865-873. - ISSN 2233-
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- [62] MICHALIK, Peter - ŠTOFA, Ján - ZOLOTOVÁ, Iveta: **The Use of Bpmn for Modelling The Mes Level in Information and Control Systems /** - 2013. In: Quality Innovation Prosperity. Roč. 17, č. 1 (2013), s. 39-47. - ISSN 1335-1745

9.4. Other publications

Publication Type	Confereces		Other
	Foreign	Home	
Number	40	93	4