DEPARTMENT OF CYBERNETICS AND ARTIFICIAL INTELLIGENCE

http://www.tuke.sk/kkui/
Tel./Fax: ++421 55 625 3574

Head of Department
prof. Ing. Ján Sarnovský, CSc.
E-mail: Jan.Sarnovsky@tuke.sk

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; business information systems; and computational and cognitive neuroscience.

The predecessor of the Department was founded in 1964. Department of Cybernetics and Artificial Intelligence was adapted in 1989. Currently it has 21 staff members, 23 internal and 11 external Ph.D. students. There are 3 sections within the department: Cybernetics and Automation, Artificial Intelligence, and Business Informatics. Within the Department there are active the following research Centers: Centre for Cybernetics (cybervirtlab.fei.tuke.sk/cybervirtlab/), Centre for Intelligent Technologies (www.ai-cit.sk) and Center of Modern Control Techniques and Industrial Informatics (kyb.fei.tuke.sk/laben).

The Department is involved in a number of research and educational projects. The following types of projects were under way in 2012: 1 Socrates thematic network, 1 US National Institutes of Health research project, 3 grants awarded by the Scientific Grant Agency, 1 grant awarded by the Slovak Research and Development Agency, 4 grants awarded by Cultural and Educational Grant Agency, 1 other international grant, 1 IBM Faculty Award, and 2 projects supported by the Research & Development Operational Programme funded by the ERDF. Moreover, thanks to the members of our department the Technical University of Košice was accepted as associate member of the ALICE project at the European Organization for Nuclear Research (CERN) in October 2012.

2   STAFF

Professors: prof. Ing. Dušan Krokavec, CSc.
Dr.h.c. prof. Ing. Ladislav Madarász, 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. Norbert Kopčo, PhD.
doc. Ing. Marián Mach, CSc.
doc. Ing. Kristína Machová, CSc.

Assistant Professors: Ing. František Babič, PhD.
Ing. Peter Butka, PhD.
Ing. Marek Bundzel, PhD.
Ing. Karol Furdík, 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. Rudolf Andoga, PhD.
Ing. Ladislav Fözö, PhD.
Ing. Stanislav Laciňák, PhD.

Ing. Jozef Wagner, PhD.
Ing. Gabriel Tutoky, PhD.

Technical Staff: Tatiana Baňasová
Mária Feješová
Jakub Šterbák

Ph.D. Students:
1[st.]

Internal	**External**
Ing. Radoslav Bielek	Ing. Ján Adamčák
Ing. Jakub Čerkala	Ing. Matúš Molčányi
Ing. Cecília Havrilová	Ing. Ladislav Miženko
Ing. Pavol Liščinský	
Ing. Daniel Lorenčík	
Ing. Peter Michalik	
Ing. Martina Tarhaničová	

2[nd.]

Internal	**External**
Ing. Vladimír Gašpar	Ing. Mousa Younes Alfitorey
Ing. Slávka Jadlovská	Ing. Róbert Fónod
Ing. Lukáš Laciňák	Ing. Nikola Kabakov
Ing. Alexandra Lukáčová	Ing. Jan Liguš
Ing. Martin Paľa	Ing. Peter Szabó
Ing. Peter Papcun	
Ing. Vladimír Serbák	
Ing. Ján Štofa	

3[rd.]

Internal
Ing. Matej Čopík
Ing. Štefan Jajčišin
Ing. Mgr. Peter Koncz
Ing. Roman Mihaľ
Ing. Adela Tušanová
Ing. Mária Virčíková

4[th.]

Internal	**External**
Ing. Ján Ilkovič	Ing. Stanislav Dvorščák
Ing. Martin Repka	Ing. Peter Kubičko

5[th.]

	External
	Ing. Marcel Kudláč

3   LABORATORIES

- Centre for Intelligent Technologies: Laboratory of Autonomous Systems (LAS-CIT), Laboratory of Humanoid Robots (LHR-CIT) http://www.ai-cit.sk
- Centre of Cybernetics (L-513) http://cybervirtlab.fei.tuke.sk/CyberVirtLab/, http://web.tuke.sk/kybernetika/labaky/L513/
- Center of Modern Control Techniques and Industrial Informatics - CMCT_II (http://kyb.fei.tuke.sk/laben)
- Laboratory of Intelligent Information and Control Systems (L-535),

http://web.tuke.sk/kybernetika/labaky/L535.html
- Laboratory of Distributed Control Systems - ROCKWELL AUTOMATION LABORATORY (L-536), http://web.tuke.sk/kybernetika/labaky/L536.html
- Laboratory of intelligent control systems of aircraft engines (in cooperation with Faculty of Aeronautics) http://lirslm.fei.tuke.sk
- Laboratory of Knowledge Technologies (V-101a) https://hi.fei.tuke.sk/portal/?q=node/100#v101a
- Laboratory of Business processes (B11) https://hi.fei.tuke.sk/portal/?q=node/100#b11
- Laboratory of Intelligent Control Network and Software Systems for Control (L-509b), http://cybereducentre.fei.tuke.sk/L509/
- Laboratory of Computer Control Systems Design (V101b - CMCT_II), http://kyb.fei.tuke.sk/Laboratoria/miest/V101b.htm
- Laboratory of Robotics (V134 - CMCT_II) http://kyb.fei.tuke.sk/Laboratoria/miest/V134.htm
- Laboratory of Mechatronics Systems (V142 - CMCT_II) http://kyb.fei.tuke.sk/Laboratoria/miest/V142.htm
- Laboratory of Process Control (V144 - CMCT_II) http://kyb.fei.tuke.sk/Laboratoria/miest/V144htm
- Laboratory of Production Lines and Image Recognition (V147 - CMCT_II) http://kyb.fei.tuke.sk/Laboratoria/miest/V147.htm
- Perception and Cognition Laboratory (V-31) http://pcl.tuke.sk

4   TEACHING

4.1.   Undergraduate Study (Bc.)

Subject	Semester	Lectures/exercises (hours per week)	Name of lecturer
Computers and Algorithms	2nd	2/2	Jadlovská, Jadlovský
Introduction to Business Informatics	2nd	2/2	Paralič, J.
Elements of Control Systems	2nd	2/2	Hladký
Artificial Intelligence I.	2nd	2/2	Machová
Simulation systems in Business Informatics	2nd	2/2	Jadlovská, Hladký
Foundations of Automatic Control	3rd	2/2	Madarász
Simulation Systems	3rd	2/2	Jadlovská
Artificial Intelligence II.	3rd	2/2	Sinčák, et al.
Knowledge-Based Systems	3rd	2/2	Machová
Office Information Systems	3rd	1/2	Zolotová
Applications of Operation Systems in Management	3rd	2/2	Liguš
Application Programming	3rd	2/2	Jakša
Analyses and design of Information Systems	4th	1/1	Sarnovský M., Babič
Control of Technological Processes	4th	2/2	Liguš
Control and Visualization Systems	4th	2/2	Zolotová
Identification and Modeling	4th	2/2	Filasová
Linux I.	4th	2/2	Jakša
Computer Tools for Technological Systems Control	4th	2,2	Jadlovský

Subject	Semester	Lectures/exercises (hours per week)	Name of lecturer
Applications of Artificial Intelligence	4th	0/2	Sinčák
Scheduling and Logistics	4th	2/2	Paralič, J.
Application programming	4th	0/2	Jakša
Computer (Based) Control	5th	2/2	Krokavec
Database Management System Applications	5th	2/2	Ocelíková
Protocols and Interfaces	5th	2/2	Jadlovský
Project Management	5th	2/2	Sabol, Babič
Cybernetics and Management	6th	2/2	Sarnovský, J.
System Analysis and Synthesis	6th	2/2	Madarász
Artificial Intelligence Languages	6th	2/1	Mach
Effective and financial management	6th	2/2	Babič
Heuristic Optimization Processes	6th	2/2	Mach

4.2.   Graduate Study (Ing.)

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

Subject	Semester	Lectures/exercises (hours per week)	Name of lecturer
Neuro-fuzzy Systems	3rd	2/2	Vaščák
Cybernetics	3rd	2/2	Sarnovský, J.
Knowledge Management	3rd	2/2	Paralič, J.
Philosophic Problems of Cybernetics and AI	4th	2/2	Sarnovský, J.
Repetition of AI Foundations	4th	0/2	Sinčák
AI Applications Seminar	4th	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, Marek Duľa, Peter Karch, Ján Kažimír, Stanislav Laciňák, Rastislav Hošák, Peter Šuster, Slávka Jadlovská, Peter Papcun, Anton Molčan and Lukáš Laciňák. 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.

- *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. 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.

- *Utilisation of intelligent methods for control and modeling of aircraft engines in educational process*, Cultural and Educational Grant Agency project No. 001 – 010 TUKE4/2010, duration: 2010-2012, project leader: Ladislav Madarász. The aim of the project is to create a platform for the use of small turbojet engines in the Laboratory of Intelligent control systems of aircraft engines outside the frame of the ongoing research for educational purposes. This project will be oriented on the following areas of education: the area of digital acquisition of operating parameters of the engine in real-time, the area of basic analysis and visualization of the obtained data, visualization and creation of basic models and demonstration of control

algorithms. Because the small turbojet engines have similar characteristics as normal engines they are appropriate   objects for demonstration of characteristics of real engines, modern methods of measurement of extreme parameters, algorithms of modeling and control.

- ***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), Ján Sarnovský, Eva Ocelíková, Ján Jadlovský, Anna Jadlovská, 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.

- ***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. 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 will be designed and implemented elektronic 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.

- ***Innovative Education of Business Analytics for Students***, IBM Faculty Award, duration: 2012, members: Ján Paralič (project leader), František Babič, Peter Koncz, Alexandra Lukáčová, Cecília Havrilová. Activity: The aim of this project was to design and implement effective methods and tools for education of business analytics within the university courses. We built on our experiences in education of knowledge discovery and data mining since ten years, making use of up to date IBM software and existing laboratories. Our experiences show that it is inevitable educate students to understand the business aspects of problems to be solved. Therefore our ambition was in cooperation with experienced IBM specialists to design and develop a couple of cases where the students will be able to better grasp the nature of (real) business problems and how to approach them with suitable business analytics methods and tools.

- ***Perceptual, Contextual, and Cross-Modal Learning in Hearing and Vision***. The European Community's 7FP/2007-13 grant no GA-2009-247543 (Marie Curie program for Research Staff Exchange) PI Norbert Kopčo, staff Rudolf Andoga, Beáta Tomoriová. Collaboration with University of California, Boston University, Martinos Center/Harvard Medical School.

- ***Co-funding grant for Perceptual, Contextual, and Cross-Modal Learning in Hearing and Vision***. Slovak Research and Development Agency Project, No. PP7RP-0027-09. PI Norbert Kopčo, staff Rudolf Andoga, Beáta Tomoriová. Reimbursement grant for the costs of grant preparation for successful applicants for EU research grants.

- ***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.

- ***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. Ativity: this project is being solved at our Faculty of Electrical Engineering and Informatics as cooperation of researchers and educators from three different departments. We analysed current learning processes and best practices on a set of 15 different courses from mathematics and computer science. Based on the

analysis, crutial processes have been identified, modelled and will be supported by various electronic services – exsitng ones, which will be 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 modelled by means of an ontology.

- ***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 published an article about our University. Members of the Center of Modern Control Techniques and Industrial Informatics (Department of Cybernetics and Artificial Intelligence, Faculty of Electrical Engineering and Informatics TUKE) participate in implementing tasks related to the project. They have begun work on the modernization of the Detector Control System, focusing on the optimization of the data exchange interface between online and offline databases.

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
- 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

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
- Kuyshu Institute of Technology, Japan
- Université Joseph Fourier Grenoble, IUT 1 (Institut Universitaire de Technologie 1), Grenoble, France
- Heudiasyc UMR CNRS 6599, UTC, Compiegne, 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
- 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
- Karch, P.: EAEEIE – European Association for Education in Electrical and Information Engineering
- Kopčo, N.: Association for Research in Otolaryngology, Acoustical Society of America, Society for Neuroscience
- 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 micro'CAD The Univesity 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.: SWIIS - Suplementary 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
- 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

7   THESES

Thesis type	Bachelor	Master	Doctoral
Number	210	111	6

8   OTHER ACTIVITIES

- SAMI 2012 (IEEE 10th Jubilee International Symposium on Applied Machine Intelligence and Informatics) has been organized in Herľany, Slovakia, January 26-28

- CogInfoCom 2012 (3rd IEEE International Conference on Cognitive Infocommunications) has been organized in Košice, Slovakia, December 2-5

- International seminar New Challenges of Intelligent Systems has been organized at the Centre of Intelligente Technologies in Košice, October 23

9   PUBLICATIONS

9.1. Books

[1] HLÁDEK, Daniel - VAŠČÁK, Ján - SINČÁK, Peter: **Towards Fuzzy Learning Classifier Systems** Theory and Application of the Reinforcement Learning, Fuzzy Logic and Learning Classifier Systems. Saarbrücken: Lap Lambert Academic Publishing - 2012. 117 p. ISBN 978-3-8473-1135-5

[2] KOŠČÁK, Juraj - JAKŠA, Rudolf - SINČÁK, Peter: **Stochastic Weight Update in Neural Networks** Theoretical study of stochastic neural networks learning. Saarbrücken: LAP Lambert Academic Publishing - 2012. 95 p. ISBN 978-3-659-23102-5

[3] MADARÁSZ, Ladislav - ŽIVČÁK, Jozef: **Aspects of Computational Intelligence: Theory and Applications** Revised and Selected Papers of the 15th IEEE International Conference on Intelligent Engineering Systems 2011, INES 2011 - 1. vyd. Berlin Heidelberg: Springer-Verlag - 2012. 436 p. ISBN 978-3-642-30667-9

[4] MADARÁSZ, Ladislav - ANDOGA, Rudolf - BUČKO, Marián - GAŠPAR, Vladimír: **Systems Analysis and Synthesis** (in Slovak)**.** 2nd extended edition. Košice: elfa, 2012. 303 p. ISBN 978-80-8086-193-3

[5] SABOL, Tomáš – BABIČ, František – MACEJ, Peter: **Project management** (in Slovak). 2nd extended edition. Košice, Elfa, 2012, 295 p., ISBN 978-80-553-0897-5

[6] SARNOVSKÝ, Ján - LIGUŠ, Ján: **Cybernetics and Management** (in Slovak). 1st edition. CD version. Košice: TU - 2012. 180 p. ISBN: 978-80-553-1132-6

[7] SARNOVSKÝ, Ján - POPOVIČ, Ľuboš: **Cybernetics** (in Slovak). 1st edition, Košice: Elfa, 2012. 152 s. ISBN 978-80-8086-201-5

[8] SMOLÁR, Peter - SINČÁK, Peter - VIRČÍKOVÁ, Mária: **Intelligent Image Categorization** Object Categorization with Artmap Neural Networks. Saarbrucken: LAP Lambert Academic Publishing - 2012. 181 p. ISBN 978-3-659-24795-8

[9] TREBUŇA, František - JADLOVSKÝ, Ján - FRANKOVSKÝ, Peter - PÁSTOR, Miroslav: **Automation in Photostress method** (in Slovak). 1st edition, Košice: TU - 2012. 285 p. ISBN 978-80-553-1207-1

[10] ZOLOTOVÁ, Iveta – DUĽA, Marek: **Office Information Systems** (in Slovak).1st edition, Košice: TU – 2012. 212 p. ISBN 978-80-553-0960-6

[11] ZOLOTOVÁ, Iveta – KARCH, Peter – Laciňák, Stanislav: **Control and Visualization Systems** (in Slovak). 1st edition, Košice: TU – 2012. 222 p. ISBN 978-80-553-0958-3

9.2. Book chapters

[12] JADLOVSKÁ, Anna - KATALINIC, Branko - HRUBINA, Kamil -

MACUROVÁ, Anna - WESSELY, Emil: **Solution to the Problem Control of a Distributed Parameter Process**. In: DAAAM International Scientific Book 2012. Vienna: DAAAM International, 2012, p. 169-186. ISBN 978-3-901509-86-5, ISSN 1726-9687

[13] KROKAVEC, Dušan - FILASOVÁ, Anna - HLADKÝ, Vratislav: **Residual generator design for a class of nonlinear systems described by Takagi-Sugeno models**. In: Topics in Intelligent Engineering and Informatics: Aspects of Computational Intelligence: Theory and Applications. Berlin Heidelberg: Springer-Verlag, 2012, p. 3-23. ISBN 978-3-642-30667-9, ISSN 2193-9411

[14] RICHTER, Christoph - SIMONENKO, Ekaterina - SUKIBUCHI, Tsuyoshi - SPYRATOS, Nicolas - BABIČ, František - WAGNER, Jozef - PARALIČ, Ján - RAČEK, Michal - DAMSA, Crina - CHRISTOPHIDES, Vassilis: **Mirroring tools for collaborative analysis and reflection**. In: Collaborative Knowledge Creation: Practices, Tools, Concepts. Rotterdam: Sense Publishers, 2012 p. 117-140. ISBN 978-94-6209-002-6

[15] VAŠČÁK, Ján: **Automatic Design and Optimization of Fuzzy Inference Systems**.In: Intelligent Systems Reference Library: Volume 38: Handbook of Optimization: From Classical to Modern Approach. Berlin Heidelberg: Springer-Verlag, 2012 p. 287-309. ISBN 978-3-642-30503-0, ISSN 1868-4394

[16] WIMMER, Maria A. - FURDÍK, Karol - BICKING, Melanie - MACH, Marián - SABOL, Tomáš - BUTKA, Peter: **Open Collaboration in Policy Development: Concept and Architecture to Integrate Scenario Development and Formal Policy Modelling**. In: Empowering Open and Collaborative Governance: Technologies and Methods for Online Citizen Engagement in Public Policy Making. Berlin Heidelberg: Springer-Verlag, 2012 p. 199-219. ISBN 978-3-642-27218-9

9.3. Journals

[1] BABIČ, František - WAGNER, Jozef - PARALIČ, Ján: **The use of event logs for collaborative practices reflection**. In: International Journal of Intelligent Information and Database Systems. Vol. 6, no. 5 (2012), p. 421-435. ISSN 1751-5866

[2] BABIČ, František - WAGNER, Jozef - PARALIČ, Ján: **Investigation of performed user activities in overall context with IT analytical framework**. In: Lecture Notes in Business Information Processing: Business Information Systems. - Heidelberg: Springer-Verlag, 2012 Vol. 117 (2012), p. 284-295. ISSN 1865-1348

[3] ČOPÍK, Matej - JADLOVSKÝ, Ján: **Utilization of Petri Nets for the Analysis of Production Systems**. In: Procedia Engineering. No. 48 (2012), p. 56–64. ISSN 1877-7058

[4] FILASOVÁ, Anna - KROKAVEC, Dušan: **H∞ control of discrete-time linear systems constrained in state by equality constraints**. In: International Journal of Applied Mathematics and Computer Science. Vol. 22, no. 3 (2012), p. 551-560. ISSN 1641-876X

[5] FILASOVÁ, Anna - GONTKOVIČ, Daniel - KROKAVEC, Dušan: **LMI based control design for linear systems with distributed time delays**. In: Archives of Control Sciences. Vol. 22, no. 2 (2012), p. 217-231. ISSN 0004-072X

[6] FILASOVÁ, Anna - SERBÁK, Vladimír: **Design of fuzzy based virtual actuator for a class of nonlinear systems**. In: Advances in Electrical and Electronic Engineering. Vol. 10, no. 2 (2012), p. 75-80. ISSN 1804-3119

[7] GAŠPAR, Vladimír - MADARÁSZ, Ladislav - PARALIČ, Ján - TÉNAIOVÁ, Katarína - VIDO, Jozef - GRANČÁKOVÁ, Zuzana - RIŇAK, Martin: **Simple Mobile Warehouse System for Microsoft Dynamics Navision ERP System**. In: Software Engineering. Vol. 2, no. 2 (2012), p. 21-28. ISSN 2162-8408

[8] JADLOVSKÁ, Anna - JAJČIŠIN, Štefan: **Predictive control algorithms verification on the laboratory helicopter model**. In: Acta Polytechnica Hungarica. Vol. 9, no. 4 (2012), p. 221-245. ISSN 1785-8860

[9] JADLOVSKÝ, Ján - PAPCUN, Peter: **Optimizing Industry Robot for Maximum Speed with High Accuracy**. In: Procedia Engineering. No. 48 (2012), p. 533-542. ISSN 1877-7058

[10] JADLOVSKÝ, Ján - ILKOVIČ, Ján: **Material flow modelling in mechatronic manufacturing system**. In: Procedia Engineering. Vol. 48 (2012), p. 254-263. ISSN 1877-7058

[11] KLIMEŠOVÁ, Dana - OCELÍKOVÁ, Eva: **Spatial-temporal modeling and visualisation**. In: International Journal of Mathematical Models and Methods in Applied Sciences. Vol. 6, no. 1 (2012), p. 149-156. ISSN 1998-0140

[12] KONCZ, Peter - HIĽOVSKÁ, Katarína: **Application of Artificial Intelligence and Data Mining Techniques to Financial Markets**. In: ACTA VŠFS. Vol. 6, no. 1 (2012), p. 62-76. ISSN 1802-792X

[13] KOŠČÁK, Juraj - JAKŠA, Rudolf - SINČÁK, Peter: **Prediction of Temperature Daily Profile by Stochastic Update of Backpropagation through Time Algorithm**. In: Journal of Mathematics and System Science. Vol. 2, no. 4 (2012), p. 217-225. ISSN 2159-5291

[14] KOŠČÁK, Juraj - JAKŠA, Rudolf - SINČÁK, Peter: **Influence of Numbers of Neurons inTime Delay Recurrent Networks with Stochastic Weight Update on Backpropagation through Time**. In: Advances in intelligent systems and computing. Vol. 192 (2012), p. 133-142. ISSN 2194-5357

[15] KROKAVEC, Dušan - FILASOVÁ, Anna: **Optimal fuzzy control for a class of nonlinear systems**. In: Mathematical Problems in Engineering. No. 1 (2012), p. 1-29. ISSN 1024-123X

[16] KROKAVEC, Dušan - FILASOVÁ, Anna: **A reduced-order TS fuzzy observer scheme with application to actuator faults reconstruction**. In: Mathematical Problems in Engineering. (2012), p. 1-25. ISSN 1024-123X

[17] KROKAVEC, Dušan - FILASOVÁ, Anna: **Novel fault detection criteria based on linear quadratic control performances**. In: International Journal of Applied Mathematics and Computer Science. Vol. 22, no. 4 (2012), p. 929-938. ISSN 1641-876X

[18] MACHOVÁ, Kristína - RAKUŠČINEC, Tomáš: **Dynamic Analysis of Social Networks**. In: Americal Journal of Intelligent Systems. Vol. 2, no. 6 (2012), p. 148-156. ISSN 2165-8978

[19] PAPCUN, Peter - ČOPÍK, Matej - ILKOVIČ, Ján: **Riadenie robota integrovaného v pružnom výrobnom systéme**. In: ElectroScope. Vol. 2012, no. 2 (2012), p. 1-9. ISSN 1802-4564

[20] SARNOVSKÝ, Ján: **Claude E. Shannon** (in Slovak). In: ATP Journal. No. 1 (2012), p. 11-11. ISSN 1335-2237

[21] SARNOVSKÝ, Ján: **Digital Maoism** (in Slovak). In: ATP Journal. No. 3

(2012), p. 11-11. ISSN 1335-2237

[22] SARNOVSKÝ, Ján: **Selfreproducable automata** (in Slovak). In: ATP Journal. No. 7 (2012), p. 13-13. ISSN 1335-2237

[23] SARNOVSKÝ, Ján: **W. R. Ashby** (in Slovak). In: ATP Journal. No. 10 (2012), p. 9-9. ISSN 1335-2237

[24] VAĽOVÁ, Lucia - JADLOVSKÝ, Ján - STRELTSOVA, Oxana - KOPČANSKÝ, Peter - TIMKO, Milan - KUBOVČÍKOVÁ, Martina - KONERACKÁ, Martina - ZÁVIŠOVÁ, Vlasta: **Numerical Modeling of Nanoparticles Tracking in the Blood Stream**. In: Lecture Notes in Computer Science: Mathematical Modeling and Computational Science. Vol. 7125 (2012), p. 284-289. ISSN 0302-9743

[25] VAŠČÁK, Ján: **Adaptation of fuzzy cognitive maps by migration algorithms**. In: Kybernetes. Vol. 41, no. 3/4 (2012), p. 429-443. ISSN 0368-492X

[26] VAŠČÁK, Ján - PAĽA, Martin: **Adaptation of Fuzzy Cognitive Maps for Navigation Purposes by Migration Algorithms**. In: International Journal of Artificial Intelligence. Vol. 8, no. S12 (2012), p. 20-37. ISSN 0974-0635

[27] ZOLOTOVÁ, Iveta - KARCH, Peter: **Contribution to Modification of Graph Cut Method and Its Implementation in the Image Segmentation**. In: International Journal of Circuits, Systems and Signal Processing. Vol. 6, no. 1 (2012), p. 49-56. ISSN 1998-4464

[28] ZOLOTOVÁ, Iveta – HOŠÁK, Rastislav – PAVLÍK, Miloš: **Supervisory control sustainability of technological processes after the network failure**. In: Electronics and electrical engineering: Automation, Robotics, Vol. 18, no. 9(2012), p. 1-4. ISSN 1392-1215

[29] ZOLOTOVÁ, Iveta – KUBIČKO, Peter – LANDRYOVÁ, Lenka – HOŠÁK, Rastislav: **Innovation Processes - Reference Model, Collaboration via Innovative Zone and Integration into Enterp**. In: IFIP Advances in Infomatics and Communication Technology, Advances in production Management Systems: Values Networks: Innovation, technolgies, and Management, P. 567-577, Berlin Heidelberg : Springer-Verlag, 2012. ISSN 1868-4238

9.4. Other publications

Publication Type	Confereces		Other
	Foreign	Home	
Number	37	87	4