

DEPARTMENT OF INTELLIGENT SYSTEMS

E-9

The Department of Intelligent Systems develops new methods and techniques for intelligent computer systems, with applications in the areas of the information society, computer science and informatics, and network communication systems. The main research areas are ambient intelligence, evolutionary computing, data mining, search algorithms, language and speech technologies, decision support, intelligent sensors, distributed supervisory systems and network services. The department collaborates closely with the Faculty of Computer and Information Science of the University of Ljubljana on the joint research program "Artificial Intelligence and Intelligent Systems", led by Prof. Ivan Bratko.



Head:
Prof. Matjaž Gams

Intelligent systems simulate intelligence so that a typical user seemingly perceives them as truly intelligent. In reality, these systems use complex mechanisms and implement them on digital computers to imitate human behaviour as well as possible, and combine them with raw, exponentially growing, computer power.

Ambient intelligence is a fast-developing research area. It aims at introducing the technology into our everyday environment in a friendly and unobtrusive way, making it usable without any special knowledge. Due to the rapid aging of the population, one of the area's main goals is care for the elderly. The department was developing methods for posture and movement recognition with an emphasis on fall detection. Data from various sensor types were used as inputs. We were also investigating the recognition of common patterns of behaviour in general and the representation of human motion. The purpose of this research is the recognition of unusual events, be it signs of health problems or security threats.

In the area of **data mining** we dealt with automatic web-genre identification. As part of doctoral research we developed the algorithm SEMEA, designed for text-categorization problems, such as the genre classification of web pages. Its main characteristics are: Semantic representation, Multi-label classification and Evolutionary-Algorithm-based discovery of classification rules. The framework was tested on the web-genre identification domain and its performance was compared to the state-of-the-art algorithms for text categorization. As part of future work, we intend to substitute the bag-of-words representation with the bag-of-concepts representation and introduce the concept generalization-specification genetic operation. We anticipate further improvements with the introduction of these changes.

We study **search algorithms** for path-finding and other applications. We explained many cases of pathological behaviour of these algorithms, i.e., achieving worse results at a greater search depth. We also identified several factors that influence the benefits of a deeper search.

In the field of **speech and language technologies** we dealt with speech synthesis, forensic speaker recognition and syntactic parsing. In cooperation with the Amebis company, a new speech synthesizer for Slovene has been developed. In speaker recognition, the influence of the sound quality transmitted over phone lines on the biometric/forensic speaker recognition has been studied. As for syntactic parsing, the first experiments were made using the newly built corpus of Slovene JOS Treebank.

Evolutionary computing is a subfield of computer science concerned with theoretical studies, design and applications of search procedures motivated by biological evolution and known as evolutionary algorithms. Our work in this area includes the development and analysis of evolutionary algorithms for solving problems of engineering design and optimization. It is focused on the design of efficient algorithms for multi-objective optimization problems with conflictive objectives where a set of solutions is of interest to the user. We dealt with the parallelization of our DEMO (Differential Evolution for Multiobjective Optimization) algorithm. Its implementation on a computer cluster was used to study the speedup in solving a test problem of tuning process parameters in a metallurgical production process. The results were presented in a chapter of the edited volume *Parallel Computing: Numerics, Applications and Trends*, published by Springer.

A significant part of our applied research was devoted to **energy efficiency**. A preliminary technical and economical evaluation of an alternative energy-supply system based on photovoltaic

We implemented a new algorithm for energy-flow optimization in the distribution network. The algorithm is a building block of an e-service that is under development in a collaboration with the INEA company and other academic and industrial partners.



Figure 1: The control panel of the intelligent security system ("PDR" project), where the situation in the surveilled rooms is presented with a live picture, a symbolic-graphical and textual description.

The FP7 project “Confidence” is intended to extend the independent living of the elderly by increasing their security at home and outside. Confidence users will wear a number of tags on their bodies, which will make it possible to detect falls, changes in behaviour that may indicate a disease, and call for help. We were successful in obtaining three additional international projects: “EUSAS”, “CHIRON” and “MIRACLE”.



Figure 2: The 4th Slovenian Innovations Forum, the award for the best innovation among the research organizations for the development of an intelligent security system for the surveillance of personnel and equipment in high-security buildings (“The Commander’s Right Hand” project).

An intelligent system for communication in natural language is being developed. The user enters a question into the web page and the program retrieves answers, presenting them to the user in natural language.



Figure 3: Intelligent virtual assistant provides information about the Department of Intelligent Systems at the Jožef Stefan Institute (the web page dis.ijs.si).

modules was performed to find trade-offs between its reliability and costs. In addition, we implemented a new algorithm for energy-flow optimization in the distribution network that is a building block of an e-service that is under development in a collaboration with the INEA company and other academic and industrial partners. Finally, we participated in the submission of a European FP7 project proposal in the area of Information and Communication Technologies for Energy Efficiency entitled “Micro-Request-Based Aggregation, Forecasting and Scheduling of Energy Demand, Supply and Distribution (MIRACLE)”. The project was approved and will be carried out in the period 2010–2012.

Research in the field of **agent modelling** was presented in the book Handbook of Ambient Intelligence and Smart Environments published by Springer. With partners, we have prepared a successful proposal for the EUSAS project (European Defence Agency). Methods for multi-agent modelling of asymmetric conflicts will be developed during this project.

In the **European FP7 project** called “Confidence”, we intend to extend the independent living of the elderly by increasing their security at home and outside. Confidence users will wear a number of tags on their bodies. The locations of the tags will be detected by radio sensors; from these locations, body posture and movement will be reconstructed. This will make it possible to detect falls, which are one of the main reasons for nursing-home admission. Changes in behaviour that may indicate a disease or a similar problem will also be detected.

In collaboration with the Faculty of Electrical Engineering of the University of Ljubljana and the company Špica International, we have successfully finished the “**Commanders Right Hand**” project, which was a part of the Targeted Research Project financed by the goal research program Science for Security and Peace 2006–2010. The result of the project is a working prototype of an intelligent security system for high-security buildings. It received the award for the best innovation among the research organizations at the 4th Slovenian Innovations Forum. The advanced security is achieved with a real-time location system, computer-vision methods and artificial intelligence methods. The system learns the normal behaviour patterns of an employee, recognizes the unusual behaviour, such as thefts, sabotages, staff negligence and insubordination, in real-time. It informs the supervisor with an alarm message in natural language, a graphical explanation and video recordings. Besides the unusual behaviour, the system also recognizes forbidden events, such as the entrance of an unauthorized person. The prototype learns and adapts automatically to new situations.

During the “**Intelligent Home Telekom**” project, we upgraded a universal virtual interface for interactive user communications. We improved the performance and the visual outlook. An important advantage of the interface is its adaptability. This was demonstrated by adapting the system to the needs of the various partners. We started the “**Universal Interface for Intelligent Home**” project, where we began to develop an interface for managing home entertainment centres.

A traditional activity of the Department of Intelligent Systems is the **organization of the International Multiconference Information Society**. In October 2009, the 12th multiconference was held in Ljubljana, consisting of eleven independent conferences.

Some outstanding publications in the past three years

1. D. Marinčič, T. Tušar, M. Gams, T. Šef, Analysis of automatic stress assignment in Slovene, Informatica (Vilnius), 20 (2009), 35–55.
2. J. Valentinčič, B. Filipič, M. Junkar, Machine learning induction of a model for online parameter selection in EDM rough machining, International Journal of Advanced Manufacturing Technology, 41 (2009) 865–870.
3. I. Fister, M. Mernik, B. Filipič, Optimization of markers in clothing industry, Engineering Applications of Artificial Intelligence, 21 (2008), 669–678.
4. M. Luštrek, Pathology in heuristic search. AI Communications, 21 (2008) 211–213.
5. M. Možina, J. Žabkar, I. Bratko, Argument based machine learning, Artificial Intelligence, 171 (2007), 922–937.

Patent granted

1. Patent Granted 22822 in Slovenia; Procedure and device for intelligent entry control; Matjaž Gams, Tea Tušar, Andreja Pušič, Mitja Kolbe; Jozef Stefan Institute, Jamova 39, 1000 Ljubljana, Slovenia and Špica d. o. o., Pot k sejnišču 33, 1231 Ljubljana, Slovenia.

Awards and appointments

1. The award for first place between the research and development organizations with the firm Špica International d.o.o. and the Faculty of Electrical Engineering, University of Ljubljana, the 4th Slovenian Innovation Forum in Ljubljana, 1.-2. 12. 2009, the innovation title: Intelligent security system for indoor personnel and equipment monitoring. Authors: Matjaž Gams, Rok Piltaver, Erik Dovgan, Bogdan Pogorelc, Matej Kristan, Janez Pers, Andrej Planina, Gašper Pintarič.
2. The Award for outstanding contribution to the development and promotion of the Information Society, Ljubljana, 13. 10. 2009, Program and Organizing Committee of the Information Society Multiconference 2009. Award Recipient: prof. dr. Vladislav Rajkovič

Organization of conferences, congress and meetings

1. 14th Workshop on Nature-Inspired Algorithms, Jožef Stefan Institute, Ljubljana, 29. 5. 2009
2. 12th. International Multiconference Information Society IS 2009; independent conferences:
 - Intelligent Systems,
 - Collaboration, Software and Services in Information Society,
 - Data Mining and Data Warehouses,
 - Education in Information Society,
 - Facing Demographic Challenges in Europe,
 - Cognitive Sciences,
 - Robotics,
 - Cognitonics - workshop,
 - MONDILEX Fifth Open Workshop “Research Infrastructure for Digital Lexicography”
 - The Second Mini Conference on Theoretical Computer Science 2009,
 - Increasing Interests for Higher Education in Science and Technology, Jožef Stefan Institute, Ljubljana, 12.-16. 10. 2009

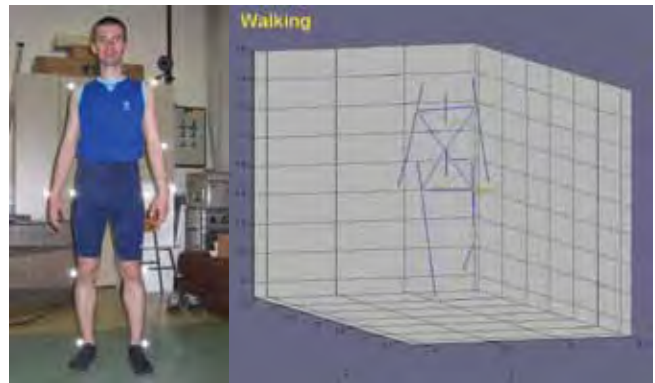


Figure 4: Placement of tags on the body (a) and visualization of tags on the computer screen (b) of the system for prolonging the independence of elderly, which we develop in the FP7 project “Confidence” and other research studies in the field of ambient intelligence. Methods, which we develop, automatically in real-time detect, falls and other health-related changes in the behaviour of the elderly, using the locations of tags on the body.

During the “Commanders Right Hand” project, which was a part of the Targeted Research Project Science for Security and Peace 2006-2010, we developed an intelligent system for the control of the movement of personnel and equipment in high-security buildings. The project received the award for the best innovation among the research organizations at the 4th Slovenian Innovations Forum.

INTERNATIONAL PROJECTS

1. Ubiquitous Care System to Support Independent Living
CONFIDENCE
7. FP, 214986
EC, Centro de Estudios e Investigaciones Técnicas de Guipuzcoa, San Sebastian, Spain
Prof. Matjaž Gams, Prof. Leon Žlajpah
2. Intelligent Information System for Health Laboratory Service: I-LAB
E-contents and E-services
3211-09-000535
Marko Lotrič, LOTRIČ d.o.o, Selca, Slovenia
Dr. Mitja Luštrek
3. Universal Interface for Intelligent Home: UVID
E-contents and E-services
3211-09-000524
Tone Stanovnik, Podjetje Špica International d.o.o., Ljubljana-Črnuče, Slovenia
Prof. Matjaž Gams
4. Multiobjective Optimization of Technological Processes
BI-FI/09-007
Dr. Erkki Laitinen, University of Oulu, Department of Mathematical Sciences, Oulu, Finland
Asst. Prof. Bogdan Filipič
5. New Methods for Automatic Identification Based on Intelligent Devices and Intelligent Agents –IntelliDAM
BI-RO/08-09/0015
Dr. (PhD. Eng.) Vlad Madalin Stefan, Faculty of Automatic Control and Computer Science, University Politehnica, Bucharest, Romania
Prof. Matjaž Gams

R & D GRANTS AND CONTRACTS

1. Forensic speaker identification
Dr. Tomaž Šef
2. Research of intelligent home telekom
Prof. Matjaž Gams
3. AvID: audiovisual speaker identification and emotion detection for secure communications
Dr. Tomaž Šef
4. Commander's right hand
Prof. Matjaž Gams

RESEARCH PROGRAM

1. Artificial Intelligence and Intelligent Systems
Prof. Matjaž Gams

NEW CONTRACTS

1. An optimization algorithm for relieving the energy transmission grid
INEA, d. o. o.
Prof. Bogdan Filipič
2. Investigation, development and implementation of a database to keep records of wall painting fragments
Institute for the Protection of Cultural Heritage of Slovenia, Restoration Center
Prof. Bogdan Filipič

VISITORS FROM ABROAD

1. Dr. Madalin Stefan Vlad, Politehnica University of Bucharest, Faculty of Automatic Control and Computer Science, Bucharest, Romania, 29. 1.-12. 2. 2009
2. Dr. Maria Corduneanu, Politehnica University of Bucharest, Faculty of Automatic Control and Computer Science, Bucharest, Romania, 29. 1.-12. 2. 2009
3. Martin Doolan, M. Sc., Lancon d.o.o, Zagreb, Croatia, 11.-18. 5. 2009
4. Dr. Wilfried Elmenreich, University of Klagenfurt, Institute of Networked and Embedded Systems, Lakeside Labs, Klagenfurt, Austria, 10. 6. 2009
5. Prof. dr. Gernard Friedrich, University of Klagenfurt, Faculty of Engineering, Department of Intelligent Systems and Business Informatics, Klagenfurt, Austria, 10. 6. 2009
6. Prof. dr. Erkki Laitinen, University of Oulu, Department of Mathematical Sciences, Finland, 6.-10. 9. 2009
7. Dr. Madalin Stefan Vlad, Politehnica University of Bucharest, Faculty of Automatic Control and Computer Science, Bucharest, Romania, 14.-16. 10. 2009
8. Dr. Maria Corduneanu, Politehnica University of Bucharest, Faculty of Automatic Control and Computer Science, Bucharest, Romania, 14.-16. 10. 2009
9. Mircea Stan, Versita, Warsaw, Poland, 8. 12. 2009

STAFF

Researchers

1. Prof. Ivan Bratko*
2. Asst. Prof. Bogdan Filipič
3. **Prof. Matjaž Gams, Head**
4. Prof. Vladislav Rajkovič*
5. Dr. Tomaž Šef

Postdoctoral associates

6. Dr. Andraž Bežek*
7. Dr. Aleš Dobnikar*
8. Dr. Matija Drobnič*
9. Dr. Mitja Luštrek
10. Dr. Domen Marinčič
11. Dr. Aleksander Pivk*

Postgraduates

12. Andrej Bratko*, B. Sc.
13. Erik Dovgan, B. Sc.
14. Boštjan Kaluža, B. Sc.

15. Jana Krivec, B. Sc.
16. Matej Ožek, M. Sc.
17. Rok Piltaver, B. Sc.
18. Bogdan Pogorelc**, B. Sc.
19. Aleš Tavčar, B. Sc.
20. Tea Tušar, M. Sc.

Technical officers

21. Robert Blatnik, B. Sc.
22. Mitja Kolbe*, B. Sc.
23. Gašper Pintarič*, B. Sc.
24. Peter Reinhardt*, B. Sc.

Technical and administrative staff

25. Dr. France Dacar
26. Lana Jelenković
27. Mitja Lasič
28. Liljana Lasič

Note:

* part-time JSI member

BIBLIOGRAPHY

ORIGINAL ARTICLES

1. Erik Dovgan, Matjaž Gams, "Intelligent entry control", *WSEAS Trans. Comput.*, vol. 8, no. 2, pp. 344-354, 2009.
2. Matjaž Gams, Jana Krivec, Boštjan Kaluža, "Varnostni sistem CIVaBiS: celoviti inteligentni varnostni biometrični sistem", *Rev. obram.*, vol. 41, no. 6, pp. 30-33, 2009.
3. Mitja Luštrek, Boštjan Kaluža, "Fall detection and activity recognition with machine learning", *Informatica (Ljublj.)*, vol. 33, no. 2, pp. 197-204, 2009.
4. Mitja Luštrek, Boštjan Kaluža, Erik Dovgan, Bogdan Pogorelc, Matjaž Gams, "Behavior analysis based on coordinates of body tags", In: *Ambient intelligence: European conference, Aml 2009, Salzburg, Austria, November 18-21, 2009: proceedings*, (Lecture notes in computer science, LNCS 5859), Manfred Tscheligi, ed., Berlin, Heidelberg, New York, Springer, 2009, vol. 5859, pp. 14-23, 2009.
5. Domen Marinčič, Matjaž Gams, Tomaž Šef, "Intraclausal coordination and clause detection as a preprocessing step to dependency parsing", In: *Text, speech and dialogue: proceedings*, (Lecture notes in computer science, Lecture notes in artificial intelligence, 5729), 12th International Conference, TSD 2009, Pilsen, Czech Republic, September 13-17, 2009, Václav Matoušek, ed., Pavel Mautner, ed., Berlin, Heidelberg, New York, Springer, cop. 2009, vol. 5729, pp.147-153, 2009.
6. Domen Marinčič, Tea Tušar, Matjaž Gams, Tomaž Šef, "Analysis of automatic stress assignment in Slovene", *Informatica (Vilnius)*, vol. 20, no. 1, pp. 35-55, 2009.
7. Lijana Martinc, Mojca Bernik, Vladislav Rajkovič, "Model samovrednotenja učiteljev", In: *Education in information society*, (Organizacija, vol. 42, 2009, no. 1), Vladislav Rajkovič, ed., Tanja Urbančič, ed., Mojca Bernik, ed., Kranj, Moderna organizacija, 2009, pp. A 23 - A 29.
8. Olga Šušteršič, Uroš Rajkovič, Dejan Dinevski, Eva Jereb, Vladislav Rajkovič, "Evaluating patients' health using a hierarchical multi-attribute decision model", *J. int. med. res.*, vol. 37, no. 5, pp. 1646-1654, 2009.
9. Joško Valentinčič, Bogdan Filipič, Mihael Junkar, "Machine learning induction of a model for online parameter selection in EDM rough machining", *Int. j. adv. manuf. technol.*, vol. 41, no. 9-10, pp. 865-870, apr. 2009.
10. Vedrana Vidulin, Mitja Luštrek, Matjaž Gams, "Multi-label approaches to web genre identification", *Journal for language technology and computational linguistics*, vol. 24, no. 1, pp. 93-110, 2009.

REVIEW ARTICLES AND CHAPTERS IN BOOKS

1. Bogdan Filipič, Matjaž Depolli, "Parallel evolutionary computation framework for single- and multiobjective optimization", In: *Parallel computing: numerics, applications, and trends*, Roman Trobec, ed., Marian Vajteršič, ed., Peter Zinterhof, ed., Dordrecht ... [etc.], Springer, 2009, pp. 217-240.
2. Matjaž Gams, "How intelligent can robots become: implications and concerns", In: *Philosophical insights about modern science*, (Scientific revolutions series), Eva Žerovnik, ed., Olga Markič, ed., Andrej Ule, ed., New York, Nova Science Publishers, cop. 2009, pp. 109-124.

PUBLISHED CONFERENCE PAPERS

Regular papers

1. Ana Čigon, Kaja Vidmar, Tina Maček, Erik Dovgan, Miha Šinkovec, Uroš Klopčič, Borut Batagelj, "0 1 virtual-real duel", In: *Proceedings ELMAR-2009: 51th International Symposium ELMAR-2009, 28-30 September 2009, Zadar, Croatia*, (Proceedings ELMAR), Mislav Grgič, ed., Jelena Božek, ed., Sonja Grgič, ed., Zadar, Croatian Society Electronics in Marine, cop. 2009, pp. 293-296.
2. Erik Dovgan, Boštjan Kaluža, Tea Tušar, Matjaž Gams, "Agent-based security system for user verification", In: *WI-IAT 2009 workshops, 2009 IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology*, Milan, Italy, 15-18 September 2009, Los Alamitos, IEEE Computer Society, 2009, pp. 331-334.
3. Erik Dovgan, Rok Piltaver, Matjaž Gams, "Inteligentni sistem za nadzor objektov", In: *Zbornik 12. mednarodne multikonference Informacijska*

- družba - IS 2009, 12.-16. oktober 2009: zvezek A: volume A, (Informacijska družba), Marko Bohanec, ed., Matjaž Gams, ed., Vladislav Rajkovič, ed., Tanja Urbančič, ed., Mojca Bernik, ed., Dunja Mladenič, ed., Marko Grobelnik, ed., Marjan Heričko, ed., Urban Kordeš, ed., Olga Markič, ed., Jadran Lenarčič, ed., Leon Žlajpah, ed., Andrej Gams, ed., Olga S. Fomichova, ed., Vladimir Fomichov, ed., Andrej Brodnik, ed., Ljubljana, Institut Jožef Stefan, 2009, pp. 89-92.
4. Bogdan Filipič, "Multiobjective optimization: concepts, algorithms and applications", In: *Book of abstracts*, [ParNum 09], Parallel Numerics '09, Smolenice, October 27-29, 2009, [S. l.], Mathematical Institute, Slovak Academy of Science, 2009, pp. 17-21.
 5. Bogdan Filipič, Ivan Lorenčin, "Tehno-ekonomsko optimiranje alternativnega sistema oskrbe z električno energijo", In: *Zbornik Osemnajste mednarodne elektrotehniške in računalniške konference - ERK 2009, 21-23. september 2009, Portorož, Slovenija*, Baldomir Zajc, ed., Andrej Trost, ed., Ljubljana, IEEE Region 8, Slovenska sekcija IEEE, 2009, zv. B, pp. 113-116.
 6. Matjaž Gams, "Je bolje preračunati ali se odločiti strateško?", In: *Zbornik Osemnajste mednarodne elektrotehniške in računalniške konference - ERK 2009, 21-23. september 2009, Portorož, Slovenija*, Baldomir Zajc, ed., Andrej Trost, ed., Ljubljana, IEEE Region 8, Slovenska sekcija IEEE, 2009, zv. B, pp. 175-178.
 7. Matjaž Gams, "Razmere v znanosti in visokem šolstvu predvsem preko analize plač", In: *Zbornik prispevkov na posvetu na inštitutu "Jožef Stefan"*, 20. oktobra 2009, Posvet Položaj in vloga inženirjev v Sloveniji, Ljubljana, 20. oktobra 2009, Peter Glavič, ed., Boris Žemva, ed., Ljubljana, Inženirska akademija Slovenije - (IAS), 2009, pp. 57-63.
 8. Matjaž Gams, "Se odločamo genetsko ali privzgojeno - analiza posilstva?", In: *Zbornik 12. mednarodne multikonference Informacijska družba - IS 2009, 12.-16. oktober 2009: zvezek A: volume A*, (Informacijska družba), Marko Bohanec, ed., Matjaž Gams, ed., Vladislav Rajkovič, ed., Tanja Urbančič, ed., Mojca Bernik, ed., Dunja Mladenič, ed., Marko Grobelnik, ed., Marjan Heričko, ed., Urban Kordeš, ed., Olga Markič, ed., Jadran Lenarčič, ed., Leon Žlajpah, ed., Andrej Gams, ed., Olga S. Fomichova, ed., Vladimir Fomichov, ed., Andrej Brodnik, ed., Ljubljana, Institut Jožef Stefan, 2009, pp. 332-335.
 9. Matjaž Gams, "Se spleča premissli globlje?", In: *Zbornik 12. mednarodne multikonference Informacijska družba - IS 2009, 12.-16. oktober 2009: zvezek A: volume A*, (Informacijska družba), Marko Bohanec, ed., Matjaž Gams, ed., Vladislav Rajkovič, ed., Tanja Urbančič, ed., Mojca Bernik, ed., Dunja Mladenič, ed., Marko Grobelnik, ed., Marjan Heričko, ed., Urban Kordeš, ed., Olga Markič, ed., Jadran Lenarčič, ed., Leon Žlajpah, ed., Andrej Gams, ed., Olga S. Fomichova, ed., Vladimir Fomichov, ed., Andrej Brodnik, ed., Ljubljana, Institut Jožef Stefan, 2009, pp. 93-96.
 10. Narciso González, Anna Kämäräinen, Mitja Luštrek, Matjaž Gams, "From users' needs to system specifications: a care system supporting older people's independent living", In: *Proceedings. Vol. 2*, The 6th International Conference on Cybernetics and Information Technologies, Systems and Applications, CITSA 2009 in the context of the 2nd International Multi-Conference on Engineering and Technological Innovation, IMETI 2009, July 10th -13th, 2009, Orlando, Florida, USA, Orlando, International Institute of Informatics and Systemics, 2009, pp. 141-146.
 11. Boštjan Kaluža, "Reducing spurious activity transitions in a sequence of movement", In: *Zbornik Osemnajste mednarodne elektrotehniške in računalniške konference - ERK 2009, 21-23. september 2009, Portorož, Slovenija*, Baldomir Zajc, ed., Andrej Trost, ed., Ljubljana, IEEE Region 8, Slovenska sekcija IEEE, 2009, zv. B, pp.163-166.
 12. Boštjan Kaluža, Erik Dovgan, "Glajenje trajektorij gibanja človeškega telesa zajetih z radijsko tehnologijo", In: *Zbornik 12. mednarodne multikonference Informacijska družba - IS 2009, 12.-16. oktober 2009: zvezek A: volume A*, (Informacijska družba), Marko Bohanec, ed., Matjaž Gams, ed., Vladislav Rajkovič, ed., Tanja Urbančič, ed., Mojca Bernik, ed., Dunja Mladenič, ed., Marko Grobelnik, ed., Marjan Heričko, ed., Urban Kordeš, ed., Olga Markič, ed., Jadran Lenarčič, ed., Leon Žlajpah, ed., Andrej Gams, ed., Olga S. Fomichova, ed., Vladimir Fomichov, ed., Andrej Brodnik, ed., Ljubljana, Institut Jožef Stefan, 2009, pp. 97-100.
 13. Boštjan Kaluža, Erik Dovgan, Tea Tušar, Matjaž Gams, "Intelligent risk analysis in access control", In: *[Workshop W29]*, [First] International Workshop on Quantitative Risk Analysis for Security Applications, (QRASA) in conjunction with the Twenty-First International Joint-Conference on Artificial Intelligence, (IJCAI-09), July 11-17, 2009, Pasadena, California, USA, [S. l., s. n.], 2009, pp. 9-16.
 14. Boštjan Kaluža, Violeta Mirčevska, Mitja Luštrek, Igone Vélez, Matjaž Gams, "Ubiquitous care system to support independent living: preliminary results", In: *Roots for the future of ambient intelligence: adjunct proceedings*, 3rd European Conference on Ambient Intelligence (AmI09), November 18th - 21st, 2009, Salzburg, Austria, Manfred Tscheligi, ed., Salzburg, University of Salzburg, 2009, pp. 308-315.
 15. Jana Krivec, Matej Guid, Ivan Bratko, "Identification and characteristic descriptions of procedural chunks", In: *Computationworld 2009: computation world: future computing, service computation, adaptive, content, cognitive, patems: 15-20 November 2009*, Athens, Greece, Petre Dini, ed., New York, IEEE Computer Society, 2009, pp. 448-453.
 16. Mitja Luštrek, Matjaž Gams, Igone Vélez, "Posture and movement monitoring for ambient assisted living", In: *IST-Africa 2009 conference proceedings: 06-08 May 2009, Kampala, Uganda*, Paul Cunningham, ed., Miriam Cunningham, ed., Dublin, IIMC International Information Management Corporation, 2009, 8 pp.
 17. Egon Milanič, Vladislav Rajkovič, "Model za ocenjevanje varnosti informacijskega sistema javne uprave", In: *Kriza kot izziv in priložnost za reforme javne uprave: referati*, Mirko Vintar, ed., Ljubljana, Fakulteta za upravo, 2009, 18 pp.
 18. Violeta Mirčevska, Matjaž Gams, "Towards robust engine for classifying human posture", In: *Zbornik 12. mednarodne multikonference Informacijska družba - IS 2009, 12.-16. oktober 2009: zvezek A: volume A*, (Informacijska družba), Marko Bohanec, ed., Matjaž Gams, ed., Vladislav Rajkovič, ed., Tanja Urbančič, ed., Mojca Bernik, ed., Dunja Mladenič, ed., Marko Grobelnik, ed., Marjan Heričko, ed., Urban Kordeš, ed., Olga Markič, ed., Jadran Lenarčič, ed., Leon Žlajpah, ed., Andrej Gams, ed., Olga S. Fomichova, ed., Vladimir Fomichov, ed., Andrej Brodnik, ed., Ljubljana, Institut Jožef Stefan, 2009, pp. 112-115.
 19. Violeta Mirčevska, Mitja Luštrek, Matjaž Gams, "Combining machine learning and expert knowledge for classifying human posture", In: *Zbornik Osemnajste mednarodne elektrotehniške in računalniške konference - ERK 2009, 21-23. september 2009, Portorož, Slovenija*, Baldomir Zajc, ed., Andrej Trost, ed., Ljubljana, IEEE Region 8, Slovenska sekcija IEEE, 2009, zv. B, pp. 183-186.
 20. Violeta Mirčevska, Mitja Luštrek, Igone Vélez, Narciso Vega González, Matjaž Gams, "Classifying posture based on location of radio tags", In: *Ambient intelligence perspective II: selected papers from the Second International Ambient Intelligence Forum 2009, [AmIF 2009, Hradec Králové]*, (Ambient intelligence and smart environments, vol. 5), Pavel Čech, ed., Vladimir Bureš, ed., Ludmila Nerudová, ed., Amsterdam ... [etc.], IOS Press, 2009, pp. 85-92.
 21. Martin Možina, Claudio Giuliano, Ivan Bratko, "Arguments extracted from text in argument based machine learning: a case study", In: *CIAM-2008: proceedings of the Workshop on Cross-Media Information Analysis, Extraction and Management 2008, Karlsruhe, Germany, December 03, 2008*, (CEUR workshop proceedings, vol. 437), João Magalhães, ed., Spiros Nikolopoulos, ed., [S. l.], CEUR-WS, cop. 2009, pp. 43-50.
 22. Matej Ožek, Matjaž Gams, Jana Krivec, "Analiza delovanja virtualnega svetovalca", In: *Zbornik 12. mednarodne multikonference Informacijska družba - IS 2009, 12.-16. oktober 2009: zvezek A: volume A*, (Informacijska družba), Marko Bohanec, ed., Matjaž Gams, ed., Vladislav Rajkovič, ed., Tanja Urbančič, ed., Mojca Bernik, ed., Dunja Mladenič, ed., Marko Grobelnik, ed., Marjan Heričko, ed., Urban Kordeš, ed., Olga Markič, ed., Jadran Lenarčič, ed., Leon Žlajpah, ed., Andrej Gams, ed., Olga S. Fomichova, ed., Vladimir Fomichov, ed., Andrej Brodnik, ed., Ljubljana, Institut Jožef Stefan, 2009, pp. 116-119.
 23. Rok Piltaver, "Zazvavanje nenavadnega obnašanja s sistemom za lociranje v realnem času in mehko logiko", In: *Zbornik 12. mednarodne multikonference Informacijska družba - IS 2009, 12.-16. oktober 2009: zvezek A: volume A*, (Informacijska družba), Marko Bohanec, ed., Matjaž Gams, ed., Vladislav Rajkovič, ed., Tanja Urbančič, ed., Mojca Bernik, ed., Dunja Mladenič, ed., Marko Grobelnik, ed., Marjan Heričko, ed., Urban Kordeš, ed., Olga Markič, ed., Jadran Lenarčič, ed., Leon Žlajpah, ed., Andrej Gams, ed., Olga S. Fomichova, ed., Vladimir Fomichov, ed., Andrej Brodnik, ed., Ljubljana, Institut Jožef Stefan, 2009, pp. 120-123.
 24. Rok Piltaver, Matjaž Gams, "Expert system as a part of intelligent surveillance system", In: *Zbornik Osemnajste mednarodne elektrotehniške in računalniške konference - ERK 2009, 21-23. september 2009, Portorož, Slovenija*, Baldomir Zajc, ed., Andrej Trost, ed., Ljubljana, IEEE Region 8, Slovenska sekcija IEEE, 2009, zv. B, pp. 191-194.
 25. Bogdan Pogorelc, "Avtomatsko razpoznavanje boleznih iz gibanja", In: *Zbornik 12. mednarodne multikonference Informacijska družba - IS 2009, 12.-16. oktober 2009: zvezek A: volume A*, (Informacijska družba), Marko Bohanec, ed., Matjaž Gams, ed., Vladislav Rajkovič, ed., Tanja Urbančič, ed., Mojca Bernik, ed., Dunja Mladenič, ed., Marko Grobelnik, ed., Marjan Heričko, ed., Urban Kordeš, ed., Olga Markič, ed., Jadran Lenarčič, ed., Leon Žlajpah, ed., Andrej Gams, ed., Olga S. Fomichova, ed., Vladimir Fomichov, ed., Andrej Brodnik, ed., Ljubljana, Institut Jožef Stefan, 2009, pp. 120-123.

- ed., Marjan Heričko, ed., Urban Kordeš, ed., Olga Markič, ed., Jadran Lenarčič, ed., Leon Žlajpah, ed., Andrej Gams, ed., Olga S. Fomichova, ed., Vladimir Fomichov, ed., Andrej Brodnik, ed., Ljubljana, Institut Jožef Stefan, 2009, pp. 124-127.
26. Bogdan Pogorelc, Matjaž Gams, "Knowledge extraction using constructive induction", In: *Zbornik Osemnajste mednarodne elektrotehniške in računalniške konference - ERK 2009, 21-23. september 2009, Portorož, Slovenija*, Baldomir Zajc, ed., Andrej Trost, ed., Ljubljana, IEEE Region 8, Slovenska sekcija IEEE, 2009, zv. B, pp. 195-198.
27. Bogdan Pogorelc, Matjaž Gams, "Prolonging autonomous living of elderly with semantic ambient media", In: *Roots for the future of ambient intelligence: adjunct proceedings*, 3rd European Conference on Ambient Intelligence (AmI09), November 18th - 21st, 2009, Salzburg, Austria, Manfred Tscheligi, ed., Salzburg, University of Salzburg, 2009, pp. 173-176.
28. Uroš Rajkovič, Olga Šušteršič, Vladislav Rajkovič, "E-documentation as a process management tool for nursing care in hospitals", In: *Connecting health and humans: proceedings of NI2009*, (Studies in health technology and informatics, Vol. 146), Kaija Saranto, ed., Amsterdam [etc.], IOS Press, cop. 2009, pp. 291-296.
29. Tomaž Šef, "Identifikacija glasov in sodno izvedenstvo v kazenskem postopku", In: *Zbornik 12. mednarodne multikonference Informacijska družba - IS 2009, 12.-16. oktober 2009: zvezek A: volume A*, (Informacijska družba), Marko Bohanec, ed., Matjaž Gams, ed., Vladislav Rajkovič, ed., Tanja Urbančič, ed., Mojca Bernik, ed., Dunja Mladenič, ed., Marko Grobelnik, ed., Marjan Heričko, ed., Urban Kordeš, ed., Olga Markič, ed., Jadran Lenarčič, ed., Leon Žlajpah, ed., Andrej Gams, ed., Olga S. Fomichova, ed., Vladimir Fomichov, ed., Andrej Brodnik, ed., Ljubljana, Institut Jožef Stefan, 2009, pp. 128-131.
30. Olga Šušteršič, Uroš Rajkovič, Vesna Prijatelj, Vladislav Rajkovič, "Evaluating patient's health by a hierarchical decision model", In: *eTelemed 2009: proceedings*, International Conference on eHealth, Telemedicine, and Social Medicine eTelemed 2009, 1-7 February 2009, Cancun, Mexico, Edward C. Conley, ed., Charles Doarn, ed., Amir Hajjam-El-Hassani, Los Alamitos, IEEE Computer Society, CPS, 2009, pp. 136-139.
31. Aleš Tavčar, Mitja Luštrek, Matjaž Gams, "Patologija minimin preiskovanja", In: *Zbornik 12. mednarodne multikonference Informacijska družba - IS 2009, 12.-16. oktober 2009: zvezek A: volume A*, (Informacijska družba), Marko Bohanec, ed., Matjaž Gams, ed., Vladislav Rajkovič, ed., Tanja Urbančič, ed., Mojca Bernik, ed., Dunja Mladenič, ed., Marko Grobelnik, ed., Marjan Heričko, ed., Urban Kordeš, ed., Olga Markič, ed., Jadran Lenarčič, ed., Leon Žlajpah, ed., Andrej

- Gams, ed., Olga S. Fomichova, ed., Vladimir Fomichov, ed., Andrej Brodnik, ed., Ljubljana, Institut Jožef Stefan, 2009, pp. 132-135.
32. Vedrana Vidulin, Matjaž Gams, "Multi-label classification of web genres", In: *Zbornik Osemnajste mednarodne elektrotehniške in računalniške konference - ERK 2009, 21-23. september 2009, Portorož, Slovenija*, Baldomir Zajc, ed., Andrej Trost, ed., Ljubljana, IEEE Region 8, Slovenska sekcija IEEE, 2009, zv. B, pp. 179-182.

TEXTBOOKS AND LECTURE NOTES

1. Aleš Dobnikar, Andrej Kramar, *Sistemi III: 1. stopnja: dodiplomski program Računalništvo in informatika (2. letnik)*, [Koper], Fakulteta za matematiko, naravoslovje in informacijske tehnologije, 2008/2009.
2. Nataša Atanasova, Ivan Bratko, Marko Debeljak, Sašo Džeroski, Andrej Kobler, Boris Kompare, Ljupčo Todorovski, Bernard Ženko, *Analysis of environmental data with machine learning methods: Ljubljana, May 4-8, 2009. Part 1*, Ljubljana, Jožef Stefan Institute, Center for Knowledge Transfer in Information Technology, 2009.
3. Nataša Atanasova, Ivan Bratko, Marko Debeljak, Sašo Džeroski, Andrej Kobler, Boris Kompare, Ljupčo Todorovski, Bernard Ženko, *Analysis of environmental data with machine learning methods: Ljubljana, May 4-8, 2009. Part 2*, Ljubljana, Jožef Stefan Institute, Center for Knowledge Transfer in Information Technology, 2009.

THESES

B. Sc. Thesis

1. Aleš Tavčar, *Pathology in minimin search: undergraduate thesis*, Ljubljana, [A. Tavčar], 2009.

PATENT

1. Matjaž Gams, Tea Tušar, Andrija Pušič, Mitja Kolbe, *Postopek in naprava za inteligentni nadzor vstopanja: patent SI22822*, Ljubljana, Urad RS za intelektualno lastnino, 31. dec. 2009.

PATENT APPLICATION

1. Matjaž Gams, Tea Tušar, Andrija Pušič, Mitja Kolbe, *Verfahren und Vorrichtung für intelligente Zugangsberechtigungskontrolle: patent application DE102009017873 (A1)*, 31. dec. 2009.