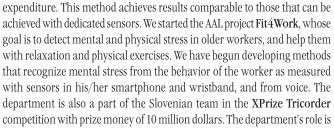# DEPARTMENT OF INTELLIGENT SYSTEMS

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, computational intelligence, agent and multi-agent systems, and language and speech technologies. 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. The department also closely collaborates with industry and significantly contributes to the employment of intelligent systems in products and services.

Head:
Prof. Matjaž Gams

Intelligent systems simulate intelligence so that a typical user perceives them as truly intelligent. In reality, these systems use complex mechanisms and implement them on digital computers to imitate human behavior as well as possible, exploiting raw, exponentially growing computer power. This field is improving greatly worldwide.

Ambient intelligence is a research area aiming to introduce technology into our everyday environment in a friendly way that is undemanding for the user. The two key topics of ambient intelligence we work on are e-health and the smart home. On the topic of e-health, our focus in the past year, was the FP7 project **COMMODITY12**, which telemonitors diabetes patients. The department's main task in the project is the analysis of patients' lifestyles using sensors in a smartphone and on a chest strap. We developed a method that first automatically recognizes which of these devices a patient carries, then it normalizes the orientation of the phone and detects in which pocket it is carried, and finally invokes the appropriate models to recognize the patient's activity and estimates his/her energy expenditure. This method achieves results comparable to those that can be achieved with dedicated sensors. We started the AAL project **Fit4Work**, whose goal is to detect mental and physical stress in older workers, and help them with relaxation and physical exercises. We have begun developing methods that recognize mental stress from the behavior of the worker as measured with sensors in his/her smartphone and wristband, and from voice. The department is also a part of the Slovenian team in the **XPrize Tricorder** competition with prize money of 10 million dollars. The department's role is to develop a method that comes up with an accurate tentative diagnosis (later confirmed by a dedicated diagnostic device) by asking as few questions as possible. Our team was ranked among the ten finalists among the more than 300 registered. On the topic of the smart home, we continued working on the Intelligent E-doorman System developed in collaboration with the Development Center Intech-Les, upgrading it into the **QuGuard** platform. We improved the intruder alert by introducing face detection, and increased the extensibility of the platform, since our goal is to use it in all upcoming smart-home applications. The first of them will be developed in the Horizon 2020 project **In Life**, which was accepted last year. This project will attempt to deploy various systems for elderly care in real life.

> **The Department of Intelligent Systems was ranked among the best 10 groups out of 300 registered at the XPrize Tricorder competition, where teams vie for 10 million dollars in prizes for the best consumer medical diagnostic devices.**

Computational intelligence is a study of stochastic search, optimization and learning methods, inspired by physical and biological systems. Research in this area at the Department of Intelligent Systems focuses on the evolutionary computation methods. We study extensions of evolutionary algorithms for multiobjective optimization and their speedup, and apply these algorithms in engineering design and optimization problems. In doctoral research projects, we visualized 3D empirical attainment functions in multiobjective optimization using three methods, i.e., slicing, maximum intensity projection and direct volume rendering, and developed a two-level multiobjective optimization algorithm for discovering optimal driving strategies for intelligent vehicles that optimizes three criteria: travelling time, fuel consumption and driving comfort. The key area of testing and transferring our methods to practice is production-process optimization. In collaboration with the University of Nova Gorica, the Institute of Metals and Technology, Ljubljana, and the Štore Steel company, we completed an applied research project on simulation and optimization of casting, rolling and heat-treatment processes for the competitive production of topmost steels. As a result, we developed a web application **VizEMO-Steel** that is used by the Štore Steel company to optimize the continuous steel casting process and visualize the results. In addition, with the University of Nova Gorica and the Institute of Metals and Technology, Ljubljana, we completed a research project on the advanced

> **For the Štore Steel company we developed a web application VizEMO-Steel that supports the optimization of a continuous steel casting process and the visualization of the results.**

modelling and simulation of liquid-solid processes called **SMACS**. Using the multiobjective optimization methods, we minimized the concentration and structural inhomogeneities in the solidified material by influencing the cooling process dynamics. We continued our research within the **COPCAMS** project, approved for funding under the Artemis call. Together with the Slovenian industrial partner Kolektor and international partners we are developing production quality-control procedures that are based on computer vision, machine learning and optimization.

In the field of **agent and multi-agent systems** the two key research areas are smart autonomous systems, such as smart city and smart home, and the strategic behaviour analysis of a group of agents. The European project **ACCUS** is aimed at developing an integration and coordination platform for urban systems to build applications across urban systems, providing adaptive and cooperative control for urban subsystems, and optimizing the combined performance. The platform currently optimizes electrical consumption in smart houses, production in thermal power plants, traffic flow and thus affects the outside parameters, such as air quality. The smart-city control continuously monitors the conditions in the city and, for example, when a warning about high air pollution is triggered it decides to lower the traffic flow, the energy consumption in residential areas and production in the local thermal power plant. The monitoring system in several time steps verifies the effects of the control actions and, if required, sends additional corrections until an adequate level of air quality is achieved. A similar system is studied within the national project **OPUS**, where the focus is on the development of smart home automation services. The aim is to apply advanced machine learning and optimization methods in order to generate real-time control strategies that increase the users' comfort and at the same time decrease operational costs of the smart home. We experimentally demonstrated that it is possible to achieve energy savings without reducing comfort. In a similar project we tried to improve the user comfort through the regulation of temperature. The observed improvements were significant, mostly due to the successful predictions of home occupancy. Additional improvements were achieved when applying learning algorithms to the heat pumps. The controller learns the user's behaviour and formulates a strategy for water heating during periods of cheaper electricity and at the same time it lowers the temperature of the stored water during days of lower consumption. In the area of agent-based strategic-behaviour analysis, we continued the work performed on the **EUSAS** project, which was focused on the development of a new approach to mission training for low-level units (security, police force, etc.) facing asymmetric threats in an urban environment. We developed algorithms and tools that can be used to discover the common-agent strategy by knowing only low-level agent behaviour and possessing basic domain knowledge. The discovered strategic action descriptions are presented to the user in the form of graph paths, agent actions, roles and corresponding rules. Meaningful behaviour patterns are later used in behaviour cloning, where software agents reproduce the observed human behaviour in a specific domain.

> **The OpUS intelligent-home automation system reduces energy consumption by 5 to 20%.**

In the field of **speech and language technologies** we work on speech synthesis, the semantic analysis of text and question answering. Together with the Amebis company, we developed a new speech synthesizer for Slovene. Both the comprehensibility and naturalness of the synthesized speech have been greatly improved. Special attention is paid to the requirements of elderly, handicapped, visually impaired people and to apply our solutions to smart devices and homes. In the past year, we manually improved a phonetically rich and balanced speech database for corpus-based speech synthesis by automatic speech-recognition methods. The speech database was recorded in cooperation with the national television and radio, RTV Slovenia. We started to develop a free text-to-speech synthesis service for mobile devices.

> **The new speech synthesizer for Slovene greatly improves the comprehensibility and naturalness of synthesized speech.**

For purposes of the JSI we developed an adapted version of the virtual assistant, Robi, which enables employees and visitors to quickly and easily find information regarding the JSI and also provides a rich set of additional applications that offer various new functionalities (employee phone book, infrastructure malfunction reporting, etc.).

The focus points of the research and developmental potential of the department are also being expressed in successfully developed, integrated and deployed solutions, available on major digital platforms and available to a wide population of users. The methods used in typical applied projects combine the procedures of intelligent agents, statistical methods and machine learning, and serve as a basis for user interfaces on smart phones, pads or desktop computers. The projects' services are developed for all key mobile platforms: Android, iOS, Windows 8 and BlackBerry, and through classic web clients.

From 13 to 17 September 2014, the **13th International Conference on Parallel Problem Solving from Nature – PPSN 2014** was held at the Ljubljana Exhibition and Convention Centre. It was organized by the Department of Intelligent Systems and the Computer Systems Department of the Jožef Stefan Institute. This meeting is devoted to the methods of natural computing, which take inspiration from biological, ecological, physical and social systems, and are used in optimization and data mining. The conference was attended by 180 participants from 28 countries, the authors presented 90 papers, and the proceedings were published by Springer.

From 6 to 10 October 2014, the **17th International Multiconference Information Society – IS 2014** (is.ijs.si) took place at the Jožef Stefan Institute. It consisted of twelve independent conferences with around 400 participants presenting approximately 200 papers. Four conference awards were given: for lifetime achievements ("Donald Michie and Alan Turing" award) to Prof. Janez Grad, for current achievements in the field of information society to Prof. Janez Demšar, and the information strawberry and lemon for the best and worst public information-society services.

The department registered two patent applications and was awarded a patent.

Some outstanding publications in the last year

1. Dovgan, E., Javorski, M., Tušar, T., Gams, M., Filipič, B.: Discovering driving strategies with a multiobjective optimization algorithm. Applied Soft Computing, 16 (2014), 1, 50–62
2. Gjoreski, H., Gams, M., Luštrek, M.: Context-based fall detection and activity recognition using inertial and location sensors. Journal of Ambient Intelligence and Smart Environments, 6 (2014), 4, 419–433
3. Kaluža, B., Cvetković, B., Dovgan, E., Gjoreski, H., Mirchevska, V., Gams, M., Luštrek, M.: A Multiagent care system to support independent living. International Journal on Artificial Intelligence Tools, 23(2014), 1, 1440001-1–1440001-30
4. Mlakar, M., Tušar, T., Filipič, B.: Comparing solutions under uncertainty in multiobjective optimization. Mathematical Problems in Engineering, 2014, doi:10.1155/2014/817964
5. Tušar, T., Filipič, B.: Visualizing exact and approximated 3D empirical attainment functions. Mathematical Problems in Engineering, 2014, doi: 10.1155/2014/569346
6. Vidulin, V., Bohanec, M., Gams, M.: Combining human analysis and machine data mining to obtain credible data relations. Information Sciences, 288(2014), 254–278
7. Zupančič, D., Luštrek, M., Gams, M.: Multi-agent architecture for control of heating and cooling in a residential space. The Computer Journal, 2014, doi: 10.1093/comjnl/bxu058

Awards and appointments

1. Hristijan Gjoreski: Award for presenting scientific achievements with scientific quality and practical usage, Ljubljana, 6th Jožef Stefan International Postgraduate School Students' Conference, Recognizing human activities and detecting falls in real-time
2. Hristijan Gjoreski, Rok Piltaver: ECCAI Travel Award 2014, Prague, Czech Republic, European Coordinating Committee for Artificial Intelligence (ECCAI), Multi-objective learning of hybrid classifiers
3. Anton Gradišek: Fulbright scholarship for work in the USA, United States Department of State Bureau of Educational and Cultural Affairs
4. Mitja Luštrek, Matjaž Gams, Anton Gradišek, Maja Somrak: Reaching the final of Qualcomm Tricorder Xprize, Chicago, ZDA, X Prize Foundation for an automatic non-invasive health, delivering diagnostics HealthStation Home as part of the Mesi Simplifying diagnostics team

Organization of conferences, congresses and meetings

1. 24th Slovene Workshop on Nature-Inspired Algorithms, AVN, Ljubljana, Slovenia, 23 May 2014
2. Student Workshop at the Genetic and Evolutionary Computation Conference, GECCO 2014, Vancouver, Canada, 12 July 2014
3. 13th International Conference on Parallel Problem Solving from Nature, PPSN 2014, Ljubljana, Slovenia, 13–17 September 2014
4. 17th International Multiconference Information Society, IS 2014, Ljubljana, Slovenia, 6–10 October 2014; independent conferences:
   - Intelligent systems
   - Facing demographic challenges
   - Collaboration, software and services in information society
   - Cognitive sciences
   - Data mining and data warehouses
   - Education in information society
   - Robotics
   - Language technologies
   - 1st Student Computer Science Research Conference (StuCoSReC)
   - Human-computer interaction in information society
   - Environmental ergonomics & physiology

5. Chiron workshop: technology and cardiovascular health

Patent granted

1. Matjaž Gams, Hristijan Gjoreski, Mitja Luštrek, Boštjan Kaluža, Method and system for context-based activity recognition, SI24356 (A), Urad RS za intelektualno lastnino, 28.11.2014.
2. Matjaž Gams, Tea Tušar, Darko Zadravec, Matej Horvat, System and method for continuous control and management of tablet manufacturing process, SI24243 (A), Urad RS za intelektualno lastnino, 30.5.2014.
3. Damjan Kužnar, Matjaž Gams, Domen Marinčič, Marko Lotrič, Klemen Čufar, Method for intelligent control of refrigeration systems of cooling devices, SI24163 (A), Urad RS za intelektualno lastnino, 28.2.2014.

INTERNATIONAL PROJECTS

1. 7FP - Xperience; Robots Bootstrapped through Learning from Experience
    Prof. Matjaž Gams
    European Commission
2. 7FP - Commodity12; Continuous Multi-parametric and Multi-layered Analysis of Diabetes Type 1&2
    Dr. Mitja Luštrek
    European Commission
3. CIP Programme; EcoDots
    Dr. Mitja Luštrek
    European Commission
4. COST TD1405; ENJECT, European Network for the Joint Evaluation of Connected Health Technologies
    Božidara Cvetković, B. Sc.
    COST Office

RESEARCH PROGRAM

1. Artificial Intelligence and Intelligent Systems
    Prof. Matjaž Gams

R & D GRANTS AND CONTRACTS

1. Advanced Modelling and Simulation of Liquid-Solid Processes
    Prof. Bogdan Filipič
2. Simulation and Optimization of Casting, Rolling and Heat Treatment Processes for Competitive Production of Topmost Steels
    Prof. Bogdan Filipič
3. Open Communication Platform for Service Integration: CC OPCOMM
    Prof. Matjaž Gams
4. Research on Adaptive Predictive Domain Models
    Dr. Boštjan Kaluža
5. Optimizing the Management of Energy Efficient Smart Buildings
    Dr. Tomaž Šef
6. Adaptive Cooperative Control in Urban (sub) Systems
    Prof. Matjaž Gams

7. COgnitive & Perceptive CAMeraS: COPCAMS
    Prof. Bogdan Filipič
8. DysLex: Universal Voice e-Reader for the Slovenian Language as a Personal Learning Tool for People with Dyslexia and Different Types of Visual Disturbances
    Dr. Tomaž Šef
9. Metis: e-Service for the Early Detection of Learning Issues
    Dr. Erik Dovgan
10. e-Xercise: Mobile Application to Monitor and Promote Exercise in Schoolchildren for More Effective Physical Education
    Dr. Mitja Luštrek
11. Self-management of Physical and Mental Fitness of Older Workers
    Dr. Mitja Luštrek

NEW CONTRACTS

1. Critical Analysis and Evaluation of Multiobjective Optimization and Machine Learning Methods for Intelligent Home Services
    Dr. Tomaž Šef
    Robotina, d. o. o.
2. Analysis and Evaluation of Advanced Spoken Language Technologies for Smart Buildings
    Dr. Tomaž Šef
    Amebis, d. o. o., Kamnik
3. User-oriented Business Reporting
    Prof. Matjaž Gams
    Result, d. o. o.
4. Intelligent Methods for Prediction of Calibration Timing
    Prof. Matjaž Gams
    Špica International, d. o. o.
5. Analysis of Shopping Behavior of Customers in Online Stores
    Dr. Mitja Luštrek
    Creatim Ržišnik Perc, d. o. o.
6. Research of Intelligent Algorithms Applicability for Sensor Data Processing on Embedded Devices
    Prof. Matjaž Gams
    Elgoline, d. o. o.
7. Research of Intelligent Algorithms Applicability for Sensor Data Processing on Embedded Devices
    Prof. Bogdan Filipič
    Štore Steel, d. o. o.

VISITORS FROM ABROAD

1. William Vulgaire, University of Paris Sud XI, Paris, France, 14 April–28 June 2014
2. Marwan Belgueddab, University of Paris Sud XI, Paris, France, 2 June–1 September 2014
3. Guillaume Bizet, University of Paris Sud XI, Paris, France, 2 June–1 September 2014
4. Aurel Billet, University of Paris Sud XI, Paris, France, 2 June–1 September 2014
5. Thomas Villeboeuf, University of Paris Sud XI, Paris, France, 2 June–1 September 2014
6. Mukhiddin Yusupov, Czech Technical University, Electrical Engineering, Cybernetics and Artificial Intelligence, Prague, Czech Republic, 1 July–15 September 2014

7. Kerhoff Rutgerus Hendrikus, Utrecht University, Faculty of Science, Netherlands, 7 July–31 August 2014
8. Mario Konecki, Faculty of Organization and Informatics, Department of Theoretical and Applied Foundations of Information Sciences, Varaždin, Croatia, 13 July–30 November 2014
9. Eda Kalayci, Yildiz Technical University, Faculty of Electrical and Electronics, Computer Engineering Department, Turkey, 14 July–5 September 2014
10. Martin Gjoreski, Faculty of Computer Science and Engineering, Univerzitet Sv. Kiril in Metodij, Skopje, Macedonia, 1 October–31 December 2014

STAFF

Researchers
1. Prof. Ivan Bratko*
2. Asst. Prof. Aleš Dobnikar*
3. Prof. Bogdan Filipič
4. **Prof. Matjaž Gams, Head**

5. Dr. Mitja Luštrek
6. Dr. Domen Marinčič*
7. Dr. Tomaž Šef
Postdoctoral associates
8. Dr. Erik Dovgan

9. Dr. Anton Gradišek
10. Dr. Matej Guid*
11. Dr. Boštjan Kaluža
12. Dr. Violeta Mirchevska
13. Dr. Aleksander Pivk*
14. Dr. Tea Tušar
15. *Dr. Vedrana Vidulin, on postdoctoral leave since 11. 03. 14*
Postgraduates
16. Robert Blatnik, M. Sc.
17. Božidara Cvetković, B. Sc.
18. Tomaž Kompara*, B. Sc.
19. Dr. Jana Krivec*
20. *Damjan Kužnar*, B. Sc., left, 30. 06. 14*
21. Miha Mlakar, B. Sc.
22. Rok Piltaver, B. Sc.
23. *Maja Somrak, B. Sc., left 01. 09. 14*

24. Aleš Tavčar, B. Sc.
25. Jernej Zupančič, B. Sc.
Technical officers
26. Blaž Mahnič, B. Sc.
27. Gašper Pintarič*, B. Sc.
Technical and administrative staff
28. Vesna Koricki Špetič, B. Sc.
29. Matej Krebelj
30. Mitja Lasič
31. Liljana Lasič
32. Jure Šorn
33. Lana Zemljak

Note:
* part-time JSI member

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ORIGINAL ARTICLE

1. Erik Čuk, Matjaž Gams, Matej Možek, Franc Strle, Vera Maraspin-Čarman, Jurij F. Tasič, "Supervised visual system for recognition of erythema migrans, an early skin manifestation of lyme borreliosis", *Stroj. vestn.*, vol. 60, no. 2, pp. 115-123, Feb. 2014.
2. Erik Dovgan, Matija Javorski, Tea Tušar, Matjaž Gams, Bogdan Filipič, "Discovering driving strategies with a multiobjective optimization algorithm", *Applied soft computing*, vol. 16, no. 1, pp. 50-62, 2014.
3. Matjaž Gams, "The unexpected hanging paradox from an AI viewpoint", *Informatica (Ljublj.)*, vol. 38, no. 2, pp. 181-185, 2014.
4. Matjaž Gams, Matej Horvat, Matej Ožek, Mitja Luštrek, Anton Gradišek, "Integrating artificial and human intelligence into tablet production process", *AAPS PharmSciTech*, vol. 15, no. 6, pp. 1147-1453, 2014.
5. Hristijan Gjoreski, Matjaž Gams, Mitja Luštrek, "Context-based fall detection and activity recognition using inertial and location sensors", *Journal of ambient intelligence and smart environments*, vol. 6, no. 4, pp. 419-433, 2014.
6. Anton Gradišek, Pedro José Sebastião, Susete Nogueira Fernandes, Tomaž Apih, Maria Helena Figueiredo Godinho, Janez Seliger, " $^1H-^2H$ cross-relaxation study in a partially deuterated nematic liquid crystal", *J. phys. chem., B Condens. mater. surf. interfaces biophys.*, vol. 118, no. 20, pp. 5600-5607, 2014.
7. Dayana Hristova, Matej Guid, Ivan Bratko, "Assessing the difficulty of chess tactical problems", *Int. j. adv. intell. syst.*, vol. 7, no. 3/4, pp. 728-738, 2014.
8. Boštjan Kaluža, Božidara Cvetković, Erik Dovgan, Hristijan Gjoreski, Violeta Mirchevska, Matjaž Gams, Mitja Luštrek, "A Multiagent care system to support independent living", *Int. j. artif. intell. tools*, vol. 23, no. 1, pp. 1440001-1-1440001-30, 2014.
9. Violeta Mirchevska, "Classifier generation by combining domain knowledge and machine learning", *Informatica (Ljublj.)*, vol. 38, no. 1, pp. 91-92, 2014.
10. Violeta Mirchevska, Mitja Luštrek, Andraž Bežek, Matjaž Gams, "Discovering strategic behaviour of multi-agent systems in adversary settings", *Comput. inform.*, vol. 33, no. 1, pp. 79-108, 2014.
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12. Miha Mlakar, Tea Tušar, Bogdan Filipič, "Comparing solutions under uncertainty in multiobjective optimization", *Math. probl. eng.*, vol. 2014, 2014, pp. 817964-1-817964-10.
13. Maja Somrak, Mitja Luštrek, Jakob Šušterič, Tomo Krivc, Ana Mlinar, Tilen Travnik, Luka Stepan, Mitja Mavsar, Matjaž Gams, "Tricorder: consumer medical devices for discovering common medical conditions", *Informatica (Ljublj.)*, vol. 38, no. 1, pp. 81-88, 2014.
14. Tea Tušar, Bogdan Filipič, "Visualizing exact and approximated 3D empirical attainment functions", *Math. probl. eng.*, vol. 2014, pp. 569346-1-569346-18, 2014.
15. Vedrana Vidulin, Marko Bohanec, Matjaž Gams, "Combining human analysis and machine data mining to obtain credible data relations", *Inf. sci.*, vol. 288, pp. 254-278, dec. 2014.
16. Domen Zupančič, Božidara Cvetković, "Smart-home energy management in the context of occupants' activity", *Informatica (Ljublj.)*, vol. 38, no. 3, pp. 171-180, 2014.

PUBLISHED CONFERENCE CONTRIBUTION

1. Jure Brence, Žiga Gosar, Vid Seražin, Jernej Zupančič, Matjaž Gams, "Multiobjective optimisation of water heater scheduling", In: *Inteligentni sistemi: zbornik 17. mednarodne multikonference - IS 2014, 7-8 oktober 2014, Ljubljana, Slovenija: zvezek A: proceedings of the 17th International Multiconference Information Society - IS 2014, October 7th-8th, 2014, Ljubljana, Slovenia: volume A*, Rok Piltaver, ed., Matjaž Gams, ed., Ljubljana, Institut Jožef Stefan, 2014, pp. 5-8.
2. Božidara Cvetković, Mitja Luštrek, "Analiza možnosti zaznavanja podobnosti med uporabniki", In: *Inteligentni sistemi: zbornik 17. mednarodne multikonference - IS 2014, 7-8 oktober 2014, Ljubljana, Slovenija: zvezek A: proceedings of the 17th International Multiconference Information Society - IS 2014, October 7th-8th, 2014, Ljubljana, Slovenia: volume A*, Rok Piltaver, ed., Matjaž Gams, ed., Ljubljana, Institut Jožef Stefan, 2014, pp. 14-17.
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4. Erik Dovgan, Klemen Gantar, Valentin Koblar, Bogdan Filipič, "Detection of irregularities on automotive semiproducts", In: *Inteligentni sistemi: zbornik 17. mednarodne multikonference - IS 2014, 7-8 oktober 2014, Ljubljana, Slovenija: zvezek A: proceedings of the 17th International Multiconference Information Society - IS 2014, October 7th-8th, 2014, Ljubljana, Slovenia: volume A*, Rok Piltaver, ed., Matjaž Gams, ed., Ljubljana, Institut Jožef Stefan, 2014, pp. 22-25.
5. Darja Fišer, Aleš Tavčar, Tomaž Erjavec, "sloWCrowd: a crowdsourcing tool for lexicographic tasks", In: *LREC 2014: proceedings*, Ninth International Conference on Language Resources and Evaluation, May 26-31, 2014, Reykjavik, Iceland, Nicoletta Calzolari, ed., [S. l.], ELRA, 2014, pp. 3471-3475.
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7. Matjaž Gams, "Actual extinctions of animals and humans", In: *Kognitivna znanost: zbornik 17. mednarodne multikonference - IS 2014, 9-10 oktober 2014, [Ljubljana, Slovenia]: zvezek C: proceedings of the 17th International Multiconference Information Society - IS 2014, October 9th-10th, 2014, Ljubljana, Slovenia: volume C*, Urban Kordeš, et al, Ljubljana, Institut Jožef Stefan, 2014, pp. 23-28.
8. Matjaž Gams, "Are humans getting smarter due to AI?", In: *Inteligentni sistemi: zbornik 17. mednarodne multikonference - IS 2014, 7-8 oktober*

2014, Ljubljana, Slovenija: zvezek A: proceedings of the 17th International Multiconference Information Society - IS 2014, October 7th-8th, 2014, Ljubljana, Slovenia: volume A, Rok Piltaver, ed., Matjaž Gams, ed., Ljubljana, Institut Jožef Stefan, 2014, pp. 30-33.

9. Hristijan Gjoreski, Simon Kozina, Matjaž Gams, Mitja Luštrek, "RAReFall - real-time activity recognition and fall detection system", In: *Percom workshops*, 2014 IEEE International Conference on Pervasive Computing and Communication, 24-28 March, Budapest, Hungary, Danvers, IEEE = Institute of Electrical and Electronics Engineers, 2014, pp. 145-147.

10. Hristijan Gjoreski, Simon Kozina, Mitja Luštrek, Matjaž Gams, "Recognizing human activities and detecting falls in real- time", In: *Zbornik: 1. del: part 1*, 6. študentska konferenca Mednarodne podiplomske šole Jožefa Stefan = 6th Jožef Stefan International Postgraduate School Students' Conference, 20.-22. 05. 2014, Ljubljana, Nejc Trdin, ed., et al, Ljubljana, Mednarodna podiplomska šola Jožefa Stefana, 2014, pp. 121-130.

11. Hristijan Gjoreski, Simon Kozina, Mitja Luštrek, Matjaž Gams, "Using multiple contexts to distinguish standing from sitting with a single accelerometer", In: *ECAI 2014: proceedings*, (Frontiers in artificial intelligence and applications, vol. 263), Torsten Schaub, ed., Gerhard Friedrich, ed., Barry O'Sullivan, ed., Amsterdam [etc.], IOS Press, cop. 2014, pp. 1015-1016.

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MENTORING

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