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, language and speech technologies, electronic and mobile health, and smart cities. The department collaborates closely with the Faculty of Computer and Information Science of the University of Ljubljana in the joint research program "Artificial Intelligence and Intelligent Systems. The department also continuously collaborates with industry and contributes significantly to the inclusion 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 platforms to imitate human behaviour by exploiting raw, exponentially growing computer power. This field is somewhat broader than artificial intelligence, both are rapidly growing worldwide and are enabling the development of the information society.

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 main area where the department applies methods of ambient intelligence is health. We finished the H2020 project **HeartMan**, which developed an application to help congestive-heart-failure patients manage their condition. A clinical trial showed that the application helps patients both physically and psychologically. The objective of the H2020 project **CrowdHealth** is to mine health data to help craft better public-health policies. In collaboration with the Faculty of Sports of the University of Ljubljana, we built methods to accurately forecast physical fitness and the characteristics of students, as well as predict their health risk. The H2020 project **WellCo** is creating a virtual coach to advise older users on wellbeing and health. We developed methods to monitor nutrition with sensors in a smart watch and with questionnaires. We also developed methods to recognize the users' emotions from their voice, to enable an affective user interface. The H2020 project **Insension** will help people with severe intellectual disability use digital services. We are developing methods for camera-based monitoring of heart rate, as well as methods to reason about the users' intent from observations of them and their context. In the Flemish-Slovenian project **STRAW**, whose objective it is to develop stress recognition from physiological signals and to learn more about stressors in the workplace, we finished the preparation for data collection. We also started the AAL project **CoachMyLife**, whose objective is to help seniors with memory impairment perform everyday tasks. As a **doctoral research project**, we developed a method that can intelligently adjust the operation of sensors in such a way that the energy consumption is as small as possibly without sacrificing a lot of quality of the results obtained with these sensors. Another doctoral student is working on advanced machine learning in the area of affective computing. Finally, we were successful at **competitions** in activity recognition with sensors: we won the Sussex-Huawei Locomotion Recognition Challenge for the second time, and together with colleagues from North Macedonia we won Challenge UP and Emteq Activity Recognition Challenge. Because of this, we received the Information Society conference award for current work, while related achievements of the past year received the Excellent in Science award from the Slovenian Research Agency.

Computational intelligence is the study of stochastic search, optimization and learning methods, inspired by biological and physical systems. Research in this area at the Department of Intelligent Systems focuses on evolutionary computation and optimization. We study evolutionary algorithms for multiobjective optimization, their acceleration through parallel computing and surrogate models, visualization of their results, methodology of algorithm benchmarking, and their applicability in science and engineering. In 2019 we completed the H2020 Twinning project **SYNERGY,** aimed at strengthening our research and innovation potential in parallelization, surrogate modelling and combining the two techniques in multi-objective optimization. The project was carried out by three partners with complementary

> We scored three victories at international competitions in activity recognition with sensors. Because of this, we received the Information Society conference award for current work, while related achievements in the past year received the Excellent in Science award from the Slovenian Research Agency.
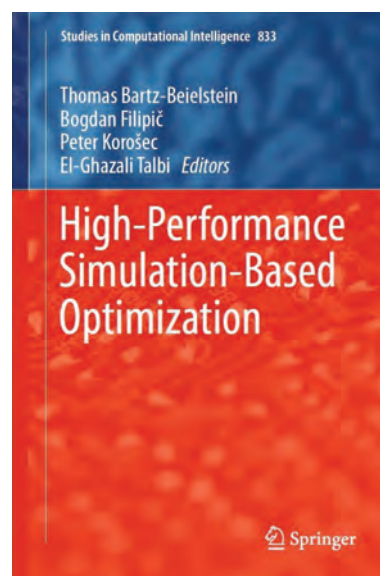
Studies in Computational Intelligence 833

Thomas Bartz-Beielstein
Bogdan Filipič
Peter Korošec
El-Ghazali Talbi *Editors*

High-Performance Simulation-Based Optimization

 Springer

Figure 1: Springer published a scientific monograph High-Performance Simulation-Based Optimization that resulted from the H2020 project SYNERGY.
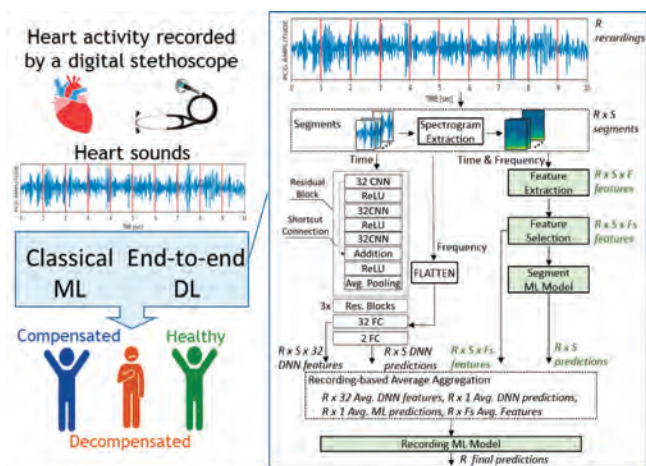
Figure 2: We are carrying out a Key Enabling Technologies for Clean Production (KET4CP) project devoted to the improved planning of tool manufacturing for injection molding.

We are designing a computer system to schedule flexible offers for electricity production and consumption aimed at reducing the mismatch between the available and the needed electrical energy.

Combination of classical feature-based machine learning and end-to-end deep learning for detection of CHF from heart sounds. The method's accuracy is 93% (on 947 subjects from seven datasets), the 7% misclassification is relatively close to the percentage of recordings labeled as "Unknown" by experts (10%).

Figure 3: Showing a scheme that combines classical feature-based machine learning and end-to-end deep learning, used for the detection of chronic heart failure from heart sounds. The method's accuracy is 93% (on 947 subjects from seven datasets). Published as: Machine learning and end-to-end deep learning for the detection of chronic heart failure from heart sounds.

Our paper entitled "Artificial intelligence and ambient intelligence" published in the "Journal of Ambient Intelligence and Smart Environments" is in the top three most-read and cited articles of that journal in 2019.

expertise: the Jožef Stefan Institute, the University of Lille, and Cologne University of Applied Sciences. One of the key scientific achievements of the project is the publication of our monograph High-Performance Simulation-Based Optimization by Springer, while the knowledge and solutions gained in the project were passed on to both academic and industrial organizations, particularly those participating in the Slovenian Smart Specialization Strategy. We have also completed the postdoctoral basic research project **Incorporating real-world problems into the benchmarking of multiobjective optimizers**, where we have designed six suites of benchmark problems consisting of mixed-integer problems and real-world problems based on games. We have integrated them into the state-of-the-art open-source COCO (Comparing Continuous Optimizers) platform for optimization algorithm benchmarking. The transfer of our knowledge and methods to industrial end users is carried out in several applied projects. We are designing **a computer system to schedule flexible offers for electricity production and consumption** aimed at reducing the mismatch between the available and the needed electrical energy, where mixed-integer linear programming is used as an optimization methodology. We work on **Multiobjective optimization for transparent tunnel design** where clothoids and multiobjective evolutionary algorithms are used to find tunnel routes that satisfy diverse objectives, such as minimal costs, best technical characteristics and minimal environmental impacts. Finally, we participate in two **Key Enabling Technologies for Clean Production (KET4CP)** projects for small manufacturing enterprises of which one deals with the improved planning of tool manufacturing for injection molding and the other with machine-vision quality control of molded plastic parts.

In the field of **agent and multi-agent systems**, the key research areas are focused on the development of smart autonomous systems for the control of smart cities, smart homes and intelligent systems for health and tourism. In the Slovenian Smart Specialization program **EkoSMART** we finished with the research activities in the field of smart cities and communities. In the project we developed a smart-city ecosystem with all the support mechanisms that are necessary for the efficient, optimized and gradual integration of different smart-city areas into a unified and well-connected system. Within the programme we were involved in activities linked to the research and development projects *"Zasnova ekosistema pametnega mesta"* and *"Electronic and mobile health"* (**EMH**), where we are the leading partner. We developed new and innovative devices and solutions to support the elderly and chronic patients at home. One of the prototypes is a smart watch with 16 functions for the elderly. We also successfully finished the Smart Specialization program **IQDOM** in the field of smart buildings and homes, coordinated by Gorenje. Our focus was on the development of smart home-automation services. We applied advanced machine learning and optimization methods to build user models and consumption profiles for housing units in order to generate control strategies that increase user comfort and, at the same time, decrease operational costs of the smart home. A similar approach was also applied to the heat pumps where the controller learns the usage behavior and formulates a strategy for water heating during periods of cheaper electricity and, at the same time, lowers the temperature of the stored water during days of lower consumption. In the Interreg **AS-IT-IC** project, we developed an integrated tourist platform for cross-border tourist exchange, tour planning and effective communication between tourists and tourist offices. The platform supports natural-language communication between the users and the system and the automatic creation of personalized itineraries based on the search concepts and preferences of users.

In the InnoStars European project **HomeCare2020** we upgraded the existing smart bracelet for the elderly. The JSI upgraded the fall-detection algorithms and extended the functionality with additional features (idle detection, warnings, wear detection, irregular activity detection), that were possible due to new sensors. We also started with ERA PerMed European project called **BATMAN**, where we will research Acne Inversa condition and system for offering support to patients. The JSI will take care of support systems for collecting and presenting the obtained data. In the final phase, we will use machine learning to analyze the data and present the models. For the project **ROBKONCEL**, we started, in cooperation with Gorenje and Unior, the development of the intelligent system for comprehensive quality control in production with a reconfigurable robotic control cell and intelligent process control system. Additionally, we also started with two commercial projects. In the first one we were chosen by the Comland Company for help in the development of a hands-free system to control application in natural language. The second one will be done in cooperation with the NiceLabel Company, where we will develop the Smart Issue Retrieval Application for grouping different incoming emails and in the next phase also suggesting what to answer to those emails.

In the field of **speech and language technologies** we work on speech synthesis, semantic analysis of text and question answering. Together with companies Alpineon and Amebis we developed a new, high-quality speech synthesizer eBralec (http://ebralec.si/). The synthesizer is improved for both comprehensibility and the natural perception of the speech. The software package has more than a thousand subscribers and is an indispensable tool for blind and visually-impaired users (it is the "official" speech synthesizer of the Slovenian Association for the Blind and Visually Impaired) and people with reading impairments (the Bravo association). For these users, eBralec is free of charge and can be ordered at the Library for the Blind and Visually Impaired (http://www.kss-ess.si/ebralec-sintetizator-govora-slovenskega-jezika/). eBralec is also an integral part of the DarsTraffic+ application, which provides traffic information, while its server version has been used by the National and University Library since 2017. We have also developed a service of speech synthesis for mobile devices (http://dis.ijs.si/dyslex/), which is free for anyone to use.

We are involved in the CityVOICE project: "Speech Technologies with Advanced Language Resources", and the AudiBook project: "Education accessibility through a digital audio library for the blind and visually impaired".

The **22nd International Multiconference Information Society – IS 2019** (is.ijs.si) took place at the Jožef Stefan Institute from October 7 to 11, 2019. It consisted of 12 independent conferences with 200 presentations. Four conference awards were presented: for lifetime achievements ("Donald Michie and Alan Turing" award) to prof. dr. Marjan Mernik, for current achievements in the field of information society to the department of intelligent system E9 JSI, and the information strawberry (Veš kaj ješ?!) and lemon (E-Zdravje) for the best and worst public information-society services.
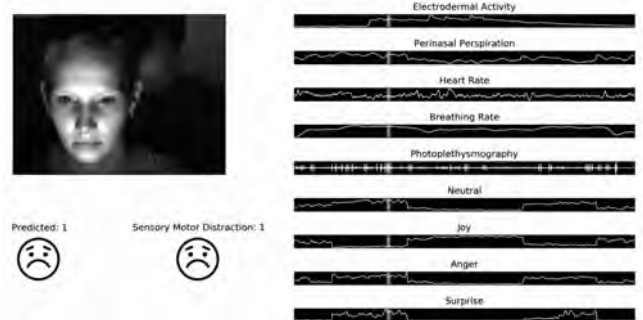

Figure 4: A collaboration between the JSI and the Fraunhofer Institute for Integrated Circuits, where machine learning was used to monitor driver distractions using psychological and visual signals.

Figure 5: The paper by Matjaz Gams, Irene Yu-Hua Gu, Aki Härmä, Andrés Muñoz and Vincent Tam titled "Artificial intelligence and ambient intelligence" and published in the Journal of Ambient Intelligence and Smart Environments (JAISE). It was among the three most read and cited papers in that journal in 2019.

Some outstanding publications in the past year

1. Dovgan, E., Gams, M., Filipič, B. A real-time multiobjective optimization algorithm for discovering driving strategies. Transportation Science, 53 (3) (2019), 695–707
2. Gams, M., Gu, I. Y. H., Härmä, A., Muñoz, A., & Tam, V. (2019). Artificial intelligence and ambient intelligence. Journal of Ambient Intelligence and Smart Environments, 11(1), 71-86.
3. Gradišek, A., van Midden, M. Koterle, M., Prezelj, V., Strle, D., **Štefane**, B., Brodnik, H., Trifkovič, M., Kvasić, I., Zupanič, E., Muševič, I. Improving the Chemical Selectivity of an Electronic Nose to TNT, DNT and RDX Using Machine Learning. Sensors 2019, 19, 5207.
4. Janko, V., Gjoreski, M., Slapničar, G., Mlakar, M., Reščič, N., Bizjak, J., ... & Luštrek, M. (2019). Winning the Sussex-Huawei locomotion-transportation recognition challenge. In Human Activity Sensing (pp. 233-250). Springer, Cham.
5. Slapničar, G., Mlakar, N., Luštrek, M. Blood pressure estimation from photoplethysmogram using a spectrotemporal deep neural network. Sensors, 19 (15) (2019), 3420-1–3420-17

Organization of conferences, congresses and meetings

1. BBOB (Blackbox Optimization Benchmarking) workshop at the Genetic and Evolutionary Computation Conference, GECCO 2019, Prague, Czech Republic, 13. 7. 2019
2. GBEA (Game-Benchmark for Evolutionary Algorithms) workshop at the Genetic and Evolutionary Computation Conference, GECCO 2019, Prague, Czech Republic, 14. 7. 2019
3. GECCO Job Market at the Genetic and Evolutionary Computation Conference, GECCO 2019, Prague, Czech Republic, 15. 7. 2019
4. Session Evolutionary Computation in Practice (ECiP) at the Genetic and Evolutionary Computation Conference, GECCO 2019, Prague, Czech Republic, 15. 7. 2019
5. 34th Slovenian Workshop on Nature-Inspired Algorithms, AVN, Boč, Slovenia, 13. 9. 2019
6. 22nd International Multiconference Information Society, IS 2019, Ljubljana, Slovenia, 7.–11. 10. 2019; independent conferences:
   - 6. Student computer science research conference
   - Professional ethics
   - Human-computer interaction in information society
   - Data mining and data warehouses
   - Cognitive science
   - International conference on cognitonics
   - People and environment
   - International conference of transfer of technologies
   - Robotics
   - Slovenian conference on artificial intelligence
   - Middle-European conference on applied theoretical computer science
   - Education in information society
7. 35th Slovenian Workshop on Nature-Inspired Algorithms, AVN, Ljubljana, Slovenia, 29. 11. 2019
8. Workshop Machine Learning for the Diagnosis and Treatment of Affective Disorders (ML4AD), ACII 2019 3. 9. 2019, Cambridge, England

Awards and appointments

1. Vito Janko, Martin Gjoreski, Nina Reščič, Carlo Maria de Masi, Matjaž Gams, Mitja Luštrek: SHL Challange – Sussex-Huawei Locomotion and Transportation Recognition Challenge, 1st Place Award; Ubicomp 2019, London.
2. Hristijan Gjoreski, Simon Stankoski, Ivana Kiprijanovska, Anastasija Nikolovska, Natasha Mladenovska, Marija Trajanoska, Bojana Velichkovska, Martin Gjoreski, Mitja Luštrek, Matjaž Gams: Challenge Up: Multimodal Fall Detection, 1st Place Award; International Joint Conference on Neural Networks (IJCNN) 2019.
3. Hristijan Gjoreski, Simon Stankoski, Ivana Kiprijanovska, Stefan Kalabakov, Martin Gjoreski: Emteq Activity recognition challenge. 1st Place Award; Ubicomp 2019, London
4. Božidara Cvetković, Robert Szeklicki, Vito Janko, Przemyslaw Lutomski, Mitja Luštrek: Excellent in science; Ljubljana; Slovenian Research Agency; human activity recognition with sensors
5. Marko Katrašnik, Junoš Lukan, Mitja Luštrek, Vitomir Štruc: Best paper award, Ljubljana, Program and organizing committee of Slovenian conference on artificial intelligence 2019 (International multiconference Information society), "Diarization procedure development using machine learning algorithms"E9 members: Award for current work in the area of information society; Ljubljana; Information Society 2019 multiconference programme and organisation committee; recent success at scientific competitions

Patent granted

1. Tomaž Kompara, Igor Gornik, Peter Virtič, Rene Markovič, Miha Mlakar, Matjaž Gams, Danijel Jankovec, Jože Dermol
   A smart home control system using artificial intelligence
   SI 25667 (A), Urad RS za intelektualno lastnino, 31. 12. 2019.

INTERNATIONAL PROJECTS

1. ERASMUS+; Audio Library for Visually Impaired; Education Accessibility through a Digital Audio Library for the Blind and Visually-Impaired
   Dr. Tomaž Šef
   European Commission
2. CardioRNA - Catalysing Transcriptomics Research in Cardiovascular Disease
   Dr. Mitja Luštrek
   Cost Association Aisbl
3. H2020 - CrowdHEALTH; Collective Wisdom Driving Public Health Policies
   Dr. Mitja Luštrek
   European Commission
4. H2020 - INSENSION; Personalized Intelligent Platform Enabling Interaction with Digital Services to Individuals with Profound and Multiple Learning Disabilities
   Dr. Mitja Luštrek
   European Commission
5. H2020 - WellCo; Wellbeing and Health Virtual Coach
   Dr. Mitja Luštrek
   European Commission
6. H2020 - HeartMan; Personal Decison Support System for Heart Failure Management
   Dr. Mitja Luštrek
   European Commission
7. H2020 - SYNERGY; Synergy for Smart Multi-Objective Optimisation
   Prof. Bogdan Filipič
   European Commission
8. Development of AI Methods for Monitoring Affective States Using Unobtrusive Sensors
   Prof. Matjaž Gams
   Slovenian Research Agency

RESEARCH PROGRAMME

1. Artificial Intelligence and Intelligent Systems
   Prof. Matjaž Gams

R&D GRANTS AND CONTRACTS

1. Disentangling the sources and context of daily work stress: a comprehensive real-time modelling study using wearbles and technological detections
   Dr. Mitja Luštrek

2. Intelligent home of the new generation designed on smart appliances and wood
   Prof. Matjaž Gams
   Ministry of Education, Science and Sport
3. Smart City Ecosystem – EkoSmart
   Prof. Matjaž Gams
   Ministry of Education, Science and Sport
4. Food for future - F4F
   Dr. Mitja Luštrek
   Ministry of Education, Science and Sport
5. Austrian-Slovenian Intelligent Tourist Information Center (AS-IT-IC)
   Prof. Matjaž Gams
   Government Office for Development and European Cohesion Policy
6. CoachMyLife
   Dr. Mitja Luštrek
   Ministry of Public Administration
7. 22nd International Multiconference Information Society 2019, IS 2019, Ljubljana, Slovenia, 7 October 2019 - 11 October 2019
   Prof. Matjaž Gams
8. BATMAN: Biomolekularne analize za personalizirano
   Prof. Matjaž Gams
   National Nuclear Research Center

NEW CONTRACTS

1. Multiobjective optimization for transparent tunnel design
   Dr. Tea Tušar
   Xlab, d. o. o.
2. Development of reconfigurable robotic cell for final product inspection
   Prof. Matjaž Gams
   Gorenje Gospodinjski Aparati, d.d.
3. Machine vision quality control of molded plastic parts
   Prof. Bogdan Filipič
   MPT, d. o. o.
4. Improved planning of manufacturing processes for individualized tools
   Prof. Bogdan Filipič
   Plamtex Int., Trgovina in Proizvodnja, d. o. o.
5. MightyFields with voice control
   Dr. Aleš Tavčar
   Comland, d. o. o.
6. NiceLabel virtual assistent
   Dr. Miha Mlakar
   Euro Plus, d. o. o.

VISITORS FROM ABROAD

1. Prof. Boris Naujoks, Beate Breiderhoff, Cologne University of Applied Sciences (TH Köln), Gummersbach, Germany, 17.–18. 1. 2019
2. Prof. El-Ghazali Talbi, prof. Nouredine Melab, University of Lille, Lille, France, 17.–18. 1. 2019
3. Prof. Yoshiaki Ichikawa, dr. Norihiko Moriwaki, Masaaki Ito, Hitachi, Tokyo, Japan, 7. 2. 2019
4. Pia Ana Čuk, University of Tübingen, Tübingen, Germany, 1. 3.–30. 6. 2019
5. Jörg Aschenbrenner, AVL Software and Functions, Regensburg, Germany, 2.–3. 4. 2019
6. Dr. Heiko Borchert, CSET, Vienna, Austria, 2.–3. 4. 2019
7. Paul Elberg, Milrem, Tallinn, Estonia, 2.–3. 4. 2019
8. Dr. Andreas Fognini, Single Quantum, Delft, The Netherlands, 2.–3. 4. 2019
9. Christian Müller, Hirtenberger Defence Systems, Hirtenberg, Austria, 2.–3. 4. 2019
10. Dr. Bernhard Peischl, AVL List Gmbh, Graz, Austria, 2.–3. 4. 2019
11. Roland Pittracher, Hirtenberger Defence Systems, Hirtenberg, Austria, 2.–3. 4. 2019
12. Johannes Sequard-Base, Ballistix Academy, Rittschen, Austria 2.–3. 4. 2019
13. Dr. Aslak Silijander, VTT Research, Espoo, Finland, 2.–3. 4. 2019
14. Martin Simon, DefSecIntel, Talin, Estonia, 2.–3. 4. 2019
15. Prof. Gerhard Skoff, AVL List Gmbh, Graz, Austria, 2.–3. 4. 2019
16. Ahto Truu, Guardtime, Tallin, Estonia, 2.–3. 4. 2019
17. Menso van Sijll, NRL, Schiphol, Netherland, 2.–3. 4. 2019
18. Tomi Viitanen, VTT Research, Espoo, Finland, 2.–3. 4. 2019
19. Sébastien Leonce, University of Paris Sud, Paris, France, 29. 4.–5. 7. 2019
20. Diclan Laurent, University of Paris Sud, Paris, France, 29. 4.–5. 7. 2019
21. Florentin Michel, University of Paris Sud, Paris, France, 29. 4.–5. 7. 2019
22. Dr. Anne Auger, Dr. Dimo Brockhoff, INRIA Palaiseau, France, 23. 4.–3. 5. 2019
23. Aidan Michael White, Bowling Green State University, Ohio, USA, 21. 5.–30. 8. 2019
24. Prof. Sergio Crovella, IRCCS, Trieste, Italy, 30. 5. and 13. 9. 2019
25. Dr. Paola Maura Tricarico, IRCCS, Trieste, Italy, 30. 5. and 13. 9. 2019
26. Dr. Octavian Machidon, Department of Electronics and Computers, Transilvania University of Brasov, Brašov, Romania, 1.–20. 7. and 15.–23. 10. 2019
27. Rossella Gratton, IRCCS, Trieste, Italy, 13. 9. 2019
28. Luisa Zupin, IRCCS, Trieste, Italy, 13. 9. 2019
29. Prof. Michele Boniotto, Université Paris Est-Créteil, Paris, France, 13. 9. 2019
30. Cecile Nait-Meddour, Université Paris Est-Créteil, Paris, France, 13. 9. 2019
31. Prof. Esther von Stebut-Borschitz, Institute Klinik für Dermatologie und Venerologie, Köln, Germany, 13. 9. 2019
32. Prof. Matthias Schmuth, Medical University Innsbruck, Innsbruck, Austria, 13. 9. 2019
33. Prof. Vincent Flacher, CNRS, Strasbourg, France, 13. 9. 2019
34. Chiara Moltrasio, Fondazione IRCCS Ca' Granda-Ospedale Maggiore Policlinico, Milano, Italy, 13. 9. 2019
35. Alexander Tietz, University of Rostock, Institute for Biostatistics and Informatics in Medicine and Ageing Research, Rostock, Germany, 15. 9.–1. 10. and 12.–26. 10. 2019
36. Peter Wappler, Hahn-Schickard, Stuttgart, Germany, 15. 10. 2019
37. Prof. Akira Oyama, Japan Aerospace Exploration Agency (JAXA), Sagamihara, Japan, 20.–22. 11. 2019
38. Dr. Carlos Kavka, dr. Mariapia Marchi, ESTECO, Trieste, Italy, 21.–22. 10. 2019
39. Prof. Boris Naujoks, Cologne University of Applied Sciences (TH Köln), Gummersbach, Germany, 2.–22. 11. 2019

STAFF

Researchers
1. Dr. Erik Dovgan
2. Prof. Bogdan Filipič
3. **Prof. Matjaž Gams, Head**
4. Asst. Prof. Anton Gradišek
5. Dr. Mitja Luštrek

6. Dr. Miha Mlakar
7. Dr. Tomaž Šef
8. Dr. Tea Tušar
Postdoctoral associates
9. Dr. Carlo Maria De Masi
10. *Dr. Matej Guid, left 01.02.19*
11. Dr. Rok Piltaver*
12. *Dr. Aleksander Pivk*, left 29.10.19*
13. Dr. Aleš Tavčar*
Postgraduates
14. Martin Gjoreski, B. Sc.
15. Vito Janko, B. Sc.
16. Tine Kolenik, B. Sc.
17. Tomaž Kompara*, B. Sc.
18. Dr. Jana Krivec*
19. Gašper Slapničar, B. Sc.
20. Aljoša Vodopija, B. Sc.
21. Jernej Zupančič, B. Sc.
Technical officers
22. Andrejaana Andova, B. Sc.

23. *Mateja Drnovšek, B. Sc., left 18.03.19*
24. David Golob, B. Sc.
25. Gregor Grasselli, B. Sc.
26. Primož Kocuvan, B. Sc.
27. Maj Smerkol, B. Sc.
28. Jakob Valič, B. Sc.
Technical and administrative staff
29. Jani Bizjak, B. Sc.
30. Matej Cigale, B. Sc.
31. Vesna Koricki, B. Sc.
32. Mitja Lasič
33. Liljana Lasič
34. Junoš Lukan, B. Sc.
35. Blaž Mahnič, B. Sc.
36. Nina Reščič, B. Sc.
37. Marjetka Šprah, B. Sc.
38. Lana Zemljak

Note:
* part-time JSI member

BIBLIOGRAPHY

ORIGINAL ARTICLE

1. Anton Gradišek, Mario Cifelli, Micham Wojcik, Tomaž Apih, Sergey V. Dvinskikh, Ewa Górecka, Valentina Domenici, "Study of liquid crystals showing two isotropic phases by ^{1}H NMR diffusometry and ^{1}H NMR relaxometry", *Crystals*, 2019, **9**, 3, 178.
2. Lidija Strojnik, Matej Stopar, Emil Zlatić, Doris Kokalj, Mateja Naglič Gril, Bernard Ženko, Martin Žnidaršič, Marko Bohanec, Biljana Mileva Boshkoska, Mitja Luštrek, Anton Gradišek, Doris Potočnik, Nives Ogrinc, "Authentication of key aroma compounds in apple using stable isotope approach", *Food chemistry*, 2019, **277**, 766-773.
3. Louise Knight, Polona Štefanič, Matej Cigale, Andrew C. Jones, Ian J. Taylor, "Towards extending the SWITCH platform for time-critical, cloud-based CUDA applications: job scheduling parameters influencing performance", *Future generation computer systems*, 2019, **100**, 542-556.
4. Polona Štefanič, Matej Cigale, Andrew C. Jones, Louise Knight, Ian Taylor, Cristiana Istrate, George Suciu, Alexandre Ulisses, Vlado Stankovski, Salman Taherizadeh, Guadalupe Flores Salado, Spiros Koulouzis, Paul Martin, Zhiming Zhao, "SWITCH workbench - a novel approach for the development and deployment of time-critical microservice-based cloud-native applications", *Future generation computer systems*, 2019, **99**, 197-212.
5. Polona Štefanič, Matej Cigale, Andrew C. Jones, Louise Knight, Ian Taylor, "Support for full life cycle cloud-native application management: dynamic TOSCA and SWITCH IDE", *Future generation computer systems*, 2019, **101**, 975-982.
6. Urška Mikac, Ana Sepe, Anton Gradišek, Julijana Kristl, Tomaž Apih, "Dynamics of water and xanthan chains in hydrogels studied by NMR relaxometry and their influence on drug release", *International journal of pharmaceutics*, 2019, **563**, 373-383.
7. Matjaž Gams, Irene Yu-Hua Gu, Aki Härmä, Andrés Muñoz, Vincent Tam, "Artificial intelligence and ambient intelligence", *Journal of ambient intelligence and smart environments*, 2019, **11**, 1, 71-86.
8. Matjaž Gams, "IKT trendi v oskrbi", Kakovostna starost: časopis za socialno gerontologijo in gerontagogiko, 2019, **22**, 4, 14-26.
9. Clarissa P. C. Gomes *et al.* (55 authors), on Behalf of the EU-CardioRNA COST Action (CA17129), "Catalyzing transcriptomics research in cardiovascular disease: the CardioRNA COST action CA17129", *Non-coding RNA*, 2019, **5**, 2, 31.
10. Gašper Slapničar, Nejc Mlakar, Mitja Luštrek, "Blood pressure estimation from photoplethysmogram using a spectrotemporal deep neural network", *Sensors*, 2019, **19**, 15, 3420.
11. Anton Gradišek, Marion Van Midden, Matija Koterle, Vid Prezelj, Drago Strle, Bogdan Štefane, Helena Brodnik Žugelj, Mario Trifković, Ivan Kvasić, Erik Zupanič, Igor Muševič, "Improving the chemical selectivity of an electronic Nose to TNT, DNT and RDX using machine learning", *Sensors*, 2019, **19**, 23, 5207.

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PUBLISHED CONFERENCE CONTRIBUTION (INVITED LECTURE)

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