**INTELLIGENT TECHNOLOGIES RESEARCH GROUP**

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**Head** – Dr. *Virginijus Marcinkevičius*

***STAFF***

**Principal researchers:** Prof. Habil. Dr. Leonidas Sakalauskas, Prof. Dr. Rimvydas Laužikas

**Senior researchers:** Dr. Virginijus Marcinkevičius, Prof. Dr. Saulius Minkevičius, Prof. Dr. Darius Plikynas

**Affiliated researchers:** Assoc. Prof. dr. Stasys Steišiūnas, Prof. Habil. Dr. Leonidas Sakalauskas

**Researchers:** Assoc. Prof. Dr. Igoris Belovas

**Junior Researchers:** Arūnas Miliauskas, Vytautas Dulskis

**Specialists and engineering staff:** Dr. Gintautas Jakimauskas, Dr. Vilma Zubaitienė, Raimundas Savukynas, Povilas Jurčys.

**Doctoral students:** Donatas Kavaliauskas, Julija Kurilova, Jūratė Vaičiulytė, Liudas Ališauskas, Albertas Jurgelevičius, Raimundas Savukynas, Mantas Stankevičius, Vytautas Dulskis, Paulius Vaitkevičius.

**RESEARCH INTERESTS**

Machine learning and its application.

Artificial intelligence and its application.

Natural language processing.

Cyber security.

Mathematical modeling.

Image analysis.

Visual odometry and localization.

Data mining and visualization.

Application of modeling, classification and clustering methods in medicine (e.g. in genetics) and economics.

Optimization. Application of stochastic optimization methods in engineering.

Multi-agent systems: simulation and application in social research.

**RESEARCH PROJECTS CARRIED OUT IN 2018**

**Projects Supported by University Budget**

***Project title*: Application of statistical modeling and stochastic programming in big data analysis.** Prof. Habil. Dr. L. Sakalauskas 2015–2018

*Main results:*

1. Developed planning algorithm for an experimental series using geometry of distance matrices with fractional degree indices
2. A recursive algorithm for hidden Markov chains was created.
3. Developed a novel metrics for the quantitative measuring of social capital and social cohesion.

*Publications:*

1. Jurgelevicius A. Sakalauskas L. (2018) Big Data Mining Using Public Distributed Computing. Information Technology and Control, Vol 47, No 2, pp. 236-248
2. Belovas I., Sakalauskas L. (2018) Limit Theorems For The Coefficients Of The Modified Borwein Method For The Calculation Of The Riemann Zeta-Function Values. Colloquium Mathematicum, Vol. 151, No 2, pp 217-227
3. A. Laukaitis, D. Plikynas, E. Ostasius (2018) Sentence Level Alignment of Digitized Books Parallel Corpora. Informatica. Vol. 29, No. 4, 1–18.

***Project title*:** **Theoretical and Engineering Aspects of e-Service Technology Development and Application in High - performance Computing Platforms**. Dr. Virginijus Marcinkevičius 2017– 2018.

*Description:* The goal of the project is to expand the capabilities of Web services technology development and use of these services in high performance computing platforms. The main tasks are such: to improve the access mechanisms to services and to enhance the analysis and realization techniques for service quality forecasting and matching the right, to develop the innovative solutions using Web services technologies for high performance computing platforms.

*Main results:*

1. Estimated supervised machine learning techniques for CERN CMS offline data certification.
2. Developed localization algorithm for UAV using particle filter and visual odometry.
3. Created a dataset of aerial imagery from robotics simulator.

*Publications:*

1. Stankevičius, Mantas; Marcinkevičius, Virginijus; Rapševičius, Valdas. Comparison of supervised machine learning techniques for CERN CMS offline data certification // Joint Proceedings of Baltic DB&IS 2018 Conference Forum and Doctoral Consortium co-located with the 13th International Baltic Conference on Databases and Information Systems (Baltic DB&IS 2018), Trakai, Lithuania, July 1-4, 2018 / edited by Audronė Lupeikienė, Raimundas Matulevičius, Olegas Vasilecas. Aachen : CEUR-WS. 2018, p. 170-176.
2. Jurevičius, R., Marcinkevičius, V., and Šeibokas J. (2018). Robust GPS Denied Localization for UAV Using Particle Filter and Visual Odometry. Machine Vision and Applications, Springer (in review).
3. Jurevičius, R., Marcinkevičius, V., AIR: A Dataset Of Aerial Imagery From Robotics Simulator. Robotics And Automation Letters (in review)

**National Research Projects**

***Project title*:** **Social Impact of Cultural Processes: Development of Metrics, Conceptual and Simulation Model.** Dr. Darius Plikynas 2017– 2019.

Main goal is development of the measuring metrics, conceptual and agent-based simulation model aimed at investigation of the social impact of cultural processes.

*Main results:*

1. Conceptual modelling of social impact to the cultural processes (events, agents and objects) using CIDOC-CRM methodic.

2. Development of a novel metrics for the quantitative measuring of social capital and social cohesion.

3. Standardized ODD protocol (used for the development of the agent-based simulation tools) employment for the detailed (technical) description of the conceptual model.

4. Algorithmization and mathematical modelling using the detailed (technical) ODD description.

5. Selection and adaptation of an agent-based simulation platform [NetLogo](https://ccl.northwestern.edu/netlogo/), that is used for the programming implementation of the mathematical model.

6. Successful passing of the interim report reviewed by Lithuania science council experts.

*Publications:*

*Accepted:*

1. A. Laukaitis, D. Plikynas, E. Ostasius (2018) Sentence Level Alignment of Digitized Books Parallel Corpora. Informatica. Vol. 29, No. 4, 1–18.
2. D. Plikynas, L. Sakalauskas, R. Laužikas, A. Miliauskas, V. Dulskis. Agent-Based Simulation of Cultural Events Impact on Social Capital Dynamics. IntelliSys2019 conference proceedings in the Springer series "Advances in Intelligent Systems and Computing".

*In review:*

1. R. Laužikas, D. Plikynas, L. Sakalauskas, A. Miliauskas, V. Dulskis. A Conceptual Model for Social Impact of Cultural Processes. Social Indicators Research. (WoS, IF=1,65)
2. D. Plikynas, L. Sakalauskas, A. Raudys. Conceptual Modelling of Brain State Dynamics as Free Energy and Entropy-based Processes. Journal of Biological physics (WoS, IF=1,0).

*Conference announcements:*

R. Laužikas, D. Plikynas, L. Sakalauskas. A Conceptual Model for Social Impact of Cultural Processes. *Conference* *CAA-2018*, Tubingen, 2018.

**MAIN R&D&I (RESEARCH, DEVELOPMENT AND INOVATION) PARTNERS**

SAP (Germany)

Neurotechnology (Lithuania)

University of Tartu (Estonia)

Vilnius Gediminas Technical University (Lithuania)

Ghent University (Belgium)

Warsaw University of Technology (Poland)

Lithuanian Culture Research Institute (Lithuania)

**OTHER SCIENTIFIC ACTIVITIES**

**Prof. L. Sakalauskas –**

* Editorial board member of Journal Technological and Economic Development of Economy http://www.tandf.co.uk/journals/journal.asp?issn=2029-4913&linktype=145
* Elected member of International Statistical Institute (2001) http://isi-web.org;
* Member of European Working Group on Continuous Optimization http://www.iam.metu.edu.tr/EUROPT
* Member of European Working Group on Stochastic Optimisation http://www.mii.lt/EWGSO
* Member of European Working Group on Civil Engineering and Sustainable Development http://http://www.orsdce.vgtu.lt
* President of Lithuanian Operational Research Society, http://www.mii.lt/LitORS
* Chair of Lithuanian Conference on Operations Research and Application in Business and Technics http://www.mii.lt/OT-2016.
* Reviewer of international journals:
  + Annals of Operation Research (Springer)
  + European Journal of Operational Research (Elsevier)
  + Informatica(IOSPress/VU)
  + Central European Journal of Operational Research (Springer),
  + Information Technology and Control (KTU),
  + International Transactions on Operational Research (Wiley&Sons)
  + Methodology and Computing in Applied Probability (Springer)
  + Technological and Economic Development of Economy (Francis&Taylor)

**Prof. D. Plikynas** -

* Reviewer in
* Computational and Mathematical Organization Theory (Springer)
* Entropy (MDPI)
* PeerJ
* Economics (VU)
* Information Technology and Control (KTU)
* Member of
* Artificial Intelligence section of Lithuanian Computer Society (LIKS-AIS)
* ESSA (European Social Simulation Association)
* ECCAI (European Coordinating Committee for Artificial Intelligence)

**Assoc. Prof. Dr. I. Belovas –**

* Member of Lithuanian Mathematical Society, <http://www.mif.vu.lt/lmd/>
* Reviewer of international journal Mathematical Modelling and Analysis (Taylor & Francis)

**Assoc. Prof. Dr. S. Minkevičius –**

* Member of Lithuanian Mathematical Society, <http://www.mif.vu.lt/lmd/>
* Reviewer of international journal Informatica (IOSPress/VU)

**Dr. V. Marcinkevičius –**

* Member of Council of Lithuanian Computer Society, <http://www.liks.lt/en/modules/tinycontent/index.php?id=3>
* Member of Lithuanian Mathematical Society, <http://www.mif.vu.lt/lmd/>
* Member of Lithuanian Operational Research Society, <http://www.mii.lt/LitORS/>
* Member of European Working Group on Stochastic Optimisation <http://www.mii.lt/EWGSO>
* Reviewer of international journal Informatica (IOSPress/VU)