VU Faculty of Mathematics and Informatics

Institute of Data Science and Digital Technologies – Annual Report 2023

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http://www.mii.lt

Director – Prof. Dr. Habil. *Gintautas Dzemyda*

STAFF
57 research fellows (incl. 48 holding research degree), 12 teachers (all of them holding research degree), 38 doctoral students.

SUBDIVISIONS OF THE INSTITUTE

Blockchain Technologies Group
Cognitive Computing Group
Cyber-Social Systems Engineering Group
Education Systems Group
Global Optimization Group
Image and Signal Analysis Group
Intelligent Technologies Research Group
Interdisciplinary Statistical Research Group
Statistics and Probability Group
Artificial Intelligence Laboratory

RESEARCH AREAS

Integrated development of mathematics, informatics and information technologies for the knowledge society advanced products and services

DOCTORAL DISSERTATIONS MAINTAINED IN 2023

Aidas Medžiūnas – *in Mathematics (N 001) defended on 30th October*
Scientific Supervisor: prof. habil. dr. Kęstutis Kubilius
"Various Classes of Stochastic Differential Equations: Existence, Uniqueness, and Approximation"

Marta Karaliutė – *in Informatics (N 009) defended on 29th September*
Scientific Supervisor: prof. dr.Kęstutis Dučinskas
Scientific Consultant: prof. habil. dr. Gintautas Dzemyda
"Supervised Bayesian classification methods of Gaussian Spatio-temporal data based on generative machine learning models"

Povilas Gudžius – *in Informatics Engineering (T 007) defended on 8th September*
Scientific Supervisor: prof. dr. Olga Kurasova
Scientific Consultant: doc. dr. Ernestas Filatovas
„Automated Machine Learning for Accurate and Low-latency Object Recognition in Optical Satellite Imagery“

MAIN CONFERENCES ORGANIZED IN 2023

- 14th International Conference *“Data Analysis Methods for Software Systems”*, November 30 – December 2, 2023, Druskininkai, Lithuania.
- 12th International Doctoral School on *Education Research*, December 4–8, 2023, Druskininkai, Lithuania.
- 4th National Conference *“Lithuanian graduate students' research in Informatics and IT”*, May 9, 2023, Vilnius.

BLOCKCHAIN TECHNOLOGIES GROUP

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www.mii.lt/en/structure/scientific-subdivisions/blockchain-technologies-group

Head – Dr. *Remigijus Paulavičius*

STAFF

Research professor: Prof. Dr. R. Paulavičius.
Senior researchers: Dr. E. Filatovas, Doc. Dr. V. Medvedev, Dr. F. J. Orts.
Researcher: Dr. L. Stripinis.
Lecturer: Dr. A. Igumenov.
Junior researcher: Dr. M. Juodis, Marco Marcozzi.
Doctoral students: A. Budžys, J. Dautartas.

RESEARCH INTERESTS

- Blockchain technologies
- Global optimization
- Optimization software
- Multi-objective optimization
- High-performance computing
- Artificial intelligence
- Image processing
- Big Data
- Quantum computing
- Quantum technologies

RESEARCH PROJECTS CARRIED OUT IN 2023

Projects Supported by University Budget

Research and development of public, private, and consortium-type blockchain systems. Prof. Dr. R. Paulavičius, 2018–2023.
Introduction of a set of improvements for implementing a quantum blockchain protocol based on hypergraphs aiming to reduce the required resources and operations and increase noise tolerance. Enhancing the state-of-the-art quantum circuits that underpin the quantum blockchain by optimizing the so-called T-count and T-depth. Evaluation of the effectiveness of proposed improvements on real quantum devices.
The Role of the DIRECT Algorithm in Derivative-Free Global Optimization. Development and DIRECT-Type Algorithms. Applications and Software of DIRECT-Type Algorithms.
Concentrated overview of the state-of-the-art Tourist Trip Design Problem (TTDP), including solution approaches. Model of personalized tourist trip design problem for a real-world application. A new greedy genetic algorithm to solve the designed TTDP. Evaluation of the performance of the proposed algorithm on the collected real-world dataset containing the main POIs of the City of London, using different complexity situations, and comparison it with other popular baseline algorithms. Introduction of a novel GlobeTrott Travel tourist recommendation system and access to it.

Main publications:

Stripinis, Linas; **Paulavičius, Remigijus**. *Derivative-free DIRECT-type global optimization: applications and software*. Cham: Springer Nature, 2023. X, 122 p. (SpringerBriefs in Optimization, ISSN 2190-8354, eISSN 2191-575X). ISBN 9783031465390. eISBN 9783031465376. DOI: 10.1007/978-3-031-46537-6

Paulavičius, Remigijus; **Stripinis, Linas**; Sutavičiūtė, Simona; Kočegarov, Dmitrij; **Filatovas, Ernestas**. A novel greedy genetic algorithm-based personalized travel recommendation system // *Expert systems with applications*. Oxford: Elsevier Ltd. ISSN 0957-4174. 2023, vol. 230, art. no. 120580, p. [1-18]. DOI: 10.1016/j.eswa.2023.120580

Orts Gomez, Francisco Jose; **Paulavičius, Remigijus**; **Filatovas, Ernestas**. Improving the implementation of quantum blockchain based on hypergraphs // *Quantum information processing*. New York : Springer. ISSN 1570-0755. eISSN 1573-1332. 2023, vol. 22, art. no. 330, p. [1-20]. DOI: 10.1007/s11128-023-04096-w

National Research Projects

Research Council of Lithuania. **Resolving research reproducibility problems in Artificial Intelligence using Blockchain Technologies** (No. P-MIP-21-196). Dr. E. Filatovas. 2021–2024.
Today, various Artificial Intelligence techniques have solved most real-world challenging decision problems (image analysis, voice and face recognition, planning, scheduling, routing, etc.). However, Artificial Intelligence research domains (as well as other research fields) face with Reproducibility Crisis. Researchers need help reproducing many key results due to the disconnection between publications and used codes, underlying data, parameter settings, etc., as they lack critical details. Solutions that improve code accessibility, data provenance tracking, research transparency, auditing of obtained results, and trust in Artificial Intelligence domains can significantly accelerate algorithm and model development, validation, and transition into real-world applications. Thanks to the features provided by Blockchain Technology, significant progress in resolving the Reproducibility Crisis and full reproducibility can be achieved.

In this context, the project's main objective is to contribute to resolving research reproducibility problems in the Artificial Intelligence field and enhance the research cycle by developing a conceptual model of a blockchain-based decentralized platform, which would be efficient, scalable, interoperable, and adaptable in various Artificial Intelligence research domains.

Main publications:

Orts Gomez, Francisco Jose; **Paulavičius, Remigijus**; **Filatovas, Ernestas**. Improving the implementation of quantum blockchain based on hypergraphs // *Quantum information processing*. New York : Springer. ISSN 1570-0755. eISSN 1573-1332. 2023, vol. 22, art. no. 330, p. [1-20]. DOI: 10.1007/s11128-023-04096-w

Orts, Francisco; **Filatovas, Ernestas**; Ortega, Gloria; Garzon, Ester M. A quantum circuit to generate random numbers within a specific interval // *EPJ quantum technology*. New York: Springer Nature. ISSN 2662-4400. eISSN 2196-0763. 2023, vol. 10, art. no. 17, p. [1-16]. DOI: 10.1140/epjqt/s40507-023-00174-1

Gudžius, Povilas; Kurasova, Olga; Darulis, Vytenis; **Filatovas, Ernestas**. AutoML-based neural architecture search for object recognition in satellite imagery // *Remote sensing*. Basel : MDPI. eISSN 2072-4292. 2023, vol. 15, iss. 1, art. no. 91, p. [1-24]. DOI: 10.3390/rs15010091

Ministry of Education and Science (Lithuania). **Excellence Centre "Data Centre for Machine Learning and Quantum Computing in the Life and Biomedical Sciences"** project on **"Development and validation of quantum machine learning methods using pre-built data sets"**. Prof. Dr. R. Paulavičius, 2023–2027.

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

Poznan Supercomputing and Networking Center (PSNC)
Imperial College London (UK)
Universidad de Almería (Spain)
Cardiff University (UK)
Systems Research Institute, Polish Academy of Sciences (Poland)
The Kharkiv National University of Radio Electronics, Computer Science Faculty (Ukraine)
Octeract Optimisation Intelligence (UK)

OTHER SCIENTIFIC ACTIVITIES

Dr. R. Paulavičius –

- Vice-president of Lithuanian Quantum Technology Association;
- member of the Young Academy of the Lithuanian Academy of Sciences;
- member of the *Artificial Intelligence and Digital Transformation* working group of the Arqus University Alliance;
- member of program committees of the international conferences:
  - NUMTA2023
  - BLOCKCHAIN'23
- topic editor of *Mathematics*;
- affiliate member of the *European Network of Excellence on High Performance and Embedded Architecture and Compilation* (HiPEAC).

Dr. E. Filatovas –

- member of the International Society on Multiple Criteria Decision Making (MCDM);
- member of the *Artificial Intelligence and Digital Transformation* working group of the Arqus University Alliance;
- member of the Lithuanian Computer Society (LIKS);
- member of Program/Scientific Committees:
  - BLOCKCHAIN'23
- Reviewer in the following scientific journals:
  - *Expert systems with Applications*
  - *IEEE Transactions on Systems, Man and Cybernetics: Systems*
  - *Computers and Electrical Engineering*
  - *Journal of Supercomputing*
  - *Informatica*

Dr. V. Medvedev –

- member of Lithuanian Computer Society, http://www.liks.lt/;
- member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/;
- member of Program/Scientific Committees:
  - program committee member of the International Workshop on Secure Mobile Cloud Computing (IWoSeMC-20, IWoSeMC-2022), http://iwosemc.eu/.
  - organizing committee member of the Conference on Data Analysis Methods for Software Systems (DAMSS), Druskininkai, Lithuania, https://www.mii.lt/damss

Dr. F. J. Orts – https://hpca.ual.es/~forts/

Dr. L. Stripinis –

- Reviewer in the following scientific journals:
  - *Journal of Global Optimization*
  - *Computational Optimization and Applications*
  - *Engineering Optimization*
  - *Mathematics*
  - *Scientific Reports*

Dr. A. Igumenov – member of Lithuanian Computer Society, http://www.liks.lt/.

Dr. M. Juodis –Reviewer in the scientific journal *Computer communications*

BEST REPORTS DELIVERED AT CONFERENCES ABROAD

- Dr. E. Filatovas. *Towards Reproducible Research in AI via Blockchain* at *4th International Conference and Summer School NUMTA 2023 "Numerical Computations: Theory and Algorithms"* June 14-20, 2023, Calabria, Italy.
- Dr. Viktor Medvedev. *Enhancing keystroke biometric authentication using deep learning techniques* at *18th Iberian Conference on Information Systems and Technologies (CISTI)*, June 20-23, 2023, Aveiro, Portugal.
- Arnoldas Budžys. *Behavioral biometrics authentication in critical infrastructure using siamese neural networks* at *HCI-CPT: 5th international conference on hci for cybersecurity, privacy and trust*, July 23-28, 2023, Kopenhaga, Denmark.

MOST IMPORTANT NATIONAL AND INTERNATIONAL AWARDS RECEIVED FOR R&D ACTIVITIES

- Dr. L. Stripinis received the VU Rector Science Award

MOST IMPORTANT PARTICIPATION CASES OF RESEARCHERS IN WORKING GROUPS OR COMMISSIONS SET UP BY STATE AUTHORITIES, STATE AND MUNICIPAL INSTITUTIONS, ORGANISATIONS, BUSINESS ENTITIES

- R. Paulavičius – member of Innovation Agency's Smart Specialisation Priority "ICT Working Group";
- R. Paulavičius – member of the Advisory Working Group (AWG) of the Lithuanian Science Council's European Horizon (EH) Programme Action Group 4 "Digital Technologies, Industry, Space";
- R. Paulavičius – member of the FinTech & Blockchain Focus Group of the Innovation Agency's ICT Roadmap Focus Group;

CONSULTATIONS PROVIDED BY THE UNIT TO THE PUBLIC OR ECONOMIC ENTITIES

- Prof. Dr. R. Paulavičius conducted the expert evaluation of the National Research Agency (ANR) application for AAPG 2023 (France).
- Prof. R. Paulavičius provided expert insights for the draft vision of Lithuania's future (state progress strategy) "Lithuania 2050"

MOST IMPORTANT RESEARCH DISSEMINATION ACTIVITIES

- Cooperation agreement between VU and PSNC on quantum technologies:
  - https://www.delfi.lt/login/progresas/mokslas/lietuva-jungiasi-prie-didziausio-kvantinio-tinklo-pasaulyje-94053847
  - https://www.psnc.pl/vilnius-university-begins-cooperation-with-the-poznan-supercomputing-and-networking-center-psnc-in-the-field-of-quantum-technologies/
- A new association has been established to develop quantum technologies in Lithuania:
  - https://www.lrt.lt/naujienos/mokslas-ir-it/11/2132276/isteigta-lietuvos-kvantiniu-technologiju-asociacija
  - https://www.vz.lt/inovacijos/technologijos/2023/11/23/siekiant-aktyviau-vystyti-kvantines-technologijas-lietuvoje-ikurta-asociacija
- Research dissemination publication on the LRT news portal on the importance of Internet of Things (IoT) technologies in our lives:
  - https://www.lrt.lt/naujienos/mokslas-ir-it/11/1870887/15-mlrd-prijungtu-prietaisu-daiktu-internetu-naudojames-patys-to-nezinodami

COGNITIVE COMPUTING GROUP

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Head – Prof. Habil. Dr. *Gintautas Dzemyda*

STAFF

Principal researchers: Prof. Habil. Dr. G. Dzemyda, Prof. Dr. A. Jakaitienė, Prof. Dr. O. Kurasova, Prof. Dr. Audris Mockus
Principal researchers of projects: Dr. R. Dukynaitė, Dr. G. Dzemydaitė, Dr. G. A. Melnik-Leroy, Dr. S. Raižienė, Prof. habil. dr. Želvys.
Researchers: Dr. R. Karbauskaitė, Dr. G. A. Melnik-Leroy, Dr. A. Usovaitė, Dr. M. Sabaliauskas, Dr. D. Stumbrienė.
Junior researchers: A. Šubonienė, V. Tiešis, J. Vaitekaitis.
Professors: Prof. Dr. Dučinskas, Prof. Habil. Dr. G. Dzemyda, Prof. Dr. O. Kurasova.
Assistants: Dr. M. Sabaliauskas, Dr. D. Stumbrienė, Dr. L. Ringienė.
Junior assistants: Dr. I. Katin, Ž. Vaišnoras.
Other staff: R. Gipiškis, L. Mikalauskienė, V. Palkevič, Dr. L. Ringienė, Dr. M. Sabaliauskas, V. Tiešis.
Doctoral students: D. Breskuvienė, V. Bulavas, R. Gipiškis, P. Gudžius, M. Karaliutė, G. Krasauskas, N. Kondrat, M. Motiejauskas, I. Pocė, R. Puronaitė, Ž. Vaišnoras, R. Vaišnorė.

RESEARCH INTERESTS

- Artificial neural networks
- Big data
- Bioinformatics
- Cognitive science
- Data mining
- Deep learning
- Global optimization methods
- Multi-objective optimization
- Image analysis, feature detection, image reconstruction, medical image processing
- Internet data mining
- Fractal dimensionality
- Local optimization methods
- Machine learning
- Medical data analysis and decision support
- Multiple criteria decision support
- Operations research
- Optimal control applications
- Parallel computing
- Simulation models in epidemiology, education, economics, and energy with uncertainty
- Statistical simulation
- Stochastic programming
- Swarm intelligence
- Visualization of multidimensional data
- Web service development

RESEARCH PROJECTS CARRIED OUT IN 2023

- **International Research Project**

Research Council of Lithuania. **Correcting misperceptions of Covid-19 data: an Innovative E-platform CognitiveSTATS for Training Statistical Intuitions in the General Public** (No. 01.2.2-LMT-K-718-05-0042), Dr. G. A. Melnik-Leroy. 2021/11-2023/09

The objective of this project is to create a prototype of the innovative e-platform for statistical intuition training in the general public, cognitiveSTATS, which will help to correct misperceptions of Covid-19 data. In order to implement this project, two activities have been planned: 1. to carry out scientific research and experiments in order to identify the most important problems in Covid-19 data interpretation (statistical and / or cognitive) and the most effective ways of training statistical intuitions; 2. based on the results of this research, to develop and test a prototype of the public's statistical intuition training platform. The platform CognitiveSTATS will help people understand some crucial phenomena inherent to the pandemic situation (the spread of the infection, the effectiveness of safety measures and vaccines, the probability to get infected, the economic consequences of the pandemic etc.) and evaluate more critically data and information, spreading in the public sphere, including those shared on social media. In order to ensure the effectiveness and the attractiveness of the platform, three innovative milestones will be used for its development: evidence from cognitive science, principles of gamification, and visualizations of Covid-19 data. In this way, the project aims at educating the society, training their skills, and as a consequence, significantly influencing the attitudes and behavior of the public. The research carried out during the project and the developed prototype of the e-platform will be presented in international-level scientific articles. Given that the project idea is adaptable to future pandemic or crisis situations and that population attitudes and behavior are an essential factor in managing any emergency situation, CognitiveSTATS has a long-term perspective and can be widely applied in a data-driven world.

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

Institute of Archaeology University of Wrocław (Poland)
State Cultural Rezerve of Kernavė (Lithuania)
University of Copenhagen (Denmark)
University of Latvia (Latvia)
University of Tartu (Estonia)

OTHER RESEARCH ACTIVITIES

Prof. Habil. Dr. G. Dzemyda –

- member of Lithuanian Academy of Science, http://lma.lt;
- recently elected as the head of Division of Technical Sciences of the Lithuanian Academy of Sciences;
- member of programme committees of the international conferences:
  - The WorldCist'21 - 9th World Conference on Information Systems and Technologies;
  - ESSE 2021, 2nd European Symposium on Software Engineering;
  - IEEE INISTA 2021, International Conference on INnovations in Intelligent SysTems and Applications (INISTA);
  - SENSORNETS 2021 : 10th International Conference on Sensor Networks;
- ❖ chairman of the 12th International Workshop *Data Analysis Methods for Software Systems*, Druskininkai, Lithuania, 2021, http://www.mii.lt/DatAMSS/;
- ❖ editor-in-Chief of
  Baltic Journal of Modern Computing http://www.lu.lv/baltic-journal-of-modern-computing/;

international journal *Informatica* (IOSPress/VU), https://www.mii.lt/Informatica/;

- ❖ editorial board member of 8 international journals: *Financial Innovation; International Journal of Computers; Communications and Control; Applied Computer Systems; Informatics in Education; Journal of Civil Engineering and Management; Nonlinear Analysis: Modelling and Control; Mathematics and Informatics. Journal of the Belarusian State University;*
- ❖ member of IFIP Technical Committee 12 Artificial Intelligence; http://www.ifiptc12.org.uk/ifiptc12/members.php;
- ❖ member of Lithuanian Computer Society, http://www.liks.lt/;
- ❖ member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/;
- ❖ member of Lithuanian Operational Research Society, http://www.mii.lt/LitORS/ .

Prof. Dr. O. Kurasova –

- member of Lithuanian Academy of Science, http://lma.lt;
- member of editorial boards of international journals:
  - *Nonlinear Analysis: Modelling and Control*, http://www.mii.lt/NA/,
  - *Information Technology and Control*, https://itc.ktu.lt/index.php/ITC/about/editorialTeam
  - *Baltic Journal of Modern Computing*, http://www.lu.lv/baltic-journal-of-modern-computing/editorial-board/,
  - *Computational Science and Techniques*, http://journals.ku.lt/index.php/CST/about/editorialTeam,
  - *Informatics*, http://www.mdpi.com/journal/informatics;
- member of Association for Computing Machinery, https://www.acm.org/,
- member of IEEE, https://www.ieee.org,
- member of Association of European Operational Research Societies https://www.euro-online.org/
- member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/,
- member of Lithuanian Operational Research Society, http://www.mii.lt/LitORS/.
- chairwoman of the doctoral committee of Informatics, Vilnius University.
- member of the doctoral committee of Informatics Engineering, Vilnius University.

Prof. Dr. A. Jakaitienė –

- member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/index.html;
- board member of Lithuanian Statistics Society, http://www.statistikusajunga.lt/;
- member of International Biometric Association, https://www.biometricsociety.org;
- country representative of International Biometric Association in Nord Baltic Region, http://ibsnbr.org;
- country representative at European Statistical Advisory Committee, https://ec.europa.eu/eurostat/web/european-statistical-advisory-committee-esac

Dr. R. Karbauskaitė –

managing editor of *Informatica* (IOSPress/VU), https://informatica.vu.lt/journal/INFORMATICA/information/INFORMATICA-Editorial

Prof. Dr. K. Dučinskas

board member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/index.html;

board member of Lithuanian Statistics Society, http://www.statistikusajunga.lt/;
member of International Biometric Association, https://www.biometricsociety.org;

Dr. G. A. Melnik-Leroy

- member of the Cognitive Science Society
- member of the programme committee of the international conference: New Sounds 2021
- member of the International Speech Communication Association

Doctoral student R. Puronaitė
member of the International Society for Clinical Biostatistics, https://www.iscb.info/

BEST REPORTS DELIVERED AT CONFERENCES ABROAD

Mockus, A. (2023). Securing LLM-based Software Supply Chains. 38th IEEE/ACM International Conference on Automated Software Engineering (ASE 2023), Track: ASE 2023 SATE - Software Engineering at the Era of LLMs. https://conf.researchr.org/details/ase-2023/ase-2023-sate-software-engineering-at-the-era-of-llms/5/Securing-LLM-based-Software-Supply-Chains

Melnik-Leroy, G. A., & Navickas, G. (2023). Can Better Perception Become a Disadvantage? Synthetic Speech Perception in Congenitally Blind Users. *INTERSPEECH 2023*, *August*, 1100–1103. https://doi.org/10.21437/interspeech.2023-2013

CYBER-SOCIAL SYSTEMS ENGINEERING GROUP

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Head – Assoc. Prof. Dr. *Audronė Lupeikienė*

STAFF

Research fellows: Dr. Romas Alonderis, Dr. Saulius Maskeliūnas, Dr. Jolanta Miliauskaitė.
Associate professors: Assoc. Prof. Dr. Audronė Lupeikienė, Dr. Jolanta Miliauskaitė, Dr. Asta Slotkienė.
Assistant research fellow: Laima Paliulionienė.
Affiliated researchers: Assoc. Prof. Dr. Saulius Gudas, Prof. Habil. Dr. Stasys Jukna, Assoc. Prof. Dr. Aida Pliuškevičienė.
Doctoral student: Karolis Noreika.

RESEARCH INTERESTS

Cyber-social systems engineering:

- Models, methods, and tools for cyber-social systems;
- Intelligent systems for digital business;
- Foundations of causality-based enterprise software engineering;
- Causal modeling of enterprise management activities and business processes;

- Model-based application development methods for different types of systems (enterprises, Internet of Things, smart systems, etc.).

Mathematical logic:

- Automated deduction;
- Knowledge analysis methods;
- Deductive systems.

RESEARCH PROJECTS CARRIED OUT IN 2023

Projects Supported by University Budget

Research of cyber-social systems and development of engineering methods at the intersection of cyber-physical and cyber-social systems. Prof. Dr. Saulius Gudas 2021–2023,
Assoc. Prof. Dr. Audronė Lupeikienė 2023.

Main results in 2023:

1. The theory on tropical circuits and their use as a rigorous mathematical model for dynamic programming, which is one of the most fundamental algorithmic paradigms for solving combinatorial, discrete optimization problems.
2. A modified Agile project management process model using the causal modeling method is created. The causal Agile management hierarchy is formalized; quantitative parameters to evaluate the state of the project are defined; a knowledge repository model was developed.
3. The method of causal modeling is applied for the quality of Web services modeling. A three-dimensional semantic space was created for the modeling of service quality parameters.

Main publications:

Jukna, Stasys. Tropical circuit complexity: limits of pure dynamic programming. Cham: Springer Nature, 2023. 129 p. (Springer Briefs in Mathematics, ISSN 2191-8198, eISSN 2191-8201). ISBN 9783031423536. eISBN 9783031423543. DOI: 10.1007/978-3-031-42354-3. Available at: https://link.springer.com/book/10.1007/978-3-031-42354-3%20%20.

Kalibatienė, Diana**; Miliauskaitė, Jolanta; Slotkienė, Asta; Gudas, Saulius**. On the development of the web service quality modelling space // Expert systems with applications. Oxford: Elsevier. ISSN 0957-4174. eISSN 1873-6793. 2023, 211, art. no. 118584, p. 1-12. DOI: 10.1016/j.eswa.2022.118584. Available at: https://www.sciencedirect.com/science/article/pii/S0957417422016438?via%3Dihub.

Noreika, Karolis; Gudas, Saulius. Causal knowledge modelling for Agile development of enterprise application systems // Informatica. Vilnius : Vilniaus universiteto leidykla. ISSN 0868-4952. eISSN 1822-8844. 2023, vol. 34, no. 1, p. 121-146. DOI: 10.15388/23-INFOR510. Available at: https://informatica.vu.lt/journal/INFORMATICA/article/1287/info

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

Riga Technical University (Latvia)
University of Tartu (Estonia)
Systems Research Institute Polish Academy of Sciences
University of Geneva (Switzerland)
University of Frankfurt (Germany)

OTHER SCIENTIFIC ACTIVITIES

Prof. Dr. Saulius Gudas

- IFIP TC8 Information Systems member;
- representative of the National Digital Coalition from LIKS;
- reviewer of the journal *Informatica*, https://www.mii.lt/informatica/;
- reviewer of the journal *Information systems and e-business management*, https://link.springer.com/journal/10257 ;
- reviewer of the *Baltic Journal of Modern Computing*, https://www.bjmc.lu.lv/ ;
- reviewer of the journal *Complex Systems Informatics and Modeling Quarterly*, https://csimq-journals.rtu.lv/index ;
- reviewer of the MDPI journal *Information*, http://www.mdpi.com/journal/information/ ;
- program committee member of the 24th International Conference on Computer Systems and technologies (CompSysTech'23), https://www.compsystech.org/_cst23/index.php?cmd=dPage&pid=pc .

Prof. Habil. Dr. Stasys Jukna

- scientific board member of the *Electronic Colloquium on Computational Complexity* (ECCC), http://eccc.hpi-web.de/colloquium/scientific_board/;
- editorial board member of the *Lithuanian Mathematical Journal*, https://www.mii.lt/en/lithuanian-mathematical-journal#editorial-board.

Assoc. Prof. Dr. Audronė Lupeikienė

- editorial board member and reviewer of the *Scientific Journal of Riga Technical University: Applied Computer Systems*, https://acs-journals.rtu.lv/;
- reviewer of the journal *Informatica*, https://www.mii.lt/informatica/;
- steering committee member of the International Baltic Conference on Digital Business and Intelligent Systems (Baltic DB&IS), https://dbis2022.lu.lv/about/organisation/;
- program committee member of the 16th International Conference on Agents and Artificial Intelligence (ICAART 2024), https://icaart.scitevents.org/ProgramCommittee.aspx, of the 27th European Conference on Advances in Databases and Information Systems (ADBIS 2023) https://www.essi.upc.edu/dtim/ADBIS2023/index.html?p=program_committee.

Dr. Saulius Maskeliūnas

- Chairman of the Council & President of the Lithuanian Computer Society https://www.liks.lt/en/contacts/ ;
- Head of the Technical Committee TK4 “Information Technology” of the Lithuanian Standards Board LST https://eshop.lsd.lt/public#!/committee/info/6040 ;
- Member of the State Commission of the Lithuanian Language Sub-Commission of Language Technologies https://vlkk.lt/struktura-ir-kontaktai/komisija/pakomises ;
- "Encyclopaedia for Lithuania and the World" (www.Lietuvai.lt) Board of Editors member https://lietuvai.lt/wiki/Enciklopedija:Bendruomen%C4%97 ;
- Lithuania representative at the International Federation for Information Processing (IFIP) https://ifip.org/index.php?option=com_content&task=view&id=125&Itemid=441&ref=25 ;
- Member of the Rules of Participation (RoP) working group of the European Open Science Cloud (EOSC), https://www.eoscsecretariat.eu/working-groups/rules-participation-working-group ;
- International AIQT Foundation Advisory Board member (in Artificial Intelligence) https://www.inaiqt.com/about/foundation-advisory-board/ ;

- program committee member of the 16th International Baltic Conference on Digital Business and Intelligent Systems (Baltic DB&IS 2024) https://dbis2024.vu.lt/organisation/programme-committee ;
- PC head and OC member of the Biennial National Conference "Computer Days 2023" https://www.liks.lt/kodi-2023/ .

Dr. Jolanta Miliauskaitė

- reviewer of the *Baltic Journal of Modern Computing*, https://www.bjmc.lu.lv/ ;
- member of the Council of the Lithuanian Computer Society (LIKS).

Laima Paliulionienė

- organizing committee member and webmaster of the 16th International Baltic Conference on Digital Business and Intelligent Systems (Baltic DB&IS 2024), https://dbis2024.vu.lt/ .

Dr. Asta Slotkienė

- reviewer of the *Baltic Journal of Modern Computing*, https://www.bjmc.lu.lv/ .

EDUCATION SYSTEM GROUP

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https://www.mii.lt/en/structure/scientific-subdivisions/education-systems-group

Head – Prof. Dr. *Valentina Dagienė*

STAFF

Chief research fellow: Prof. Dr. V. Dagienė

Senior research fellow: Dr. V. Dolgopolovas, Dr. T. Jevsikova

Research fellows:, Dr. A. Juškevičienė,

Doctoral students: S. Bagočienė, V. Masiulionytė-Dagienė

Affiliated senior research fellows: Assoc. Prof. Dr. G. Grigas, Dr. L. Markauskaitė.

RESEARCH INTERESTS

- Application of intelligent technologies in education
- Computer science (Informatics) education research
- Computing engineering education research
- Software localisation
- Technology enhanced learning

RESEARCH PROJECTS CARRIED OUT IN 2023

Research on educational environments and technologies to improve the quality of education. Prof. Dr. V. Dagienė, 2021–2023.

Main objective of the theme: To study the problems of designing, integrating and personalising

interactive educational environments and technologies in education.

Main publications:

Juškevičienė, Anita; Pears, Arnold; **Jevsikova, Tatjana**; **Stupurienė, Gabrielė**. Computational thinking design application for STEAM education // Data science in applications / editors: Gintautas Dzemyda, Jolita Bernatavičienė, Janusz Kacprzyk. Cham : Springer International Publishing, 2023. ISBN 9783031244520. eISBN 9783031244537. p. 1-26. (Studies in Computational Intelligence, ISSN 1860-949X, eISSN 1860-9503 ; 1084). DOI: 10.1007/978-3-031-24453-7_1. [Indėlis: 0,750] [M.kr.: T 007]

Stumbrienė, Dovilė; **Jevsikova, Tatjana**; Kontvainė, Vita. Key factors influencing teachers' motivation to transfer technology-enabled educational innovation // Education and information technologies: Special Issue on: What will be the new normal? Digital competence and 21st century skills: critical and emergent issues in the K-12 education. New York : Springer Nature. eISSN 1573-7608. 2023, Early Access, p. 1-35. DOI: 10.1007/s10639-023-11891-6. [Social Sciences Citation Index (Web of Science); Scopus; DBLP] [IF: 5,500; AIF: 3,000; IF/AIF: 1,833; **Q1** (2022, InCites JCR SSCI)] [M.kr.: T 007, S 007, N 00]

Dagienė, Valentina; Gülbahar, Yasemin; Grgurina, Natasa; López-Pernas, Sonsoles; Saqr, Mohammed; Apiola, Mikko; **Stupurienė, Gabrielė**. Computing education research in schools // Past, present and future of computing education research: a global perspective / editors: Mikko Apiola, Sonsoles López-Pernas, Mohammed Saqr. Cham : Springer International Publishing, 2023. ISBN 9783031253355. eISBN 9783031253362. p. 481-520. DOI: 10.1007/978-3-031-25336-2_20. [SpringerLink] [Indėlis: 0,290] [M.kr.: T 007]

International Research Projects

2020-2024 m. **COST: EUGAIN - CA19122** European Network for Gender Balance in Informatics**. (Prof. Dr. V. Dagienė, Dr. Anita Juškevičienė)**

2021-2024 m. **Erasmus+ KA220-HED**. Future IT Professionals Education in Artificial Intelligence. **(Prof. dr. V. Dagienė, Dr. V. Dolgopolovas)**

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

Ankara University (Turkey)
ETH Zurich (Switzerland)
KTH Royal Institute (Sweden)
Lancaster University (UK)
Radboud University Nijmegen (The Netherlands)
Tallinn University (Estonia)
Turku University (Finland)

OTHER RESEARCH ACTIVITIES

Prof. Dr. V. Dagienė –

- editor-in-Chief of the journal *Informatics in Education*, https://infedu.vu.lt/journal/INFEDU (Clarivate Analytics Web of Science Core Collection; Scopus; etc.);
- editor-in-Chief of the journal *Olympiads in Informatics* (Scopus, etc.), https://ioinformatics.org/page/ioi-journal-editorial-board/2;
- area editor (Computing Didactics) of the *Baltic Journal of Modern Computing*, https://www.bjmc.lu.lv (Clarivate Analytics Web of Science Core Collection; Scopus; etc.);
- editorial board member of the journals: *International Journal of Digital Literacy and Digital Competence; International Journal of Instruction*; *Acta Paedagogica Vilnensia*;

- coordinator of the Nordplus Network on Innovative Computing Engineering Education Research;
- representative of Lithuania in Education Committee TC3 under the International Federation for Information Processing (IFIP);
- chair of the Bebras Board (International Challenge on Informatics and Computational Thinking): https://www.bebras.org/?q=community.

Dr. V. Dolgopolovas –

- member of European AI Alliance https://futurium.ec.europa.eu/en/european-ai-alliance
- member of USERN: Universal Scientific Education and Research Network: https://usern.tums.ac.ir/

Dr. A. Juškevičienė –

- member for methodological group of EU co-funded project No. 01.1.1-CPVA-V-701-15-0001 „Development of Vilnius STEAM Center" activity „Preparation of the Methodological Part of STEAM Center activities: Development of Laboratory Descriptors and Integrated Methodologies for Robotics and Mobile Technology and Visual Programming Laboratory", http://steamlt.lt/

Dr. T. Jevsikova –

- member of International Federation for Information Processing (IFIP) TC3 WG 3.1 (Informatics for Secondary Education).
- member for methodological group of EU co-funded project No. 01.1.1-CPVA-V-701-15-0001 „Development of Vilnius STEAM Center" activity „Preparation of the Methodological Part of STEAM Center activities: Development of Laboratory Descriptors and Integrated Methodologies for Robotics and Mobile Technology and Visual Programming Laboratory", http://steamlt.lt/

BEST REPORTS DELIVERED AT CONFERENCES ABROAD

Vaida Masiulionytė-Dagienė. Modeling of the system for computational thinking automatic assessment. ITiCSE 2023: Conference on innovation and technology in computer science education. July 7– 12 d., 2023 m. Turku, Finland. https://doi.org/10.1145/3587103.3594218

Anita Juškevičienė, **Valentina Dagienė**, Asta Meškauskienė. Physical Computing to Motivate Girls for STEAM Education. International Edusimsteam Innovative Practices and Policy Making in STEAM Education Conference. https://edusimsteam.eba.gov.tr/en/international-edusimsteam-innovative-practices-and-policy-making-in-steam-education-conference/

MOST IMPORTANT RESEARCH DISSEMINATION ACTIVITIES

Valentina Dagienė and Tatjana Jevsikova have organized International Challenge on Informatics and Computational Thinking "Bebras", they create, translate, test tasks and develop methodological materials for teachers.

Valentina Dagienė in cooperation with Institute of Educational Sciences have organized the International Doctoral Consortium – School on Engineering Education Research in Druskininkai, December 4-8, 2023.

International journal "Informatics in Education" *Scopus* citation index 5.5 (2022 year). *WoS* Journal Impact Factor – 2.7.

GLOBAL OPTIMIZATION GROUP

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Head – Prof. Dr. *Julius Žilinskas*

STAFF

Principal research fellows: Prof. Dr. J. Žilinskas, Prof. Habil. Dr. A. Žilinskas.
Senior research fellows: Assoc. Prof. Dr. A. Lančinskas, Assoc. Prof. Dr. R. Pupeikis.
Doctoral students: S. Tautvaišas, M. Kepalas.

RESEARCH INTERESTS

- Optimization and high-performance computing

RESEARCH PROJECTS CARRIED OUT IN 2023

- **Projects Supported by University Budget**

Global Optimization. Prof. Dr. J. Žilinskas.
The aim is development of global optimization algorithms and application of them to optimization problems.
The main results were: global optimization algorithms with constraints; heuristic algorithms for facility location problems; Bayesian global optimization; linear convolution computations online optimization algorithm.

Main publications:

P. Fernández, A. Lančinskas, B. Pelegrín, J. Žilinskas (2023). A discrete competitive facility location model with proportional and binary rules sequentially applied. Optimization Letters, 17, 867–877. DOI:10.1007/s11590-022-01938-x

S. Tautvaišas, J. Žilinskas (2023). Heteroscedastic Bayesian optimization using generalized product of experts. Journal of Global Optimization. DOI:10.1007/s10898-023-01333-5

- **International Research Projects**

2023–2024 COST Action CA22137 ROAR-NET – Randomised Optimisation Algorithms Research Network. (A. Lančinskas, J. Žilinskas)

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

Universidad de Almería (Spain)
Universidad de Murcia (Spain)
Universidad de La Laguna (Spain)
Universidad de Malaga (Spain)
Universidade de Coimbra (Portugal)
Università della Calabria (Italy)
Università degli Studi di Cassino e del Lazio Meridionale (Italy)
Cardiff University (UK)
New Jersey Institute of Technology (USA)

OTHER RESEARCH ACTIVITIES

Prof. Dr. J. Žilinskas –

- member of editorial boards of international journals:
  - Computational Management Science (Springer, https://www.springer.com/journal/10287/editors),
  - Computer Science (AGH, https://journals.agh.edu.pl/csci/about/editorialTeam), Informatica (IOSPress/VU, https://informatica.vu.lt/journal/INFORMATICA/information/INFORMATICA-Editorial),
  - Information Technology and Control (KTU, https://itc.ktu.lt/index.php/ITC/about/editorialTeam),
  - Journal of Global Optimization (Springer, https://www.springer.com/journal/10898/editors),
  - Mathematical Methods of Operations Research (Springer, https://www.springer.com/journal/186/editors),
  - Mathematical Modelling and Analysis (VGTU, https://journals.vilniustech.lt/index.php/MMA/editorialboard),
  - Open Computer Science (De Gruyter, https://www.degruyter.com/journal/key/comp/html#editorial),
  - Open Engineering (De Gruyter, https://www.degruyter.com/journal/key/eng/html#editorial),
  - Optimization Letters (Springer, https://www.springer.com/journal/11590/editors),
  - Operations Research Forum (Springer Nature, https://www.springer.com/journal/43069/editors).
- member of European Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC), http://www.hipeac.net;

Prof. Habil. Dr. A. Žilinskas –

- member of IFIP working group WG 7.6 Optimization-Based Computer Aided Modeling and Design, http://www.ifip.org/bulletin/bulltcs/memtc07.htm;
- member of American Mathematical Society, http://www.ams.org/cml;
- member of programme committees of International conferences;
- member of editorial boards of international journals:
  - *Journal of Global Optimization* (Springer), http://www.springer.com/business+%26+management/operations+research/journal/10898?detailsPage=editorialBoard,
  - *Informatica* (IOSPress/VU), http://www.mii.lt/Informatica/editors.htm,
  - Control and Cybernetics, control.ibspan.waw.pl:3000/mainpage,
  - *Statistics, Optimization and Information Computing, www.iapress.org/index.php/soic*
  - *Journal of Intelligent Learning Systems and Applications*, http://www.scirp.org/journal/jilsa/,
  - *International Journal of Grid and High Performance Computing*, http://www.igi-global.com/Bookstore/TitleDetails.aspx?TitleId=1105&DetailsType=ReviewBoard
  - *The Open Cybernetics and Systemics Journal*, http://www.bentham.org/open/tocsj/EBM.htm,
  - *Baltic Journal of Modern Computing;* http://www.bjmc.lu.lv/editorial-board/ .
- member of the Lithuanian Academy of Sciences, http://lma.lt http://lma.lt/index.php?option=com_k2&view=item&layout=item&id=235&Itemid=243&lang=lt.

Dr. A. Lančinskas –

- affiliate member of European Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC), http://www.hipeac.net
- reviewer of journals:
  - Optimization Letters
  - Baltic Journal of Modern Computing
  - Journal of Global Optimization
  - Nonlinear Analysis: Modelling and Control
  - Informatica

BEST REPORTS DELIVERED AT CONFERENCES ABROAD

- Julius Žilinskas, invited speaker, Discrete Competitive Facility Location and Ranking of Candidates in Optimization Algorithms, 21st International Conference of Numerical Analysis and Applied Mathematics, September 11-17, 2023, Heraklion, Greece.
- Julius Žilinskas, Algirdas Lančinskas, Pascual Fernández, Blas Pelegrín, Discrete Facility Location with Ranking of Location Candidates Using High-Performance Computing Systems, 4th International Conference and Summer School NUMTA 2023 "Numerical Computations: Theory and Algorithms", June 14-20, 2023, Calabria, Italy
- Mindaugas Kepalas, Julius Žilinskas, 2-Dimensional Net-Constrained Clustering Problem, 2023 World Congress on Global Optimization (WCGO 2023) July 10-14, 2023, Athens, Greece

MOST IMPORTANT NATIONAL AND INTERNATIONAL AWARDS RECEIVED FOR R&D ACTIVITIES

Julius Žilinskas, European Society of Computational Methods in Science and Engineering, Honorary Fellowship for outstanding contribution in Global Optimization and Data Analysis

IMAGE AND SIGNAL ANALYSIS GROUP

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www.mii.lt/en/structure/scientific-subdivisions/image-and-signal-analysis-group

Head – Assoc. Prof. Dr. *Povilas Treigys*

STAFF

Principal researchers: Prof., Dr. Povilas Treigys, Dr. G. Korvel
Senior research fellows: Assoc., Prof. Dr. G. Korvel, Assoc. Prof., Dr. G. Tamulevičius, Dr. Jolita Bernatavičienė
Affiliated research fellows: Prof. Habil. Dr. K. Kazlauskas
Projects specialist: G. Navickas
Doctoral students: B. Čiapas, S. Virbukaitė, M. Danilovaitė, R. Jurkus, A. Vaitulevičius, R. Surkant, J. Ramonaitė, G. Mikalkėnienė, D. Zakševski, K. Karlauskas
Study staff: L. Aidokas, A. Rasmusson, J. Globienė, M. Liutvinavičius, G. Navickas, J. Jucevičius.

RESEARCH INTERESTS

Audio and image signal processing; pattern recognition; robotics; machine learning; artificial inteligence; natural language processing;

RESEARCH PROJECTS CARRIED OUT IN 2023

- **Projects Supported by University Budget**
- **National Research Projects**

The project of Research Council of Lithuania "Research on propaganda and disinformation: automatic recognition by machine learning, impact and societal resilience", 2023-09-01-2026-06-30, Gražina Korvel: principal researcher.

Postdoctoral Project “Investigating speech in the presence of noise interferences employing signal processing and machine learning methods”, 2021-07-2023.07, Gražina Korvel: principal researcher, Povilas Treigys - supervisor.

- **International Research Projects**

COST action CA18231 "Multi3Generation: Multi-task, Multilingual, Multi-modal Language Generation", Member of Managing Committee Dr. G. Korvel 2019-2023

- Language generation (LG) is a crucial technology if machines are to communicate with humans seamlessly using human natural language. A great number of different tasks within Natural Language Processing (NLP) are language generation tasks, and being able to effectively perform these tasks implies (1) that machines are equipped with world knowledge that can require multi-modal processing and reasoning (e.g. textual, visual and auditory inputs, or sensory data streams), and (2) the study of strong, novel Machine Learning (ML) methods (e.g. structured prediction, generative models), since virtually all state-of-the-art NLP models are learned from data. Moreover, human languages can differ wildly in their surface realisation (i.e. scripts) as well as their internal structure (i.e. grammar), which suggests that multilinguality is a central goal if machines are to perform seamless language generation. Language generation technologies would greatly benefit both public and private services offered to EU citizens in a multilingual Europe and have strong economic and societal impacts.

COST action CA21167 "Universality, diversity and idiosyncrasy in language technology (UniDive)", Member of Managing Committee Dr. G. Korvel 2022-2026

- Efficient access to the constantly growing quantities of data, especially of language data, largely relies on advances in data science. This domain includes natural language processing (NLP), which is currently booming, to the benefit of many end users. However, this optimization-based technological progress poses an important challenge: accounting for and fostering language diversity. The UniDive Action takes two original stands on this challenge. Firstly, it aims at embracing both inter- and intra-language diversity, i.e. a diversity understood both in terms of the differences among the existing languages and of the variety of linguistic phenomena exhibited within a language. Secondly, UniDive does not assume that linguistic diversity is to be protected against technological progress but strives for both of these aims jointly, to their mutual benefit. Its approach is to: (i) pursue NLP-applicable universality of terminologies and methodologies, (ii) quantify inter- and intra-linguistic diversity, (iii) boost and coordinate universality- and diversity-driven development of language resources and tools. UniDive builds upon previous experience of European networks and projects which provided a proof of concept for language modelling and processing,

unified across many languages but preserving their diversity. The main benefits of the Action will include, on the theoretical side, a better understanding of language universals, and on the practical side, language resources and tools covering, in a unified framework, a bigger variety of language phenomena in a large number of languages, including low-resourced and endangered ones.

Main results:

- Feature space analysis for machine-based recognition.
- Machine learning algorithms for multiscale data analysis.
- Machine learning methods for language generation.
- Efficient deployment of fractal theory to industry applications.

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

- Hospital Kauno klinikos of Lithuanian University of Health Sciences (Lithuania)
- MB Sauliaus Vaitkaus ausų, nosies, gerklės ligų klinika (Lithuania)
- Forensic Science Centre of Lithuania (Lithuania)
- Vilnius University Hospital Santaros klinikos (Lithuania)
- National Cancer Institute (Lithuania)
- Gdansk University of Technology, Faculty of Electronics, Telecommunications and Informatics, Audio Acoustics Laboratory
- Aveiro University, Portugal
- Konstantinos Diamantaras, Department of Information and Electronic Engineering, International Hellenic University, Greece
- Elena Lloret, Department of Software and Computing Systems, University of Alicante, Alicante, Spain
- Justino Laurenco, Porto, ISPGAYA Portugal

OTHER RESEARCH ACTIVITIES

Prof. Dr. P. Treigys –

- reviewer of the journals:
  - *Informatica*, http://www.mii.lt/informatica;
  - *Modelling and Control Journal*, http://www.mii.lt/NA;
  - Nonlinear Analysis
  - Baltic Journal of Modern Computing
  - MDPI Senesors
  - MDPI Electronics

Prof. Habil. Dr. K. Kazlauskas –

- member of Lithuanian Computer Society, http://www.liks.lt;
- member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/;
- reviewer of international journals:
  - *IEEE Trans. On Signal Processing;*
  - *IEEE Trans. On Circuits and Systems;*
  - *Informatica;*
  - *Information Technology and Control.*

Assoc. Prof. Dr. G. Tamulevičius –

- reviewer for the international journals:

- *Informatica*, http://www.mii.lt/Informatica/;
- *Baltic Journal of Modern Computing*, www.lu.lv/baltic-journal-of-modern-computing;
- *Nonlinear Analysis: Modelling and Control Journal*, http://www.mii.lt/NA;
- *IEEE Access*, *IEEE Access*.
- *Neurocomputing https://www.journals.elsevier.com/neurocomputing*
- *IEEE Journal of Biomedical and Health Informatics https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6221020*
- *International Journal of Applied Mathematics and Computer Sciences https://www.amcs.uz.zgora.pl/*

- Senior member of IEEE Computer Society, Signal Processing Society, and Computational Intelligence Society sections. Chairman of the IEEE Lithuania Section Computer Society section.
- Member of European Association For Signal Processing (EURASIP).

Dr. G. Korvel –

- Member of Lithuanian Computer Society, http://www.liks.lt;
- Member of the Young Academy of the Lithuanian Academy of Sciences https://www.lma.lt/jaunoji-akademija
- Member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/
- Member of INSTICC (the Institute for Systems and Technologies of Information, Control and Communication), https://portal.insticc.org/
- Member of IEEE Computer Society https://www.ieee.org/

Editorial board member:

- A member of editorial board of The Journal of Intelligent Information Systems

Reviewer of international journals:

- *Journal of the Audio Engineering Society* www.aes.org/journal;
- *Archives of Acoustics* acoustics.ippt.gov.pl**;**
- *Metrology and Measurement Systems* http://www.metrology.pg.gda.pl;
- *Journal of Intelligent Information Systems* https://link.springer.com/journal/10844;
- *Information Technology and Control* http://itc.ktu.lt;
- *Informatica* www.mii.lt/informatica;
- *Pattern Recognition Letters* www.journals.elsevier.com/speech-communicat;
- *Speech Communication* www.journals.elsevier.com/speech-communication;
- *Symmetry https://www.mdpi.com/journal/symmetry*
- *Applied Sciences https://www.mdpi.com/journal/applsci*
- Electronics https://www.mdpi.com/journal/electronics

Dr. J. Bernatavičienė –

- Managing Co-editor of Baltic Journal of Modern Computing, http://www.bjmc.lu.lv/editorial-board/;
- member of IEEE http://www.ieee.org;
- Member of Lithuanian Computer Society (Artificial Intelligence Section), http://www.liks.lt/;
- Member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/;
- Member of Lithuanian Operational Research Society, http://www.mii.lt/LitORS/;
- reviewer of international journals:
  - *Informatica (IOSPress/VU),*

- *Baltic Journal of Modern Computing*
- *Sensors*
- *Applied Sciences*
- *Journal of Marine Science and Engineering*

G. Navickas –

- member of Lithuanian Computer Society, http://www.liks.lt;
- member of IEEE http://www.ieee.org;

BEST REPORTS DELIVERED AT CONFERENCES ABROAD

- G. Navickas, G. A. Melnik-Leroy. Can Better Perception Become a Disadvantage? Synthetic Speech Perception in Congenitally Blind Users // 24th INTERSPEECH Conference, 20-24 August 2023, Dublin, Ireland.
- Surkant, R., Bernatavičienė, J., Naruševičiūtė, I., Trakymas, M., & Treigys, P. Time-signal curve evaluation from dynamic contrast-enhanced MRI for prostate cancer detection. The 11th IEEE International Conference on E-Health and Bioengineering - EHB 2023 Grigore T. Popa University of Medicine and Pharmacy Iasi, November 9-10, 2023, Bucharest, Romania.
- Virbukaitė, Sandra; Bernatavičienė, Jolita. Deep Neural Networks application for Cup-to-Disc ratio estimation in eye fundus images // Proceedings of the 18th conference on computer science and intelligence systems, September 17–20, 2023. Warsaw, Poland / Maria Ganzha, Leszek Maciaszek, Marcin Paprzycki, Dominik Ślęzak (eds.). Warsaw : Polskie Towarzystwo Informatyczne, 2023. eISBN 9788396744784. p. 1191-1195. (Annals of computer science and information systems, ISSN 2300-5963 ; vol. 35). DOI: 10.15439/2023F944.
- Stankevičius, Dominykas; Treigys, Povilas. Investigation of machine learning methods for colour audio noise suppression // 2023 18th Iberian Conference on Information Systems and Technologies (CISTI), 20–23 June 2023, Aveiro, Portugal. New York : IEEE, 2023. ISBN 9798350305272. eISBN 9789893347928. eISSN 2166-0727. p. [1-6]. DOI: 10.23919/CISTI58278.2023.10211742.
- Ramonaitė, J., Korvel, G. (2023, April). Noisy Phoneme Recognition Using 2D Convolution Neural Network. In 2023 IEEE 10th Jubilee Workshop on Advances in Information, Electronic and Electrical Engineering (AIEEE) (pp. 1-6). IEEE.

MOST IMPORTANT NATIONAL AND INTERNATIONAL AWARDS RECEIVED FOR R&D ACTIVITIES

Project LIEPA-2 received the award as one of the best projects, funded by the Ministry of Transportation. Award„Progreso kelias 2023“ (The Way of the Progress 2023), category “Pilietiškiausias projektas” (Best social project). Project participants from Image and Signal Analysis Group: Gediminas Navickas, Gintautas Tamulevičius, Gražina Korvel, Jolita Bernatavičienė.

MOST IMPORTANT PARTICIPATION CASES OF RESEARCHERS IN WORKING GROUPS OR COMMISSIONS SET UP BY STATE AUTHORITIES, STATE AND MUNICIPAL INSTITUTIONS, ORGANISATIONS, BUSINESS ENTITIES

Participation in an AI foresight workshop organised by the European Commission's Scientific Advice Mechanism (SAM). Selected experts discussed what the future of science with AI could look like and formulated scientific recommendations for the European Commissioners. (Brussels, Belgium, 26 October 2023)

MOST IMPORTANT RESEARCH DISSEMINATION ACTIVITIES

- TV show „Labas rytas“ on National TV *LRT*, dissemination about research on speech recognition and synthesis, robotics and artificial intelligence at VU DMSTI, November 9, 2023, Gediminas Navickas, (from 14:05 min): https://www.lrt.lt/mediateka/irasas/2000304130/labas-rytas-lietuva-i-d
- Povilas Treigys LRT.LT On compulsory AI training in schools: “Can we turn a blind eye to innovation?” https://www.lrt.lt/naujienos/mokslas-ir-it/11/2048647/apie-privaloma-dirbtinio-intelekto-mokyma-mokyklose-ar-mes-galime-uzsimerkti-kai-ateina-naujoves
- Gražina Korvel. Presentation at the Seimas Committee for the Future on "Artificial Intelligence in Speech Signal Processing. Potential challenges and risks" (2023-06-02)
- Gintautas Tamulevičius. "The other – a spectral approach to the adult voice and its characteristics". Klaipėda Region Otorhinolaryngology Association and Klaipėda University Conference "Topicalities of Voice Disorders", December 8, 2023, Klaipėda.
- Gintautas Tamulevičius. Interview on Speech signal technologies, for LNK TV, shown on November 13, 2023 [https://lnk.lt/zinios/Visi/222178].

INTELLIGENT TECHNOLOGIES RESEARCH GROUP

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www.mii.lt/en/structure/scientific-subdivisions/intelligent-technologies-research-group

Head – Prof. Dr. *Virginijus Marcinkevičius*

STAFF

Principal researchers: Prof. Dr. Darius Plikynas, Prof. Dr. Jūratė Ruzaitė.
Senior researchers: Prof. Dr. Virginijus Marcinkevičius, Prof. Dr. Darius Plikynas, Prof. Dr. Igoris Belovas.
Researchers: Dr. Mantas Martišius.
Junior researchers: Ieva Rizgelienė.
Affiliated researchers: Prof. Habil. Dr. Leonidas Sakalauskas**,** Dr. Stasys Steišūnas,
Junior assistants: Aivaras Bielskis, Rolandas Gricius
Profesors: Prof. Dr. Virginijus Marcinkevičius , Dr. Igoris Belovas.
Doctoral students: Aivaras Bielskis , Chaževskas Andrius, Dulskis Vytautas, Gricius Rolandas, Saulius Grigaitis, Ieva Rizgelienė, Brendonas Stakauskas, Urbonaitė Neringa, Vaitkevičius Paulius.
Other staff: Lukas Kuzma, Paulius Zaranka.

RESEARCH INTERESTS

- Machine learning and its application.
- Artificial intelligence and its application.
- Natural language processing.
- Cyber security.
- Mathematical modeling.
- Image analysis.
- 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.
- Propaganda and disinformation recognition, classification and societal impact modeling
- Experimental mathematics
- Analytic number theory

RESEARCH PROJECTS CARRIED OUT IN 2023

- **Projects Supported by University Budget**

Research theme "Theoretical and applied aspects of machine learning and mathematical modelling (2019–2023)"
Main goal – to develop and explore models based on machine learning and mathematical modelling for cyber security, anomalous data detection, real-time data classification, prediction, and explanation of results.

Main results:

- Proposed a benchmark for hyperspectral unmixing algorithm evaluation.
- The inequality concerning absolute values of the Riemann zeta function at places symmetric with respect to the critical line has been proven, thus finalizing the problem posed more than 60 years ago.
- The main term of asymptotic of the geometric polynomials has been obtained.

Main publications:

- Paura, Vytautas; Marcinkevičius, Virginijus. Benchmark for hyperspectral unmixing algorithm evaluation // Informatica. Vilnius : Vilniaus universiteto leidykla. ISSN 0868-4952. eISSN 1822-8844. 2023, vol. 34, no. 2, p. 285-315. DOI: 10.15388/23-INFOR522. (Impact Factor 2022: 2,9; Q1: Mathematics Applied, Q3: Computer Science, Information Systems)
- Belovas, Igoris. The asymptotics of the geometric polynomials // Mathematica Slovaca, 73 (2), 335-342. DOI: 10.1515/ms-2023-0026 (Impact Factor 2022: 1,6; Q1: Mathematics)
- Belovas, Igoris. An inequality for the Riemann zeta function // Acta Mathematica Hungarica, 2023, 170(1), 367-378. DOI: 10.1007/s10474-023-01329-3 (Impact Factor 2022: 0,9; Q2: Mathematics)

- **National Research Projects**

LSC project “Efficient algorithms for the visualization of Mandelbulbs associated with the Riemann zeta function” / „Mandelbroto apvalkų, susietų su Rymano dzeta funkcija, vizualizavimo efektyvieji algoritmai“, (project Nr. P- SV-23-9: Investigator – L. Kuzma. Supervisor - I. Belovas).

National government commissioned studies: Priority Research Programme 2023-2026 "Building Societal Resilience and Crisis Management in the Context of Contemporary Geopolitical Developments". Implementation via Lithuanian Research Council.

Project title: 'Propaganda and disinformation research: machine learning-based automatic recognition, impact and societal resilience'.
Funding agreement: 30 June 2023, No. S-VIS-23-8.
Implementation period: 01.09.2023 - 30.06.2026.
Financing amount: 195607 EUR.

Partners: University of Arkansas, UAB Delfi, University of Cyprus, Strategic Communication Department of the Lithuanian Armed Forces, VŠĮ Lietuvos nacionalinis radijas ir televizija.
The aim of the project is to develop a recommendation decision support tool for automatic detection of propaganda and disinformation in media news portals and social network messages using machine learning methods.

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

SAP (Germany)
Neurotechnology (Lithuania)
University of Tartu (Estonia)
Vilnius Gediminas Technical University (Lithuania)
Strategic Communications Department of the Lithuanian Armed Forces (Lithuania)
Lithuanian National Radio and Television (Lithuania)
UAB Delfi (Lithuania)
University of Arkansas (US)
University of Cyprus (Cyprus)

OTHER RESEARCH 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)

Prof. Dr. I. Belovas –

- Member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/
- Member of editorial board of "Lietuvos matematikos rinkinys" journal
- Reviewer of international journal "Informatica"
- Reviewer of international journal "Mathematical Modeling and Analysis"
- Reviewer of international journal "Nonlinear Analysis: Modelling and Control"

Prof. Dr. V. Marcinkevičius –

- Member 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)
- Member of editorial board of journal Applied Computer Systems
- Member of IST-141-RTG on Exploratory Visual Analytics group
- Substitute in COST action Statistical and machine learning techniques in human microbiome studies.
- Member of Artificial Intelligence Doctoral Academy (AIDA), https://www.i-aida.org/

BEST REPORTS DELIVERED AT CONFERENCES ABROAD

R. Gricius, I Belovas/ Generation of Synthetic Invoices for the Training of Machine Learning Models. XIIth International Conference on Pattern Recognition Applications and Methods, 22-02-2023 -24-02-2023, Lisbon, Portugal, https://icpram.scitevents.org/?y=2023

B.Strauskis/ Comparison of Phylogenetic Inference Methods Accuracy Using SARS-CoV-2 Data; 20th IEEE Conference on Computational Intelligence in Bioinformatics and Computational Biology 29-08-2023 - 31-08-2023, https://cmte.ieee.org/cis-bbtc/cibcb2023/.

CONSULTATIONS PROVIDED BY THE UNIT TO THE PUBLIC OR ECONOMIC ENTITIES

Prof. Darius Plikynas. AI development expert working on the project "CONSULTANCY SERVICE PRODUCT CONCEPT AND DEVELOPMENT STRATEGY BY THE LITHUANIAN CENTRE OF AGRARIAN AND FOREST SCIENCES".

MOST IMPORTANT RESEARCH DISSEMINATION ACTIVITIES

- The presentation was given at the seminar-discussion 'Artificial intelligence. not sometime and somewhere, but now and on my computer', https://www.lma.lt/2023-10-09-dirbtinis-intelektas-ne-kazkada-ir-kazkur-o-dabar-ir-mano-kompiuteryje
- The report was read at the LMA seminar 'Artificial intelligence: opportunities and threats', https://www.lma.lt/news/1990/38/Dirbtinis-intelektas-galimybes-ir-gresmes

INTERDISCIPLINARY STATISTICAL RESEARCH GROUP

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Head – Prof. Dr. *Audronė Jakaitienė*

STAFF

Principal Researcher: Jakaitienė Audronė
Senior Researchers: Čiginas Andrius, Žvirblis Tadas
Researcher: Stupurienė Gabrielė
Assistant: Ringienė Laura
Phd Students: Burakauskaitė Ieva, Puronaitė Roma, Šablauskas Karolis, Vaišnorė Ramunė

RESEARCH INTERESTS

- Biostatistical analysis in biomedical research.
- Statistical analysis and modelling of International Large-Scale Assessment data.
- Application of statistical methods in mechatronic systems processes.
- Non-probability and probability sample integration.
- Parameter estimation in small population areas.

MAIN SCIENTIFIC ACHIEVEMENTS IN 2023

1. Camanho, Ana S.; Stumbrienė, Dovilė; Barbosa, Flávia; Jakaitienė, Audronė. The assessment of performance trends and convergence in education and training systems of European countries // European Journal of Operational Research: Volume 305, Issue 1, 16 February 2023, Pages 356-372. Amsterdam : Elsevier. ISSN 0377-2217. eISSN 1872-6860. 2023, vol. 305, no. 1, p. 356-372.
2. Burakauskaitė, Ieva; Čiginas, Andrius. An approach to integrating a non-probability sample in the population census // Mathematics. Basel : MDPI. eISSN 2227-7390. 2023, vol. 11, iss. 8, art. no. 1782, p. [1-14].

RESEARCH PROJECTS CARRIED OUT IN 2023

International Research Projects

1. European Joint Programme on Rare Diseases (EJP RD) Joint Transnational Call 2022 funded Project “Resolve 15q” No. EJPRD22-134; Nr. S-EJP RD-23-1. Coordinator: University of Heidelberg. https://www.ejprarediseases.org/funded-projects-jtc22/
2. 2. R&D project “Education Systems Benchmarking with Frontier Techniques (eduBEST)”. Application No. 2022.08686.PTDC. Coordinator: University of Porto. Funding source: Portugal budget. https://edubest.inesctec.pt

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

Institute of Human Genetics, Heidelberg university [GERMANY]
Krembil Research Institute [CANADA]
Karolinska Institutet [SWEDEN]
Radboud institute for molecular life sciences [THE NETHERLANDS]
University of Porto [PORTUGAL]

OTHER RESEARCH ACTIVITIES

Prof. A. Jakaitienė, PhD –

- member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/index.html;
- board member of Lithuanian Statistics Society, http://www.statistikusajunga.lt/;
- member of International Biometric Association, https://www.biometricsociety.org;
- country representative of International Biometric Association in Nord Baltic Region, http://ibsnbr.org;
- country representative at European Statistical Advisory Committee, https://ec.europa.eu/eurostat/web/european-statistical-advisory-committee-esac
- member of the International Society for Clinical Biostatistics, https://www.iscb.info/

Gabrielė Stupurienė, PhD

- member of Lithuanian Computer Society, http://www.liks.lt;
- member of Lithuanian Educational Research Association, http://www.lera.lt;
- member of Lithuanian Young Scientists Union, https://www.ljms.lt/;
- country representative at European Commission Joint Research Center network of experts for the use cases of the tool SELFIE for TEACHERS.
- Executive Editor of the journal Informatics in Education, https://infedu.vu.lt/journal/INFEDU (Clarivate Analytics Web of Science Core Collection; Scopus; etc.).

Andrius Čiginas, PhD

- member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/index.html;
- member of Lithuanian Statistics Society, http://www.statistikusajunga.lt/;
- steering committee member of Baltic-Nordic-Ukrainian Network on Survey Statistics https://wiki-emerita.it.helsinki.fi/display/BNU/Organisation
- member, country representative of International Association of Survey Statisticians (IASS)

Tadas Žvirblis, PhD

- member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/index.html;
- member of Lithuanian Statistics Society, http://www.statistikusajunga.lt/.

Doctoral student R. Puronaitė

- member of the International Society for Clinical Biostatistics, https://www.iscb.info/

BEST REPORTS DELIVERED AT CONFERENCES ABROAD

International conference on Medical and Health Care Sciences „Knowledge for Use in Practice“. 29-31 March 2023, Riga Stradinš University, Riga Latvia.
TITLE: Interdisciplinary Future? Systems biology at Vilnius university

15th annual International Conference on Education and New Learning Technologies (EDULEARN23), Palma de Mallorca (Spain). 3rd - 5th of July, 2023
TITLE: Are the Trends of Education and Training Systems in European Countries Improving and Converging?

ISCB44: 44th annual conference of the International Society for Clinical Biostatistics; Joint conference with the Italian Region of the International Biometric Society, Milan, Italy, 27-31 August
TITLE: Multiple Regression Models for Predicting Rare Outcomes in Hypertrophic Cardiomyopathy

6th Baltic-Nordic Conference on Survey Statistics, 21-25 August 2023, Helsinki, Finland, https://wiki-emerita.it.helsinki.fi/display/BNU/BANOCOSS2023
TITLE: Integration of a voluntary sample assuming the not missing at random response mechanism

64th World Statistics Congress, 14-20 July 2023, Otava, Canada, https://www.isi-web.org/event-detail/208
TITLE: Estimation of proportions in very small population domains

MOST IMPORTANT NATIONAL AND INTERNATIONAL AWARDS RECEIVED FOR R&D ACTIVITIES
Vilnius University Rector's Award for the best scientific publication in 2022.
Interdisciplinary monograph "(Im)measurable educational efficiency and productivity. Vilnius: Vilnius University Publishing House, 2022"
Audronė Jakaitienė, Dovilė Stumbrienė, **Laura Ringienė,** Julius Žilinskas, Antanas Žilinskas, Rita Dukynaitė, Rimantas Želvys, Jogaila Vaitekaitis, Saulė Raižienė

STATISTICS AND PROBABILITY GROUP

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Head – Prof. Habil. Dr. *Kęstutis Kubilius*

STAFF
Principal research fellows: Prof. Habil. Dr. K. Kubilius, Dr. (HP) S. Norvidas.
Professor: Prof. Habil. Dr. M. Sapagovas (emeritus).
Senior research fellows: Dr. D. E. Otera, Dr. M., Dr. M. Vaičiulis.
Research fellows: Dr. A. Astrauskas, Dr. V. Kurauskas, Dr. J. Novickij.
Affiliated research fellows: Dr. J. J. Mačys, Prof. Dr. R. Mikulevičius, Prof. Habil. Dr. R. Rudzkis, Prof. Habil. Dr. J. K. Sunklodas.

RESEARCH INTERESTS
- Statistical inference for long memory processes
- Stochastic differential equations
- Heavy tails
- Rough paths
- Differential equations with an integral boundary condition
- Random graphs
- Combinatorics
- Discrete mathematics
- Algebraic geometry

RESEARCH PROJECTS CARRIED OUT IN 2023

Projects Supported by University Budget

Analysis and Application of Probabilistic and Deterministic Models. Prof. Habil. Dr. K. Kubilius. 2023–2024.

Main results obtained in 2023:

- The inverse Euler method for a nonlinear one-dimensional parabolic equation with nonlocal boundary conditions is constructed and analysed. The stability and convergence of the difference scheme in the maximum norm are considered.
- A geometric proof of the linearity of the growth-rate of the simple connectivity at infinity for Gromov-hyperbolic groups.
- A new class of one-dimensional fractional stochastic differential equations with stochastic forcing is described, and the conditions for the existence and uniqueness of solutions of such equations are obtained. Moreover, the convergence rate of the implicit Euler approximation scheme for them is established.

Main publications:

1. Sapagovas, Mifodijus; Novickij, Jurij. On stability in the maximum norm of difference scheme for nonlinear parabolic equation with nonlocal condition // Nonlinear analysis: modelling and control. Vilnius : Vilniaus universiteto leidykla. ISSN 1392-5113. eISSN 2335-8963. 2023, vol. 28, no. 2, p. [1-12]. DOI: 10.15388/namc.2023.28.31562
2. Otera, Daniele Ettore. Remarks on the end-topology of some discrete groups. AIMS Mathematics, 8(9): 20143–20153. DOI: 10.3934/math.20231026
3. Kubilius, Kęstutis; Medžiūnas, Aidas. A class of fractional stochastic differential equations with a soft wall // Fractal and fractional. Basel : MDPI. eISSN 2504-3110. 2023, vol. 7, iss. 2, art. no. 110, p. [1-19]. DOI: 10.3390/fractalfract7020110

OTHER RESEARCH ACTIVITIES

Prof. K. Kubilius –

- co-editor-in-Chief of the *Modern Stochastics: Theory and Applications*, https://www.vmsta.org/journal/VMSTA/information/editorial-board;
- editorial board member of the *Lithuanian Mathematical Journal*, https://link.springer.com/journal/10986/editors;
- editorial board member of the *Mathematical Modelling and Analysis*, https://journals.vilniustech.lt/index.php/MMA/editorialboard

Prof. S. Norvidas –

- editorial board member of the *Lithuanian Mathematical Journal*, https://link.springer.com/journal/10986/editors.

Prof. Emeritus M. Sapagovas –

- editorial board member of the *Lithuanian Mathematical Journal*, https://link.springer.com/journal/10986/editors;
- editorial board member of the journal *Nonlinear Analysis: Modelling and Control*, *https://www.journals.vu.lt/nonlinear-analysis/about/editorialTeam*;
- editorial board member of the journal *Informatica*, https://informatica.vu.lt/journal/INFORMATICA/information/INFORMATICA-Editorial;

- editorial board member of the *Mathematical Modelling and Analysis*, https://journals.vilniustech.lt/index.php/MMA/editorialboard.

ARTIFICIAL INTELLIGENCE LABORATORY

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www.mii.lt/en/structure/scientific-subdivisions/artificial-intelligence-laboratory

Head – Dr. *Virginijus Marcinkevičius*

STAFF

Senior researchers: Dr. Virginijus Marcinkevičius.
Junior researcher: Linas Aidokas
Other staff: Neringa Urbonaitė
Doctoral students: Shubham Juneja, Vytautas Paura, Mantas Briliauskas.

RESEARCH INTERESTS

- Advance machine learning in process automatization.
- Natural language processing.
- Image processing and analysis with deep neural networks.
- Visual odometry and localization.

RESEARCH PROJECTS CARRIED OUT IN 2023

- **Projects Supported by University Budget**

The main goal is to investigate machine and imitational learning usage for robot navigation and localization in real environments. Research of natural language processing applications in human-machine interface

Main publications:

1. Paura, Vytautas; Marcinkevičius, Virginijus. Benchmark for hyperspectral unmixing algorithm evaluation // Informatica. Vilnius : Vilniaus universiteto leidykla. ISSN 0868-4952. eISSN 1822-8844. 2023, vol. 34, no. 2, p. 285-315. DOI: 10.15388/23-INFOR522. (Impact Factor 2022: 2,9; Q1: Mathematics Applied, Q3: Computer Science, Information Systems)
2. Melnik-Leroy Gerda Ana, Aidokas Linas, Dzemyda Gintautas, Dzemydaitė Giedrė, Marcinkevičius Virginijus, Tiešis Vytautas, Usovaitė Ana, Is my visualization better than yours? Analyzing factors modulating exponential growth bias in graphs, Frontiers in Psychology 14 (2023), DOI: 10.3389/fpsyg. 2023.1125810 (Impact Factor 2022: 4,232)

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

SAP (Germany)

Neurotechnology (Lithuania)

OTHER RESEARCH ACTIVITIES

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)
- Member of editorial board of journal Applied Computer Systems
- Member of IST-141-RTG on Exploratory Visual Analytics group
- Substitute in COST action Statistical and machine learning techniques in human microbiome studies.

BEST REPORT DELIVERED AT CONFERENCES ABROAD

Vytautas, Paura; Virginijus, Marcinkevičius, Semi-Supervised Hyperspectral Unmixing Dataset Creation Methods For Unmixing Algorithm', Analysis Image and Signal Processing for Remote Sensing XXIX, 3-7 September of 2023, Amsterdam, Netherlands, http://dx.doi.org/10.1117/12.2679826.

MOST IMPORTANT RESEARCH DISSEMINATION ACTIVITIES

- The presentation was given at the seminar-discussion 'Artificial intelligence. not sometime and somewhere, but now and on my computer', https://www.lma.lt/2023-10-09-dirbtinis-intelektas-ne-kazkada-ir-kazkur-o-dabar-ir-mano-kompiuteryje
- The report was read at the LMA seminar 'Artificial intelligence: opportunities and threats', https://www.lma.lt/news/1990/38/Dirbtinis-intelektas-galimybes-ir-gresmes