VU Institute of Mathematics and Informatics
Annual Report 2017

Akademijos str. 4, LT-08663 Vilnius
Tel. (+370 5) 210 9300, fax (+370 5) 272 9209
E-mail: info@mii.vu.lt
http://www.mii.lt

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

STAFF

63 research fellows (including 5 doctors habilitatus and 50 doctors),
49 doctoral students.

1. RESEARCH AREAS

Integrated Development of Mathematics, Informatics and Information Technologies for the Knowledge Society Advanced Products and Services

2. DOCTORAL DISSERTATIONS MAINTAINED IN 2017

Vytautė Pilipauskaitė – in Mathematics (01 P) – defended on 20th of October,
Scientific Supervisors: Prof. Dr. Habil. Donatas Surgailis, Prof. Dr. Habil. Anne Philippe,
„**Limit Theorems For Spatio-Temporal Models With Long-Range Dependence**" (abstract [in Lithuanian]).

Ieva Grublytė – in Mathematics (01 P) – defended on 20th of October,
Scientific Supervisors: Prof. Dr. Habil. Donatas Surgailis, Prof. Dr. Paul Doukhan,
„**Modelling Of Nonlinear Long Memory**" (abstract [in Lithuanian]).

Tomas Pranckevičius – in Informatics Engineering (07 T) – defended on 28th of September,
Scientific Supervisor: Dr. Virginijus Marcinkevičius,
„**Investigation Of Multi-Class Classification Methods For Textual Data**" (abstract [in Lithuanian]).

Tatjana Liogienė – in Informatics (09 P) – defended on 28th of September,
Scientific Supervisor: Assoc. Prof. Dr. Gintautas Tamulevičius,
„**Hierarchical Classification Of Speech Emotions**" [in Lithuanian] (abstract).

Evaldas Žulkas – in Informatics Engineering (07 T) – defended on 29th of September,
Scientific Supervisor: Prof. Dr. Dalė Dzemydienė,
„**Development Of Energy Consumption Forecasting And Autonomous Management System In Smart House Environment**" [in Lithuanian] (**abstract**).

Edgaras Artemčiukas – in Informatics (09 P) – defended on 29th of September,
Scientific Supervisor: Prof. Dr. Habil. Leonidas Sakalauskas,
„**Hybrid Object Tracking Method For Augmented Reality Systems Using The Kalman Filter**" [in Lithuanian] (abstract).

Gražina Gimbutienė – in Informatics (09 P) – defended on 15th of September,
Scientific Supervisor: Prof. Dr. Habil. Antanas Žilinskas,
„**Algorithms For Non-Convex Global Optimization Based On The Statistical Ans Lipschitz Objective Function Models**" (abstract [in Lithuanian]).

Martynas Sabaliauskas – in Informatics Engineering (07 T) – defended on 26th of May,
Scientific Supervisor: Dr. Virginijus Marcinkevičius,
„**Computerized Modeling Technology Of Unique Footwear Surface Manufacturing Design**" (abstract [in Lithuanian]).

Andrius Škarnulis – in Mathematics (01 P) – defended on 15th of May,
Scientific Supervisor: Prof. Dr. Habil. Donatas Surgailis,
„**Quadratic ARCH Models With Long Memory And QML Estimation**" (abstract [in Lithuanian]).

3. MAIN CONFERENCES ORGANIZED IN 2017

9th International Workshop "Data Analysis Methods for Software Systems",
November 30 – December 2, 2017, Druskininkai, Lithuania

8th International Doctoral Consortium "Informatics Engineering Education Research",
November 29 – December 3, 2017, Druskininkai, Lithuania

The 10th International Conference on Informatics in Schools (ISSEP 2017),
November 13 – 15, 2017, Helsinky, Finland

International Workshop on Improvement of Doctoral Studies, October/Novemeber 2017

11th International Conference on Informatics Education joint with International Olympiad
in Informatics, July 28 – August 4, 2017, Teheran, Iran

4. SUBDIVISIONS OF THE INSTITUTE

4.1 COGNITIVE COMPUTING GROUP

Akademijos 4, LT-08663 Vilnius
Tel. (+370 5) 210 9300, fax (+370 5) 272 9209
E-mail: gintautas.dzemyda@mii.vu.lt

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

STAFF
Principal researchers: Prof. Habil. Dr. Gintautas Dzemyda, Prof. Habil. Dr. Antanas Žilinskas, Prof. Dr. Olga Kurasova, Prof. Dr. Kęstutis Dučinskas, Prof. Dr. Audronė Jakaitienė
Senior researchers: Dr. Virginijus Marcinkevičius
Affiliated researchers: Prof. Habil. Dr. Algis Garliauskas, Prof. Habil. Dr. Jonas Mockus
Researchers: Dr. Jolita Bernatavičienė, Dr. Rasa Karbauskaitė, Dr. Viktor Medvedev, Dr. Ernestas Filatovas
Junior Researchers: Dr. Aurimas Rapečka, Dr. Martynas Sabaliauskas, Dovilė Stumbrienė
Specialists and engineering staff: Vytautas Tiešis, Dr. Laura Ringienė
Doctoral students: Liudas Ališauskas, Denisas Bykovas, Andrius Daranda, Povilas Gudžius, Povilas Jurčys, Rokas Jurevičius, Marta Karaliutė, Roma Puronaitė, Rimantė Rybnikovė, Giedrius Stabingis, Mantas Stankevičius, Dovilė Stumbrienė, Ričardas Toliušis, Jelena Liutvinavičienė, Viktoras Bulavas

RESEARCH INTERESTS

Artificial neural networks;
Big data;
Bioinformatics;
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 2017

Projects Supported by University Budget

***Project title:* Optimal decisions in the problems of data mining, visualization, and image processing.** Prof. Habil. Dr. Gintautas Dzemyda, Prof. Dr. Olga Kurasova. 2017–2019

Description: The aim of the project is to develop the integrated data mining, visualization, and image processing methods and tools and to apply them to solve the problems in economics, health care, medicine and chemical engineering.

Main results:
1. A new web-based solution for defining and modelling data mining processes has been proposed.
2. An algorithm for automated 2D segmentation of prostate in magnetic resonance imaging has been developed.
3. A preference-based multi-objective evolutionary algorithm with stochastic local search has been developed.
4. In the analysis of transversal plane images, obtained by computer tomography scans, a method of the feature-based registration has been developed, where the model of the rib-bounded contour serves as the basis of the similarity criterion of image slices.
5. Methods of multiobjective optimization have been applied to optimal design of tecgnological processes in chemical engineering.

Publication:
1. Medvedev, V., O. Kurasova, J. Bernatavičienė, P. Treigys, V. Marcinkevičius, G. Dzemyda (2017). A new web-based solution for modelling data mining processes. *Simulation Modelling Practice and Theory*, 76, 34-46. DOI: http://dx.doi.org/10.1016/j.simpat.2017.03.001
2. Jucevičius, J., P.Treigys, J.Bernatavicienė, R.Briedienė, I.Naruševičiūtė, G.Dzemyda, V.Medvedev (2017). Automated 2D Segmentation of Prostate in T2-weighted MRI Scans. *International Journal of Computers Communications & Control*, 12(1), 53-60. DOI: http://dx.doi.org/10.15837/ijccc.2017.1
3. Filatovas, Ernestas; Lančinskas, Algirdas; Kurasova, Olga; Žilinskas, Julius. A preference-based multi-objective evolutionary algorithm R-NSGA-II with stochastic local search // Central European journal of operations research. Heidelberg : Springer. ISSN 1435-246X. 2017, Vol. 25, no 4, p. 859-878. DOI: 10.1007/s10100-016-0443-x.
4. Bilinskas, M.J., G. Dzemyda, M. Trakymas (2017). Feature-based registration of thorax CT scan slices. *Informatica*, 28 (3), 439-452. DOI: http://dx.doi.org/10.15388/Informatica.2017.137
5. Pardalos, Panos M.; Žilinskas, Antanas; Žilinskas, Julius. Non-Convex Multi-Objective Optimization. Cham : *Springer Nature*, 2017. 204 p. ISBN 9783319610054.

***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. A new method has been developed for correction of lateral chromatic aberration in digital eye fundus images.
2. Vision-based particle filter and visual odometry have been applied for **unmanned** aerial vehicles localization.

Publication:
1. Jakštys, Vytautas; Marcinkevičius, Virginijus; Treigys, Povilas. Evaluation of correction methods of lateral chromatic aberration in digital eye fundus images // 8th International Conference of Pattern Recognition Systems (ICPRS 2017). Stevenage : The Institution of Engineering and Technology, 2017. ISBN 9781785616525. [6 p]. DOI: 10.1049/cp.2017.0132.
2. Jurevičius, Rokas; Marcinkevičius, Virginijus. Application of vision-based particle filter and visual odometry for UAV localization // WSCG 2017: 25th conference on computer graphics, visualization and computer vision [Elektroninis išteklius]. Plzen : Vaclav Skala - UNION Agency. 2017, [p. 1-7]. Prieiga per internetą: <http://wscg.zcu.cz/wscg2017/2017-WSCG-Conference-Schedule.html>.
3. Pranckevičius, Tomas; Marcinkevičius, Virginijus. Comparison of Naïve Bayes, Random Forest, Decision Tree, Support Vector Machines, and Logistic Regression classifiers for text reviews classification // Baltic journal of modern computing. Riga : University of Latvia. ISSN 2255-8942. eISSN 2255-8950. 2017, Vol. 5, No. 2, p. 221-232. DOI: 10.22364/bjmc.2017.5.2.05.

National Research Projects

1. **Lithuanian education system status and its influencing factors modeling** (No. MIP-024/2015,Research Council of Lithuania) Dr. A. Jakaitienė. 2015-2017.
   Description: The project has two main goals: the international PISA survey data analysis and education system monitoring index construction.
   Publication:
   1. Želvys, Rimantas; Jakaitienė, Audronė; Stumbrienė, Dovilė. Moving towards different educational models of the welfare state: comparing the education systems of the Baltic countries = Link skirtingų gerovės valstybių švietimo modelių: Baltijos šalių švietimo sistemų palyginimas // Filosofija. Sociologija. Vilnius : Lietuvos mokslų akademija. ISSN 0235-7186. 2017, T. 28, Nr. 2, p. 139-150.

2. Creation of Production Planning Algorithm (No. 20161005-01/APS- 580000-1991, 2016-2017, UAB Netcode)
   Description: The aim of the project is to develop the algorithms for construction of active and semi-active schedules for job shop with fixed post-processing periods.

International Research Projects
1. COST action **Big Data Era in Sky and Earth Observation TD1403** Member of Managing Committee Prof. Dr. Olga Kurasova. 2014-2018, http://www.cost.eu/COST_Actions/TDP/Actions/TD1403
2. COST action **High-Performance Modelling and Simulation for Big Data Applications (cHiPSet) IC1406** Member of Managing Committee Dr. Viktor Medvedev 2014-2018, http://www.cost.eu/COST_Actions/ict/IC1406

3. COST action **A new Network of European BioImage Analysts to advance life science imaging (NEUBIAS) CA15124** Member of Managing Committee Dr. Povilas Treigys 2016-2020, http://www.cost.eu/COST_Actions/ca/CA15124
4. COST action **Open Multiscale Systems Medicine CA15120** Member of Managing Committee dr. Jolita Bernatavičienė 2016-2020, http://www.cost.eu/COST_Actions/ca/CA15120

MAIN R&D&I (RESEARCH, DEVELOPMENT AND INOVATION) PARTNERS
1. University of Almeria, Spain
2. University College London, UK
3. Bar-Ilan University, Israel
4. University of Ferrara, Italy
5. Southwestern University of Finance and Economics, China
6. Belarus State University
7. University of Calabria, Italy
8. National Cancer Institute of Lithuania
9. Hospital of Lithuanian University of Health Sciences Kauno klinikos
10. Maribor University, Slovenia

OTHER SCIENTIFIC ACTIVITIES

Prof. Habil. Dr. G. Dzemyda –
● Member of Lithuanian Academy of Sience, http://lma.lt
● Member of programme committees of the following International conferences:
  o International Conference on Operations Research and Enterprise Systems (ICORES 2017)
  o International conference on Psychological Computing Systems (PhyCS 2017),
  o 4th International Conference on Sensor Networks (SENSORNET 2018),
● Chairman of the 9th International Workshop „Data Analysis Methods for Software Systems", Druskininkai, Lithuania, 2017, http://www.mii.lt/DatAMSS/
● Editor-in-Chief of *Baltic Journal of Modern Computing* http://www.lu.lv/baltic-journal-of-modern-computing/ and the International Journal *Informatica* (IOSPress/VU) https://www.mii.lt/Informatica/.
● Editorial board member of 9 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; Scientific Proceedings of Riga Technical University. Computer Science, Information Technology and Management Science.*
● Member of the Lithuanian Academy of Sciences http://lma.lt/
● Member of IFIP Technical Committee 12 Artificial Intelligence, http://www.ifiptc12.org.uk/ifiptc12/members.php
● Board member of Transportation Science and Information Technologies in Ministry of Transport and Communications of the Republic of Lithuania
● Board member of Military Science and Technologies in Ministry of National Defence of the Republic of Lithuania
● 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. 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 the following International conferences:
  o CompSysTech 2015, Dublin, Ireland, 25-26 June 2015
  o World Congress on Global Optimization, 2015, Gainesvile, Florida, Fed 22-25, 2015
  o 8th Workshop on Computational Optimization, Lodz, Ploland, 13-16 September, 2015
- Member of editorial boards of international journals:
  o *Journal of Global Optimization* (Springer), http://www.springer.com/business+%26+management/operations+research/journal/10898?detailsPage=editorialBoard
  o *Informatica* (IOSPress/VU), http://www.mii.lt/Informatica/editors.htm
  o *Statistics, Optimization and Information Computing,*
  o *Journal of Intelligent Learning Systems and Applications*, http://www.scirp.org/journal/jilsa/
  o *International Journal of Grid and High Performance Computing*, http://www.igi-global.com/Bookstore/TitleDetails.aspx?TitleId=1105&DetailsType=ReviewBoard
  o *The Open Cybernetics and Systemics Journal*, http://www.bentham.org/open/tocsj/EBM.htm
  o *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

Prof. Habil. Dr. J. Mockus –
- Member of the Lithuanian Academy of Sciences http://lma.lt/index.php?option=com_k2&view=item&layout=item&id=235&Itemid=243&lang=lt
- Member of American Mathematical Society http://www.ams.org/cml
- Member of IFIP Technical Committee WG 7.7 Stochastic Optimization, http://www.ifip.org/bulletin/bulltcs/memtc07.htm

Prof. Dr. O. Kurasova –
- Member of editorial boards of international journals:
  o *Nonlinear Analysis: Modelling and Control*, http://www.mii.lt/NA/
  o *Baltic Journal of Modern Computing*, http://www.lu.lv/baltic-journal-of-modern-computing/editorial-board/
  o *Computational Science and Techniques* http://journals.ku.lt/index.php/CST/about/editorialTeam
  o Informatics, http://www.mdpi.com/journal/informatics
- 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/
- Reviewer of international journals:
  o *Informatica* (IOSPress/VU)
  o *Mathematical Modelling and Analysis* (Taylor & Francis)
  o *Journal of Visualization* (Springer)
  o *Mechanical Systems and Signal Processing* (Elsevier)

- o *Informatics in Education* (VU)
- o *Central European Journal of Computer Science (Springer),*
- o *Neural Processing Letters* (Springer),
- o *Optimization Letters* (Springer),
- o *Information Technology and Control* (KTU),
- o *Neurocomputing* (Elsevier)

Dr. J. Bernatavičienė –
- Managing Co-editor of *Baltic Journal of Modern Computing,*
  http://www.bjmc.lu.lv/editorial-board/
- 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:
  - o *Informatica* (IOSPress/VU)
  - o *Baltic Journal of Modern Computing*

Dr. E. Filatovas –
- Member of International Society on Multiple Criteria Decision Making (MCDM)
  http://mcdmsociety.org/members/country.php?country=LITHUANIA
- Member of Council of Lithuanian Computer Society,
  http://www.liks.lt/en/modules/tinycontent/index.php?id=3
- Reviewer of international journals:
  - o *Baltic Journal of Modern Computing*
  - o *Central European Journal of Operations Research (Springer)*
  - o *IEEE Transactions on Systems, Man, and Cybernetics: Systems*
  - o *Informatica* (IOSPress/VU)

Dr. R. Karbauskaitė –
- Managing editor of *Informatica* (IOSPress/VU) http://www.mii.lt/informatica/editors.htm
- 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/
- Reviewer of international journal *Informatica* (IOSPress/VU)

Dr. V. Medvedev –
- 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 SERVICE COMPUTATION 2013–2017 Technical Program Committee
- reviewer of international journals:
  - o *Informatica* (IOSPress/VU)
  - o *Mathematical Modelling and Analysis* (Taylor & Francis)
  - o *Journal of Global Optimization* (Springer)
  - o *Pattern Recognition Letters* (Elsevier)

- *International Journal of Applied Mathematics and Computer Science* (University of Zielona Góra and the Lubuskie Scientific Society in Zielona Góra, Poland)
- *Applied Computing and Informatics* (Elsevier)
- *The Baltic Journal of Road and Bridge Engineering* (Technika/VGTU, Lithuania)
- *Baltic Journal of Modern Computing*

V. Tiešis –
● Member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/

4.2   CYBER-SOCIAL SYSTEMS ENGINEERING GROUP

Akademijos 4, LT-08663 Vilnius
Tel. (+370 5) 2109 340, fax (+370 5) 2729209
E-mail: saulius.gudas@mii.vu.lt
WWW: https://www.mii.lt/en/structure/scientific-groups/cyber-social-systems-engineering-group

Head – Prof. Dr. *Saulius.Gudas*

STAFF

Chief research fellows: Prof. Dr. Saulius Gudas.
Research fellows: Prof. Dr. D. Dzemydienė, Assoc. Prof. Dr. A. Lupeikienė, Dr. S. Maskeliūnas.
Junior research fellow: Dr. J. Miliauskaitė, Dr. H. Giedra.
Chief Specialists: Prof. Dr. A. Čaplinskas, Prof. Dr. O. Vasilecas.
Assistant research fellow: L. Paliulionienė.
Doctoral students: A. Šaikūnas, A. Valatavičius, M. Jusis, R. Savukynas, I. Mičiulytė.

Sector of Mathematical Logic

Research fellows: Dr. R. Alonderis, Assoc. Prof. Dr. J. Sakalauskaitė.
Affiliated principal researcher: Prof. Habil. Dr. S. Jukna.
Affiliated senior researchers: Assoc. Prof. Habil. Dr. R. Pliuškevičius, Assoc. Prof. Dr. A. Pliuškevičienė.

RESEARCH INTERESTS

Software engineering for cyber-physical-social systems:
- Theoretical foundations of information systems
- Domain causal dependencies modeling for software engineering
- Model based applications development (MBD) for different types of domains (enterprises, Internet of Things, smart systems, etc.)
- Knowledge-based development of cyber-physical-social systems
- Process mining

Mathematical logic:
- Automated deduction
- Knowledge analysis methods
- Deductive systems

Projects Supported by University Budget

Research of software engineering methods arrangement with semantic modelling methods of business management. **Construction of calculi and solving procedures for modal logics and lower bounds of complexity for discrete optimisation problems**
Prof. Dr. S. Gudas (leader), Prof. Dr. A. Čaplinskas, Prof. Dr. D. Dzemydienė,
Assoc. Prof. Dr. A. Lupeikienė, Dr. S. Maskeliūnas, Dr. J. Miliauskaitė, A. Miliauskas,
A. Šaikūnas, L. Paliulionienė. Assoc. Prof. Habil. Dr. R. Pliuškevičius, Dr. R. Alonderis,
Habil. Dr. S. Jukna, Assoc. Prof. Dr. J. Sakalauskaitė. 2015-2017.

Main results obtained in 2017:

1. A new way of looking to software development by integrating the internal modeling paradigm with MDA approach. The modified MDA schema includes the new layer of the domain knowledge discovery. Frameworks for internal modeling of enterprise domain will help to trace the causal dependencies across the layers, and to determine the influence of domain causality to the integrity and interoperability of the application.

2. An approach to transform business process models (BPMN 2.0 notation) into the SBVR business vocabularies and business rules. The SBVR business vocabularies and business rules can be derived from the BPMN 2.0 model when the modeling complies with certain requirements for business processes models.

3. The normalization method of the enterprise modeling stage is developed, which is based on the perceived causality of the target domain. The provided research motivate normalization of the entire SDLC. Today usage of concepts normalization, and functional dependency (FD) is limited to only the database design stage. The first step is the discovery of management FD (MFD) of business activities. Management transaction is an initial specification of MFD, which gives a basis for enterprise model normalization. Enterprise model normal forms ENF1 – ENF5 defined and illustrated.

4. Complete and correct sequent calculi for the half-order normal modal logics K to S5 inclusive without function symbols have been constructed. Based on these calculi, the decision procedures for the mentioned logics have been presented.

Main publications:

1. Gudas, Saulius; Valatavičius, Andrius. Towards deep knowledge based interoperability of applications // Informacijos mokslai, 2017.

2. Mickevičiūtė, Eglė; Butleris, Rimantas; Gudas, Saulius; Karčiauskas, Eimutis. Transforming BPMN 2.0 business process model into SBVR business vocabulary and rules // Information technology and control = Informacinės technologijos ir valdymas. Kaunas : KTU, 2017, vol. 46, iss. 3, p. 360-371.

3. Gudas, Saulius; Valatavičius, Andrius. Normalization of domain modeling in enterprise software development // Baltic Journal of Modern Computing, 2017, Vol. 5, No. 4, p. 329-350.

4. Alonderis, Romas; Sakalauskaitė, Jūratė. A Labelled Sequent Calculus for Half-Order Modal Logic // IfCoLog Journal of Logics and their Applications, 2017.

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

University of Latvia (Latvia)
Riga Technical University (Latvia)
University of Tartu (Estonia)
University of Maribor (Slovenia)
University of Geneva (Switzerland)
University of Frankfurt (Germany)
Poznan University of Technology (Poland)

OTHER SCIENTIFIC ACTIVITIES

Prof. Dr. S. Gudas

- editorial board member of the journal *Transformations in Business and Economy*, http://www.transformations.khf.vu.lt/about/board;

- editorial board member of the journal *Informacijos mokslai*, http://www.vu.lt/leidyba/lt/mokslo-zurnalai/informacijos-mokslai/redakcine-kolegija.

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

- reviewer of the *Journal of Systemics, Cybernetics and Informatics (JSCI)*, http://www.iiisci.org/journal/sci/JournalReviewers.asp?var=;

- reviewer of the journal *Informatica*, https://www.mii.lt/informatica/;

- program committee member of the 23rd International Conference on Information and Software Technologies (ICIST 2017), http://icist.if.ktu.lt/index.php/ICIST/pages/view/Chairs&Commitee;

- program committee member of the 2nd Workshop on Managed Complexity (ManComp 2017), https://wwwswt.informatik.uni-rostock.de/ManComp2017/comm;

- program committee member of the 14th International Conference *Beyond Databases, Architectures and Structures* during IFIP World Computer Congress (IFIP WCC)" (BDAS 2018) http://bdas.polsl.pl/default.asp?service=opis&tekst=4;

- program committee member of the International Conference on Computer Science and Information Communication Technology (CSICT 2017) https://iccsict.jimdo.com/committees/;

- program committee member of the conference *Information Society and University Studies* (IVUS 2017) https://ivus.ktu.edu/index.php/ivus2017/index/pages/view/ChairsCommittee.

Prof. Dr. A. Čaplinskas

- editorial board member of the journal *Informatica*, http://www.mii.lt/informatica/editors.htm;

- editorial board member of the *Baltic Journal of Modern Computing*, http://www.bjmc.lu.lv/editorial-board/;

- editorial board member of the *Scientific Journal of Riga Technical University: Applied Computer Systems*, https://ortus.rtu.lv/science/en/series/16;

- steering committee member of the 21st East European Conference on Advances in Databases and Information Systems (ADBIS), Nicosia, Cyprus, September 24-27, 2017, http://cyprusconferences.org/adbis2017/committees.html;

- steering committee member of the International Baltic Conference on Databases and Information Systems (BalticDB&IS), https://www.mii.lt/balticDBIS2018/index.php?q=conference-organisation;

- program committee member of the 21st East European Conference on Advances in Databases and Information Systems (ADBIS), Nicosia, Cyprus, September 24-27, 2017, http://cyprusconferences.org/adbis2017/committees.html;

- program committee member of the 7th International Conference on Business Intelligence and Technology (BUSTECH 2017), Athens, Greece, February 19-23, 2017, https://www.iaria.org/conferences2017/ComBUSTECH17.html;

- program committee member of the 9th International Conference on Advanced Cognitive Technologies and Applications COGNITIVE 2017, Athens, Greece, February 19-23, 2017, https://www.iaria.org/conferences2017/ComCOGNITIVE17.html;

- program committee member of the 29th International Conference on Advanced Information Systems Engineering (CAiSE'17), Essen, Germany, June 12-16, 2017, http://caise2017.paluno.de/committees/program-committee/;

- program committee member of 9th International Workshop on Data Analysis Methods for Software Systems (DAMSS), Druskininkai, Lithuania, November 30 - December 2, 2017, https://www.mii.lt/damss/index.php?page=organizers&lang=en;

- program committee member of the 10th IFIP WG 8.1 Working Conference on The Practice of Enterprise Modeling (PoEM) Leuven, Belgium, November 22-24, 2017, https://kuleuvencongres.be/poem2017/articles/Committee;

- program committee member of the 19th IEEE Conference on Business Informatics Thessaloniki, Greece, July 24-26, 2017, https://conferences.cwa.gr/cbi2017/program-committee/;

- program committee member of the 4th International Workshop on Cyber-Physical Systems (IWCPS 2017) of the Federated Conference on Computer Science and Information Systems (FedCSIS 2017), Prague, Czech Republic, September 3-6, 2017, https://www.fedcsis.org/2017/iwcps/committee;

- program committee member of the 18th Computer Science Scientific Conference of *Computer Days – 2017*, Kaunas, Lithuania, September 21-22, 2017, https://www.liks.lt/en/modules/tinycontent/index.php?id=17.

Prof. Dr. D. Dzemydienė

- editorial board member of the *Scientific Journal of Riga Technical University: Applied Computer Systems*, https://ortus.rtu.lv/science/en/series/16;

Assoc. Prof. Dr. A. Lupeikienė

- editorial board member of the journal *Informatica*, http://www.mii.lt/informatica/editors.htm;

- editorial board member of the *Scientific Journal of Riga Technical University: Applied Computer Systems*, https://ortus.rtu.lv/science/en/series/16;

- steering committee member of the International Baltic Conference on Databases and Information Systems (BalticDB&IS), https://www.mii.lt/balticDBIS2018/index.php?q=conference-organisation;
- program committee co-chair of the International Baltic Conference on Databases and Information Systems (BalticDB&IS), https://www.mii.lt/balticDBIS2018/index.php?q=conference-organisation;
- doctoral consortium co-chair of the 30th International Conference on Advanced Information Systems Engineering (CaiSE'18), https://caise2018.ut.ee/committees/;
- program committee member of the 21st East European Conference on Advances in Databases and Information Systems (ADBIS), Nicosia, Cyprus, September 24-27, 2017, http://cyprusconferences.org/adbis2017/committees.html;
- program committee member of the 10th International Conference on Agents and Artificial Intelligence (ICCART 2018), Funchal, Madeira, Portugal, January 16-18, 2018, http://www.icaart.org/ProgramCommittee.aspx;
- reviewer of the 16th International Conference on Perspectives in Business Informatics Research (BIR 2017), Copenhagen, Denmark, August 28-30, 2017, http://www.bir2017.aau.dk/organization/;
- program committee member of the 18th Computer Science Scientific Conference of "Computer Days – 2017", Kaunas, Lithuania, September 21-23, 2017, https://www.liks.lt/en/modules/tinycontent/index.php?id=17.

Dr. S. Maskeliūnas

- program committee chair and organizing committee chair of the 18th Computer Science Scientific Conference of "Computer Days – 2017", Kaunas, Lithuania, September 21-23, 2017, https://www.liks.lt/en/modules/tinycontent/index.php?id=17;
- co-chair of 9th International Workshop on Data Analysis Methods for Software Systems (DAMSS), Druskininkai, Lithuania, November 30 - December 2, 2017, https://www.mii.lt/damss/index.php?page=organizers&lang=en;
- chairman of the Council of the Lithuanian Computer Society, http://www.liks.lt/en/modules/tinycontent/index.php?id=3;
- organizing chair of the 13th International Baltic Conference on Databases and Information Systems (Baltic DB&IS 2018), Trakai, Lithuania, July 1-4, 2018, https://www.mii.lt/balticDBIS2018/index.php?q=conference-organisation.

Dr. J. Miliauskaitė

- organizing committee member of the 13th International Baltic Conference on Databases and Information Systems (Baltic DB&IS 2018), Trakai, Lithuania, July 1-4, 2018, https://www.mii.lt/balticDBIS2018/index.php?q=conference-organisation.

L. Paliulionienė

- organizing committee member of the 13th International Baltic Conference on Databases and Information Systems (Baltic DB&IS 2018), Trakai, Lithuania, July 1-4, 2018, https://www.mii.lt/balticDBIS2018/index.php?q=conference-organisation.

Prof. **Habil. Dr. S. 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*, http://www.mii.lt/index.php?siteaction=pages.browse&page=lmj_an&lang=en.

Assoc. Prof. **Habil. Dr. R. Pliuškevičius**

- editorial board member of the *Lithuanian Mathematical Journal*, http://www.mii.lt/index.php?siteaction=pages.browse&page=lmj_an&lang=en .

4.4   EDUCATION SYSTEMS GROUP

Akademijos str. 4 , LT-08663 Vilnius
Tel. (+370 5) 210 9732
E-mail: valentina.dagiene@mii.vu.lt

Head - Prof. Dr. *Valentina Dagienė*

STAFF

Chief research fellow: Prof. Dr. V. Dagienė.
Senior reseach fellow: Dr. J. Kurilov.
Research fellows: Dr. T. Jevsikova, Dr. A. Juškevičienė, Dr. S. Kubilinskienė.
Junior reseach fellows: Dr. E. Jasutė.
Specialists: D. Ardickas, Dr. J. Skūpienė.
Doctoral students: G. Beresnevičius, A. Berniukevičius, V. Dvareckienė, V. Dolgopolovas, D. Gudonienė, O. Mirzianov, G. Stupurienė, L. Vinikienė.
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
Personalised Learning
Software Localisation
Technology Enhanced Learning

RESEARCH PROJECTS CARRIED OUT IN 2016

Projects Supported by University Budget

Research on Intelligent Technologies Application for Teaching, Learning and Cultural Environment. Prof. Dr. V. Dagienė, 2015-2019.

Creation of engineering solutions for improving teaching and learning by implementing intelligent technologies; creation of personalised learning methods and activities as well as ontologies to teach and learn informatics engineering. Creation of personalised engineering solutions for mobile learning; creating of e-learning recommendations based on semantic web. Creation of methodologies to evaluate the quality of distance learning courses and learning object repositories;

Creation of computational thinking operational model; research on its application in general education and in Informatics and Computational Thinking contest "Bebras".

Main publications:

1. Dolgopolovas, Vladimiras; Jevsikova, Tatjana; Dagienė, Valentina. From Android games to coding in C-An approach to motivate novice engineering students to learn programming: a case study // Computer applications in engineering education. Hoboken : Wiley. ISSN 1061-3773. eISSN 1099-0542. 2017, first on line, p. 1-16. DOI: 10.1002/cae.21862. [Science Citation Index Expanded (Web of Science); Scopus; Applied Science & Technology Source] [Indėlis: 0,667] [Citav. rod.: 0.694 (2016, SCIE)] [M.kr.: 07S,07T]

2. Dagienė, Valentina; Sentance, Sue; Stupurienė, Gabrielė. Developing a two-dimensional categorization system for educational tasks in informatics // Informatica. Vilnius: Matematikos ir informatikos institutas. ISSN 0868-4952. 2017, Vol. 28, no 1, p. 23-44. Prieiga per internetą: <https://www.mii.lt/informatica/pdf/INFO1127.pdf> [žiūrėta 2017-04-10]. [Science Citation Index Expanded (Web of Science); Scopus; INSPEC; Zentralblatt MATH (zbMATH); MatSciNet] [Indėlis: 0,667] [Citav. rod.: 1.056 (2016, SCIE)] [M.kr.: 07T]

International Research Projects

NordNICE: Nordplus Network of Innovative Computing Education (No. NPHZ 2015/1053) http://nordnice.wix.com/nordplus

Intercultural Learning in Mathematics and Science: Initial Teacher Education (IncluSMe), 2016-1-DE01-KA203-002910

Structuring Cooperation in Doctoral Research, Transferrable Skills Training, and Academic Writing instruction in Ukraine's regions (DocHub). 574064-EPP- 1-2016- 1- LT-EPPKA2-CBHE-SP

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

ETH Zurich (Switzerland)
Nikon University (Japan)
Turku University (Finland)
Uppsala University (Sweden)
Università degli Studi di Milano (Italy)

OTHER SCIENTIFIC ACTIVITIES

Prof. Dr. V. Dagienė –

Editor-in-Chief of the journal Informatics in Education, http://www.mii.lt/informatics_in_education (Clarivate Analytics Web of Science Core Collection; Scopus; etc.);

Editor of the journal Olympiads in Informatics (Scopus, etc);

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.);

Co-Editor of Lecture Notes in Computer Science (LNCS), vol. 10696, 2017: Informatics in Schools: Focus on Learning, Programming. 10th International Conference on Informatics in Schools: Situation, Evolution, and Perspectives, ISSEP 2017, Helsinki, Finland, November 13-15, 2017, Proceedings, ©Springer International Publ.

Editorial board member of the Journals: „International Journal of Digital Literacy and Digital Competence"; „International Journal of Instruction", „Acta Paedaogica 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);

Expert of the Programme EUREKA Eurostars.

Member of Steering Committee of International Olympiads in Informatics;

Member of Joint Doctoral Committee of Education (Vytautas Magnus University; Vilnius University; Klaipėda University; Riomeris University; and Aveiro University), 2015–2019

Assoc. Prof. Dr. J. Kurilov –

Executive Editor of the journal Informatics in Education, http://www.mii.lt/informatics_in_education/ (Thomson Reuters Web of Science Core Collection);

Guest Editor of the journal International Journal of Engineering Education (Tempus Publications, Ireland), Special Issue on Computer Engineering Education, http://www.ijee.ie/ (Thomson Reuters Web of Science);

Co-editor Europe of the journal International Journal of Knowledge Society Research (IGI Global, USA), http://www.igi-global.com/journal/international-journal-knowledge-society-research/1180;

Associate Editor of the Journal of Engineering and Computer Innovations (Academic Journals), http://www.academicjournals.org/JECI/index.htm;

Editorial board member of the journal International Journal On Advances in Software (IARIA journal, USA), http://www.iariajournals.org/software/index.html;

Editorial board member of the Journal of Studies in Education (Macrothink Institute, USA), http://www.macrothink.org/journal/index.php/jse/index.

Dr. T. Jevsikova –

Member of International Federation for Information Processing (IFIP) TC3 WG 3.1 (Informatics for Secondary Education);

Dr. A. Juškevičienė –

PostDoc: "Algorithmic thinking enhancement by modern technologies in basic education", Lithuanian Research Council, 2017-2019

4.4 GLOBAL OPTIMIZATION GROUP

Akademijos 4, LT-08663 Vilnius
Tel. (+370 5) 210 9304
E-mail: julius.zilinskas@mii.vu.lt

Head – Prof. Dr. (HP) *Julius Žilinskas*

STAFF
Principal researchers: Prof. Dr. (HP) Julius Žilinskas
Senior researchers:, Assoc. Prof. Dr. Rimantas Pupeikis, Dr. Remigijus Paulavičius
Researchers: Dr. Algirdas Lančinskas
Junior researchers: Linas Stripinis
Doctoral students: Vaidas Jusevičius, Rima Kriauzienė, Ieva Meržvinskaitė, Natalija Puzanskaja, Linas Stripinis, Eglė Zikarienė

RESEARCH INTERESTS
Optimization and high-performance computing.
Nonlinear control methods;
Time delay estimation;

RESEARCH PROJECTS CARRIED OUT IN 2017
Projects Supported by University Budget

Project title: **Analysis, recognition, optimization, and control of non-linear systems and signals with complex structure** Prof. Dr. (HP) J. Žilinskas
Description: Optimization algorithms for speech models, engineering structures, location and other problems. Analysis of the information protection methods and cryptanalysis strength enhancement. Identification and management methods algorithms of self-regulation of nonlinear systems, consisting of a linear block and a static nonlinearity combinations, analysis by the way of computer simulation.
Main results:
1. Reinforced methods for dynamical system identification and adaptive control;
2. Optimization algorithms for container loading problem and constrained global optimization.

Publications:
- **R. Pupeikis**. Reinforced methods for dynamical system identification and adaptive control. Aachen:Shaker Verlag, ISBN 9783844052183, 2017. 178p.(monografija). [Indėlis: 1,000]
- P.M. Pardalos, A. Žilinskas, **J. Žilinskas** (2017) Non-Convex Multi-Objective Optimization. Springer, ISBN 978-3-319-61005-4. doi:10.1007/978-3-319-61007-8.
- P. Fernández, B. Pelegrín, **A. Lančinskas**, **J. Žilinskas** (2017) New heuristic algorithms for discrete competitive location problems with binary and partially binary customer behavior. *Computers & Operations Research*, ISSN 0305-0548, **79**, 12-18. doi:10.1016/j.cor.2016.10.002

National Research Projects

Research Council of Lithuania. ***Development and applications of bilevel optimization algorithms*** (No. P-MIP-17-60). Dr. R. Paulavičius, 2017-2020. *Description*: Bilevel optimization is important from the practical viewpoint, but efficient bilevel optimization methods still exist only in specific cases. As a result, development of general bilevel optimization methods is particularly relevant and timely. Many practical problems in the economy, engineering, and other fields can be described as bilevel optimization models. However, a plethora of these applications still cannot be solved with existing optimization tools. More importantly, only in the last decade, the first methods to solve general bilevel optimization problems were proposed. Unfortunately, the application of these methods has been mainly demonstrated only on small test instances. In this project, we seek an ambitious goal to develop new and improve existing bilevel optimization algorithms, enabling to solve real practical problems. It is equally important to implement efficient and publicly accessible bilevel optimization software, which would allow solving such problems for a broad range of practitioners. This would have a significant and internationally recognizable contribution to the field of bilevel optimization.

Research Council of Lithuania. ***Development and parallelization of ranking-based optimization algorithms*** (No. 09.3.3-LMT-K-712-02-0087) Dr. A. Lančinskas, 2017-2019.
Description: The project will deal with combinatorial optimization algorithms and their application to high-performance computing systems.
The objective of the project is to develop a ranking-based algorithm for solving combinatorial optimization problems using high-performance computing systems.
The project is based on two activities: development of the ranking-based algorithm and its application to high-performance computing systems.
The goal of the first activity is to develop the ranking-based algorithm suitable to solve combinatorial optimization problems. Beside well-known combinatorial optimization test problems, various instances of competitive facility location problems will be used in an experimental investigation. It is planned to organize a research visit at University of Murcia, where researchers have experience in modelling and solving facility location problems.
The goal of the second activity is to develop parallel versions of the algorithm ensuring effective communication between processors. For this purpose, it is necessary to search for novel solution in high-performance computing in order to create an optimal communication strategy. Computational experiments will be performed using high-performance computing system at Vilnius University. It is also planned to collaborate with Edinburgh Parallel Computing Centre in developing the parallel algorithm for large-scale high-performance computing systems.
In the case of success, a ranking-based algorithm for solving combinatorial optimization problems using high-performance computing systems will be proposed and experimentally investigated. The proposed algorithm will allow to solve complex combinatorial optimization problems encountered in various research and industry areas. The proposed principal solutions to create and parallelize the algorithm will contribute to further researches in development and parallelization of similar algorithms.

International Research Projects

1. COST action **Mathematical Optimization in the Decision Support Systems for Efficient and Robust Energy Networks TD1207** Member of Managing Committee Prof.

Dr. (HP) J. Žilinskas. 2013-2017, http://www.cost.eu/domains_actions/ict/Actions/TD1207?management

> *Description:* Energy Production and Distribution (EP&D) is among the biggest challenges of our time, since energy is a scarce resource whose efficient production and fair distribution is associated with many technical, economical, political and ethical issues like environmental protection and people health. EP&D networks have rapidly increased their size and complexity, e.g. with the introduction and interconnection of markets within the EU. Thus, there is an increasing need of systems supporting the operational, regulatory and design decisions through a highly inter-disciplinary approach, where experts of all the concerned fields contribute to the definition of appropriate mathematical models. This is particularly challenging because these models require the simultaneous use of many different mathematical optimization tools and the verification by experts of the underlying engineering and financial issues.

2. COST action **Network for Sustainable Ultrascale Computing (NESUS) IC1305** Member of Managing Committee Dr. A. Lančinskas. 2014-2018, http://www.cost.eu/COST_Actions/ict/Actions/IC1305

> *Description:* Ultrascale systems are envisioned as large-scale complex systems joining parallel and distributed computing systems that will be two to three orders of magnitude larger that today's systems. The EU is already funding large scale computing systems research, but it is not coordinated across researchers, leading to duplications and inefficiencies. The goal of the NESUS Action is to establish an open European research network targeting sustainable solutions for ultrascale computing aiming at cross fertilization among HPC, large scale distributed systems, and big data management. The network will contribute to glue disparate researchers working across different areas and provide a meeting ground for researchers in these separate areas to exchange ideas, to identify synergies, and to pursue common activities in research topics such as sustainable software solutions (applications and system software stack), data management, energy efficiency, and resilience. Some of the most active research groups of the world in this area are members of this proposal. This Action will increase the value of these groups at the European-level by reducing duplication of efforts and providing a more holistic view to all researchers, it will promote the leadership of Europe, and it will increase their impact on science, economy, and society.

3. COST action **Improving Applicability of Nature-Inspired Optimisation by Joining Theory and Practice** (ImAppNIO) CA15140. Member of Managing Committee Dr. A. Lančinskas. 2016–2020.

> *Description:* Nature-inspired search and optimisation heuristics are easy to implement and apply to new problems. However, in order to achieve good performance it is usually necessary to adjust them to the problem at hand. Theoretical foundations for the understanding of such approaches have been built very successfully in the past 20 years but there is a huge disconnect between the theoretical basis and practical applications. The development of powerful analytical tools, significant insights in general limitations of different types of nature-inspired optimisation methods and the development of more practically relevant perspectives for theoretical analysis have brought impressive advances to the theory-side of the field. However, so far impact on the application-side has been limited and few people in the diverse potential application areas have benefitted from these advances.

The main objective of the COST Action is to bridge this gap and improve the applicability of all kinds of nature-inspired optimisation methods. It aims at making theoretical insights more

accessible and practical by creating a platform where theoreticians and practitioners can meet and exchange insights, ideas and needs; by developing robust guidelines and practical support for application development based on theoretical insights; by developing theoretical frameworks driven by actual needs arising from practical applications; by training Early Career Investigators in a theory of nature-inspired optimisation methods that clearly aims at practical applications; by broadening participation in the ongoing research of how to develop and apply robust nature-inspired optimisation methods in different application areas.

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

1. Universidad de Almería (Spain)
2. Università della Calabria (Italy)

OTHER SCIENTIFIC ACTIVITIES

Prof. Dr. (HP) J. Žilinskas –
- Member of editorial boards of international journals:
  - *Informatica* (IOSPress/VU), http://www.mii.lt/informatica/editors.htm
  - *Information Technology and Control* (KTU),
  - http://itc.ktu.lt/index.php/ITC/about/editorialTeam
  - *Journal of Global Optimization* (Springer), http://www.springer.com/business+%26+management/operations+research/journal/10898?detailsPage=editorialBoard
  - *Mathematical Methods of Operations Research* (Springer) http://www.springer.com/mathematics/journal/186/PSE?detailsPage=editorialBoard
  - *Mathematical Modelling and Analysis* (Taylor&Francis/VGTU), http://www.tandfonline.com/action/journalInformation?show=editorialBoard&journalCode=tmma20
  - *Open Computer Science* (De Gruyter), https://www.degruyter.com/view/j/comp
  - *Open Engineering* (De Gruyter), https://www.degruyter.com/view/j/eng
  - *Optimization Letters* (Springer), http://www.springer.com/mathematics/journal/11590?detailsPage=editorialBoard
- Chair of managing board of Continuous Optimization Working Group of The Association of European Operational Research Societies (EURO), https://www.euro-online.org/websites/continuous-optimization/managing-board/
- Member of board of Lithuanian Operational Research Society (member society of EURO and IFORS), head of working group Optimization Methods and Applications, http://www.mii.lt/LitORS/
- Member of European Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC), http://www.hipeac.net
- Member of Program/Scientific Committees
  - 9th International Workshop Data Analysis Methods for Software Systems, Druskininkai, Lithuania, November 30 - December 2, 2017.
  - PPAM 2017: 12th International Conference on Parallel Processing and Applied Mathematics Lublin, Poland, September 10-13, 2017.
  - Euro-Par 2017: International European Conference on Parallel and Distributed Computing, Santiago de Compostela, Spain, August 28 - September 1, 2017.
  - EUROPT 2017: 15th EUROPT Workshop on Advances in Continuous Optimization, Montreal, Canada, July 12-14, 2017.

- o LION11: 11th Learning and Intelligent OptimizatioN Conference, Nizhny Novgorod, Russia, June 19-21, 2017.
- o GOC 2017: Global Optimization Conference, College Station, TX, USA, March 30 - April 1, 2017.

Assoc. Prof. Dr. R. Pupeikis –
- Reviewer for the international journals
  - o *Automatica,* https://www.journals.elsevier.com/automatica/
  - o *Informatica*, http://www.mii.lt/Informatica/
  - o *Information Technology and Control* itc.ktu.lt
  - o *Journal of Zhejiang University* http://www.springer.com/engineering/mechanical+engineering/journal/11582
  - o *Measurement* https://www.journals.elsevier.com/measurement
  - o *Signal Processing* https://www.journals.elsevier.com/signal-processing
  - o *Applied Mathematical Modelling* https://www.journals.elsevier.com/applied-mathematical-modelling/
- member of Lithuanian Computer Society, http://www.liks.lt;
- member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/;
- member of Lithuanian Scientific Society, http://www.lms.lt/?q=en/members.

Dr. A. Lančinskas –
- Affiliate member of European Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC), http://www.hipeac.net.
- Member of management committee of COST action IC1305 Network for Sustainable Ultrascale Computing (NESUS).
- Member of management committee of COST action CA15140 Improving Applicability of Nature-Inspired Optimisation by Joining Theory and Practice (ImAppNIO).
- Reviewer of international journals:
  - o *Journal of Global Optimization*
  - o *Central European Journal of Computer Science*
  - o *Central European Journal of Engineering*
  - o *Informatica*
  - o *Optimization Letters*
  - o *Computers & Operations Research*
  - o *Baltic Journal of Modern Computing*

Dr. R. Paulavičius –
- Affiliate member of European Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC), www.hipeac.net
- Member of the American Institute of Chemical Engineers (AIChE), www.aiche.org
- Member of The Mathematical Optimization Society (MOS), http://www.mathopt.org/
- Reviewer of international journals:
  - o *Journal of Global Optimization*
  - o *Optimization Letters*
  - o *Information Technology and Control*
  - o *Central European Journal of Computer Science*
  - o *Communications in Nonlinear Science and Numerical Simulation*
  - o *Informatica*
  - o *Baltic Journal of Modern Computing*

4.5   OPERATION RESEARCH GROUP

Akademijos 4, LT-08663 Vilnius
Tel. (+370 5) 210 9300, fax (+370 5) 272 9209
E-mail: leonidas.sakalauskas@mii.vu.lt

Head – Prof. Habil. Dr. *Leonidas Sakalauskas*

STAFF
Principal researchers: Prof. Habil. Dr. Leonidas Sakalauskas, Prof. Dr. Rimvydas Laužikas
Senior researchers: Prof. Dr. Saulius Minkevičius, Prof. Dr. Darius Plikynas
Affiliated researchers: Doc. Dr. Stasys Steišiūnas
Researchers: Assoc. Prof. Dr. Igoris Belovas
Junior Researchers: Arūnas Miliauskas
Specialists and engineering staff: Dr. Gintautas Jakimauskas, Vytautas Dulskis, Ana Ušpurienė
Doctoral students: Albertas Jurgelevičius, Donatas Kavaliauskas, Julija Kurilova, Natalija Pozniak, Jūratė Vaičiulytė

RESEARCH INTERESTS
Creation and computational realization of complex simulation models in epidemiology, education, economics, and energy supply systems and of various other origin with uncertainty;
Operations research;
Statistical simulation;
Stochastic programming;
Swarm intelligence.

RESEARCH PROJECT CARRIED OUT IN 2017

Project title: **Application of statistical modeling and stochastic programming in big data analysis.** Prof. Habil. Dr. L. Sakalauskas 2015–2018
Main results:
1. Stochastic linear and non-linear algorithms were made and aplied to big financial data analysis and management;
2. Big data interpolation methods in applicacion of Euclidian distance matrices were made and apllied.

Publications:
- Jurgelevičius, Albertas; Sakalauskas, Leonidas. BOINC from the view point of Cloud computing // CEUR workshop proceedings. Aachen : CEUR-WS. ISSN 1613-0073. 2017, Vol. 1973, p. 61-66.
- Minkevičius, Saulius; Greičius, Edvinas. On the inequality between queue length and virtual waiting time in open queueing networks under conditions of heavy traffic // International journal of mathematical and computational sciences. Dubai : WASET. ISSN 1307-6892. 2017, Vol. 4, No. 10, p. 954-957.

OTHER SCIENTIFIC ACTIVITIES

Prof. Habil. Dr. 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 Board of European Working Group on Stochastic Programming http://www.mii.lt/EWGSP;
- 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).*

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 –
- reviewer of international journal Informatica (IOSPress/VU)
reviewer of international journal *Nonlinear Analysis; Modelling and Control* http://www.mii.lt/NA/

4.6   STATISTICS AND PROBABILITY GROUP

Akademijos str. 4, LT-08663 Vilnius
Tel. (+370 5) 210 9731
E-mail: kestutis.kubilius@mii.vu.lt

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

STAFF

Principal researchers: Prof. Habil. Dr. Kęstutis Kubilius
         Prof. Habil. Dr Artūras Dubickas (discharged since 30 June 2017)
         Affiliated scientist Prof. Dr Liudas Giraitis
         Prof. Habil. Dr Remigijus Leipus (discharged since 30 June 2017)
         Affiliated scientist Dr.Juozas Juvencijus Mačys
         Prof. Habil. Dr. Eugenijus Manstavičius (discharged since 30 June 2017)
         Affiliated scientist Prof. Dr Remigijus Mikulevičius

Dr. Saulius Norvidas
Dr. Stasys Rutkauskas
Professor Emeritus Mifodijus Sapagovas
Prof. Habil. Dr. Jonas Kazys Sunklodas (discharged since 31 August 2017)
Professor Emeritus Donatas Surgailis
Dr. Štikonas Artūras (discharged since 30 September 2017)

Senior researchers: Dr. Arvydas Astrauskas
Dr. Olga Januškevičienė (discharged since 31 August 2017)
Dr. Otera Daniele Ettore
Dr. Marijus Radavičius
Prof. Habil. Dr. Rimantas Rudzkis
Dr. Marijus Vaičiulis

Researchers: Dr. Andrius Čiginas
Dr. Dainius Dzindzalieta
Dr. Valentas Kurauskas
Dr. Viktor Skorniakov (discharged since 30 June 2017)

Specialists: Šarūnas Dirmeikis (discharged since 31 August 2017)
Ieva Grublytė (discharged since 31 August 2017)
Vytautė Pilipauskaitė

Affairs manager: Jurgita Zinkevičienė

Doctoral students: Vygantas Butkus
Šarūnas Germanas
Lina Dreižienė
Monika Lapėnaitė Gedvilė
Rūta Užupytė

RESEARCH INTERESTS: statistical inference for long memory processes, statistical hypothesis testing, heavy tails, aggregation, random fields, self-similar processes, Levy processes, rough paths, random Hamiltonians, finite population statistics and statistical analysis of data, extremal problems in harmonic analysis, random graphs, combinatorics, discrete mathematics, algebraic geometry.

RESEARCH PROJECTS CARRIED OUT IN 2017

Project Supported by University Budget:
Analysis of probabilistic models and research of asymptotic properties

Main results:
A complete description of anisotropic scaling limits and the existence of scaling transition for nonlinear functions (Appell polynomials) of stationary linear random fields on Z^2 with moving average coefficients decaying at possibly different rate in the horizontal and the vertical direction is obtained.

A characterization of what characteristic functions of a probability measures are uniquely determined by their imaginary parts is given. The conditions under which, for a

neighbourhood U of infinity and a characteristic function F on U, there exists an uniquely extension of F to the whole line also are investigated.

Main publications:

1. **Norvidas, Saulius**. An uniqueness theorem for characteristic functions // Positivity. 2017, Vol. 21, Iss. 4, p. 1341-1352.

2. **Pilipauskaitė, Vytautė; Surgailis, Donatas**. Scaling transition for nonlinear random fields with long-range dependence // Stochastic Processes and their Applications. 2017, Volume 127, Issue 8, p. 2751-2779.

3. **Dubickas, Artūras**. On rational approximations to two irrational numbers // Journal of number theory. 2017, Vol. 177, p. 43-59.

OTHER SCIENTIFIC ACTIVITIES

Prof. K. Kubilius –
- co-editor-in-chief of the *Modern Stochastics: Theory and Applications* https://www.i-journals.org/vtxpp/VMSTA/ ;
- editorial board member of the *Lithuanian Mathematical Journal* http://www.springer.com/mathematics/journal/10986?detailsPage=editorialBoard ;
- editorial board member of the *Mathematical Modelling and Analysis*, http://inga.vgtu.lt/~art/ ;
- board member of the Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/index_en.html .

Prof. A. Dubickas --
- editorial board member of *Uniform Distribution Theory* https://math.boku.ac.at/udt/
- editorial board member of *European Journal of Mathematics*
- editorial board member of *Conference Papers in Mathematics* http://www.springer.com/mathematics/algebra/journal/40879/PSE?detailsPage=editorialBoard
- section editor of *Lithuanian Mathematical Journal* http://www.springer.com/mathematics/journal/10986?detailsPage=editorialBoard ;
- editorial board member of *Šiauliai Mathematical Seminar* http://www.su.lt/index.php?option=com_content&view=article&id=16758&Itemid=17530&lang=en .

Prof. R. Leipus --

- editorial board member of *Lithuanian Mathematical Journal* http://www.springer.com/mathematics/journal/10986?detailsPage=editorialBoard ;
- editorial board member editor of *Pinigų studijos (Monetary Studies)* https://www.lb.lt/pinigu_studijos_redkolegija .

Prof. E. Manstavičius –
- section editor of the *Lithuanian Mathematical Journal*, http://www.springer.com/mathematics/journal/10986?detailsPage=editorialBoard ;
- editorial board member of the *International Journal of Number Theory*, http://www.worldscientific.com/page/ijnt/editorial-board ;

4.7   VIDEO AND SIGNAL ANALYSIS GROUP

Akademijos 4, LT-08663 Vilnius
Tel. 210 9328
E-mail: povilas.treigys@mii.vu.lt

Head – Assoc. Prof. Dr. Povilas Treigys

STAFF
Senior research fellows: Assoc. Prof., Dr. Povilas Treigys.
Affiliated research fellows: Prof. Habil. Dr. K. Kazlauskas, Prof. Habil. Dr. Adolfas Laimutis Telksnys.
Research fellows: Dr. G. Korvel, Assoc. Prof., Dr. G. Tamulevičius.
Junior research fellow: J. M. Bilinskas.
Doctoral students: J. M. Bilinskas, J. Jucevičius, M. Morkūnas, J. Venskus.

RESEARCH INTERESTS
Audio and video signal processing; random processes analysis and recognition.

RESEARCH PROJECTS CARRIED OUT IN 2017

Project Supported by University Budget

Project title: Analysis, recognition, optimization, and control of non-linear systems and signals with complex structure.

Tasks in 2017: To create and analyze modeling methods and algorithms, to employ them in acoustic analysis for speech synthesis, recognition, and speech quality assessment.

Main results:

- High-order autoregressive modeling of individual speaker's spectral properties.
- Fractal dimension-based description of speech signals. Employment of fractal dimension-based features for speech emotion recognition.
- Voiceless stop consonant modelling and synthesis framework based on MISO dynamic system.

International Research Projects

COST action „A new Network of European BioImage Analysts to advance life science imaging (NEUBIAS)" Member of Managing Committee Assoc. Prof. Dr. P.Treigys 2016-2020

This Action is a programme for establishing a network of BioImage Analysts (BIAlysts), to maximize the impact of advances in imaging technology on the Life-Sciences (LSc), and to boost the productivity of bioimaging-based research projects in Europe. BIAlysts have recently emerged in various research institutions, but these experts are still not well recognised in the LSc community. The Action aims to provide a stronger identity to BIAlysts by organising a new type of meeting fostering interactions between all stakeholders including Life scientists, BIAlysts, microscopists, developers and the private sector.

Main results:

- Machine learning algorithms for tumour classification.

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

- Hospital Kauno klinikos of Lithuanian University of Health Sciences (Lithuania)

- Vilnius University Hospital Santaros klinikos (Lithuania)
- National Cancer Institute (Lithuania)
- JSC NetCode (Lithuania)
- Brno University of Technology (Czech Republic)
- Gdansk University of Technology, Faculty of Electronics, Telecommunications and Informatics, Audio Acoustics Laboratory

OTHER SCIENTIFIC ACTIVITIES

Assoc. Prof. Dr. P. Treigys –

- reviewer of the journal *Informatica*, http://www.mii.lt/informatica;
- reviewer of the journal *Nonlinear Analysis: Modelling and Control Journal,* http://www.mii.lt/NA;

Prof. Habil. Dr. A. L. Telksnys –

- member of Council on Digitization of Lithuanian Cultural Heritage;
- board member of the Ministry of Culture of the Republic of Lithuania Archives;
- member of the IEEE Technical Committee on eHealth;
- member of the Working group WG 7.1 Modeling and Simulation of the International Federation of Information Processing (IFIP);
- member of th Lithuanian Academy of Sciences;
- member of Commission of the Seimas of the Republic of Lithuania on Lithuanian traditions and heritage actualization;
- editorial board member of the international journals: *Informatica*, http://www.mii.lt/Informatica/editors.htm; *Information Technology and Contro*l, http://www.itc.ktu.lt/index.php/ITC/about/editorialTeam; *Tamkang Journal of Science and Engineering*, http://www2.tku.edu.tw/~tkjse/editorial_board-en.htm;
- editorial board member of the journal *Informacijos mokslai*, http://www.leidykla.vu.lt/lt/mokslo-darbai/informacijos-mokslai/informacijos-mokslai-2011-55-tomas/redaktoriu-kolegija/;
- Prepared the Concept of Lithuanian speech into Electronic Media Research Development in 2014–2020 *LIEPA 2*.

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;
- member of IEEE Computer society and Signal processing society sections.

Dr. G. Korvel –

- member of Lithuanian Computer Society, http://www.liks.lt;
- member of Lithuanian Society of Young Researchers. http://www.ljms.lt/;
- reviewer of international journals: 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 .