### BLOCKCHAIN TECHNOLOGIES GROUP

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**Head** – Dr. Remigijus Paulavičius

***STAFF***

**Senior researchers:** dr. Remigijus Paulavičius, dr. Ernestas Filatovas, dr. Viktor Medvedev

**Junior researchers:** Linas Stripinis

**Doctoral students:** Vaidas Jusevičius, Ieva Meržvinskaitė, Linas Stripinis, Andrius Adamonis, Saulius Grigaitis, Jaroslava Arsenjeva

***RESEARCH INTERESTS***

Blockchain technologies

Global optimization

Multi-Objective optimization

High-Performance Computing

Artificial Intelligence

Image Processing

Big Data

***RESEARCH PROJECTS CARRIED OUT IN 2018***

**Projects Supported by University Budget**

**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.

**Main results:**

* New algorithm for global optimization based on a bisection of hyper-rectangles, a novel sampling on diagonals and a set of Lipschitz constants was developed.
* New parallel versions of dominance ranking algorithms for multiobjective optimization were developed.

**Main publications:**

1. **R. Paulavičius**, L. Chiter, J. Žilinskas (2018) Global optimization based on bisection of rectangles, function values at diagonals, and a set of Lipschitz constants. *Journal of global optimization*. Springer 2018, Vol. 71 (1), 5-20. DOI: [10.1007/s10898-016-0485-6](https://doi.org/10.1007/s10898-016-0485-6).
2. **L. Stripinis, R. Paulavičius**, Žilinskas, Julius (2018). Improved scheme for selection of potentially optimal hyper-rectangles in DIRECT. *Optimization Letters*. Springer, 2018, vol. 12, no 7, p. 1699-1712, DOI: [10.1007/s11590-017-1228-4](https://doi.org/10.1007/s11590-017-1228-4).
3. J.J. Moreno, G. Ortega, **E. Filatovas**,J.A. Martínez, E.M. Garzón (2018) Improving the performance and energy of Non-Dominated Sorting for evolutionary multiobjective optimization on GPU/CPU platforms. *Journal of Global Optimization*, Springer, Vol. 71 (3), 631-649, DOI: 10.1007/s10898-018-0669-3.

**International Research Projects**

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>

Description: The Big Data era poses a critically difficult challenge and striking development opportunities in High-Performance Computing (HPC): how to efficiently turn massively large data into valuable information and meaningful knowledge. Computationally effective HPC is required in a rapidly-increasing number of data-intensive domains, such as Life and Physical Sciences, and Socioeconomic Systems. Modelling and Simulation (MS) offer suitable abstractions to manage the complexity of analysing Big Data in various scientific and engineering domains. Unfortunately, Big Data problems are not always easily amenable to efficient MS over HPC. Also, MS communities may lack the detailed expertise required to exploit the full potential of HPC solutions, and HPC architects may not be fully aware of specific MS requirements. Therefore, there is an urgent need for European co-ordination to facilitate interactions among data-intensive MS and HPC experts, ensuring that the field, which is strategic and of long-standing interest in Europe, develops efficiently – from academic research to industrial practice. This Action will provide the integration to foster a novel, coordinated Big Data endeavour supported by HPC. It will strongly support information exchange, synergy and coordination of activities among leading European research groups and top global partner institutions, and will promote European software industry competitiveness.

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

1. Imperial College London (UK)
2. Universidad de Almería (Spain)
3. Università della Calabria (Italy)
4. Systems Research Institute, Polish Academy of Sciences (Poland)

***OTHER SCIENTIFIC ACTIVITIES***

**dr. R. Paulavičius –**

* Affiliate member of European Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC), [www.hipeac.net](http://www.hipeac.net)
* Member of the American Institute of Chemical Engineers (AIChE), [www.aiche.org](http://www.aiche.org)
* Member of The Mathematical Optimization Society (MOS), <http://www.mathopt.org/>
* Member of Program/Scientific Committees:
  + 1st Workshop on Blockchain and Smart Contract Technologies (BSCT 2018)
* Reviewer of international journals:
  + *Journal of Global Optimization*
  + *Optimization Letters*
  + *Information Technology and Control*
  + *Central European Journal of Computer Science*
  + *Communications in Nonlinear Science and Numerical Simulation*
  + *Informatica*
  + *Baltic Journal of Modern Computing*

**dr. E. Filatovas –**

* Member of International Society on Multiple Criteria Decision Making (MCDM).
* Member of the Lithuanian Computer Society (LIKS).
* Member of Program/Scientific Committees:
  + 1st Workshop on Blockchain and Smart Contract Technologies (BSCT 2018)
* Reviewer of international journals:
  + *Complexity*
  + *Information Technology and Control*
  + *Informatica*
  + *Baltic Journal of Modern Computing*

**dr. V. Medvedev -**

* Expert of FP7-ICT Committee (2013)
* Member of Lithuanian Computer Society, http://www.liks.lt/
* Member of Lithuanian Mathematical Society, http://www.mif.vu.lt/lmd/
* Member of SERVICE COMPUTATION 2014-2017 Technical Program Committe
* Reviewer of international journals:
  + *Informatica (IOSPress/VU);*
  + *Mathematical Modelling and Analysis (Taylor & Francis);*
  + *Journal of Global Optimization (Springer);*
  + *Pattern Recognition Letters (Elsevier);*
  + *The Baltic Journal of Road and Bridge Engineering (Technika/VGTU, Lithuania);*
  + *Baltic Journal of Modern Computing;*
  + *Applied Computing and Informatics (Elsevier).*