

# **6th International Young Scientists Conference in HPC and Simulation (YSC 2017)**

Procedia Computer Science Volume 119

Kotka, Finland  
1 – 3 November 2017

## **Editors:**

**Alexandra Klimova  
Anna Bilyatdinova**

**Jari Kortelainen  
Alexander Boukhanovsky**

ISBN: 978-1-5108-5590-8

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© by Elsevier B.V.  
All rights reserved.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact Elsevier B.V.  
at the address below.

Elsevier B.V.  
Radarweg 29  
Amsterdam 1043 NX  
The Netherlands

Phone: +31 20 485 3911  
Fax: +31 20 485 2457

<http://www.elsevierpublishingsolutions.com/contact.asp>

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)



## Table of Contents

### Editorial

- Where Youth strives in Computational Science: retrospective Analysis of Young Scientist Conference in HPC and Simulation ..... 1  
*Alexandra Klimova, Anna Bilyatdinova, Jari Kortelainen, Peter Sloot, and Alexander Boukhanovsky*

### Expert Opinion and Invited Papers

- Pitfalls in Modeling and Simulation ..... 8  
*Matti Koivisto*
- Two Approaches to System-of-Systems from Lative Logic Point of View ..... 16  
*Patrik Eklund and Jari Kortelainen*
- A Distributed System for Conducting Chess Games in Parallel ..... 22  
*Aleksander Rydzewski and Pawel Czarnul*
- Multi-View Data approaches in Recommender Systems: an Overview ..... 30  
*Ivan Palomares and Sergey V. Kovalchuk*
- Vulnerability of Transportation Networks: The New York City Subway System under Simultaneous Disruptive Events ..... 42  
*Lani M'cleod, Richard Vecsler, Yuan Shi, Ekaterina Levitskaya, Sunny Kulkarni, Sergey Malinchik, and Stanislav Sobolevsky*
- Evaluation of modal-choice rules through ground transportation modeling using subway data ..... 51  
*Sergei Ivanov and Anastasiia Lantseva*
- Toolkit for Intensive Work with Metadata in Specialized Information Systems ..... 59  
*Andrey Polyakov, Dmitry Kokovin, Alexey Poyda, Mikhail Zhizhin, Alexander Andreev, Alexander Govoriv, and Viacheslav Ilyin*
- Revisiting Master's Program Design in Computational Science: Case of ITMO University ..... 65  
*Anna Bilyatdinova and Alexandra Klimova*
- Neural network for synthesizing deterministic finite automata ..... 73  
*Petr Grachev, Igor Lobanov, Ivan Smetannikov, and Andrey Filchenkov*

**eScience**

Implementation of Concurrent Parallelization of Branch-and-bound algorithm in Everest Distributed Environment .....	83
<i>Sergey Smirnov and Vladimir Voloshinov</i>	
Multidimensional Global Optimization Method Using Numerically Calculated Derivatives .....	90
<i>Alexey Goryachih and Maria Rachinskaya</i>	
Parallelizing an Exact Algorithm for the Traveling Salesman Problem .....	97
<i>Victor Burkhovetskiy and Boris Steinberg</i>	
A parallel SAT solving algorithm based on improved handling of conflict clauses .....	103
<i>Oleg Zaikin</i>	
Simplifying the Use of Clouds for Scientific Computing with Everest .....	112
<i>Sergey Volkov and Oleg Sukhoroslov</i>	
A Simulator for Event-oriented Data in Flexible Assembly System Fault Prediction .....	121
<i>Tero Keski-Valkama</i>	
Modeling computational algorithms using nonlinear storytelling methods of computer game design .....	131
<i>Mika Letonsaari and Jukka Selin</i>	
Adaptive load balancing of distributed multi-agent simulations on heterogeneous computational infrastructures .	139
<i>Oksana Severiukhina, Pavel Smirnov, Klavdiya Bochenina, Denis Nasonov, and Nikolay Butakov</i>	

**eKnowledge**

Simulating robot groups with elements of a social structure using Kvorum .....	147
<i>Maxim Rovbo and Elena Ovsyannikova</i>	
Bridging Network Static Properties and Activation Dynamics .....	157
<i>Stepan Kochemazov</i>	
On the effect of stabilizing mean firing rate of a neuron due to STDP .....	166
<i>Alexandr Sboev, Roman Rybka, and Alexey Serenko</i>	
Visualization of Maximizing Images with Deconvolutional Optimization Method for Neurons in Deep Neural Networks .....	174
<i>Dmitry Nekhaev and Vyacheslav Demin</i>	

**eHealth**

Multiscale dynamic visualization of signal transduction processes with detailing of target-genes activation in three-dimensional genome structure .....	182
<i>Kseniia Bureiko, Maria Semashko, Ksenia Mukhina, and Andrey Karsakov</i>	
Mathematical modeling shows the frequency of Ca <sup>2+</sup> sparks in cells depends on the ryanodine receptor's arrangement .....	190
<i>Bogdan Iaparov, Svyatoslav Khamzin, Alexander Moskvina, and Olga Solovyova</i>	
Pattern-based Mining in Electronic Health Records for Complex Clinical Process Analysis .....	197
<i>Oleg Metsker, Ekaterina Bolgova, Alexey Yakovlev, Anastasia Funkner, and Sergey Kovalchuk</i>	
Towards a Simulation Framework for Decision Support in Healthcare Quality Assessment .....	207
<i>Iliia Kisliakovskii, Marina Balakhontceva, Sergey Kovalchuk, Nadezhda Zvartau, and Alexandra Konradi</i>	
Parallel 2D Ray Casting Algorithm for Brain Cell Registration with Brodmann's Layer Decomposition from Nissl-stained Mouse Cortex Images .....	215
<i>Svetlana Nosova and Vadim Turlapov</i>	

Absolute humidity anomalies and the influenza onsets in Russia: a computational study . . . . .	224
<i>Nikita Seleznev and Vasiliy Leonenko</i>	
Towards Evolutionary Discovery of Typical Clinical Pathways in Electronic Health Records . . . . .	234
<i>Anastasia Funkner, Alexey Yakovlev, and Sergey Kovalchuk</i>	
Simulation of Overdrive Pacing in 2D Phenomenological Models of Anisotropic Myocardium . . . . .	245
<i>Timofey Epanchintsev, Sergei Pravdin, Andrey Sozykin, and Alexander Panfilov</i>	
<b>eCity</b>	
GPU-powered Calculation of Navigation Fields for Agent-based Simulation . . . . .	255
<i>Vadim Shmelev, Andrey Karsakov, Alexander Moiseev, and Aleksandr Zagarskikh</i>	
Use of video data for analysis of special transport movement . . . . .	262
<i>Ivan Derevitskii, Alexey Kurilkin, and Klavdiya Bochenina</i>	
Smart Cities Prospects from the Results of the World Practice Expert Benchmarking . . . . .	269
<i>Lyudmila Vidiasova, Polina Kachurina, and Felipe Cronemberger</i>	
Accident monitoring framework based on online social network sensing . . . . .	278
<i>Timur Fatkulin, Nikolay Butakov, Alexei Krikunov, and Daniil Voloshin</i>	
<b>eEnviroments</b>	
Urban Pluvial Flood Forecasting using Open Data with Machine Learning Techniques . . . . .	288
<i>Jeerana Noymanee, Nikolay Nikitin, and Anna Kalyuzhnaya</i>	
Floodvision: A Tool for Fast and Comfortable Scenario-Based Visual Analysis of a Large Climate Datasets . . . . .	298
<i>Kirill Golubev, Aleksandr Zagarskikh, Alexander Moiseev, and Andrey Karsakov</i>	
VIIRS Nightfire Remote Sensing Volcanoes . . . . .	307
<i>Grigory Trifonov, Mikhail Zhizhin, Dmitry Melnikov, and Alexey Poyda</i>	
Quality control and data restoration of metocean Arctic data . . . . .	315
<i>Jose Luis Araya-Lopez, Amir Uteuov, and Anna Kalyuzhnaya</i>	
Spatially adaptive ensemble optimal interpolation of in-situ observations into numerical vector field models . . . . .	325
<i>Anton Gusarov, Anna Kalyuzhnaya, and Alexander Boukhanovsky</i>	
High-performance meteorological data processing framework for real-time analysis and visualization . . . . .	334
<i>Gali-Ketema Mbogo, Stepan Rakitin, and Alexander Visheratin</i>	
<b>eSociety</b>	
Usability Issues of Virtual Reality Learning Simulator in Healthcare and Cybersecurity . . . . .	341
<i>Jussi Kasurinen</i>	
Simternet - Complex Internet Exercise on a Virtual ICT Learning Environment . . . . .	350
<i>Vesa Kankare and Jussi Kasurinen</i>	
Analysis of Comments of Users of Social Networks to Assess the Level of Social Tension . . . . .	359
<i>Dmitry Donchenko, Nadezhda Ovchar, Natalia Sadovnikova, Olga Shabalina, Danila Parygin, and Danish Ather</i>	
Chaos Theory in Finance . . . . .	368
<i>Igor Klioutchnikov, Mariia Sigova, and Nikita Beizerov</i>	
Modelling multistage information spreading in dynamic complex networks . . . . .	376
<i>Bakhruz Dzhabarov, Daniil Voloshin, Max Petrov, and Nikolay Butakov</i>	
Author Index . . . . .	386