

# **2019 IEEE 15th International Scientific Conference on Informatics**

**Poprad, Slovakia  
20 – 22 November 2019**



**IEEE Catalog Number: CFP19E80-POD  
ISBN: 978-1-7281-3181-8**

**Copyright © 2019 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP19E80-POD
ISBN (Print-On-Demand):	978-1-7281-3181-8
ISBN (Online):	978-1-7281-3180-1

**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  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# Table of Contents

<b>Welcome .....</b>	<b>N/A</b>
<b>Committees.....</b>	<b>N/A</b>
<b>Optimization design for parallel coloring of a set of graphs in the High-Performance Computing.....</b>	<b>11</b>
Adam Dudáš, Jarmila Škrinárová, Eduard Vesel	
<b>Designing Voice-Controllable APIs .....</b>	<b>19</b>
Matúš Sulír, Jaroslav Porubán	
<b>High Order Numerical Integration Method and its Applications – The First 36 Years .....</b>	<b>25</b>
Gabriela Necasová, Petr Veigend and Václav Sátek	
<b>Versioned database storage using unitemporal relational database .....</b>	<b>31</b>
Ján Janech, Marek Tavač, Michal Kvet	
<b>A Comparison Study of Similarity Measures in Rough Sets Clustering .....</b>	<b>37</b>
Arnold Szederjesi-Dracomir, Radu D. Gaceanu, Horia F. Pop and Costel Sarbu	
<b>Cyber Rapid Response Team: An Option within Hybrid Threats .....</b>	<b>43</b>
Darko Galinec, William Steingartner, Vinko Zebic	
<b>Software architecture of Automatic Train Operation .....</b>	<b>51</b>
Michal Ďuračík, Emil Kršák, Matej Meško and Ján Ružbarský	
<b>Two classes of graphs with symmetries allowing a compact representation.....</b>	<b>55</b>
Uros Cibej, Jurij Mihelic	
<b>New Challenges in Forensic Analysis in Railway Domain .....</b>	<b>61</b>
Jasmin Cosic, Christian Schlehuber, Drazen Morog	
<b>A comparison of refinement techniques for the backtracking algorithms for the subgraph isomorphism problem .....</b>	<b>65</b>
Jurij Mihelic, Uros Cibej	
<b>Detection of non-standard situation in smart water metering .....</b>	<b>71</b>
Ondrej Kainz, Eduard Karpiel, Rastislav Petija, Miroslav Michalko, František Jakab	
<b>Graphical Development Environment for Object Programming Teaching Support .....</b>	<b>77</b>
Monika Václavková, Marek Kvet, Peter Sedláček	
<b>Valuation in the Sector of New Technologies – Taxonomic Measures and Comparison of Markets .....</b>	<b>83</b>
Paweł Kossecki	
<b>Short-Term Rainfall Estimation by Machine Learning Methods .....</b>	<b>89</b>
Peter Krammer, Marcel Kvassay, Ondrej Habala, Ladislav Hluchý	
<b>Modified Radial Basis Functions Approximation Respecting Data Local Features.....</b>	<b>95</b>
Jakub Vasta, Vaclav Skala, Michal Smolik, Martin Cervenka	
<b>A Chatbot based on Deep Neural Network and Public Cloud Services with TJBOT Interface.....</b>	<b>101</b>
Michal Povinsky, Miroslav Melicherčík, Vladimír Siládi	

<b>Classification of Tire Tread Images by Using Neural Networks .....</b>	<b>107</b>
Alzbeta Michalíková, Branislav Pazicky	
<b>Realtime attack environment for DDoS experimentation .....</b>	<b>113</b>
Ladislav Huraj, Marek Šimon	
<b>Design of Omni-directional Hexapod Robot with Horizontal Coxa Joint .....</b>	<b>119</b>
Marek Zak, Jaroslav Rozman, Frantisek V. Zboril	
<b>A Class of Multidimensional Oscillating Sequences and Related Young Functionals.....</b>	<b>125</b>
Andrzej Z. Grzybowski, Piotr Puchala	
<b>Comparative study of inconsistency indices based on a notion of a triad inconsistency .....</b>	<b>131</b>
Andrzej Z. Grzybowski, Tomasz Starczewski	
<b>Chaos simulation and audio output.....</b>	<b>137</b>
Branislav Sobota, Filip Majcher, Martin Sivý, Marián Hudák	
<b>Network motifs uncovering hidden characteristics of urban public transportation.....</b>	<b>143</b>
Alexandru Iovanovici, Lilla Pellegrini, Anca-Maria Moscovici, Monica Leba	
<b>HaskellCompass: Extending the CodeCompass comprehension framework for Haskell.....</b>	<b>149</b>
Boldizsár Németh, Tibor Brunner	
<b>Training Neural Networks with Computer Generated Images.....</b>	<b>155</b>
János Hollósi, Áron Ballagi	
<b>Accuracy of Unit Under Test Identification Using Latent Semantic Analysis and Latent Dirichlet Allocation .....</b>	<b>161</b>
Matej Madeja, Jaroslav Poruban	
<b>Obtaining tire tread model from its real world photo .....</b>	<b>167</b>
Michal Vagac, Michal Povinsky, Miroslav Melicherčík	
<b>Enhancing Team Interaction and Cross-platform Access in Web-based Collaborative Virtual Environments .....</b>	<b>171</b>
Marián HUDÁK, Štefan KOREČKO, Branislav SOBOTA	
<b>Hierarchical Clustering based on IndoorGML Document.....</b>	<b>177</b>
Judit Tamas	
<b>Significance of implementation of Management Information Systems in the IPO chain for SMEs .....</b>	<b>183</b>
Katarína Teplická	
<b>An implementation of the M-tree index structure for PostgreSQL using GiST .....</b>	<b>189</b>
István Donkó, János M. Szalai-Gindl, Gergő Gombos, Attila Kiss	
<b>Interconnecting YAJCo with Xtext: Experience Report .....</b>	<b>195</b>
Sergej Chodarev, Ján Halama	
<b>SSVDAG* : Efficient Volume Data Representation Using Enhanced Symmetry-Aware Sparse Voxel Directed Acyclic Graph .....</b>	<b>201</b>
Peter Čerešník, Branislav Madoš, Anton Baláž, Zuzana Bilanová	
<b>Real-time processing of cybersecurity system data for attacker profiling.....</b>	<b>207</b>
Patrik Pekarčík, Tomáš Kekenák, Pavol Sokol, Terézia Mézesová	
<b>A case study on the effects and limitations of refactoring.....</b>	<b>213</b>
Bianka Flóra Békefi, Kristóf Szabados, Attila Kovács	
<b>The Role of the Version Control Information in Code Comprehension.....</b>	<b>219</b>
Tibor Brunner, Zoltán Porkoláb	

<b>Towards More Sophisticated Static Analysis Methods of Python Programs .....</b>	<b>225</b>
Hristina Gulabovska, Zoltán Porkoláb	
<b>Efficiency of the relational database tuple access.....</b>	<b>231</b>
Michal Kvet, Karol Matiaško	
<b>epiBAT: Multi-objective bat algorithm for detection of epistatic interactions .....</b>	<b>237</b>
Jozef Sitarcík, Mária Lucká	
<b>Automatic restoration of diacritics based on word n-grams for Slovak texts .....</b>	<b>243</b>
Štefan Toth, Emanuel Zaymus, Michal Ďuračík, Matej Meško, Patrik Hrkút	
<b>Adoption of cloud and containerization technologies in Mongolia .....</b>	<b>249</b>
Baasanjargal Erdenebat, Tamás Kozsik	
<b>Seeking Relevant Information Sources .....</b>	<b>255</b>
Marek Mensík, Marie Duzí, Adam Albert, Vojtech Patschka, Miroslav Pajr	
<b>Building Neural Networks as Dataflow Graphs .....</b>	<b>261</b>
Gabor Kruppai, Attila Kiss	
<b>A proposal for service design based on user's action history using machine learning .....</b>	<b>267</b>
Xinyue Wang, Nobutada Fujii, Toshiya Kaihara, Daisuke Kokuryo	
<b>Analysis of Training Parameters of Feed Forward Neural Networks for WiFi RSSI Modeling.....</b>	<b>273</b>
Bence Bogdandy, Zsolt Toth	
<b>Classification of malicious emails.....</b>	<b>279</b>
Eva Marková, Tomáš Bajtos, Pavol Sokol, Terézia Mézesová	
<b>Evaluation and analysis of bio-inspired optimisation algorithms for feature selection .....</b>	<b>285</b>
Drazen Bajec, Bruno Zoric, Mario Dudjak, Goran Martinovic	
<b>Symbolic Execution with Finite State Automata .....</b>	<b>293</b>
Endre Fülöp, Norbert Pataki	
<b>A study on support method of consulting service using text mining .....</b>	<b>299</b>
Ruriko Watanabe, Nobutada Fujii, Daisuke Kokuryo, Toshiya Kaihara, Yoichi Abe, Ryoko Santo	
<b>Performance guarantees for P4 through cost analysis .....</b>	<b>305</b>
Dániel Lukács, Gergely Pongrácz, Máté Tejfel	
<b>Large Astronomical Time Series Pre-processing and Visualization for Classification using Artificial Neural Networks .....</b>	<b>311</b>
David Andresic, Petr Saloun, Bronislava Suchanova	
<b>Comparison of Predictive Statistical Learning Accuracy with Computational Intelligence Methods .....</b>	<b>317</b>
Dusan Marcek	
<b>An Approach to Web Advertising Server Parsing - Apartment Price Analysis in the Czech republic.....</b>	<b>323</b>
Alena Pozdílková, Marie Nedvěďová, Jaroslav Marek	
<b>A Simulation Study of Depot with Multiple Temperature Modes: Maximum Flow Estimation .....</b>	<b>329</b>
Marie Nedvěďová, Alena Pozdílková, Jaroslav Marek, Michael Bažant	
<b>Teachers' attitudes towards implementing coding at schools .....</b>	<b>335</b>
Hana Bučková, Jiří Dostál	
<b>On the Carrier Suppressed Optical Modulation Methods for High Capacity DWDM Systems .....</b>	<b>341</b>
Tomáš Huszaník, Ján Turán, Ľuboš Ovseník	

<b>Towards Automated Translating Natural Language Sentences into Intensional Constructions .....</b>	<b>345</b>
Branislav Bednár, Zuzana Bilanová	
<b>Virtual Reality Test Setup for Visual Impairment Studies .....</b>	<b>351</b>
Ingmar Basic, Zikrija Avdagic, Kerim Hodzic	
<b>The Use of Mini Computer in Hybrid FSO/RF System .....</b>	<b>357</b>
Renát Haluška, Luboš Ovseník, Peter Šulaj	
<b>Comparative study of relational and graph databases.....</b>	<b>363</b>
Malgorzata Lazarska, Olga Siedlecka-Lamch	
<b>Possibilities of human interaction in the virtual environment .....</b>	<b>371</b>
Patrik Voštinár, Dana Horváthová, Martin Mitter, Martin Bako	
<b>Reconstruction of Corrupted Vector Fields using Radial Basis Functions.....</b>	<b>377</b>
Michal Smolik, Vaclav Skala	
<b>Java Virtual Machine Educational Tools .....</b>	<b>383</b>
Tomaz Dobravec	
<b>Some innovations of teaching the course on Data structures and algorithms .....</b>	<b>389</b>
William Steingartner, Ján Eged, Davorka Radakovic, Valerie Novitzká	
<b>Towards Complete SAT-based Cryptanalysis of RC5 Cipher.....</b>	<b>397</b>
Artur Sobon, Mirosław Kurkowski, Sylwia Stachowiak	
<b>Complexity of Security Protocols Verification Tools.....</b>	<b>403</b>
Michał Mazur, Mirosław Kurkowski	
<b>Managing The Implementation Of A Smart Pedestrian Network (SPN) System .....</b>	<b>409</b>
George Papageorgiou, Anastasia Ioannou, Athanasios Maimaris, Alexander N. Ness	
<b>Logic and Semantic Technologies for Computer Science Education .....</b>	<b>415</b>
Wolfgang Schreiner	
<b>Design of Microstrip Patch Antennas Operating on 2.45GHz in HFSS and FEKO .....</b>	<b>421</b>
Michal Márton, Luboš Ovseník, Ján Turán, Tomáš Huszaník, Jakub Urbanský	
<b>Queueing Models of Systems with Non-Homogeneous Customers and their Applications in Computer Science .....</b>	<b>427</b>
Oleg Tikhonenko, Marcin Ziółkowski	
<b>Pre-diagnostic of diabetes with the use of statistical machine learning .....</b>	<b>433</b>
Jana Dudova, Emil Krsak, Tomas Kello	
<b>Synergy of Organizational Patterns and Aspect-Oriented Programming .....</b>	<b>439</b>
Peter Berta, Valentino Vranic	
<b>Coordinated jogging algorithm for general serial robot architectures .....</b>	<b>445</b>
Martin Svejda, Tomas Myslivec, Martin Goubej	
<b>Novel RBF Approximation Method Based on Geometrical Properties for Signal Processing with a New RBF Function: Experimental Comparison.....</b>	<b>451</b>
Vaclav Skala, Martin Cervenka	
<b>Totally bounded metric spaces and similarity detecting algorithms .....</b>	<b>457</b>
Gábor Sági, Karrar Al-Sabti	

<b>Towards a formal description and automatic execution of production processes .....</b>	<b>463</b>
Marko Vještica, Vladimir Dimitrieski, Milan Pisarić, Slavica Kordić, Sonja Ristić, Ivan Luković	
<b>Influence of CNN Input Modification for Red Blood Cells Trajectory Prediction in Blood Flow .....</b>	<b>469</b>
Michal Chovanec, Hynek Bachraty, Katarína Jasencáková and Katarína Bachratá	
<b>Mind Map and Business Process Model: Specification support by model transformation .....</b>	<b>477</b>
Ján Lang, Radovan Kohút	
<b>A Deep Meta-learning Framework for Heart Disease Prediction .....</b>	<b>483</b>
Iman Salem, Radwa Fathalla, Mohamed Kholeif	
<b>Automated configuration of a Linux web server security .....</b>	<b>491</b>
Michal Olencin, Ján Perhác	
<b>A Framework for Evaluating the Benefits of Implementing a Smart Pedestrian Network System .....</b>	<b>497</b>
George Papageorgiou, Anastasia Ioannou, Athanasios Maimaris, Alexander N. Ness	
<b>Modelling and computer simulations with the use of a specific organisation of calculations .....</b>	<b>503</b>
Elzbieta Gawronska	
<b>Software visualization of natural semantics of imperative languages - a teaching tool .....</b>	<b>509</b>
William Steingartner, Martin Haratim, Jirí Dostál	
<b>Authors' Index .....</b>	<b>515</b>