# 2018 IEEE First International Conference on System Analysis & Intelligent Computing (SAIC 2018)

Kyiv, Ukraine 8-12 October 2018



IEEE Catalog Number: ISBN: CFP18SUA-POD 978-1-5386-7197-9

### **Copyright © 2018 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:	CFP18SUA-POD
ISBN (Print-On-Demand):	978-1-5386-7197-9
ISBN (Online):	978-1-5386-7196-2

### 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 Web: www.proceedings.com



# **CONTENTS**

### **TRACK 1**

System Analysis of Complex Systems

Parameterization of Sustainable Development Components Using Nightlight	8
Indicators in Ukraine	
Michael Zgurovsky, Viktor Putrenko, Iryna Dzhygyrey, Andrey Boldak, Kostiantyn	
Yefremov, Nataliia Pashynska, Ivan Pyshnograiev and Sergiy Nazarenko	
Strategy of Complex Systems Development Based on the Synthesis of Foresight and	13
Cognitive Modelling Methodologies	
Galina Gorelova and Nataliya D. Pankratova	
Study of Automated Control Methods in Cognitive Maps' Impulse Processes with	19
Suppressing Constrained Disturbances	
Victor Romanenko and Yuriy Milyavsky	
Combinatorial Method for Aggregation of Incomplete Group Judgments	25
Vitalii Tsyganok, Sergii Kadenko, Oleh Andriichuk and Pavlo Roik	
Evaluation of Ecology Projects for Black Sea Odessa Region on Basis of a Network	31
BOCR Criteria Model	• -
Nataliya D. Pankratova and Nadezhda I. Nedashkovskaya	
Application of Petri Networks for Support of Functional Stability of Information	36
Systems	•••
O. Barabash, N. Lukova-Chuiko, V. Sobchuk and A. Musienko	
Empirical Analysis of the Relation Between Moon's Gravitational-Wave and	40
Earth's Global Temperature: Influence of Time-Trend Cyclic Change of Distance	40
from Moon	
Yoshio Matsuki and Petro I. Bidyuk	
Guaranteed Estimation of Solutions of First Order Linear Systems of Ordinary	44
Differential Periodic Equations with Inexact Data from Their Indirect Noisy	••
Observations	
Oleksandr Nakonechnyi and Yuri Podlipenko	
Building the Non-Linear Regression Equations on the Basis of Multivariate	48
Normalizing Transformations	10
Sergiy Prykhodko, Natalia Prykhodko and Lidiia Makarova	
Anasysis of On-Line Computation Effectiveness in Redundant Number System	53
Ivan Dychka, Valerii Zhabin and Valentina Zhabina	30
About Stability of First Kind Equation Solving	59
	57
Ganna Shyshkanova	
Ganna Shyshkanova	
Stochastic Equation of the Technological Process	64
<b>Stochastic Equation of the Technological Process</b> Oleh Pihnastyi and Valery Khodusov	
Stochastic Equation of the Technological ProcessOleh Pihnastyi and Valery KhodusovModel of a Composite Magistral Conveyor Line	64 68
<b>Stochastic Equation of the Technological Process</b> Oleh Pihnastyi and Valery Khodusov	

**Proactive Aviation Security Control** 

Dan Tavrov, Olena Temnikova, Volodymyr Temnikov, Valerii Kozlovskyi and Andrii Temnikov

Expert System for Identification of the Technical State of the Aircraft Engine TV3- 117 in Flight Modes	77
Yurii Shmelov, Serhii Vladov, Yana Klimova and Marina Kirukhina	
Security Key Indicators Assessment for Modern Cellular Networks Roman Odarchenko, Viktor Gnatyuk, Sergiy Gnatyuk and Anastasiia Abakumova	83
System Analysis and Classification of Spatial Configurations Sergiy Yakovlev and Oleksii Kartashov	90
<b>On Optimization Problems on the Polyhedral-Spherical Configurations with Their</b> <b>Properties</b> <i>Sergiy Yakovlev, Oksana Pichugina and Olga Yarovaya</i>	94
<b>Performance Analysis of Positioning System by Navigational Aids in Three</b> <b>Dimensional Space</b> <i>N.S. Kuzmenko and I.V. Ostroumov</i>	101
<b>Using Morphological Table Networks for Modeling Social Disaster Situations</b> <i>Illia Savchenko</i>	105
<b>Increase in The Efficiency of Situational Control Systems by Forces and Means to</b> <b>Prevent from and Liquidate Crisis Situations</b> <i>Yuriy Danyk and Valery Shestakov</i>	109
Hurricane Forecasting Using by Parallel Calculations & Machine Learning Yaroslav Vyklyuk, Milan M. Radovanović and Petro Sydor	115
<b>Recommendations for Practical Use of the Method of Planning of Exit of</b> <b>Compound Technical Objects into Repair During Operation According to State</b> <i>I. Sachuk, S. Bortnovskyi, A. Artemenko, A. Kalyta, P. Open'ko and V. Tyurin</i>	121
<b>Analysis of Prediction Mathematical Models of Shrinkage Defects in Castings</b> <i>Tatjana Selivyorstova and Aleksandr Mikhalyov</i>	125
Fractal Analyzing of Active Earthquake Fault Data Ebru Aydındağ, Pınar Kırcı and İsmail Kırbaslar	130

TRACK 2 Computational Intelligence

<b>Evolving Hybrid GMDH-Neuro-Fuzzy Networks and Their Applications</b> <i>Yevgeniy Bodyanskiy, Yuriy Zaychenko, Olena Boiko and Galib Hamidov</i>	134
<b>The Use of Backpropagation Artificial Neural Networks in Thermal Tomography</b> <i>Roman Galagan and Andrii Momot</i>	140
<b>Neural Dialogue System with Emotion Embeddings</b> Roman Shaptala, Gennadiy Kyselov and Anna Kyselova	146
Neural Network for Online Principal Component Analysis in Medical Data Mining Tasks Iryna Perova, Yevgeniy Bodyanskiy, Pavlo Mulesa and Yelizaveta Brazhnykova	150
Modeling Military Conflicts Using Bayesian Networks Peter Bidyuk, Aleksandr Gozhyj and Iryna Kalinina	155
<b>Application of Cellular Automates in Some Models of Artificial Intelligence</b> O.S. Makarenko and V.M. Osaulenko	
<b>Deep Learning Approach in Computer-Aided Detection System for Lung Cancer</b> <i>Bohdan Chapaliuk and Yuriy Zaychenko</i>	165

<b>An Enhancement of a Learning Procedure in Neuro-Fuzzy Model</b> Alexander Vlasenko, Olena Vynokurova, Nataliia Vlasenko and Yevgeniy Bodyanskiy	169
<b>Application of Neural Network Technologies for Information Protection in Real</b> <b>Time</b> <i>Viktor Khavalko and Andrew Khudyy</i>	173
Unsupervised Pre-Training with Spiking Neural Networks in Semi-Supervised Learning Yaroslav Dorogyy and Vadym Kolisnichenko	177
Human Action Recognition Using Fusion of Modern Deep Convolutional and Recurrent Neural Networks Dmytro Tkachenko	181
<b>Deep Neural Network for Detection of Cyber Attacks</b> Myroslav Komar, Vitaliy Dorosh, Grygoriy Hladiy and Anatoliy Sachenko	186
Image Enhancement in Automatic Mode by Piecewise NonLinear ContrastStretchingSergei Yelmanov and Yuriy Romanyshyn	190

### TRACK 3

# Intelligent Computing Technologies

<b>Modified Method of Software Testing for Distributed Computer System</b> Vadim Mukhin, Yaroslav Kornaga, Yuriy Bazaka, Maxim Bazaliy and Alla Yakovleva	197
<b>Intelligent Service Discovery and Orchestration</b> Anatolii Petrenko and Bogdan Bulakh	
Integral Indicator for Complex System Building based on Semi-Supervised Learning Leonid Lyubchyk, Galyna Grinberg and Klym Yamkovyi	206
<b>An Area Navigation (RNAV) System Performance Monitoring and Alerting</b> <i>I.V. Ostroumov and N.S. Kuzmenko</i>	211
Model of the Information Shock Waves in Social Network Based on the Special Continuum Neural Network Andriy Bomba, Nataliia Kunanets, Volodymyr Pasichnyk and Yuriy Turbal	215
<b>Type-Theoretical Foundations of Certified Reasoning in Coq</b> Vasyl Lenko, Volodymyr Pasichnyk, Nataliia Kunanets and Yuriy Shcherbyna	220
A Novel Algorithm for Attacking Path Explosion in Model-Based Test Generation for Data Flow Coverage Alexander Kolchin	226
Parameters Optimization Method of the Information-Extreme Object Recognition System on the Terrain Artem Korobov, Alena Moskalenko, Volodymyr Nahornyi, Julia Zavgorodnya, Oleg Berest and Vyacheslav Zhurba	231
Information Technology Based on Chunk Approach for Ontology Driven E- learning Engine Sergiy Syrota, Viacheslav Liskin and Sergii Kopychko	236
Knowledge Model and Ontology for Security Services Oleksii Kovalenko and Taras Kovalenko	240
<b>Agent Based Modelling Support for Systems of Situational Management</b> Vladimir Kosolapov and Oleksii Kovalenko	244

# **TRACK 4**

## Data Science and Risk Management in Financial World

<b>Forecasting of Financial Risk Users' Outflow</b> Nataliia Kuznietsova and Petro Bidyuk	250
<b>Big Data Tools in Processing Information from Open Sources</b> Mariana Mateeva Petrova, Olena Sushchenko, Iryna Trunina and Nadiya Dekhtyar	256
<b>The Non-Linear Regression Model to Estimate the Part of NPLS in the Whole</b> <b>Loan Portfolio of Ukrainian Banks</b> <i>Natalia Prykhodko, Sergiy Prykhodko and Mykhaylo Vorona</i>	261
<b>Using Econometric Modeling in Likelihood Assessing of Investment Activity Risks</b> <i>Bogomolov A.B., Nevezhin V.P. and Chagovets L.O.</i>	266
<b>Some Methods for Estimating Financial Risks in Banking</b> Nataliia Kuznietsova, Marta Seebauer and Stanislav Zabielin	271
Author Index	275

### **Author Index**