# **2022 XXV International Conference on Soft Computing** and Measurements (SCM 2022)

Saint Petersburg, Russia 25 – 27 May 2022



IEEE Catalog Number: CFP22C43-POD **ISBN:** 

978-1-6654-9670-4

# Copyright © 2022 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:	CFP22C43-POD
ISBN (Print-On-Demand):	978-1-6654-9670-4
ISBN (Online):	978-1-6654-9669-8

#### 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



#### Content

### 1. General Measurement Theory. Metrology, Measures and Scales. Uncertainty in Measurements

Intelligent Sensor Networks in Industry 5.0. Generalized Concept of Creating Digital Platforms for Managing Complex Systems Based on a Regularizing Bayesian Approach Prokopchina S.V.	3
Metrological Tests of Measurement Results of Probabilistic Characteristics of Random Processes Mikus O.A., Suloeva E.S., Tsvetkov E.I.	6
Evaluation of Human Factor Effect for the Accuracy of 3D Models of Heritage Science Badillo Pablo D., Jabr Yara, Parfenov V.A.	10
Crisis Indicators for Large Industrial Systems Nedosekin A.O., Abdoulaeva Z.I., Kokorin M.S., Nikitina T.A.	N/A
Developing a Performance Criterion to Assess Dating Error in the Personified Distributed Information- Measuring System Romantsova N.V., Tsareva A.V., Tyarkin Ya.A.	19
Modification of the Kalman Filter with Residual Separation and Localization Gogorev I.R., Belsky G.V.	
2. Probabilistic Methods in Information Processing. The Bayesian Approach	
Cumulative Mean Function of Public Posting Episodes in the Online Media with Regard to User's Digital Trace. Limited Data on Publications Dates and Profile Data Stoliarova V.F., Tulupyev A.L.	
Discretization of a Continuous Frequency Value in a Model of Socially Significant Behavior Toropova A.V., Tulupyeva T.V.	
RuBERT Embeddings in the Task of Classifying User Posts on a Social Media Oliseenko V.D., Abramov M.V.	31
3. Systems Simulation. Complex Objects Control Under Uncertainty	
Methods and Technologies of Application of Fuzzy Models for Processing Industrial Data and Quality Management of Polymer Materials Chistyakova T.B. Makaruk R.V. Tedtoev A.Ch.	34
Control System Structure Design of a Gas Pre-Separation Unit Barashkin R.L., Popadko V.E.	
Analytical Solution for DC-DC Boost Converter and Comparison of Analytical Solution with MATLAB and ngspice Models	40
Adnan M., Barnabas B.S., Koirala N., Prokshin A.N., Karpov G.A., Niroula P., Simulation of the Load Distribution System on Electric Drives in the Wire Part of the Paper Machine Kozlova L.P., Kozlova O.A.	
Service for Monitoring and Control of Remote Testing by Video Information Grigoriev I.S.	
Mobile Robot Model Predictive Control Model Bondarchuk A.P., Abramov P.V., Bogdanova S.M., Filatov D.M.	53
Implementation of Complex Control Algorithms at a Gas Production Enterprise Abramkin S.E., Dushun S.E.	56
Extended Object-Oriented Modeling of Intelligent Information Agent Planners Ptitsyna L.K., Zharanova A.O., Ptitsyn N.A., Belov M.P.	60
Application of Neural Networks in Electric Drive Systems of Pumping Units Belov A.M., Belov M.P.	64
Synthesis of a Control System for the Oil Cooling Process in the Oil Supply System of a Gas Turbine Engine Mal'tsev P.A., Shatilova N.A., Abramkin S.E.	68
Monitoring of Spatial Characteristics of Two-dimensional Models of Three-dimensional Microelectronic Objects Mironov S.E., Andreev L.E.	
Development of a Compressor-free Climate Control System Chervonaya Veronika, Lillo A.V.	76

Simulation of the Technical Condition of the Electrolyzer Using Neural Networks Ilyushina A.N., Beliaevskii O.A., Novozhilov I.M.	80
Temperature Regime Management of Air Cooling Units of the Gas Transmission System Cherepanov N.A., Semenov A.S.	84
4. Neurocomputing Networks and Neurotechnologies	
Shear Strength Prediction of Unusual Interior Reinforced Concrete Beam-Column Joint Using Multi-Layer Neural Network: a Data Collection by Digital 3D Finite Element Simulation Christ John L. Marcos, Silva Dante L.	88
Neuro-fuzzy Model for In-circuit Control Systems Morozov S.M., Kupriyanov M.S.	92
Advanced Traffic Sign Recognition System Macheev E.M., Devyatkin A.V., Muzalevsky A.R.	95
Correlation Discriminator of Images in the Class of Fast Neural Networks Dorogov A.Yu.	99
5. Models and Methods for Artificial Intelligence Systems. Cognitive Systems	
The Method for End-to-end Automatic Test Generation from Natural Language Test Scenarios Based on Pretrained OpenIE Model Kobyshev K.S., Molodyakov S.A.	103
Application of Text Analysis Methods to Recommend Student Choices Korytov P.V., Kholod I.I.	
Generative Adversarial Approach in Natural Language Processing Karuna E.N., Sokolov P.V., Gavrilic D.A.	111
Platform (SDK) for Self-Healing of a Special Microkernel Operating System (KasperskyOS, QNX, Minix, osFree) Based on Cyberimmunity Balyabin A.A., Petrenko S.A.	115
Application of Machine Learning Methods to Assessment of Applicants Timofeev A.A.	119
Logical Data Model for Intelligent Video Surveillance Systems Zhukova N.A., Subbotin A.N.	122
On one Approach to the Dynamic Digital Twins Models Synthesis Vodyaho A.I., Zhukova N.A., Abbas S.A., Kulikov I.A., Annam F.A.	126
The Quantum Circuits Configurations for the Module of Conjugate Coefficients Permutations when Performing QFT	120
Kalmychkov V.A., Kukaev A.S., Matveeva I.V. Generalized Model of Cognitive Activity Taking into Account Uncertainty in an Information-saturated Environment	129
Pisarev A.S., Kotova E.E., Pisarev I.A.	133
Causal Relationships in Explainable Artificial Intelligence Shevskaya N.V., Akhrymuk E.S., Popov N.V.	138
6. Fuzzy Methods and Systems	
<i>Fuzzy Linear Regression for Horizontally Partitioned Data</i> Gisin V.B., Volkova E.S.	142
The Multicollinearity Problem in the Fuzzy Linear Regression Model Gisin V.B., Putko B.A., Yarygina I.Z.	146
<i>Fuzzy Logic in PRO-networks in the System of Simulation Modeling of Production Processes</i> Sevastyanov M.S., Novakova N.E.	149
Using of Fuzzy Logic in Regulation Tasks Kozlova L.P., Kozlova O.A.	153
7. New Approaches in Measurements: Intellectual, Soft and Fuzzy Measurements	
Processes Maturity Parameters Measuring Approach Zemlyakova A.S., Jaschenko V.V.	156

Universal Indicator of Information Content of the Speech Signature of a Document Alyushin A.M.	. 159
Correctness of the Information Contained in the Biosignature Document of the Document Alyushin A.M., Alyushin M.V., Dvoriankin S.V.	. 163
Construction of the Concept of Primary Assessment of the Sequestration Potential of Territories Akhmedova G., Bakhtina N.D., Minina A.A., Zhdanova E.N.	
8. Intelligent Measurements Systems and Sensors	
Dynamic Positioining Data Analysis Using Wavelet Scaleograms	
Ambrosovskaya E.B., Romaev D.V., Kalimov D.V.	. 171
Geotaxons Classification Based on Carbon Impact Severity Alekseev V.V., Orlova N.V., Vavilov R.E., Bryzgalo V.S.	. 174
The Appearance of the Information-measuring System for Qualimetry of Collective Protection Against Aircraft Noise	
Dragan S.P., Bogomolov A.V., Kharitonov V.V., Drozdov S.V.	. 177
Data Transmission over a Wireless Communication Channel of a Mobile Information Measurement System for the Study of a Person Kinematic Portrait Tokareva I.A., Tsareva A.V., Popov D.B.	101
Creating a Mobile Application for the Study of a Person Kinematic Portrait	. 101
Tokareva I.A., Alekseev V.V., Surov Denis, Mikus O.A.	. 184
9. Technologies and Systems BIG DATA, Data Science, Business Intelligence	
Automation of Search for University Employees Scientific Papers Using Artificial Intelligence Methods	
Gallini N.I., Chetyrbok P.V., Kamornitskiy D.T., Motuz N.S.	. 188
Development of an Intelligent Speech Analysis System Seliverstov Y.A., Komissarov A.A., Tsyrkov D.A., Torsionov S.S., Lesovodskaya A.A., Podtikhov A.V	. 192
Recommender Machine for the Formation of an Individual Educational Trajectory Ivanov V.S.	. 198
Application of Text Mining Technology to Solve Project Management Problems Vasiliev A.A., Goryachev A.V.	. 202
10. IoT and Industrial 4.0. Technologies and Systems	
Distributed System for Evaluating the Residual Charge of a Modular Multi-level Energy Storage Device Lavrinovskiy V.S., Dobroskok N.A., Trusova E.S.	. 206
11. Artificial Intelligence and Measurements in Industry, Ecology and Economics	
Comparative Analysis of Models for Assessing the Digital Maturity of the Transformation Infrastructure	
Brusakova I.A.	. 209
Determination of the Components Toxicity of the Polycrystalline Solar Panel Semenova M.I., Vezhenkova I.V., Manakhova P.V., Porokhnenko K.A.	212
Fuzzy Model for the Analysis of Corporate Degradation in Crisis Conditions	. 212
Nedosekin A.O., Abdoulaeva Z.I., Kurbanbaeva D.F., Karpenko N.A.	. 218
Computer Vision System for Image-based Automated Dial Meter Reading Devyatkin A.V., Muzalevskiy A.R., Morozov A.S.	. 222
Applicant's Decision Support System for Choosing the Direction of Study Chekalev A.A., Khlobystova A.O., Tulupyeva T.V.	. 226
Artificial Intelligence in the Media Industry (on the Minds of AI2Media) Semenov V.P., Myalenka V.Yu., Yakovlev A.I., Meshcheryakov D.E.	. 229
Detection of Anomalous Components in Spatial Surveys Based on a Multidimensional Model of Poisson Flows and their Cognitive Visualization Gorokhov V.L., Brusakova I.A.	. 233
The Selection of Optimal Parameters for Machine Learning Methods of Detecting Malicious Requests to Web Applications	
Bolgov A.O., Kamenskih A.N.	. 236

Sociocultural and Information Security Issues in the Implementation of Neural Network Technologies	
in Chat-bots Design Pokrovskaia N.N.	240
Mixed-criticality Application Scheduling in Safety-involved Embedded Systems Dushutina E.V.	244
Neural Network Solutions for Intellectual Analysis of Heterogeneous Information Petukhov V.D., Mirko A.	250
Intelligent Detection of the Nanomaterials Spatial Structure with Synthetic Electron Microscopy Images Polyanichenko D.S., Chernov A.V., Kartashov O.O., Alexandrov A.A., Butova V.V., Butakova M.A	254
12. Application of Methods and Means of Artificial Intelligence and Measurements in Medicine	
An Algorithm for Continuous Respiratory Monitoring Using Nasal Pressure Airflow Measurement Noriega Alvarado H.S., Ibrahim Anaghem	259
To the Question of the Use of Artificial Intelligence in Medicine Semenov V.P., Baranova L.Yu., Yagya T.S.	262
Biomechanics of Occupational Diseases of the Spine of Operators of Inspection and Examination Complexes Afonin D.N., Afonin P.N.	266
Algorithm for Processing Medical Images to Create a Dataset while Maintaining the Size of Structural Elements Gerasimenko A.E., Evdakova E.G.	269
<i>The Concept of a Device for Lung Monitoring</i> Bogdanova A.S., Bobrova Yu.O.	272
Assessment of Blood Pressure by Photoplethysmogram Signal Based on the Combined Configuration of an Artificial Neural Network Kalinichenko A.N., Antipov N.O., Anisimov A.A.	275
13. Application of Methods and Systems of Artificial Intelligence and Measurements in Agricultural Complexes for Sustainable Development of Territories	