2024 8th Scientific School Dynamics of Complex Networks and their Applications (DCNA 2024)

Kaliningrad, Russia
19-21 September 2024

IEEE Catalog Number: CFP24O96-POD
ISBN: 979-8-3503-9084-1

Copyright © 2024 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:	CFP24O96-POD
ISBN (Print-On-Demand):	979-8-3503-9084-1
ISBN (Online):	979-8-3503-9083-4
ISSN:	2770-7431

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

Alenina Evgeniia A., Kosonogov Vladimir S., Terentieva Kristina V. Neural Processing of Social Stimuli in High vs. Low Social Anxiety Individuals: A Pilot Study 7

Andreev Andrey, Badarin Artem Recovery of hidden macroscopic signals in a Kuramoto phase oscillators network 10

Antipov Vladimir Comparison of Wearable Video-based Eye Tracking and EOG for Oculomotor Activity Detection in Specific Research Tasks 13

Antipov Vladimir Identification of Mechanisms and Biomarkers of Learning Efficiency Based on Multimodal Data 16

Avilov Vadim, Prakash Chander, Polupanov Nikita, Fedotov Aleksandr, Kazantsev Victor, Smirnov Vladimir Memristor structures shape effect: nanoscale resistive switching of dot and lateral electrochemical titanium oxide 19

Bolshakov Denis I., Mishchenko Mikhail A., Chindarev Daniil V., Matrosov Valery V. Recursive map neuron model 23

Bordanov Ilya, Shchanikov Sergey Memristive Artificial Neural Networks Accuracy Evaluation Using Data-Driven Models 27

Brovkova M.B., Brzhozovsky B.M., Martynov V.V., Zinina E.P., Perunov N. Real-Time Identification of Dynamic Process Characteristics in Complex Technical Systems 31

Brusinskii Nikita Using Brainwave Entropy to Evaluate Visual Search Performance in School-Aged Children 34

Brusinskii Nikita, Antipov Vladimir, Badarin Artem Detection of Eye Movement Characteristics Using Reservoir Computing in High-Noise Environments 36

Bukina Tatyana V., Chvanova Marina S., Khramova Marina V., Hramov Alexander E. Determination of the psychological and pedagogical substantiation of the cognitive functions influence on the development of higher education students' universal competencies 39

Butorova Anastasia S., Tarasov Dmitriy A., Kosachenko Alexandra I., Sergeev Aleksandr P. Learning Foreign Languages by Adults Using Immersive Virtual Reality Systems: Review of Recent Studies (2014-2024) 43

Bykova Ekaterina, Suvorova Svetlana, Gavrilov Pavel, Lavrova Anastasia Implementation of Decision Tree Models in Differentiating Hard-to-Diagnose Lung Nodules 47

Chernov Andrey, Granichin Oleg SPSA-based Consensus Algorithm for Collaborative Learning with Heavy-Tailed Noises 50

Chirkin Evgenii, Lopatin Dmitrii About the possibility of using generative neural networks for malicious «high-quality»-purposes 54

Dubinkina Elizaveta S., Borovkova Ekaterina I., Karavaev Anatoly S. Non-stationarity of the natural frequency of the sympathetic control loop of the heart rhythm 62

Efimov Alexandr, Lavrova Anastasia, Proskurkin Ivan Memory Block Development for Neuromorph Setup: experimental study 65

Ezhov Dmitry M., Ponomarenko Vladimir I., Prokhorov Mikhail D. Collective Dynamics in a Network of Electronic FitzHugh-Nagumo Generators Coupled via a Hub 69

Fedorova Alina, Kipelkin Ivan, Talanov Max Investigating the spinal cord CPG neural circuits with emphasis on STDP mechanism 71

Garamov Konstantin A., Lobov Sergey A. Single Spiking Neuron Learns Dynamic Stimuli 75

Granichin Oleg, Tikhonov Alexey, Ivanskiy Yury, Kopylova Kseniia AI methods of control for distributed space systems: a review 79

Grubov Vadim Extreme events in epilepsy 83

Gulyaev Sergey, Garmash Alexandr Default resting state EEG activity mathematical analysis as the new neurophysiological technology 87

Hramkov Aleksey N., Prokhorov Mikhail D., Bezruchko Boris P., Karavaev Anatoly S. Comparison of Methods for Modeling Phase Dynamics Using the Models of Different Orders 92

Ishbulatov Yurii M., Tarasova Olga S., Borovik Anatoly S., Vahlaeva Anna M., Bezruchko Boris P., Karavaev Anatoly S. Reconstructing the model equation for the autonomic control of the mean arterial pressure from rat data 94

Ivanova Anna, Ivashkin Dmitry, Toropova Ksenia, Ivashkina Olga, Anokhin Konstantin Behavioral Enhancement of Associative Learning Requires Overlapping Neuronal Populations 97

Jnadi Ali, Savin Sergei Comparative Analysis of Linear and Exact Control Laws in Zonotope-Based MPC 101

Kabir Muhammad Salman, Kurkin Semen, Paunova Rositsa, Stoyanov Drozdstoy, Hramov Alexander HTM Spatial Pooler − a Nonparametric Interpretable Feature Selection Algorithm? An Introductory Exploration 106

Karavaev Anatoly, Borovkova Ekaterina, Dubinkina Elizaveta, Bezruchko Boris, Chepurnova Yulia, Prokhorov Mikhail Circadian rhythms in the interaction between the processes of autonomic control of blood circulation 112

Khorev Vladimir, Kurkin Semen, Mayorova Larisa, Portnova Galina, Kushnir Anastasia Network-based approach in fMRI experiment with affective touch 115

Khorev Vladimir, Kurkin Semen, Portnova Galina, Bukina Tatiana, Stoyanov Drozdstoy Differences in optimal community structure in brain connectivity organization in major depressive disorder 119

Khoymov Matvey, Tynterova Anastasia, Reznik Elina, Shusharina Natalia Biomarkers of early post-stroke cognitive impairment 123

Klinshov Vladimir, Zlobin Alexander, Nekorkin Vladimir Intermittent synchronization in a population of neurons with adaptive myelination 125

Kolesnikov Ivan, Maksimov Daniil, Semenova Nadezhda How internal noise impacts simplified deep neural network during training 128

Kononov Roman, Maslennikov Oleg, Nekorkin Vladimir Dynamics of reward-based training of piece-wise linear recurrent neural networks for context-dependent decision making 131

Kovalev Nickolay, Khabibullin Farit, Guba Artem, Klyuev Konstantin, Shchapin Vladimir, Kastalskiy Innokentiy, Kazantsev Victor The development of lifting force in flapping wing robots with variable angle of attack 135

Kovaleva Natalia S., Matrosov Valery V., Mishchenko Mikhail A. Working memory capacity in spiking neural network with two types of plasticity 139

Kuc Alexander, Grubov Vadim, Badarin Artem Using long-range temporal correlations in the brain to predict intellectual development in children 142

Kulagin Nikita, Andreev Andrey, Hramov Alexander Reservoir computing shows partial statistical dynamics prediction of two coupled stochastic FitzHugh-Nagumo neurons 145

Kurbako Aleksander V., Ezhov Dmitry M., Prokhorov Mikhail D., Ponomarenko Vladimir I. Recognizing patterns in images using a small spiking neural network 148

Kuzmina Ekaterina, Dylov Dmitry V., Lebedev Mikhail Advanced Modeling for Adaptive DBS: Capturing Parkinson's Disease Complexity 150

Kvasnevskaya Polina, Borovkova Ekaterina, Karavaev Anatoly Development of methods for studying the synchronization of circuits in autonomic regulation of blood circulation based on the analysis of the statistical properties of instantaneous phase differences 154

Len Irina, Len Julia, Amelina Amelina, Ivanskiy Yury Robot navigation under uncertainty 158

Marasanova Ekaterina A., Vedunova Maria V., Mitroshina Elena V. Effect of Blockade of the 5-HT4 Receptors on the Calcium Activity of Neuron-Glial Networks in vitro 162

Merkulova Ksenia O., Postnov Dmitry E. Towards modeling local sleep phenomena: a toy model of a smallest sleep unit 165

Mishchenko Mikhail A., Kovaleva Natalia S., Mikhailov Alexey Novel memristive STDP approach and neural clusters formation 169

Moskalenko Olga I., Koronovskii Alexey A., Kurovskaya Maria K., Khanadeev Vladislav A., Evstifeev Evgeniy V. Intermittent behavior near the boundary of generalized synchronization in systems with different topologies of attractors 173

Nazarikov Sergei, Grubov Vadim, Utashev Nikita, Karpov Oleg Two-stage approach based on combination of one-class SVM and CNN for epileptic seizure identification 175

Nazarikov Sergei, Vertinskaya Olga, Grubov Vadim Cascade CNN-based model for epileptic seizure diagnostics 178

Panyushev Anton, Posnenkova Olga, Stankevich Nataliya Different types of multistability in the Chialvo map 181

Piljugin Oleg Functional Brain Network Analysis in Children Performing Working Memory Tasks: EEG Study 184

Piljugin Oleg, Antipov Vladimir The Relationship Between IQ Level and Functional Brain Network Centrality During Cognitive Activity in Children 187

Pisarchik Alexander N., Serrano Natalia Pena, R. Jaimes-Reategui Rider Brain Connectivity Hypergraphs 190

Ponomarenko Vladimir I., Prokhorov Mikhail D. Experimental Realization of Neuron-Like Activity Generators 194

Pospelov Nikita, Rogozhnikova Olga, Plusnin Viktor, Ivanova Anna, Toropova Ksenia, Ivashkina Olga, Anokhin Konstantin Effective dimensionality of neuronal population activity in hippocampus correlates with behavior 196

Potapov Ivan A., Zharinov Alexey I., Mitin Ilya V., Lobov Sergey A. Connection between CPG model and servomotor of biomorphic fish robot 200

Radushev Daniil, Dogonasheva Olesia, Gutkin Boris, Zakharov Denis Topological markers of dynamical regimes in spiking neural networks 204

Reznik Elina, Khoymov Matvey, Shusharina Natalia, Tynterova Anastasia Immunological correlates of ischemic stroke severity 208

Ryabova Margarita, Matsukatova Anna, Emelyanov Andrey Parylene-MoO_x nanocomposite memristor crossbar for neuromorphic computing applications 210

Savinov Vladimir, Kamyshov Gleb, Sapunov Viktor, Shusharina Natalia Using artificial neural networks for graffiti detection 213

Sergeev Aleksandr P., Butorova Anastasia S., Shichkin Andrey V. Preprocessing of the Initial Data with Discrete Wavelet Transform to Predict Time Series Using LSTM 216

Shabaeva Alina, Borovkova Ekaterina, Karavaev Anatoly Biomarkers of coronary heart disease based on the analysis of the form of the ST segment of the electrocardiogram 220

Simonyan Margarita, Drozhdeva Evgenia, Ukolov Rodion, Zhuravleva Yulia Investigation of Time-Frequency Characteristics of Nighttime EEG Signals in Various Brain Regions Depending on Chronotype 224

Takaishvili Lev V., Ponomarenko Vladimir I., Sysoev Ilya V. Hardware electronic circuit modeling neuron with diode based non-linearity 226

Talanov Max Neuropunk revolution: energy consumption aspects of modern AI 229

Tipikin Aleksey, Kuzhelev Aleksandr FIRI-2018: MATLAB package for the lower ionosphere model 232

Tominov Roman, Vakulov Zakhar, Kazantsev Victor, Prakash Chander, Rodriguez Daniel, Smirnov Vladimir Synaptic plasticity in the nanocrystalline ZnO cross-point for neuromorphic systems of AI 235

Tynterova Anastasia, Barantsevich Evgenii, Khoymov Matvey, Shusharina Natalia Possibilities of rehabilitation using virtual reality technologies in patients with post-stroke cognitive impairment 239

Tynterova Anastasia, Khoymov Matvey, Shusharina Natalia Indicators of functional outcome of patients with different degrees of cognitive deficit in the acute period of ischemic stroke 241

Vakulov Zakhar, Tominov Roman, Kazantsev Victor, Fedotov Alexander, Dzyuba Dmitry, Smirnov Vladimir Synthesis and size effect on resistive switching in ZnO:Ga thin films for neuromorphic applications 243

Vasilieva Daria, Borovkova Ekaterina, Karavaev Anatoly Comparison of non-stationarity heart rate variability in healthy volunteers and patients with impaired autonomic control of blood circulation 247

Verisokin Andrey Yu., Verveyko Darya V., Brazhe, Alexey R. Lagosha Stanislav V. Simple model of neurogliovascular unit activity with noradrenaline leading force 250

Verveyko Darya V., Verisokin Andrey Yu., P. Lukin Pavel O. Spatial model of neurogliovascular unit: arachidonic acid can control the stability 254

Vlasenko Daniil, Zaikin Alexey, Zakharov Denis Ensemble methods for representation of fMRI, EEG/MEG data in graph form for classification of brain states 258

Vodichev Nikita, Leus Andrew, Gavrilov Dmitry, Efremov Vlad, Zuev Viktor, Kholodnyak Ivan, Parshikov Mikhail, Gershtein Nikolay, Laukhin Vadim, Dastgerdi Masoud Vahid Distance and relative speed estimation of vehicles moving in the same direction 262

Zharinov Alexey I., Potapov Ivan A., Lobov Sergey A., Kazantsev Victor B. Modeling of systems that imitate biologically similar movements of a fish robot and a snake robot 266