

2023 19th International Asian School-Seminar on Optimization Problems of Complex Systems (OPCS 2023)

**Novosibirsk, Moscow, Russia
14-22 August 2023**



**IEEE Catalog Number: CFP23U46-POD
ISBN: 979-8-3503-3114-1**

**Copyright © 2023 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:	CFP23U46-POD
ISBN (Print-On-Demand):	979-8-3503-3114-1
ISBN (Online):	979-8-3503-3113-4

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

Table of Contents

Title page	1
Program Committee.....	3
TSP review: performance comparison of the well known methods on a standardized dataset <i>Iskander Akhmetov, Alexandr Pak</i>	4
Investigation of Strength of E91 Quantum Key Distribution Protocol <i>Yenlik Begimbayeva, Temirlan Zhaxalykov, Olga Ussatova</i> ,.....	10
Evaluating Large Language Models for Sentence Augmentation in Low-Resource Languages: A Case Study on Kazakh <i>Zhamilya Bimagambetova, Dauren Rakhyymzhanov, Assel Jaxylykova, Alexandr Pak</i>	14
Machine Learning-Based Hybrid Optimization Model of Personnel Digital Development Planning <i>Mikhail Bolshakov, Aleksei Poletaikin, Valery Kanev, Tatiana Monastirskaya</i>	19
Tabu search for the (r p)-centroid problem under uncertainty <i>Ivan Davydov, Roman Kozhevnikov</i>	25
A Heuristic Algorithm for the Temporal Knapsack Problem <i>Yana Glotova, Yury Kochetov</i>	31
Method for Solving Multidimensional Problems of Optimizing the Parameters of High-power Klystrons <i>Valentin Ivanov</i>	36
The Comparative Analysis of Technologies and Software for Single Sign-On <i>Sergey Kratov</i>	44
Decomposition strategies for solving a large-scale consistent vehicle routing problem <i>Igor Kulachenko</i>	48
Model for Long-term Partnerships between the Government and Subsoil Users in Production and Infrastructure Construction <i>Sergey Lavlinskii, Alexander Zyryanov</i>	53
Algorithm For Selecting Optimal Features In Face Recognition Systems <i>Narzillo Mamatov, Abdurashid Samijonov, Nilufar Niyozmatova, Boymizo Samijonov, Keulimjay Erejepov, Olimjon Jamalov</i>	59
Mathematical Model of Information Processing with Relative Priority and Different Service Intensity <i>Svetlana Moiseeva, Ekaterina Pakulova, Natalia Haustova</i>	65

Deep Learning-based Refinement of the Emission Source Identification Results <i>Alexey Penenko, Mikahil Emelyanov, Erjena Tsybenova</i>	74
Mean field optimal control problem for predicting the spread of viral infections <i>Viktoriya Petrakova, Olga Krivorotko</i>	79
Using the Arc of a Great Circle to Search for the Best Metrological Characteristics of a Number of Projection Reference Systems when Cataloging Linear Engineering Objects <i>Aleksei Portnov</i>	85
Cognisant Simulation: New Age <i>Alexey Rodionov</i>	90
A grouping genetic algorithm for the temporal vector bin packing problem <i>Maksim Sakhno</i>	94
On Optimizing MEC Enabled Monitoring Systems <i>Vladimir Shakhov, Olga Sokolova, Insoo Koo</i>	100
A Fitness Functions Based Algorithm for the Two-Dimensional Irregular Strip Packing Problem <i>Sofia Shperling, Yury Kochetov</i>	104
Simulation of Air Pollution Monitoring using Geosensors Placed on Vehicles <i>Kirill Tkachev, Olga Sokolova, Andrei Materukhin</i>	110
Generative Pre-trained Transformer for Kazakh Text Generation Tasks <i>Gulmira Tolegen, Alymzhan Toleu, Rustam Mussabayev, Bagashar Zhumazhanov, Gulzat Ziyatbekova</i>	114
Parallel Clustering Algorithm for the k-medoids Problem in High-dimensional Space for Large-scale Datasets <i>Sergei Vandanova, Aleksandr Plyasunov, Anton Ushakov</i>	119
On the Core and Harsanyi Extensions of the Almost Positive Games <i>Valery Vasil'ev</i>	125
Metaheuristics for Finding the Stability Radius in the Bilevel Facility Location and Uniform Pricing Problem <i>Maxim Vodyan, Aleksandr Plyasunov, Artem Panin</i>	130
Determining Web Application Vulnerabilities Using Machine Learning Methods <i>Aidana Zhumabekova, Vladislav Karyukin, Olga Ussatova, Eric T. Matson, Kuanysh Zhumabekova, Tansholpan Telbayeva, Berik Zhuandykov</i>	136
Acknowledgement of Support	140
Author Index	141