The 2nd Siberian Scientific Workshop on Data Analysis Technologies with Applications 2021 (SibDATA 2021)

Short Paper Proceedings of the 2nd Siberian Scientific Workshop on Data Analysis Technologies with Applications 2021

Edited by
Anna V. Korobko | Tatyana G. Penkova | Natalya Mikhailenko | Yuliya Zharkova

http://sibdata.online/

Krasnoyarsk, Russia
June 2021
This volume contains the papers presented at the 2nd Siberian Scientific Workshop on Data Analysis Technologies with Applications (SibDATA-2021), held in Krasnoyarsk, Russia, on June 25, 2021.

Due to the uncertainties and restrictions related to the coronavirus pandemic, SibDATA-2021 workshop held online.

SibDATA-2021 workshop aims to discuss the most recent innovations, trends, practical challenges, and solutions in the field of data analysis technologies. The workshop provides the high-quality forum in Siberia for academic scientists, researchers, practitioners and educators to exchange and share their experiences and new research results, to transfer knowledge to young scientists and generate new ideas. The workshop areas include but are not limited to the following: Data Science: Data Fusion, Pattern Recognition, Predictive Modelling, Data Mining, Process Mining, Deep Learning, Evolutionary Computing and Optimization, Fuzzy Computing, Neural Network; Business Intelligence: Big Data, Exploratory Data Analysis, Text Analytics, Web Analytics, Social Data Analytics, Semantic Web Technologies, Cognitive Modeling, Decision Support Systems, Smart Cities and Urban Data Analytics; Data Management: Data Integrity, Data Quality, Large Scale Databases, Mobile Databases, NoSQL Databases, Open Source Databases, Data Warehouse Management, Object-Oriented Database Systems, Query Processing and Optimization.

In total 20 papers have been accepted for the SibDATA-2021 Workshop as short papers and were presented as oral presentations. The participants of SibDATA-2021 covered 2 corresponding members of the Russian Academy of Sciences, 12 doctors and 26 candidates of sciences, more than 10 participants are scientific youth.

The SibDATA-2021 workshop has been supported by the Krasnoyarsk Mathematical Center and financed by the Ministry of Science and Higher Education of the Russian Federation in the framework of the establishment and development of regional Centers for Mathematics Research and Education (Agreement No. 075-02-2021-1384).

---

1 Copyright © 2021 for the individual papers by the papers' authors.
Copyright © 2021 for the volume as a collection by its editors. This volume and its papers are published under the Creative Commons License Attribution 4.0 International (CC BY 4.0).
Program Chair

- **Anna V. Korobko**, Candidate of Science (Tech.), Associate Professor of the Department of Information and Control Systems, Reshetnev Siberian State University of Science and Technology; Senior Research Associate, Institute of Computation Modeling SB RAS, Krasnoyarsk, Russia
- **Tatiana G. Penkova**, Candidate of Science (Tech.), Associate Professor, Senior Research Associate, Institute of Computation Modeling SB RAS; Associate Professor of Department of Computer Science, Siberian Federal University, Krasnoyarsk, Russia

Program Committee

- **Aleksei Dudchenko**, Master of Science, Scientific Associate, Institute of Medical Informatics, Heidelberg University Hospital, Heidelberg, Germany
- **Alexander Ryjov**, Doctor of Science (Tech.), Candidate of Science (Phys.-Math.), Professor, Department of Mechanics and Mathematics Lomonosov Moscow State University; Head of the Chair, School of IT-Management Russian Presidential Academy of National Economy and Public Administration, Moscow, Russia
- **Andrey Vlasov**, Laureate of the State Prize of Russia in Science and Technology, Candidate of Science (Tech.), Associate Professor, Assistant Manager of the Department of Design and Technology of Electronic Devices, Bauman Moscow State Technical University, Moscow, Russia
- **Anna Glazkova**, Candidate of Science (Tech.), Senior Lecturer of the Department of Software, Institute of Mathematics and Computer Science, University of Tyumen, Tyumen, Russia
- **Christina Brester**, Doctor of Science (Tech.), Professor of the Department of Information Systems and Technologies, National Research University Higher School of Economics, N. Novgorod, Russia; Researcher, University of Eastern Finland, Kuopio, Finland
- **Ekaterina Kirik**, Candidate of Science (Phys.-Math.), Associate Professor, Senior Research Associate, Institute of Computation Modeling SB RAS, Krasnoyarsk, Russia
- **Elena Basan**, Candidate of Science (Tech.), Associate Professor, Senior Research Associate, Institute of Computation Modeling SB RAS, Associate Professor at the Department of Computer-Aided Design Systems, Institute of Computer Technologies and Information Security, Southern Federal University, Rostov-on-Don, Russia
- **Elena Makarova**, Doctor of Science (Tech.), Professor, Department of Technical Cybernetics, Ufa State Aviation Technical University, Ufa, Russia
- **Evgeniya Karepova**, Candidate of Science (Phys.-Math.), Associate Professor, Senior Research Associate, Institute of Computation Modeling SB RAS, Docent,
Head of the Department of Computational Mathematics, Leading Researcher, Institute of Computation Modeling SB RAS; Associate Professor at the Department of Computing and Information Technologies, Siberian Federal University, Krasnoyarsk, Russia

- **Ilya Hodashinsky**, Doctor of Science (Tech.), Professor, Department of Complex Information Security of Computer Systems, Tomsk State University of Control Systems and Radioelectronics, Tomsk, Russia

- **Irina Pustokhina**, Candidate of Science (Tech.), Associate professor at the Department of Entrepreneurship and Logistics, Plekhanov Russian University of Economics, Moscow, Russia

- **Konstantin Simonov**, Doctor of Science (Tech.), Professor, Leading Researcher, Institute of Computation Modeling SB RAS; Department of Applied Mathematics and Computer Security, Siberian Federal University, Krasnoyarsk, Russia

- **Leonid Gladkov**, Candidate of Science (Tech.), Associate professor, Professor at the Department of Computer-Aided Design Systems, Institute of Computer Technologies and Information Security, Southern Federal University, Rostov-on-Don, Russia

- **Ludmila Nozhenkova**, Doctor of Science (Tech.), Professor, Head of the Department of Applied Computer Science, Chief Researcher, Institute of Computation Modeling SB RAS, Krasnoyarsk, Russia

- **Margarita Favorskaya**, Doctor of Science (Tech.), Professor, Head of Department of Informatics and Computer Techniques, Reshetnev Siberian State University of Science and Technology, Krasnoyarsk, Russia

- **Maria Lapina**, Candidate of Science (Phys.-Math.), Deputy Director for International Affairs, Associate Professor at the Department of Information Security of Automated Systems, Institute of Mathematics and Information Technologies (named after Professor N.I. Chervyakova), North Caucasus Federal University, Stavropol, Russia

- **Maria Senashova**, Candidate of Science (Phys.-Math.), Associate professor, Senior Research Associate, Institute of Computation Modeling SB RAS, Krasnoyarsk, Russia

- **Maxim Shcherbakov**, Doctor of Science (Tech.), Head of the Department of Computer-Aided Design Systems, Volgograd State Technical University, Volgograd, Russia

- **Michael Sadovsky**, Doctor of Science (Tech.), Professor, Chief Researcher, Institute of Computation Modeling SB RAS, Krasnoyarsk, Russia

- **Nikolay Teslya**, Candidate of Science (Tech.), Senior Research Associate, St. Petersburg Federal Research Center of the Russian Academy of Sciences, St. Petersburg, Russia

- **Vladimir Shidurov**, Doctor of Science (Phys.-Math.), Corresponding Member of Russian Academy of Sciences, Head of the scientific direction of Mathematical Modeling, Chief Researcher, Institute of Computation Modeling SB RAS; Head of Department of Computing and Information Technologies, Siberian Federal University, Krasnoyarsk, Russia