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Proceedings of the

**MIP: Computing-V-2022**

**V International Workshop on Modeling,  
Information Processing and Computing  
(MIP: Computing-V-2022)**

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## Preface

This volume contains the papers presented at the V International Workshop on Modeling, Information Processing and Computing (MIP: Computing-V-2022) held on 25 January 2022 in Krasnoyarsk, Russia.

The Workshop MIP: Computing-V-2022 was jointly organized by the International and Russian Union of Scientific and Engineering Associations (Moscow, Russia), Krasnoyarsk Science and Technology City Hall and Siberian Scientific Centre DNIT (Krasnoyarsk, Russia). Bukhara State Engineering Technological Institute (Bukhara, Uzbekistan) was the partner university at the Workshop.

The main partner organizations in preparing and organizing as well in sponsoring the Workshop in Krasnoyarsk as well as of the previous scientific events were Siberian Federal University, Siberian Scientific Centre DNIT, JSC “Academician M. F. Reshetnev Information satellite systems”, Krasnoyarsk Scientific Centre of the Siberian Branch of the Russian Academy of Sciences and China Aviation Industry General Aircraft Zhejiang Institute Co., Ltd.

The purpose of the Workshop was to share the experience of leading experts in the application of innovative information technologies, mathematical modelling and intelligent systems in science and engineering, industrial production, education, data protection.

The main directions of the Workshop were as follows:

- Cybernetics, Computation and Simulation Modeling;
- Applied Mathematics and Business Informatics;
- Information Technologies, Software Reliability and Data Protection;
- Information Processing, Software Engineering and Applications.

The international scope of the Workshop was confirmed by the participation of representatives from more than 30 universities and research centers from Russia, China, Kazakhstan, Ukraine.

- Bauman Moscow State Technical University, Moscow, Russia
- Bunin Yelets State University, Lipetsk oblast, Yelets, Russia
- China Aviation Industry General Aircraft Zhejiang Institute Co., Ltd, China
- Concern OCEANPRIBOR JSC, St. Petersburg, Russia
- Economy and Public Administration, Khabarovsk, Russia
- Expert and Analytical Center, Moscow, Russia
- Far-East Institute of management, branch of the Russian Presidential Academy of National
- Institute of Astronomy of the Russian Academy of Sciences, Moscow, Russia
- Invent Technology; LLP, Almaty, Kazakhstan
- Joint Stock Company Special Research of Moscow Power Engineering Institute, Moscow, Russia
- JSC “Academician M F Reshetnev Information satellite systems”, Zheleznogorsk, Krasnoyarsk region, Russia
- Krasnoyarsk Science and Technologies City Hall, Krasnoyarsk, Russia
- Krasnoyarsk State Agrarian University, Krasnoyarsk, Russia
- Kuban State Agrarian University named after I.T. Trubilin, Krasnodar, Russia
- Marine Hydrophysical Institute of the Russian Academy of Sciences, Sevastopol, Russia
- MIREA – Russian Technological University, Moscow, Russia
- Povolzhskiy State University of Telecommunications and Informatics, Samara, Russia
- Radio Engineering Institute named after Academician A.L. Mints, Moscow, Russia
- Reshetnev Siberian State University of Science and Technology, Krasnoyarsk, Russia
- Saint Petersburg Electrotechnical University, St. Petersburg, Russia

- Saint Petersburg National Research University of Information Technologies, Mechanics and Optics University, ITMO, Saint Petersburg, Russia
- Saint Petersburg University of State Fire Service of EMERCOM of Russia, Saint Petersburg, Russia
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- Saint-Petersburg Federal Research Center of the Russian Academy of Sciences, Saint Petersburg, Russia
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- Siberian Federal University, Krasnoyarsk, Russia
- Special Research of Moscow Power Engineering Institute, Moscow, Russia
- St. Petersburg State University, St. Petersburg, Russia
- St. Petersburg Federal Research Center of the Russian Academy of Sciences (SPC RAS), St. Petersburg, Russia
- Sternberg Astronomical Institute, Moscow State University, Moscow, Russia
- Sumy State University, Sumy, Ukraine
- Vladimir State University, Vladimir, Russia

All papers are based on presentations made at the Workshop. 86 reports were submitted to the Organizing Committee. 16 reports were selected for inclusion into this Volume after the review process. Out of these 4 were accepted as regular papers and 12 were accepted as short papers. All the papers were subjected to rigorous peer-review by workshop committee members and international reviewers. The papers were selected based on their quality and relevance to the Workshop directions. The high quality of the scientific content of these papers is due to the efforts of the contributing authors. The Programme Committee members and reviewers represent Germany, Slovenia, Bulgaria, Finland, Austria, Serbia, Uzbekistan and Russia, have valuable scientific publications in the field of computer science and have a good representation in DBLP.

On behalf of the Workshop Committee and organizers, we would like to thank all the authors who contributed to this Volume as well as to the reviewers, speakers and all the workshop participants for their support to MIP: Computing-V-2022.

The Workshop Committee highly appreciates the contribution of scientists and professors of Siberian Federal University, Saint Petersburg State University of Aerospace Instrumentation, Sevastopol State University, MIREA – Russian Technological University, ITMO University, Reshetnev University, for active participation in the Workshop.

We are thankful to the CEUR Workshop Proceedings (CEUR-WS.org) advisory and management team for providing valuable guidance and for publishing this Workshop proceedings.

## Editors

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