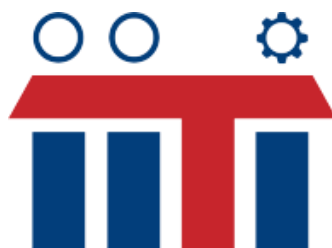**7th INTERNATIONAL SCIENTIFIC CONFERENCE
"INTELLIGENT INFORMATION TECHNOLOGIES
FOR INDUSTRY"
IITI'23**

CONFERENCE PROGRAMMME

**September 25 - 30, 2023, St. Petersburg,
Russia**

ORGANIZERS

Rostov State Transport University (Russia)
St. Petersburg Federal Research Center of RAS (Russia)
ITMO University (Russia)
Russian Association for Artificial Intelligence (Russia)

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- **Vladimir Vasiliev**, ITMO University, Russia
- **Andrey Ronzhin**, St. Petersburg Federal Research Center of RAS, Russia
- **Imran Akperov,** Southern University, Russia

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- **Igor Kotenko**, St. Petersburg Federal Research Center of RAS, and ITMO University, Russia

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- **Danil Zakoldaev**, ITMO University, Russia
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- **Ivan Olgeizer**, JSC "NIIAS", Russia
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- **Gao Hongwei**, Qingdao University, China
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- **Valery Karpov**, The National Research Centre "Kurchatov Institute", Russia
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- **Vladimir Kureichik**, Southern Federal University, Russia
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- **Sergey Kuznetsov**, Higher School of Economics, Russia
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- **Muhammad Ary Murti**, Telkom University, Indonesia
- **Evgenia Novikova**, Saint Petersburg Electrotechnical University "LETI", Russia
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- **Ilias Savvas**, University of Thessaly, Greece
- **Giuseppe ML Sarne**, University of Milano Bicocca, Italy
- **Rajeev Shorey**, IIT Delhi, India
- **Petr Skobelev**, Samara Federal Center of Russian Academy of Science & Samara State Technical University, Russia
- **Alexander Smirnov**, Saint-Petersburg Federal Research Center of Russian Academy of Sciences, Russia
- **Vadim Stefanuk**, Institute for Information Transmission Problems, Russia
- **Maya Sukhanova**, Azov-Black Sea State Engineering Institute, Russia
- **Alexander Tselykh**, Southern Federal University, Russia
- **Alexander Tulupyev**, North-West Institute of Management, Branch of RANEPA, Russia
- **Lev Utkin**, Peter the Great St Petersburg Polytechnic University, Russia
- **Dmtry Vinogradov,** Federal Research Center "Informatics and Management" of the Russian Academy of Sciences, Russia
- **Jian Wang**, Hangzhou Dianzi University, Hangzhou, China
- **Wang Wenfa**, Yan'an University, China
- **Nadezhda Yarushkina**, Ulyanovsk State Technical University, Russia
- **Dmitry Yudin**, Moscow Institute of Physics and Technology, Artificial Intelligence Research Institute, Russia
- **Mikhail Zabezhailo**, Dorodnicyn Computing Centre of Russian Academy of Sciences, Russia
- **Dazhi Zhang**, Harbin Institute of Technology, China

WORKSHOP ORGANIZERS

Saint Petersburg State University (Russia)
Harbin Institute of Technology (China)
Rostov State Transport University (Russia)

Workshop Chairs

- **Ovannes Petrosyan**, St. Petersburg State University, Russia
- **Li Yin**, Harbin Institute of Technology, China

Workshop Program Committee

- **Konstantin Amelin**, St. Petersburg State University, Russia
- **Zhang Dazhi**, Harbin Institute of Technology, China
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- **Wang Wenfa**, Yan'an University, China
- **Deng Xiaote**, Peking University, China
- **Guo Zhichang**, Harbin Institute of Technology, China

<div align="center">**VENUE**</div>

Conference sessions will be held at:

ITMO University, Faculty of Secure Information Technologies
St. Petersburg Pesochnaya Emb. 14
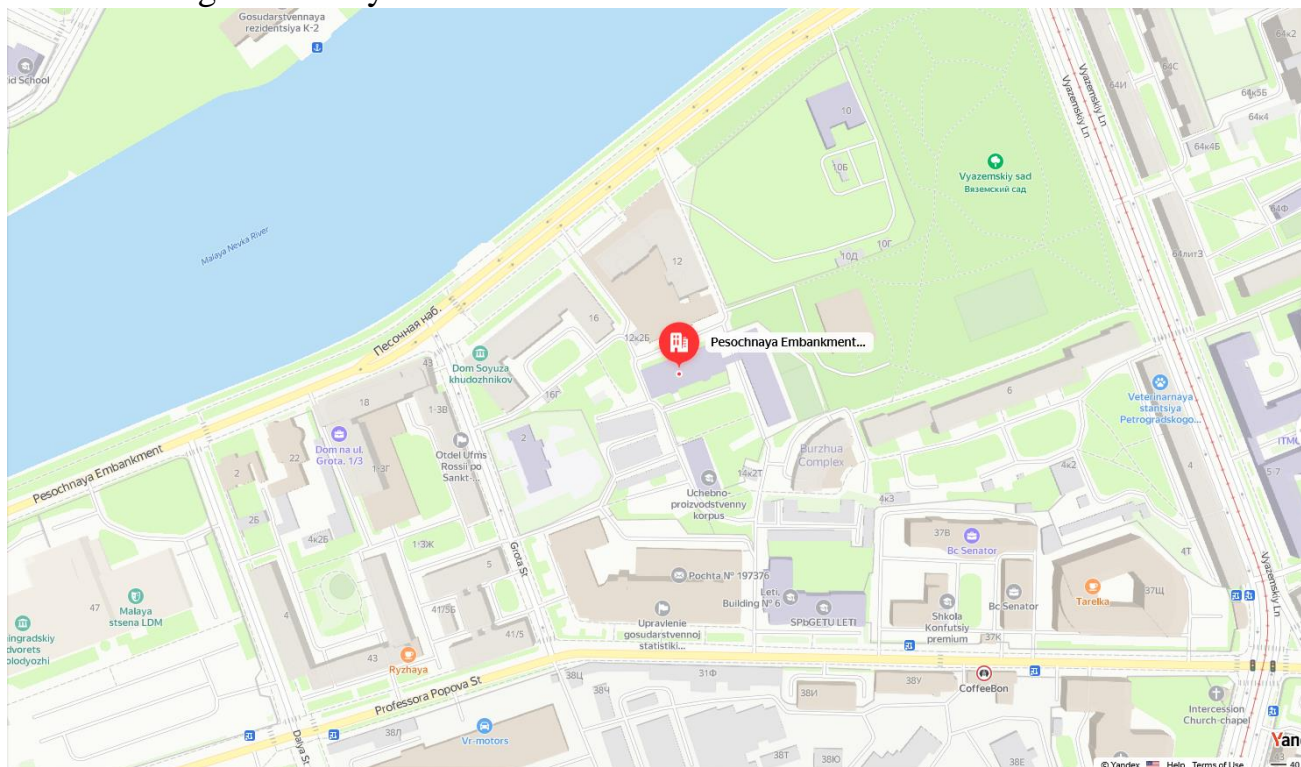
Monday, September 25, 10:00 – 17:00, ITMO
Tuesday, September 26, 10:00 – 17:00, ITMO
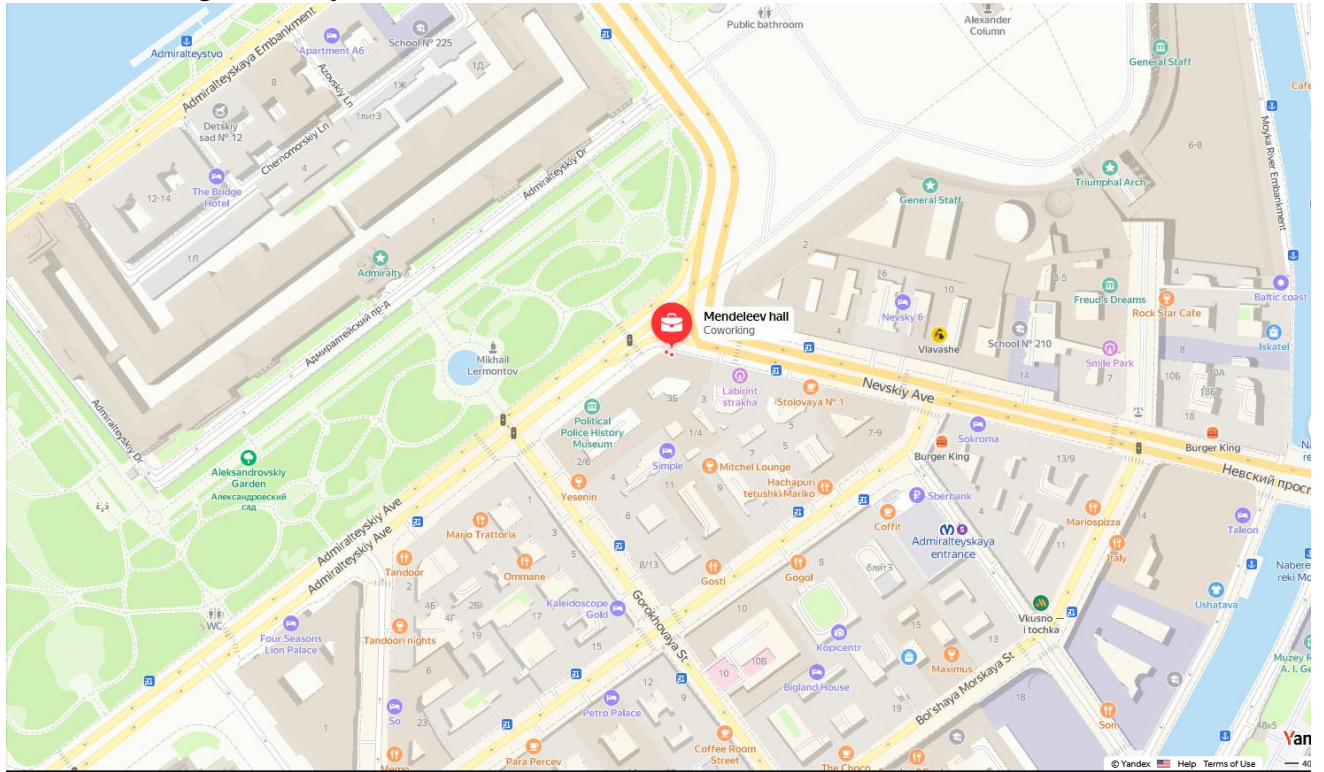Wednesday, September 27, 10:00 – 17:00, ITMO

Hall 1 ZOOM Link:
https://itmo.zoom.us/j/86894658778
ID: 868 9465 8778

Hall 2 ZOOM Link:
https://itmo.zoom.us/j/89805437294
ID: 898 0543 7294

Workshop sessions will be held at:
St. Petersburg State University (SPBU), Mendeleev Congress Hall
St. Petersburg, Nevsky Ave., 1

Thursday, September 28, 10:00 – 18:00, SPBU

ZOOM Link:
https://zoom.us/j/92672919746?pwd=YkZIRzZ6RmlxNTYrbWFycmk2ZEpYQT09
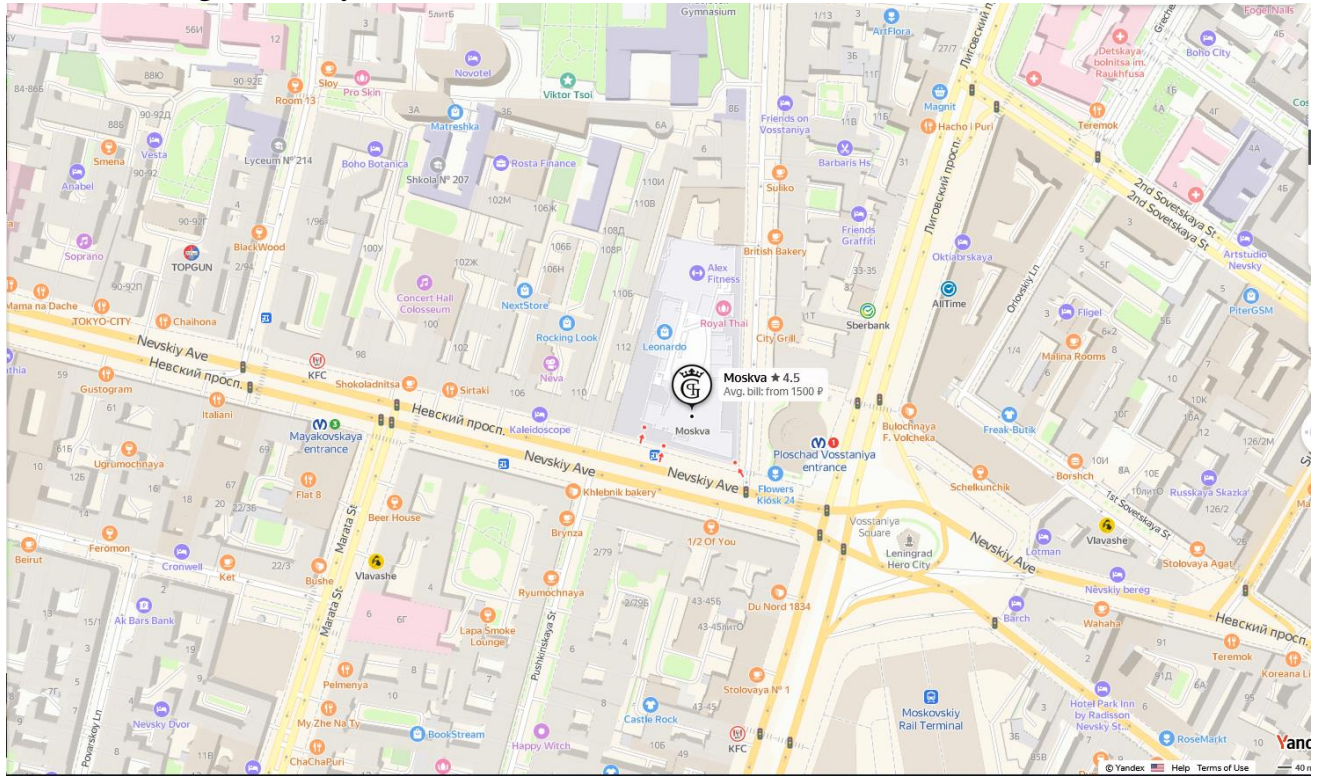
ID: 926 7291 9746
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Official IITI Dinner will be held at:
Moskva Restaurant
St. Petersburg, Nevskiy Ave., 114-116

Thursday, September 28, 19:00 – 23:00, Moskva Restaurant

CONFERENCE PROGRAMME

Monday, September 25
Venue:
- ITMO (10:00 – 18:00)

Events:
- Opening Session
- Keynotes
- Machine Learning and Its Applications
- Decision-Making Intelligent Systems
- Bioinspired, multi-agent systems and explainable AI
- Intelligent Medical Systems

09:00 – 09:30	**Registration at ITMO University**
09:30 – 10:00	**Opening Session (Hall 1).** **Sergey Kovalev, Igor Kotenko, Andrey Sukhanov and Danil Zakoldaev**
10:00 – 11:00	**Keynote (Hall 1)** **Intelligent Interfaces and Systems for Human-Computer Interaction** **Alexey Karpov** **ITMO University, Saint-Petersburg Federal Research Center of Russian Academy of Sciences, Russia**
11:00 – 12:00	**Keynote (Hall 1)** **Three Knowledge Sources and Three Constituents of Artificial Intelligence Foundation (Looking Back and Looking Ahead)** **Vladimir Gorodetsky** **JSC Eureca, Russia**
12:00 – 13:00	**Lunch**
13:00 – 14:30	**Session 1 (Hall 1). Machine Learning and Its Applications. Part 1.** **Chairs: Lev Utkin, Alexander Panov** 1. Planning Maneuvers for Autonomous Driving Based on Offline Reinforcement Learning: Comparative Study (offline) Aleksandr Panov and Mikhail Melkumov 2. Comparative Analysis of Data Synthesis Methods for Prognostic Models Development in Cardiology (offline) Vladimir Kosterin, Karina Shakhgeldyan, Boris Geltser and Vladislav Rublev 3. Methodology for detecting and feature selection of an information attack in the process of mediatization (offline) Ksenia Namyatova, Dmitrii Gavra and Lidia Vitkova 4. Big Five: What user posts say? (offline) Valerii D. Oliseenko, Shamil R. Hastiev and Tatiana V. Tulupyeva 5. Gated Recurrent Unit Autoencoder for Fault Detection in Penicillin Fermentation Process (offline) Murshedul Arifeen and Andrei Petrovski 6. Impact of Loss Functions on the Training of Lidar-based Place Recognition Models (offline) Alexander Melekhin and Dmitry Yudin

13:00 – 14:30	Session 2 (Hall 2). Decision-Making Intelligent Systems. Part 1. Chairs: Valeria Gribova, Anna Kolodenkova 1. Making diagnostic decisions based on the evaluation of mixed production rules (offline) Anna Kolodenkova, Svetlana Vereshchagina and Dmitry Shvalov 2. Ontology-based methodology for the knowledge maps design (offline) Tatiana Gavrilova, Olga Alkanova and Anna Kuznetsova 3. Operating With Fuzzy Cases In Distributed Intelligent Systems (offline) Eremeev Alexander, Varshavskii Pavel, Sesin Anatoly and Polyakov Sergey 4. Methodology for development based on ontological models intelligent services with explanation generation (offline) Valeriya Gribova and Elena Shalfeeva 5. Characterization of the person's leading interests in terms of RIASEC scores (offline) Anastasiia Khlobystova, Valerie Stoliarova and Maxim Abramov 6. Quantum Game Theory on Entangled Players (offline) Noureldin Mohamed Abdelaal Ahmed Mohamed, Huang Taisheng and Pang Jinhui
14:30 – 15:00	**Coffee Break**
15:00 – 16:30	Session 8 (Hall 1). Bioinspired, multi-agent systems and explainable AI Chair: Maxim Abramov 1. Bayesian belief network for association between clusters of social media users with similar personality traits profiles and color characteristics of their avatar images (offline) Fedor Bushmelev, Valerie Stoliarova and Maxim Abramov 2. Algebraic Bayesian Networks: the Generation of the Network Canonical Representation (offline) Nikita Kharitonov, Artyom Vyatkin and Alexander Tulupyev 3. Explanatory capabilities of an ontology-based solver with linguistic and visual support (offline) Kurbatov Sergey 4. Explainable Document Classification via Pattern Structures (online) Sergei Kuznetsov and Eric George Parakal 5. Features of the use of multiagent technology in the management of urban parking space (offline) Galina Rybina and Vladimir Stepankov

15:00 – 16:30	**Session 2 (Hall 2). Decision-Making Intelligent Systems. Part 2.**
	Chairs: Valeria Gribova, Anna Kolodenkova
	1. Cognitive Architecture of a System to Replicate Human Strategic Decision-making (online)
	Alexander Tselykh and Larisa Tselykh
	2. A Method for Modeling the Control Impact Strategy Based on the Mental Frame of References of the Decision-maker (online)
	Alexander Tselykh, Vladislav Vasilev and Larisa Tselykh
	3. Using an Intelligent Assistant for Aircraft Diagnostics and Maintenance (offline)
	Aleksandr Yurin, Olga Nikolaychuk, Nikita Dorodnykh, Alexander Stolbov and Daria Denisova
	4. Approach to the selection of significant parameters for diagnostics of complex technical systems using "soft computing" (offline)
	Anna Kolodenkova, Svetlana Vereshchagina, Denis Zavodyannyi and Ivan Olgeyzer
	5. The Use of Machine Learning for Digital Shadowing in Thermal Spray Coating (offline)
	Andrey Petrovskiy, Sergei Petrovski and Dipto Arifeen
	6. Ontology-based Explanations of Neural Networks for Collaborative Human-AI Decision Support Systems (offline)
	Alexander Smirnov and Andrew Ponomarev
16:30 – 17:00	**Coffee Break**
17:00 – 18:00	**Session 1 (Hall 1). Machine Learning and Its Applications. Part 2.**
	Chairs: Maria Butakova, Dmitriy Yudin
	1. Resume Recommendation using RNN Classification and Cosine Similarity (online)
	Ilham Huseyinov, Issa Diallo and Mhd Wasim Raed
	2. Artificial Intelligence Approach to Palladium Nanocatalysts Diagnostics Automation (online)
	Oleg Kartashov, Dmitry Polyanichenko, Maria Butakova, Ilias Savvas and Grigory Beliavsky
	3. Machine learning for adaptive analysis and evaluation of soil slopes (online)
	Andrew Shulzhenko, Alexander Alexandrov, Grigory Belyavsky, Anton Mezhenkov and Maria Butakova
	4. Development and Testing Intelligent Video Surveillance Systems Based on the CNN Algorithm (online)
	Vladimir Polyakov, Aleksandr Mezhenin and Igor Dolgiy
17:00 – 18:00	**Session 7 (Hall 2). Intelligent Medical Systems**
	Chair: Vadim Borisov
	Classifier-Based Combined Measure of Syllable Pronunciation Similarity in Speech Rehabilitation (offline)
	Dariya Novokhrestova, Evgeny Kostyuchenko and Aleksey Borovskoy
	Application of computer vision technologies to reduce injuries in the athletes training (online)
	Anton Misnik, Vadim Borisov, Alexandr Velkov and Mariya Shalukhova
	Architecture of a Hybrid Clinical Decision Support System (offline)
	Karina Shakhgeldyan, Boris Geltser and Bogdan Potapenko

Tuesday, September 26
Venue:
- ITMO (10:00 – 17:00)

Events:
- Keynotes
- Automation and Intellectualization for Industrial, Transport and Energetic Systems
- Cyber security in Industry 4.0

10:00 – 11:00	**Keynote (Hall 1)** **Recent Investigations in Machine Learning and Edge Computing** **Rajeev Shorey** **IIT Delhi, India**
11:00 – 12:00	**Roundtable discussion (Hall 1)** **Main Trends in AI Theory and Applications** **Chairs: Sergey Kovalev, Vadim Stefanuk** **Speakers: Rajeev Shorey, Alexey Karpov, Vladimir Gorodetsky, Lev Utkin, Petr Skobelev**
12:00 – 13:00	**Lunch**
13:00 – 14:30	**Session 5 (Hall 1). Automation and Intellectualization for Industrial, Transport and Energetic Systems. Part 1** **Chairs: Vadim Stefanuk, Sergey Kovalev** 1. Synthesis of PLL in capture mode with a fuzzy controller of quasi-optimal structure based on the maximum condition of the generalized power function (online) Andrey Kostoglotov, Vladimir Zekhtser and Sergey Lazarenko 2. Automated Discovery of Direct Speech to Increase Quality and Battery Saving in Telephony (offline) Vadim Stefanuk and Liudmila Savinitch 3. Distributed Control System for the Protection of an Autonomous Object Based on Hybrid Artificial Intelligence Technologies (online) Valeriy Kemaikin, Boris Paliukh and Alexey Khabarov 4. Using Semantic Annotation of Tabular Data for Domain Knowledge Graph Population (online) Nikita Dorodnykh and Aleksandr Yurin 5. Robust Filtering of Nonlinear Stochastic Processes in Machine Learning Systems (online) Sergey Sokolov, Olga Sokolova and Marianna Kurinenko 6. Selecting a Machine Learning Model to Optimize the Burner Digital Twin (offline) Nikita Gladilin, Vladislav Kovalnogov, Dmitriy Generalov, Ruslan Fedorov and Vyacheslav Sherkunov

13:00 – 14:30	**Session 6 (Hall 2). Cyber security in Industry 4.0. Part 1** **Chairs: Igor Kotenko, Andrey Chechulin** 1. Train Without Label: A Self-supervised Learning-based One-class Classification Approach for IoT Anomaly Detection (offline) Huiyao Dong and Igor Kotenko 2. Decision-making module to improve the stability of the UAV flight (offline) Elena Basan, Alexander Basan, Anton Mogilnyy and Alexandr Lesnikov 3. Security evaluation method for perspective types of human-computer interfaces (offline) Ksenia Zhernova and Andrey Chechulin 4. Attacks against Machine Learning Systems: Analysis and GAN-based Approach to Protection (offline) Igor Kotenko, Igor Saenko, Oleg Lauta, Nikita Vasiliev and Dmitry Iatsenko 5. Comparative analysis of machine learning methods in vulnerability metrics transformation (offline) Dmitry Levshun 6. An Approach to Early Computer Network Intrusion Detection Based on the Wavelet Transform Energy Spectra Analysis (offline) Igor Saenko, Peter Bortniker, Oleg Lauta, Inna Zhdanova and Nikita Vasiliev
14:30 – 15:00	**Coffee Break**
15:00 – 17:00	**Session 5 (Hall 1). Automation and Intellectualization for Industrial, Transport and Energetic Systems. Part 2** **Chairs: Ivan Olgeizer, Andrey Sukhanov** 1. Development of a management system with forecasting models of technological industrial processes (offline) Pham Quang Bang, Murashev Pavel and Bogatikov Valeriy 2. Synthesis of a quasi-optimal system of multiparametric neural network identification of a UAV orientation model in a turbulent atmosphere (online) Andrey Kostoglotov, Anton Penkov, Vladimir Zekhtser and Sergey Lazarenko 3. Method of dynamic multi-criteria quality assessment and optimization for proactive complex objects functioning schedules (offline) Valerii Zakharov 4. Intelligent Design of Images of Engineering Networks for Spatial Analysis (online) Stanislav Belyakov, Alexander Bozhenyuk, Igor Rozenberg and Margarita Knyazeva 5. Method for determining and fixing the information need of users in the low-code development (offline) Yuri Rogozov, Vyacheslav Lapshin and Sergey Kucherov 6. Modeling of intuition in human-machine decision-making complexes in the management of transport systems (online) Vladimir Vereskun, Nikolay Lyabakh and Evgeniia Chebotareva 7. Intelligent maintenance and repair on railway transport (online) Nikolay Lyabakh, Olesya Ignatieva and Vasilii Shapovalov 8. Traction induction motor state observer based on an Luenberger Filter (online) Pavel G. Kolpakhchyan, Sergey Pakhomin, Andrey Evstaf'Ev, Alexander E. Kochin and Vladimir E. Andreev

15:00 – 16:00	**Session 6 (Hall 2). Cyber security in Industry 4.0. Part 2** **Chairs: Igor Kotenko, Andrey Chechulin** 1. On the formation of approximate descriptions of cause-and-effect relationships in the process of empirical data analysis (online) Alexander A. Grusho, Nick A. Grusho, Elena E. Timonina and Michael I. Zabezhailo 2. Intelligent graph-based correlation of security events in cyber-physical systems (offline) Diana Levshun and Igor Kotenko 3. About explainable machine learning models for anomaly detection in cyber-physical systems (offline) Yury Chernyshov

Wednesday, September 27
Venue:
- ITMO (10:00 – 14:30)

Events:
- Keynotes
- Fuzzy and Evolutional Modeling

10:00 – 11:00	**Keynote (Hall 1)** **Attention Mechanism in Machine Learning Models by Tabular Training Data** **Lev Utkin** **Peter the Great St. Petersburg Polytechnic University, Russia**
11:00 – 12:00	**Keynote (Hall 1)** **Emergent Intelligence: from the concept - to applications** **Petr Skobelev** **Samara Federal Center of Russian Academy of Science & Samara State Technical University, Russia**
12:00 – 13:00	**Lunch**
13:00 – 14:30	**Session 3 (Hall 1). Fuzzy and Evolutional Modeling** **Chairs: Vadim Borisov, Leonid Gladkov** 1. Studying the Efficiency of Parameter Scaling in Optimal Control Problems with Parallel Memetic Algorithm (online) Maxim Sakharov and Kamila Koledina 2. Canonical Representation of Transport Networks and Their Identification Based on Evolutionary Modeling (online) Vera Ilicheva and Alexander Guda 3. Modified Adaptive Particle Swarm Algorithm (online) Oleg Lebedev, Olga Purchina and Dmitriy Fugarov 4. Development and research of algorithms for the synthesis of combinational logic circuits based on the evolutionary approach (offline) Leonid Gladkov, Nadezhda Glagkova and Gennady Veselov 5. Analysis and multidimensional prediction of complex systems based on fuzzy temporal ontological and cognitive models (online) Vadim Borisov and Anton Zharkov 6. Synthesis of intelligent tracking filter with fuzzy for parameter setting in problems of air traffic management automation (online) Sergey Lazarenko, Vladimir Mamai, Denis Sumin and Aleksandr Yakovlev

Thursday, September 28.
Venue:
- SPBU (10:00 – 18:00)

Events:
- International Workshop "Application of Mathematical Methods in Artificial Intelligence"
- Closing session
- Official Dinner

10:00 – 11:00	**Plenary session 1 (Mendeleev Congress Hall)** **Chair: Ovanes Petrosian** 1. On Complexity of Computing Markov Perfect Equilibrium in General-sum Stochastic Games (offline) Deng Xiaotie (Peking University, China) 2. Decision Making Under Uncertainties — Artificial intelligence (offline) Oleg Granichin (Saint-Petersburg State University, Russia)
11:00 – 12:00	**Session 2 (Mendeleev Congress Hall). Fundamental machine learning** **Chair: Ovanes Petrosian** 1. Neural Attention Forests: Transformer-Based Forest Improvement (offline) Andrei Konstantinov, Lev Utkin, Alexey Lukashin and Vladimir Muliukha (Peter the Great St. Petersburg Polytechnic University, Russia) 2. Stability Analysis for Class of Delayed Neural Networks (offline) Xinge Liu (Central South University, China) 3. Quantification of Localization Uncertainty in One-stage Object Detection (offline) Yalin Liang, Jie Ning, Yao Li, Junrui Wu, Ruizi Sun, Qi Pan and Luyun Miao (Harbin Institute of Technology, China) 4. Explainable AI: Graph Based Sampling Approach for High Dimensional AI System (offline) Jinying Zou, Feiran Xu, Ovanes Petrosian and Yin Li (Saint-Petersburg State University, Russia)
12:00 – 13:00	**Session 3 (Mendeleev Congress Hall). Machine learning and applications** **Chair: Ovanes Petrosian** 1. Dynamical-system-based Approach in Forecasting and Diagnosis Problems (offline) Anna Golovkina (Saint-Petersburg State University, Russia) 2. Research on Neural Network Defense Problem based on Random Noise Injection (offline) Juan Kang, Enzhe Zhao, Zhichang Guo, Shibo Wang, Weijia Su and Xing Zhang (Harbin Institute of Technology, China) 3. Monitoring of Grain Crops Nitrogen Status using Neutral Networks (offline) Ivan Blekanov (Saint-Petersburg State University, Russia) 4. Repeating Christmas Jump in LIBOR (offline) Vikenty Mikheev (Saint-Petersburg State University)

13:00 – 14:00	Lunch
14:00 – 15:00	**Session 4 (Mendeleev Congress Hall). Deep learning and applications** **Chair: Yin Li** 1. Deep Learning for Math Problems (offline) Qiufeng Wang (Xi'an Jiaotong-Liverpool University, China) 2. Research on Video Pedestrian Tracking based on Combination of Optical Flow Method and Target Tracking Network (offline) Enzhe Zhao, Dazhi Zhang, Yao Li, Yuying Guo, Boying Wu, Zhichang Guo and Jie Ning (Harbin Institute of Technology, China) 3. Adapting to Change: Understanding Concept Drift in Online Environments (offline) Haitao Wu, Ovanes Petrosian (Saint-Petersburg State University, Russia) 4. Audio-visual Multi-modal Meeting Recording System (offline) Wenfeng Yang, Pengyi Li, Wei Yang, Yuxing Liu, Ovanes Petrosian and Yin Li (Saint-Petersburg State University, Russia)
15:00 – 16:00	**Session 5 (Mendeleev Congress Hall). Applications of Machine learning** **Chair: Yin Li** 1. Advances in Applied AI for Railways (offline) Andrey Sukhanov (JSC "NIIAS", Rostov State Transport University, Russia) 2. Data Processing Automation in Nuclear Medicine (offline) Elena Kotina (Saint-Petersburg State University) 3. Artificial Intelligence in Oncology: Neural Networks for Searching of Focal Liver Change during Ultrasound Examination (offline) Anastasia Goncharova, Ekaterina Busko (Saint-Petersburg State University, NMIC of Oncology named after N.N. Petrov, Russia) 4. Smart Digital Twins as Trend of Energy Systems Intellectualization in Russia (online) Liudmila Massel and Aleksei Massel (Melentiev Energy Systems Institute of Siberian Branch of the Russian Academy of Sciences, Russia)
16:00 – 16:30	**Coffee Break**
16:30 – 17:30	**INDUSTRY EXPERTS roundtable (Mendeleev Congress Hall)** **Chairs: Yin Li, Ovanes Petrosian** **Content:** open research problems in industry, future important directions 1. Yimin Huang (graduated from Peking University), technology and company expert in AI of International IT company (offline) 2. Vikenty Mikheev (graduated from Kanzas University), technology and company expert in graph theory of International IT company (offline) 3. Oleg Sushkov (graduated from State University of Management), guidance of digital technological vision and digital R&Ds of oil refinement and supply chain in Gazpromneft (offline)
17:30 – 18:00	**Closing session (Mendeleev Congress Hall)** **Sergey Kovalev, Igor Kotenko, Andrey Sukhanov and Danil Zakoldaev**
19:00 – 23:00	**Official IITI Dinner**