

15TH INTERNATIONAL CONFERENCE
ON PATTERN RECOGNITION
AND INFORMATION PROCESSING

ARTIFICIAL INTELLIGENCE: FACING THE CHALLENGES

21-24 SEPTEMBER • MINSK

2021



PRIP
.BY

ONLINE EVENT

CONFERENCE PROGRAMME



15th International Conference on Pattern Recognition and Information Processing

21 -24 September 2021 • online

Minsk • UIIP NAS Belarus

Since its first edition in 1991, the PRIP has been the place for scientists, researchers, and engineers to come together and discuss the basic and applied science in the field of pattern recognition and information processing, the latest developments in machine learning, computer vision. UIIP NASB, BSUIR, and BSU were perfect venues to meet colleagues to exchange up-to-date technical knowledge, new ideas, and experience. In these challenging times, when physical meetings are poorly-possible, we have decided that **PRIP2021 will go online!** We will stream sessions which will allow us to reach out to representatives of the wider scientific community including the young generation that would normally not have the means and/or time to physically travel to Minsk.



Web-site: <https://prip.by/2021/>

YouTube channel: <https://www.youtube.com/channel/UCUw7NEfbR0Js2ZLXRbVaPcg>

Facebook page: <https://www.facebook.com/events/339505177837896>

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Conference Regulations

The conference is held online.

All speakers (presenters) should familiarize themselves with the timing and connect during the session "Get Together" or during the breaks.

Please be sure of your cameras and microphones!

Having received the focus from the conference moderator, the speaker shares his screen and presents his materials in any convenient form. Each speaker has 10-12 minutes for presentation and 5-3 minutes for questions from other conference participants and the audience of the stream.

Conference Sessions

Plenary (P) – Plenary Session (keynotes).

Sessions A – Sessions “Pattern Recognition and Classification, Knowledge-based Expert and Decision Support System. Application of Pattern Recognition”.

Sessions B – Sessions “Image Analysis and Signal, Information Processing and 3D Image Processing, Modeling. Application of Image Analysis”.

GÉANT Session (G) – Session organized with conjunction of GÉANT Association as a partner of the Conference.

User GDPR Agreement

Acknowledge that you have completely read and fully understand the following.

PRIP'2021 Conference is organized by UIIP NASB and endorsed by IAPR, AAIA, GÉANT Association, and EaPConnect project, and so we wish to inform you about your rights regarding your personal data, which we ask you to share with us.

Conference Proceedings including your papers are to be available for download under *Creative Commons Attribution 4.0 International License* (in two weeks after the Conference). Thus personal data you indicated there will be available with free access. Once it is published it cannot be edited or deleted at any time.

We would also like to draw your attention that during the conference, a free live YouTube stream will be organized, as well as audio and video recording of all speeches. We will use materials on the conference website to provide the conference participants with relevant information and to promote the event via social media, newsletters, mailshots, magazine articles, and blogs. During PRIP'2021 we could also collect your feedback, take screenshots of you to use for such purposes.

We take your privacy seriously and will only use your personal information, provided by you. We will keep this information available on the PRIP'2021 website for an indefinite period for informational purposes. Your registration contact details will be added to our mailing list, which is only used for disseminating information about this conference.

Conference Schedule

(**PROGRAM** starts from the next page)

Day 1- Tuesday (September 21, 2021)

09:50-10:00		Get Together / Connection Troubleshooting
10:00-10:20	Opening	<ul style="list-style-type: none"> • Prof. Alexander Tuzikov (UIIP NASB). <i>Conference Chairman</i> • Acad. Prof. Sergey Ablameyko (BSU). <i>Conference Vice-Chairman</i> • Acad. Prof. Sergey Gaponenko (Head of BRFFR). <i>Distinguished guest</i>
11:00-12:00		Session Chairman: Prof. Alexander Tuzikov
10:20-11:00	Plenary 1	P1.1 Jos Roerdink. Generalisations of mathematical morphology and their application to the processing of scalar, vector, and tensor images
11:00-11:40		P1.2 Frederic Fol Leymarie Towards Creative Robots and AI with a Human Touch
11:40-12:00		Breathing break
12:00-13:30		Session Chairman: Prof. Viktor Krasnoproshin
12:00-12:15	Session AI	A1.1 Sergii Sushko, Alexander Chemeris and Svetlana Reznikova. Parallelizing by Smart Tiling
12:15-12:30		A1.2 Liudmila Cheremisinova and Dmitry Cheremisinov. Graph-Based Recognition of High-Level Structures in Transistor Circuits
12:30-12:45		A1.3 Sergey Dvoenko and Denis Pshenichny. Metric Correction of Similarities based on Orthogonal Decomposition
12:45-13:00		A1.4 Viktor Krasnoproshin, Vadim Rodchenko and Anna Karkanitsa. Pattern Recognition Based on Classes Distinctive Features
13:00-13:15		A1.5 Zurab Gasitashvili, Merab Phkhovelishvili and Natela Archvadze. New algorithm for building effective model from prediction models using parallel data
13:15-13:30		A1.6 Katsiaryna Rumiantsava, Roman Sergeev, Alexander Tuzikov, Andrei Gabrielian and Alex Rosenthal. Search for genomic mutations associated with drug-resistant tuberculosis
13:30-14:30		Big Break
14:30-16:00		Session Chairman: Prof. Vladimir Golovko
14:30-14:45	Session B1	B1.1 Sviatlana Ihnatsueva, Rykhard Bohush and Sergey Ablameyko. Joint dataset for CNN-based person re-identification
14:45-15:00		B1.2 Nadia Brancati, Maria Frucci, Daniel Riccio and Crispino Cicala. Bag of Deep features for classification of gigapixel histological images
15:00-15:15		B1.3 Victor Krasnoproshin and Andrew Naumovich. Chest Pathologies Intellectual Analysis
15:15-15:30		B1.4 Vitali Liauchuk, Aleh Tarasau and Vassili Kovalev. AI-Based Retrospective Study for Revealing Diagnostic Errors in Chest X-ray Screening
15:30-15:45		B1.5 Olga Nedzved, Vera Yashina, Sergey Ablameyko, Igor Gurevich, Ren Tiaojuan and Ye Fangfang. Analysis of Motion of Dynamic Scenes in Microscopy Images: Formalization, Criteria and Results
15:45-16:00		B1.6 Vladimir Golovko, Egor Mikhno and Aleksandryna Mamyha. Neural network approach for estimating the level and volume of liquid in transparent containers
16:00-16:15		Breathing break
		Session Chairman: Prof. Alexander Tuzikov
16:15-17:00	Plenary 1	P1.3 Andrei Gabrielian and Vassili Kovalev. Towards AI-based diagnosis of lung tuberculosis. TB Portals: where traditional medicine joins forces with AI, 3D visualizations, genomics and data mining

SEE YOU next day!

Day 2 – Wednesday (September 22, 2021)

09:50-10:00		Get together / Connection Troubleshooting
10:00-11:20		Session Chairman: Prof. Alexander Tuzikov
10:00-10:40	Plenary 2	P2.1 Henning Müller. The ExaMode project for large-scale multimodal data analysis for decision support in histopathology
		P2.2 Axel Mosig. Molecularly Interpretable Machine Learning for Computational Pathology
10:40-11:20		
11:20-11:45		Breathing break
11:45-13:30		Session Chairman: Prof. Vassili Kovalev
11:45-12:00 12:00-12:15 12:15-12:30 12:30-12:45 12:45-13:00 13:00-13:15 13:15-13:30	Session B2	B2.1 Stanislav Sholtanyuk and Aliaksandr Leunikau. Lightweight deep neural networks for dense crowd counting estimation
		B2.2 Boris Assanovich. Towards Creation of SmileID Obtained from Face Biometrics Binded to Concatenated Error-Correcting Codes
		B2.3 Rykhard Bohush, Huafeng Chen and Sergey Ablameyko. Formalization of people and crowd detection and tracking in video
		B2.4 Eduard Adaska and Anton Lechanka. UNetX: Real-time Pedestrian CrosswalkSegmentation on Mobile Device
		B2.5 Dzmitry Mazouka and Victor Krasnoproshin. Developmental Milestones of Graphics Technologies
		B2.6 Viktoria Sorokina and Sergey Ablameyko. Extraction of human body parts in image using convolutional neural network and attention model
		B2.7 Vladimir Mikhailov and Vladislav Sobolevsky. Reindeer recognition and counting system based on aerial images and convolutional neural networks
13:30-14:30		Big Break
14:30-15:15		Session Chairman: Prof. Alexander Tuzikov
14:30-15:15	Plenary 2	P2.3 Ruslan Salakhutdinov. From Differentiable Reasoning to Self-supervised Embodied Active Learning
15:15-16:45		Session Chairman: Dr. Aleksandra Maksimova
15:15-15:30 15:30-15:45 15:45-16:00 16:00-16:15 16:15-16:30 16:30-16:45	Session A2	A2.1 Katsiaryna Kosarava and Boris Assanovich. A Simple Indoor Fall Control System for the Elderly Based on the Analysis of Object Bounding Box Parameters
		A2.2 Aleksandra Maksimova. GAN-SSL Classification for Identification Expertise in Chemistry
		A2.3 Andrei Brazhuk and Evgeny Olizarovich. Contextualizing of architectural security patterns as a knowledge management challenge
		A2.4 Boris Zhalezka and Volha Siniauskaya. Theory and Practice of Multi-Agent Systems Construction
		A2.5 Rahim Mammadov, Elena Rahimova and Gurban Mammadov. Increasing the Reliability of Pattern Recognition by Analyzing the Distribution of Errors in Estimating the Measure of Proximity Between Objects
		A2.6 Viktor Evdokimov, Anatoly Davydenko and Serhii Hilgurt. Using GRID for Centralized Synthesis of FPGA-based Information Security Systems
16:45-17:00		Breathing break

17:00-17:45	Session Chairman: Dr. Marina Lukashevich	
17:00-17:15	Session B3	B3.1 Ales Zhuk and Sergey Ablameyko. Augmentation Tools For Object Detection In Satellite Images By Using U-Net Neural Network
17:15-17:30		B3.2 Egor Busko, Alexander Nedzved and Shiping Ye. Preprocessing of SAR image for building detection
17:30-17:45		B3.3 Marina Lukashevich, Yuliya Golub, Valery Starovoitov and Aun Irtaza. Retinal Image Analysis for Diabetic Retinopathy Grading: Preliminarily Results

SEE YOU **next day!**



Day 3 – Thursday (September 23, 2021)

09:30-9:40		Get together / Connection Troubleshooting
09:40-14:00	Moderator: Chris Atherton	
09:40-09:45	GÉANT Session	Session Intro. Chris Atherton, GÉANT (The Netherlands)
09:45-10:00		G1 Irina Matthews. GÉANT and EaPConnect – Enabling Digital Highways for the Benefit of Scientific, Research and Education Communities Around the World
10:00-10:35		G2 Hrachya Astsatryan. Armenian Data Cube: Lessons Learned
10:35-11:15		G3 Marek Justyna. Image processing or machine learning - what is better for the quality control of electronic components
11:15-11:50		G4 Peter Boers. SURFnet8 - Evolving from Device Automation to Service Orchestration
11:50-12:15		Breathing Break
12:15-12:50		G5 Pierre Philippe Mathieu and Φ -lab. The Advent of Artificial Intelligence for Space Applications
12:50-13:25		G6 Nikos Bogonikolos. Information processing towards business and marketing improvements using blockchain technology
13:25-14:00		G7 Juraj Bilić. Does AI Dream of Electric Sheeps
14:00-14:45		Big Break
14:45-16:15	Session Chairman: Prof. Alexey Kharin	
14:45-15:00	Session A3	A3.1 Liudmila Cheremisinova and Dmitry Cheremisinov. Correctness of Control Systems with Concurrency Behavior
15:00-15:15		A3.2 Aleksei Rozhnov. Some Trends in Updating the Nomenclature of Specialties of Researchers in the Areas of Research Methods and Means of Intellectualization
15:15-15:30		A3.3 Alexey Kharin. Robustification of Sequential Statistical Decision Rules for Stochastic Data Flows Analysis
15:30-15:45		A3.4 Valerian Ivashenko, Nikita Zotov and Maksim Orlov. Semantic logging of repeating events in a forward branching time model
15:45-16:00		A3.5 Mikita Shuldau, Artsemi Yushkevich, Ivan Bosko, Alexander Tuzikov and Alexander Andrianov. Development of molecular autoencoders as generators of protein inhibitors: Application for prediction of potential drugs against coronavirus SARS-CoV-2
16:00-16:15		A3.6 Tatyana Kim and Ryhor Prakapovich. Development of an adaptive motion controller for a two-wheeled mobile robot along a color-contrast line based on the use of RL technology
16:15-16:30		Breathing break
16:30-17:15	Session Chairman: Dr. Victor Skakun	
16:30-16:45	Session B4	B4.1 Valery Malyshau. Nuclei detection based on single-point labels
16:45-17:00		B4.2 Silun Xu and Victor Skakun. Comparison of deep learning preprocessing algorithms of nuclei segmentation on fluorescence immunohistology images of cancer cells
17:00-17:15		B4.3 Aliaksandr Leunikau, Alexander Nedzved, Alexei Belotserkovsky and Stanislav Sholtanyuk. Multiple human's pose detection algorithm for real time video

Day 4 – Friday (September 24, 2021)

09:50-10:00		Get together / Connection Troubleshooting
		Moderator: Dr. Alexei Belotserkovsky
10:00-10:45	Panel	<p>“AI Issues and the Modern Information Society: Education, Science, Business, and Legislation”</p> <p>Panelists (in alphabetic order):</p> <ul style="list-style-type: none"> • Hrachya Astsatryan, IIAP NAS (Armenia) • Juraj Bilić, CARNET (Croatia) • Vladimir Golovko, BSTU (Belarus) • Vassili Kovalev, UIIP NASB (Belarus) • Frederic Fol Leymarie, University of London (UK) • Alexander Tuzikov, UIIP NASB (Belarus)
10:45-11:00		Breathing break
11:00-12:30		Session Chairman: Prof. Alexander Nedzved
11:00-11:15	Session B5	<p>B5.1 Vassili Kovalev. Small Image Training Sets: Exploring the Limits of Conventional and CNN-Based Methods</p>
11:15-11:30		<p>B5.2 Yue Zhang, Cheng Zhang, Shichao Kan, Yigang Cen and Linna Zhang. Weather Recognition based on Attention Image Search Method</p>
11:30-11:45		<p>B5.3 Ivan Kosik, Alexander Nedzved, Ryhor Karapetsian, Vera Yashina and Igor Gurevich. Automation of the Study of Radiologically Isolated Syndrome in Multiple Sclerosis</p>
11:45-12:00		<p>B5.4 Oleg Naidovich, Alexander Nedzved and Shiping Ye. DSDNet neural network for shadow detection from urban satellite images</p>
12:00-12:15		<p>B5.5 Alexander Usatov and Ivan Kosik. Identifying The Presence Of Covid-19 On X-ray Medical Images Using A Neural Network</p>
12:15-12:30		<p>B5.6 Mikhail Kharinov. Superpixel Clustering for Detection of Binary Object Hierarchy Using Modernized Classical Clustering Methods</p>
12:30-12:45		Breathing break
12:45-14:00		Session Chairman: Prof. Alexander Nedzved
12:45-13:00	Session A4	<p>A4.1 Xunhuan Ren, Jun Ma, Konopelko Valery and Tsviatkou Victor. An Iterative Error Patterns Library Formation Method For the Decoding of Product Codes</p>
13:00-13:15		<p>A4.2 Nicholas Nechval, Gundars Berzins, Konstantin Nechval, Max Moldovan, Vadims Danovics and Irina Bausova. Innovative Technique for Computing Shortest Length and/or Equal Tails Confidence Intervals in Reliability and Safety under Parametric Uncertainty</p>
13:15-13:30		<p>A4.3 Igor Zakharov, Jonathan Anderson, Garrett Parsons and Michael Henschel. Blockchain Systems Review and Analysis for Information Security of Big Data</p>
13:30-13:45		<p>A4.4 Mikalai Yatskou and Vladimir Apanasovich. A Digital Platform for Processing Fluorescence Spectroscopy Data Using Simulation Modelling and Machine Learning Algorithms</p>
13:45-14:00		<p>A4.5 Valery Demko and Victoria Zaitseva. Proprietary transformations of symmetric matrices in information processing problems</p>
14:00-15:00		Big Break

15:00-16:15	Session Chairman: Prof. Alexhander Doudkin	
15:00-15:15	Session B6	B6.1 Artem Andreiev and Anna Kozlova. Enhancement of land cover classification by training samples clustering
15:15-15:30		B6.2 Ahmedkhan Radzhabov. Performance Analysis of Deep Learning Models for Heart Segmentation in Chest X-ray Images on a Small Dataset
15:30-15:45		B6.3 Jun Ma, Xunhuan Ren, Konopelko Konstantinovich and Tsviatkou Yurievich. An automatic pruning method for skeleton images
15:45-16:00		B6.4 Alexhander Doudkin, Alexhander Voronov and Valentin Ganchenko. Software Control System for Equipment of Integrated Circuit Layout Inspection
16:00-16:15		B6.5 Alexandr Labokha, Artsiom Shamyna and Alexei Ardyako. Cloud detection in aerospace imagery of environmental monitoring
16:15-16:20	Breathing Break	
16:20-16:30	Closing	<ul style="list-style-type: none"> • Dr. Alexei Belotserkovsky (UIIP NASB). <i>Program Committee Chairman / CEO</i> • Dr. Marina Lukashevich (Softeq). <i>Program Committee Co-Chairman</i>

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