

**V IEEE International Conference "Video and Audio **Signal Processing** in the **Context** of **Neurotechnologies**"**

**SPCN - 2020**

**9-13 of November 2020 St. Petersburg, Russia**

<https://spcn.co>

The 5-th International Conference SPCN -2020 November 2020 St. Petersburg, Russia is organized as part of the implementation of the program of the world-class scientific center – “Pavlov center "Integrative physiology - Medicine, High-Tech Healthcare and Stress resistance Technologies " in accordance with an agreement with the Ministry of Education and Science

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The V SPCN 2020 St. Petersburg conference "Image and Sound Signal Processing in the Context of Neurotechnologies" is being held in conjunction with the SPCN -2020 Taiwan conference ( <https://spcn2020taiwan.com/committee-spcn-2020-taiwan> ),

with the IEEE Brain Data Bank Challenge (BDBC) conference

IEEE BRAIN DATA BANK CHALLENGE (BDBC) - FINALE 05 Dec 2020

Time: 09:00 AM to 01:30 PM, Los\_Angeles, USA

and with the conference "NeuralNetworks and NeuralTechnologies" November 2020, St. Petersburg, Russia. The conference "NeuralNetworks and NeuralTechnologies" is held within the framework of the project for the creation and development of a world-class scientific center - "Pavlov Center " Integrative Physiology - Medicine, High-Tech Healthcare and Stress Resilience Technologies "in accordance with an agreement with the Ministry of Education and Science

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**November 9, 2020**

**Chairs: Varvara Semenova, Kirill Kotchenko**

**10.00 Ludmila Filaretova** (*Pavlov Institute of Physiology of the Russian Academy of Sciences, St.Petersburg, Russia*) WELCOME TO INTEGRATIVE PHYSIOLOGY.

**10.30 Michail Kupriyanov** (*St. Petersburg State Electrotechnical University "LETI", St.Petersburg, Russia*) ARTIFICIAL INTELLIGENCE: TECHNOLOGY, ETHICS, RESEARCH.

**10.50 Alexander Evmenov** (*St. Petersburg State University of Film and Television, St. Petersburg, Russia*) ARTIFICIAL INTELLIGENCE AND EDUCATION: RESEARCH AND MODELING OF ARTISTIC CREATIVITY

**11.10 Narisa Nan Chu** (*Brain Data Bank - Brain Communication, CWLab International, USA*) PERSPECTIVES IN DEEP LEARNING WITH GLOBAL BRAIN IMAGING DATA

**11.40 Anna Mamonova** (*Data Research, Block of Corporate and Investment Business, PJSC Sberbank*) HOW AI TRANSFORM THE BUSINESS OF SBER BANK.

**12.00 Konstantin Shelepin, Nigel Foreman** (*Pavlov Institute of Physiology, Russian Academy of Sciences, St.Petersburg, Russia, Middlesex University London, UK*) NEUROPHYSIOLOGY OF INSIGHT AND INCOMPLETE SCENE RECOGNITION

Lunch time **12.30- 14.00**

**14.00 Yuri Shelepin, Narisa Nan Chu** (*I.P.Pavlov Institute of Physiology, St.-Petersburg, Russia; CWLab International, IEEE BMSB, Los Angeles, USA*) THE PERISCOPIC AND TELESCOPIC VISION - THE IMPORTANCE OF UNSEEN SIGHT

**14.30 Valeria Bondarko, Valerii Chikhman** (*Pavlov Institute of Physiology of the Russian Academy of Sciences*) MODELING OF FRAGMENTED NOISED AND NON-NOISED CONTOUR IMAGES RECOGNITION.

**15.00 Elena Mikhailova** (*Institute of Higher Nervous Activity and Neurophysiology of Russian Academy of Sciences, Moscow, Russia*) THE FUNCTIONAL HIERARCHY OF SIMPLE VISUAL SIGNS MATCHING IN WORKING MEMORY.

**16.00 Arnold Wilkins** (*Psychology department, University of Essex. UK*) VISUAL STRESS.

**16.30 Narisa Nan Chu** (*CWLab International, IEEE BMSB, Los Angeles, USA*) IMPROVE DEEP LEARNING PERFORMANCE USING TRANSFER LEARNING TO PREDICT EARLY STAGES OF ALZHEIMER IN ADNI DATASET.

**17.00 Discussion**

**November 10**

**Chairs: Varvara Semenova, Kirill Kotchenko**

**10.00 Invitation to participate in the SPCN 2020 hackathon on the application of neurotechnology and machine learning methods.**

**10.40 Roman Malashin, Dmitry Malashin, Arina Boiko** (*Pavlov Institute of Physiology Russian Academy of Sciences, State University of Aerospace Instrumentation, Production Association "Ural Optical and Mechanical Plant named after Mr. E.S. Yamalov", Russia*) PRINCIPLE OF LEAST ACTION IN DYNAMICALLY CONFIGURED IMAGE ANALYSIS SYSTEMS.

**11.00 Elena Ogorodnikova, Sergey Pak, Elvira Stolyarova, Anna Balyakova.** (*Pavlov Institute of Physiology Russian Academy of Sciences*) AUDITORY PERCEPTION OF RHYTHM.

**11.30 Archil Kezeli, David Janelidze, Manana Khomeriki, Natela Lomashvili** (*Laboratory of Physiology of Vision I. Beritashvili Center of Experimental Biomedicine, Tbilisi, Georgia*) COLOR-CONTINGENT AFTEREFFECTS AND RECALIBRATION OF COLOR VISION SYSTEM.

**12.00 Denis Yavna, Vitaly Babenko, Igor Plavel'sky** (*Southern Federal University Rostov-on-Don, Russia*) TEXTURE IMAGES FOR TRAINING ARTIFICIAL NEURAL NETWORKS IN DECODING THE AMPLITUDE VALUES OF SPATIAL MODULATIONS.

**12.30 Svetlana Alekseenko, Shkorbatova Polina** (*Pavlov Institute of Physiology of the Russian Academy of Sciences, St. Petersburg, Russia*) CONTRIBUTION OF NEURAL PATHWAYS FROM THE STRIATE CORTICAL AREA TO THE PERCEPTION OF MIRROR- SYMMETRY OF OBJECTS RELATIVE TO THE VISUAL MIDLINE

**13.00 Vladimir Molodtsov, Vadim Smirnov, Sergey Solushkin, Valery Chikhman.** (*LETI University, Pavlov Institute of Physiology of the Russian Academy of Sciences; St. Petersburg, Russia*) RESPONSE PAD FOR PSYCHOPHYSICAL EXPERIMENTSHUMAN-DEVICE INTERACTION.

**13.30 Elvira Stolyarova, Sergey Solnushkin, Valery Chikhman** (*Pavlov Institute of Physiology Russian Academy of Sciences, St. Petersburg, Russia*) SOFTWARE COMPLEX FOR A CORRECTION WORK IN TEACHING CHILDREN WITH HEARING AND SPEECH IMPAIRMENTS

**14.00 Larisa Golovanova, Elena Ogorodnikova, Natalia Belokurova, Ekaterina Lapteva, Maria Boboshko** (*North-Western State Medical University named after I.I. Mechnikov; St. Petersburg Geriatric Medico-social Center, Municipal Audiology Center; Pavlov Institute of Physiology Russian Academy of Sciences; Academician I.P. Pavlov First St. Petersburg State Medical University*) AGE-RELATED ASPECTS OF AUDITORY DISORDERS (AUDIOLOGICAL CORRELATES AND THE LIFE QUALITY ASSESSMENT).

**14.30 Irina Shoshina, Inna Zelenskaya, Valeriia Karpinskaia, Vsevolod Lyakhovetsky, Konstantin Zelensky** (*Pavlov Institute of Physiology Russian Academy of Sciences, Institute of Biomedical Problems Russian Academy of Sciences, St. Petersburg State University*) THE CONTRAST SENSITIVITY IN THE CONDITIONS OF MICROGRAVITATION.

#### **14.50 Discussion**

**November 11**

**Chairs: Arina Boiko, Evgenii Shelepin**

**10.00 Po-Lei Lee** (*Department of Electrical Engineering, National Central University, Taiwan*). ARTIFICIAL INTELLIGENCE – BASED BRAIN COMPUTER INTERFACE

**10.30 Miriam Reiner** (*Technion - Israel Institute of Technology, Haifa, Israel*) A MULTIFACTORIAL NEUROBEHAVIORAL MOTOR REHABILITATION SYSTEM.

**11.00 Marina Danilova, Chie Takahashi, John Mollon.** (*Pavlov Institute of Physiology, St.Petersburg, Russia; Cambridge university, UK*) TWO TYPES OF SENSORY COMPARISONS.

**11.30 Alexander Tibilov** (*ITMO University, St.Petersburg, Russia*) SUPPRESSION OF RECEPTOR NOISE AT THE FIRST SYNAPSE.

**12.00 Galina Andreeva., Konstantin Naumov** (*Military medical Academy of S.M. Kirov, St.Petersburg, Russia*) THE POSSIBILITY OF REGULATION CENTRAL AUTONOMIC NEURAL NETWORK

**12.30 Eugene Shelepin, Kseniya Skuratova** (*Pavlov Institute of Physiology, Russian Academy of Sciences, St.Petersburg, Russia*) LOCAL AND GLOBAL ANALISIS OF THE TEXT DURING READING.

#### **Lunch time 13.00-13.30**

**13.30 Katerina Malakhova** (*Pavlov Institute of Physiology Russian Academy of Sciences, St.Petersburg, Russia*) THE ROLE OF OPPONENT PROCESSES IN IMAGE RECOGNITION BY CONVOLUTIONAL NEURAL NETWORKS

**14.00 Konstantin Naumov, Igor Litvinenko, Kirill Markin, Andrei Emelin, Vladimir Lobzin** (*Military medical Academy of S.M. Kirov, St.Petersburg, Russia*) MULTISENSORY INSUFFICIENCY AS ONE OF THE CAUSES OF COGNITIVE IMPAIRMENT

**14.30 Maria Agaeva.** (*Pavlov Institute of Physiology Russian Academy of Sciences, St.Petersburg, Russia*) EFFECT OF MASKER ON LOCALIZATION OF COHERENT AND INCOHERENT SIGNALS.

**15.00 Elena Yakimova, Denis Tsyppkin, Petr Vasilev, Evgeny Shelepin.** (*Pavlov Institute of Physiology, Russian Academy of Sciences, St.Petersburg State University*)

USING EYE-TRACKING IN THE RESEARCH OF THE HISTORICAL TYPES OF RUSSIAN WRITING.

**15.30 Maria Belova.** (*Department of Biotechnical Systems, St. Petersburg State Electrotechnical University "LETI"*) EVOKED VISUAL POTENTIALS TO COLORED STIMULI.

**16.00 Alexander Gerasimov** (*Almazov National Medical Research Centre, Pavlov First St.Petersburg State Medical University*) FUNCTIONAL GENOMICS AND INTERACTOMICS OF ION CHANNELS AND MEDIATOR SYSTEMS IN EPILEPSY.

**16.30 Andrei Khrennikov** (*Karl Linnaeus University, Sweden*) QUANTUM-LIKE COGNITION AND IRRATIONALITY OF HUMAN BEHAVIOUR: FROM PARADOXES OF DECISION THEORY TO SOCIAL LASER MODEL OF CROWD'S BEHAVIOUR.

**November 12**

**Chairs: Ekaterina Petropavlovskaia, Katerina Malakhova, Evgenii Shelepin, Arina Boiko**

**10.30 Varvara Semenova, Ekaterina Petropavlovskaia, Lidia Shestopalova, Svetlana Vaitulevich.** (*Pavlov Institute of Physiology Russian Academy of Sciences, St.Petersburg, Russia*) ASYMMETRIC PERFORMANCE DURING DISCRIMINATION OF SOUND MOTION DIRECTION IN DICHOTIC CONDITIONS.

**11.00 Alisa Gvozdeva, Irina Andreeva.** (*Sechenov Institute of Evolutionary Physiology and Biochemistry Russian Academy of Sciences, St.Petersburg, Russia*) NEW MODEL OF APPROACHING AND RECEDING SOUND SOURCES TO STUDY FREE-FIELD MOTION PERCEPTION

**11.30 Ekaterina Petropavlovskaia, Lidia Shestopalova, Diana Salikova.** *Pavlov Institute of Physiology of the Russian Academy of Sciences.* AUDITORY MOTION-ONSET RESPONSE IN SIMULTANEOUS MASKING.

**12.00 Results of the SPCN 2020 hackathon on the application of neurotechnology and machine learning methods.**

**12.30 Olga Zhukova.** Pavlov Institute of Physiology of the Russian Academy of Sciences. RECONSTRUCTION OF A LARGE-SCALE NEURAL NETWORK IN THE TASKS OF FACE RECOGNITION.

**13.00 Vitaliy Babenko, Denis Yavna, Polina Anokhina** (*Southern Federal University, Rostov-on-Don, Russia*) ROLE OF NONLOCAL CONTRAST IN FACE DETECTION AND GENDER DETECTION.

**14.30 Alexandra Zamaro, Vladimir Kulchitsky.** (*Institute of physiology of the National Academy of Sciences of Belarus, Minsk, Belarus*) BRAIN PATHOLOGY AND CORRECTION OF VIDEO SIGNAL PROCESSING BY PERINEURAL MESENCHYMAL STEM CELL IMPLANTATION.

**15.30 Kirill Markin, Artem Trufanov, Dmitrii Tarumov** (*Military medical Academy of S.M. Kirov, St.Petersburg, Russia*) MIGRAINE IN THE ASPECT OF FUNCTIONING OF BRAIN NEURAL NETWORKS

**16.00 Kirill Markin, Dmitrii Tarumov, Konstantin Naumov, Vladimir Lobzin** (*Military medical Academy of S.M. Kirov, St.Petersburg, Russia*) FUNCTIONAL CONNECTIVITY OF NEURAL NETWORKS AND COGNITIVE STATUS IN PATIENTS WITH ALZHEIMER'S DISEASE

### **17.00 Discussion**

**November 13**

**Chairs: Roman Malashin, Svyatoslav Ponomarev, Evgenii Shelepin, Arina Boiko, Katerina Malakhova**

**10.00 Roman Malashin.** (*Pavlov Institute of Physiology Russian Academy of Sciences*) MEASURING THE DISTANCE TO CARS TO CARS BY MEANS OF A SIDE VIEW CAMERA WITHOUT USING ROAD MARKINGS.

**10.30 Svyatoslav Ponomarev, Sergey Drozdov.** (*Pavlov Institute of physiology, Russian Academy of Science*) THE EFFECTIVENESS OF SLAM RGB-D ALGORITHMS OUTDOORS UNDER VARIABLE LIGHTING CONDITIONS.

**11.00 Mikhail Titarenko, Malashin Roman.** (*Pavlov Institute of Physiology, St. Petersburg ITMO University, St.Petersburg*) IMAGE ENHANCEMENT WITH DEEP NEURAL NETWORKS USING HIGH-LEVEL FEATURE LOSS.

**11.30 Arina Boiko, Roman Malashin.** (*Pavlov Institute of Physiology, Russian Academy of Sciences; St.PetersburgState University of Aerospace Instrumentation*) SINGLE FRAME NOISE2NOISE: LEARNING VIDEO IMAGE ENHANCEMENT WITHOUT CLEAN DATA.

**12.30 Vladimir Pastushenkov, Maksim Kuznetsov, Lew Glaznikov, Vladimir Dvoryanchikov** (*Military medical Academy of S.M. Kirov, St.Petersburg, Russia*) ELECTROPHYSIOLOGICAL ASSESSMENT FUNCTIONAL STATE OF PERIPHERAL PART OF AUDITORY ANALYZER DURING PROPHYLACTIC USE OF A TRIAZINO-INDOLE DERIVATIVE ON THE ACOUSTIC TRAUMA MODEL

**13.00 Natalia Ivanova, Maia Pospelova, Tatiana Alekseeva, Daria Ryzhkova, Maria Efimova, Yulia Skripkina, Anastasia Teteneva, Maria Krutko, Alexander Gerasimov** (*Almazov National Medical Research Centre*) THE STATE OF COGNITIVE FUNCTIONS AND BRAIN PERFUSION IN CHRONIC BRAIN ISCHEMIA.

### **LUNCH TIME 13.30-14.30**

**14:30 Po-Lei Lee, Hao-teng Hsu, Kuo-Kai Syu.** (*National Central University, Taiwan*); IMPLEMENTATION OF A HIGH FREQUENCY SSVEP BASED BCI USING ITERATIVE FILTERING - EMPIRICAL MODE DECOMPOSITION (IF-EMD).

**15.00 Nikolay Pivovarov, Ekaterina Surkova** (*Pescara private ophthalmological clinic, Pescara, Italy; Central Clinical Hospital of the Administrative Department of the*

*President of the Russian Federation*) EPIGENETIC FACTOR IN THE DEVELOPMENT OF MYOPIA IN CHILDREN.

**15.30 Sergey Koskin, Galina Moiseenko, Sergey Pronin, Dmitrij Zhilchuk** (*Pavlov Institute of Physiology of the Russian Academy of Sciences, Military medical Academy named after S.M. Kirov, St.Petersburg, Russia*) VANISHING OPTOTYPES: SPATIAL FREQUENCY CHARACTERISTICS AND DETECTION THE FALSE RESPONSES BY VISUAL EVOKED POTENTIALS MEASURING.

**16.00 Svetlana Murav'eva.** (*Pavlov Institute of Physiology, Russian Academy of Sciences, St.Petersburg, Russia*) COGNITIVE VISUAL EVOKED POTENTIALS OF SCHIZOPHRENIA AND DEPRESSION PATIENTS.

**16.30 Kseniya Kozub** (*Pavlov Institute of physiology, Russian Academy of Sciences, St.Petersburg, Russia*) RETINAL CHANGES IN PATIENTS WITH SCHIZOPHRENIA.

**17.00 Elmira Panakhova, U. Hashimova, K. Javadova, S. Pashkevich, A. Zamaro, M. Dosina, I. Galandarly, R. Guiyeva.** (*Azerbaijan National Academy of Sciences, Karaev Institute of Physiology Baku, Azerbaijan*) VISUAL- AMYGDALAR INTERACTION AND THE EFFECT OF TURMERIC ON THE RESTORATION OF BEHAVIOR AND SPATIAL MEMORY IN THE MORRIS WATER MAZE IN AN EXPERIMENTAL MODEL OF ALZHEIMER'S DISEASE.

**17.30 Alexander Pavlov** (*St. Petersburg ITMO University, St.Petersburg*) NEURAL NETWORKS MODEL FOR QUANTUM-LIKE DISJUNCTION EFFECTS IN DECISION MAKING.

## **18.00 General Discussion**

## Supplement

### **"FUNCTIONAL GENOMICS AND COGNITIVE FUNCTIONS"**

(PRESENTATION BY YOUNG SCIENTISTS).

Moderator: **Gerasimov A.P.** (*Almazov National Medical Research Centre, Pavlov First St.Petersburg State Medical University, St. Petersburg, Russia*)

SODIUM CHANNEL GENETICS AND ITS CLINICAL ASPECTS. Zavrazhnova A.A., Galiavin S. I. - *Pavlov First St.Petersburg State Medical University* – 7 min.

POTASSIUM CHANNEL GENETICS AND ITS CLINICAL ASPECTS. Komarova D.A., Samusenkova D.V., Oskolkova E.S. - I.I. *Mechnikov North-Western State Medical University*– 7 min.

CALCIUM CHANNEL GENETICS AND ITS CLINICAL ASPECTS. Okhrimenko A.S., Kishinskaja E.I. – *St.Petersburg State Pediatric Medical University*– 7 min.

CHLORIDE CHANNEL GENETICS AND ITS CLINICAL ASPECTS. Kalandarova N.N., Ishchenko I.O. – *St.Petersburg State Pediatric Medical University*– 7 min.

ION PUMP GENETICS AND CLINICAL ASPECTS. Ushanov V.V. (*Almazov National Medical Research Centre, Pavlov First St.Petersburg State Medical University*), Dyachuk N.M. (*St-Petersburg State Pediatric Medical University*) – 7 min.

GENETICS OF THE GLYCINE MEDIATOR SYSTEM AND ITS CLINICAL ASPECTS. Zhumatov M.M., Lobzhanidze T. B.-A. – *St.Petersburg State Pediatric Medical University* – 7 min.

GENETICS OF THE GABA-SYSTEM AND ITS CLINICAL ASPECTS. Shakel A.A. (*St-Petersburg State Pediatric Medical University*), Ganieva A.I. (*Pavlov First St.Petersburg State Medical University*) – 7 min.

GENETICS OF THE NMDA-SYSTEM AND ITS CLINICAL ASPECTS. Pavlova V.S., Popov F.A. – *St.Petersburg State Pediatric Medical University* – 7 min.