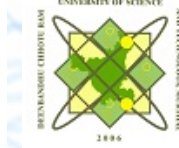




**Technical University of Sofia
Sofia, Bulgaria**



**Deenbandhu Chhotu Ram University of
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3rd International Workshop on New Approaches for Multidimensional Signal Processing NAMSP'2022

WORKSHOP PROGRAM

**Technical University of Sofia
Sofia, Bulgaria
July 07-9, 2022**



<http://rcvt.tu-sofia.bg/NAMSP2021>

General Information

The purpose of the workshop is to bring together researchers working in the various areas of Multidimensional Signal Processing and its applications in fields like Telecommunications, Computer Vision, Healthcare, Bioinformatics, Remote Ecological Monitoring, Agriculture, Forestry and others. The workshop proposes themes like: Multidimensional Image Processing, Sensor Heterogeneous Data Clustering, Spatio-Temporal Filtering, Multidimensional Interpolation, Multidimensional Object Segmentation, Multiview Representation, Multidimensional Visualization, Virtual and Augmented Reality and others. Authors are invited to present their recently achieved results, exchange ideas and cooperate in a friendly framework.

The Workshop will take place at the **Technical University of Sofia, Bulgaria** **between the 7th and 9th of July 2022**. We hope that the participants will appreciate the beautiful venue of the workshop in the **TU-Sofia** campus.

We welcome you to NAMSP'2020!

NAMSP 2022 is organized under the frame of the bilateral Indian-Bulgarian cooperation research project between **Technical University of Sofia, Bulgaria** and **Deenbandhu Chhotu Ram University of Science and Technology, Murthal, Sonapat, India** with a duration of two years under the title "*Contemporary Approaches for Processing and Analysis of Multidimensional Signals in Telecommunications*", financed by the **Department of Science and Technology (DST), India** and the **Ministry of Education and Science, Bulgaria**.

The project is aimed to acquire new knowledge, to promote scientific exchange and to foster the development of close links and cooperation between scientific organizations. The main objectives are in two priority areas: information and communication technologies, and the technologies related to healthcare and life quality improvement. The project achievements will support the medical diagnostics, surveillance (forests protection or agriculture support), etc.

As it is known, every day has to be processed and saved huge amounts of signals, images, and image sequences got from various sensors, which are saved in large databases. To enhance the interpretation of the so obtained visual information contained in various multidimensional images (MDI), many approaches exist for their computer processing. High requirements exist about their compression, time needed for the processing, automatic segmentation, filtration, and classification of the investigated objects. The project objectives are related to investigation and dissemination of knowledge for new methods for representation, processing and analysis of various kinds of signals and MDI (video sequences, computed tomography images, nuclear magnetic resonance, multispectral, ultrasound, thermo vision, etc). All this requires to solve some basic tasks: 1) Multidimensional signals and image representation through new methods based on the hierarchical tensor decomposition developed by the team members. The main advantages are the lower computational complexity compared to famous similar methods and the ability for parallel processing. This will increase the analysis accuracy; 2) Signals and MDI processing based on new approach for adaptive 3D interpolation (also developed by a part of the team members), which has low computational complexity and ensures high quality of the interpolated areas (objects) in the 3D images. This approach permits high-quality enlargement of selected 3D objects in the MDI, which to be used for medical decision support; 3) MDI analysis based on new, intelligent methods for 3D objects segmentation.

NAMSP 2022 is part of the “Days of Science” at Technical University of Sofia, with the kind collaboration of the Research and Development Sector at TU-Sofia, Bulgaria.

Main topics of interest

Image Processing Specific Topics

- N-Dimensional (N-D) Multicomponent Image Processing
- Adaptive N-D Filtration in Intelligent Image Systems
- Multidimensional Image Representation and Super-Resolution
- Compression of Multidimensional Spatio-Temporal Images
 - Multidimensional Image Transmission Systems
- Three-Dimensional (3D) Image Processing and Reconstruction
- Multidimensional (MD) Computer Vision Systems
 - Multidimensional Multimedia Systems
- Reasoning-Based Intelligent Systems for MD Image Processing
- Intelligent Analysis of MD Medical Images
- Learning-Based MD Image Processing and Expert Systems
- Neural Networks for MD Image Processing
 - MD Image Preprocessing for Pattern Recognition
- Generic and Fuzzy Systems for MD Image Processing, Analysis and Recognition
 - Data-Based MD Image Retrieval and Knowledge Data Mining
- Watermarking, Hiding and Encryption of MD Images
- Surveillance Systems, Based on Intelligent MD Image Processing
- Objects Detection and Tracking, Based on MD Image Processing
 - Intelligent Multi-Spectral and Hyper-Spectral Image Processing
- Intelligent Multi-View Image Processing

- Real-Time MD Image Processing Systems and Transmission
- MD Image Processing in Robot Systems
- Intelligent Visualization of MD Images
- Web-Based Search Systems for MD Images
- Forensic Analysis Systems for MD Images

General Data Processing and Generation Topics

- Pattern Recognition
 - Deep Learning
 - Machine Learning
 - Machine Intelligence
 - Neural Networks
 - Data Mining
- Tensor-based Data Processing
- Self-organization Modeling
 - Biomedicine
 - Biological Modeling
 - Bio-inspired Methods
- Biomedical Computing
 - Financial Modeling
 - Social Modeling
 - Medical Imagistic
 - Virtual Reality
 - Augmented Reality
- 3D and Multiview Visualization
 - Telepresence
 - Computer Graphics
 - Computer Animation
 - and others...

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NAMSP'2022 Program

All Hours are Bulgarian Time (GMT+3)

July 7th, 2022 (Thursday)

10:00 – 11:00 Opening

Join Zoom Meeting

<https://us06web.zoom.us/j/84273221856?pwd=WWx5Y2ZSVGhOOmJlR245S0RRT25GZz09>

Meeting ID: 842 7322 1856

Passcode: 113565

11:00-12:00 Plenary Session

Join Zoom Meeting

<https://us06web.zoom.us/j/84273221856?pwd=WWx5Y2ZSVGhOOmJlR245S0RRT25GZz09>

Meeting ID: 842 7322 1856

Passcode: 113565

Chairman: Prof. Roumen Kountchev, Technical University of Sofia, Bulgaria

11:00 – 11:30 Plenary Lecture 1: Iantovics, B., Measuring the machine intelligence using black-box-based universal intelligence metrics

11:30 – 12:00 Plenary Lecture 2: Milanova, M., Human Augmentation: Robust and Trusted Human-Machine interaction

12:00 – 13:00 Break

13:00 – 14:45 Paper Session 1

Join Zoom Meeting

<https://us06web.zoom.us/j/84273221856?pwd=WWx5Y2ZSVGhOQmJIR245S0RRT25GZz09>

Meeting ID: 842 7322 1856

Passcode: 113565

Chairman: Prof. Parvinder Singh, Deenbandhu Chhotu Ram University of Science and Technology, India

13:00 – 13:15 Prateek Pardeshi, Reethik Prasad and T. K. Sivakumar, Dog Breed Classification Using Deep Learning

13:15 – 13:30 Preeti Yadav and Parvinder Singh, Disease detection techniques in Plants: Transition from manual to automaton

13:30 – 13:45 Deepakshi Dabas and Jasvinder Kaur, Literature Review of Smart Contracts using Blockchain Technology

13:45 – 14:00 Parvinder Singh and Pardeep Kumar, A comprehensive study of 5th generation scheduling algorithms

14:00 – 14:15 Lalita Yadav and Manoj Duhan, All Digital Phase Locked Loop (ADPLL) and Its Blocks - A Comprehensive Knowledge

14:15 – 14:30 Neha Neha, Jasvinder Kaur and Banita Banita, A Comparative Analysis of Homogeneous and Heterogeneous Protocols to Maximize the Lifetime of WSN for Precision Agriculture

14:30 – 14:45 Amol Kumar, Manoj Duhan and Poonam Sheoran, Electromyography Signal Acquisition, Processing, Optimization and its Applications

13:00 – 15:15 Paper Session 2

Join Zoom Meeting

<https://us06web.zoom.us/j/83684321622?pwd=Q2VYnBxWGNOcHIQLzlKSnhUazZuZz09>

Meeting ID: 836 8432 1622

Passcode: 301883

Chairman: Prof. Jun Wang, University College London

13:00 – 13:15 Yansong Shi, Shiyu Xing, Peijian Wang, Dai Jiawei, Neural network algorithm is applied in electrical engineering automation

13:15 – 13:30 Deyong Ma, Jun Wang, Practice system of ant colony optimization algorithm in Business Administration

13:30 – 13:45 Hui Hui Li, The integration development and upgrading path of industry 4.0 architecture industrial engineering network driven by big data

13:45 – 14:00 Zhiqiang Xu, Yunxian Cui, and Baoliang Li, Truss Structure Optimization Design based on FE-PSO-SQP Algorithm

14:00 – 14:15 Jicong Xue, SAAS application prospect analyze in HRM and methods to upgrade the contemporary system

14:15 – 14:30 Xingtian Zhang, Bingfeng Hu, Maoyuan Mou, Development and Design of Intelligent Traction System for Bulk Cargo Terminal

14:30 – 14:45 Mingyang Liu, On the Role of IOT Platform in Logistic Warehouse Management

14:45 – 15:00 Research on the Radar Signal Classification Method Based on the Deep Faith Network Model

15:00 – 15:15 Discussion on the New Model of Smart Tourism Development under the Background of Big Data

14:45 – 15:00 Coffee Break

15:00 – 16:30 Paper Session 3

Join Zoom Meeting

<https://us06web.zoom.us/j/84273221856?pwd=WWx5Y2ZSVGhOOmJIR245S0RRT25GZz09>

Meeting ID: 842 7322 1856

Passcode: 113565

Chairman: Prof. Rumén Mironov, Technical University of Sofia, Bulgaria

15:00 – 15:15 Raneem Ismail, Péter Prukner and Szilvia Nagy, On applying gradient based thresholding on the Canny edge detection results to improve the effectiveness of fuzzy Hough transform for colonoscopy polyp detection purposes

15:15 – 15:30 Roumen Kountchev and Roumiana Kountcheva, Tensor Spectral Pyramid for Color Video Sequences Representation, Based on 3D FO-AHKLT

15:30 – 15:45 Ari Aharari, Jair Minoro Abe and Kazumi Nakamatsu, Development of IoT Indoor Monitoring System for Independent Elderly

15:45 – 16:00 Samira Sestari Do Nascimento, Jair Minoro Abe, Luiz Roberto Forçan, Cristina Corrêa de Oliveira, Kazumi Nakamatsu and Ari Aharari, Improving the Process of Evaluating User Stories using the Paraconsistent Annotated Evidential Logic $E\tau$

16:00 – 16:15 Mahmoud Bassiouni, Islam Hegazy, Nouhad Rizk, El-Sayed El-Dahshan and Abdelbadeeh Salem, COVID Detection using ECG image reports: A survey

16:15 – 16:30 Afsana Mou, Mariofanna Milanova and Mark Baillie, Deep Learning Approaches for Classroom Audio Classification using Mel Spectrograms

Invited Speakers



Prof. Mariofanna Milanova, University of Arkansas at Little Rock, USA

Title of Lecture: Visual Intelligence and Deep Learning models: What we can learn from hierarchies in the primate's Visual Cortex?

Abstract: Video Analytics is a prominent field in multimedia research with numerous fundamental applications, including video surveillance, patient monitoring systems, law enforcement, video indexing, and human computer interaction. Various kinds of deep learning neural network architectures are the main technical basis for the current state of the art for the anticipation of human body motions from a video. This presentation will briefly cover the main concepts of Deep Learning, NVIDIA Developers Program and then focus on applications in video analytics healthcare. Recent advances in the field of human gait analysis systems using 2D single camera and muscle synergies from electromyography (EMG) signals will also be highlighted.

Biographical Notes: Mariofanna Milanova is a Professor of the Computer Science Department at the University of Arkansas at Little Rock, USA since 2001. She received a M.Sc. in Expert Systems and Artificial Intelligence and Ph.D. in Telecommunications from the Technical University, Sofia, Bulgaria. Dr. Milanova conducted post-doctoral research in visual perception at the University of Paderborn, Germany. Dr. Milanova has extensive academic experience at various academic and research organizations worldwide.

Dr. Milanova is IEEE Senior Member, Fulbright U.S. Scholar, and NVIDIA Deep Learning Institute University Ambassador. Dr. Milanova's work is supported by NSF, NIH, DARPA, DoD, Homeland Security, NATO, Nokia Bell Lab, NJ, USA and NOKIA, Finland. Prof. Milanova's research areas of interest are: Artificial Intelligence, Machine Learning, Image/Video Processing, Brain-like Computing and Computer Graphics. Dr. Milanova serves as a book editor for two books and as associate editor for various international journals. She has published more than 120 publications, over 53 journal papers, 35 book chapters, and numerous conference papers and has 2 patents.



Prof. Barna Iantovics, George Emil Palade University of Medicine, Pharmacy, Science and Technology of Targu Mures (UMFST), Targu Mures, Romania

Title of Lecture:

Measuring the machine intelligence using black-box-based universal intelligence metrics

Abstract: Most of the intelligent systems are agent-based systems that could be intelligent agents that operate individually or cooperative multiagent systems. The number and diversity of intelligent systems applied for real-life problems solving in all the fields is increasing very fast. In this context measuring the machine/systems intelligence becomes of utmost importance. Machine intelligence metrics presented in the scientific literature rely on different philosophies, hindering their effective comparison. There is no standardization on what machine intelligence is and what should be measured to quantify it. This study investigates the measurement of the artificial complex systems intelligence from the viewpoint of real-life difficult problem-solving abilities and highlights the importance of being able to make accurate and robust comparisons in intelligence between multiple intelligent complex systems. The most important property of an intelligence metric must be the universality based on the very large diversity of intelligent complex systems. In this sense an important approach consists in the black-box-based intelligence metrics that should be able to treat aspects like the variability in intelligence, and extreme intelligence (rarely very low and high intelligence manifestations in different situations). Universal black-box-based machine intelligence metrics are a useful tool for intelligent systems developers in measuring the intelligence of their systems and comparing them with the intelligence of other systems no matter the diversity of their architecture.

Biographical Notes: L.B. Iantovics received BSc and MSc in Mathematics and Informatics from “Transilvania” University of Brasov; a PhD in Artificial Intelligence (AI) from “Babes-Bolyai” University of Cluj-Napoca and finished a Postdoctoral study in AI at “Alexandru Ioan Cuza” University of Iasi. In 2020 he obtained the habilitation degree at the George Emil Palade University of Medicine, Pharmacy, Science and Technology of Targu Mures (UMFST). Dr. Iantovics is Full Professor and Director of the Research Center on Artificial Intelligence, Data Science and Smart Engineering (Artemis) within UMFST from 2021. His principal research interests include intelligent systems, measuring machine intelligence, computational intelligence, biostatistics and data science, topics on which he has published dozens of papers, book chapters and has contributed to research projects as project director or researcher. Contributions to international research projects coordination include: Hybrid Medical Complex Systems (ComplexMediSys); Electronic Health Records for the Next Generation Medical Decision Support in Romanian and Bulgarian National Healthcare Systems (NextGenElectroMedSupport) and Social Network of Machines (SOON). Dr. Iantovics has acted as committee member at numerous prestigious conferences, reviewed papers at many prestigious journals, being a member in the editorial board of numerous journals, has organized conferences as General Chair and Principal Scientific Organizer like BICS, CANS, UICS, etc. He has edited valuable books and journal special issues such as “Advanced Intelligent Computational Technologies and Decision Support Systems”; “Advances in Intelligent Analysis of Medical Data and Decision Support Systems”, published in Computational Intelligence series; “Advanced Computational Technologies” published by the Romanian Academy Publishing House, and others.