



Conference program

26th International Conference on Systems,
Signals and Image Processing

Osijek, Croatia
5 – 7 June 2019



EURASIP
EUROPEAN ASSOCIATION
FOR SIGNAL PROCESSING



IWSSIP

OSIJEK 2019



Organized by

Faculty of Electrical Engineering,
Computer Science and Information Technology Osijek,
Josip Juraj Strossmayer University of Osijek

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IEEE Croatia Section,
Communications Chapter,
Systems Man and
Cybernetics Chapter,
Reliability Chapter, Signal
Processing Chapter



Croatian Academy of
Engineering



PLENARY SPEAKER

Branka Zovko-Cihlar

UNIVERSITY OF ZAGREB

Faculty of Electrical Engineering and Computing

26 Years of the IWSSIP Conference

Biography

Branka Zovko-Cihlar was a full professor at the Department of Radiocommunications and Microwave Engineering, Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia. She received her B.Sc. and Ph.D. degrees in electrical engineering in 1959 and 1964, respectively. She is the author of the book "Noise in Radiocommunications" published in 1987, and the author of more than 216 papers published in international journals and conferences. She was the project leader of scientific projects: Research and development in radiocommunications, Research in new Croatian broadcast technology, Development in cable television services and multimedia communication systems. She was mentor of ten PhD thesis in Croatia and five in Slovenia, Slovakia and Bosnia and Herzegovina.

She is the President of Croatian Society Electronics in Marine - Elmar for 20 years. She is the General Co-Chair of International ELMAR Symposiums for 25 years. She is a member of ELMAR, IWSSIP and BIHTEL International Program Committee from 1991. She is a member of Croatian Academy of Engineering, a member of IEEE and a member of the Editorial Board of Journal of Electrical Engineering, Bratislava, Slovakia. From the year 2000 until 2004 she was the president of the Croatian Council for Radio and Television elected by the Parliament of the Republic of Croatia.

She received a Technology Award "Moć znanja" from the Croatian Academy of Engineering Foundation and "Golden plaque Josip Lončar" from the Faculty of Electrical Engineering and Computing, University of Zagreb

KEYNOTE SPEAKER

Aleksandra Pižurica

GHENT UNIVERSITY

Department of Telecommunications and Information Processing



Multimodal Data Processing and Deep Learning in Digital Painting Analysis

Art investigation - an emerging and rapidly growing cross-disciplinary field of research - relies increasingly on signal processing and machine learning. Multimodal imaging is now routinely employed in order to support the technical study of art work, its conservation, or even presentation. Analysis of multimodal data often uncovers regions or patterns of interest that would otherwise remain unnoticed, thus enabling new insights and even support for certain decisions that are made during the conservation-restoration treatments. In this talk, we discuss recent advances in digital signal processing and machine learning for supporting the study and restoration of paintings. The focus will be on sparse coding, representation learning and deep learning, spatial context modelling and Bayesian inference in tasks such as crack detection, paint loss detection and virtual inpainting. Concrete examples will be shown from the ongoing conservation-restoration treatment of the Ghent Altarpiece.

Biography

Dr. Aleksandra Pižurica is a professor in statistical image modelling at Ghent University (received her BSc, MSc and PhD in 1994, 1997 and 2002, respectively). Her research is in the area of signal processing and machine learning, including multiresolution statistical image models, Markov Random Field models, sparse coding, representation learning, image and video reconstruction, restoration and analysis.

Prof. Pižurica currently serves as a Senior Area Editor for the IEEE Transactions on Image Processing and an Associate Editor for the IEEE Transactions on Circuits and Systems for Video Technology. She was also an Associated Editor for the IEEE Transactions on Image Processing (2012-2016) and the lead guest editor for the EURASIP Journal on Advances in Signal Processing for the Special Issue "Advanced Statistical Tools for Enhanced Quality Digital Imaging with Realistic Capture Models" (2013). The work of her team was rewarded the Best Paper Award of the IEEE GRSS (Geoscience and Remote Sensing Society) Data Fusion contest twice, in 2013 and 2014. She received the scientific prize "de Boelpaepe" for 2013-2014, awarded by the Royal Academy of Science, Letters and Fine Arts of Belgium.



KEYNOTE SPEAKER

Andrea M. Tonello

UNIVERSITY OF KLAGENFURT

Institute of Networked and Embedded Systems

Learning, Processing and Communication in Smart Energy Grids

The introduction of renewables and the goal of increasing efficiency and reliability is revolutionizing energy grids. Energy grids must become intelligent and be able to manage energy flows and flexibly adapt to changes in production and demand. This paradigm has fostered the creation of new business models on top of technology advances. The physical infrastructure must embed sensing, communication and processing capabilities. This talk will provide an overview of relevant applications (from metering and diagnostics to energy management) and discuss the role of sensing, processing and inference.

It will also cover relevant communication technologies to provide connectivity and in particular new applications of power line communication that enable grid diagnostics by processing high frequency signals. In this context, we will also elaborate on the concept of learning the system model and discuss how top-down phenomenological approaches followed by machine learning paradigms can be merged with bottom-up physical domain approaches.

Biography

Dr. Andrea Tonello is professor of embedded communication systems at the University of Klagenfurt, Austria. He has been associate professor at the University of Udine, Italy, technical manager at Bell Labs-Lucent Technologies, USA, and managing director of Bell Labs Italy, where he was responsible for research on cellular technology. He is also the founder of the spin-off company WiTiKee. He received his PhD from the University of Padova, Italy, and several awards, among which are the Lucent Bell Labs Recognition of Excellence Award, the RAENG (UK) Distinguished Visiting Fellowship, the IEEE VTS and COMSOC Distinguished Lecturer Awards, and the Italian Full Professor Habilitation.

He has also received nine best paper awards. He has served as an associate editor for IET Smart Grid, IEEE ACCESS, IEEE Trans. on Communications, the AEÜ Int. Journal of Electronics and Communications, and the IEEE Trans. on Vehicular Technology. He was the chair of the IEEE Technical Committee on PLC, the general chair of IEEE SmartGridComm 2014 and IEEE ISPLC 2011. His current research spans the areas of wireless and power line communications, statistical signal processing, energy grids, and aerial robotics.

KEYNOTE SPEAKER

Milan Z. Bjelica

UNIVERSITY OF NOVI SAD & RT-RK RESEARCH INSTITUTE



Deep Learning vs. Safety – Practical Approach and Platform Design Perspective

Deep Learning is a promising field, allowing an increase in artificial intelligence applications across many fields, ranging from data science, medical, weather, and aerospace to automotive. Applications of computer vision-based deep learning are vastly assisted by modern System-on-Chip architectures, which provide the required parallelism, heterogeneity and interfacing. However, the application of deep learning to safety-critical contexts where human lives might be at stake, such as in self-driving cars, still has many pitfalls. Ongoing academic research tackles transparent AI, in which the correctness of AI is attempted to be reached by design; however, the outcome of this research is still far-fetched. In this talk, we will discuss a practical approach when integrating deep learning vision-based solutions into a safety-critical context, which can be achieved today. We outline an approach which introduces a software/hardware platform design which fosters diversity, with the goal of minimizing risk of critical failures which are induced by AI in decision making.

Biography

Prof. Milan Z. Bjelica is an associate professor at the University of Novi Sad, and Head of Innovation at RT-RK Research Institute. During his career, he led the implementation of numerous

solutions for the industry in the fields of consumer electronics, the Internet of Things, multimedia and automotive, which are utilized by several major international Tier 1 and OEM companies. Some of the latest contributions include his work on central car computer design, providing heterogeneous environments for the efficient execution of automotive algorithms, as well as providing means for deep learning execution in a transparent, controllable and safe environment. Dr. Bjelica has authored over a hundred scientific and professional publications, out of which 11 were published in major journals, as well as 24 patents and numerous technical contributions. He won the “Special Merit Award” for his talk at the Consumer Electronics Show – ICCE in Las Vegas, 2013. He was nominated as the best young researcher by the Faculty of Technical Sciences in 2014. He is an active member of IEEE, especially IEEE Consumer Electronics Society, within which he was a Technical Program Chair for IEEE ICCE conferences in Berlin, Germany (2015, 2017) and one of the founders of IEEE ZINC conferences in Novi Sad, where he also chaired the program (2016–2018). He is also a regular visiting researcher and speaker at major events, including the Fraunhofer Institute (Germany) and the Consumer Electronics Association (USA).

KEYNOTE SPEAKER

Gregor Rozinaj

SLOVAK UNIVERSITY OF TECHNOLOGY IN BRATISLAVA
Faculty of Electrical Engineering and Information Technologies



Methodology and Technologies for Online Education

Rozinaj G., Podhradsky P.

The educational process is as old as the mankind itself. Education of the younger generation is a complex task and every suitable tool has been used to improve the process. Nowadays, not only modern approaches like the student centric model, gamification, personalization, experience-based learning, problem-based learning, project orientation rather than knowledge acquisition have been introduced, but new technologies like virtual reality (VR), augmented reality (AR), interactive multimedia services offer better experience-based learning, faster education and more durable knowledge. Technology solutions are deeply dependent on the economic situation of schools.

One of the open problems of online education is distant presence of students and teachers. Telereality is a new keyword and covers the research area of full virtual access to a distant place with 3D audio and video stream and, in specific cases, with multisensorial experience.

Many projects have been devoted to online education. Authors have many years of experience in online

education within dozens of mostly European projects. The results of these projects show that online education is an extremely complex task with multidisciplinary problems. However, the projects show promising results regarding this topic. Results of the new Horizon 2020 NEWTON will be discussed, too.

Biography

Gregor Rozinaj is a professor at the Faculty of Electrical Engineering and Information Technologies, Slovak University of Technology in Bratislava. Currently, he is a director of the Institute for Multimedia ICT, FEI STU. He has published approximately 150 papers in scientific journals and international conferences. He is the author of 4 patents, 3 of them worldwide. His scientific school consists of 14 successfully finished PhD students and more than 120 MSc students. He has served as a principal investigator on more than 20 research projects, among them Horizon2020/FP7 projects. His research interest is oriented to multimedia processing, optimization techniques, fast algorithms, HCI. Previously, he worked at the University of Stuttgart, Germany and Alcatel Research Centre in Stuttgart, Germany. (h-index: 6, Google scholar: 9).

TUTORIAL

Robert Cupec

JOSIP JURAJ STORSSMAYER UNIVERSITY OF OSIJEK
Faculty of Electrical Engineering, Computer Science
and Information Technology



Object Detection and Classification in 3D Point Clouds for Mobile Robot Manipulation

The ability to perceive a scene as a set of objects and recognize objects of interest is very important for intelligent robots which are expected to operate in complex and unstructured environments. Hence, this topic is of great interest to both the computer vision and robotics research community. In this tutorial, approaches to segmenting 3D point clouds acquired by a 3D camera into objects, recognition of precisely defined objects of interest and classification of objects into one of previously learned object classes are considered. Plenty of methods solving the considered tasks are proposed. In this tutorial, we focus on methods suitable for the application to service robots in households and public institutions as well as to automated agriculture. In these applications, besides the detection of the presence of an object of interest or identification of its class, an accurate object pose with respect to the robot as well as identification of object parts is required, since this information is often needed for planning a robot manipulation operation.

Biography

Robert Cupec graduated from the Faculty of Electrical Engineering, University of Zagreb, in 1995, where he also received his MSc degree in 1999. Upon graduation, he joined the Department of Control and Computer Engineering in Automation, University of Zagreb, where he was employed until 2000. From 2000 to 2004, he worked at the Institute of Automatic Control Engineering, Technische Universität München, where he received his PhD degree in 2005. Currently, he is employed as a Full Professor at the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek, Josip Juraj Strossmayer University of Osijek, Croatia. His main research interest is in robot vision.

Wednesday, 5 June 2019

9:00 – 16:00
Registration

10:00 – 10:50 (Room A – Lipa)
OPENING CEREMONY

General Chairs:

Drago Žagar,
Snježana Rimac–Drlje

PLENARY TALK

Branka Zovko–Cihlar
*26 Years of the IWSSIP
Conference*

11:00 – 12:00 (Room A – Lipa)
Chair: Irena Galić

KEYNOTE TALK I

Aleksandra Pižurica
*Multimodal Data Processing and
Deep Learning in Digital Painting
Analysis*

12:00 – 13:30
Lunch Break

13:30 – 15:10 (Room A – Lipa)

Chair:

Dušan Gleich, Tomislav Matić

SESSION 1:

Signal Processing I

Blaž Pongrac and Dušan Gleich
*Overview of Opto-Electrical
Terahertz Spectroscopy*

Danijel Šipoš, Marko Malajner
and Dušan Gleich
*Stepped Frequency and
UWB Pulse Based Radars for
Landmine Detection*

Tomislav Radišić, Mario Muštra
and Petar Andrašić
*Design of an UAV Equipped
with SDR Acting as a GSM Base
Station*

Julius Foit and Miroslav Husák
Stabilized-Load Crystal Oscillator

Sven Ubik, Karel Hynek
and Jiří Melnikov
*FPGA Packet Reflector for
Network Path Testing*

13:30 – 15:10 (Room B – Kesten)

Chairs:

Bruno M. Carvalho, Sonja Grgić

SESSION 2:

Image Processing I

Raimundo C. S. Vasconcelos and
Helio Pedrini

*Estimation of Fingerprint Image
Quality Based on Neighborhood
Strengthness Homogeneity*

Jose Silva Neto, Waldson Leandro,
Matheus Gadelha, Tiago Santos,
Bruno M. Carvalho
and Edgar Garduño

*Automatic Fuzzy Segmentation
of Textural Images Using
Adaptive Divergence Affinity
Functions*

Marcos R. Souza, Diego Bertolini,
Helio Pedrini and Yandre M. G. Costa

*Offline Handwritten Script
Recognition Based on Texture
Descriptors*

Lucas G. Helal, Diego Bertolini,
Yandre M. G. Costa,
George D. C. Cavalcanti,
Alceu S. Britto Jr.
and Luiz E. S. Oliveira

*Representation Learning
and Dissimilarity for Writer
Identification*

Luciana T. Menon, Israel A. Laurensi,
Manoel C. Penna, Luiz E. S. Oliveira
and Alceu S. Britto Jr.

*Data Augmentation and
Transfer Learning Applied to
Charcoal Image Classification*

15:10 – 15:30

Coffee Break

15:30 – 16:30 (Room A – Lipa)

Chair: Drago Žagar

KEYNOTE TALK II

Andrea Tonello

*Learning, Processing and
Communication in
Smart Energy Grids*



Wednesday, 5 June 2019

16:30 – 17:50 (Room A – Lipa)

Chairs:

Milan Bjelica, Krešimir Nenadić

SESSION 3:

**Image Processing for
Autonomous Driving**

Luis F. V. Silva, Danilo R. C. Bandeira
and Bruno M. Carvalho

*A Low-Budget Approach for
Vehicle Detection and Occlusion
Removal on Traffic Videos*

Max N. Roecker, Yandre M. G. Costa,
Alceu S. Britto Jr., Luiz E. S. Oliveira
and Diego Bertolini

*Vehicle Detection and
Classification in Traffic
Images Using ConvNets with
Constrained Resources*

Ivona Matoš, Zdravko Krpić and
Krešimir Romić

*The Speed Limit Road Signs
Recognition Using Hough
Transformation and Multi-Class
SVM*

Gustavo R. Valiati and David Menotti

*Detecting Pedestrians with
YOLOv3 and Semantic
Segmentation Infusion*

16:30 – 17:50 (Room B – Kesten)

Chairs:

Aura Conci, Irena Galić

SESSION 4:

**Biomedical Signal Processing
and Analysis I**

Corin F. Otesteanu

*Ultrasound Elastography:
Excitation Methods and Low-
Cost Alternative*

Lenin G. Falconí, María Pérez and
Wilbert G. Aguilar

*Transfer Learning in Breast
Mammogram Abnormalities
Classification with Mobilenet and
Nasnet*

Matej Kompanek, Martin Tamajka
and Wanda Benesova

*Volumetric Data Augmentation
as an Effective Tool in MRI
Classification Using 3D
Convolutional Neural Network
SVM*

Marija Habijan, Hrvoje Leventić, Irena
Galić and Danilo Babin

*Whole Heart Segmentation
from CT images Using 3D U-Net
Architecture*

18.30 – 20.00

GUIDED OSIJEK SIGHTSEEING

Meeting point:

Hotel Osijek, main entrance

20:00 – 22:00

WELCOME RECEPTION

Muzej Slavonije

Trg Svetog Trojstva 3



Thursday, 6 June 2019

8:30 – 15:00
Registration

9:00 – 10:40 (Room A - Lipa)

Chairs:

Gregor Rozinaj, Mario Muštra

SESSION 5:

**Networks and Wireless
Communications**

Samira Homayouni, Stefan Schwarz
and Markus Rupp

*Impact of SIR Estimation on
Feedback Reduction During
Heavy Crowd Events in 4G/5G
Networks*

Marko Malajner, Dušan Gleich and
Peter Planinšič

*Indoor AoA Estimation Using
Received Signal Strength
Parameter and a Support Vector
Machine*

Namir Škaljo, Alen Begović, Nermin
Goran and Emir Turajlić

*On Possibilities for
Improvements of xDSL
Troubleshooting Testing*

Irena Petrijevčanin Vuksanović
*Modeling an Interdependent
Concept of Cyber Security in
Croatian Digital Society*

Dušan Gleich, Bojan Gergič, Sofija
Temkova, Dimitar Gjorgjiev, Zivko
Kokolanski, Tomislav Shuminoski,
Srećko Simović, Matic Podobnik,
Zlatko Ruščić and Marijan Pavošević

*CORELA: Collaborative Learning
Platform with Integrated Remote
Laboratory Environment in VET*



9:00 – 10:40 (Room B – Kesten)

Chairs:

Aleksandra Pižurica, Irena Galić

SESSION 6:

Biomedical Signal Processing and Analysis II

Qiaoliang Li, Zhigang Yu, Suwen Qi, Zhuoying He, Shiyu Li and Huimin Guan

A Recognition Method of Urine Cast Based on Deep Learning

Suwen Qi, Tao Nie, Qiaoliang Li, Zhuoying He, Depeng Xu and Qiwen Chen

A Sperm Cell Tracking Recognition and Classification Method

Abhishek Verma, Piyush Singh and John S. R. Alex

Modified Convolutional Neural Network Architecture Analysis for Facial Emotion Recognition

Adriel Araújo, Juan Vieira, Eduardo Jandre, Aura Conci, Diego Passos, Vanessa Braganholo and José Viterbo

A Framework for Monitoring Patients with Alzheimer's and Other Dementias

Gustavo Z. Felipe, Rafael L. Aguiar, Yandre M. G. Costa, Carlos N. Silla Jr., Sheryl Brahnham, Loris Nanni and Shannon McMurtrey

Identification of Infants' Cry Motivation Using Spectrograms

10:40 – 11:00

Coffee Break

11:00 – 12:00 (Room A – Lipa)

Chair: Goran Martinović

KEYNOTE TALK III

Milan Bjelica

Deep Learning vs. Safety – Practical Approach and Platform Design Perspective

12:00 – 13:00

Lunch Break

13:00 – 14:00 (Room A – Lipa)

Chair: Kruno Miličević

INDUSTRY SESSION

Vinko Staković, Ericsson Nikola Tesla d.d. "Ericsson Nikola Tesla

– Innovation and Knowledge company"

Anamarija Čavka, Visage Technologies "Computer vision

– from an algorithm to a product".

14:00 – 15:00 (Room A – Lipa)

Chair: Kruno Miličević

TUTORIAL

Robert Cupec

Object Detection and Classification in 3D Point Clouds for Mobile Robot Manipulation

15:30 – 23:30

Excursion, Conference Dinner,

Awards Ceremony

Excursion by bus, meeting point: Hotel Osijek, main entrance

Friday, 7 June 2019

8:30 – 12:00
Registration

9:00 – 10:30 (Room A - Lipa)
Chair:
Marko Malajner, Zdravko Krpić

SESSION 7:
Signal Processing II

Corneliu Rusu
*Results in One-Dimensional
Discrete Phase Retrieval*

Raissa Likhonina
*QRD RLS Algorithm for
Hand Gesture Recognition
Applications*

Panagiotis Tsinganos,
Bruno Cornelis, Jan Cornelis,
Bart Jansen and
Athanassios Skodras
*A Hilbert Curve Based
Representation of sEMG Signals
for Gesture Recognition*

Bo Ram Cho, Sukgyu Koh, Jun-Kyu
Park, Chang-Hyun Kim
and Suwoong Lee
*Fundamental Experiment on
Relationship Between External
Force and Light Intensity in Soft
Tactile Sensor Using Sponge*

Hagai Barmatz, Dana Klein, Yoni
Vortman, Sivan Toledo
and Yizhar Lavner
*A Method for Automatic
Segmentation and Parameter
Estimation of Bird Vocalizations*

9:00 – 10:30 (Room B – Kesten)

Chair:

Carlos N. Silla Jr., Josip Job

SESSION 8:

Image Processing II

Deepak Anand, Goutham Ramakrishnan and Amit Sethi

Fast GPU-Enabled Color Normalization for Digital Pathology

Ali Alsam and Hans J. Rivertz

Colour to Grey by Maximum Signed Gradient

Filip Bajić, Josip Job and Krešimir Nenadić

Chart Classification Using Simplified VGG Mode

Vitor G. Marques, Luis R. D. da Silva, Bruno M. Carvalho, Leandson R. F. de Lucena and Marcela M. Vieira

Deep Learning-Based Pore Segmentation of Thin Rock Sections for Aquifer Characterization Using Space Color Reduction

Darwin Ttito, Rodolfo Quispe, Adín R. Rivera and Helio Pedrini

Where Are the People? A Multi-Stream Convolutional Neural Network for Crowd Counting via Density Map from Complex Images

10:30 – 11:00

Coffee Break

11:00 – 11:45 (Room A – Lipa)

Chair: Snježana Rimac-Drlje

KEYNOTE TALK IV

Gregor Rozinaj

Methodology and Technologies for Online Education

Friday, 7 June 2019

11:45 – 13:00 (Room A – Lipa)

Chair:

Goran Martinović, Ratko Grbić

SESSION 9:

Machine Learning

Delia Velasco-Montero, Jorge Fernández-Berni, Ricardo Carmona-Gátán and Ángel Rodríguez-Vázquez
On the Correlation of CNN Performance and Hardware Metrics for Visual Inference on a Low-Cost CPU-Based Platform

Martin Tamajka, Wanda Benesova and Matej Kompanek
Transforming Convolutional Neural Network to an Interpretable Classifier

Dongxue Lu, Guiling Sun, Zhouzhou Li and Yangyang Li
Sparse Signal Reconstruction Algorithm Based On Residual Descent

Dražen Bajec, Bruno Zorić, Mario Dudjak and Goran Martinović
Performance Analysis of SMOTE-Based Oversampling Techniques When Dealing with Data Imbalance

11:45 – 13:00 (Room B – Kesten)

Chair:

Hans J. Rivertz, Snježana Rimac-Drlje

SESSION 10:

Image and Video Processing

Mateusz Buczkowski and Ryszard Stasiński
Convolutional Neural Network-Based Image Distortion Classification

Yasutaka Matsuo
Inter Prediction Using Super-Resolved or Blurred Local-Decoded Picture in Each CU

Jelena Vlaović, Mario Vranješ, Dominik Grabić and Dragan Samardžija
Comparison of Objective Video Quality Assessment Methods on Videos with Different Spatial Resolutions

Sarah A. Carneiro, Gabriel P. Silva, Guilherme V. Leite, Ricardo Moreno, Silvio J. F. Guimarães and Helio Pedrini
Multi-Stream Deep Convolutional Network Using High-Level Features Applied to Fall Detection in Video Sequences

13:00 – 13:15 (Room A – Lipa)
CLOSING CEREMONY

13:15 – 14:00
Coffee and Light Lunch

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