

Virtual Conference



The 19th International Conference

**27-30**

**SEPTEMBER 2021**

28 - 30 September, Main Conference Event

27 September, Tutorials

Due to the COVID-19 global pandemic, CAIP 2021 will be held as a virtual conference. The Organizing Committee would like to thank you for your commitment and support and reassure you that they are dedicated to offering the best possible online experience to attendees.

**FINAL PROGRAM**

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## WELCOME

CAIP 2021 is the 19th in the CAIP series of biennial international conferences devoted to all aspects of computer vision, image analysis and processing, pattern recognition, and related fields. Previous conferences were held in Salerno, Ystad, Valletta, York, Seville, Münster, Vienna, Paris, etc, see following subsection.

The scientific program of the conference consists of plenary lectures and contributed papers presented in a single track. A total of 129 papers were submitted that were reviewed single blindly by at least two reviewers per paper. A total of 87 papers were accepted. The program features the presentation of these papers organized under the following 15 Sessions:

- SESSION 1: 3D Vision I
- SESSION 2: 3D Vision II
- SESSION 3: Biomedical Image and Pattern Analysis I: Segmentation
- SESSION 4: Biomedical Image and Pattern Analysis II: Segmentation and Classification
- SESSION 5: Biomedical Image and Pattern Analysis III: Disease Diagnosis
- SESSION 6: Deep Learning I: Classification
- SESSION 7: Deep Learning II: Classification
- SESSION 8: Deep Learning III: Image Processing and Analysis
- SESSION 9: Machine learning for image and pattern analysis
- SESSION 10: Feature Extraction
- SESSION 11: Object Recognition
- SESSION 12: Face and Gesture
- SESSION 13: Guess the Age Contest
- SESSION 14: Biometrics, Cryptography and Security
- SESSION 15: Segmentation and Image Restoration

Furthermore, CAIP 2021 features a contest on Guess The Age: Age Estimation From Facial Images with Deep Convolutional Neural Networks, organized by Antonio Greco, University of Salerno, Italy.

CAIP 2021 proceedings will be published by Springer Verlag's series Lecture Notes in Computer Science (LNCS).

In addition, CAIP 2021 program includes distinguished plenary keynote speakers from academia and the industry world who will share their insights and accomplishments as well as their vision for the future of the field. More specifically:

Keynote Lectures Session 1:	Deep Learning and Pattern Analysis
Keynote Lectures Session 2:	CYENS Centre of Excellence Keynote Session on Image and Pattern Analysis for Emerging Technologies
Keynote Lectures Session 3:	Industry Challenges in Meeting Emerging Markets in Image and Video Analysis

Moreover, CAIP 2021 includes three tutorials as follows:

Tutorial 1:	Discovering Patterns in the Road from Genotype to Phenotype
Tutorial 2:	Video Summarization for Unpaired Videos
Tutorial 3:	Large Scale Video Analytics

We want to express our deepest appreciation to all the members of the CAIP 2021 organizing committees and technical program committees, the associate editors, as well as all the reviewers for their dedication and hard work in creating an excellent scientific program. We want to thank all the authors who submitted their papers for presentation at the meeting, and all of you for being here to take part in CAIP 2021 and share your work.

Moreover, we would like to express our sincere thanks to Easy Conferences personnel and especially Christos Therapontos and formerly Kyriakos Kyriakou for their excellent and continuous support throughout the course of organizing this conference. In addition, we would like to express our sincere thanks to Elena Polycarpou for her excellent secretarial support.

Due to the COVID-19 global pandemic, CAIP 2021 will be held as a virtual conference. The Organizing Committee would like to thank you for your commitment and support and reassure you that they are dedicated to offering the best possible online experience to attendees.

We look forward to meeting you all during this exciting and memorable event!

### **General Chairs**

Constantinos S. Pattichis, *CYENS & University of Cyprus, Cyprus*

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Mario Vento, *University of Salerno, Italy*



## International Conference on Computer Analysis of Images and Patterns (CAIP)

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CAIP has been held biennially since 1985 as follows:

Nr/Year	Location	Dates	Chair(s)	Proceedings
<a href="#">18/2019</a>	Salerno, Italy	Sept 3-5	Mario Vento and Gennaro Percannella	<a href="#">LNCS 11678-11679</a>
<a href="#">17/2017</a>	Ystad, Sweden	Aug 22-24	Michael Felsberg, Anders Heyden, Norbert Krueger	<a href="#">LNCS 10424-10425</a>
<a href="#">16/2015</a>	Valletta, Malta	Sept 2-4	George Azzopardi and Nicolai Petkov	<a href="#">LNCS 9256-9257</a>
<a href="#">15/2013</a>	York, UK	Aug 27-29	Edwin Hancock, Adrian Bors, Will Smith, and Richard Wilson	<a href="#">LNCS 8047-8048</a>
<a href="#">14/2011</a>	Seville, Spain	Aug 29-31	Walter Kropatsch and Pedro Real Jurado	<a href="#">LNCS 6854-6855</a>
<a href="#">13/2009</a>	Münster, Germany	Sep 2-4	Xiaoyi Jiang and Nicolai Petkov	<a href="#">LNCS 5702</a>
<a href="#">12/2007</a>	Vienna, Austria	Aug 27-29	Walter Kropatsch and Martin Kampel	<a href="#">LNCS 4673</a>
<a href="#">11/2005</a>	Paris, France	Sep 5-8	André Gagalowicz	<a href="#">LNCS 3691</a>
<a href="#">10/2003</a>	Groningen, The Netherlands	Aug 25-27	Nicolai Petkov and Michel Westenberg	<a href="#">LNCS 2756</a>
<a href="#">9/2001</a>	Warsaw, Poland	Sep 5-7	Wladyslaw Skarbek	<a href="#">LNCS 2124</a>
<a href="#">8/1999</a>	Ljubljana, Slovenia	Sep 1-3	Franc Solina and Ales Leonardis	<a href="#">LNCS 1689</a>
<a href="#">7/1997</a>	Kiel, Germany	Sep 10-12	Gerald Sommer, Konstantinos Daniilidis and Josef Pauli	<a href="#">LNCS 1296</a>
<a href="#">6/1995</a>	Prague, Czech Republic	Sep 6-8	Václav Hlavác and Radim Sára	<a href="#">LNCS 970</a>
<a href="#">5/1993</a>	Budapest, Hungary	Sep 13-15	Dmitry Chetverikov and Walter Kropatsch	<a href="#">LNCS 719</a>
<a href="#">4/1991</a>	Dresden, Germany	Sep 17-19	Reinhard Klette	<a href="#">Akademie Verlag</a>
<a href="#">3/1989</a>	Leipzig, Germany	Sep 8-10	Klaus Voss, Dmitry Chetverikov and Gerald Sommer	<a href="#">Akademie Verlag</a>
<a href="#">2/1987</a>	Wismar, Germany	Sep 2-4	L. P. Iaroslavskii, Azriel Rosenfeld and Wolfgang Wilhelmi	<a href="#">Akademie Verlag</a>
<a href="#">1/1985</a>	Berlin, Germany	Oct 17-18	Reinhard Klette	<a href="#">Kammer der Technik</a>

# CAIP 2021 Tutorials

September 27<sup>th</sup>, 2021

**12:00 – 15:00 (CET)**

## **Tutorial 1:**

### **Discovering patterns in the road from genotype to phenotype**

“Bioinformatics approaches reveal network signatures towards biomarker and drug discovery”,

Prof. George M. Spyrou, *Bioinformatics Department, The Cyprus Institute of Neurology and Genetics*

“Criticality investigation in biological data and biomedical signals”,

Dr. George Minadakis, *Bioinformatics Department, The Cyprus Institute of Neurology and Genetics*

“EEG analysis approaches to discover patterns in sleep disorders”,

Dr. Myrto Stylianou, *Bioinformatics Department, The Cyprus Institute of Neurology and Genetics*

“Radiogenomics: connecting biomarkers with imaging markers towards a more comprehensive disease profiling”,

Sotiroula Afxenti, PhD candidate, *Cyprus School of Molecular Medicine (CSMM) at The Cyprus Institute of Neurology and Genetics*

**15:00 – 15:15 (CET)**

**BREAK**

**15:15 – 16:30 (CET)**

## **Tutorial 2:**

### **Video Summarization for Unpaired Videos**

Sinnu Susan Thomas, *Digital University Kerala (IIITMK), India*

**16:30 – 16:45 (CET)**

**BREAK**

**16:45 – 18:45 (CET)**

## **Tutorial 3: Large Scale Video Analytics**

Marios S. Pattichis, *University of New Mexico, USA*

Andreas Panayides, *University of Cyprus, Cyprus*

# CAIP 2021 Program at a Glance

## VIRTUAL CONFERENCE

TIME (CET)	TUESDAY 28 September 2021	WEDNESDAY 29 September 2021	THURSDAY 30 September 2021
12:00-13:00 (CET)	<b>3D Vision I</b> Chair: Torben Fetzner	<b>Deep Learning I: Classification</b> Chair: Stefan Becker	<b>Object Recognition</b> Chair: Estefanía Talavera Martínez
13:00-14:00 (CET)	<b>3D Vision II</b> Chair: Helder Oliveira	<b>Deep Learning II: Classification</b> Chair: Riccardo La Grassa	<b>Face and Gesture</b> Chair: Marios Pattichis
14:00-14:10 (CET)	BREAK		
14:10-15:40 (CET)	<b>Keynote Lectures Session 1: Deep Learning and Pattern Analysis</b>  Chairs: Constantinos S. Pattichis & Nicolai Petkov	<b>Invited Lectures Session 2: CYENS Centre of Excellence</b>  <b>Keynote Session on Image and Pattern Analysis for Emerging Technologies</b>  Chairs: Andreas Lanitis & Andreas Panayides	<b>Invited Lectures Session 3: Industry Challenges in Meeting Emerging Markets in Image and Video Analysis</b>  Chairs: Nicolas Tsapatsoulis & Theo Theodorides
15:40-15:50 (CET)	BREAK		
15:50-16:50 (CET)	<b>Biomedical image and pattern analysis I: Segmentation</b>  Chair: Efthymou Kyriacou	<b>Deep Learning III: Image Processing and Analysis</b>  Chair: George Azzopardi	<b>Guess the Age Contest</b>  Chair: Antonio Greco
16:50-17:50 (CET)	<b>Biomedical image and pattern analysis II: Segmentation and Classification</b>  Chair: Ümit Ince	<b>Machine learning for image and pattern analysis</b>  Chair: Andreas Kamilaris	<b>Biometrics, Cryprography and Security</b>  Chair: Rahma Abed
17:50-18:00 (CET)	BREAK		
18:00-19:00 (CET)	<b>Biomedical image and pattern analysis III: Disease Diagnosis</b>  Chair: Christos Loizou	<b>Feature Extraction</b> Chair: Baptiste Magnier	<b>Segmentation and Image Restoration</b> Chair: Vassilien Chizhov
19:00-19:15 (CET)	<b>Closing Ceremony Contest Awards</b>		

## Presentation Guidelines

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All paper presentation sessions have been allocated a 60 minutes slot for the presentation of 6 papers. Each paper has been allocated an 8 minutes slot for its presentation and 2 minutes for discussion. In each session, all papers will be firstly presented (i.e. first 48 minutes) and the last 12 minutes will be allocated for discussion.

Presenters will be required to upload their presentations to the submission system by the 20th of September. Please find below instructions for uploading your document:

- 1) To submit your file please Log in to our system <https://www.easyacademia.org/caip2021> and select the submission entry for which you want to submit your document.
- 2) Click on “upload presentation” on the “To-dos” column and follow the process for uploading your presentation.

**Accepted formats:** PowerPoint (.ppt) and PDF (.pdf).

September 28<sup>th</sup>, 2021

## Keynote Lectures Session 1: Deep Learning and Pattern Analysis

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### Chairs:

- Constantinos S. Pattichis, *CYENS Centre of Excellence & University of Cyprus*
- Nicolai Petkov, *Univ. of Groningen, Netherlands*

14.10 – 14.15 (CET)	Welcome Constantinos S. Pattichis, <i>CYENS Centre of Excellence &amp; University of Cyprus</i>  Nicolai Petkov, <i>Univ. of Groningen, Netherlands</i>
14.15 – 14.55 (CET)	“Biomedical Imaging Segmentation: from thresholding to deep learning based methods” João Manuel R. S. Tavares, <i>Faculdade de Engenharia da Universidade do Porto, Portugal</i>
14.55 – 15.35 (CET)	“If the brain is a very sparse network, why does deep learning use dense neural networks?” Constantine Dovrolis, <i>Computer Science, Georgia Institute of Technology, USA &amp; CYENS Centre of Excellence</i>
15.35 – 15.40 (CET)	Concluding Comments

**Prof. João Manuel R. S. Tavares**, *Faculdade de Engenharia da Universidade do Porto, Portugal*



**Short Biography:** João Manuel R. S. Tavares graduated in Mechanical Engineering at the Universidade do Porto, Portugal in 1992. He also earned his M.Sc. degree and Ph.D. degree in Electrical and Computer Engineering from the Universidade do Porto in 1995 and 2001, and attained his Habilitation in Mechanical Engineering in 2015. He is a senior researcher at the Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial (INEGI) and Full Professor at the Department of Mechanical Engineering (DEMec) of the Faculdade de Engenharia da Universidade do Porto (FEUP).

João Tavares is co-editor of more than 60 books, co-author of more than 50 book chapters, 650 articles in international and national journals and conferences, and 3 international and 3 national patents. He has been a committee member of several international and national journals and conferences, is co-founder and co-editor of the book series “Lecture Notes in Computational Vision and Biomechanics” published by Springer, founder and Editor-in-Chief of the journal “Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization” published by Taylor & Francis, Editor-in-Chief of the journal “Computer Methods in Biomechanics and Biomedical Engineering” published by Taylor & Francis, and co-founder and co-chair of the international conference series: ComplIMAGE, ECCOMAS VipIMAGE, ICCEBS and BioDental. Additionally, he has been (co-)supervisor of several MSc and PhD thesis and supervisor of several post-doc projects, and has participated in many scientific projects both as researcher and as scientific coordinator.

His main research areas include computational vision, medical imaging, computational mechanics, scientific visualization, human-computer interaction and new product development.

(More information can be found at: [www.fe.up.pt/~tavares](http://www.fe.up.pt/~tavares))

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**Presentation Title:**

Biomedical Imaging Segmentation: from thresholding to deep learning based methods

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**Abstract:**

The segmentation of biomedical images by computational methods is very challenging, and it is mostly undertaken using thresholding, deformable models built on statistical, geometrical or physical principles, and/or machine learning based approaches. Examples of current applications of segmentation methods include the identification of skin lesions, lungs, heart, prostate, liver, blood vessels, brain, ear, and related structures, just to name a few. In this lecture, algorithms that we have developed to segment images acquired using different biomedical imaging modalities will be described and their use in different applications discussed.



Short Biography: Dr. Constantine Dovrolis is a Professor at the School of Computer Science at the Georgia Institute of Technology (Georgia Tech). He is a graduate of the Technical University of Crete (Engr.Dipl. 1995), University of Rochester (M.S. 1996), and University of Wisconsin-Madison (Ph.D. 2000). His research combines Network Science, Data Mining and Machine Learning with applications in climate science, biology, neuroscience, sociology and machine learning. More recently, his group has been focusing on neuro-inspired architectures for machine learning based on what is currently known about the structure of brain networks.

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**Presentation Title:**

If the brain is a very sparse network, why does deep learning use dense neural networks?

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**Abstract:**

What we know from neuroscience (“connectomics”) is that the brain is, overall, a very sparse network with relatively small locally dense clusters of neurons. These topological properties are crucial for the brain’s ability to perform efficiently, robustly, and to process information in a hierarchically modular manner. On the other hand, the artificial neural networks we use today are very dense, or even fully connected, at least between successive layers. Additionally, it is well known that deep neural networks are highly over-parameterized: pruning studies have shown that it is often possible to eliminate 90% of the connections (weights) without significant loss in performance. Pruning, however, is typically performed after the dense network has been trained, which only improves the run-time efficiency of the inference process. The previous points suggest that we need methods to design sparse neural networks, without any training, that can perform almost as well as the corresponding dense networks after training. This talk will first provide some background in the pruning literature, either after training or before training. Then, we will present a recently proposed (ICML 2021) method called PHEW (Paths with Higher Edge Weights) which creates sparse neural networks, before training, and that can learn fast and generalize well. Additionally, PHEW does not require access to any data as it only depends on the initial weights and the topology of the given network architecture.

September 29<sup>th</sup>, 2021

## Keynote Lectures Session 2:

### CYENS Centre of Excellence Keynote Session on Image and Pattern Analysis for Emerging Technologies

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#### Chairs:

- Andreas Lanitis, *CYENS Centre of Excellence & Cyprus University of Technology*
- Andreas Panayides, *University of Cyprus*

14.10 – 14.15 (CET)	"CYENS Centre of Excellence" Yiorgos Chrysanthou, <i>CYENS Centre of Excellence &amp; University of Cyprus</i>
14.15 – 14.40 (CET)	"The effect of shape and illumination on material perception: model and applications" Karol Myszkowski, <i>Max-Planck-Institut für Informatik, Germany</i>
14.40 – 14.55 (CET)	"DgiStreamer the new way to develop and deploy your imaging/vision pipeline" Alessandro Artusi, <i>CYENS Centre of Excellence, Cyprus</i>
14.55 – 15.10 (CET)	"Observing and modeling the physical world during climatic emergency" Andreas Kamilaris, <i>CYENS Centre of Excellence, Cyprus</i>
15.10 – 15.25 (CET)	"Computer Vision in the Social World: On fairness and fairness perception in image tagging algorithms" Jahna Otterbacher, <i>CYENS Centre of Excellence &amp; Open University Cyprus, Cyprus</i>
15.25 – 15.40 (CET)	Panel Discussion





**Short Biography:** Yiorgos L. Chrysanthou is the Research Director of the Centre on Interactive Media, Smart Systems and emerging Technologies - CYENS Centre of Excellence. He is also a Professor at the Computer Science Department of the University of Cyprus. Yiorgos was educated in the UK (BSc and PhD from Queen Mary College, University of London) and worked for several years as a research fellow and a lecturer at University College London. He has published over 80 papers in journals and international conferences on computer graphics and virtual reality and is a co-author of the book "Computer Graphics and Virtual Environments: From Realism to Real-Time", (Addison-Wesley 2001+ China Machine Press 2004). Yiorgos serves as an associate editor for the Journals Computer Graphics Forum and Computers and Graphics, and review editor for Frontiers in Robotics and AI (Specialty Section Virtual Environments). He served as the local or overall coordinator of over 25 research projects, related his research interests, that lie in the general area of 3D Computer Graphics, recently focusing more on the development of algorithms for real-time AR and VR rendering, reconstruction of urban environments and computer animation.

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**Presentation Title:** CYENS Centre of Excellence

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**Short Biography:** Karol Myszkowski is a senior researcher at the MPI Informatik, Saarbruecken, Germany. In the period from 1993 till 2000 he served as an associate professor in the Department of Computer Software at the University of Aizu, Japan. In the period from 1986 till 1992 he worked for Integra, Inc. a Japan-based, company specialized in developing rendering and global illumination software. He

received his PhD (1991) and habilitation (2001) degrees in computer science from Warsaw University of Technology (Poland). In 2011 he was awarded with a lifetime professor title by the President of Poland. His research interests include global illumination and rendering, perception issues in graphics, high dynamic range imaging, and stereo 3D. He co-authored the book High Dynamic Range Imaging, and participated in various committees and editorial boards. He also chaired ACM SIGGRAPH Asia 2020, and co-chaired Rendering Symposium in 2001, ACM Symposium on Applied Perception in Graphics and Visualization in 2008, Spring Conference on Computer Graphics 2008, and Graphicon 2012.

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**Presentation Title:** The effect of shape and illumination on material perception: model and applications

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**Abstract:** Material appearance hinges on material reflectance properties but also surface geometry and illumination. The unlimited number of potential combinations between these factors makes understanding and predicting material appearance a very challenging task. In this work, we collect a large-scale dataset of perceptual ratings of appearance attributes with more than 215,680 responses for 42,120 distinct combinations of material, shape, and illumination. The goal of this dataset is twofold. First, we analyze for the first time the effects of illumination and geometry in material perception across such a large collection of varied appearances. We connect our findings to those of the literature, discussing how previous knowledge generalizes across very diverse materials, shapes, and illuminations. Second, we use the collected dataset to train a deep learning architecture for predicting perceptual attributes that correlate with human judgments. We demonstrate the consistent and robust behavior of our predictor in various challenging scenarios, which, for the first time, enables estimating perceived material attributes from general 2D images. Since the predictor relies on the final appearance in an image, it can compare appearance properties across different geometries and illumination conditions. Finally, we demonstrate several applications that use our predictor, including appearance reproduction using 3D printing, BRDF editing by integrating our predictor in a differentiable renderer, illumination design, or material recommendations for scene design.



**Short Biography:** Alessandro Artusi, PhD received a PhD in Computer Science from the Vienna University of Technology in 2004. He is currently the Managing Director of the DeepCamera group at CYENS (Cyprus). He has been active member of standardization committees such as JPEG and MPEG, as member of the IST/037 coding of picture, audio, multimedia and hypermedia information, of the British Standard Institute (BSI). He has been one of the Editors of the JPEG-XT standard for encoding High Dynamic Range content

and for this work he has been awarded with the prestigious BSI Award. Recently, he has joined, representing CYENS, as one of the funding members of Moving Picture, Audio and Data Coding by Artificial Intelligence (MPAI), a not-for-profit standards organization established in Geneva. He is the co-author of the CRC Press reference book on High Dynamic Range Technology 'Advanced High Dynamic Range Technology: Theory and Practice' 1st and 2nd edition and the author of CRC Press book 'Image Content Retargeting: Maintaining Tone, Color and Spatial Consistency'. His research interests include visual perception, image/video processing, computer graphics, High dynamic Range technology, objective/subjective imaging/video evaluation, deep-learning, computer vision and color science, with particular focus into the development and deployment of the next generation of imaging/video pipeline.

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**Presentation Title:** DgiStreamer the new way to develop and deploy your imaging/vision pipeline

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**Abstract:** Image/Video Processing and Computer Vision developers may deploy complex imaging/video pipelines through the usage of specialized SDKs/APIs such as gstreamer, which may also support deeplearning APIs such as deepstream. However, this process is tedious and time demanding especially when working with complex pipelines. DeepCamera group at CYENS has recently launched DgiStreamer, which it is a game-changing tool that helps computer vision and image/video processing researchers/developers to easily construct their imaging pipelines and deploy them with flexibility in mind into any system. DgiStreamer is built on top of the powerful multimedia framework gstreamer and the NVIDIA's deepstream SDK's. By combining the media streaming functionalities offered by the above SDK's, developers can now, with just a few clicks, visually generate their image/video pipelines, deploy them to any remote device and perform high-level machine learning tasks using state-of-the-art pre-trained models. In this talk, the philosophy behind DgiStreamer, its infrastructure, some user cases and the future features will be presented. This will give to the audience a well understanding of the potential and benefits provided by this innovative tool.



**Short Biography:** Andreas received the BA degree in Computer Science from University of Cyprus in 2007 and the MS degree in Distributed Systems from the ETH University of Zurich, Switzerland in 2009. He performed his PhD at the University of Cyprus, focusing on the topic of "Enabling Smart Homes using Web Technologies" at the Computer Science department. During this time, he co-founded Elevate-Me Promotions, which was the first company that brought to Cyprus the radical-new concept of elevator advertising. After his PhD, Andreas performed postdoc research at the National University of Singapore, (studying techniques for reducing the ICT-based plug loads in offices and commercial buildings), at the University of Cyprus (project manager of the Social Electricity Online Platform European project), and at the Insight Centre for Data Analytics of the National University of Ireland (research related to real-time Internet-of-Things stream processing and large-scale data analytics for smart city applications). Andreas received a Marie Skłodowska-Curie fellowship in 2016, working at the Institute of Agriculture and Food Research and Technology (IRTA Barcelona), through the European P-SPHERE project, collaborating with the Autonomous University of Barcelona, performing research on big data analysis and applications in the agri-food sector. By April 2018, he has been working as an Assistant Professor at the Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS) of the University of Twente, the Netherlands. By October 2019, he is the leader of the SuPerWorld MRG at CYENS Centre of Excellence. During his career, Andreas has published more than 60 research papers, has received several awards and has co-founded three start-ups.

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**Presentation Title:** Observing and modeling the physical world during climatic emergency

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**Abstract:** Climatic emergency requires actions leading to the protection of the earth's important biospheres, such as forests, wetlands and oceans, protecting biodiversity and avoiding or reducing pollution. Large-scale monitoring of biospheres is important and can be achieved by combining various technologies such as IoT and remote sensing, as well as techniques such as computer vision and geospatial analysis. At the Pervasive Real-World Computing for Sustainability (SuPerWorld) research group, we combine these technologies together to observe and model the physical world, providing guidelines and advice at policy-level for environmental conservation. In this talk, we show examples of performing census of endangered species, detecting invasive tree species in forests and illegal dumping in cities, creating land cover, digital surface and land change maps, as well as performing nutrient management in agricultural fields. Finally, we demonstrate how mobile phone computing can assist humans in disasters, considering COVID-19 pandemic and wildfires.



**Short Biography:** Jahna Otterbacher received her doctorate from the University of Michigan (Ann Arbor, USA), School of Information. She is currently Associate Professor at the Open University of Cyprus (OUC), School of Pure and Applied Sciences. Jahna coordinates the Cyprus Center for Algorithmic Transparency (CyCAT) at the OUC, funded by the H2020 Widespread Twinning program. The CyCAT seeks to promote transparency and accountability in algorithmic systems that people routinely use, but that are rather opaque to them, through three types of interventions – data-, developer- and user-focused. In addition to her post at the OUC, Jahna holds a concurrent appointment as team leader of the Transparency in Algorithms Group at CYENS, a new center of excellence and innovation in Nicosia, Cyprus, in collaboration with two international Advanced Partners, UCL and MPI.

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**Presentation Title:** Computer Vision in the Social World: On fairness and fairness perception in image tagging algorithms

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**Abstract:** Automated image tagging is proving to be a boon to applications where user modeling, personalization and adaptation are required. From e-stores, where image recognition is used to curate a “personal style” for a shopper based on previously viewed items, to dating apps, which can now act as “visual matchmakers,” the technology has gained increasing influence in our digital interactions. However, most models remain black boxes, with many social and ethical issues surrounding their use in contexts where people can be harmed. In this talk, I discuss our work in analyzing proprietary image tagging services (e.g., Clarifai, Google Vision, Amazon Rekognition) for possible gender and racial biases when tagging images of people. I will present our techniques for discrimination discovery in this domain, as well as our work on understanding users’ perceptions of fairness. Finally, I summarize key findings thus far, taking into consideration the larger socio-technical picture of how these services are used by third party developers

September 30<sup>th</sup>, 2021

### Keynote Lectures Session 3:

## Industry Challenges in Meeting Emerging Markets in Image and Video Analysis

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#### Chairs:

- Nicolas Tsapatsoulis, *Cyprus University of Technology, Cyprus*
- Theo Theocharides, *KIOS & University of Cyprus, Cyprus*

14.10 – 14.15 (CET)	Welcome Nicolas Tsapatsoulis, <i>Cyprus University of Technology, Cyprus</i>
14.15 – 14.25 (CET)	Earth Observation & 5G for Cultural Heritage Vasiliki (Betty) Charalampopoulou, <i>GEOMATICS (Cyprus) Ltd</i>
14.25– 14.35 (CET)	Computer Vision techniques in critical engineering infrastructures Anastasios Doulamis, <i>National Technical University of Athens, Greece</i>
14.35 – 14.45 (CET)	Embedded Image Processing for Industrial Applications Anastasis Kounoudes, <i>SignalGeneriX, Cyprus</i>
14.45 - 14.55 (CET)	Developing Industrial Methods for Large-scale Video Analysis: Some Lessons Learned Marios Pattichis, <i>University of New Mexico, USA</i>
14.55 – 15.40 (CET)	Panel Discussion: Industry Challenges in Meeting Emerging Markets in Image and Video Analysis



## Session Speakers/Panellists

### Earth Observation & 5G for Cultural Heritage

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Vasiliki (Betty) Charalampopoulou, *GEOMATICS (Cyprus) Ltd*



Vasiliki (Betty) Charalampopoulou is the Director of GEOMATICS (Cyprus) Ltd and CEO and President of GEOSYSTEMS HELLAS S.A. in which is co-founder and also acts as channel head incremental sales for R & D and H2020 calls, lead in an international environment. She has performed a 150k project with airborne LiDAR coverage and processing services for new road construction. Has performed a detailed study in collaboration with the Oceanographic

Centre for the evaluation of the waves energy of the Cypriot AOZ. Has being the Project Manager for Earth Observation under the ESA Contract No. 4000xxxxxx/19/NL/SC-FEASIBILITY STUDY OF CYPRUS SPACE SECTOR DEVELOPMENT-Cyprus space sector dEvelopment Study (CERES). She is also performing as Project Manager for the YADES: H2020-MSCA-RISE-2019 for the risk analysis of archaeological sites using EO monitoring and artificial intelligence & ESA Contract No. xxx Monitoring CypRus ecOnomy by Space (MICROS).

### Computer Vision techniques in critical engineering infrastructures

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Anastasios Doulamis, *National Technical University of Athens, Greece*



Prof. Anastasios Doulamis (M) has received the Diploma degree in Electrical and Computer Engineering from the National Technical University of Athens (NTUA) with the highest honor and the PhD degree in Electrical and Computer Engineering from NTUA. He is currently Associate Professor at the NTUA, while he has served as associate professor at the Technical University of Crete. Prof. Anastasios Doulamis has received several awards and prizes during his studies, including the Best Greek Student in all fields of engineering in national level, the Best Graduate Thesis Award in the

area of Electrical Engineering and several prizes from the National Technical University of Athens, the National Scholarship Foundation and the Technical Chamber of Greece. In 1997, he was given the NTUA Medal as Best Young Engineer. He is the author of more than 450 papers in the area of computer vision, image analysis, deep learning and multimedia. He also has about 7,000 citations in the respective field. Prof. Anastasios Doulamis is the coordinator of H2020 HEART project and served as coordinator of H2020 TERPSICHORE. He is involved in numerous H2020 projects such as euPOLIS, Heron, Incisive, Stamina, YADES, Hyperion, etc.

## Embedded Image Processing for Industrial Applications

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Anastasis Kounoudes, *SignalGeneriX, Cyprus*



Dr. Tasos Kounoudes holds a PhD in Signal Processing and Telecommunications from Imperial College, UK and an M.Eng. in Computer Engineering and Informatics from University of Patras, Greece. He is the co-founder and the Chief Executive Officer of SignalGeneriX, a leading Cypriot technology company which focuses on the design and development of innovative technologies and high-end electronics systems for a wide range of Industries. He has more than twenty years of industrial experience in the development of innovative products and extensive experience in developing and implementing multimillion-euro R&D projects at a European and National level. Dr. Kounoudes is the author of three International patents and the author/co-author of more than sixty scientific publications including book chapters, peer reviewed journal papers and international conference papers in his domain of expertise.

## Developing Industrial Methods for Large-scale Video Analysis: Some Lessons Learned

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Marios Pattichis, *University of New Mexico, USA*



Marios S. Pattichis is a Professor of Electrical and Computer Engineering at the University of New Mexico. He has received 10 patents on image and video processing methods that range from the computation of image and video representations, biomedical image analysis, the computation of 2D convolutions and cross-correlations on FPGAs and GPUs, and adaptive control of rate, quality and computational complexity for video coding and delivery. His patents and software are currently been used by a small number of companies working in Biomedical image and video analysis and delivery. He is currently serving as a Senior Associate Editor of the IEEE Transactions on Image Processing and a lead guest-editor of a special issue on "Large scale video analytics for clinical decision support," to be published by the IEEE Biomedical and Health Informatics. He received his B.Sc. in Computer Sciences with high honors and special honors, the B.A. in Mathematics with high honors, the M.Sc. in Electrical Engineering, and the Ph.D. in Computer Engineering, all from the University of Texas at Austin.



# CAIP 2021 Detailed Program

Monday 27 September 2021

## Tutorial 1: Discovering patterns in the road from genotype to phenotype

12:00 – 15:00 (CET)

**“Bioinformatics approaches reveal network signatures towards biomarker and drug discovery”**

*Prof. George M. Spyrou, Bioinformatics Department, The Cyprus Institute of Neurology and Genetics*

**“Criticality investigation in biological data and biomedical signals”**

*Dr. George Minadakis, Bioinformatics Department, The Cyprus Institute of Neurology and Genetics*

**“EEG analysis approaches to discover patterns in sleep disorders”**

*Dr. Myrto Stylianou, Bioinformatics Department, The Cyprus Institute of Neurology and Genetics*

**“Radiogenomics: connecting biomarkers with imaging markers towards a more comprehensive disease profiling”**

*Sotiroula Afxenti, PhD candidate, Cyprus School of Molecular Medicine (CSMM) at The Cyprus Institute of Neurology and Genetics*

### BREAK

15:00 – 15:15 (CET)

## Tutorial 2: Video Summarization for Unpaired Videos

15:15 – 16:30 (CET)

*Sinnu Susan Thomas, Digital University Kerala (IIITMK), India*

### BREAK

16:30 – 16:45 (CET)

## Tutorial 3: Large Scale Video Analytics

16:45 – 18:45 (CET)

*Marios S. Pattichis, University of New Mexico, USA*

*Andreas Panayides, University of Cyprus, Cyprus*

Tuesday 28 September 2021

## 3D Vision I

12:00 – 13:00 (CET)

Chair: Torben Fetzer

**Simultaneous Bi-Directional Structured Light Encoding for Practical Uncalibrated Profilometry**

*Torben Fetzer, Gerd Reis, Didier Stricker*

**Joint Global ICP for Improved Automatic Alignment of Full Turn Object Scans**

*Torben Fetzer, Gerd Reis, Didier Stricker*

**Fast Projector-Driven Structured Light Matching in Sub-Pixel Accuracy using Bilinear Interpolation Assumption**

*Torben Fetzner, Gerd Reis, Didier Stricker*

**Pyramidal Layered Scene Inference with Image Outpainting for Monocular View Synthesis**

*Marcos Souza, Jhonatas Conceição, Jose Flores-Campana, Luis Decker, Diogo Luvizon, Gustavo Carvalho, Helena Maia, Helio Pedrini*

**Out of the Box: Embodied Navigation in the Real World**

*Roberto Bigazzi, Federico Landi, Marcella Cornia, Silvia Cascianelli, Lorenzo Baraldi, Rita Cucchiara*

**3D Vision II**

13:00 – 14:00 (CET)

Chair: Helder Oliveira

**Toward a novel LSB-based collusion-secure fingerprinting schema for 3D video**

*Karama Abdelhedi, Faten Chaabane, William Puech, Chokri BenAmar*

**A Combinatorial Coordinate System for the Vertices in the Octagonal  $\mathbb{Z}_4\mathbb{Z}_8$  Grid**

*Lidija Comic*

**Bilingual Speech Recognition by Estimating Speaker Geometry from Video Data**

*Luis Sanchez Tapia, Antonio Gomez, Mario Esparza, Venkatesh Jatla, Marios Pattichis, Sylvia Celedon-Pattichis, Carlos LopezLeiva*

**Cost-efficient Color Correction Approach on Uncontrolled Lighting Conditions**

*Pedro H. Carvalho, Inês Rocha, Fábio Azevedo, Patrícia S. Peixoto, Marcela A. Segundo, Hélder P. Oliveira*

**HPA-Net: Hierarchical and Parallel Aggregation Network for Context Learning in Stereo Matching**

*Wei Chen, Jun Peng, Ziyu Zhu, Yong Zhao*

**MTStereo 2.0: accurate stereo depth estimation via Max-tree matching**

*Rafael Brandt, Nicola Strisciuglio, Nicolai Petkov*

**BREAK**

14:00 – 14:10 (CET)

**KEYNOTE LECTURES**

14:10 – 15:40 (CET)

Chair: Constantinos Pattichis

**Welcome (14:10 - 14:15)**

*Constantinos S. Pattichis, CYENS Centre of Excellence & University of Cyprus*

**Biomedical Imaging Segmentation: from thresholding to deep learning based methods (14:15 - 14:55)**

*João Manuel R. S. Tavares - Faculdade de Engenharia da Universidade do Porto, Portugal*

**If the brain is a very sparse network, why does deep learning use dense neural networks? (14:55 - 15:35)**

*Constantine Dovrolis, Computer Science, Georgia Institute of Technology, US*

**Concluding Comments (15:35 - 15:40)**

**BREAK**

15:40 – 15:50 (CET)

**Biomedical image and pattern analysis I: Segmentation**

15:50 – 16:50 (CET)

Chair: Efthymou Kyriacou

**H-OCS: A Hybrid Optic Cup Segmentation of Retinal Images**

*Abdullah Sarhan, Jon Rokne, Reda Alhajj*

**Retinal Vessel Segmentation using Blending-based Conditional Generative Adversarial Networks**

*Suraj Saxena, Sharad Joshi, Kanhaiya Lal*

**U-shaped densely connected Convolutions for Left ventricle segmentation from CMR images**

*Khoulood Boukhris, Asma Ben Abdallah, Ramzi Mahmoudi, Mabrouk AbdelAli, Badii Hmida, Mohamed Hédi Bedoui*

**Deep Learning approaches for Head and Operculum Segmentation in Zebrafish Microscopy Images**

*Navdeep Kumar, Alessio Carletti, Paulo Gavaia, Marc Muller, Leonor Cancela, Pierre Geurts, Raphael Maree*

**Shape Analysis Approach towards Assessment of Cleft Lip Repair Outcome**

*Paul Bakaki, Bruce Richard, Ella Pereira, Aristides Tagalakakis, Andy Ness, Yonghuai Liu*

**MMEC: Multi-Modal Ensemble Classifier for Protein Secondary Structure Prediction**

*Gabriel Bianchin de Oliveira, Helio Pedrini, Zanoni Dias*

**Biomedical image and pattern analysis II: Segmentation and Classification**

16:00 – 17:50 (CET)

Chair: Ümit Ince

**Patch-level Nuclear Pleomorphism Scoring using Convolutional Neural Networks**

*Leonardo O. IHEME, Gizem Solmaz, Fatma Tokat, Serkan Çayır, Engin Bozaba, Çisem Yazıcı, Gülşah Özsoy, Samet Ayaltı, Cavit Kerem Kayhan, Ümit Ince*

**Automatic Myelofibrosis Grading from Silver-Stained Images**

*Lorenzo Putzu, Maxim Untesco, Giorgio Fumera*

**A deep learning-based pipeline for celiac disease diagnosis using histopathological images**

*Farhad Maleki, Kevin Cote, Keyhan Najafian, Katie Ovens, Yan Miao, Rita Zakarian, Caroline Reinhold, Zu-hua Gao, Reza Forghani, Peter Savadjiev*

**HEp-2 Cell Image Recognition with Transferable Cross-Dataset Synthetic Samples**

*Tomas Majtner*

**Clinically Guided Trainable Soft Attention for Early Detection of Oral Cancer**

*Roshan Welikala, Paolo Remagnino, Jian Han Lim, Chee Seng Chan, Senthilmani Rajendran, Thomas Kallarakkal, Rosnah Zain, Ruwan Jayasinghe, Jyotsna Rimal, Alexander Kerr, Rahmi Amtha, Karthikeya Patil, Wanninayake Tilakaratne, Sok Ching Cheong, Sarah Barman*

**Small and Large Bile Ducts Intrahepatic Cholangiocarcinoma Classification: a Preliminary Feature-Based Study**

*Chiara Losquadro, Silvia Conforto, Maurizio Schmid, Gaetano Giunta, Marco Rengo, Vincenzo Cardinale, Guido Carpino, Andrea Laghi, Ana Lleo, Riccardo Muglia, Ezio Lanza, Guido Torzilli*

**BREAK**

17:50 – 18:00 (CET)

**Biomedical image and pattern analysis III: Disease Diagnosis**

18:00 – 19:00 (CET)

Chair: Christos Loizou

**Breast Cancer Brain Metastasis: Automated MRI Image Analysis for the Prediction of Primary Cancer Using Radiomics**

*Vangelis Tzardis, Efthymou Kyriacou, Christos P Loizou, Anastasia Constantinidou*

**An Adaptive Semi-Automated Integrated System for Multiple Sclerosis Lesion Segmentation in Longitudinal MRI Scans Based on a Convolutional Neural Network**

*Andreas Georgiou, Christos Loizou, Andria Nicolaou, Marios Pantzaris, Constantinos Pattichis*

**A Three-Dimensional Reconstruction Integrated System for Brain Multiple Sclerosis Lesions**

*Charalambos Gregoriou, Christos P. Loizou, Andreas Georgiou, Marios Pantzaris, Costandinos S. Pattichis*

**Rule Extraction in the Assessment of Brain MRI Lesions in Multiple Sclerosis: Preliminary Findings**

*Andria Nicolaou, Constantinos S. Pattichis, Christos P. Loizou, Marios Pantzaris, Antonis Kakas*

**Invariant Moments, Textural and Deep features for Diagnostic MR and CT Image Retrieval**

*Lorenzo Putzu, Andrea Loddo, Cecilia Di Ruberto*

**Toward multiwavelet Haar-Schauder entropy for biomedical signal reconstruction**

*Wafa Belhaj Khalifa, Malika Jallouli, Anouar Ben Mabrouk, Mohamed Ali Mahjoub*

Wednesday 29 September 2021

**Deep Learning I: Classification**

12:00 – 13:00 (CET)

Chair: Stefan Becker

**Handling Missing Observations with an RNN-based Prediction-Update Cycle**

*Stefan Becker, Ronny Hug, Wolfgang Hübner, Michael Arens, Brendan Tran Morris*

**eGAN: Unsupervised approach to class imbalance using transfer learning**

*Ademola Okerinde, Lior Shamir, William Hsu, Tom Theis, Nasik Nafi*

**Progressive Contextual Excitation for Smart Farming Application**

*Chia-Hung Bai, Setya Widyawan Prakosa, He-Yen Hsieh, Jenq-Shiou Leu, Wen-Hsien Fang*

**Fine-Grained Image Classification for Pollen Grain Microscope Images**

*Francesca Trenta, Alessandro Ortis, Sebastiano Battiato*

**Adaptive Style Transfer Using SISR**

*Anindita Das, Prithwish Sen, Nilkanta Sahu*

**Object-Centric Anomaly Detection using Memory Augmentation**

*Jacob Dueholm, Kamal Nasrollahi, Thomas Moeslund*

**Deep Learning II: Classification**

13:00 – 14:00 (CET)

Chair: Ricardo La Grassa

**Document Language Classification : Hierarchical Model With Deep Learning Approach**

*Sarathi Shah, Manjunath Joshi*

**Parsing Digitized Vietnamese Paper Documents**

*Linh Truong Dieu, Thuan Trong Nguyen, Nguyen D. Vo, Tam V. Nguyen, Khang Nguyen*

**EnGraf-Net: Multiple Granularity Branch Network with Fine-Coarse Graft Grained for Classification Task**

*Riccardo La Grassa, Ignazio Gallo, Nicola Landro*

**When Deep Learners Change Their Mind: Learning Dynamics for Active Learning**

*Javad Zolfaghari Bengar, Bogdan Raducanu, Joost van de Weijer*

**Learning to Navigate in the Gaussian Mixture Surface**

*Riccardo La Grassa, Ignazio Gallo, calogero vetro, Nicola Landro*

**A Deep Hybrid Approach For Hate Speech Analysis**

*Vipul Shah, Sandeep Udmale, Vijay Sambhe, Amey Bhole*

**BREAK**

14:00 – 14:10 (CET)

**CYENS Special Session**

14:10 – 15:40 (CET)

Chair: Andreas Lanitis

**CYENS Centre of Excellence (14:10 - 14:15)**

*Yiorgos Chrysanthou - CYENS Centre of Excellence & University of Cyprus*

**The effect of shape and illumination on material perception: model and applications (14:15 - 14:40)**

*Karol Myszkowski - Max-Planck-Institut für Informatik*

**DgiStreamer the new way to develop and deploy your imaging/vision pipeline (14:40 - 14:55)**

*Alessandro Artusi - CYENS Centre of Excellence*

**Observing and modeling the physical world during climatic emergency (14:55 - 15:10)**

*Andreas Kamilaris - CYENS Centre of Excellence*

**Computer Vision in the Social World: On fairness and fairness perception in image tagging algorithms (15:10 - 15:25)**

*Jahna Otterbacher, CYENS Centre of Excellence & Open University Cyprus*

**Panel Discussion (15:25 - 15:40)**

**BREAK**

15:40 – 15:50 (CET)

**Deep Learning III: Image Processing and Analysis**

15:50 – 16:50 (CET)

Chair: George Azzopardi

**On improving generalization of CNN-based image classification with delineation maps using the CORF push-pull inhibition operator**

*Guru Swaroop Bennabhaktula, Joey Antonisse, George Azzopardi*

**Fast Hand Detection in Collaborative Learning Environments**

*Sravani Teeparthi, Venkatesh Jatla, Marios Pattichis, Sylvia Celedon-Pattichis, Carlos Lopez Leiva*

**Assessing the Role of Boundary-level Objectives in Indoor Semantic Segmentation**

*Roberto Amoroso, Lorenzo Baraldi, Rita Cucchiara*

**Skin lesion classification using convolutional neural networks based on Multi-Features Extraction**

*Samia Benyahia, Boudjelal Meftah, Olivier Lézoray*

**Recursively Refined R-CNN: Instance Segmentation with Self-RoI Rebalancing**

*Leonardo Rossi, Akbar Karimi, Andrea Prati*

**Layer-wise Relevance Propagation based Sample Condensation for Kernel Machines**

*Daniel Winter, Ang Bian, Xiaoyi Jiang*

**Machine learning for image and pattern analysis**

16:00 – 17:50 (CET)

Chair: Andreas Kamilaris

**Deep Learning Based Automated Vickers Hardness Measurement**

*Ehsaneddin Jalilian, Andreas Uhl*

**ElasticHash: Semantic Image Similarity Search by Deep Hashing with Elasticsearch**

*Nikolaus Korfhage, Markus Mühling, Bernd Freisleben*

**Land Use Change Detection Using Deep Siamese Neural Networks and Weakly Supervised Learning**

*Indrajit Kalita, Savvas Karatsiolis, Andreas Kamilaris*

**AMI-Class: Towards a Fully Automated Multi-view Image Classifier**  
*Mahmoud Jarraya, Maher Marwani, Gianmarco Aversano, Ichraf Lahouli, Sabri Skhiri*  
**How realistic should synthetic images be for training crowd counting models?**  
*Emanuele Ledda, Lorenzo Putzu, Rita Delussu, Andrea Loddo, Giorgio Fumera*  
**Unsupervised Recognition of the logical structure of Business Documents based on Spatial Relationships**  
*Louisa kessi, Frank Lebourgeois, Christophe Garcia*

#### BREAK

17:50 – 18:00 (CET)

#### Feature Extraction

18:00 – 19:00 (CET)

Chair: Baptiste Magnier

**The method for adaptive material classification and pseudo-coloring of the baggage X-ray images.**

*Krzysztof Dmitruk, Marcin Denkowski, Paweł Mikołajczak, Emil Benedykciuk*

**Sampling of Non-flat Morphology for Grey Value Images**

*Vivek Sridhar, Michael Breuss*

**A Multi-Scale Line Feature Detection Using Second Order Semi-Gaussian Filters**

*Baptiste Magnier, Ghulam-Sakhi Shokouh, Binbin Xu, Philippe Montesinos*

**Experimental analysis of Appearance Maps as Descriptor Manifolds approximations**

*Alberto Jaenal, Francisco-Angel Moreno, Javier Gonzalez-Jimenez*

**Building Hierarchical Tree Representations Using Homological-Based Tools**

*Fernando Díaz-del-Río, Pablo Sánchez-Cuevas, Helena Molina-Abril, Pedro Real, María José Morón-Fernández*

**Face verification in practice: The case of Greek artist Leonidas Arniotis**

*Nicolas Tsapatsoulis, Katerina Diakoumopoulou*

Thursday 30 September 2021

#### Object Recognition

12:00 – 13:00 (CET)

Chair: Estefania Talavera Martinez

**Spatio-temporal object detection from UAV on board cameras**

*Daniel Cores, Víctor M. Brea, Manuel Mucientes*

**Automatic Watermeter Reading in Presence of Highly Deformed Digits**

*Ashkan Mansouri Yarahmadi, Michael breuss*

**HR-Crime: Human-Related Anomaly Detection in Surveillance Videos**

*Kayleigh Boekhoudt, Alina Matei, Maya Aghaei, Estefanía Talavera*

**Sequence-based Recognition of License Plates with Severe Out-of-Distribution Degradations**

*Denise Moussa, Anatol Maier, Franziska Schirrmacher, Christian Rieß*

**Exploiting Spatio-Temporal Coherence for Video Object Detection in Robotics**

*David Fernandez-Chaves, J. Luis Matez-Bandera, J. Raul Ruiz-Sarmiento, Javier Monroy, Nicolai Petkov, Javier Gonzalez-Jimenez*

#### Face and Gesture

13:00 – 14:00 (CET)

Chair: Marios Pattichis

**A Study of General Data Improvement for Large-Angle Head Pose Estimation**

*Jue Bai, Chenglei Peng, Zhaoxu Li, Sidan Du, Yang Li*

**Knight Tour Patterns: Novel Handcrafted Feature Descriptors for Facial Expression Recognition**

*Mukku Nisanth Kartheek, Rapolu Madhuri, Munaga V. N. K. Prasad, Raju Bhukya*

**Exploiting visual context to identify people in TV programs**

*Thomas Petit, Pierre Letessier, Stefan Duffner, Christophe Garcia*

**Foreground-guided Facial Inpainting with Fidelity Preservation**

*Jireh Jam, Connah Kendrick, Vincent Drouard, Kevin Walker, Moi Hoon Yap*

**Talking Detection In Collaborative Learning Environments**

*Wenjing Shi, Marios Pattichis, Sylvia Celedon-Pattichis, Carlos Lopez-Leiva*

**Facial Recognition in Collaborative Learning Videos**

*Phuong Tran, Marios Pattichis, Sylvia Celedon-Pattichis, Carlos Lopez-Leiva*

**BREAK**

14:00 – 14:10 (CET)

**Industry Session: Industry Challenges in Meeting Emerging Markets in Image and Video Analysis**

14:10 – 15:40 (CET)

Chair: *Nicolas Tsapatsoulis*

**Welcome (14:10 - 14:15)**

*Nicolas Tsapatsoulis*

**Earth Observation & 5G for Cultural Heritage (14:15 - 14:25)**

*Vasiliki (Betty) Charalampopoulou*

**Computer Vision techniques in critical engineering infrastructures (14:25 - 14:35)**

*Anastasios Doulamis*

**Embedded Image Processing for Industrial Applications (14:35 - 14:45)**

*Anastasis Kounoudes*

**Developing Industrial Methods for Large-scale Video Analysis: Some Lessons Learned (14:45 - 14:55)**

*Marios Pattichis*

**Panel Discussion - Industry Challenges in Meeting Emerging Markets in Image and Video Analysis (14:55 - 15:40)**

**BREAK**

15:40 – 15:50 (CET)

**Guess the Age Contest**

15:50 – 16:50 (CET)

Chair: *Antonio Greco*

**Guess The Age Contest: Age Estimation From Facial Images with Deep Convolutional Neural Networks**

*Antonio Greco*

**Real-Time Age Estimation From Facial Images Using YOLO and EfficientNet**

*Giovanna Castellano, Berardina De Carolis, Nicola Marvulli, Mauro Sciancalepore, Gennaro Vessio*

**Single View Facial Age Estimation Using Deep Learning with Cascading Random Forests**

*Imad Eddine Toubal, Linqun Lyu, Dan Lin, Kannappan Palaniappan*

**Age-Style Augmentation for Facial Age Estimation**

*Yu Hong Lin, Gee-Sern Hsu, Chia-Hao Tang, Zhi-Ting Chen, Md Shopon, Marina Gavrilova*

**LAE : Long-tailed Age Estimation**



## Biometrics, Cryptography and Security

16:00 – 17:50 (CET)

Chair: Rahma Abed

**Toward a robust shape and texture face descriptor for efficient face recognition in the wild**

*Rahma Abed*

**Automatic Gender Classification from Handwritten Images: a Case Study**

*Irina Rabaev, Marina Litvak, Sean Asulin, Or Haim Tabibi*

**Learning to Read L'Infinito: Handwritten Text Recognition with Synthetic Training Data**

*Silvia Cascianelli, Marcella Cornia, Lorenzo Baraldi, Maria Ludovica Piazzzi, Rosiana Schiuma, Rita Cucchiara*

**Robust watermarking approach for 3D multiresolution meshes based on multi-wavelet transform, SHA512 and turbocodes**

*Malika Jallouli, Ikbel Sayahi, Anouar Ben Mabrouk, Mohamed Ali Mahjoub, Chokri Ben Amar*

**A spherical harmonics-LSB-quantification adaptive watermarking approach for 3D multiresolution meshes security**

*Ikbel Sayahi, Malika Jallouli, Anouar Ben Mabrouk, Chokri Ben Amar, Mohamed Ali Mahjoub*

**Authentication of Vincent van Gogh's Work**

*Lucas David, Helio Pedrini, Zanoni Dias, Anderson Rocha*

## BREAK

17:50 – 18:00 (CET)

## Segmentation and Image Restoration

18:00 – 19:00 (CET)

Chair: Vassillen Chizhov

**Anisotropic Diffusion-Based Enhancement of Scene Segmentation with Instance Labels**

*Ioannis Kleitsiotis, Ioannis Mariolis, Dimitrios Giakoumis, Spiridon Likothanassis, Dimitrios Tzovaras*

**Jigsaw Puzzle Solving as a Consistent Labeling Problem**

*Marina Khoroshiltseva, Ben Vardi, Alessandro Torcinovich, Arianna Traviglia, Ohad Ben-Shahar, Marcello Pelillo*

**Single-Loss Multi-Task Learning For Improving Semantic Segmentation Using Super-Resolution**

*Andreas Aakerberg, Anders Skaarup Johansen, Kamal Nasrollahi, Thomas Baltzer Moeslund*

**Deep Fisher Score Representation via Sparse Coding**

*Sixiang Xu, Damien Muselet, Alain Trémeau*

**D-LSD: a Distorted Line Segment Detector for Calibrated Images**

*David Zuniga-Noel, Francisco-Angel Moreno, Javier Gonzalez-Jimenez*

**Efficient Data Optimisation for Harmonic Inpainting with Finite Elements**

*Vassillen Chizhov, Joachim Weickert*

## CONCLUDING REMARKS

19:00 – 19:10 (CET)