

# **SPIE.** OPTICAL METROLOGY

**26-29 June 2023**  
Munich, Germany

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**#SPIEOpticalMetrology**





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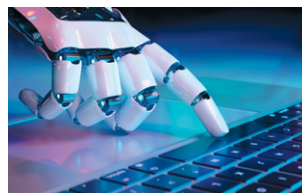
CONFERENCE 12618—PAGE 11  
**Optical Measurement Systems for Industrial Inspection XIII**  
26 - 29 June 2023 | ICM Room 14c



CONFERENCE 12619—PAGE 20  
**Modeling Aspects in Optical Metrology IX**  
26 - 28 June 2023  
ICM Room 12b (Mon-Tue);  
ICM Room 14c (Wed)



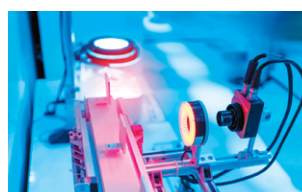
CONFERENCE 12620—PAGE 24  
**Optics for Arts, Architecture, and Archaeology (O3A) IX**  
26 - 27 June 2023 | ICM Room 12a



CONFERENCE 12621—PAGE 28  
**Multimodal Sensing and Artificial Intelligence: Technologies and Applications III**  
27 - 29 June 2023 | ICM Room 12a



CONFERENCE 12622—PAGE 32  
**Optical Methods for Inspection, Characterization, and Imaging of Biomaterials VI**  
26 - 29 June 2023 | Hall B1,  
Room 3-Wilhelm Röntgen



CONFERENCE 12623—PAGE 39  
**Automated Visual Inspection and Machine Vision V**  
28 June 2023 | ICM Room 12b

## 2023 OPTICAL METROLOGY SYMPOSIUM CHAIRS



**Marc P. Georges**  
Univ. de Liège (Belgium)

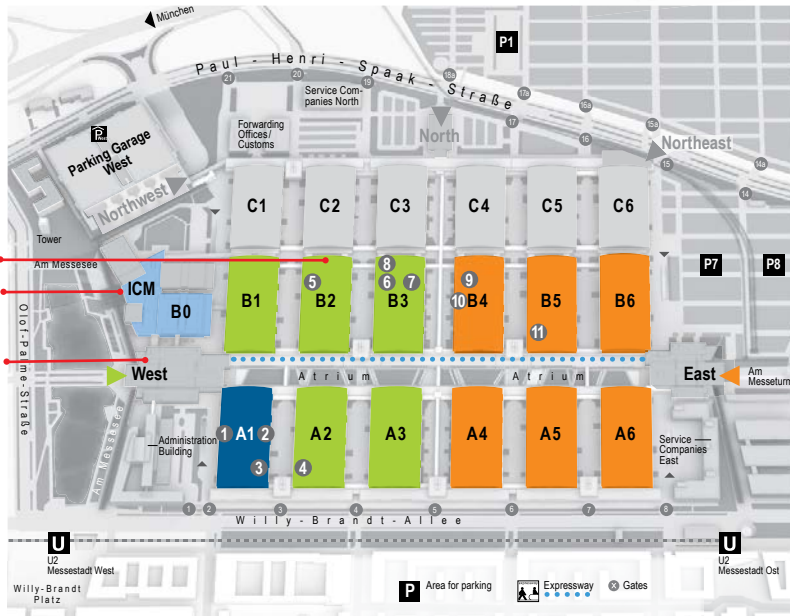


**Jörg Seewig**  
Technische Univ.  
Kaiserslautern (Germany)

# Fairgrounds map

June 27-30, 2023  
Trade Fair Center Messe München

1 visit, 1 location,  
3 leading trade fairs!



Status: 05/2023

- 1 Forum World of QUANTUM
- 2 Forum Quantum Science & Industry
- 3 Qiskit Hackathon @ World of QUANTUM
- 4 Forum Lasers and Optics
- 5 Forum Biophotonics and Medical Applications
- 6 Forum Laser Materials Processing
- 7 Special Show: Photons in Production
- 8 Career Center & Job Board
- 9 Start-up Arena
- 10 career now
- 11 Vision Expert Huddles

## World of LASER PHOTONICS 50 YEARS OF LASER

- A2** Lasers and optoelectronics, integrated photonics, optical information and communication
- A3** Lasers and laser systems for production engineering, sensors, test and measurement, optical measurement systems, imaging
- B1** Optics, manufacturing technology for optics
- B2** Lasers and optoelectronics, biophotonics and medical engineering
- B3** Lasers and laser systems for production engineering

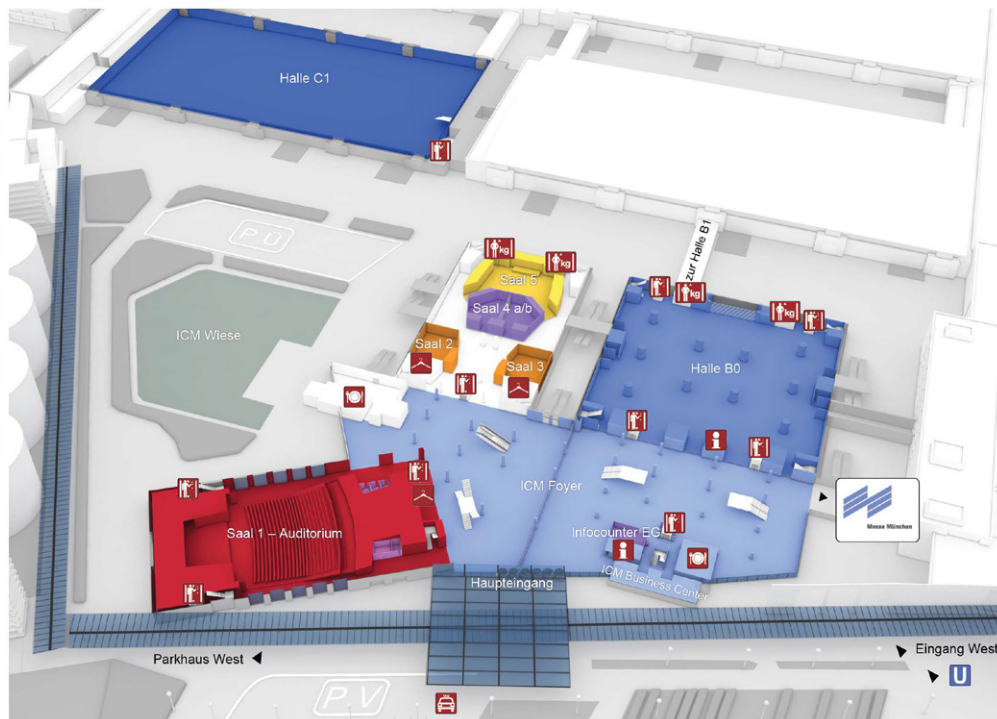
## World of QUANTUM

- A1** Laser systems, subsystems and components for quantum technology, quantum computing and simulation, quantum communication and cryptography, quantum sensing & imaging

## automatica

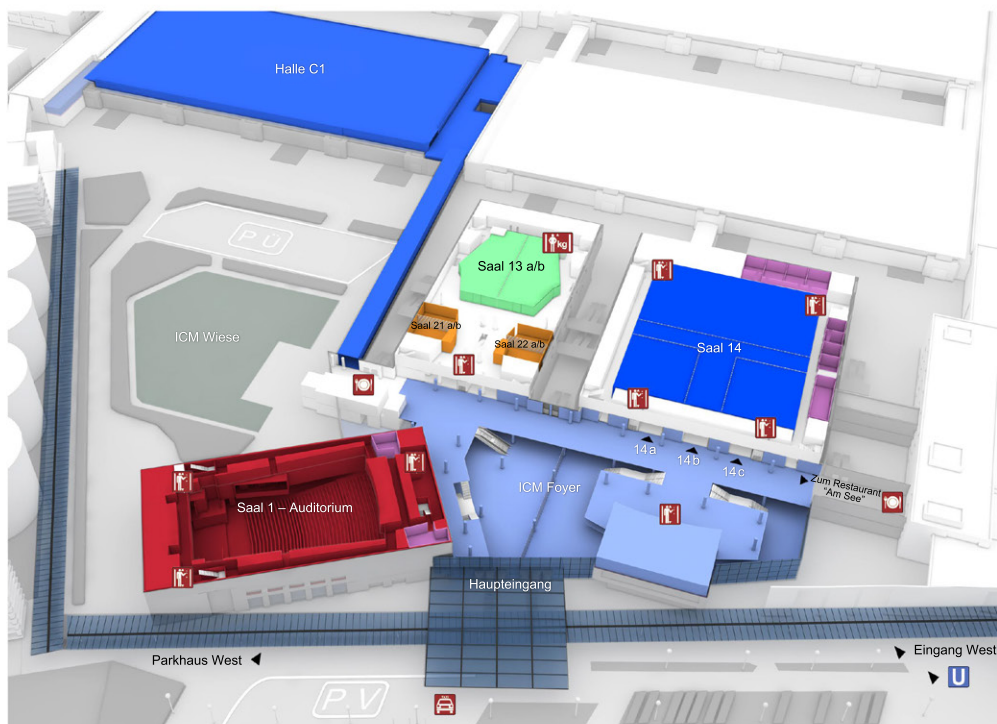
- B6** Industrial robots, drive technology, control systems technology and industrial communications, software and cloud computing
- B5** Machine vision, sensor technology, supply technology, industrial robots
- B4** Industrial robots (incl. collaborative, mobile), professional service robotics, Start-up Arena, career now
- A6** Assembly and handling technology
- A5** Assembly and handling technology, positioning systems
- A4** Machine vision, safety and security technology, supply technology, industrial robots (incl. collaborative, mobile), professional service robotics










# ICM – Internationales Congress Center München ERDGESCHOSS



- U** U-Bahn (Messestadt West)
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- Information**
- Catering**
- Personenaufzug**
- Lastenaufzug**
- PÜ** Ü-Wagen Stellplatz
- PV** VIP Parkplatz
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## ICM – Internationales Congress Center München 2. OBERGESCHOSS



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## ICM – Internationales Congress Center München 1. OBERGESCHOSS



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**FOR A SAFER MEETING**





# TECHNICAL CONFERENCE OVERVIEW — PROGRAMME IS CURRENT AS OF 12 JUNE 2023

	<b>CONFERENCE 12618</b> Optical Measurement Systems for Industrial Inspection XIII Chairs: Peter Lehmann; Wolfgang Osten; Armando Albertazzi Gonçalves Jr.	<b>CONFERENCE 12619</b> Modeling Aspects in Optical Metrology IX Chairs: Bernd Bodermann; Karsten Frenner; Bryan M. Barnes; George Koutsourakis	<b>CONFERENCE 12620</b> Optics for Arts, Architecture, and Archaeology (O3A) IX Chairs: Haida Liang; Roger Groves	<b>CONFERENCE 12621</b> Multimodal Sensing and Artificial Intelligence: Technologies and Applications III Chairs: Ettore Stella; Francesco Soldovieri; Dariusz Ceglarek; Qian Kemao
TIME	ICM Room 14c	ICM Room 12b (Mon-Tue); ICM Room 14c (Wed)	ICM Room 12a	ICM Room 12a
<b>MONDAY 26 JUNE 2023</b>				
MORNING	08:30 - 10:00 SESSION 1: <b>Artificial Intelligence in Metrology</b>	10:30 - 10:40 <b>Opening Remarks</b>	08:30 - 10:00 SESSION 1: <b>Light Material Interaction</b>	
	10:00 - 10:30 • Coffee Break	10:30 - 10:40 <b>Welcome and Introduction</b>	10:00 - 10:30 • Coffee Break	
	10:30 - 12:30 SESSION 2: <b>Process-integrated and In-situ Measurement</b>	10:40 - 12:30 SESSION 1: <b>Workshop on Compressed Sensing</b>	10:30 - 12:30 SESSION 2: <b>Advanced Image Processing and Data Visualisation</b>	
AFTERNOON	12:30 - 13:40 • Lunch Break	12:30 - 13:40 • Lunch Break	12:30 - 13:50 • Lunch Break	
	13:40 - 15:20 SESSION 3: <b>Interferometric Techniques and Shearography</b>	13:40 - 15:30 SESSION 2: <b>Optical Nanometrology and Ellipsometry</b>	13:50 - 15:30 SESSION 3: <b>Imaging and Spectroscopy Instrument and Method Development</b>	
	15:30 - 16:00 • Coffee Break	15:30 - 16:00 • Coffee Break	15:30 - 16:00 • Coffee Break	
	16:00 - 18:00 SESSION 4: <b>Fringe Projection, Structured Illumination, and Photogrammetry</b>	16:00 - 18:00 SESSION 3: <b>Interferometry and Phase</b>	16:00 - 17:40 SESSION 4: <b>3D Surfaces and Structural Analysis</b>	
<b>TUESDAY 27 JUNE 2023</b>				
MORNING	08:30 - 10:00 SESSION 5: <b>High Resolution Topography Measurement</b>	08:40 - 10:00 SESSION 4: <b>Optical Systems</b>	08:30 - 10:00 SESSION 5: <b>Multimodal Imaging and Spectroscopy</b>	
	10:00 - 10:30 • Coffee Break	10:00 - 10:30 • Coffee Break	10:00 - 10:30 • Coffee Break	
	10:30 - 12:50 SESSION 6: <b>Topography Measurement and Profilometry</b>	10:30 - 12:30 SESSION 5: <b>Scatterometry and OCD Metrology</b>	10:30 - 11:50 SESSION 6: <b>Applications to Art, Archaeology and Architecture</b>	
AFTERNOON	12:50 - 14:00 • Lunch Break	12:30 - 14:00 • Lunch Break	11:50 - 12:40 SESSION 7: <b>Poster Slam: Optics for Arts, Architecture, and Archaeology</b>	
	14:00 - 15:30 ICM, Saal 1	<b>WORLD OF PHOTONICS PLENARY</b> <b>Laser-driven inertial confinement fusion, power source of the future?</b> Tammy Ma, Livermore National Lab. (USA); Constantin L. Haefner, Fraunhofer-Institute for Laser Technology (Germany)		
	15:30 - 16:00 • Coffee Break	15:30 - 16:00 • Coffee Break		
	16:00 - 18:00 SESSION 7: <b>Holographic Techniques</b>	16:00 - 17:50 SESSION 6: <b>Super-resolution, Wave Propagation, and 3D</b>		16:00 - 18:10 SESSION 1: <b>Multimodal Sensing and Inverse Modelling for Infrastructures and Environmental Monitoring</b>





<b>CONFERENCE 12622</b> Optical Methods for Inspection, Characterization, and Imaging of Biomaterials VI Chairs: Pietro Ferraro; Demetri Psaltis; Simonetta Grilli <b>Hall B1, Room 3-Wilhelm Röntgen</b>		<b>CONFERENCE 12623</b> Automated Visual Inspection and Machine Vision V Chairs: Jürgen Beyerer; Michael Heizmann <b>ICM Room 12b</b>	
08:00 - 10:00 SESSION 1: <b>Quantitative Phase Imaging and Tomography I</b>			
10:00 - 10:30 • Coffee Break			
10:30 - 12:30 SESSION 2: <b>Quantitative Phase Imaging and Tomography II</b>			
12:30 - 13:30 • Lunch Break			
13:30 - 15:30 SESSION 3: <b>Special Session on Digital and Computational Pathology I</b>			
15:30 - 16:00 • Coffee Break			
16:00 - 18:00 SESSION 4: <b>Special Session, Digital and Computational Pathology III</b>			
08:00 - 10:00 SESSION 5: <b>Systems and Methods for Biosensing</b>			
10:00 - 10:30 • Coffee Break			
10:30 - 12:50 SESSION 6: <b>Special Session, Single-cell Flow Cytometry</b>			
12:50 - 14:00 • Lunch Break			
15:30 - 16:00 • Coffee Break			
16:00 - 17:50 SESSION 7: <b>AI-powered Microscopy</b>			

# TECHNICAL CONFERENCE OVERVIEW — PROGRAMME IS CURRENT AS OF 12 JUNE 2023

	<b>CONFERENCE 12618</b> Optical Measurement Systems for Industrial Inspection XIII Chairs: Peter Lehmann; Wolfgang Osten; Armando Albertazzi Gonçalves Jr.	<b>CONFERENCE 12619</b> Modeling Aspects in Optical Metrology IX Chairs: Bernd Bodermann; Karsten Frenner; Bryan M. Barnes; George Koutsourakis	<b>CONFERENCE 12620</b> Optics for Arts, Architecture, and Archaeology (O3A) IX Chairs: Haida Liang; Roger Groves	<b>CONFERENCE 12621</b> Multimodal Sensing and Artificial Intelligence: Technologies and Applications III Chairs: Ettore Stella; Francesco Soldovieri; Dariusz Ceglarek; Qian Kemao
<b>TIME</b>	<b>ICM Room 14c</b>	<b>ICM Room 12b (Mon-Tue); ICM Room 14c (Wed)</b>	<b>ICM Room 12a</b>	<b>ICM Room 12a</b>

## WEDNESDAY 28 JUNE 2023

MORNING	08:30 - 10:00 • JOINT SESSION I			08:20 - 10:00 SESSION 2: <b>Multimodal Sensing for Robotics</b>
	SESSION 8: <b>Joint Session (TracOptic) I: Modelling and Characterisation of Quantitative Microscopes</b>	SESSION 7: <b>Joint Session (TracOptic) I: Modelling and Characterisation of Quantitative Microscopes</b>		
	10:00 - 10:30 • Coffee Break			
10:30 - 11:25 ICM, Saal 1	<b>OPTICAL METROLOGY PLENARY SESSION</b> <b>Welcome Address and Plenary Speaker Introduction</b> Marc P. Georges, Liège Univ. (Belgium); Jörg Seewig, Technische Univ. Kaiserslautern (Germany) 2023 Symposium Chairs  <b>12622-500 • PLENARY PRESENTATION</b> <b>Remote photonic medicine</b> , Zeev Zalevsky, Bar-Ilan Univ. (Israel)			
	11:30 - 12:30 • Lunch Break			
AFTERNOON 12:30 - 13:30 ICM, Hall B0	<b>POSTERS-WEDNESDAY — SEE ONLINE FOR FULL LIST OF POSTERS</b> Poster authors, please set up posters between the morning coffee break and the end of Lunch Break on Wednesday. Plan to stand by your poster to discuss it with session attendees during the poster session. Remove your poster following the poster session conclusion as posters left on the boards will be discarded.			
	13:30 - 15:30 • JOINT SESSION II			13:30 - 15:30 SESSION 3: <b>Multimodal Sensing for Inspection</b>
	SESSION 9: <b>Joint Session (TracOptic) II: Modelling and Characterisation of Quantitative Microscopes</b>	SESSION 8: <b>Joint Session (TracOptic) II: Modelling and Characterisation of Quantitative Microscopes</b>		
	15:30 - 16:00 • Coffee Break	15:30 - 16:00 • Coffee Break		15:30 - 16:00 • Coffee Break
	16:00 - 17:40 SESSION 10: <b>Measurement of Precision Components and Optical Systems</b>			16:00 - 17:50 SESSION 4: <b>Multimodal Sensing Applications I</b>

## THURSDAY 29 JUNE 2023

MORNING	08:30 - 10:00 SESSION 11: <b>Special Session, Metrology for Autonomous Vehicles</b>			08:10 - 10:00 SESSION 5: <b>Multimodal Sensing for Health</b>
	10:00 - 10:30 • Coffee Break			10:00 - 10:30 • Coffee Break
	10:30 - 12:20 SESSION 12: <b>Scattering, Diffraction, and Speckle Techniques</b>			10:30 - 12:00 SESSION 6: <b>Full-field Imaging and Applications I</b>
AFTERNOON	12:20 - 13:30 • Lunch Break			12:00 - 13:00 • Lunch Break
	13:30 - 15:30 SESSION 13: <b>Polarimetric and Spectroscopic Techniques</b>			13:10 - 14:20 SESSION 7: <b>Full-field Imaging and Applications II</b>
	15:30 - 16:00 • Coffee Break			
	16:00 - 18:00 SESSION 14: <b>Large-area, Large and Multiscale Measurements</b>			14:20 - 17:30 SESSION 8: <b>Multimodal Sensing Applications II</b>

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<b>CONFERENCE 12622</b> Optical Methods for Inspection, Characterization, and Imaging of Biomaterials VI Chairs: Pietro Ferraro; Demetri Psaltis; Simonetta Grilli <b>Hall B1, Room 3-Wilhelm Röntgen</b>		<b>CONFERENCE 12623</b> Automated Visual Inspection and Machine Vision V Chairs: Jürgen Beyerer; Michael Heizmann <b>ICM Room 12b</b>	
08:40 - 10:00 SESSION 8: <b>Special Session, Digital and Computational Pathology IV</b>		08:30 - 09:50 SESSION 1: <b>Imaging</b>	
		09:50 - 10:30 • Coffee Break	
13:40 - 15:30 SESSION 9: <b>Innovative Diagnostic Tools I</b>		13:30 - 14:30 SESSION 2: <b>Synthetic Data for Machine Learning</b>	
		14:30 - 15:30 SESSION 3: <b>Machine Learning and Classification</b>	
15:30 - 16:00 • Coffee Break		15:30 - 16:00 • Coffee Break	
16:00 - 18:10 SESSION 10: <b>Innovative Diagnostic Tools II</b>		16:00 - 17:00 SESSION 4: <b>Image-based Measurement Technology</b>	
		17:00 - 18:00 SESSION 5: <b>Image-based Position Measurement</b>	
08:30 - 10:00 SESSION 11: <b>Advanced Optics and Photonic Systems I</b>			
10:00 - 10:30 • Coffee Break			
10:30 - 12:10 SESSION 12: <b>Advanced Optics and Photonic Systems II</b>			
12:00 - 13:10 • Lunch Break			
13:20 - 15:30 SESSION 13: <b>High Throughput Imaging Modalities</b>			
15:30 - 16:00 • Coffee Break			
16:00 - 17:10 SESSION 14: <b>Advanced Optics and Photonic Systems III</b>			

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<b>Optical Measurement Systems for Industrial Inspection XIII</b>	<b>Multimodal Sensing and Artificial Intelligence: Technologies and Applications III</b>
Chair(s): Peter Lehmann; Wolfgang Osten; Armando Albertazzi Gonçalves Jr.	Chair(s): Ettore Stella; Francesco Soldovieri; Dariusz Ceglarek; Qian Kemao
26 - 29 June 2023   ICM Room 14c	27 - 29 June 2023   ICM Room 12a
CONFERENCE 12619 . . . . . 20	CONFERENCE 12622 . . . . . 32
<b>Modeling Aspects in Optical Metrology IX</b>	<b>Optical Methods for Inspection, Characterization, and Imaging of Biomaterials VI</b>
Chair(s): Bernd Bodermann; Karsten Frenner; Bryan M. Barnes; George Koutsourakis	Chair(s): Pietro Ferraro; Demetri Psaltis; Simonetta Grilli
26 - 28 June 2023   ICM Room 12b (Mon-Tue); ICM Room 14c (Wed)	26 - 29 June 2023   Hall B1, Room 3-Wilhelm Röntgen
CONFERENCE 12620 . . . . . 24	CONFERENCE 12623 . . . . . 39
<b>Optics for Arts, Architecture, and Archaeology (O3A) IX</b>	<b>Automated Visual Inspection and Machine Vision V</b>
Chair(s): Haida Liang; Roger Groves	Chair(s): Jürgen Beyerer; Michael Heizmann
26 - 27 June 2023   ICM Room 12a	28 June 2023   ICM Room 12b



## CONFERENCE 12618

# Optical Measurement Systems for Industrial Inspection XIII

26 - 29 June 2023 | ICM Room 14c

Conference Chairs: **Peter Lehmann**, Univ. Kassel (Germany); **Wolfgang Osten**, Univ. Stuttgart (Germany)

Conference Co-Chair: **Armando Albertazzi Gonçalves**, Univ. Federal de Santa Catarina (Brazil)

Programme Committee: **Oleg V. Angelsky**, Yuriy Fedkovych Chernivtsi National Univ. (Ukraine); **Andrei G. Anisimov**, Technische Univ. Delft (Netherlands); **Anand Krishna Asundi**, Nanyang Technological Univ. (Singapore); **Partha P. Banerjee**, Univ. of Dayton (United States); **Ralf B. Bergmann**, Bremer Institut für angewandte Strahltechnik GmbH (Germany); **Harald Bosse**, Physikalisch-Technische Bundesanstalt (Germany); **Rémi Bourgois**, Safran Reosc (France); **Jan Burke**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Chau-Jern Cheng**, National Taiwan Normal Univ. (Taiwan); **Jürgen W. Czarske**, Technische Univ. Dresden (Germany); **Peter J. de Groot**, Zygo Corporation (United States); **Konstantinos Falaggis**, The Univ. of North Carolina at Charlotte (United States); **Pietro Ferraro**, CNR-Institute of Applied Sciences and Intelligent Systems "Eduardo Caianiello" (Italy); **Andreas Fischer**, Bremer Institut für Messtechnik, Automatisierung und Qualitätswissenschaft (BIMAQ) (Germany); **Cosme Furlong**, Worcester Polytechnic Institute (United States); **Marc P. Georges**, Univ. de Liège (Belgium); **Sen Han**, Univ. of Shanghai for Science and Technology (China); **Yoshio Hayasaki**, Utsunomiya Univ. (Japan); **Xiangqian Jiang**, Univ. of Huddersfield (United Kingdom); **Myung K. Kim**, Univ. of South Florida (United States); **Tomasz Kozacki**, Warsaw Univ. of Technology (Poland); **Richard K. Leach**, The Univ. of Nottingham (United Kingdom); **Eberhard Manske**, Technische Univ. Ilmenau (Germany); **Andrew John Moore**, Heriot-Watt Univ. (United Kingdom); **Gunther Notni**, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); **Yukitoshi Otani**, Utsunomiya Univ. (Japan); **Xiang Peng**, Shenzhen Univ. (China); **Nikolay V. Petrov**, ITMO Univ. (Russian Federation); **Pascal Picart**, Univ. du Maine (France); **Stephan Reichelt**, Univ. Stuttgart (Germany); **Christian Rembe**, TU Clausthal (Germany); **Robert Schmitt**, RWTH (Germany); **Jörg Seewig**, Technische Univ. Kaiserslautern (Germany); **Rainer Tutsch**, Technische Univ. Braunschweig (Germany); **Eriko Watanabe**, The Univ. of Electro-Communications (Japan); **Toyohiko Yatagai**, Utsunomiya Univ. (Japan); **Changhe Zhou**, Shanghai Institute of Optics and Fine Mechanics (China)

### MONDAY 26 JUNE

#### SESSION 1: ARTIFICIAL INTELLIGENCE IN METROLOGY

26 June 2023 • 08:30 - 10:00 | ICM Room 14c

Session Chair: Peter Lehmann, Univ. Kassel (Germany)

12618-1 • 08:30 - 09:00 | ICM Room 14c

**The use of deep learning for computational optical imaging: from data driven to physics driven** (*Keynote Presentation*)

Author(s): Guohai Situ, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences (China)

12618-2 • 09:00 - 09:20 | ICM Room 14c

**AI-based solution for robust detection with optical microresonators**

Author(s): Anton V. Saetchnikov, Ben Luis Hack, Daniel Vonk, Tobias Glasmachers, Axel Mosig, Andreas Ostendorf, Ruhr-Univ. Bochum (Germany)

12618-3 • 09:20 - 09:40 | ICM Room 14c

**Thin-film thickness measurement based on spectral reflectometer using artificial neural network algorithm**

Author(s): Jonghan Jin, Korea Research Institute of Standards and Science (Republic of Korea), Univ. of Science and Technology (Republic of Korea); Joonyoung Lee, Univ. of Science and Technology (Republic of Korea)

12618-4 • 09:40 - 10:00 | ICM Room 14c

**AI-guided numerical-aperture-controlled scatterometry for measurement of deep HAR and thin-film structures with a large depth variation**

Author(s): Zih-Ying Fu, Fu-Sheng Yang, Liang-Chia Chen, National Taiwan Univ. (Taiwan)

Coffee Break 10:00 - 10:30

#### SESSION 2: PROCESS-INTEGRATED AND IN-SITU MEASUREMENT

26 June 2023 • 10:30 - 12:30 | ICM Room 14c

Session Chair: Marc P. Georges, Ctr. Spatial de Liège (Belgium)

12618-5 • 10:30 - 10:50 | ICM Room 14c

**In-process powder bed monitoring with angular illumination**

Author(s): Thomas Milde, Carl Zeiss Microscopy GmbH (Germany); Alexander Freytag, Carl Zeiss AG (Germany)

26 June 2023 12618-123 • 10:50 - 11:10 | ICM Room 14c

**Snapshot 3D profilometry using a RGB polarization camera**

Author(s): Yukitoshi Otani, Yuuki Maeda, Nathan A. Hagen, Utsunomiya Univ. (Japan)

12618-7 • 11:10 - 11:30 | ICM Room 14c

**Laser drilling controlled by laser-generated sound**

Author(s): Sotaro Komatsu, Takuma Miura, Yoshio Hayasaki, Utsunomiya Univ. (Japan)

12618-8 • 11:30 - 11:50 | ICM Room 14c

**Sensor-guided machining of large-scale CFRP components based on resin transfer molded features**

Author(s): Maximilian Muth, Philip Carstensen, Fraunhofer-Institut für Fertigungstechnik und Angewandte Materialforschung IFAM (Germany); Wolfgang Hintze, Technische Univ. Hamburg-Harburg (Germany); Simon Gnad, Christoph Brillinger, Christian Möller, Christian Boehlmann, Fraunhofer-Institut für Fertigungstechnik und Angewandte Materialforschung IFAM (Germany)

12618-9 • 11:50 - 12:10 | ICM Room 14c

**Optical sensor for localized damage detection and modal analysis on fast rotating fiber reinforced polymer structures**

Author(s): Julian Lich, Tino Wollmann, Robert Kuschmierz, Maik Gude, Jürgen Czarske, TU Dresden (Germany)

# CONFERENCE 12618

12618-124 • 12:10 - 12:30 | ICM Room 14c

## Improving the accuracy and precision of OCD measurement by systematic error correction in self-interference pupil ellipsometry

Author(s): Seungwoo Lee, Yeeun Park, Seungryeol Lee, Hoonchul Chang, Jaehwang Jung, Inho Shin, Seoyeon Jeong, SAMSUNG Electronics Co., Ltd. (Republic of Korea); Sooyeong Lee, SAMSUNG Electronics Co. (Republic of Korea); Jinwoo Ahn, Taejoong Kim, Taeyong Jo, Myungjun Lee, SAMSUNG Electronics Co., Ltd. (Republic of Korea)

Lunch Break 12:30 - 13:40

## SESSION 3: INTERFEROMETRIC TECHNIQUES AND SHEAROGRAPHY

26 June 2023 • 13:40 - 15:20 | ICM Room 14c

Session Chair: Thomas Kissinger,  
Technische Univ. Ilmenau (Germany)

12618-11 • 13:40 - 14:00 | ICM Room 14c

## Simultaneous orthogonal shearography using two pairs of parallel slits and a tetra-split lens

Author(s): Tainara P. de Lima, Estiven S. Barrera, Bernardo C. F. de Oliveira, Armando Albertazzi Gonçalves, Univ. Federal de Santa Catarina (Brazil)

12618-12 • 14:00 - 14:20 | ICM Room 14c

## A fibre optic angle sensing tape for applications in robotics and automation

Author(s): Sivaji Pillai, Thomas O. H. Charrett, Cranfield Univ. (United Kingdom); Thomas Kissinger, Technische Univ. Ilmenau (Germany), Cranfield Univ. (United Kingdom); Stephen W. James, Ralph P. Tatam, Cranfield Univ. (United Kingdom)

12618-13 • 14:20 - 14:40 | ICM Room 14c

## Multiwavelength study of etalon effects in LCOS-based spatial light modulators

Author(s): Max Liebmann, Philip Engel, HOLOEYE Photonics AG (Germany)

12618-14 • 14:40 - 15:00 | ICM Room 14c

## Three-channel space-qualified high power pulsed fiber laser system for accurate velocity detection in bistatic configuration

Author(s): Yagya Malik, Lekshmi S. Rajan, Sharath Umesh, Shubhajit Biswas, Bhavesh Mendhaker, Amit Bhardwaj, Nirlesh Singh, Ravikumar Keshavappa, M.S. Lalithya, K. A. Lohar, Sanjay Mittal, S.B. Umesh, V.V. Lakshmi pathi, Elumalai S., K.V. Sriram, Lab. for Electro-Optics Systems (India)

12618-15 • 15:00 - 15:20 | ICM Room 14c

## The Nyquist criterion and its applicability in phase-stepping digital shearography

Author(s): Kazi Monowar Abedin, Awatef Rashid Al Jabri, S.M. Mujibur Rahman, Sultan Qaboos Univ. (Oman)

Coffee Break 15:30 - 16:00

## SESSION 4: FRINGE PROJECTION, STRUCTURED ILLUMINATION, AND PHOTOGRAMMETRY

26 June 2023 • 16:00 - 17:40 | ICM Room 14c

Session Chair: Ralf B. Bergmann, Bremer Institut für angewandte Strahltechnik GmbH (Germany)

12618-16 • 16:00 - 16:20 | ICM Room 14c

## Thermal single-shot 3D shape measurement of transparent objects: optimization of the projected spatial-statistical LWIR pattern

Author(s): Martin Landmann, Henri Speck, Stefan Heist, Peter Kühmstedt, Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); Gunther Notni, Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany), Technische Univ. Ilmenau (Germany)

12618-18 • 16:20 - 16:40 | ICM Room 14c

## Identification and correction of magnification factor deviations of a telecentric fringe projection system

Author(s): Pascal Kern, Lennart Hinz, Markus Kästner, Eduard Reithmeier, Leibniz Univ. Hannover (Germany)

12618-19 • 16:40 - 17:00 | ICM Room 14c

## Metrology inside a cryostat using a cutting-edge periscope

Author(s): Adrien Girardot, Jean-Emmanuel Migniau, Univ. de Lyon, Univ. Claude Bernard Lyon 1 (France), Ecole Normale Supérieure de Lyon (France), Ctr. de Recherche Astrophysique de Lyon, CNRS (France); Edgard Renault, Aix Marseille Univ, CNRS, CNES, LAM (France); Magali Loupias, Aurélien Jarno, Alban Remillieux, Univ. de Lyon, Univ. Claude Bernard Lyon 1 (France), Ecole Normale Supérieure de Lyon (France), Ctr. de Recherche Astrophysique de Lyon, CNRS (France)

12618-20 • 17:00 - 17:20 | ICM Room 14c

## Photogrammetry for optical metrology of metal additively manufactured parts

Author(s): Adam Semancik, Jakub Hynek, Samuel Lukacovic, Tomáš Koutecký, Brno Univ. of Technology (Czech Republic)

## TUESDAY 27 JUNE

## SESSION 5: HIGH RESOLUTION TOPOGRAPHY MEASUREMENT

27 June 2023 • 08:30 - 10:00 | ICM Room 14c

Session Chair: Jörg Seewig, Rheinland-Pfälzische Technische Univ. Kaiserslautern-Landau (Germany)

12618-22 • 08:30 - 09:00 | ICM Room 14c

## Microsphere-assisted microscopy: challenges and opportunities (*Keynote Presentation*)

Author(s): Arash Darafsheh, Vahid Abbasian, Washington Univ. School of Medicine (United States)

12618-23 • 09:00 - 09:20 | ICM Room 14c

## Super-resolution coherence scanning interferometry with 3D printed micro-optics

Author(s): Göran Maconi, Univ. of Helsinki (Finland); Gordon Zyla, Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas (Greece); Anton Nolvi, Univ. of Helsinki (Finland); Dimitra Ladika, Vasileia Melissinaki, George Barmparis, Maria Farsari, Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas (Greece); Edward Hæggröm, Ivan Kassamakov, Univ. of Helsinki (Finland)

12618-24 • 09:20 - 09:40 | ICM Room 14c

## EUV reflective coherent diffraction imaging system for wafer metrology

Author(s): Tao Shen, Paolo Ansuinelli, Iacopo Mochi, Yasin Ekinci, Paul Scherrer Institut (Switzerland)

12618-25 • 09:40 - 10:00 | ICM Room 14c

## Multimodal local spectral/topographic characterization of laser-induced colored stainless steel with coherence scanning interferometry

Author(s): Paul C. Montgomery, Lab. des sciences de l'Ingénieur, de l'Informatique et de l'Imagerie (France); Sébastien Marbach, Lab. des sciences de l'Ingénieur, de l'Informatique et de l'Imagerie (France), Optiive SAS (France); Rémy Claveau, Florie Ogor, Christophe Cordier, Jesse Schiffler, Manuel Flury, Lab. des sciences de l'Ingénieur, de l'Informatique et de l'Imagerie (France)

Coffee Break 10:00 - 10:30

### SESSION 6: TOPOGRAPHY MEASUREMENT AND PROFILOMETRY

27 June 2023 • 10:30 - 12:50 | ICM Room 14c

Session Chair: Paul C. Montgomery, Lab. des sciences de l'Ingénieur, de l'Informatique et de l'Imagerie (France)

12618-26 • 10:30 - 10:50 | ICM Room 14c

## Indirect geometry measurement method based on confocal microscopy and fluorescent microparticles

Author(s): Andreas Tausendfreund, Björn Espenhahn, Gert Behrends, Andreas Fischer, Bremer Institut für Messtechnik, Automatisierung und Qualitätswissenschaft (BIMAQ) (Germany)

12618-27 • 10:50 - 11:10 | ICM Room 14c

## Robust measurement of surface topography for additive manufacturing using imaging confocal microscopy

Author(s): Narcis Vilar, Roger Artigas, Sensofar-Tech, S.L. (Spain); Martí Duocastella, Univ. de Barcelona (Spain); Guillem Carles Santacana, Sensofar-Tech, S.L. (Spain)

12618-28 • 11:10 - 11:30 | ICM Room 14c

## Double-pass modulated differential confocal microscopy for closed-loop axial control of direct laser writing

Author(s): Johannes Belkner, Jaqueline Stauffenberg, Christian Görner Tenorio, Ingo Ortlepp, Eberhard Manske, Technische Univ. Ilmenau (Germany)

12618-29 • 11:30 - 11:50 | ICM Room 14c

## Construction of a time-domain full-field OCT for non-contact volumetric layer thickness measurement

Author(s): Georgis Bulun, Marvin Lotz, Andrej Keksel, Gerhard Stelzer, Jörg Seewig, Rheinland-Pfälzische Technische Univ. Kaiserslautern-Landau (Germany)

12618-30 • 11:50 - 12:10 | ICM Room 14c

## Improved 3D form profiler based on extending illumination aperture

Author(s): Mostafa Agour, Claas Falldorf, Ralf B. Bergmann, Bremer Institut für angewandte Strahltechnik GmbH (Germany)

12618-31 • 12:10 - 12:30 | ICM Room 14c

## Sparse surface profile reconstruction from scattering light distributions

Author(s): Tycho Groche, Jörg Seewig, Viktor Follmann, Julian Uebel, Rheinland-Pfälzische Technische Univ. Kaiserslautern-Landau (Germany)

12618-32 • 12:30 - 12:50 | ICM Room 14c

## Computational self-correction of scanning nonlinearities in optical profilometry

Author(s): Lena Zhukova, Roger Artigas Pursals, Guillem Carles Santacana, Sensofar-Tech, S.L. (Spain)

Lunch Break 12:50 - 14:00

### WORLD OF PHOTONICS PLENARY

27 June 2023 • 14:00 - 15:30 | ICM, Saal 1

This plenary session features a presentation by **Tammy Ma**, Lawrence Livermore National Lab. (United States), and **Constantin Haefner**, Fraunhofer-Institute for Laser Technology (Germany), on laser-driven inertial confinement fusion.

Coffee Break 15:30 - 16:00

### SESSION 7: HOLOGRAPHIC TECHNIQUES

27 June 2023 • 16:00 - 18:00 | ICM Room 14c

Session Chair: Jürgen W. Czarske, TU Dresden (Germany)

12618-33 • 16:00 - 16:20 | ICM Room 14c

## Robust semiconductor overlay metrology with non-uniform illumination beams using digital holographic microscopy

Author(s): Manashee Adhikary, Tamar Cromwijk, Stefan Witte, Vrije Univ. Amsterdam (Netherlands), Advanced Research Ctr. for Nanolithography (Netherlands); Johannes F. de Boer, Vrije Univ. Amsterdam (Netherlands); Arie den Boef, Vrije Univ. Amsterdam (Netherlands), Advanced Research Ctr. for Nanolithography (Netherlands), ASML Netherlands B.V. (Netherlands)

12618-34 • 16:20 - 16:40 | ICM Room 14c

## Self-assembling of microlenses by pyro-electric effect for the development of compact systems

Author(s): Sara Coppola, Lisa Miccio, Veronica Vespini, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Nicolò Incardona, Univ. Politècnica de València (Spain); Simonetta Grilli, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Manuel Martínez-Corral, Univ. de València (Spain); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12618-35 • 16:40 - 17:00 | ICM Room 14c

## Non-isoplanatic lens aberration corrections in digital holographic microscopy

Author(s): Tamar Cromwijk, Manashee Adhikary, Advanced Research Ctr. for Nanolithography (Netherlands); Sander Konijnenberg, Wim Coene, Teus Tukker, ASML (Netherlands); Johannes de de Boer, Vrije Universiteit (Netherlands); Stefan Witte, Advanced Research Ctr. for Nanolithography (Netherlands); Arie den Boef, ASML (Netherlands)

12618-75 • 17:00 - 17:20 | ICM Room 14c

## Nanoscale surface topography using low-cost digital holographic microscopy

Author(s): Dhruvam Pandey, Subrahmanya K. N., Gannavarapu Rajshekhar, Indian Institute of Technology Kanpur (India)

12618-37 • 17:20 - 17:40 | ICM Room 14c

## Lens-free holographic imager with ultrahigh phase sensitivity and large field-of-view

Author(s): Sebastian Haegele, ICFO - Institut de Ciències Fotòniques (Spain); Giacomo Corrielli, CNR-Istituto di Fotonica e Nanotecnologie (Italy); Matěj Hejda, ICFO - Institut de Ciències Fotòniques (Spain), Univ. of Strathclyde (United Kingdom); Luc Dümpelmann, Roland A. Terborg, ICFO - Institut de Ciències Fotòniques (Spain); Roberto Osellame, CNR-Istituto di Fotonica e Nanotecnologie (Italy); Valerio Pruneri, ICFO - Institut de Ciències Fotòniques (Spain), ICREA - Institució Catalana de Recerca i Estudis Avançats (Spain)

# CONFERENCE 12618

12618-38 • 17:40 - 18:00 | ICM Room 14c

## Optical thickness mapping of directly inaccessible phase objects using lens-less digital holographic interferometry

Author(s): Arun Anand, Sardar Patel Univ. (India); Subhash Utadiya, The Maharaja Sayajirao Univ. of Baroda (India); Vismay Trivedi, Gyanendra Sheoran, National Institute of Technology, Delhi (India); Atul Srivastava, Indian Institute of Technology Bombay (India); Daniel Claus, Univ. Ulm (Germany); Humberto Cabrera, The Abdus Salam International Ctr. for Theoretical Physics (Italy)

## WEDNESDAY 28 JUNE

### SESSION 8: JOINT SESSION (TRACOPTIC) I: MODELLING AND CHARACTERISATION OF QUANTITATIVE MICROSCOPES

28 June 2023 • 08:30 - 10:00 | ICM Room 14c

Session Chair: Bernd Bodermann, Physikalisch-Technische Bundesanstalt (Germany)

*Joint Session between conference 12618, Optical Measurement Systems for Industrial Inspection, and 12619, Modeling Aspects in Optical Metrology.*

12619-32 • 08:30 - 09:00 | ICM Room 14c

### Modelling the topographic lateral resolution of interferometers (Invited Paper)

Author(s): Peter J. de Groot, James W. Kramer, Zygo Corporation (United States); Torrie P. Sutherland, Southern Connecticut State Univ. (United States)

12619-33 • 09:00 - 09:20 | ICM Room 14c

### On aberration retrieval for optical microscopes in length metrology

Author(s): Jan Krüger, Bernd Bodermann, Rainer Köning, Physikalisch-Technische Bundesanstalt (Germany); Phillip Manley, Lin Zschiedrich, Philipp-Immanuel Schneider, Zuse Institute Berlin (Germany), JCMwave GmbH (Germany); Andreas Heinrich, Christian Eder, Hochschule Aalen - Technik und Wirtschaft (Germany); Ulrike Zeiser, Aksel Goehnermeier, Carl Zeiss Industrielle Messtechnik GmbH (Germany)

12619-34 • 09:20 - 09:40 | ICM Room 14c

### Efficient simulation of microscopic imaging for reconstruction of nanostructures

Author(s): Phillip Manley, JCMwave GmbH (Germany); Jan Krüger, Bernd Bodermann, Rainer Köning, Physikalisch-Technische Bundesanstalt (Germany); Andreas Heinrich, Christian Eder, Hochschule Aalen - Technik und Wirtschaft (Germany); Aksel Goehnermeier, Ulrike Zeiser, Carl Zeiss Industrielle Messtechnik GmbH (Germany); Martin Hammerschmidt, Lin Zschiedrich, Philipp-Immanuel Schneider, JCMwave GmbH (Germany)

12619-35 • 09:40 - 10:00 | ICM Room 14c

### Universal Fourier optics model for virtual coherence scanning interferometers

Author(s): Peter Lehmann, Tobias Pahl, Jörg Riebeling, Univ. Kassel (Germany)

Coffee Break 10:00 - 10:30

## OPTICAL METROLOGY PLENARY SESSION

28 June 2023 • 10:30 - 11:25 | ICM, Saal 1

10:30 to 10:40 hrs

### Welcome Address and Plenary Speaker Introduction

**Marc P. Georges**, Liège Univ. (Belgium)

**Jörg Seewig**, Technische Univ. Kaiserslautern (Germany)

2023 Symposium Chairs

12622-500 • 10:40 - 11:25 | ICM, Saal 1

### Remote photonic medicine (Plenary Presentation)

Author(s): Zeev Zalevsky, Bar-Ilan Univ. (Israel)

Lunch Break 11:30 - 12:30

## POSTERS-WEDNESDAY

28 June 2023 • 12:30 - 13:30 | ICM, Hall BO

Poster authors, please set up posters between the morning coffee break and the end of Lunch Break on Wednesday. Plan to stand by your poster to discuss it with session attendees during the poster session. Remove your poster following the poster session conclusion as posters left on the boards will be discarded.

12618-10 • 12:30 - 13:30 | ICM, Hall BO

### Forging measurement using passive stereo vision

Author(s): Petr Vitek, Jakub Hurník, Ondrej Vaverka, Daniel Koutny, Brno Univ. of Technology (Czech Republic)

12618-68 • 12:30 - 13:30 | ICM, Hall BO

### Measurement analysis of optical micrometers with polygonal mirror-based laser scanners

Author(s): Attila Tiberiu Teodorovits, Corina Mnerie, Univ. "Aurel Vlaicu" din Arad (Romania); Virgil-Florin Duma, Univ. "Aurel Vlaicu" din Arad (Romania), Univ. Politehnica Timisoara (Romania)

12618-69 • 12:30 - 13:30 | ICM, Hall BO

### Comparative performance of high and medium resolution cameras for defect detection in carbon-fiber reinforced composites by digital shearography

Author(s): Kazi Monowar Abedin, Sultan Qaboos Univ. (Oman); Nan Tao, Andrei G. Anisimov, Roger M. Groves, Technische Univ. Delft (Netherlands)

12618-70 • 12:30 - 13:30 | ICM, Hall BO

### Iterative zero-order suppression in dual-wavelength digital holography for 3D single-shot imaging

Author(s): Huangcheng Shangguan, Jeroen Kalkman, Paul Urbach, Technische Univ. Delft (Netherlands)

12618-71 • 12:30 - 13:30 | ICM, Hall BO

### Uncertainty reduction of CO2 laser calibration system in National Institute of Metrology (Thailand)

Author(s): Kanokwan Nontapot, Chanasorn Nutsathaporn, National Institute of Metrology (Thailand) (Thailand)

12618-72 • 12:30 - 13:30 | ICM, Hall BO

### Photoelastic and Stokes images through deep convolutional neural networks: a comparison of stress fields

Author(s): Diego Eusse-Naranjo, Alejandro Restrepo-Martínez, Univ. Nacional de Colombia (Colombia)

12618-73 • 12:30 - 13:30 | ICM, Hall BO

### Optical design of refractive imaging spectrometer for semiconductor metrology

Author(s): Wei-Jei Peng, Ming-Fu Chen, Taiwan Instrument Research Institute (Taiwan); Tsung-Xian Lee, Graduate Institute of Color and Illumination Technology, NTUST (Taiwan)



12618-76 • 12:30 - 13:30 | ICM, Hall BO

## **Precision inspection of microcomponents flatness by Moiré interferometry**

Author(s): Saïd Meguellati, Univ. Ferhat Abbas de Sétif (Algeria)

12618-77 • 12:30 - 13:30 | ICM, Hall BO

## **Interferograms analysis for measuring the thickness of aluminum thin films**

Author(s): Ivan Choque, Univ. Nacional Jorge Basadre Grohmann (Peru); Miguel Asmad, Josue Miranda, Pontificia Univ. Católica del Perú (Peru); Alberto Quispe, Univ. Nacional Jorge Basadre Grohmann (Peru)

12618-78 • 12:30 - 13:30 | ICM, Hall BO

## **Laser-based measurement system for the detection of delamination in tunnel linings**

Author(s): Valentin Vierhub-Lorenz, Christoph S. Werner, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Karsten Weiher, Christoph Heinze, Fraunhofer-Institut für Grosstrukturen in der Produktionstechnik IGP (Germany); Alexander Reiterer, Albert-Ludwigs-Univ. Freiburg (Germany), Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany)

12618-80 • 12:30 - 13:30 | ICM, Hall BO

## **OCT versus x-ray imaging in the inspection of ball grid arrays (BGAs)**

Author(s): Sorina Coroban, YAZAKI Component Technology S.R.L. (Romania); Corina Mnerie, Univ. "Aurel Vlaicu" din Arad (Romania); Virgil-Florin Duma, Univ. "Aurel Vlaicu" din Arad (Romania), Univ. Politehnica Timisoara (Romania)

12618-81 • 12:30 - 13:30 | ICM, Hall BO

## **Thickness analysis of double-layered thin-film sample using spectral reflectometry**

Author(s): Jungjae Park, Korea Research Institute of Standards and Science (Republic of Korea), Univ. of Science and Technology (Republic of Korea); Jaeseok Bae, Meterlab Co. Ltd. (Republic of Korea); Yoon-Soo Jang, Korea Research Institute of Standards and Science (Republic of Korea); Jonghan Jin, Korea Research Institute of Standards and Science (Republic of Korea), Univ. of Science and Technology (Republic of Korea)

12618-82 • 12:30 - 13:30 | ICM, Hall BO

## **Optical reflectometry-based high-speed temperature change measurement of silicon wafer surfaces**

Author(s): Jinho Bae, Minji Hyun, KAIST (Republic of Korea); Jinhee Hong, Youngeun Jeon, Sanghyun Son, Yongjun Seo, Sangmin Ha, SEMES Co., Ltd. (Republic of Korea); Jungwon Kim, KAIST (Republic of Korea)

12618-83 • 12:30 - 13:30 | ICM, Hall BO

## **Scanning Phase-Calculation Formula for Surface Profiling of Optical Flat using Fizeau Interferometer**

Author(s): Hwan Kim, Jurim Jeon, Juncheol Bae, Yangjin Kim, Pusan National Univ. (Republic of Korea)

12618-85 • 12:30 - 13:30 | ICM, Hall BO

## **Intensity-based dynamic speckle method for analysis of variable-rate dynamic events**

Author(s): Elena Stoykova, Lian Nedelchev, Blaga Blagoeva, Branimir Ivanov, Mikhail Levchenko, Nataliya Berberova-Buhova, Dimana Nazarova, Institute of Optical Materials and Technologies (Bulgaria)

12618-86 • 12:30 - 13:30 | ICM, Hall BO

## **High NA lens assessment using self-interference incoherent digital holography**

Author(s): Youngrok Kim, Hyunsik Sung, Wonseok Son, Sung-Wook Min, Kyung Hee Univ. (Republic of Korea)

12618-87 • 12:30 - 13:30 | ICM, Hall BO

## **Development of Gaussian window for the surface profiling of silicon wafer in wavelength-scanning Fizeau interferometer**

Author(s): Juncheol Bae, Jurim Jeon, Hwan Kim, Juyoung Yun, Yangjin Kim, Pusan National Univ. (Republic of Korea)

12618-88 • 12:30 - 13:30 | ICM, Hall BO

## **A novel phase extraction method based on deep learning for estimating geometric properties of optical flat**

Author(s): Jurim Jeon, Yangjin Kim, Pusan National Univ. (Republic of Korea)

12618-89 • 12:30 - 13:30 | ICM, Hall BO

## **Adaptive Shack-Hartmann wavefront system with extended dynamic range for lens characterization**

Author(s): Rania M. Abdelazeem, Mahmoud M. A. Ahmed, Cairo Univ. (Egypt); Mostafa Agour, Aswan Univ. (Egypt)

12618-90 • 12:30 - 13:30 | ICM, Hall BO

## **Accurate spectral transmittance measurement method of highly-opaque materials in the UV-to-IR using optical attenuators**

Author(s): Khaled Mahmoud, Khalid AlMakhli, NMCC/SASO (Saudi Arabia)

12618-91 • 12:30 - 13:30 | ICM, Hall BO

## **Extended modalities of coherent Fourier scatterometry for enhanced edge detection and topology characterisation of low contrast phase objects**

Author(s): Sarika Soman, Sylvania Pereira, Technische Univ. Delft (Netherlands)

12618-92 • 12:30 - 13:30 | ICM, Hall BO

## **CANCELED: Distance-insensitive measurement of the spectrally-resolved reflectance of scattering and absorbing media**

Author(s): Karsten Pink, Philipp Hank, Luismar Barbosa da Cruz, Alwin Kienle, Institut für Lasertechnologien in der Medizin und Messtechnik an der Univ. Ulm (Germany)

12618-93 • 12:30 - 13:30 | ICM, Hall BO

## **Coaxial deflectometry: absolute shape measurement with interferometric accuracy**

Author(s): Yves Surrel, Maxime Bordoux, Wyse Light (France)

12618-94 • 12:30 - 13:30 | ICM, Hall BO

## **Development of a robust instrument for shop floor optical metrology**

Author(s): Rafael Porcar, Diego Ormaechea, Xavier Levecq, Imagine Optic SA (France)

12618-95 • 12:30 - 13:30 | ICM, Hall BO

## **A new method for (thin) plane parallel optics metrology**

Author(s): Rafael Porcar, Diego Ormaechea, Xavier Levecq, Nicolas Lefaudeux, Imagine Optic SA (France)

12618-96 • 12:30 - 13:30 | ICM, Hall BO

## **Automated assessment for grinding spots on aircraft landing gear components using robotic white light interferometry**

Author(s): Jessica Ehrbar, Falko Kähler, Thorsten Schüppstuh, Technische Univ. Hamburg-Harburg (Germany)

# CONFERENCE 12618

12618-97 • 12:30 - 13:30 | ICM, Hall BO

## **Characterization of the maximum measurable slope of optical topography measuring instruments**

Author(s): Sai Gao, Andre Felgner, Dorothee Hueser, Silvana Wyss, Uwe Brand, Physikalisch-Technische Bundesanstalt (Germany)

12618-98 • 12:30 - 13:30 | ICM, Hall BO

## **Introducing ITF compensation in CGH interferometry**

Author(s): Hai-xiang Hu, Zhen-yu Liu, Ming-zhuo Li, Ming-sen Tian, Xiao Luo, Changchun Institute of Optics, Fine Mechanics and Physics (China)

12618-99 • 12:30 - 13:30 | ICM, Hall BO

## **Detection of geometrical patterns of self-assembled gold nanospheres and top-down fabricated nanostructures using Coherent Fourier Scatterometry**

Author(s): Sandra Krämer, Technische Hochschule Mittelhessen (Germany); Kathrin Kroth, Justus-Liebig-Universität Giessen (Germany); Thomas Sure, Technische Hochschule Mittelhessen (Germany); Peter J. Klar, Justus-Liebig-Universität Giessen (Germany)

12618-100 • 12:30 - 13:30 | ICM, Hall BO

## **Studies on micromanipulation capabilities of micro-objects and combined Raman spectroscopy based on photonic jet fiber optic**

Author(s): Karsten Schmiedel, Westsächsische Hochschule Zwickau (Germany); Alexander Kabardiadi-Virkovski, Tobias Baselt, Peter Hartmann, Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS (Germany), Westsächsische Hochschule Zwickau (Germany), Forschungs- und Transferzentrum e.V. an der Westsächsischen Hochschule Zwickau (Germany)

12618-101 • 12:30 - 13:30 | ICM, Hall BO

## **Investigation to evaluate the aging condition utilizing UV radiation of carbon black filled rubber compounds as measured by ATR spectroscopy**

Author(s): Florian Rudek, Westsächsische Hochschule Zwickau (Germany)

12618-102 • 12:30 - 13:30 | ICM, Hall BO

## **Improving the phase modulation of spatial light modulator using Shack-Hartmann wavefront sensor**

Author(s): Rania M. Abdelazeem, Mahmoud M. A. Ahmed, Salah Hassab-Elnaby, Cairo Univ. (Egypt); Mostafa Agour, Aswan Univ. (Egypt)

12618-103 • 12:30 - 13:30 | ICM, Hall BO

## **Conical null-screen design for evaluating fast free-form convex surfaces**

Author(s): Francisco Javier Bautista-Clemente, Manuel Campos-García, Daniel Aguirre, Dulce González-Utrera, Univ. Nacional Autónoma de México (Mexico); Brenda Villalobos-Mendoza, Universidad de Monterrey (Mexico)

12618-104 • 12:30 - 13:30 | ICM, Hall BO

## **Shape measurement of phase objects using fringe projection technique**

Author(s): Vismay Trivedi, National Institute of Technology, Delhi (India); Mugdha Joglekar, Subhash Utadiya, The Maharaja Sayajirao Univ. of Baroda (India); Nishant Chhillar, Shivam Sharma, Gyanendra Sheoran, National Institute of Technology, Delhi (India); Arun Anand, Sardar Patel Univ. (India)

12618-105 • 12:30 - 13:30 | ICM, Hall BO

## **Detection of delaminated areas in thermal barrier coatings by active infrared thermography using different heat sources**

Author(s): Andrés Felipe García Revuelta, Jhonatan Román Román, Alexander Arboleda, Alejandro Toro, Alejandro Restrepo-Martínez, Univ. Nacional de Colombia (Colombia)

12618-106 • 12:30 - 13:30 | ICM, Hall BO

## **Rapid surface metrology of freeform shapes using CGH interferometry**

Author(s): Edward LaVilla, Jim Burge, Chunyu Zhao, Shleby Ament, Jake Beverage, Tyler Steele, Arizona Optical Metrology LLC (United States)

12618-107 • 12:30 - 13:30 | ICM, Hall BO

## **Non-destructive evaluation of thermal barrier coating thickness using IR thermography in chemical removal processes**

Author(s): Jhonatan Román Román, Andrés Felipe García Revuelta, Alejandro Restrepo-Martínez, Alejandro Toro, Oscar D. Muñoz, Univ. Nacional de Colombia (Colombia)

12618-109 • 12:30 - 13:30 | ICM, Hall BO

## **Development of a liquid interferometric optical microscope (L-IOM) in phase-shift mode with standard Mirau objectives**

Author(s): Marc Jobin, Haute école du paysage, d'ingénierie et d'architecture de Genève (Switzerland)

12618-111 • 12:30 - 13:30 | ICM, Hall BO

## **New wafer shape measurement technique for 300mm blank vertically held silicon wafers**

Author(s): Juan M. Trujillo-Sevilla, Rubén Abrante, Miguel Jiménez, Wootpix, S.L. (Spain); Kiril Ivanov Kurtev, Guillermo Castro Luis, Wootpix (Spain); Jan O. Gaudestad, Wootpix, S.L. (United States)

12618-112 • 12:30 - 13:30 | ICM, Hall BO

## **3D hologram optical element for angle measuring devices and sighting systems**

Author(s): Oleksandr Akhmerov, Odessa I. I. Mechnikov National Univ. (Ukraine)

12618-113 • 12:30 - 13:30 | ICM, Hall BO

## **Fabrication and test of functional panels for multimission modular satellite platform**

Author(s): Sara Coppola, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Ciro Tortora, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy), Univ. degli Studi di Napoli Federico II (Italy); Massimo Rippa, Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12618-114 • 12:30 - 13:30 | ICM, Hall BO

## **Infrared thermography at low temperature**

Author(s): Jean-François Vandenrijt, Stéphane Roose, Ctr. Spatial de Liège (Belgium); Gianluca Casarosa, European Space Agency (Netherlands)

12618-115 • 12:30 - 13:30 | ICM, Hall BO

## **Pyro-electrohydrodynamic printing of liquid crystals**

Author(s): Veronica Vespini, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Jaromir Behal, Univ. degli Studi di Napoli Federico II (Italy); Lisa Miccio, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Luciano De Sio, Sapienza Univ. di Roma (Italy); Sara Coppola, Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12618-116 • 12:30 - 13:30 | ICM, Hall BO

## **Development of a projection Moiré method for full-field wafer warpage measurement**

Author(s): Yu-Cheng Yang, Hung-Lin Hsieh, Hao-Wen Chia, National Taiwan Univ. of Science and Technology (Taiwan); Ju-Yi Lee, National Central Univ. (Taiwan)

12618-117 • 12:30 - 13:30 | ICM, Hall B0

## Robotization of engineering equipment to improve the safety of emergency rescue operations using optical methods

Author(s): Maretta Kazaryan, North Ossetian State Medical Academy (Russian Federation); Mikhail Shakhramanyan, Financial Univ. under the Government of the Russian Federation (Russian Federation); Alexander Zelensky, Moscow State Univ. of Technology (Russian Federation); Evgeny A. Semenishchev, Moscow State Univ. of Technology "STANKIN" (Russian Federation)

12618-118 • 12:30 - 13:30 | ICM, Hall B0

## Block-Based Multi-Scale Image Enhancement Method for Industrial Inspection System

Author(s): Viacheslav Voronin, Moscow State Univ. of Technology "STANKIN" (Russian Federation); Nikolay Gapon, Marina Zhdanova, Moscow State Univ. of Technology (Russian Federation); Evgeny A. Semenishchev, Alexander Zelensky, Moscow State Univ. of Technology "STANKIN" (Russian Federation); Yuri Ilyukhin, Moscow State Univ. of Technology (Russian Federation)

12618-119 • 12:30 - 13:30 | ICM, Hall B0

## Development of a full-field polarization interferometer for measurement of wafer surface profile

Author(s): Ju-Yi Lee, National Central Univ. (Taiwan); Yue-Jhe Tsai, National Central Univ. (Taiwan); Hsing-Hsien Tsai, National Central Univ. (Taiwan); Hung-Lin Hsieh, National Taiwan Univ. of Science and Technology (Taiwan)

12618-120 • 12:30 - 13:30 | ICM, Hall B0

## Absolute flatness measurement based on shift-rotation method using the second deviation

Author(s): Jiayi Zhang, Dapeng Chen, Shanghai Institute of Optics and Fine Mechanics (China); Shijie Liu, Shanghai Institute of Optics and Fine Mechanics (China); Yunbo Bai, Shanghai Institute of Optics and Fine Mechanics (China); Jianda Shao, Shanghai Institute of Optics and Fine Mechanics (China); Qi Lu, Shanghai Institute of Optics and Fine Mechanics (China)

12618-121 • 12:30 - 13:30 | ICM, Hall B0

## Ion beam etching for large-aperture and high-precision CGH nulls

Author(s): Wa Tang, Changchun Institute of Optics, Fine Mechanics and Physics (China)

12618-122 • 12:30 - 13:30 | ICM, Hall B0

## Development of a heterodyne speckle interferometer based on asymmetric optical path design

Author(s): Hung-Lin Hsieh, Yuen-Jung Lee, Yu-Chia Chang, National Taiwan Univ. of Science and Technology (Taiwan)

12618-125 • 12:30 - 13:30 | ICM, Hall B0

## Foil model-based surface reconstruction algorithm for coherence scanning interferometry

Author(s): Jiayu Liu, Shanghai Jiao Tong Univ. (China), Precision Optical Manufacturing and Testing Ctr., Shanghai Institute of Optics and Fine Mechanics (China); Rong Su, Precision Optical Manufacturing and Testing Ctr., Shanghai Institute of Optics and Fine Mechanics (China); Mingjun Ren, Limin Zhu, Shanghai Jiao Tong Univ. (China); Jeremy M. Coupland, Wolfson School of Mechanical, Electrical and Manufacturing Engineering, Loughborough Univ. (United Kingdom)

## SESSION 9: JOINT SESSION (TRACOPTIC) II: MODELLING AND CHARACTERISATION OF QUANTITATIVE MICROSCOPES

28 June 2023 • 13:30 - 15:30 | ICM Room 14c

Session Chair: Peter J. de Groot, Zygo Corporation (United States)

*Joint Session between conference 12618, Optical Measurement Systems for Industrial Inspection, and 12619, Modeling Aspects in Optical Metrology.*

12618-39 • 13:30 - 13:50 | ICM Room 14c

## Compatibility analysis of profile and areal material measures

Author(s): Matthias Eifler, IU International Univ. of Applied Sciences (Germany); Julian Hering-Stratemeier, Georg von Freymann, Jörg Seewig, Rheinland-Pfälzische Technische Univ. Kaiserslautern-Landau (Germany)

12618-40 • 13:50 - 14:10 | ICM Room 14c

## Investigations on the accuracy and evaluation of the uncertainty of stitching in optical surface metrology

Author(s): Janik Schaude, Tino Hausotte, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)

12619-36 • 14:10 - 14:30 | ICM Room 14c

## Physically based rendering method to derive realistic simulation of chromatic confocal measurements

Author(s): Dan Linnert, Manuel Stavridis, Ulrich Neuschaefer-Rube, Physikalisch-Technische Bundesanstalt (Germany); Rainer Tutsch, Institut für Produktionsmesstechnik (Germany)

12619-37 • 14:30 - 14:50 | ICM Room 14c

## Rigorous modeling of a confocal microscope

Author(s): Silvana Wyss, Jan Krüger, Sai Gao, Physikalisch-Technische Bundesanstalt (Germany); Liwei Fu, Alexander Birk, Karsten Frenner, Stephan Reichelt, Univ. Stuttgart (Germany)

12619-38 • 14:50 - 15:10 | ICM Room 14c

## Comparison of approximate methods for modelling coherence scanning interferometry

Author(s): Helia Hooshmand-Ziafi, The Univ. of Nottingham (United Kingdom); Tobias Pahl, Univ. Kassel (Germany); Peter J. de Groot, Zygo Corporation (United States); Peter Lehmann, Univ. Kassel (Germany); Athanasios Pappas, The Univ. of Nottingham (United Kingdom); Rong Su, Shanghai Institute of Optics and Fine Mechanics (China); Richard Leach, Samanta Piano, The Univ. of Nottingham (United Kingdom)

12618-41 • 15:10 - 15:30 | ICM Room 14c

## Evaluation of anisotropic resolutions of optical microscopes using star-shaped material measures

Author(s): Frank Segel, Zhen Li, Sophie Gröger, Technische Univ. Chemnitz (Germany)

**Coffee Break 15:30 - 16:00**

# CONFERENCE 12618

## SESSION 10: MEASUREMENT OF PRECISION COMPONENTS AND OPTICAL SYSTEMS

28 June 2023 • 16:00 - 17:40 | ICM Room 14c

Session Chair: Matthias Eifler,  
IU International Univ. of Applied Sciences (Germany)

12618-42 • 16:00 - 16:20 | ICM Room 14c

### Improved alignment of the setup for traceable measurements of the Modulation Transfer Function (MTF)

Author(s): Hanno Dierke, Markus Schake, Physikalisch-Technische Bundesanstalt (Germany)

12618-43 • 16:20 - 16:40 | ICM Room 14c

### Long-term wavelength stabilisation of widely modulated lasers

Author(s): Kieran B. Wiseman, Cranfield Univ. (United Kingdom); Thomas Kissinger, Technische Univ. Ilmenau (Germany); Ralph P. Tatam, Cranfield Univ. (United Kingdom)

12618-44 • 16:40 - 17:00 | ICM Room 14c

### Precision form measurement of biconic surfaces using scanning Fizeau interferometry

Author(s): Thomas Dresel, Zygo Corporation (United States)

12618-45 • 17:00 - 17:20 | ICM Room 14c

### Versatile Modulation Transfer Function and direct point spread function measurement with a random target method

Author(s): Franck Michaud, Safran Electronics & Defense (France)

12618-46 • 17:20 - 17:40 | ICM Room 14c

### Implementation of a new algorithm for resolution enhancement in wavefront sensing-based metrology

Author(s): Rafael Porcar, Xavier Levecq, Pauline Treimany, Imagine Optic SA (France)

## SESSION 11: SPECIAL SESSION, METROLOGY FOR AUTONOMOUS VEHICLES

29 June 2023 • 08:30 - 10:00 | ICM Room 14c

Session Chair: Stephan Reichelt, Univ. Stuttgart (Germany)

12618-47 • 08:30 - 09:00 | ICM Room 14c

### Development of a LiDAR system for low visibility conditions

Author(s): Valentin Vierhub-Lorenz, Jannis Gangelhoff, Christoph S. Werner, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Claudia Monika Bett, Karsten Frenner, Wolfgang Osten, Institut für Technische Optik (Germany); Alexander Reiterer, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany), Univ. of Freiburg (Germany)

12618-48 • 09:00 - 09:20 | ICM Room 14c

### A lightweight laser scanner for UAV-based applications

Author(s): Jannis Gangelhoff, Philipp von Olshausen, Simon Frey, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Alexander Reiterer, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany), Univ. of Freiburg (Germany)

12618-49 • 09:20 - 09:40 | ICM Room 14c

### Towards image-free object detection for autonomous vehicles under harsh environmental conditions

Author(s): Claudia Monika Bett, Karsten Frenner, Stephan Reichelt, Wolfgang Osten, Univ. Stuttgart (Germany)

12618-50 • 09:40 - 10:00 | ICM Room 14c

### Coherence-gated digital holographic imaging through extended scattering media for autonomous driving vehicles

Author(s): Alexander Gröger, Giancarlo Pedrini, Univ. Stuttgart (Germany); Daniel Claus, ILM Ulm (Germany); Stephan Reichelt, Univ. Stuttgart (Germany)

29 June 2023

Coffee Break 10:00 - 10:30

## SESSION 12: SCATTERING, DIFFRACTION, AND SPECKLE TECHNIQUES

29 June 2023 • 10:30 - 12:20 | ICM Room 14c

Session Chair: Tino Hausotte, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)

12618-51 • 10:30 - 11:00 | ICM Room 14c

### Digital holographic microscopy with functionally-integrated waveguide illuminator (*Keynote Presentation*)

Author(s): Eriko Watanabe, The Univ. of Electro-Communications (Japan)

12618-52 • 11:00 - 11:20 | ICM Room 14c

### Surface roughness measurement of large areas with high spatial resolution by spectral speckle correlation

Author(s): Patrick Laux, Annelie Schiller, Alexander Bertz, Daniel Carl, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Stephan Reichelt, Univ. Stuttgart (Germany)

12618-53 • 11:20 - 11:40 | ICM Room 14c

### Application and performance of laser speckle odometry applied to a mobile industrial robot

Author(s): Thomas O. H. Charrett, Sam Gibson, Ralph P. Tatam, Cranfield Univ. (United Kingdom)

12618-54 • 11:40 - 12:00 | ICM Room 14c

### Gas analyzer based on inelastic light scattering and acoustic resonance for fast and accurate Wobbe index measurement

Author(s): Konstantin Harr, Siemens AG (Germany), Karlsruhe Institut für Technologie (Germany); Camiel Heffels, Siemens AG (Germany)

12618-55 • 12:00 - 12:20 | ICM Room 14c

### Portable low-cost setup for outdoor implementation of dynamic speckle technique

Author(s): Mikhail Levchenko, Elena Stoykova, Institute of Optical Materials and Technologies (Bulgaria); Keehoon Hong, Joongki Park, Electronics and Telecommunications Research Institute (Korea, Democratic Peoples Republic of)

Lunch Break 12:20 - 13:30

## SESSION 13: POLARIMETRIC, SPECTROSCOPIC, AND NONDESTRUCTIVE TECHNIQUES

29 June 2023 • 13:30 - 15:30 | ICM Room 14c

Session Chair: Alexander Bertz, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany)

12618-56 • 13:30 - 13:50 | ICM Room 14c

### Optimal Mueller matrix imaging polarimeter in the visible band based on division-of-aperture

Author(s): Sara Peña, Santiago Royo, Univ. Politècnica de Catalunya (Spain)

12618-57 • 13:50 - 14:10 | ICM Room 14c

### An infrared optical sensor for quantitative inline inspection of nanocoatings on plastic products

Author(s): Benedikt Hauer, Adrian Daniel Dorfschmidt, Friederike Münch, Jens Scherer, Daniel Carl, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany)

12618-58 • 14:10 - 14:30 | ICM Room 14c

### Diffraction-limited mid-infrared hyperspectral single-pixel imaging microscopy

Author(s): Alexander Ebner, Paul Gattinger, Ivan Zorin, Christian Rankl, Markus Brandstetter, Research Ctr. for Non Destructive Testing GmbH (Austria)

12618-59 • 14:30 - 14:50 | ICM Room 14c

### Tolerance analysis and design optimization of additively manufactured mechanical structure for a Raman spectrometer system

Author(s): Panpan Xia, Grabe Tobias, Tobias Biermann, Simon Teves, Arved Ziebehel, Roland Lachmayer, Institut für Produktentwicklung und Gerätebau (Germany)

12618-60 • 14:50 - 15:10 | ICM Room 14c

### In-line fluorescence detector for production control in robot-driven environments

Author(s): Vivien Behrendt, Dominic Buchta, Stefan Adolph, Christian Lutz, Jens Scherer, Alexander Blättermann, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany)

12618-67 • 15:10 - 15:30 | ICM Room 14c

### Investigation and development of a combined nondestructive evaluation measurement laboratory for aerospace composites

Author(s): Jean-François Vandenrijt, Ctr. Spatial de Liège (Belgium); Jonathan Rochet, Sébastien Hoffait, Thibault Boulanger, V2i (Belgium); Pierre Servais, NDTPro (Belgium); Clemente Ibarra-Castanedo, Xavier Maldague, Univ. Laval (Canada); Marc Georges, Ctr. Spatial de Liège (Belgium)

Coffee Break 15:30 - 16:00

## SESSION 14: LARGE-AREA, LARGE AND MULTISCALE MEASUREMENTS

29 June 2023 • 16:00 - 17:40 | ICM Room 14c

Session Chair: Armando Albertazzi Gonçalves, Univ. Federal de Santa Catarina (Brazil)

12618-62 • 16:00 - 16:20 | ICM Room 14c

### Frequency comb-based high-speed, large-area surface profilometry

Author(s): HyunSoo Kwak, Jinho Bae, Yongjin Na, KAIST (Republic of Korea); Sungyoon Ryu, Jinwoo Baik, Younghoon Sohn, SAMSUNG Electronics Co., Ltd. (Republic of Korea); Jungwon Kim, KAIST (Republic of Korea)

12618-63 • 16:20 - 16:40 | ICM Room 14c

### Accelerated measurement and defect characterization on large optical components

Author(s): Matthias Liedmann, Torsten Machleidt, Gesellschaft für Bild- und Signalverarbeitung (GBS) mbH (Germany)

12618-64 • 16:40 - 17:00 | ICM Room 14c

### An extended model for the kinematic identification of a tiltable laser plane in adaptive light-section triangulation

Author(s): Hagen Bossemeyer, Markus Kästner, Eduard Reithmeier, Leibniz Univ. Hannover (Germany)

12618-653 • 17:00 - 17:20 | ICM Room 14c

### Comparison of optical methods supporting 3D digital image correlation applied to investigations of large engineering objects

Author(s): Adam R. Styk, Michal Jankowski, Tomasz Kowaluk, Malgorzata Kujawinska, Warsaw Univ. of Technology (Poland)

12618-66 • 17:20 - 17:40 | ICM Room 14c

### Digital holography in a machine tool: measuring large-scale objects with micron accuracy

Author(s): Tobias Seyler, Markus Fratz, Annelie Schiller, Alexander Bertz, Daniel Carl, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Tobias Schmitt-Manderbach, Carl Zeiss AG (Germany); Markus Langer, toolcraft AG (Germany)

# CONFERENCE 12619

## Modeling Aspects in Optical Metrology IX

26 - 28 June 2023 | ICM Room 12b (Mon-Tue); ICM Room 14c (Wed)

Conference Chair: **Bernd Bodermann**, Physikalisch-Technische Bundesanstalt (Germany)

Conference Co-Chairs: **Karsten Frenner**, Institut für Technische Optik (Germany); **Bryan M. Barnes**, National Institute of Standards and Technology (United States); **George Koutsourakis**, National Physical Lab. (United Kingdom)

Programme Committee: **Markus Bär**, Physikalisch-Technische Bundesanstalt (Germany); **Jörg Bischoff**, Osires Optical Engineering (Germany); **Sven Burger**, Konrad-Zuse-Zentrum für Informationstechnik (Germany); **Peter Evanschitzky**, Fraunhofer-Institut für Integrierte Systeme und Bauelementetechnologie IISB (Germany); **Liwei Fu**, Univ. Stuttgart (Germany); **Norbert Kerwien**, Carl Zeiss AG (Germany); **Rainer Köning**, Physikalisch-Technische Bundesanstalt (Germany); **Stefanie Kroker**, Physikalisch-Technische Bundesanstalt (Germany); **Johannes Ruoff**, Carl Zeiss SMT GmbH (Germany); **Thomas Siefke**, Physikalisch-Technische Bundesanstalt (Germany); **Frank Wyrowski**, Friedrich-Schiller-Univ. Jena (Germany)

### MONDAY 26 JUNE

#### OPENING REMARKS

26 June 2023 • 10:30 - 10:40 | ICM Room 12b

12619-100 • 10:30 - 10:40 | ICM Room 12b

#### Welcome and Introduction

Author(s): Bernd Bodermann, Physikalisch-Technische Bundesanstalt (Germany)

#### SESSION 1: WORKSHOP ON COMPRESSED SENSING

26 June 2023 • 10:40 - 12:30 | ICM Room 12b

Session Chair: Phillip Manley, JCMwave GmbH (Germany)

12619-1 • 10:40 - 11:20 | ICM Room 12b

#### The coherence function for optical metrology: a new paradigm and the role of information theory and compressed sensing (*Keynote Presentation*)

Author(s): Ralf B. Bergmann, Claas Falldorf, André F. Müller, Bremer Institut für angewandte Strahltechnik GmbH (Germany); C. Bockelmann, Univ. Bremen (Germany); Mostafa Agour, Bremer Institut für angewandte Strahltechnik GmbH (Germany)

12619-2 • 11:20 - 11:50 | ICM Room 12b

#### Compressed sensing for optical metrology of semiconductor materials and devices (*Invited Paper*)

Author(s): George Koutsourakis, James C. Blakesley, Andrew Thompson, Aidas Baltusis, Sebastian Wood, National Physical Lab. (United Kingdom)

12619-3 • 11:50 - 12:10 | ICM Room 12b

#### Realization of subsampling schemes for compressive nano-FTIR imaging

Author(s): Dario Siebenkotten, Manuel Marschall, Gerd Wübbeler, Arne Hoehl, Physikalisch-Technische Bundesanstalt (Germany); Eckart Rühl, Freie Univ. Berlin (Germany); Clemens Elster, Bernd Kästner, Physikalisch-Technische Bundesanstalt (Germany)

12619-4 • 12:10 - 12:30 | ICM Room 12b

#### Compressed sensing approach for temporal and spectral photoluminescence imaging of semiconductors

Author(s): Aidas Baltusis, Univ. of Glasgow (United Kingdom); George Koutsourakis, Sebastian Wood, James Blakesley, National Physical Lab. (United Kingdom); Stephen J. Sweeney, Univ. of Glasgow (United Kingdom)

Lunch Break 12:30 - 13:40

#### SESSION 2: OPTICAL NANOMETROLOGY AND ELLIPSOMETRY

26 June 2023 • 13:40 - 15:30 | ICM Room 12b

Session Chair: Karsten Frenner, Institut für Technische Optik (Germany)

12619-5 • 13:40 - 14:10 | ICM Room 12b

#### Trajectory-based sensitivity analysis in spectroscopic ellipsometry modeling (*Invited Paper*)

Author(s): Dmitriy V. Likhachev, GlobalFoundries Dresden Module One LLC & Co. KG (Germany)

12619-6 • 14:10 - 14:30 | ICM Room 12b

#### Non-normalized Mueller ellipsometry is better than normalized Mueller ellipsometry

Author(s): Poul Erik Hansen, DFM A/S (Denmark); Thomas Siefke, Friedrich Schiller University Jena, Institut für Angewandte Physik (Germany); Astrid Tranum Rømer, DFM A/S (Denmark)

12619-8 • 14:30 - 14:50 | ICM Room 12b

#### Optical measurements and numerical simulations of the Mueller matrix at silicon nanowire structures

Author(s): Jana Grundmann, Tim Käseberg, Bernd Bodermann, Physikalisch-Technische Bundesanstalt (Germany)

12619-51 • 14:50 - 15:10 | ICM Room 12b

#### Comparative analysis of grating reconstruction: deep learning vs. Levenberg-Marquardt methods

Author(s): Liwei Fu, Univ. Stuttgart (Germany); Xiwei Wang, Karsten Frenner, Institut für Technische Optik (Germany); Stephan Reichelt, Univ. Stuttgart (Germany)

12619-52 • 15:10 - 15:30 | ICM Room 12b

#### Simulation of light scattering from complex 3D structures for confocal microscope using accelerated boundary element method

Author(s): Liwei Fu, University of Stuttgart (Germany); Alexander Birk, Karsten Frenner, Institut für Technische Optik (Germany); Stephan Reichelt, Univ. Stuttgart (Germany); Sai Gao, bPhysikalisch-Technische Bundesanstalt (Germany)

Coffee Break 15:30 - 16:00

## SESSION 3: INTERFEROMETRY AND PHASE

26 June 2023 • 16:00 - 18:00 | ICM Room 12b  
Session Chair: Liwei Fu, Univ. Stuttgart (Germany)

12619-11 • 16:00 - 16:20 | ICM Room 12b

### Calibration system for photomask roundness based on a precision rotary table

Author(s): Mariko Kajima, Kentaro Sugawara, Yasuaki Hori, Tsukasa Watanabe, National Institute of Advanced Industrial Science and Technology (Japan)

12619-12 • 16:20 - 16:40 | ICM Room 12b

### Modeling of digital receiver-induced ranging bias variations in the context of high precision space-borne metrology systems

Author(s): Philipp Euringer, Gerald Hechenblaikner, Francis Soualle, Simon Delchambre, Tobias Ziegler, Airbus Defence and Space (Germany); Walter Fichter, Institute of Flight Mechanics and Control, Univ. Stuttgart (Germany)

12619-13 • 16:40 - 17:00 | ICM Room 12b

### Advanced in situ metrology for large aperture flat mirrors

Author(s): Erhui Qi, Haixiang Hu, Xiao Luo, Changchun Institute of Optics, Fine Mechanics and Physics (China); Zhenyu Liu, Changchun Institute of Optics, Fine Mechanics and Physics (China)

12619-18 • 17:00 - 17:20 | ICM Room 12b

### Modeling the wavefront degeneration and optimizing the CGH interferometric null test

Author(s): Mingzhuo Li, Haixiang Hu, Changchun Institute of Optics, Fine Mechanics and Physics (China); Xuejun Zhang, Sida Lv, Changchun Institute of Optics, Fine Mechanics and Physics (China)

12619-46 • 17:20 - 17:40 | ICM Room 12b

### A new three-wavelength chromatic-corrected hybrid phase shifting method for single-camera digital photoelasticity

Author(s): Alejandro Restrepo-Martínez, Univ. Nacional de Colombia Sede Medellín (Colombia)

12619-40 • 17:40 - 18:00 | ICM Room 12b

### Evaluation of aluminum molds using the null screens test

Author(s): Agustín Santiago-Alvarado, Univ. Tecnológica de la Mixteca (Mexico), Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Fermín-Salomón Granados-Agustín, María Elizabeth Percino-Zacarias, Oliver Huerta-Carranza, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Víctor Iván Moreno Oliva, Universidad del Istmo (Mexico)

## TUESDAY 27 JUNE

## SESSION 4: OPTICAL SYSTEMS

27 June 2023 • 09:00 - 10:00 | ICM Room 12b  
Session Chair: Martin Hammerschmidt, JCMwave GmbH (Germany)

12619-15 • 09:00 - 09:20 | ICM Room 12b

### Experimental versus simulated secondary scan patterns produced by a pair of Risley prisms

Author(s): Alexandru-Lucian Dîmb, Virgil-Florin Duma, Univ. "Aurel Vlaicu" din Arad (Romania), Univ. Politehnica Timisoara (Romania)

12619-17 • 09:20 - 09:40 | ICM Room 12b

### Scientific modeling of optical 3D measuring devices based on GPU-accelerated ray tracing using the NVIDIA OptiX Engine

Author(s): Andrej Keksel, Institut für Mess- und Sensortechnik, Rheinland-Pfälzische Technische Univ. Kaiserslautern-Landau (Germany); Samuel Schmidt, Institute for Measurement and Sensor-Technology, Rheinland-Pfälzische Technische Univ. Kaiserslautern-Landau (Germany); Dietrich Beck, Jörg Seewig, Institut für Mess- und Sensortechnik, Rheinland-Pfälzische Technische Univ. Kaiserslautern-Landau (Germany)

12619-50 • 09:40 - 10:00 | ICM Room 12b

### RCWA acceleration for channel-hole structures with a neural network

Author(s): Hyomin Ahn, Yoonsung Bae, Jeung Song, Namyoon Kim, Joonyoung Ahn, Sungmin Jo, Wookrae Kim, Myungjun Lee, SAMSUNG Electronics Co., Ltd. (Republic of Korea)

Coffee Break 10:00 - 10:30

## SESSION 5: SCATTEROMETRY AND OCD METROLOGY

27 June 2023 • 10:30 - 12:30 | ICM Room 12b  
Session Chairs: Bryan M. Barnes, National Institute of Standards and Technology (United States), Stefanie Kroker, Physikalisch-Technische Bundesanstalt (Germany)

12619-19 • 10:30 - 10:50 | ICM Room 12b

### Non-integral model-based scatterometry for single-structure OCD metrology

Author(s): Wei-Hsin Chein, Fu-Sheng Yang, Zih-Ying Fu, Liang-Chia Chen, National Taiwan Univ. (Taiwan)

12619-20 • 10:50 - 11:10 | ICM Room 12b

### Efficient reconstruction of model parameters using Bayesian target-vector optimization

Author(s): Matthias Plock, Zuse Institute Berlin (Germany); Sven Burger, Zuse Institute Berlin (Germany), JCMwave GmbH (Germany); Philipp-Immanuel Schneider, JCMwave GmbH (Germany), Zuse Institute Berlin (Germany)

12619-21 • 11:10 - 11:30 | ICM Room 12b

### Using singular value decomposition to study near electromagnetic field of the 3D through silicon via array with high aspect ratio

Author(s): Song-En Chen, Chih-Chung Wang, Jia-Han Li, National Taiwan Univ. (Taiwan)

12619-23 • 11:30 - 11:50 | ICM Room 12b

### Experimental study and modelling of high aspect ratio through silicon vias (TSVs)

Author(s): Alejandro Avellan, Wiebke Schöttler, Matthias Meyer, FRT GmbH (Germany)

12619-24 • 11:50 - 12:10 | ICM Room 12b

### Systematic influence of line edge roughness on the line width measured by scatterometry

Author(s): Thomas Siefke, Friedrich-Schiller-Univ. Jena (Germany); Sebastian Heidenreich, Physikalisch-Technische Bundesanstalt (Germany)

12619-25 • 12:10 - 12:30 | ICM Room 12b

### Forward simulation of coherent beams on grating structures for coherent scatterometry

Author(s): Martin Hammerschmidt, Lin Zschiedrich, JCMwave GmbH (Germany), Zuse Institute Berlin (Germany); Lauryna Siaudinyté, VSL National Metrology Institute (Netherlands); Phillip Manley, Philipp-Immanuel Schneider, JCMwave GmbH (Germany), Zuse Institute Berlin (Germany); Sven Burger, Zuse Institute Berlin (Germany), JCMwave GmbH (Germany)

Lunch Break 12:30 - 14:00

# CONFERENCE 12619

## WORLD OF PHOTONICS PLENARY

27 June 2023 • 14:00 - 15:30 | ICM, Saal 1

This plenary session features a presentation by **Tammy Ma**, Lawrence Livermore National Lab. (United States), and **Constantin Haefner**, Fraunhofer-Institute for Laser Technology (Germany), on laser-driven inertial confinement fusion.

Coffee Break 15:30 - 16:00

## SESSION 6: SUPER-RESOLUTION, WAVE PROPAGATION, AND 3D

27 June 2023 • 16:00 - 17:50 | ICM Room 12b

Session Chair: Stefanie Kroker, Physikalisch-Technische Bundesanstalt (Germany)

12619-26 • 16:00 - 16:30 | ICM Room 12b

### Nanoscale imaging using short-wavelength Fourier ptychography combined with structured illumination for semiconductor metrology (*Invited Paper*)

Author(s): Mark-Alexander Henn, National Institute of Standards and Technology (United States), Univ. of Maryland (United States); Martin Y. Sohn, National Institute of Standards and Technology (United States)

12619-28 • 16:30 - 16:50 | ICM Room 12b

### Simulative investigation of microcylinder-assisted microscopy in reflection and transmission mode

Author(s): Tobias Pahl, Sebastian Hagemeyer, Lucie Hüser, Felix Rosenthal, Peter Lehmann, Univ. Kassel (Germany)

12619-29 • 16:50 - 17:10 | ICM Room 12b

### Simulating achromatic plasmonic lenses with inverted design for improved nano-optics

Author(s): Tim Käseberg, Physikalisch-Technische Bundesanstalt (Germany); Stefanie Kroker, Technische Univ. Braunschweig (Germany); Bernd Bodermann, Physikalisch-Technische Bundesanstalt (Germany)

12619-30 • 17:10 - 17:30 | ICM Room 12b

### Near- and far-field simulations of 2D particles with photonic structure

Author(s): Poul Erik Hansen, Astrid Trantum Rømer, DFM A/S (Denmark); Nikoline Mai Bøgely Rehn, Mirza Karamehmedović, Technical Univ. of Denmark (Denmark)

12619-31 • 17:30 - 17:50 | ICM Room 12b

### Computational methodologies for reliable tomographic phase imaging flow cytometry

Author(s): Pasquale Memmolo, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Daniele Pirone, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Marika Valentino, Giusy Giugliano, Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Lisa Miccio, Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy)

## WEDNESDAY 28 JUNE

## SESSION 7: JOINT SESSION (TRACOPTIC) I: MODELLING AND CHARACTERISATION OF QUANTITATIVE MICROSCOPES

### NOTE ROOM CHANGE

28 June 2023 • 08:30 - 10:00 | ICM Room 14c

Session Chair: Bernd Bodermann, Physikalisch-Technische Bundesanstalt (Germany)

*Joint Session between conference 12618, Optical Measurement Systems for Industrial Inspection, and 12619, Modeling Aspects in Optical Metrology.*

12619-32 • 08:30 - 09:00 | ICM Room 14c

### Modelling the topographic lateral resolution of interferometers (*Invited Paper*)

Author(s): Peter J. de Groot, James W. Kramer, Zygo Corporation (United States); Torrie P. Sutherland, Southern Connecticut State Univ. (United States)

12619-33 • 09:00 - 09:20 | ICM Room 14c

### On aberration retrieval for optical microscopes in length metrology

Author(s): Jan Krüger, Bernd Bodermann, Rainer Köning, Physikalisch-Technische Bundesanstalt (Germany); Phillip Manley, Lin Zschiedrich, Philipp-Immanuel Schneider, Zuse Institute Berlin (Germany), JCMwave GmbH (Germany); Andreas Heinrich, Christian Eder, Hochschule Aalen - Technik und Wirtschaft (Germany); Ulrike Zeiser, Aksel Goehnermeier, Carl Zeiss Industrielle Messtechnik GmbH (Germany)

12619-34 • 09:20 - 09:40 | ICM Room 14c

### Efficient simulation of microscopic imaging for reconstruction of nanostructures

Author(s): Phillip Manley, JCMwave GmbH (Germany); Jan Krüger, Bernd Bodermann, Rainer Köning, Physikalisch-Technische Bundesanstalt (Germany); Andreas Heinrich, Christian Eder, Hochschule Aalen - Technik und Wirtschaft (Germany); Aksel Goehnermeier, Ulrike Zeiser, Carl Zeiss Industrielle Messtechnik GmbH (Germany); Martin Hammerschmidt, Lin Zschiedrich, Philipp-Immanuel Schneider, JCMwave GmbH (Germany)

12619-35 • 09:40 - 10:00 | ICM Room 14c

### Universal Fourier optics model for virtual coherence scanning interferometers

Author(s): Peter Lehmann, Tobias Pahl, Jörg Riebeling, Univ. Kassel (Germany)

Coffee Break 10:00 - 10:30

## OPTICAL METROLOGY PLENARY SESSION

28 June 2023 • 10:30 - 11:25 | ICM, Saal 1

10:30 to 10:40 hrs

### Welcome Address and Plenary Speaker Introduction

**Marc P. Georges**, Liège Univ. (Belgium)

**Jörg Seewig**, Technische Univ. Kaiserslautern (Germany)

2023 Symposium Chairs

12622-500 • 10:40 - 11:25 | ICM, Saal 1

### Remote photonic medicine (*Plenary Presentation*)

Author(s): Zeev Zalevsky, Bar-Ilan Univ. (Israel)

Lunch Break 11:30 - 12:30



## POSTERS-WEDNESDAY

28 June 2023 • 12:30 - 13:30 | ICM, Hall B0

Poster authors, please set up posters between the morning coffee break and the end of Lunch Break on Wednesday. Plan to stand by your poster to discuss it with session attendees during the poster session. Remove your poster following the poster session conclusion as posters left on the boards will be discarded.

12619-39 • 12:30 - 13:30 | ICM, Hall B0

### **An exploration of laser scanning modalities: from raster and spiral to Lissajous and Risley prisms-based**

Author(s): Attila Csillag, Virgil-Florin Duma, Univ. "Aurel Vlaicu" din Arad (Romania), Univ. Politehnica Timisoara (Romania)

12619-41 • 12:30 - 13:30 | ICM, Hall B0

### **Microscopic to macroscopic modelling of optical defect inspection system**

Author(s): Yi-Hao Chen, Ansys, Inc. (Taiwan); Ling Zhang, Ansys (China); Han-Hsiang Cheng, Ansys, Inc. (Taiwan); Federico D. Gomez, Ansys Canada Ltd. (Canada); Sandra Gely, Ansys, Inc. (France)

12619-423 • 12:30 - 13:30 | ICM, Hall B0

### **Fluence in a scattering disc under Lambertian illumination**

Author(s): Manuel Petzi, André Liemert, Felix Ott, Dominik Reitzle, Alwin Kienle, Institut für Lasertechnologien in der Medizin und Messtechnik an der Univ. Ulm (Germany)

12619-43 • 12:30 - 13:30 | ICM, Hall B0

### **Results of uncertainty evaluation on the thickness and refractive index spectrum measurement of silicon dioxide thin film layer using a spectroscopic ellipsometer**

Author(s): Yong Jai Cho, Won Chegal, Junho Choi, Korea Research Institute of Standards and Science (Republic of Korea)

12619-44 • 12:30 - 13:30 | ICM, Hall B0

### **Investigation of image formation in a confocal laser scanning microscope for custom-made cylindrical multi-scatterers**

Author(s): David Hevisov, Felix Glöckler, Felix Ott, Alwin Kienle, Institut für Lasertechnologien in der Medizin und Messtechnik an der Univ. Ulm (Germany)

12619-45 • 12:30 - 13:30 | ICM, Hall B0

### **Axial super-localization with superpositions of vortex beams**

Author(s): Michal Peterek, Palacký Univ. Olomouc (Czech Republic)

12619-47 • 12:30 - 13:30 | ICM, Hall B0

### **Coating layer on samples with roughness: numerical study for coherent Fourier scatterometry**

Author(s): Dmytro Kolenov, Silvania Pereira, Technische Univ. Delft (Netherlands)

12619-48 • 12:30 - 13:30 | ICM, Hall B0

### **Simple method for evaluating plano-convex aspherical lenses**

Author(s): Oliver Huerta-Carranza, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Manuel Campos-García, Univ. Nacional Autónoma de México (Mexico); Fermín-Salomón Granados-Agustín, Agustín Santiago-Alvarado, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Alejandro Cornejo-Rodríguez, Instituto Nacional de Astrofísica (Mexico); Maximino Avendaño-Alejo, Univ. Nacional Autónoma de México (Mexico)

## SESSION 8: JOINT SESSION (TRACOPTIC) II: MODELLING AND CHARACTERISATION OF QUANTITATIVE MICROSCOPES

### NOTE ROOM CHANGE

28 June 2023 • 13:30 - 15:30 | ICM Room 14c

Session Chair: Peter J. de Groot, Zygo Corporation (United States)

*Joint Session between conference 12618, Optical Measurement Systems for Industrial Inspection, and 12619, Modeling Aspects in Optical Metrology.*

12618-39 • 13:30 - 13:50 | ICM Room 14c

### **Compatibility analysis of profile and areal material measures**

Author(s): Matthias Eifler, IU International Univ. of Applied Sciences (Germany); Julian Hering-Stratemeier, Georg von Freymann, Jörg Seewig, Rheinland-Pfälzische Technische Univ. Kaiserslautern-Landau (Germany)

12618-40 • 13:50 - 14:10 | ICM Room 14c

### **Investigations on the accuracy and evaluation of the uncertainty of stitching in optical surface metrology**

Author(s): Janik Schaudé, Tino Hausotte, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)

12619-36 • 14:10 - 14:30 | ICM Room 14c

### **Physically based rendering method to derive realistic simulation of chromatic confocal measurements**

Author(s): Dan Linnert, Manuel Stavridis, Ulrich Neuschaefer-Rube, Physikalisch-Technische Bundesanstalt (Germany); Rainer Tutsch, Institut für Produktionsmesstechnik (Germany)

12619-37 • 14:30 - 14:50 | ICM Room 14c

### **Rigorous modeling of a confocal microscope**

Author(s): Silvana Wyss, Jan Krüger, Sai Gao, Physikalisch-Technische Bundesanstalt (Germany); Liwei Fu, Alexander Birk, Karsten Frenner, Stephan Reichelt, Univ. Stuttgart (Germany)

12619-38 • 14:50 - 15:10 | ICM Room 14c

### **Comparison of approximate methods for modelling coherence scanning interferometry**

Author(s): Helia Hooshmand-Ziafi, The Univ. of Nottingham (United Kingdom); Tobias Pahl, Univ. Kassel (Germany); Peter J. de Groot, Zygo Corporation (United States); Peter Lehmann, Univ. Kassel (Germany); Athanasios Pappas, The Univ. of Nottingham (United Kingdom); Rong Su, Shanghai Institute of Optics and Fine Mechanics (China); Richard Leach, Samanta Piano, The Univ. of Nottingham (United Kingdom)

12618-41 • 15:10 - 15:30 | ICM Room 14c

### **Evaluation of anisotropic resolutions of optical microscopes using star-shaped material measures**

Author(s): Frank Segel, Zhen Li, Sophie Gröger, Technische Univ. Chemnitz (Germany)

## CONFERENCE 12620

# Optics for Arts, Architecture, and Archaeology (O3A) IX

26 - 27 June 2023 | ICM Room 12a

Conference Chairs: **Haida Liang**, Nottingham Trent Univ. (United Kingdom); **Roger Groves**, Technische Univ. Delft (Netherlands)

Programme Committee: **Dario Ambrosini**, Univ. degli Studi dell'Aquila (Italy); **Daniela Comelli**, Politecnico di Milano (Italy); **Claudia Daffara**, Univ. degli Studi di Verona (Italy); **Vincent Detalle**, CYU Paris Cergy Univ. (France); **John K. Delaney**, National Gallery of Art (United States); **Martin C. Fischer**, Duke Univ. (United States); **Raffaella E. M. Fontana**, Istituto Nazionale di Ottica (Italy); **Igor P. Gurov**, ITMO Univ. (Russian Federation); **Gaël Latour**, Univ. Paris-Sud (France); **Nicola Masini**, Consiglio Nazionale delle Ricerche (Italy); **Vadim A. Parfenov**, Saint Petersburg Electrotechnical Univ. "LETI" (Russian Federation); **Luca Pezzati**, Istituto Nazionale di Ottica-CNR (Italy); **Robert Sitnik**, Warsaw Univ. of Technology (Poland); **Mathieu Thoury**, Synchrotron SOLEIL (France); **Vivi Tornari**, Foundation for Research and Technology-Hellas (Greece)

### MONDAY 26 JUNE

#### SESSION 1: LIGHT MATERIAL INTERACTION

26 June 2023 • 08:30 - 10:00 | ICM Room 12a

Session Chair: Haida Liang,  
Nottingham Trent Univ. (United Kingdom)

12620-1 • 08:30 - 09:00 | ICM Room 12a

#### Prospects of pump-probe microscopy for revealing pigment identity and degradation (*Invited Paper*)

Author(s): Martin C. Fischer, Yue Zhou, Heidi Kastenholz, Michael Topper, David Grass, Warren Warren, Duke Univ. (United States)

12620-2 • 09:00 - 09:20 | ICM Room 12a

#### Nonlinear optical microscopy for the assessment of in-depth aging effects on terpenoid varnish

Author(s): Mohamed Oujja, Marina Martínez-Weinbaum, Laura Maestro-Guijarro, Paula María Carmona-Quiroga, Instituto de Química Física Rocasolano (Spain); Salvatore Siano, Daniele Ciofini, Istituto di Fisica Applicata "Nello Carrara" (Italy); Marta Castillejo, Instituto de Química Física Rocasolano (Spain)

12620-33 • 09:20 - 09:40 | ICM Room 12a

#### VIS-NIR hyperspectral imaging as a valuable tool to monitor radiation damage on paintings

Author(s): Amelia Suzuki, Nottingham Trent Univ. (United Kingdom), Institute of Heritage Science, Consiglio Nazionale delle Ricerche (Italy); Yu Li, Chi Shing Cheung, Nottingham Trent Univ. (United Kingdom); Cristiano Riminesi, Institute of Heritage Science, Consiglio Nazionale delle Ricerche (Italy); Haida Liang, Nottingham Trent Univ. (United Kingdom)

12620-4 • 09:40 - 10:00 | ICM Room 12a

#### Green can be blue: characterization of color change by spectroscopic techniques

Author(s): Aurélie Tournié, Anne Michelin, Christine Andraud, Ctr. de Recherche sur la Conservation des Collections, Muséum national d'Histoire naturelle, CNRS (France); Solenn Reguer, Synchrotron SOLEIL (France)

Coffee Break 10:00 - 10:30

#### SESSION 2: ADVANCED IMAGE PROCESSING AND DATA VISUALISATION

26 June 2023 • 10:30 - 12:30 | ICM Room 12a

Session Chair: Vincent Detalle, CY Cergy Paris Univ. (France)

12620-5 • 10:30 - 10:50 | ICM Room 12a

#### An integrated multimodal architecture for the visualization of macro-XRF elemental distribution maps

Author(s): Ruven Pillay, Eric Laval, Ctr. de Recherche et de Restauration des Musées de France, CNRS (France)

12620-6 • 10:50 - 11:10 | ICM Room 12a

#### The analysis of XRF images using discrete wavelet transformation with application to artworks

Author(s): Jake Hollis, Golnaz Shahtahmassebi, Haida Liang, Nottingham Trent Univ. (United Kingdom)

12620-7 • 11:10 - 11:30 | ICM Room 12a

#### Multiscale convolutional autoencoder network-based Implicit Information mining of cultural relics

Author(s): Kai Yu, Northwest Univ. (China), Shaanxi Silk Road Digital Protection Inheritance of Cultural Heritage Collaborative Innovation Ctr. (China); Zhichao Li, Northwest Univ. (China); Yi Duan, Shaanxi Academy of Archaeology (China); Lin Wang, Northwest Univ. (China); Jun Wang, Northwest Univ. (China), Shaanxi Province Silk Road Digital Protection and Inheritance of Cultural Heritage Collaborative Innovation Ctr. (China); Jinye Peng, Northwest Univ. (China)

12620-8 • 11:30 - 11:50 | ICM Room 12a

#### Multimodal image registration and mosaicking of artworks: an approach based on mutual information

Author(s): Maria Eugenia Villafane, Imperial College London (United Kingdom), The National Gallery (United Kingdom); Nathan Daly, The Fitzwilliam Museum (United Kingdom); Christine Kimbriel, Hamilton Kerr Institute (United Kingdom); Catherine Higgitt, The National Gallery (United Kingdom); Pier Luigi Dragotti, Imperial College London (United Kingdom)

12620-10 • 11:50 - 12:10 | ICM Room 12a

#### Intelligent labeling of murals with fragmentation disease based on gradient trainable Gabor and U-Net

Author(s): Jinye Peng, Northwest Univ. (China), Shaanxi Province Silk Road Digital Protection and Inheritance of Cultural Heritage Collaborative Innovation Ctr. (China); Yang Yu, Northwest Univ. (China); Qunxi Zhang, Shaanxi History Museum (China), Shaanxi Province Silk Road Digital Protection and Inheritance of Cultural Heritage Collaborative Innovation Ctr. (China); Yuheng Li, Northwest Univ. (China); Jing Ji, Lvzheng Zhang, Xi'an Jiaotong Univ. (China); Kai Yu, Northwest Univ. (China), Shaanxi Province Silk Road Digital Protection and Inheritance of Cultural Heritage Collaborative Innovation Ctr. (China); Jun Wang, Northwest Univ. (China), Shaanxi Province Silk Road Digital Protection and Inheritance of Cultural Heritage Collaborative Innovation Ctr. (China)

#### O3A TOPICAL DISCUSSION FORUM 12:10 - 12:30

Lunch Break 12:30 - 13:50

## SESSION 3: IMAGING AND SPECTROSCOPY INSTRUMENT AND METHOD DEVELOPMENT

26 June 2023 • 13:50 - 15:30 | ICM Room 12a

Session Chair: Martin C. Fischer, Duke Univ. (United States)

12620-11 • 13:50 - 14:10 | ICM Room 12a

### Non-invasive quantitative characterization of varnish thickness on gilt leather by line-field confocal optical coherence tomography

Author(s): Giulia Galante, Lab. d'Optique et Biosciences (France), Ctr. de Recherche sur la Conservation (France); Maëlle Virbert, Lab. d'Optique et Biosciences (France); Laurianne Robinet, Ctr. de Recherche sur la Conservation des Collections, Muséum national d'Histoire naturelle, CNRS (France); Marie-Claire Schanne-Klein, Lab. d'Optique et Biosciences (France); Gaël Latour, Lab. d'Optique et Biosciences (France), Univ. Paris-Saclay (France)

12620-12 • 14:10 - 14:30 | ICM Room 12a

### Improved illumination-induced multispectral imaging system and machine learning approach for the examination of artworks

Author(s): Marie Didier, Gabriel Bernasconi, MATIS SA (Switzerland); Sébastien Blanc, CSEM SA (Switzerland); Pierre-Antoine Héritier, MATIS SA (Switzerland); Vincent Carrel, Pedram Pad, Andrea Dunbar, CSEM SA (Switzerland)

12620-13 • 14:30 - 14:50 | ICM Room 12a

### Multiscale imaging of complex artworks with a hyperspectral camera

Author(s): Alessia Di Benedetto, Daniela Comelli, Alessia Candeo, Gianluca Valentini, Politecnico di Milano (Italy); Cristian Manzoni, CNR-Istituto di Fotonica e Nanotecnologie (Italy); Benedetto Ardini, Politecnico di Milano (Italy)

12620-14 • 14:50 - 15:10 | ICM Room 12a

### Simple smartphone-based artworks diagnostics by Moiré method and a diffractive optical element

Author(s): Claudia Daffara, Sara Mazzocato, Univ. degli Studi di Verona (Italy); Tullio de Rubeis, Dario Ambrosini, Univ. degli Studi dell'Aquila (Italy)

12620-15 • 15:10 - 15:30 | ICM Room 12a

### Four-flux model combined with optical coherence tomography technique for non-destructive testing of the colour ground layers of the paintings

Author(s): Xiang Wang, Andrei G. Anisimov, Roger M. Groves, Technische Univ. Delft (Netherlands)

Coffee Break 15:30 - 16:00

## SESSION 4: 3D SURFACES AND STRUCTURAL ANALYSIS

26 June 2023 • 16:00 - 17:20 | ICM Room 12a

Session Chair: Luca Pezzati, Istituto Nazionale di Ottica (Italy)

12620-16 • 16:00 - 16:20 | ICM Room 12a

### Application of shearography with thermal loading for the structural inspection of Rembrandt's Night Watch

Author(s): Nan Tao, Andrei G. Anisimov, Technische Univ. Delft (Netherlands); Esther van Duijn, Lisette Vos, Ilse Steeman, Rijksmuseum (Netherlands); Katrien Keune, Rijksmuseum (Netherlands), Van't Hoff Institute for Molecular Sciences, Univ. of Amsterdam (Netherlands); Petria Noble, Rijksmuseum (Netherlands); Roger M. Groves, Technische Univ. Delft (Netherlands)

12620-17 • 16:20 - 16:40 | ICM Room 12a

### Dynamic infrared multispectral imaging of paintworks by active pulsed thermography

Author(s): Alexandre Semerok, Univ. Paris-Saclay, CEA (France); Vincent Detalle, CY Cergy Paris Univ. (France); Xueshi Bai, Thomas Calligaro, Ctr. de Recherche et de Restauration des Musées de France, CNRS (France); Stephane Boubanga Tombet, Telops Inc. (Canada)

12620-18 • 16:40 - 17:00 | ICM Room 12a

### Can we unlock more information from interferometric sensors? Feasibility and performance analysis

Author(s): Sara Mazzocato, Claudia Daffara, Univ. degli Studi di Verona (Italy)

12620-20 • 17:00 - 17:20 | ICM Room 12a

### Optical surface metrology for heritage science: proof of concept and critical-constructive discussion

Author(s): Claudia Daffara, Sara Mazzocato, Giacomo Marchioro, Univ. degli Studi di Verona (Italy)

## TUESDAY 27 JUNE

## SESSION 5: MULTIMODAL IMAGING AND SPECTROSCOPY

27 June 2023 • 08:30 - 10:00 | ICM Room 12a

Session Chair: Roger M. Groves, Technische Univ. Delft (Netherlands)

12620-21 • 08:30 - 09:00 | ICM Room 12a

### Multimodal system for monitoring of changes in shape, color, and structural integrity of cultural heritage objects (*Invited Paper*)

Author(s): Athanasia Papanikolaou, Marcin Adamczyk, Warsaw Univ. of Technology (Poland); Sony George, Norwegian Univ. of Science and Technology (Norway); Malgorzata Kujawska, Warsaw Univ. of Technology (Poland)

12620-22 • 09:00 - 09:20 | ICM Room 12a

### Ancient coins' surface inspection with web-based neural RTI visualization

Author(s): Leonardo Righetto, Univ. degli Studi di Verona (Italy); Arianna Traviglia, Istituto Italiano di Tecnologia (Italy); Enrico Gobetti, Ctr. for Advanced Studies, Research and Development in Sardinia (Italy); Federico Ponchio, Istituto di Scienza e Tecnologia dell'Informazione "A. Faedo" (Italy); Andrea Giachetti, Univ. degli Studi di Verona (Italy)

12620-23 • 09:20 - 09:40 | ICM Room 12a

### Noninvasive microscale depth-resolved analysis of paint layers using multiwavelength OCT and micro-SORS

Author(s): Chi Shing Cheung, Nottingham Trent Univ. (United Kingdom); Claudia Conti, Institute of Heritage Science, Istituto di Scienze del Patrimonio Culturale, Consiglio Nazionale delle Ricerche (Italy); Patrick Atkinson, Anita Sunny, Nottingham Trent Univ. (United Kingdom); Silvia Prati, Microchemistry and Microscopy Art Diagnostic Lab., Univ. degli Studi di Bologna (Italy); Haida Liang, Nottingham Trent Univ. (United Kingdom)

12620-24 • 09:40 - 10:00 | ICM Room 12a

### Large scale historical wall painting analysis and visualisation using multimodal remote spectral imaging and spectroscopy

Author(s): Florence Liggins, Sotiria Kogou, Amelia Suzuki, Chi Shing Cheung, Nottingham Trent Univ. (United Kingdom); Patrick Cassitti, Stiftung Pro Kloster St. Johann (Switzerland); Haida Liang, Nottingham Trent Univ. (United Kingdom)

Coffee Break 10:00 - 10:30

# CONFERENCE 12620

## SESSION 6: APPLICATIONS TO ART, ARCHAEOLOGY AND ARCHITECTURE

27 June 2023 • 10:30 - 11:50 | ICM Room 12a

Session Chair: Daniela Comelli, Politecnico di Milano (Italy)

12620-25 • 10:30 - 10:50 | ICM Room 12a

### First onsite case studies of the Münstair Monastery mural painting with a mobile multispectroscopic analysis prototype for the characterization of cultural heritage materials: test and evaluation

Author(s): Xueshi Bai, Ctr. de Recherche et de Restauration des Musées de France, CNRS (France); Patrick Cassitti, Stiftung Pro Kloster St. Johann (Switzerland); Didier Brissaud, Lab. de Recherche des Monuments Historiques (France); Vincent Detalle, Systèmes et Applications des Technologies de l'Information et de l'Energie, CY Cergy Paris Univ. (France), Ctr. de Recherche et de Restauration des Musées de France (France)

12620-26 • 10:50 - 11:10 | ICM Room 12a

### Multitechnique objectivation of an intervention in restoration: cleaning of paintings

Author(s): Emma Gillet, Ctr. de Recherche sur la Conservation, Muséum national d'Histoire naturelle, Ministère de la Culture, CNRS (France), Institut national du patrimoine (France), SATIE, CY Cergy Paris Univ. (France); Vincent Gauthier, SATIE, CY Cergy Paris Univ. (France); Sandie Le Conte, Institut national du patrimoine (France); Claudia Fritz, Lutheries - Acoustique - Musique, Institut Jean le Rond d'Alembert, Sorbonne Univ., CNRS (France); Stéphane Serfaty, SATIE, CY Cergy Paris Univ. (France); Christine Andraud, Ctr. de Recherche sur la Conservation des Collections, Muséum national d'Histoire naturelle, CNRS (France)

12620-27 • 11:10 - 11:30 | ICM Room 12a

### Selection of optimal spectral metrics for classification of inks in historical documents using hyperspectral imaging data

Author(s): Ana Belén López-Baldomero, Miguel Ángel Martínez-Domingo, Eva M. Valero, Ramón Fernández-Gualda, Ana López-Montes, Rosario Blanc-García, Teresa Espejo, Univ. de Granada (Spain)

12620-28 • 11:30 - 11:50 | ICM Room 12a

### Comprehensive spectral and imaging studies of marble to assess the environmental damage using ULF Raman and THz absorption studies

Author(s): Puspita Chanda, Khushboo Singh, Uzair Aalam, Aparajita Bandyopadhyay, Indian Institute of Technology Delhi (India); Karl Bertling, Aleksandar Rakic, The Univ. of Queensland (Australia); Amartya Sengupta, Indian Institute of Technology Delhi (India)

## SESSION 7: POSTER SLAM: OPTICS FOR ARTS, ARCHITECTURE, AND ARCHAEOLOGY

27 June 2023 • 11:50 - 12:40 | ICM Room 12a

Session Chair: Claudia Daffara, Univ. degli Studi di Verona (Italy)

*Join the poster presenters of the Optics for Arts, Architecture, and Archaeology conference for their ten-minute oral slams.*

*Each poster author is invited to give a brief (ten-minute) preview of their research during this poster slam session.*

Following the poster slam session on Tuesday, the posters will also be available for viewing during the Poster Session 12:30 to 13:30 hrs on Wednesday.

11:50: 12620-29

### Pulsed thermography applied to the study of a Chinese bronze lei

Xue Yang, Beichen Chen, Gangbo Hu, Xiangyu Wang, Wei Fang, Jianan Zhang, Ning Tao, Guangkuo Yuan, Capital Normal Univ. (China)

12:00: 12620-30

### Characterising the degradation of green colourants on early hand-coloured works on paper using multispectral imaging and reflectance spectroscopy

Yun Liu, KU Leuven Core Facility for Heritage Science and Digitisation Technologies (Belgium); Lieve Watteeuw, KU Leuven (Belgium)

12:10: 12620-31

### Moving matter and pigments analysis by images to tunable, accurate and fast spectral imaging: methodology and applications in cultural heritage, archeology and architecture

Marcello Melis, Matteo Fois, Marco Muzi, Donato Quarta, Profilocolore Srl (Italy); Federica Vacatello, Sapienza Univ. di Roma (Italy)

12:20: 12620-32

### Hyperspectral image fusion based on dual-resolution fusion feature mutual guidance network

Lu Liu, Northwest Univ. (China), Shaanxi Silk Road Digital Protection Inheritance of Cultural Heritage Collaborative Innovation Ctr. (China); Kai Ma, Northwest Univ. (China); Jing Yan, Fulai Xing, Archaeological Institute of Shaanxi Province (Shaanxi Archaeological Museum) (China); Wanqing Zhao, Northwest Univ. (China), Shaanxi Silk Road Digital Protection Inheritance of Cultural Heritage Collaborative Innovation Ctr. (China); Shenglin Peng, Lin Wang, Northwest Univ. (China)

## WORLD OF PHOTONICS PLENARY

27 June 2023 • 14:00 - 15:30 | ICM, Saal 1

This plenary session features a presentation by **Tammy Ma**, Lawrence Livermore National Lab. (United States), and **Constantin Haefner**, Fraunhofer-Institute for Laser Technology (Germany), on laser-driven inertial confinement fusion.

POSTERS-WEDNESDAY

28 June 2023 • 12:30 - 13:30 | ICM, Hall B0

Poster authors, please set up posters between the morning coffee break and the end of Lunch Break on Wednesday. Plan to stand by your poster to discuss it with session attendees during the poster session. Remove your poster following the poster session conclusion as posters left on the boards will be discarded.

12620-29 • 12:30 - 13:30 | ICM, Hall B0

**Pulsed thermography applied to the study of a Chinese bronze lei**

Author(s): Xue Yang, Beichen Chen, Gangbo Hu, Xiangyu Wang, Wei Fang, Jianan Zhang, Ning Tao, Guangkuo Yuan, Capital Normal Univ. (China)

12620-30 • 12:30 - 13:30 | ICM, Hall B0

**Characterising the degradation of green colourants on early hand-coloured works on paper using multispectral imaging and reflectance spectroscopy**

Author(s): Yun Liu, KU Leuven Core Facility for Heritage Science and Digitisation Technologies (Belgium); Lieve Watteeuw, KU Leuven (Belgium)

12620-31 • 12:30 - 13:30 | ICM, Hall B0

**Moving matter and pigments analysis by images to tunable, accurate, and fast spectral imaging: methodology and applications in cultural heritage, archeology and architecture**

Author(s): Marcello Melis, Matteo Fois, Marco Muzi, Donato Quarta, Profilocolore Srl (Italy); Federica Vacatello, Sapienza Univ. di Roma (Italy)

12620-32 • 12:30 - 13:30 | ICM, Hall B0

**Hyperspectral image fusion based on dual-resolution fusion feature mutual guidance network**

Author(s): Lu Liu, Northwest Univ. (China), Shaanxi Silk Road Digital Protection Inheritance of Cultural Heritage Collaborative Innovation Ctr. (China); Kai Ma, Northwest Univ. (China); Jing Yan, Fulai Xing, Archaeological Institute of Shaanxi Province (Shaanxi Archaeological Museum) (China); Wanqing Zhao, Northwest Univ. (China), Shaanxi Silk Road Digital Protection Inheritance of Cultural Heritage Collaborative Innovation Ctr. (China); Shenglin Peng, Lin Wang, Northwest Univ. (China)

## CONFERENCE 12621

# Multimodal Sensing and Artificial Intelligence: Technologies and Applications III

27 - 29 June 2023 | ICM Room 12a

Conference Chair: **Ettore Stella**, CNR (Italy)

Conference Co-Chairs: **Francesco Soldovieri**, Istituto per il Rilevamento Elettromagnetico dell'Ambiente (Italy); **Dariusz Ceglarek**, The Univ. of Warwick (United Kingdom); **Qian Kema**, Nanyang Technological Univ. (Singapore)

Programme Committee: **Andrei G. Anisimov**, Technische Univ. Delft (Netherlands); **Vittorio Bianco**, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); **Salah Bourenane**, Institut Fresnel (France); **Cosimo Distant**, Univ. del Salento (Italy); **Pietro Ferraro**, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); **Marc P. Georges**, Liège Univ. (Belgium); **Antonio Lanzotti**, Univ. degli Studi di Napoli Federico II (Italy); **Luiz Marcos Garcia Gonçalves**, UFRN (Brazil); **Michele Meo**, Univ. of Bath (United Kingdom); **Thomas B. Moeslund**, Aalborg Univ. (Denmark); **Nicola Mosca**, CNR (Italy); **Massimo Ripa**, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); **Clive Roberts**, The Univ. of Birmingham (United Kingdom); **Pierre R. Slangen**, Mines Alès (France); **Rocco Zito**, Flinders Univ. (Australia)

## TUESDAY 27 JUNE

### WORLD OF PHOTONICS PLENARY

27 June 2023 • 14:00 - 15:30 | ICM, Saal 1

This plenary session features a presentation by **Tammy Ma**, Lawrence Livermore National Lab. (United States), and **Constantin Haefner**, Fraunhofer-Institute for Laser Technology (Germany), on laser-driven inertial confinement fusion.

### SESSION 1: MULTIMODAL SENSING AND INVERSE MODELLING FOR INFRASTRUCTURES AND ENVIRONMENTAL MONITORING

27 June 2023 • 16:00 - 18:10 | ICM Room 12a

Session Chairs: Valerio Gagliardi, Univ. degli Studi di Roma Tre (Italy), Livia Lantini, Univ. of West London (United Kingdom)

12621-1 • 16:00 - 16:20 | ICM Room 12a

#### Detection of structural targets using ground-based interferometric synthetic aperture radar and augmented reality

Author(s): Saeed Sotoudeh, Stephen Uzor, Livia Lantini, Univ. of West London (United Kingdom), The Faringdon Research Ctr. for Non-Destructive Testing and Remote Sensing (United Kingdom); Kevin Munisami, Univ. of West London (United Kingdom), Signal Processing, Electronics, Automation and Robotics (SPEAR) Research Group (United Kingdom); Fabio Tosti, Univ. of West London (United Kingdom), The Faringdon Research Ctr. for Non-Destructive Testing and Remote Sensing (United Kingdom)

12621-2 • 16:20 - 16:50 | ICM Room 12a

#### Digital Twin implementation by multisensors data for smart evaluation of transport infrastructure (Invited Paper)

Author(s): Valerio Gagliardi, Univ. degli Studi di Roma Tre (Italy); Antonio Napolitano, Sapienza Univ. di Roma (Italy); Fabrizio D'Amico, Alessandro Calvi, Andrea Benedetto, Univ. degli Studi di Roma Tre (Italy)

12621-3 • 16:50 - 17:10 | ICM Room 12a

#### Multisensors for BIM modeling and digital twinning of historical buildings: preliminary results on Circus of Maxentius in Rome

Author(s): Luca Bianchini Ciampoli, Univ. degli Studi di Roma Tre (Italy); Roberta Santarelli, Sapienza Univ. di Roma (Italy); Pietro Meriggi, Jhon Romer Diezmos Manalo, Univ. degli Studi di Roma Tre (Italy); Alessandra Ten, Sapienza Univ. di Roma (Italy); Ersilia Maria Loreti, Sovrintendenza Capitolina ai Beni Culturali (Italy); Andrea Benedetto, Univ. degli Studi di Roma Tre (Italy)

12621-4 • 17:10 - 17:30 | ICM Room 12a

#### Moving train wheel axles automated detection, counting and tracking by combining AI with Kalman filter applied to thermal infrared image sequences

Author(s): Jean Dumoulin, Boualem Merainani, Thibaud Toullier, Univ. Gustave Eiffel (France)

12621-5 • 17:30 - 17:50 | ICM Room 12a

#### Microwave tomography and artificial intelligence for water leakage detection: preliminary results

Author(s): Giuseppe Esposito, Alvaro Y. Ruiz, Istituto per il Rilevamento Elettromagnetico dell'Ambiente (Italy); Gianluca Gennarelli, Istituto di Studi sui Sistemi Intelligenti per l'Automazione (Italy); Giovanni Ludeno, Rosa Scapatucci, Roberta Palmeri, Lorenzo Crocco, Ilaria Catapano, Francesco Soldovieri, Istituto per il Rilevamento Elettromagnetico dell'Ambiente (Italy)

12621-6 • 17:50 - 18:10 | ICM Room 12a

#### Enhanced decay detection and structural mapping in tree trunks using GPR and smartphone LiDAR

Author(s): Saeed Parnow, Stephen Uzor, Livia Lantini, Fabio Tosti, Univ. of West London (United Kingdom), The Faringdon Research Ctr. for Non-Destructive Testing and Remote Sensing (United Kingdom)

## WEDNESDAY 28 JUNE

### SESSION 2: MULTIMODAL SENSING FOR ROBOTICS

28 June 2023 • 08:20 - 10:00 | ICM Room 12a

Session Chairs: Vito Renò, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato (Italy), Vittorio Sala, SUPSI (Switzerland)

12621-7 • 08:20 - 08:40 | ICM Room 12a

#### Multimodal imaging sensor based on lidar for advanced perception tasks

Author(s): Pablo García-Gómez, BEAMAGINE S.L. (Spain); Noel Rodrigo, Eduardo Bernal, Ana Rodríguez-Aramendia, Univ. Politècnica de Catalunya (Spain); Jordi Riu, BEAMAGINE S.L. (Spain); Santiago Royo, Univ. Politècnica de Catalunya (Spain)

12621-13 • 08:40 - 09:00 | ICM Room 12a

#### AWANDT: assessing welding anomalies via nondestructive tests (Keynote Presentation)

Author(s): Adriano Liso, Angelo Cardelicchio, Cosimo Patruno, Massimiliano Nitti, Ettore Stella, Vito Renò, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato, Consiglio Nazionale delle Ricerche (Italy)

12621-9 • 09:00 - 09:20 | ICM Room 12a

## Path following of tracked vehicle via model predictive control with identified long short-term memory dynamic models

Author(s): Dun-Ren Liu, Chia-Wei Hsu, Chun-Ting Sung, Ting-Chien Chen, Shean-Jen Chen, National Yang Ming Chiao Tung Univ. (Taiwan)

12621-10 • 09:20 - 09:40 | ICM Room 12a

## Sensor fusion for stand-off estimation in direct energy deposition

Author(s): Vittorio Sala, Ambra Vandone, Stefano Baraldo, Michele Banfi, Angelo Baj, Francesco Impaziente, Federico Mazzucato, Anna Valente, SUPSI (Switzerland)

12621-11 • 09:40 - 10:00 | ICM Room 12a

## Path following and obstacle avoidance of tracked vehicle via deep reinforcement learning with model predictive control as reference

Author(s): Ting-Chien Chen, Yu-Cheng Sung, Chai-Wei Hsu, Dun-Ren Liu, Shean-Jen Chen, National Yang Ming Chiao Tung Univ. (Taiwan)

Coffee Break 10:00 - 10:30

### OPTICAL METROLOGY PLENARY SESSION

28 June 2023 • 10:30 - 11:25 | ICM, Saal 1

10:30 to 10:40 hrs

#### Welcome Address and Plenary Speaker Introduction

Marc P. Georges, Liège Univ. (Belgium)

Jörg Seewig, Technische Univ. Kaiserslautern (Germany)

2023 Symposium Chairs

12622-500 • 10:40 - 11:25 | ICM, Saal 1

#### Remote photonic medicine (Plenary Presentation)

Author(s): Zeev Zalevsky, Bar-Ilan Univ. (Israel)

Lunch Break 11:30 - 12:30

### POSTERS-WEDNESDAY

28 June 2023 • 12:30 - 13:30 | ICM, Hall BO

Poster authors, please set up posters between the morning coffee break and the end of Lunch Break on Wednesday. Plan to stand by your poster to discuss it with session attendees during the poster session. Remove your poster following the poster session conclusion as posters left on the boards will be discarded.

12621-34 • 12:30 - 13:30 | ICM, Hall BO

#### Thermal camera data preprocessing based on real-time inter-frame data

Author(s): Evgeny A. Semishchev, Moscow State Univ of Technology "STANKIN" (Russian Federation); Viacheslav Voronin, Aleksandr Zelensky, Moscow State Univ of Technology (Russian Federation); Egor Surkov, Tula State University (Russian Federation)

12621-42 • 12:30 - 13:30 | ICM, Hall BO

#### Combining multispectral UAV-borne and terrestrial point cloud data for time-saving forest inventory using artificial intelligence

Author(s): Frederik Kammel, Lars Rathmann, Univ. of Freiburg (Germany); Annette Schmitt, Alexander Reiterer, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany), Univ. of Freiburg (Germany)

12621-43 • 12:30 - 13:30 | ICM, Hall BO

#### Automated plant-scale crop monitoring by a farmer robot using a consumer-grade RGB-D camera

Author(s): Rosa Pia Devanna, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato, Consiglio Nazionale delle Ricerche (Italy); Giovanni Matranga, Istituto di Scienze e Tecnologie per l'Energia e la Mobilità Sostenibili, Consiglio Nazionale delle Ricerche (Italy); Marcella Biddoccu, Istituto di Scienze e Tecnologie per l'Energia e la Mobilità Sostenibili, Consiglio Nazionale delle Ricerche (Italy); Annalisa Milella, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato, Consiglio Nazionale delle Ricerche (Italy); Giulio Reina, Politecnico di Bari (Italy)

12621-44 • 12:30 - 13:30 | ICM, Hall BO

#### A microcontroller-based multi-sensor system using ultrasonic range sensors and radar sensors for sensor data fusion: accuracy study and performance test

Author(s): Kevin Blümel, Michael Kuhl, Finn Alfred Hölzel, Karl Kunze, Hochschule Mittweida (Germany)

12621-45 • 12:30 - 13:30 | ICM, Hall BO

#### Action recognition algorithm from multimodal images for human-robot collaboration systems

Author(s): Viacheslav Voronin, Marina Zhdanova, Moscow State Univ of Technology (Russian Federation); Evgeny A. Semishchev, Moscow State Univ of Technology "STANKIN" (Russian Federation); Alexander Zelensky, Nikolay Gapon, Yurii Ilyukhin, Moscow State Univ of Technology (Russian Federation)

### SESSION 3: MULTIMODAL SENSING FOR INSPECTION

28 June 2023 • 13:30 - 15:30 | ICM Room 12a

Session Chair: Rufe Zou, Beijing Univ. of Technology (China)

12621-12 • 13:30 - 13:50 | ICM Room 12a

#### Classification of material and surface roughness using polarimetric multispectral LiDAR

Author(s): Yu Han, David Salido-Monzú, Andreas Wieser, Institut für Geodäsie und Photogrammetrie, ETH Zurich (Switzerland)

12621-8 • 13:50 - 14:10 | ICM Room 12a

#### An integrated tool for semi-automatic repair of CFRP laminates and nondestructive quality control

Author(s): Simone Pio Negri, Giuseppe Lastilla, Maria di Summa, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato, Consiglio Nazionale del (Italy); Massimiliano Nitti, Istituto di Studi sui Sistemi Intelligenti per l'Automazione (Italy); Carmelo Antonio Ardito, Univ. LUM Giuseppe Degennaro (Italy); Vito Renò, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato, Consiglio Nazionale del (Italy)

12621-14 • 14:10 - 14:30 | ICM Room 12a

#### Assessing switch weld quality with 3D sensing and machine learning

Author(s): Cosimo Patruno, Massimiliano Nitti, Angelo Cardelicchio, Nicola Mosca, Maria di Summa, Vito Renò, Consiglio Nazionale delle Ricerche (Italy)

12621-15 • 14:30 - 14:50 | ICM Room 12a

#### On the use of Yolov5 for detecting common defects on existing RC bridges

Author(s): Angelo Cardelicchio, Consiglio Nazionale delle Ricerche (Italy); Sergio Ruggieri, Andrea Nettis, Politecnico di Bari (Italy); Nicola Mosca, Consiglio Nazionale delle Ricerche (Italy); Giuseppina Uva, Politecnico di Bari (Italy); Vito Renò, Consiglio Nazionale delle Ricerche (Italy)

# CONFERENCE 12621

12621-16 • 14:50 - 15:10 | ICM Room 12a

## Advances in chemical detection on surfaces with a snapshot Fourier-Transform Raman hyperspectral sensor

Author(s): Jean-Charles Barिताux, Tommy Dedole, CEA-LETI (France); Silvère Gousset, Etienne Le Coarer, Univ. Grenoble Alpes (France)

12621-17 • 15:10 - 15:30 | ICM Room 12a

## Lightweight dual-wavelength bathymetric LiDAR for accurate seabed mapping

Author(s): Jannis Gangelhoff, Christoph S. Werner, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Alexander Reiterer, Albert-Ludwigs-Univ. Freiburg (Germany)

Coffee Break 15:30 - 16:00

### SESSION 4: MULTIMODAL SENSING APPLICATIONS I

28 June 2023 • 16:00 - 17:50 | ICM Room 12a

Session Chairs: Francesco Carlo Morabito, Univ. Mediterranea di Reggio Calabria (Italy), Andrei G. Anisimov, Technische Univ. Delft (Netherlands)

12621-18 • 16:00 - 16:20 | ICM Room 12a

## Multiple caterpillar tracking and 3D positioning in orchard via YOLO plus DeepSORT

Author(s): Sumesh Nair, Chai-Wei Hsu, National Yang Ming Chiao Tung Univ. (Taiwan); Yvonne Yuling Hu, National Cheng Kung Univ. (Taiwan); Shean-Jen Chen, National Yang Ming Chiao Tung Univ. (Taiwan)

12621-193 • 16:20 - 16:50 | ICM Room 12a

## An autoencoder solution for the electromagnetic inverse source problem (*Invited Paper*)

Author(s): Eliana Cinotti, Istituto per il Rilevamento Elettromagnetico dell'Ambiente (Italy), Univ. degli Studi di Napoli Federico II (Italy); Giuseppe Esposito, Gianluca Gennarelli, Giovanni Ludeno, Ilaria Catapano, Istituto per il Rilevamento Elettromagnetico dell'Ambiente (Italy); Amedeo Capozzoli, Claudio Curcio, Angelo Liseno, Univ. degli Studi di Napoli Federico II (Italy); Francesco Soldovieri, Istituto per il Rilevamento Elettromagnetico dell'Ambiente (Italy)

12621-20 • 16:50 - 17:10 | ICM Room 12a

## Neural network-based tomographic reconstruction of high-speed interferometric and Schlieren image data for density and velocity detection

Author(s): Johannes Gürtler, TU Dresden (Germany); Sami Tasmany, Technische Univ. Graz (Austria); Robert Kuschmierz, TU Dresden (Germany); Jakob Woisetschläger, Technische Univ. Graz (Austria); Jürgen Czarske, TU Dresden (Germany)

12621-21 • 17:10 - 17:30 | ICM Room 12a

## Supercontinuum-based hyperspectral laser scanning: towards enhanced 3D surface reconstruction and its benefits for remote sensing

Author(s): Pabitra Ray, David Salido-Monzú, Andreas Wieser, Tomislav Medic, ETH Zurich (Switzerland)  
28 June

12621-22 • 17:30 - 17:50 | ICM Room 12a

## A LiDAR imaging system using temporal and polarization discrimination for turbid media

Author(s): Maria Ballesta Garcia, Sara Peña-Gutiérrez, Univ. Politècnica de Catalunya (Spain); Ana Rodríguez-Aramendía, Univ. Politècnica de Catalunya (Spain); Beamagine SL (Spain); Pablo García-Gómez, Beamagine SL (Spain); Noel Rodrigo, Santiago Royo, Univ. Politècnica de Catalunya (Spain)

WEDNESDAY 28 JUNE

### SESSION 5: MULTIMODAL SENSING FOR HEALTH

29 June 2023 • 08:40 - 10:00 | ICM Room 12a

Session Chairs: Maria di Summa, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato (Italy), Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12621-24 • 08:40 - 09:00 | ICM Room 12a

## Oxygen saturation estimation from near-infrared multispectral video data using 3D convolutional residual networks

Author(s): Wang Liao, Chen Zhang, Xinyu Sun, Technische Univ. Ilmenau (Germany); Gunther Notni, Technische Univ. Ilmenau (Germany), Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany)

12621-253 • 09:00 - 09:20 | ICM Room 12a

## Deep learning-based phase unwrapping for holographic tomography

Author(s): Michal Gontarz, Vibekananda Dutta, Malgorzata Kujawinska, Wojciech Krauze, Warsaw Univ. of Technology (Poland)

12621-26 • 09:20 - 09:40 | ICM Room 12a

## End-to-end neural network for speeding up the tomographic reconstruction in holographic imaging flow cytometry

Author(s): Daniele Pirone, Daniele G. Sirico, Lisa Miccio, Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Martina Mugnano, Univ. degli Studi di Napoli Federico II (Italy); Pietro Ferraro, Pasquale Memmolo, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy)

12621-27 • 09:40 - 10:00 | ICM Room 12a

## Realistic interactions with micro-objects in a virtual environment

Author(s): Maria di Summa, Nicola Mosca, Luciana Colella, STIIMA-CNR (Italy); Vittorio Bianco, Pietro Ferraro, ISASI-CNR (Italy); Ettore Stella, STIIMA-CNR (Italy)

Coffee Break 10:00 - 10:30

### SESSION 6: FULL-FIELD IMAGING AND APPLICATIONS I

29 June 2023 • 10:30 - 12:00 | ICM Room 12a

Session Chairs: Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy), Yanmin Zhu, The Univ. of Hong Kong (Hong Kong, China)

12621-28 • 10:30 - 10:50 | ICM Room 12a

## Multimodal non-destructive techniques for composite inspection

Author(s): Fabiana Graziano, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle (Italy), Univ. degli Studi della Campania Luigi Vanvitelli (Italy); Ciro Tortora, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle (Italy), Univ. degli Studi di Napoli Federico II (Italy); Veronica Vespini, Massimo Rippa, Simonetta Grilli, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle (Italy); Roberto Marani, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato, Consiglio Nazionale del (Italy); Sara Coppola, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle (Italy); Ettore Stella, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato, Consiglio Nazionale del (Italy); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle (Italy)



12621-29 • 10:50 - 11:20 | ICM Room 12a

## Pixel super-resolution phase retrieval for lensless microscopy (*Invited Paper*)

Author(s): Yunhui Gao, Feng Yang, Liangcai Cao, Tsinghua Univ. (China)

12621-30 • 11:20 - 11:40 | ICM Room 12a

## On the use of machine learning for microplastic identification from holographic phase-contrast signatures

Author(s): Marika Valentino, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy), Univ. degli Studi di Napoli Federico II (Italy); Jaromír Běhal, Daniele Pirone, Pasquale Memmolo, Lisa Miccio, Vittorio Bianco, Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy)

12621-31 • 11:40 - 12:00 | ICM Room 12a

## EUV ptychography: material-specific imaging at the nanoscale

Author(s): Jan Rothhardt, Helmholtz Institute Jena (Germany)

Lunch Break 12:00 - 13:10

### SESSION 7: FULL-FIELD IMAGING AND APPLICATIONS II

29 June 2023 • 13:10 - 14:20 | ICM Room 12a

Session Chairs: Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy), Yanmin Zhu, The Univ. of Hong Kong (Hong Kong, China)

12621-32 • 13:10 - 13:30 | ICM Room 12a

## Deep learning-enabled far-infrared active imaging and video-surveillance through fire

Author(s): Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle (Italy); Jaromír Běhal, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle (Italy), Univ. degli Studi di Napoli Federico II (Italy); Pier Luigi Mazzeo, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle (Italy); Marika Valentino, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle (Italy), Univ. degli Studi di Napoli Federico II (Italy); Paolo Spagnolo, Lisa Miccio, Cosimo Distante, Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle (Italy)

12621-33 • 13:30 - 14:00 | ICM Room 12a

## Holographic and polarization features analysis for microplastics characterization and water monitoring (*Invited Paper*)

Author(s): Yanmin Zhu, Yuxing Li, Jianqing Huang, Yunping Zhang, Edmund Y. Lam, The University of Hong Kong (Hong Kong, China)

12621-46 • 14:00 - 14:20 | ICM Room 12a

## Synthetic Data Generation for Improvement of Machine Learning based Optical Quality Control: A Practical Approach in the Welding Context

Author(s): Omar De Mitri, Andreas Frommknecht, Fraunhofer-Institut für Produktionstechnik und Automatisierung IPA (Germany); Cosimo Distante, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

### SESSION 8: MULTIMODAL SENSING APPLICATIONS II

29 June 2023 • 14:20 - 17:30 | ICM Room 12a

Session Chair: Francesco Soldovieri, Istituto per il Rilevamento Elettromagnetico dell'Ambiente (Italy)

12621-35 • 14:20 - 14:50 | ICM Room 12a

## A metalearning approach to multimodal space imaging (*Keynote Presentation*)

Author(s): Francesco C. Morabito, Univ. Mediterranea di Reggio Calabria (Italy)

12621-36 • 14:50 - 15:10 | ICM Room 12a

## Investigation on automated visual SMD-PCB inspection based on multimodal one-class novelty detection

Author(s): Zheng Liu, Qichao Wang, Rico Nestler, Gunther Notni, Technische Univ. Ilmenau (Germany)

12621-37 • 15:10 - 15:30 | ICM Room 12a

## Scale-invariant semantic segmentation of natural RGB-D images combining decisional tree and deep learning models

Author(s): Laura Romeo, Rosa Pia Devanna, Roberto Marani, Giovanni Matranga, Marcella Biddoccu, Annalisa Milella, Consiglio Nazionale delle Ricerche (Italy)

Coffee Break 15:30 - 16:00

12621-38 • 16:00 - 16:30 | ICM Room 12a

## Characterization of bolted joint surface enabled by multimodal measurement (*Invited Paper*)

Author(s): Rufe Zou, Qini Ge, Beijing TaiGeek Technology Co., Ltd. (China); Yuexiang Peng, Beijing Univ. of Technology (China)

12621-39 • 16:30 - 16:50 | ICM Room 12a

## Automated detection and counting of grape bunches using a farmer robot

Author(s): Rosa Pia Devanna, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato, Consiglio Nazionale delle Ricerche (Italy); Annalisa Milella, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato, Consiglio Nazionale del (Italy); Giulio Reina, Politecnico di Bari (Italy)

12621-40 • 16:50 - 17:10 | ICM Room 12a

## The role of reciprocity in ptychography

Author(s): Lars Loetgering, ZEISS Research Microscopy Solutions (Germany)

12621-41 • 17:10 - 17:30 | ICM Room 12a

## Kinematic-aware UKF-based fast fiducial marker tracker

Author(s): Stefano Mutti, Nicola Pedrocchi, Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato, Consiglio Nazionale delle Ricerche (Italy); Giovanni Dimauro, Univ. degli Studi di Bari Aldo Moro (Italy)

## Optical Methods for Inspection, Characterization, and Imaging of Biomaterials VI

26 - 29 June 2023 | Hall B1, Room 3-Wilhelm Röntgen

Conference Chairs: **Pietro Ferraro**, Institute of Applied Sciences and Intelligent Systems (ISASI-CNR) (Italy); **Demetri Psaltis**, Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Simonetta Grilli**, Institute of Applied Sciences and Intelligent Systems (ISASI-CNR) (Italy)

Programme Committee: **Sophie Brasselet**, Institut Fresnel (France); **Mercedes Carrascosa Rico**, Univ. Autónoma de Madrid (Spain); **Giuseppe Chirico**, Univ. degli Studi di Milano-Bicocca (Italy); **Gabriella Cincotti**, Univ. degli Studi di Roma Tre (Italy); **Jürgen W. Czarske**, TU Dresden (Germany); **Alberto Diaspro**, Istituto Italiano di Tecnologia (Italy); **Frank Dubois**, Univ. Libre de Bruxelles (Belgium); **David C. Duffy**, Quanterix Corp. (United States); **Wolfgang A. Ertmer**, Leibniz Univ. Hannover (Germany); **Jochen R. Guck**, Technische Univ. Dresden (Germany); **Pasquale Memmolo**, Istituto di Scienze Applicate e Sistemi Intelligenti (ISASI-CNR) (Italy); **Fernando Mendoza Santoyo**, Ctr. de Investigaciones en Óptica, A.C. (Mexico); **Lisa Miccio**, Institute of Applied Sciences and Intelligent Systems (ISASI-CNR) (Italy); **Serge Monneret**, Institut Fresnel (France); **Heidi Ottevaere**, Vrije Univ. Brussel (Belgium); **Natan Tzvi Shaked**, Tel Aviv Univ. (Israel); **Sanna Uusitalo**, VTT Technical Research Ctr. of Finland Ltd. (Finland); **Zeev Zalevsky**, Bar-Ilan Univ. (Israel); **Yao Zhang**, Jinan Univ. (China); **Guan Zheng**, Univ. of Connecticut (United States)

### MONDAY 26 JUNE

#### SESSION 1: QUANTITATIVE PHASE IMAGING AND TOMOGRAPHY I

26 June 2023 • 08:00 - 10:00 | Hall B1, Room 3-Wilhelm Röntgen

Session Chair: Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-3 • 08:00 - 08:20 | Hall B1, Room 3-Wilhelm Röntgen

**Polarization grating based common path optical diffraction tomography with optimized spatio-temporal coherence and reduced speckle noise**

Author(s): Piotr Zdankowski, Maciej Trusiak, Warsaw Univ. of Technology (Poland)

12622-2 • 08:20 - 08:40 | Hall B1, Room 3-Wilhelm Röntgen

**Deep learning-enabled holographic tomography: cell morphology analysis and diagnosis**

Author(s): Chau-Jern Cheng, Chung-Hsuan Huang, Han-Wen Chi, Hui-Ching Chang, National Taiwan Normal Univ. (Taiwan); Han-Yen Tu, Chinese Culture University (Taiwan)

12622-1 • 08:40 - 09:00 | Hall B1, Room 3-Wilhelm Röntgen

**Computational nucleus specificity for holographic tomography in flow cytometry**

Author(s): Daniele Pirone, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Joowon Lim, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Francesco Merola, Lisa Miccio, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Martina Mugnano, Univ. degli Studi di Napoli Federico II (Italy); Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Flora Cimmino, Feliciano Visconte, CEINGE-Biotecnologie Avanzate (Italy); Annalaura Montella, Mario Capasso, CEINGE-Biotecnologie Avanzate (Italy), Univ. degli Studi di Napoli Federico II (Italy); Achille Iolascon, CEINGE-Biotecnologie Avanzate (Italy); Pasquale Memmolo, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-4 • 09:00 - 09:30 | Hall B1, Room 3-Wilhelm Röntgen

**Quantitative phase microscopy for biomaterial and device characterization (Invited Paper)**

Author(s): Peter T. C. So, Massachusetts Institute of Technology (United States)

12622-5 • 09:30 - 10:00 | Hall B1, Room 3-Wilhelm Röntgen

**Three-dimensional quantitative phase imaging: from label-free imaging of live cells to dielectric tensor tomography of birefringent materials (Invited Paper)**

Author(s): YongKeun Park, KAIST (Republic of Korea)

Coffee Break 10:00 - 10:30

#### SESSION 2: QUANTITATIVE PHASE IMAGING AND TOMOGRAPHY II

26 June 2023 • 10:30 - 12:10 | Hall B1, Room 3-Wilhelm Röntgen

Session Chair: Lisa Miccio, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-6 • 10:30 - 11:00 | Hall B1, Room 3-Wilhelm Röntgen

**Towards label-free fingerprinting of cellular dynamics by time-lapse single-cell electrically modulated light microscopy (Invited Paper)**

Author(s): Cristina Polonschii, International Ctr. of Biodynamics (Romania); Mihaela Gheorghiu, International Ctr. of Biodynamics (Romania), Univ. din Bucuresti (Romania); Sorin David, Dumitru Bratu, International Ctr. of Biodynamics (Romania); Eugen Gheorghiu, International Ctr. of Biodynamics (Romania), Univ. din Bucuresti (Romania)

12622-7 • 11:30 - 11:50 | Hall B1, Room 3-Wilhelm Röntgen

**Multicore fiber endoscopy for 3D rotation of cancer cells (Invited Paper)**

Author(s): Juergen W. Czarske, Nektarios Koukourakis, Jiawei Sun, BIOLAS, TU Dresden (Germany)

12622-8 • 11:50 - 12:10 | Hall B1, Room 3-Wilhelm Röntgen

**Optimizing the experimental layout and the computational processing for lab-on-chip-based tomographic flow cytometry system**

Author(s): Francesca Borrelli, Univ. degli Studi di Napoli Federico II (Italy), Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Jaromír Behal, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Martina Mugnano, Univ. degli Studi di Napoli Federico II (Italy), CEINGE-Biotecnologie Avanzate (Italy); Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Amedeo Capozzoli, Claudio Curcio, Angelo Liseno, Univ. degli Studi di Napoli Federico II (Italy); Lisa Miccio, Pasquale Memmolo, Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-9 • 11:00 - 11:30 | Hall B1, Room 3-Wilhelm Röntgen

## Improved multiwavelength twin image and coherent noise reduction in Gabor holographic microscopy

Author(s): Maciej Trusiak, Mikolaj Rogalski, Warsaw Univ. of Technology (Poland)

Lunch Break 12:10 - 13:30

### SESSION 3: SPECIAL SESSION ON DIGITAL AND COMPUTATIONAL PATHOLOGY I

26 June 2023 • 13:30 - 15:30 | Hall B1, Room 3-Wilhelm Röntgen

Session Chair: Laura Sironi, Univ. degli Studi di Milano-Bicocca (Italy)

12622-11 • 13:30 - 14:00 | Hall B1, Room 3-Wilhelm Röntgen

## Virtual staining of label-free tissue using deep learning (Invited Paper)

Author(s): Aydogan Ozcan, UCLA Samueli School of Engineering (United States)

12622-12 • 14:00 - 14:30 | Hall B1, Room 3-Wilhelm Röntgen

## Life beyond the pixels: single-cell analysis using deep learning and image analysis methods (Invited Paper)

Author(s): Péter Horváth, Biological Research Ctr. (Hungary)

12622-13 • 14:30 - 14:50 | Hall B1, Room 3-Wilhelm Röntgen

## Two-photon laser polymerized microlenses for nonlinear excitation microscopy of biological samples

Author(s): Alessandra Nardini, Politecnico di Milano (Italy); Rebeca Martínez Vázquez, Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche (Italy); Mario Marini, Univ. degli Studi di Milano-Bicocca (Italy); Claudio Conci, Politecnico di Milano (Italy); Margaux Bouzin, Maddalena Collini, Univ. degli Studi di Milano-Bicocca (Italy); Roberto Osellame, Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche (Italy); Giulio Cerullo, Behjat S. Kariman, Politecnico di Milano (Italy); Maria Farsari, Elmina Kabouraki, Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas (Greece); Giuseppe Giberto Chirico, Univ. degli Studi di Milano-Bicocca (Italy); Manuela Raimondi, Politecnico di Milano (Italy)

12622-14 • 14:50 - 15:10 | Hall B1, Room 3-Wilhelm Röntgen

## CANCELED: Biodistribution study in tumor bearing mice of the tumor targeting antibody L19 using intravital and confocal microscopy

Author(s): Tommaso Virgilio, Istituto di Ricerca in Biomedicina, Univ. della Svizzera Italiana (Switzerland); Alain Pulfer, Istituto di Ricerca in Biomedicina, Univ. della Svizzera Italiana (Switzerland), ETH Zurich (Switzerland); Kamil Chahine, Chiara Pizzichetti, Louis L. Renner, Istituto di Ricerca in Biomedicina, Univ. della Svizzera Italiana (Switzerland); Dario Neri, Philochem AG (Switzerland), Philogen S.p.A. (Italy); Emanuele Puca, Roberto De Luca, Philochem AG (Switzerland); Santiago F. González, Istituto di Ricerca in Biomedicina, Univ. della Svizzera Italiana (Switzerland)

12622-15 • 15:10 - 15:30 | Hall B1, Room 3-Wilhelm Röntgen

## Super-MAPPS: a supervised AI-phasor-based method to investigate collagen micro-architecture and early detect tumorous tissue in human samples

Author(s): Riccardo Scodellaro, Davide Panzeri, Elena Pagani, Margaux Bouzin, Laura D'Alfonso, Maddalena Collini, Giuseppe G. Chirico, Laura Sironi, Univ. degli Studi di Milano-Bicocca (Italy)

Coffee Break 15:30 - 16:00

### SESSION 4: SPECIAL SESSION, DIGITAL AND COMPUTATIONAL PATHOLOGY III

26 June 2023 • 16:00 - 18:00 | Hall B1, Room 3-Wilhelm Röntgen

Session Chair: Giuseppe Giberto Chirico, Univ. degli Studi di Milano-Bicocca (Italy)

12622-16 • 16:00 - 16:30 | Hall B1, Room 3-Wilhelm Röntgen

## Quantification of inflammation and toxicity-induced effects on living cells and in histological ex vivo tissues utilizing digital holographic phase microscopy (Invited Paper)

Author(s): Björn Kemper, Westfälische Wilhelms-Univ. Münster (Germany)

12622-17 • 16:30 - 16:50 | Hall B1, Room 3-Wilhelm Röntgen

## Towards kidney histophysiology by using Fourier Ptychography

Author(s): Marika Valentino, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy), Univ. degli Studi di Napoli Federico II (Italy); Vittorio Bianco, Lisa Miccio, Pasquale Memmolo, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Valentina Brancato, Paolo Libretti, Marcello Gambacorta, Marco Salvatore, Synlab Italia srl (Italy); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-18 • 16:50 - 17:10 | Hall B1, Room 3-Wilhelm Röntgen

## Holo-tomographic flow cytometry: a new paradigm in diagnostics by high-throughput and stain-free single-cell imaging

Author(s): Lisa Miccio, Daniele Pirone, Jaromír Behal, Giusy Giugliano, Michela Schiavo, Vittorio Bianco, Pasquale Memmolo, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy)

12622-19 • 17:10 - 17:30 | Hall B1, Room 3-Wilhelm Röntgen

## Biological tissue-enhanced visualization through polarimetric observables

Author(s): Mónica Canabal-Carbia, Irene Estévez Caride, Univ. Autònoma de Barcelona (Spain); Adriana Rosalía Sánchez Montes, I. U. Física Aplicada a las Ciencias y las Tecnologías, U. de Alicante, 03080, Alicante, Spain (Spain); Maria Marroco, Univ. Autònoma de Barcelona (Spain); José J. Gil, Univ. de Zaragoza (Spain); Ignacio San José, Instituto Aragonés de Estadística (Spain); Emilio González-Arnay, Univ. de La Laguna (Spain); Juan Campos, Angel Lizana Tutusaus, Univ. Autònoma de Barcelona (Spain)

12622-61 • 17:30 - 18:00 | Hall B1, Room 3-Wilhelm Röntgen

## Meta-optics for new approaches to all-optical image processing (Invited Paper)

Author(s): Lukas Wesemann, Shaban B. Sulejman, Niken Priscilla, Wendy Lee, Lincoln Clark, The Univ. of Melbourne (Australia), Australian Research Council Ctr. of Excellence for Transformative Meta-Optical Systems TMOS (Australia); Jon Rickett, Jingchao Song, Jieqiong Lou, Elizabeth Hinde, The Univ. of Melbourne (Australia); Timothy J. Davis, Ann Roberts, The Univ. of Melbourne (Australia), Australian Research Council Ctr. of Excellence for Transformative Meta-Optical Systems TMOS (Australia)

# CONFERENCE 12622

TUESDAY 27 JUNE

## SESSION 5: SYSTEMS AND METHODS FOR BIOSENSING

27 June 2023 • 08:30 - 10:00 | Hall B1, Room 3-Wilhelm Röntgen

Session Chair: Simonetta Grilli, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-20 • 08:30 - 09:00 | Hall B1, Room 3-Wilhelm Röntgen

**Light-driven cellular micromotors and biosensors**  
(Invited Paper)

Author(s): Hongxiang Lei, Sun Yat-Sen Univ. (China)

12622-21 • 09:00 - 09:30 | Hall B1, Room 3-Wilhelm Röntgen

**Multiparametric remote optical sensing by a spinning upconverting microparticle at the microscale**  
(Invited Paper)

Author(s): Elisa Ortiz-Rivero, Daniel Jaque, Patricia Haro-González, Univ. Autónoma de Madrid (Spain)

12622-23 • 09:30 - 10:00 | Hall B1, Room 3-Wilhelm Röntgen

**Nano-biosensing using lensfree microscopy** (Invited Paper)

Author(s): Euan McLeod, Wyant College of Optical Sciences (United States)

Coffee Break 10:00 - 10:30

## SESSION 6: SPECIAL SESSION, SINGLE-CELL FLOW CYTOMETRY

27 June 2023 • 10:30 - 12:50 | Hall B1, Room 3-Wilhelm Röntgen

Session Chairs: Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy), Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

12622-24 • 10:30 - 11:00 | Hall B1, Room 3-Wilhelm Röntgen

**Image-activated cell sorting 2.0** (Invited Paper)

Author(s): Keisuke Goda, The Univ. of Tokyo (Japan)

12622-25 • 11:00 - 11:30 | Hall B1, Room 3-Wilhelm Röntgen

**Holographic cytology** (Invited Paper)

Author(s): Adam P. Wax, Duke Univ. (United States)

12622-26 • 11:30 - 12:00 | Hall B1, Room 3-Wilhelm Röntgen

**Quantitative imaging flow cytometry based on digital holographic microscopy** (Invited Paper)

Author(s): Natan T. Shaked, Tel Aviv Univ. (Israel)

12622-27 • 12:00 - 12:30 | Hall B1, Room 3-Wilhelm Röntgen

**High-throughput and high-precision flow cytometry based on digital holographic microscopy**  
(Invited Paper)

Author(s): Feng Pan, Wen Xiao, Lu Xin, Beihang Univ. (China); Hao Wang, Cancer Ctr., Peking Univ. Third Hospital (China); Ran Peng, Xi Xiao, Peking Univ. Third Hospital (China)

12622-28 • 12:30 - 12:50 | Hall B1, Room 3-Wilhelm Röntgen

**Encoding single-cell phase-contrast tomograms by 3D Zernike descriptors**

Author(s): Pasquale Memmolo, Daniele Pirone, Daniele G. Sirico, Lisa Miccio, Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Ahmed B. Ayoub, Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

Lunch Break 12:50 - 14:00

## WORLD OF PHOTONICS PLENARY

27 June 2023 • 14:00 - 15:30 | ICM, Saal 1

This plenary session features a presentation by **Tammy Ma**, Lawrence Livermore National Lab. (United States), and **Constantin Haefner**, Fraunhofer-Institute for Laser Technology (Germany), on laser-driven inertial confinement fusion.

Coffee Break 15:30 - 16:00

## SESSION 7: AI-POWERED MICROSCOPY

27 June 2023 • 16:00 - 17:50 | Hall B1, Room 3-Wilhelm Röntgen

Session Chair: Lisa Miccio, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-29 • 16:00 - 16:30 | Hall B1, Room 3-Wilhelm Röntgen

**Optical design using physics-inspired neural networks**  
(Invited Paper)

Author(s): Demetri Psaltis, Carlo Gigli, Amirhossein Saba, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

12622-30 • 16:30 - 16:50 | Hall B1, Room 3-Wilhelm Röntgen

**Deep learning assisted Fourier ptychography for cells and tissue analysis**

Author(s): Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Marika Valentino, Jaromir Behal, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy), Univ. degli Studi di Napoli Federico II (Italy); Daniele Pirone, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Francesco Bardozzo, Univ. degli Studi di Salerno (Italy); Pasquale Memmolo, Lisa Miccio, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Roberto Tagliaferri, Univ. degli Studi di Salerno (Italy); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-31 • 16:50 - 17:10 | Hall B1, Room 3-Wilhelm Röntgen

**Hierarchical learning approaches for improving label-free single-cell classification in holographic microscopy**

Author(s): Pasquale Memmolo, Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Roberta Russo, Immacolata Andolfo, Martina Mugnano, Univ. degli Studi di Napoli Federico II (Italy); Francesco Merola, Lisa Miccio, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Achille Iolascon, Univ. degli Studi di Napoli Federico II (Italy); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-32 • 17:10 - 17:30 | Hall B1, Room 3-Wilhelm Röntgen

**Out of distribution detection in deep learning-based scattering pattern classification**

Author(s): David Dannhauser, Univ. degli Studi di Napoli Federico II, CRIB (Italy); Paolo Antonio Netti, Filippo Causa, Centro Interdipartimentale di Ricerca sui Biomateriali, Univ. degli Studi di Napoli Federico II (Italy)

12622-33 • 17:30 - 17:50 | Hall B1, Room 3-Wilhelm Röntgen

**Volumetric bioimaging via dual resonant scanning multiphoton microscopy with 3D generator U-Net**

Author(s): Chai-Wei Hsu, Sumesh Nair, Chun-Yu Lin, Shean-Jen Chen, National Yang Ming Chiao Tung Univ. (Taiwan)

## WEDNESDAY 28 JUNE

### SESSION 8: SPECIAL SESSION, DIGITAL AND COMPUTATIONAL PATHOLOGY IV

28 June 2023 • 08:40 - 10:00 |  
Hall B1, Room 3-Wilhelm Röntgen

Session Chair: Giuseppe Giberto Chirico, Univ. degli Studi di Milano-Bicocca (Italy)

12622-34 • 08:40 - 09:00 | Hall B1, Room 3-Wilhelm Röntgen

#### Virtually stained H&E images and nuclei segmentation combining neural networks and spectral phasor analysis

Author(s): Elena Pagani, Davide Panzeri, Riccardo Scodellaro, Margaux Bouzin, Laura D'Alfonso, Maddalena Collini, Giuseppe G. Chirico, Univ. degli Studi di Milano-Bicocca (Italy); Donato Inverso, I.R.C.C.S. Ospedale San Raffaele, Univ. Vita-Salute San Raffaele (Italy); Laura Sironi, Univ. degli Studi di Milano-Bicocca (Italy)

12622-35 • 09:00 - 09:20 | Hall B1, Room 3-Wilhelm Röntgen

#### Development and characterization of a two-photon fluorescence microscope for collagen tissue based on a nanosecond laser

Author(s): Tobias Baselt, Robert Scheller, Westsächsische Hochschule Zwickau (Germany); Burkhard Fleck, Ernst-Abbe-Hochschule Jena (Germany); Peter Hartmann, Westsächsische Hochschule Zwickau (Germany)

12622-36 • 09:20 - 09:40 | Hall B1, Room 3-Wilhelm Röntgen

#### Fibrosis detection and quantification in whole slide images through deep learning

Author(s): Davide Panzeri, Elena Pagani, Riccardo Scodellaro, Giuseppe G. Chirico, Univ. degli Studi di Milano-Bicocca (Italy); Luca Di Tommaso, IRCCS Istituto Clinico Humanitas (Italy); Donato Inverso, I.R.C.C.S. Ospedale San Raffaele, Univ. Vita-Salute San Raffaele (Italy); Laura Sironi, Univ. degli Studi di Milano-Bicocca (Italy)

12622-81 • 09:40 - 10:00 | Hall B1, Room 3-Wilhelm Röntgen

#### Label-free white blood cell classification during flow combining holographic imaging with deep learning

Author(s): Anat Cohen, Matan Dudaie, Nathan T. Shaked, Tel Aviv Univ. (Israel)

Coffee Break 10:00 - 10:30

### OPTICAL METROLOGY PLENARY SESSION

28 June 2023 • 10:30 - 11:25 | ICM, Saal 1

10:30 to 10:40 hrs

#### Welcome Address and Plenary Speaker Introduction

**Marc P. Georges**, Liège Univ. (Belgium)

**Jörg Seewig**, Technische Univ. Kaiserslautern (Germany)

2023 Symposium Chairs

12622-500 • 10:40 - 11:25 | ICM, Saal 1

#### Remote photonic medicine (*Plenary Presentation*)

Author(s): Zeev Zalevsky, Bar-Ilan Univ. (Israel)

Lunch Break 11:30 - 12:30

### POSTERS-WEDNESDAY

28 June 2023 • 12:30 - 13:30 | ICM, Hall B0

Poster authors, please set up posters between the morning coffee break and the end of Lunch Break on Wednesday. Plan to stand by your poster to discuss it with session attendees during the poster session. Remove your poster following the poster session conclusion as posters left on the boards will be discarded.

12622-64 • 12:30 - 13:30 | ICM, Hall B0

#### Refractive index measurement and particle sizing of dense particle suspensions using spectral interferometry

Author(s): Peter Speets, Jeroen Kalkman, Technische Univ. Delft (Netherlands)

12622-65

#### Shaping and characterization of an integrated optic on polymer by simple 3D printing

Author(s): Eros Gavini, Institut d'Électronique et des Technologies du numéRique, Univ. de Rennes 1 (France), Ecole Normale Supérieure de Rennes (France); Sylvain Pernon, ISTIC UFR Informatique & Electronique, Univ. de Rennes 1 (France); Jordan Gastebois, Nathalie Coulon, Institut d'Électronique et des Technologies du numéRique, Univ. de Rennes 1 (France); Christophe Levallois, Fonctions Optiques pour les Technologies de l'information, Univ. de Rennes 1 (France); Alain Moréac, Arnaud Saint-Jalmes, Institut de Physique de Rennes, Univ. de Rennes 1 (France); Gautier Querrec, Institut d'Électronique et des Technologies du numéRique (France); Bruno Bêche, Institut d'Électronique et des Technologies du numéRique, Univ. de Rennes 1 (France)

12622-66 • 12:30 - 13:30 | ICM, Hall B0

#### Experimental observation of distributed pulse wave velocity with a noncontact portable shearing-speckle interferometer

Author(s): Neisei Hayashi, Ryohei Hanayama, Katsuhiko Ishii, The Graduate School for the Creation of New Photonics Industries (Japan)

12622-67 • 12:30 - 13:30 | ICM, Hall B0

#### Focusing coherent light through volume scattering phantoms with well defined optical properties via wavefront shaping

Author(s): Niklas Fritzsche, Felix Ott, Karsten Pink, Alwin Kienle, Institut für Lasertechnologien in der Medizin und Messtechnik an der Univ. Ulm (Germany)

12622-68 • 12:30 - 13:30 | ICM, Hall B0

#### Measurement of the optical properties of fluorescent media using an integrating sphere

Author(s): Thomas Brall, Florian Foschum, Florian Bergmann, Alwin Kienle, Institut für Lasertechnologien in der Medizin und Messtechnik an der Univ. Ulm (Germany)

12622-69 • 12:30 - 13:30 | ICM, Hall B0

#### Optical coherence tomography and microbiology evaluations of different methods for manufacturing dental prostheses

Author(s): Mihai Stefan Duma, Denisa Drimbe, Ralph-Alexandru Erdelyi, Univ. Politehnica Timisoara (Romania); Virgil-Florin Duma, Aurel Vlaicu University from Arad (Romania); Daria Negrut, Ioana Moldovan, Anne-Marie Heredeia, Elena Rodica Heredeia, Meda Lavinia Negrutiu, Daniela Maria Pop, Mihai Rominu, Univ. de Medicina si Farmacie "Victor Babes" din Timisoara (Romania); Dan Ioan Stoia, Univ. Politehnica Timisoara (Romania); Cosmin G. Sinescu, CMI dr Sinescu Cosmin (Romania)

# CONFERENCE 12622

12622-70 • 12:30 - 13:30 | ICM, Hall B0

## Imaging of phase samples by polarization microscope with spatially structured wave plate under polychromatic illumination

Author(s): Michal Baránek, Matej Kalavský, Palacký Univ. Olomouc (Czech Republic)

12622-71 • 12:30 - 13:30 | ICM, Hall B0

## Differentiation of biological tissue based on angle-resolved scattering distribution using fiber-coupled single-mode light source with spectrally controllable emission characteristics

Author(s): Daniel Ruf, Forschungs- und Transferzentrum e.V. (Germany); Tobias Baselt, Alexander Kabardiadi-Virkovski, Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS (Germany), Westsächsische Hochschule Zwickau (Germany), Forschungs- und Transferzentrum e.V. (Germany); Peter Hartmann, Forschungs- und Transferzentrum e.V. (Germany), Westsächsische Hochschule Zwickau (Germany)

12622-72 • 12:30 - 13:30 | ICM, Hall B0

## Evaluation of hydrodynamic focusing in a microfluidic channel for flexible high-throughput analysis in digital holographic imaging flow cytometry

Author(s): Álvaro Barroso, Mark Stude, Jian Kim, Steffi Ketelhut, Jürgen Schnekenburger, Björn Kemper, Westfälische Wilhelms-Universität Münster (Germany)

12622-73 • 12:30 - 13:30 | ICM, Hall B0

## Motility-based screening of probiotic bacteria candidates by label-free coherent light tester

Author(s): Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Filomena Nazzaro, Istituto di Scienze dell'Alimentazione (Italy); Zhe Wang, Jaromír Behal, Univ. degli Studi di Napoli Federico II (Italy); Simonetta Grilli, Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-74 • 12:30 - 13:30 | ICM, Hall B0

## Quantitative evaluation of nanoparticles internalization in living cells by holographic microscopy

Author(s): Daniele Pirone, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Martina Mugnano, Univ. degli Studi di Napoli Federico II (Italy); Pasquale Memmolo, Francesco Merola, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Giuseppe Cesare Lama, Rachele Castaldo, Istituto per i Polimeri, Compositi e Biomateriali (Italy); Lisa Miccio, Vittorio Bianco, Simonetta Grilli, Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-75 • 12:30 - 13:30 | ICM, Hall B0

## Detection of cells with lipid droplets exploiting their biolens' signature in holographic imaging flow cytometry

Author(s): Daniele Pirone, Daniele G. Sirico, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Martina Mugnano, Univ. degli Studi di Napoli Federico II (Italy); Danila del Giudice, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Ivana Kurelac, Beatrice Cavina, Univ. degli Studi di Bologna (Italy); Pasquale Memmolo, Lisa Miccio, Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-76 • 12:30 - 13:30 | ICM, Hall B0

## Phase-contrast tomography of plant cells' nuclei enabled by reversible induced dehydration

Author(s): Zhe Wang, Univ. degli Studi di Napoli Federico II (Italy); Daniele Pirone, Vittorio Bianco, Pasquale Memmolo, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Massimiliano M. Villone, Pier Luca Maffettone, Univ. degli Studi di Napoli Federico II (Italy); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy)

12622-77 • 12:30 - 13:30 | ICM, Hall B0

## Customized iris diaphragm enables quantitative evolution from liquid droplet to free-standing thin film

Author(s): Vincenzo Ferraro, Zhe Wang, Univ. degli Studi di Napoli Federico II (Italy); Lisa Miccio, Veronica Vespini, Volodymyr Tkachenko, Sara Coppola, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Pier Luca Maffettone, Univ. degli Studi di Napoli Federico II (Italy)

12622-78 • 12:30 - 13:30 | ICM, Hall B0

## Exploring multicellular spheroids behaviour by laser illumination and photovoltaic tweezers

Author(s): Pablo Camarero, Esther Rincón, Ángel García-Cabañes, Mercedes Carrascosa, Marta Quintanilla, Patricia Haro-González, Univ. Autónoma de Madrid (Spain)

12622-79 • 12:30 - 13:30 | ICM, Hall B0

## Three-dimensional distribution dynamic change observation of carbon nano-onions particle inside cancer cell based on digital holographic tomography

Author(s): Yakun Liu, Beihang University (China); Wen Xiao, Xiaosu Yi, Beihang Univ. (China); Xi Xiao, Hao Wang, Ran Peng, Peking Univ. Third Hospital (China); Yuchen Feng, Qi Zhao, Chinese Academy of Sciences (China); Feng Pan, Beihang Univ. (China)

### SESSION 9: INNOVATIVE DIAGNOSTIC TOOLS I

28 June 2023 • 13:40 - 15:30 | Hall B1, Room 3-Wilhelm Röntgen

Session Chair: Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-37 • 13:40 - 14:10 | Hall B1, Room 3-Wilhelm Röntgen

## Quantitative label-free optical microscopy for bioimaging: from artificial lipid membranes to living cells (*Invited Paper*)

Author(s): Paola Borri, Cardiff Univ. (United Kingdom)

12622-38 • 14:10 - 14:40 | Hall B1, Room 3-Wilhelm Röntgen

## Reducing the cost and complexity of imaging for digital protein detection in point-of-care diagnostics (*Invited Paper*)

Author(s): Raymond E. Meyer, Alexander D. Wiener, Jianli Zhang, Ryan Manning, Cheuk W. Kan, Bharathi Kolluru, Joseph M. Johnson, Quanterix Corp. (United States); David M. Rissin, ; Nira Pollock, Boston Children's Hospital (United States); David C. Duffy, Quanterix Corp. (United States)

12622-39 • 14:40 - 15:10 | Hall B1, Room 3-Wilhelm Röntgen

## Combining high-content imaging and repurposing of approved drugs to tackle lysosomal storage diseases (*Invited Paper*)

Author(s): Diego Medina, Telethon Institute of Genetics and Medicine (Italy)

12622-40 • 15:10 - 15:30 | Hall B1, Room 3-Wilhelm Röntgen

## Label-free imaging and microfluidics to diagnose space-induced effects on blood components

Author(s): Lisa Miccio, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Jaromír Behal, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Univ. degli Studi di Napoli Federico II (Italy); Daniele Pirone, Pasquale Memmolo, Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Martina Mugnano, Massimiliano M. Villone, Univ. degli Studi di Napoli Federico II (Italy); Francesca Ferranti, Italian Space Agency (Italy); Silvia Mari, Italian Space Agency, Via del Politecnico snc, 00133 (Italy); Pier Luca Maffettone, Univ. degli Studi di Napoli Federico II (Italy)

Coffee Break 15:30 - 16:00

**SESSION 10: INNOVATIVE DIAGNOSTIC TOOLS II**

28 June 2023 • 16:00 - 18:10 | Hall B1, Room 3-Wilhelm Röntgen  
 Session Chair: Simonetta Grilli, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-41 • 16:00 - 16:30 | Hall B1, Room 3-Wilhelm Röntgen  
**High-resolution imaging and modeling of collagen architecture alterations in high-grade serous ovarian cancer** (*Keynote Presentation*)  
 Author(s): Paul J. Campagnola, Samuel Alkmin, Melissa Champer, Manish Patankar, Univ. of Wisconsin-Madison (United States)

12622-42 • 16:30 - 17:00 | Hall B1, Room 3-Wilhelm Röntgen  
**A multifarious platform for extracellular vesicles analysis** (*Invited Paper*)  
 Author(s): Marina Cretich, Istituto di Scienze e Tecnologie Chimiche 'Giulio Natta', Consiglio Nazionale delle Ricerche (Italy)

12622-43 • 17:00 - 17:30 | Hall B1, Room 3-Wilhelm Röntgen  
**Integrated advanced microscopy in optofluidic lab-on-a-chip** (*Invited Paper*)  
 Author(s): Roberto Osellame, CNR-Istituto di Fotonica e Nanotecnologie (Italy)

12622-44 • 17:30 - 17:50 | Hall B1, Room 3-Wilhelm Röntgen  
**Differences between wild type and LSD populations of HeLa and MEF cells through investigation of lysosomal aggregation and morphological variations by digital holography**  
 Author(s): Giusy Giugliano, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Jaromír Behal, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy), Univ. degli Studi di Napoli Federico II (Italy); Daniele Pirone, Michela Schiavo, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Antonella Capuozzo, Sandro Montefusco, Telethon Institute of Genetics and Medicine (Italy); Vittorio Bianco, Lisa Miccio, Pasquale Memmolo, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Diego Medina, Telethon Institute of Genetics and Medicine (Italy); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy)

12622-45 • 17:50 - 18:10 | Hall B1, Room 3-Wilhelm Röntgen  
**Optical coherence tomography and polymeric particles: a combination for three-dimensional thermal imaging in tissues**  
 Author(s): Tamara Muñoz Ortiz, José Lifante, Univ. Autónoma de Madrid (Spain); Idoia Alayeto, Jorge Rubio, Univ. Complutense de Madrid (Spain); Dirk Ortgies, Riccardo Marin, Emma Martín-Rodríguez, Ginés Lifante, José García Solé, Daniel Jaque, Univ. Autónoma de Madrid (Spain)

**THURSDAY 29 JUNE**

**SESSION 11: ADVANCED OPTICS AND PHOTONIC SYSTEMS I**

29 June 2023 • 08:30 - 10:00 | Hall B1, Room 3-Wilhelm Röntgen  
 Session Chair: Marina Cretich, Istituto di Scienze e Tecnologie Chimiche 'Giulio Natta' (Italy)

12622-46 • 08:30 - 09:00 | Hall B1, Room 3-Wilhelm Röntgen  
**Ultracompact meta-microscope enables wide-field and depth-of-field microscopy** (*Invited Paper*)  
 Author(s): Tao Li, Xin Ye, Beibei Xu, Shining Zhu, Nanjing Univ. (China)

12622-47 • 09:00 - 09:20 | Hall B1, Room 3-Wilhelm Röntgen  
**An innovative optical viscometer using a resonant surface signal**  
 Author(s): Jordan Gastebois, Hervé Lhermite, Institut d'Électronique et des Technologies du numéRique, Univ. de Rennes 1 (France); Hervé Cormerais, Institut d'Électronique et des Technologies du numéRique, Univ. de Rennes 1 (France), CentraleSupélec (France); Arnaud Saint-Jalmes, Véronique Vié, Institut de Physique de Rennes, Univ. de Rennes 1 (France); Lucas Garnier, Bruno Bêche, Institut d'Électronique et des Technologies du numéRique, Univ. de Rennes 1 (France)

12622-48 • 09:20 - 09:40 | Hall B1, Room 3-Wilhelm Röntgen  
**Polarization phase shifting interferometry applied to studying diffusion through a cellulose biomembrane**  
 Author(s): Arkadiusz T. Kus, Institute of Micromechanics and Photonics, Warsaw Univ. of Technology (Poland); Aneta Wegierek-Ciuk, Katarzyna Galczynska, The Jan Kochanowski Univ. in Kielce (Poland); Sławomir Wasik, Institute of Physics, The Jan Kochanowski Univ. in Kielce (Poland); Oleg Lyzwiniski, Michal Ziemczonok, Warsaw Univ. of Technology (Poland); Michal Arabski, The Jan Kochanowski Univ. in Kielce (Poland); Malgorzata Kujawinska, Warsaw Univ. of Technology (Poland)

12622-49 • 09:40 - 10:00 | Hall B1, Room 3-Wilhelm Röntgen  
**Ion-beam-induced nanostructuring on titanium surfaces**  
 Author(s): Jens Bauer, Hannaneh Hosseini, Gregor Dornberg, Frank Frost, Leibniz-Institut für Oberflächenmodifizierung e.V. (Germany)

Coffee Break 10:00 - 10:30

**SESSION 12: ADVANCED OPTICS AND PHOTONIC SYSTEMS II**

29 June 2023 • 10:30 - 12:10 | Hall B1, Room 3-Wilhelm Röntgen  
 Session Chair: Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-50 • 10:30 - 11:00 | Hall B1, Room 3-Wilhelm Röntgen  
**Terahertz technology for biophotonics: a general overview and recent advances in THz spectroscopy toward biology** (*Invited Paper*)  
 Author(s): Romain Peretti, Institut d'Electronique de Microélectronique et de Nanotechnologie, CNRS (France)

12622-51 • 11:00 - 11:30 | Hall B1, Room 3-Wilhelm Röntgen  
**Nano-optical manipulation and imaging using biomicrolenses** (*Invited Paper*)  
 Author(s): Yuchao Li, Jinan Univ. (China)

12622-52  
**Freeform beam shaping optics for large-size 3D scaffold fabrication with high accuracy**  
 Author(s): Alejandro Madrid Sánchez, Yunfeng Nie, Fabian Duerr, Heidi Ottevaere, Vrije Univ. Brussel (Belgium)  
 29 June 2023 • 11:30 - 11:50 | Hall B1, Room 3-Wilhelm Röntgen

12622-53 • 11:50 - 12:10 | Hall B1, Room 3-Wilhelm Röntgen  
**Multimodal characterization of thin polymeric film by digital holography-based methods**  
 Author(s): Zhe Wang, Vincenzo Ferraro, Univ. degli Studi di Napoli Federico II (Italy); Lisa Miccio, Veronica Vespini, Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Francesca Ferranti, Silvia Mari, Italian Space Agency (Italy); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Pier Luca Maffettone, Univ. degli Studi di Napoli Federico II (Italy); Sara Coppola, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy)

Lunch Break 12:10 - 13:20

# CONFERENCE 12622

## SESSION 13: HIGH THROUGHPUT IMAGING MODALITIES

29 June 2023 • 13:20 - 15:30 | Hall B1, Room 3-Wilhelm Röntgen  
Session Chair: Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-54 • 13:20 - 13:50 | Hall B1, Room 3-Wilhelm Röntgen

### **High-throughput imaging across multiple spatial scales with the multi-camera array microscope (MCAM)** *(Invited Paper)*

Author(s): Lucas A. Kreiss, Duke Univ. (United States); Kevin Zhou, Duke Univ. (United States), Univ. of California (United States); Kanghyun Kim, Duke Univ. (United States); Mark Harfouche, Ramona Optics, Inc. (United States); Shiqi Xu, Joakim Jonsson, Duke Univ. (United States); Kyung Chul Lee, Duke Univ. (United States), Yonsei Univ. (Republic of Korea); Clare Cook, Xi Yang, Duke Univ. (United States); Paul Reamey, Veton Saliu, Gregor Horstmeyer, Ramona Optics (United States); Roarke Horstmeyer, Duke Univ. (United States), Ramona Optics, Inc. (United States)

12622-55 • 13:50 - 14:10 | Hall B1, Room 3-Wilhelm Röntgen

### **Three-dimensional holographic particle tracking in space-time digital holography**

Author(s): Zhengzhong Huang, Tsinghua Univ. (China); Zhe Wang, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy), Univ. degli Studi di Napoli Federico II (Italy); Daniele Pirone, Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Pasquale Memmo, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Liangcai Cao, Tsinghua Univ. (China); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy)

12622-56 • 14:10 - 14:30 | Hall B1, Room 3-Wilhelm Röntgen

### **Numerical study of the hydrodynamic interactions among cells for holographic in-flow tomography**

Author(s): Massimiliano M. Villone, Univ. degli Studi di Napoli Federico II (Italy); Lisa Miccio, Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Pier Luca Maffettone, Univ. degli Studi di Napoli Federico II (Italy)

12622-57 • 14:30 - 14:50 | Hall B1, Room 3-Wilhelm Röntgen

### **Phase-retrieval in scanning digital holography for optofluidics**

Author(s): Zhe Wang, Univ. degli Studi di Napoli Federico II (Italy); Vittorio Bianco, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Pier Luca Maffettone, Univ. degli Studi di Napoli Federico II (Italy); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-58 • 14:50 - 15:10 | Hall B1, Room 3-Wilhelm Röntgen

### **Multimodal imaging flow cytometry based on single capture bright field and digital holographic microscopy for the analysis of living cells**

Author(s): Jose Angel Picazo-Bueno, Álvaro Barroso, Steffi Ketelhut, Universitätsklinikum Münster (Germany); Vicente Micó, Univ. de València (Spain); Jürgen Schenekenburger, Björn Kemper, Universitätsklinikum Münster (Germany)

12622-59 • 15:10 - 15:30 | Hall B1, Room 3-Wilhelm Röntgen

### **Classification of drug-resistant ovarian cancer cells using holographic flow cytometry through interpretable machine learning**

Author(s): Lu Xin, Wen Xiao, Beihang Univ. (China); Huanzhi Zhang, Peking Univ. People's Hospital (China); Xiaosu Yi, Beihang Univ. (China); Xiaoping Li, Peking Univ. People's Hospital (China); Feng Pan, Beihang Univ. (China)

Coffee Break 15:30 - 16:00

## SESSION 14: ADVANCED OPTICS AND PHOTONIC SYSTEMS III

29 June 2023 • 16:00 - 17:10 | Hall B1, Room 3-Wilhelm Röntgen  
Session Chair: Tao Li, Nanjing Univ. (China)

12622-60 • 16:00 - 16:30 | Hall B1, Room 3-Wilhelm Röntgen

### **On the use of physics in machine learning for manufacturing process inspection** *(Invited Paper)*

Author(s): George Barbastathis, Qihang Zhang, Ajinkya Pandit, Massachusetts Institute of Technology (United States); Wenlong Tang, Charles Papageorgiou, Takeda Pharmaceuticals International, Inc. (United States); Richard Braatz, Allan S. Myerson, Massachusetts Institute of Technology (United States); Bingyao Tan, Leopold Schmetterer, Nanyang Technological Univ. (Singapore), Singapore Eye Research Institute (Singapore)

12622-62 • 16:30 - 16:50 | Hall B1, Room 3-Wilhelm Röntgen

### **Chemical reaction optimization for protein immobilization on activated glass slides to develop an innovative biosensor for testing picogram level of the astronaut health biomarkers during spaceflight**

Author(s): Concetta Di Natale, Univ. degli Studi di Napoli Federico II (Italy); Sara Coppola, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", Consiglio Nazionale delle Ricerche (Italy); Veronica Vespini, Volodymyr Tkachenko, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); Giuseppina Luciani, Giuseppe Vitiello, Univ. degli Studi di Napoli Federico II (Italy); F. Ferranti, ; Silvia Mari, Italian Space Agency, Via Del Politecnico SNC (Italy); Pier Luca Maffettone, Univ. degli Studi di Napoli Federico II (Italy); Simonetta Grilli, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy)

12622-63 • 16:50 - 17:10 | Hall B1, Room 3-Wilhelm Röntgen

### **Second-harmonic optical diffraction tomography**

Author(s): Amirhossein Saba, Carlo Gigli, Ye Pu, Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (Switzerland)



# CONFERENCE 12623

## Automated Visual Inspection and Machine Vision V

28 June 2023 | ICM Room 12b

Conference Chairs: **Jürgen Beyerer**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Michael Heizmann**, Karlsruher Institut für Technologie, Institute of Industrial Information Technology (Germany)

Programme Committee: **Christian Frese**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Andreas Heinrich**, Hochschule Aalen (Germany); **Bernd Jähne**, Ruprecht-Karls-Univ. Heidelberg (Germany); **Thomas Längle**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Markus Maurer**, VITRONIC Dr.-Ing. Stein; **Wolfgang Osten**, Univ. Stuttgart (Germany); **Stephan Reichelt**, Institute of Applied Optics, Univ. Stuttgart (Germany); **Felix Salazar**, Univ. Politécnica de Madrid (Spain); **Robert Schmitt**, Fraunhofer-Institut für Produktionstechnologie (Germany); **Hugo Thienpont**, Vrije Univ. Brussel (Belgium); **Stefan Werling**, Duale Hochschule Baden-Württemberg (Germany); **Ernst Wiedenmann**, Serious Enterprises (Germany); **Volker Willert**, Hochschule für angewandte Wissenschaften Würzburg-Schweinfurt (Germany)

### WEDNESDAY 28 JUNE

#### SESSION 1: IMAGING

28 June 2023 • 08:30 - 09:50 | ICM Room 12b

Session Chair: Michael M. Heizmann, Karlsruher Institut für Technologie (Germany)

12623-1 • 08:30 - 08:50 | ICM Room 12b

#### Thermographic imaging of shear flow at a wind-driven water surface

Author(s): Bernd Jähne, Sebastian Leyer, Roman Stewing, Kerstin E. Krall, Ruprecht-Karls-Univ. Heidelberg (Germany)

12623-2 • 08:50 - 09:10 | ICM Room 12b

#### A multi-camera and multi-illumination system for combined measurements of mass exchange and waves at a wind-driven water surface

Author(s): Bernd Jähne, Dennis Hofmann, Ruprecht-Karls-Univ. Heidelberg (Germany)

12623-17 • 09:10 - 09:30 | ICM Room 12b

#### Single image defogging and evaluation with deep neural networks without the need of ground truth

Author(s): Gerard de Mas Giménez, Univ. Politècnica de Catalunya (Spain); Pablo García-Gómez, BEAMAGINE S.L. (Spain); Josep Ramon Casas, Santiago Royo, Univ. Politècnica de Catalunya (Spain)

12623-4 • 09:30 - 09:50 | ICM Room 12b

#### Application of polarimetric imaging for automated visual inspection of freeze-dried vaccines

Author(s): Denise Tellbach, Rahul Bhattacharyya, Sanjay E. Sarma, Massachusetts Institute of Technology (United States)

12623-3 • 09:50 | ICM Room 12b

#### CANCELED: Light field Inspection

Author(s): Christian Kludt, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

Coffee Break 09:50 - 10:30

#### OPTICAL METROLOGY PLENARY SESSION

28 June 2023 • 10:30 - 11:25 | ICM, Saal 1

10:30 to 10:40 hrs

#### Welcome Address and Plenary Speaker Introduction

**Marc P. Georges**, Liège Univ. (Belgium)

**Jörg Seewig**, Technische Univ. Kaiserslautern (Germany)

2023 Symposium Chairs

12622-500 • 10:40 - 11:25 | ICM, Saal 1

#### Remote photonic medicine (Plenary Presentation)

Author(s): Zeev Zalevsky, Bar-Ilan Univ. (Israel)

Lunch Break 11:25 - 12:30

#### POSTERS-WEDNESDAY

28 June 2023 • 12:30 - 13:30 | ICM, Hall B0

Poster authors, please set up posters between the morning coffee break and the end of Lunch Break on Wednesday. Plan to stand by your poster to discuss it with session attendees during the poster session. Remove your poster following the poster session conclusion as posters left on the boards will be discarded.

12623-18 • 12:30 - 13:30 | ICM, Hall B0

#### Deep learning technique for generating sparse defects to improve image classification performance

Author(s): Dahyun Park, Jaehyeon Cho, So-myeong Ahn, Kyunghwan Moon, Youngmin Hwang, Hyojin Lee, HB Technology (Republic of Korea)

12623-20 • 12:30 - 13:30 | ICM, Hall B0

#### Development of CNN-based asymmetric label smoothing method for visual inspection

Author(s): Motoki Okazaki, F. C. C. Co., Ltd. (Japan); Ryohei Hanayama, The Graduate School for the Creation of New Photonics Industries (Japan)

12623-21 • 12:30 - 13:30 | ICM, Hall B0

#### Development of smart manufacturing technology based on deep learning example for industrial product classification and defect detection

Author(s): Shih-Yu Chen, Fong-Ji Tsai, National Yunlin Univ. of Science and Technology (Taiwan)

#### SESSION 2: SYNTHETIC DATA FOR MACHINE LEARNING

28 June 2023 • 13:30 - 14:30 | ICM Room 12b

Session Chair: Jürgen Beyerer, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

12623-5 • 13:30 - 13:50 | ICM Room 12b

#### Adapting synthetic training data in deep learning-based visual surface inspection to improve transferability of simulations to real-world environments

Author(s): Ole Schmedemann, Technische Univ. Hamburg-Harburg (Germany); Simon Schlodinski, Dirk Holst, Hamburg University of Technology (Germany); Thorsten Schüppstuhl, Technische Univ. Hamburg-Harburg (Germany)

12623-6 • 13:50 - 14:10 | ICM Room 12b

#### Reinforcement learning optimized digital twin based synthetic data generation for defect detection of titanium spacer

Author(s): Sankarsan Mohanty, Eugene Su, Chao-Ching Ho, National Taipei Univ. of Technology (Taiwan)

# CONFERENCE 12623

12623-7 • 14:10 - 14:30 | ICM Room 12b

## **Synthetically generated microscope images of microtopographies using stable diffusion**

Author(s): Stefan Siemens, Markus Kästner, Eduard Reithmeier, Leibniz Univ. Hannover (Germany)

### **SESSION 3: MACHINE LEARNING AND CLASSIFICATION**

28 June 2023 • 14:30 - 15:30 | ICM Room 12b

Session Chair: Jürgen Beyerer, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

12623-8 • 14:30 - 14:50 | ICM Room 12b

## **Improved segmentation of damages on high-resolution coating images using CNN-based ensemble learning**

Author(s): Kolja Hedrich, Lennart Hinz, Eduard Reithmeier, Leibniz Univ. Hannover (Germany)

12623-9 • 14:50 - 15:10 | ICM Room 12b

## **Multi-sensor data fusion using deep learning for bulky waste image classification**

Author(s): Manuel Bihler, Karlsruher Institut für Technologie (Germany); Lukas Roming, Fraunhofer Institute of Optronics, System Technology and Image Exploitation (Germany); Yifan Jiang, Ahmed J. Afifi, Karlsruher Institut für Technologie (Germany); Jochen Aderhold, Fraunhofer Institute for Wood Research, Wilhelm-Klauditz-Institut (WKI) (Germany); Dovile Cibiraite-Lukenskiene, Fraunhofer Institute for Industrial Mathematics (ITWM) (Germany); Sandra Lorenz, Richard Gloaguen, Helmholtz-Institut Freiberg für Ressourcentechnologie (Germany); Robin Gruna, Fraunhofer Institute of Optronics (Germany); Michael Heizmann, Karlsruher Institut für Technologie (Germany)

12623-10 • 15:10 - 15:30 | ICM Room 12b

## **CANCELED: Deep learning for detection of powder on complex surfaces using computer vision**

Author(s): Ali Ghandour, Samanta Piano, Mohammed A. Isa, The Univ. of Nottingham (United Kingdom); Konstantin Rybalcenko, AMT Ltd. (United Kingdom)

**Coffee Break 15:30 - 16:00**

### **SESSION 4: IMAGE-BASED MEASUREMENT TECHNOLOGY**

28 June 2023 • 16:00 - 17:00 | ICM Room 12b

Session Chair: Jürgen Beyerer, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

12623-11 • 16:00 - 16:20 | ICM Room 12

## **Differential perspective as a nonexpensive distance sensing principle**

Author(s): Tobias J. Haist, Felix Lodholz, Andreas Faulhaber, Stephan Reichelt, Institut für Technische Optik (Germany)

12623-12 • 16:20 - 16:40 | ICM Room 12b

## **Unsupervised anomaly detection for industrial manufacturing using multiple perspectives of free falling parts**

Author(s): Anna Khatyeva, Iris Kuntz, Tobias Schmid-Schirling, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Thomas Brox, Univ. of Freiburg (Germany); Daniel Carl, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany)

12623-13 • 16:40 - 17:00 | ICM Room 12b

## **Automated visual vegetation detection for weed management on transportation infrastructure**

Author(s): Christoph S. Werner, Simon Frey, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Alexander Reiterer, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany), Univ. of Freiburg (Germany)

### **SESSION 5: IMAGE-BASED POSITION MEASUREMENT**

28 June 2023 • 17:00 - 18:00 | ICM Room 12b

Session Chair: Michael M. Heizmann, Karlsruher Institut für Technologie (Germany)

12623-14 • 17:00 - 17:20 | ICM Room 12b

## **Multimodal RGB-D-T-scanning for interactive robot teaching**

Author(s): Yan Zhang, Gunther Notni, Technische Univ. Ilmenau (Germany)

12623-15 • 17:20 - 17:40 | ICM Room 12b

## **High-accuracy robotic metrology for precise industrial manipulation tasks**

Author(s): Mohammed A. Isa, Mojtaba A. Khanesar, Richard K. Leach, David Branson, Samanta Piano, The Univ. of Nottingham (United Kingdom)

12623-16 • 17:40 - 18:00 | ICM Room 12b

## **High-speed optical sensing of pose, position, and surface normal for dynamic projection mapping**

Author(s): Leo Miyashita, Masatoshi Ishikawa, Tokyo Univ. of Science (Japan)

# NOTES



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