

# **Eurocast 2022**

***February 20-25, 2022***

***Museo Elder de la Ciencia y la Tecnología  
Las Palmas de Gran Canaria  
Canary Islands, Spain***



## **18<sup>th</sup> International Conference on Computer Aided Systems Theory**

***To the Memory of Werner de Pauli Schimanovich***

### **Final Program**



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## Conference Chair

*Roberto Moreno-Díaz*

Instituto Universitario de Ciencias y Tecnologías Cibernéticas, Las Palmas

## Program Chair

*Franz Pichler*

Johannes Kepler Universität, Linz

## Logistics Chair

*Alexis Quesada Arencibia*

Instituto Universitario de Ciencias y Tecnologías Cibernéticas, Las Palmas

## Workshops and Chairpersons

### **Systems Theory and Applications**

Pichler (Linz, AT), Moreno-Díaz (Las Palmas, ES)

### **Pioneers and Landmarks in the development of Information and Communication Technologies**

Pichler (Linz, AT)

### **Theory and Applications of Metaheuristic Algorithms**

Affenzeller, Wagner (Hagenberg, AT), Raidl (Vienna, AT)

### **Model-Based System Design, Verification and Simulation**

Nikodem (Wroclaw, PL), Češka, (Brno, CZ), Ito (Chuo, JP), Nikodem (Wroclaw, PL)

### **Applications of Signal Processing Technology**

Zagar (Linz, AT), Lunglmayr (Linz, AT), Haselmayr (Linz, AT)

### **Artificial Intelligence and Data Mining for Intelligent Transportation Systems and Smart Mobility**

Sánchez-Medina (Las Palmas, ES), del Ser (Bilbao, ES), Celikoglu (Istanbul, TR), Gosakar (Istanbul, TR), Acosta (La Laguna, ES)

### **Computer Vision, Machine Learning for Image Analysis and Applications**

Penedo (A Coruña, ES), Rádeva (Barcelona, ES), Ortega-Hortas (A Coruña, ES)

### **Computer and Systems Based Methods and Electronic Technologies in Medicine**

Rozenblit (Tucson, AZ US),  
Maynar (Las Palmas, ES),  
Klempous (Wroclaw, PL), Kovacs (Budapest, HU)

### **Systems in Industrial Robotics, Automation and IoT**

Jacob (Kempton, DE), Stetter (Munich, DE), Markl (Vienna, AT)

### **Systems Thinking. Relevance for Technology, Science and Management Professionals.**

Schwaninger (St. Gallen CH),  
Schoenenberger (Berne CH)

### **Cybersecurity and Indoor Positioning Systems**

Caballero (La Laguna ES),  
Quesada-Arencibia (Las Palmas ES)

## **Organizing Committee**

Alayón, Francisco  
Alemán Alemán, Jonathan  
Alonso-García, Mayte  
Caballero-Gil, Cándido  
Caballero-Gil, Pino  
Cristóbal, Teresa

De Blasio, Gabriel  
García-Rodríguez, Carmelo Rubén  
Molina-Gil, Jezabel  
Ojeda Rodríguez, Nancy  
Padrón, Gabino  
Rodríguez-Rodríguez, José Carlos

## **Program Committee**

Acosta, L. (Spain)  
Affenzeller, M. (Austria)  
Caballero, P. (Spain)  
Celikoglu, H. (Turkey)  
Češka, M. (Czech Republik)  
del Ser, J. (Spain)  
Gokasar, I. (Turkey)  
Haselmayr, W. (Austria)  
Jacob, D. (Germany)  
Klempous, R. (Poland)  
Kovacs, L. (Hungary)  
Ito, A. (Japan)  
Lunglmayr, M. (Austria)

Markl, E. (Austria)  
Maynar, M. (Spain)  
Moreno-Díaz, R. (Spain)  
Nikodem, J. (Poland)  
Nikodem, M. (Poland)  
Ortega-Hortas, M. (Spain)  
Penedo, M. (Spain)  
Pichler, F. (Austria)  
Quesada-Arencibia, A. (Spain)  
Rádeva, P. (Spain)  
Raidl, G. (Austria)  
Rozenblit, J. (USA)  
Sanchez-Medina, J. (Spain)

Schoenenberger, L. (Switzerland)  
 Schwaninger, M. (Switzerland)  
 Stetter, R. (Germany)

Wagner, S. (Austria)  
 Zagar, B. (Austria)

## **Eurocast Board**

Affenzeller (Hagenberg)  
 Huemer (Linz)  
 Moreno-Diaz (Las Palmas)

Pichler (Linz)  
 Quesada-Arencia (Las Palmas)

## **Eurocast 2022 Health Security Advisor**

Prof. Lluís Serra-Majén  
 University Institute of Biomedical and Sanitary Research, Las Palmas  
 Member of the Canary Islands Committee of Experts for Covid 19  
 Pandemic.

## **Codes of Sessions**

- |  |  |  |
|--|--|--|
| 1. Systems Theory and Applications   | 7. Artificial Intelligence and Data Mining for Intelligent Transportation Systems and Smart Mobility | 10. Systems in Industrial Robotics, Automation and IoT                               |
| 2. Pioneers and Landmarks in the development of Information and Communication Technologies | 8. Computer Vision, Machine Learning for Image Analysis and Applications                             | 11. Systems Thinking. Relevance for Technology, Science and Management Professionals |
| 4. Theory and Applications of Metaheuristic Algorithms                                     | 9. Computer and Systems Based Methods and Electronic Technologies in Medicine                        | 13. Cybersecurity and Indoor Positioning Systems                                     |
| 5. Model-Based System Design, Verification and Simulation                                  |  |  |
| 6. Applications of Signal Processing Technology  |  |  |

## Sessions Chairpersons Table

<b>Monday, February 21</b>		
<b>Room A</b>	<b>Room B</b>	<b>Room C</b>
Sessions 4.1 to 4.7 <b>Raidl, G.; Pitzer, E.</b>	Sessions 9.1 to 9.4 <b>Nikodem, J.</b>	Sessions 11.1 to 11.5 <b>Schwanager, M.</b>
	Sessions 9.5 to 9.8 <b>Nikodem, M.</b>	

<b>Tuesday, February 22</b>		
<b>Room A</b>	<b>Room B</b>	<b>Room C</b>
Sessions 4.8 to 4.9 <b>Beham, A.</b>	Sessions 5.2 to 5.6 <b>Nikodem, J.</b>	Sessions 1.1 to 1.2 <b>Pichler, F.</b>
Sessions 4.10 to 4.13 <b>Wagner, S.</b>		Sessions 2.2 to 2.3 <b>Pichler, F.</b>
Sessions 4.14 to 4.16 <b>Frohner, N.</b>	Sessions 5.7 to 5.8 <b>Nikodem, M.</b>	Sessions 10.1 to 10.3 <b>Stetter, R.</b>

<b>Wednesday, February 23</b>		
<b>Room A</b>	<b>Room B</b>	<b>Room C</b>
Sessions 4.17 to 4.18 <b>Jatschka, T.</b>	Sessions 5.10 to 5.12 <b>Nikodem, M.</b>	Sessions 10.4 to 10.9 <b>Stetter, R.</b>
Sessions 4.19 to 4.22 <b>Winkler, S.</b>		
Sessions 4.23 to 4.25 <b>Affenzeller, M.</b>		Session 10.10 to 10.13 <b>Stetter, R.</b>



<b>Thursday, February 24</b>		
<b>Room A</b>	<b>Room B</b>	<b>Room C</b>
Sessions 6.1 to 6.4 <b>Lunglmayr, M.</b>	Sessions 8.1 to 8.4 <b>Penedo, M.</b>	Sessions 7.1 to 7.4 <b>Sánchez-Medina, J.</b>
Sessions 6.5 to 6.7 <b>Lunglmayr, M.</b>	Sessions 8.5 to 8.8 <b>Ortega-Hortas, M.</b>	Sessions 7.5 to 7.8 <b>Sánchez-Medina, J.</b>
Sessions 6.8 to 6.9 <b>Lunglmayr, M.</b>	Sessions 8.9 to 8.10 <b>Ortega-Hortas, M.</b>	Sessions 13.1 to 13.7 <b>Caballero-Gil, P.</b>

## Plenary Lectures (Room A)

### Monday, February 21

10:00-11:00 **Werner de Pauli Schimanovich – Inventor, Scientist and Spiritus Rector of EUROCAST**

Prof. Wilfried Grossmann  
University Vienna, Austria

### Tuesday, February 22

9:00-10:00 **Prescriptive Analytics: Optimization meets Data- and Simulation-based Systems Modeling**

Prof. Michael Affenzeller  
Applied Sciences University of Upper Austria, Austria

### Wednesday, February 23

9:00-10:00 **The Impact of Computer Processed Neuroimaging in Modern Clinical Neuroscience: Some Implications for Psychiatry and Neurology**

Prof. Nikos Makris  
Harvard University and Boston General Hospital, USA

## Sunday, February 20

16:30-19:00 **Registration**

## Monday, February 21

9:30-10:00 **Opening Session**

## Additional Program

### Elder Museum Projection and Planetarium

#### Monday, February 21

19:00-20:30 3D Projection: Wild Australia. An epic journey through some of the wildest landscapes on Earth as you enter the world of crocodiles.

Planetarium Paco Sánchez: Discover the night sky of the islands, the stars and the Universe.

Canary Islands Marine Laboratory: Discover the origin and geological formation of the islands

### Elder Museum Music Performance and Reception

#### Tuesday, February 22

19:00-21:00 Live music with the Canarian timplist, guitarist and composer Derque Martín.

Reception offered by the Elder Museum director: Tasting of Canarian products.

### Conference Dinner

#### Wednesday, February 23

19:30-22:00 The already classical confraternity dinner in the Marinera restaurant.

### Closing Session. Visit to Gáldar and Sardina

#### Friday, February 25

10:00-15:00 Closing Session, City Hall, Gáldar.  
Visits to Gáldar and Sardina.

## **Systems Theory and Applications**

- 1.1 Software Development for Early Crisis Detection  
*K Albrecht, C Nitzl, U.M. Borghoff*
- 1.2 Uncertainty and Ambiguity: Challenging Layers in Model Construction  
*M. Miró-Julià, M.J. Ruiz-Miró, I. García-Mosquera*

## **Pioneers and Landmarks in the development of Information and Communication Technologies**

- 2.2 George J. Boole. A Nineteenth Century Man for the Modern Digital Era  
*R.S. Stanković, M. Stanković, J.T. Astola, C. Moraga*
- 2.3 Improvement of Electromagnetic Systems by Werner Von Siemens  
*H. Schwärtzel, F. Pichler*

## **Theory and Applications of Metaheuristic Algorithms**

- 4.1 Multi-criteria Optimization of Workflow-based Assembly Tasks in Manufacturing  
*F. Holzinger, A. Beham*
- 4.4 Lightweight Interpolation-Based Surrogate Modelling for Multi-Objective Continuous Optimisation  
*A.C. Zăvoianu, B. Lacroix, J. McCall*
- 4.6 An Open Ended Multi-Objective Approach for Solving a Dynamic Optimization Problem in Steel Logistics  
*A. Beham, T. Leitner, S. Wagner*
- 4.7 Analysis and Handling of Dynamic Problem Changes in Open-Ended Optimization  
*J. Karder, B. Werth, A. Beham, S. Wagner, M. Affenzeller*

- 4.8 Measuring Features of Dynamic and Time-Linked Optimization Problems  
*B. Werth, E. Pitzer, J. Karder, S. Wagner, M. Affenzeller*
- 4.9 Fitness Landscape Analysis of Dynamic Optimization Problems  
*E. Pitzer, B. Werth, J. Karder*
- 4.10 Learning Value Functions for Same-Day Delivery Problems in the Tardiness Regime  
*N. Frohner, G.R. Raidl*
- 4.11 A Relative Value Function Based Learning Beam Search for Longest Common Subsequence Problems  
*M. Huber, G.R. Raidl*
- 4.12 Multi-day Container Drayage Problem with Active and Passive Vehicles  
*U. Ritzinger, B. Hu, H. Koller*
- 4.13 On Discovering Optimal Trade-Offs when Introducing New Routes in Existing Multi-Modal Public Transport Systems  
*K. Han, L.A. Christie, A.C. Zăvoianu, J. McCall*
- 4.14 A Mathematical Model and GRASP for a Tourist Trip Design Problem  
*D. Santos-Peñate, J.A. Moreno-Pérez, C. Campos-Rodríguez, R. Suárez-Vega*
- 4.15 Analysis of the basic VNS for TD-TOPTW  
*J.A. Moreno-Pérez, A. Moya Antón*
- 4.16 A Large Neighborhood Search for Battery Swapping Station Location Planning for Electric Scooters  
*T. Jatschka, M. Rauscher, B. Kreutzer, T. Rodemann, G.R. Raidl*
- 4.17 Shapley Value based Variable Interaction Networks for Data Stream Analysis  
*J. Zenisek, S. Dorl, S.M. Winkler, M. Affenzeller*

**EUROCAST 2022 P**

**REGISTRATION: Sunday February 20 from 16:30 to**

	<b>Monday February 21</b>			<b>Tuesday February 22</b>			<b>W F</b>
9:00				<b>M. Affenzeller</b>			
9:30	<b>Opening Session</b>						
10:00	<b>W. Grossmann</b>			4.8	5.2	1.1	4.17
10:30				4.9	5.3	1.2	4.18
11:00	<b>Coffee Break</b>						
11:30	4.1	9.1	11.1	4.10	5.4	2.2	4.19
12:00	4.4	9.2	11.2	4.11	5.5	2.3	4.20
12:30	4.6	9.3	11.4	4.12	5.6		4.21
13:00	4.7	9.4	11.5	4.13			4.22
15:00		9.5		4.14	5.7	10.2	4.23
15:30		9.6		4.15	5.8	10.3	4.24
16:00		9.7		4.16			4.25
16:30		9.8					
19:00	<b>Elder Museum Planetarium and Projection</b>			<b>Elder Museum Music Performance and Reception</b>			
19:30							<b>Conf</b>

**First Column (left to right) for each day is in Room A, second in Room B, t**

**Worksho**

<ol style="list-style-type: none"> <li>1. <b>Systems Theory and Applications</b></li> <li>2. <b>Pioneers and Landmarks in the development of Information and Communication Technologies</b></li> <li>4. <b>Theory and Applications of Metaheuristic Algorithms</b></li> <li>5. <b>Model-Based System Design, Verification and Simulation</b></li> </ol>	<ol style="list-style-type: none"> <li>6. <b>Applications of Signal Proc</b></li> <li>7. <b>Artificial Intelligence and D Intelligent Transportation Mobility</b></li> <li>8. <b>Computer Vision, Machine Analysis and Applications</b></li> </ol>
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## Final Program

### 19:00 and all Conference days at office hours

Wednesday February 23		Thursday February 24			Friday February 25
<b>N. Makris</b>		6.1	8.1	7.1	<b>Visit to Gáldar and Sardina</b>
		6.2	8.2	7.2	
5.10	10.4	6.3	8.3	7.3	
5.11	10.5	6.4	8.4	7.4	
5.12	10.6	6.5	8.5	7.5	
	10.7	6.6	8.6	7.6	
	10.8	6.7	8.7	7.7	
	10.9		8.8	7.8	
	10.10	6.8	8.9	13.1	
	10.11	6.9	8.10	13.2	
	10.12			13.3	
	10.13			13.4	
				13.5	
				13.6	
				13.7	
<b>Conference Dinner</b>					

### Third in Room C.Rubik 10

#### Topics

<p><b>Processing Technology</b></p> <p><b>Data Mining for</b></p> <p><b>Systems and Smart</b></p> <p><b>Learning for Image</b></p>	<p><b>9. Computer and Systems Based Methods and Electronic Technologies in Medicine</b></p> <p><b>10. Systems in Industrial Robotics, Automation and IoT</b></p> <p><b>11. Systems Thinking. Relevance for Technology, Science and Management Professionals</b></p> <p><b>13. Cybersecurity and Indoor Positioning Systems</b></p>
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- 4.18 Symbolic Regression with Fast Function Extraction and Nonlinear Least Squares Optimization  
*L. Kammerer, G. Kronberger, M. Kommenda*
- 4.19 Comparing Shape-Constrained Regression Algorithms for Data Validation  
*F. Bachinger*
- 4.20 Improving the Flexibility of Shape-Constrained Symbolic Regression with Extended Constraints  
*D. Piringer, S. Wagner, C. Haider, G. Kronberger, A. Fohler, S. Silber, M. Affenzeller*
- 4.21 Shape-constrained Symbolic Regression with NSGA-III  
*C. Haider*
- 4.22 Vectorial Genetic Programming - Optimizing Segments for Feature Extraction  
*P. Fleck, S.M. Winkler, M. Kommenda, M. Affenzeller*
- 4.23 Using Explainable Artificial Intelligence for Data Based Detection of Complications in Records of Patient Treatments  
*M. Strobl, J. Vetter, G. Halmerbauer, T. Königswiser, S.M. Winkler*
- 4.24 Identifying Differential Equations to predict Blood Glucose using Sparse Identification of Nonlinear Systems  
*D. Joedicke, D. Parra, G. Kronberger, S.M. Winkler*
- 4.25 Combining Structured Grammatical Evolution and Universal Differential Equations for Glucose Prediction  
*D. Parra, D. Joedicke, A. Gutiérrez, J.M. Colmenar, J.M. Velasco, O. Garnica, J.I. Hidalgo*



## Model-Based System Design, Verification and Simulation

- 5.2 Modeling Approaches for Cyber Attacks on Energy Infrastructure  
*A. Attenberger*
- 5.3 Simulation setup for Monitoring Neuro-muscular blockade aiming for the Development of Medical Devices  
*M. Hrubý, A Gonzalez, R. Ruiz Nolasco, P. Biro*
- 5.4 Textile In The Loop as Automated Verification Tool for Smart Textiles Applications  
*P. Petz, J. Langer, F. Eibensteiner*
- 5.5 Orchestrating Digital Twins for Distributed Manufacturing Execution Systems  
*T. Fiedor, M. Hruška, A. Smrčka*
- 5.6 Automata with Bounded Repetition in RE2  
*M. Horký, J. Síč, L. Turoňová, L. Holík*
- 5.7 Neural analysis of time series showing measurements in an intelligent building.  
*A. Stachno*
- 5.8 Integrating OSLC Services into Eclipse  
*J. Fiedor, B. Křena, A. Smrčka, O. Vašíček, T. Vojnar*
- 5.10 Developing an Application in the Forest for New Tourism Post COVID-19  
*Y. Hiramatsu, A. Ito, A. Sasaki*
- 5.11 GPU-Accelerated Synthesis of Probabilistic Programs  
*R. Andriushchenko, M. Češka, V. Marcin, T. Vojnar*
- 5.12 Static Deadlock Detection in Low-Level C Code  
*D. Harmim, V. Marcin, L. Svobodová, T. Vojnar*

## Applications of Signal Processing Technology

- 6.1 3D Ultrasound Fingertip Tracking  
*E. Pfann, M. Huemer*
- 6.2 An Artificial Skin from Conductive Rubber  
*S. Affortunati, B.G. Zagar*
- 6.3 Improving the Performance of Angular Encoders  
*S. Michlmayr, B.G. Zagar*
- 6.4 On the Cancellation of Modulated Spurs in 4GTransceivers via Advanced Learning based Architectures  
*O. Ploder, A. Meingassner, O. Lang, M. Huemer*
- 6.5 Neural Network Based Single-Carrier Frequency Domain Equalization  
*S Baumgartner, O. Lang, M. Huemer*
- 6.6 Smooth Step Detection  
*M. Lunglmayr, Y.E. Garcia, F. Calliari, G. Castro do Amaral*
- 6.7 Optical Preprocessing and Digital Signal Processing for the Measurement of Strain in Thin Specimen  
*A. Spaett, B.G. Zagar*
- 6.8 Characterizing shape features of plastic pellets using Fourier Descriptors  
*S. Michlmayr, B.G. Zagar*
- 6.9 Lower Limbs Gesture Recognition Approach to Control a Medical Treatment Bed  
*C. Tischler, K. Pendl, E. Schimbäck, V. Putz, C. Kastl, T. Schlechter, F. Runte*

## Artificial Intelligence and Data Mining for Intelligent Transportation Systems and Smart Mobility

- 7.1 JKU-ITS Automobile for Research on Autonomous Vehicles  
*N. Certad, W. Morales-Alvarez, G. Novotny, C. Olaverri-Monreal*
- 7.2 Development of a ROS-based Architecture for Intelligent Autonomous on Demand Last Mile Delivery  
*G. Novotny, W. Morales-Alvarez, N. Smirnov, C. Olaverri-Monreal*
- 7.3 Contrastive Learning for Simulation-to-Real Domain Adaptation of LiDAR data  
*A. Barrera, F. García, J.A. Iglesias*
- 7.4 Deep Learning Data Association Applied to Multi-Object Tracking Systems  
*J. Urdiales, D. Martin, J.M. Armingol*
- 7.5 A Methodology to Consider Explicitly Emissions in Dynamic User Equilibrium Assignment  
*M. Ali Silgu, I. Goksd Erdagi, S. Akti, S. Hulagu, H. Akova, G. Goksu, H. Berk Celikoglu*
- 7.6 Sensitivity Analysis for A Cooperative Adaptive Cruise Control Car Following Model: Preliminary Findings  
*S. Goncu, M. Ali Silgu, I. Goksd Erdagi, H. Berk Celikoglu*
- 7.7 On Smart Mobility and Data Stream Mining  
*J. Sánchez-Medina, J. Guerra-Montenegro, A. Sánchez-Medina, I. Alonso-González, D. Sánchez-Rodríguez*
- 7.8 Smart Vehicle Inspection  
*P. Ľapák, M. Kocur, M. Rabek, J. Matej*

## Computer Vision, Machine Learning for Image Analysis and Applications

- 8.1 Impact of the Region of Analysis on the Performance of the Automatic Epiretinal Membrane Segmentation in OCT Images  
*M. Gende, D. Iglesias-Morís, J. de Moura, J. Novo, M. Ortega-Hortas*
- 8.2 Performance Analysis of GAN approaches in the Portable Chest X-ray synthetic image generation for COVID-19 screening  
*D. Iglesias-Morís, M. Gende, J. de Moura, J. Novo, M. Ortega-Hortas*
- 8.3 Clinical Decision Support tool for the Identification of Pathological Structures Associated with Age-related Macular Degeneration  
*I. Barrientos, J. de Moura, J. Novo, M. Ortega-Hortas, M.G. Penedo*
- 8.4 Deep Features-based approaches for Phytoplankton Classification in Microscopy Images  
*D. Rivas-Villar, J. Morano, J. Rouco, M.G. Penedo, J. Novo*
- 8.5 Robust Deep Learning-based Approach for Retinal layer Segmentation in Optical Coherence Tomography Images  
*A. Budiño, L. Ramos, J. de Moura, J. Novo, M.G. Penedo, M. Ortega-Hortas*
- 8.6 Impact of increased centerline weight on the Joint segmentation and classification of arteries and veins in color fundus images  
*J. Morano, D. Rivas-Villar, A. Hervella, J. Rouco, J. Novo*
- 8.7 Dealing with Highly Imbalance Data for Diagnosing Diabetic Retinopathy  
*A. Casado-García, M. García-Dominguez, J. Heras, A. Inés, D. Royo, M.A. Zapata*

- 8.8 Gait Recognition using 3D View-Transformation Model  
*P. Schwarz, J. Scharinger, P. Hofer*
- 8.9 Segmentation and Multi-Facet Classification of Individual Logs in Wooden Piles  
*C. Praschl, P. Auersperg-Castell, B. Forster-Heinlein, G. A. Zwettler*
- 8.10 Drone Detection Using Deep Learning: A Benchmark Study  
*A. Hashem, T. Schlechter*

## **Computer and Systems Based Methods and Electronic Technologies in Medicine**

- 9.1 Classification of Myoelectric Signals with Continuous Time Normalized Signal Trains  
*P. Gaßner, K. Buchenrieder*
- 9.2 A Comparison of Covariate Shift Detection Methods on Medical Datasets  
*S. Dreiseitl*
- 9.3 Tactile Feedback in Minimally Invasive Robotic Surgery with the use of Strain Gauges  
*D. Govalla, M. Hong, J. Rozenblit*
- 9.4 High Resolution Digital Tissue Slide Processing and 3D visualization  
*K. Papp, A. Benhamida, V. Jónás, M. Vincze, M. Kucarov, M. Ogbolu, D. Mahmoud, R. Paulik, M. Kozlovsky*
- 9.5 A New Approach to Analysis of Performance of Japanese Fencing - A Novel Application of Motion Capture based on: Analysis of Performance of Sword Fencing in the Historical European Martial Arts (HEMA) Domain  
*K. Kluwak, R. Klempous, A. Ito, T. Górski, J. Nikodem, Z. Chaczko, J. Rozenblit, W. Bożejko, G. Borowik, M. Kulbacki, M. Wojciechowska, L. Horyza*

- 9.6 Towards Better mHealth Solutions for Continuous Heart Rhythm Monitoring  
*J. Nikodem, K. Kluwak, D. Zyśko, R. Klempous, B. Hrymniak, J. Rozenbliit, T. Zelniker, A. Wytyczak-Partyka, W. Bożejko, D. Jagielski*
- 9.7 Training System for Improving Procedures of Rescue Operations at the site of a Mass Incident or Disaster  
*M. Nikodem, G. de Blasio, J. Nikodem, P. Gawlowski, R. Klempous, A. Quesada-Arencibia*
- 9.8 Designing sightseeing support system in Oku-Nikko using BLE beacon  
*A. Ito, H. Kawakami, H. Nakayama, Y. Hiramatsu, M. Hasegawa, Y. Harada, K. Ueda, A. Sasaki*

## **Systems in Industrial Robotics, Automation and IoT**

- 10.2 Mixed Reality HMI for Collaborative Robots  
*J. Hörbst, H. Orsolits*
- 10.3 A Digital Twin Demonstrator for Research and Teaching in Universities  
*M. Jungwirth, W. Lee*
- 10.4 KI-Net: AI-based Optimization in Industrial Manufacturing - A Project Overview  
*B. Freudenthaler, A. Fensel, K. Höfig, S. Huber, D. Jacob*
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# NOTES

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*Instituto Universitario de Ciencias y Tecnologías Cibernéticas  
Universidad de Las Palmas de Gran Canaria  
Campus de Tafira, E-35017, Las Palmas, ESPAÑA  
Tel: +34 928 457100 / 08  
E-mail: [eurocast@iuctc.ulpgc.es](mailto:eurocast@iuctc.ulpgc.es)  
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