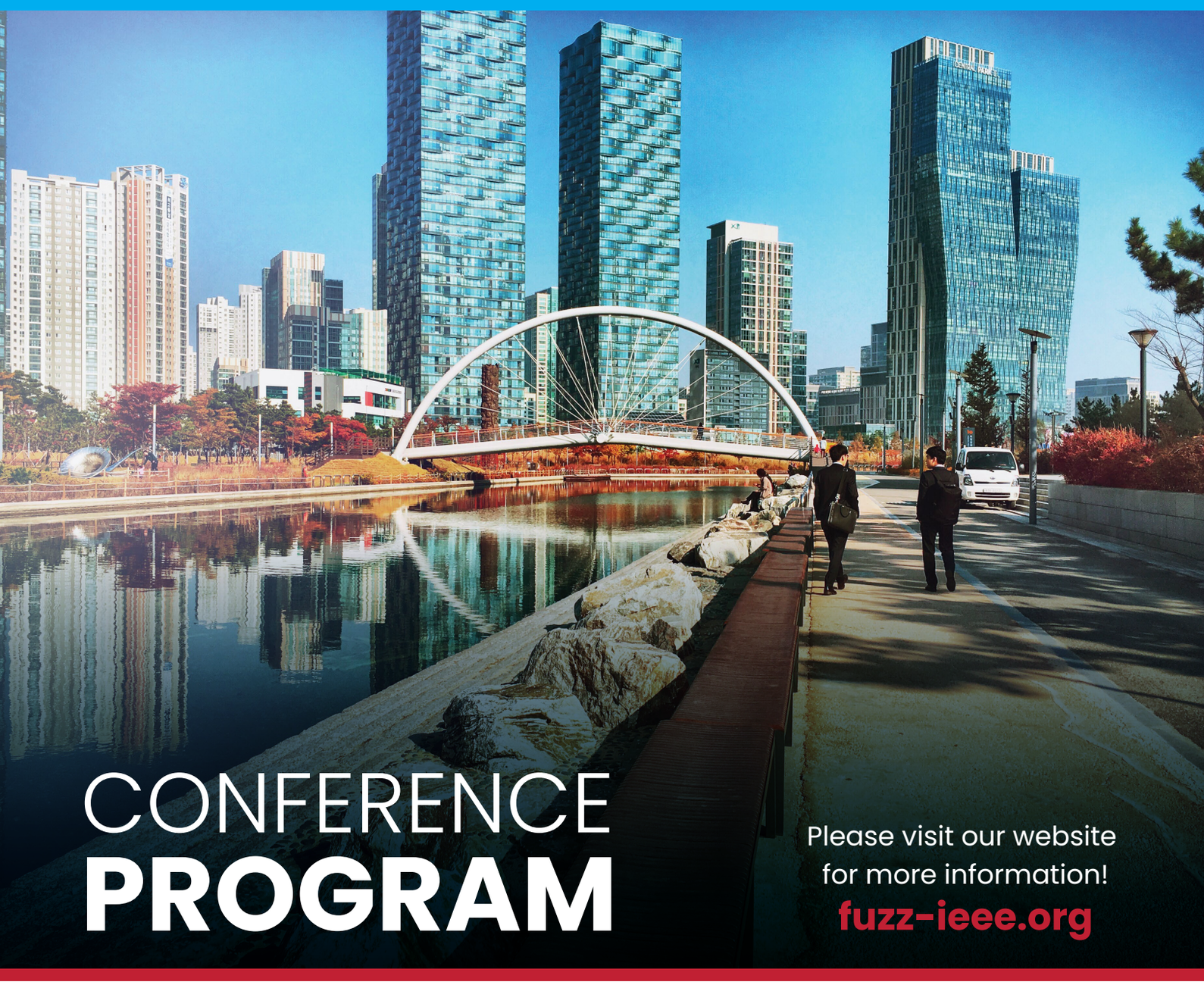
FUZZ-IEEE 2023

2023 IEEE International Conference on Fuzzy Systems



CONFERENCE PROGRAM

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General Chair Welcome Message

We are pleased to welcome you to the 2023 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE 2023) held in Songdo Incheon, Korea, which is one of the most beautiful modern metropolitan cities in Asia with a historical wealth of cultural and tourist attractions.

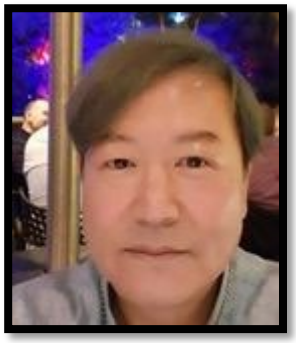
It is a privilege to serve as the general chair of FUZZ-IEEE 2023 that is composed of rich and internationally diverse committee chairs and members. We were fortunate to have a strong and excellent support from internationally distributed program committee members that coordinated the program and review process.

The FUZZ-IEEE 2023 conference is the venue where academia and industrial research laboratories share current trends as well as latest advances in the area of fuzzy sets and systems.

We wish to express our sincere gratitude to the authors for their commitment to share their studies, to the reviewers for their professional evaluation, and to the program committee members for their dedication to the making of FUZZ-IEEE 2023 conference a successful and technically sound event. Especially, we would like to thank the entire organizing committee members for their excellent collaboration.

We truly believe you will enjoy the technical program of FUZZ-IEEE 2023 and find this conference to be an informative, inspiring, and enjoyable experience.

Thank you and enjoy beautiful Songdo.



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Keynote Speakers

Dr. Hao Ying

"Model-Free Fuzzy Control Paradigm: Theoretical Challenges and Real-World Successes"

Wayne State University, USA

Abstract: The concept of a fuzzy controller, first introduced by E.H. Mamdani in 1974, was revolutionary and created a new and powerful knowledge-based model-free control paradigm. The underlying idea was to construct a nonlinear controller without a mathematical model of the system to be controlled. Instead, fuzzy sets, fuzzy logic, fuzzy rules, and fuzzy reasoning are used to intuitively capture, represent, and process a human operator's control strategy in order to build a controller. This is sensible because system behavior and dynamics are reflected in human control expertise and therefore implicitly utilized in the controller design. This paradigm has proven to be successful in a variety of real-world applications and commercial products since the early 1980s.

Not requiring a mathematical model in controller design significantly reduces product development time and cost, making the paradigm more practically useful than model-based control approaches. It is challenging to attain an accurate mathematical model for any real-world system, and modeling efforts are typically time-consuming and costly. This is partially because finding a plausible mathematical model structure is a difficult task to begin with, and validating it is another challenge. This explains why the PID controller, a simple, century-old model-free controller, is controlling more than 90% of control system applications worldwide, despite the existence of numerous model-based control theories developed over many decades.

The knowledge-based model-free approach, while practical, lacks mathematical rigor, which has limited its acceptance. A fuzzy controller is widely treated as a black box whose input-output analytical structure is unknown. To bridge this gap, we have developed a mathematical model-free fuzzy control theory that provides a rigorous and insightful perspective on the behavior and effectiveness of fuzzy controllers.

In this presentation, we will explore the benefits of our approach by discussing example type-1 and interval type-2 fuzzy controllers, and demonstrating how to derive their analytical structures. With this information, we can gain a deeper understanding of how and why fuzzy controllers work and identify connections between fuzzy controllers and conventional controllers. We will also examine the differences between type-1 and interval type-2 fuzzy controllers, and their relative merits and pitfalls. With this approach, we can encourage acceptance of fuzzy control in safety-critical fields, such as medicine and nuclear engineering, where black box controllers are not currently acceptable.

Complemented with other fuzzy control approaches, our model-free fuzzy control theory is mathematically rigorous and offers unique analysis and design tools not available elsewhere.

Jerry Mendel

"Why This and Why That?"

University of Southern California, USA

Abstract: Rule based fuzzy systems have progressed from using type-1 fuzzy sets, to interval type-2 fuzzy sets, to general type 2 fuzzy sets, etc. In this talk I will highlight the potential benefits for using (why use?) each of these fuzzy systems, and will then focus on why it may/should be possible to obtain even better performance out of type-1 and interval type- 2 fuzzy systems than is currently demonstrated. This is important because designers of more advanced fuzzy systems arguably need to compare performance from such advanced fuzzy systems with the best designed simpler kind of fuzzy system. Why? Because advanced fuzzy systems are more complicated to understand and design, so their use in real world applications must be fully justified. More needs to be done, and some suggestions will be provided.

Sanghamitra Bandyopadhyay

"**Metaheuristics in Optimization and Applications: Multiple objectives and multimodality"**

Indian Statistical Institute, India

Abstract: Optimization problems are ubiquitous, finding applications in numerous real-life situations. Multi-objective optimization problems (MOPs) are ones that require simultaneous optimization of multiple conflicting objectives such that improving solutions in terms of one objective leads to deterioration in terms of one or more of the other objectives. In MOPs, the target is to arrive at the best trade-off surface, called the Pareto optimal front. Population based metaheuristics find favor in solving MOPs because of their ability to work with multiple solutions at the same time. Multi-modal MOPs (MMMOPs) are those where a many-to-one mapping exists from solution space to objective space. As a result, multiple subsets of the Pareto-optimal set could independently generate the same Pareto-Front. The discovery of such equivalent solutions across the different subsets is essential during decision-making to facilitate the analysis of their non-numeric, domain-specific attributes.

In this talk, we will first provide a brief introduction to MOPs and discuss some metaheuristics for solving them. Applications in clustering and in drug design will be demonstrated. We will then discuss the basic concept of multi-modality in MOPs and describe the crowding illusion problem. A method for solving MMMOPs with a graph Laplacian-based Optimization using Reference vector assisted Decomposition (LORD) will thereafter be described. The talk will conclude with the brief discussion of an application of MMMOPs to the problem of building energy optimization.

Tutorials

All Tutorials will take place on Sunday, August 13, 2023

Tutorial: Random fuzzy sets: theory and 9:00 application to machine learning
Organizer(s): Thierry Denœux
Abstract: The theory of epistemic random fuzzy sets has been recently proposed as a very general formalism for uncertain reasoning, encompassing both the Dempster-Shafer theory of evidence and possibility theory as special cases. This tutorial is intended to provide an introduction to this new framework and to demonstrate its application to uncertainty quantification in machine learning.

Tutorial: Natural language analysis with fuzzy topic models
Organizer(s): Prof. Uzay Kaymak, Emil Rijcken
Abstract: This tutorial covers the motivations and the aims behind the choice of training fuzzy topic models. Moreover, the tutorial focuses on using fuzzy topic modeling to analyze natural language data and create topic embeddings paving the way to more interpretable text classification. A brief introduction to the fundamentals of topic modeling and fuzzy clustering will be provided to facilitate aspiring scientists and newcomers to the field.

The practical part of the tutorial will include the presentation of the Python library FuzzyTM. Attendees will learn how to preprocess natural language data and train various fuzzy topic models. Once topic models are trained, we will create topic embeddings to represent texts numerically.

Tutorial: Capture Contextual Information from Stakeholders Using Intervals and Fuzzy Sets – with a Case Study on Online Driving Safety Assessment
Organizer(s): Jimiama Mafeni Mase, Grazziela Figueredo, Christian Wagner
Abstract: This tutorial introduces a technique that aims at supporting the moderation of multi-modal data stream analysis/decision by incorporating expert input about the impact of factors not present in the data collected. For applications where individuals are subject to data-driven assessment, it is important to detect factors, their perceived impact, and subsequently, incorporate the information into intelligent decision-making. This brings both users and individuals, subject to intelligent system assessment, at the center of the solution development process i.e., human-centric AI. It also allows for fairer, transparent, explainable decision making that can be easily validated or challenged by stakeholders. This addresses many concerns around responsible data-driven AI and it is a timely, effective solution to a variety of problems.

Tutorial: Data-driven Fuzzy Modeling Methods

Organizer(s): Prof. Vilém Novák, Prof. Irina Perfilieva

Abstract: By fuzzy modeling we understand application of a group of special mathematical methods that enable to include vague information possibly obtained from experts that is often expressed using natural language only. The developed models that are called “fuzzy” are quite successful in applications because they provide solution in situations when traditional mathematical models fail — either due to their non-adequacy, or due to their inability to utilize all the available information. In this course, the audience will be acquainted with a few special methods of fuzzy modeling that utilize results of fuzzy mathematics, mathematical fuzzy logic and linguistics.

Competition

Competition: 2nd Edition of Autonomous Drone Racing Competition
Organizer(s): Dr. Andriy Sarabakha and Prof. Erdal Kayacan
Abstract: Drone racing is a recreational sport in which the goal is to pass through a sequence of gates in a minimum amount of time while avoiding collisions with the environment. In autonomous drone racing, one must accomplish this task by flying fully autonomously in an unknown environment relying only on the on-board resources. Thus, autonomous drone racing is an exciting case study that aims to motivate more researchers to develop innovative ways of solving complex problems. What makes drone racing such an interesting challenge is the cumulative complexity of each sub-problem to be solved, such as *perception*, *localisation*, *path planning* and *control*.

Competition: A Sandbox for Teaching and Learning in CI for Pre-University and Undergraduate Students
Organizer(s): Chang-Shing Lee, Gui N. DeSouza, Alexander Dockhorn, Yusuke Nojima, Marek Reformat, Li-Wei Ko, and Chun-Rong Huang
Abstract: Computational Intelligence (CI), which includes fuzzy logic (FL), neural network (NN), and evolutionary computation (EC), is an imperative branch of artificial intelligence (AI). As a core technology of AI, it plays a vital role in developing intelligent systems, such as games and game engines, neural-based systems including a variety of deep network models, evolutionary-based optimization methods, and advanced cognitive techniques. The idea is to create a young student workshop with an associated competition during FUZZ-IEEE 2023 inspired by the F.I.R.S.T. robotics competition. Before or during the first hours of the event, students will receive learning materials and guidance from tutors to learn about a CI-related topic. Later students will be enabled to test learned materials in a simple real-world application. Namely, programming robots to solve various tasks.

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Time	SUNDAY, AUGUST 13	
	ROOM #113	ROOM #114
08:00	Tutorial Random fuzzy sets: theory and application to machine learning	
08:30		
09:00		A Sandbox for Teaching and Learning in CI for Pre-University and Undergraduate Students Competition
09:30	Coffee Break	
10:00	Tutorial Natural language analysis with fuzzy topic models	
10:30		
11:00		
11:30	Lunch on Your Own	
12:00		
12:30		
13:00	Tutorial Capture Contextual Information from Stakeholders Using Intervals and Fuzzy Sets – with a Case Study on Online Driving Safety Assessment	A Sandbox for Teaching and Learning in CI for Pre-University and Undergraduate Students Competition (Continued)
13:30		
14:00		
14:30	Coffee Break	
15:00	Tutorial Data-driven Fuzzy Modeling Methods (Part 1)	
15:30		
16:00		
16:30	Break	
17:00	Tutorial Data-driven Fuzzy Modeling Methods (Part 2)	
17:30		
18:00		
	Premier B	
19:00	Welcome Reception	
20:30		

PROGRAM AT A GLANCE

FUZZ-IEEE 2023
2023 IEEE International Conference on Fuzzy Systems

MONDAY, AUGUST 14

Time	PREMIER A + HALL	ROOM #113	ROOM #114	ROOM #115
08:30		SS: Advances on Explainable Artificial Intelligence **Presentation Paper ID: 048/067/086/095/232**	SS: Fuzzy Interpolation **Presentation Paper ID: 087/136/144/177/094**	SS: Fuzzy and Uncertain Intelligent Knowledge Engineering Systems **Presentation Paper ID: 010/011/047/196/133/080**
09:00	2nd Edition of Autonomous Drone Racing Competition			
09:30				
10:00				
10:30	Coffee Break			
	PREMIER A			
11:00	Plenary Prof. Hao Ying			
11:30				
12:00	Lunch on Your Own			Best Paper Award Meeting Lunch
12:30				
13:00				
	ROOM #113	**ROOM #114**	**ROOM #115**	
13:30	Fuzzy Applications **Presentation Paper ID: 158/162/181/202/204/116**	SS: Interval Uncertainty **Presentation Paper ID: 071/046/113/159/189/019**	SS: Advances on Explainable Artificial Intelligence **Presentation Paper ID: 138/149/164/188/210**	
14:00				
14:30				
15:00				
15:30	Coffee Break			
16:00	Fuzzy Applications **Presentation Paper ID: 008/035/068/089/108/146**	Fuzzy Quantum **Presentation Paper ID: 141/178/192/184/248/256**	Fuzzy Clustering **Presentation Paper ID: 052/118/123/151/157/186**	
16:30				
17:00				
17:30				
18:00			Paper Development Workshop	
19:30				

PROGRAM AT A GLANCE

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TUESDAY, AUGUST 15

Time	PREMIER A + HALL	ROOM #113	ROOM #114	ROOM #115
08:30		SS: Fuzzy Machine Learning **Presentation Paper ID: 009/014/230/194/063/020**	Fuzzy Applications **Presentation Paper ID: 043/148/226/102/228**	Fuzzy Aggregation **Presentation Paper ID: 013/085/124/132/041**
09:00	2nd Edition of Autonomous Drone Racing Competition			
09:30				
10:00				
10:30	Coffee Break			
	PREMIER A			
11:00	Plenary Prof. Jerry Mendel			
11:30				
12:00	Lunch on Your Own			Women in Computational Intelligence Lunch Reception
12:30				
13:00				
	ROOM #113	**ROOM #114**	**ROOM #115**	
13:30	SS: Fuzzy Machine Learning **Presentation Paper ID: 081/107/212/199**	Fuzzy Logic **Presentation Paper ID: 139/180/182/185/187/190**	SS: Uncertainty Modeling for Engineering Applications **Presentation Paper ID: 021/088/150/167/168/250**	
14:00				
14:30				
15:00				
15:30	Coffee Break			
16:00	SS: Fuzzy Data and Information Mining for Wearable and Non-Wearable Health Sensors **Presentation Paper ID: 120/032/117/208/217/249**	Fuzzy Logic **Presentation Paper ID: 051/075/077/078/099/110**	SS: Uncertainty Modeling for Engineering Applications **Presentation Paper ID: 169/211/073/152/103**	
16:30				
17:00				
17:30				
18:00			Mentor-Mentee Event & Dinner	
19:30				

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Time	WEDNESDAY, AUGUST 16			
	PREMIER A + HALL	ROOM #113	ROOM #114	ROOM #115
08:30		SS: Software for Soft Computing	SS: Recent Trends in Mathematical Fuzzy Logics	SS: Fuzzy Natural Language Processing and Applications
09:00	Panel Discussion			
09:30		**Presentation Paper ID: 105/166/215/070/252**	**Presentation Paper ID: 007/119/130/223/163 /058**	**Presentation Paper ID: 225/122/129/092**
10:00				
10:30	Coffee Break			
	PREMIER A			
11:00	Plenary Prof. Sanghamitra Bandyopdhyay			
11:30				
12:00	Lunch on Your Own			
12:30				
13:00				
13:30	SS: Type-2 Fuzzy Sets and Systems: Theoretical advances and novel applications (T2-A)	SS: Sequence Data Analysis and Management with Computational Intelligence	Fuzzy Theory	
14:00				
14:30	**Presentation Paper ID: 057/079/175/040/201/213**	**Presentation Paper ID: 160/024/049/054/066/137**	**Presentation Paper ID: 131/173/195/203/221/231**	
15:00				
15:30	Coffee Break			
16:00	SS: Cybersecurity in Complex Environments & SS: Application of Soft Computing-based Systems on Precision Agriculture	SS: Fuzzy Approaches for Fault Diagnosis and Fault-Tolerant Control of Cyber-Physical Systems	Fuzzy Theory	
16:30				
17:00	**Presentation Paper ID: 005/006/026/064/198/200**	**Presentation Paper ID: 056/074/096/246/028**	**Presentation Paper ID: 003/084/104/114/251**	
17:30				
18:00	Break			
	Premier A+B			
19:00	Banquet & Closing Ceremony			
21:30				

PROGRAM AT A GLANCE

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Time	THURSDAY, AUGUST 17	
	Venue Front	
08:00	Free Shuttle Bus Ride to Airport (Circulation)	Free Theme Tours & Afterwards Free Shuttle Bus Ride to Airport
~		
12:00		
~	Free Shuttle Bus Ride to Airport (Circulation)	
17:00		

Monday, August 14, 2023

08:30 - 10:30
SS: Advances on Explainable Artificial Intelligence
Room: 113
Session Chairs: Anna Wilbik

08:30
(048) Explain Reinforcement Learning Agents Through Fuzzy Rule Reconstruction
Liang Ou (University of Technology Sydney)*; Yu-Cheng Chang (University of Technology Sydney); Yukai Wang (University of Technology Sydney); Chin-Teng Lin (University of Technology Sydney, Australia)

08:50
(067) NoiseCAM: Explainable AI for the Boundary Between Noise and Adversarial Attacks
Wenkai Tan (Embry-Riddle Aeronautical University); Justus Renkhoff (University of Maryland, Baltimore County); Alvaro Velasquez (University of Colorado Boulder); Ziyu Wang (Old Dominion University); Lusi Li (Old Dominion University); Jian Wang (University of Tennessee at Martin); Shuteng Niu (Bowling Green State University); Fan Yang (Embry-Riddle Aeronautical University); Yongxin Liu (Embry-Riddle Aeronautical University)

09:10
(086) Towards causal fuzzy system rules using causal direction
Te Zhang (University of Nottingham)*; Jingda Ying (University of Nottingham); Christian Wagner (University of Nottingham); Jon Garibaldi (University of Nottingham, UK)

09:30
(095) Fuzzy-Vocabulary-Based Detection and Explanation of Anomalies
Rahul Nath (Department of Informatics, University of Bergen); Grégory Smits (IMT Atlantique / Lab-STICC)*; Olivier Pivert (IRISA - Université Rennes)

09:50
(232) Towards Explainable Linguistic Summaries
Carla Wrede (Maastricht University)*; Mark H. M. Winands (Maastricht University); Evgueni Smirnov (Maastricht University); Anna Wilbik (MaastrichtUniversity)

08:30 - 10:30
SS: Fuzzy Interpolation
Room: 114
Session Chairs: Qiang Shen

08:30
(087) Towards Dynamic Fuzzy Rule Interpolation via Density-Based Spatial Clustering of Interpolated Outcomes
Jinle Lin (Aberystwyth University)*; Ruilin Xu (Aberystwyth University); Chaangjing Shang (Aberystwyth University); Qiang Shen (Aberystwyth University)

08:50
(136) Sparse Training Data-based Hyperspectral Image Super Resolution via ANFIS Interpolation
Jing Yang (Shanxi University); Chaangjing Shang (Aberystwyth University); Lu Chen (Shanxi University)*; Pan Su (School of Control and Computer Engineering, North China Electric Power University); Qiang Shen (Aberystwyth University)

09:10
(144) Similarity Function-Assisted Dynamic Fuzzy Rule Interpolation: An Improved Approach
Ruilin Xu (Aberystwyth University)*; Chaangjing Shang (Aberystwyth University); Jinle Lin (Aberystwyth University); Qiang Shen (Aberystwyth University)

09:30
(177) Monotone Fuzzy Rule Interpolation for TSK-FIS-Like n-ary Aggregation Functions
Chian Haur Jong (Universiti Malaysia Sarawak); Kai Meng Tay (Universiti Malaysia Sarawak)*; Yi Wen Kerk (The National University of Malaysia); Chee Peng Lim (Deakin University)

09:50
(094) A new Particle Swarm Optimisation based Memetic Procedure for Fuzzy J-K Flop Neural Networks Learning
Piotr A. Kowalski (AGH University of Science and Technology)*; Tomasz Słoczyński (AGH University of Science and Technology)

08:30 - 10:30
SS: Fuzzy and Uncertain Intelligent Knowledge Engineering Systems
Room: 115
Session Chairs: Gautam Srivastava

08:30
(010) Federated heuristic optimization based on fuzzy clustering and red fox optimization algorithm
Dawid Polap (Silesian University of Technology)*; Katarzyna Prokop (Silesian University of Technology); Gautam Srivastava (Brandon University)

08:50
(011) Fuzzy analysis for consensus in federated learning with simulated heuristic attacks
Dawid Polap (Silesian University of Technology)*; Gautam Srivastava (Brandon University)

09:10
(047) Fuzzy Electricity Management System with Anomaly Detection and Fuzzy Q-Learning
Jia-Hao Syu (National Taiwan University)*; Jerry Chun-Wei Lin (Western Norway University of Applied Sciences); Gautam Srivastava (Brandon University)

09:30
(196) Using the Pre-large Concept for Maintaining High Fuzzy Utility Itemsets
Tzung-Pei Hong (National University of Kaohsiung)*; Wei-Teng Hung (National Sun Yat-Sen University); Yu-Chuan Tsai (National University of Kaohsiung); Wei-Ming Huang (National Sun Yat-sen University)

09:50
(133) An Intelligent Fuzzy Inference System for High Priority Vehicles in Vehicular Named Data Networks
Anu Kaushik (Chandigarh University); Bobbinpreet Kaur (Chandigarh University); Rasmeet Bali (Chandigarh University); Gautam Srivastava (Brandon University)*

10:10
(080) Discovering Fuzzy Partial Periodic Patterns in Quantitative Irregular Multiple Time Series
Veena Pamalla (SBRIT college); Likhitha Palla (University of Aizu); Uday Kiran RAGE (The University of Aizu)*; Jose Maria-Luna (University of Cordoba); Philippe Fournier-Viger (Shenzhen University); Koji Zettsu (National Institute of Information and Communications Technology)

09:00 - 10:30
2nd Edition of Autonomous Drone Racing Competition
Room: Premier A + Hall

10:30 - 11:00
Coffee Break

11:00 - 12:00
Plenary: Prof. Hao Ying
Session Chairs: James Keller

Model-Free Fuzzy Control Paradigm: Theoretical Challenges and Real-World Successes

Dr. Hao Ying
Wayne State University, USA

The concept of a fuzzy controller, first introduced by E.H. Mamdani in 1974, was revolutionary and created a new and powerful knowledge-based model-free control paradigm. The underlying idea was to construct a nonlinear controller without a mathematical model of the system to be controlled. Instead, fuzzy sets, fuzzy logic, fuzzy rules, and fuzzy reasoning are used to intuitively capture, represent, and process a human operator's control strategy in order to build a controller. This is sensible because system behavior and dynamics are reflected in human control expertise and therefore implicitly utilized in the controller design. This paradigm has proven to be successful in a variety of real-world applications and commercial products since the early 1980s.
Not requiring a mathematical model in controller design significantly reduces product development time and cost, making the paradigm more practically useful than model-based control approaches. It is challenging to attain an accurate mathematical model for any real-world system, and modeling efforts are typically time-consuming and costly. This is partially because finding a plausible mathematical model structure is a difficult task to begin with, and validating it is another challenge. This explains why the PID controller, a simple, century-old model-free controller, is controlling more than 90% of control system applications worldwide, despite the existence of numerous model-based control theories developed over many decades.

The knowledge-based model-free approach, while practical, lacks mathematical rigor, which has limited its acceptance. A fuzzy controller is widely treated as a black box whose input-output analytical structure is unknown. To bridge this gap, we have developed a mathematical model-free fuzzy control theory that provides a rigorous and insightful perspective on the behavior and effectiveness of fuzzy controllers.
In this presentation, we will explore the benefits of our approach by discussing example type-1 and interval type-2 fuzzy controllers, and demonstrating how to derive their analytical structures. With this information, we can gain a deeper understanding of how and why fuzzy controllers work and identify connections between fuzzy controllers and conventional controllers. We will also examine the differences between type-1 and interval type-2 fuzzy controllers, and their relative merits and pitfalls. With this approach, we can encourage acceptance of

fuzzy control in safety-critical fields, such as medicine and nuclear engineering, where black box controllers are not currently acceptable.

Complemented with other fuzzy control approaches, our model-free fuzzy control theory is mathematically rigorous and offers unique analysis and design tools not available elsewhere.

12:00 - 13:30
Lunch on Your Own

13:30 - 15:30
Fuzzy Applications
Room: 113
Session Chairs: Marek Reformat

13:30
(158) FCM-induced Switching Fuzzy Factorization Machine for Collaborative Filtering
Rikuto Daido (Osaka Metropolitan University); Katsuhiro Honda (Osaka Metropolitan University)*; Seiki Ubukata (Osaka Metropolitan University); Notsu Akira (Osaka Metropolitan University)

13:50
(162) Knowledge Graph-based Genetic Fuzzy Agent for Human Intelligence and Machine Co-Learning
Chang-Shing Lee (National University of Tainan)*; Mei-Hui Wang (National University of Tainan); CHIH-YU CHEN (National University of Tainan); Marek Z Reformat (University of Alberta); Yusuke Nojima (Osaka Metropolitan University); Naoyuki Kubota (Tokyo Metropolitan University)

14:10
(181) Perceptual System of a Mobile Robot for Autonomous Adaptation to Environmental Changes
Masaya Shoji (Tokyo Metropolitan University / ROBOTIS Co.,Ltd.)*; Azhar Aulia Saputra (TMU); Takenori Obo (Tokyo Metropolitan University); Naoyuki Kubota (Tokyo Metropolitan University)

14:30
(202) Scalable computation of fuzzy joins over large collections of JSON data
Matthew Damigos (Ionian University)*; Laurent d'Orazio (Univ Rennes); Rémi RU Uhartegaray (Univ Rennes); Eleftherios Kalogeros (Ionian University)

14:50
(204) Fuzzy-baseed Solar Magnetogram Image Retrieval
Rafal Grycuk (Czestochowa University of Technology)*; Marcin Korytkowski (Czestochowa University of Technology); Rafal Scherer (Czestochowa University of Technology)

15:10

(116) Growing Memory Network with Random Weight 3DCNN for Continuous Human Action Recognition

Wenbang Dou (Tokyo Metropolitan University)*; Wei Hong Chin (Tokyo Metropolitan University); Naoyuki Kubota (Tokyo Metropolitan University)

13:30 - 15:30
SS: Interval Uncertainty
Room: 114
Session Chairs: Vladik Kreinovich

13:30

(071) Driving Risk Assessment Using Intervals and Weighted Fuzzy Rules

Jimiama Mosima M Mafeni Mase (University of Nottingham)*; Peter Chapman (University of Nottingham); Christian Wagner (University of Nottingham); Grazziela Figueredo (University of Nottingham)

13:50

(046) Fuzzy Uncertainty-based Out-of-Distribution Detection Algorithm for Semantic Segmentation

Qiao Lin (University of Nottingham)*; Jon Garibaldi (University of Nottingham, UK); Xin Chen (University of Nottingham); Chao Chen (University of Nottingham); Direnc Pekaslan (University of Nottingham)

14:10

(113) Representatives-based Interval Analytic Hierarchy Process

Tomoe Entani (University of Hyogo)*

14:30

(159) An Uncertainty-Accuracy-based Score Function For Wrapper Methods in Feature Selection

Mansoureh Maadi (The University of Melbourne)*; Hadi Akbarzadeh Khorshidi (The University of Melbourne); Uwe Aickelin (The University of Melbourne)

14:50

(189) A Restricted Parametrized Model for Interval-Valued Regression

Jingda Ying (University of Nottingham)*; Shaily Kabir (University of Nottingham); Christian Wagner (University of Nottingham)

15:10

(019) Aggregation of interval valued intuitionistic fuzzy sets based on transformation techniques

José Carlos R. Alcantud (Universidad de Salamanca); Gustavo Santos-Garcia (Universidad de Salamanca)

13:30 - 15:30
SS: Advances on Explainable Artificial Intelligence
Room: 115
Session Chairs: Anna Wilbik

13:30
(138) An Initial Step Towards Stable Explanations for Multivariate Time Series Classifiers with LIME
Han Meng (University of Nottingham)*; Isaac Triguero (Nottingham University); Christian Wagner (University of Nottingham)

13:50
(149) Human-Oriented Fuzzy Set Based Explanations of Spatial Concepts
Brendan Young (University of Missouri)*; Derek Anderson (University of Missouri); James Keller (University of Missouri, Columbia, USA); Fred Petry (Naval Research Laboratory); Chris Michael (Naval Research Laboratory); Blake Ruprecht (University of Missouri)

14:10
(164) Federated TSK Models for Predicting Quality of Experience in B5G/6G Networks
José Luis Corcuera Bárcena (University of Pisa); Pietro Ducange (University of Pisa); Francesco Marcelloni (University of Pisa); Alessandro Renda (University of Pisa); Fabrizio Ruffini (University of Pisa)*; Alessio Schiavo (University of Pisa)

14:30
(188) Knowledge Integration in XAI with Gödel Integrals
Adulam Jeyasothy (Lip6-Sorbonne Université)*; Agnès Rico (Universite Claude Bernard Lyon1); Marie-Jeanne Lesot (LIP6); Christophe Marsala (LIP6, Sorbonne Université); Thibault Laugel (AXA)

14:50
(210) An Explainable Intrusion Detection System for IoT Networks
Michela Fazzolari (Institute of Informatics and Telematics - National Research Council); Pietro Ducange (University of Pisa)*; Francesco Marcelloni (University of Pisa)

15:30 - 16:00
Break

16:00 - 18:00
Fuzzy Applications
Room: 113

16:00

(008) A trading strategy based on BitCoin high and low prices: the role of an evolving fuzzy model for interval-valued time series forecasting

Leandro S Maciel (University of Sao Paulo)*

16:20

(035) An Effective IoT based Waste Management System using Fuzzy Soft Expert Systems

Lavanya G (Saveetha Engineering College)*; Ganeshkumar P (Anna University Regional Centre Coimbatore); Vignesh S (Saveetha Engineering College); Anand Paul (Kyungpook National University)

16:40

(068) Fuzzy vs. Crisp in Uncertainty-aware Service Selection: Enabling Sustainability on Multimedia Event Processing

Felipe A Pontes (University of Galway)*; Michael Schukat (National University of Ireland, Galway); Edward Curry (Insight SFI Centre for Data Analytics)

17:00

(089) Trust Mechanism Fuzzy Rules Intelligent Car Real-Time Diagnostic System

Adam Zielonka (Faculty of Applied Mathematics, Silesian University of Technology); Andrzej Sikora (Silesian University of Technology: Politechnika Slaska); Marcin Wozniak (Silesian University of Technology)*

17:20

(108) The Concept of a City Bike Network Management System Using Fuzzy Sets

Adam Kiersztyn (Lublin University of Technology); Krystyna Kiersztyn (The John Paul II Catholic University of Lublin); Michał Dolecki (Lublin University of Technology)*

17:40

(146) Modelling the level of sunlight by using fuzzy sets

Dariusz Czerwinski (Lublin University of Technology); Adam Kiersztyn (Lublin University of Technology); Pawel Karczmarek (Lublin University of Technology); Michał Dolecki (Lublin University of Technology)*; Marek Miłosz (Lublin University of Technology)

16:00 - 18:00
Fuzzy Quantum
Room: 114
Session Chairs: David Lobo

16:00
(141) Fuzzy Inference on Quantum Annealers
Amir Pourabdollah (Nottingham Trent University)*; Colin Wilmott (Nottingham Trent University); Roberto Schiattarella (University of Naples Federico II); Giovanni Acampora (University of Naples Federico II)

16:20
(178) A Comparison of Quantum Computer Architectures in Running Fuzzy Inference Engines
Giovanni Acampora (University of Naples Federico II); Michele Grossi (CERN); Roberto Schiattarella (University of Naples Federico II)*

16:40
(192) Distributing Fuzzy Inference Engines on Quantum Computers
Giovanni Acampora (University of Naples Federico II); Alfredo Massa (QuantumNet); Roberto Schiattarella (University of Naples Federico II)*; Autilia Vitiello (University of Naples Federico II)

17:00
(184) Bipolar multi-adjoint relation equations as systems of bipolar multi-adjoint sup-equations
M.E. Cornejo (Universidad de Cádiz); David Lobo (University of Cádiz)*; Jesús Medina (Universidad de Cádiz)

17:20
(248) Fuzzy Markup Language-based Quantum FIE for Student and Robot Co-Learning Model Assessment
Chang-Shing Lee (National University of Tainan)*; Mei-Hui Wang (National University of Tainan); Pei-Ying Wu (National University if Tainan); Roberto Schiattarella (University of Naples Federico II); Giovanni Acampora (University of Naples Federico II); Autilia Vitiello (University of Naples Federico II)

17:40
(256) On quasi-intents in Fuzzy Formal Concept Analysis
Manuel Ojeda-Hernández (Universidad de Málaga)*; Inma P. Cabrera (Universidad de Málaga); Pablo Cordero (Univ. Málaga); Emilio Muñoz-Velasco (University of Malaga)

16:00 - 18:00
Fuzzy Clustering
Room: 115
Session Chairs: Thomas Runkler

16:00
(052) A Convergence Study of the Possibilistic One Means Algorithm
Thomas A. Runkler (Siemens AG)*

(118) 16:20
Network Traffic Load Balance Using Fuzzy C-Mean Clustering in 6G Cellular Networks
Haesik Kim (VTT)*

16:40
(123) A self-tuning version for the possibilistic fuzzy c-means clustering algorithm
Mirtill-Boglarka Naghi (Obuda University); Levente Kovács (Obuda University); Laszlo Szilagyi (Sapientia University of Transylvania, Tirgu Mures, Romania)*

17:00
(151) Incremental Cluster Validity Index for Predicting Early Signs of Change in Data Streams
Omar O Ibrahim (University of Alberta)*; Marek Z Reformat (University of Alberta); Petr Musilek (University of Alberta)

17:20
(157) Handling of Component-wise Noise in ANFIS Induced by Ellipsoidal Fuzzy Clustering
Katsuhiro Honda (Osaka Metropolitan University)*; Ryuta Kurahashi (Osaka Metropolitan University); Seiki Ubukata (Osaka Metropolitan University); Notsu Akira (Osaka Metropolitan University)

17:40
(186) Gaussian process to Takagi-Sugeno fuzzy model using supervised clustering
Aljaž Blažič (University of Ljubljana, Faculty of Electrical Engineering)*; Igor Skrjanc

18:00 - 20:30
Paper Development Workshop
Room: 113

Tuesday, August 15, 2023

08:30 - 10:30
SS: Fuzzy Machine Learning
Room: 113
Session Chairs: Jie Lu

08:30
(009) Interval-valued Observations-based Multi-source Domain Adaptation using Fuzzy Neural Networks
Guangzhi Ma (University of Technology Sydney)*; Jie Lu (University of Technology Sydney); Guangquan Zhang (University of Technology Sydney)

08:50
(014) Attention-Bridging TS Fuzzy Rules for Universal Multi-Domain Adaptation without Source Data
Keqiuyin Li (University of Technology Syndey)*; Jie Lu (University of Technology Sydney); Hua Zuo (University of Technology Sydney); Guangquan Zhang (University of Technology Sydney)

09:10
(230) Fuzzy Classifiers with a Two-Stage Reject Option
Yusuke Nojima (Osaka Metropolitan University)*; Koyo Kawano (Osaka Prefecture University); Hajime Shimahara (Osaka Prefecture University); Eric Vernon (Osaka Metropolitan University); Naoki Masuyama (Osaka Metropolitan University); Hisao Ishibuchi (Southern University of Science and Technology)

09:30
(194) Fuzzy Clustering for QAOA Complexity Reduction
Giovanni Acampora (University of Naples Federico II); Angela Chiatto (University of Naples Federico II)*; Autilia Vitiello (University of Naples Federico II)

09:50
(063) Multiple fault recognition for chemical processes based on TSK-type Neural Networks with nonlinear consequences
Jiaming Chen (Dalian University of Technology); Xiaodong Liu (Dalian University of Technology); Wei Lu (Dalian University of Technology)*

10:10
(020) Belief Functions on the Real Line defined by Transformed Gaussian Random Fuzzy Numbers
Thierry Denoeux (Université de Technologie de Compiègne)*

08:30 - 10:30
Fuzzy Applications
Room: 114
Session Chairs: Grant Scott

08:30
(043) Circular Intuitionistic Fuzzy GRA for Hospital location Problem
Ashutosh Tiwari (SOUTH ASIAN UNIVERSITY)*; Dr. Mohd Shoaib Khan (Department of Engineering Mathematics, College of Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, AP, India); Q.M. Danish Lohani (South Asian University)

08:50
(148) Human-in-the-Loop (HITL) Augmented Growing Neural Gas for Labeling Aerial Image Datasets
Derek Anderson (University of Missouri)*; James Keller (University of Missouri, Columbia, USA); Grant Scott (University of Missouri); Jeffrey Schulz (University of Missouri - Columbia)

09:10
(226) Fast Power Tracking Control of Wind Turbines for Frequency Support
Horst Schulte (University of Applied Sciences Berlin (HTW), Department of Engineering I)*; Nico Goldschmidt (University of Applied Sciences Berlin (HTW), Department of Engineering I)

09:30
(102) Hierarchical Intuitionistic TSK Fuzzy System for Bitcoin Price Forecasting
Petr Hajek (University of Pardubice)*; Vladimir Olej (University of Pardubice)

09:50
(228) Improved ANFIS Model based on Confinement Optimized PSO to predict the air quality of Delhi, India
Aryan Karki (NIT Warangal); Chaitanya Hardikar (NIT Warangal); M Akshay Kumar (NIT Warangal); Sujit Das (NIT Warangal)*

08:30 - 10:30
Fuzzy Aggregation
Room: 115
Session Chairs: Michał Dolecki

08:30
(013) Smooth Quadrature-Inspired Generalized Choquet Integral in an Application to Anomaly Detection
Pawel Karczmarek (Lublin University of Technology); Michał Dolecki (Lublin University of Technology)*; Łukasz Gałka (Lublin University of Technology); Witold Pedrycz (University of Alberta); Dariusz Czerwinski (Lublin University of Technology)

08:50

(085) Understanding fuzzy measures: measurement of interactions in a bi-dimensional scenario

Inmaculada Gutiérrez García-Pardo (Universidad Complutense de Madrid)*; Daniel Sr Santos (UCM); Javier Castro (Universidad Complutense); Daniel Gomez (UCM); Rosa Espínola Vílchez (Universidad Complutense de Madrid)

09:10

(124) Geometrically Motivated Fuzzy Measures and Choquet Integral for Multi-Look Fusio

Brendan J Alvey (University of Missouri)*; Derek Anderson (University of Missouri)

09:30

(132) Aggregation of Tennis Multivariate Time-Series Using the Choquet Integral and Its Generalizations

Maria Skublewska-Paszkowska (Lublin University of Technology); Pawel Karczmarek (Lublin University of Technology); Pawel Powroznik (Lublin University of Technology); Edyta Lukasik (Lublin University of Technology); Jakub Smolka (Lublin University of Technology); Michał Dolecki (Lublin University of Technology)*

09:50

(041) A Modified Sugeno Integral based Similarity Measure for Intuitionistic Fuzzy Soft Set and its Application

Niher Ranjan Das (South Asian University)*; Q.M. Danish Lohani (South Asian University)

9:00 - 10:30
2nd Edition of Autonomous Drone Racing Competition
Room: Premier A + Hall

10:30 - 11:00
Coffee Break

11:30 - 12:00
Plenary: Prof. Jerry Mendel
Session Chairs: Frank Chung-Hoon Rhee

Why This and Why That?

Jerry Mendel

University of Southern California, USA

Rule based fuzzy systems have progressed from using type-1 fuzzy sets, to interval type-2 fuzzy sets, to general type 2 fuzzy sets, etc. In this talk I will highlight the potential benefits for using (why use?) each of these fuzzy systems, and will then focus on why it may/should be possible to obtain even better performance out of type-1 and interval type-2 fuzzy systems than is currently demonstrated. This is important because designers of more advanced fuzzy systems arguably need to compare performance from such advanced fuzzy systems with the best designed simpler kind of fuzzy system. Why?

Because advanced fuzzy systems are more complicated to understand and design, so their use in real world applications must be fully justified. More needs to be done, and some suggestions will be provided.

12:00 - 13:30
Lunch on Your Own

11:30 - 13:30
Women in Computational Intelligence Lunch Reception

13:30 - 15:30
SS: Fuzzy Machine Learning
Room: 113
Session Chairs: Elle Li

13:30
(081) A New Linguistic Fuzzy PRISM Algorithm
Łukasz K. Bartczuk (Czestochowa University of Technology)*

13:50
(107) The Sugeno integral used for federated learning with uncertainty for unbalanced data
Anna Wilbik (Maastricht University)*; Barbara Pekala (University of Rzeszow); Jarosław Szkoła (University of Rzeszów); Krzysztof Dyczkowski (Adam Mickiewicz University)

14:10
(212) Towards the Interpretation of Multi-label Image Classification using Transformers and Fuzzy Cognitive Maps
Georgia Sovatzidi (University of Thessaly, Greece); Michael Vasilakakis (University of Thessaly, Greece); Dimitris K Iakovidis (University of Thessaly, Greece)*

14:30
(199) EMGTFNet: Fuzzy Vision Transformer to decode Upperlimb sEMG signals for Hand Gestures Recognition
Christian Flores Vega (UTEC)*; Javier Andreu-Perez (University of Essex); Joseph Cherre Córdova (UTEC)

13:30 - 15:30
Fuzzy Logic
Room: 114
Session Chairs: Andrew Buck

13:30
(139) Application of fuzzy logic to optimise cnc machine motion dynamics
Dawid Kalandyk (Rzeszów University of Technology)*; Bogdan BK Kwiatkowski (Rzeszów University of Technology); Mazur Damian (Rzeszów University of Technology)

13:50
(180) An LMI-based approach for local output-feedback stabilization of continuous-time Takagi-Sugeno fuzzy systems
Yara Marinho (University of Campinas); Ricardo C. L. F. Oliveira (University of Campinas)*; Pedro Peres (UNICAMP)

14:10
(182) Proof of accuracy-transparency trade-off in Takagi-Sugeno model and its implications
Gregor Černe (Univerza v Ljubljani)*; Igor Skrjanc

14:30
(185) GEnI-FR: Granularity to Ensure Interpretability of the Fuzzy Rules
Genicleito Gonçalves (Universidade Federal da Bahia); Tatiane Nogueira (Universidade Federal da Bahia)*

14:50
(187) Lindstrom's Characterizability of Abstract Fuzzy Logic Systems for Convolutions
Krystian Jobczyk (AGH University of Science and Technology)*; Krzysztof Kluza (AGH University of Science and Technology)

15:10
(190) FuzzyLogic.jl: a flexible library for efficient and productive fuzzy inference
Luca Ferranti (University of Vaasa)*; Jani Boutellier (University of Vaasa)

13:30 - 15:30
SS: Uncertainty Modeling for Engineering Applications
Room: 115
Session Chairs: Krzysztof Dyczkowski

13:30
(021) Optimal Location of Hubs over Networks with Demand Uncertainty: A Fundamental Mathematical Model
Alfredo Cuzzocrea (Universitá della Calabria)*; Carmine Gallo (University of Calabria); Giulia Fornari (ISIRES); Vittorio Gatto (ISIRES)

13:50
(088) UAVs fleet routing under weather and customer orders uncertainty parameters
Grzegorz Radzki (Koszalin University of Technology); Grzegorz Bocewicz (Koszalin University of Technology)*; Peter Nielsen (Aalborg University); Malogrzata Jasiulewicz-Kaczmarek (Poznan University of Technology); Zbigniew Banaszak (Koszalin University of Technology)

14:10
(150) The S-power Invariance Property and the Mixed Invariance Property for Fuzzy Implication Functions
Grzegorz Mos (University of Silesia in Katowice); Michal Baczynski (University of Silesia in Katowice)*

14:30
(167) A new look at the entropy of interval-valued fuzzy sets - theory and applications
Przemyslaw Grzegorzewski (Warsaw University of Technology); Barbara Pekala (University of Rzeszow)*; Krzysztof Dyczkowski (Adam Mickiewicz University); Dawid DK Kosior (University of Rzeszów)

14:50
(168) Federated similarity-based learning with incomplete data
Barbara Pekala (University of Rzeszow)*; Jaroslaw Szkola (University of Rzeszow); Krzysztof Dyczkowski (Adam Mickiewicz University); Anna Wilbik (Maastricht University)

15:10
(250) Streamflow Forecasting Using Data Driven Level Set Modeling
Leandro S Maciel (University of Sao Paulo); Rosangela Ballini (University of Campinas); Fernando Gomide (University of Campinas)*

15:30 - 16:00
Coffee Break

16:00 - 18:00
SS: Fuzzy Data and Information Mining for Wearable and Non-Wearable Health Sensors
Room: 113
Session Chairs: Mihail Popescu

16:00
(120) Cohort Discovery from Bed Sensor Data with Fuzzy Evidence Accumulation Clustering
Trevor M Bajkowski (University of Missouri - Columbia)*; Noah Marchal (Institute for Data Science & Informatics, University of Missouri, Columbia); Jamal Saied (Electrical Engineering and Computer Science (EECS) Department, University of Missouri, Columbia); James Keller (University of Missouri, Columbia); Marjorie Skubic (University of Missouri-Columbia); Pallavi Gupta (Institute for Data Science & Informatics, University of Missouri, Columbia); Grant Scott (University of Missouri)

16:20
(032) Semantic Annotation of Sensor Data using a Sequential Possibilistic Clustering methodology
Wenlong Wu (University of Missouri)*; James Keller (University of Missouri, Columbia); Marjorie Skubic (University of Missouri-Columbia); Mihail Popescu (University of Missouri-Columbia); Kari Lane (University of Missouri); Marilyn Rantz (University of Missouri)

16:40
(117) Evaluating Simple Exercises with a Fuzzy System Based on Human Skeleton Poses
Chyan Zheng Siow (Tokyo Metropolitan University)*; Wei Hong Chin (Tokyo Metropolitan University); Naoyuki Kubota (Tokyo Metropolitan University)

17:00
(208) Fusion of a fuzzy rule-based method and other decision-making models in injury prediction problem in football
Aleksandra Sadurska (Adam Mickiewicz University)*; Tomasz Pilka (Adam Mickiewicz University in Poznan, Poland); Bartłomiej Grzelak (KKS Lech Poznań); Tomasz Górecki (Adam Mickiewicz University); Krzysztof Dyczkowski (Adam Mickiewicz University); Michal Zareba (Adam Mickiewicz University)

17:20
(217) Multilayer Growing Neural Gas for Text-Mining of Nursing Care in Computational Systems Care
Takenori Obo (Tokyo Metropolitan University)*; Rino Kaburagi (Tokyo Metropolitan University); Naoyuki Kubota (Tokyo Metropolitan University)

17:40

(249) Data-Driven Decision Support System for Dengue Fever Mitigation Action Based on Fuzzy-Decision Tree

Wiwik Anggraeni (Institut Teknologi Sepuluh Nopember)*; Margustin Salim (Institut Teknologi Sepuluh Nopember); Surya Sumpeno (Institut Teknologi Sepuluh November); Hanifan Muhayat (Institut Teknologi Sepuluh Nopember); Pujiadi Pujiadi (Malang Regency Public Health Office); Mauridhi Hery Purnomo (ITS Surabaya)

16:00 - 18:00
Fuzzy Logic
Room: 114
Session Chairs: Mihail Popescu

16:00

(051) Decomposing Conventional Fuzzy Logic Systems to Hierarchical Fuzzy Systems

Tajul Rosli Razak (Universiti Teknologi MARA)*; Nor Hanimah Kamis (Universiti Teknologi MARA); Nurul Hanan Anuar (Universiti Teknologi MARA); Jon Garibaldi (University of Nottingham, UK); Christian Wagner (University of Nottingham)

16:20

(075) Latent Space Encoding for Interpretable Fuzzy Logic Rules in Continuous and Noisy High-Dimensional Spaces

John W Hostetter (North Carolina State University)*; Min Chi (North Carolina State University)

16:40

(077) Leveraging Fuzzy Logic Towards More Explainable Reinforcement Learning-Induced Pedagogical Policies on Intelligent Tutoring Systems

John W Hostetter (North Carolina State University)*; Mark Abdelshiheed (North Carolina State University); Tiffany Barnes (North Carolina State University); Min Chi (North Carolina State University)

17:00

(078) Design and Implementation of a Novel Self-Tuning Single Input Fuzzy Controller for PMSM

Kursad Metehan Gul (Istanbul Technical University); Berk Kacar (Figes A. S.); Mohammad Aziziaghdam (Figes A.S.); Tufan Dr. Kumbasar (Istanbul Technical University)*

17:20

(099) Multi-threshold Generation Method of Fuzzy Implications

Paweł Drygaś (University of Rzeszów)*; Anna Król (University of Rzeszow); Feng Qin (School of Mathematics and Statistics, Jiangxi Normal University, Nanchang)

17:40

(110) Annotated Logic with Rough Double Stone Algebraic Interpretation

Yotaro Nakayama (BIPROGY Inc.)*; Seiki Akama (C-Republic, Inc.); Jair Abe (Universidade Paulista Unip); Tetsuya Murai (Chitose Institute of Science and Technology)

16:00 - 18:00
SS: Uncertainty Modeling for Engineering Applications
Room: 115
Session Chairs: Barbara Pękala

16:00

(169) Partial order based approach to preference assessment in portfolio selection

Patryk Żywica (Adam Mickiewicz University in Poznań)*; Joanna Siwek (Adam Mickiewicz University); Anna Stachowiak (Adam Mickiewicz University in Poland); Agata Kulhawczuk (Adam Mickiewicz University, Poznań, Poland)

16:20

(211) The use of a fuzzy rule-based system in adaptive e-learning content based on intercultural competence

Jacek Marciniak (Adam Mickiewicz University)*; Marcin Szczepański (Adam Mickiewicz University); Krzysztof Dyczkowski (Adam Mickiewicz University in Poznań); Karolina Mazurowska (SWPS University); Radosław Stanczewski (SWPS University); Joanna Grzybek (Jagiellonian University); Dorota Marciniak (SWPS University)

16:40

(073) Inference mechanism based on ordered fuzzy rules

Katarzyna Rudnik (Opole University of Technology)*; Anna Chwastyk (Opole University of Technology)

17:00

(152) Capturing Uncertainty in Monocular Depth Estimation: Towards Fuzzy Voxel Maps

Andrew R Buck (University of Missouri)*; Derek Anderson (University of Missouri); Raub Camaioni (US Army DEVCOM C5ISR); Jack DE Akers (University of Missouri); Robert Luke (US Army DEVCOM C5ISR); James Keller (University of Missouri, Columbia)

17:20

(103) A Correlation based Circular Intuitionistic Fuzzy TOPSIS for Hospital location Problem

Ashutosh Tiwari (South Asian University)*; Q.M. Danish Lohani (South Asian University)

18:00 - 20:30
Mentor-Mentee Event

Wednesday, August 16, 2023

08:30 - 10:30
SS: Software for Soft Computing
Room: 113
Session Chairs: Jon Garibaldi

08:30
(105) The Design and Implementation of a Constrained Interval Type-2 Fuzzy System for Credit Card Fraud Detection
Xinxin Wang (Sichuan University)*; Ming Li (Sichuan University); Chao Chen (University of Nottingham); Jon Garibaldi (University of Nottingham)

08:50
(166) An Application for Federated Learning of XAI Models in Edge Computing Environments
Alessio Bechini (University of Pisa); Mattia Daole (University of Pisa); Pietro Ducange (University of Pisa); Francesco Marcelloni (University of Pisa); Alessandro Renda (University of Pisa)*

09:10
(215) An IEEE Std 1855 Driver for Synthetizing Quantum Fuzzy Inference Engines
Giovanni Acampora (University of Naples Federico II); Autilia Vitiello (University of Naples Federico II)*

09:30
(070) A Comparative Study of Open-Source Fuzzy Modelling Toolkit Licenses and Features
Felipe A Pontes (University of Galway)*; Edward Curry (Insight SFI Centre for Data Analytics); Michael Schukat (National University of Ireland, Galway)

09:50
(252) Handling Categorical Variables in the Estimation of Fuzzy Models with pyFUME
Daniele M Papetti (Università degli studi Milano-Bicocca); Caro Fuchs (Eindhoven University of Technology)*; Vasco Coelho (University of Milano-Bicocca); Uzay Kaymak (Eindhoven University of Technology); Marco S Nobile (Ca' Foscari University of Venice)

08:30 - 10:30
SS: Recent Trends in Mathematical Fuzzy Logics
Room: 114
Session Chairs: Stefano Aguzzoli

08:30
(007) On the q-Rung Orthopair Fuzzy Aggregation Operators
Hoang Nguyen (Gdynia Maritime University)*

08:50

(119) Operations on balanced fuzzy sets

Zofia Matusiewicz (University of Information Technology and Management in Rzeszow)*; Władysław Homenda (Warsaw University of Technology)

09:10

(130) Averaging the truth value of formulas in Gödel logic

Stefano Aguzzoli (Università degli Studi di Milano); Brunella Gerla (University of Insubria)*

09:30

(223) A Reasoning System for Time and Vagueness

Yoshihiro Maruyama (The Australian National University)*; Frank Zhang (The Australian National University)

09:50

(163) Additively Generated (a,b)-Implication Functions

Helida S Santos (FURG)*; Graçaliz Dimuro (Universidade Federal do Rio Grande); Benjamin Bedregal (Universidade Federal do Rio Grande do Norte); Rui Paiva (IFCE); Tiago Asmus (Universidade Federal do Rio Grande); Giancarlo Lucca (Federal University of Rio Grande); Bruno Moura Paz (Federal University of Pampa); Anderson Cruz (UFRN); Humberto Bustince (Universidad Publica de Navarra)

10:10

(058) Vietoris–Rips Complex induced by Intuitionistic Fuzzy Distance Measure

Dr. Mohd Shoaib Khan (Department of Engineering Mathematics, College of Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, AP, India)*; Ashutosh Tiwari (South Asian University); Q.M. Danish Lohani (South Asian University)

08:30 - 10:30
SS: Fuzzy Natural Language Processing and Applications
Room: 115
Session Chairs: Joao Paulo Carvalho

08:30

(225) Effect of calculating Pointwise Mutual Information using a Fuzzy Sliding Window in Topic Modeling

Emil Rijcken (Eindhoven University of Technology)*; Kalliopi Zervanou (Leiden University); Marco Spruit (Leiden University); Floortje Scheepers (University Medical Centre Utrecht); Uzay Kaymak (Eindhoven University of Technology)

08:50

(122) An Investigation into Fuzzy Negation in Semantic Similarity Measures

Naeemeh Adel (Manchester Metropolitan University)*; Keeley A. Crockett (Manchester Metropolitan University); Joao Paulo Carvalho (INESC-ID / Instituto Superior Técnico, University of Lisbon, Portugal)

09:10

(129) Fuzzy Fingerprinting Transformer Language-Models for Emotion Recognition in Conversations

Patrícia Pereira (Instituto Superior Técnico / INESC-ID); Rui Ribeiro (IST/INESC-ID); Helena Moniz (INESC-ID / Faculdade de Letras da Universidade de Lisboa); Luisa Coheur (IST/INESC-ID); Joao Paulo Carvalho (INESC-ID / Instituto Superior Técnico, University of Lisbon, Portugal)*

09:30
(092) Cluster Validity for Fuzzy Text Segmentation
Evan Lucas (Michigan Technological University)*; Timothy Havens (Michigan Technological University)

09:00 - 10:30
Panel Discussion
Room: Premier A + HALL

10:30 - 11:00
Coffee Break

11:00 - 12:00
Plenary: Prof. Sanghamitra Bandyopdhyay
Session Chairs: Thomas A. Runkler

Model-Free Fuzzy Control Paradigm: Theoretical Challenges and Real-World Successes
Sanghamitra Bandyopadhyay
Indian Statistical Institute, India
Optimization problems are ubiquitous, finding applications in numerous real-life situations. Multi-objective optimization problems (MOPs) are ones that require simultaneous optimization of multiple conflicting objectives such that improving solutions in terms of one objective leads to deterioration in terms of one or more of the other objectives. In MOPs, the target is to arrive at the best trade-off surface, called the Pareto optimal front. Population based metaheuristics find favor in solving MOPs because of their ability to work with multiple solutions at the same time. Multi-modal MOPs (MMMOPs) are those where a many-to-one mapping exists from solution space to objective space. As a result, multiple subsets of the Pareto-optimal set could independently generate the same Pareto-Front. The discovery of such equivalent solutions across the different subsets is essential during decision-making to facilitate the analysis of their non-numeric, domain-specific attributes.

In this talk, we will first provide a brief introduction to MOPs and discuss some metaheuristics for solving them. Applications in clustering and in drug design will be demonstrated. We will then discuss the basic concept of multi-modality in MOPs and describe the crowding illusion problem. A method for solving MMMOPs with a graph Laplacian-based Optimization using Reference vector assisted Decomposition (LORD) will thereafter be described. The talk will conclude with the brief discussion of an application of MMMOPs to the problem of building energy optimization.

12:00 - 13:30
Lunch on Your Own

13:30 - 15:30
SS: Type-2 Fuzzy Sets and Systems: Theoretical advances and novel applications (T2-A)
Room: 113
Session Chairs: Christian Wagner

13:30
(057) On the stability of Fuzzy Classifiers to Noise Induction
Javier Fumanal Idocin (Public University of Navarre)*; Humberto Bustince (Universidad Publica de Navarra); Javier Andreu-Perez (University of Essex); Hani Hagras (University of Essex, UK)

13:50
(079) Towards Reliable Uncertainty Quantification and High Precision with General Type-2 Fuzzy Systems
Batuhan Avcı (Istanbul Technical University); Aykut Beke (Istanbul Technical University); Tufan Dr. Kumbasar (Istanbul Technical University)*

14:10
(175) Determining inflation expectations using fuzzy interval sets
Aleksandra Rutkowska (Poznan University of Economics and Business)*

14:30
(040) Datasets with rich labels for machine learning
Arthur Hoarau (Université de Rennes)*; Constance Thierry (Université de Rennes); Arnaud Martin (Université de Rennes); Jean-Christophe Dubois (Université de Rennes); Yolande Le Gall (Université de Rennes)

14:50
(201) FuzzySentClass: Interval-valued fuzzy approach to the Sentiment Analysis Problem via SentiWordNet
Bruno Moura Paz (Federal University of Pampa)*; Lidiane Silva (UFPEL); Rafael Bastos (UFPEL); Francisco Franco (UFPEL); Adenauer C Yamin (UFPel); Renata Hax Sander Reiser (UFPEL); Ulisses Brisolara Corrêa (UFPEL)

15:10
(213) Personalised and Adjustable Interval Type-2 Fuzzy-Based PPG Quality Assessment for the Edge
Jose Miranda (EPFL)*; Javier Andreu-Perez (University of Essex); Celia López-Ongil (Universidad Carlos III de Madrid)

13:30 - 15:30
SS: Sequence Data Analysis and Management with Computational Intelligence
Room: 114
Session Chairs: Mihail Popescu

13:30
(160) Data analytics and prediction of long COVID cases with fuzzy logic
Carson K. Leung (University of Manitoba)*

13:50
(024) Application of a Novel Fuzzy Pattern Mining Algorithm for Sequence Data
Thimani Ranathungage (University of Manitoba); Sulalitha M B B Bowala Mudiyanselage (University of Manitoba)*; Md Erfanul Hoque (Thompson Rivers University); Aerambamoorthy Thavaneswaran (University of Manitoba); Ruppa Thulasiram (University of Manitoba)

14:10
(049) Enhancing MBTI Personality Trait Prediction from Imbalanced Social Media Data Using Hybrid Query Expansion Ranking and GloVe-BiLSTM
Gede Aditra Pradnyana (Institut Teknologi Sepuluh Nopember); Wiwik Anggraeni (Institut Teknologi Sepuluh Nopember); Eko Mulyanto Yuniarno (Institut Teknologi Sepuluh Nopember); Mauridhi Hery Purnomo (ITS Surabaya)*

14:30
(054) Fuzzy-TOPSIS and the Urgency-Seriousness-Growth Scoring Technique to Determine Weights of Uncertainty Issues in School Reopening Factors during COVID-19
Feby Artwodini Muqtadiroh (Institut Teknologi Sepuluh Nopember)*; Tsuyoshi Usagawa (Kumamoto University); Diana Purwitasari (Institut Teknologi Sepuluh Nopember); Riris Diana Rachmayanti (Universitas Airlangga); Eko Mulyanto Yuniarno (Institut Teknologi Sepuluh Nopember); Supeno Mardi Susiki Nugroho (Institut Teknologi Sepuluh Nopember); Mauridhi Hery Purnomo (ITS Surabaya)

14:50
(066) Classification of Time Series Using FCM-based Forecasting Models
Mariusz Wrzesien (WSIiZ Rzeszow)*; Milosz Wrzesien (AGH University of Science and Technology)

15:10
(137) Time Series Classification Based on Fuzzy Cognitive Maps and Multi-class Decomposition with Ensembling
Paweł Wesołowski (Warsaw University of Technology); Kacper Walasek (Warsaw University of Technology); Wladyslaw Homenda (Warsaw University of Technology)*; Chenxi Ouyang (Beijing Normal University); Fusheng Yu (Beijing Normal University)

13:30 - 15:30
Fuzzy Theory
Room: 115
Session Chairs: Adam Grabowski

13:30
(131) Subgroup Discovery through Sharp Transitions using Implicative Type Rules
Raquel Fernandez-Peralta (University of the Balearic Islands)*; Sebastia Massanet (University of the Balearic Islands); Megha Gupta (Indian Institute of Technology Hyderabad); Kavit Nanavati (IIT Hyderabad); Balasubramaniam Jayaram (Indian Institute of Technology Hyderabad)

13:50
(173) Finite frequency Fuzzy Static Output Feedback H∞ Control for Diesel engine Air-Path : Descriptor approach
Abderrahim El AMRANI (MIS/UPJV); Ahmed Hajjaji (Laboratoire de MIS, Université de Picardie Jules Verne, 33-rue Saint Leu 80039 Amiens Cedex 1-France)*; Jerôme Bosche (MIS/UPJV)

14:10
(195) Computer-Supported Encoding of Fuzzy Negations and Laws of Contraposition
Adam Grabowski (University of Bialystok)*

14:30
(203) Data-Driven Structure Identification of Takagi Sugeno Fuzzy Models Using a Bounded Error Approach
Felix Wittich (University of Kassel)*; Andreas Kroll (University of Kassel)

14:50
(221) An Improved Fuzzy Controller Design via Higher Order Derivatives of Lyapunov Function for Takagi-Sugeno Fuzzy System
Sakumi Toyoda (Aoyama Gakuin University)*; Yuto Asai (Aoyama Gakuin University); Taku Itami (Aoyama Gakuin University); Jun Yoneyama (Aoyama Gakuin University)

(231) 15:10
NCode: Encoding Non-Homogeneous Information into Type-2 Fuzzy Words in Decision-Making
Taniya Seth (South Asian University)*; Pranab K. Muhuri (South Asian University)

15:30 - 16:00
Coffee Break

16:00 - 18:00
SS: Cybersecurity in Complex Environments & SS: Application of Soft Computing-based Systems on Precision Agriculture
Room: 113
Session Chairs: Alessandro Renda

16:00
(005) A Fuzzy Deep Learning Network for Dynamic Mobile Malware Detection
Francesco Mercaldo (University of Molise)*; Fabio Martinelli (Institute for Informatics and Telematics, National Research Council of Italy (CNR)); Antonella Santone (University of Molise)

16:20
(006) Image-based Malware Detection through a Deep Neuro-Fuzzy Model
Francesco Mercaldo (University of Molise)*; Fabio Martinelli (Institute for Informatics and Telematics, National Research Council of Italy (CNR)); Antonella Santone (University of Molise)

16:40
(026) Evaluating Fuzzy Machine Learning for Smart Grid Instability Detection
Fabio Martinelli (Institute for Informatics and Telematics, National Research Council of Italy (CNR)); Francesco Mercaldo (University of Molise)*; Antonella Santone (University of Molise)

17:00
(064) Explainable AI for deep learning based potato leaf disease detection
Siwar Ben Gamra (Laboratory of Informatics, Modeling and Information and Knowledge Processing (LIMTIC))*; Ezzeddine Zagrouba (Université Virtuelle de Tunis); André Bigand (University of the Littoral Opal Coast)

17:20
(198) Hierarchical Convolutional Neural Networks for Leaf Disease Detection
Ezzeddine Chakroun (Omicrone); Haythem Ghazouani (Ecole Nationale d'Ingénieurs de Carthage)*; Walid Barhoumi (Tunisia); Prof. Ezzeddine Zagrouba (URSIIVA); Gwanggil Jeon (Incheon National University)

17:40
(200) Multi-View-based Apple Maturity Classification using Similarity Network Fusion versus Classical Machine Learning Classifiers
Amani Elaoud (limtic)*; Dr. Walid Barhoumi (SIIVA - RIADI Laboratory)

16:00 - 18:00
SS: Fuzzy Approaches for Fault Diagnosis and Fault-Tolerant Control of Cyber-Physical Systems
Room: 114
Session Chairs: Peng Shi

16:00
(056) A Control and Attack Detection Scheme for Fuzzy Systems against Cyber-attacks
Linlin Li (University of Science and Technology Beijing)*; Haili Zhang (University of Science and Technology Beijing); Liang Qiao (University of Science and Technology Beijing)

16:20
(074) Variable Impulsive Consensus of Multi-Agent Systems via Fuzzy Modelling Approach
Zhengle Zhang (Chongqing University)*; Tiedong Ma (Chong Qing University); Peng Shi (University of Adelaide)

16:40
(096) Zero-Sum-Game-Based Fuzzy Adaptive Fault-Tolerant Tracking Control of UAV
Ying Wu (Nanjing University of Aeronautics and Astronautics)*; chen mou (College of Automation Engineering, Nanjing University of Aeronautics and Astronautics); M. Chadli (UPS- UEVE IBISC)

17:00
(246) DB Workload Management through Characterization and Idleness Detection
Abdul Mateen (FUUAST)*

17:20
(028) An Improved Fault-Tolerant Control and Stabilization for Positive Polynomial Fuzzy Systems
Aiwen Meng (Hebei University)*; Hak Keung Lam (King's College London); Ohmin Kwon (Chungbuk National Univ.); Peiguang Wang (Hebei University); Zhaoyan Zhang (Hebei University)

16:00 - 18:00
Fuzzy Theory
Room: 115

16:00

(003) A Comparative Analysis of Fuzzifying the Best Worst Method

Y.P. Tsang (The Hong Kong Polytechnic University)*; Y.L. Li (The Hong Kong Polytechnic University); C.K.M. Lee (The Hong Kong Polytechnic University); Z.S. Chen (Wuhan University)

16:20

(084) Dynamic evaluation of fuzzy compositions

Nhung Cao (University of Ostrava); Michal Burda (University of Ostrava)*; Stanislav Ozana (University of Ostrava)

16:40

(104) Fuzzy Cognitive Maps and Hidden Markov Models: Comparative Analysis of Efficiency within the Confines of the Time Series Classification Task

Agnieszka Jastrzebska (Warsaw University of Technology)*; Jakub Bilski (Warsaw University of Technology)

17:00

(114) A New Event-Triggered Scheme For Output Feedback Control Design of Nonlinear Systems With Actuator Faults

Mourad Kchaou (College of engineering of hail); Ahmed HAJJAJI (Laboratoire de MIS, Université de Picardie Jules Verne, 33-rue Saint Leu 80039 Amiens Cedex 1-France)*

17:20

(251) Late Breaking Results: Confidence Intervals in Evolving Model-based Design of Experiments

Miha Ožbot (Faculty of Electrical Engineering, University of Ljubljana)*; Igor Skrjanc

19:15 – 22:30
Banquet
Room: Premier B

Thursday, August 17, 2023

08:00 – 12:00
Free Theme Tours & Afterwards Free Shuttle Bus Ride to Airport