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Welcome to the 2021 IEEE Symposium Series on Computational Intelligence (IEEE SSCI 2021)

Welcome!

Dear IEEE SSCI 2021 attendees,

Welcome to the IEEE Symposium Series on Computational Intelligence (IEEE 2021). IEEE SSCI 2021 is the continuation of a successful series started in 2007 and is aimed to unify the theory and applications of the topics all around the computational intelligence.

This conference was originally planned to take place in Orlando, USA as an in-person event. In January 2021, we had to turn to a hybrid event and in September 2021, we had no choice than to turn to a fully digital conference. COVID-19 brought lots of challenges to all of us across the world and many of us were hopeful to attend IEEE SSCI in-person. It was a very sad decision to turn to a digital conference, which was due to the uncertainty in traveling for most of our participants.

IEEE SSCI 2021 is aimed to promote and stimulate discussion on the latest theory, algorithms, applications and emerging topics on computational intelligence across several unique symposia, providing an opportunity for cross-fertilization of research and future collaborations.

The technical program of IEEE SSCI 2021 is divided into 36 symposia and 11 special sessions, reflecting all aspects of the field, and chaired by experts who make the decisions on accepted papers.

This year, we received a total 574 papers and accepted 371 of them for oral presentation. The acceptance rate is calculated for each symposium in the table on the next page. It ranges from 31% to 82%. Overall, 1,191 authors from 47 countries across all continents present their scientific works in 371 papers. In addition to papers, we have 3 plenaries, 8 keynote talks, 12 tutorials, 3 competitions, 3 panels, and 1 best paper award sponsored by the IEEE Brain Technical Community. We are very proud to be able to offer such a rich technical program in its depth and breadth.

We are thrilled to welcome our plenary speakers Nicolas Lane from the University of Cambridge and Samsung AI, UK, Sanghamitra Bandyopadhyay from the Indian Statistical Institute, Kolkata, India, and Hussein Abbass, the Editor in Chief of IEEE Transactions on AI from the University of New South Wales Canberra. We feel greatly honored that they are joining us to make IEEE SSCI a successful event.

We especially welcome our eight keynote speakers Jürgen Branke from the University of Warwick, UK, Cynthia Rudin from Duke University, USA, Andy Song from RMIT University, Australia, Ying Tan from the University of Melbourne, Australia, Laurie Williams from NC State University, USA, Jason Scholz from Trusted Autonomous Systems Defense CRC, Albert Y. Zomaya from the University of Sydney, and Anthony Kuh from the University of Hawaii, USA.

The organization of a conference like this is a tremendous task relying on many people. We are very thankful for their work. We would like to mention the different chairs: submission, program, publication, publicity, tutorial, keynote, competition, special session, finance, registration, conflict of interest, student activities, plagiarism, Conference Catalysts, MCE registration services and the entire program committee.

We would like to specifically mention and thank our finance chair, Piero Bonissone, and our submission chair Nicolo Navarin, for the professional, dedicated work and their kindness. Personal thanks go to Carlos Coello Coello, program co-chair, who did not hesitate to spend several nights working on the program and the schedule. We are grateful to Tom Cholewo, for his full and non-stop support all around the submission system. Special thanks go to Jo-Ellen Snyder for all her help in the organization of IEEE SSCI 2021 and her continuing dedication to IEEE SSCI.

We would like to thank all authors for submitting their work to IEEE SSCI 2021 and all our reviewers for their dedication and hard work.

Enjoy the conference!

IEEE SSCI 2021 General Co-Chairs

Keeley Crockett

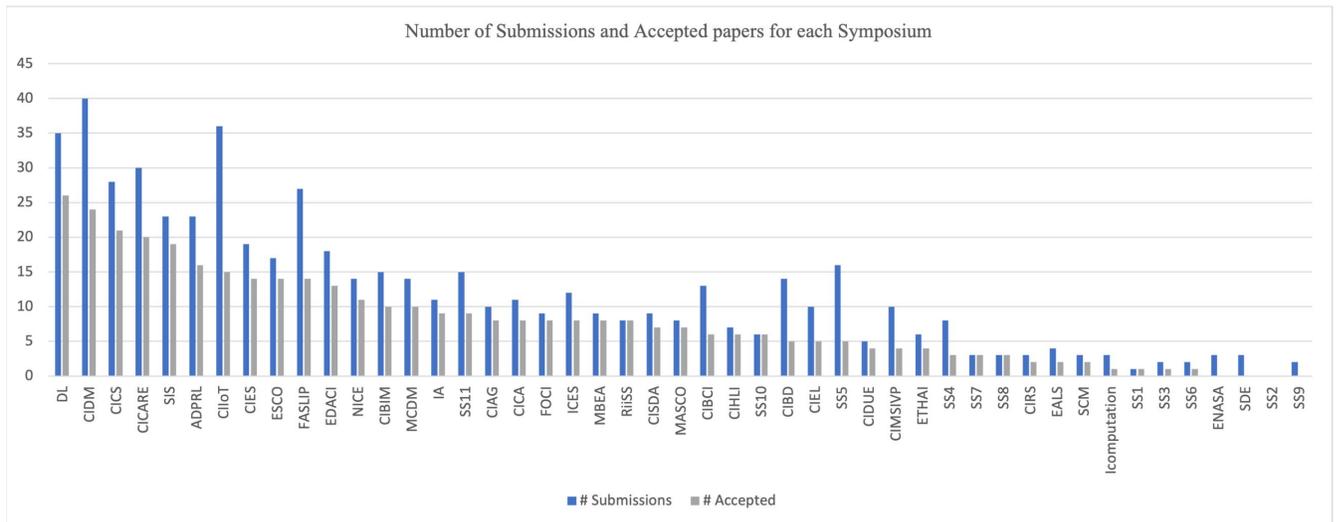
Manchester Metropolitan University, UK

Sanaz Mostaghim

Otto von Guericke University Magdeburg, Germany

IEEE SSCI 2021 Statistics

	Country	#Authors	#Papers		Country	#Authors	#Papers
1	United States	239	78	25	Iran	6	3
2	China	126	33	26	Colombia	6	1
3	Germany	125	36	27	Luxembourg	6	1
4	Japan	97	31	28	Austria	5	2
5	United Kingdom	74	25	29	Pakistan	5	2
6	Brazil	68	20	30	Poland	5	2
7	Canada	48	18	31	Slovenia	5	1
8	Italy	42	13	32	Switzerland	5	1
9	Netherlands	33	10	33	Denmark	4	1
10	Australia	33	9	34	Russia	8	2
11	France	26	6	35	Saudi Arabia	3	2
12	India	26	5	36	Macedonia	3	1
13	New Zealand	22	7	37	Croatia	3	1
14	Norway	20	7	38	Israel	2	2
15	Spain	18	3	39	Peru	2	1
16	Taiwan	17	7	40	Ireland	2	1
17	South Africa	15	8	41	Venezuela	2	1
18	Czech Republic	13	7	42	Malaysia	2	1
19	Singapore	13	4	43	Turkey	1	2
20	Portugal	12	4	44	United Arab Emirates	1	1
21	Mexico	11	3	45	Cyprus	1	0
22	Sweden	10	2	46	Vietnam	1	0
23	Greece	9	3	47	Jordan	1	0
24	Korea (South)	15	3	Total		1191	371



Submissions	Accepted	Symposium
23	16	Adaptive Dynamic Programming and Reinforcement Learning (IEEE ADPRL)
10	8	CI in Agriculture (IEEE CIAg)
13	6	CI for Brain Computer Interfaces (IEEE CIBCI)
14	5	Computational Intelligence in Big Data (IEEE CIBD)
15	10	CI in Biometrics and Identity Management (IEEE CIBIM)
11	8	CI in Control and Automation (IEEE CICA)
30	20	CI in Healthcare and E-health (IEEE CICARE)
28	21	CI in Cyber Security (IEEE CICS)
40	24	CI in Data Mining (IEEE CIDM)
5	4	CI in Dynamic and Uncertain Environments (IEEE CIDUE)
10	5	CI and Ensemble Learning (IEEE CIEL)
19	14	CI for Engineering Solutions (IEEE CIES)
7	6	CI for Human-like Intelligence (IEEE CIHLI)
36	15	CI in IoT and Smart Cities (IEEE CIIoT)
10	4	CI for Multimedia Signal and Vision Processing (IEEE CIMSIVP)
3	2	CI in Remote Sensing (IEEE CIRS)
9	7	CI for Security and Defense Applications (IEEE CISDA)
35	26	Deep Learning (IEEE DL)
4	2	Evolving and Autonomous Learning Systems (IEEE EALS)
18	13	Explainable Data Analytics in Computational Intelligence (IEEE EDACI)
3	0	Evolutionary Neural Architecture Search and Applications (IEEE ENASA)
17	14	Evolutionary Scheduling and Combinatorial Optimisation (IEEE ESCO)
6	4	Ethical, Social and Legal Implications of Artificial Intelligence (IEEE ETHAI)
27	14	CI in Feature Analysis, Selection and Learning in Image and Pattern Recognition (IEEE FASLIP)
9	8	Foundations of CI (IEEE FOCI)
11	9	Intelligent Agents (IEEE IA)
12	8	Evolvable Systems (IEEE ICES)
3	1	Immune Computation (IEEE IComputation)
8	7	Multi-agent System Coordination and Optimization (IEEE MASCO)
9	8	Model-Based Evolutionary Algorithms (IEEE MBEA)
14	10	Multicriteria Decision-Making (IEEE MCDM)
14	11	Nature-Inspired Computation in Engineering (IEEE NICE)
8	8	Robotic Intelligence in Informationally Structured Space (IEEE RiSS)
3	2	Cooperative Metaheuristics (IEEE SCM)
3	0	Differential Evolution (IEEE SDE)
23	19	Swarm Intelligence Symposium (IEEE SIS)
1	1	SS1: Special Session on Computational Intelligence for Transport-Energy Interfacing System
0	0	SS2: Special Session on Evolutionary Computation for Computer Vision and Image Analysis
2	1	SS3: Special Session on Genetic Programming and Machine Learning for Scheduling
8	3	SS4: Special Session on Computational Intelligence for Natural Language Processing
16	5	SS5: Special Session on CI for Integrated Remote Sensing and Cyber-Physical Systems
2	1	SS6: Special Session on Evolutionary Transfer Learning and Domain Adaptation
3	3	SS7: Special Session on Computational Intelligence Approaches for Efficient Energy Transition
3	3	SS8: Special Session on Hybrid Intelligent Models and Applications
2	0	SS9: Special Session on Responsible AI: Improving Fairness in Machine Learning
6	6	SS10: Special Session on Population dynamics in evolutionary computation
15	9	SS11: Special Session on Games

IEEE SSCI 2021 Organising Committee

General Chairs



Keeley Crockett, UK and Sanaz Mostaghim, Germany

Program Chairs



Alice Smith, USA and Carlos A. Coello Coello, Mexico

Finance Chair



Piero Bonissone, USA

Publications Chairs



Dipti Srinivasan, Singapore and Anna Wilbik, Netherlands

Conflict of Interest Chair



Marley Vellasco, Brazil

Registration Chairs



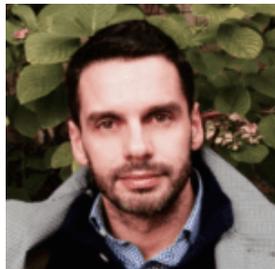
Julia Chung, Taiwan and Steven Corns, USA

Keynote Chairs



Gary Yen, USA and Manuel Roveri, Italy, Bernadette Bouchon-Meunier, France

Tutorial Co-Chairs



Daniel Ashlock, Canada, and Manuel Roveri, Italy and Sansanee Auephanwiriyaikul, Thailand

Special Session Chair



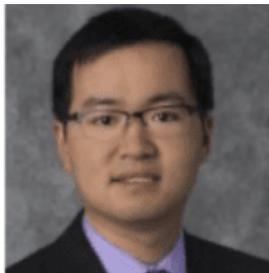
Marde Helbig, Australia

Submission Chair



Nicolò Navarin, Italy

Local Organizing Chair



Zhen Ni, USA

Travel Grant Chair



Pauline Haddow, Norway

Whova Chair



Albert Lam, Hong Kong

Conference Activities Chair



Bing Xue, New Zealand

Social Event Chair



Jo-Ellen Synder, USA

Publicity Chairs



Jen-Wei Huang, Taiwan, Jialin Liu, China, Joao Carvalho, Portugal and Matt Garrat, Australia

History of IEEE SSCI Meetings

IEEE SSCI 2020

1-4 December, 2020

Virtual, Canberra, Australia

General Chair: Hussein Abbas

IEEE SSCI 2019

December 6-9, 2019

Xiamen, China

General Chair: Tingwen Huang

IEEE SSCI 2018

18 – 21 November, 2018,

Bengaluru, India

General Chairs: Sundaram Suresh and Koshy George

IEEE SSCI 2017

November 27-December 1, 2017

Hilton Hawaiian Village Waikiki Resort, Honolulu, Hawaii

General Chairs: Piero Bonissone and David Fogel

IEEE SSCI 2016

December 6-9, 2016

Royal Olympic Hotel, Athens, Greece

General Chair: Yaochu Jin and Stefanos Kollias

IEEE SSCI 2015

December 8-10, 2015

Cape Town International Convention Center, Cape Town, South Africa

General Chair: Andries Engelbrech

IEEE SSCI 2014

December 9-12, 2014

Caribe Royale All-Suite Hotel & Convention Center, Orlando, Florida, USA

General Chair: Haibo He

IEEE SSCI 2013

April 16-19, 2013

Grand Copthorne Waterfront Hotel, Singapore

General Chair: P. N. Suganthan

IEEE SSCI 2011

April 11-15, 2011

La Halles aux Farines, Paris, France

General Chair: Bernadette Bouchon-Meunier

IEEE SSCI 2009

March 30 - April 2, 2009

Sheraton Music City Hotel, Nashville, TN, USA

General Chair: Vincenzo Piuri

IEEE SSCI 2007

April 1-5, 2007

Hilton Hawaiian Village, Honolulu, Hawaii

General Chair: David B Fogel

IEEE SSCI 2021 Symposia and Chairs

This year we have 36 exciting symposia co-located within the IEEE SSCI 2021. We would like to acknowledge all symposia chairs for their efforts in making it a success. In particular:

- Jenny Si and Zhen Ni, co-chairs of the 2021 IEEE Symposium on Adaptive Dynamic Programming and Reinforcement Learning (IEEE ADPRL);
- Guilherme N. DeSouza, Derek T. Anderson, Felix B. Fritschi, co-chairs of the 2021 IEEE Symposium on CI in Agriculture (IEEE CIAg)
- Yu-Kai Wang, Gang Li, Fani Deligianni, Chun-Shu Wei, co-chairs of the 2021 IEEE Symposium on CI for Brain Computer Interfaces (IEEE CIBCI)
- Svetlana Yanushkevich, Masood Khan, Ajita Rattani, co-chairs of the 2021 IEEE Symposium on CI in Biometrics and Identity Management (IEEE CIBIM)
- Handing Wang, Yaochu Jin, Spencer Thomas co-chairs of the 2021 IEEE Symposium on Computational Intelligence in Big Data (IEEE CIBD)
- Daoyi Dong, Xiaojun Zeng, co-chairs of the 2021 IEEE Symposium on CI in Control and Automation (IEEE CICA)
- Amir Hussain, Aziz Sheikh, Mufti Mahmud, co-chairs of the 2021 IEEE Symposium on CI in Healthcare and E-health (IEEE CICARE)
- Dipankar Dasgupta, Kaushik Roy, co-chairs of the 2021 IEEE Symposium on CI in Cyber Security (IEEE CICS)
- Zhen Ni, Simone Ludwig, Bach Nguyen Hoai co-chairs of the 2021 IEEE Symposium on CI in Data Mining (IEEE CIDM)
- Michalis Mavrovouniotis, Changhe Li, Shengxiang Yang, co-chairs of the 2021 IEEE Symposium on CI in Dynamic and Uncertain Environments (IEEE CIDUE)
- P. N. Suganthan, Xin Yao, co-chairs of the 2021 IEEE Symposium on CI and Ensemble Learning (IEEE CIEL)
- Michael Beer, Vladik Kreinovich, Rudolf Kruse, co-chairs of the 2021 IEEE Symposium on CI for Engineering Solutions (IEEE CIES)
- Jacek Mańdziuk, Włodzisław Duch, Marcin Woźniak co-chairs of the 2021 IEEE Symposium on CI for Human-like Intelligence (IEEE CIHLI)
- Amir H. Gandomi, Mahmoud Daneshmand, Huansheng Ning, Mohammad S. Khan, Honggang Wang, Chonggang Wang, co-chairs of the 2021 IEEE Symposium on CI in IoT and Smart Cities (IEEE CIIoT)
- Pablo Mesejo, Harith Al-Sahaf, Mengjie Zhang, Youssef S.G. Nashed, co-chairs of the 2021 IEEE Symposium on CI for Multimedia Signal and Vision Processing (IEEE CIMSIVP)
- Jayavelu Senthilnath, Jon Atli Benediktsson, co-chairs of the 2021 IEEE Symposium on CI in Remote Sensing (IEEE CIRS)
- Rami Abielmona, Robert Bolia, Robert Hunjet, co-chairs of the 2021 IEEE Symposium on CI for Security and Defense Applications (IEEE CISDA)
- Alessandro Sperduti, Plamen Angelov, Jose C. Principe, co-chairs of the 2021 IEEE Symposium on Deep Learning (IEEE DL)
- Plamen Angelov, Nikola Kasabov, co-chairs of the 2021 IEEE Symposium on Evolving and Autonomous Learning Systems (IEEE EALS)
- Jian Wang, Huaqing Li, Kai Zhang, co-chairs of the 2021 IEEE Symposium on Explainable Data Analytics in Computational Intelligence (IEEE co-chairs of the 2021 IEEE Symposium on EDACI)
- Yanan Sun, chair of the 2021 IEEE Symposium on Evolutionary Neural Architecture Search and Applications (IEEE ENASA)
- Yi Mei, Nelishia Pillay, Liang Gao, Rong Qu, co-chairs of the 2021 IEEE Symposium on Evolutionary Scheduling and Combinatorial Optimisation (IEEE ESCO)
- Keeley Crockett, Matthew Garratt, co-chairs of the 2021 IEEE Symposium on Ethical, Social and Legal Implications of Artificial Intelligence (IEEE ETHAI)
- Bing Xue, Mengjie Zhang, Hisao Ishibuchi, Brijesh Verma, co-chairs of the 2021 IEEE Symposium on CI in Feature Analysis, Selection and Learning in Image and co-chairs of the 2021 IEEE Symposium on Pattern Recognition (IEEE FASLIP)

- Manuel Ojeda-Aciego, Leonardo Franco, Pietro S. Oliveto, Chao Qian, co-chairs of the 2021 IEEE Symposium on Foundations of CI (IEEE FOCI)
- Andy Tyrrell, Martin A. Trefzer, co-chairs of the 2021 IEEE Symposium on Evolvable Systems (IEEE ICES)
- Mario Pavone, Wenjian Luo, Uwe Aickelin, Licheng Jiao, co-chairs of the 2021 IEEE Symposium on Immune Computation (IEEE IComputation)
- Sabrina Senatore , Mario G.C.A. Cimino, Riyaz Sikora, co-chairs of the 2021 IEEE Symposium on Intelligent Agents (IEEE IA)
- Jing Liu, Kai Wu, co-chairs of the 2021 IEEE Symposium on Multi-agent System Coordination and Optimization (IEEE MASCO)
- Jose A. Lozano, Ran Cheng, Yaochu Jin, Cheng He, co-chairs of the 2021 IEEE Symposium on Model-Based Evolutionary Algorithms (IEEE MBEA)
- Hemant Singh, Kalyanmoy Deb, co-chairs of the 2021 IEEE Symposium on Multicriteria Decision-Making (IEEE MCDM)
- João Paulo Papa, Xin-She Yang, co-chairs of the 2021 IEEE Symposium on Nature-Inspired Computation in Engineering (IEEE NICE)
- Janos Botzheim, Wei Hong Chin, Chu Kiong Loo, Hiroyuki Masuta, Naoki Masuyama, co-chairs of the 2021 IEEE Symposium on Robotic Intelligence in Informationally Structured Space (IEEE RiSS)
- Mohammed El-Abd, Seyedali Mirjalili, Junfeng Chen, Shi Cheng, co-chairs of the 2021 IEEE Symposium on Cooperative Metaheuristics (IEEE SCM)
- Rammohan Mallipeddi, Guohua Wu, co-chairs of the 2021 IEEE Symposium on Differential Evolution (IEEE SDE)
- Sanaz Mostaghim, Yuhui Shi, Shi Cheng, co-chairs of the 2021 IEEE Symposium on Swarm Intelligence Symposium (IEEE SIS)

IEEE SSCI 2021 Special Sessions

Computational Intelligence for Transport-Energy Interfacing System

Organisers: Kailong Liu, Zhile Yang, Tianyu Hu, Pengfei Hu, Zhijia Huang, Zong Woo Geem

Evolutionary Computation for Computer Vision and Image Analysis

Organisers: Ying Bing, Bing Xue and Mengjie Zhang

Genetic Programming and Machine Learning for Scheduling

Organisers: Fangfang Zhang, Yi Mei, Su Nguyen, Mengjie Zhang

Computational Intelligence for Natural Language Processing

Organisers: Sriparna Saha, Naveen Saini, Jose G Moreno

Computational Intelligence for Integrated Remote Sensing and Cyber-Physical Systems

Organisers: Taufiq Asyhari, Ambreen Hussain, Mahardhika Pratama, Zhaozhao Tang, Huma Chaudhry

Evolutionary Transfer Learning and Domain Adaptation

Organisers: Bach Nguyen, Liang Feng, Bing Xue, Mengjie Zhang

Computational Intelligence Approaches for Efficient Energy Transition

Organisers: Tiago Pinto, Zita Vale, José Rueda, Kwang Y. Lee

Hybrid Intelligent Models and Applications

Organisers: Eduardo Gomez-Ramirez, Patricia Melin

Responsible AI: Improving Fairness in Machine Learning

Organisers: Stan Uryasev, Robert Golan

Population dynamics in evolutionary computation: Insight, analysis, and visualization

Organisers: Roman Senkerik, Michal Pluhacek, Pavel Kromer

Special Session on Games

Organisers: Jialin Ju, Hamna Aslam, Georgios Yannakakis

List of Tutorials

T1 Advances in Evolutionary Multi-Criterion Optimization, Kalyanmoy Deb, USA

Started in early Nineties, evolutionary computation methods for solving multi-criterion optimization problems were increasingly adopted by researchers and practitioners alike. In this two-hour long tutorial, we shall briefly introduce early methods which started the field and focus more on recent methods which are currently used for research and applications. Related pragmatic topics, such as multi-criterion decision-making, visualization, “innovization” principles, surrogate-assisted methods, will be introduced. Case studies from industrial applications will also be presented as a support of the importance and usefulness of this fast-growing field on multi-criterion optimization in practice.

Presenter: Kalyanmoy Deb is Koenig Endowed Chair Professor at Department of Electrical and Computer Engineering in Michigan State University, USA. Prof. Deb’s research interests are in evolutionary optimization and their application in multi-criterion optimization (EMO), modeling, and machine learning. He was awarded IEEE Evolutionary Computation Pioneer Award for his sustained work in EMO, Infosys Prize, TWAS Prize in Engineering Sciences, CajAstur Mamdani Prize, Distinguished Alumni Award from IIT Kharagpur, Edgeworth-Pareto award, Bhatnagar Prize in Engineering Sciences, and Bessel Research award from Germany. He is fellow of IEEE, ASME, and three Indian science and engineering academies. He has published over 570 research papers with Google Scholar citation of over 160,000 with h-index 124. He is in the editorial board on 18 major international journals. More information about his research contribution can be found from <https://www.coin-lab.org>

T2 Evolutionary Algorithms and Hyper-Heuristics, Nelishia Pillay, South Africa

Hyper-heuristics is a rapidly developing domain which has proven to be effective at providing generalized solutions to problems and across problem domains. Evolutionary algorithms have played a pivotal role in the advancement of hyper-heuristics, especially generation hyper-heuristics. Evolutionary algorithm hyper-heuristics have been successfully applied to solving problems in various domains including packing problems, educational timetabling, vehicle routing, permutation flowshop and financial forecasting amongst others. The aim of the tutorial is to firstly provide an introduction to evolutionary algorithm hyper-heuristics for researchers interested in working in this domain. An overview of hyper-heuristics will be provided including the assessment of hyper-heuristic performance. The tutorial will examine each of the four categories of hyper-heuristics, namely, selection constructive, selection perturbative, generation constructive and generation perturbative, showing how evolutionary algorithms can be used for each type of hyper-heuristic. A case study will be presented for each type of hyper-heuristic to provide researchers with a foundation to start their own research in this area. The EvoHyp library will be used to demonstrate the implementation of a genetic algorithm hyper-heuristic for the case studies for selection hyper-heuristics and a genetic programming hyper-heuristic for the generation hyper-heuristics. A theoretical understanding of evolutionary algorithm hyper-heuristics will be provided. A new measure to assess the performance of hyper-heuristic performance will also be presented. Challenges in the implementation of evolutionary algorithm hyper-heuristics will be highlighted. An emerging research direction is using hyper-heuristics for the automated design of computational intelligence techniques. The tutorial will look at the synergistic relationship between evolutionary algorithms and hyper-heuristics in this area. The use of hyper-heuristics for the automated design of evolutionary algorithms will be examined as well as the application of evolutionary algorithm hyper-heuristics for the design of computational intelligence techniques. The tutorial will end with a discussion session on future directions in evolutionary algorithms and hyper-heuristics.

Presenter: Nelishia Pillay is chair of the IEEE Task Force on Hyper-Heuristics with the Technical Committee of Intelligent Systems and Applications at IEEE Computational Intelligence Society. She is an active researcher in the field of evolutionary algorithm hyper-heuristics for combinatorial optimization and automated design. This is one of the focus areas of the NICOG (Nature-Inspired Computing Optimization) research group which she has established. She has worked on the project “Automated Intelligent Design

Support Using Hyper-Heuristics” in collaboration with the University of Nottingham which was supported by a Royal Society Newton International exchange grant. She is the first author of the first book on hyper-heuristics “Hyper-Heuristics: Theory and Applications”, which was published in October 2018.

T3 Advances in Particle Swarm Optimization Development, Analysis, and Understanding, Andries Engelbrecht and Christopher Cleghorn, South Africa

The tutorial will be presented in two parts:

Particle Swarm Optimization Part 1: Development of A Multi-purpose Algorithm

The main objective of this part of the tutorial is to show that particle swarm optimization (PSO) has emerged as a multi-purpose optimization approach. In the context of this tutorial, this means that the PSO can be applied to a wide range of optimization problem types as well as search domain types. The discussion will start with a very compact overview of the original, basic PSO. Some experience and background on PSO will be assumed. The remainder and bulk of this part of the tutorial will cover a classification of different problem types, and will show how PSO can be applied to solve problems of these types.

Particle Swarm Optimization Part 2: Analysis and Understanding

The main objective of this part of the tutorial is demonstrate and explain the key strides made in the theoretical analysis and understanding of PSO behaviour and performance. One of the main challenges encountered when solving a new optimization task with meta- heuristic is the lack of clear guidance on how to best configure the meta-heuristic at hand. The lack of clear guidance often stems from the challenging nature of predicting how a meta-heuristic will truly behave under a given configuration. However, given that PSO has undergone a considerable amount of rigours analysis, there are in fact a number of clear guidelines and insights available to a PSO practitioner that allow for effective and informed real world use of the optimizer.

Presenter: Andries Engelbrecht (<https://engel.pages.cs.sun.ac.za/>) received the Masters and PhD degrees in Computer Science from the University of Stellenbosch, South Africa, in 1994 and 1999 respectively. He is Voigt Chair in Data Science in the Department of Industrial Engineering, with a joint appointment as Professor in the Computer Science Division, Stellenbosch University. His research interests include swarm intelligence, evolutionary computation, artificial neural networks, artificial immune systems, and the application of these Computational Intelligence paradigms to data analytics, games, bioinformatics, finance, and difficult optimization problems. He is author of two books, Computational Intelligence: An Introduction and Fundamentals of Computational Swarm Intelligence. He has published over 400 papers and has presented a number of tutorials at international conferences.

Presenter: Christopher Cleghorn (<https://scholar.google.co.za/citations?user=QB71eI8AAAAJ&hl=en>) received his Masters and PhD degrees in Computer Science from the University of Pretoria, South Africa, in 2013 and 2017 respectively. He is an Associate Professor in the School of Computer Science and Applied Mathematics, at the University of the Witwatersrand. His research interests include swarm intelligence, evolutionary computation, machine learning, and radio-astronomy with a strong focus of theoretical research. Prof Cleghorn annually serves as a reviewer for numerous international journals and conferences in domains ranging from swarm intelligence and neural networks to mathematical optimization.

T4 Essentials of Fuzzy Networks, Alexander Gegov and Farzad Arabikhan, UK

The tutorial focuses on the theoretical essentials of fuzzy networks and highlights some recent research results of the presenters as the ones from the publications listed below. Fuzzy networks are similar to neural networks in terms of general structure. However, their nodes and connections are different. The nodes of fuzzy networks are fuzzy systems represented by rule bases and the connections between the nodes are outputs from and inputs to these rule bases. In this context, apart from being a structural counterpart for a neural network, a fuzzy network is also a conceptual generalisation of a fuzzy system.

Presenter: Alexander Gegov is Reader in Computational Intelligence in the School of Computing, University of Portsmouth, UK. He holds a PhD degree in Cybernetics and a DSc degree in Artificial Intelligence – both from the Bulgarian Academy of Sciences. He has been a recipient of a National Annual Award for Best Young Researcher from the Bulgarian Union of Scientists. He has been Humboldt Guest Researcher at the University of Duisburg in Germany. He has also been EU Visiting Researcher at the University of Wuppertal in Germany and the Delft University of Technology in the Netherlands. Alexander Gegov's research interests are in the development of computational intelligence methods and their application for modelling and simulation of complex systems and networks. He has edited 6 books, authored 5 research monographs and over 30 book chapters – most of these published by Springer. He has authored over 50 articles and 100 papers in international journals and conferences – many of these published and organised by IEEE. He has also presented over 20 invited lectures and tutorials – most of these at IEEE Conferences on Fuzzy Systems, Intelligent Systems, Computational Intelligence and Cybernetics. Alexander Gegov is Associate Editor for 'IEEE Transactions on Fuzzy Systems', 'Fuzzy Sets and Systems', 'Intelligent and Fuzzy Systems', 'Computational Intelligence Systems' and 'Intelligent Systems'. He is also Reviewer for several IEEE journals and National Research Councils. He is Member of the IEEE Computational Intelligence Society and the Soft Computing Technical Committee of the IEEE Society of Systems, Man and Cybernetics. He has also been Guest Editor for a recent Special Issue on Deep Fuzzy Models of the IEEE Transactions on Fuzzy Systems.

Presenter: Farzad Arabikhan joined the University of Portsmouth, UK, as a Lecturer in 2017 after completing his PhD on Modelling Telecommuting using Fuzzy Networks at the same university. He has published his research results in several journal articles and conference papers. He has also secured funding from the EU COST Programme for research collaboration with leading academics at the Paris-Sorbonne University, France and the Mediterranean University of Reggio Calabria, Italy. He holds BSc and MSc degrees in Civil Engineering and Transportation Engineering from the Sharif University of Technology, Tehran, Iran.

T5 Genetic Programming for Job Shop Scheduling, Fangfang Zhang, Mengjie Zhan, Yi Mei, Su Nguyen, New Zealand

Job shop scheduling (JSS) is an important combinatorial optimisation problem, which covers a full range of topics and tasks including static JSS, dynamic JSS, flexible JSS, dynamic flexible JSS, from basic research to a huge number of real-world industrial applications. With recent technological advances in internet-of-things, artificial intelligence, and automation, modern production systems are digitalized and more flexible, and production environments can be monitored and diagnosed in real-time. Scheduling in such dynamic and complex environments is challenging since scheduling needs to be more efficient and reactive, and scheduling decisions have to incorporate dynamic information and uncertainty. Instead of manually designing scheduling heuristics and algorithms for each problem, we can use machine learning and hyper-heuristics to automatically learn effective scheduling heuristics from low-level heuristics, characteristics of scheduling problems, and dynamic information from production environments. Among the techniques studied and applied within the research field of JSS, genetic programming (GP), a powerful evolutionary machine learning technique, has been successfully used to learn scheduling heuristics for JSS, especially for dynamic JSS. This automated design approach can significantly reduce the time required to develop solution methods by domain experts and increase the chance of discovering novel and effective scheduling heuristics. Although GP has shown its advantage in learning scheduling heuristics for JSS, GP still has several limitations for handling JSS such as high computational cost and large search space. In addition, most of existing studies focus mainly on single JSS task optimisation, the multiple tasks solving ability of GP has not been explored. The tutorial will introduce the general JSS problem, including the similarities and differences of different types of job shop scheduling. The basic GP will be also introduced. How and why to use genetic programming to learn scheduling heuristics for JSS will be introduced. Different surrogate techniques used in GP for JSS will be introduced with examples. How feature selection techniques can be used in GP for JSS will be described. In addition, how to learn scheduling heuristics for multiple JSS tasks simultaneously will be discussed. In summary, we will show how such techniques can

be used to help GP learn scheduling heuristics for JSS. All the techniques mentioned will be introduced with promising results.

Presenters: Fangfang Zhang is a Postdoctoral Research Fellow in the School of Engineering and Computer Science, Victoria University of Wellington, New Zealand. She has nearly 30 journal and conference papers. Her current research interests include evolutionary computation, hyper-heuristics learning/optimisation, job shop scheduling, and multitask optimization. Fangfang is a member of the IEEE Computational Intelligence Society and Association for Computing Machinery, and has been serving as a reviewer for top international evolutionary computation journals such as the IEEE Transactions on Evolutionary Computation, the IEEE Transactions on Cybernetics, Applied Soft Computing, Computers and Operations Research, Journal of Scheduling and Complex & Intelligent Systems, and conferences including the Genetic and Evolutionary Computation Conference (GECCO) and the IEEE Congress on Evolutionary Computation (CEC). She is also a committee member of the IEEE New Zealand Central Section.

Mengjie Zhang is a Professor of Computer Science, the Head of the Evolutionary Computation Research Group, and the Associate Dean (Research and Innovation) with the Faculty of Engineering, Victoria University of Wellington, New Zealand. His current research interests include artificial intelligence and machine learning, particularly genetic programming, image analysis, feature selection and reduction, job shop scheduling, and transfer learning. He has published over 700 research papers in refereed international journals and conferences. Prof. Zhang is a Fellow of the Royal Society of New Zealand, a Fellow of IEEE and an IEEE Distinguished Lecturer. He was the Chair of the IEEE CIS Intelligent Systems and Applications Technical Committee, the IEEE CIS Emergent Technologies Technical Committee, and the Evolutionary Computation Technical Committee, and a member of the IEEE CIS Award Committee. He is a Vice-Chair of the Task Force on Evolutionary Computer Vision and Image Processing, and the Founding Chair of the IEEE Computational Intelligence Chapter in New Zealand. He is a Fellow of Royal Society of New Zealand, a Fellow of IEEE, and an IEEE Distinguished Lecturer.

Yi Mei is a Senior Lecturer with the School of Engineering and Computer Science, Victoria University of Wellington, New Zealand. He has more than 100 fully referred publications, including the top journals in Evolutionary Computation and Operations Research, such as IEEE Transactions on Evolutionary Computation, IEEE Transactions on Cybernetics, Evolutionary Computation, European Journal of Operational Research, and ACM Transactions on Mathematical Software. His research interests include evolutionary scheduling and combinatorial optimization, machine learning, genetic programming, and hyper-heuristics. Dr. Mei was a Vice-Chair of the IEEE CIS Emergent Technologies Technical Committee and a member of the Intelligent Systems Applications Technical Committee. He is an Editorial Board Member/Associate Editor of three international journals, and a Guest Editor of a special issue of the Genetic Programming and Evolvable Machines journal. He serves as a reviewer of over 30 international journals.

Su Nguyen is a Senior Research Fellow and an Algorithm Lead with the Centre for Data Analytics and Cognition, La Trobe University, Melbourne, Australia. His expertise includes evolutionary computation, simulation optimization, automated algorithm design, interfaces of artificial intelligence/operations research, and their applications in logistics, energy, and transportation. He has more than 70 publications in top evolutionary computation/operations research peer-reviewed journals and conferences. His current research focuses on novel people-centric artificial intelligence to solve dynamic and uncertain planning tasks by combining the creativity of evolutionary computation and power of advanced machine-learning algorithms.

Dr. Nguyen was the Chair of IEEE Task Force on Evolutionary Scheduling and Combinatorial Optimisation from 2014 to 2018 and is a member of the IEEE CIS Data Mining and Big Data Technical Committee. He delivered technical tutorials about evolutionary computation and artificial intelligence based visualization at Parallel Problem Solving from Nature Conference in 2018 and IEEE World Congress on Computational Intelligence in 2020. He served as an Editorial Member of Complex and Intelligence Systems and the Guest Editor of the special issue on Automated Design and Adaption of Heuristics for Scheduling and Combinatorial Optimization in Genetic Programming and Evolvable Machines journal.

T6 Knowledge Graphs: A Practical Introduction across Disciplines, Mayank Kejriwal, USA

Knowledge Graphs (KGs) like Wikidata, NELL and DBPedia have recently played instrumental roles in several applications of computational intelligence, including search and information retrieval, natural language processing, and data mining. The simplest definition of a KG is as a directed, labeled multi-network. Yet, despite being ubiquitous in the communities mentioned above, the full scope of KGs has not been explored across the computational intelligence community. With the rapid rise in Web data, there are many interesting and domain-specific opportunities in this area. We propose a tutorial that will provide a detailed and rigorous synthesis of KGs, along with discussing the application potential of KGs across multiple domains within computational intelligence

Presenter: Dr. Mayank Kejriwal, is a research assistant professor (Industrial and Systems Engineering) and research lead (Information Sciences Institute) at the University of Southern California. He is affiliated with the Center on Knowledge Graphs¹ at USC/ISI. His research focuses on knowledge graphs (KG), an area of AI that has found widespread applications in industry (including Amazon and Google), academia (health informatics and social sciences) and for social causes (fighting human trafficking and crisis response). He has given talks and tutorials in international academic and industrial venues, most recently serving as a roundtable speaker and participant at the Concordia Summit that was co- held with the UN General Assembly in New York City in September, 2019. He is also the author of an MIT Press textbook on knowledge graphs, and he authored the popular Springer Brief ‘Domain-specific Knowledge Graph Construction’ in 2019

T7 Embedding Knowledge Into Optimization Process, Amir H. Gandomi, Australia

Real-world optimization problems are usually large-scale and involve several constraints and sometimes even finding a single feasible/acceptable solution is a challenging task. To solve these complex real-world problems, heuristics and concept-based approaches can be very helpful and narrow down the search space. Here, I am going to talk about four approaches used in order to incorporate information into the problem and the optimization process, listed below:

- Semi-Independent Variable
- Boundary update
- Variable functioning
- Variable grouping and co-evolution

These four approaches are coupled with several evolutionary optimization algorithms and the results show that they are practical and effective approaches, and lead to better solutions with fewer function evaluations in most cases. This tutorial should motivate optimization researchers and practitioners to pay more attention to embedding different sources of knowledge into the optimization process to boost it.

Presenter: Amir H. Gandomi is a Professor of Data Science and an ARC DECRA Fellow at the Faculty of Engineering & Information Technology, University of Technology Sydney. Prior to joining UTS, Prof. Gandomi was an Assistant Professor at Stevens Institute of Technology, USA and a distinguished research fellow in BEACON center, Michigan State University, USA. Prof. Gandomi has published over two hundred journal papers and seven books which collectively have been cited 20,000+ times (H-index = 66). He has been named as one of the most influential scientific mind and Highly Cited Researcher (top 1% publications and 0.1% researchers) for four consecutive years, 2017 to 2020. He also ranked 18th in GP bibliography among more than 12,000 researchers. He has served as associate editor, editor and guest editor in several prestigious journals such as AE of SWEVO, IEEE TBD, and IEEE IoTJ. Prof Gandomi is active in delivering keynotes and invited talks. His research interests are global optimisation and (big) data analytics using machine learning and evolutionary computations in particular.

T8 Evolutionary Continuous Dynamic Optimization, Danial Yazdani and Xin Yao, China

Change is an inescapable aspect of natural and artificial systems, and adaptation is central to their resilience [1]. Optimization problems are no exception to this maxim. Indeed, viability of businesses and their operational success depends heavily on their effectiveness in responding to a change in the myriad of optimization problems they entail. For an optimization problem, this boils down to the efficiency of an algorithm to find and maintain a quality solution to an ever-changing problem. Ubiquity of dynamic optimization problems demands extensive research into design and development of algorithms capable of dealing with various types of change [2].

Inspired by biological evolution and natural self-organized systems, evolutionary algorithms and swarm intelligence methods have been vastly used for optimizing dynamic optimization problems due to their natural capability in dealing with environmental changes [3]. Indeed, both classes have been successfully applied to dynamic optimization problems with various environmental and dynamic characteristics [2,4]. However, one cannot directly apply them to tackle dynamic optimization problems as these methods are originally designed for optimization in static environments and cannot cope with the challenges of a dynamic optimization problem alone. Hence, they are usually used together with some other components to form evolutionary dynamic optimization methods.

This Tutorial is dedicated to exploring the recent advances in the field of evolutionary continuous dynamic optimization. This tutorial first describes the definition of dynamic optimization problems and explains different classes of these problems [5, 6]. Then, components of evolutionary continuous dynamic optimization methods [7] are described. This is followed by describing the state-of-the-art and well-known used benchmarks in the field. This tutorial also introduces the commonly used performance indicators that have been used for analyzing and comparing the performance of the algorithms. After introducing several real-world applications, the tutorial is concluded by discussing some of the current challenges, the gap between academic research and real-world problems, and some potential future research directions.

Presenters: Danial Yazdani (M'20) received his Ph.D. degree in computer science from Liverpool John Moores University, Liverpool, UK, in 2018. He is currently a Research Assistant Professor with the Department of Computer Science and Engineering, Southern University of Science and Technology, Shenzhen, China. Besides dynamically changing environments, his main research interests include evolutionary algorithms, large-scale optimization, simulation optimization, and their applications. He was a recipient of the Best Thesis Award from the Faculty of Engineering and Technology, Liverpool John Moores University, and the SUSTech Presidential Outstanding Postdoctoral Award from the Southern University of Science and Technology. He is a member of the IEEE Task Force on Evolutionary Computation in Dynamic and Uncertain Environments, and the IEEE Task Force on Large-Scale Global Optimization.

Dr. Yazdani has been working on evolutionary dynamic optimization for more than 10 years and both his MSc and PhD [8] theses were focused on this topic, which resulted in publishing more than 15 peer-reviewed papers on this field (all as the first author) [7, 9-22].

Xin Yao (M'91SM'96F'03) obtained his Ph.D. in 1990 from the University of Science and Technology of China (USTC), MSc in 1985 from North China Institute of Computing Technologies and BSc in 1982 from USTC. He is a Chair Professor of Computer Science at the Southern University of Science and Technology, Shenzhen, China, and a part-time Professor of Computer Science at the University of Birmingham, UK. He is an IEEE Fellow and was a Distinguished Lecturer of the IEEE Computational Intelligence Society (CIS). His major research interests include evolutionary computation, ensemble learning, and their applications to software engineering. Prof. Yao's paper on evolving artificial neural networks won the 2001 IEEE Donald G. Fink Prize Paper Award. He also won 2010, 2016, and 2017 IEEE Transactions on Evolutionary Computation Outstanding Paper Awards, 2011 IEEE Transactions on Neural Networks Outstanding Paper Award, and many other best paper awards. He received a prestigious Royal Society Wolfson Research Merit Award in 2012, the IEEE CIS Evolutionary Computation Pioneer Award in 2013 and the 2020 IEEE

Frank Rosenblatt Award. He was the President (2014-15) of IEEE CIS and the Editor-in-Chief (2003-08) of IEEE Transactions on Evolutionary Computation.

T9 Dynamic Multi-objective Optimization: Introduction, Challenges, Applications and Future Directions, Mardé Helbig, Australia

Most optimization problems in real-life have more than one objective, with at least two objectives in conflict with one another and at least one objective/constraint that changes over time. These kinds of optimization problems are referred to as dynamic multi-objective optimization (DMOO) problems (DMOPs). Instead of re-starting the optimization process after a change in the environment has occurred, previous knowledge is used and if the changes are small enough, this may lead to new solutions being found much quicker.

Most research in multi-objective optimization has been conducted on static problems and most research on dynamic problems has been conducted on single-objective optimization. The goal of a single-objective dynamic optimization algorithm is to find the most optimal solution and only one solution exists. However, due to the conflicting objectives of a DMOP, a single solution does not exist. Therefore, the goal of a DMOO algorithm (DMOA) is to find an optimal set of trade-off solutions that is as close as possible to the true set of solutions and that contains a diverse set of solutions (similar to static MOO). However, in addition to these goals a DMOA also has to track the changing set of optimal solutions over time. Therefore, the DMOA also has to deal with the problems of a lack of diversity and outdated memory (similar to dynamic single-objective optimization). This tutorial will introduce the participants to the field of DMOO

Presenter: Dr Mardé Helbig is a Senior Lecturer at the School of ICT at Griffith University in Australia. Her research focuses on solving dynamic multi- objective optimization (DMOO) problems using computational intelligence algorithms. She is the chair of the IEEE CIS Chapters sub- committee, co-chair of the IEEE CIS mentoring sub-committee, and a sub-committee member of the IEEE CIS Young Professionals and IEEE Women in CI. She has organised special sessions and presented tutorials and keynotes on DMOO at various conferences, including IEEE WCCI 2018 and GECCO 2021. She is the special sessions chair at SSCI2021. She is a member of the South African Young Academy of Science and has received the 2018/2019 TW Kambule-NSTF: Emerging Researcherpage2image49624576 award for her research in DMOO.

T10 Machine Learning models, adversarial attacks and defense strategies, Dipankar Dasgupta and Kishor Datta Gupta, USA

Adversarial attacks can disrupt any AI based system functionalities; while handling such attacks are challenging, but also provide significant research opportunities. The tutorial will cover emerging adversarial machine learning attacks on systems and the state-of-the- art defense techniques. First, we will explore how and where adversarial attacks can happen in an AI framework. We will then present classification of adversarial attacks and their severity and applicability for AI/ML-based security. We will discuss limitations of existing defenses in their implementation. Following that, we will present possible research directions in addressing adversarial learning challenges.

Presenters: Dr. Dipankar Dasgupta is a Professor of Computer Science at the University of Memphis; he completed his Ph.D in 1994 in the area of nature-inspired algorithms for Search and Optimization. His research interests are broadly in the area of scientific computing, design, and development of intelligent solutions inspired by biological processes. His book, "Immunological Computation", is a graduate level textbook, was published by CRC press in 2009. He also edited two books: one on Evolutionary Algorithms in Engineering Applications (1996) and the other is entitled "Artificial Immune Systems and Their Applications", published by Springer-Verlag in 2008 . His latest textbook on Advances in User Authentication will be published by Springer- Verlag, 2016. Dr. Dasgupta has more than 300 publications with 18000+ citations and having h-index of 62 as per Google scholar. He received four Best Paper Awards at international conferences (1996, 2006, 2009, and 2012) and two Best Runner-Up Paper Awards (2013 and 2014). Among other awards, he is the recipient of 2012 Willard R. Sparks Eminent Faculty Award, the

highest distinction and most prestigious honor given to a faculty member by the University of Memphis. Prof. Dasgupta received the 2014 ACM SIGEVO Impact Award, and also designated as an ACM Distinguished Speaker from 2015-2020.

Kishor Datta Gupta completed his Ph.D. in computer science from the University of Memphis in 2021. He is currently working as a Post-doc scholar at North Carolina A&T University and presently researching Autonomous system vulnerabilities. His research interest includes evolutionary computation, Adversarial machine learning, algorithm bias. He is co-inventor of adversarial defense system patent.

T11 Decomposition Multi-Objective Optimization: Current Developments and Future Opportunities, Ke Li, UK

Evolutionary multi-objective optimization (EMO) has been a major re- search topic in the field of evolutionary computation for many years. It has been generally accepted that combination of evolutionary algorithms and traditional optimization methods should be a next generation multi-objective optimization solver. As the name suggests, the basic idea of the decomposition-based technique is to transform the original complex problem into simplified subproblem(s) so as to facilitate the optimization. Decomposition methods have been well used and studied in traditional multi-objective optimization. MOEA/D decomposes a multi-objective problem into a number of subtasks, and then solves them in a collaborative manner. MOEA/D provides a very natural bridge between multi-objective evolutionary algorithms and traditional decomposition methods. It has been a commonly used evolutionary algorithmic framework in recent years. Within this tutorial, a comprehensive introduction to MOEA/D will be given and selected research results will be presented in more detail. More specifically, we are going to (i) introduce the basic principles of MOEA/D in comparison with other two state-of-the-art EMO frameworks, i.e., Pareto- and indicator-based frameworks; (ii) present a general overview of state-of-the-art MOEA/D variants and their applications; (iii) discuss the future opportunities for possible further developments.

Presenter: Ke Li is a Senior Lecturer (Associate Professor) in Computer Science at the Department of Computer Science, University of Exeter. He earned his PhD from City University of Hong Kong. Afterwards, he spent a year as a postdoctoral research associate at Michigan State University. Then, he moved to the UK and took the post of research fellow at University of Birmingham. His current research interests include the evolutionary multi-objective optimization, automatic problem solving, machine learning and applications in water engineering and software engineering. He is the founding chair of IEEE CIS Task Force on Decomposition-based Techniques in Evolutionary Computation. He currently serves as an associate editor of IEEE Transactions on Evolutionary Computation, International Journal of Machine Learning and Cybernetics and Complex & Intelligent Systems. He served as a guest editor in Neurocomputing Journal and Multimedia Tools and Applications Journal. His current research interests include the evolutionary multi-objective optimization, automatic problem solving, machine learning and applications in water engineering and software engineering. Recently, he has been awarded a prestigious UKRI Future Leaders Fellowship.

T12 How to Estimate Time Complexity of Your Evolutionary Algorithm?, Han Huang, China

Time complexity analysis, which qualitatively describes the runtime of algorithms, is an important and fundamental problem in the field of evolutionary computing. Current theoretical results are mainly based on the simplified algorithms, while there are few analysis results of the existing state-of-the-art evolutionary algorithms in practical application. This tutorial focuses on introducing the estimation of the time complexity of evolutionary algorithms in practical application and aims at bridging the gap between the theoretical basis and practical application.

Presenter: Han Huang received the B.Man. degree in information management and information system from the School of Mathematics, South China University of Technology (SCUT), Guangzhou, China, in 2003, and the Ph.D. degree in computer science from the South China University of Technology, Guangzhou, in 2008. He is currently a Professor with the School of Software Engineering, SCUT. His research interests include evolutionary computation, and swarm intelligence and their application. He is the

Associate Editor of IEEE Transactions on Evolutionary Computation, and the Member of IEEE CS, SMC, ACM and CCF. He is also the reviewer for the peer-refereed journals including IEEE Transaction on Evolutionary Computation, IEEE Transaction on Cybernetics, Information Science, and Soft Computing. He has published over 60 papers in international journals such as IEEE TETC, IEEE TSE, IEEE TEVC, IEEE TIP, IEEE TFS, IEEE TII, IEEE CIM, and IEEE TCYB. Besides, he is the principal investigator of the research project“Research on computational time complexity comparison and estimation methods of evolutionary algorithms” funded by the National Natural Science Foundation of China (61876207).

Plenary Speakers



Nic Lane (University of Cambridge and Samsung AI)

Nic Lane is a Senior Lecturer (Associate Professor) in the department of Computer Science and Technology at the University of Cambridge where he leads the Machine Learning Systems Lab (CaMLSys — <http://mllsys.cst.cam.ac.uk/>). Alongside his academic role, he is also a Director (On-Device and Distributed Machine Learning) at the Samsung AI Center in Cambridge. Of late, Nic research has specialized in the study of efficient machine learning, and over the last five years he has pioneered a range of embedded and mobile forms of deep learning. Nic has received multiple best paper awards, including ACM/IEEE IPSN 2017 and two from ACM UbiComp (2012 and 2015). In 2018 and 2019, he (and his co-authors) received the ACM SenSys Test-of-Time award and ACM SIGMOBILE Test-of-Time award for pioneering research, performed during his PhD thesis, that devised machine learning algorithms used today on devices like smartphones. Most recently, Nic is the 2020 ACM SIGMOBILE Rockstar award winner for his contributions to “the understanding of how resource-constrained mobile devices can robustly understand, reason and react to complex user behaviors and environments through new paradigms in learning algorithms and system design.”

Flower: A Friendly Federated Learning Framework

Abstract: Federated Learning (FL) has emerged as a promising technique for edge devices to collaboratively learn a shared prediction model, while keeping their training data on the device, thereby decoupling the ability to do machine learning from the need to store the potentially privacy sensitive user data in the cloud. However, despite the rapid progress made in FL in recent years, it still remains far too difficult to evaluate FL algorithms under a full range of realistic system constraints (viz. compute, memory, energy, wired/wireless networking) and scale (thousands of federated devices and larger). As a consequence, our understanding of how these factors influence FL performance and should shape the future evolution of FL algorithms remains in a very underdeveloped state. In this talk, I will describe how we have begun to address this situation by developing Flower — an open-source framework (<http://flower.dev>) built to help bridge this gap in evaluation and design. Through Flower, it becomes relatively simple to measure the impact of common real-world FL situations, such as if devices have limited compute (e.g., an embedded device), or when network speeds are highly varied and unstable. I will highlight early empirical observations, made using Flower, as to what the implications are for existing algorithms under the types of heterogeneous large-scale FL systems we anticipate will increasingly appear. I will also show the benefits of Flower for FL design by detailing our recent study of federated end-to-end speech recognition. Using Flower, we devise a solution able to train effective federated speech models even under extremely heterogeneous data: speech samples from 2,000 real users — this represents the largest successful experiment of its type to date. Finally, to showcase the flexibility of Flower, I will show how it can even be used to make assessments of the carbon footprint of FL in various settings — to the best of our knowledge, this is the first time FL has been studied from the perspective of its environmental impact.



Sanghamitra Bandyopadhyay (Indian Statistical Institute, Kolkata)

Prof. Sanghamitra Bandyopadhyay did her B Tech, M Tech and Ph. D. in Computer Science from Calcutta University, IIT Kharagpur and Indian Statistical Institute respectively. She then joined the Indian Statistical Institute as a faculty member, and became the Director in 2015. Since 2020 she is continuing in her second tenure as the Director of the Institute. Her research interests include computational biology, soft and evolutionary computation, artificial intelligence and machine learning. She has authored/co-authored several books and numerous articles in journals, book chapters, and conference proceedings and has a citation h-index of 54. Prof. Bandyopadhyay has worked in many Institutes and Universities worldwide. She is the recipient of several awards including the Shanti Swarup Bhatnagar Prize in Engineering Science, TWAS Prize, Infosys Prize, Swarnajayanti fellowship, INAE Silver Jubilee award, INAE Woman Engineer of the Year award (academia), IIT Kharagpur Distinguished Alumni, Humboldt Fellowship from Germany, Senior Associateship of ICTP, Italy, several young engineer/scientist awards, and Dr. Shanker Dayal Sharma Gold Medal and Institute Silver from IIT, Kharagpur, India. She is a Fellow of the Indian National Science Academy (INSA), National Academy of Sciences, India (NASI), National Academy of Engineers (INAE), Institute of Electrical and Electronic Engineers (IEEE), The World Academy of Sciences (TWAS), International Association for Pattern Recognition (IAPR) and West Bengal Academy of Science and Technology.

Multimodal, Multiobjective Optimization Problems: Decomposition in Decision and Objective Spaces

Abstract: Multi-objective optimization problems (MOPs) deal with optimizing multiple conflicting objectives to attain the state of Pareto-optimality, where improving solutions in terms of one objective only leads to deterioration in terms of one or more of the other objectives. Multi-modal MOPs (MMMOPs) are those problems 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. However, algorithms purely designed for MOPs are unable to cater to this requirement as they do not seek multiple solution subsets. In contrast to such algorithms, approaches designed for MMMOPs show good solution diversity in the solution space (often by using crowding distance) at the cost of relatively poor performance (convergence and diversity) in the objective space. In this talk, we will touch upon the basic concepts in MMMOPs, and identify a problem of the existing approaches, which we refer to as the crowding illusion problem due to the usage of crowding distance over the entire solution space. We will then describe a method of solving MMMOPs with a graph Laplacian-based Optimization using Reference vector assisted Decomposition (LORD). Experimental results comparing the performance of LORD with the state-of-the-art algorithms for MOPs and MMMOPs on CEC 2019 multi-modal multi-objective test suite and polygon problems will be presented. The talk will conclude with a mention of some areas of further research in MMMOPs.



Hussein Abbass (University of New South Wales Canberra)

Hussein Abbass is a Full Professor in the School of Engineering and Information Technology, University of New South Wales, Canberra (UNSW Canberra) Campus. He has been with UNSW Canberra since March 2000, and a full professor since 2007. Before joining UNSW Canberra, he was an academic with Cairo University since 1995. Before that, he was working for industry in the IT domain. Prof. Abbass is a Fellow of IEEE, a Fellow of the Australian Computer Society, a Fellow of the UK Operations Research Society, and a Fellow of the Australian Institute of Managers and Leaders. Prof. Abbass is the Founding Editor-in-Chief of the IEEE Transactions on Artificial Intelligence and an Associate Editor of a number of IEEE journals and ACM Computing Surveys. In addition to his basic research into AI theory, algorithms, and human-AI-teaming, he has applied his research to a wide variety of applications.

Artificial Intelligence is Not There Yet!

Abstract: In this talk, I will commence with a quick scan throughout the history of Artificial Intelligence (AI) to demonstrate that many challenges for AI since its inception remain as significant research gaps awaiting brave steps from the community to tackle. I will define AI and Computational Intelligence (CI) to disambiguate them and ensure transparency when delving deeper in the AI challenges. I will also offer concise mathematical definitions for interpretability, explainability, transparency, predictability, and symbiomemesis as core concepts underneath these challenges. The presentation will then polarise on one challenge: Trusted Human-AI Teaming. I will show how CI methods are well positioned to contribute to this challenge.

Keynote Speakers

IEEE ESCO Keynote: Scheduling Dynamic Job Shops – An Anticipative and a Self-Organization Approach



Professor Jürgen Branke, University of Warwick, UK

Most practical scheduling problems are dynamic and stochastic: New jobs arrive over time and need to be integrated into the schedule, machines break down, raw material is delivered late, etc. In this talk, we present two quite different approaches to tackle such dynamic scheduling problems. Both utilize evolutionary algorithms, but in very different ways. The first approach is to re-schedule whenever new information becomes available. As we show, it is then advantageous to search for solutions that are not only good with respect to the primary objective (e.g., minimising tardiness), but also flexible and easy to adapt when new information becomes available. Evolutionary algorithms can be modified easily to take this into account. The second approach renounces planning and uses self-organization principles in form of simple priority rules to decide, based on local information, which job should be processed on a machine when this machine becomes available. Such an approach is very popular in practice, but it is quite challenging to design effective priority rules for a particular shop. Hyperheuristics can automatically design shop-floor specific priority rules yielding much better performance than human-designed priority rules.

IEEE DL Keynote: Interpretable Neural Networks for Computer Vision: Clinical Decisions that are Computer-Aided, not Automated



Professor Cynthia Rudin, Duke University

Let us consider a difficult computer vision challenge. Would you want an algorithm to determine whether you should get a biopsy, based on an xray? That's usually a decision made by a radiologist, based on years of training. We know that algorithms haven't worked perfectly for a multitude of other computer vision applications, and biopsy decisions are harder than just about any other application of computer vision that we typically consider. The interesting question is whether it is possible that an algorithm could be a true partner to a physician, rather than making the decision on its own. To do this, at the very least, we would need an interpretable neural network that is as accurate as its black box counterparts. In this talk, I will discuss two approaches to interpretable neural networks: (1) case-based reasoning, where parts of images are compared to other parts of prototypical images for each class, and (2) neural disentanglement, using a technique called concept whitening. The case-based reasoning technique is strictly better than saliency maps, and the concept whitening technique provides a strict advantage over the posthoc use of concept vectors. Here are the papers I will discuss:

This Looks Like That: Deep Learning for Interpretable Image Recognition. NeurIPS spotlight, 2019.
<https://arxiv.org/abs/1806.10574>

Concept Whitening for Interpretable Image Recognition. Nature Machine Intelligence, 2020.
<https://rdcu.be/cbOKj>

Stop Explaining Black Box Machine Learning Models for High Stakes Decisions and use Interpretable Models Instead, Nature Machine Intelligence, 2019.
<https://rdcu.be/bBCPd>

IAIA-BL: A Case-based Interpretable Deep Learning Model for Classification of Mass Lesions in Digital Mammography, 2021.
<https://arxiv.org/abs/2103.12308>

Interpretable Machine Learning: Fundamental Principles and 10 Grand Challenges, 2021
<https://arxiv.org/abs/2103.11251>

Biography: Cynthia Rudin is a professor of computer science, electrical and computer engineering, and statistical science at Duke University, and directs the Prediction Analysis Lab, whose main focus is in interpretable machine learning. She is also an associate director of the Statistical and Applied Mathematical Sciences Institute (SAMSI). Previously, Prof. Rudin held positions at MIT, Columbia, and NYU. She holds an undergraduate degree from the University at Buffalo, and a PhD from Princeton University. She is a three-time winner of the INFORMS Innovative Applications in Analytics Award, was named as one of the "Top 40 Under 40" by Poets and Quants in 2015, and was named by Businessinsider.com as one of the 12 most impressive professors at MIT in 2015. She is a fellow of the American Statistical Association and a fellow of the Institute of Mathematical Statistics. Some of her (collaborative) projects are: (1) she has developed practical code for optimal decision trees and sparse scoring systems, used for creating models

for high stakes decisions. Some of these models are used to manage treatment and monitoring for patients in intensive care units of hospitals. (2) She led the first major effort to maintain a power distribution network with machine learning (in NYC). (3) She developed algorithms for crime series detection, which allow police detectives to find patterns of housebreaks. Her code was developed with detectives in Cambridge MA, and later adopted by the NYPD. (4) She solved several well-known previously open theoretical problems about the convergence of AdaBoost and related boosting methods. (5) She is a co-lead of the Almost-Matching-Exactly lab, which develops matching methods for use in interpretable causal inference.

IEEE FASLIP Keynote: Fake Images through Learning of Fast Evolutionary GAN



Professor Andy Song, RMIT University, Australia

Generative Adversarial Networks (GAN) are well known for their capability of generating photo-realistic images or data collections that appear real. One of state-of-the-art approaches in GAN is Evolutionary GAN (E-GAN) which can outperform other GAN methods by leveraging the advantages of evolutionary computing, including population based search, mutation and elitism operators. Evolutionary search is often demanding in terms of resources, e.g. computational power and time. That limits its applicability when resource is limited. Partial Transfer learning can improve the efficiency of E-GAN. With the method, the training of generators and discriminators can be achieved with smaller data sets as features can be transferred across different stages of training. Besides the improved performance, it requires less resources to achieve a similar performance as E-GAN. Through partial transfer learning we can speed up generative adversarial learning.

Biography: Andy Song is an Associate Professor at the School of Computing Technologies, RMIT University. He is the associated director of the Centre for Industrial AI Research and Innovation. His research interests include evolutionary computing, machine learning and machine vision, especially EC based learning for solving complex real-world problems, such as texture analysis, motion detection, activity recognition, event detection, and optimisation. He has been active in establishing cutting-edge techniques, which integrate machine intelligence, mobile and crowd sensing, to benefit transportation, logistics and warehouse industry. He collaborates with a wide range of industry partners. He has received multiple awards for his research works, including the prestigious Australian iAwards. He regularly publishes his papers in top evolutionary computing and AI journals and conferences. He serves in several several journals and committees. He was one of the local chairs of IJCAI 2017. He is the secretary of the National AI Committee of Australia, a knowledge partner of OECD, a taskforce member of B20 and the AI directors of a few companies.

IEEE CICA Keynote: Explicit and Implicit Learning Strategies in Computational Modelling of Human Motor Systems



Professor Ying Tan, University of Melbourne, Australia

This talk first presents a computational human model system (HMS), which is developed to capture the learning capacity of a human subject in adapting his or her movements in the presence of novel dynamics when the explicit feedback is used. Such an explicit learning mechanism can be modelled by various iterative learning control (ILC) algorithms, which are able to characterize human learning behaviours through repetitive processes. The ILC can perform the adaptation based on a set of experimental data captured from the natural behaviour of the individual of interest. The resulting computational model is experimentally validated. Such a technique yields the capability of subject specific modelling of the motor function, as is required for prediction of individual behaviour in physical rehabilitation. The second part of this talk will present our recent work, which aims to induce a motor adaption in an experimental setup solely relying on the effort without any explicit error feedback. That is, the subjects have neither instruction nor indication regarding the preferred movement, suggesting that healthy subjects can adapt their movements unconsciously. The results demonstrate the feasibility of inducing motor adaptation by some interventions without explicit error feedback nor instruction. Our future work will explore how to utilize both explicit learning and implicit learning strategies in control design and synthesise of rehabilitation robotic systems in rehabilitation processes.

Biography: Ying Tan is a full professor at the Department of Mechanical Engineering (DEEE) at The University of Melbourne, Australia. She received her bachelor's degree from Tianjin University, China, in 1995, and her PhD from the National University of Singapore in 2002. She joined McMaster University in 2002 as a postdoctoral fellow in the Department of Chemical Engineering. Since 2004, she has been with the University of Melbourne. She was awarded an Australian Postdoctoral Fellow (2006-2008) and a Future Fellow (2009-2013) by the Australian Research Council. Her research interests are in data-driven optimization, sampled-data distributed systems, rehabilitation robotic systems, and human-robot interfaces.

IEEE CICS Keynote: Solving Software Security Challenges with Artificial Intelligence



Professor Laurie Williams, NC State University, USA

Software security lies at the intersection of software engineering and cybersecurity – building security into a product. Software security techniques focus on preventing the injection of vulnerabilities and detecting the vulnerabilities that make their way into a product or the deployment pipeline before the product is released. Increasingly, artificial intelligence is being used to power software security techniques to aid organizations in deploying secure products. This talk will present a landscape of research and practice at the intersection of software engineering, cybersecurity, and artificial intelligence to solve cybersecurity challenges. The talk will also present research projects conducted by the speaker’s own research group.

Biography: Laurie Williams is a Distinguished University Professor in the Computer Science Department of the College of Engineering at North Carolina State University (NCSU). Laurie is a co-director of the NCSU Science of Security Lablet sponsored by the National Security Agency, the NCSU Secure Computing Institute, and is the Principal Cybersecurity Technologist of the SecureAmerica Institute. Laurie’s research focuses on software security; agile software development practices and processes, particularly continuous deployment; and software reliability, software testing and analysis. Laurie is an ACM and an IEEE Fellow.

IEEE CISDA Keynote: Disruptive AI for Defense



Professor Jason Scholz, Chief Executive Officer, Trusted Autonomous Systems Defence CRC

The delivery of disruptive AI technologies and innovations to Defence through research and development isn't easy. To understand why, we consider the drivers of the past and how warfare is transformed by computational intelligence in this 'age of free silicon'. Defence platforms have typically been *complex* to ensure they are capable in battle, *large* in order to carry an array of defences to keep people alive, and *few* because they are so expensive we can't afford more and as a result we can't afford to lose them. However, we are at a tipping point, the application of AI, miniaturisation, digital design, and low production costs are witness to disruptive changes towards the *Smart, Small* and the *Many*. This transformation in Defence will be described, along with some of the new challenges this brings. Examples of the 'smart, small and many' developed through the Trusted Autonomous Systems Defence Centre in Australia will be highlighted. These will include "Cognitive ISR" for fully-autonomous coordinated unmanned aircraft missions in denied areas, and "Fire Fly" a self-organising high-altitude balloon constellation for locating wildfires and providing communication for responders. Key to this future is the legal, ethical and regulatory assurance of systems. One area will be described where AI can assist in response to situations of laws of armed conflict (LOAC) concern; such as a weapon system capable of identifying a red cross on a target and autonomously calling off a strike.

Biography: Jason is the Chief Executive Officer at Trusted Autonomous Systems and also contributes research leadership in the Decision Sciences. His formal background in Electrical and Electronic Engineering (Bachelors Degree and PhD), and over 30 years' experience in AI and decision-making covering all areas of Command, Control, Communications and Intelligence (C3I). Jason was Exchange Scientist with the US Air Force Research Lab in New York state. He was research leader for the Vital Planning and Analysis (VIPA) system which saved Defence well over \$120m and is in operational use. Prior to commencing with Trusted Autonomous Systems, he was responsible to the Chief Defence Scientist for the Strategic Research Initiative in trusted autonomous systems, and to the five-eyes community as chair of the Autonomy Strategic Challenge which culminated in 2018 in Autonomous Warrior 18, the largest trial of autonomous systems in air, land, sea environments ever conducted. Jason is a graduate of the Australian Institute of Company Directors and a tenured Innovation Professor with RMIT University. Jason is passionate about building sovereign capability for the Nation, and ensuring the high-impact research, development and innovation of the Centre transitions for operational use by the ADF. In 2020 Jason was awarded the Australian Naval Institute Mc Neil Prize presented annually to "...an individual from Australian industry and academia who has made an outstanding contribution to the capabilities of the Royal Australian Navy".

IEEE CIIOT Keynote: Edge-AI Meets Mission-critical Industrial Applications

Professor Albert Y. Zomaya, University of Sydney, Australia

Abstract: In the past few decades, industrial automation has become a driving force in a wide range of industries. There is a broad agreement that the deployment of computing resources close to where data is created is more business-friendly, as it can address system latency, privacy, cost, and resiliency challenges that a pure cloud computing approach cannot address. This computing paradigm is now known as Edge Computing. Having said that, the full potential of this transformation for both of computing and data analytics is far from being realized. The industrial requirements are much more stringent than what a simple edge computing paradigm can deliver. This is particularly true when mission-critical industrial applications have strict requirements on real-time decision making, operational technology innovation, data privacy, and running environment. In this talk, I aim to provide a few answers by combining real-time computing strengths into modern data- and intelligence-rich computing ecosystems. I will also explore the topic of Edge AI, which is a process in which the Edge systems uses machine learning algorithms to process data generated by the user's devices.

Biography: Albert Y. ZOMAYA is Chair Professor of High-Performance Computing & Networking in the School of Computer Science and Director of the Centre for Distributed and High-Performance Computing at the University of Sydney. To date, he has published > 600 scientific papers and articles and is (co-)author/editor of >30 books. A sought-after speaker, he has delivered >250 keynote addresses, invited seminars, and media briefings. His research interests span several areas in parallel and distributed computing and complex systems. He is currently the Editor in Chief of the ACM Computing Surveys and served in the past as Editor in Chief of the IEEE Transactions on Computers (2010-2014) and the Founding Editor in Chief IEEE Transactions on Sustainable Computing (2016-2020). Professor Zomaya is a decorated scholar with numerous accolades including Fellowship of the IEEE, the American Association for the Advancement of Science, and the Institution of Engineering and Technology (UK). Also, he is an Elected Fellow of the Royal Society of New South Wales and an Elected Foreign Member of Academia Europaea. He is the recipient of the 1997 *Edgeworth David Medal* from the Royal Society of New South Wales for outstanding contributions to Australian Science, the *IEEE Technical Committee on Parallel Processing Outstanding Service Award* (2011), *IEEE Technical Committee on Scalable Computing Medal for Excellence in Scalable Computing* (2011), *IEEE Computer Society Technical Achievement Award* (2014), *ACM MSWIM Reginald A. Fessenden Award* (2017), and the *New South Wales Premier's Prize of Excellence in Engineering and Information and Communications Technology* (2019).

IEEE CIDM Keynote: Real-Time Distributed Learning Using Kernel Methods

Professor Anthony Kuh, University of Hawaii, USA

In recent years there have been many applications where data comes from distributed sources and with the increasing computational capabilities of edge devices more computing, processing and machine learning is done at the edge. Applications range from monitoring the environment to healthcare to transportation to energy to social networking. The edge devices could be sensors from a sensor network, IoT devices, mobile phones, or intelligent assistants. The edge devices learn from data they receive with popular methods including Federated Learning (FL). FL has advantages with learning done by edge devices thereby eliminating the need for data to be transmitted to the cloud or central processor. These advantages include communication savings, increased security, and addressing privacy concerns. In this presentation, we discuss real-time FL using kernel methods. We discuss real-time learning as much of the data in applications is dynamic or streaming requiring online learning and decision-making. Kernel methods are used as online nonlinear linear algorithms can easily be developed using tools from adaptive signal processing and convex optimization approaches. We show how online kernel methods can be modified for distributed learning and FL. Online FL kernel algorithms are developed, analyzed, and compared via simulation studies.

Biography: Anthony Kuh received his B.S. in Electrical Engineering and Computer Science at the University of California, Berkeley in 1979, an M.S. in Electrical Engineering from Stanford University in 1980, and a Ph.D. in Electrical Engineering from Princeton University in 1987. Dr. Kuh previously worked at AT&T Bell Laboratories and has been on the faculty in Electrical Engineering at the University of Hawai'i since 1986. He is currently a Professor in the Department, serving as director of the interdisciplinary renewable energy and island sustainability (REIS) group. Previously, he served as Department Chair of Electrical Engineering. Dr. Kuh's research is in the area of neural networks and machine learning, adaptive signal processing, sensor networks, and renewable energy and smart grid applications. Dr. Kuh won a National Science Foundation Presidential Young Investigator Award and is an IEEE Fellow. He was also a recipient of the Boeing A. D. Welliver Fellowship and received a Distinguished Fulbright Scholar's Award working at Imperial College in London. From 2017 to 2021, he served as program director for NSF in the Electrical, Communications, and Cyber Systems (ECCS) division working in the Energy, Power, Control, and Network (EPCN) group. At NSF he also assisted in initiatives including Harnessing the Data Revolution (HDR), the Mathematics of Deep Learning (MoDL), the AI Institutes, Cyber Physical Systems (CPS), and Smart and Connected Communities. He currently serves on the Awards Board of the IEEE Signal Processing Society and is President of the Asia Pacific Signal and Information Processing Association.

IEEE SSCI 2021 Panel and Activity Sessions

Panel Session: Students and Young Professionals Activity: How to write research papers and grant proposals

Organised by the IEEE Computational Intelligence Society Students Activities Sub-Committee

Panel Aim

In this virtual activity, three speakers will share their experience and suggestions of writing research papers and grant proposals, followed by Q&A.

Panel Co-chairs

- Dr. Jialin Liu, Southern University of Science and Technology, China.
- Dr. Chao Qian, Nanjing University, China.
- Dr. Harith Al-Sahaf, Victoria University of Wellington, New Zealand.

Talk: How to Write Research Papers?

Speaker: Prof. Xin Yao, Southern University of Science and Technology, China

Abstract: The title of this talk is a question that is impossible to answer correctly. In fact, it is not even an appropriate question to ask in the first place. Unfortunately, I am stuck with this title because I am incapable of coming up with a better one. In this talk, I will first explain why this is not an ideal question to ask. Then I will share some of my own experiences of doing research and reporting research outcomes. Some of these experiences have taught me what not to do, in addition to what I should have done. Finally, a few random remarks will be made.

Talk: Securing Research Funding, for PhD students and Post Docs

Speakers: Prof. Carola Doerr and Dr. Martin Krejca, Sorbonne Université, CNRS, LIP6, Paris, France

Abstract: Almost every researcher needs to apply for research funding at some point in their career. In this presentation, we will 1) provide an overview of major grant types for PhD and Post Doc positions, for research visits, and conference attendance, 2) discuss best practices for contacting potential hosts, and 3) share best practices for how to write a good grant proposal. The presentation will have a strong focus on European funding schemes, but we will do our best to collect and to make available relevant information for funding opportunities for other regions. Such a list will be linked from the homepage of Carola, available at <https://webia.lip6.fr/~doerr/>.

Panel Session: Using AI to establish sustainably trustworthy and responsible research and innovation

Organised by the IEEE Computational Intelligence Society Task Force on Ethical and Social Implications of Computational Intelligence

Panel Aim

To provide academia and industry with an overview of the current ethical AI landscape to discuss and debate how to establish sustainably trustworthy and responsible research and innovation.

Discussion themes include (but are not limited to):

- The impact of emerging global legislation on data and AI ethics on conducting AI research and innovation.
- Responsibility and Accountability in the AI decision making
- Algorithm bias in machine learning
- Can Industry Self-regulation Deliver 'Ethical AI'?
- Sustainable and Responsible AI
- Citizen involvement in conceptualisation of AI products and services to build trust.

Panel Co-chairs

- Professor Keeley Crockett, Manchester Metropolitan University, UK.
- Professor Matt Garratt, UNSW Canberra, Australia,

Panelists

- Dr Jennifer Boger (PhD, PEng), Director, Intelligent Technology for Wellness and Independent Living (ITWIL) lab, Adjunct Assistant Professor, Systems Design Engineering, University of Waterloo, Research Scientist, Research Institute for Aging
- Dr. Ansgar Koene, Global AI Ethics and Regulatory Leader at EY (Ernst & Young)
- Dr Carolyn Ashurst, Senior Research Associate in Safe and Ethical AI at the Alan Turing Institute
- Prof. Bob Reynolds, College of Engineering, Wayne State University

Panel Session: The Future of Computational Intelligence is Diversity

Co-organised by IEEE Women in Computational Intelligence

Panel Aim

To discuss diversity and inclusion themes within the field of Computational Intelligence (CI) and explore the role of diversity and inclusion in designing responsible CI research and technological innovation.

Discussion themes include (but are not limited to):

- What do we mean by diversity and inclusion?
- Why is it important (in general) and specifically in Computational Intelligence?
- The impact of unconscious bias
- Building a culture of diversity and inclusion in tech.
- The role of IEEE TAB Diversity and Inclusion committee

Panel Co-chairs

- Professor Keeley Crockett, Manchester Metropolitan University, UK.
- Professor Svetlana Yanushkevich, University of Calgary, Canada

Panelists

- Ms Naeemeh Adel, PhD candidate, Manchester Metropolitan University, UK
- Prof. Dalma Novak, Chair IEEE TAB Diversity and Inclusion Committee, VP of Engineering at Octane Wireless, USA
- Prof. Nelishia Pillay, Professor at the University of Pretoria, South Africa
- Prof. Yanan Sun, College of Computer Science, Sichuan University, China.
- Prof. Bing Xue, Professor in Artificial Intelligence, and Program Director of Science in School of Engineering and Computer Science at Victoria University of Wellington.

IEEE CIS Technical Challenge

Third IEEE-CIS Technical Challenge: Predict+Optimize for Renewable Energy Scheduling (US\$20k in prizes)

The IEEE Computational Intelligence Society (IEEE CIS) presents its third technical challenge, this year on the topic of scheduling for demand flexibility and battery usage in an uncertain renewable energy setting. We want to improve scheduling based on energy production and demand forecasting, based on data from the Monash microgrid with rooftop solar installations and batteries for energy storage.

IEEE-CIS works across a variety of Artificial Intelligence and machine learning areas, including deep neural networks, fuzzy systems, evolutionary computation, and swarm intelligence. Today they're partnering with Monash University (Melbourne, Australia), seeking the best solutions for battery and load scheduling, and now you are invited to join the challenge. Winners will be invited to present their solution at the 2021 IEEE Symposium Series on Computational Intelligence (SSCI).

IEEE SSCI Virtual Social Events and Networking

IEEE SSCI 2021 Virtual networking and social events will take place on Gather Town. Visit the CONFlux virtual platform to join Gather and meet fellow attendees.

Gather.Town will be available throughout the conference.

Please join us at the following social and networking opportunities.

- 5th December Virtual Reception: 2pm – 3pm New York Time
- 6th December Virtual Meet and Greet (Bring your own coffee!): 6am – 7am New York Time
- 6th December Virtual Social Event – with dedicated rooms for Women in Computational Intelligence, Young Professionals and Students: 2pm – 3pm New York Time
- 7th December Virtual Meet and Greet (Bring your own coffee!): 5am – 6am New York Time

Sunday, December 5

Technical Program

+++ Note: The time is “New York, USA” time Zone (Eastern Standard Time)

Sunday 5 December 2021

Tutorial T5: Genetic Programming for Job Shop Scheduling

Sunday, December 5, 5:00AM-7:00AM, Room: Room 1, Instructor: Fangfang Zhang, Mengjie Zhang

Tutorial T7: Embedding Knowledge Into Optimization Process

Sunday, December 5, 5:00AM-7:00AM, Room: Room 2, Instructor: Amir H. Gandomi

Tutorial T9: Dynamic Multi-objective Optimization: Introduction, Challenges, Applications and Future Directions

Sunday, December 5, 5:00AM-7:00AM, Room: Room 3, Instructor: Marde Helbig

Tutorial T8: Evolutionary Continuous Dynamic Optimization

Sunday, December 5, 5:00AM-7:00AM, Room: Room 4, Instructor: Danial Yazdani, Xin Yao

Tutorial T2: Evolutionary Algorithms and Hyper-Heuristics

Sunday, December 5, 5:00AM-7:00AM, Room: Room 5, Instructor: Nelishia Pillay

Tutorial T1: Advances in Evolutionary Multi-Criterion Optimization

Sunday, December 5, 7:00AM-9:00AM, Room: Room 1, Instructor: Kalyanmoy Deb

Tutorial T6: Knowledge Graphs: A Practical Introduction across Disciplines

Sunday, December 5, 7:00AM-9:00AM, Room: Room 2, Instructor: Mayank Kejriwal

Tutorial T10: Machine Learning models, adversarial attacks and defense strategies

Sunday, December 5, 7:00AM-9:00AM, Room: Room 3, Instructor: Dipankar Dasgupta, Kishor Datta Gupta

Tutorial T12: How to Estimate Time Complexity of Your Evolutionary Algorithm?

Sunday, December 5, 7:00AM-9:00AM, Room: Room 4, Instructor: Han Huang

Tutorial T3: Advances in Particle Swarm Optimization Development, Analysis, and Understanding

Sunday, December 5, 7:00AM-9:00AM, Room: Room 6, Instructor: Andries Engelbrecht, Christopher Cleghorn

Tutorial T4: Essentials of Fuzzy Networks

Sunday, December 5, 7:00AM-9:00AM, Room: Room 7, Instructor: Alexander Gegov, Farzad Arabikhan

Tutorial T11: Decomposition Multi-Objective Optimization: Current Developments and Future Opportunities

Sunday, December 5, 7:00AM-9:00AM, Room: Room 8, Instructor: Ke Li

Sunday, December 5

Session: IEEE CIS Technical Challenge

Sunday, December 5, 7:00AM-9:00AM, Room: Room 5, Chair: Christoph Bergmeir

7:00 AM Welcome

Luis Magdalena, IEEE CIS VP for Technical Activities

7:05 AM Introduction to the 3rd IEEE CIS Technical Challenge and summary of results Christoph Bergmeir and Frits de Nijs

7:15 AM Presentation 1

Rasul Esmailbeigi

7:30 AM Presentation 2

Richard Bean

7:45 AM Presentation 3

Steffen Limmer

8:00 AM Presentation 4

Julian Ruddick

8:15 AM Presentation 5

Qingling Zhu

8:30 AM Presentation 6

Yogesh Pipada Sunil Kumar

8:45 AM Presentation 7

Akylas Stratigakos

Panel Session PA1: How to write an Early Career Grant Application?

Sunday, December 5, 9:00AM-10:30AM, Room: Room 1, Chairs: Jialin Liu, Chao Qian, Harith Al-Sahaf

Welcome Speech from the General Chairs and IEEE CIS President

Sunday, December 5, 10:30AM-11:00AM, Room: Room 1, Chairs: Keeley Crockett, Sanaz Mostaghim

Plenary Talk PI1: Flower: A Friendly Federated Learning Framework

Sunday, December 5, 11:00AM-12:00PM, Room: Room 1, Speaker: Nicholas Lane, Chair: Manuel Roveri

Sunday, December 5

Session CIBD: Novel CI Methods of Big Data Acquisition/CI in Distributed Computing of Big Data/Data Mining in Big Data

Sunday, December 5, 12:00PM-1:00PM, Room: Room 5, Chair: Handing Wang, Yaochu Jin

- 12:00PM The Internet of Tall Buildings [#1080]
Huber Nieto-Chaupis
Universidad Autonoma del Peru, Peru
- 12:12PM An Experimental Study of Class Imbalance in Federated Learning [#1542]
Chenguang Xiao and Shuo Wang
University of Birmingham, United Kingdom
- 12:24PM Distributed Ensemble Feature Selection Framework for High-Dimensional and High-Skewed Imbalanced Big Dataset [#1335]
Majid Soheili and Maryam Amir Haeri
Computer Engineering Department Neka Branch, Islamic Azad University, Neka, Iran, Iran;
Learning, Data-Analytics and Technology Department, University of Twente, Netherlands
- 12:36PM Convergence Analysis of Gravity-Based Clustering (GBC) Algorithm [#1492]
Mohammad Askarizadeh, Abolfazl Javidian, Masoumeh Zare and Kim Khoa Nguyen
ETS University of Montreal, Canada; SBUK University, Iran; University of Montreal, Canada
- 12:48PM Ensemble2Net: Learning from Ensemble Teacher Networks via Knowledge Transfer [#1399]
Chih-Lin Chang, Shiou-Chi Li and Jen-Wei Huang
National Cheng Kung University, Taiwan

Session MCDM1: Evolutionary algorithms and other metaheuristics for multi-objective optimization I

Sunday, December 5, 12:00PM-1:00PM, Room: Room 6, Chair: Hemant Singh, Kalyanmoy Deb

- 12:00PM Benchmarking Many-Objective Topology and Weight Evolution of Neural Networks: A Study with NEWS/D [#1262]
Adham Salih and Amiram Moshaiov
Tel-Aviv University, Israel
- 12:12PM Periodical Weight Vector Update Using an Unbounded External Archive for Decomposition-Based Evolutionary Multi-Objective Optimization [#1272]
Longcan Chen, Lie Meng Pang, Hisao Ishibuchi and Ke Shang
Southern University of Science and Technology, China
- 12:24PM A Generator for Scalable SAT Constrained Multi-Objective Optimization Benchmark Problems [#1523]
Felipe Honjo Ide, Hernan Aguirre, Minami Miyakawa and Darrell Whitley
Shinshu University, Japan; Colorado State University, United States
- 12:36PM Initial Population Generation Method and its Effects on MOEA/D [#1549]
Cheng Gong, Lie Meng Pang and Hisao Ishibuchi
Southern University of Science and Technology, China
- 12:48PM A Multi-objective Multimodal Evolutionary Algorithm Using a Novel Tournament and Environmental Selections [#1102]
Mahrokh Javadi and Sanaz Mostaghim
Faculty of Computer Science, Otto von Guericke University, Magdeburg, Germany

Sunday, December 5

Session CIBCI: Computational intelligence for BCI signal processing/Computational intelligence for BCI feature extraction/Computational intelligence for BCI pattern recognition/Computational intelligence for emerging BCI applications

Sunday, December 5, 12:00PM-1:00PM, Room: Room 7, Chair: Yu-Kai Wang, Gang Li

- 12:00PM Electrode Selection and Convolutional Attention Network for Recognition of Silently Spoken Words from EEG Signals [#1400]
Sahil Datta, Jorunn Jo Holmberg and Elena Antonova
Brunel University London, United Kingdom
- 12:12PM Normalized Canonical Correlation Analysis for Calibrating the Background EEG Activity in SSVEP Detection [#1358]
Chun-Shu Wei
National Yang Ming Chiao Tung University, Taiwan
- 12:24PM Comparing Autonomic Physiological and Electroencephalography Features for VR Sickness Detection Using Predictive Models [#1510]
Li Gang, Onuoha Ogechi, McGill Mark, Brewster Stephen, Chen Chao Ping and Pollick Frank
University of Glasgow, United Kingdom; Shanghai Jiao Tong University, China; University of Glasgow, Great Britain
- 12:36PM A Closed-Loop AR-based BCI for Real-World System Control [#1384]
Campbell Gorman and Yu-Kai Wang
University of Technology Sydney, Australia
- 12:48PM Intention Detection of Gait Adaptation in Natural Settings [#1313]
Ines Domingos, Guang-Zhong Yang and Fani Deligianni
Imperial College London, United Kingdom; Shanghai Jiao Tong University, China; University of Glasgow, United Kingdom

Session IA1: Neural Networks and Deep Learning/Evolutionary Algorithms

Sunday, December 5, 12:00PM-1:00PM, Room: Room 8, Chair: Sabrina Senatore, Mario G.C.A. Cimino

- 12:00PM Combining Self-critical dynamics and Hebbian learning to explain utility of bursty dynamics in neural networks [#1425]
Ivan Shpurov and Tom Froese
Okinawa Institute of Science and Technology Graduate University, Japan
- 12:12PM Investigating Neural Network Architectures, Techniques, and Datasets for Autonomous Navigation in Simulation [#1504]
Jared Mejia, Christiana Marchese, Oliver Chang and Anthony Clark
Pomona College, United States
- 12:24PM MCS-HMS: A Multi-Cluster Selection Strategy for the Human Mental Search Algorithm [#1447]
Ehsan Bojnordi, Seyed Jalaleddin Mousavirad, Gerald Schaefer and Iakov Korovin
Information Technology Department, Iranian National Tax Administration, Iran; Computer Engineering Department, Hakim Sabzevari University, Iran; Department of Computer Science, Loughborough University, United Kingdom; Southern Federal University, Russia
- 12:36PM Towards Feature-Free Automated Algorithm Selection for Single-Objective Continuous Black-Box Optimization [#1531]
Raphael Patrick Prager, Moritz Vinzent Seiler, Heike Trautmann and Pascal Kerschke
University of Muenster, Germany; TU Dresden, Germany

Sunday, December 5

- 12:48PM Promoting Behavioral Diversity via Multi-Objective/Quality-Diversity Novelty Producing Synaptic Plasticity [#1282]
Edoardo Bizzotto, Anil Yaman and Giovanni Iacca
University of Trento, Italy; Korea Advanced Institute of Science and Technology, Korea, Republic of

Session CICS1: Intrusion/malware detection, prediction, classification, and response Sensor network security, web security, wireless, and 4G, 5G media security I

Sunday, December 5, 12:00PM-1:00PM, Room: Room 1, Chair: Dipankar Dasgupta, Kaushik Roy

- 12:00 PM **Keynote: Solving Software Security Challenges with Artificial Intelligence** *Laurie Williams*
- 12:36PM Efficient Detection of GPS Spoofing Attacks on Unmanned Aerial Vehicles Using Deep Learning [#1140]
Richmond Agyapong, Mahmoud Nabil, Abdul-Rauf Nuhu, Mushahid Rasul and Abdollah Homaifar
North Carolina Agricultural & Technical State University, United States
- 12:48PM An Intrusion Response Approach for Elastic Applications Based on Reinforcement Learning [#1153]
Stefano Iannucci, Emiliano Casalicchio and Matteo Lucantonio
Mississippi State University, United States; Sapienza University of Rome, Italy

Session CIDM1: Neural Networks and Data Mining

Sunday, December 5, 12:00PM-1:00PM, Room: Room 2, Chair: Zhen Ni

- 12:00 PM **Keynote: Real-Time Distributed Learning Using Kernel Methods** *Anthony Kuh*
- 12:36PM AutoLL: Automatic Linear Layout of Graphs based on Deep Neural Network [#1112]
Chihiro Watanabe and Taiji Suzuki
The University of Tokyo, Japan; The University of Tokyo, RIKEN, Japan
- 12:48PM Predicting the Trends of Stock Price By Social Networks and Fuzzy Deep Support Vector Machine [#1250]
Hao Pei-Yi
Department of Intelligent Commerce. National Kaohsiung University of Science and Technology, Taiwan

Session DL1: DL Theory

Sunday, December 5, 12:00PM-1:00PM, Room: Room 3, Chair: Alessandro Sperduti, Jose Principe

- 12:00 PM **Keynote: Interpretable Neural Networks for Computer Vision: Clinical Decisions that are Computer-Aided, not Automated** *Cynthia Rudin*
- 12:36PM CLC: Noisy Label Correction via Curriculum Learning [#1258]
Jaeyoon Lee, Hyuntak Lim and Ki-Seok Chung
Hanyang University, Korea (South)
- 12:48PM Neural Metric Learning using Contrastive Anchors to Enforce Feature Separability [#1314]
Charlie Veal, Marshall Lindsay, Scott Kovaleski, Derek Anderson and Stanton Price
University of Missouri, United States; U.S. Army Engineer Research and Development Center, United States

Sunday, December 5

Session ESCO1: Machine learning for scheduling and combinatorial optimisation/Project Scheduling

Sunday, December 5, 12:00PM-1:00PM, Room: Room 4, Chair: Yi Mei

- 12:00PM **Keynote: Scheduling Dynamic Job Shops – An Anticipative and a Self-Organization Approach**
Juergen Branke
- 12:36PM Intelligent Strategies to Combine Move Heuristics in Selection Hyper-heuristics for Real-World Fibre Network Design Optimisation [#1433]
Anil Arpaci, Jun Chen, John Drake and Tim Glover
Queen Mary University of London, United Kingdom; University of Leicester, United Kingdom; British Telecom, United Kingdom
- 12:48PM Investigation of Linear Genetic Programming for Dynamic Job Shop Scheduling [#1107]
Zhixing Huang, Yi Mei and Mengjie Zhang
Victoria University of Wellington, New Zealand

Session CICS2: Intrusion/malware detection, prediction, classification, and response Sensor network security, web security, wireless, and 4G, 5G media security II

Sunday, December 5, 1:00PM-2:00PM, Room: Room 1, Chair: Dipankar Dasgupta, Kaushik Roy

- 1:00PM Explainability of Cybersecurity Threats Data Using SHAP [#1167]
Rafa Alenezi and Simone A. Ludwig
North Dakota State University, United States
- 1:12PM Classifying DNS Tunneling Tools For Malicious DoH Traffic [#1168]
Rafa Alenezi and Simone A. Ludwig
North Dakota State University, United States
- 1:24PM Rallying Adversarial Techniques against Deep Learning for Network Security [#1185]
Joseph Clements, Yuzhe Yang, Ankur Sharma, Hongxin Hu and Yingjie Lao
Clemson University, United States; University at Buffalo, United States
- 1:36PM Investigation of Domain Name System Attack Clustering using Semi-Supervised Learning with Swarm Intelligence Algorithms [#1213]
Hussain Al Ibrahim and Simone Ludwig
North Dakota State University, United States
- 1:48PM Compositional Linear Regression on Interval-valued Data [#1435]
Direnc Pekaslan and Christian Wagner
University of Nottingham, United Kingdom

Session CIDM2: Machine learning and deep learning algorithms I

Sunday, December 5, 1:00PM-2:00PM, Room: Room 2, Chair: Zhen Ni

- 1:00PM Second-order Time Delay Reservoir Computing for Nonlinear Time Series Problems [#1273]
Shi Xinming, Gao Jiashi, Minku Leandro L., Yu James J. Q. and Yao Xin
University of Birmingham, United Kingdom; Southern University of Science and Technology, China
- 1:12PM DIBERT: Dependency Injected Bidirectional Encoder Representations from Transformers [#1286]
Abdul Wahab and Rafet Sifa
Fraunhofer IAIS, Germany
- 1:24PM Balanced K-means using Quantum annealing [#1340]
Ahmed Zaiou, Younes Bennani, Basarab Matei and Mohamed Hibti
EDF lab paris saclay, France; LIPN, France

Sunday, December 5

- 1:36PM Fast Non-Parametric Conditional Density Estimation using Moment Trees [#1417]
Fabian Hinder, Valerie Vaquet, Johannes Brinkrolf and Barbara Hammer
CITEC, Bielefeld University, Germany
- 1:48PM Online Learning on Non-Stationary Data Streams for Image Recognition using Deep Embeddings [#1357]
Valerie Vaquet, Fabian Hinder, Jonas Vaquet, Johannes Brinkrolf and Barbara Hammer
Bielefeld University, Germany

Session DL2: (Efficient) Algorithms for DL and Deep Reinforcement Learning

Sunday, December 5, 1:00PM-2:00PM, Room: Room 3, Chair: Alessandro Sperduti, Jose Principe

- 1:00PM ClaRe-GAN: Generation of Class-Specific Time Series [#1078]
Hiba Arnout, Johanna Bronner and Thomas Runkler
Technical University of Munich, Germany; Siemens AG, Germany; Siemens AG/ Technical University of Munich, Germany
- 1:12PM Initialization Method of Batch Uniformization Auto Encoder by Principal Component Analysis [#1337]
Shogo Takaoka, Takuya Kitamura, Aiga Suzuki and Masahiro Murakawa
University of Tsukuba, Japan; National Institute of Technology, Toyama College, Japan; National Institute of Advanced Industrial Science and Technology, Japan
- 1:24PM Enhancing Adversarial Examples on Deep Q Networks with Previous Information [#1311]
Korn Sooksatra and Pablo Rivas
Baylor university, United States
- 1:36PM One run to attack them all: finding simultaneously multiple targeted adversarial perturbations [#1114]
Leonardo Lucio Custode and Giovanni Iacca
University of Trento, Italy
- 1:48PM Model Selection - Knowledge Distillation Framework for Model Compression [#1533]
Renhai Chen, Shimin Yuan, Shaobo Wang, Zhenghan Li, Meng Xing and Zhiyong Feng
Tianjin University, China

Session ESCO2: Production Scheduling

Sunday, December 5, 1:00PM-2:00PM, Room: Room 4, Chair: Nelishia Pillay

- 1:00PM Towards Interpretable Dispatching Rules: Application of Expression Simplification Methods [#1065]
Lucija Planinic, Marko Durasevic and Domagoj Jakobovic
University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia
- 1:12PM Solving Large-scale Relay Satellite Scheduling Problem with A Dynamic Population Firework Algorithm: A Case Study [#1235]
Yanjie Song, Bingyu Song, Yang Huang, Lining Xing and Yingwu Chen
National University of Defense Technology, China
- 1:24PM Encoder-Decoder Neural Network Architecture for solving Job Shop Scheduling Problems using Reinforcement Learning [#1363]
Ricardo Magalhaes, Miguel Martins, Susana Vieira, Filipe Santos and Joao Sousa
Instituto Superior Tecnico, Portugal
- 1:36PM Hybrid Flowshop Scheduling using Leaders and Followers: An Implementation with Iterated Greedy and Genetic Algorithm [#1512]
Tsung-Su Yeh and Tsung-Che Chiang
National Taiwan Normal University, Taiwan

Sunday, December 5

- 1:48PM Meeting Demands for Mass Customization: A Hybrid Organic Computing Approach [#1388]
Thomas Seidelmann, Jens Weise and Sanaz Mostaghim
Otto von Guericke University Magdeburg, Germany

Session SS10: Population dynamics in evolutionary computation: Insight, analysis, and visualization

Sunday, December 5, 1:00PM-2:00PM, Room: Room 5, Chair: Pavel Kromer

- 1:00PM On the common population diversity measures in metaheuristics and their limitations [#1441]
Michal Pluhacek, Adam Viktorin, Tomas Kadavy and Anezka Kazikova
Tomas Bata University in Zlin, Czech Republic
- 1:12PM On Modifications Towards Improvement of the Exploitation Phase for SOMA Algorithm with Clustering-aided Migration and Adaptive Perturbation Vector Control [#1529]
Tomas Kadavy, Adam Viktorin, Michal Pluhacek and Stanislav Kovar
Tomas Bata University in Zlin, Czech Republic
- 1:24PM Novelty Search in Particle Swarm Optimization [#1565]
Adam Ulrich, Adam Viktorin, Michal Pluhacek, Tomas Kadavy and Jan Krnavek
Tomas Bata University in Zlin, Czech Republic
- 1:36PM Towards Better Visualization of Permutation Evolution [#1522]
Pavel Kromer
VSB - Technical University of Ostrava, Czech Republic
- 1:48PM The Impact of Population Size on the Convergence of Multi-objective Evolutionary Algorithms [#1406]
Tobias Benecke and Sanaz Mostaghim
Otto-von-Guericke-University Magdeburg, Germany

Session MCDM2: Evolutionary algorithms and other metaheuristics for multi-objective optimization II/Visualization Techniques/Preference Articulation for Multi-Objective Optimization

Sunday, December 5, 1:00PM-2:00PM, Room: Room 6, Chair: Hemant Singh, Kalyanmoy Deb

- 1:00PM An Ensemble of S-energy Based Mating Restrictions for Multi-Objective Evolutionary Algorithms [#1145]
Amin V. Bernabe Rodriguez and Carlos A. Coello Coello
CINVESTAV-IPN, Mexico
- 1:12PM A Comparative Study of Different Encodings on the Multi-Objective Pathfinding Problem [#1379]
Jens Weise, Heiner Zille and Sanaz Mostaghim
Otto von Guericke University Magdeburg, Germany
- 1:24PM Visualization-based Multi-Criterion Decision Making with NIMBUS Method Using PaletteViz [#1164]
Kalyanmoy Deb and AKM Khaled Talukder
Professor, Michigan State University, United States; PhD Student, Michigan State University, United States
- 1:36PM A Bi-Population Based Multi-Objective Evolutionary Algorithm Using Hybrid Identification Method for Finding Knee Points [#1193]
Junfeng Tang and Handing Wang
Xidian University, China
- 1:48PM A Customized Niching Methodology for the Many-Objective Pathfinding Problem [#1084]
Jens Weise and Sanaz Mostaghim
Otto von Guericke University Magdeburg, Germany

Sunday, December 5

Session CIEL: Ensemble methods for classification/Ensemble methods for optimization/Applications of Ensemble Methods

Sunday, December 5, 1:00PM-2:00PM, Room: Room 7, Chair: Ponnuthurai N. Suganthan

- 1:00PM Improving Diversity in Concept Drift Ensembles [#1133]
Jose Luis Perez, Laura Maria Marino and Roberto Barros
CIn-UFPE - Centro de Informatica, Universidade Federal de Pernambuco, Brazil
- 1:12PM Optimal N-ary ECOC Matrices for Ensemble Classification [#1249]
Hieu Nguyen, Lucas Lavalva, Shen-Shyang Ho, Mohammed Khan and Nicholas Kaegi
Rowan University, United States
- 1:24PM Model-agnostic Ensemble-based Explanation Correction Leveraging Rashomon Effect [#1134]
Masaki Hamamoto and Masashi Egi
Hitachi, Ltd., Japan
- 1:36PM Environment Sound Classification (ESC) with Choquet Integral Fusion [#1562]
Yilin Wang, Timothy Havens and Andrew Barnard
Michigan Technological University, United States
- 1:48PM Autonomous Learning with Automatically Created Models and a Novel Model Selection [#1521]
Harshal Bharatia
ACM Student Member, United States

Session IA2: Intelligent Agent Architectures/Reinforcement Learning/Intelligent Agents for Information Search, Retrieval and Navigation

Sunday, December 5, 1:00PM-2:00PM, Room: Room 8, Chair: Riyaz Sikora, Mario G.C.A. Cimino

- 1:00PM Interaction-Based Trust Evaluation in a Team of Agents Using a Determination of Trust Model [#1356]
Shuo Yang, Michael Barlow, Erandi Lakshika and Kathryn Kasmarik
University of New South Wales, Australia
- 1:12PM A Novel Learning and Response Generating Agent-based Model for Symbolic - Numeric Knowledge Modeling and Combination [#1454]
Alex Doboli and Simona Doboli
Stony Brook University, United States; Hofstra University, United States
- 1:24PM Swarm Reinforcement Learning Method Based on Hierarchical Q-Learning [#1382]
Yasuaki Kuroe, Kenya Takeuchi and Yutaka Maeda
Kansai University, Japan
- 1:36PM A Multi-Agent Knowledge-Enhanced Model for Decision-Supporting Agroforestry Systems [#1396]
Danilo Cavaliere and Sabrina Senatore
University of Salerno, Italy
- 1:48PM A co-evolutionary approach to interpretable reinforcement learning in environments with continuous action spaces [#1019]
Leonardo Lucio Custode and Giovanni Iacca
University of Trento, Italy

Monday, December 6

Session CICS3: Intrusion/malware detection, prediction, classification, and response Sensor network security, web security, wireless, and 4G, 5G media security III/Modeling adversarial behavior for insider and outsider threat detection

Monday, December 6, 7:00AM-8:00AM, Room: Room 1, Chair: Dipankar Dasgupta, Kaushik Roy

- 7:00AM Mitigating Poisoning Attack in Federated Learning [#1475]
Aashma Uprety and Danda B. Rawat
Howard University, United States
- 7:12AM Crown Jewels Analysis using Reinforcement Learning with Attack Graphs [#1442]
Rohit Gangupantulu, Tyler Cody, Abdul Rahman, Christopher Redino, Ryan Clark and Paul Park
Deloitte Consulting, LLC, United States; Virginia Polytechnic University, United States; Deloitte & Touche LLP, United States
- 7:24AM Automated Behavior-based Malice Scoring of Ransomware Using Genetic Programming [#1464]
Muhammad Shabbir Abbasi, Harith Al-Sahaf and Ian Welch
Victoria University of Wellington, New Zealand
- 7:36AM A Performance-Oriented Comparison of Neural Network Approaches for Anomaly-based Intrusion Detection [#1497]
Stefano Iannucci, Jesse Ables, William Anderson, Bhuvanesh Abburi, Valeria Cardellini and Ioana Banicescu
Mississippi State University, United States; University of Rome "Tor Vergata", Italy
- 7:48AM Similarity Analysis of Ransomware based on Portable Executable (PE) File Metadata [#1305]
Md. Ahsan Ayub and Ambareen Siraj
Tennessee Tech University, United States

Session DL3: Trustworthy DL/Learning representations/Applications of Deep Learning I

Monday, December 6, 7:00AM-8:00AM, Room: Room 4, Chair: Alessandro Sperduti, Jose Principe

- 7:00AM Hierarchical Open-Set Recognition for Automatic Target Recognition [#1277]
Walter Bennette, Nathaniel Hofmann, Nathaniel Wilson and Tyler Witter
Air Force Research Lab, Information Directorate, United States; Northeastern University, United States
- 7:12AM Clustering in Recurrent Neural Networks for Micro-Segmentation using Spending Personality [#1231]
Charl Maree and Christian Omlin
University of Agder, Norway
- 7:24AM Symbolic regression for scientific discovery: an application to wind speed forecasting [#1004]
Ismail Alaoui Abdellaoui and Siamak Mehrkanoon
DKE, Maastricht University, Netherlands
- 7:36AM Image Captioning using Deep Learning: Text Augmentation by Paraphrasing via Backtranslation [#1051]
Ingrid Ravn Turkerud and Ole Jakob Mengshoel
NTNU, Norway
- 7:48AM Dynamic Context in Graph Neural Networks for Item Recommendation [#1092]
Asma Sattar and Davide Bacciu
University of Pisa, Italy

Monday, December 6

Session CICARE1: (Bio-, health-, medical-, neuro-) informatics and signal and image analysis systems

Monday, December 6, 7:00AM-8:00AM, Room: Room 7, Chair: Mufti Mahmud

- 7:00AM Exploiting the Differential Wavelet Domain of Resting-State EEG Using a Deep-CNN for Screening Parkinson's Disease [#1017]
Mohamed Shaban, Stephen Cahoon, Fiza Khan and Mahalia Polk
University of South Alabama, United States
- 7:12AM Slopewise Aggregate Approximation SAX: keeping the trend of a time series [#1150]
Lamprini Pappa, Petros Karvelis, George Georgoulas and Chrysostomos Stylios
Dept. of Informatics and Telecommunications, University of Ioannina, Greece; Dept. of Informatics and Telecommunications, University of Ioannina, Greece; Industrial Systems Institute, Athena Research Center, Greece
- 7:24AM A Comparative Study of Fuzzy Topic Models and LDA in terms of Interpretability [#1401]
Emil Rijcken, Floortje Scheepers, Pablo Mosteiro, Kalliopi Zervanou, Marco Spruit and Uzay Kaymak
Eindhoven University of Technology, Netherlands; University Medical Centre Utrecht, Netherlands; Utrecht University, Netherlands; Leiden University Medical Centre, Netherlands
- 7:36AM Generalized Automated Energy Function Selection for Protein Structure Prediction on 2D and 3D HP Models [#1530]
Mustafa Misir
Istinye University; Duke Kunshan University, Turkey
- 7:48AM Selection-based Per-Instance Heuristic Generation for Protein Structure Prediction of 2D HP Model [#1538]
Mustafa Misir
Istinye University; Duke Kunshan University, Turkey

Session SIS1: Ant colony optimization algorithms/Brain storm optimization algorithms/Other swarm intelligence algorithms

Monday, December 6, 7:00AM-8:00AM, Room: Room 8, Chair: Qiqi Duan, Sanaz Mostaghim

- 7:00AM A Greedy Approach to Ant Colony Optimisation Inspired Mutation for Permutation Type Problems [#1432]
Darren Chitty
University of Exeter, United Kingdom
- 7:12AM UGV Path Planning based on an Improved Continuous Ant Colony Optimisation Algorithm [#1484]
Jing Liu, Aya Hussein, Sreenatha Anavatti, Matthew Garratt and Hussein Abbass
University of New South Wales, Australia
- 7:24AM BSO-ES: A Hybrid Direct Policy Search Algorithm for Reinforcement Learning [#1371]
Youkui Zhang, Liang Zhang, Qiqi Duan and Yuhui Shi
Southern University of Science and Technology, China
- 7:36AM HMS-OS: Improving the Human Mental Search Optimisation Algorithm by Grouping in both Search and Objective Space [#1290]
Seyed Jalaeddin Mousavirad, Gerald Schaefer, Iakov Korovin, Diego Oliva, Mahshid Helali Moghadam and Mehrdad Saadatmand
Hakim Sabzevari University, Iran; Loughborough University, United Kingdom; Southern Federal University, Russia; Universidad de Guadalajara, Mexico; RISE Research Institutes of Sweden, Sweden

Monday, December 6

- 7:48AM A Hierarchical Simple Probabilistic Population-Based Algorithm Applied to the Dynamic TSP [#1361]
Edward Kupfer, Hoang Thanh Le, Johanna Zitt, Ying-Chi Lin and Martin Middendorf
Leipzig University, Germany

Session CIOT1: CI Applications in IoT I

Monday, December 6, 7:00 AM-8:00 AM, Room: Room 2, Chair: Amir H. Gandomi

- 7:00 AM **Keynote: Edge-AI Meets Mission-critical Industrial Applications**
Albert Y. Zomaya
- 7:36AM A Review on Serious Games in E-learning [#1246]
Huansheng Ning, Hang Wang, Wenxi Wang, Xiaozhen Ye, Jianguo Ding and Per Backlund
the School of Computer and Communication Engineering, University of Science and Technology Beijing, China; the Department of Computer Science, Blekinge Institute of Technology, Sweden; University of Skovde, Sweden
- 7:48AM An Online Intelligent Task Pricing Mechanism Based on Reverse Auction in Mobile Crowdsensing Networks for the Internet of Things [#1256]
Bing Jia, Haodong Cen, Xi Luo, Shuai Liu, Khan Muhammad, Amir H. Gandomi and Victor Hugo C. de Albuquerque
Inner Mongolia University, China; Hunan Normal University, China; Sejong University, Korea (South); University of Technology Sydney, Australia; Federal University of Ceara, Brazil

Session FASLIP1: Image Analysis

Monday, December 6, 7:00AM-8:00AM, Room: Room 3, Chair: Bing Xue, Mengjie Zhang

- 7:00 AM **Keynote: Fake Images through Learning of Fast Evolutionary GAN**
Andy Song
- 7:36AM Simulator of Vehicle-Mounted Camera Video to Verify Dynamic Saliency Maps for Predicting Drivers' Gaze Points [#1139]
Rintarou Mizuno, Sorach Nakazawa and Yohei Nakada
Graduate School of Advanced Mathematical Sciences, Meiji University, Japan
- 7:48AM Using Machine Learning to Detect Rotational Symmetries from Reflectional Symmetries in 2D Images [#1161]
Koen Ponse, Anna V. Kononova, Maria Loleyt and Bas van Stein
Leiden University, Netherlands; Ornamika, Russia

Session CISDA1: Situational Assessment, Intelligence Gathering and Exploitation/Energy Aware Computational Intelligence

Monday, December 6, 7:00 AM-8:00AM, Room: Room 5, Chair: Robert Hunjet, Rami Abielmona

- 7:00 AM **Keynote: Disruptive AI for Defence**
Jason Scholz
- 7:36AM Maritime Incident Information Extraction using Machine and Deep Learning Techniques [#1469]
Andrew Mackenzie, Alex Teske, Rami Abielmona and Emil Petriu
Larus Technologies, Canada; University of Ottawa, Canada
- 7:48AM Evaluating Machine Learning Classifiers for Data Sharing in Internet of Battlefield Things [#1477]
Hassan Karim and Danda Rawat
Howard University, United States

Monday, December 6

Session CICA1: Control and Decision

Monday, December 6, 7:00AM-8:00AM, Room: Room 6, Chair: Daoyi Dong, Xiaojun Zeng

- 7:00 AM **Keynote: Explicit and Implicit Learning Strategies in Computational Modelling of Human Motor Systems**
Ying Tan
- 7:36AM Translation of Time Series Data from Controlled DC Motors using Disentangled Representation Learning [#1079]
Hiba Arnout, Johanna Bronner, Johannes Kehrer and Thomas Runkler
Technical University of Munich, Germany; Siemens AG, Germany; Siemens AG/ Technical University of Munich, Germany
- 7:48AM Applying Context State Machines to Smart Elevators: Design, Implementation and Evaluation [#1148]
Songhui Yue and Randy Smith
The University of Alabama, United States

Session CICS4: Identity science, authentication, and access control I

Monday, December 6, 8:00AM-9:00AM, Room: Room 1, Chair: Dipankar Dasgupta, Kaushik Roy

- 8:00AM Image Encryption Algorithm based on Particle Swarm Optimization and Chaos Logistic Map [#1212]
Hussain Al Ibrahim and Simone Ludwig
North Dakota State University, United States
- 8:12AM EMO-GAT: An Evolutionary Multi-Objective Method for Adversarial Training [#1431]
Marcellus Smith, Brown Brown, Gerry Dozier and Michael King
Auburn University, United States; Florida Institute of Technology, United States
- 8:24AM An Attack Tree Based Risk Analysis Method for Investigating Attacks and Facilitating Their Mitigations in Self-Sovereign Identity [#1462]
Nitin Naik, Paul Grace and Paul Jenkins
Aston University, United Kingdom; Cardiff Metropolitan University, United Kingdom
- 8:36AM Fake News Detection: An Application of QuantumK-Nearest Neighbors [#1494]
Ziyan Tian and Sanjeev Baskiyar
Auburn University, United States
- 8:48AM Authentication Based on Touch Patterns Using an Artificial Immune System [#1482]
Nawaf Aljohani, Joseph Shelton and Kaushik Roy
Institute of Public Administration, Saudi Arabia; Virginia State University, United States; North Carolina Agricultural and Technical State University, United States

Session CIOT2: CI Applications in IoT II/CI Applications in Sensors

Monday, December 6, 8:00AM-9:00AM, Room: Room 2, Chair: Amir H. Gandomi

- 8:00AM Mobility-Aware Multi-Objective Task Allocation for Wireless Sensor Networks [#1452]
Dominik Weikert, Christoph Steup, David Atienza and Sanaz Mostaghim
Otto von Guericke University Magdeburg, Germany
- 8:12AM Self-learning Wavelet Compression Method for Data Transmission from Environmental Monitoring Stations with a Low Bandwidth IoT Interface [#1334]
Jaromir Konecny, Monika Borova and Michal Prauzek
VSB - Technical University of Ostrava, Czech Republic
- 8:24AM Reinforcement Learning-assisted Threshold Optimization for Dynamic Honeypot Adaptation to Enhance IoT Networks Security [#1499]
Elnaz Limouchi and Imad Mahgoub
Florida Atlantic University, United States

Monday, December 6

- 8:36AM A DRL based 4-r Computation Model for Object Detection on RSU using LiDAR in IIoT [#1253]
Ms Mekala, Rizwan Patan, Amir H. Gandomi, Ju H. Park and Ho-Youl Jung
Yeungnam University, Korea (South); Kennesaw State University, United States; University of Technology Sydney, Australia; Yeungnam University, Korea (South)
- 8:48AM Data-Driven Self-Learning Controller Design Approach for Power-Aware IoT Devices based on Double Q-Learning Strategy [#1333]
Tereza Paterova, Michal Prauzek and Jaromir Konecny
VSB - Technical University of Ostrava, Czech Republic

Session FASLIP2: Feature Extraction/Feature Learning

Monday, December 6, 8:00AM-9:00AM, Room: Room 3, Chair: Bing Xue, Mengjie Zhang

- 8:00AM Using Stain Decomposition for Nucleus Segmentation on Multisource H&E Slide Images [#1331]
Hung-Chun Hsu, Maria Gabrani, Antonio Foncubierto Rodriguez, Hung-Wen Tsai, Pau-Choo Chung and Yu-Ting Wu
National Cheng Kung University, Taiwan; IBM, Switzerland; National Cheng Kung University Hospital, Taiwan
- 8:12AM Anomaly Detection on the Rail Tracks Using Semantic Segmentation and Self-supervised Learning [#1420]
Kanwal Jahan, Jeethesh Pai Umesh and Michael Roth
German Aerospace Center (DLR), Germany
- 8:24AM Feature Selection for Fake News Classification [#1465]
Simen Sverdrup-Thygeson and Pauline C. Haddow
Norwegian University of Science and Technology, Norway
- 8:36AM Self-Organizing Transformations for Automatic Feature Engineering [#1466]
Ericks da Silva Rodrigues, Denis Mayr Lima Martins and Fernando Buarque de Lima Neto
University of Pernambuco, Brazil; University of Muenster, Germany
- 8:48AM Exploring Unsupervised Learning Methods for Automated Protocol Analysis [#1202]
Arijit Dasgupta, Yi Xue Yan, Clarence Ong, Buggy Jenn-Yue Teo and Andrew Chia-Wei Lim
National University of Singapore, Singapore; Nanyang Technological University, Singapore; DSO National Laboratories, Singapore

Session DL4: Applications of Deep Learning II

Monday, December 6, 8:00AM-9:00AM, Room: Room 4, Chair: Alessandro Sperduti, Jose Principe

- 8:00AM A Neural Anthropometer Learning from Body Dimensions Computed on Human 3D Meshes [#1093]
Yansel Gonzalez Tejeda and Helmut A. Mayer
Computer Science Department, Paris Lodron University of Salzburg, Austria
- 8:12AM Multistream Graph Attention Networks for Wind Speed Forecasting [#1183]
Dogan Aykas and Siamak Mehrkanon
DKE, Maastricht University, Netherlands
- 8:24AM Point Proposal Network: Accelerating Point Source Detection Through Deep Learning [#1207]
Duncan Tilley, Christopher Cleghorn, Kshitij Thorat and Roger Deane
University of the Witwatersrand, Johannesburg, South Africa; University of Pretoria, Pretoria, South Africa

Monday, December 6

- 8:36AM Joint Vehicle Trajectory and Cut-In Prediction on Highways using Output Constrained Neural Networks [#1234]
Mathis Brosowsky, Paul Orschau, Olaf Duenkel, Philip Elspas, Daniel Slieter and Marius Zoellner
Dr. Ing. h.c. F. Porsche AG; FZI Research Center for Information Technology; KIT Karlsruhe Institute of Technology, Germany; Dr. Ing. h.c. F. Porsche AG, Germany; KIT Karlsruhe Institute of Technology, Germany; FZI Research Center for Information Technology; KIT Karlsruhe Institute of Technology, Germany
- 8:48AM Connoisseur: Provenance Analysis in Paintings [#1293]
Lucas David, Helio Pedrini, Zanoni Dias and Anderson Rocha
Institute of Computing, University of Campinas, Brazil

Session CISDA2: Autonomy for Defense applications/Modeling and Simulation of Defense Operations/Defense and Security Applications

Monday, December 6, 8:00AM-9:00AM, Room: Room 5, Chair: Robert Hunjet, Rami Abielmona

- 8:00AM OACAL: Finding Module-consistent Specifications to Secure Systems from Weakened User Obligations [#1251]
Pengcheng Jiang and Kenji Tei
Waseda University, Japan; Waseda University / National Institute of Informatics, Japan
- 8:12AM An approximate dynamic programming approach to tackling mass evacuation operations [#1138]
Mark Rempel, Nicholi Shiell and Kaeden Tessier
Defence Research and Development Canada, Canada; Canadian Joint Operations Command, Canada
- 8:24AM Near-real-time Anomaly Detection in Encrypted Traffic using Machine Learning Techniques [#1264]
Daniele Ucci, Filippo Sobrero, Federica Bisio and Matteo Zorzino
aizoOn Technology Consulting, Italy
- 8:36AM Scaling Multi-Objective Optimization for Clustering Malware [#1424]
Noah MacAskill, Zachary Wilkins and Nur Zincir-Heywood
Dalhousie University, Canada
- 8:48AM Characterization of Deep Learning-Based Aerial Explosive Hazard Detection using Simulated Data [#1426]
Brendan Alvey, Derek Anderson, Clare Yang, Andrew Buck, James Keller, Ken Yasuda and Hollie Ryan
Department of EECS, University of Missouri, United States; DEVCOM C5ISR Center, U.S. Army, United States

Session CICA2: Intelligent Control Systems/Fuzzy Neural Systems and Control

Monday, December 6, 8:00AM-9:00AM, Room: Room 6, Chair: Daoyi Dong, Xiaojun Zeng

- 8:00AM Output Tracking Control Based on Piecewise Multilinear Models for a Class of MIMO Discrete-Time Nonlinear Systems [#1481]
Tadanari Taniguchi and Michio Sugeno
Tokai University, Japan; Tokyo Institute of Technology, Japan
- 8:12AM Leakage Detection for Pipe Systems with Fuzzy Monitoring Strategy [#1126]
Raheleh Jafari, Sina Razvarz, Cristobal Vargas-Jarillo, Alexander Gegov and Omar Ali
School of design, university of Leeds, Leeds, LS2 9JT, UK, United Kingdom; Departamento de Control Automatico, CINVESTAV-IPN (National Polytechnic Institute), Mexico City ;07360, Mexico, Mexico; School of Computing, University of Portsmouth, Portsmouth, United Kingdom, United Kingdom

Monday, December 6

- 8:24AM Compressing Interpretable Representations of Piecewise Linear Neural Networks using Neuro-Fuzzy Models [#1151]
Leon Glass, Wael Hilali and Oliver Nelles
Robert Bosch GmbH, Germany; University of Siegen, Germany
- 8:36AM Application on Vehicle Detector using Laser Ranging Image Sensor [#1328]
Lin Teng, Nobuhiro Watanabe, Takashi Izumi, Hiroaki Matsuzaki, Tomoaki Takahashi and Norio Kiryu
Nihon University, Japan; NIPPON SIGNAL CO., LTD., Japan
- 8:48AM Globally Finite-Time Stabilization of delayed Quaternion-Valued Neural Networks based on a class of Extended L-R Method [#1378]
Chengsheng Li and Jinde Cao
Southeast University, China

Session CICARE2: Computer vision, pattern recognition and machine learning applied to healthcare I

Monday, December 6, 8:00AM-9:00AM, Room: Room 7, Chair: Mufti Mahmud

- 8:00AM A preliminary evaluation of Echo State Networks for Brugada syndrome classification [#1113]
Giovanna Maria Dimitri, Claudio Gallicchio, Alessio Micheli, Maria-Aurora Morales, Emanuele Ungaro and Federico Vozzi
University of Pisa, Italy; CNR, Pisa, Italy
- 8:12AM CovXR: Automated Detection of COVID-19 Pneumonia in Chest X-Rays through Machine Learning [#1120]
Vishal Shenoy and Sachin Malik
Cupertino High School, United States; Stanford University Department of Radiology, United States
- 8:24AM Prediction model of response to standardized painful stimulation during general anesthesia: applying machine learning to the EEG signal [#1146]
Joan Altes, Jose F. Valencia, Sebastian Jaramillo and Pedro L. Gambus
Predictheon Medical S.L., Spain; Universidad de San Buenaventura, Colombia; Hospital Clinic de Barcelona, Spain
- 8:36AM UUnet: An effective cascade Unet for automatic segmentation of renal parenchyma [#1198]
Cao Gaoyu, Sun Zhanquan, Pan Minlan, Pang Jiangfei, He Zhiqiang and Shen Jiayu
University of Shanghai for Science and Technology, China
- 8:48AM Forecasting Ambulance Demand using Machine Learning: A Case Study from Oslo, Norway [#1214]
Anna H. Hermansen and Ole Jakob Mengshoel
NTNU, Norway

Session SIS2: Swarm intelligence for optimization problems I/Swarm intelligence for real applications

Monday, December 6, 8:00AM-9:00AM, Room: Room 8, Chair: Qiqi Duan, Sanaz Mostaghim

- 8:00AM Heuristic Hybridization for CaRSP, a multilevel decision problem [#1294]
Murilo Oliveira Machado, Elizabeth Ferreira Gouvea Goldbarg, Marco Cesar Goldbarg, Gustavo de Araujo Sabry, Islame Felipe da Costa Fernandes and Thiago Soares Marques
Universidade Federal do Mato Grosso do Sul, Brazil; Universidade Federal do Rio Grande do Norte, Brazil; Instituto Federal Baiano, Brazil
- 8:12AM A Study in Overlapping Factor Decomposition for Cooperative Co-Evolution [#1463]
Elliott Pryor, Amy Peerlinck and John Sheppard
Montana State University, United States

Monday, December 6

- 8:24AM Using Particle Swarm Optimization to Learn a Lane Change Model for Autonomous Vehicle Merging [#1280]
Na'Shea Wiesner, John Sheppard and Brian Haberman
Montana State University, United States; Johns Hopkins University, United States
- 8:36AM GBMPSO: Hybrid Gradient Boosting Machines with Particle Swarm Optimization in Cell Segmentation Data [#1483]
Temidayo Adeluwa, Eunjin Kim and Junguk Hur
University of North Dakota, United States
- 8:48AM A Comparative Study on Population-Based Evolutionary Algorithms for Multiple Traveling Salesmen Problem with Visiting Constraints [#1485]
Bao Cong, Yang Qiang, Gao Xu-Dong and Zhang Jun
School of Artificial Intelligence, Nanjing University of Information Science and Technology, China; Zhejiang Normal University, China

Panel Session PA2: Using AI to establish sustainably trustworthy and responsible research and innovation

Monday, December 6, 9:00AM-10:00AM, Room: Room 1, Chair: Keeley Crockett

Future Conference Presentations

Monday, December 6, 10:30AM-11:00PM, Room: Room 1, Chair: Sanaz Mostaghim and Keeley Crockett

Plenary Talk PI2: Multimodal, Multiobjective Optimization Problems: Decomposition in Decision and Objective Spaces

Monday, December 6, 11:00AM-12:00PM, Room: Room 1, Speaker: Sanghamitra Bandyopadhyay, Chair: Gary Yen

Session CICS5: Identity science, authentication, and access control II/Application Areas: Social network, electronic healthcare, big data, blockchain, digital forensics, and information visualization

Monday, December 6, 12:00PM-1:00PM, Room: Room 1, Chair: Dipankar Dasgupta, Kaushik Roy

- 12:00PM Adversarial UFP/UFN Attack Evolution [#1557]
Brandon Brown, Marcellus Smith, Sadaira Packer, Jabari Leslie, Cheryl Seals, Gerry Dozier and Micheal King
Auburn University, United States; Florida Institute of Technology, United States
- 12:12PM Evaluation of Gender Bias in Facial Recognition with Traditional Machine Learning Algorithms [#1569]
Mustafa Atay, Hailey Gipson, Tony Gwyn and Kaushik Roy
Winston-Salem State University, United States; North Carolina A&T State University, United States
- 12:24PM A Graph Database Supported GA-based Approach to Social Network Analysis [#1254]
Hui Ma, Hartmann Sven, Arnold Ariadi, Tao Shi and Sawczuk da Silva Alexandre
Victoria University of Wellington, New Zealand; Clausthal University of Technology, Germany
- 12:36PM Website Privacy Notification for the Visually Impaired [#1236]
Karen Schnell and Kaushik Roy
North Carolina A & T State University, United States
- 12:48PM Privacy-Preserving Online Mirror Descent for Federated Learning with Single-Sided Trust [#1179]
Olusola Odeyomi and Zaruba Gergely
Wichita State University, United States

Monday, December 6

Session CIDM3: Machine learning and deep learning algorithms II/Mining with Big Data/Data mining from nonstationary and drifting environments I

Monday, December 6, 12:00PM-1:00PM, Room: Room 2, Chair: Simone Ludwig

- 12:00PM Piecewise Simplification Approach for Accurate and Understandable Model [#1127]
Hiroyuki Namba and Masashi Egi
Hitachi, Ltd., Japan
- 12:12PM Segment Based Highway Traffic Flow Prediction in VANET Using Big Data Analysis [#1525]
Hani M Alnami, Imad Mahgoub and Hamzah Al-Najada
Florida Atlantic University, United States
- 12:24PM Task-Sensitive Concept Drift Detector with Constraint Embedding [#1279]
Andrea Castellani, Sebastian Schmitt and Barbara Hammer
CITEC, Bielefeld University, Germany; Honda Research Institute Europe GmbH, Germany
- 12:36PM Naive Importance Weighting for Data Stream with Intermediate Latency [#1297]
Pedro Henrique Parreira and Ronaldo Cristiano Prati
Federal University of ABC (UFABC), Brazil
- 12:48PM Dynamic-Radius Species-Conserving Genetic Algorithm for the Financial Forecasting of Cryptocurrencies [#1094]
Michael Brown
University of Maryland Baltimore County, United States

Session CIBIM1: Biometrics beyond vision/Similarity measures and applications in biometrics/Evaluation methods and algorithms

Monday, December 6, 12:00PM-1:00PM, Room: Room 3, Chair: Masood Khan, Svetlana Yanushkevich

- 12:00PM Subject and Activity-wise Performance for Activity Independent Person Recognition [#1550]
Seham Abd Elkader, Michael Barlow and Erandi Lakshika
University of New South Wales Canberra, Australia
- 12:12PM Scalable embedding of multiple perspectives for indefinite life-science data analysis [#1359]
Maximilian Muench, Simon Heilig, Philipp Vaeth and Frank-Michael Schleif
University of Groningen, Netherlands; University of Applied Sciences Wuerzburg-Schweinfurt, Germany
- 12:24PM Towards Frame-Level Person Identification Using Kinect Skeleton Data with Deep Learning [#1187]
Wenbing Zhao
Cleveland State University, United States
- 12:36PM Decision Support for Infection Outbreak Analysis: the case of the Diamond Princess cruise ship [#1495]
Helder C. R. Oliveira, Vlad Shmerko and Svetlana N. Yanushkevich
University of Calgary, Canada
- 12:48PM Compact CNN Models for On-device Ocular-based User Recognition in Mobile Devices [#1455]
Ali Almadan and Ajita Rattani
Wichita State University, United States

Monday, December 6

Session DL5: Applications of Deep Learning III

Monday, December 6, 12:00PM-1:00PM, Room: Room 4, Chair: Alessandro Sperduti, Jose Principe

- 12:00PM Separate Sound into STFT Frames to Eliminate Sound Noise Frames in Sound Classification [#1275]
Thanh Tran, Huy-Kien Bui, Nhat-Truong Pham, Marco Carratu, Consolatina Liguori and Jan Lundgren
Mid Sweden University, Sweden; Kyoto Institute of Technology, Japan; Ton Duc Thang University, Viet Nam; University of Salerno, Italy
- 12:12PM Improving transformer model translation for low resource South African languages using BERT [#1408]
Paddington Chiguvare and Christopher Cleghorn
University of Pretoria, South Africa; University of the Witwatersrand, South Africa
- 12:24PM Deep Learning Approaches to Remaining Useful Life Prediction: A Survey [#1457]
Logan Cummins, Brad Killen, Kirby Thomas, Paul Barret, Shahram Rahimi and Maria Seale
Mississippi State University, United States; U.S. Army, United States
- 12:36PM A Daily Tourism Demand Prediction Framework Based on Multi-head Attention CNN: The Case of The Foreign Entrant in South Korea [#1516]
Kim Dong-Keon, Shyn Sung Kuk, Kim Donghee, Jang Seungwoo and Kim Kwangsu
Sungkyunkwan University, Korea, Republic of
- 12:48PM 1D CNN Architectures for Music Genre Classification [#1307]
Safaa Allamy and Alessandro Lameiras Koerich
ETS Montreal, Canada

Session SS11a: Special Session on Games I

Monday, December 6, 12:00PM-1:00PM, Room: Room 5, Chair: Hamna Aslam

- 12:00PM Dynamic Difficulty Adjustment in Virtual Reality Exergames through Experience-driven Procedural Content Generation [#1269]
Tobias Huber, Silvan Mertes, Stanislava Rangelova, Simon Flutura and Elisabeth Andre
University of Augsburg, Germany
- 12:12PM Procedural Content Generation of Levels with Increased Connectedness using Complex String Generators [#1450]
Michael Dube and Daniel Ashlock
University of Guelph, Canada
- 12:24PM Creating Adjustable Human-like AI Behavior in a 3D Tennis Game with Monte-Carlo Tree Search [#1326]
Yuan Tu, Kaito Kimura, Maxim Mozgovoy and Riku Tanji
University of Aizu, Japan
- 12:36PM Adapting Procedural Content Generation to Player Personas Through Evolution [#1402]
Pedro M. Fernandes, Jonathan Jorgensen and Niels N. T. G. Poldervaart
INESC-ID and Instituto Superior Tecnico, Univ. de Lisboa, Portugal; Norwegian University of Science and Technology, Norway; Leiden University, Netherlands
- 12:48PM A Family of Turn-Based Strategy Games with Moose [#1423]
Daniel Ashlock, Joseph Alexander Brown, Connor Gregor and Munir Makhmutov
University of Guelph, Canada; Innopolis University, Russian Federation

Monday, December 6

Session ICES1:

Monday, December 6, 12:00PM-1:00PM, Room: Room 6, Chair: Andy Tyrrell, Martin Trefzer

- 12:00PM Evolution of Approximate Functions for Image Thresholding [#1218]
Michal Bidlo
Brno University of Technology, Czech Republic
- 12:12PM Spiking Neural Network-based Structural Health Monitoring Hardware System [#1071]
Aqib Javed, Jim Harkin, Liam McDaid and Liu Junxiu
Ulster University, Magee Campus, United Kingdom
- 12:24PM Adaptive Integer Quantisation for Convolutional Neural Networks through Evolutionary Algorithms [#1137]
Ziwei Wang, Martin Trefzer, Simon Bale and Andy Tyrrell
University of York, United Kingdom
- 12:36PM Evolving spiking neuron cellular automata and networks to emulate in vitro neuronal activity [#1415]
Jorgen Jensen Farner, Hakon Weydahl, Ruben Jahren, Ola Huse Ramstad, Stefano Nichele and Kristine Heiney
Oslo Metropolitan University, Norway; Norwegian University of Science and Technology, Norway; Oslo Metropolitan University, Simula Metropolitan, Norway; Norwegian University of Science and Technology, Oslo Metropolitan University, Norway
- 12:48PM Implementation of Reduced Precision Integer Epigenetic Networks in Hardware [#1024]
Andrew Walter, Simon Bale and Andy Tyrrell
University of York, United Kingdom

Session EDAC11: Neural Network Learning Models I

Monday, December 6, 12:00PM-1:00PM, Room: Room 7, Chair: Jian Wang, Zhang Kai

- 12:00PM Evaluating Robustness of Counterfactual Explanations [#1053]
Andre Artelt, Valerie Vaquet, Riza Velioglu, Fabian Hinder, Johannes Brinkrolf, Malte Schilling and Barbara Hammer
Bielefeld University, Germany
- 12:12PM Lithology Identification using Well Logging Images Based on Improved Inception Network [#1345]
Rui Shan, Qiang Xing, Jinyan Zhang, Jun Wang, Yanjiang Wang and Baodi Liu
China University of Petroleum (East China), China; Well Logging Company of Sinopec Shengli Petroleum Engineering Co., LTD, China
- 12:24PM Detecting Contradictions in German Text: A Comparative Study [#1355]
Lisa Pucknat, Maren Pielka and Rafet Sifa
Fraunhofer IAIS, University of Bonn, Germany; Fraunhofer IAIS, Germany
- 12:36PM Developing Interpretable Machine Learning for Forward Kinematics of Robotic Arms [#1489]
Sai Teja Kanneganti, Jin-Song Pei and Dean Frederick Hougen
University of Oklahoma, United States
- 12:48PM **Nikkei Stock Price Prediction Model using Economic Policy Uncertainty Index by BERT [#1556] (WITHDRAWN)**
Shunnsuke Ono and Yoshitaka Sakurai
Meiji University, Japan

Monday, December 6

Session CIHLI: Models and architectures, including cognitively-plausible architectures and systems for human-like intelligence/Problem solving based on nature, heuristic, intuition, creativity, insight, curiosity and imagination/Theory and application of bio inspired al

Monday, December 6, 12:00PM-1:00PM, Room: Room 8, Chair: Jacek Mandziuk, Marcin Wozniak

- 12:00PM Combining Utility AI and MCTS Towards Creating Intelligent Agents in Video Games, with the Use Case of Tactical Troops: Anthracite Shift [#1100]
Maciej Swiechowski, Daniel Lewinski and Rafal Tyl
QED Software, Poland
- 12:12PM Simultaneous Causal Noise Removal for Causal Rule Discovery and Learning [#1225]
Xiwen Yang and Seng-Beng Ho
AI Initiative, Agency for Science Technology and Research, Singapore; Department of Social and Cognitive Computing, Institute of High Performance Computing, Singapore
- 12:24PM A Double-Layer Subsumption Mechanism for Enforcing Sequential Behaviors in a Cognitive Architecture [#1473]
Ricardo Gudwin, Eric Rohmer, Andre Paraense, Eduardo Froes, Wandemberg Gibaut, Klaus Raizer and Aneta Vulgarakis Feljan
University of Campinas, Brazil; Ericsson Telecomunicacoes S.A., Brazil; Ericsson AB, Sweden
- 12:36PM Mimicking the Human Approach in the Game of Hive [#1449]
Duncan Kampert, Ana-Lucia Varbanescu, Matthias Muller-Brockhausen and Aske Plaat
University of Amsterdam, Netherlands; Leiden University, Netherlands
- 12:48PM Towards biologically plausible learning in neural networks [#1352]
Jesus Garcia Fernandez, Enrique Hortal Quesada and Siamak Mehrkanoon
Maastricht University, Netherlands

Session ESCO3: Vehicle Routing

Monday, December 6, 1:00PM-2:00PM, Room: Room 1, Chair: Rong Qu

- 1:00PM Heterogeneous Multiobjective Differential Evolution for Electric Vehicle Charging Scheduling [#1088]
Wei-Li Liu, Yue-Jiao Gong, Wei-Neng Chen, Jinghui Zhong, Sang-Woon Jeon and Jun Zhang
Guangdong Polytechnic Normal University, China; South China University of Technology, China; Hanyang University, Korea (South)
- 1:12PM An Efficient Ant Colony System for Multi-Robot Task Allocation with Large-scale Cooperative Tasks and Precedence Constraints [#1117]
Xiao-Fang Liu, Bo-Cheng Lin, Zhi-Hui Zhan, Sang-Woon Jeon and Jun Zhang
Nankai University, China; South China University of Technology, China; Hanyang University, Korea (South)
- 1:24PM An Efficient Nature-Inspired Method to Solve the Shortest Path Tour Problem [#1122]
Yi-Ming Ma, Hang Zhou and Xiao-Bing Hu
Civil Aviation University of China, China
- 1:36PM Influence of a GRASP Initialization on the Performance of the Hybrid Genetic Search with Adaptive Diversity Control [#1303]
Alexander Fiabane and Aurora Pozo
Federal University of Parana, Brazil
- 1:48PM An Improved Multi-Objective Genetic Programming Hyper-Heuristic with Archive for Uncertain Capacitated Arc Routing Problem [#1155]
Shaolin Wang, Yi Mei and Mengjie Zhang
Victoria University of Wellington, New Zealand

Monday, December 6

Session CIDM4: Data mining from nonstationary and drifting environments II/Classification, Clustering, Regression

Monday, December 6, 1:00PM-2:00PM, Room: Room 2, Chair: Bach Nguyen

- 1:00PM A Shape-Based Method for Concept Drift Detection and Signal Denoising [#1418]
Fabian Hinder, Johannes Brinkrolf, Valerie Vaquet and Barbara Hammer
CITEC, Bielefeld University, Germany
- 1:12PM Non-generational Geometric Semantic Genetic Programming [#1191]
Daiki Koga and Kei Ohnishi
Kyushu Institute of Technology, Japan
- 1:24PM On the Suitability of Incremental Learning for Regression Tasks in Exoskeleton Control [#1233]
Jonathan Jakob, Martina Hasenjaeger and Barbara Hammer
Bielefeld University, Germany; Honda Research Institute Europe, Germany
- 1:36PM Investigating Normalized Conformal Regressors [#1390]
Ulf Johansson, Henrik Bostrom and Tuwe Lofstrom
Jonkoping University, Sweden; KTH Royal Institute of Technology, Sweden
- 1:48PM Exclusion and Inclusion: A Model Agnostic Approach to Feature Importance in DNNs [#1398]
Subhadip Maji, Arijit Ghosh Chowdhury, Raghav Bali and Vamsi M Bhandaru
Optum Global Solutions, India

Session CIBIM2: Forensic, identity and security applications/Explainable Artificial Intelligence

Monday, December 6, 1:00PM-2:00PM, Room: Room 3, Chair: Masood Khan, Svetlana Yanushkevich

- 1:00PM Automated Person Identification Framework Based on Fingernails and Dorsal Knuckle Patterns [#1410]
Mona Alghamdi, Plamen Angelov and Bryan Williams
Lancaster university, United Kingdom
- 1:12PM Harnessing Unlabeled Data to Improve Generalization of Biometric Gender and Age Classifiers [#1247]
Aakash Varma Nadimpalli, Narsi Reddy, Sreeraj Ramachandran and Ajita Rattani
Wichita State University, United States; University of Missouri, United States
- 1:24PM Phishing Detection Using URL-based XAI Techniques [#1087]
Paulo R. Galego Hernandez Jr., Camila P. Floret, Katia F. Cardozo Almeida, Vinicius C. Silva, Kelton A. Pontara Costa and Joao Paulo Papa
Fatec Ourinhos, Brazil; Unesp Bauru, Brazil
- 1:36PM Numerical Analysis of Possibilistic Answer Set [#1157]
Asraful Islam
Student, Australia
- 1:48PM Towards Explainable Person Re-Identification [#1315]
Divyansh Goyal, Netra Patel, Thomas Truong and Svetlana Yanushkevich
University of Calgary, Canada

Session DL6: Applications of Deep Learning IV

Monday, December 6, 1:00PM-2:00PM, Room: Room 4, Chair: Alessandro Sperduti, Plamen Angelov

- 1:00PM Deep Neural Networks for Railway Switch Detection and Classification Using Onboard Camera Images [#1383]
Kanwal Jahan, Joshua Niemeijer, Nils Kornfeld and Michael Roth
DLR, Germany

Monday, December 6

- 1:12PM Efficient Multilingual Deep Learning Model for Keyword Categorization [#1374]
Mirko Polato, Demchenko Denys, Kuanyshkereyev Almat and Navarin Nicolo'
University of Turin, Italy; ID Ward, United Kingdom; University of Padua, Italy
- 1:24PM Simple Multi-resolution Gated GNN [#1571]
Luca Pasa, Navarin Nicolo' and Sperduti Alessandro
University of Padua, Italy
- 1:36PM Decoding the Confidence Level of Subjects in Answering Multiple Choice Questions Using EEG Induced Capsule Network [#1123]
Shirsha Bose, Sayantani Ghosh, Amit Konar and Atulya K. Nagar
Jadavpur University, India; Liverpool Hope University, United Kingdom
- 1:48PM Multi-view Semi-Supervised Learning for Cooperative Spectrum Sensing [#1298]
Lusi Li, Laura Slayton, Hepeng Li and Haibo He
Old Dominion University, United States; University of Rhode Island, United States

Session SS11b: Special Session on Games II

Monday, December 6, 1:00PM-2:00PM, Room: Room 5, Chair: Hamna Aslam

- 1:00PM Deck Building in Collectible Card Games using Genetic Algorithms: A Case Study of Legends of Code and Magic [#1322]
Ya-Ju Yang, Tsung-Su Yeh and Tsung-Che Chiang
National Taiwan Normal University, Taiwan
- 1:12PM Monte Carlo Skill Estimation for Darts [#1500]
Thomas Miller and Christopher Archibald
Brigham Young Univeristy, United States; Brigham Young University, United States
- 1:24PM Maximum Entropy Reinforcement Learning in Two-Player Perfect Information Games [#1536]
Taichi Nakayashiki and Kaneko Tomoyuki
The University of Tokyo, Japan
- 1:36PM On the Evolution of the MCTS Upper Confidence Bounds for Trees by Means of Evolutionary Algorithms in the Game of Carcassonne [#1561]
Edgar Galvan and Gavin Simpson
Maynooth University, Ireland
- 1:48PM Interpretable AI Agent Through Nonlinear Decision Trees for Lane Change Problem [#1430]
Abhiroop Ghosh, Yashesh Dhebar, Ritam Guha, Kalyanmoy Deb, Subramanya Nagesh Rao, Ling Zhu, Eric Tseng and Dimitar Filev
Michigan State University, United States; Ford Motor Company, United States

Session ICE/RIIS: Evolutionary Substrates for Artificial Intelligence and Unconventional Computing/Evolutionary Robotics/Informationally Structured Space

Monday, December 6, 1:00PM-2:00PM, Room: Room 6, Chair: Andy Tyrrell, Hiroyuki Masuta

- 1:00PM Tradeoffs with physical delay feedback reservoir computing [#1353]
Tian Gan, Susan Stepney and Martin Trefzer
University of York, United Kingdom
- 1:12PM Moonwalkers: Evolving Robots for Locomotion in a Moon-like Environment [#1136]
Koen van der Pool and A.E. Eiben
Vrije Universiteit Amsterdam, Netherlands
- 1:24PM Improvements to Speed and Efficacy in Non-Stationary Learning in a Flapping-Wing Air Vehicle: Constrained and Unconstrained Flight [#1389]
John Gallagher and Monica Sam
University of Cincinnati, United States; Wright State University, United States

Monday, December 6

- 1:36PM Proposal of Self-generation of Reward for danger avoidance by disregarding specific situations [#1518]
Yuya Ono, Kentarou Kurashige, Afiqe Anuar Bin Muhammad Nor Hakim, Sosuke Kondo and Kodai Fukuzawa
Division of Information and Electronic Engineering Muroran Institute of Technology, Japan;
ASTEC Co.,Ltd., Japan
- 1:48PM A Plane Extraction Method for Embedded Computers in Mobile Robots [#1274]
Alfin Junaedy, Hiroyuki Masuta, Kei Sawai, Tatsuo Motoyoshi and Noboru Takagi
Toyama Prefectural University, Japan

Session EDAC12: Neural Network Learning Models II/Dimensionality reduction and analysis of large and complex data/Evolutionary Optimization Computation/Time Series and System Modeling/Interpretability of Fuzzy Rule-based Systems for Nonlinear Modeling

Monday, December 6, 1:00PM-2:00PM, Room: Room 7, Chair: Jian Wang, Zhang Kai

- 1:00PM Zero-Reference Fractional-Order Low-Light Image Enhancement Based on Retinex Theory [#1128]
Qiang Zhang, Feiqi Fu, Kai Zhang, Feng Lin and Jian Wang
China University of Petroleum (East China), China
- 1:12PM Feature Selection using Modified Null Importance [#1203]
Shuhei Kimura, Daichi Oda and Masato Tokuhisa
Tottori University, Japan
- 1:24PM A Quantum-inspired Particle Swarm Optimization K-means++ Clustering Algorithm [#1197]
Hua Chun
College of Computer Sciences and Technology Inner Mongolia Minzu University, China
- 1:36PM Time series forecasting with missing data using neural network and meta-transfer learning [#1036]
Maya Mario, Yu Wen and Li Xiaoou
CINVESTAV-IPN, Mexico
- 1:48PM Feature Selection for Fuzzy Neural Networks using Group Lasso Regularization [#1395]
Tao Gao, Xiao Bai, Liang Zhang and Jian Wang
School of Computer Science and Engineering, Beihang University, China; College of Science, China University of Petroleum (East China), China

Session ADPRL1: Deep ADP and RL methods/Multiagent ADP, multiagent RL, and multiplayer games

Monday, December 6, 1:00PM-2:00PM, Room: Room 8, Chair: Zhen Ni

- 1:00PM Measuring Data Quality for Dataset Selection in Offline Reinforcement Learning [#1238]
Phillip Swazinna, Steffen Udluft and Thomas Runkler
Siemens Technology & TU Munich, Germany; Siemens Technology, Germany
- 1:12PM Online Microgrid Energy Management Based on Safe Deep Reinforcement Learning [#1404]
Hepeng Li, Zhenhua Wang, Lusi Li and Haibo He
University of Rhode Island, United States; Old Dominion University, United States
- 1:24PM Learning Sparse Evidence-Driven Interpretation to Understand Deep Reinforcement Learning Agents [#1541]
Giang Dao, Wesley Huff and Minwoo Lee
University of North Carolina at Charlotte, United States

Monday, December 6

- 1:36PM Hierarchical Cooperative Swarm Policy Learning with Role Emergence [#1222]
Tianle Zhang, Zhen Liu, Zhiqiang Pu, Tenghai Qiu and Jianqiang Yi
Institute of Automation, Chinese Academy of Sciences, Beijing 100190, China, China
- 1:48PM Improving Traffic Signal Control With Joint-Action Reinforcement Learning [#1266]
Joao V. B. Labres, Ana L. C. Bazzan and Monireh Abdoos
UFRGS, Brazil; Shahid Beheshti University, Iran

Tuesday, December 7

Plenary Talk PI3: Artificial Intelligence is Not There Yet!

Monday, December 7, 6:00AM-7:00AM, Room: Room 1, Speaker: Hussein Abbass, Chair: Bernadette Bouchon-Meunier

Session CIOT3: CI Applications in Smart Cities/CI Applications in Management/CI Applications in Energy

Tuesday, December 7, 7:00AM-8:00AM, Room: Room 1, Chair: Mohammad S. Khan

- 7:00AM Cyclist Motion State Forecasting - Going beyond Detection [#1028]
Maarten Bieshaar, Stefan Zernetsch, Katharina Riepe, Konrad Doll and Bernhard Sick
University of Kassel, Germany; University of Applied Sciences Aschaffenburg, Germany
- 7:12AM Collaborative Computation in the Network for Remote Driving [#1105]
Lijun Dong and Richard Li
Futurewei Technologies Inc., United States
- 7:24AM Analysis of integration of financial series classification and constrained portfolio optimization [#1320]
Fernando Garcia Diniz Campos Ferreira, Rodrigo Tomas Nogueira Cardoso and Amir Hossein Gandomi
Centro Federal de Educacao Tecnologica de Minas Gerais, Brazil; University of Technology Sydney, Australia
- 7:36AM A Benchmark for Parking Duration Prediction of Electric Vehicles for Smart Charging Applications [#1368]
Karl Schwenk, Kaleb Phipps, Benjamin Briegel, Veit Hagenmeyer and Ralf Mikut
Karlsruhe Institute of Technology/Mercedes-Benz AG, Germany; Karlsruhe Institute of Technology, Germany; Mercedes-Benz AG, Germany
- 7:48AM Causal Analysis of On-line Math Tutoring Impact on Low-income High School Students Using Bayesian Logistic and Beta Regressions [#1292]
Maher Alhossaini and Mohammed Aloqeely
King Saud University, Saudi Arabia; Takaful Foundation, Saudi Arabia

Session RISS2: Adaptation, Learning and Evolution in Robotics/Human-Robot Interaction

Tuesday, December 7, 7:00AM-8:00AM, Room: Room 2, Chair: Naoki Masuyama, Wei Hong Chin

- 7:00AM Efficient exploration by switching agents according to degree of convergence of learning on Heterogeneous Multi-Agent Reinforcement Learning in Single Robot [#1366]
Riku Narita, Tatsufumi Matsushima and Kentarou Kurashige
Division of Information and Electronic Engineering, Muroran Institute of Technology, Japan; Panasonic ITS Co., Ltd. Development center 1 Section 1, Japan; Department of Information and Electronic Engineering, Muroran Institute of Technology, Japan
- 7:12AM Gradient-Free Deep Q-Networks Reinforcement learning: Benchmark and Evaluation [#1545]
Mohamad Yani, Fernando Ardilla, Aulia Saputra Azhar and Naoyuki Kubota
Tokyo Metropolitan University, Japan
- 7:24AM Effects of Different Optimization Formulations in Evolutionary Reinforcement Learning on Diverse Behavior Generation [#1551]
Victor Villin, Naoki Masuyama and Yusuke Nojima
Osaka Prefecture University, Japan
- 7:36AM Novel Bidirectional Multimodal System for Affective Human-Robot Engagement [#1349]
Timothy Applewhite, Vivienne Jia Zhong and Rolf Dornberger
FHNW University of Applied Sciences and Arts Northwester Switzerland, Switzerland

Tuesday, December 7

- 7:48AM Voice Dialog System for Simulated Patient Robot and Detection of Interviewer Nodding [#1365]
Takuya Hashimoto, Satoshi Honma, Terumichi Fujikura, Yoshiaki Hayasaka, Toshiyuki Takeshita, Yasuhiko Ito, Kimihiro Okubo and Hiroshi Takemura
Tokyo University of Science, Japan; Nippon Medical School, Japan

Session CICARE3: Computer vision, pattern recognition and machine learning applied to healthcare II

Tuesday, December 7, 7:00AM-8:00AM, Room: Room 3, Chair: Mf Mahmud

- 7:00AM Assessment of Post-Stroke Motor Function Weakness using Pressure Sensor Data [#1306]
Aakash Bhatt, Nitya Shah, Sahil Bhatt, Svetlana Yanushkevich, Mohammed Almekhlafi and MacKenzie Horn
University of Calgary, Canada
- 7:12AM Kidney Segmentation for Quantitative Analysis applying MaskRCNN Architecture. [#1376]
Mathilde Overgaard Lauersen, Busra Koylu, Bryan Haddock and John Aa. Soerensen
The Capital Region of Denmark, Denmark; Technical University of Denmark, Denmark; Rigshospitalet Glostrup, Denmark
- 7:24AM Diabetes Prediction Using Quantum Neurons with Preprocessing Based on Hypercomplex Numbers [#1440]
Claudio A. Monteiro and Fernando M. de Paula Neto
Universidade Federal de Pernambuco, Brazil
- 7:36AM A Comparative Study of Supervised and Unsupervised Neural Networks for Oral Lesion Detection [#1467]
Gerber Mia, Nelishia Pillay and Khammissa Razia
University of Pretoria, South Africa
- 7:48AM An Evidence-Based Study of Diabetes Prevention and Management with NLP and Deep Learning [#1548]
Vimal Vidyadharan, Mohammad Hamdan and Ali Zalzal
Heriot-Watt University, United Arab Emirates; Yarmouk University, Jordan; Community Tracks Ltd, United Kingdom

Session NICE1: Nature-inspired optimization algorithms I

Tuesday, December 7, 7:00AM-8:00AM, Room: Room 4, Chair: Xin-She Yang, Joao Paulo Papa

- 7:00AM More is not Always Better: Insights from a Massive Comparison of Meta-heuristic Algorithms over Real-Parameter Optimization Problems [#1219]
Javier Del Ser, Eneko Osaba, Aritz D. Martinez, Miren Nekane Bilbao, Javier Poyatos, Daniel Molina and Francisco Herrera
TECNALIA, Basque Research & Technology Alliance, Spain; University of the Basque Country (UPV/EHU), Spain; University of Granada, Spain
- 7:12AM Hybrid Evolutionary Approach to Multi-objective Path Planning for UAVs [#1237]
Nikolas Hohmann, Mariusz Bujny, Juergen Adamy and Markus Olhofer
Technical University Darmstadt, Germany; Honda Research Institute Europe, Germany
- 7:24AM Explainable Landscape-Aware Optimization Performance Prediction [#1243]
Risto Trajanov, Stefan Dimeski, Martin Popovski, Peter Korosec and Tome Eftimov
Faculty of Computer Science and Engineering, Ss. Cyril and Methodius, University, Macedonia; Computer Systems Department, Jozef Stefan Institute, Slovenia

Tuesday, December 7

- 7:36AM Heterogeneous Parallel Island Models [#1308]
Lucas Angelo da Silveira, Jose Luis Soncco-Alvarez, Thaynara Arielly de Lima and Mauricio Ayala-Rincon
Universidade de Brasilia, Brazil; Universidad Nacional de San Antonio Abad del Cusco, Peru; Universidade Federal de Goias, Brazil
- 7:48AM MO-MFCGA: Multiobjective Multifactorial Cellular Genetic Algorithm for Evolutionary Multitasking [#1016]
Osaba Eneko, Del Ser Javier, D. Martinez Aritz, L. Lobo Jesus, J. Nebro Antonio and Yang Xin-She
TECNALIA, Basque Research and Technology Alliance (BRTA), Spain; Dept. de Lenguajes y Ciencias de la Computacion, ITIS Software, Universidad de Malaga, Spain; Middlesex University London, United Kingdom

Session ADPRL2: RL and ADP-based control/Distributed intelligent systems and information transfer in ADPRL

Tuesday, December 7, 7:00AM-8:00AM, Room: Room 5, Chair: Xiangnan Zhong

- 7:00AM Adaptive Optimal Control of Continuous-Time Linear Systems via Hybrid Iteration [#1177]
Omar Qasem, Weinan Gao and Tao Bian
Florida Institute of Technology, United States; WorldQuant LLC., United States
- 7:12AM Investigation of Maximization Bias in Sarsa Variants [#1317]
Ganesh Tata and Eric Austin
University of Alberta, Canada
- 7:24AM Introducing Human Corrective Multi-Team SRR Sports Scheduling via Reinforcement Learning [#1554]
James Peng, Antwan Clark and Anton Dahbura
Johns Hopkins University, United States
- 7:36AM An Intelligent and Secure Control Approach for Nonlinear Systems under Attacks [#1458]
Xiangnan Zhong and Zhen Ni
Florida Atlantic University, United States
- 7:48AM Multi-task Transfer with Practice [#1553]
Upasana Pattnaik and Minwoo Lee
University of North Carolina at Charlotte, United States

Session FOCI1: Theoretical Foundations of Evolutionary Computation/Theoretical Foundations of Fuzzy Logic Systems/Theoretical Foundations of Neural Networks and other Machine Learning Techniques

Tuesday, December 7, 7:00AM-8:00AM, Room: Room 6, Chair: Pietro Oliveto, Chao Qian

- 7:00AM The Non-Walking Triangle Optimization Representation: Enabling Monte Carlo Tree Search-like Methods for Real Parameter Optimization Problems [#1288]
Rachel Brown and Daniel Ashlock
University of Guelph, Canada
- 7:12AM Fuzzy Conceptual Graphs: a comparative discussion [#1096]
Adam Faci, Marie-Jeanne Lesot and Claire Laudy
LIP6, SU & LRASC, Thales, France; LIP6, SU, France; LRASC, Thales, France
- 7:24AM Extended Learning Optimality Theory for the XCS classifier system on Multiple Reward Scheme [#1111]
Motoki Horiuchi and Masaya Nakata
Yokohama National University, Japan

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- 7:36AM Solving nonlinear classification and regression problems by wave interference with a single-layer complex-valued perceptron [#1209]
Babette Dellen and Uwe Jaekel
University of Applied Sciences Koblenz, Germany
- 7:48AM An Algorithm for Randomized Nonnegative Matrix Factorization and Its Global Convergence [#1319]
Takao Masuda, Tsuyoshi Migita and Norikazu Takahashi
Okayama University, Japan

Session CIES1: Complex engineering systems, structures and processes/Management and processing of uncertainties

Tuesday, December 7, 7:00AM-8:00AM, Room: Room 7, Chair: Michael Beer, Vladik Kreinovich

- 7:00AM A Hierarchical Modeling Method for Complex Engineering System with Hybrid Dynamics [#1194]
Ruihua Wang, Xuelei Wang, Jiechao Yang and Liwen Kang
Institute of Automation, Chinese Academy of Sciences; School of Artificial Intelligence, University of Chinese Academy of Sciences, China; Institute of Automation, Chinese Academy of Sciences, China
- 7:12AM Interaction-Aware Sensitivity Analysis for Aerodynamic Optimization Results using Information Theory [#1239]
Patricia Wollstadt and Sebastian Schmitt
Honda Research Institute Europe GmbH, Germany
- 7:24AM Exploiting Generative Models for Performance Predictions of 3D Car Designs [#1397]
Sneha Saha, Thiago Rios, Leandro L. Minku, Bas van Stein, Patricia Wollstadt, Xin Yao, Thomas Baeck, Bernhard Sendhoff and Stefan Menzel
Honda Research Institute Europe GmbH, Germany; University of Birmingham, United Kingdom; Leiden Institute of Advanced Computer Science, Netherlands; University of Birmingham, Southern University of Science and Technology, Shenzhen, United Kingdom
- 7:36AM Uncertainty: Ideas Behind Neural Networks Lead Us Beyond KL-Decomposition and Interval Fields [#1143]
Michael Beer, Olga Kosheleva and Vladik Kreinovich
Leibniz University Hannover, Germany; University of Texas at El Paso, United States
- 7:48AM While, In General, Uncertainty Quantification (UQ) Is NP-Hard, Many Practical UQ Problems Can Be Made Feasible [#1170]
Ander Gray, Scott Ferson, Olga Kosheleva and Vladik Kreinovich
University of Liverpool, United Kingdom; University of Texas at El Paso, United States

Session SIS3: Particle swarm optimization algorithms

Tuesday, December 7, 7:00AM-8:00AM, Room: Room 8, Chair: Qiqi Duan, Sanaz Mostaghim

- 7:00AM A Tuning Free Approach to Multi-guide Particle Swarm Optimization [#1103]
Kyle Erwin and Andries Engelbrecht
Stellenbosch University, South Africa
- 7:12AM Set-based Particle Swarm Optimization for Portfolio Optimization with Adaptive Coordinate Descent Weight Optimization [#1108]
Kyle Erwin and Andries Engelbrecht
Stellenbosch University, South Africa

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- 7:24AM Biased Eavesdropping Particles: A Novel Bio-inspired Heterogeneous Particle Swarm Optimisation Algorithm [#1343]
Fevzi Tugrul Varna and Phil Husbands
University of Sussex, United Kingdom
- 7:36AM HIDMS-PSO Algorithm with an Adaptive Topological Structure [#1344]
Fevzi Tugrul Varna and Phil Husbands
University of Sussex, United Kingdom
- 7:48AM AHPSO: Altruistic Heterogeneous Particle Swarm Optimisation Algorithm for Global Optimisation [#1416]
Fevzi Tugrul Varna and Phil Husbands
University of Sussex, United Kingdom

Session CIOT4: CI Applications in Transportation/CI Applications in Health/CI Applications in Environment

Tuesday, December 7, 8:00AM-9:00AM, Room: Room 1, Chair: Mohammad S. Khan

- 8:00AM Road-network aware Dynamic Workload Balancing Technique for Real-time Route Generation in On-Demand Public Transit [#1029]
Perera Thilina, Wijerathna Lahiru, Wijesundera Deshya and Srikanthan Thambipillai
Nanyang Technological University, Singapore
- 8:12AM Optimal Public Electric Bus Fleet Charging Schedule with Solar and Energy Storage Considering Static and Dynamic Route Assignment [#1532]
Nicholas Masri, Mertcan Yetkin, Emma Hillman, Daniel Fay and Shaline Kishore
Lehigh University, United States
- 8:24AM Chest X-Rays Image Classification from beta-Variational Autoencoders Latent Features [#1166]
Leonardo Crespi, Daniele Loiacono and Arturo Chiti
Politecnico di Milano; Human Techopole, Italy; Politecnico di Milano, Italy; Humanitas University; Humanitas Research Hospital, Italy
- 8:36AM Optimization of air flowrate under different control strategies focus on biological process in wastewater treatment plant [#1572]
Lili Lorensia Mallu, Wu-Yang Sean and Pacheco Maria
Chung Yuan Christian University, Taiwan
- 8:48AM Rainfall-runoff prediction using a Gustafson-Kessel clustering based Takagi-Sugeno Fuzzy model [#1478]
Subhrasankha Dey and Tanmoy Dam
University of Melbourne, Australia, Australia; University of New South Wales Canberra, Australia, Australia

Session CIAG1: AI for seasonal forecasting models, improve yielding prediction of healthier and more productive crops/AI for farmers, harvesting and precision Ag/AI and autonomous systems for field phenotyping (UAVs, ground, remote, etc.)

Tuesday, December 7, 8:00AM-9:00AM, Room: Room 2, Chair: Guilherme N. DeSouza, Derek T. Anderson

- 8:00AM An Investigation on Multi-Objective Fish Breeding Program Design [#1255]
Fergus Currie, Yi Mei, Mengjie Zhang, Maren Wellenreuther and Linley Jesson
Victoria University of Wellington, New Zealand; Plant and Food Research, New Zealand

Tuesday, December 7

- 8:12AM DeepAg: Deep Learning Approach for Measuring the Effects of Outlier Events on Agricultural Production and Policy [#1248]
Sai Gurrapu, Feras Batarseh, Pei Wang, MD Nazmul Kabir Sikder, Nitish Gorentala and Munisamy Gopinath
Virginia Tech, United States; University of Georgia, United States
- 8:24AM Harvesting End-effector Design and Picking Control [#1296]
Jonah Mapes, Andong Dai, Yunjun Xu and Shinsuke Agehara
Mechanical and Aerospace Engineering, University of Central Florida, United States; Gulf Coast Research and Education Center, University of Florida, United States
- 8:36AM Classifying Cover Crop Residue from RGB Images: a Simple SVM versus a SVM Ensemble [#1570]
Parth C. Upadhyay, Lokesh Karanam, John A. Lory and Guilherme N. DeSouza
University of Missouri, Columbia, United States
- 8:48AM Spatio-Temporal Reconstruction and Visualization of Plant Growth for Phenotyping [#1515]
Jacket Demby's, Ali Shafiekhani, Felix B. Fritschi and Guilherme N. DeSouza
University of Missouri-Columbia, United States

Session CICARE4: Affective, cognitive, evolutionary and pervasive computing applications to healthcare/Other emerging topics in e-health and healthcare/Computer vision, pattern recognition and machine learning applied to healthcare

Tuesday, December 7, 8:00AM-9:00AM, Room: Room 3, Chair: Mufti Mahmud

- 8:00AM Towards Explainable, Privacy-Preserved Human-Motion Affect Recognition [#1289]
Matthew Malek-Podjaski and Fani Deligianni
University of Glasgow School of Computing Science, United Kingdom
- 8:12AM Monitoring Activities of Daily Living with a Mobile App and Bluetooth Beacons [#1144]
Wenbing Zhao and Perish Jack
Cleveland State University, United States
- 8:24AM A Pipeline Consisting of Pattern Recognition and Finite Automata for Recognizing VCV Productions in the Study of Vocal Hyperfunction [#1567]
Gbenga Omotara, Guilherme Desouza, Maria Dietrich and Mark Berardi
University of Missouri, United States; University Hospital Bonn, Germany
- 8:36AM Predicting Patient Discharge Disposition in Acute Neurological Care [#1491]
Charles Mickle and Debzani Deb
Winston-Salem State University, United States
- 8:48AM Detection of Dementia Through 3D Convolutional Neural Networks Based on Amyloid PET [#1200]
Giovanna Castellano, Andrea Esposito, Marco Mirizio, Graziano Montanaro and Gennaro Vessio
Department of Computer Science, University of Bari, Italy

Session NICE2: Nature-inspired optimization algorithms li/Parameter tuning and sensitivity analysis/Hyperparameter optimization/Applications in engineering

Tuesday, December 7, 8:00AM-9:00AM, Room: Room 4, Chair: Xin-She Yang, Joao Paulo Papa

- 8:00AM Hybridizing Cuckoo Search with Naked Mole-rat Algorithm: Adapting for CEC 2017 and CEC 2021 Test Suites [#1346]
Rohit Salgotra, Supreet Singh, Urvinder Singh, Sriparna Saha and Amir H Gandomi
Thapar Institute of Engineering & Technology, India; Thapar Institute of Engineering & Technology, India; Indian Institute of Technology, Patna, India; University of Technology, Sydney, Australia

Tuesday, December 7

- 8:12AM An Investigation of Automated Design of VMAF [#1543]
Ahmed Hassan and Nelishia Pillay
University of Pretoria, South Africa
- 8:24AM Improving Pre-Trained Weights through Meta-Heuristics Fine-Tuning [#1013]
Gustavo de Rosa, Mateus Roder, Claudio dos Santos and Joao Papa
Sao Paulo State University, Brazil; Eldorado Research Institute, Brazil
- 8:36AM Efficient AutoML via Combinational Sampling [#1560]
Duc Anh Nguyen, Anna V. Kononova, Stefan Menzel, Bernhard Sendhoff and Thomas Baeck
Leiden University, Netherlands; Honda Research Institute Europe, Germany
- 8:48AM Feedback-Circulating Optimum Design for Perceiving Constellation Principle of Regional Observation Satellites [#1189]
Kanakano Machii, Kazuhisa Chiba and Yasuhiro Kawakatsu
The University of Electro-Communications, Japan; Japan Aerospace Exploration Agency, Japan

Session ADPRL3: Applications of ADP and RL

Tuesday, December 7, 8:00AM-9:00AM, Room: Room 5, Chair: Xiangnan Zhong

- 8:00AM A Reinforcement Learning Benchmark for Autonomous Driving in Intersection Scenarios [#1267]
Yuqiu Liu, Qichao Zhang and Dongbin Zhao
Institute of Automation, Chinese Academy of Sciences, China
- 8:12AM Proximal Policy Optimization with Continuous Bounded Action Space via the Beta Distribution [#1488]
Irving Petrazzini and Eric Antonelo
UFSC, Brazil
- 8:24AM Generative Adversarial Imitation Learning for End-to-End Autonomous Driving on Urban Environments [#1505]
Gustavo Claudio Karl Couto and Eric Aislan Antonelo
Federal University of Santa Catarina, Brazil
- 8:36AM Improving Generalization of Deep Reinforcement Learning-based TSP Solvers [#1537]
Wenbin Ouyang, Yisen Wang, Shaochen Han, Zhejiang Jin and Paul Weng
University of Michigan/Shanghai Jiao Tong University, United States; Shanghai Jiao Tong University, China
- 8:48AM Cooperative Optimization Strategy for Distributed Energy Resource System using Multi-Agent Reinforcement Learning [#1558]
Zhaoyang Liu, Tianchun Xiang, Tianhao Wang and Chaoxu Mu
Tianjin University, China; State Grid Tianjin Electrical Power Company, China

Session MASCO:

Tuesday, December 7, 8:00AM-9:00AM, Room: Room 6, Chair: Kai Wu

- 8:00AM ABM/LUCC of a Complex Economic System of Land and Home Markets Facing an Intense Residential Development [#1072]
Dominique Prunetti, Claudio Dettoto, Corinne Idda, Eric Innocenti, Yuheng Ling and Charles-Mathieu Vinciguerra
UMR CNRS 6240 LISA, France
- 8:12AM Computing Sequences of Coalition Structures [#1295]
Tabajara Krausburg, Juergen Dix and Rafael H. Bordini
PUCRS, Brazil; Clausthal University of Technology, Germany

Tuesday, December 7

- 8:24AM Accelerated Primal-Dual Algorithm for Distributed Non-convex Optimization [#1414]
Shengjun Zhang and Colleen Bailey
University of North Texas, United States
- 8:36AM Information sharing in multi-agent search and task allocation problems [#1109]
Mathias Minos-Stensrud, Hans Jonas Fossum Moen and Jan Dyre Bjerknes
University of Oslo and Norwegian Defence Research Establishment, Norway; University of South-Eastern Norway, Norway
- 8:48AM Agent-Based Modelling of the spread of COVID-19 in Corsica [#1173]
Eric Innocenti, Marielle Delhom, Corinne Idda, Pierre-Regis Gonsolin and Dominique Urbani
UMR CNRS 6240 LISA, France; UMR CNRS 6134 SPE, France; Corsica Institute of Technology, France; Lycee Laetitia High School, France

Session CIES2: Intelligent analysis, control and decision-making/Reliable Computing/Monitoring and identification approaches I

Tuesday, December 7, 8:00AM-9:00AM, Room: Room 7, Chair: Michael Beer, Vladik Kreinovich

- 8:00AM Machine Learning for Stock Prediction Based on Fundamental Analysis [#1010]
Yuxuan Huang, Luiz Fernando Capretz and Danny Ho
Broadridge Financial Solutions, Canada; Western University, Canada; NFA Estimation, Canada
- 8:12AM Object Detection Using Deep Convolutional Generative Adversarial Networks Embedded Single Shot Detector with Hyper-parameter Optimization [#1119]
Ranjith Dinakaran and Li Zhang
Northumbria University, United Kingdom; Royal Holloway, University of London, United Kingdom
- 8:24AM Optimized Electric Machine Design Solutions with Efficient Handling of Constraints [#1367]
Bhuvan Khoshoo, Julian Blank, Thang Pham, Kalyanmoy Deb and Shanelle Foster
Michigan State University, United States
- 8:36AM Estimating crowd-worker's reliability with interval-valued labels to improve the quality of crowdsourced work [#1421]
Makenzie Spurling, Chenyi Hu, Huixin Zhan and Victor S. Sheng
University of Central Arkansas, United States; Texas Tech University, United States
- 8:48AM Microgrid Online Estimation for the Power Flow Solution in Distribution Systems [#1063]
Leinyker Palacios, Eduardo Marles and Eduardo Gomez
GERS USA, United States; Universidad del Valle, Colombia

Session SIS4: Swarm Robots/Swarm intelligence for optimization problems II

Tuesday, December 7, 8:00AM-9:00AM, Room: Room 8, Chair: Qiqi Duan, Sanaz Mostaghim

- 8:00AM Investigating Genetic Network Programming for Multiple Nest Foraging [#1409]
Fredrik Foss, Truls Stenrud and Pauline Catriona Haddow
NTNU, Norway
- 8:12AM Towards predictive and decentralized bio-inspired navigation models for distributed systems [#1429]
Simon Gay, Ngoc-Tan Truong, Edwige Pissaloux and Jean-Paul Jamont
LCIS, University of Grenoble Alpes, France; LITIS, University of Rouen Normandy, France
- 8:24AM Emergent Behavior in Swarms with On-board Sensing [#1461]
Richard Hall, Alexander Maxseiner, Brian Matejevich, Donald Sofge and Daniel Lofaro
Duke University, United States; U.S. Naval Research Laboratory, United States

Tuesday, December 7

- 8:36AM Discrete Collective Estimation in Swarm Robotics with Ranked Voting Systems [#1394]
Qihao Shan, Alexander Heck and Sanaz Mostaghim
Otto von Guericke University Magdeburg, Germany
- 8:48AM Are small swarms effective in PSO optimization tasks? [#1351]
George Tambouratzis
Athena Res. Centre, Greece

Panel Session Pa3: The Future of Computational Intelligence is Diversity

Tuesday, December 7, 9:00AM-10:00AM, Room: Room 1, Chair: Keeley Crockett, Svetlana Yanushkevich

Session CIDM5: Classification, Clustering, Regression/Data Mining Applications

Tuesday, December 7, 10:00AM-11:00AM, Room: Room 1, Chair: Simone Ludwig

- 10:00AM Incremental and Semi-Supervised Learning of 16S-rRNA Genes For Taxonomic Classification [#1511]
Emrecan Ozdogan, Norman Sabin, Thomas Gracie, Steven Portley, Mali Halac, Thomas Coard, William Trimble, Bahrad Sokhansanj, Gail Rosen and Robi Polikar
Rowan University, United States; Drexel University, United States; University of Chicago, United States
- 10:12AM Curvature-Oriented Splitting for Multivariate Model Trees [#1555]
Marvin Schoene and Martin Kohlhase
Bielefeld University of Applied Sciences, Germany
- 10:24AM Near duplicate column identification: a machine learning approach [#1302]
Marc Chevallier, Faouzi Boufares, Nistor Grozavu, Nicoleta Rogovschi and Charly Clairmont
Sorbonne Paris Nord University, France; Synaltic, France
- 10:36AM Automatic Indexing of Financial Documents via Information Extraction [#1364]
Rajkumar Ramamurthy, Max Luebbering, Thiago Bell, Michael Gebauer, Bilge Ulusay, Daniel Uedelhoven, Tim Dilmaghani Khameneh, Ruediger Loitz, Maren Pielka, Christian Bauckhage and Rafet Sifa
Media Engineering, Fraunhofer IAIS, Germany; TU Berlin, Germany; PricewaterhouseCoopers GmbH WPG, Germany
- 10:48AM Preserving Coupled Nodes in Population-Based CNP Solvers by Clustering-Elitism Search [#1391]
Mingyang Feng, Qi Zhao, Liang Zhang, Shan He and Yuhui Shi
Southern University of Science and Technology, China; The University of Birmingham, United Kingdom

Session CIAG2: AI and Machine learning methods for data analytics in Ag/NR/AI in animal sciences

Tuesday, December 7, 10:00AM-11:00AM, Room: Room 2, Chair: Guilherme N. DeSouza, Derek T. Anderson

- 10:00AM FoodChem: A food-chemical relation extraction model [#1141]
Gjorgjina Cenikj, Barbara Korousic Seljak and Tome Eftimov
Jozef Stefan International Postgraduate School; Jozef Stefan Institute, Slovenia; Jozef Stefan Institute, Slovenia
- 10:12AM Perithecia Detection from Images of Stubble using Deep Learning Models [#1493]
Hilda Azimi, Pengcheng Xi, Miroslava Cuperlovic-Culf and Martha Vaughan
National Research Council Canada, Canada; U.S. Department of Agriculture, United States

Tuesday, December 7

- 10:24AM Weight-Identification Model of Cattle Using Machine-Learning Techniques for Anomaly Detection [#1448]
Rodrigo Garcia, Jose Aguilar, Mauricio Toro and Marvin Jimenez
Universidad EAFIT, Colombia; Universidad de los Andes, Venezuela; Universidad del Sinu, Colombia
- 10:36AM Deep Learning Based Plant Disease Classification With Explainable AI and Mitigation Recommendation [#1369]
Arvind Channnarayapatna Srinivasa, Aditi Totla, Tanisha Jain, Nandini Sinha, Jyothi Ranganath, Aditya Karthully, Keerthan Hoskere Subramanya, Farhan Mohammed, Sumukh Guruprasad and Guruprasad Akkihebbal Krishna jois
Bioinformatics Institute- A*STAR, RV College of Engineering, Singapore; RV College of Engineering, India; Dr Ambedkar Institute of Technology, India; RV Institute of Technology and Management, India; Brigade Group, India
- 10:48AM Classification of Seeds using Domain Randomization on Self-Supervised Learning Frameworks [#1026]
Venkat Margapuri and Mitchell Neilsen
Kansas State University, United States

Session ETHAI:

Tuesday, December 7, 10:00AM-11:00AM, Room: Room 3, Chair: Keeley Crockett

- 10:00AM Reflection of Political Bias within YouTube Search and Recommendation Algorithms [#1330]
Michael Lutz, Sanjana Gadaginmath, Natraj Vairavan and Phil Mui
Bellarmine College Preparatory, United States; De Anza Middle College, United States; University of California, Berkeley, United States; Santa Clara University, United States
- 10:12AM Machine Learning based Prediction of Situational Awareness in Pilots using ECG Signals [#1106]
Anushri Rajendran, Parham M. Kebria, Navid Mohajer, Abbas Khosravi and Saeid Nahavandi
Institute for Intelligent Systems Research and Innovation, Deakin University, Australia
- 10:24AM Hateful Memes Classification using Machine Learning [#1350]
Jafar Badour and Joseph Alexander Brown
Innopolis University, Russia
- 10:36AM Bias and Fairness in Computer Vision Applications of the Criminal Justice System [#1444]
Sophie Noiret, Jennifer Lumetzberger and Martin Kampel
Vienna University of Technology, Austria
- 10:48AM The Ethical Landscape of Data and Artificial Intelligence: Citizen Perspectives [#1160]
Keeley Crockett, Annabel Latham and Edwin Colyer
Manchester Metropolitan University, United Kingdom

Session FASLIP3: Feature Learning, Pattern Recognition/Machine Learning

Tuesday, December 7, 10:00AM-11:00AM, Room: Room 4, Chair: Bing Xue, Hisao Ishibuchi

- 10:00AM Classification of Artificial and Real Objects Using Faster Region-Based Convolutional Neural Networks [#1490]
Ritvik Teegavarapu and Debojit Biswas
Max Planck Florida Institute of Neuroscience, United States; Florida Atlantic University, United States
- 10:12AM Deep SIMBAD: Landmark Ranking-based Scene Descriptor for Highly Compressive Self-localization Across Domains [#1252]
Kanji Tanaka
University of FUKUI, Japan

Tuesday, December 7

- 10:24AM Folksonomy Based Fuzzy Filtering Recommender System [#1110]
Vinod Kumar, Ayush Tanwar, Arhan Relan and Chittraksh Grover
Delhi Technological University, India
- 10:36AM Noise Boosted Neural Receptive Fields [#1566]
Federico A. Galatolo, Mario G.C.A. Cimino, Alessandro Marincioni and Gigliola Vaglini
University of Pisa, Italy
- 10:48AM From Actions to Events: A Transfer Learning Approach Using Improved Deep Belief Networks [#1201]
Mateus Roder, Jurandy Gomes Almeida, Gustavo Henrique Rosa, Leandro Aparecido Passos, Andre Rossi and Joao Paulo Papa
Sao Paulo State University, Brazil; Federal University of Sao Paulo, Brazil

Session FOCI/EAL: Theoretical Foundations of Fuzzy Logic Systems/Evolving in Dynamic Environments/Self-organising Systems/ Evolving Neuro-fuzzy Systems

Tuesday, December 7, 10:00AM-11:00AM, Room: Room 5, Chair: Pietro Oliveto, Plamen Angelov

- 10:00AM Data-Driven Fuzzy Demand Forecasting Models for Resilient Supply Chains [#1182]
Aerambamoorthy Thavaneswaran, Ruppa K. Thulasiram, Md. Erfanul Hoque and Srimantoorao S. Appadoo
University of Manitoba, Canada
- 10:12AM Data-Driven Robust and Sparse Solutions for Large-scale Fuzzy Portfolio Optimization [#1184]
Na Yu, You Liang and Aerambamoorthy Thavaneswaran
Ryerson University, Canada; University of Manitoba, Canada
- 10:24AM Fuzzy Option Pricing with Data-Driven Volatility using Novel Monte-Carlo Approach [#1221]
You Liang, Aerambamoorthy Thavaneswaran, Alexander Paseka and Bhanushali Janakumar
Ryerson University, Canada; University of Manitoba, Canada
- 10:36AM Incremental & Semi-Supervised Learning for Functional Analysis of Protein Sequences [#1446]
Mali Halac, Bahrad Sokhansanj, William Trimble, Thomas Coard, Norman Sabin, Emre Can Ozdogan, Robi Polikar and Gail Rosen
Drexel University, United States; University of Chicago, United States; Rowan University, United States
- 10:48AM Multi-Objective Structure and Parameter Evolution of Neuro-Fuzzy Systems [#1287]
Amiram Moshaiov and Adham Salih
Tel-Aviv University, Israel

Session MBEA: Surrogate-assisted evolutionary computation for computationally expensive problems/Estimation of distribution algorithms

Tuesday, December 7, 10:00AM-11:00AM, Room: Room 6, Chair: Ran Cheng, Cheng He

- 10:00AM Regression versus Classification for Predicting Feasibility in Offline Data-Driven Evolutionary Constrained Optimization [#1076]
Yongcun Liu and Handing Wang
Xidian University, China
- 10:12AM An Adaptive Model Management Strategy: Balancing Exploration and Exploitation [#1169]
Caie Hu, Sanyou Zeng and Changhe Li
Mechanical Engineering and Electronic Information China University of Geoscience (Wu Han), China; Automation and Hubei key Laboratory of Advanced Control and Intelligent Automation for Complex Systems China University of Geoscience (Wu Han), China

Tuesday, December 7

- 10:24AM Accelerated Random Search for Black-Box Constraint Satisfaction and Optimization [#1539]
Jenna Iorio and Rommel Regis
Saint Joseph's University, United States
- 10:36AM Test Problem in Which Bits Used for Fitness Calculation Depend on Bit Pattern [#1152]
Kei Ohnishi, Daiki Koga and Tian-Li Yu
Kyushu Institute of Technology, Japan; National Taiwan University, Taiwan
- 10:48AM Natural Evolution Strategy for Unconstrained and Implicitly Constrained Problems with Ridge Structure [#1517]
Masahiro Nomura and Isao Ono
Tokyo Institute of Technology, Japan

Session VR: Vehicle Routing/Engineering Applications

Tuesday, December 7, 10:00AM-11:00AM, Room: Room 7, Chair: Nelishia Pillay and Rong Qu

- 10:00AM Comparative Analysis of Five Local Search Operators on Visiting Constrained Multiple Traveling Salesmen Problem [#1385]
Liu Xin-Xin, Liu Dong, Yang Qiang, Liu Xiao-Fang, Yu Wei-Jie and Zhang Jun
College of Computer and Information Engineering, Henan Normal University, China; School of Artificial Intelligence, Nanjing University of Information Science and Technology, China; College of Artificial Intelligence, Nankai University, China; School of Information Management, Sun Yat-sen University, China; Zhejiang Normal University, China
- 10:12AM Bi-Objective Splitting Delivery VRP with Loading Constraints and Restricted Access [#1407]
Jiyuan Pei, Chengpeng Hu, Jialin Liu, Yi Mei and Xin Yao
Southern University of Science and Technology, China; Victoria University of Wellington, New Zealand
- 10:24AM Learning Penalisation Criterion of Guided Local Search for Large Scale Vehicle Routing Problem [#1544]
Joao Guilherme Cavalcanti Costa, Yi Mei and Mengjie Zhang
Victoria University of Wellington, New Zealand
- 10:36AM Learning Boosts Optimisation: Surrogate-Assisted Real Engine Calibration [#1354]
Hao Tong, Jiyuan Pei, Qingquan Zhang, Jialin Liu, Xudong Feng and Feng Wu
Southern University of Science and Technology, China; Xidian University, China; AECC Sichuan Gas Turbine Establishment, China
- 10:48AM A Machine Learning-Explainable AI approach to tropospheric dynamics analysis using Water Vapor Meteosat images. [#1241]
Julio J. Valdes and Antonio Pou
National Research Council Canada, Canada; Autonomous University of Madrid, Spain

Session SS8/SS5: Hybrid Intelligent Models and Applications/Computational Intelligence for Integrated Remote Sensing and Cyber-Physical Systems

Tuesday, December 7, 10:00AM-11:00AM, Room: Room 8, Chair: Eduardo Gomez-Ramirez, Ambreen Hussain

- 10:00AM Balancing Accuracy and Interpretability through Neuro-Fuzzy Models for Cardiovascular Risk Assessment [#1278]
Gabiella Casalino, Giovanna Castellano, Uzay Kaymak and Gianluca Zaza
University of Bari Aldo Moro, Italy; Eindhoven University of Technology, Netherlands

Tuesday, December 7

- 10:12AM Exploration of the evolution-based footprint on the Generative Adversarial Networks [#1439]
Pawel Kopciwicz and Vitalii Morskyi
AGH University of Science and Technology, Poland; Rzeszow University of Technology, Poland
- 10:24AM Population based Reinforcement Learning [#1443]
Kyle William Pretorius and Nelishia Pillay
University of Pretoria, South Africa
- 10:36AM Low Latency and Non-Intrusive Accurate Object Detection in Forests [#1428]
Ambreen Hussain, Bidushi Barua, Ahmed Osman, Raouf Abozariba and Taufiq Asyhari
Birmingham City University, United Kingdom
- 10:48AM Real-Time Object Detection with Automatic Switching between Single-Board Computers and the Cloud [#1434]
Ahmed Osman, Raouf Abozariba, A. Taufiq Asyhari, Adel Aneiba, Ambreen Hussain, Bidushi Barua and Moazam Azeem
Birmingham City University, United Kingdom

Competitions

Tuesday, December 7, 11:00AM-12:00PM, Room: Room 1, Chair: Alexander Dockhorn, Annabel Latham

Session SS7: Special Session on Computational Intelligence Approaches for Efficient Energy Transition

Tuesday, December 7, 11:00AM-12:00PM, Room: Room 2, Chair: Tiago Pinto, Eduardo Gomez-Ramirez

- 11:00AM A Statistical Analysis of Performance in the 2021 CEC-GECCO-PESGM Competition on Evolutionary Computation in the Energy Domain [#1244]
Fernando Lezama, Joao Soares, Bruno Canizes and Zita Vale
GECAD-Polytechnic of Porto, Portugal; GECAD, Polytechnic of Porto, Portugal; Polytechnic of Porto, Portugal
- 11:12AM Optimal Allocation of FACTS Devices for Improving Voltage Stability with Two-Stage Brain Storm Optimization [#1547]
Tomoaki Takahashi and Hiroyuki Mori
Meiji University, Japan
- 11:24AM Evolutionary Algorithms applied to the Intraday Energy Resource Scheduling in the Context of Multiple Aggregators [#1242]
Jose Almeida, Joao Soares, Fernando Lezama, Bruno Canizes and Zita Vale
GECAD, Polytechnic of Porto, Portugal; Polytechnic of Porto, Portugal
- 11:36AM Evaluation of Graph Convolutions for Spatio-Temporal Predictions of EV-Charge Availability [#1427]
Malte Schilling, Christopher Burgahn and Rebecca Fortmann
Bielefeld University, Germany; fronyx GmbH, Germany
- 11:48AM A semi-supervised learning approach to study the energy consumption in smart buildings [#1445]
Carlos Quintero, Jose Aguilar and Maria R-Moreno
Universidad de Los Andes, Venezuela; Universidad de Alcala, Spain

Tuesday, December 7

Session CIDUE: Dynamic optimization problems/Dynamic multi-objective optimization problems

Tuesday, December 7, 11:00AM-12:00PM, Room: Room 3, Chair: Michalis Mavrovouniotis, Changhe Li

- 11:00AM Evolutionary Learning of Private Equity Recommitment Strategies [#1130]
Emmanuel Kieffer, Frederic Pinel, Thomas Meyer, Georges Gloukoviezoff, Hakan Lucius and Pascal Bouvry
University of Luxembourg, Luxembourg; European Investment Bank, Luxembourg
- 11:12AM An Adaptive Evolutionary Algorithm for Bi-Level Multi-objective VRPs with Real-Time Traffic Conditions [#1064]
Baojian Chen, Changhe Li, Sanyou Zeng, Shengxiang Yang and Michalis Mavrovouniotis
School of Automation, China University of Geosciences, China; School of Mechanical Engineering and Electronic Information, China University of Geosciences, China; School of Computer Science and Informatics, De Montfort University, United Kingdom; KIOS Research and Innovation Center of Excellence and Department of Electrical and Computer Engineering, University of Cyprus, Cyprus
- 11:24AM A fuzzy-based heuristic algorithm for online outbound container stacking problem with uncertain weight information [#1180]
Jiawei Li, Can Zhou, Kejia Wu and Ruibin Bai
University of Nottingham Ningbo China, China
- 11:36AM An Optimized Training Dynamic for Data Streams [#1323]
Sylvia Victor, Silvio Melo and Bruno Maciel
Universidade Federal de Pernambuco, Brazil
- 11:48AM Privacy Preserving Modified Projection Subgradient Algorithm for Multi-Agent Online Optimization [#1372]
Jiaojiao Yan and Jinde Cao
Southeast University, China

Session SS4: Special Session on Computational Intelligence for Natural Language Processing/Community-centric Systems

Tuesday, December 7, 11:00AM-12:00PM, Room: Room 4, Chair: Naveen Saini, Wenjian Luo

- 11:00AM A Feasibility Study of Open-Source Sentiment Analysis and Text Classification Systems on Disaster-Specific Social Media Data [#1018]
Mayank Kejriwal, Ge Fang and Ying Zhou
University of Southern California, United States
- 11:12AM Transformer-Based Bidirectional Encoder Representations for Emotion Detection from Text [#1097]
Ashok Kumar Jayaraman, Erik Cambria and Tina Esther Trueman
Anna University, Chennai, India; Nanyang Technological University, Singapore, Singapore
- 11:24AM Relation Representation Learning for Special Cargo Ontology [#1341]
Vahideh Reshadat, Alp Akcay, Kalliopi Zervanou, Yingqian Zhang and Eelco de Jong
Department of Industrial Engineering and Innovation Sciences Eindhoven University of Technology Eindhoven, The Netherlands, Netherlands; Validaide B.V Amsterdam, The Netherlands, Netherlands
- 11:36AM Development of Esteem Support based on Psychodrama and Design Thinking approach [#1172]
Akihiro Yorita, Simon Egerton, Carina Chan and Naoyuki Kubota
La Trobe University, Australia; Tokyo Metropolitan University, Japan

Tuesday, December 7

- 11:48AM Development of the patent values evaluation method considering growth of technical community [#1419]
Yuta Yamamoto, Asahi Hentona, Koji Marusaki, Kohei Watabe, Seiya Kawano, Tokimasa Goto, Yutaka Hada, Kazuhisa Fukuzawa and Hirofumi Nonaka
Information and Management Systems Engineering, Nagaoka University of Technology, Japan; Information Science and Control Engineering, Nagaoka University of Technology, Japan; Department of Electrical, Electronics and Information Engineering, Nagaoka University of Technology, Japan; Graduate School of Science and Technology, Nara Institute of Science and Technology, Japan; Department of Business Administration, Management and Information Systems major, Aichi Institute of Technology, Japan

Session SS5: Special Session on Computational Intelligence for Integrated Remote Sensing and Cyber-Physical Systems/Special Session on Evolutionary Transfer Learning and Domain Adaptation

Tuesday, December 7, 11:00AM-12:00PM, Room: Room 5, Chair: Ambreen Hussain

- 11:00AM Adaptive Grouping and Pseudonym Changing Policy for Protection of Vehicles Location Information in VANETs [#1162]
Ikram Ullah, Munam Ali Shah, Abid Khan and None None
COMSATS University Islamabad, Pakistan; Aberystwyth University, Aberystwyth SY23 3DB, UK, United Kingdom; None, Pakistan
- 11:12AM Evaluation of Cyber Security Threats in Banking Systems [#1260]
Abdul Qarib Stanikzai and Dr. Munam Ali Shah
COMSATS University Islamabad, Pakistan
- 11:24AM Different Haze Image Conditions for Single Image Dehazing Method [#1188]
Noor Asma Husain, Mohd Shafry Mohd Rahim and Huma Chaudhry
Universiti Teknologi Malaysia, Malaysia; Melbourne Institute of Technology, Victoria, Australia, Australia
- 11:36AM A Study of Transfer Learning in a Generation Constructive Hyper-Heuristic for One Dimensional Bin Packing [#1468]
Darius Scheepers and Nelishia Pillay
University of Pretoria, South Africa
- 11:48AM Predicting CMA-ES Operators as Inductive Biases for Shape Optimization Problems [#1370]
Stephen Friess, Peter Tino, Stefan Menzel, Bernhard Sendhoff and Xin Yao
The University of Birmingham, United Kingdom; Honda Research Institute Europe GmbH, Germany; The University of Birmingham / Southern University of Science and Technology, China

Session MISC: Cooperative Metaheuristics/Single- and Multi-Objective Optimization

Tuesday, December 7, 11:00AM-12:00PM, Room: Room 6, Chair: Seyedali Mirjalili

- 11:00AM Parallel Population-Based Simulated Annealing for High-Dimensional Black-Box Optimization [#1386]
Youkui Zhang, Qiqi Duan, Chang Shao and Yuhui Shi
Southern University of Science and Technology, China; Harbin Institute of Technology, China; University of Technology Sydney, Australia
- 11:12AM Naive Hyper-heuristic Online Learning to Generate Unfolded Population-based Metaheuristics to Solve Continuous Optimization Problems [#1487]
Jorge M. Cruz-Duarte, Ivan Amaya, Jose Carlos Ortiz-Bayliss and Nelishia Pillay
Tecnologico de Monterrey, Mexico; University of Pretoria, South Africa

Tuesday, December 7

- 11:24AM Distributed fitness landscape analysis for cooperative search with domain decomposition [#1519]
Stefanie Holly and Astrid Niesse
OFFIS e.V., Germany
- 11:36AM Lower Bounds on Kemeny Rank Aggregation with Non-Strict Rankings [#1520]
Sina Akbari and Adolfo, R Escobedo
School of Computing and Augmented Intelligence, Arizona State University, Tempe, Arizona, United States
- 11:48AM Comparative Study of Crossovers for Decision Space Diversity of Non-Dominated Solutions [#1276]
Motoki Sato and Akira Oyama
School of engineering, the university of Tokyo, Japan; Institute of Space and Astronautical Science, JAXA, Japan

Session CIES3: Monitoring and identification approaches II/Lifecycle analysis and design

Tuesday, December 7, 11:00AM-12:00PM, Room: Room 7, Chair: Michael Beer, Vladik Kreinovich

- 11:00AM A discharge detection method in high-voltage direct current system using wavelet transform with adaptive wavelet level decision [#1131]
Yanan Wang, Jianqiang Li, Yan Pei, Zerui Ma, Yanhe Jia and YuChih Wei
Beijing University of Technology, China; University of Aizu, Japan; Beijing Information Science and Technology University, China; National Taipei University of Technology, Taiwan
- 11:12AM Supervised Noise Reduction for Clustering on Automotive 4D Radar [#1329]
Michael Lutz and Monsij Biswal
Bellarmine College Preparatory, United States; University of California, Santa Barbara, United States
- 11:24AM Space and Time Efficiency Analysis of Data-Driven Methods Applied to Embedded Systems [#1392]
Iron Tessaro, Roberto Zanetti Freire, Viviana Cocco Mariani and Leandro dos Santos Coelho
Pontifical Catholic University of Parana (PUCPR), Brazil
- 11:36AM Corrosion-like Defect Severity Estimation in Pipelines Using Convolutional Neural Networks [#1471]
Guilherme Ferreira, Paula Sesini, Luis de Souza, Alan Kubrusly and Helon Ayala
Pontifical Catholic University of Rio de Janeiro, Brazil
- 11:48AM A Survey of HMM-based Algorithms in Machinery Fault Prediction [#1479]
Somayeh Bakhtiari Ramezani, Brad Killen, Logan Cummins, Shahram Rahimi, Amin Amirlatifi and Maria Seale
Mississippi State University, United States; Eng. Research and Dev. Center, United States

Session CIMSIVP: Object detection and classification/Gesture recognition

Tuesday, December 7, 11:00AM-12:00PM, Room: Room 8, Chair: Harith Al-Sahaf, Pablo Mesejo

- 11:00AM Raindrops on Windshield: Dataset and Lightweight Gradient-Based Detection Algorithm [#1125]
Vera Soboleva and Oleg Shipitko
Evocargo LLC, Russian Federation
- 11:12AM Multi-stage Deep Learning Technique with a Cascaded Classifier for Turn Lanes Recognition [#1568]
Pubudu Sanjeevani, Brijesh Verma and Joseph Affum
Central Queensland University, Australia; Transport Safety, Australian Road Research Board (ARRB), Australia

Tuesday, December 7

- 11:24AM Deep Convolutional Neural Networks with Transfer Learning for Waterline Detection in Mussel Farms [#1316]
Alistair John McLeay, Abigail McGhie, Dana Briscoe, Ying Bi, Bing Xue, Ross Vennell and Mengjie Zhang
School of Engineering and Computer Science, Victoria University of Wellington, New Zealand; Coastal and Freshwater Group, Cawthron Institute, New Zealand
- 11:36AM Optimal video handling in on-line hand gesture recognition using Deep Neural Networks [#1070]
Dimitris Makrygiannis, Christos Papaioannidis, Ioannis Mademlis and Ioannis Pitas
Aristotle University of Thessaloniki, Greece
- 11:48AM Leveraging Trajectory Prediction for Pedestrian Video Anomaly Detection [#1300]
Asiegbu Kanu-Asiegbu, Ram Vasudevan and Xiaoxiao Du
University of Michigan, United States

Closing Session & Awards

Tuesday, December 7, 12:00PM-1:00PM