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Welcome Message

It is with great pleasure that we welcome all the participants of the 10th Conference on Control, Decision and Information Technologies (CoDIT 2024) at the University of Malta (UM), Valletta Campus, July 1-4, 2024.

CoDIT is now an affirmed conference in the field of Control, Optimization, Decision, Computer Science and Information Technologies. From its first edition in 2013 in Tunisia, CoDIT has gained an increasing international importance and recognition. This year CoDIT received over 850 submissions, which yield to the organization of 76 technical sessions. The conference is enriched by three plenary talks from internationally recognized researchers on emerging research topics. This year the conference features also a cultural event with agala dinner, whichwill be held on Wednesday 3 July 2024. The attendees are togather at 18:00, at theground floor lobby of the University of Malta Valletta Campus.

The conference is organized under the technical sponsorship of the IEEE Control Systems Society, the IEEE Systems, Man, and Cybernetics Society, the IEEE Robotics and Automation Society, and the International Federation of Automatic Control (IFAC) with the great support of the University of Malta.

Finally, an event of this size and importance could not be organized without the strong commitment of all the members of the organizing committee together with support and help of many volunteers. Special thanks go to the UM Conferences and Events Unit for the sterling service provided for the organisation and hosting of this event.

On behalf of the Organizing Committee

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Bozenna Pasik-Duncan, University of Kansas, USA
Achraf Jabeur Telmoudi, University of Tunis, Tunisia

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Keynotes

KEYNOTE 1

(July 01, 2024 / 10:30-11:20)

Decision and control for smart energy communities

Prof. Mariagrazia Dotoli (IEEE Fellow)

Politecnico di Bari, Italy

Chair: Prof. Bozenna Pasik-Duncan, University of Kansas, USA **Room:** Aula Magna

Abstract

A powerful solution contributing to the green transformation of modern power systems is represented by the so-called energy community. The term 'energy community' denotes a community of users (private, public, or mixed) located in a specific reference area, where all stakeholders – such as end-users (e.g., citizens, companies, etc.), market players (e.g., utilities, service providers), practitioners, planners and policy-makers – actively cooperate to develop a 'smart' energy system. Independently from the implemented architecture, the success of energy communities relies on the deployment of suitable decision and control mechanisms that efficiently and widespreadly exploit renewable sources and distributed storage, while enabling the application of measures oriented to cost-effectiveness, sustainability, and reliability. In this context, the talk presents innovative decision and control frameworks, such as game-theoretic methodologies, for energy communities composed of heterogenous actors equipped with trading and sharing service oriented energy systems. The effectiveness of the presented approaches is shown through numerical simulations on realistic scenarios.

Biography of Prof. Mariagrazia Dotoli

Dr. Mariagrazia Dotoli (http://dclab.poliba.it/people/mariagrazia-dotoli/) holds a PhD in Electrical Engineering and is a Full Professor in Automatic Control at Politecnico di Bari, Italy, where she is also the Founder and Coordinator of the Italian National PhD Program on Autonomous Systems (DAUSY, http://dausy.poliba.it/phd/), an interuniversity PhD Program with 25 Universities all over Italy. Prof. Dotoli was the Vice Rector for research of Politecnico di Bari and a member elect of the Academic Senate.

She is the founder and director (2012-) of the Decision and Control Laboratory of Politecnico di Bari, Italy http://dclab.poliba.it/ and was the founder and coordinator (2020-2022) of PhD Program on Industry 4.0, Politecnico di Bari, Italy http://phdindustria40.poliba.it/ind/. She is the founder (2012) of Politecnico di Bari spin-off company Innolab S.r.l. (https://www.innolabsrl.it/) She is member of the Executive Board of the Italian MEDITECH competence center for Industry 4.0 https://meditech4.com/ funded by the Italian Ministry for Economic Development.

Her research interests include decision and control approaches for energy systems, smart manufacturing, intelligent logistics, transportation systems and smart cities. She is author of 200+ international publications in these fields, including 1 textbook (in Italian) and 80+ international journal papers. Her h-index in Google Scholar equals 45, with 7000+ citations.

Prof. Dotoli is listed in the world top 2% scientists list for career-long impact and single-year categories in the "Industrial Engineering & Automation" and "Artificial Intelligence & Image Processing" fields in accordance with the well-known standardized citation metrics author database developed by Ioannidis et al., 2022 and released by Stanford University and Elsevier BV.

KEYNOTE 2

(July 01, 2024 / 14:20-15:10)

Autoencoder-embedded Evolutionary Algorithmsfor High-dimensional Expensive Optimization Problems

Prof. MengChu Zhou

(Fellow of IEEE, IFAC, AAAS, CAA and NAI)

New Jersey Institute of Technology, USA

Chair: Prof. Maria Pia Fanti, Polytechnic University of Bari, Italy **Room:** Aula Magna

Abstract

A High-dimensional computationally Expensive Problems (HEPs) in which a single fitness evaluation consumes hours or even days have attracted much attention from both academia and industry. Exponentially expanding search space and complex landscape brought by numerous decision variables make HEPs extremely challenging to be solved by traditional algorithms with limited physical/computational resources. Therefore, an Autoencoder-embedded Evolutionary Optimization (AEO) framework is invented to deal with them. To be specific, high-dimensional search space can be compressed to informative low-dimensional space by using an autoencoder as an effective dimension reduction tool. The search operation conducted in this low-dimensional space facilitates the population in convergence towards the optima. To balance the exploration and exploitation ability during optimization, two sub-populations are adopted to coevolve in a distributed/parallel fashion, wherein one is assisted by an autoencoder and the other undergoes a regular evolutionary process. Dynamic information exchange is conducted between them after each cycle to promote population diversity. Moreover, surrogate models can be incorporated into AEO (SAEO) to further boost its performance by reducing unnecessary fitness evaluation. Compared with the state-of-the-art algorithms for HEPs, AEO shows extraordinarily high efficiency for these challenging problems while SAEO can greatly improve the performance of AEO in most cases, thus opening new directions for various swarm optimization and evolutionary algorithms under both AEO and SAEO to tackle HEPs and greatly advancing the field of high-dimensional computationally expensive optimization. Their recent applications to mobile edge-computing systems, human-cyber-physical systems, and production scheduling are also illustrated.

Biography of Prof. MengChu Zhou

MengChu Zhou received his B.S. degree in Control Engineering from Nanjing University of Science and Technology, Nanjing, China in 1983, M.S. degree in Automatic Control from Beijing Institute of Technology, Beijing, China in 1986, and Ph. D. degree in Computer and Systems Engineering from Rensselaer Polytechnic Institute, Troy, NY in 1990. He joined New Jersey Institute of Technology (NJIT), Newark, NJ in 1990, and has been Distinguished Professor in Electrical and Computer Engineering since 2013. His research interests are in Petri nets, intelligent automation, AI, Cloud/edge Computing, Internet of Things, big data, web services, and intelligent transportation. He has over 1200 publications including 17 books, 850+ journal papers (650+ in IEEE transactions), 31 patents and 32 book-chapters. He is the founding Editor of IEEE Press Book Series on Systems Science and Engineering, and Associate Editor of IEEE Internet of Things Journal, IEEE Transactions on Intelligent Transportation Systems, and IEEE Transactions on Systems, Man, and Cybernetics: Systems. He was Editor-in-Chief of IEEE/CAA Journal of AutomaticaSinica (2018-2022). His present Google citation count is well over 67000 with h-index being 132. He was ranked #99 in the world among the 2023 Top 1000 Scientists in Computer Science in the World by Research.com. He is a life member of Chinese Association for Science and Technology-USA and served as its President in 1999. He is a Fellow of IEEE, International Federation of Automatic Control (IFAC), American Association for the Advancement of Science (AAAS), Chinese Association of Automation (CAA), and National Academy of Inventors (NAI).

KEYNOTE 3

(July 02, 2024 / 10:20-11:10)

Data-Driven Production, Innovation: Industry X.0

Prof. Farouk Yalaoui

(UTT's Senior Director, Vice-President of Research,

Director and Founder of Connected Innovation Chair)

Université de Technologie de Troye, France

Chair: Prof. Carla Seatzu, University of Cagliari, Italy **Room:** Aula Magna

Abstract

The proposed talk is a part of large work developed since many years with my team at UTT and different collaboration around the world. In France's Grand Est region, recognized for its evolving industry and innovative practices, a comprehensive, data-informed plenary speech on Industry X.0 is delivered. This speech investigates how data shapes today's production and innovation. It also highlights the challenges introduced by the evolving data-centric Industry X.0. Transitioning from theoretical insights to real-world applications, the speech delves into modern factory trends, spotlighting the flexible production systems influenced by Industry 4.0. It further examines real-time decision-making techniques, detailing approaches such as offline, online, and semi-online scheduling. Additionally, the Network of Supply Systems (NSS) and its role in shaping digital and sustainable business practices are discussed, emphasizing the alignment of products and strategies with user demands. The interplay between Data, Information, and Knowledge in production settings is emphasized. The speech examines the traditional 'Big Data' approach and presents the 'Smart Data' perspective as an avenue for enhanced efficiency. In illustrating this, the value and impact of different types of information, especially in task scheduling, are explored. The topic of quality control in Industry X.0 is also broached, focusing on state-of-the-art systems that integrate with cyber-physical production systems (CPPS). The innovative "Meta" quality control concept, leveraging digital twin models, is introduced and contextualized using a case example. Concluding, the speech underscores the importance of innovation in Industry X.0, ofnew ideas and cross-disciplinary collaboration. There's also a call to reimagine educational approaches in line with Society 5.0 and Industry 5.0 principles. The plenary speech wraps up by envisioning the future trajectory of Industry X.0, championing the intelligent utilization of technology in sync with human skills and evolving societal needs.

Biography of Prof. Farouk Yalaoui

Professor Farouk YALAOUI (https://www.faroukyalaoui.com) is currently a full Professor at Troyes University of Technology (UTT), France, where he is the Senior Director for Research of UTT. He is also scientific director of Industrial Chair "Connected Innovation" of UTT since 2016. He is the former director of LOSI Lab. (Logistiques et Optimisation des systèmes Industriels) of UTT and and former director of Services and Industries of The future of Troyes Institute (ISIFT). He obtained his Engineering degree in Industrial Engineering from the Polytechnics School of Algiers (Algeria) in 1995, his master's degree in Industrial System Engineering from Polytechnics Institute of Lorraine (Nancy, France) in 1997, his Ph.D. degree in Production Management from the Troyes University of Technology (UTT) in 2000 and followed by a Habilitation à diriger les recherches (Dr. Hab) from Compiegne University of Technology (UTC) in 2006. His research topic focuses on the scheduling problems, system design, operations research, modeling, analysis and optimization of logistic and production systems, reliability and maintenance optimization and on optimization problems in general. He supervised or co-supervised 29 Ph.D thesis and more than 82 projects since 2001.