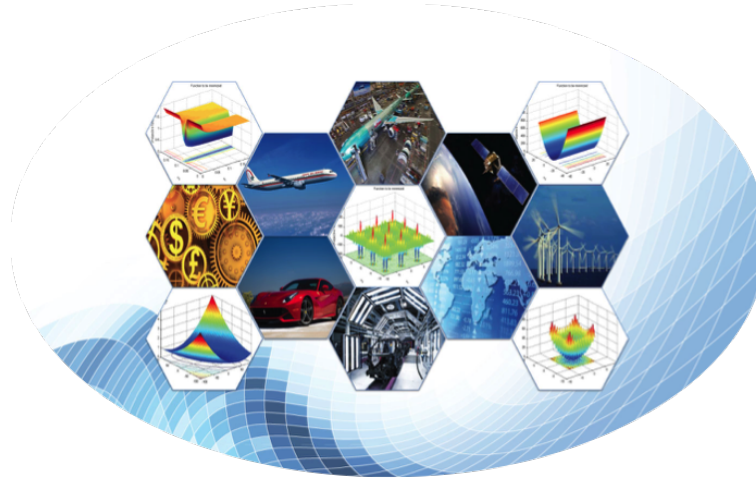# UNIVERSITY OF GENOA
and SULTAN MOULAY SLIMANE UNIVERSITY

The 8th EDITION of the INTERNATIONAL CONFERENCE on OPTIMIZATION and APPLICATIONS

ICOA2022

06th – 07th October 2022
Sestri Levante, Italy

The 8th Edition of the International Conference on Optimization and Applications (ICOA2022) provides a high-level international forum and an excellent venue for scientists, researchers, academic faculties, students, industry leaders, and others in the fields of optimization to present, discuss and publish their recent research results and approaches.

https://icoa2022.dibris.unige.it/

CONFERENCE CHAIRS:
Prof. Dr. HACHIMI Hanaa
Prof. Dr. MASULLI Francesco
Prof. Dr. ROVETTA Stefano
Prof. Dr. RIBAUDO Marina

TECHNICAL PROGRAM

Contents

Welcome Message from the Conference Chairs

Welcome to the 8th IEEE International Conference on Optimization and Applications (ICOA2022), which is held at Sestri Levante, Italy, 06-07 October 2022. The conference is organized by University of Genoa, Italy and Sultan Moulay Slimane University, Beni Mellal, Morocco. The ICOA2022 is Technically Supported by the International IEEE Advancing Technology of Humanity. ICOA2022 is a forum for depicting excellent results and new challenges on the optimization and its theoretical and applicative aspects. It brings together industrial and academic experts who are proficient in various engineering, design and research fields. This conference will provide an exceptional opportunity for the academic and industrial communities to address new challenges, share solutions and discuss future research guidance in this thematic. ICOA2022 received submissions from many countries. Many people have collaborated and worked hard to produce a successful ICOA2022 conference. Thus, we would like to thank all the authors for their interest to this conference, the scientific committee members, who carried out the most difficult work by carefully evaluating the submitted papers. Thanks to Publicity, Organizing and all Committees members for their assistance in making this conference a success. Our special thanks to our distinguished Keynote Speakers who have agreed to address the conference attendees. We are also grateful to all our partners and sponsors for their help and support of our conference. Welcome to Sestri Levante, Italy and we hope that you will enjoy the conference program.

Conference Chairs

Prof. Dr. HACHIMI Hanaa : hanaa.hachimi@usms.ma
Prof. Dr. MASULLI Francesco : francesco.masulli@unige.it
Prof. Dr. ROVETTA Stefano: stefano.rovetta@unige.it
Prof. Dr. RIBAUDO Marina : marina.ribaudo@unige.it

Sponsors and Partners

Many Thanks!
The involvement and sponsorship of our sponsors plays a major role in the success of our event.
The ICOA2022 sincerely thanks all the structures who have contributed to the success of this conference.

Organizing Secretariat

Promoest srl

Via G.B. Moroni 33 – 20146 Milano – Italy
tel : +39.02.43912468
email: congressi@promoest.com

HONORARY COMMITTEE

Prof. Dr. HMINA Nabil
President of Sultan Moulay Slimane University, Morocco

Prof. Eng. DELFINO Federico
President of Genoa University, Italy

GENERAL CHAIR

Prof. Dr. HACHIMI Hanaa
Sultan Moulay Slimane University, Beni Mellal, Morocco

LOCAL CHAIRS

Prof. Dr. MASULLI Francesco
UNIGE, Genoa, Italy

Prof. Dr. ROVETTA Stefano
UNIGE, Genoa, Italy

Prof. Dr. RIBAUDO Marina
UNIGE, Genoa, Italy

ORGANIZATION COMMITTEE

- Prof. Dr. ABDELLAOUI Abderrahim (ENSA, Kenitra, Morocco)
- Prof. Dr. ADDAIM Adnane (ENSA, Kenitra, Morocco)
- Prof. Dr. AMINE Abdellah (USMS, Beni Mellal, Morocco
- Prof. Dr. BEN MAISSA Yann (FSR, Rabat, Morocco)
- Prof. Dr. BENBRAHIM Houssam (ENSA, Kenitra, Morocco)
- Prof. Dr. BOUTALLINE Mohammed (USMS, Beni Mellal, Morocco)
- Prof. Dr. CHAOUI Habiba (ENSA, Kenitra, Morocco)
- Prof. Dr. EL HISSI Youmna (USMS, Beni Mellal, Morocco)
- Prof. Dr. El MOKHI Chakib (EDAG, Wolfsburg, Germany)
- Prof. Dr. ELKHADDARI Amal (FS, Kenitra, Morocco)
- Prof. Dr. HACHIMI Hanaa (ENSA, Kenitra, Morocco)
- Prof. Dr. HMINA Nabil (USMS, Beni Mellal, Morocco)
- Prof. Dr. KAICER Mohammed (FS, Kenitra, Morocco)
- Prof. Dr. MASLOUHI Mostafa (ENSA, Kenitra, Morocco)
- Prof. Dr. SAIDI RAJAA (INSEA, Rabat, Morocco)
- Prof. Dr. SEMLALI Naoual (EMI, Rabat, Morocco)
- Prof. Dr. ZAIDOUNI Dounia (INPT, Rabat, Morocco)
- Dr. GOUSKIR Mohamed (USMS, Beni Mellal, Morocco)
- Mr. ABOUHILAL Abdelmoula (ENCG, Beni Mellal, Morocco)
- Mr. BOUKHNIEF Nabil (USMS, Beni Mellal, Morocco)
- Mr. ERROCHDI Mohamed Amine (USMS, Beni Mellal, Morocco)

LOCAL COMMITTEE
University of Genoa – ITALY

- Prof. Dr. MASULLI Francesco (UNIGE, Genoa, Italy)
- Prof. Dr. ROVETTA Stefano (UNIGE, Genoa, Italy)
- Prof. Dr. RIBAUDO Marina (UNIGE, Genoa, Italy)

SCIENTIFIC COMMITTEE

- Prof. Dr. ABOU EL MAJD Badr (FS, Rabat, Morocco)
- Prof. Dr. ABOULAICH Rajaa (EMI, Rabat, Morocco)
- Prof. Dr. ADDAIM Adnane (EMI)
- Prof. Dr. AIRAJ Mohammed (FST, Marrakech, Morocco)
- Prof. Dr. AIT DAOUD Rachid (FP, Beni Mellal, Morocco)
- Prof. Dr. AIT MADI Abdessalam (UIT, Kenitra, Morocco)
- Prof. Dr. AIT YACINE Fatiha (USMS, Beni Mellal, Morocco)
- Prof. Dr. ALAMI MARKTANI Malika (ENSA, Fes, Morocco)
- Prof. Dr. ALLALOUL Chakir (FST, Beni Mellal, Morocco)
- Prof. Dr. AMIN Sallem (ENIS, Tunisia)
- Prof. Dr. AMINE Abdellah (EST, Fquih Ben Salah, Morocco)
- Prof. Dr. ANTARI Jilali (FP, Tarouant, Morocco)
- Prof. Dr. ASSIF Safaa (ENSA, El Jadida, Morocco)
- Prof. Dr. AZEROUAL Abdelhamid (FPK, Khouribga, Morocco)
- Prof. Dr. AZZOUZI Salma (UIT, Kenitra, Morocco)
- Prof. Dr. BADI Imad (ENSA, Al Hoceima, Morocco)
- Prof. Dr. BAHSINE Saida (FP ,Safi, Morocco)
- Prof. Dr. BAJIT Abderrahim (ENSA, Kenitra, Morocco)
- Prof. Dr. BAJJOU Omar (FST, Beni Mellal, Morocco)
- Prof. Dr. BAKHADACH Idris (USMS, Beni Mellal, Morocco)
- Prof. Dr. BEKKAY Hajji (ENSA , Oujda, Morocco)
- Prof. Dr. BELHOUIDEG Soufiane (FP, Beni Mellal, Morocco)
- Prof. Dr. BEN MAISSA Yann (INPT, Rabat, Morocco (IEEE Senior Member))
- Prof. Dr. BENAMAR Nabil (UMI, Meknes, Morocco)
- Prof. Dr. BENDIAB Mohammed (Areva, Erlangen, Germany)
- Prof. Dr. BENGHABRIT Asmaa (ENSMR, Rabat, Morocco)
- Prof. Dr. BENHLIMA Said (FS, Meknes, Morocco)
- Prof. Dr. BENJOUAD Abdelghani (UMI, Meknes, Morocco)
- Prof. Dr. BENKIRANE Said (UCAM, Marrakech, Morocco)
- Prof. Dr. BENMAMOUN Zoubida (ENSA, Kenitra, Morocco)
- Prof. Dr. BENTERKI Djamel (Setif University, Algeria)
- Prof. Dr. BIERLAIRE Michel (Polytechnic School of Lausanne, Switzerland)
- Prof. Dr. BOUAINE Amine (FS Ben M'sick, UH2C, Morocco)
- Prof. Dr. BOUATTANE Omar (ENSET, UH2C, Morocco)
- Prof. Dr. BOUDI El Mostapha (EMI, Rabat, Morocco)
- Prof. Dr. BOUIKHALENE Belaid (FP, Beni Mellal, Morocco)
- Prof. Dr. BOUKLATA Bouchra (ENSA, Kenitra, Morocco)
- Prof. Dr. BOUKOURAY Jamal (ESCA, Casablanca, Morocco)
- Prof. Dr. BOULOIZ Hafida (ENSA, Agadir, Morocco)
- Prof. Dr. BOUMEZZOUGH Ahmed (FP, Beni Mellal, Morocco)
- Prof. Dr. BOUSSELAM Kaouthar (INPT, Rabat, Morocco)
- Prof. Dr. BOUTALLINE Mohammed (ENSA, Beni Mellal, Morocco)
- Prof. Dr. BOUVRY Pascal (University of Luxembourg, Luxembourg)
- Prof. Dr. CHADLI Lalla Saadia (FST, Beni Mellal, Morocco)
- Prof. Dr. CHAOUB Abdelaali (INPT, Rabat, Morocco)
- Prof. Dr. CHAOUI Habiba (ENSA, Kenitra, Morocco)
- Prof. Dr. CHAOUKI ABOUNAIMA Mohammed (USMBA, Fez, Morocco)
- Prof. Dr. CHARAF My El Hassan (UIT, Kenitra, Morocco)
- Prof. Dr. CHERRADI Bouchaib (ENSET, Mohammedia, Morocco)
- Prof. Dr. CHIHAB Younes (UCAM, Marrakech, Morocco)
- Prof. Dr. CHIKH Khalid (EST, Beni Mellal, Morocco)
- Prof. Dr. DAOUI Cherki (FST, ERRACHIDIA, Morocco)
- Prof. Dr. DARGHAM Abdelmajid (ENSA, Khouribga, Morocco)
- Prof. Dr. DARIF Anouar (FP, Beni Mellal, Morocco)
- Prof. Dr. DAROUICHI Aziz (FST, Marrakech, Morocco)
- Prof. Dr. DIPTI Kapoor Sarmah (Deemed University, India)
- Prof. Dr. DOUIRI Moulay Rachid (EMI, Rabat, Morocco)
- Prof. Dr. ECHAJIA Malika (FST, Beni Mellal, Morocco)
- Prof. Dr. EDUARDO Souza de Cursi (INSA, Rouen, France)
- Prof. Dr. EL ABBADI Laila (ENSA, Kenitra, Morocco)
- Prof. Dr. EL ABDALLAOUI Abderrahim (ENSA, Kenitra,Morocco)
- Prof. Dr. EL ALEM Wafae (UM5, Rabat, Morocco)
- Prof. Dr. EL AMRANI Aumeur (FST, ERRACHIDIA, Morocco)
- Prof. Dr. EL AYACHI Rachid (FST, Beni Mellal, Morocco)
- Prof. Dr. EL BANNAY Omar

(ENSA, Khouribga, Morocco)

- Prof. Dr. EL BOUAYADI Rachid (ENSA, Kenitra, Morocco)
- Prof. Dr. EL BOUZEKRI Younès El Idrissi ( )
- Prof. Dr. EL GHAZALI Talbi (University of Lille, France)
- Prof. Dr. EL GOURI Rachid (ENSA, Kenitra, Morocco)
- Prof. Dr. EL GUARMAH El Mahdi (ERA, Marrakech, Morocco)
- Prof. Dr. EL HAMI Abdelkhalek (INSA, Rouen, France)
- Prof. Dr. EL HAMI Norelislame (ENSA, Kenitra, Morocco)
- Prof. Dr. EL IDRISSI Mohammed (FP, Beni Mellal, Morocco)
- Prof. Dr. EL KAMILI Mohamed (EST, Casablanca, Morocco)
- Prof. Dr. EL KARKOURI Khalid (Aix-Marseille, Marseille, France)
- Prof. Dr. EL KETTANI Mohamed El Youssfi (FS, Kenitra, Morocco)
- Prof. Dr. EL KHECHAFI Mariam (UIT, Kenitra, Morocco)
- Prof. Dr. EL MAKHFI Noureddine (FST, Al Hoceima, Morocco)
- Prof. Dr. EL MARKHI Hassane (USMBA, Fez, Morocco)
- Prof. Dr. EL MOKHI Chakib (ENSA, Kenitra, Morocco)
- Prof. Dr. EL MOUMEN Samira (FS Ain Chok, Casablanca, Morocco)
- Prof. Dr. EL OUADGHIRI Mly Driss (FS, Meknes, Morocco)
- Prof. Dr. EL OUAFY Tarik (FPK, Khouribga, Morocco)
- Prof. Dr. EL YAAKOUBI Nouzha (FS, Rabat, Morocco)
- Prof. Dr. EL-HAMI Khalil (FPK, Khouribga, Morocco)
- Prof. Dr. ELHISSI Youmna (ENCG, Beni Mellal, Morocco)
- Prof. Dr. Elhoussine Azroul (

USMBA, Fez, Morocco)

- Prof. Dr. ELLAIA Rachid (EMI, Rabat, Morocco)
- Prof. Dr. Elmostafa Atify (FP, Beni Mellal, Morocco)
- Prof. Dr. ELOMARI M'Hamed (EST, Fez, Morocco)
- Prof. Dr. ETTOLBA Mohammed (INPT, Rabat, Morocco)
- Prof. Dr. FAIEQ Soufiane (FS, Rabat, Morocco)
- Prof. Dr. FAKHFAKH Mourad (University of Sfax, Tunisia)
- Prof. Dr. FALIH Noureddine (FP, Beni Mellal, Morocco)
- Prof. Dr. FAOUZI Hassan (USMS, Beni Mellal, Morocco)
- Prof. Dr. GALLAB Maryam (EMI, Rabat, Morocco)
- Prof. Dr. GOUSKIR Mohamed (USMS, Beni Mellal, Morocco)
- Prof. Dr. HACHIMI Hanaa (USMS, Morocco (IEEE Senior Member))
- Prof. Dr. HACHKAR Zakaria (UCAM, Marrakech, Morocco)
- Prof. Dr. HADMI Azhar (UM1, Montpellier France)
- Prof. Dr. HAFIZUL Fahri Hanafi (Universiti Pendidikan Sultan Idris, Malaysia)
- Prof. Dr. Hemlal Bhattarai (Jigme Namgyel Engineering College, Royal University of Bhutan)
- Prof. Dr. HILAL Khalid (FST, Beni Mellal, Morocco)
- Prof. Dr. HILALI Nabil (ESCA, Casablanca, Morocco)
- Prof. Dr. HMINA Nabil (USMS, Morocco)
- Prof. Dr. HOUMANI Hanane (ENSEM, Casablanca, Morocco)
- Prof. Dr. IDRISSI Fahd Khamlichi (DEVOTEAM, Rabat, Morocco)
- Prof. Dr. IDRISSI Najlae (FST, USMS, Morocco)
- Prof. Dr. IDRISSI Said (FP, Safi, Morocco)
- Prof. Dr. IGOUZAL Mo-

hammed (UIT, Kenitra, Morocco)

- Prof. Dr. JARIR Zahi (FSSM, Marrakech, Morocco)
- Prof. Dr. JENSEN Nils (Ostfalia, Wolfenbüttel, Germany)
- Prof. Dr. JERRY Chakib (UIT, Kenitra, Morocco)
- Prof. Dr. JERRY Mounir (FSJES, Kenitra, Morocco)
- Prof. Dr. JRAIFI Abdelilah (ENSA, Safi, Morocco)
- Prof. Dr. KAICER Mohammed (FS, Kenitra, Morocco)
- Prof. Dr. KAJJOUNI Ahmed (EST, Beni Mellal, Morocco)
- Prof. Dr. KATARINA Jelemenská (Slovak University of Technology, Bratislava)
- Prof. Dr. KHALID Najib (ENIM, Rabat, Morocco)
- Prof. Dr. KHATRI Sunil (Amity Iniversity India)
- Prof. Dr. KUMAR Sandeep (Amity University, Jaipur, Rajasthan, India)
- Prof. Dr. LACHHAB Abdeslam (EST, Meknes, Morocco)
- Prof. Dr. LAGRAT Ismail (ENSA, Kenitra, Morocco)
- Prof. Dr. LAKHBAB Halima (FS, Casablanca, Morocco)
- Prof. Dr. LAKHOUIT Abderrahim (Usherbrooke, Canada)
- Prof. Dr. LAMARTI SEFIAN Mohammed (ENS, Tetouan, Morocco)
- Prof. Dr. LEBBAR Maria (ENSMR, Rabat Morocco)
- Prof. Dr. Lhoucine Oufni (FST, Beni Mellal, Morocco)
- Prof. Dr. LOKRITI Abdesslam (FPK, Khouribga, Morocco)
- Prof. Dr. LOTFI Bouchra (ENSA, Berchid, Morocco)
- Prof. Dr. MABROUK Abdelfettah (ENSIAS, Rabat, Morocco)
- Prof. Dr. MABTOUL Samira (ENSA, Kenitra, Morocco)
- Prof. Dr. MADINI-ZOUINE Zhour (ENSA, Kenitra, Morocco)
- Prof. Dr. MAKHLOUFI

Abderrahman (INSA, Rouen, France)

• Prof. Dr. MANSOURI Khalifa (ENSET, Mohammedia, Morocco)

• Prof. Dr. MASLOUHI Mostafa (ENSA, Kenitra, Morocco)

• Prof. Dr. MASULLI Francesco (University of Genova, Italy)

• Prof. Dr. MBARKI Mohamed (FST, Beni Mellal, Morocco)

• Prof. Dr. MEDARHRI Ibtissam (ENSMR, Rabat, Morocco)

• Prof. Dr. MEHAR Chand (Guru Kashi UniversityBathinda, India)

• Prof. Dr. MEJRI Mohamed (ULAVAL, Canada)

• Prof. Dr. MELLIANI Said (FST, Beni Mellal, Morocco)

• Prof. Dr. MESBAHI Abdelouahed (ENSEM, Casablanca, Morocco)

• Prof. Dr. METRANE Abdelmoutalib (ENSA, USMS, Morocco)

• Prof. Dr. MGHAZLI Zoubida (FS, Kenitra, Morocco)

• Prof. Dr. MJAHED Mostafa (Royal School of Aeronautics, Morocco)

• Prof. Dr. MOUAYN Zouhair (FST, Beni Mellal, Morocco)

• Prof. Dr. MOUBARIK Amine (FP, Beni Mellal, Morocco)

• Prof. Dr. MOULOUDI Abdelaziz (FS, Kenitra, Morocco)

• Prof. Dr. MOUSSA Hicham (FST, Beni Mellal, Morocco)

• Prof. Dr. MOUSSAID Nourddine (FST, Mohammedia, Morocco)

• Prof. Dr. MRAOUA Mohammed (HEC, Montreal, Canada)

• Prof. Dr. NACHAOUI Mourad (FST, Beni Mellal, Morocco)

• Prof. Dr. NASSIH Bouchra (ENSA, Kenitra, Morocco)

• Prof. Dr. NAYYAR Anand (Duy Tan University, Vietnam)

• Prof. Dr. NGADI Mohammed

(ENSA, Khouribga, Morocco)

• Prof. Dr. OBAID Abdelatif (UQAM, Canada)

• Prof. Dr. OUAARAB Aziz (CSCM-LRIT, FSR, UM5, Rabat, Morocco)

• Prof. Dr. OUACHA Ali (EMI, Rabat, Morocco)

• Prof. Dr. OUASMI Nabila (FST, Beni Mellal, Morocco)

• Prof. Dr. OUBAHA Jawad (ENSIAS, Rabat, Morocco)

• Prof. Dr. OUBENALI Mustapha (FST, Beni Mellal, Morocco)

• Prof. Dr. OUHIMOU Siham (FS Ain chock Casablanca, Morocco)

• Prof. Dr. OUMAIRA Ilham (ENSA, Kenitra, Morocco)

• Prof. Dr. OZEN Özer (Kırklareli University, Turkey)

• Prof. Dr. PEREIRA Pedro (University NOVA of Lisbon, Portugal)

• Prof. Dr. POIRIER Franck (UBS, France)

• Prof. Dr. POONIA Sandeep (Amity University Rajasthan,India)

• Prof. Dr. QBADOU Mohammed (ENSET, Mohammedia, Morocco)

• Prof. Dr. RADGUI Amina (INPT, Rabat, Morocco)

• Prof. Dr. RADGUI Maryem (INSEA, Rabat, Morocco)

• Prof. Dr. RADZI Ambar (Universiti Tun Hussein Onn Malaysia)

• Prof. Dr. RAHMANI Khalid (FP, Beni Mellal, Morocco)

• Prof. Dr. RAIHANI Abdelhadi (ENSET, Mohammedia, Morocco)

• Prof. Dr. RAISSI Nadia (UM5, Rabat, Morocco)

• Prof. Dr. RAMOUL H. (Abbes laghrour University, Algeria)

• Prof. Dr. RIBAUDO Marina (University of Genoa, Italy)

• Prof. Dr. RIYAMI Bouchaib

(UBS, France)

• Prof. Dr. ROVETTA Stefano (University of Genova, Italy)

• Prof. Dr. RZIZA Mohammed (FSR, Rabat, Morocco)

• Prof. Dr. S.B. Singh (Punjabi University, Patiala, India)

• Prof. Dr. SAADI Shaimaa (ENSA, Kenitra, Morocco)

• Prof. Dr. SAADI Youssef (FST, Settat, Morocco)

• Prof. Dr. SAFI Said (FP, Beni Mellal, Morocco)

• Prof. Dr. SAID Sami (Telecom-Tunis, Tunisie)

• Prof. Dr. SAIDI Rajaa (INSEA, Rabat, Morocco)

• Prof. Dr. SALHI Abderrahim (FST, Beni Mellal, Morocco)

• Prof. Dr. SAOUD Sahar (ENCG, Agadir, Morocco)

• Prof. Dr. SATORI Hassan (USMBA, Fez, Morocco)

• Prof. Dr. SEMLALI AOURAGH HASSANI Naoual (EMI, Rabat, Morocco)

• Prof. Dr. SEN Soumya (University of Calcutta, India)

• Prof. Dr. SHAHRIAR Hossain (Kennesaw State University, USA)

• Prof. Dr. SHAMUL Jamel Elias (Universiti Teknologi MARA Malaysia)

• Prof. Dr. SIADAT Ali (ENSAM, LCFC, France)

• Prof. Dr. SIARRY Patrick (University of Paris 12, France)

• Prof. Dr. SINGH Narinder (Baba Farid University, India)

• Prof. Dr. SO Suseendran (G Vels University, India)

• Prof. Dr. SOULAYMANI Abdelmajid (FSK, Kenitra, Morocco)

• Prof. Dr. SULIADI Sufahani (Universiti Tun Hussein Onn Malaysia)

• Prof. Dr. SYED Akhter Hossain (Daodil International University, India)

• Prof. Dr. SYED Zulkarnain

Syed (UniMAP, Malaysia)
- Prof. Dr. TARBOUCHI Mohammed (Royal Military College of canada, Canada)
- Prof. Dr. TAZI El Bachir (EST, Khenifra, Morocco)
- Prof. Dr. TGARGUIFA Ahmed (EST, El Kelaa des Sraghna, Morocco)
- Prof. Dr. TKIOUAT Mohammed (EMI, Rabat, Morocco)
- Prof. Dr. TLELOCUAUTLE Esteban (INAOE, Mexico)
- Prof. Dr. TOLLENAERE Michel (Grenoble-INP, France)
- Prof. Dr. TORRES Jairo Rafael (Montoya University, Colombia)
- Prof. Dr. TOUMI Abdelghani (UIC, Casablanca, Morocco)
- Prof. Dr. WAJIH Aschraf (Aligarh Muslim University, Aligarh, Uttar Pradesh, India)
- Prof. Dr. XIE Min (College of Science and Engineering, Hong Kong (IEEE Fellow Member))
- Prof. Dr. YALAOUI Farouk (UTT of Troyes, France)
- Prof. Dr. YOUSSFI Mohamed (ENSET, Mohammedia, Morocco)
- Prof. Dr. ZEJLI Driss (ENSA, Kenitra, Morocco)
- Prof. Dr. ZEMZAMI Maria (USMS, Beni Mellal, Morocco)
- Prof. Dr. ZIANI Mohammed (UM5, Rabat, Morocco)
- Prof. Dr. ZOUINE Younes (ENSA, Kenitra, Morocco)
- Prof. Dr. ZRIOUEL Sanae (FP, Beni Mellal, Morocco)
- Prof. Dr. ZYAD Abdelmajid (FST, Beni Mellal, Morocco)

LIST OF TOPICS
The ICOA2022 Conference Seeks Original and High Quality Papers

Tools and Methods	Fields and Areas
Artificial Intelligence	Electric, Electronic engineering
Learning Algorithms	Embedded Systems
Combinatorial Optimization	Telecommunication Engineering
and Mathematical Programming	Robotic
Numerical Methods	Control and Mechatronics
Linear and Non-linear Programming	Physics
Multiobjective Programming	Civil Engineering
Parallel and Distributed Computation	Smart Grids and energy systems
Bio-inspired Computations and Neural Networks	Smart city and traffic simulation
Fuzzy systems	Aerospace, Naval and Marine Engineering
Evolutionary Computing	Transportation, Logistic Engineering
Metaheuristic Optimization Algorithms	Software and Computer Engineering
Hybrid Algorithms	Big data
Dynamic Optimization	Scheduling and Data mining
Continuous Optimization	Bio mathematics
	Automotive mechatronics
	Aviation

All accepted and presented papers will be published in IEEE Xplore Digital Library and indexed in Scopus.

Technical Program Overview

Thursday 06th October 2022

8h00 - 9h00	**Registration: Day 1**
9h00 - 10h00	**Opening Ceremony** **Welcome Coffee** **Photos Session**
10h00 - 10h30	**Keynote 1**
10h30 - 12h30	**TM1** **TM2** **TM3**
12h30 - 14h30	**Free Lunch**
14h30 - 15h00	**Coffee Break**
15h00 - 16h30	**TA1** **TA2** **TA3**
20h00	**Gala Dinner**

Friday 07th October 2022

09h30 - 10h00	**Registration: Day 2**
10h00 - 10h30	**Keynote 2**
10h30 - 11h00	**Coffee Break**
11h00 - 12h30	**TM1** **TM2** **TM3**
13h00	**Closing Ceremony and Free Lunch**

TM/A: **T**hursday **M**orning/**A**fternoon
FM/A: **F**riday **M**orning/**A**fternoon

Session		Topics	Microsoft Teams session link
Opening Ceremony & Keynote 1			**shorturl.at/bFGH9**
TM	TM1	Optimisation and applications	**shorturl.at/fklN2**
	TM2	Maching Learning and applications	**shorturl.at/knvw2**
	TM3	Mathematics	**shorturl.at/befIR**
TA	TA1	Industry and Materials	**shorturl.at/jQT37**
	TA2	Biostatistics/Fuzzy	**shorturl.at/ALQZ0**
	TA3	Artificial intelligence	**shorturl.at/AST25**
Keynote 2			**shorturl.at/gnY78**
FM	FM1	Optimisation	**shorturl.at/frtW8**
	FM2	Artificial intelligence	**shorturl.at/hi467**
	FM4	Telecommunication and Cybersecurity	**shorturl.at/jKPU7**
Closing Ceremony			**shorturl.at/bgjqU**

Keynote Speakers

KN 1: Prof. Dr. Pierre Baldi
University of California, Irvine, USA

Session Chair: Prof. Dr. Hanaa HACHIMI

Thursday 06th October 2022
10h00 - 10h30

KN 2: Prof. Dr. Abderrahim Lakhouit
University of Sherbrooke, Canada

Application of Machine Learning in the field of Waste Management

Session Chair: Prof. Dr. Francesco Masulli

Friday 07th October 2022
09h30 - 10h00

Sessions Content

TM1: Optimisation and applications			|| Thursday, October 06-2022 (10h30 to 12h30)
Session Chairs: Prof. Dr. Pierre Baldi/ Prof. Dr. Hanaa HACHIMI			
10h30	ID. 23	Nouhayla Ait Oussaid, Mourad El Ouali, Sultana Ben Aadi, Khalid Akhlil and Salma Gaou	Nonsmooth Optimization for Synaptic Depression Dynamics
10h45	ID. 33	Sara Rhouas and Norelislam El Hami	A packaging industry optimization based on three metaheuristics methods
11h00	ID. 38	Anas El Attaoui and Norelislam El Hami	Assignement problem solved by two metaheuristic algorithms ACO and HHO
11h15	ID. 43	Issam El Khadiri, Mohamed Abouelmajd, Maria Zemzami, Nabil Hmina, Manuel Lagache, Bandar Almangour, Ahmed Bahlaoui, Ismail Arroub and Soufiane Belhouideg	TPMS Lattice Structure derived using Topology Optimization for the Design of Additive Manufactured
11h30	ID. 44	Elizaveta Tarasova and Natalya Grigoreva	Accounting for large jobs for a single-processor online model
11h45	ID. 47	Hakima Reddad, Maria Zemzami, Norelislam El Hami and Nabil Hmina	A comparative study of several metaheuristic algorithms for optimization problems
12h00	ID. 82	Xiaoxiao Song, Emilie Poirson, Yannick Ravaut and Fouad Bennis	Multi-objective layout optimization of industrial environment
12h15	ID. 11	Atzemourt Mossaab, Farchi Abdelmajid, Chihab Younes and Hachkar Zakaria	Beamforming Optimization by Binary Genetic Algorithm

TM2: Maching Learning and applications			‖ Thursday, October 06-2022 (10h30 to 12h00)
Session Chairs : Prof. Dr. Stefano Rovetta/ Prof. Dr. Adnane Addaim			
10h30	ID. 42	Ali Amkor and Noureddine El Barbri	Electronic nose based on gas sensors and a machine-learning algorithm to discriminate potatoes according to the cultivated field nature
10h45	ID. 52	Oumaima Bouakline, Youssef El Merabet and Kenza Khomsi	Deep-Learning models for daily PM10 forecasts using feature selection and genetic algorithm
11h00	ID. 57	El Miloud Smaili, Salma Azzouzi and Moulay El Hassan Charaf	An Optimized Adaptive Learning Approach Based on Cuckoo Search Algorithm
11h15	ID. 62	Ibtissam Medarhri, Mohamed Hosni, Najib Nouisser, Fatma Chakroun and Khalid Najib	Predicting Stock Market Price Movement using Machine Learning Techniques
10h30	ID. 73	Shahid Mohammad Ganie, Pijush Kanti Dutta Pramanik, Majid Bashir Malik and Dr. Anand Nayyar	An Improved Ensemble Learning Approach for Heart Disease Prediction using Boosting Algorithms
11h45	ID. 77	Youssef Kossale, Mohammed Airaj and Aziz Darouichi	Mode Collapse in Generative Adversarial Networks: An Overview
12h00	ID. 6	Jouilil Youness and Mentagui Driss	LSTM Deep Learning vs ARIMA Algorithms for Univariate Time Series Forecasting: A case study
12h15	ID. 90	Kaoutar Boussaoud, Meryeme Ayache and Abdeslam Ennouaary	Performance Evaluation of Supervised ML Algorithms of Elephant Flow Detection in SDN

TM3: Mathematics			‖ Thursday, October 06-2022 (10h30 to 12h00)
Session Chairs : Prof. Dr. Francesco Masulli/ Prof. Dr. Chakib El Mokhi			
10h30	ID. 4	El Hassene Osmani, Mounir Haddou and Naceurdine Bensalem	A Smooth Approach to the solution of Nonlinear Complementarity Problems involving P0-function
10h45	ID. 9	Rachid Fateh, Anouar Darif and Said Safi	Hyperbolic Functions Impact Evaluation on Channel Identification Based on Recursive Kernel Algorithm
11h00	ID. 21	Najat Chefnaj, Khalid Hilal and Ahmed Kajouni	Nonlocal Neutral Conformable Fractional Differential Equations with Measure of Noncompactness in Banach Space
11h15	ID. 28	Abdelmjid Benmerrous, Lalla Saadia Chadli, Abdelaziz Moujahid, Said Melliani and M'Hamed Elomari	Solution of Schrodinger type Problem in Extended Colombeau Algebras
11h30	ID. 30	Hamid Lmou, Khalid Hilal and Ahmed Kajouni	Existence result for psi-Hilfer fractional hybrid Langevin inclusion
11h45	ID. 35	Achraf Azanzal, Fatima Ouidirne, Chakir Allalou and Said Melliani	Well-posedness and Gevrey regularity of mild solutions to the parabolic-elliptic system of drift-diffusion type in critical Fourier-Besov spaces with variable exponents
12h15	ID. 85	Salma Solhi, Ahmed Kajouni and Khalid Hilal	Existence of positif solutions of a non-linear quadratic differential fractional equations

TA1: Industry and Materials			‖ Thursday, October 06-2022 (15h00 to 16h30)
Session Chairs : Prof. Dr. Maria Zemzami / Prof. Dr. Mohammed Boutalline			
15h00	ID. 18	Youness Foukhari, Mohamed Sammouda and Mohamed Driouich	The Influence of Porous Layer Thickness on Free Convection Heat in an Annular Partial Porous Medium Saturated By Nanofluid
15h15	ID. 29	Aziz Oukaira	Transient Thermal Profile Prediction for Integrated Circuits (ICs) Thermal Management
15h30	ID. 45	Khalid El Moutaouakil, Brahim Jabir and Noureddine Falih	Agriculture 4.0: Literature Review and Application Challenges in the "Beni Mellal-Khenifra" region
15h45	ID. 54	Mohamed Abouelmajd, Issam El Khadiri, Ismail Ezzaraa, Maria Zemzami, Mohamed El Afi, Manuel Lagache, Bandar Almangour, Ismail Arroub, Rachid Bouferra, Mohamed Essaleh, Ahmed Bahlaoui, Nabil Hmina and Soufiane Belhouideg	Mechanical Behavior of TPMS-Based Solid Network Structures Obtained by Additive Manufacturing Technology
16h00	ID. 84	Ouassima El Qouarti, Ahmed Essadki, Hammadi Laghridat and Tamou Nasser	Power Management Strategy for a Direct Current Hybrid Microgrid based on Doubly Fed Induction Generator and Fuel Cell

TA2: Biostatistics/Fuzzy			‖ Thursday, October 06-2022 (15h00 to 17h00)
Session Chairs : Prof. Dr. Hajar Sabiki / Prof. Dr. Rabha Allaoui			
15h00	ID. 32	Khadija Channan, Hilal Khalid and Ahmed Kajouni	The asymptotic stability of an epidemiological model "Covid 19 variant English"
15h15	ID. 37	Ali Raza, Muhammad Ahmad Raza Cheema, Dumitru Baleanu and Farooq Haider	Mathematical Modeling of Nipah Virus Disease Through Evolutionary Computations
16h45	ID. 40	Sohaib Khalid, Driss Effina and Jouilil Youness	An Econometric Analysis of the Determinants of Small's Cities' Attractiveness: Evidence from Moroccan Case
15h30	ID. 48	Assia Najm, Abdelali Zakrani and Marzak Abdelaziz	Optimal Additive C-Fuzzy Regression Trees for Software Development Effort Prediction
15h45	ID. 58	Zineb Belhallaj, M'Hamed Elomari, Said Melliani and Lalla Saadia Chadli	On intuitionistic fuzzy laplace transforms for solving intuitionistic fuzzy partial Volterra integro-differential equations
16h00	ID. 60	Fatima Ezzahrae Fadili, Essaid Anaama, Chakir Allalou and Khalid Hilal	Dynamics of a delayed SEIR epidemic model for the COVID-19
16h15	ID. 64	Samira Zerbib, Khalid Hilal and Ahmed Kajouni	Existence result for fuzzy hybrid fractional differential equation involving psi-Hilfer fractional derivative
16h30	ID. 69	Said Idrissi, Youssef El Fezazi, Nabil El Fezazi and Elhoussaine Tissir	Improved stability analysis for Takagi-Sugeno (T-S) fuzzy systems with two additive time-varying delays

TA3: Artificial intelligence			‖ Thursday, October 06-2022 (15h00 to 16h30)
Session Chairs : Prof. Dr. Mohamed Gouskir / Prof. Dr. Rachid Ait Daoud			
15h00	ID. 2	Tarana Singh, Arun Solanki and Sanjay Kumar Sharma	Evolution of Smart Home Energy Management System Using Internet of Things and Machine Learning Algorithms
15h15	ID. 7	Jihad Satri, Chakib El Mokhi and Hanaa Hachimi	Artificial intelligence and machine learning for a better decision making in the public sector
15h30	ID. 20	Malak Dargham and Hanaa Hachimi	How AI is automating writing : The rise of robot writers
15h45	ID. 34	Sara Samine, Maria Zemzami, Nabil Hmina, Manuel Lagache and Soufiane Belhouideg	Towards the use of artificial intelligence and machine learning in material scientist field
16h00	ID. 46	Ouassam Elhoucine, Hmina Nabil, Bouikhalene Belaid and Hachimi Hanaa	Agent-based Modeling and Simulation of Digital Learning Environment
16h15	ID. 49	Bouzaachane Khadija	Automatic detection of covid-19 using CNN model combined with Firefly algorithm

FM1: Optimisation			‖ Friday, 0ctober 07-2022 (11h00 to 12h30)
Session Chairs : Prof. Dr. Abderrahim Lakhouit / Prof. Dr. Houda Moudni			
11h00	ID. 53	Elizaveta Tarasova and Klavdiya Bochenina	A conceptual framework for personality-sensitive scheduling models
11h15	ID. 68	Ayoub Razouk, Rachid Ait Daoud and Moulay El Mehdi Falloul	Numerical optimization methods for financial time series GARCH(p,q) model, a comparative approach
11h30	ID. 70	Wassim Chouaf, Ahmed Abbou and Ali Agga	Optimal energy management for a connected micro-grid using dynamic programming method
11h45	ID. 79	Narimen Hafsi, Hanaa Hachimi and Djamel Benterki	A new hybrid genetic with firefly algorithm for solving cyber-criminal's attacks
12h00	ID. 80	Jihane Ech-Chatebi and Asmaa Farah	The importance of Enterprise Resource Planning (ERP) in the optimisation of the SME's ressources in Morocco
12h15	ID. 82	Adam El Khaldi and Prof. Dr. Hanaa Hachimi	Optimized management of green supply chains by the use of Ant Colonies multiobjetive algorithm: The integration of the economic, environmental and social impacts of multimodal transport

FM2: Artificial intelligence			‖ Friday, October 07-2022 (11h00 to 12h00)
Session Chairs : Prof. Dr. Abdelmoula Abouhilal / Prof. Dr. Lamiae Demraoui			
11h00	ID. 51	Fahd Belmajdoub and Souad Abderafi	Soft sensing of vertical raw mill fineness using artificial neural network
11h15	ID. 71	Sanaa Lakrouni, Marouane Sebgui and Slimane Bah	Using AI and IoT at the Edge of the network
11h30	ID. 72	Khalil Ibrahim Hamzaoui, Mohammed Gabli and Laurent Peyrodie	An intelligent decision support system to anticipate the fall of a structure for paraplegic patients
11h45	ID. 83	Abdellah Haddad, Badr Abou El Majd and Driss Bennis	On PI-Net deep learning model for classification of images
12h00	ID. 91	Gouskir Lahcen, Mohamed Eddahbi, Mohamed Gouskir, Hanaa Hachimi and Abdelmoula Abouhilal	Machine learning approach for waste solid management in Beni Mellal

FM3: Telecommunication and Cybersecurity || Friday, October 06-2022 (10h30 to 12h00)			
Session Chairs : Prof. Dr. Marina Ribaudo/ Prof. Dr. Ismail El Bazi			
10h30	ID. 14	Ikram Daanoune and Abdennaceur Baghdad	Reliable and energy-efficient transmission scheme based on error correction codes and clustered routing protocol for WSN
10h45	ID. 22	Mohamed Marzouk, Ibrahime Hassan Nejdi, Youssef Rhazi and Mohamed Saih	Multiband and Wide Band Octagonal Fractal Antenna for Telecommunication Applications
11h00	ID. 27	Prabuddh Kumar Ashok and Arun Solanki	Applying Privacy & Proof of Ownership on Software Licenses & Patents using Non-Fungible Tokens on Public Blockchains & Securing them using Hashing Algorithms
11h15	ID. 61	Khadija Bouzaachane and El Mahdi El Guarmah	Applying Face Recognition in Video Surveillance for Security Systems
11h30	ID. 67	Hamza Ouamna, Zhour Madini and Younes Zouine	6G and V2X Communications: Applications, Features, and Challenges
11h45	ID. 76	Hasnaa Souabni, Houssam Benbrahim and Aouatif Amine	Secure Data Acces in Odoo System
12h15	ID. 78	Fouzia El Abassi, Aziz Darouichi and Aziz Ouaarab	Images Segmentation using Deep Learning Algorithms and Metaheuristics
12h00	ID. 89	Hajar Lazar and Zahi Jarir	Road traffic accident prediction: a driving behavior approach

Sestri Levanti city

The event will be held in Sestri Levante, a wonderful place to be in.

Welcome!