

Preface

The 4th International Conference on Artificial Intelligence and Applied Mathematics (JIAMA26)

Under the theme

Artificial Intelligence & Applied Mathematics in Sustainable Energy and Engineering Science

In a constantly evolving world, where environmental, energy, and societal challenges demand increasingly innovative solutions, the fields of applied physics, systems engineering, and computational sciences emerge as essential catalysts for transformation. This work is positioned at the crossroads of these disciplines, exploring how methodological and technological advances redefine our ability to model, analyze, and optimize complex systems.

This volume is structured around a rich thematic architecture, reflecting the convergence of traditional engineering approaches with the revolutionary paradigms of artificial intelligence and high-performance computing. The first part, "Applied Physics & Engineering Systems Modeling", delves into the physical foundations and advanced modeling techniques, covering topics ranging from the dynamics of inelastic fluids to aerodynamic optimization, including wind turbine noise estimation and the energy recovery of industrial residues.

The second part, "AI and Computational Sciences for Engineering Applications," illustrates the transformative power of artificial intelligence, machine learning, and computational methods. It explores their applications in diverse fields such as climate risk forecasting for agriculture, optimization of building energy efficiency, classification of environmental disasters thru UAV imaging, as well as epidemic modeling and the development of green finance. This section highlights how AI not only improves existing processes but also opens new avenues for predictive analysis, optimized decision-making, and the creation of sustainable solutions.

Together, the contributions of this work critically examine the synergies and tensions that emerge from the integration of these disciplines. They demonstrate how computational tools and AI, far from being mere instruments, act as dynamic forces, deeply rooted in scientific, economic, and societal logics. This volume invites a deep reflection on how these advancements enable actors to reconfigure processes, roles, and values across various fields, thus positioning technological innovation as a fundamental lever to address contemporary challenges and shape a more sustainable and resilient future. It is aimed at an audience of researchers, engineers, students, and decision-makers eager to understand and participate in this multidisciplinary transformation.

Younes Abouelhanoune
Aicha Chorak
Patricia Palenzuela Ardila
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Aim and Scope of the Book

The 4th International Conference on Artificial Intelligence and Applied Mathematics (JIAMA'26) brings together researchers, academics, and practitioners from around the world to share and discuss recent advances, emerging trends, and practical challenges at the intersection of artificial intelligence and applied mathematics. As these two fields continue to evolve and increasingly complement one another, JIAMA'26 serves as a dynamic platform for fostering interdisciplinary collaboration and innovation. This esteemed gathering was held at the National School of Applied Sciences of Al-Hoceima, Morocco, on May 12–13, 2026. The conference has been co-organized by ENSAH with the LSCD laboratory of the School of New Sciences and Engineering (ENSI) and partnered with the FSTH and A2MIA.

The conference aims to highlight cutting-edge research in areas such as machine learning, optimization, data science, statistical learning, and energetics, and their applications to real-world problems in physics, engineering, environmental science, materials science, and sustainability. By bridging theoretical developments with practical implementations, JIAMA'26 promotes the development of robust and efficient solutions to complex scientific and industrial challenges

The conference attracted more than 76 research submissions from reputed institutions across Morocco, as well as international contributions from France, Uzbekistan, Saudi Arabia, Iraq, India, and South Korea. After a rigorous peer-review process, 30 high-quality papers are being published in the Scopus-indexed proceedings of EPJ Web of Conferences by EDP Sciences, France, ensuring wide visibility and academic impact achieving an acceptance rate of approximately **39%**.

In Figure 1, we present the thematic architecture that guides our exploration of Integrated Intelligent Systems for Sustainable Engineering. This architecture, which emerges from an analysis of the contributions and current trends in the field, groups the research into four main pillars, each reflecting shared concerns, specific analytical approaches, and distinct empirical contexts.

The first hub, "Artificial Intelligence & Computational Sciences in Engineering", encompasses advanced methodologies such as Machine Learning, Deep Learning, Optimization, XAI (eXplainable AI), Data Science, and Predictive Modeling. These tools are fundamental for the analysis of complex data and informed decision-making. At the same time, the field of "Energy, Environment & Climate Systems" focuses on renewable energies, hydrogen, energy systems, climate risk assessment, and environmental data analysis, highlighting the urgency of ecological challenges.

On the more traditional engineering side, the "Applied Physics & Engineering Systems Modeling" cluster explores techniques such as CFD (Computational Fluid Dynamics), transportation modeling, simulation, and dynamic analysis, which are essential for the design and optimization of physical systems. Finally, the cluster "Sustainable Systems & Circular Economy" addresses key concepts such as resource efficiency, Life Cycle Analysis (LCA), smart cities, and sustainable agriculture, illustrating the concrete application of engineering in the service of sustainability.

These four clusters, although distinct in their specifics, are intrinsically linked and converge toward the central goal of sustainable engineering. They collectively reflect underlying concerns regarding resource optimization, system resilience, environmental impact, and the integration of artificial intelligence for innovative solutions. This interconnection offers a robust analytical framework to understand and develop holistic solutions to the complex challenges of our time.

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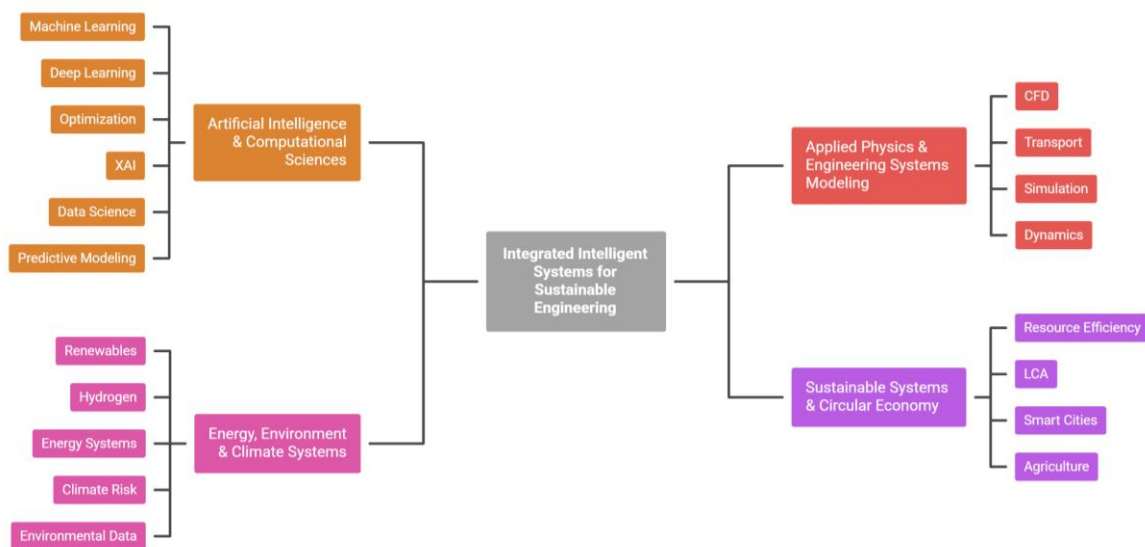


Figure 1. The thematic architecture identified

The sessions were organized as parallel and joint sessions, covering the following topics:

- Applications of AI Technology and Tools in the Monitoring and Management of Environmental Pollution
- Applications of the Finite Element Method in Solving Structural, Mechanical, and Biomedical Engineering Problems – Using Abaqus and LS-DYNA
- Mathematical Thinking and Model Validation in Artificial Intelligence
- Advanced Graph-Based Cognitive AI Frameworks for Complex Computational Environments
- From Computation to Commercial AI: Bridging Theory, Innovation, and Real-World Deployment

We would like to express our sincere gratitude to all keynote speakers, all authors for their valuable contributions, to the members of the scientific committee and reviewers for their rigorous evaluation

and dedication, and to the organizing institutions and sponsors for their continuous support and commitment to the success of this event.

We hope that JIAMA'26 volume will provide a stimulating environment for fruitful discussions, knowledge exchange, and the establishment of long-lasting collaborations, contributing to the advancement of artificial intelligence and applied mathematics in service of sustainable engineering and scientific progress. Feedback and suggestions from readers are warmly welcomed.

The Editors gratefully acknowledge the invaluable contributions of the members of the Technical Program Committees.

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Prof. Younes ABOUELHANOUNE is currently serving as Full Professor at the National School of Applied Sciences (ENSA) of Al Hoceima, Abdelmalek Essaadi University, Morocco. He earned his Ph.D. in Applied Mathematics, Engineering Science, and Technology from Abdelmalek Essaadi University (FST Tangier, Morocco) in 2015. Dr. ABOUELHANOUNE research interests include applied and numerical mathematics, heat and mass transfer, fractal contact mechanics, porous media, and viscoelastic materials. Also focused on artificial intelligence and explainable AI, particularly in their applications to engineering and environmental modeling. He has supervised and co-supervised numerous academic projects, including more than forty engineering final-year projects and several doctoral theses. Dr. ABOUELHANOUNE is the founder and president of the Moroccan Association of Applied Mathematics and Artificial Intelligence (A2MIA) and has played a leading role in organizing several international scientific events.

Dr. Patricia Palenzuela Ardila is PhD from the University of Almería (2012) and is permanent researcher at the Plataforma Solar de Almería (CIEMAT) since 2024. Her work focuses on the integration of desalination with Concentrated Solar Power (CSP), particularly on the modeling, simulation, and techno-economic assessment of hybrid plants for water and energy production.

During her PhD, she developed advanced simulation tools and models for Multi-Effect Distillation (MED) plants, validated through experimental campaigns, and carried out comparative studies with Reverse Osmosis technologies. She is the author of numerous high-impact scientific publications (h-index 24 in Scopus) and of the book *“Concentrating Solar Power and Desalination Plants”* (Springer, 2015), a key reference in the field.

She has worked as a postdoctoral researcher in Qatar and Chile, participating in projects related to solar desalination and water treatment in areas with environmental challenges. Throughout her career, she has been involved in multiple national and international projects and has supervised doctoral and academic theses. Since 2014, she leads research on high-temperature energy cycles, sustainable water management, and brine valorization. She currently leads several projects and is responsible for scientific facilities related to solar water treatment, desalination, and energy testing laboratories

Dr. Aicha Chorak is a Professor and Director of Research, Development and innovation at the École des Nouvelles Sciences et Ingénierie (ENSI) in Tangier, Morocco. She holds a Ph.D. in Energetics in 2018 and a degree in Industrial Engineering from the Faculty of Sciences and Techniques of Tangier, completed in collaboration with the Plataforma Solar de Almería (PSA) – Center for Energy, Environmental, and Technological Research (CIEMAT, Spain), as well as a Master’s in Hospital Engineering and Architecture from the University of Cádiz (Spain). Her research expertise spans solar-powered seawater desalination, hybrid systems using absorption heat pumps, and energy efficiency and comfort in buildings. Dr. Chorak has coordinated numerous national and international renewable energy projects addressing water–energy nexus challenges and Near Zero Energy Buildings, in collaboration with partners from Spain, Colombia, the United States, Mexico, and Morocco. Dr. Chorak has authored multiple international publications, holds several patents, and is actively involved in organizing international scientific conferences, including ISSD-WM, ICCTS, DataAI2SD, and CRNOEH. She is also an active member of global scientific committees, including SolarPACES, Módulo Arquitectura CUC, and the Water Positive Think Tank. Her research focuses on integrating renewable energy systems and improving energy performance to advance net-zero emission goals in the water and construction sectors.

Prof. Mustapha MAHDAOUI is a researcher and lecturer at the Université Polytechnique des Hauts-de-France, affiliated with the Laboratoire d'Automatique, de Mécanique et d'Informatique industrielles et Humaines, and also teaches at INSA Hauts-de-France. He obtained his PhD in 2014 in energy engineering through a joint supervision between the Université de Pau et des Pays de l'Adour and the University of Zaragoza, where he developed research on thermal systems, heat transfer, and fluid mechanics, with a strong focus on energy efficiency and modelling of complex energy systems. He later completed a postdoctoral research position at the LIMSI (CNRS), strengthening his expertise in thermal energy systems, heat transfer enhancement, and energy storage technologies. His research activities focus on energy engineering, building physics, and the development of innovative solutions such as bio-based materials and phase change materials (PCM) for thermal energy storage. With over 10 years of experience in higher education and research, he has authored more than 50 scientific publications, supervised numerous research projects, and actively contributed to the international scientific community through teaching, peer review, and collaborative research in energy efficiency and sustainable systems.