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Preface for the Special Issue of the fifth International Conference of Computer Science and Artificial Intelligence'24: Integrating Artificial Intelligence with Computer Science for Intricate Systems, Cross-Disciplinary Insights, and Advanced solutions

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Abstract The main contributions of [Stat. Optim. Inf. Comput. Vol.15, No.2 (2026): ICCSAI'24], consisting of fifteen papers selected and revised from the fifth International Conference of Computer Science and Artificial Intelligence'24, are highlighted.

The convergence of mathematics, computer science, and artificial intelligence is ushering in a transformative era where theoretical rigor and computational power coalesce to drive groundbreaking innovation. This special issue assembles a diverse and comprehensive collection of research that epitomizes this synthesis—each work grounded in solid mathematical principles and supported by robust computational frameworks, while simultaneously addressing real-world challenges across multiple domains.

1. Medical Imaging and Biomedical Applications

Several contributions focus on deep learning applications in medical imaging and healthcare. Naim et al. propose a deep learning-based framework for the classification of retinal pathologies, contributing to improved diagnostic accuracy in ophthalmology. Echine et al. introduce an efficient deep learning approach based on a 3D Res-UNet architecture for multimodal brain tumor segmentation, leveraging complementary imaging modalities to enhance segmentation performance. Oussahi et al. address medical image quality enhancement through an attention-enhanced deep convolutional denoising autoencoder designed to improve cervical cancer image clarity and diagnostic reliability.

2. Computer Vision and Environmental Monitoring

Advances in computer vision techniques are explored in several application-driven studies. Illi et al. analyze performance discrepancies between U-Net and TransUNet architectures for aircraft emergency landing site detection, providing insights relevant to aviation safety systems. Amir et al. propose innovative hybrid techniques combining computer vision and machine learning for cloud detection and segmentation, enhancing the reliability of environmental and atmospheric monitoring systems.

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3. Recommender Systems and Context-Aware Technologies

Recommender systems constitute a major research axis in this special issue. Elbaz et al. present a contextual wellness recommender system that exploits contextual information to deliver personalized health recommendations. Chafiki et al. introduce IoT-CR, a novel IoT-based approach designed to address data sparsity in context-aware recommendation systems. Asri et al. enhance recommender system performance through active learning strategies combined with matrix factorization techniques. Zaizi et al. propose a hybrid multi-objective immune algorithm for commercial recommendation systems, addressing optimization under competing objectives.

4. Security, Privacy, and Blockchain Technologies

Security-related challenges are addressed through intelligent and cryptographic solutions. Azizi et al. provide a comprehensive study of machine learning and deep learning approaches applied to intrusion detection systems. Cherkaoui et al. introduce a hardened Merkle–Damgård hash construction based on a Fisher–Yates shuffle to strengthen blockchain proof-of-work mechanisms. Lkoaiza et al. propose an extended Grendel-based approach for blockchain signatures as an alternative to Keccak permutation, contributing to cryptographic innovation in distributed systems.

5. Mathematical Modeling and Data Analysis

Foundational computational and modeling techniques are explored in several contributions. Benhari et al. investigate the resolution of linear interval systems using neural networks and demonstrate their application to the Leontief economic model. Ouriarhli et al. evaluate discretization techniques for Hidden Markov Model (HMM)-based classifiers, providing insights into classifier robustness and performance. Oulahbib et al. apply author profiling techniques at the document level on Reddit comments, highlighting advances in natural language processing and social data analysis.

Together, these contributions span a remarkable breadth of topics, illustrating a seamless blend of theoretical innovation and practical application. The fusion of mathematical depth, computational efficiency, and domain-specific expertise evident throughout the volume ensures the robustness, relevance, and impact of the research presented.

This special issue targets an audience of researchers, engineers, and students who value both conceptual elegance and computational performance—those eager to deepen their understanding of the mathematical and algorithmic principles that underpin modern intelligent systems and to push the boundaries of AI-driven innovation.

We express our deepest gratitude to all contributors for their insightful and impactful research, which embodies the harmonious fusion of analytical thinking and real-world problem solving. We also thank the anonymous reviewers for their constructive and thorough evaluations, which substantially enhanced the quality of the papers.

Finally, the Guest Editors extend special thanks to Prof. David G. Yu, Coordinating Editor of the Statistics, Optimization and Information Computing (SOIC) journal (Zhejiang University of Science and Technology, China), whose invaluable support and dedication were instrumental in organizing and coordinating the successful publication of this special issue.

Guest Editors:

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