

Innovations in Deep Learning and Intelligent Systems for Healthcare and Engineering Applications

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Abstract

This editorial summarises the special issue entitled “Future Trends of Machine Intelligence in Science and Industry”, which brings together several pieces of research that showcase the transformative impact of deep learning and intelligent systems across various domains, including healthcare, security and communication networks. By exploring advanced methodologies and innovative applications, this collection highlights significant strides in medical imaging, mental health diagnosis, biometric identification, smart grid management and adaptive e-learning. The featured articles delve into topics such as breast cancer detection using UNET architecture, psychodiagnosis prediction with deep learning, and blockchain-secured IoT systems for healthcare. Additionally, the issue covers revolutionary approaches in historical manuscript analysis, and contactless palm-print recognition. Through these comprehensive studies, we aim to inspire further advancements and cross-disciplinary collaborations, pushing the boundaries of what is achievable with modern technology.

Keywords

Deep learning; Healthcare technology; Blockchain; IoRT; Data security; Smart grids; e-Learning.

In recent years, the intersection of deep learning, artificial intelligence and innovative technology has paved the way for groundbreaking advancements across various fields. This special issue delves into cutting-edge research and developments that are transforming healthcare, security, communication and beyond. Our collection of articles showcases the immense potential and diverse applications of these technologies. We are thrilled to present a selection of studies that highlight the depth and breadth of current advancements in these domains.

Moreover, the integration of machine intelligence into real-world applications has not only enhanced existing systems but also opened up new avenues for research and innovation. The interdisciplinary nature of these studies emphasizes the importance of collaboration between different fields to achieve technological breakthroughs.

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This special issue serves as a testament to the remarkable progress being made and the potential for future discoveries that can significantly impact society. Furthermore, we would like to introduce individual articles briefly.

1. **Interoperable IoRT for Healthcare: Securing Intelligent Systems with Decentralized Blockchain.** In the realm of healthcare IoT, this paper discusses the integration of decentralized blockchain technology to secure intelligent systems. The interoperable internet of robotic things (IoRT) framework ensures data integrity and security, critical for modern healthcare applications.
2. **Efficient Contactless Palmprint Recognition System Based on Deep Rule-Based Classification.** This study focuses on advancing contactless palm-print recognition through deep rule-based classification. The enhanced methodology offers superior recognition performance, crucial for secure and user-friendly authentication systems.
3. **Deep Neural Network-Based Model for Breast Cancer Lesion Diagnosis in Mammography Images.** The first article introduces a state-of-the-art deep neural network making use of the UNET architecture to enhance the detection of breast cancer lesions in mammography images. This research represents a significant leap in medical imaging, offering improved accuracy and early diagnosis capabilities.
4. **Beyond Traditional Biometrics: Harnessing Chest X-Ray Features for Robust Person Identification.** Moving beyond conventional biometrics, this research explores the use of chest X-ray features for person identification. The novel approach demonstrates high robustness and accuracy, opening new avenues for biometric security.
5. **Revolutionizing Historical Manuscript Analysis: A Deep Learning Approach with Intelligent Feature Extraction for Script Classification.** Applying deep learning to the analysis of historical manuscripts, this paper presents intelligent feature selection techniques for script classification. The innovative approach promises to revolutionize the preservation and study of historical documents.
6. **Deep Learning Proactive Approach to Blackout Prevention in Smart Grids: An Early Warning System.** In the field of smart grid management, this article introduces a deep learning-driven early warning system for blackout prevention. The proactive approach enhances grid stability and reliability, ensuring uninterrupted power supply.
7. **Deep Learning Approach for Predicting Psychodiagnosis.** Addressing the burgeoning field of mental health, this study proposes a deep learning-based approach to predict psychodiagnoses. By analysing behavioural and psychological data, the model aims to facilitate early intervention and personalized treatment plans.
8. **Advancements in Breast Cancer Diagnosis: A Comprehensive Review of Mammography Datasets, Preprocessing and Classification Techniques.** This comprehensive review explores the latest techniques in mammography data preprocessing and classification. The article provides valuable insights into the advancements that are pushing the boundaries of breast cancer diagnosis.
9. **Examining Adaptive E-Learning Approaches to Enhance Learning and Individual Experiences** (as a Miscellanea article type). Lastly, this paper investigates adaptive e-learning approaches designed to personalize and enhance educational experiences, where approaches based on artificial intelligence are increasingly applied. The findings highlight the potential of adaptive technologies to cater to individual learning needs, promoting better engagement and outcomes.

We hope this special issue inspires further research and innovation in these dynamic fields. Each article contributes to a growing body of knowledge, pushing the frontiers of what is possible with deep learning and intelligent systems. We are excited to see the continued impact of these advancements on society and technology.

At the end of this editorial, we present information about the review process. Based on the initial call for papers at the *National Conference on Artificial Intelligence: From Theory to Practice* (NCAI'2023; the conference took place on December 19–20, 2023, Tebessa, Algeria), 41 manuscripts were offered for review by the authors. The articles were thoroughly reviewed by two or three international experts in the field of computer science and health informatics. The reviewers were selected by the Special Issue Editors and/or Editor-in-Chief, who served as Academic Editor for all the articles. With the recommendation from the reviewers, the Editor-in-Chief sent the final notifications of acceptance, revision or rejection to the authors. After further selection and peer review, nine articles were accepted (acceptance rate 22%) for publication in *Acta Informatica Pragensia* (volume 13, issue 2).

In conclusion, we express our deepest gratitude to all the contributors, reviewers, and editorial team members who made this special issue possible. The collaborative efforts and dedication to advancing machine intelligence research have resulted in a valuable compilation of pioneering work. We look forward to seeing the future developments inspired by these contributions and the continuous evolution of this exciting field.

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