Editor's Note

The International Journal of Interactive Multimedia and Artificial Intelligence (IJIMAI) provides a forum for researchers and professionals to share the latest advances in artificial intelligence (AI) and its applications. This December issue brings together contributions that showcase diverse uses of AI, ranging from spatio-temporal prediction in cities and communication networks to educational analytics and deep-learning-assisted medical diagnosis, as well as cultural heritage, 3D modeling, and security in the Internet of Things (IoT).

The issue opens with a study that proposes a two-dimensional clustering approach to detect where crimes are likely to occur. The study identifies high-risk areas based on spatio-temporal clusters and shows that models incorporating hotspot analysis perform better than those that do not. Sharing the same concern for anticipating what will happen in urban spaces, the following article also focuses on spatio-temporal dynamics, this time from the perspective of vehicle movement.

The next article addresses the prediction of vehicle trajectories by combining different sources of context (scene information, interactions between agents, road characteristics) using a deep multimodal model. The goal is to accurately anticipate future trajectories in complex scenarios, which is key for applications such as autonomous driving and advanced driver assistance systems. As in the crime-prediction scenario, the key lies in exploring the spatio-temporal structures of the data. The same idea of analyzing the temporality of the data to obtain a reliable prediction is carried over, in the third article, to the domain of energy consumption.

This third contribution proposes a sustainability-focused deep learning approach for predicting the energy consumption of next-generation electronic devices. The authors explore architectures based on LSTM networks and training strategies that balance accuracy and computational cost, with the aim of facilitating efficient energy management in environments with limited resources and changing demands. This issue continues with an analysis of the performance of large language models on mathematical problem-solving task.

In the following article, the authors examine the ability of different large language models to solve mathematical problems, comparing various models and prompting strategies, including Chain of Thought (CoT) approaches, on a set of carefully selected tasks. The study reveals performance differences between models and highlights the importance of prompt design for the quality of solutions, opening the debate on these systems can be used as reliable assistants in educational contexts. The following article remains in the educational domain, inviting reflection on the role of AI in continuous classroom assessment.

This contribution proposes a real-time teacher assessment system based on automatic emotion recognition, using YOLO and an LSTM model that captures the dynamics of emotional contagion between teachers and students. The system generates continuous measures of class satisfaction based on sequences of facial expressions, offering an objective, online alternative to traditional end-of-course questionnaires and allowing the dynamics of the session to be adjusted on the fly. Continuing with computer vision, the next article turns to sports biomechanics.

The following study uses a portable nano-biosensor that captures signals while the athlete runs on a curve and based on these signals, estimates posture and motion using machine learning techniques. The model allows the detection of movement patterns that could be associated with performance or risk of injury, demonstrating that the combination of sensors and machine learning models can provide very detailed information about the body in motion. From the representation of the human body, the issue then moves on to the geometric and computationally efficient representation of complex natural structures.

The subsequent contribution proposes an automatic method for extracting individual tree skeletons and reconstructing 3D models, seeking a balance between visual realism and computational efficiency. The approach enables the generation of trees with coherent and detailed structures, suitable for applications in simulation, video games, or landscape visualization, without requiring excessively costly models. This attention to form and structural complexity is echoed in the following article, which focuses on the generation of rubbings and the detection of small, dense characters in ancient inscriptions.

The next article addresses the challenge of recognizing OBI (Oracle Bone Inscription) characters, which are often very small, dense, and noisy. The study combines geometric techniques to generate synthetic rubbings and semantic enhancement mechanisms to improve automatic detection, contributing to the digitization and analysis of historical heritage through a highly sophisticated computer vision approach. Just as this work attempts to gather as much information as possible about visual patterns, the next group of articles explores a similar idea but to medical diagnosis.

The first of these medical contributions designs a framework for classifying diabetic retinopathy severity levels based on an ensemble of features extracted from optimized deep architectures (VGG16, ResNet, and Inception). The system improves the ability to distinguish between different degrees of the disease using fundus images, which is particularly relevant for automated monitoring. The following work also focuses on diagnosis, but this time it deals with breast cancer in ultrasound images.

The next paper presents a convolutional network with residual bottleneck blocks and attention modules, designed to operate on breast ultrasound images. The model aims to automatically highlight regions with suspected lesions, improving early detection and yielding better results than more traditional approaches.

Continuing with medical diagnosis and image analysis, the subsequent contribution introduces an architecture based on ResNet-50, in which the standard activation function is replaced by an attentional activation module (AttAct), combined with a SimCLR-type self-supervised learning scheme to extract richer representations of brain MRI images, even when manual annotations are limited. The proposed method achieves very high performance, demonstrating the potential of self-supervision and attention to improve the early detection of neurodegenerative diseases with fewer labeling requirements.

To conclude this section focused on health, the final medical article compares two models, a CNN (MpoxNet) and a Swin Transformer, to identify monkeypox lesions captured by mobile devices, integrated into an application that enables near real-time automatic classification. This highlights the potential of AI to support public health decision-making, especially in resource-limited settings.

Shifting to intelligent communication services, the next contribution presents an adaptive resource management framework for 5G vehicular networks, that considers mobility, quality of service and spectral efficiency. Using optimization and learning-based techniques,

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the system dynamically adjusts resource allocation to ensure robust, low-latency communications between vehicles and infrastructure, which is essential for critical applications such as cooperative driving and connected emergency services.

Continuing with the theme of reliable and efficient communication infrastructures, the final article presents a security model for IoT based on blockchain technologies, aimed at providing authentication, integrity, and traceability in environments with heterogeneous devices and limited resources. The model integrates distributed trust mechanisms without compromising efficiency and mitigates common attacks in IoT scenarios.

The articles in this issue illustrate how AI is increasingly being integrated into complex systems and high-impact social contexts, where advanced techniques, such as multimodal models, attention-based architectures, supervised (and self-supervised) learning schemes, and deep ensembles are applied to real-world challenges. We hope that these contributions will inspire the research community and help open new avenues of cross-disciplinary collaboration, bringing AI closer to applications that truly serve society.

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