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Editorial: Intelligent Systems and the Next Wave of Digital Innovation

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Abstract – The field of artificial intelligence (AI), machine learning and intelligent automation has become pervasive in our modern digital world. It extends from business and public services to environmental management and even into people's daily experiences with technology. In this special issue "Intelligent Systems and the Next Wave of Digital Innovation," published in the Journal of Informatics and Web Engineering, reviews several studies to explore the increasing role of intelligent systems in current society and their importance. Some of the more significant areas of discussion are how to formalize the expectations for explainable AI, evaluating face recognition models in the real world, how trust and transparency of AI models are evaluated and more. It also highlights a promising and emerging frontier of intelligent automation — from swarm intelligence and optimization within manufacturing to the ubiquity of multimodal interfaces, such as sign language chatbots. Furthermore, smart environmental analytics techniques such as neuro-intelligent techniques for drought prediction and IoT-generated flood intelligence systems help communities to plan for disaster events are also being studied. All of these contributions in turn reinforce the notion that intelligent systems can be developed more responsively and contextually through data-driven architectures. These also reflect a wider digital innovation trend: an era when decision-support tools and algorithmic intelligence and real-time data and other technologies converge toward reliability, efficiency, inclusivity, and resilience in increasingly complex social and technical ecosystems.

Keywords—Artificial Intelligence, Intelligent Systems, Optimization, Explainable AI, Digital Innovation, Flood Management, Machine Learning, Automation.

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1. INTRODUCTION

Today, intelligent systems are at the centre of digital transformation as companies and governments make strides toward Industry 4.0 and widespread automation. This is thanks to advances over the years in cloud computing, big data, IoT platforms, and deep learning technologies [1], [2] as applied worldwide, and the use of AI is now increasing exponentially. Research estimates that AI could contribute trillions of dollars to the global economy by 2030 as nations develop innovation hubs and deploy higher-performance computing [3], [4]. Within organizations, factors such as strong leadership, clear strategies, and digital maturity have frequently distinguished successful transformations [5], [6].

Technically, companies are continually improving their operating systems, bringing in optimization algorithms, machine learning analytics (ML), and data-based judgment-based thinking in their day-to-day life. Algorithms such as Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO), and Glowworm Swarm Optimization (GSO) are having a noticeable effect, resulting in better results in software testing, manufacturing, and intelligent search [7], [8]. Explainable AI (XAI) is becoming increasingly critical to building AI systems people can trust. When natural-language requirements cannot clearly be conveyed and AI systems operate many times as "black boxes," interest has been heightened in developing rules and frameworks that can be expressed more transparently in these systems to help people better understand how they work [9], [10]. At the same time, in the field of data augmentation, multimodal learning, real-time AI etc much more AI is already available in the market in the areas of accessibility tools, environmental forecasting, and smart community solutions [11], [12]. Meanwhile the world's level of environmental intelligence is on a higher level when the countries grapple with more frequent irregular weather, droughts and floods. Old monitoring technologies can be supplemented with new tools — like IoT sensors and online flood dashboards. These tools provide communities with immediate knowledge and assistance to make informed choices on environmental hazards [13-15]. Contributions to this theme focus on these rising priorities through the following two main clusters: (i) Intelligent Systems for Trust, Automation and Optimization, and (ii) Intelligent Environmental Analytics and Community Resilience.

2. IN THIS THEMATIC ISSUE

2.1 Cluster 1 — Intelligent Systems for Trust, Automation & Optimization

One study identifies the main components needed for intelligent systems to work reliably and transparently in real-world conditions. The next three papers examine intelligent automation through swarm intelligence, multimodal learning, and hybrid metaheuristic approaches. These practical issues, especially front-end deployment limits, how reliable optimisation is, and how well regression tests catch problems, are still central to engineering modern intelligent systems [16]–[19].

- "Test Case Prioritization Using Ant Colony Optimization to Improve Fault Detection and Time" by Zainal et al.: Using Ant Colony Optimization, regression test suites are reorganized in this work for improved performance in early fault detection and by reducing execution time. This work highlights the ongoing relevance of swarm intelligence for software quality assurance and continuous integration workflows.
- "Evaluating Accuracy, Latency and Robustness of Face Recognition Models for Real-Time Web Applications" by Sharzizi et al.: The current study compares FaceNet, SFace, OpenFace, and DeepFace under lighting, occlusion, and pose conditions. The results highlighted practical performance trade-offs between accuracy, robustness, and processing latency – key parameters for browser-based authentication and real-time web systems. Overall, this work offers some first principles for an intelligent systems architecture based on transparent, robust and operationally dependable.
- "An Enhanced Glowworm Swarm Optimization for Minimizing Surface Roughness in Die Sinking Electrical Discharge Machining" by Zainal et al.: The study presented an Enhanced Glowworm Swarm Optimization (EGSO) algorithm which combines the behaviour of Artificial Fish Swarm (AFS) to solve stagnation state and a local optima issue. Such developments may be linked to improved precision and micro–nano manufacturing systems owing to ongoing intelligent improvement.
- "A Conceptual Framework on Development of Sign Language Chatbot for E-Commerce" by Nisha et al.: This model combines CNN-based hand gesture recognition with NLP-driven chatbot responses and aims to provide a communication system for those with a hearing disability. This contributes to the growing interest in inclusive AI and the design of multimodal interactions. This study shows how smart algorithms can provide efficiency, more inclusivity and better decision-making for the digital world.

2.2 Cluster 2 — Intelligent Analytics for Environment, Resilience & Smart Communities

Two projects combine smart models and live analytics in climate resiliency and environmental decision support. Recent studies emphasise that reliable drought forecasting and actionable flood risk communication require models and tools that are sensitive to temporal scales and can support decision-making in real-world communities [20]-[21].

- "ANFIS and RBFNN Efficacy and Timescale Dependence in SPEI-Based Drought Prediction using Meteorological Inputs" by Afendi et al.: Using a review of several SPEI timescales, the authors evaluate ANFIS and RBFNN as appropriate for drought prediction. In the same vein, the results indicate high sensitivity for temporal resolution of models and the need to select climate indices of interest.
- "Flood Disaster Preparedness and Response Using a Web-Based Integrated Flood Management System (IFMS)" by Abdirahim et al.: The emphasis on integrated, web-based flood communication platforms, as well as situational awareness and society's preparedness, is evident in such work. The systems also resonate with wider trends within digital flood communication and a need for real-time tools for decision-support in action.

Combined, these pieces indicate the tremendous impact that smart analytics can have on public safety, the environment and a resilient community.

3. CONCLUSION

The papers in this special issue point to a simple fact: intelligent systems have moved beyond research labs and are now part of everyday academic and professional practice. They are playing a growing role in how digital solutions are planned, assessed, and put into practice in real-world settings. Across the articles, a few key themes appear repeatedly. There is an increasing need to describe AI requirements in clearer, more practical terms that are easier to implement. In sectors where trust matters, such as healthcare and public services, intelligent technologies are unlikely to be widely adopted unless stakeholders can see how decisions are made and why they are justified. In academic work, explainability should be treated as a requirement, because it supports trust and helps people accept a system over time. A second theme concerns optimisation. In fields like software testing, manufacturing, and assistive systems, optimisation methods now handle much of the behind-the-scenes work that supports everyday tasks and decisions. These techniques can improve performance and efficiency in ways that users may not notice, yet they can strongly shape the overall quality and reliability of modern digital systems. A second clear change can be seen in environmental analytics. Low-cost sensors and easy-to-use online dashboards now let communities track drought conditions and rising water levels on an ongoing basis, a level of local monitoring that was hard to imagine even ten years ago. The trajectory is clear: intelligent systems will soon be part of the basic infrastructure for digital development.

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Hairulnizam Mahdin – Completed the entire article.

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No conflict of interest was disclosed.

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Our publication ethics follow The Committee of Publication Ethics (COPE) guideline. https://publicationethics.org/.

DATA AVAILABILITY

Data availability is not applicable to this paper as no new data were created or analysed in this study.

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