Editorial

As technological innovation accelerates, research increasingly focuses on enhancing the performance, sustainability, and intelligence of modern systems across utilities, manufacturing, and energy infrastructure. The featured studies in this issue exemplify this progression, addressing critical challenges through advanced computational models, smart sensing, and reimagined energy transfer mechanisms. Whether optimizing water quality monitoring through deep learning, improving defect detection in manufacturing via in-mold sensors, or pioneering efficient power transmission through industrial repurposing, these contributions demonstrate the diverse potential of applied research in solving real-world problems.

Ensuring the potability of water is a growing concern amid rising levels of pollution and increased demand across multiple sectors. Addressing this, a comparative evaluation of Multilayer Perceptron (MLP) and Long Short-Term Memory (LSTM) neural networks was conducted to classify water quality using deep learning approaches. With a binary classification framework, the MLP model demonstrated exceptional accuracy and predictive power, achieving near-perfect scores across all major performance metrics including a 99.9% accuracy and a perfect ROC-AUC. These results markedly surpassed those of the LSTM model, reinforcing the suitability of MLP in water quality classification tasks. The study's outcomes present a highly efficient and reliable method for real-time water assessment, ensuring compliance with sector-specific potability standards and enabling prompt intervention when water quality deviates from acceptable thresholds [1].

In high-precision manufacturing environments, particularly injection molding, early defect detection is essential for ensuring consistent product quality and minimizing material waste. To address this, a real-time cavity monitoring system was developed using non-destructive in-mold sensors. The system takes into account part geometry to optimize sensor placement, enhancing the detection of abnormalities in regions prone to defects. A simulated case study using SolidWorks Plastics validated the proposed approach, with piezoelectric sensors achieving root mean square error values below 0.0004 V and peak errors of only 0.0012 V. These findings suggest a powerful enhancement to process monitoring, offering manufacturers better control over mold conditions and ultimately improving output quality and operational efficiency [2].

In the realm of transnational power distribution, leveraging existing infrastructure can offer innovative and cost-effective alternatives to traditional methods. A novel feasibility study explores the use of Oil & Gas (O&G) seabed piping infrastructure for high-voltage (HV) power transmission from Sarawak to Singapore. By suspending HV cables in the center of air-filled O&G pipes and using a return loop for air cooling, the setup aims to emulate the thermal dissipation properties of overhead lines, thereby overcoming the limitations of conventional submarine cables. Laboratory simulations involving current transmission up to 50 A across varying pipe diameters were conducted to measure eddy current-induced heat, with projections extended to currents of 1000 A. The findings highlight the potential for improved efficiency and reliability in long-distance power transmission using this unconventional yet practical approach [3].

Collectively, these studies illustrate the value of domain-specific innovation in addressing contemporary technological and environmental challenges. By integrating smart data-driven systems, intelligent infrastructure utilization, and precision engineering, the research featured here contributes to shaping more efficient, sustainable, and resilient solutions for tomorrow's global needs.

References:

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