Editorial

In the evolving landscape of science and engineering, multidisciplinary research continues to push boundaries, drive innovation, and address pressing technological and societal challenges. The current issue of our journal highlights a diverse collection of studies that exemplify this spirit of inquiry, presenting solutions to real-world problems ranging from power systems to pharmaceutical formulations, from AI integration in education to cryptographic resilience in mobile networks. Each contribution provides significant theoretical or practical advancements, reflecting the collaborative effort and intellectual rigor of the global research community.

A novel lightning detection system tailored for wind turbine applications is developed using a large-diameter Rogowski coil paired with an analog integrator. The coil, with a lower cutoff frequency of 0.1 Hz, and the integrator circuitry effectively reconstruct the original lightning current waveform. Verified across a range of current types—including AC, damped sinusoidal, and rectangular pulses—the system offers a broad bandwidth from 0.1 Hz to 100 kHz. This makes it not only compliant with standard performance criteria but also cost-efficient, positioning it as a viable alternative to commercial lightning detection systems [1].

A comprehensive physicochemical stability analysis of extemporaneous omeprazole-based formulations identifies environmental and compositional factors influencing drug shelf life. The study utilizes a 2k factorial design with temperature, luminosity, and diluent type as variables. Physiological saline solution emerges as the most stable and accessible diluent, offering a shelf-life of over five hours under optimal conditions. The findings underscore the critical importance of evaluating environmental conditions prior to drug administration to ensure patient safety and treatment efficacy [2].

Addressing the pedagogical challenges faced by digital universities in Africa, an exploration into the use of AI-powered chatbots reveals their potential to transform learner-content interaction. By leveraging platforms such as Rasa and Moodle, the study presents a model where chatbots facilitate personalized learning, improve student engagement, and support formative assessments. Comparative analysis of different chatbot frameworks further illuminates the technological considerations necessary for seamless integration, reinforcing the role of intelligent systems in reducing dropout rates and enhancing academic outcomes [3].

The physical principles underpinning rotor slot skewing in squirrel-cage induction machines are rigorously analyzed, leading to a set of derived formulas that account for synchronous and asynchronous parasitic torques. Through comparative analysis of magnetic motive force (MMF) curves and detailed case studies, the study provides a theoretical framework for targeted skew application. The development of theorems on residual torque and differential leakage attenuation marks a significant advancement in the precise and noise-mitigated design of induction machines [4].

In an era where mobile data transmission faces increasing threats, an enhanced ZUC algorithm is proposed to reinforce LTE network security using chaos-based dynamic S-boxes. The updated algorithm generates highly randomized key streams and demonstrates superior resistance to cryptographic attacks. Implemented on a Xilinx FPGA platform, the architecture proves both resource-efficient and high-performing, achieving a throughput of over 2500 Mbps. This design not only meets modern data protection demands but also aligns with the constraints of real-time mobile applications [5].

To address the complexities of handwritten text line segmentation in Myanmar scripts, a segmentation method based on average linkage clustering is proposed. Utilizing connected

component analysis and convex hull re-segmentation, the system adeptly handles overlapping characters and irregular line spacing. With high Intersection over Union (IU) scores on two datasets, the method outperforms existing clustering algorithms such as DBSCAN, thus representing a robust solution for enhancing optical character recognition (OCR) in complex handwritten scripts [6].

Expanding the analytical framework of rotor slot number selection for 5-phase motors, this study applies a previously validated method across a comprehensive range of machine configurations. By incorporating the Noise Component Equivalence Measure, the analysis allows precise prediction of torque oscillations and acoustic noise, guiding optimal rotor slot number decisions. The resulting design rules are systematic and adaptable to various stator and pole configurations, offering an unprecedented level of granularity and predictability in multiphase motor design [7].

In summary, the papers featured in this issue collectively demonstrate the ingenuity and relevance of applied research in addressing modern engineering and technological challenges. From ensuring power system integrity and secure data transmission to optimizing educational outcomes and mechanical design, these studies not only advance their respective fields but also offer scalable and practical solutions. It is our hope that these contributions will inspire further innovation and interdisciplinary collaboration.

References:

[1] S. Pramualsingha, K. Yamamoto, R. Tanaka, “Lightning Detection System for Wind Turbines Using a Large-Diameter Rogowski Coil,” Advances in Science, Technology and Engineering Systems Journal, 10(1), 1–6, 2025, doi:10.25046/aj100101.

[2] E. Cruz-Pérez, J. Locia-Espinoza, J.J. Díaz-Vallejo, M.O. Pérez-Vásquez, L.M. de la Vega, L.I. Pascual-Mathey, “Evaluation of physicochemical stability in extemporaneous omeprazole-based preparations,” Advances in Science, Technology and Engineering Systems Journal, 10(1), 7–12, 2025, doi:10.25046/aj100102.

[3] K. Sylla, B. Babou, M. Amar, S. Ouya, “Impact of Integrating Chatbots into Digital Universities Platforms on the Interactions between the Learner and the Educational Content,” Advances in Science, Technology and Engineering Systems Journal, 10(01), 13–19, 2025, doi:10.25046/aj100103.

[4] G. Kovács, “Analytical Study on the Effect of Rotor Slot Skewing on the Parasitic Torques of the Squirrel Cage Induction Machine,” Advances in Science, Technology and Engineering Systems Journal, 10(1), 20–36, 2025, doi:10.25046/aj100104.

[5] M. Madani, E.-B. Bourennane, S. El Assad, “Hardware and Secure Implementation of Enhanced ZUC Steam Cipher Based on Chaotic Dynamic S-Box,” Advances in Science, Technology and Engineering Systems Journal, 10(1), 37–47, 2025, doi:10.25046/aj100105.

[6] N. Phyo Wai, N. War, “Text Line Segmentation on Myanmar Handwritten Document using Average Linkage Clustering Algorithm,” Advances in Science, Technology and Engineering Systems Journal, 10(1), 48–59, 2025, doi:10.25046/aj100106.

[7] G. Kovács, “Selection of Rotor Slot Number in 3-phase and 5-phase Squirrel Cage Induction Motor; Analytic Calculation,” Advances in Science, Technology and Engineering Systems Journal, 10(01), 60–74, 2025, doi:10.25046/aj100107.

Editor-in-chief

Prof. Passerini Kazmersk