Editorial

The expansion of digital transformation, advanced scientific methods, and innovative pedagogical strategies continues to reshape diverse fields of knowledge and practice. From education and artificial intelligence to atmospheric science, electrical engineering, and instructional reform, research efforts are converging to address pressing challenges while creating pathways for improvement and innovation. The following studies highlight significant contributions across these domains, illustrating how technology, models, and frameworks can enhance performance, accuracy, and adaptability in both academic and industrial contexts.

The quality of higher education in Brazil faces significant challenges arising from digital distractions, weak academic foundations, and high dropout risks. To address these issues, a machine learning-based assessment tool called AILA has been developed to predict academic performance and recommend personalized study resources. Using psychometric profiles of more than 41,000 students, the system provides tailored support in fundamental areas such as Portuguese and Mathematics. With CatBoost achieving an accuracy of 0.74 in predicting proficiency, the findings demonstrate how artificial intelligence can optimize individual learning trajectories, strengthen academic engagement, and support institutional strategies for improving student outcomes [1].

In regions with limited ground-based ionospheric monitoring infrastructure, satellite-based approaches are offering new opportunities for atmospheric science. Using radio occultation data from the COSMIC-2 mission, this study provides the first analysis of ionospheric peak parameters over equatorial Africa. Results show distinct diurnal and seasonal variations, with NmF2 values peaking after sunrise and reaching higher levels during equinoxes compared to solstices. A comparative analysis with the IRI-2016 model revealed significant overestimations, particularly during declining phases, with discrepancies reaching up to 60 percent. By highlighting these differences, the research underscores the value of satellite-based observations for improving ionospheric modeling in regions where data has been historically scarce [2].

In the study of electrical machines, the influence of MMF space harmonics on squirrel-cage induction motors has long been recognized, yet often fragmented in analysis. This work integrates the origin, behavior, and interaction of harmonics into a unified system that explains parasitic torques, magnetic force waves, and their physical relationships. A comprehensive equivalent circuit diagram and tabulated representation of magnetic forces provide clarity on synchronous and asynchronous phenomena, reducing the need to consider an infinite range of harmonics. By identifying the harmonics most relevant to design and performance, the study offers both theoretical and practical contributions, enabling more precise calculations and more efficient motor design methodologies [3].

Engineering education requires adaptive pedagogical models that align academic learning with the demands of rapidly changing industries. This research proposes a blended instructional framework based on micro-topic pedagogy under the New Engineering Education paradigm. In a quasi-experimental study involving 132 learners, the experimental group using the micro-topic approach demonstrated significant improvements in applied skills, participation, and problem-solving abilities compared to traditional methods. Real-time simulation tools and adaptive feedback mechanisms amplified these outcomes, with a 23 percent increase in troubleshooting proficiency. The results position this model as a scalable and effective strategy to strengthen interdisciplinary expertise and bridge the gap between academic training and professional application [4].

Together these studies underscore the transformative power of advanced technologies, systematic analysis, and pedagogical innovation across different fields. Whether enhancing

learning outcomes in higher education, improving ionospheric modeling, optimizing electrical machine design, or reforming engineering education, these contributions provide practical solutions and theoretical advancements. They collectively highlight how interdisciplinary approaches and technological integration can drive progress in both scientific research and societal development.

References:

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