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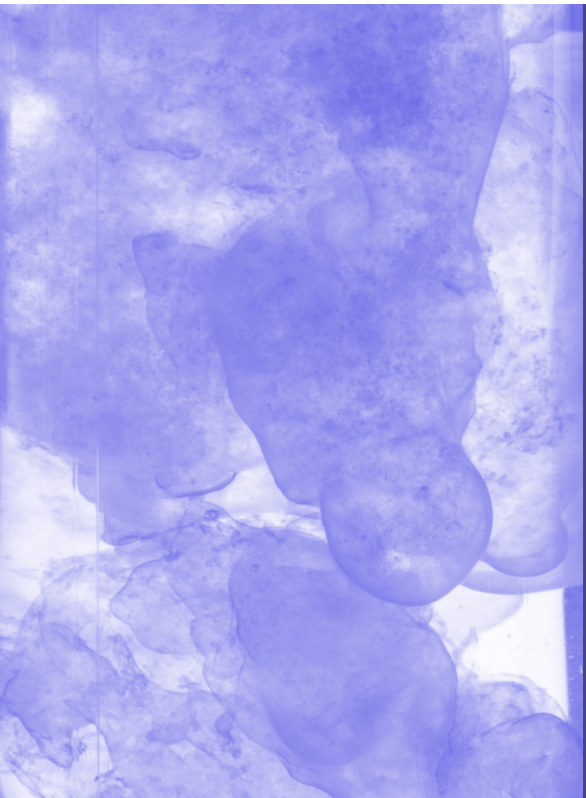
Applied Industrial Technologies



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Section Information

This section focuses on industrial smart and sustainable technologies and processes oriented towards practical applications. It focuses on smart industrial systems, and related environmental and sustainability research and practice. Through our published articles, we aim at helping societies become more sustainable. It has the aims of waste valorization and increasing efficiencies in the uses of energy, water, and resources, within an industrial symbiosis and circular economy perspective, with special focus on the use of modern techniques aligned with the Industry 4.0 strategy. By contrast, works focusing on more theoretical developments should be addressed to more specialized journals. The section publishes original papers, review articles, technical notes, and letters to the editor. Authors are encouraged to submit manuscripts that bridge the gaps between applied research, development, and implementation.

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Selected Papers

Head-to-Head Evaluation of FDM and SLA in Additive Manufacturing: Performance, Cost, and Environmental Perspectives

Authors: Maryam Abbasi, Paulo Váz, José Silva and Pedro Martins

Abstract: This paper conducts a comprehensive experimental comparison of two widely used additive manufacturing (AM) processes, Fused Deposition Modeling (FDM) and Stereolithography (SLA), under standardized conditions using the same test geometries and protocols. FDM parts were printed with both Polylactic Acid (PLA) and Acrylonitrile Butadiene Styrene (ABS) filaments, while SLA used a general-purpose photopolymer resin. Quantitative evaluations included surface roughness, dimensional accuracy, tensile properties, production cost, and energy consumption. Additionally, environmental considerations and process reliability were assessed by examining waste streams, recyclability, and failure rates. The results indicate that SLA achieves superior surface quality (R_a≈2μm vs. 12–13μm) and dimensional tolerances (±0.05mm vs. ±0.15–0.20mm), along with higher tensile strength (up to 70MPa). However, FDM provides notable advantages in cost (approximately 60% lower on a per-part basis), production speed, and energy efficiency. Moreover, from an environmental perspective, FDM is more favorable when using biodegradable PLA or recyclable ABS, whereas SLA resin waste is hazardous. Overall, the study highlights that no single process is universally superior. FDM offers a rapid, cost-effective solution for prototyping, while SLA excels in precision and surface finish. By presenting a detailed, data-driven comparison, this work guides engineers, product designers, and researchers in choosing the most suitable AM technology for their specific needs.

https://doi.org/10.3390/app15042245

From Mathematical Modeling and Simulation to Digital Twins: Bridging Theory and Digital Realities in Industry and Emerging Technologies

Authors: Antreas Kantaros, Theodore Ganetsos, Evangelos Pallis and Michail Papoutsidakis

Abstract: Against the background of the unprecedented advancements related to Industry 4.0 and beyond, transitioning from classical mathematical models to fully embodied digital twins represents a critical change in the planning, monitoring, and optimization of complex industrial systems. This work outlines the subject within the broader field of applied mathematics and computational simulation while highlighting the critical role of sound mathematical foundations, numerical methodologies, and advanced computational tools in creating data-informed virtual models of physical infrastructures and processes in real time....

https://doi.org/10.3390/app15169213

Machine Learning-Based Lithium Battery State of Health Prediction Research

Authors: Kun Li and Xinling Chen

Abstract: To address the problem of predicting the state of health (SOH) of lithium-ion batteries, this study develops three models optimized using the particle swarm optimization (PSO) algorithm, including the long short-term memory (LSTM) network, convolutional neural network (CNN), and support vector regression (SVR), for accurate SOH estimation. Key features were extracted by analyzing the temperature, voltage, and current curves of the battery, and health factors with high correlation to SOH were selected as model inputs using the Pearson correlation coefficient. The PSO algorithm was employed to optimize model parameters, resulting in the construction of three predictive models: PSO-LSTM, PSO-CNN, and PSO-SVR. The models were validated using the NASA PCoE battery aging datasets B0005, B0006, and B0007, with prediction accuracy evaluated based on Root Mean Square Error (RMSE), Mean Absolute Error (MAE), Mean Absolute Percentage Error (MAPE), and Coefficient of Determination (R^2). Results indicate that the optimized models achieved significant improvements in prediction accuracy, with RMSE and MAE reduced by over 0.5%, a minimum reduction of 38% in MAPE, and R^2 exceeding 0.8, demonstrating strong fitting capabilities and validating the effectiveness of the PSO strategy. Among the three models, PSO-LSTM exhibited the best predictive performance, achieving a minimum MAE of 0.67%, RMSE of 0.94%, MAPE of 45.82%, and R^2 as high as 0.9298 across the three datasets. These findings suggest that the PSO-LSTM model provides a robust reference for accurate SOH prediction of lithium-ion batteries and shows promising potential for practical applications.

https://doi.org/10.3390/app15020516

Techniques and Models for Addressing Occupational Risk Using Fuzzy Logic, Neural Networks, Machine Learning, and Genetic Algorithms: A Review and Meta-Analysis

Authors: Chris Mitrakas, Alexandros Xanthopoulos and Dimitrios Koulouriotis

Abstract: This article aims to present a structured literature review that utilizes computational intelligence techniques, specifically fuzzy logic, neural networks, genetic algorithms, and machine learning, to assist in the assessment of workplace risk from human factors. The general aim is to highlight the existing literature on the subject, while the specific goal of the research is to attempt to answer research questions that emerge after the review and classification of the literature, which are aspects that have not previously been addressed. The methodology for retrieving relevant articles involved a keyword search in the Scopus database. The results from the search were filtered based on the selected criteria. The research spans a 40-year period, from 1984 to 2024. After filtering, 296 articles relevant to the topic were identified....

https://doi.org/10.3390/app15041909

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Deadline: 20 January 2027

Intelligent Metal Forming: AI Modeling, Simulation, and Digital Twins

Guest Editors: Dr. Olga Bylya, Dr. Abhilash Puthanveettil Madathil, Dr. Evgenia Yakushina and Prof. Dr. Andrew Sherlock
Deadline: 20 February 2027

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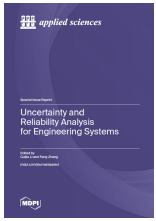

Uncertainty and Reliability Analysis for Engineering Systems

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