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Editorial

Special Issue "Advanced Digital Technologies for the Integration of Production and Maintenance"

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Production scheduling and maintenance management are responsibilities of different functions often corresponding to different departments of a manufacturing company. The relationship between these two functions is conflicting in nature, since maintenance tasks take time that could be differently used for production, while, on the other hand, delaying these activities to promote production may increase the probability of machine failures. A joint vision would allow for achieving optimized management, in coherence with the single objectives of the two departments, but also aligned with the overall goal of the company: enhanced results are expected, through a joint planning and control approach, both in terms of cost savings and improved technical performances [1]. In this scenario, the widespread use of digital technologies driving the Industry 4.0 paradigm, as IoT-enabled tools, can help to improve collaboration between the two activities and decision-making processes in pursuit of common organizational goals. This Special Issue aimed to collect and present contributions providing models, new methodologies, techniques, and frameworks for the integration and optimization of production and maintenance operations. Within this scope, the Special Issue focused on contributions that employ new technologies in the scope of Industry 4.0 aimed at fostering sustainable goals. A total of six papers are collected in this Special Issue covering different aspects of several industrial fields. Reforgiato et al. [2] proposed a predictive approach based on data analysis and machine learning techniques to predict future failures in oil and gas applications. They pointed out that data pre-processing represents a must-do process aiming at improving the dataset quality and prediction accuracy. Pirola et al. [3] provided guidance for the reengineering procedure of the maintenance service delivery process in a data-driven fashion by using the dual-perspective, data-based, decision-making process for maintenance service delivery (D3M) framework. The presented procedure showed that the implementation of a proper decision-making process requires the constant flow of information exchange between the actors involved, aiming at providing a complete and detailed overview of the operating context. Paulauskaite-Taraseviciene et al. [4] presented a methodology based on image processing technologies for automated data extraction. This approach involves two phases—object segmentation and key points extraction—and it is applied to automatically measure the hanging garments disregarding constraints such as space restriction, background requirements, shooting distances, or additional tags needed for measurements. Chiacchio et al. [5] suggested an innovative solution based on non-fungible tokens (NFTs) applied to the track and trace process of pharmaceutical products, aiming at both improving the communication among the supply chain stakeholders and fostering more final customer trust. Aust and Pons [6] performed the comparison of engine blade inspection skills and performance between human operators and modern technology such as image processing (IP), artificial intelligence (AI), and 3D scanning. Their findings determined that operators outperformed inspection

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software in screen-based inspection tasks due to their better cognitive powers, capacity to make wise decisions, flexibility, and ability to adjust to changing situations. Jwo et al. [7] proposed a deep learning-based approach for a railway wheelset inspection system with the purpose of improving the reliability and efficiency of manual inspection of wheelset assembly quality. To overcome the severe imbalance between positive and negative data, a deep Siamese network is used to perform the prediction model of press-fit quality, resulting in a suitable driver for the digital manufacturing development.

Although submissions for this Special Issue have been closed, more in-depth research in the field of the potential integration between production scheduling and maintenance management is still important, especially considering the increasingly valuable and crucial adoption of new technologies within Industry 4.0. Thus, the implementation of such I4.0 technologies requires more attention as a suitable solution to drive the paradigm shift from traditional manufacturing to digital manufacturing.

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