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Editorial

Special Issue on Machine Condition Monitoring and Fault Diagnosis: From Theory to Application

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Modern machines are becoming more complex in structure and are operating under harsher loading and operational conditions. To ensure the efficient and reliable operation of machines, minimize unscheduled downtime, and lower operation and maintenance costs, it is necessary to develop intelligent fault diagnostic methods and assess their health state with the aim of identifying the mode, type, severity, and degradation trend of faults.

This Special Issue aims to present innovative research on machine condition monitoring and fault diagnosis that brings together theoretical research, experimental studies, and industrial applications. This research includes artificial neural networks, sequential convolutional networks, deep learning, and other areas.

A total of six research papers in various fields of machine condition monitoring and fault diagnosis including fault prediction, the fatigue analysis of machinery, signal processing, and the classification of faults are presented in this Special Issue. Lee et al. [1] proposed a system-level fault diagnosis framework for industrial robots. Useful features are extracted from the motor control signals obtained during operation, the current health status of each component is diagnosed by an artificial neural network, and the related degradation of the robot system's performance is estimated through Gaussian process regression. Jankowska et al. [2] proposed a speed sensor fault detection, classification, and compensation mechanism for motor drive systems based on a state variable observer and shallow neural networks, which has an improved detection efficiency and increased immunity to false alarms. Chen et al. [3] proposed a predictive maintenance method that use Hilbert–Full-Vector Spectrum to extract the spectrum information and use a sequential convolutional network as well as a double-layer attention mechanism to predict the amplitudes of different characteristic frequencies in order to improve the prediction accuracy. Gu et al. [4] proposed a model for motor fault diagnosis based on deep learning and multi-sensor information fusion, including the steps of data layer fusion, feature layer fusion, and fault classification, and finally realized the fast and accurate diagnosis of motor faults. Ye et al. [5] proposed a simultaneous fault diagnosis method based on hierarchical multi-label classification and a sparse Bayesian extreme learning machine to identify the single failure and simultaneous failures of the main reducer and determine the probability of each failure mode. Chen et al. [6] proposed a method of weak fault feature extraction based on sparse coding and adaptive empirical wavelet transform, which helps to achieve sparse denoising and enhance impact features.

A focal point of this Special Issue is the synthesis of theoretical insights and practical applications. Although submissions for this Special Issue have now been closed, the field of machine condition monitoring and fault diagnosis is poised for continued advancements. Exploring new ways that combine different fields like artificial intelligence, data science, and advanced sensors can lead to amazing discoveries. Integrating these innovative ideas into practical work settings is highly important for progress.

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