Machine Learning-Driven Condition Monitoring and Fault Detection in Manufacturing

ICETAS 2024 - 9th IEEE International Conference on Engineering Technologies and Applied Sciences • Conference Paper • 2024 • DOI: 10.1109/ICETAS62372.2024.11120241

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Abstract

The manufacturing industry has witnessed a surge in the adoption of machine learning (ML) techniques to enhance various aspects of production processes. One critical application of ML in manufacturing is condition monitoring and fault detection, which play a pivotal role in ensuring product quality, minimizing downtime, and maximizing operational efficiency. This paper presents a comprehensive review of the use of machine learning for condition monitoring and fault detection in manufacturing environments. It also discusses the importance of data preprocessing, feature engineering, and model selection in developing robust and reliable ML-based condition monitoring systems. Furthermore, the paper addresses the case studies, challenges and future trends associated with deploying ML-driven condition monitoring, such as data quality, model interpretability, and integration with existing manufacturing systems. It also highlights emerging trends and future

research directions in this domain, including the integration of edge computing, digital twins, and advanced analytics for real-time, predictive, and prescriptive maintenance strategies. © 2024 IEEE.

Author keywords

Condition Monitoring; Fault Detection; Machine Learning; Sensor- based Monitoring; Supervised Learning

Indexed keywords

Engineering controlled terms

Engineering education; Learning systems; Maintenance; Predictive analytics; Supervised learning

Engineering uncontrolled terms

Condition; Critical applications; Faults detection; Machine learning techniques; Machine-learning; Manufacturing industries; Manufacturing IS; Production process; Products quality; Sensor- based monitoring

Engineering main heading

Condition monitoring

Abstract

Author keywords

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