Machine Learning Approaches in Predictive Maintenance for Manufacturing

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Abstract. This article examines the role of machine learning in predictive maintenance for manufacturing industries. By leveraging historical data and real-time monitoring, machine learning models can predict equipment failures before they occur, reducing downtime and maintenance costs. The study highlights various machine learning techniques, including supervised and unsupervised learning, and their applications in identifying patterns and anomalies. Comparative analysis with traditional maintenance strategies reveals the advantages in terms of accuracy and efficiency. The results underline the transformative potential of intelligence-driven maintenance solutions in modern manufacturing.

Keywords: maintenance, machine, manufacturing, predictive, efficiency

Introduction: The manufacturing sector is increasingly recognizing the necessity for efficient maintenance strategies to enhance operational efficiency and reduce unexpected downtimes. Conventional maintenance approaches often lead to excessive costs and untimely breakdowns. With advancements in machine learning, predictive maintenance has emerged as a powerful alternative, offering precise foresight into equipment health and performance. This research delves into various machine learning methodologies applied in predictive maintenance scenarios, focusing on the comparison with traditional techniques in terms of accuracy and reliability. By analyzing data-driven insights, the study aims to propose an optimized framework that enhances the predictive capabilities in manufacturing settings. Such intelligence-driven maintenance not only minimizes downtimes but

also significantly cuts costs, driving efficiency across production lines.

References

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