**ABSTRACT**

Predictive maintenance is becoming increasingly vital in industrial settings due to the need to reduce downtime, optimize operational efficiency, and manage the wear and tear of machinery. Artificial intelligence (AI) has emerged as a crucial technology in enhancing predictive maintenance by enabling more accurate forecasting of equipment failures and optimizing maintenance schedules. This paper explores the role of AI in predictive maintenance, focusing on machine learning and deep learning algorithms, their implementation in industrial environments, and real-world case studies demonstrating their effectiveness. To comprehend the magnitude of this transformation, it is crucial to understand the rich history and evolution of maintenance strategies. From the rudimentary 'fix-when-broken' approach to the 'prevent-before-fail' preventive maintenance, and finally, to the predictive maintenance era, this paper provides a historical context that underscores the significance of the present technological advancements. The integration of AI-driven predictive maintenance systems significantly reduces costs, extends equipment lifespan, and ensures uninterrupted production processes.

**Keywords:** Artificial Intelligence (AI), Predictive Maintenance, Machine Learning, Deep Learning, Industrial Equipment.