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| **BTECH PROJECT SYNOPSYS** | |

Project ID: 3

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**DEPARTMENT OF INFORMATION TECHNOLOGY**

**B.TECH. (IT)**

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**ABSTRACT**

**Abstract***: Predictive maintenance is an approach that leverages machine learning and advanced analytics to predict potential failures in industrial machinery, thereby reducing downtime, enhancing operational efficiency, and optimizing maintenance strategies. This project focuses on developing a predictive maintenance system that integrates machine learning models to classify machine parts and predict failures, coupled with a Large Language Model (LLM) for generating detailed diagnostic reports. The project utilizes a comprehensive dataset that reflects real-world predictive maintenance scenarios, enabling the training and validation of robust classification models. These models not only predict the likelihood of failure but also identify the specific type of failure, providing critical insights for maintenance planning. The integration of an LLM allows for the automatic generation of diagnostic reports, translating complex model outputs into clear, actionable insights.*

*The future scope of the project extends to the deployment of the system in various industrial settings, including manufacturing, energy, and transportation, where predictive maintenance can significantly reduce costs and improve reliability. Future developments aim to enhance the system through the incorporation of deep learning techniques, edge computing for real-time analysis, and the integration of digital twins for advanced simulation and scenario testing. This work represents a significant step forward in the field of predictive maintenance, offering a scalable, intelligent solution that not only anticipates machine failures but also provides comprehensive diagnostics to support proactive maintenance decisions. By leveraging the power of AI and machine learning, the project paves the way for smarter, more efficient industrial operations, aligned with the demands of modern industry and technology.*

**Keywords:** Predictive Maintenance, Machine Learning, LLM, Report Generation.