ABSTRACT

This report presents a machine learning-based approach for predicting brake system faults in heavy transport vehicles using Random Forest (RF) classifiers, augmented by explainable AI (XAI) techniques. Traditional fault detection in transportation systems often relies on complex diagnostics or manual analysis, which can be labor-intensive and difficult to interpret. By leveraging the RF algorithm in conjunction with SHAP and LIME for feature attribution, this study provides an automated, interpretable, and resource-efficient solution. The approach was evaluated on the Scania Trucks APS dataset, which contains anonymized sensor readings. Through SHAP, the model identifies the most critical features influencing fault predictions, reducing input dimensions while maintaining high accuracy. Metrics like accuracy, F1-Score, and computational efficiency improvements further underscore the model's robustness and scalability. This report explores the methodologies, results, and broader implications of AI-enhanced fault prediction, highlighting the potential of XAI in improving reliability and transparency in heavy transport maintenance.

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