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An Ensemble Machine Learning Model for Vehicular Engine Health Prediction

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Abstract: *In the automotive industry, maintaining optimal engine health is vital for vehicle performance and longevity. Traditional diagnostics often lack real-time capabilities, creating the need for predictive systems. This project proposes an ensemble deep learning approach combining Random Forest, Decision Tree, and K-Nearest Neighbors (KNN) algorithms. Random Forest achieved 84% accuracy, leveraging its strength in managing complex data. Decision Tree offered 76% accuracy with strong interpretability, while KNN reached 80%, using instance-based classification. The ensemble model enhances overall accuracy and robustness, supporting real-time engine monitoring and proactive maintenance. This intelligent framework offers a scalable solution for predictive automotive diagnostics and health management. By combining these individual models into an ensemble framework, the system significantly improves prediction accuracy, robustness, and overall reliability. The ensemble method addresses the limitations of each algorithm while leveraging their strengths to produce more consistent and precise outcomes. The model is trained on a comprehensive dataset containing engine parameters such as temperature, pressure, vibration, fuel usage, and emissions. As a result, it facilitates early anomaly detection, supports proactive maintenance, and reduces repair costs and vehicle downtime. This ensemble deep learning solution offers scalability and intelligence for next-generation automotive health diagnostics*

Keywords: Engine Health Monitoring, Ensemble Learning, Random Forest, Decision Tree, KNN, Predictive Maintenance, Automotive Diagnostics, Machine Learning.

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