ONLINE PROGNOSTIC SYSTEM OF KEY VEHICLE COMPONENTS

A PROJECT REPORT

Submitted by,
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Under the guidance of,

Ms. PRIYANKA NIRANJAN SAVADEKAR

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING, INTERNET OF THINGS(IOT).

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PRESIDENCY UNIVERSITY

BENGALURU

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CERTIFICATE

This is to certify that the Project report **"ONLINE PROGNOSTIC SYSTEM OF KEY VEHICLE COMPONENTS"** being submitted by "G.GIRIDHARESWAR 2011CIT0019" "A.PRUDHVI REDDY 20211CIT0086" "R.RUKMANANDA REDDY 20211CIT0002" in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering is a bonafide work carried out under my supervision.

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DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **ONLINE PROGNOSTIC SYSTEM OF KEY VEHICLE COMPONENTS** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Engineering**, is a record of our own investigations carried under the guidance of Mrs. PRIYANKA N.SAVADEKAR, Assistant Professor **School of Computer Science Engineering & Information Science, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

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ABSTRACT

The **Online Prognostic System of Key Vehicle Components** aims to advance the concept of predictive maintenance in the automotive industry by leveraging machine learning algorithms to predict failures in critical vehicle components. With the growing complexity of modern vehicles and the need for optimized maintenance, this system offers an innovative solution to reduce vehicle downtime, enhance safety, and decrease maintenance costs. As vehicles today are equipped with a variety of diagnostic tools, real-time data can be harnessed to predict component failures before they occur, allowing for timely intervention and maintenance scheduling.

This project is centered on the development of a software-based system that uses machine learning to analyze historical and real-time vehicle performance data. The system processes diagnostic outputs from key components, including the engine, brakes, transmission, and electrical systems, to detect early warning signs of failures. It correlates these data points with historical performance data to identify patterns and anomalies that indicate potential failures. The machine learning model is trained using this data to predict the likelihood of failure for each component. Each feature in the dataset is carefully analyzed to determine the threshold value, beyond which a failure is likely to occur.

The system's predictive model is built on a variety of machine learning techniques, such as regression, classification, and time-series analysis, ensuring that the model is both accurate and robust in forecasting failures. By analyzing these datasets, the system generates a failure probability score for each component, allowing the user to understand the risk level of different vehicle parts in real time. This information is made available to users through an intuitive web-based dashboard, which displays real-time predictions and sends alerts when the failure probability crosses a critical threshold. These notifications enable vehicle owners, fleet managers, or service centers to perform preventive maintenance or take corrective actions before a failure occurs, ultimately reducing vehicle downtime and extending the lifespan of key components.

The proposed system also offers significant benefits to both individual vehicle owners and large fleet operators. For individual users, the system offers peace of mind by providing early warnings about potential failures, allowing for informed decision-making regarding vehicle repair or replacement. For fleet operators, the system provides a valuable tool to monitor and manage the health of multiple vehicles in real time, improving operational efficiency and minimizing unplanned downtime. The ability to forecast potential failures and perform proactive maintenance also leads to substantial cost savings, as it reduces the need for costly repairs and parts replacements that could have been avoided. This research investigates the effectiveness of various machine learning algorithms and evaluates the

accuracy and performance of the predictive model. Multiple validation techniques are employed to assess the model's reliability, including cross-validation and performance metrics such as precision, recall, and F1 score. The results of the study show that the proposed model significantly outperforms traditional maintenance schedules, which often rely on time-based or reactive approaches. The predictive system, in contrast, allows for a more targeted, condition-based maintenance strategy, which is both cost-effective and efficient.

In addition to the predictive capabilities, the system integrates seamlessly with a web-based user interface, where users can access real-time data, track the health status of vehicle components, and receive alerts. The dashboard is designed to be user-friendly, providing easy access to failure predictions and maintenance recommendations. The system's cloud-based infrastructure allows for remote monitoring, making it scalable and adaptable to both individual vehicles and large fleets.

The impact of this system extends beyond just maintenance optimization; it also contributes to the larger field of machine learning and predictive analytics in the automotive industry. By utilizing data-driven models for predictive maintenance, the system offers a blueprint for other industries where equipment uptime is critical. The implications of this research suggest that such predictive systems can be extended to other types of machinery and vehicles, furthering the adoption of smart maintenance strategies.

Overall, this project demonstrates the potential of machine learning in transforming how vehicle maintenance is approached, providing a powerful tool for both consumers and the automotive industry as a whole. By forecasting component failures and enabling proactive maintenance, the system promises to increase vehicle reliability, reduce operational costs, and ultimately contribute to safer and more efficient transportation systems worldwide.

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