Maintenance and Reliability Engineering Research

In the realm of monitoring maintenance procedures, various techniques such as preventive maintenance, prognostic/predictive maintenance, and reactive maintenance have been explored. The integration of artificial intelligence, big data analytics, deep learning, and machine learning methods, including FMEA, MATLAB, PLC, and SCADA, has laid the foundation for innovative solutions. Despite these advancements, challenges persist, including limited data points, smaller sample sizes, sensor specificity for anomaly detection, sustainability issues, accuracy constraints, and the need for advanced data cleaning methods. Addressing these limitations, this paper endeavors to overcome these challenges, focusing on larger sample sizes across various operational settings. It aims to statistically compare previous work, improve fault detection accuracy, and identify the best regression models for "time-to-failure" predictions, ultimately achieving a 4% increase in accuracy over previous studies.

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Emerging Solutions and Limitations

1 ── **Emerging Solutions**

Researchers have merged maintenance and reliability engineering with artificial intelligence, big data analytics, and machine learning to facilitate innovative monitoring techniques.

2 ── **Limitations**

Challenges such as scarcity of data points, smaller sample sizes, sensor specificity, and sustainability issues continue to impede progress in this field.

Data Enhancement and Statistical Comparisons

Multiple Factors Considered

The paper focuses on relatively larger sample sizes, encompassing multiple engine types and diverse operational settings to enhance data quality.

Statistical Comparison

Efforts have been made to statistically compare previous work and applied methodologies for improved fault detection and accuracy enhancement.
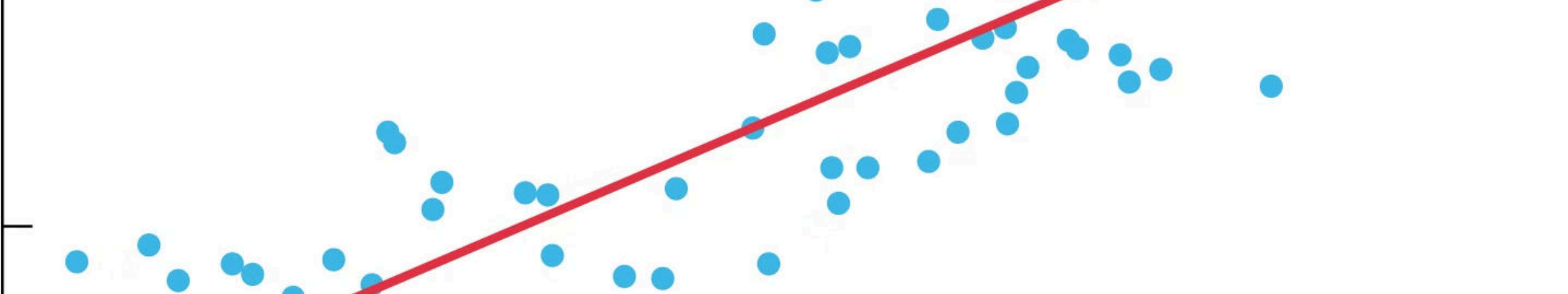
Regression Models and Accuracy Enhancement

1	2

Regression Model Selection

Comparative analysis of multiple regression models to identify the best fit for precise "time-to-failure" predictions.

Accuracy Improvement

The paper successfully achieved a 4% increase in accuracy over previous studies through meticulous regression model selection and enhancements.

Sustainability and Source Data Quality

1 **Sustainability Concerns**

Addressing non-sustainability issues by enhancing the quality of source data and ensuring data cleaning methods are sophisticated and effective.

2 **Data Cleaning Methods**

Focusing on critical enhancements of data cleaning methods to ensure the accuracy and reliability of the derived insights.
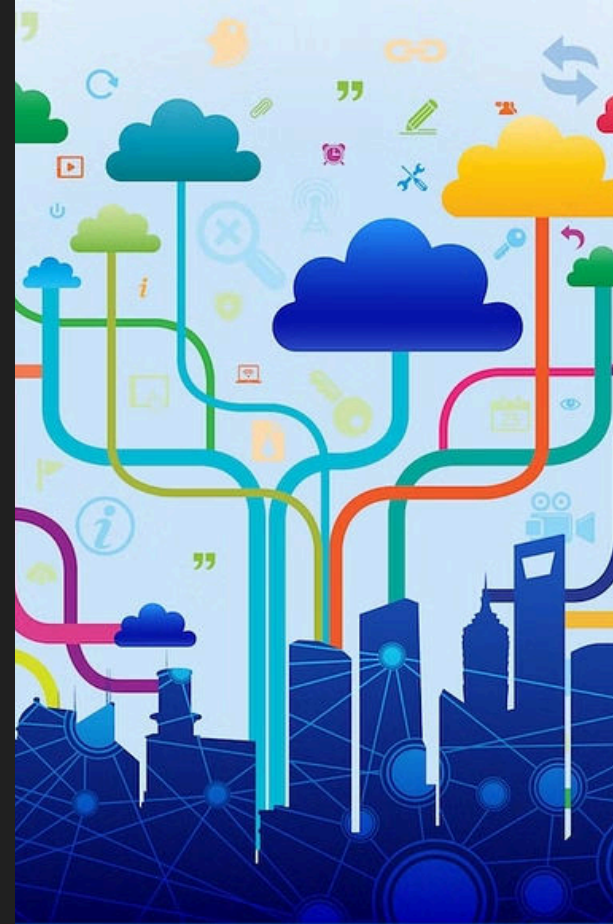
Effective Anomaly Detection and Sensor Specificity

Anomaly Detection

Challenging the existing limitations by considering specific sensor requirements for improved anomaly detection techniques.

Sensor Specificity

Recognizing the scarcity of data points and the need for a specific type of sensor for accurate anomaly detection in maintenance and reliability engineering.

Anomaly Detector on Cognitive Services

Application Insights

4

Azure Databricks

5

6

Stream Analytics

Service Bus

Synapse

3 Compute
Aggregation
Preprocessing
Postprocessing

Made with Gamma