Predictive Maintanance

Outline

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01. Introduction

- Techline Industries is investing into predictive maintenance to reduce operational costs, minimize unplanned downtime, and improve equipment reliability

- The project focuses on modelling a solution for timely preventive maintenance

Objectives

02.

- The main objective of this project is to develop a machine learning model that predicts whether a machine is likely to fail within the next 7 days, using sensor and operational data

- Modeling two machine learning classification algorithms and evaluate their performance

03. Data Understanding

- Data sourced from Kaggle.

- Contains 22 machine operating conditions and 500,000 machine records

- Details cover synthetic sensor operational data of different machines in industrial setups

04. Data Preprocessing

- Dropped missing and irrelevant data.

- Preprocessing is important for machine learning algorithms to better understand the data

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Modeling

05.

1. Second model - Decision Tree

- Shows our model predicted all correctly

Other metrics:
Accuracy : 1.0000
Precision: 1.0000
Recall   : 1.0000
F1 Score : 1.0000

06. # Evaluation

- Both models demonstrated good performance but the second model yielded better results

- A high-performing model like this can significantly improve failure detection, especially for rare but critical failure events.

- The perfect score may indicate overfitting on synthetic or oversampled data. Careful real-world testing and monitoring will be essential post-deployment.

06. Recommendations

- Develop separate models tailored to specific machine types

- Explore advanced algorithms such as Random Forest or XGBoost for better generalization

- Consider implementing time-aware cross-validation if temporal features (e.g., timestamps or installation year) are available

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