Predictive Maintenance Analysis

GROUP 11

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Project Overview:

Predictive Maintenance refers to the use of data driven and proactive maintenance methods that are designed to analyse the condition of equipment in the industry and help predict when maintenance is required. Predictive maintenance software uses data science and predictive analytics to estimate when a piece of equipment might fail so that corrective maintenance can be scheduled before the point of failure. The goal is to schedule maintenance at the most convenient and most cost-efficient moment, allowing the equipment's lifespan to be optimized to its fullest, but before the equipment has been compromised. Indeed, accurately modelling if a machine will break is crucial for industrial and manufacturing businesses as it can be beneficial in the following ways:

- Maintain a safe work environment by ensuring that machines are working properly.
- Increase productivity by preventing unplanned reactive maintenance and minimizing downtime.
- Optimize costs by removing the need for too many unnecessary checks or repairs of components.

Problem Statement:

To develop an algorithm which classifies if the given machine fails or not. In case the failure takes place, the model is trained to predict the reasons which led to failure.

Data Description:

Rows: - 10K Columns: - 14

The dataset consists of 10,000 data points stored as rows with 14 features in columns

Data Sources:

Website Link: [UCI Machine Learning Repository: AI4I 2020 Predictive Maintenance Dataset Data Set]

Dataset Information:

The dataset contains attributes like UID (Unique Identifier), Product ID (Low, Medium, and High), Air Temperature & Process Temperature which help in distinguishing machines as well as their external conditions from each other. Moreover, the additional features like rotational speed (rpm), torque (Nm), and Tool wear(min) depict the characteristics of the machine. There are two targets first one is machine failure which demonstrates whether the machine will fail or not. Second target variable signifies which type of failure has led the machine to fail.

Potential Methods:

A closer examination of the problem leads us to the conclusion that we can use both regression and classification. However, the machine learning method does not know which of the failure modes caused the process to fail, such as tool wear failure (TWF) or heat dissipation failure (HDF), and so on. So, to solve this problem, we will try to implement Regression, which attempts to fit data with the best hyperplane that passes through the points. The main reason we use regression is to determine the strength of predictors, forecast an effect, and forecast a trend. We would like to start with a Support vector machine (SVC) as our primary approach. We would also test it with XG Boost, Logistic Regression, and Lasso regression.