CS-5710: Machine Learning

PREDICTIVE MAINTENANCE

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TITLE OF THE PROJECT: PREDICITVE MAINTENANCE

ABSTRACT

In this project, we would like to fit the best model which can predict both when a failure will occur and the type of that failure. The independent provided in the dataset are such as Air temperature [k], Type, Process temperature [k], Rotational speed [rpm], Torque [Nm], Tool wear [min] which defines the failure type and when a failure occurs. Before applying the classification techniques, we will perform the Exploratory Data Analysis and feature selection such as checking for missing values, finding the correlation between the variables and visualizing the data.

The obtained data will be split into train and test splits. Then we fit the training dataset into classification models such as Logistic Regression, K-Nearest Neighbour (KNN), Naïve Bayes and Decision tree etc., from all the classification algorithms trained, the best model with better accuracy is selected. For those models the confusion matrix will be displayed which tells the true positive and true negative rate and also displays the precision for all the models.

PREDICTIVE MAINTENANCE

Predictive maintenance has gained a lot of attention in the previous few years for a variety of reasons. It has continued to be difficult for industries to adopt which method is appropriate, reliable, and provides the most accurate detection as new algorithms and methodologies are evolving across various learning methods. One of the key elements of predictive maintenance is defect detection, which is essential for businesses to do so in a timely and accurate manner. It is occasionally necessary to develop a model in a production setting with little to no historical data in order to reduce the cost of maintenance.

In predictive maintenance scenarios, data is collected over time to monitor the state of equipment. The goal is to find patterns that can help predict and ultimately prevent failures.

PROBLEM STATEMENT

i. Predicting when a failure will occurs using independent variables.

Predictor Variables: Air temperature [k], Type, Process temperature [k], Rotational Speed [rpm], Torque [Nm], Tool ware [min].

Response Variables: Target

ii. Predicting type of failure will occurs using predicting variables.

Predictor Variables: Air temperature [k], Type, Process temperature [k], Rotational Speed [rpm], Torque [Nm], Tool ware [min].

Response Variables: Failure Type.

Execution Plan & Result Evaluation

A data set with 10 features and 10,000 entries will be taken into consideration. We are going to apply various preprocessing methods to this data, and we are going to find accuracy by applying the classification models listed below. We will be determining the true positive, true negative, and precision for the models that have the highest degree of accuracy.

Classification models:

i. Logistic Regression
ii. K-Nearest Neighbor
iii. Naïve Bayes

And will update the models in the coming weeks. We may learn how to use the various machine learning classification algorithms and which methods work best for these kinds of problem statements through this research.

References:

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