HIGH LEVEL DESIGN (HLD)

Scania Truck Failures Prediction

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DOCUMENT VERSION CONTROL

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ABSTRACT

The Air Pressure System (APS) is a critical component of a heavy-duty vehicle that uses compressed air to force a piston to provide pressure to the brake pads, slowing the vehicle down. The benefits of using an APS instead of a hydraulic system are the easy availability and long-term sustainability of natural air.

This is a Binary Classification problem, in which the affirmative class indicates that the failure was caused by a certain component of the APS, while the negative class indicates that the failure was caused by something else

1. INTRODUCTION

* 1. WHY THIS HIGH-LEVEL DESIGN DOCUMENT?

The purpose of this High-Level Design (HLD) Document is to add the necessary detail to the current project description to represent a suitable model for coding. This document is also intended to help detect contradictions prior to coding, and can be used as a reference manual for how the modules interact at a high level.

THE HLD WILL:

* PRESENT ALL THE DESGIN ASEPCTS AND DEFINE THEM IN DETAIL
* DESCRIBE THE USER INTERFACE BIENG IMPLEMENTED
* DESCRIBE THE HARDWARE AND SOFTWARE INTERFACE
* DESCRIBE THE PERFORMANCE REQUIREMENT
* INCLUDE DEFINE FEATURE AND ARCHITECHTURE OF THE PROJECT
* LIST AND DESCRIBE THE NON-FUNCTIONAL ATTRIBUTES
* SECURITY
* RELIABLILTY
* MAINTAINABILITY
* PORTIBILITY
* REUSEABILITY
* APPLICATION COMPATIBILTY
* RESOURCE UTILIZATION
* SERVICEABILITY

1.2 SCOPE

The HLD documentation presents the structure of the system, such as the database architecture, application architecture (layers), application flow (Navigation), and technology architecture. The HLD uses non-technical to mildly-technical terms which should be understandable to the administrators of the system.

* 1. DEFINATION

|  |  |
| --- | --- |
| TERM | DESCRIPTION |
| DATABASE | Collection of Information Monitored by the System |
| IDE | Integrated Development Environment |

2. GENERAL DISCRIPTION

2.1 PRODUCT PERSPECTIVE

Scania Truck Failures Prediction is UI based application which will be predicting the whether the cause of failure in trucks is Air Pressure System (APS) or not.

2.2 PROBLEM STATEMENT

To create an UI application which can be used by the truck company to get the clear idea of the cause of failure in truck. It will be able to tell whether the failure is caused by Air Pressure System (APS) or not.

2.3 PROPOSED SOLUTION

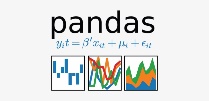
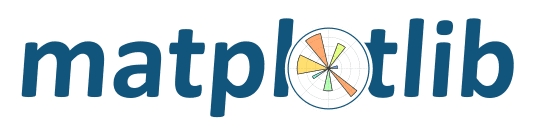
The solution to the above stated problem is creating a UI application. The UI will enable company to predict the cause of failure in truck. On the basis of many factors, company will be able to make a prediction of the cause of failure in truck. These factors are renamed in the data for security purpose.

2.4 FURTHER IMPROVEMENTS

With more datasets, we can improve our model to a great.

2.5 TECHINICAL REQUIREMENTS

No hardware tool is required but services like cloud services are required to host the website and database is required to store the data.

2.6 TOOLS USED



2.7 Data Requirements

In this model we are using APS Failure at Scania Trucks Dataset taken from UCI Machine Learning Repository. There are 171 unique column and 60000 rows of data.

2.8 CONSTRAINTS

The scope of this model is limited to only the failures of APS system of trucks, as data is based on that particular part of particular vehicle. Using the same model for the failure prediction of any other part besides APS system or failure prediction of any part in any other vehicle besides trucks can lead to incorrect predictions.

2.8 ASSUMPTIONS

Model assumes the company customer from Scania Trucks.

3. DESIGN DETAIL

3.1 PROCESS FLOW

3.1.1 Proposed methodology

ML model for prediction

Validation from the dataset

Data from the Scania Trucks

Prediction of failures in APS system

3.1.2 Model training and evaluation

Feature Engineering

Validation Set

Training Set

Model

Result for Evaluation

Prediction

3.1.3 Deployment Process

Upload test file

Load Model

Download Prediction Results

Prediction Results

Make Predictions

3.2 EVENT LOG

The system is going to log everything so that the user gets to know which process is running internally.

3.3 ERROR HANDLING

Should errors be encountered, an explanation will be displayed as to what went wrong? An error will be defined as anything that falls outside the normal and intended usage.

4. PERFORMANCE

The hosted website will be used by many daily professionals so coding will be done in a proper modular fashion to reduce the run time and for faster execution.

4.1 REUSABLILITY

The code written should have the ability to be reused with no problems.

4.2 APPLICATION COMPATIBILTY

The different components for this project will be using Python as an interface between them. Each component will have its own task to perform, and it is the job of the Python to ensure proper transfer of information.

4.3 RESOURCE UTILIZATION

When any task is performed, it will likely use all the process power available until that function is finished.

4.4 DEPLOYMENT



5. KEY PERFORMANCE INDICATOR

The indicators in our application will be the area under ROC curve and the confusion matrix of the application. We will also use the precision and recall scores for the better understanding of the model performance.

6. CONCLUSION

The application will be providing the truck company an interactive platform where they just have to give some required inputs, and based to previous data, model will be able to produce a prediction stating whether the failure was caused by APS system or not.