Exhaust Air Leak

AutoPulse Case Study

Objectives

- Identify a single engine fault and its source in 80 hours of vehicle data
- Demonstrate generalizability of Acerta's algorithms across vehicle types and models

Challenges

- No background information provided regarding the nature of the failure
- Minimal training data

Results

- AutoPulse identified anomalous signals in 0.029% of the data as indicative of an engine fault with >98% accuracy
- Acerta reduced the client's root-cause analysis time from ~ 2 weeks to <1 hour

Learn more at:
https://acerta.ca

Background

A leading North American OEM was looking to resolve an issue during vehicle qualification testing. The client's existing data collection system was collecting data during on-road vehicle testing, when the test driver noticed unusual behaviour that worsened with time, eventually forcing a stop. Acerta was provided with 250 MB of data recorded from 350 sensors during 80 hours of driving for this case. Our goal was to identify the location and type of failure, and thereby facilitate the client's root cause analysis.

The Problem

Acerta's goal was to uncover the small subset of anomalous signals corresponding to a single engine failure from several days' worth of vehicle data. Additionally, in order to demonstrate AutoPulse's detection capabilities across vehicle platforms, no information was provided regarding the type or model of the vehicle, nor the nature of the failure mode. The data was taken from 350 different input parameters, though the total size of the dataset was only 250 MB, as it contained a large number of observations, but over relatively few sensors.

Solution Process

The Acerta team started with a simple assumption: the anomaly which ultimately led to the engine failure must have occurred toward the end of the test drive. This enabled our data scientists to train AutoPulse on the normal operation of the vehicle, using the initial portion of the test drive data.

Once trained, the algorithm identified issues in 8 out of the 350 sensors installed in the car and was able to detect the anomaly towards the end of the recording. AutoPulse identified anomalous behaviour in relationships between the signals representing the oxygen level in the exhaust system, the fuel banks, the engine speed and the cylinder pressure.

Results

AutoPulse correctly identified the 0.029% of vehicle data that was anomalous with >98% accuracy. Rather than the typical two weeks, a combustion expert using the information provided by AutoPulse identified the root cause of the problem (an air leak in the exhaust system) in less than an hour.