

## Feel the Car - Automatic Anomaly Detection for Unstructured Test Drive Data

### Background

Car manufactures, especially in the high-end sector, let their car series undergo a long development circle to optimize not only the design and the performance, but also the quality and the driving behavior. Those characteristics are under strong supervision and continuously tested during the whole production process. Beside component specific tests like for the engine itself, the test drives play a very important role.

The sensors measure different metrics like temperature, vibrations, and speed. The cameras are used to observe the street to find possible reasons for irregularities like pot holes. Further, the microphones try to capture unusual driving sounds or vibration in the body shell. The data of the test drives get collected and afterwards analyzed to find possible problems. This process is currently mainly manual: a car engineer observes the sensor values and the audio/video files to identify irregularities. Identified irregularities have to be examined in detail. The engineer has to find the possible causes and thereby combines all the test data to, for example, conclude, that a pot hole led to steering anomalies. Unfortunately, the effort is too high to analyze every single test drive in detail and therefore most of the collected data stays unused.



### Project Partner

**Mercedes-AMG** is the high performance division of Mercedes-Benz. AMG independently engineers, manufactures and customizes Mercedes-Benz vehicles. AMG is specializing in performance improvements for Mercedes vehicles and produces only the top cars of Mercedes-Benz.

## Project Description

Within the bachelor project we will focus on the unstructured data that is collected during test drives. We will evaluate the potential to automatically analyze massive amounts of unstructured data in order to detect certain irregularities like pot holes. Therefore, the audio and video files have to be processed, split into snippets and finally classified. AMG is providing these test drive data for the development of our system. In addition, the data from AMG can be enriched by video data that is published on sharing platforms like Youtube. Furthermore, if this data can be combined with GPS positions of the cars, the analyzed data can be used by the BAST (Bundesanstalt für Straßenbau) to have a real-time overview of the road conditions.

During the bachelor project the students have to face the following tasks:

- Evaluation of possible occurrences like potholes
  - Sample audio files has to be analyzed
  - Requirements by the car manufacturers has to be collected
  - Use cases have to clarified for each occurrence
- The underlying architecture has to be evaluated
  - Apache Hadoop could be one part of it
  - Research on the best Machine Learning Algorithms
- User interface has to be defined
- Evaluating the test data interpretation process of AMG
- Early prototypes should help to gather early feedback from car engineers
- Implement the final classification model as a mobile service to detect the occurrences in real-time whole test driving the car

The used programming languages highly depend on the project partner requirements and on the bachelor team itself. Nevertheless, the user interface should be an easy-to-use web interface/service/mobile app using modern frameworks like Angular or React. The final goal is to have a running system that is capable of analyzing massive amounts of unstructured audio and video files.

## Contact

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