Detecting Vehicle Malfunctions using Acoustic Data and AI

Abstract

Mechanical equipment and machinery play a critical role in modern society, as such, it is crucial for us to always keep these systems healthy and functional. There are many ways to diagnose mechanical systems (like …)[[1]](#footnote-1), however, one of the most common ways humans tend to notice issues is initially through sound. When a person drives their vehicle, they notice when something doesn’t sound quite right; maybe there is a clicking noise coming from the engine, or the sound of the tires on the road sound uneven. Sounds like these are tell-tale signs that there is something wrong with the equipment and humans tend to hear these sounds later than they should, however, we can use adaptive AI to identify these sounds sooner and more precisely.

Problem: Some mechanical issues (like …)[[2]](#footnote-2) can be difficult for a human to hear so they wouldn’t be aware that something needs fixing until the problem has gotten worse. With an AI that is familiar with the vehicle or machine, it can help locate or identify audible issues when something is not working the way it is supposed to.

Method: Pairing an adaptive AI with an integrated library of common sounds (like …)[[3]](#footnote-3) and audio anomalies (like …)[[4]](#footnote-4) that occur within a mechanical system will help it recognize sounds that do not belong. By letting the AI observe the e.g., daily functions, it will become more and more acclimated to how the system should sound, and when something does not fit with the usual sounds it will notify the user.

This study (and the application behind it) proposes a novel approach to detecting vehicle malfunctions using sound-based analysis and machine-learning algorithms. The system records sound generated by the engine, wheels, and other components of the vehicle while it is in operation, and uses this data to train a supervised learning model. The trained model can then classify sounds into two categories: normal or abnormal, (and in specific cases as not-categorizable).

The proposed system has several advantages over traditional diagnostic methods (like …)[[5]](#footnote-5), such as visual inspection or manual testing. Firstly, it is non-invasive, meaning that it does not require physical access to the vehicle or any special equipment. Secondly, it is automated, which reduces the time and effort required for diagnosis. Finally, it can potentially detect issues that are difficult to identify through other means (like …)[[6]](#footnote-6), such as intermittent faults (like …)[[7]](#footnote-7) or hidden defects (like …)[[8]](#footnote-8).

This study has several implications (like …)[[9]](#footnote-9) for the automotive industry, particularly in the areas of preventive maintenance and quality control. By detecting problems early, the system can help reduce the risk of breakdowns and accidents, as well as extend the lifespan of the vehicle. Additionally, it can provide valuable feedback (like …)[[10]](#footnote-10) to manufacturers on the quality of their products and the effectiveness of their production processes. Overall, the sound-based problem detection system represents a promising new direction in the field of vehicle diagnostics.

We need also to describe the demo-data and the question needing an answer: …

Next step is an OAM based on the bearing-wear-documentation.
Your first system model could be a new approach based on the available data.
c.f. [https://miau.my-x.hu/miau/280/degradation\_path\_01.xlsx](https://miau.my-x.hu/miau/280/degradation_path_01.xlsx%22%20%5Ct%20%22_blank)
A new approach is a new OAM + the question needing an answer based on the OAM.
A new OAM should have other objects and other attributes (incl other values) compared to the existing one (see doc = [https://miau.my-x.hu/miau/283/bearing\_wear\_en.docx](https://miau.my-x.hu/miau/283/bearing_wear_en.docx%22%20%5Ct%20%22_blank) and xls)
A new question can be concerned an estimation or forecast or evaluation or ...

1. Please, complete the list with examples! [↑](#footnote-ref-1)
2. Please, complete the list with examples! [↑](#footnote-ref-2)
3. Please, complete the list with examples! [↑](#footnote-ref-3)
4. Please, complete the list with examples! [↑](#footnote-ref-4)
5. Please, complete the list with examples! [↑](#footnote-ref-5)
6. Please, complete the list with examples! [↑](#footnote-ref-6)
7. Please, complete the list with examples! [↑](#footnote-ref-7)
8. Please, complete the list with examples! [↑](#footnote-ref-8)
9. Please, complete the list with examples! [↑](#footnote-ref-9)
10. Please, complete the list with examples! [↑](#footnote-ref-10)