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Forschungsarbeit/Master thesis on the subject of

Anomaly detection in multivariate time series through machine learning

Background

Daimler automatically performs a huge number of measurements at various sensors in test vehicles and in engine test fields per day. Before such measurement data is evaluated, its plausibility has to be checked in order to detect and to fix possible sensor failures. This is a very time-consuming task if it is done manually. Accordingly, this problem should be automized by making use of a machine learning system. The reason for choosing a machine learning system lies in the big variety of sensors, measuring channels and vehicle conditions. An algorithm shall learn independently to distinguish between plausible and implausible measurements.

Since only plausible measurements are available after the initial startup of a measuring system, the use of a classical binary classifier is not possible. Instead, special machine learning methods are required to solve such one-class problems. One functional approach has already been successfully designed and implemented at our institute. Subject of future research is particularly the extension of unsupervised anomaly detection by taking multivariate and temporal coherences into account.

Task

The focus of this thesis lies on the detection of multivariate (nonlinear) dependencies between various sensor signals from Daimler trucks. Therefore, unsupervised machine learning methods based on neural networks shall be deployed. A resulting dependency graph will lay the groundwork for the detection of contextual anomalies in multivariate time series.

Prerequisites

- Highly motivated, autonomous way of working
- Preknowledge in Python or MATLAB is beneficial