1 AI Service for Module 1 in the Service Life Cycle: Service

SERVICE MEISTER

PREDICTIVE MAINTENANCE FOR OPTIMAL SERVICE AND MAXIMUM MACHINE AVAILABILITY

Connected devices open up new possibilities for dynamically designing maintenance cycles, minimising machine downtime, and providing recommendations for use and action. By regularly monitoring and analysing sensor and usage data, it is possible to see whether the machine is in a normal state and when the next maintenance should be carried out.

FOR THE FOLLOWING CHALLENGES

- Maintenance on demand instead of within predefined cycles
- Early detection of errors and misuse
- Reduction of downtime through optimisation of maintenance cycles
- Cost reduction by avoiding cyclical, preventive replacement of components
- Increasing customer satisfaction

THE USE CASE

- Sensor and usage data of the machines are synchronised regularly.
- Based on predefined rules, device and usage data are systematically monitored in order to derive the current condition of the device and predict future maintenance dates.
- In the course of monitoring the condition of the device, errors are also detected at an early stage to prevent a total loss of the device. Deviating sensor values for vibrations or temperature, for example, can indicate imminent bearing damage.

By systematically monitoring and analysing device data, maintenance cycles can be planned in advance so that no unplanned downtime occurs. Early warnings of possible errors or misuse can be configured.

THE SOLUTION IN DETAIL

Based on existing sensor and usage data, a set of rules is created with the help of machine learning, which makes it possible to identify maintenance requirements and errors at an early stage. Machine learning makes it possible here to recognise and map even more complex relationships that could not be captured if rules were created manually.

- Based on the rules, an algorithmic decision is made as to whether the machine is in a normal state or whether critical states are indicated.
- Sensor values are constantly monitored and analysed so that the user is notified promptly when errors are identified.
- By analysing usage and sensor data, it is also possible to predict when maintenance is needed next.
- Through the continuously collected data, the created set of rules can be further optimised and thus also adapted to changes.

PROJECT STATUS

- (To be updated)

REQUIREMENTS

- At the beginning of the project, usage data is required that contains both the normal state of the device and error cases (incidence overview including time stamps). The more data processed, the better the set of rules created.
- Usage data should be complete so that a full machine and usage profile can be created.
- The infrastructure must allow data to be synchronised on a regular basis.
- There must be an interface through which the set of rules can pass on recommendations for action.

AVAILABILITY

- (To be updated)

CONTACT:
Laura Ohrndorf
hello@grandcentrix.net

SERVICE MEISTER

SPECIFICATION

	Input data	Preprocessing	Data storage	Algorithms	Interfaces
High-level description	Sensor data as time series and associated data on maintenance and error cases	Data cleansing and calculation of KPIs	Storage of data in a time series data bank	Monitoring of sensor values by means of anomaly detection for error cases and KPI trend analysis for maintenance requirements	Dashboard for visualisation of predictions and aggregated data
Configurability	Select data source (database)	Optional aggregation	Lead time	Set of rules, e.g. with regard to sensitivity	Data source
Technical Implement ation	Importing source data or retrieving data from the database	ML Services Data Science Pipeline	NoSQL database (Cosmos DB)	Azure Stream Analytics	Plotly Dash
Specific example from the speedboat project	Numerical sensor values: Temperature, voltage, duration of use, charge cycles, time stamps	Continuous import and interpolation of missing values	Prepared data is stored in Cosmos DB	Recognise the need for maintenance of the battery due to decreasing capacity. Detection of defects, e.g. low voltage of the battery after full charge	Overview of aggregated sensor data, probabilities for any errors, and maintenance requirements

CONTACT:
Laura Ohrndorf
hello@grandcentrix.net