

Embracing AI at Porsche: innovative data analysis ensures high-voltage performance

05/06/2025 Artificial intelligence (AI) is becoming increasingly important in vehicle development. It has become an indispensable tool, especially for complex systems in a network, such as the battery-electric energy storage system.

The increasing number of highly developed sensors provides a volume of data that could no longer be processed with conventional software. For Porsche, using machine learning and AI for data analysis is helpful for understanding huge amounts of information and varying contexts. Using these tools helps to provide reliable insights into component behaviour and interaction.

AI in battery development

A high-voltage battery is a complex system that is exposed to a wide range of external and internal

influences. These influences are made visible by Porsche's engineers through data analysis and the use of AI in connection with the effects on the energy system. The knowledge gained in this way is an essential basis for developing ever-better components and systems for Porsche customers.

AI supports developers in particular in detecting implausible behaviour within a battery. This allows the algorithms to analyse the balancing behaviour of individual cells and the entire battery as early as the development stage. Balancing refers to the charge balance between the cells of a battery module. If the values deviate from the expected state, the data allows faster conclusions to be drawn about the causes and underlying processes. At the same time, the data quality in the development process is improved, so that later findings from customer vehicles are even more reliable.

In addition to the known main drivers of battery ageing, modern analysis methods can also be used to identify other influences. Through the coupled application of state-of- the-art data-analysis methods and physicochemical models, forecasts and analyses of the ageing of high-voltage batteries in the customer fleet can be created. With the understanding of the various ageing influences on the basis of data analyses, the system developers work on the further optimisation of the operating strategy. All optimisation criteria such as range, charging time, system performance, weight, durability and consumption are worked out.

The results of analyses based on AI must be understandable and explainable in order to create a reliable basis for decision-making for development. For this purpose, what are known as 'explainable AI' methods are used. For Porsche, AI is a tool that helps the team to understand complex relationships and take all relevant aspects into account. In combination with the expertise of the sports car manufacturer's development engineers, this enables a precise classification of the situation at the end of the analysis.

Through an intelligent and adapted system design, the ageing influences identified by AI can be reduced in a targeted manner. Customers benefit from this as the service life of a vehicle battery can be extended significantly.

Preventative anomaly detection – direct to the customer

A particularly innovative data analysis method, which is being applied for the first time to data from the high-voltage battery of the Porsche Macan, is preventive anomaly exploration. This assesses the technical cause and relevance if any anomalies are detected in the data. It ensures the long-term performance of the high-voltage system while helping the development of future products through the findings.

Preventive anomaly detection uses detectors that use intelligent algorithms to extract, for example, a change in the behaviour of the battery in the online data. The detected anomalies are analysed, deciphered and evaluated in the cloud.

However, if a relevant anomaly should occur, Porsche proactively informs the driver – including specific instructions, including via the MyPorsche app. What is particularly impressive is that this method can evaluate the data of each cell of the battery individually.

Preventive anomaly detection aims to use data-analysis methods to ensure the reliability and performance of vehicles on the one hand and to predict potential limitations on the other. This function is therefore one of the central elements of the quality work of the future.

MEDIA ENQUIRIES



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Consumption data

Macan Turbo (WLTP)*: Electrical consumption combined: 20.6 – 18.3 kWh/100 km; CO_2 emissions combined: 0 g/km; CO_2 class: A

*Further information on the official fuel consumption and the official specific CO_2 emissions of new passenger cars can be found in the "Leitfaden über den Kraftstoffverbrauch, die CO_2-Emissionen und den Stromverbrauch neuer Personenkraftwagen" (Fuel Consumption, CO_2Emissions and Electricity Consumption Guide for New Passenger Cars), which is available free of charge at all sales outlets and from DAT (Deutsche Automobil Treuhand GmbH, Helmuth-Hirth-Str. 1, 73760 Ostfildern-Scharnhausen, www.dat.de).

Video

https://newstv.porsche.com/porschevideos/newstv.porsche.com_317336_en.mp4

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