Using Artificial Intelligence to its Full Potential

Making operational processes more efficient through data science and machine learning

» **Overcoming challenges associated with the use of AI**
» **Identifying potential for improvement in the organization**
» **Minimizing costs and downtime with AI-guided systems**

Many operational processes can be made significantly more efficient through the proper use of artificial intelligence (AI) and data science. AI-based solutions can add considerable value compared to conventional solutions, particularly in terms of energy management and predicting component failures along the entire value chain. Thanks to AI, it is possible to dynamically predict downtimes of critical systems and the energy consumption of components in their overall context, and to minimize them through smart management. Data science provides the foundation for the development of AI systems. MicroNova's consultants conduct preliminary analysis of your data as well as workshops to develop a customized strategy for the challenges facing your business.

In the field of artificial intelligence, and in particular Narrow AI, MicroNova offers services covering all aspects of predictive maintenance, energy management, and test management with a focus on deep learning, which uses algorithms that allow a system to train itself to perform specific tasks. For example, AI-based systems can improve the flexibility of battery management systems (BMS) in unforeseen situations by making accurate predictions about the state of charge and health of the connected battery cells.

Whether optimizing existing or delivering new AI initiatives, we will be happy to assist you with your challenges involving the use of artificial intelligence.

AI Services at a Glance

Data Science: Consulting

Business Understanding

- » Identification of problems and KPIs
- » Development of strategies for designing a new AI solution
- » Enhancement and optimization of existing AI initiatives
- » Synchronization of AI strategy with business objectives
- » Transformation planning taking into account existing processes and infrastructure

Predictive Modeling

- » Postprocessing of results from existing models
- » Performance analysis of existing models
- » Development and implementation of the identified algorithms
- » Evaluation of the new AI solution

Feature Engineering

- » Definition of data required for the solution
- » Determination of the relevant parameters for a given problem
- » Development and implementation of the algorithms

Data Cleaning, Data Mining, Data Exploration

- » Data collection and preparation
- » Data visualization
- » Pattern recognition

Machine Learning:
Reinforcement Learning, Supervised Learning, Unsupervised Learning in Combination with Regression

Training

» Basic introduction to and presentations on supervised learning, unsupervised learning, time series forecasting, and anomaly detection

Consulting on the Use, Assessment and Comparison of Algorithms

» Which algorithm is appropriate for which question?
» What are the metrics for specific algorithms?
» What is the current state of research regarding the given question?

Selecting the Right Technologies and Processes

» Analysis of operational processes
» Innovation workshops and data preanalyses

Use Cases for AI

Predictive Maintenance

AI applications can be used to predict component failures at an early stage based on sensor data from system components using anomaly detection. This helps to minimize downtimes for industrial plants and reduce costs for businesses by adapting maintenance intervals.

Certain types of neural networks, such as Convolutional Neural Networks (CNNs) and Long Short-term Memory (LSTM), are suitable in such cases for effectively predicting upcoming faults. In addition, established algorithms such as random forest are used to predict faults and downtimes. MicroNova Consulting supports businesses in analyzing data, selecting appropriate AI technologies for modeling, and integrating and validating individual model components.

Energy Management

AI applications can reduce a company's CO_2 emissions as well as costs through improved load forecasting and optimized energy use strategies. Thus, AI solutions can help optimize resource use along the entire value chain. Historical data can be used, for example, to provide capacity forecasts in telecommunications networks based on real-time data, significantly reducing the energy consumption of the entire network by making appropriate adjustments. The main application in this area is neural networks that specialize in time series forecasting. These include, for example, transformers and LSTMs. MicroNova Consulting supports businesses in analyzing data, selecting appropriate AI technologies for modeling, and integrating and validating individual model components.

Fuzz Testing

The importance of reliable ECU validation during development continues to gain importance as part of automotive manufacturers' cybersecurity strategies. AI-based fuzzing tools can significantly reduce the time required for ECU testing, delivering direct added value to the value chain.

Concepts such as Reinforcement Learning and Generative Adversarial Networks (GANs) play a particularly important role here. Inputs to the tests generated by GANs can be assessed and transformed into test strategies through Reinforcement Learning, allowing security vulnerabilities in ECU software to be detected more quickly than with conventional strategies. MicroNova Consulting supports businesses in selecting the best possible algorithms, evaluation strategies, and in model validation.

Simulation models

The creation of a so-called digital twin accelerates vehicle development because it enables control unit software to be tested in a virtual environment – without the need for a real prototype. This approach requires a large number of simulation models. With regard to autonomous vehicles in particular, such models can cover many different scenarios and factors virtually.

Here, neural networks are particularly suitable for those vehicle components that are difficult to reproduce with physical modeling, such as individual parts of an engine. MicroNova Consulting supports businesses in analyzing data, selecting appropriate AI technologies for modeling, and integrating and validating individual model components.

Our Experience – Your Benefit

MicroNova's consultants have many years of practical experience in their particular field and maintain close contact with our experts in hardware and software development as well as testing. Benefit from knowledge and experience acquired in over 35 years of automotive engineering. Contact us to discover how we can support you with your individual challenges.