Focus
ARTIFICIAL INTELLIGENCE: READY, STEADY, GO

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The international innovation contest in the field of artificial intelligence within an industrial environment is rapidly gaining momentum. For mechanical and plant engineers from Germany, it is becoming increasingly important to quickly develop the potential of this technology.

By Dr. Claudia Weise

In July last year, ground was broken for a spectacular global technology competition. The People's Republic of China declared its intention to become the global champion in artificial intelligence (AI) by 2030. To achieve this, the State Council announced a national AI plan which includes an investment of two billion euros in an "industrial park for artificial intelligence". Applications in industrial production play a crucial role here. With this, China is going on the offensive and has set its sights on its American rival, who, thanks to its Internet giants, remains the current undisputed number one in AI use. This is the case in the area of private consumption in particular - speech assistants, dynamic translations and image recognition are examples of everyday suitability of AI solutions.

Germany in pole position
AI has not yet found its place in daily applications in the mechanical and plant engineering industry. This critical stage is still to come. "AI needs large volumes of data in an industrial environment and these are not as easy to obtain as, for example data from social networks. German mechanical engineers, however, obtain a lot of data from their machines and are thus AI ready," explains André Rauschert, Head of the Digital Business Processes/Big Data research group at the Fraunhofer Institute for Traffic and Transport. "German companies have missed the boat for B2C business," says Rauschert, although he is convinced that "Germany is in a good position with its broad industrial basis and its culture of innovations. Data sovereignty is not in the hands of the American tech companies."

The chances are therefore looking good that Germany can gleefully come in at third place at the end of the international innovation contest. Everything needed to develop new tools and solutions with the aid of AI is available in Germany: operating data, excellent engineering knowledge - known as domain information - as well as the relevant IT expertise. Now, more companies must be resolute and use the opportunities which AI technologies offer.

Higher quality, higher availability and better performance
"AI presents huge potential to make traditional production processes much more efficient," says Peter Seeberg, Business Development Manager at Softing Industrial Automation GmbH. Seeberg describes the AI approach as follows: "Algorithms identify causalities from countless production data, which otherwise remain hidden to traditional methods. These algorithms can be used to significantly improve the overall equipment efficiency."

Better overall equipment efficiency means higher quality, higher availability and better performance. In order to optimize the system availability in line with predictive maintenance, context and patterns can be extracted from production data from machines and systems using AI technologies and machine learning. Furthermore, this enables predictions on future damaging events. This analysis goes much further than traditional condition monitoring systems which would merely send an alarm when statically defined limit values are

exceeded, for example during bearing vibrations of large turbines or pumps. In this way, it is possible to carry out repair measures in a timely manner and to schedule repair strategies better.

AI-based image recognition could be used in order to increase the quality in production. These systems recognize whether a component corresponds exactly to the design template or not. Furthermore, their performance can also continually improve through training. The AI will be continuously presented with new parts which are either acceptable or end up in the reject pile.

With an AI-optimized human-robot collaboration, huge increases in efficiency can be attained and better performance achieved in industrial production. Intelligent or autonomous industrial robots are aware of their environment and can adjust their behavior interactively and in real time. These robots are named collaborative robots, or Cobots, because they can intuitively adjust their operation through human signals, including speech, gestures or movement. In this way, they are capable of learning new, unergonomic and monotonous tasks and of carrying out these independently. AI can also be useful in the area of service robots: as driverless transport systems, aerial robots or even drones which can be used for warehouse inventory or inspections (for wind power plants, for example).

AI as driver of growth

"Whether the hype around AI is valid or not - at the end of the day, AI must create a practical benefit, high transparency and confidence," explains Damir Dobric, Managing Director of daenet Gesellschaft für Informationstechnologie mbH. "There is huge potential both for large and small to medium-sized companies," says Dobric assuredly. He therefore recommends companies to realize the importance of AI and to seize the opportunities presented. This opinion is shared by leading analysts. According to a study by the consultancy firm Accenture, through the successful use of AI, there could be an additional 38 percent increase in corporate profits by 2035 - in the area of industrial production, this could even create a 50 percent increase.

Companies now need to be bold and make the most of these opportunities for growth. Together with their research and service partners, they can give Germany a decisive boost to remain at the top of the field in the global technology race. ■

VDMA expert Prof. Claus Oetter says:

"Machine learning is an important area in computer sciences and a fundamental part of artificial intelligence. Computer programs based on machine learning can find autonomously solutions for new and unknown problems using algorithms. The artificial system 'identifies patterns' and consistencies in the learning data it is provided with. Tools already established on the market provide assistance in finding the algorithms. New frameworks and platforms support the wide application of these previously academic topics in everyday project activities.

This technology enables many new and exciting approaches in mechanical engineering in particular. Machine learning ensures that software and information technologies become an ever more important innovation driver in the mechanical engineering sector. Management needs to understand the possibilities unlocked by the use of machine learning and the extent to which new business models will revolutionize the market of tomorrow. Applied artificial intelligence is much more than a technology that has now made the leap into industry. In many sectors, it will enable totally new approaches and solutions to optimize processes through the use of the gathered data (big data). Data is absolutely indispensable for machine learning. If ML algorithms are the engine of future developments, data is the fuel."

Background: Algorithm is it

Background information on AI.

Artificial intelligence is based on algorithms which analyze huge data streams and extract complex contexts and patterns without having been explicitly programed to do this. Machine learning is an AI core technology which learns from example data and derives correlations in the form of models. Known models are decision trees, regression lines, cluster centers or artificial neural networks. These models can react to new data, by assigning this data to categories and creating predictions. The more example data or data for training purposes the learning method obtains, the more the models can improve. Artificial, neuronal networks are trained as part of deep learning.

Source: Fraunhofer-Allianz Big Data, Author: André Rauschert ■

Background: VDMA Working Group machine learning

What are the potential applications of machine learning? What technologies are there? How can the jump be made from big to smart data? Which qualifications will employees need? What is the key to successful implementation?

These questions are the focus of the activities of the working group of the VDMA Software and Digitalization Trade Association which was founded in April 2017. On the occasion of the Hanover Messe (April 23 to 27, 2018), the expert group is publishing a Quick Guide which presents the results of previous work. ■

Further Information

VDMAimpulse | VDMA Software and Digitalization | VDMA Industrie 4.0 Forum | VDMAimpulse 01-2018: "Background: Algorithm is it" | VDMAimpulse 01-2018: "Background: VDMA Working Group Machine Learning" | Fraunhofer Big Data Alliance | Accenture Report: "How AI Boosts Industry Profits and Innovation"

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