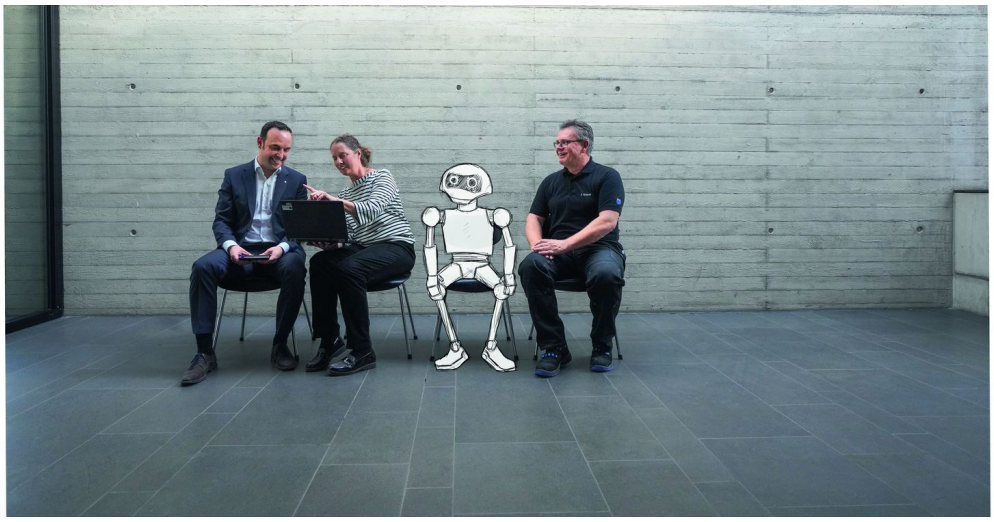


SVENJA FISCHER

Artificial intelligence: Do machines think like humans?

What does it look like when artificial intelligence (AI) supports the machines at TRUMPF? This is what our editor wants to find out during a voyage of discovery.

Clear forms, pure white, radiant dark blue. You don't have to show a person thousands of TRUMPF machines until he understands what makes a TRUMPF machine visually different. Artificial intelligence does: It needs time, the AI, many repetitions and people to learn.

"When a machine starts making a whistling noise at 300 Hertz, humans like us are typically at a loss to know where to start," says Jens Ottnad, head of pre-development networked systems. AI is already playing a major role in each and every one of his team's projects, with the digital and physical worlds increasingly fusing together. When it comes to key questions like what exactly the problem is and how best to solve it, AI offers invaluable assistance – and not always in the guise of a robot. I decided to take a journey of discovery through the company to find out how AI can support TRUMPF now and in the future.

Email from AI

My first port of call is the Grüsch production site in Switzerland – a place where AI is already in action. Jonathan Hartmann works on the shop floor as an electrical engineer, and a quick glance at his laptop screen shows that the sender 'AI' has just sent him an email – at least in a manner of speaking.

"We receive a message automatically whenever the AI detects any anomalies in the machine." On this occasion, outliers on the graph show there is a problem with the frequency responses. That means it's time for Hartmann and his colleagues to make their way to the TruLaser 5030 fiber on the production line. We can hear the problem – an irritating whistling sound – long before we reach the machine. "In the past, the only way we could find out which mechanical component had that resonant frequency was to replace parts one by one until the sound went away. Depending on what kind of problem it was, the troubleshooting process could end up taking all day." But now an AI solution is simplifying, accelerating and improving the quality control process.

DR. AI diagnoses the problem

TRUMPF's headquarters in Ditzingen is where the team of developers behind this solution is based, specifically at the test facility for machine tools, known for short as VFW. The TRUMPF machines are working flat out, and a cacophony of rattling and hissing sounds fill the air. Suddenly I stop short: I recognize that noise! The whistling continues and I follow the sound until I am standing in front of a TruLaser 5030 fiber. This is where the developers are busy working on axis diagnostics to enable the AI solution to run smoothly in far-off Switzerland. It works on the basis of data that the developers have compiled from over 4,000 machines worldwide since 2014. "Now it's diagnosing machines entirely on its own," says development engineer Martin Lukas. "Whenever the AI detects an anomaly, it not only identifies where the fault lies, but also offers suggested solutions from a knowledge base," says product owner Martin Schober.



Artificial intelligence supports TRUMPF machines in quality control.

Adaptive machines

The developers at TRUMPF's Schramberg site also employ these kinds of machine learning methods. VisionLine is an image processing system used to detect what position a part is in. The team recently extended its capabilities by enabling it to immediately detect whether the welding process matches the customer's requirements. Andreas Jahn, an expert in machine learning, shows me a photo of a weld seam on his laptop. Superimposed on the seam is a kind of thermal image: "To create this visualization, we train a model that is perfectly tailored to the relevant process. In the first stage of the project, the customer sends us photos of weld seam, and our algorithms then pinpoint the key areas. That's how we check our model is accurate." Any problematic areas – such as discoloration or a seam that is too thick or too thin – appear in dark red on the screen. "The fascinating thing is that the AI highlights exactly those areas that the customer would focus on," says Jahn. "But it does it much faster, without any interruptions or deviations. That builds trust in this solution. And the subsequent evaluation can then be conducted directly on the machine itself." Many of the problems customers face would be impossible to solve without this type of AI. "Writing the source code would be far too time-consuming. All we have to do with this solution is press start and the AI automatically calculates a model. That reduces programming time enormously and gives us the capacity to take on more customer projects."

Nothing to fear from AI

Back in Ditzingen the tour is over and I am chatting to two people who bring together the threads of all the AI projects: Volker Nestle, head of Corporate R&D, and Jens Ottnad, head of pre-development networked systems. "Nowadays we expect machines to perform increasingly complex tasks faster than ever before," says Nestle. "AI helps us achieve that by taking over some of the labo-rious, routine tasks.

We can't even imagine all the possibilities AI will open up." Ottnad believes AI is already changing the way we work: "And we shouldn't be hindering this development. The idea of machines seizing power is good Hollywood material, but it has nothing to do with our work here. AI is a tool that will enable us to make our machines even better in the future."

An ethical question

Nevertheless, discussing the ethical implications of AI is a high priority for big industrial nations like Germany. "We mustn't let ethical and moral issues stall development and put us at a disadvantage compared to other countries, but we can certainly create a unique selling point by maximizing the responsible handling of AI from research through to applications," says Nestle. That would ensure TRUMPF machines continue to impress customers in the future, not only with their clean lines and gleaming white and dark blue design – but also with their artificial intelligence.



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