Improving *Wieland's QA* with *AI-driven* **Computer Vision**

To inspect products even more efficiently, Wieland Group and Capgemini set up AI-driven computer vision, a solution that ensures the highest quality and is managed in the cloud, enabling Wieland to scale it independently as required.

A leading supplier of semi-finished products

The Wieland Group is the global market leader for semi-finished products and system solutions made of copper and copper alloys. Founded in 1820, the company now employs around 9,500 people at more than 80 locations and generates a turnover of 6.3 billion euros - with the aim of continuing to grow. To drive sustainability, efficiency, productivity and reliability, Wieland is focusing on digital transformation, automation and optimization. This is why the company turned to Capgemini, a global leader in transforming businesses through intelligent industry solutions, to collaborate on innovative digital solutions.

Following a thorough review of Wieland's existing operations, including on-site visits, the partners set up a series of joint workshops that identified pain points that could be addressed with intelligent solutions. Through these engagements, Wieland and Capgemini identified that the organization had to invest a disproportionately high amount of effort to ensure quality demands were met. Meanwhile, the partners also recognized the myriad possibilities offered by image processing solutions based on AI. These complementary conclusions led Wieland and Capgemini to select AI-driven computer vision as their initial focus for innovation.

Overview

Client: Wieland Group

Industry: Metal Processing

Region: Global

Client Challenge:

Wieland places not only the highest functional but also visual quality demands on its products. In order to guarantee this quality, manual visual inspection has always been of great importance. Both the fact that it is a round test object and the metallic, reflective copper surface pose challenges.

Solution:

Wieland worked with Capgemini to develop, implement, and test a scalable computer vision solution based on a deep learning model to enable the automation of visual quality inspection for many use cases in production.

Benefits:

- More efficient visual quality inspection with improved performance at the same time
- Support for more than 20 test cells and 50 products with a scrap rate of 1.5%
- Centralized management from the cloud
- Easy scalability to further use cases

Determining the feasibility of an AI solution

With the primary objectives, challenges, and solution established, the project team then launched a feasibility study. This enabled Wieland and Capgemini to determine whether or not, when excluding real-world factors and constraints, they could train a deep learning model to detect purely optical defects on the surface of components.

However, this study clarified an additional challenge: a lack of specimens. This meant that the partners would need a smart idea and a clever extension of the training data set. Fortunately, Wieland and Capgemini utilized data augmentation to artificially expand the training dataset, significantly improving the trained model's ability to detect the considered defects. Thus, the team could reliably conclude that such a solution could work if applied effectively.

Of course, the model had to be applied under realistic conditions. This meant finding a hardware setup that met real-time requirements, such as a reliable and resilient edge computing approach with fast response times, which was necessary for consistent operation in case the network or infrastructure failed. As the project team setup, the hardware, they took into consideration camera angles, background, and other critical factors that would impact the solution's effectiveness. In the end, this showed that reliable recognition rates were possible under practical conditions.

Based on the OPC UA standard, a fast, reliable, real-time data exchange could be established between the Programmable Logic Controller of the conventional measuring system and the robot in order to enable material feeding for the edge device. With the hardware and edge computing in place, the partners then connected the setup to the cloud, which served as the basis for future data analysis and efficient management of the AI solution.

Setting up Wieland to scale independently

Following the successful feasibility study and PoC, Wieland and Capgemini took the next step: setting up Wieland to be able to self-reliantly carry out the solution's large-scale deployment. This was done based on Capgemini's own CLEA* solution, a pre-existing generic platform allowing the verification of controlled assets and triggering actions based on computer vision. This included the computer vision system and edge device's hardware setup, as well as the cloud requirements and the necessary configurations and connections.

During this phase, close alignment and open communication between Wieland and Capgemini were the key to the project's success. Ultimately, trusting cooperation laid the foundation that enables Wieland to continuously improve the solution and independently scale it to further use cases.

As a result of this engagement, Wieland now has a solution that can be extended to more than 20 test cells and applied to more than 50 products. Computer vision can also inspect one million parts per week with a scrap rate of 1.5%.

Due to the applicability to a wide range of the company's product portfolio, the solution is a significant building block of automation and digitization and represents a major step towards intelligent industry for Wieland. AI-driven computer vision enables Wieland to produce high-quality products for their customers in a highly efficient manner. The collected data in the cloud provides the potential to run additional evaluations to improve production and processes and enable the company to make data-driven decisions.
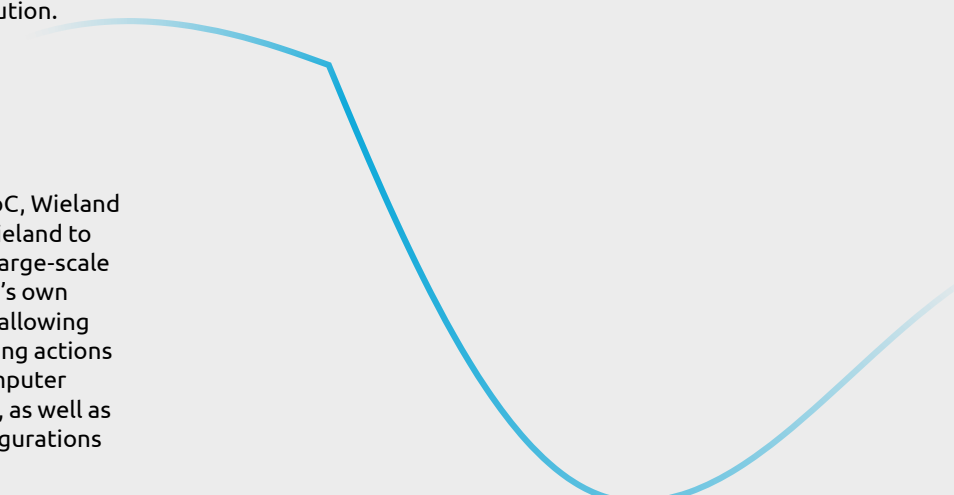
*CLEA Info Box

CLEA stands for "Check Live Easy & Automatized" and is a Capgemini owned solution for automated quality control. It represents a pre-existing platform that allows the automated verification of assets. CLEA is vendor-independent and, once in place, can be seen as a shell for AI models that can be individually fitted to the existing system environment.

The assets that are to be controlled can be anything from finished products to single components and barcodes. CLEA can even scan workers' outfits to check for the complete use of protective equipment. CLEA combines hardware and software to automate controls in an intelligent manner based on use cases and once implemented, triggers expected actions, such as operator notification, process termination, acoustic/visual alerts.

CLEA works on a vendor-independent basis and resembles a blueprint after implementation. The solution acts as a shell for AI models, which can be designed variably in order to adapt them individually to the existing system environment.

"Digitization and automation are among the cornerstones of Wieland's corporate strategy. In addition to the business-oriented alignment of our IT and engineering functions, we focus on specific, value-creating use cases in order to successfully and sustainably implement new technologies to increase productivity. As a long-term partner to our customers, this enables us to further improve quality and reliability, generate competitive advantages, and modernize the existing working environment with attractive and exciting new technologies.

Capgemini has supported us in taking our productivity gains to a new level through automated testing using artificial intelligence and machine learning."

Michael Demmer
Chief Strategy Officer, Wieland Group

"Automated visual surface inspection has the long-term potential to significantly increase productivity and reliability in production. Wieland's manual inspection processes have always met very high standards, although the reflective copper surface has been a challenge. The mature, self-learning solution can now be scaled to other processes and extended to other applications to increase production quality across the board."

Dr. Viola Goldbach
Vice President Operations and EHS,
Business Unit Engineered Products

About Capgemini

Capgemini is a global business and technology transformation partner, helping organizations to accelerate their dual transition to a digital and sustainable world, while creating tangible impact for enterprises and society. It is a responsible and diverse group of 340,000 team members in more than 50 countries. With its strong over 55-year heritage, Capgemini is trusted by its clients to unlock the value of technology to address the entire breadth of their business needs. It delivers end-to-end services and solutions leveraging strengths from strategy and design to engineering, all fueled by its market leading capabilities in AI, cloud and data, combined with its deep industry expertise and partner ecosystem. The Group reported 2023 global revenues of €22.5 billion.

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