NeuroCheck AI-Xtension - In the Paradigm of Industry 4.0

NeuroCheck as a Platform
The Basis for your Deep Learning Application

Deep learning is becoming an increasingly important technology in the manufacturing industry. That's why NeuroCheck has been providing in-house developed backpropagation networks for image content and object feature classification for over 25 years. The necessary neural network structures have been an integral part of the NeuroCheck image processing software since 1994. With increasing computing power, cloud computing and fast Internet connections, new possibilities for the use of Deep Learning in industrial vision open up. Hard-to-solve inspection tasks become feasible.

NeuroCheck AI-Xtension gives the user the opportunity to use his own deep learning know-how productively. Self-developed and trained models can be quickly and easily integrated into production processes.

Neural Network Tools
NeuroCheck Plug-In

DENK Keras PyTorch
TensorFlow ONNX ML.NET

Neural networks can be integrated directly into NeuroCheck in the TensorFlow and ONNX format. Other model formats such as CNTK, Pytorch, Keras, Watson, and others are also possible. As a basis for your deep learning application, process integration (Profibus, Profinet, EthernetIP etc.), hardware support (2D, 3D cameras), and data acquisition (image data, XML, data base) have already been part of the standard functionality of NeuroCheck for a long time.

NEURO CHECK
Industrial Vision Systems

NeuroCheck AI-Xtension: The AI boost for your image processing application

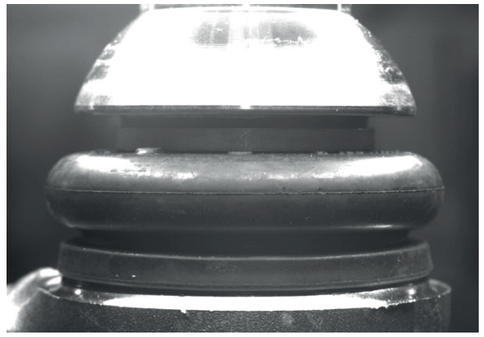
With the NeuroCheck AI-Xtension (CPU/GPU), toolkits are available for creating and training neural networks for the following applications:

- Classification
- Object detection
- Segmentation
- Detection of anomalies

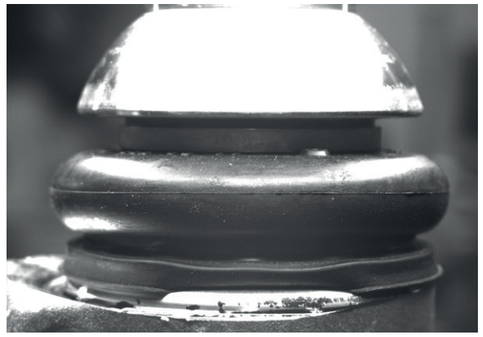
The NeuroCheck plug-in works with neural networks with local inference directly in the test program. Existing systems can be retrofitted without adapting the hardware.* NeuroCheck also offers advice and training to optimally support customers in solving their AI task.
** as of NeuroCheck 6.1. Subject to performance review.*

Example application: Inspecting a rubber sleeve
False alarm rate reduced significantly

As part of an automated production step, a rubber sleeve is affixed to a carrier. This can cause pinches and back folding, which in turn may compromise leak tightness and thus the proper working of the assembly group. The challenging part of this inspection task is the high variety of fault appearances that can occur and that it is impossible to establish a quantitative classification of the faults.



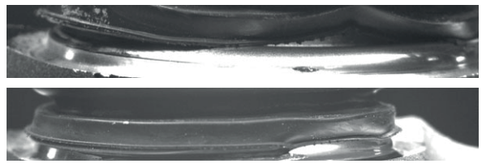
Check the rubber sleeve » Faultless » OK

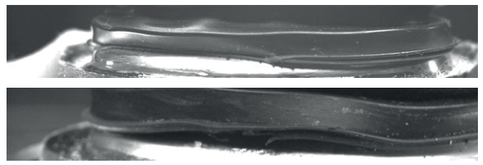


Check the rubber sleeve » Faulty » NOK

In addition, the component images differ in size, position, contrast, and brightness due to the production process. Traditional image procession produces a high rate of false alarms with an additional high risk for errors going undetected. By using deep learning, the false alarm rate was reduced more than tenfold, thus the recognition rate was significantly improved.

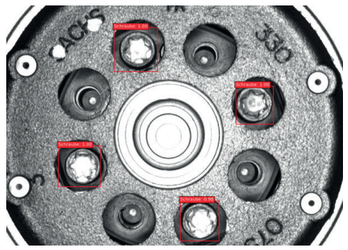
Further examples of the most varied types of faults



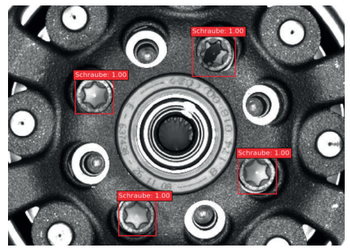


Example application: Identification and localization of screws
Neural network solves inspection task

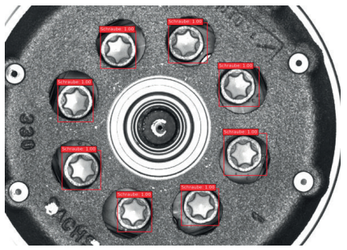
To control an automated screwing process, precise identification and localization of the screws is necessary. The station processes a high number of various assembly groups with varying numbers of screws, surfaces and geometries. In addition, the screws may be slightly covered or absent, which must lead to a termination of the screwing process.



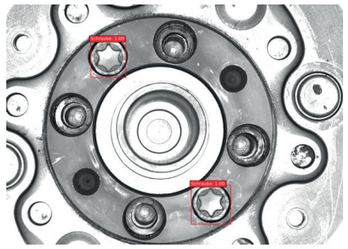
Variations in brightness because of overexposure



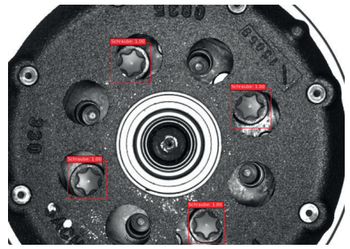
Recognition of screw despite soiling



Screws of varying number and size



Example for another type



Screw not completely visible

With this application as well, a number of complex environmental conditions need to be dealt with. The example images show various levels of brightness, various sizes of assembly parts, positions and levels of focus.

Traditional industrial vision processes require the creation and adjustment of special inspection programs for each assembly type. The high number of variants made this approach very time-consuming and entailed maintenance difficulties.

By using a neural network, the entire task was solved with a single program. In addition, robustness of recognition under changing environmental conditions was greatly improved compared with the traditional process.

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