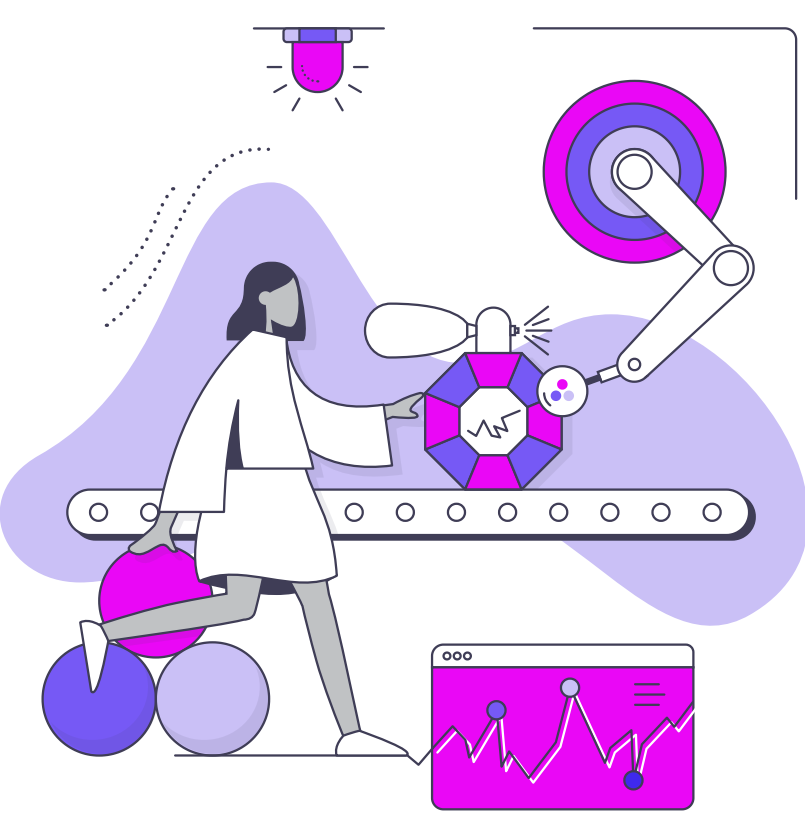


4th part of our infographic series

How Deep Learning drives businesses forward through automation.

How to maintain product quality with automatic defect detection

Quality control is one of the most important use cases for AI in the manufacturing industry. Today we look at the example of perfume bottles. Due to the production process, small cracks can appear in the glass from time to time. Faulty perfume bottles should not leave the assembly line and reach the retailer or customer

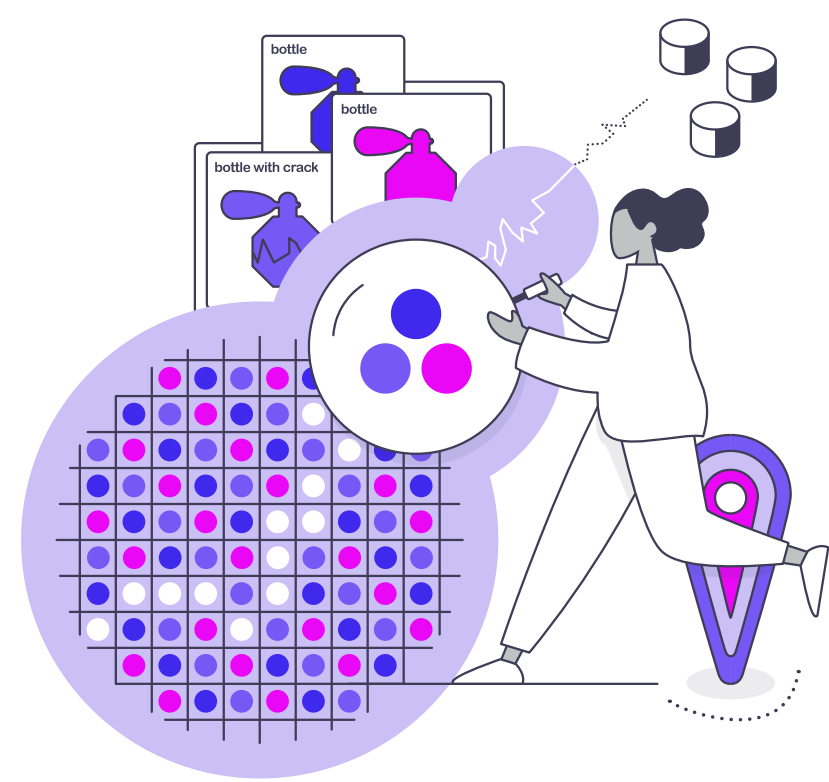
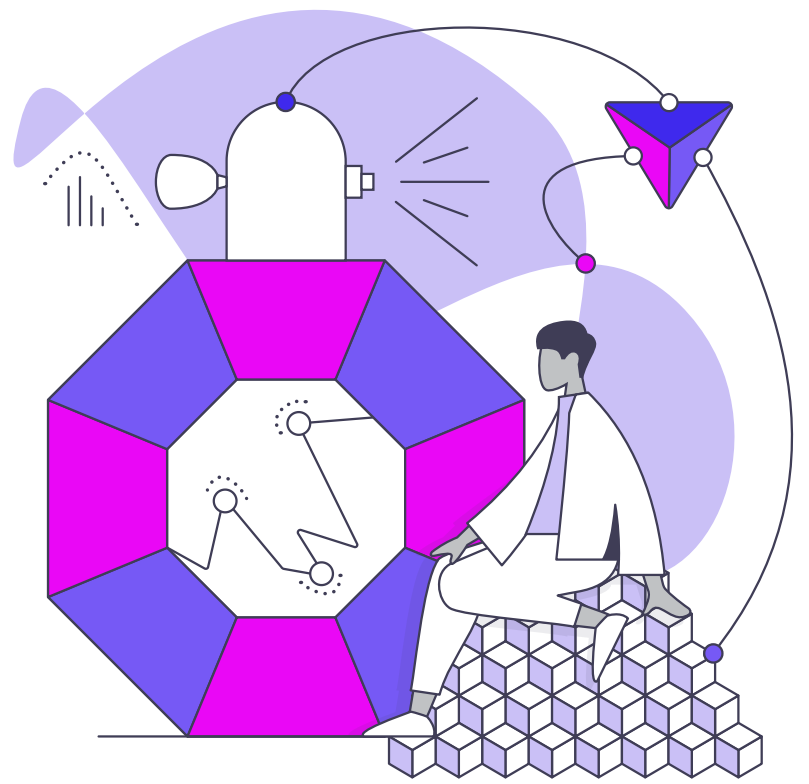


Challenge

Manual inspection of the assembly line is possible, but AI can perform this task faster and more reliably. So the process of **crack detection should be automated**. For this purpose, the bottles must be recorded with a camera to obtain photographic descriptions that can be analyzed by AI. The challenge is to accurately describe the location of cracks. The photos must be viewed and analyzed on pixel-level.

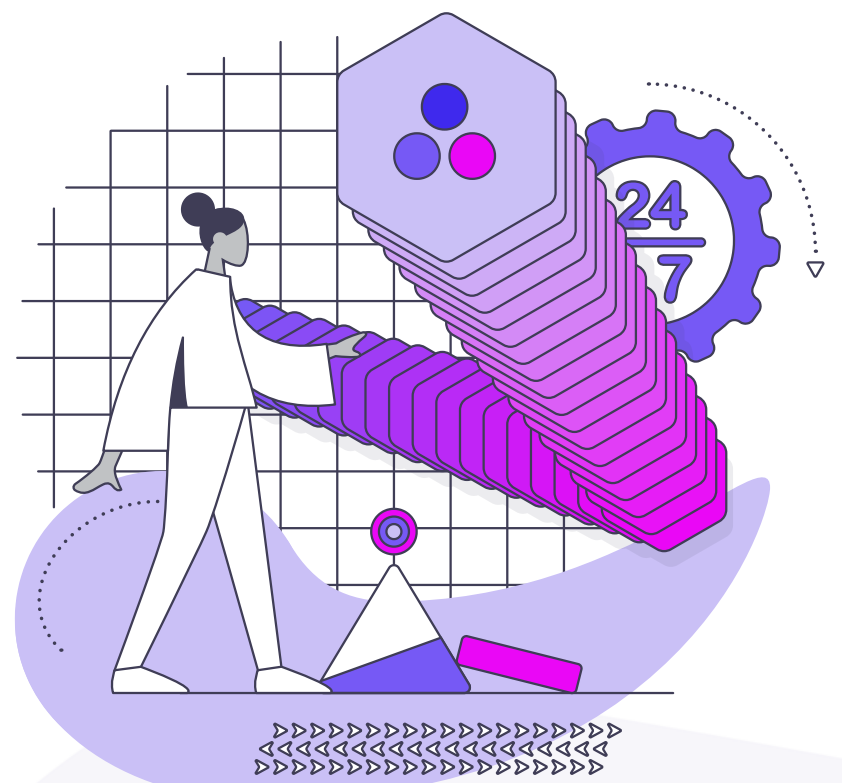
Collection of Training Data

First, we need to create a training dataset, which means **we need several 100 images of glass bottles with cracks. The areas with cracks must be marked** (so-called mask). The dataset should contain a large variety of cracks in order to train the model comprehensively. If there is not enough training data, techniques like data synthesis can help to create additional data.



Training and Results

To precisely describe the location of cracks, a pixel-level image segmentation is necessary. During image segmentation, each pixel of the image is annotated with the information whether a crack is present or not. When enough data is prepared, we train a model with it and afterwards evaluate the performance of the model against unseen data. **With a well curated dataset a trained model can reach an accuracy over 95% (<5% error rate).**



Benefits

Automatic crack detection is able to identify faulty bottles before they reach the packaging stage.

While manual visual inspection has a high error rate, **the automatic AI solution is fast, reliable and can work 24/7 with constant quality.** This helps to avoid cost-intensive returns and meets high quality standards for perfumes. In addition, this solution is scalable. It can inspect any number of produced items.