



# AI-Platform for Automated Training of Object Detection Models Based on CAD Data

## Organizations

**Gabler Engineering GmbH** is a production SME working in the design and manufacturing of production machines, especially confectionery machines and pharma production lines.

**Kimoknow UG** is an expert in object detection with cameras, based on deep learning models.

**SolidLine GmbH** is a sales and engineering company for CAD products from Dassault Systèmes. The company is an expert in 3D CAD software, CAD model databases, and product lifecycle management solutions.

**Karlsruher Institute of Technology** is one of the biggest science institutions in Europe and owns HPC infrastructure.



End User



Technology Expert & End User



Domain Expert & Tech Distributor



HPC Center

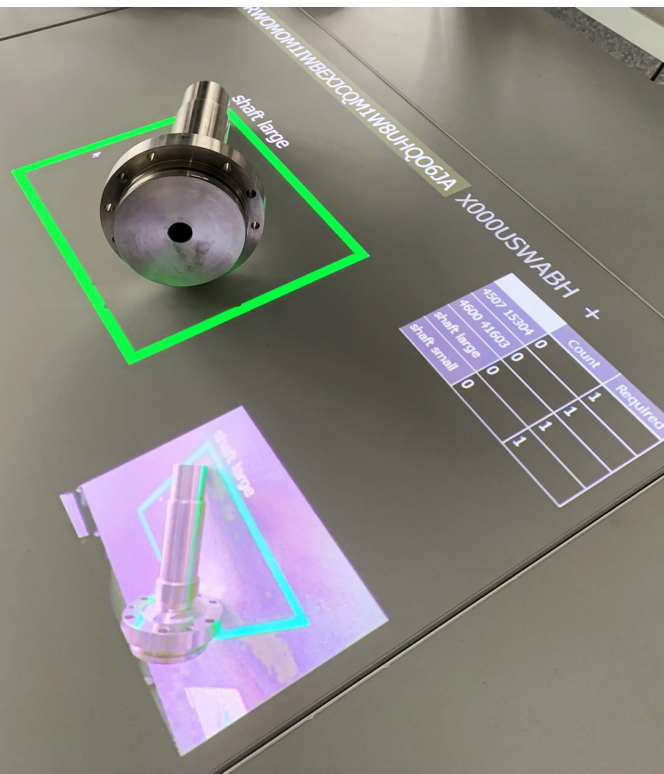


## The Challenge

The manual assembly of devices consisting of many individual parts is a time-consuming, tedious and error-prone industrial process, which could in principle be supported by automated recognition technologies. Gabler is a manufacturer of production machines for packaging goods, each consisting of thousands of individual parts, either retrieved from an internal warehouse or obtained from external suppliers.

The part identification process could be assisted through automated object detection within an Augmented Reality (AR) application which outputs a list of potential candidates that limits the number of objects to check.

However, while vision-based part recognition that is based on DL provides an easy and fast solution to the industrial challenge, the traditional way of building such tools is not cost-effective: huge amounts of images with corresponding labels are needed to train object recognition models. This is time-consuming and costly, thus severely limiting many industrial applications in terms of the number of different objects. Currently, only a few specific industrial applications such as autonomous robots or mass production quality control can benefit. Applications such as warehouse part detection, where one is dealing with thousands of individual parts, are still not economically feasible. Kimoknow seeks to speed up and simplify the generation of these AR applications in order to offer them to a much broader market, including companies like Gabler.





Industry Sector  
**Manufacturing**

Technology used:  
**HPC, AI, ML**

## The Solution

To make object detection for large datasets of industrial parts possible, Kimoknow maximized the automation of AI training. The approach for automatic AI training entails generating synthetic images from 3D CAD data in the first stage and then using these datasets to train an object recognition model. Both stages, particularly the data generation stage, have been parallelized and accelerated using multiple GPUs. To make the procedure scalable and available to a large number of industrial end-user companies the solution is service-based and can be scaled modularly to available computing resources. The reduced time to generate an AI model allows very quick delivery to a customer and fast, cost-effective fine-tuning of the results. The use of on-demand HPC resources makes it possible to fine-tune the recognition model in a more cost-effective manner and to achieve even better practical results.

## The Impact

End-users of the Kimoknow AI detection system can enable their staff to be more efficient and to work in increasingly complex environments. Therefore, jobs can be preserved as staff becomes more effective, and workers can be hired to do difficult tasks without extensive training.

The infrastructure built during the experiment provides Kimoknow with a business model that is highly scalable and can be backed by a cost-effective and energy-efficient HPC backend for the batched creation of fine-tuned object detection models in reduced time.

This serves the long-term business goal of Kimoknow to provide object detection services, where users can easily train object detection models based on their CAD data. Production and logistics companies such as Gabler Engineering benefit from Kimoknow services as they can generate object detection models for their own data with very low manual effort and implement object detection applications much more cost-effectively, thus creating AR tools to substantially improve their processes, as described above. Companies that are new to AI-object detection can see results for their own use cases a lot faster and therefore the entry barriers to new applications are significantly lowered.

## Benefits

- Reduction of manual effort from more than 800 hours to less than 10 minutes for generation of an AI model of more than 1.000 parts through fully automated, HPC-based training.
- Kimoknow can offer AI applications previously economically unfeasible (Gabler case).
- Kimoknow is now able to provide its services to thousands of customers at once and to expand its business using the experiment results with steadily growing subscriptions and annual recurring subscription revenues.
- By using the generated affordable AI models, end users like Gabler can save several work hours each day through reduced search times, resulting in higher productivity and quality.