

# Zebra's Deep Learning Capabilities

## MACHINE VISION SOFTWARE TOOLS

Artificial intelligence, specifically machine learning by way of deep learning, is making machine vision technology for automated visual inspection more accessible and capable. Deep learning technology mimics how the human brain processes visual input but performs this task with the speed and robustness of a computerized system. The technology works to ensure quality in manufacturing industries, controlling production costs and enhancing customer satisfaction.



## Deep Learning And Its Role In Machine Vision

Deep learning technology excels at certain applications, such as identification, defect and object detection specifically in instances where there are complex and varying imaging conditions. The technology still benefits from conventional image processing and analysis to locate regions of interest within images to speed up the overall process and make it even more robust.

## Real-World Examples

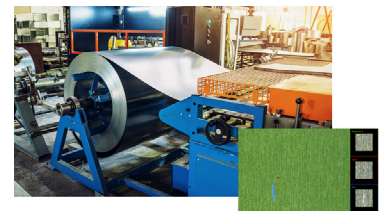
### IDENTIFICATION

Image classification using deep learning categorizes images or image regions to distinguish between similarly looking objects including those with subtle imperfections. Image classification can, for example, determine if the lips of glass bottles are safe or not.



### DEFECT DETECTION

Image segmentation using deep learning categorizes image neighborhoods to pinpoint features like defects, such as dents and scratches on sheet metal. The located features can then be further analyzed and measured using traditional machine vision tools.



### OBJECT DETECTION

Object detection with deep learning serves to locate and count objects or features in complex and varying scenery. Deep learning-based object detection can, for instance, be trained to perform assembly verification within a manufacturing environment, detecting and verifying the presence and correct placement of components or parts at various stages of assembly to ensure correct installation.

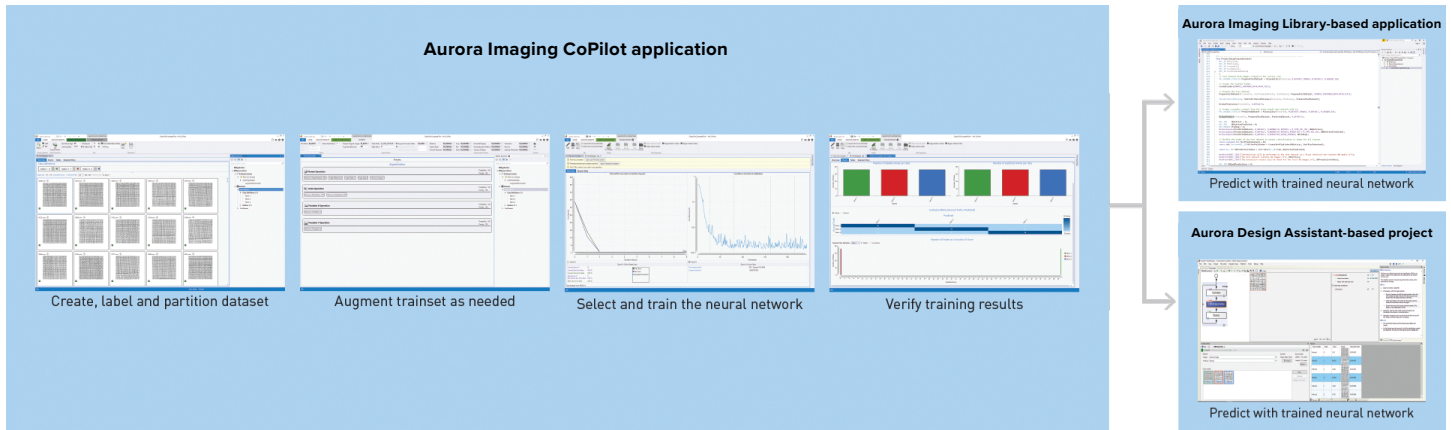


**Deep Learning Software and Hardware**

Zebra Aurora Imaging Library™ and Zebra Aurora Design Assistant™ include vision tools to classify or segment images, or detect and count objects or features, for inspection using deep learning. Both software packages deliver optimized deep neural networks or models for the task.

Key to deep learning is the training of a neural network model. Aurora Imaging CoPilot interactive environment provides the platform for training these models for use in machine vision applications. It delivers all the functionality needed for this task, so you can create and label the training image dataset; augment the image dataset, if necessary; and train, analyze, and test the neural network model.

Zebra also offers hardware products that facilitate deep learning training and deployment. The Zebra 4Sight EV7 vision controller and Zebra Iris GTX smart cameras are available to run both traditional machine vision workloads as well as deep learning inference.



Related Products	Additional Resources
<a href="#">Aurora Imaging Library vision software</a>	<a href="#">Deep Learning: The Answer for Challenging Character Recognition Projects Whitepaper</a>
<a href="#">Aurora Design Assistant vision software</a>	<a href="#">Deep Learning Cuts Through Cost, Time, Human Error Case Study</a>
<a href="#">Zebra Iris GTX smart cameras</a>	<a href="#">Deep Learning OCR Video</a>
<a href="#">Zebra 4Sight EV7 vision controllers</a>	

Zebra’s team of vision experts know where and when to leverage machine and deep learning technologies to your best advantage. Our specialists can help assess your application and identify the best tools for your situation.

To find out more, visit [zebra.com/machine-vision](https://zebra.com/machine-vision)



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