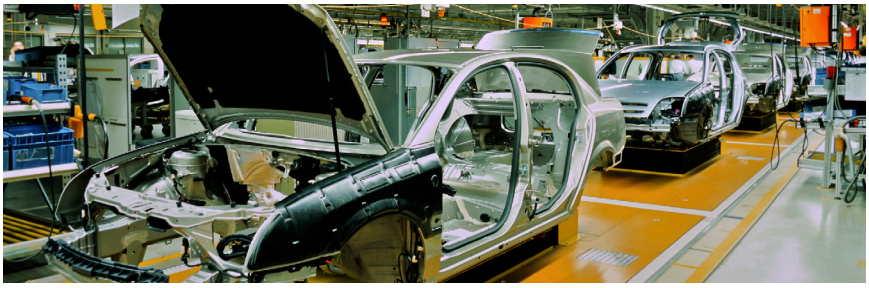
LANDING AI™

# Deep Learning for Automotive Inspection: The Landing AI and LandingLens Difference

Machine vision has long played a significant role for major automotive manufacturers. By implementing machine vision technologies into production processes, automotive manufacturers can maintain quality standards and keep up with customer demands. Nearly every part of an automobile — whether it's a printed circuit board, brake, wheel, or door — can benefit from visual inspection and machine vision technologies. Certain inspection tasks fall beyond the realm of traditional, rules-based machine vision systems, and deep learning can help fill these gaps in manufacturing inspection.



## Rules-Based Challenges

Several issues can complicate inspection routines for rules-based systems. These include part variability. For instance, automotive manufacturing requires significant assembly verification, and each vehicle can have a different trim or type of materials. Body paint inspection presents issues as well, since the same paint can look different under different circumstances and may reflect differently. Finding every dent on a car body when looking at one color or similar colors of paint is a tall task.

Furthermore, inspecting automobiles in the body-in-white stage — when the metal frame has been assembled — is difficult because of the number of welds involved. Traditional machine vision may not catch amorphous shapes — such as welds, soldering points, and glue — that go beyond a certain tolerance and are considered defects.

Increasing quality standards is another challenge for traditional automotive machine vision inspection. Identifying complex machined and cast part defects can be quite challenging for traditional machine vision, as can defining what these defects are in a rules-based system.

*"We are pleased with LandingLens, which provides a collaborative approach to AI. Landing AI did not just provide a "black box" application, but took the time to explain the concepts and theory behind the solution. Many AI companies are providing black box solutions, but this does not help DENSO in its mission to understand the technology deeply so that we can apply and expand it across our manufacturing footprint by ourselves. Working with partners like Landing AI help us kaizen the technology and improve results."*

Raja Shembekar
Vice President, N.A. Production Innovation Center
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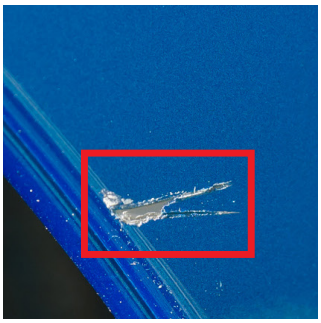
## Deep Learning Solutions

Where manual or traditional machine vision inspection falls short, deep learning software can reliably handle product variability and surface finish quality inspection tasks. Deep learning can also provide accurate inspection capabilities for difficult shapes, mixed parts, and mixed models, and it can adapt and learn as products, processes, and environmental conditions change. Furthermore, effective deep learning platforms allow end users to define defects up front so that the software can recognize defective parts.



Deep learning software cannot replace traditional machine vision, however, but it offers a perfect complement. Deep learning allows systems to not only locate parts and inspect for defects but also to classify and categorize defects. Many manufacturers store images and data from past projects, and these can help train deep learning algorithms. Over time, neural networks can be iteratively improved upon and adjusted to continuously improve the inspection process.

## The LandingLens Difference

Several deep learning software packages can help solve problems in automotive manufacturing inspection, but Landing AI's LandingLens end-to-end platform simplifies the process and offers an efficient, easy method for continually improving your models for long-term success. This all begins with our data-centric approach to AI, which involves feeding the model with clean, high-quality data (images).

LandingLens' digital defect book makes it easy to efficiently define defects, while the defect consensus tool delivers the ability to improve the defect book over time. The software's smart tagging tool allows cross-functional collaboration for accurate labeling, no matter the location. Other tools simplify model development and management, while training tools allow users to test and evaluate models and to execute many training environments simultaneously, using a variety of model architectures to fit any machine vision application. Additionally, the software offers an error analysis report for evaluating existing models, removing the need to start each model anew.

*"With significant technological advances in AI-powered vision over the last few years, powerful visual inspection capabilities are now available to the automotive industry. These can help make a meaningful impact on the total cost of nonconformance (CONC) and enhance the speed of quality inspections."*

Kai Yang
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