AI computer Vision for
Quality Inspection

Automate defect detection with real-time
visual intelligence

COMPUTER VISION

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The solution

Modern manufacturing demands speed, precision, and consistency, especially when it comes to quality control.

AI Computer Vision enables automated, real-time defect detection and classification in manufacturing.

This no-code solution empowers non-experts to train and deploy models easily, providing centralized quality control across production.

Key benefits

>90%
Defect Detection Accurancy

>90%
Reduction in QA Labor Costs

99%
Real-Time Visibility and Alerts

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Pain points

Waste and Avoid Recalls at All Costs

Late-stage defect detection leads to costly recalls and material waste.

High Labor Costs and Operator Dependency

Skilled inspectors are costly and hard to scale.

Human Error and Inconsistent Inspection

Manual inspections vary with fatigue and subjectivity.

Production Bottlenecks from QA Delays

Slow manual QA creates delays and disrupts flow.

Limited Visibility and Traceability

Lack of inspection data hinders root cause analysis.

Use case

Case

Automating Quality Control for Metal Parts

The company sought to eliminate manual inspection and implement a fully automated vision-based defect detection system on its metal parts lines.

The ultimate goal was to fully remove human intervention in quality inspection while preparing the system for future enhancements, such as automatic side flipping and the arrangement of conforming parts.

Challenge

Manual Inspection Limits Scalability and Accuracy

The manual inspection process required four operators per shift
to flip and inspect each part for surface defects.

This approach presented several challenges:

- ✓ High line speed (1 part per second) with the need for
real-time inspection and classification

- ✓ Random positioning of parts on the conveyor

- ✓ Elimination of human involvement while
preserving accuracy

- ✓ Inconsistent detection due
to operator fatigue

- ✓ Lighting, vibrations and variability in part placement complicating camera-based inspection

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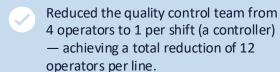
Solution

Vision AI-Based Inspection with Automated Defect Ejection

Tupl implemented an AI-powered vision system on Conveyor 2 —
the most stable section along the line for image capture.

Two inspection stations were deployed, each equipped with top and side-view cameras to capture both faces of the part. Laser sensors were installed to manage part timing and activate a high-speed pneumatic piston for automatic rejection of defective pieces.

A user-friendly interface allowed real-time monitoring of inspection results, and the team was enabled to independently retrain models as new parts or defect types were introduced.

Outcome

✓ Reduced the quality control team from 4 operators to 1 per shift (a controller) — achieving a total reduction of 12 operators per line.

✓ Achieved reliable, real-time detection of surface defects on both sides of each part without human intervention.

✓ Prepared the system for future automation of part flipping and conforming part arrangement.

✓ Delivered a scalable, intuitive, and fully retrainable system, empowering Doga's team for long-term autonomy.

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Installed components

To implement the AI-powered vision inspection system at the production line, the following hardware and components were installed:

Industrial Cameras (x6): high-resolution cameras mounted at two inspection stations (top and side views) for full-surface image acquisition.

Laser Sensors (x2): installed to detect part presence and synchronize the timing of image capture and piston activation.

Pneumatic Ejection Piston (x1): high-speed actuator for automatic removal of defective parts identified by the AI model.

Industrial Jetson Edge Device (x1): handles real-time image inference and communicates with the server for model updates.

Central Server (Trainer): manages model training and orchestration, enabling future retraining and system scalability.

User Interface Display: touchscreen display installed for operators to view system status, inspection results, and initiate retraining when needed.

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