



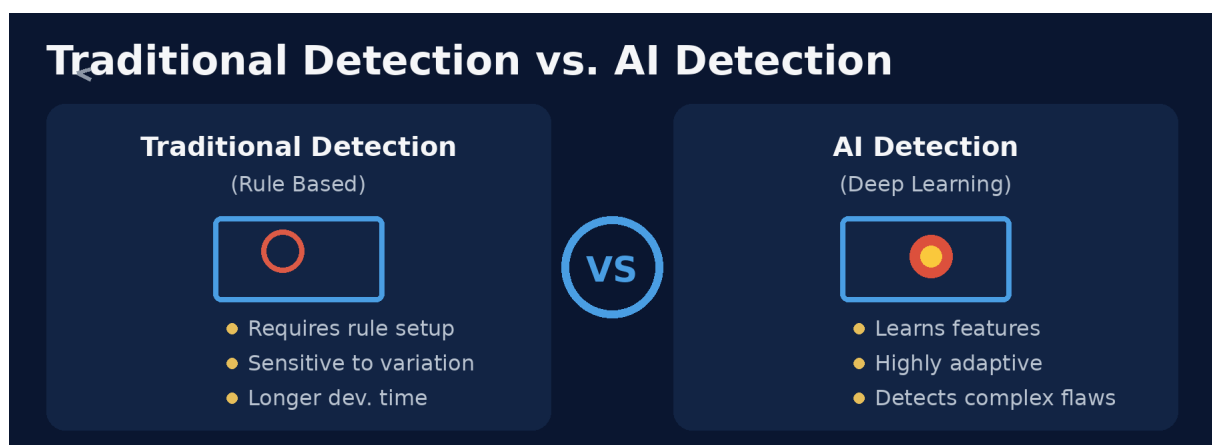
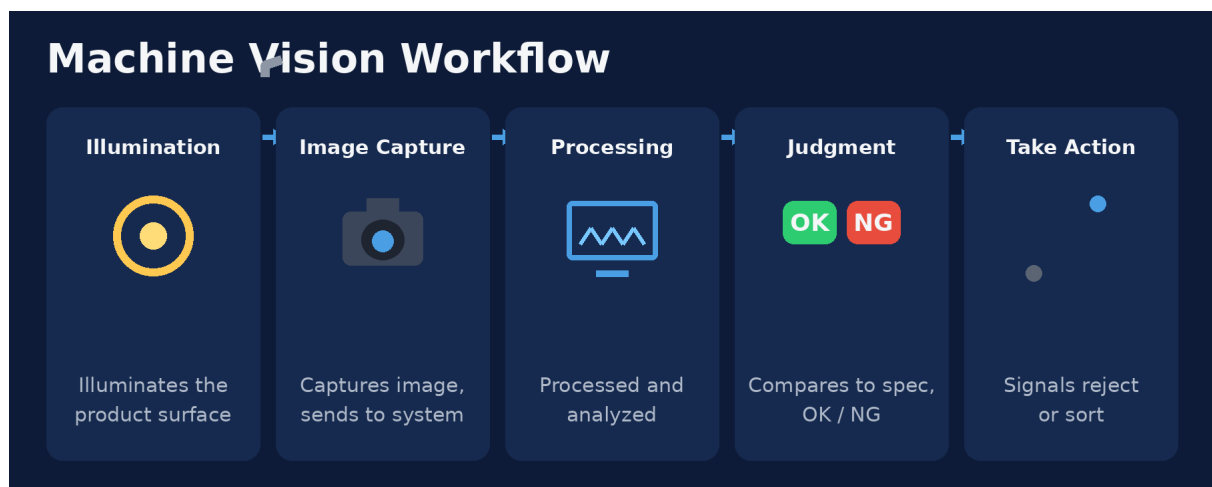
What Is Machine Vision?

A Quick Guide to Machine Vision

What Is Machine Vision?

Machine Vision uses industrial cameras, lenses, light sources, and image processing software to give equipment the ability to “see” and “judge” products. Based on pre-configured criteria, the system can automatically determine whether a product meets specification, completing inspection, measurement, and classification on high-speed production lines.

Compared with manual visual inspection, machine vision offers faster speed, consistent judgment, and stable long-term operation. It is now widely used across the semiconductor, electronics, food, medical, automotive parts, logistics, and packaging industries.





How Does Machine Vision Work?

A complete machine vision system typically consists of the following five steps:

1 Lighting

Use suitable lighting to illuminate the object under inspection, clearly revealing product features such as scratches, cracks, printed text, or dimensional outlines.

2 Image Acquisition

An industrial camera paired with a lens captures the product image and transmits it to a computer or vision controller.

3 Image Processing

Algorithms perform filtering, edge detection, grayscale analysis, contour extraction, feature recognition, and other processing to improve inspection accuracy.

4 Inspection

Based on pre-set standards or an AI model, the system compares whether the product meets specification — for example, whether dimensions are correct, whether there are scratches, or whether printed text is complete.

5 Control

When the system determines a product is defective (NG), it can immediately send a signal to a PLC or robotic arm to automatically reject, sort, or stop the equipment — enabling fully automated production.



What Equipment Does a Machine Vision System Need?

A complete system typically includes:

- Industrial Camera
- Industrial Lens
- LED Lighting
- Light Controller
- Frame Grabber (depending on interface requirements)
- Vision Controller or Industrial PC (IPC)
- Vision Software or AI Algorithms
- PLC or Automation Equipment

Equipment combinations vary depending on the specific application requirements.



What Are the Applications of Machine Vision?

1. Surface Defect Inspection

Checks products for surface defects such as scratches, cracks, dents, stains, or chipping.

2. Dimensional Measurement

Measures length, diameter, height, hole diameter, spacing, and other dimensions, improving measurement efficiency and consistency.

3. OCR / OCV Character Recognition

Reads lot numbers, serial numbers, production dates, barcodes, or QR codes on products, and verifies that the content is correct.

4. Positioning & Guidance

Provides precise coordinate positions for robotic arms or automated equipment, used for pick-and-place, assembly, or positioning.

5. Color Recognition

Determines whether a product's color meets specification — for example, bottle caps, labels, parts, or packaging.

6. Foreign Object Detection

Checks whether foreign objects have been mixed into food, pharmaceuticals, or packaging, improving product safety.



Why Do Companies Adopt Machine Vision?

Adopting machine vision brings a range of benefits:

- Improved product quality and consistency
- Lower manual inspection costs
- Continuous 24-hour inspection
- Reduced missed defects and false judgments
- Higher production efficiency and yield
- Complete inspection image records and quality traceability
- Supports smart manufacturing and Industry 4.0



Which Industries Are Suited to Machine Vision?

Machine vision is already widely used in:

- Semiconductor & wafer manufacturing
- PCB & electronic components
- Food & beverage packaging
- Medical devices
- Automotive parts
- Metal processing
- Plastic injection molding
- Lithium batteries & new energy
- Logistics & warehousing
- Optoelectronics



How to Choose the Right Machine Vision System?

Requirements for lighting, cameras, lenses, and algorithms vary by inspection task. Before planning, it's recommended to confirm:

- What features need to be inspected?
 - What is the product's size and material?
 - How fast is the production line?
 - What level of precision is required?
 - Is installation space on-site limited?
 - Does it need to integrate with a PLC, robotic arm, or MES system?
- A thorough requirements analysis and testing process is the key to building a machine vision solution that balances stability, efficiency, and cost-effectiveness.

Conclusion

Machine vision is more than just “taking a picture” — it's the integration of optics, image processing, and automation control that gives equipment fast, stable, and consistent inspection capability. As AI technology continues to advance, machine vision is increasingly becoming a core pillar of smart manufacturing, helping companies improve quality, reduce costs, and build more competitive production processes.

If you'd like to find the right machine vision solution for your production line, feel free to contact InRay. We can provide professional evaluation and integration recommendations based on your product characteristics and production requirements.