APAI 2024

Real Scenario In Machine Vision

mix between AI and CV solutions

AIVIZ SRL

JEKSON VISION

Agenda

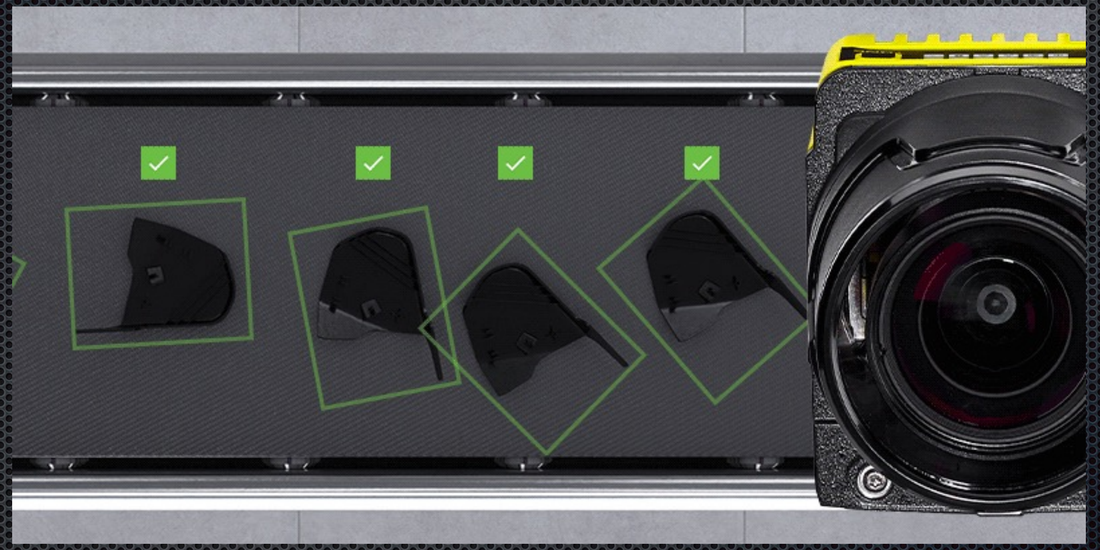
- Introduction Real scenarios in Machine Vision
- Challenges When AI becomes a real opportunity
- Online Dataset MVTEC dataset
- AIVIZ Challenges Daily Job with AI in Machine Vision

AIVIZ SRL

JEKSON VISION

Real Application

What is Machine Vision?



AIVIZ SRL

JEKSON VISION

Machine Vision

It lets automated systems see:

- components,
- products,
- patterns,
- codes, or other objects

Make decisions at high speeds and high accuracy, improving product quality and reducing waste.

Generate data that is critical to factories looking for efficiency gains

AIVIZ SRL

JEKSON VISION

Machine Vision

Why?

AIVIZ SRL

JEKSON VISION

Machine Vision

	Human Vision	Machine Vision
Speed	The human visual system can process 10 to 12 images per second.	High speed – hundreds to thousands of parts per minute (PPM)
Resolution	High image resolution	High resolution & magnification.
Interpretation	Complex information. Best for qualitative interpretation of unstructured scene	Follows program precisely. Best for quantitative and numerical analysis of a structured scene
Light spectrum	Visible light – Human eyes are sensitive to wavelengths ranging from 390 to 770 nm requires additional lighting to highlight parts being inspected.	Some machine-vision systems function at infrared (IR), ultraviolet (UV), or X-ray wavelengths.
Consistency, reliability & safety	Impaired by boredom, distraction & fatigue	Continuous repeatable performance – 24/7, 100% accuracy

AIVIZ SRL

JEKSON VISION

Machine Vision

Which type of organization touches?

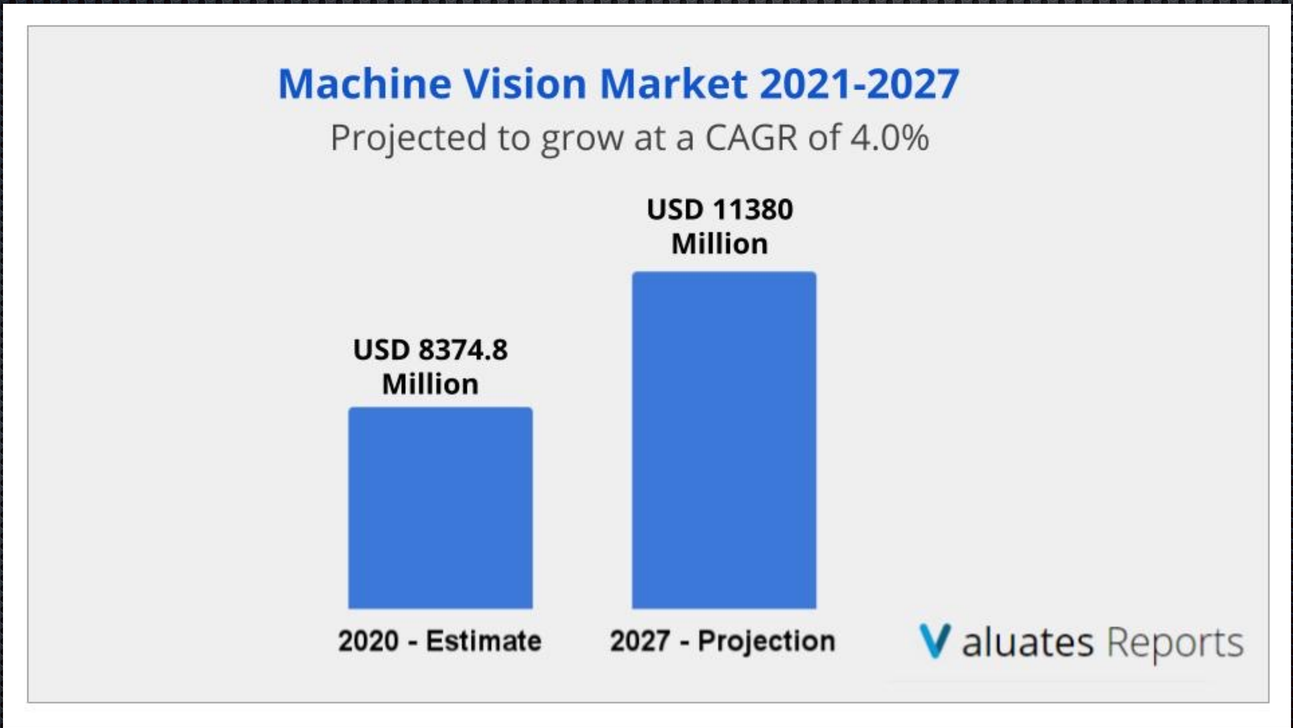
- Manufacturing facilities and factories
- Logistics providers and warehouses

AIVIZ SRL

JEKSON VISION

Machine Vision

Market Size:



AIVIZ SRL

JEKSON VISION

Machine Vision

Which type of organization touches?

- Logistics providers and warehouses

AIVIZ SRL

JEKSON VISION

Machine Vision

Benefits:

IMPROVE PRODUCT QUALITY

AIVIZ SRL

JEKSON VISION

Machine Vision

Benefits:

TRACKING

AIVIZ SRL

JEKSON VISION

Machine Vision

Benefits:

REDUCE WAISTE

AIVIZ SRL

JEKSON VISION

Machine Vision

Benefits:

INCREASE PRODUCTIVITY AND EFFECTIVENESS

AIVIZ SRL

JEKSON VISION

Machine Vision

Benefits:

ENSURE COMPLIANCE

AIVIZ SRL

JEKSON VISION

Machine Vision

Why AI in Machine Vision?

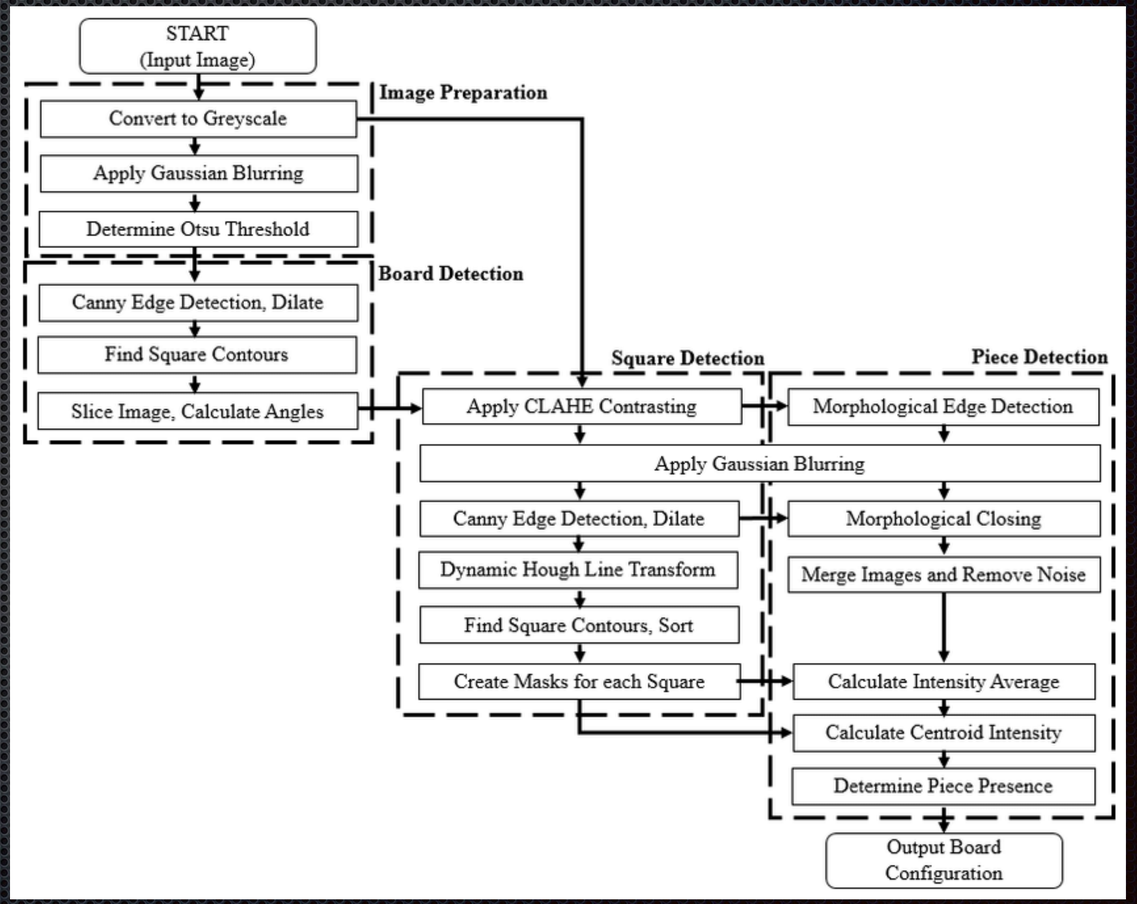
- Standard computer Vision solution needs Specific Knowledge to be setup
- Standard computer Vision cannot reach high performance in complex scenarios

AIVIZ SRL

JEKSON VISION

Machine Vision

Why AI in Machine Vision?

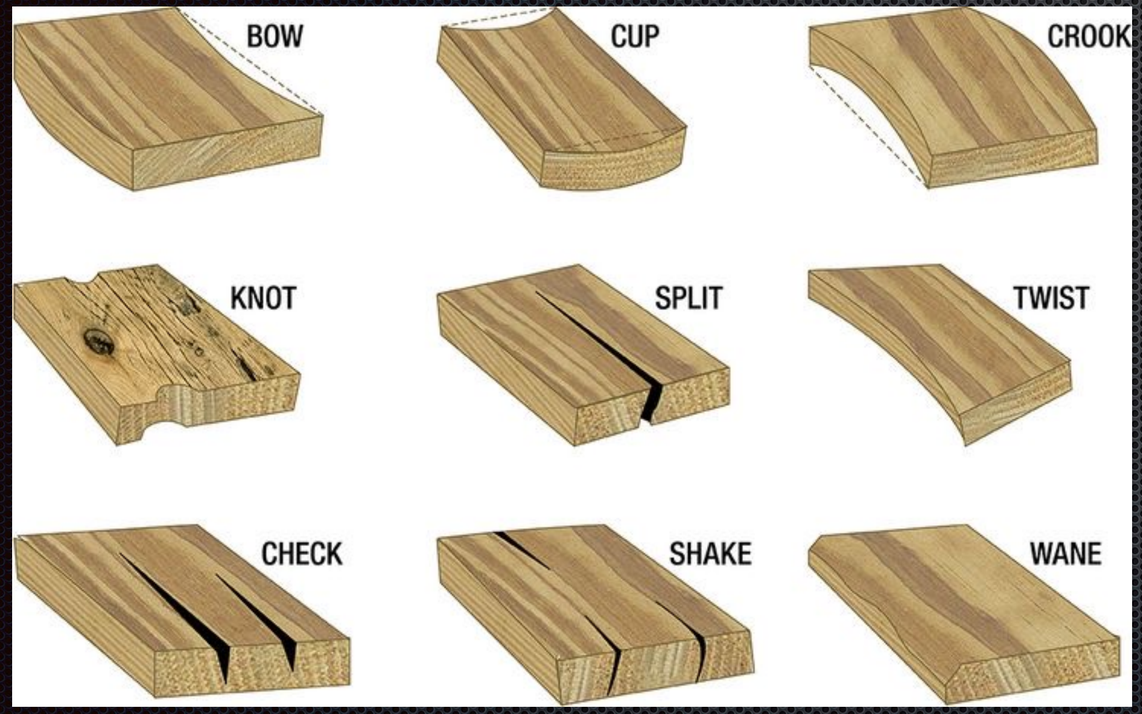


AIVIZ SRL

JEKSON VISION

Machine Vision

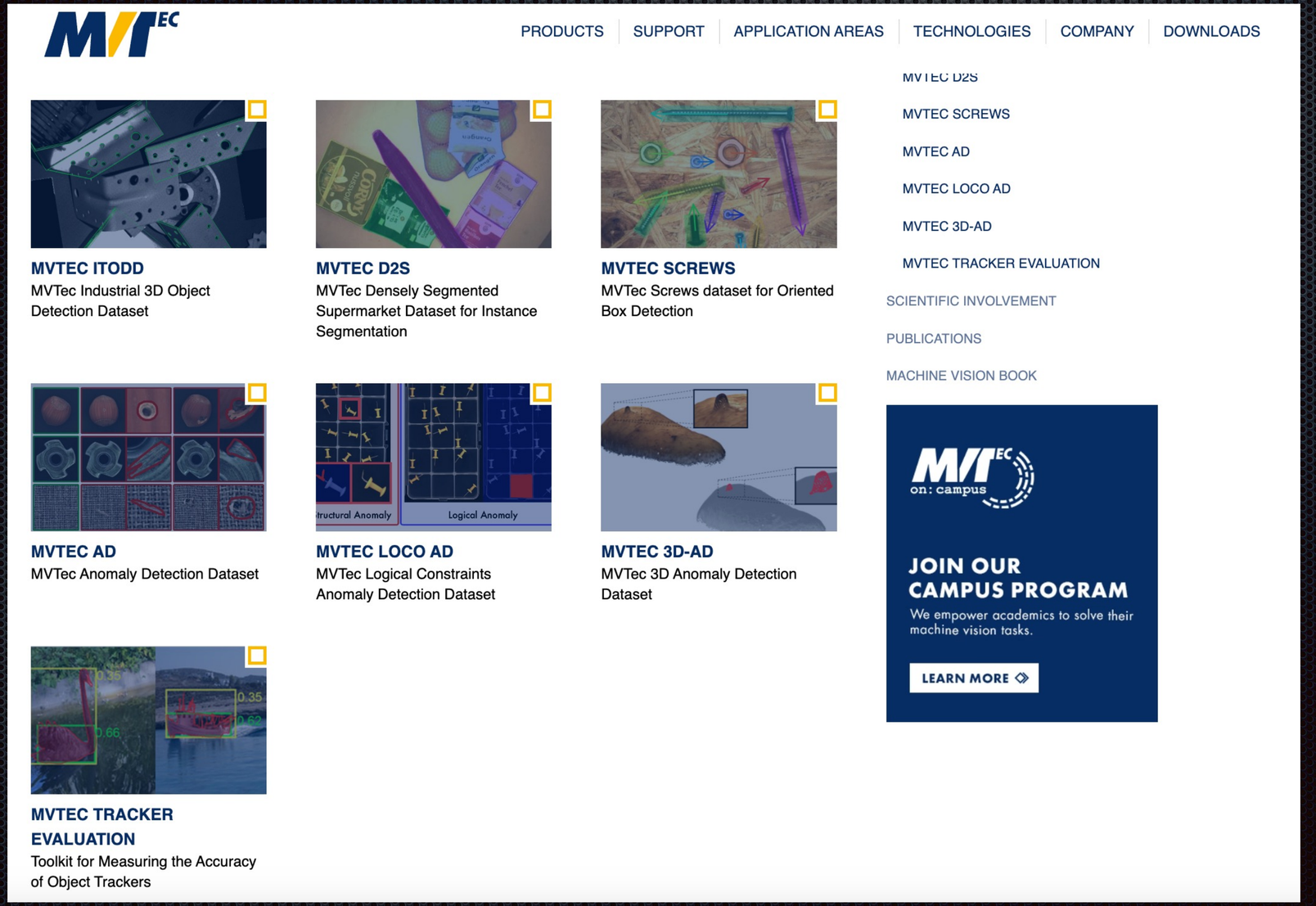
Why AI in Machine Vision?



AIVIZ SRL

JEKSON VISION

MVTEC dataset



AIVIZ SRL

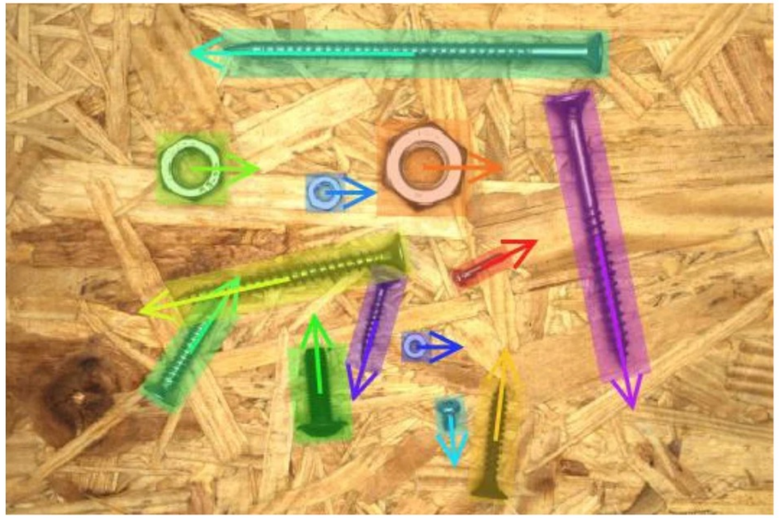
JEKSON VISION

MVTEC dataset

MVTec screws dataset

Abstract

The MVTec Screws dataset has been designed for oriented box detection. It contains 384 images of 13 different types of screws and nuts on a wooden background. All objects are labeled by oriented bounding boxes and their respective category. Overall, there are 4,426 of such annotations.



AIVIZ SRL

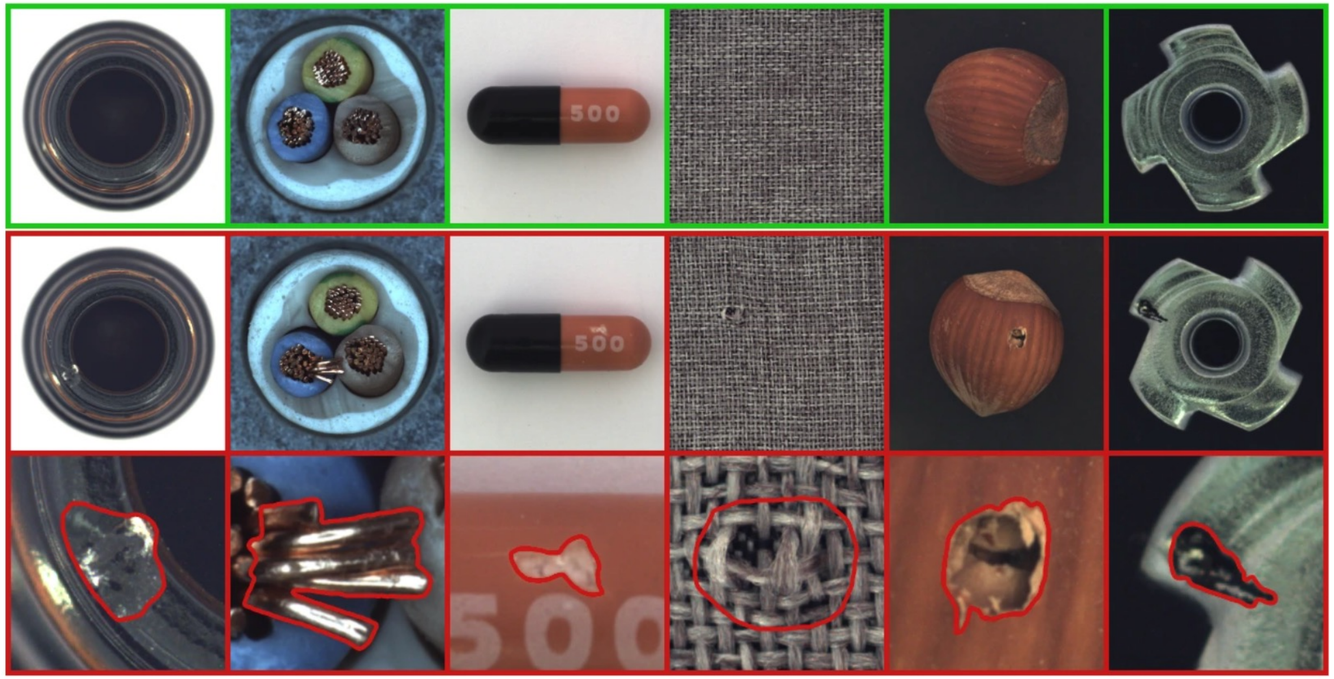
JEKSON VISION

MVTEC dataset

The MVTec anomaly detection dataset (MVTec AD)

MVTec AD is a dataset for benchmarking anomaly detection methods with a focus on industrial inspection. It contains over 5000 high-resolution images divided into fifteen different object and texture categories. Each category comprises a set of defect-free training images and a test set of images with various kinds of defects as well as images without defects.

Pixel-precise annotations of all anomalies are also provided. More information can be in our paper "MVTec AD – A Comprehensive Real-World Dataset for Unsupervised Anomaly Detection" and its extended version "The MVTec Anomaly Detection Dataset: A Comprehensive Real-World Dataset for Unsupervised Anomaly Detection".



AIVIZ SRL

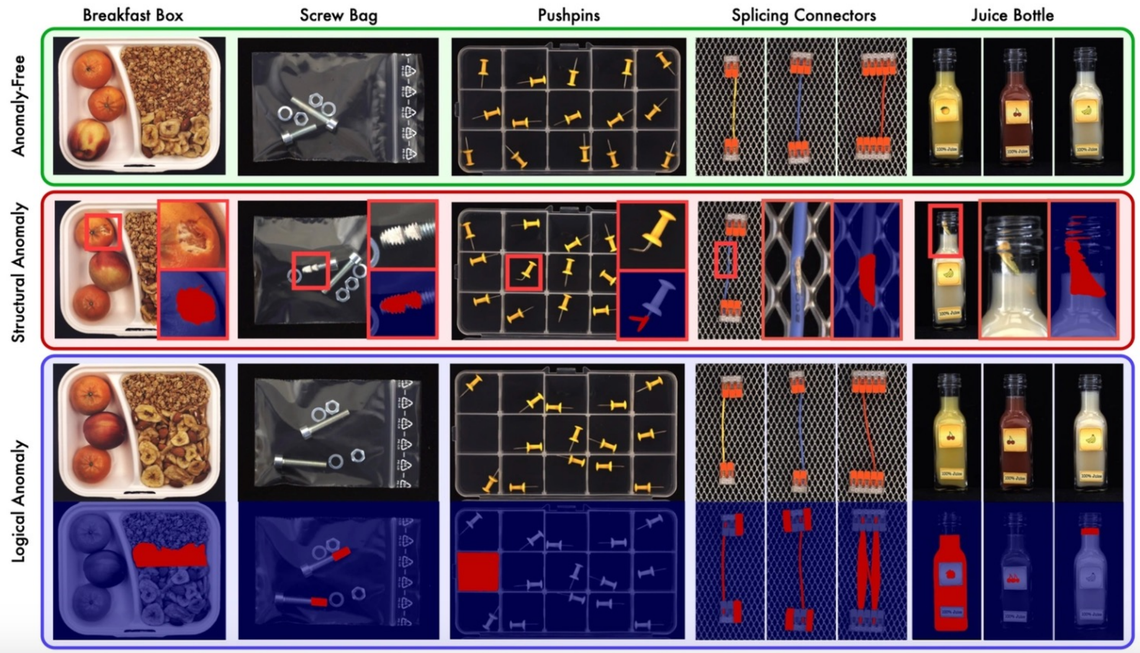
JEKSON VISION

MVTEC dataset

The MVTec logical constraints anomaly detection dataset (MVTec LOCO AD)

The **MVTec logical constraints anomaly detection (MVTec LOCO AD)** dataset is intended for the evaluation of unsupervised anomaly localization algorithms. The dataset includes both structural and logical anomalies. It contains 3644 images from five different categories inspired by real-world industrial inspection scenarios. Structural anomalies appear as scratches, dents, or contaminations in the manufactured products. Logical anomalies violate underlying constraints, e.g., a permissible object being present in an invalid location or a required object not being present at all. The dataset also includes pixel-precise ground truth data for each anomalous region.

More information can be found in our corresponding paper titled "Beyond Dents and Scratches: Logical Constraints in Unsupervised Anomaly Detection and Localization".



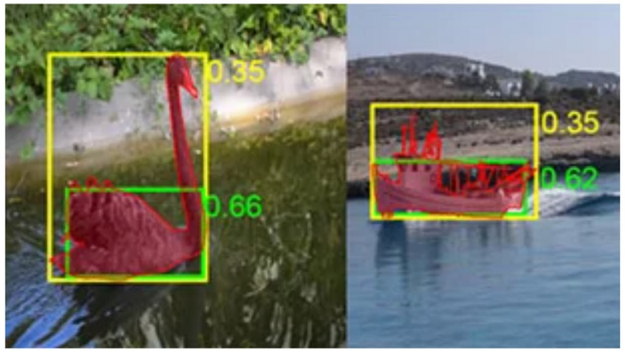
AIVIZ SRL

JEKSON VISION

MVTEC dataset

MVTec tracker evaluation

Toolkit for measuring the accuracy of object trackers



The accuracy of object detectors and trackers is most commonly evaluated by the Intersection over Union (IoU) of the tracker prediction and the ground truth. In all of the common tracking benchmarks, the ground truth is restricted to axis-aligned or oriented boxes. To help evaluate the accuracy of trackers more precisely, we present a toolkit which works with ground truth segmentations. To gain a perspective on how well all approaches restricted to boxes can perform, we present upper bounds for all box-based trackers of the Visual Object Tracking (VOT) and Densely Annotated Video Segmentation (DAVIS) challenges. The toolkit is easy-to-use, and arbitrary trackers from Python, Matlab, or HALCON can be added.

AIVIZ SRL

JEKSON VISION

AIVIZ

- 7 developers + 1 technician
- 100% of employees are Technical
- Bureaucratic aspects managed externally
- Technical Partner of JEKSON VISION

AIVIZ SRL

JEKSON VISION

Application 1

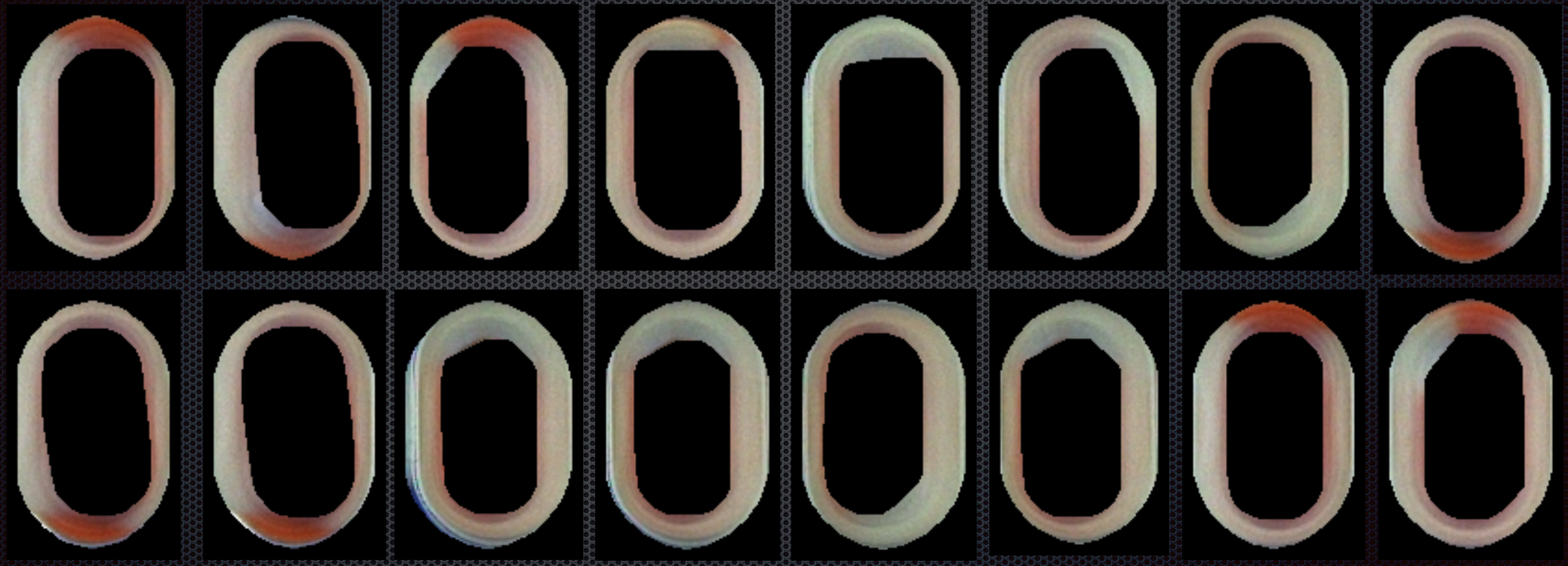
Blister Inspection

AIVIZ SRL

JEKSON VISION

Application 1

Blister Inspection – Good Samples



AIVIZ SRL

JEKSON VISION

Application 1

Blister Inspection – Bad Samples

AIVIZ SRL

JEKSON VISION

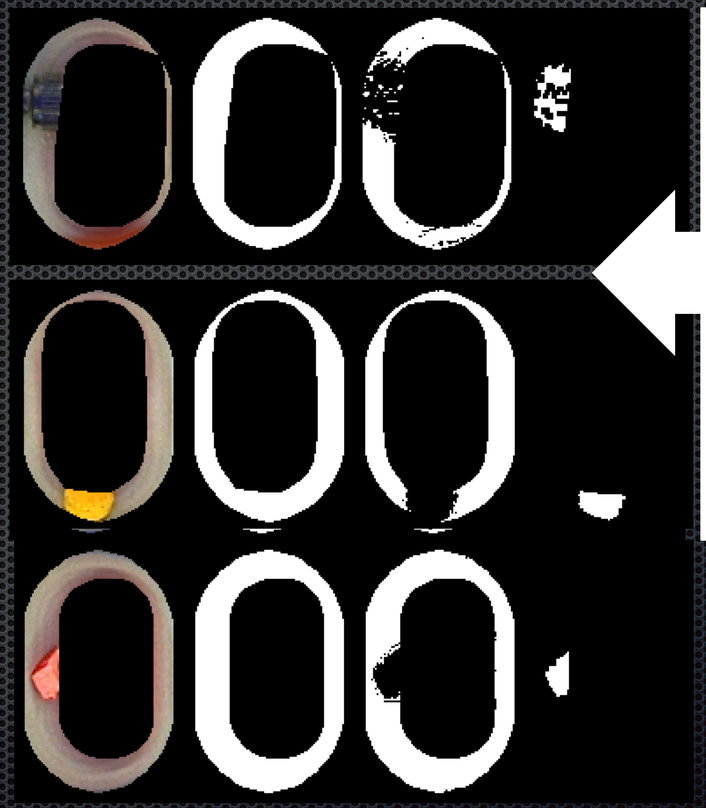
Application 1

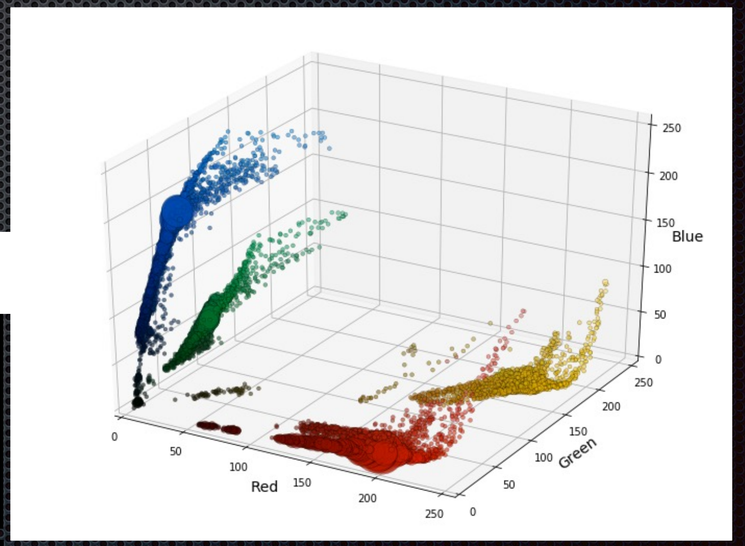
Blister Inspection – Our solution

- Collect all cavity's pixel from good samples
- Perform k-Means N class
- Segment for each class color
- Put in Or all mask obtained
- Morphological Operator
- Blob Analysis

Teach

Inspection



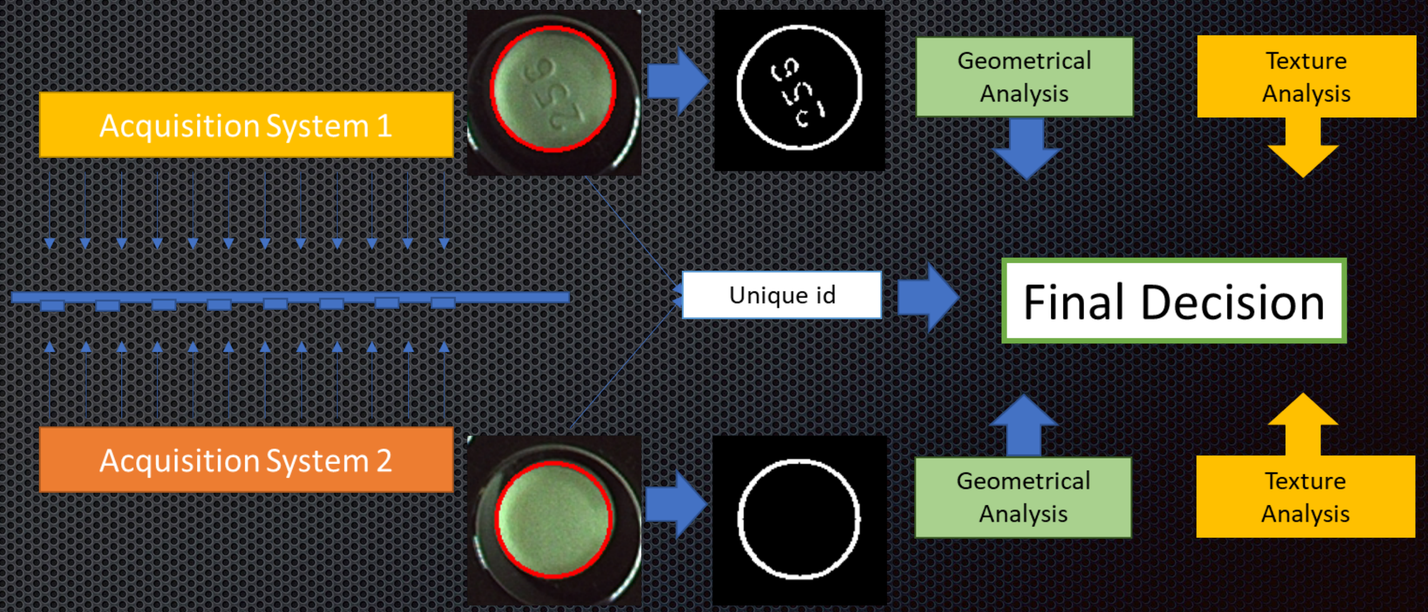


AIVIZ SRL

JEKSON VISION

Application 2

Blister Inspection Dual Layer Inspection

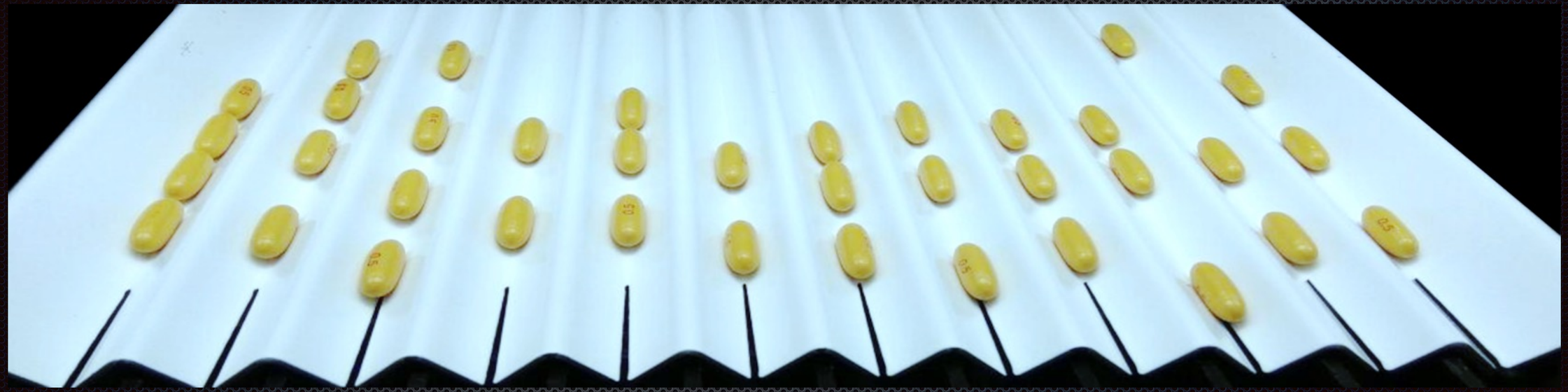


AIVIZ SRL

JEKSON VISION

Application 3

Tablet Inspection System

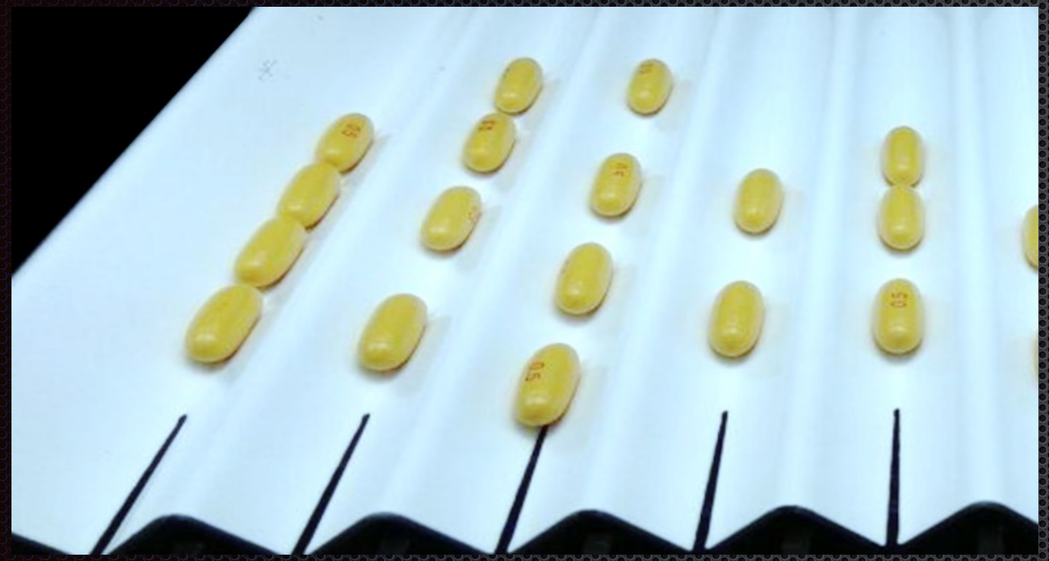


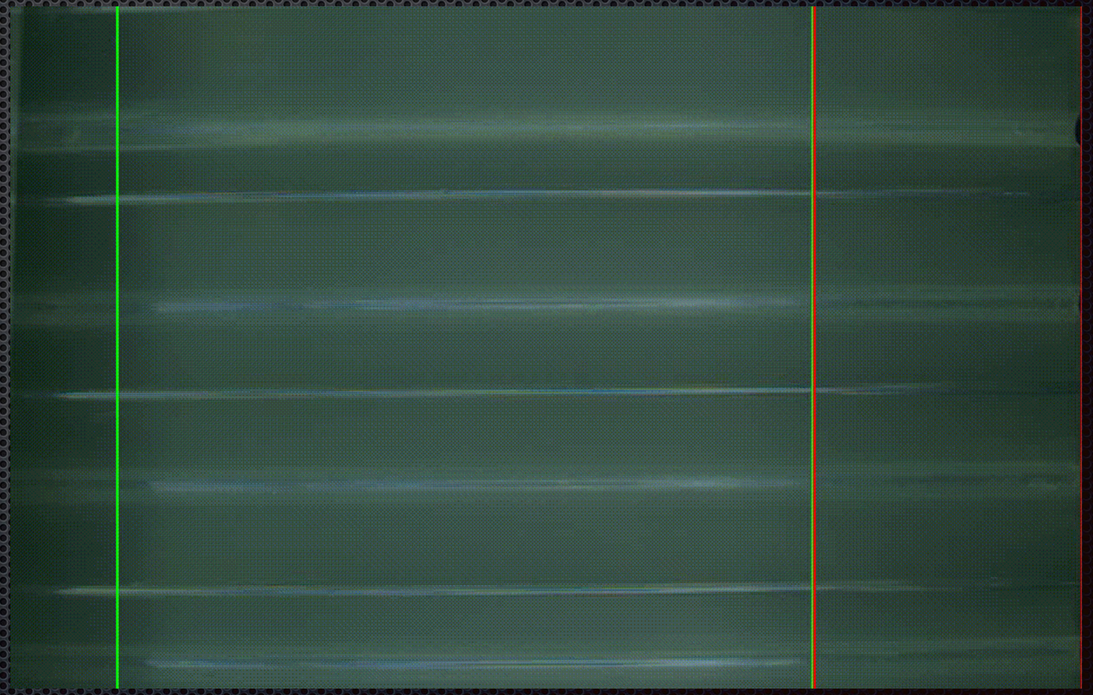
AIVIZ SRL

JEKSON VISION

Application 3

Tablet Inspection System





AIVIZ SRL

JEKSON VISION

Application 3

Challenges:

- Recognize Bad Samples (pills or tablet but not good)
- Recognize Any Type of Object that Contaminate the inspection Area (foreign Particle)

AIVIZ SRL

JEKSON VISION

Support

AIVIZ
SRL

Via Roveggia 122/A, Verona (VR)