

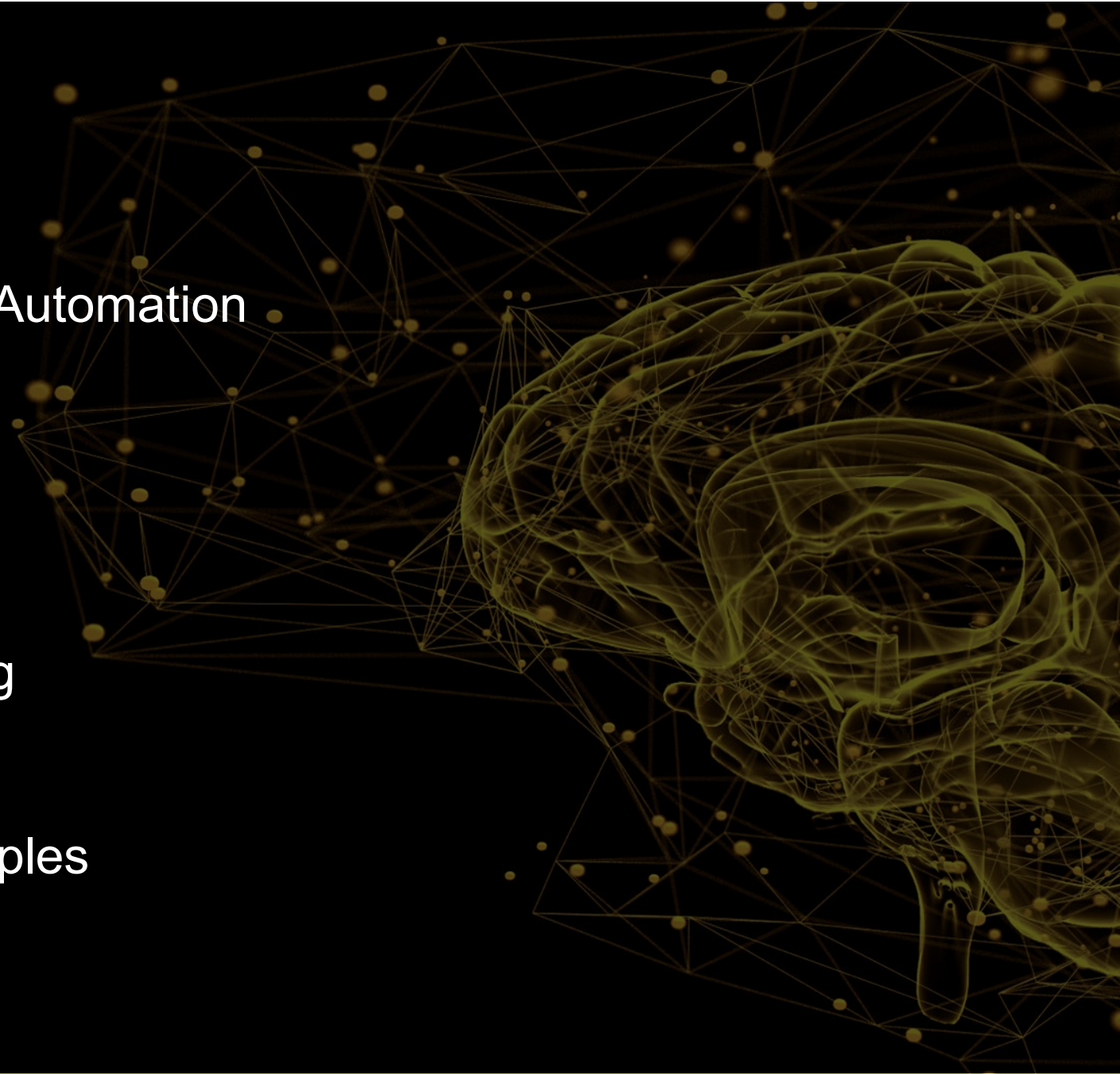


What is Edge Learning

Cognex Corporation | 11/01/2022

Agenda

- Example-Based vs. Rule-Based Automation
- Using AI in Machine Vision
- Edge Learning Basics
- How Edge Learning Works
- Edge Learning vs. Deep Learning
- Benefits of Edge Learning
- Edge Learning Application Examples



Example-Based vs. Rule-Based Automation

Example-based Automation

- Image analysis
- Setup pass/fail based on labeling of good and bad parts
- Can accommodate high variability within the same class

Rule-based Automation

- Measurements
- Precise location and fixturing
- Specific tolerances
- Predictability within classes
- Ideal for: robotic guidance, text and barcode reading

Using AI in Machine Vision

- Manufacturers are combining the power of **example-based AI** and **rule-based machine vision** to improve quality control and optimize efficiency
- AI augments rule-based vision
 - Solves tasks the human eye can solve that rule-based tools can not
 - Solves tasks that are too complicated and time-consuming to program with rules
- Two leading AI technologies:
 - Edge learning
 - Deep learning



Edge Learning Basics



Subset of artificial intelligence (AI)



Processes images “at the edge”



Extremely easy-to-use

No prior experience needed

Less time and fewer images required for training



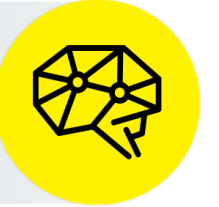
Solves a wide range of applications across all industries



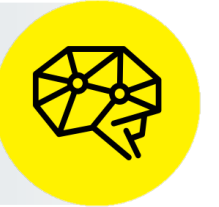
How Edge Learning Works



Learns by example from images labeled as good/bad



Leverages pre-trained algorithms based on structural patterns



Results in a less programming-intensive deployment



Edge Learning vs. Deep Learning



Edge Learning

Deploy in minutes



Deep Learning

Analyze fine details

Target User:

Moderate technical users

- Beginners

- Experts

User Cases:

*Defect detection,
classification,
assembly verification,
OCR*

- Simple and common applications
- Tasks with consistency
- Higher tolerance (low threshold) for acceptable anomalies

- Complex and highly customized applications
- Tasks with significant variation
- Low tolerance (high threshold) for acceptable anomalies

Benefits of Edge Learning



	Edge Learning	Deep Learning
Benefit: <i>Fewer images required for training</i>	Five to ten images required for training	Hundreds to thousands of images required for training
Benefit: <i>Faster learning</i>	Seconds to minutes required for processing	Hours to day required for processing
Benefit: <i>Higher ease of use</i>	No prior experience needed	Significant understanding of deep learning systems and programming needed



Edge Learning Applications

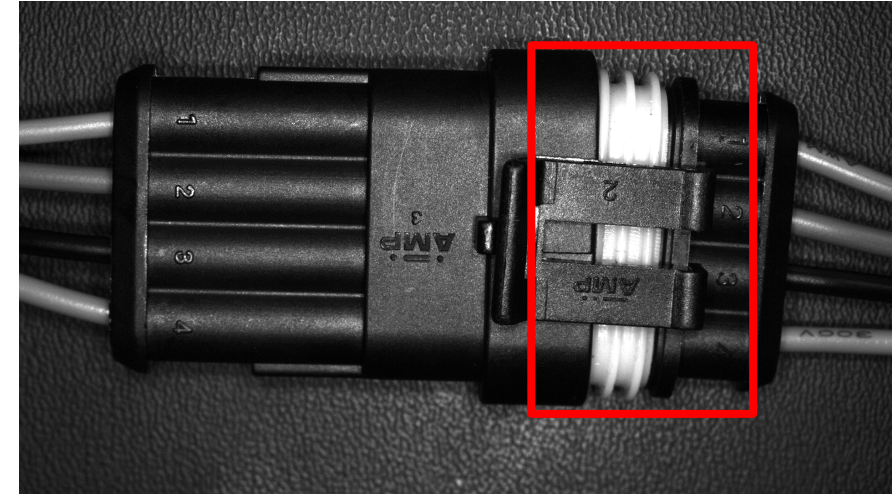
Edge Learning Example | Automotive

EV Connector Insertion Check

Verify whether the pieces of a connector are correctly put together

Challenge: Small variations between classes

NG X



OK ✓

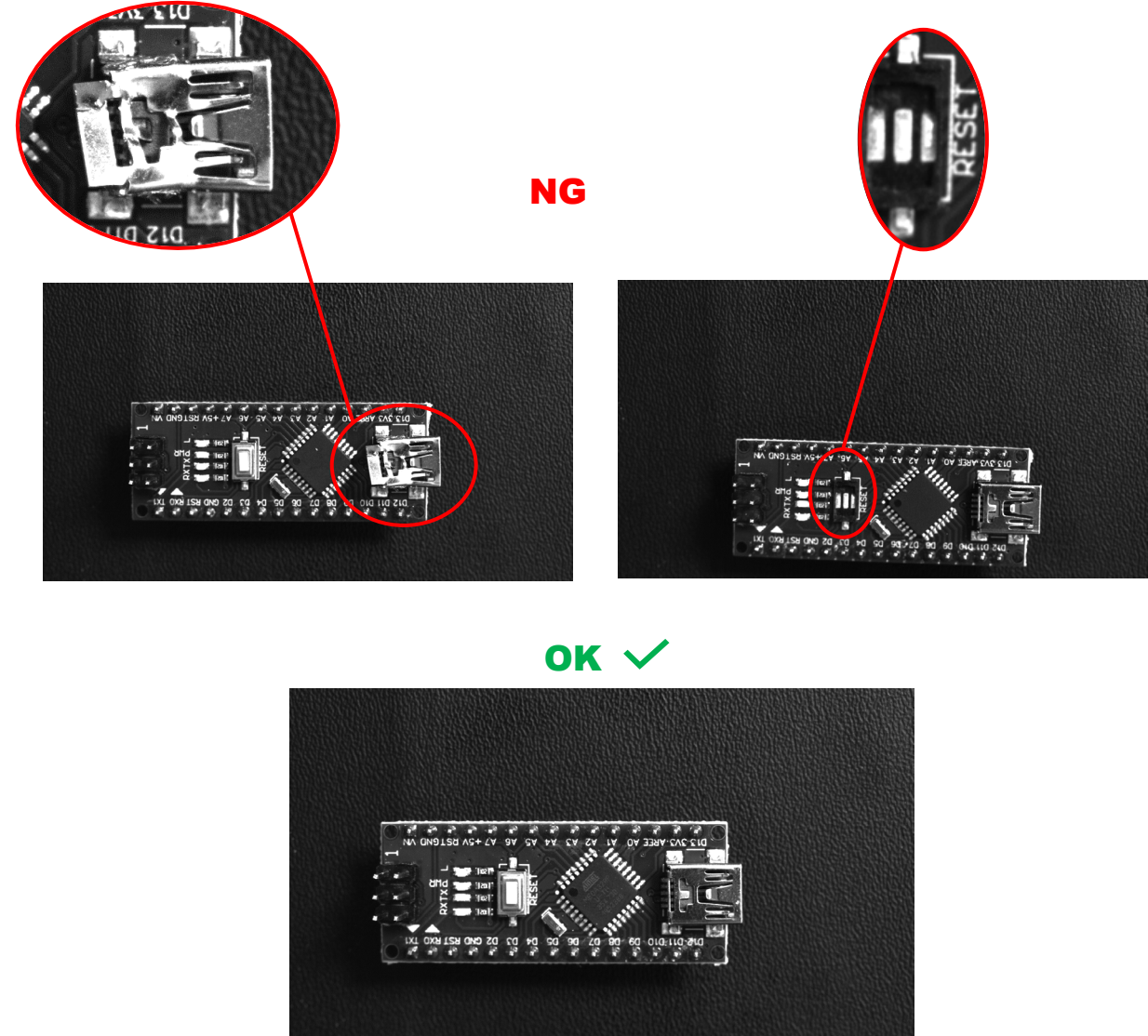


Edge Learning Example | Electronics

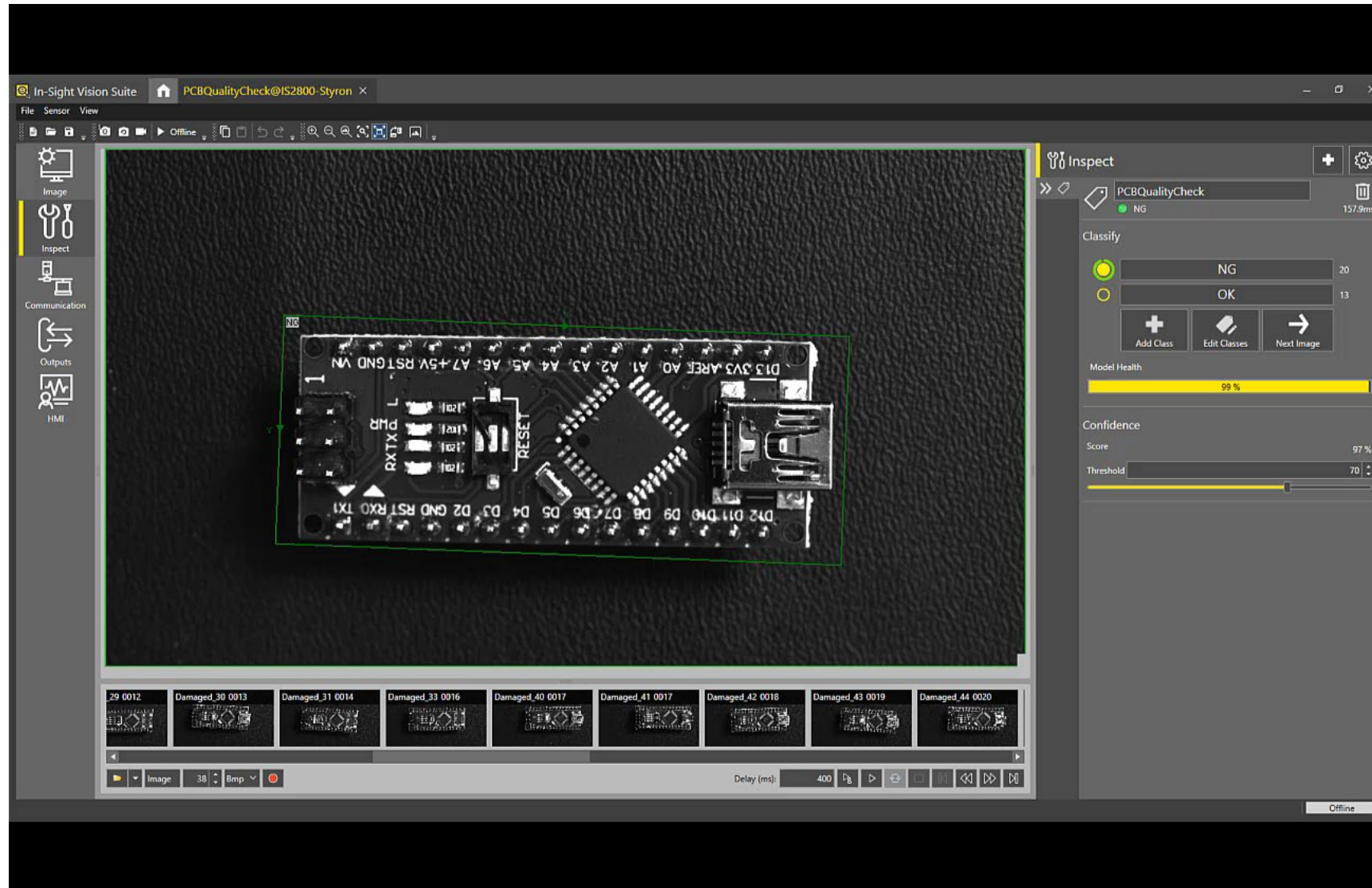
PCB Quality Check

Determine if a PCB has all the correct parts and ensures that none of the components are damaged.

Challenge: Small components, small variations between good/bad components



Edge Learning Example | Electronics



Edge Learning Example | Logistics

Item sortation and classification

Ensures items are routed correctly

Challenge: Variation between packaging types (size, material, label quality, hygiene issues)

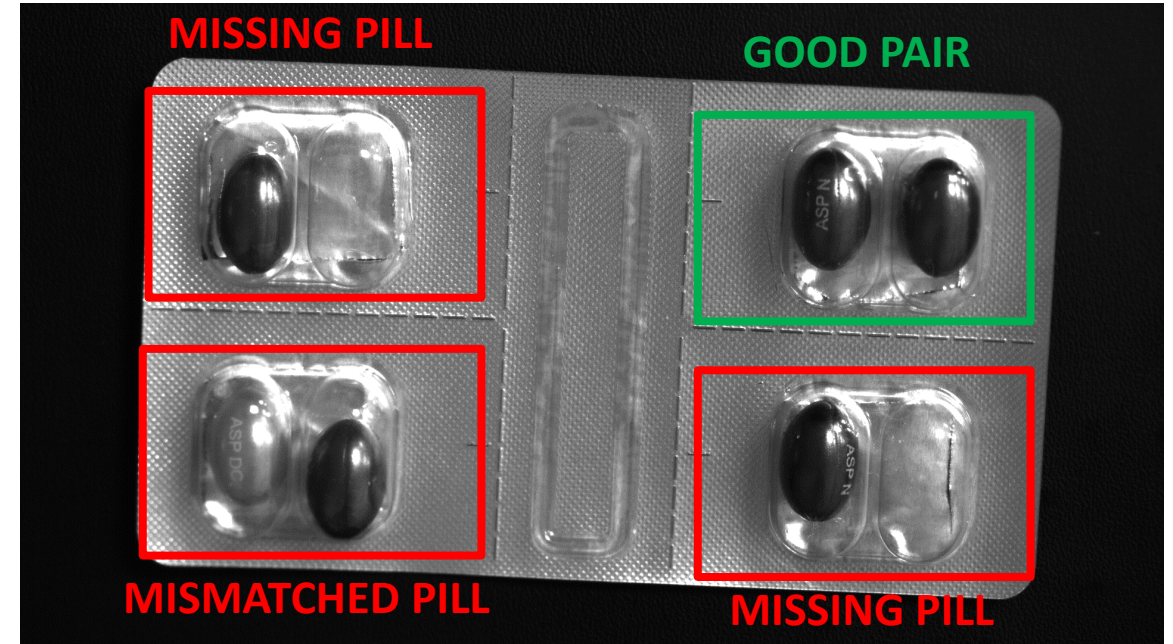


Edge Learning Example | Packaging

Blister Pack Multi-ROI Quality Check

Perform multiclass classification on four different regions of pills in a blister pack. Each region is classified as either a good pair, missing a pill, or having a mismatched pill.

Challenge: Reflective packaging





Thank you!