



Baidu Cloud Industry Quality Inspection Solution

Baidu Inc.

Lei Nie

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Highest Labor Cost in Complex Cosmetic Defect Inspections



Target product(e.g.)

Previous machine vision automation solution still cannot solve this problem



Human inspections

The complexity and variability of cosmetic defect

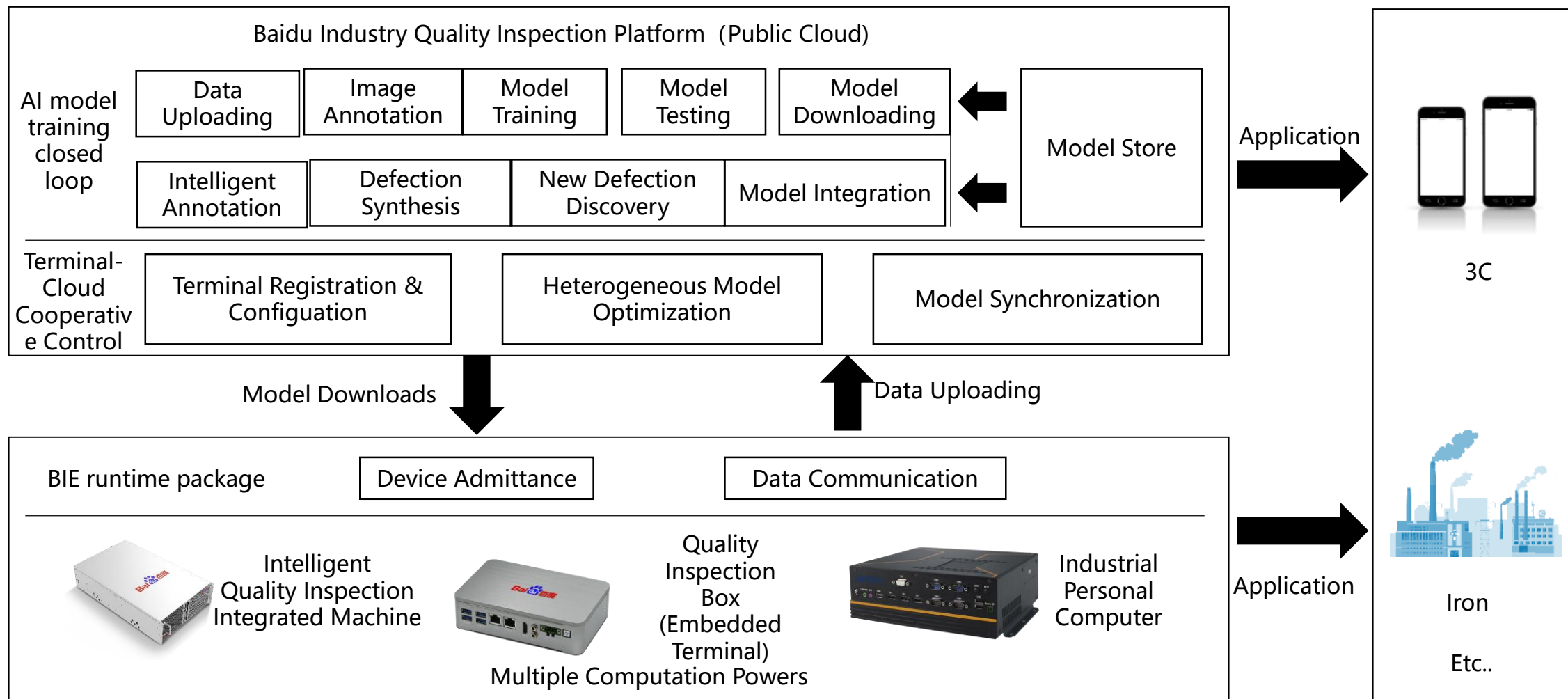
The complexity and variability of products' surface

Limitations of traditional rule-based machine-vision algorithms

industry	daily output	current cycle time	labor amount	avg. labor cost	Monthly inspection labor cost	% of inspection labor #
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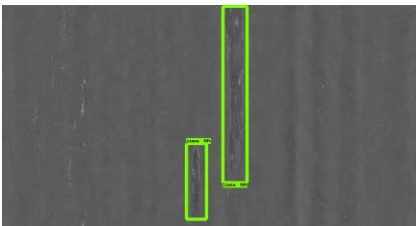
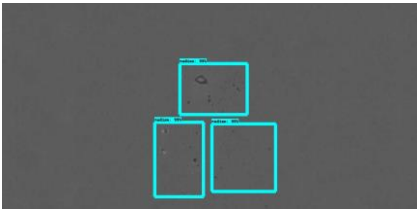
3C	2.3 million pcs	19 pcs/person/min	261	7800 RMB	2.03 million RMB	from 20% to 40% in past 3 yrs.
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Unified Terminal-Cloud Quality Inspection Solution



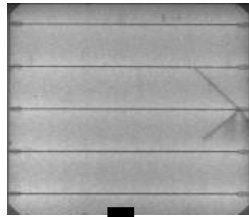
5 Key Features on Baidu Industry Quality Inspection

Intelligent Data Annotation



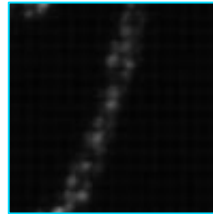
Over 80% Data Labeling Time Reduced

Defection Synthesis for New Product Line



Fast Product Line Translation

New Defect Discovery



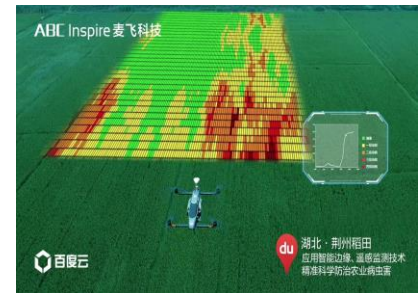
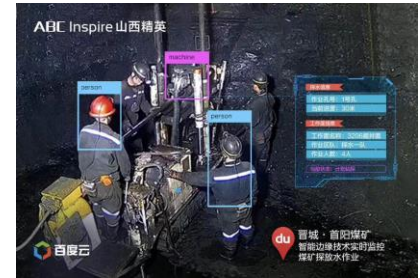
Discovery Unclassified Defect

Heterogeneous Inference Engine



Best Performance-Cost Balance

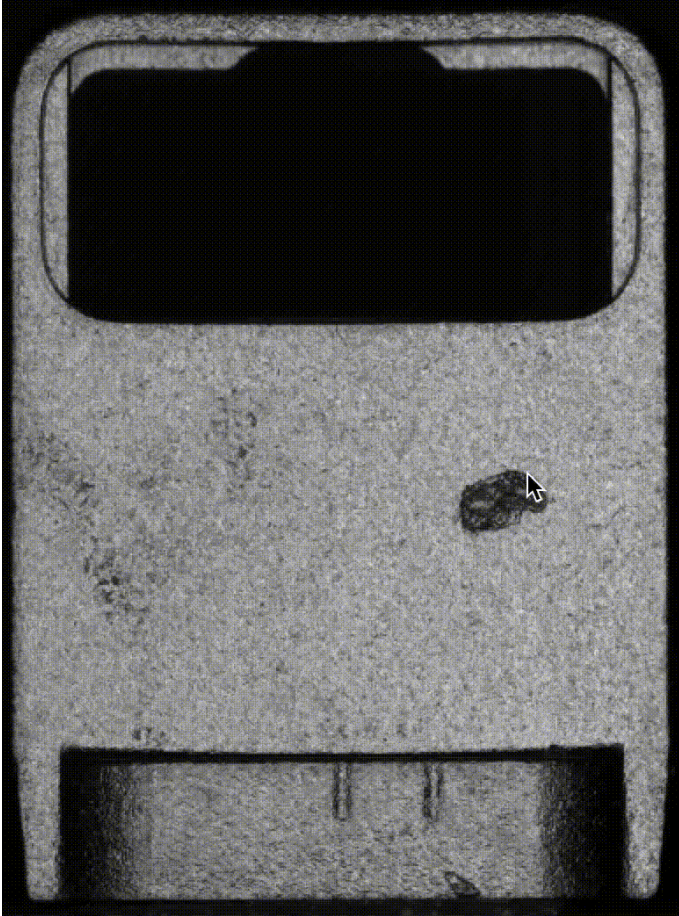
Edge-Cloud Association



Model and Data Cycle

Intelligent Data Annotation

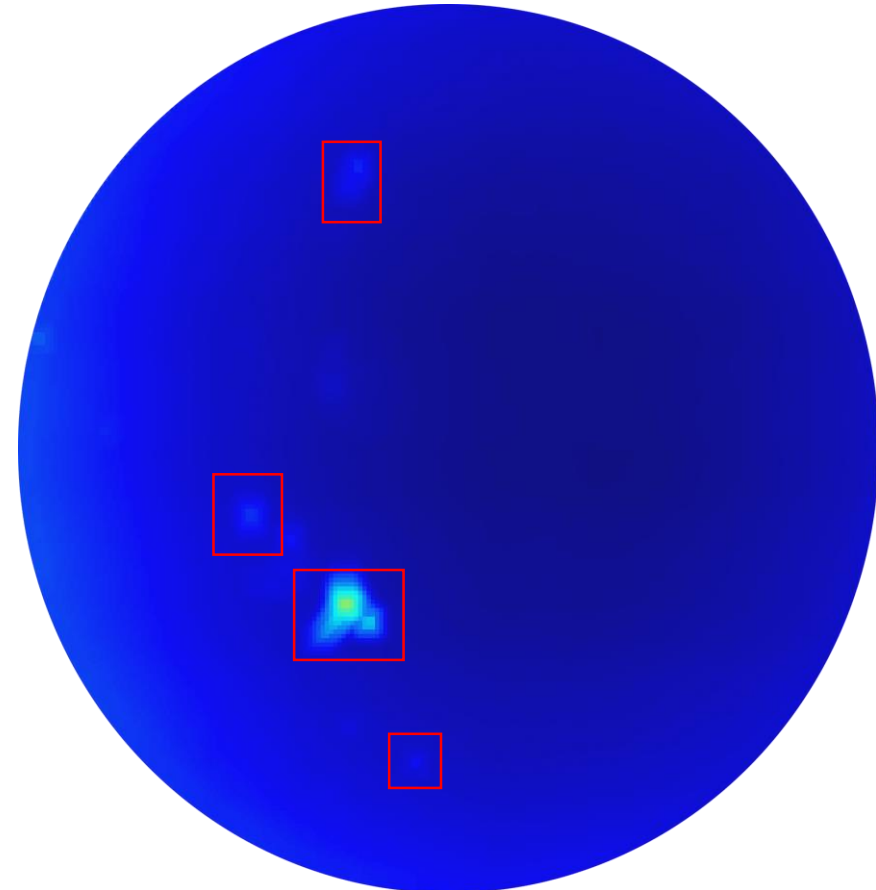
Annotation : Slow(usually > 50s per object) → Potential Defect Suggestion (> 80% precision)
Coarse (approximated polygon) → Automatically Segment Foreground (only 4 corners)



Interactive Segmentation



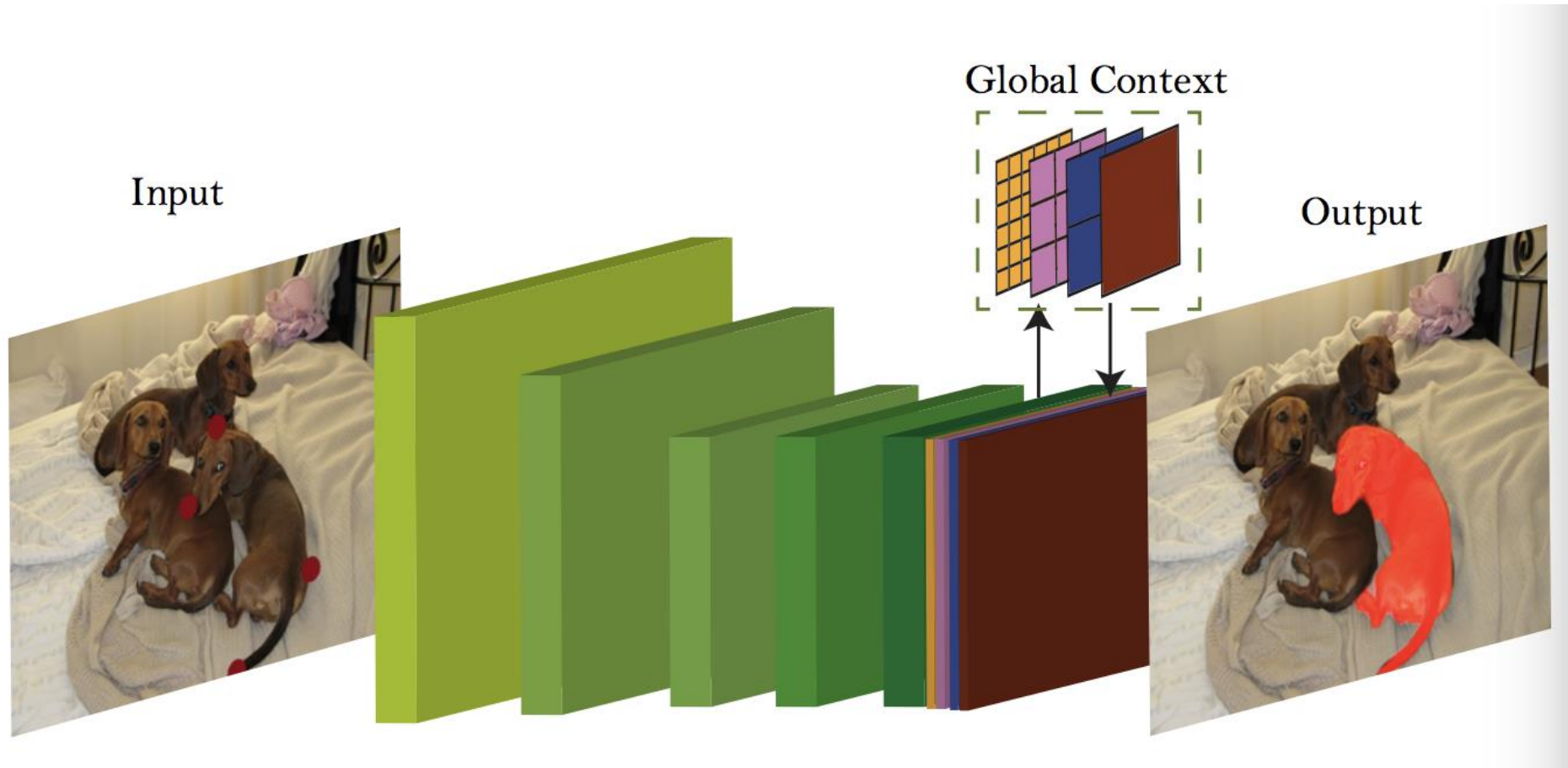
Input Image



Predefined Defected Area

Intelligent Data Annotation- Interactive Segmentation

Interactive Segmentation: class-agnostic semantic segmentation with global context heatmap to acquire high accuracy

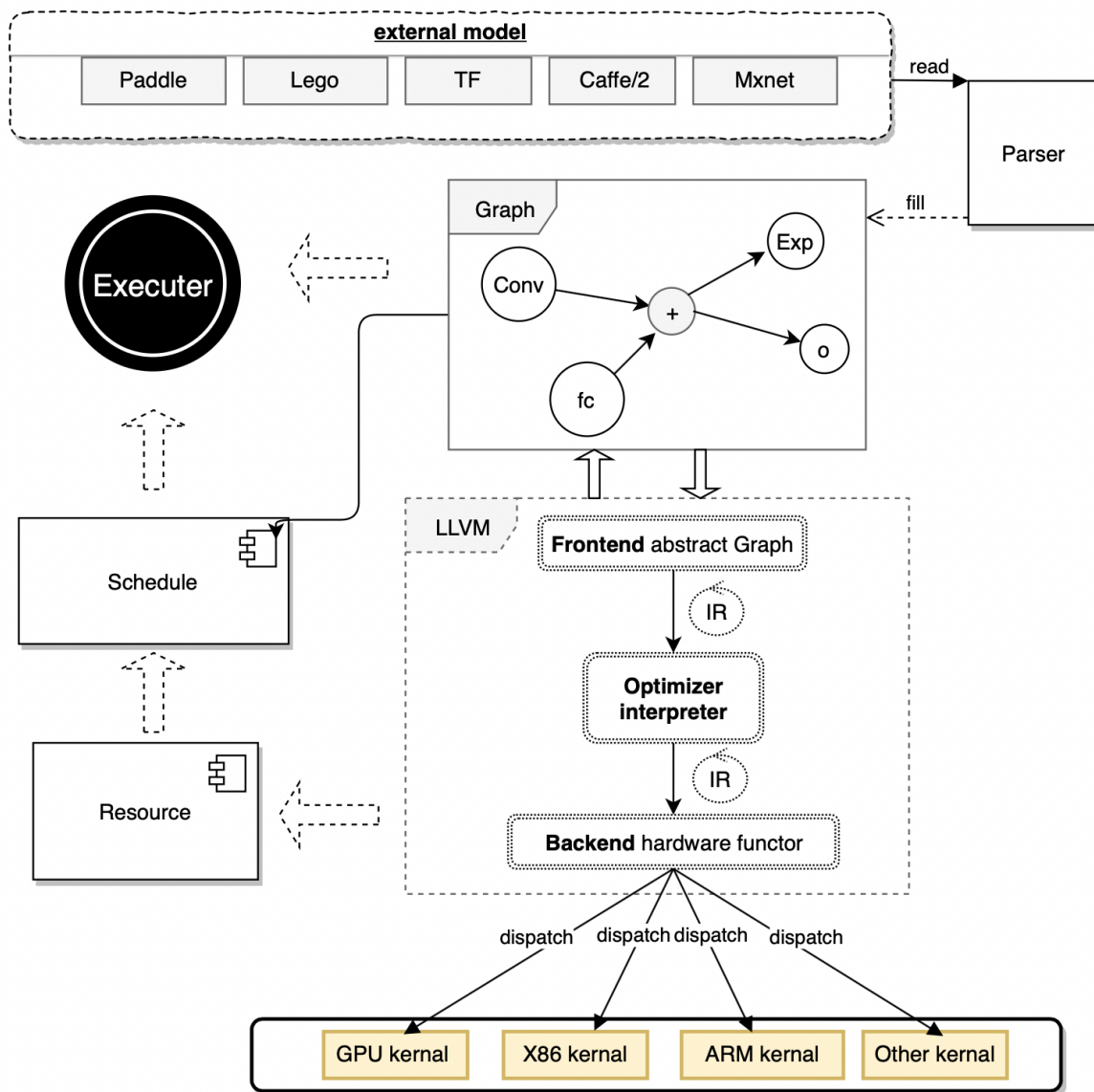


Deep Segmentation from Extreme Points

Heterogeneous Inference Engine

Anakin- Baidu Heterogeneous Inference Engine

- 1、 Multiple Deep Learning Framework
- 2、 Graph Merging and memory re-using
- 3、 Address Pre-Mapping
- 4、 Heterogeneous Assembly Optimized



Intelligent Defection Synthesis

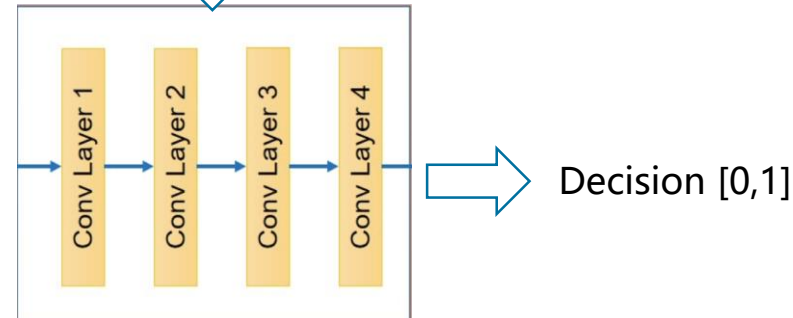
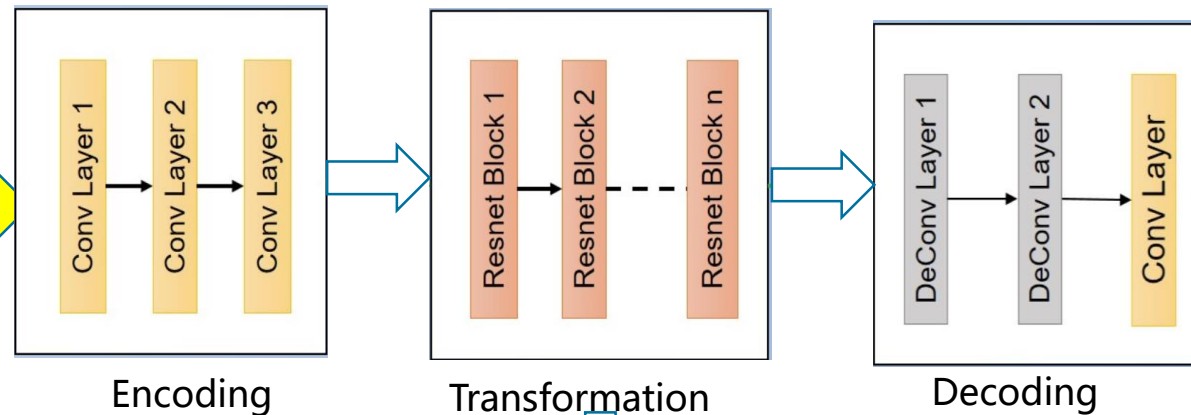
New Product Line Cold Start: Transfer time-consuming labeled data collection (> 3 months) to 30 minutes

Mono Defect-Free Sample

Mono Defect Sample

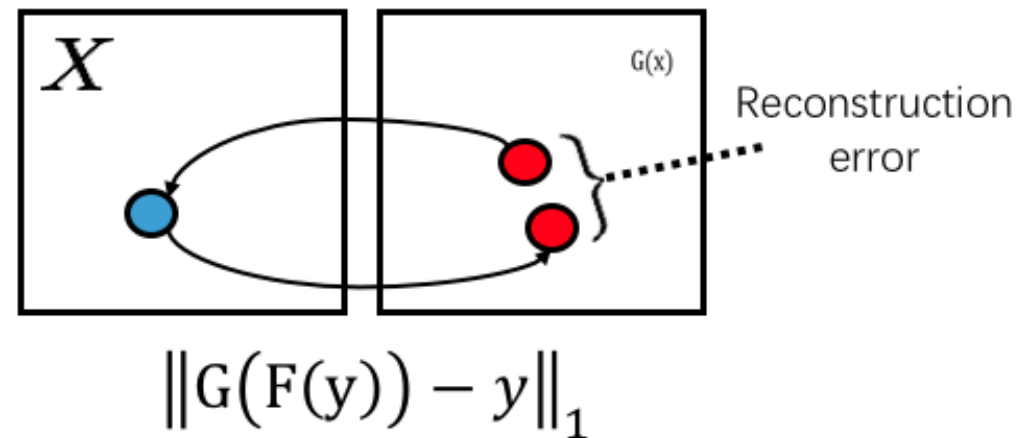
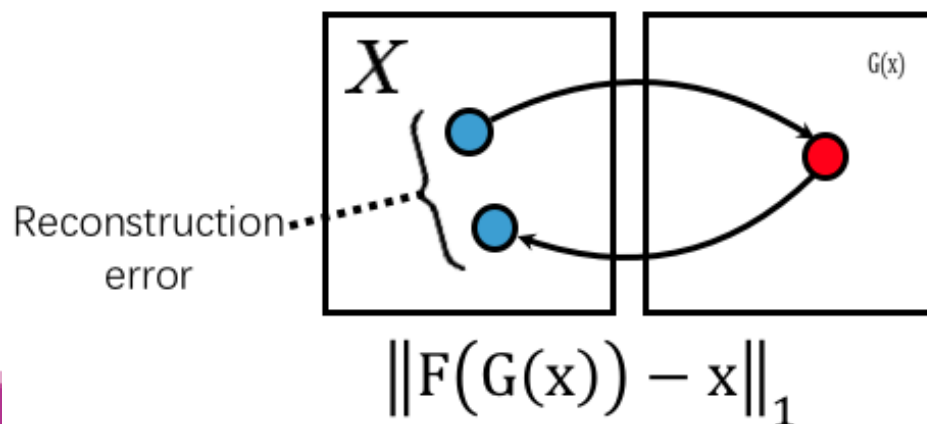
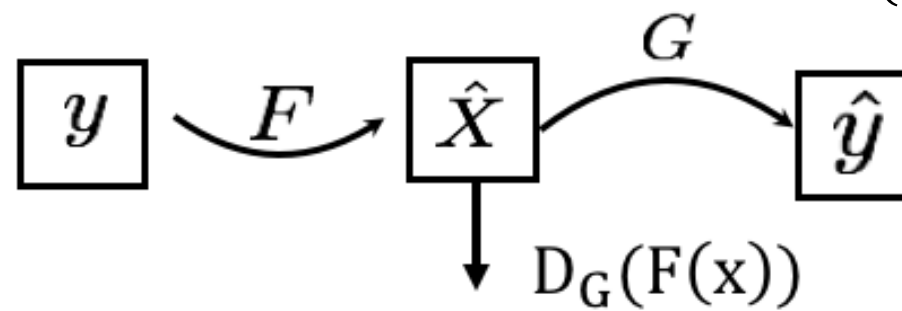
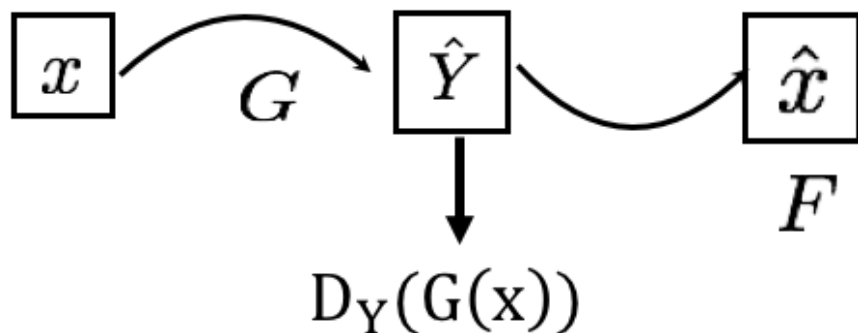
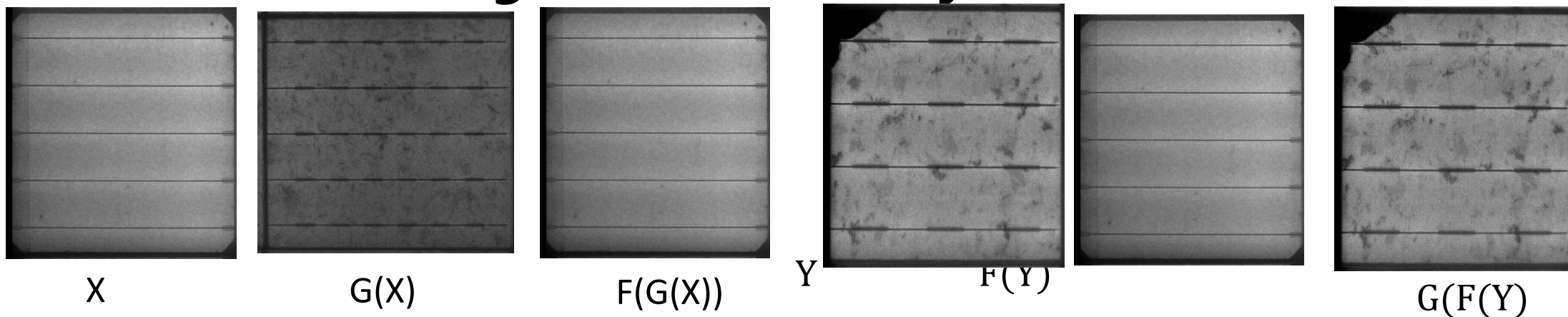
Poly Defect-Free Sample

Poly Defect Synthesised Sample



Discriminative Network

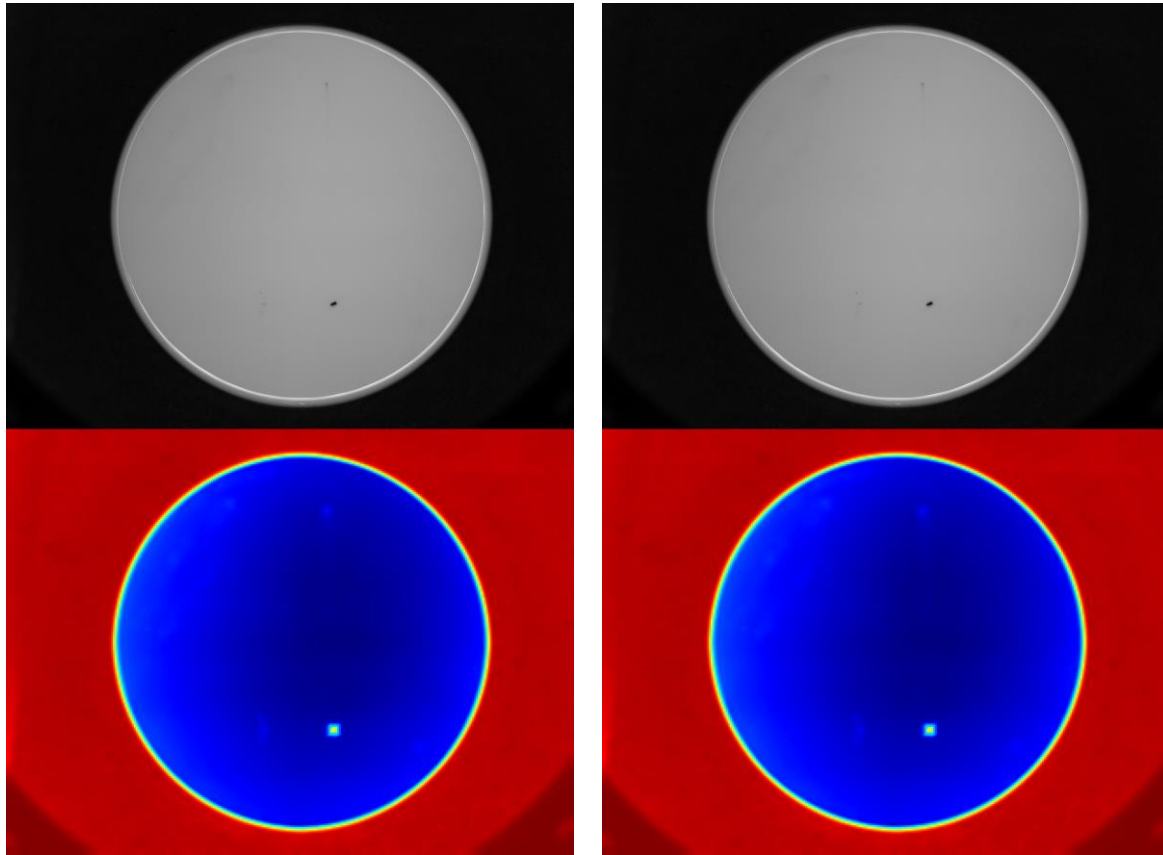
Intelligent Defection Synthesis



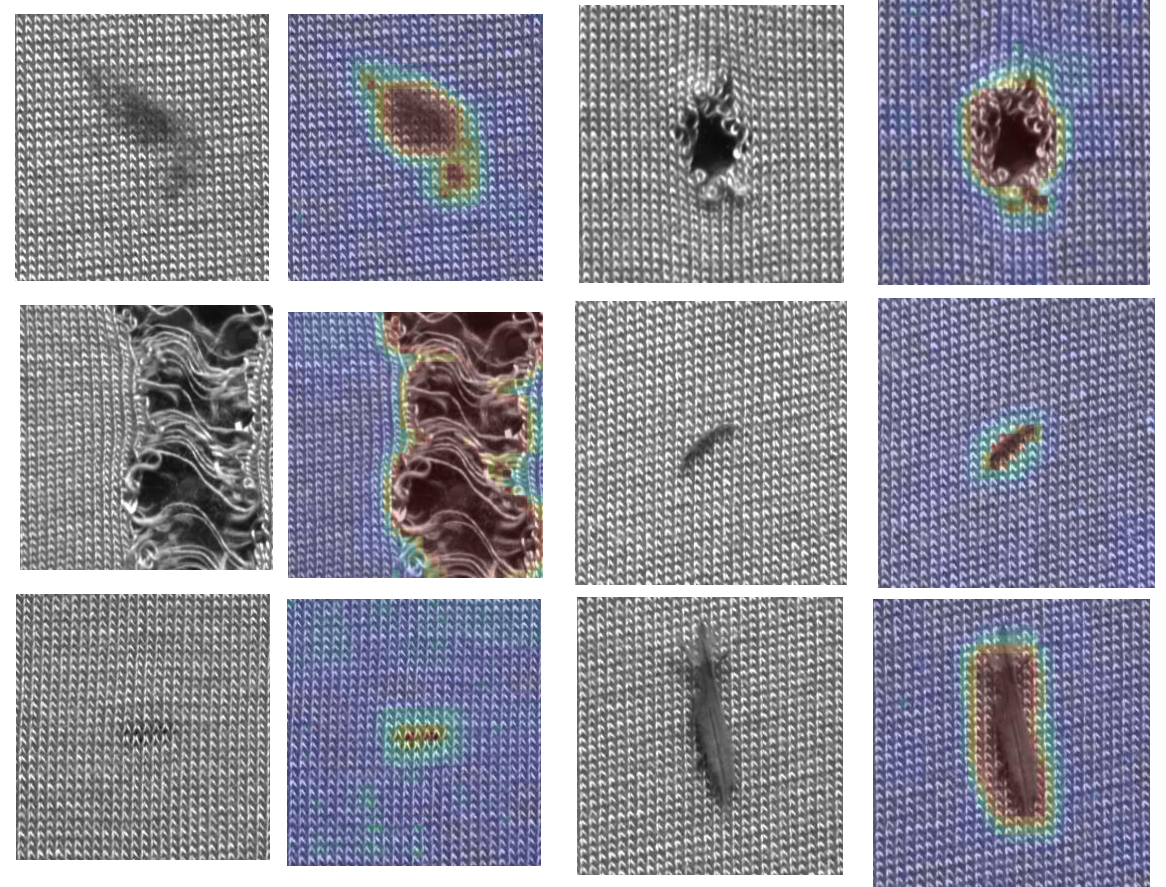
New Defection Discovery

Maintenance : Discovery un-classified defect for model optimization

Novel Defect discovery: discover un-predefined defect by modeling defect-free image



Apple iWatch Charger



Textured Anomaly Dataset

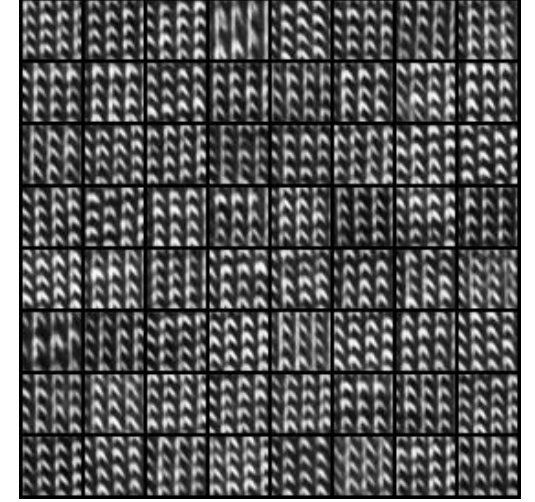
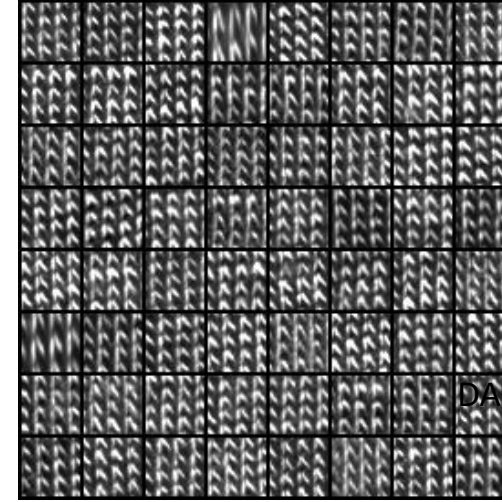
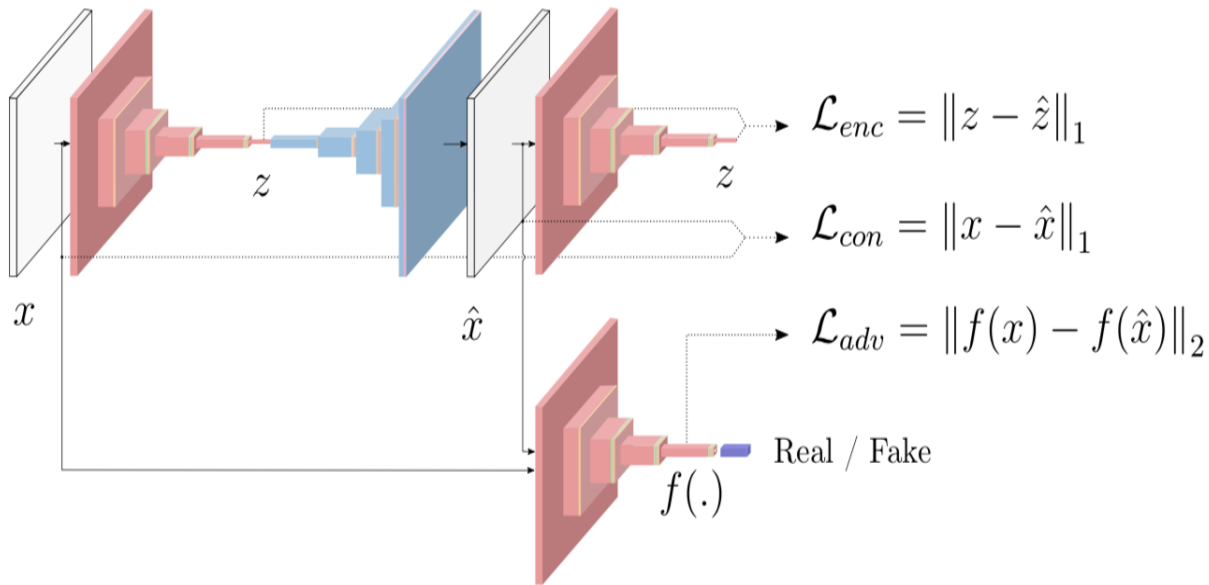
New Defection Discovery

Network:

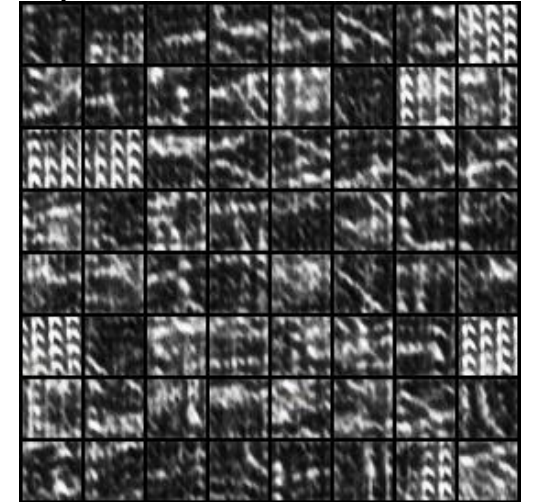
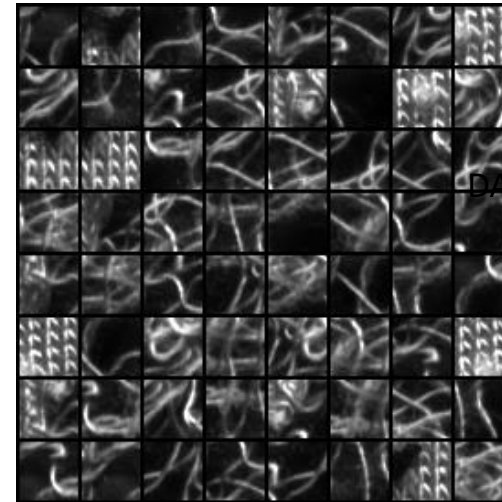
- Reconstruction Network: Denoising/Variation AutoEncoder
- Discrimination Network: Detect Anomaly Samples

Loss Function:

- Encoding Loss: latent variable loss
- Content Loss: Ensure the reconstructed image
- Adversarial Loss: Ensure the authenticity of samples generated

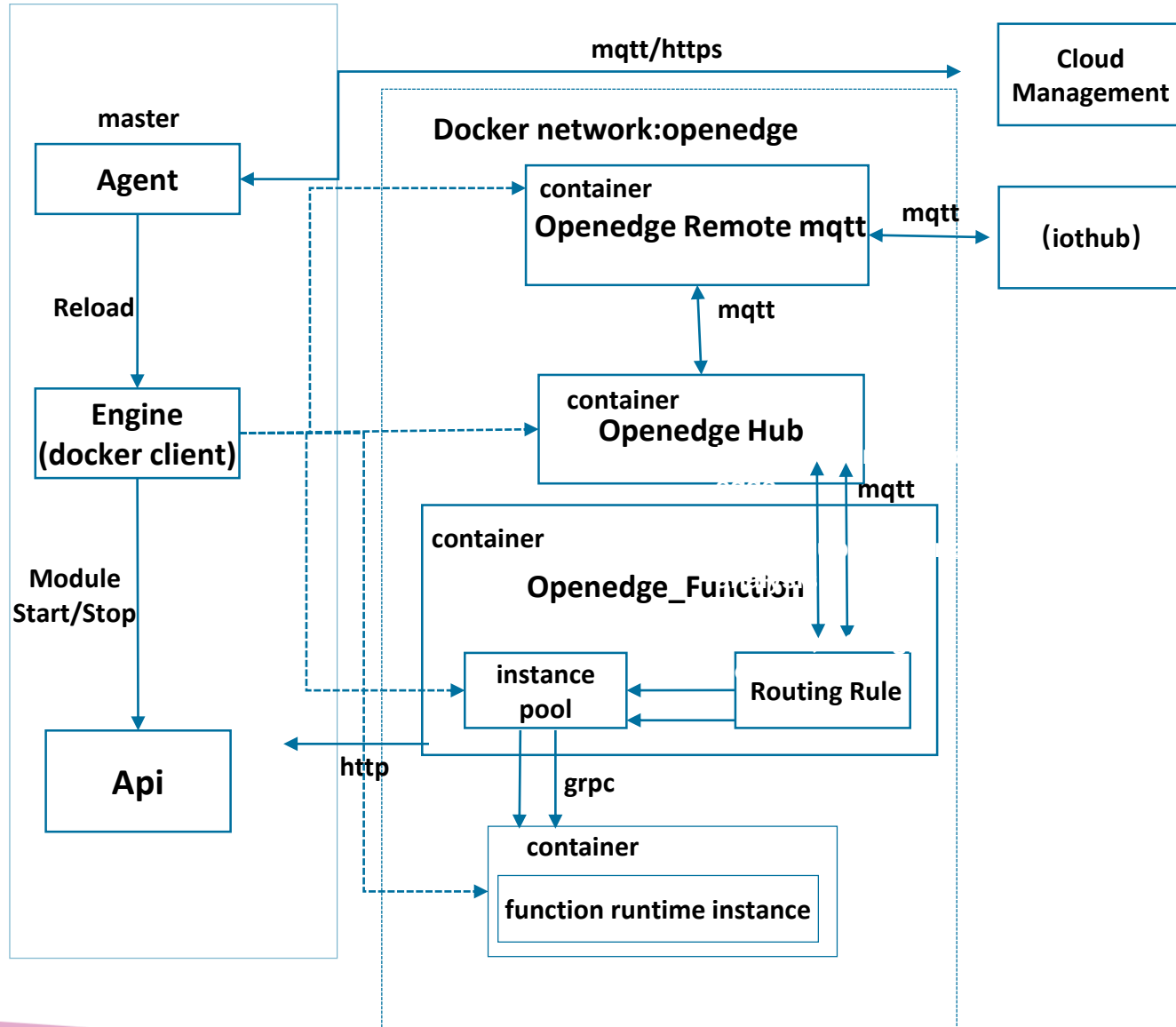


Normal samples



Anomaly samples

Edge Cloud Synchronization



Baidu Intelligent Edge(BIE) Framework

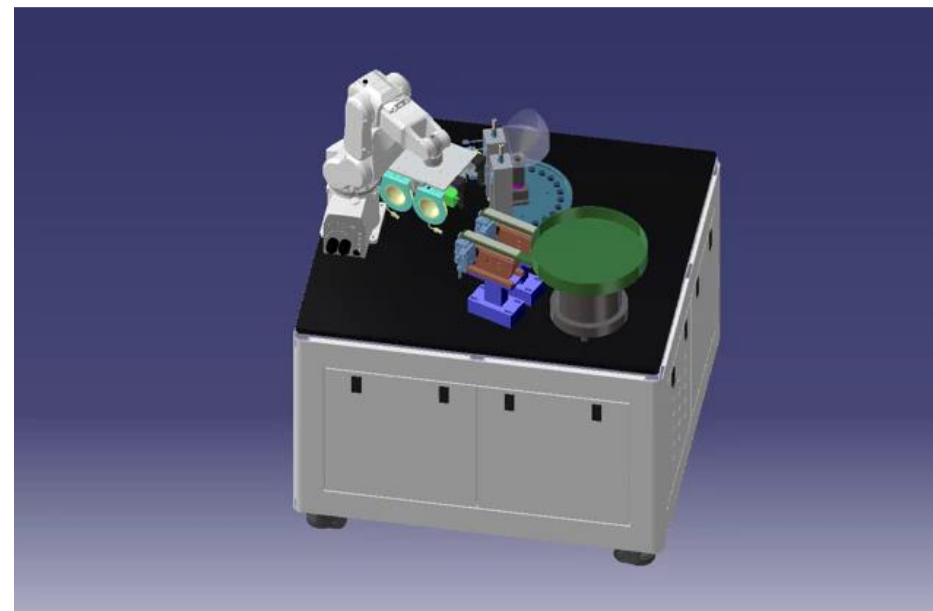
1、 Hardware and Framework Transparency

2、 Edge-Cloud Association

3、 AI on the Edge Device

4、 Seamless Integration with Industrial Inspection

Baidu Cloud ABC Integrated Industrial Inspection



High-Performance Industry Inspection Device

Feature	Strictly Meet AQL and FP for super-star
Scenario	Replace 100% labor + Computer Center + Quality Tracing Center
Customer	Digital Industrial Inspection for large company (> 200+, 1 million RMB per Machine)

High Performance-Cost Industry Inspection

Feature	Basically Meet the AQL and FP
Scenario	Replace the Entire- workers(Verification worker reserved) , rapidly deployment
Customer	Rapid labor-saving for small incorporation with sailing and renting (> 2000, renting for 10,000 per month)

THANKS

The background features a series of overlapping, wavy, translucent shapes in shades of magenta, blue, and purple. These shapes create a layered, mountain-like effect that spans the width of the image, with the colors blending into each other at the edges.