Introduction to Beyond AI X-Ray

November 2019

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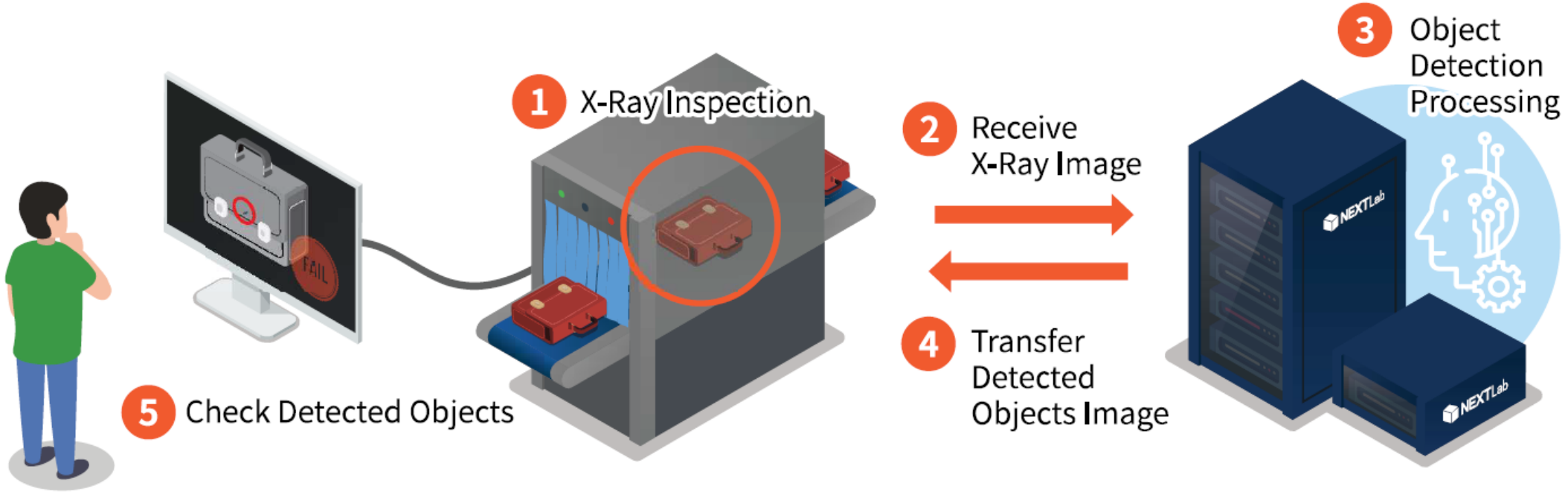
What is Beyond AI X-Ray ?

- ✓ **Automated Foreign Objects**(Defects) **Detection System**
- ✓ **Applicable Products : Garment Products** (Bags, Handbags, Shoes and Apparels)
- ✓ **Based on Deep-Learning Technology** (for detecting various shaped objects)



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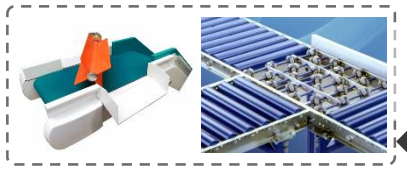
How it works

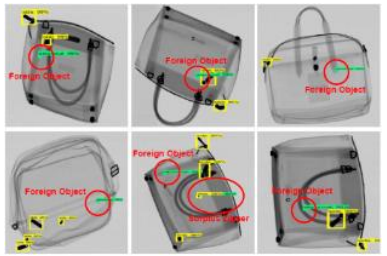


Sends Signals to other automation systems

Displays the detection results

Beyond AI X-Ray

Shows Detection Results



Deep-Learning based Detection Engine

Finds “Foreign Objects” by analyzing the X-Ray image

X-Ray Machine

Generated X-Ray Image file is transferred for analyzing

Detection Results

Production Information
(Model Name, Lot No.)

MES Integration

Using Web-API or Database Linking

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Specifications

Analysis Speed

< 0.9 seconds

After getting image file
from the X-Ray machine

Accuracy

98.9%
(Development Stage)

Tested with 10,000 samples

> 95%
(Production Stage)

From the running results
of backpack production

Detection Performance

More than 2 X 2 pixel sized foreign objects†

†Actual Size vary with the X-Ray machine's resolutions
(For Techik's TXR-6080XH, 1 Pixel = 0.43mm at Width Direction, 1 Pixel = 0.2mm at Length Direction)

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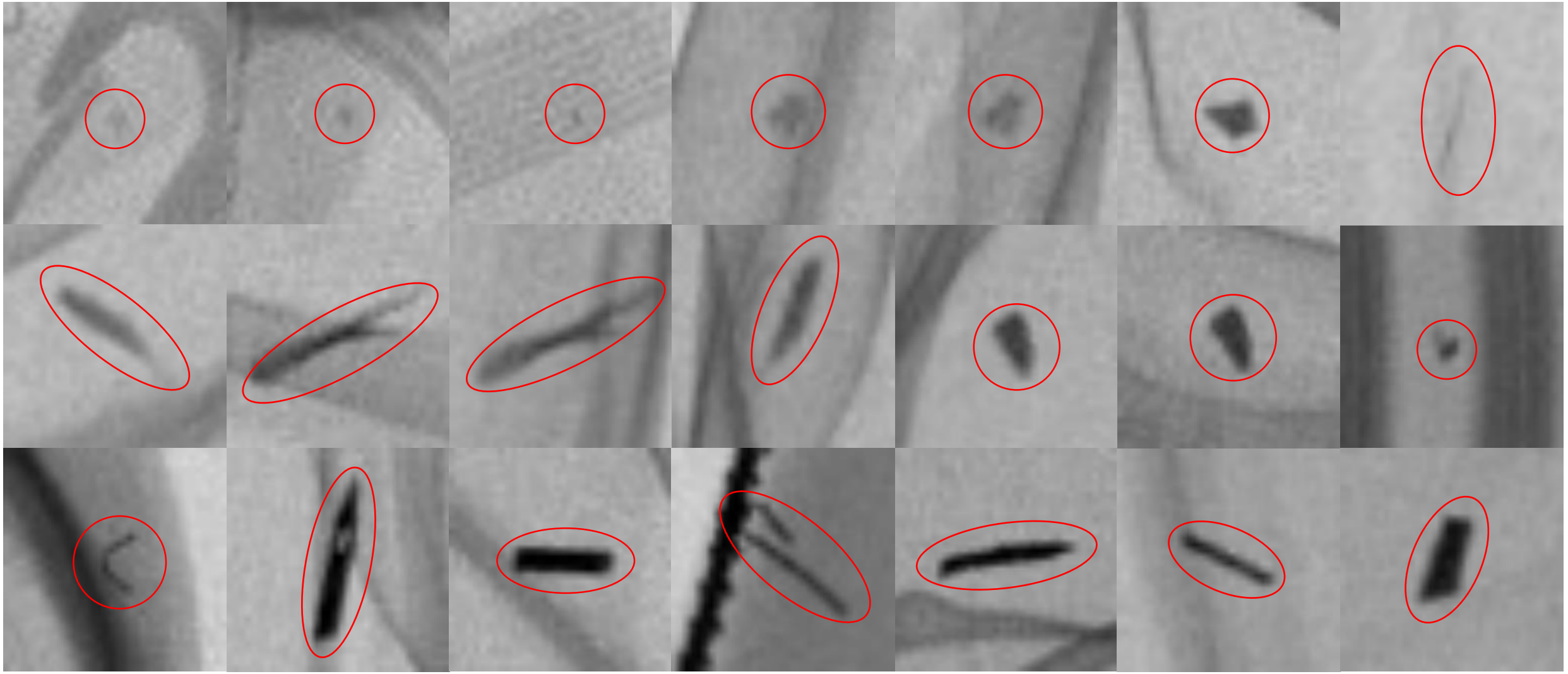
Examples of Detectable Objects

- ✓ From needle piece to scissors, the Beyond AI X-Ray can detect wide-range of foreign objects
- ✓ Thanks to the deep-learning technology, the detection accuracy can be continuously increasing



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Advantages over existing methods

- ✓ From needle piece to scissors, the Beyond AI X-Ray can detect wide-range of foreign objects
- ✓ Thanks to the deep-learning technology, the detection accuracy can be continuously increasing

As-Is		With Beyond AI X-Ray
Metal Detector	X-Ray Machine	
		
Cannot apply to metal accessories attached products	**(1) Human Error** - Detection accuracy vary with the inspector's eyesight and concentration **(2) Lack of Automation** - Factory's MES cannot be linked - No Reporting features	**(1) Automated Detection** - Various types of objects can be detected - Using Deep-Learning based algorithm **(2) Customer Optimization** - Can be linked with customer's MES - Can be applied to the automated lines **(3) Managed Service** - Provides remote S/W monitoring & upgrading

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How to use 1. Inspector Confirmation Mode

- ✓ An Inspector reviews and confirms the detailed detection results
- ✓ The worker in the output section checks the confirmed results and separates the “NG” products

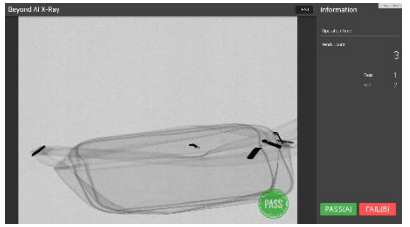
(1) Input

Worker inputs a bag following the monitor’s command

(2) Detect & Confirm

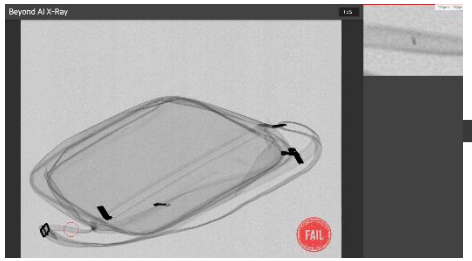
Case 1 : Detected as “OK”

Review results and Confirm



Case 2 : Detected as “NG”

Review results with Zooming&Panning and Confirm



(3) Separation

Worker classifies output bag by the monitor’s displayed results

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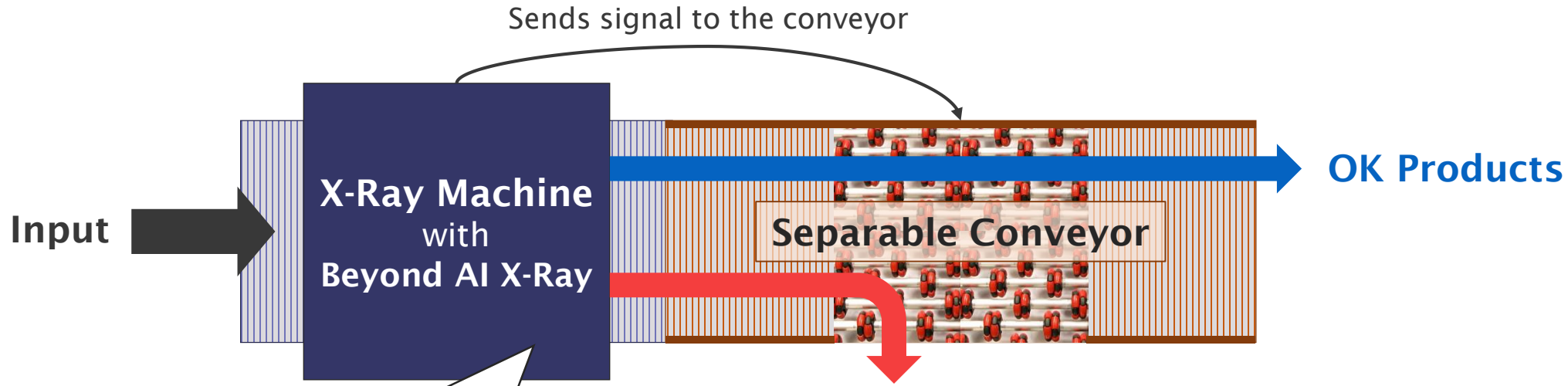
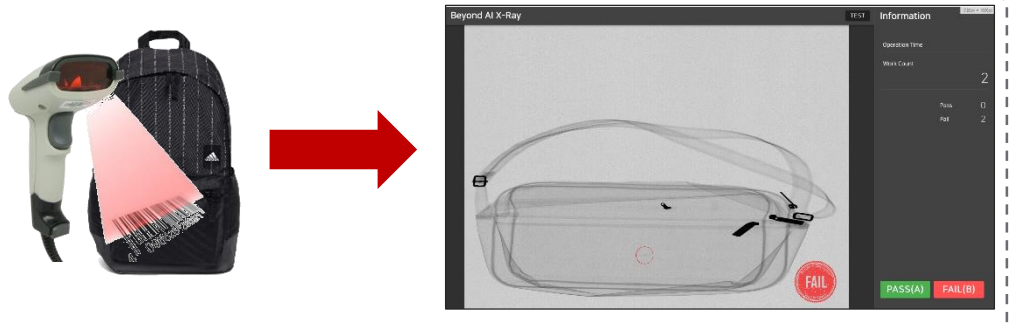
How to use 2. Automated Separation Mode

- ✓ Beyond AI X-Ray also can sends signal with its own I/O terminal
- ✓ A separable conveyor can separates “NG” products and inspectors can check the detailed detection results afterward





for NG Products

(Barcode Reading → Confirms the detection results)

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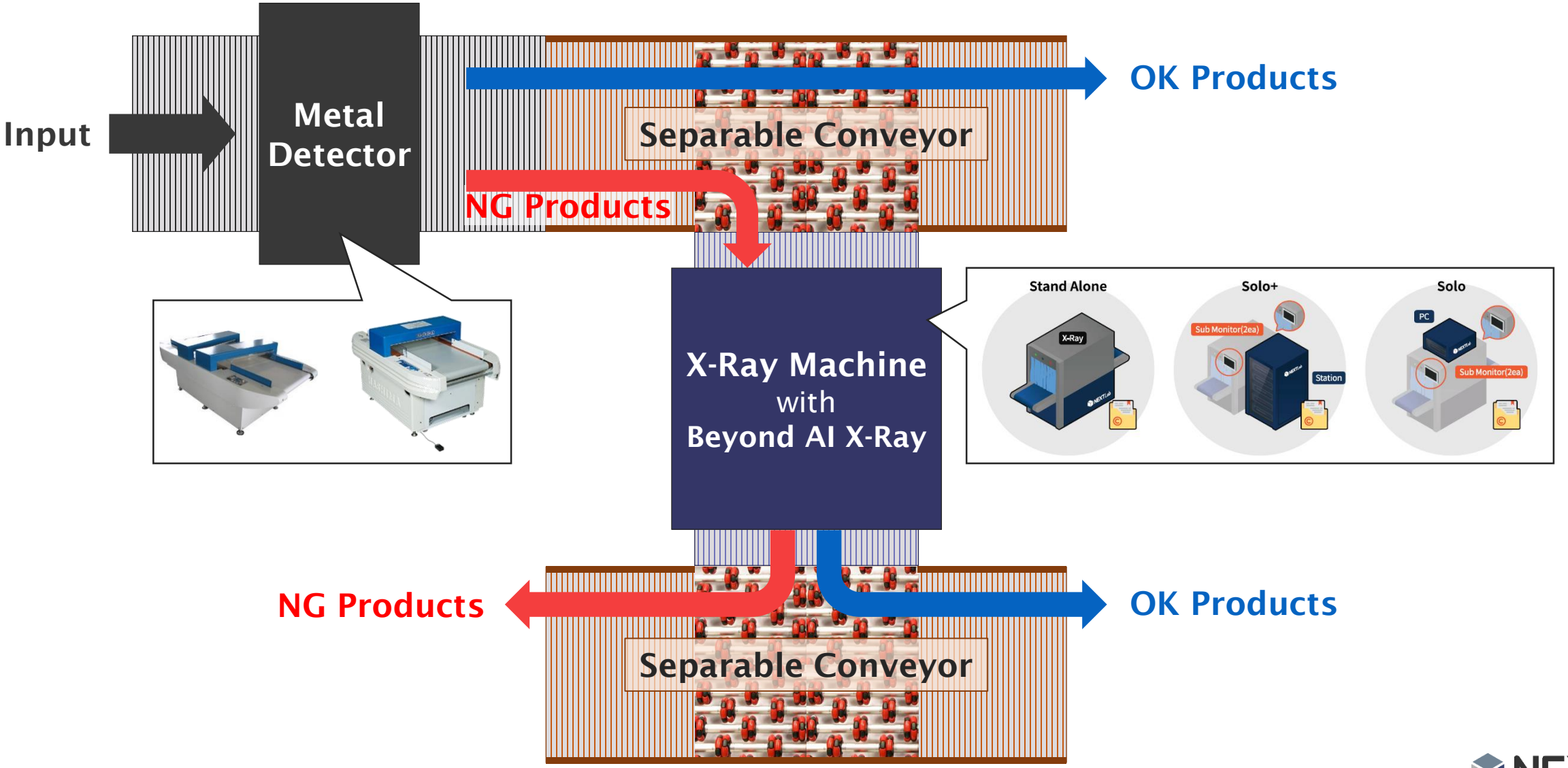
How to use 3. Metal Detector Integration Mode

- ✓ Working with metal detectors can also be an option
- ✓ Effective for products with metallic ornaments



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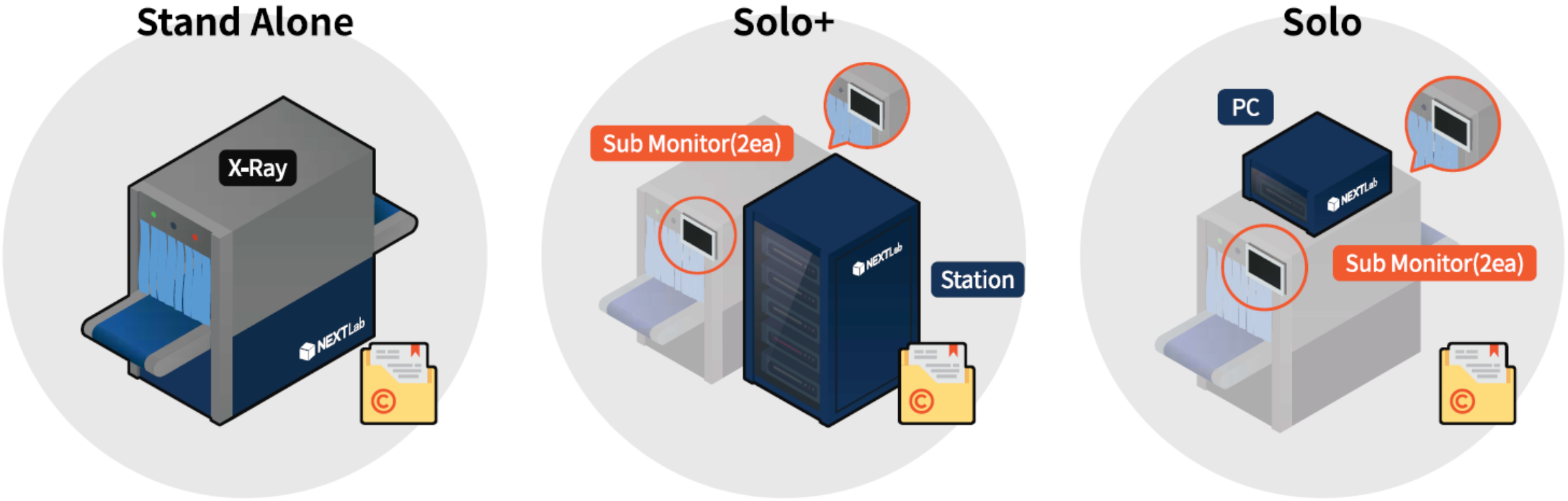
Product Line-ups

- ✓ Customers who already have X-Ray machine can also use “Beyond AI X-Ray” (Solo+, Solo)
- ✓ Beyond AI X-Ray can be worked with most of X-Ray machines[1)]



1) X-Ray machine requirements
- Running with Microsoft Windows XP or higher versions
- Has 1 100Mbps or higher ethernet port

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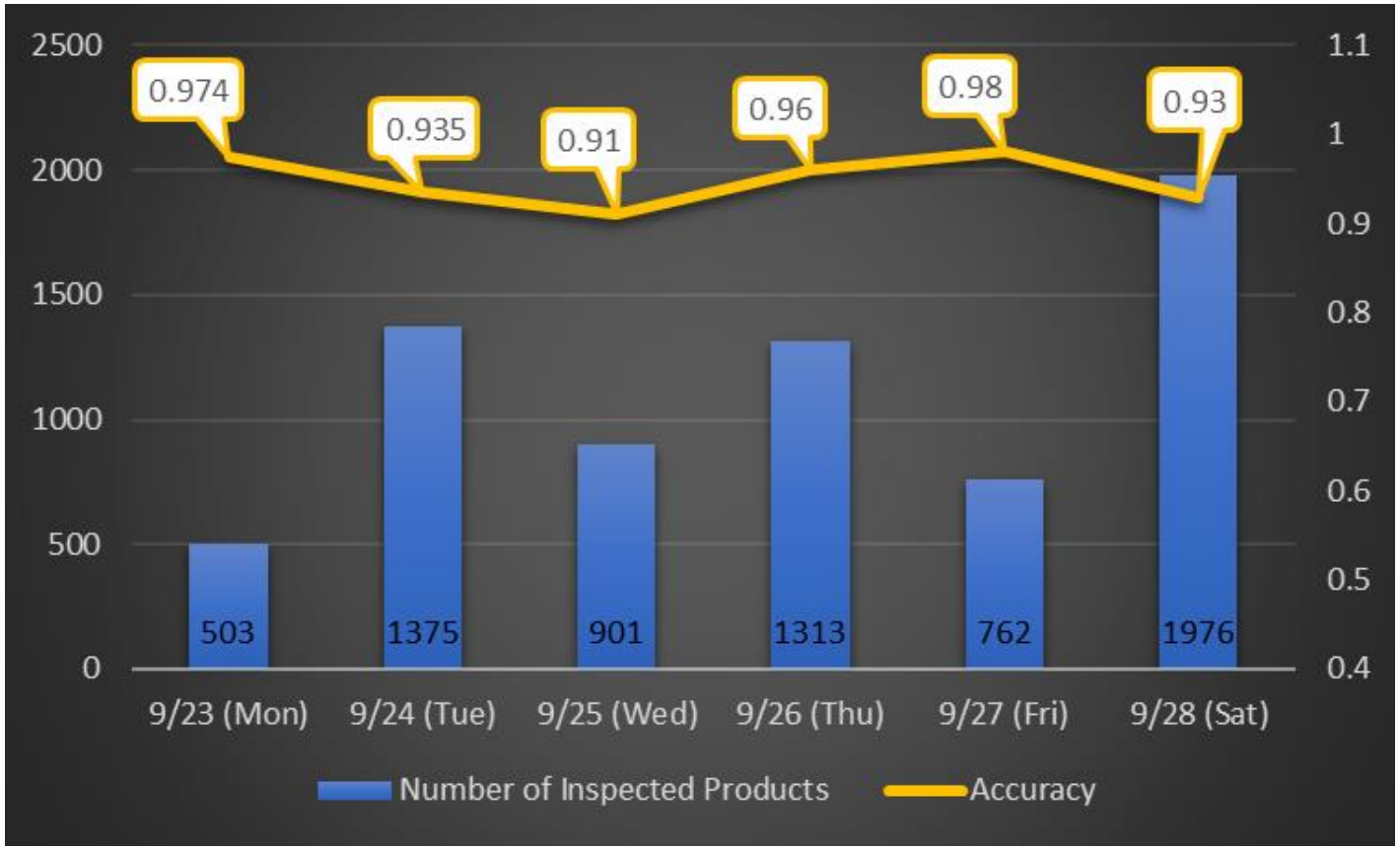
Case Study – Pungkook Corporation (Pungkook Saigon III)

- ✓ Pungkook Corporation is one of leading OEM in Handbags, backpacks and other baggage manufacturing
- ✓ A backpack inspection system was delivered to Pungkook Corporation in August 2019

Mode 1 Inspection is operating



Operation Results : Average accuracy reached 94.8%

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Company Overview – Business Fields

Image Processing & Deep Learning based Automation

Business Fields

Smart Testing

Smart Devices' Quality Testing Solutions
(i.e., IPTV, Smartphone, Vehicle Infotainment)

Quality Monitoring & Prediction Solutions

SK telecom · SK broadband · LG Electronics · LG U+

Smart Factory

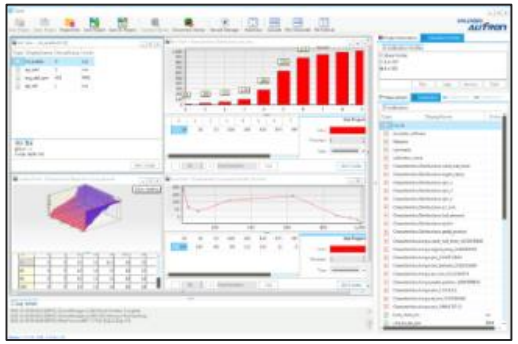
Machine-Learning based Defects Detection
PLM based Warehouse Management

PUNGKOOK CORPORATION
SINCE 1966 · LUGGAGE, PACK AND LEATHER GOODS

SK broadband

Automotive Engineering

Machine-Learning based
Vehicle ECU Optimization



HYUNDAI AUTRON

Company Overview – Engineering Experts

- ✓ 80% of staffs are R&D personnel
- ✓ Core people are leading to develop Beyond AI X-Ray

CG Lee

Master's Degree in Mech. Engineering

CEO of NEXTLab (2012~)
Naver Corporation (2008~2012)
SK Communications (2003~2007)

YS Park

Lead of R&D Team

Ph.D in Control Engineering

NEXTLab (2019~)
NeilLab (2017~2019)
LG Electronics (2012~2017)

JW Lee

System Development

Master's Degree in Mech. Engineering

NEXTLab (2018~)
Hyundai Engineering (2017~2018)

SM Kim

Product Development, Technical Sales

Master's Degree in Mech. Engineering

NEXTLab (2014~)
LG Electronics (2013~2014)

SY Lee

Image Processing Algorithm

Bachelor's Degree in Computer Engineering

NEXTLab (2012~)

GO Gil

Deep Learning Algorithm

Master's Degree in Aviation Engineering

NEXTLab (2018~)

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INNOVATION WITH NEXTLab

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