



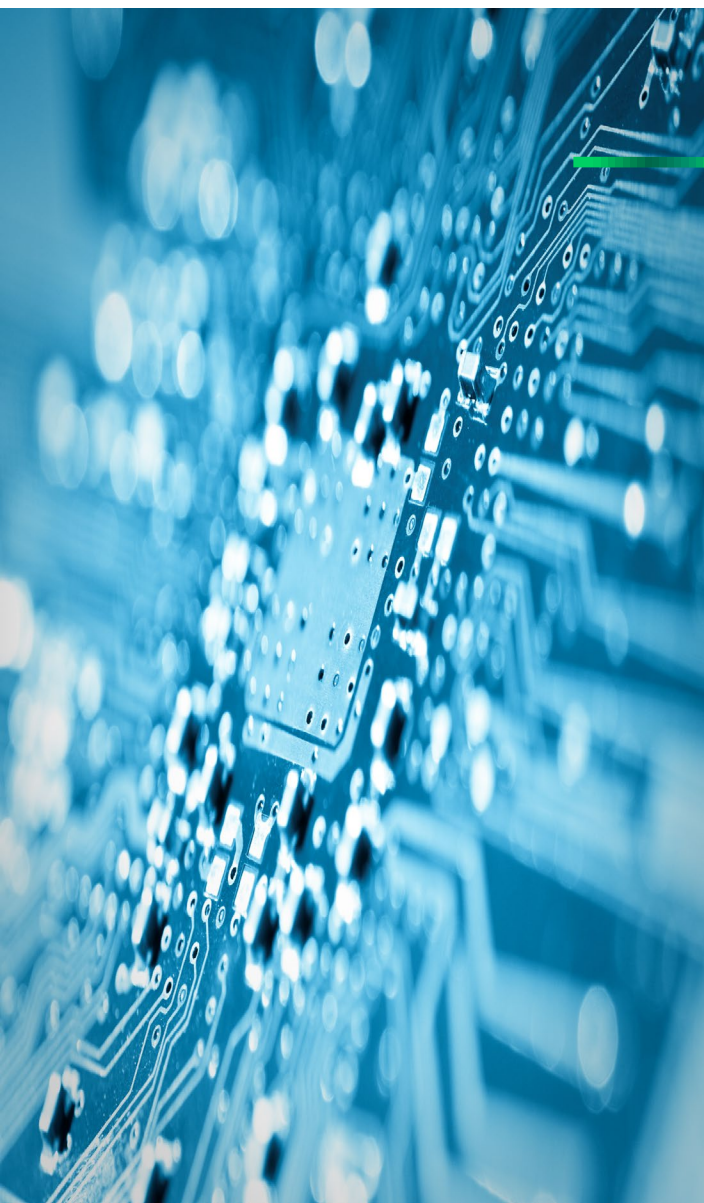
Artificial Intelligence Solution for Radiographic Testing

Applying Medical Imaging Technology to NDT Workflows

A4A NDT Forum, September 22, 2026

FUJIFILM Healthcare Americas Corporation

Non-Destructive Testing / John Flaherty, Product Manager



Agenda

Foreword

- ① Core Technology and AI Capability
- ② AI Solution for NDT Industry
- ③ AI Screening for Welds and Castings
- ④ Wall-thickness AI
- ⑤ Workflow AI
- ⑥ Novel AI Solutions & Future Steps

Contributions to
the NDT industry

New solutions

Foreword on Artificial Intelligence

AI is a broad term for systems designed to perform tasks that typically require human judgment.

- **Generative AI**, such as chatbots, creates new text, images, or other content. It may produce plausible but incorrect information, often called “**hallucinations.**”
- **Our NDT AI model** is a specialized image-analysis system trained to recognize patterns associated with defined indications in digital X-ray images.

How our NDT AI behaves: Focused image analysis, not content generation

- The model analyzes the X-ray image provided.
- It identifies image patterns that may indicate a relevant condition.
- It returns an assessment, such as a classification, detection, or confidence score.
- It does not create information or explanations in the way generative AI does.

Important distinction:

While it does not hallucinate in the generative-AI sense, it can still produce **false positives or false negatives**. Results should therefore be used as part of a validated inspection workflow and, where required, reviewed by a qualified inspector.



Core Technology and AI Capability



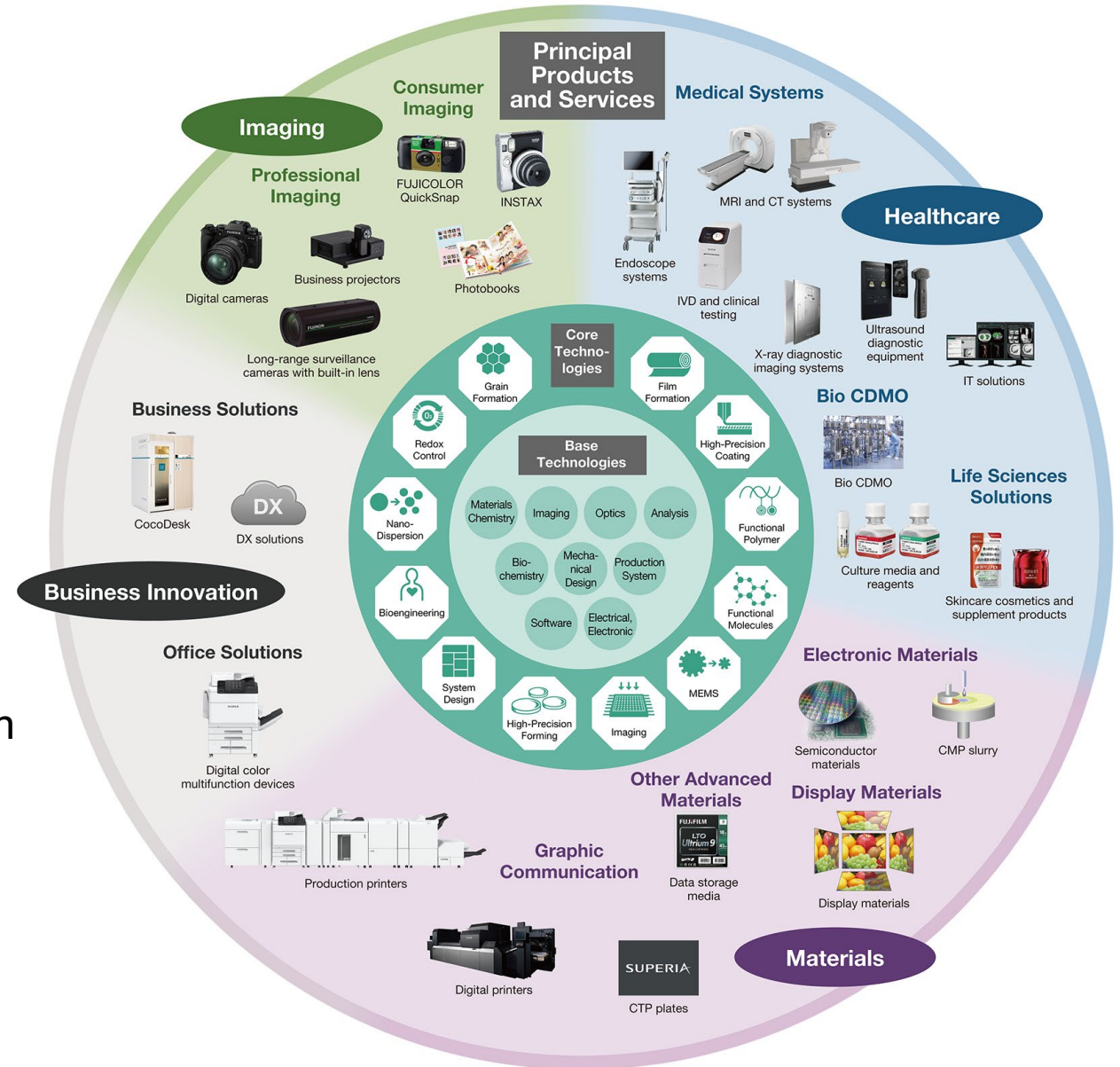
01

Core Technology

First: A short summary of our company's evolution, before demonstrating NDT applications.

We provide a wide range of products and services through a combination of “core technologies.”

At the heart of these, photography-related technologies are fundamental to the solutions in NDT.



Core Technology | Photographs

Photography is a mixture of technologies.

The process to capture a single photograph utilizes a wide range of advanced technologies. Our technical capabilities were cultivated through the R&D of photography.

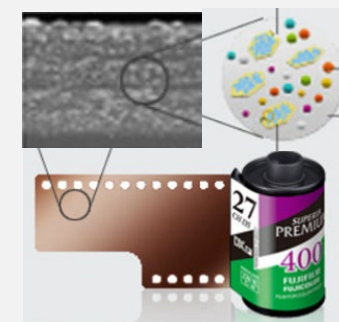
1. Photography with Cameras

Hardware with high-quality lenses, software systems for precise camera control



2. Recording on Film

Coating on films with a micrometer-level thickness to form a uniform layered structure



3. Photo Developing System

Advanced system for exact control of photo developing



4. Printing - Photos and Albums

Meticulous control of chemical reactions for high color replicability and printing durability

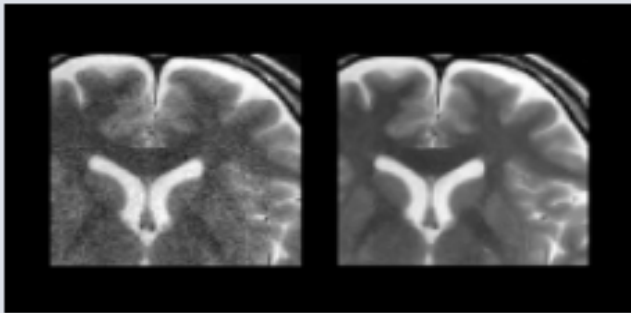


Medical AI

Medical AI is a collective of AI technologies, creating new values in collaboration with AI and humans. It was originally launched to solve medical challenges but has numerous capabilities applicable to NDT.

01

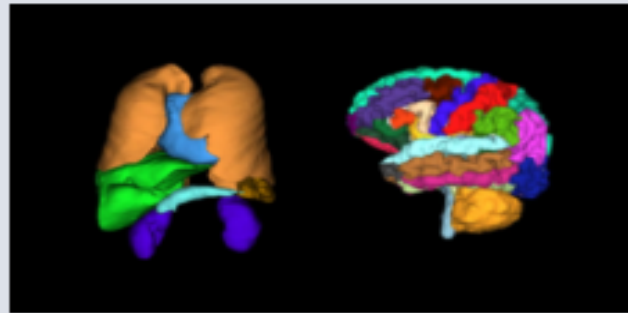
Image Enhancement



AI technology to achieve high image visibility while maintaining original textures, which is optimal for both diagnosis and AI utilization.

02

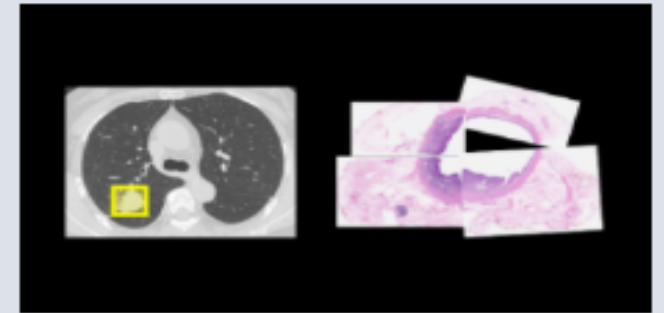
Segmentation & Labeling



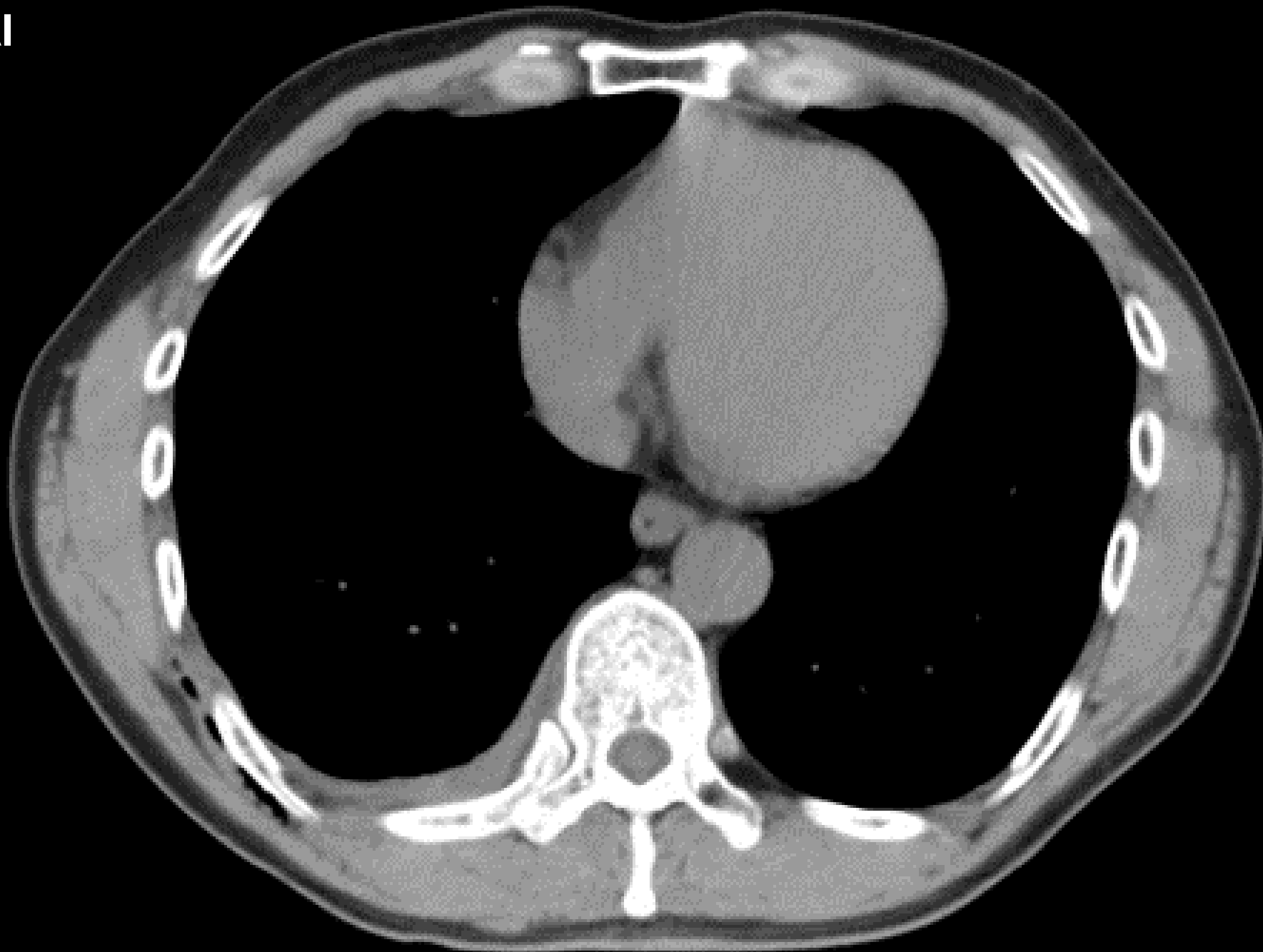
AI technology to accurately extract organs, regardless of deviations due to individual variations and imaging conditions.

03

Detection & Measurement



AI technology to automatically detect and quantify suspicious lesions in medical images.





AI Solution for the NDT Industry



02

Challenges in the NDT Industry



Labor shortage is a challenge in the NDT industry. The number of certified RT inspectors is declining, especially for Level 2 inspectors, showing a 14% decrease from 2017 to 2024 in Japan alone.

Meanwhile, demand for aircraft and energy is growing. There are increasing needs to reduce onsite workload by improving inspection efficiency.

AI technology can be utilized to solve these challenges.

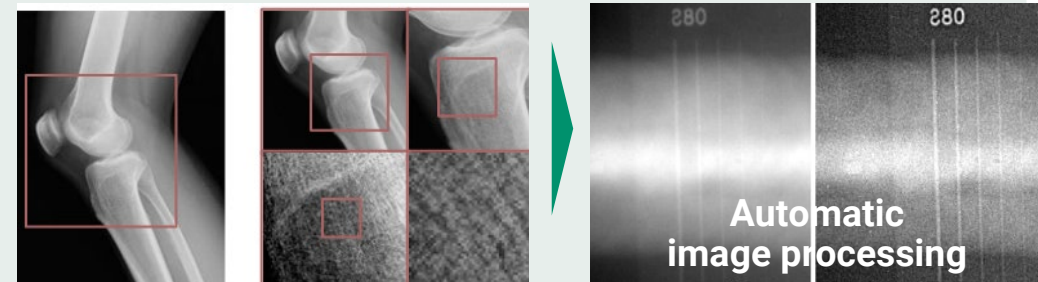
Application of Medical AI to NDT

To address these NDT challenges, Medical AI technologies can be applied since both fields share commonalities in the fundamental problematic structures to be inspected.

01. *Image Enhancement*

Enhancement of subject appearance of medical x-ray images utilizing multiple resolutions, facilitating diagnosis.

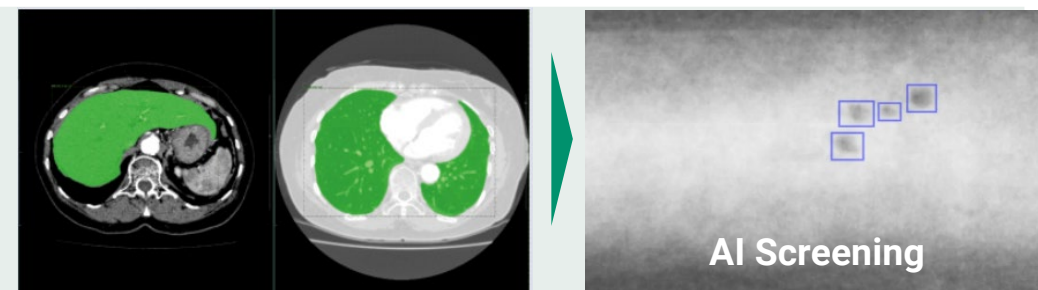
→ Image processing optimized for RT



02. *Segmentation & Labeling*

Segmentation of organ/bone structures in CT images, enabling anatomical analysis like assigning “bone numbers.”

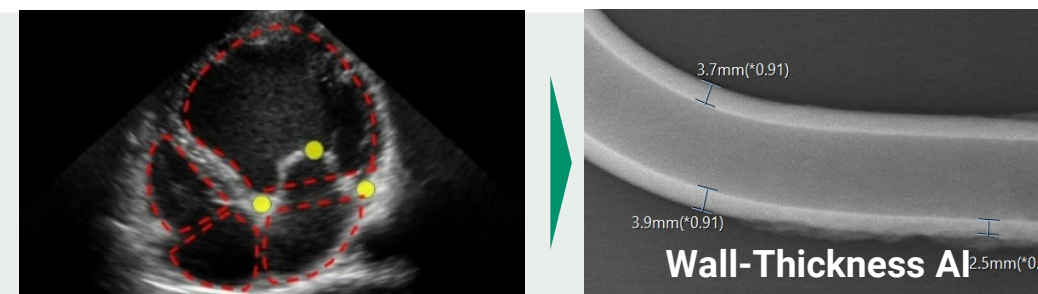
→ Detection of defects in welding/casting



03. *Detection & Measurement*

Automatic recognition of the heart and surrounding organs, enabling capacity measurements and function estimations.

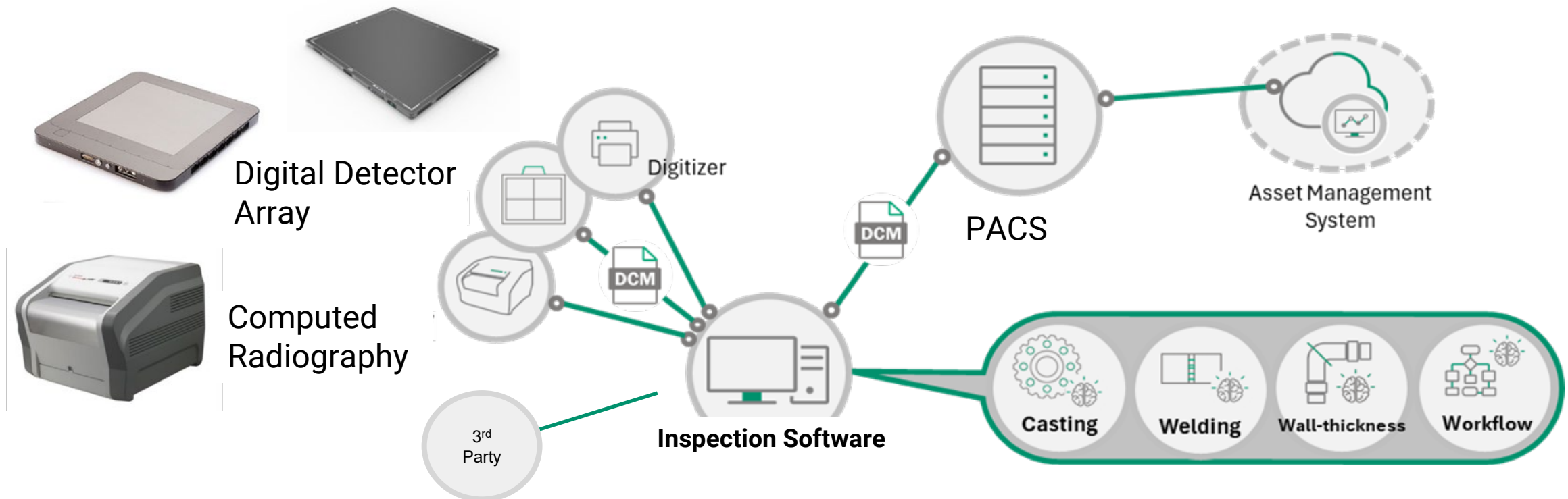
→ Recognition of pipe boundaries



Inspection Software with AI Overview

Inspection software should offer superior image processing, annotation, and measurement tools, and support improved inspection workflow.

- DICOM format enables vendor-independent inspection.
- AI-powered tools are typically available as additional functions:
 - AI Screening for defect detection on welds and castings.
 - Wall Thickness AI to measure and detect corrosion and erosion.





AI Screening for Welds and Castings



03

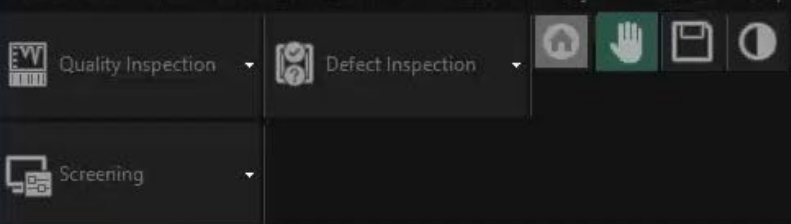
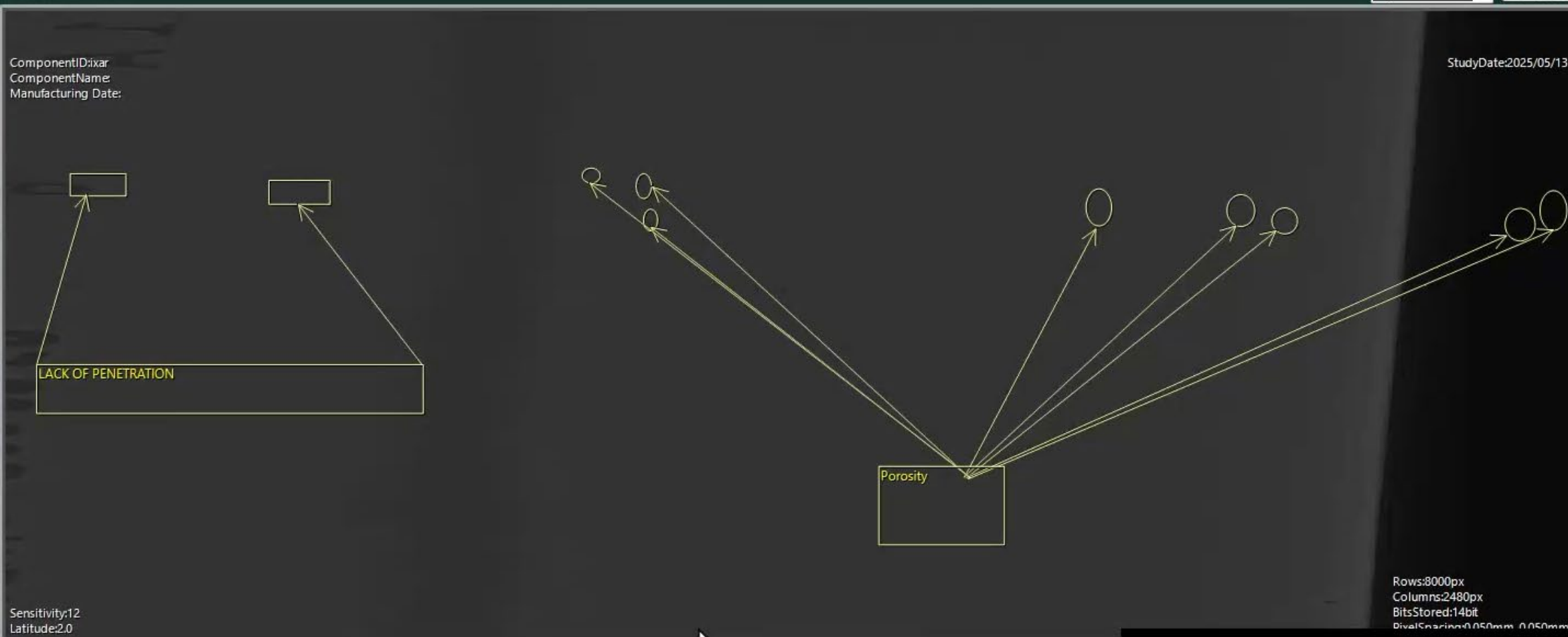


Image 2025-05-13 0001



AI Screening for Welds | Support for Disposition

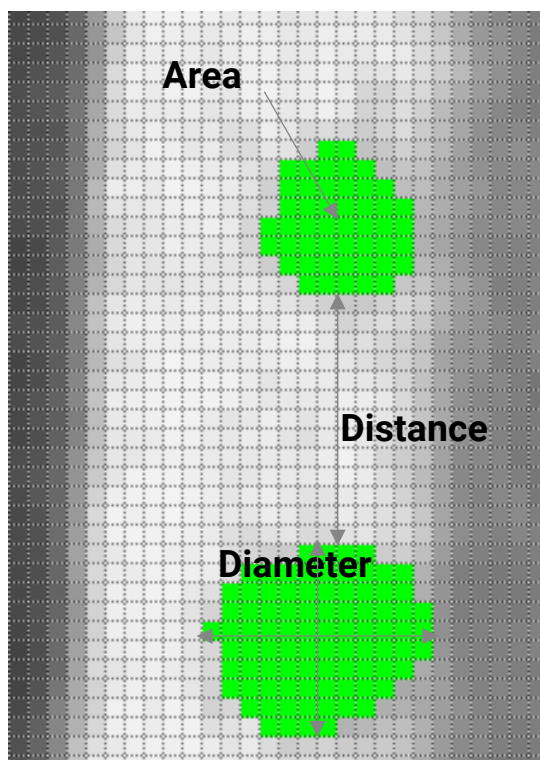
Within the software, AI Screening results can be displayed as rectangular annotations over images. The internal processing of AI Screening uses pixel-wise information of the detected indications.

→ Detailed measurements of each indication can be displayed in a list.

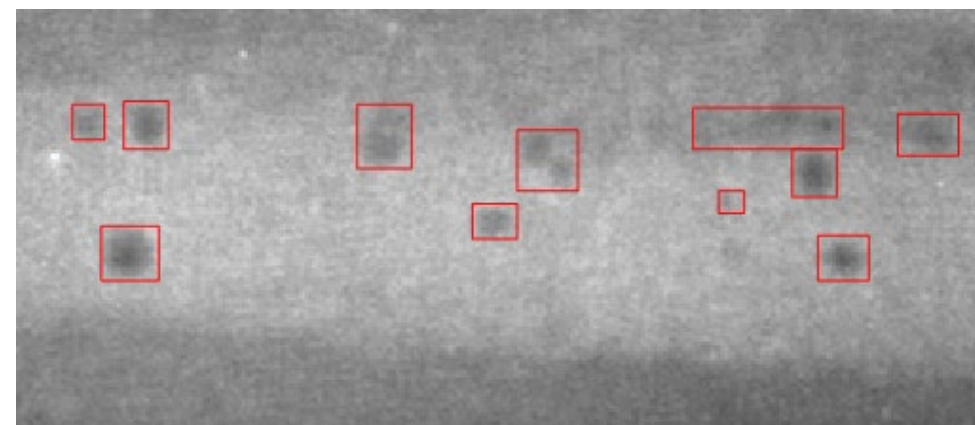
- Position (X,Y coordinate)
- Max length (diameter)
- Area
- Pixel Value (PV) mean
- Distance between indications
- Total number of indications

Filtering can be applied to the results based on the values above, making the inspection easier.

The results may also be helpful in judging acceptable/rejectable indications based on criteria.



Start X	Start Y	Max Length	PV mean
1062	762	2.20	16383
1310	3137	2.12	12505
1477	390	2.00	16383
1274	3462	1.80	12609
786	2924	1.74	13188



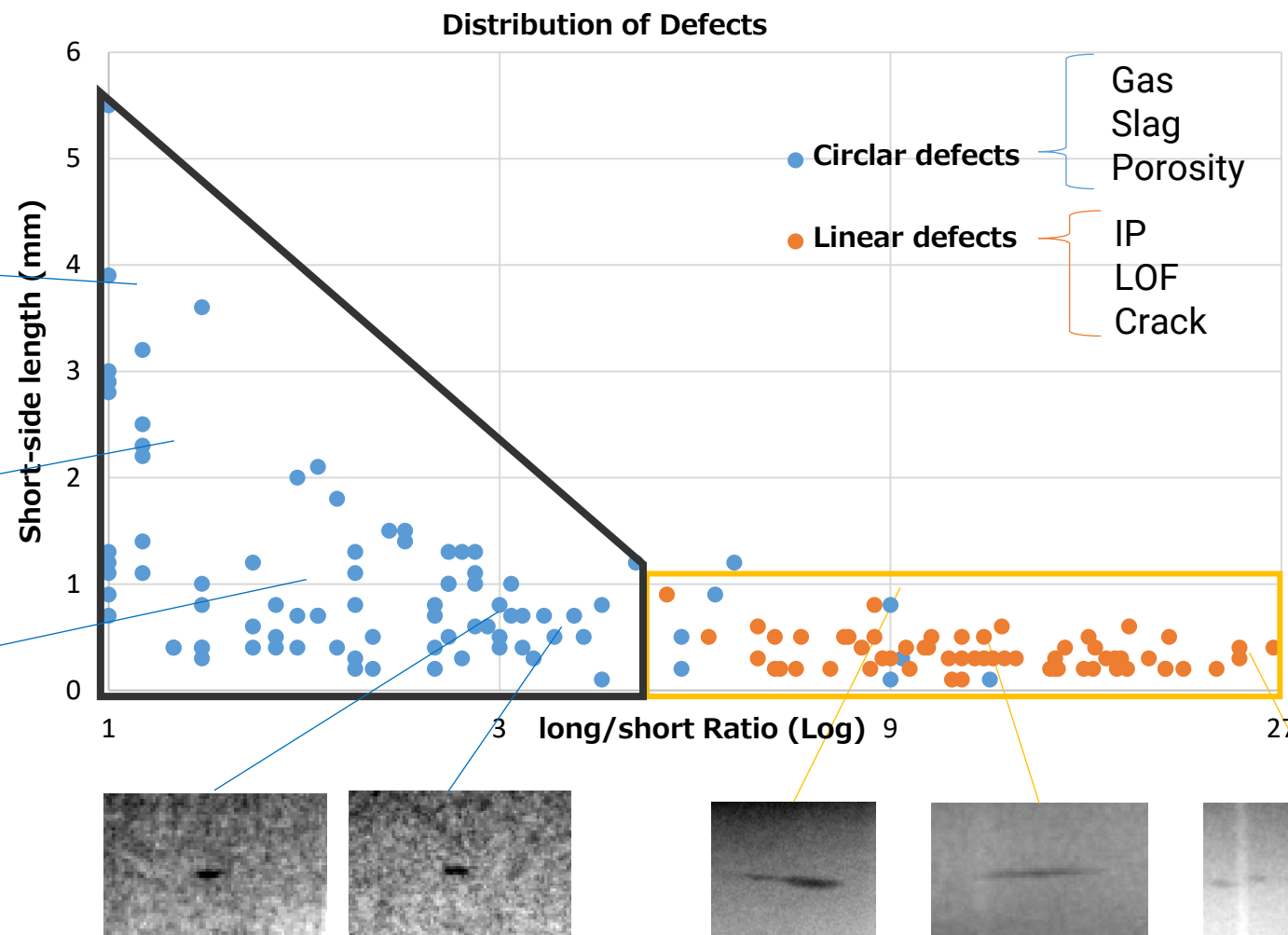
AI Screening for Welds | Training Data

Developing AI models requires a large amount of training data (i.e., defect images).

Simultaneously, it is important that the training data has appropriate variations of defects.

It is important to collect various defect data including both the commonly seen circular-shaped defects (Gas, Porosity) and the relatively rare linear-shaped defects (IP, LOF).

A strong dataset will help produce a robust AI model and contribute to a better true positive rate.



AI Screening for Welds | Results - Summary

We have evaluated AI performance on several different parts.

→ True-Positive Rate, or TPR, measured against on-site data, is listed.

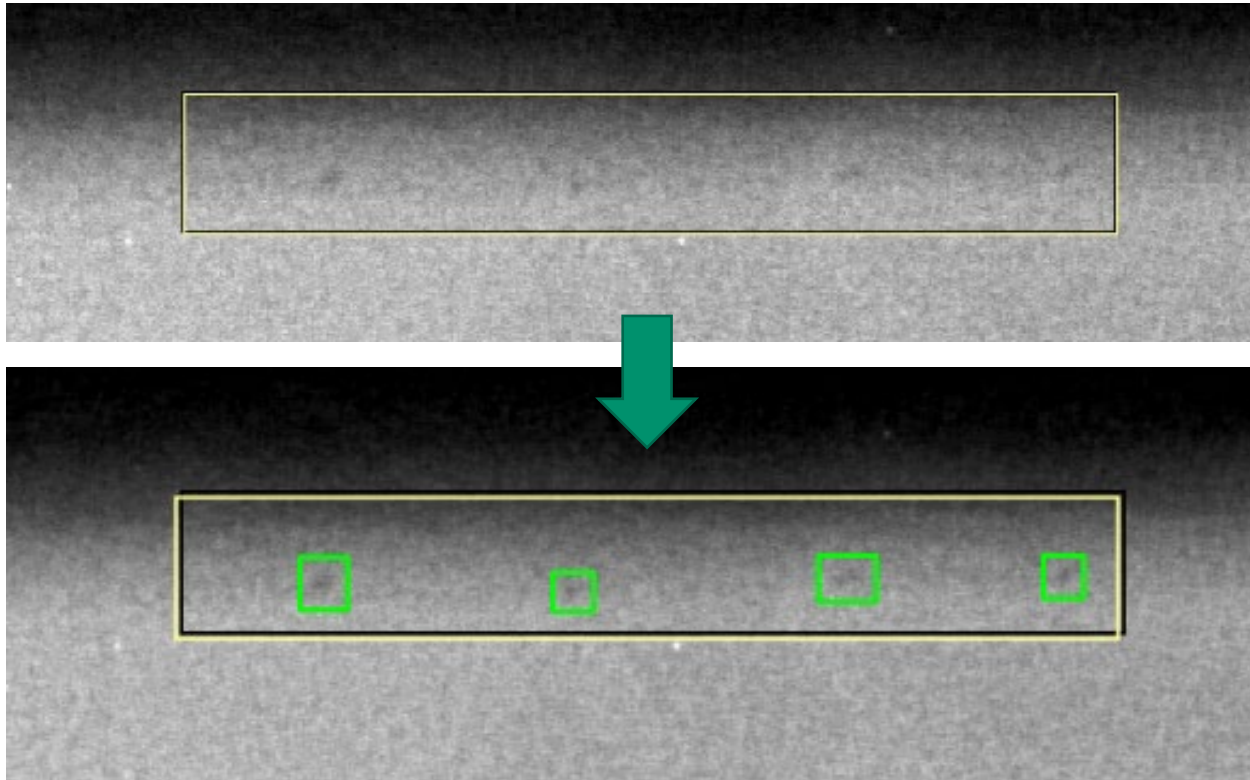
Stable performance showed the AI is functional even in “blind” conditions.

Inspection Obj.	Target Defect	TPR	Evaluation Conditions
EBW (Titanium)	Porosity (Φ: 0.2mm to 1.0mm, or 0.008” to 0.040”)	92% (62/67)	The AI was installed on-site and has had stable performance for more than 3 years .
Pipe Welds (Steel)	Slag Inclusion (Φ: 0.5mm to 50mm, or 0.020” to 2”)	90% (112/125)	Indications that appeared on site for more than 2 years are used as test data.
Wheel Welds (Steel)	Gas Holes (Φ: 0.5mm to 10mm, or 0.020” to 0.400”)	99% (140/141)	All the “blind” shots are evaluated.

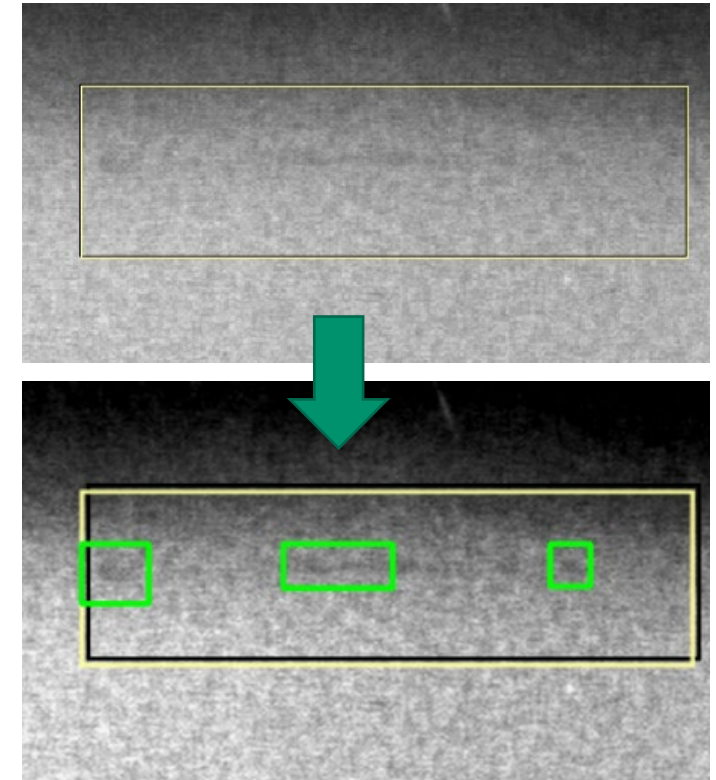
AI Screening | Results - Details

AI Screening can detect indications that are not easily identified by a conventional AI for a few reasons:

1) Dissimilar metal welds shows a steep gradient of PV across the welding direction, making it harder to see defects.



2) Linear-shaped indication training data is difficult to obtain due to lower appearance rates.



→ Focusing on these challenges early on and enriching the training dataset over time can lead to improved AI performance.

AI Screening for Castings

- FUJIFILM has collaborated with multiple aerospace casting manufacturers, primarily in North America, to collect and evaluate production inspection data.
- The AI Screening for Castings model has been trained and validated using **more than 1,600 real-world aerospace casting defects** collected from production environments.
- Overall detection performance **exceeded 90% TPR** across the evaluated aerospace casting datasets.



Wall Thickness AI



04

Recently studies - Viewimage - Dynamlx

File

Edit

View

Function

Annotation

Measure

Layout

Toolbar

Help

WallThickness AI

Quality Inspection

Defect Inspection

Report

Print

Undo

Home

Save

Help

TP^2 JH-DAG 2011/03/15 1001

1 * 1

ComponentID:JH-DAG
ComponentName:TP^2
Manufacturing Date:

StudyDate:2011/03/15

Sensitivity:121
Latitude:1.7

Rows:4280px
Columns:3520px
BitsStored:12bit
PixelSpacing:0.100mm, 0.100mm

Panning

GA/GS

Select

Image Adjust

Annotation

Measure

WallThickness

Rotate & flip

View

Zoom

File Header

Image Layout

Series Layout

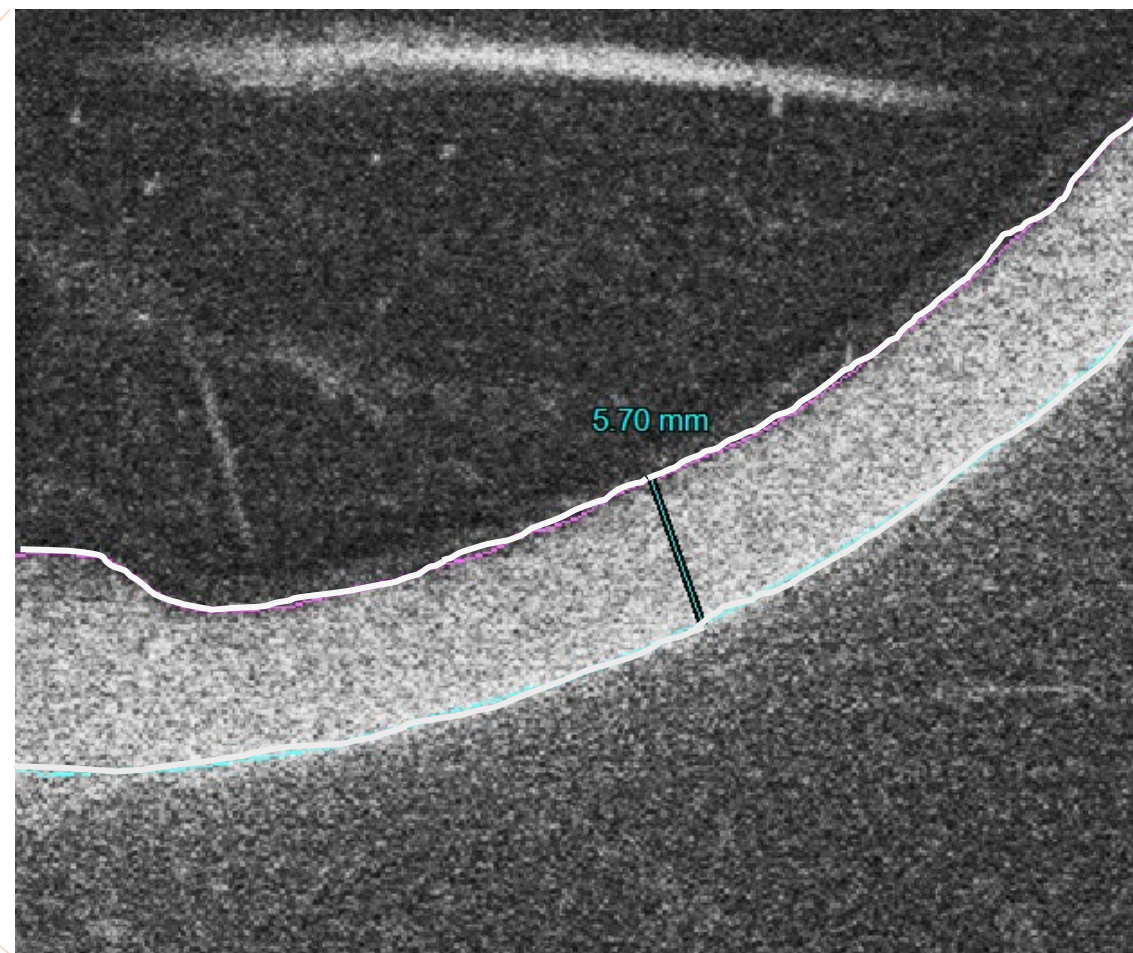
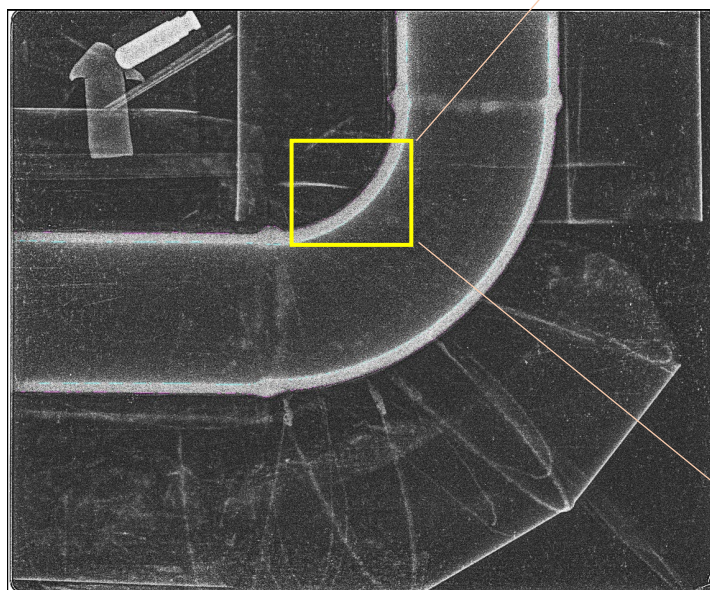
Right-click to open IME options

Zoom rate 25.73% ☐ Processed None

Wall Thickness AI | Algorithm

How AI identifies corrosion:

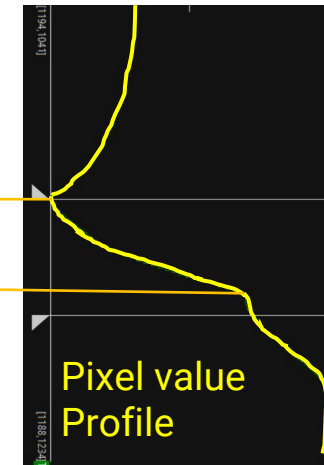
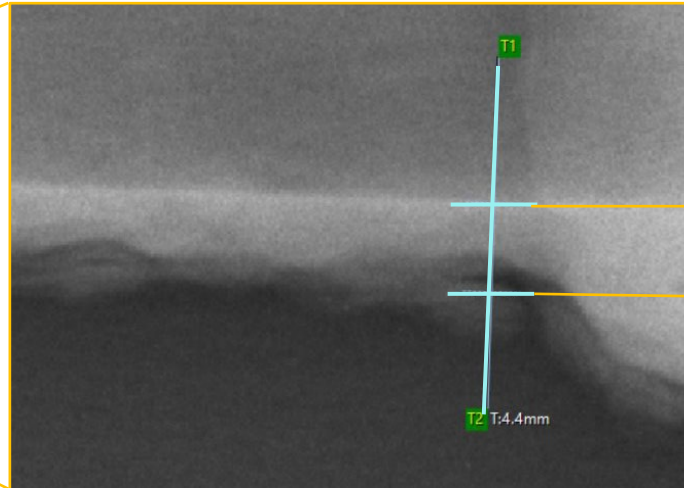
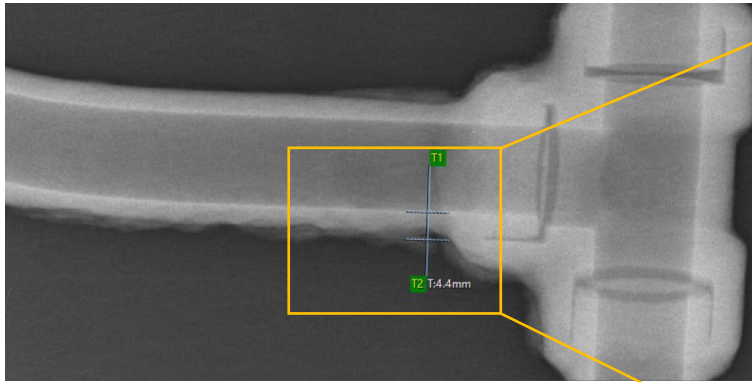
1. Detect the boundaries of the pipe walls
2. Calculate the distance between the inner and outer edges.
3. Identify the thinnest pipe wall section.



To ensure consistency of the boundary training dataset for AI, image processing technology is utilized, making it easier for annotators to clearly identify the pipe wall edges.

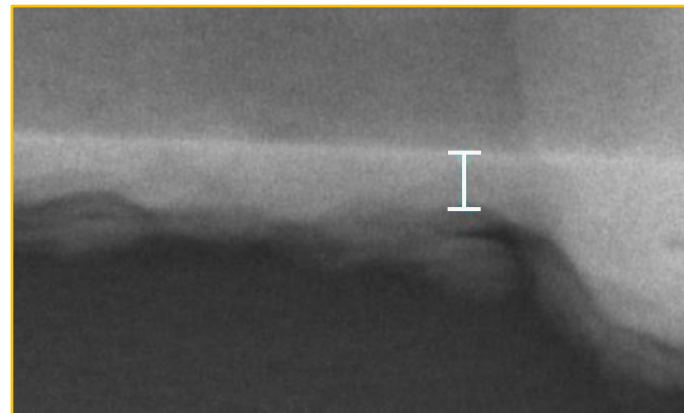
Wall Thickness AI | Robustness

The **conventional method** to automatically measure wall thickness based on pixel value profiles seemed sufficient, but there are cases where it does not work well; e.g., results are erratic when the surface of pipe is surrounded with severe irregularities.



There seems to be no “hint” in the profile to identify the “true” boundary

The **AI-based method** is more accurate in such cases since the AI not only refers to pixel values in nearby areas but judges the continuity of pipe wall boundaries with a broader field of view.



AI-based method can use the broader area to identify a reasonable boundary.

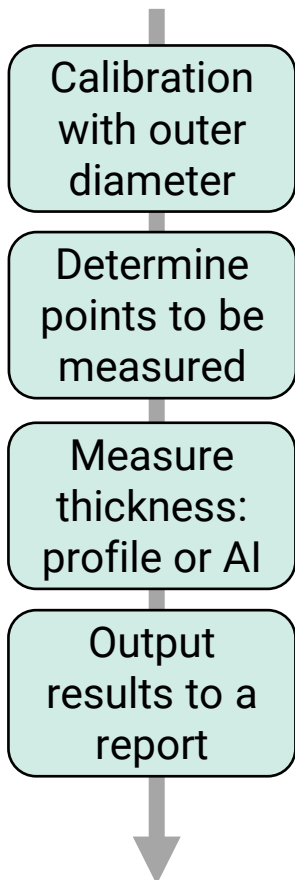
Wall Thickness AI | Effectiveness

Time-study and Efficacy trials were conducted. Results showed the wall thickness AI successfully reduced the inspection time and improved inspection accuracy.

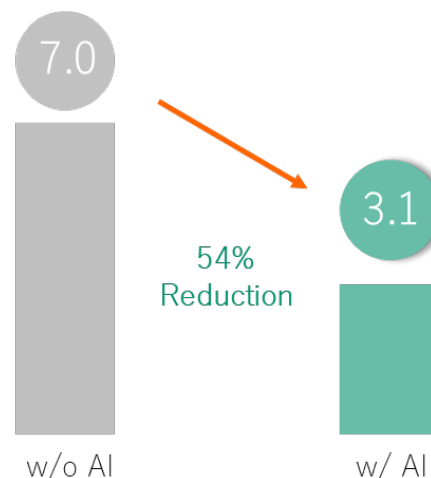
Inspection Workflow ⇒



Total 5 inspectors participated, each inspected 5 images both with/without AI.



Inspection Time
(Avg minutes/image)



Fluctuation of measured thickness
(standard deviation/results(mm))

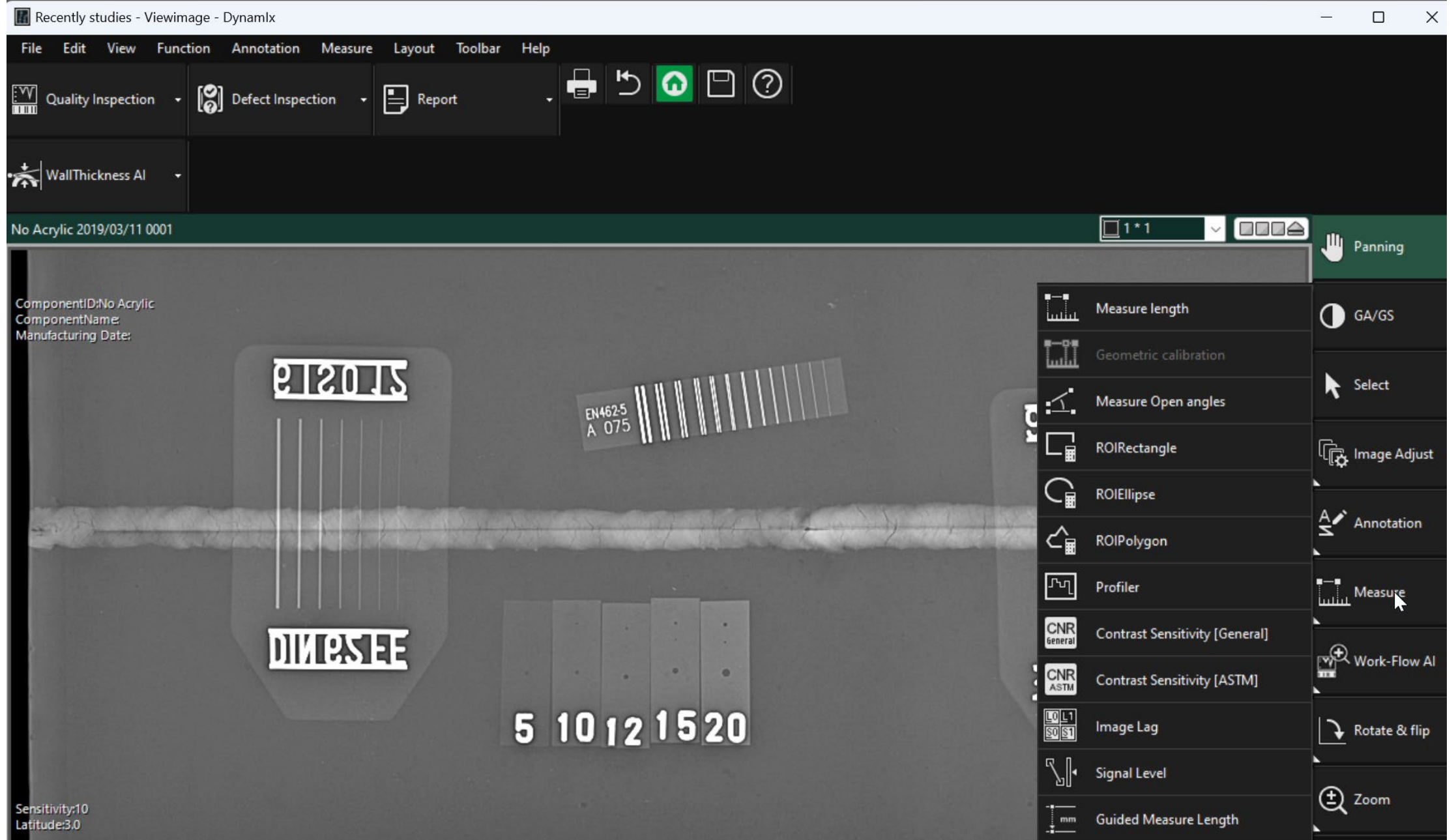




Workflow AI



05





Novel AI Solution & Future Steps



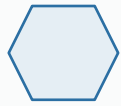
06

A Novel AI-assisted Approach to Detecting Water Intrusion in Honeycomb Structures

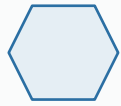
Typical applications of honeycomb structures



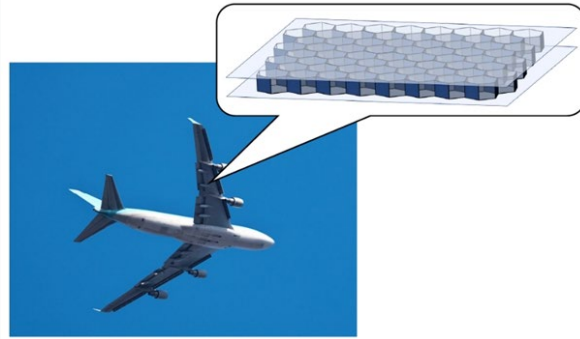
Wings



Fuselage



Helicopter rotor blades



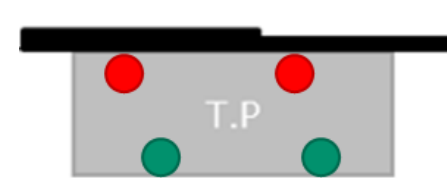
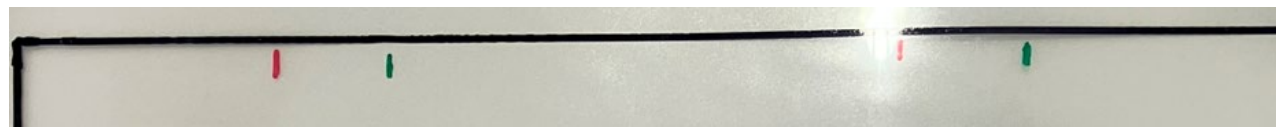
Water ingress may increase weight and contribute to corrosion or degradation of bonded areas. X-ray inspection is therefore performed during maintenance.

Current inspection process and challenges

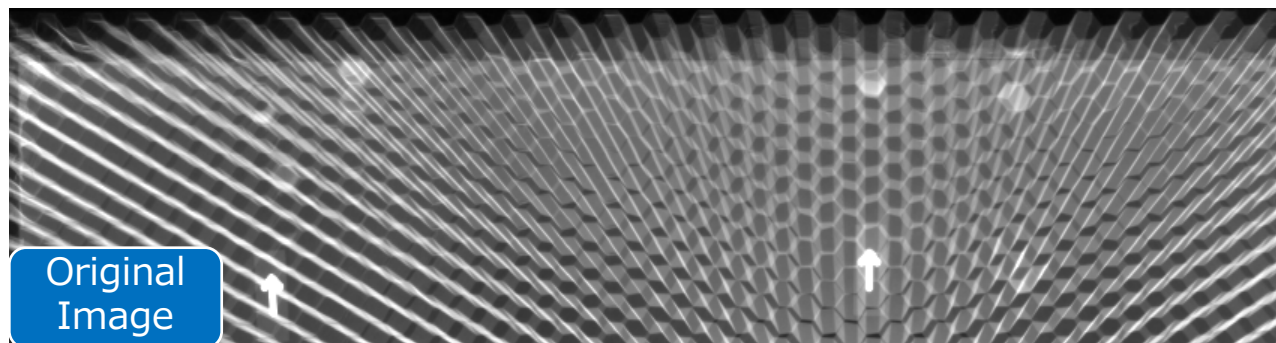
1. **X-ray imaging** – Visualize the internal honeycomb structure
2. **Inspection** – Identify cells that may contain water
3. **Detailed review** – Retake images of questionable areas and compare them with previous images, when available. This can make assessment time-consuming.

Goal: is it feasible to use an AI model to assist with detection of water intrusion?

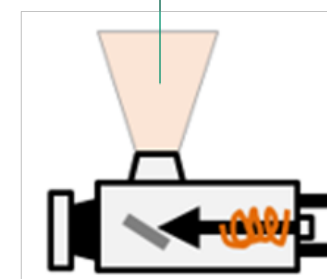
A Novel AI-assisted Approach to Detecting Water Intrusion in Honeycomb Structures



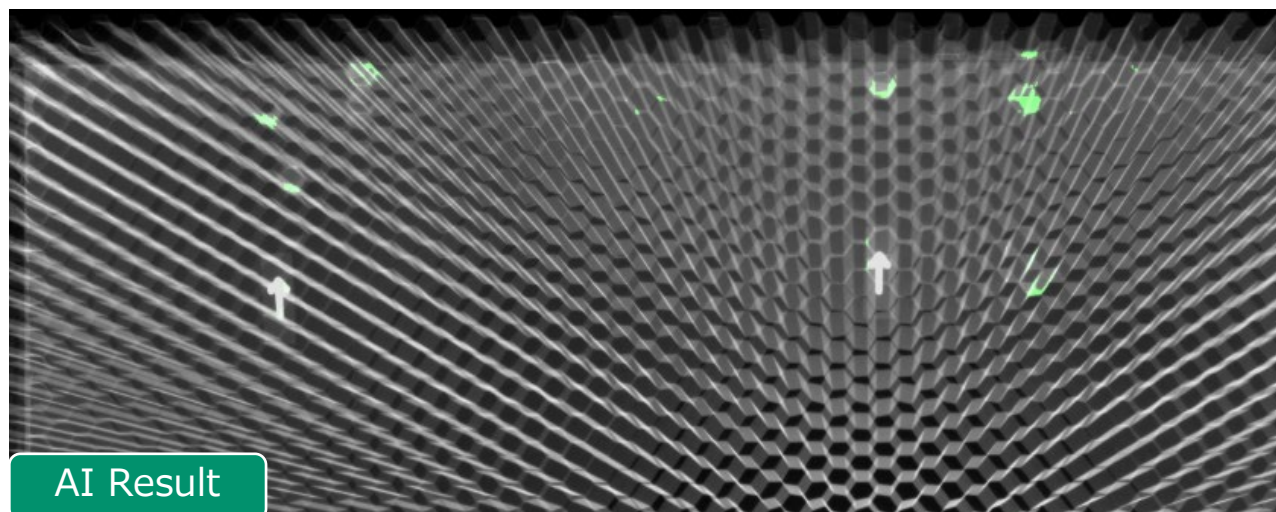
Red: Detector side
Green: X-ray source side



Original Image

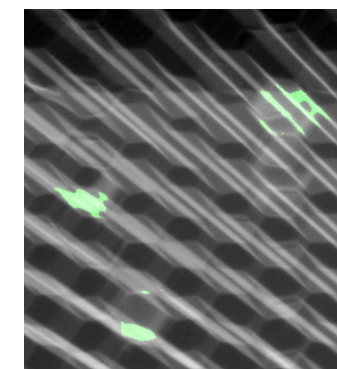
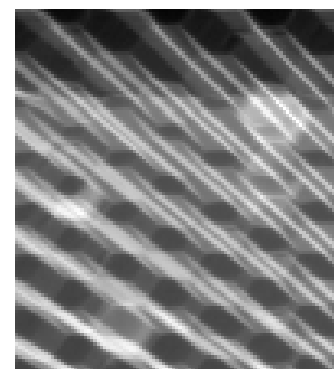


Test Piece example
Water introduced from the top



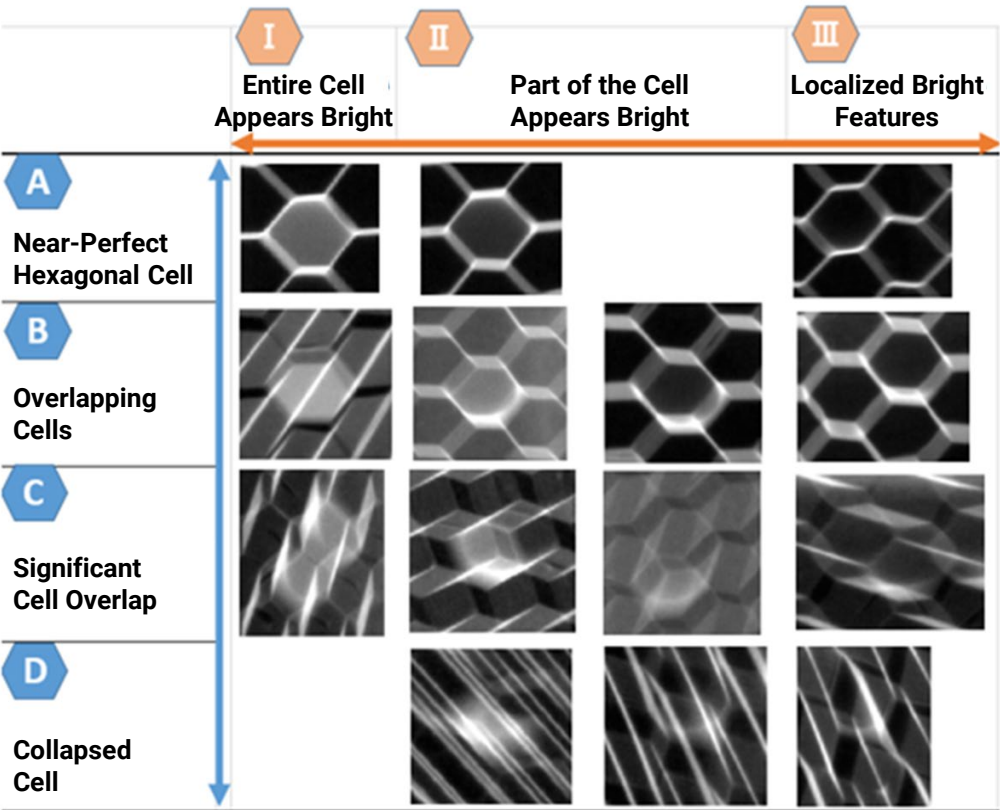
AI Result

Enlarged views:
Brightness and shape features associated with water were detected



A Novel AI-assisted Approach to Detecting Water Intrusion in Honeycomb Structures

- Cell appearance varies depending on X-ray geometry and the amount of water present
- True Positive Rate (TPR) for the most frequent Type II: 93%
- Overall TPR, excluding the extremely challenging Shape D: 89%



- Red:** TPR $\geq 90\%$ / **Blue:** TPR $\geq 80\%$
- TPR for Type II (58% of all samples): 93%
- Overall TPR excluding highly challenging Shape D: 89%

	Type I		Type II		Type III		Tot	
Cell Shape A	100%		89%		83%		87%	
	3	3	55	62	29	35	87	100
Cell Shape B	100%		95%		95%		95%	
	3	3	38	40	18	19	59	62
Cell Shape C	50%		96%		82%		87%	
	5	10	55	57	23	28	83	95
Cell Shape D	0%		100%		45%		54%	
	0	2	6	6	9	20	15	28
Tot	61%		93%		77%		86%	
	11	18	154	165	79	102	244	285

Future Steps

- Ensure compliance with relevant NDT standards, such as NAS410, ASTM, and ASME
 - Need for members to drive development of new standards
 - Update existing standards so that Level IIIs have a path forward
- Continue exploring and testing advanced AI models for novel applications
 - Report writing by agentic AI
 - Understanding standards enough to warn user if incorrect technique/IQIs are used
- Continuous validation of models with real inspection data
 - Rare defect conditions are extremely valuable
 - Need equal parts testing and validation data
- Provide expert feedback loop during and after development phase
- Potential “bounty” programs for new manufacturing processes

Thank you!
Questions?



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