Artificial Intelligence in Medical Imaging

From Image Generation to Workflow Automation

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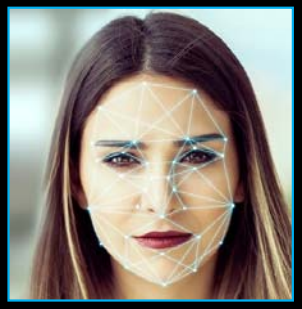
Deep Learning

Traditional Approach

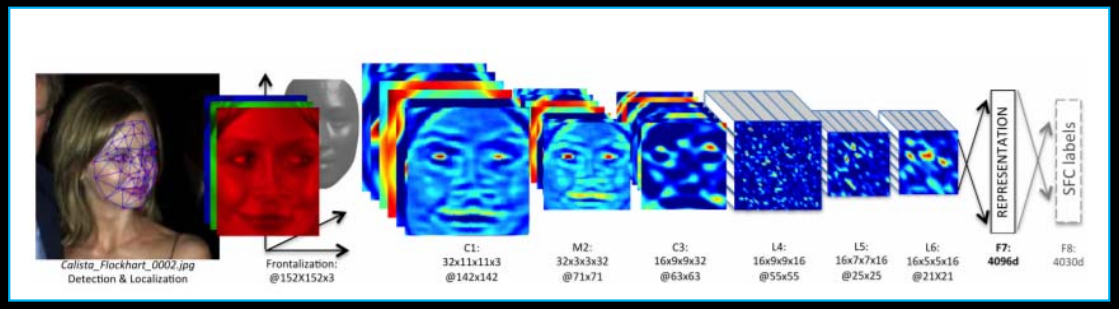
Manually designed features, e.g. distances between major landmarks



60%
success rate

Deep Learning Approach

Features are learned from training samples



>97%
success rate

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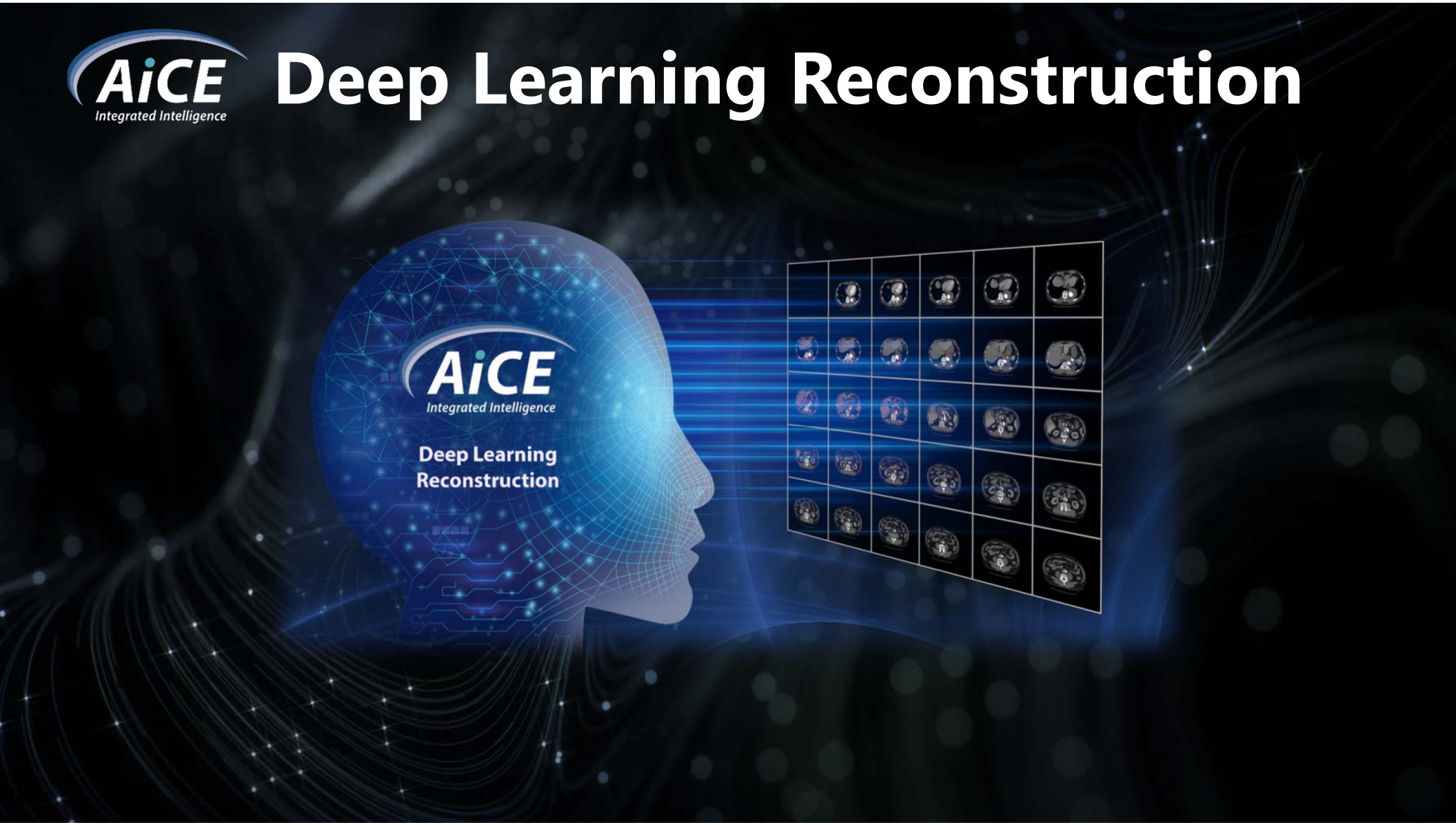
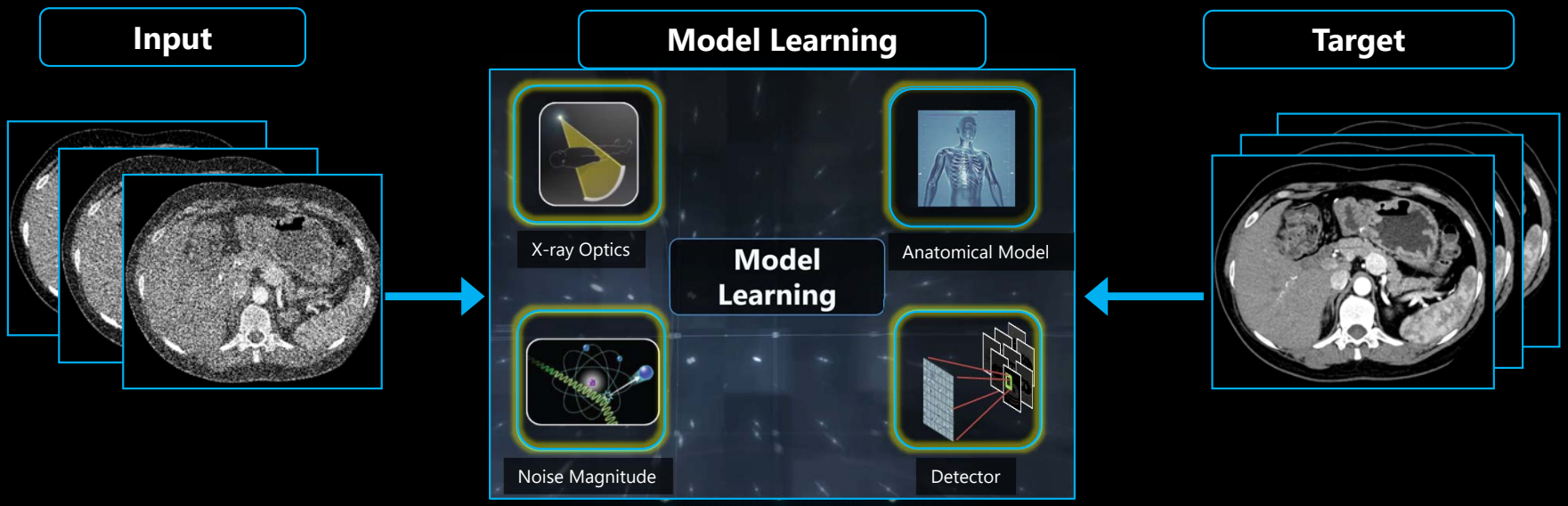
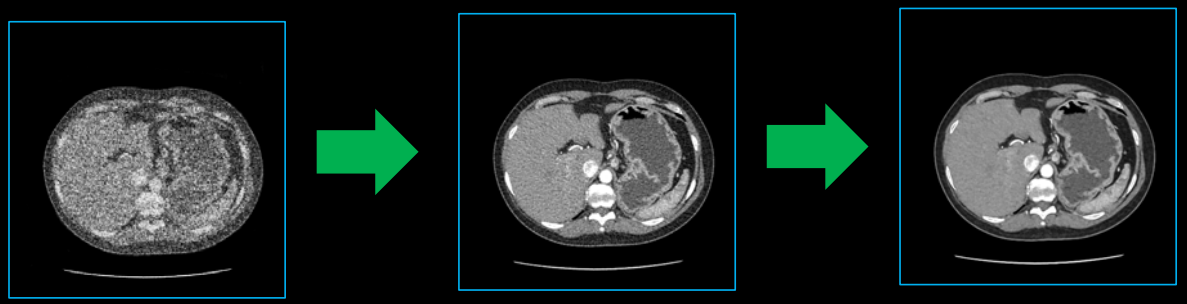
Deep Learning Reconstruction

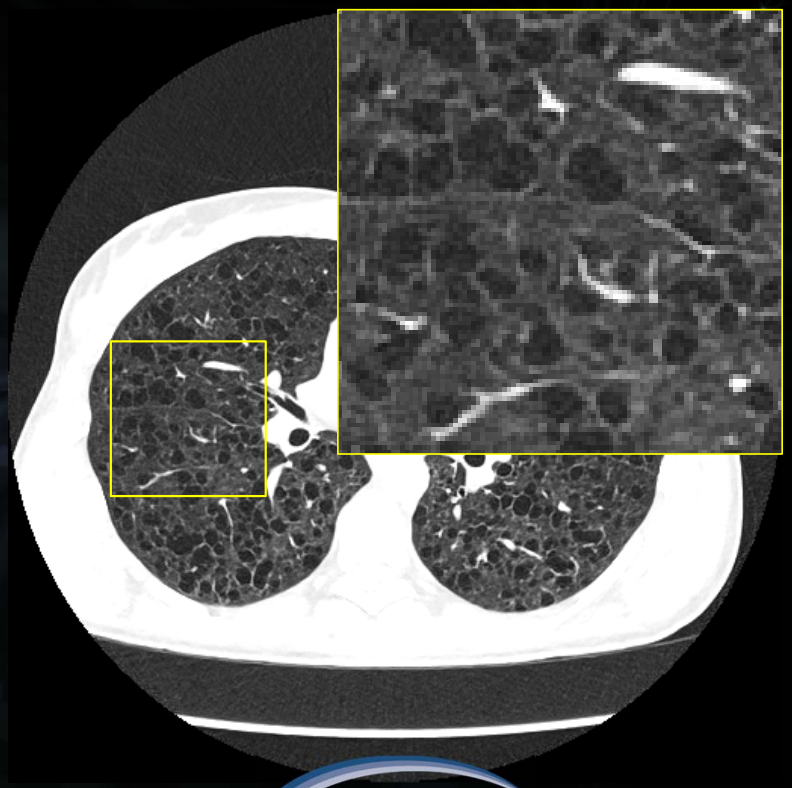


AiCE DLR Learns the System Model from MBIR





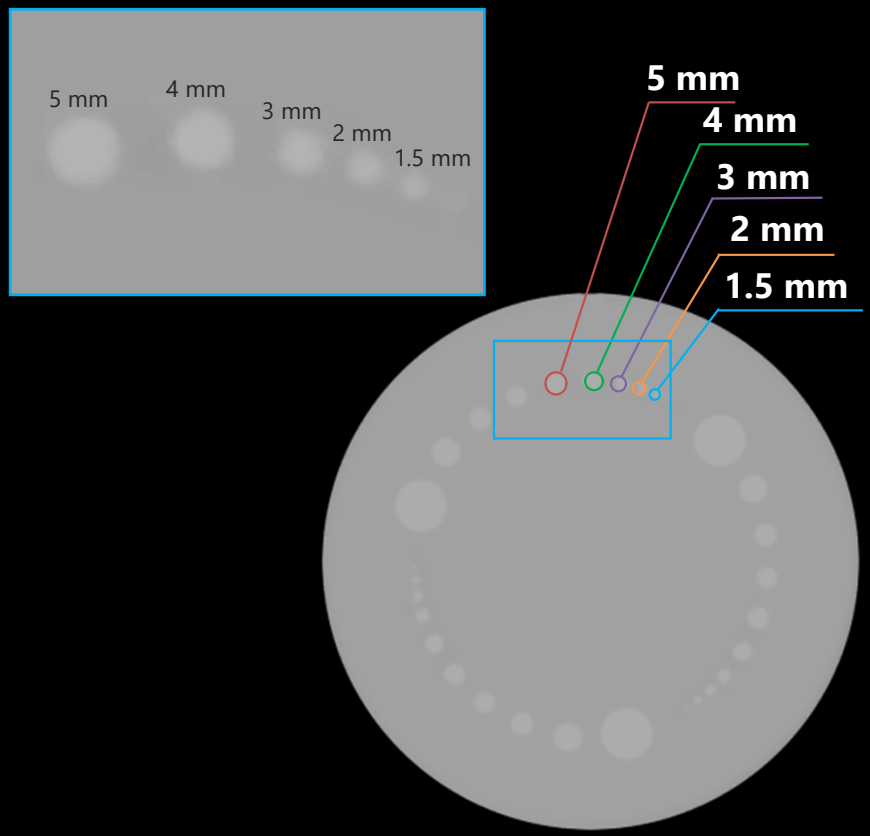
Hybrid IR



AiCE Integrated Intelligence

Image courtesy of National Institute of Health

Body, Lung, Cardiac

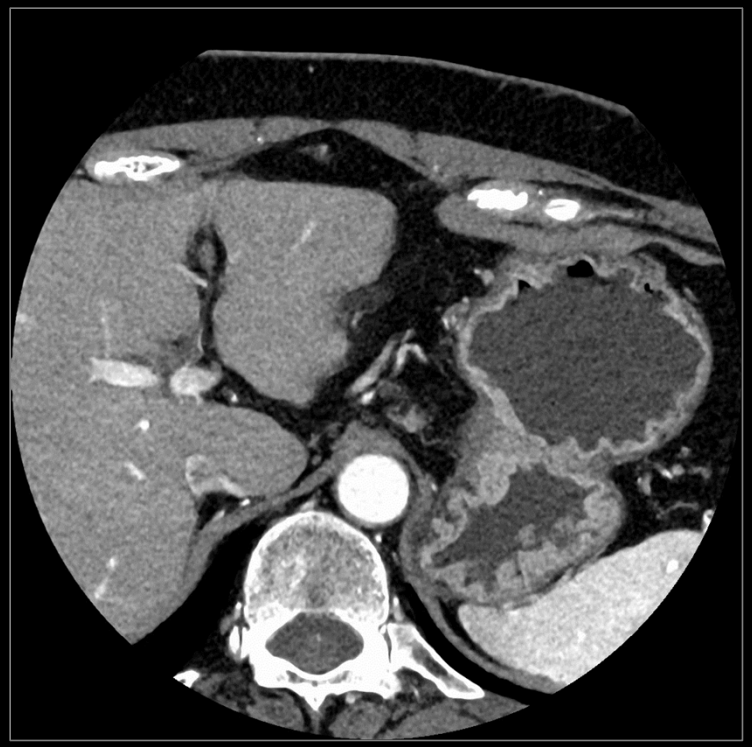


New Low Contrast Detectability

Object Size	CTDIvol
3 mm at 0.3%	5.3 mGy
2 mm at 0.3%	10.5 mGy
1.5 mm at 0.3%	22.6 mGy
Scan Parameters	
10 mm (with AiCE Body)	
Phantom	
(CTP344, Phantom Labs)	

Dose-Neutral Ultra-High Resolution

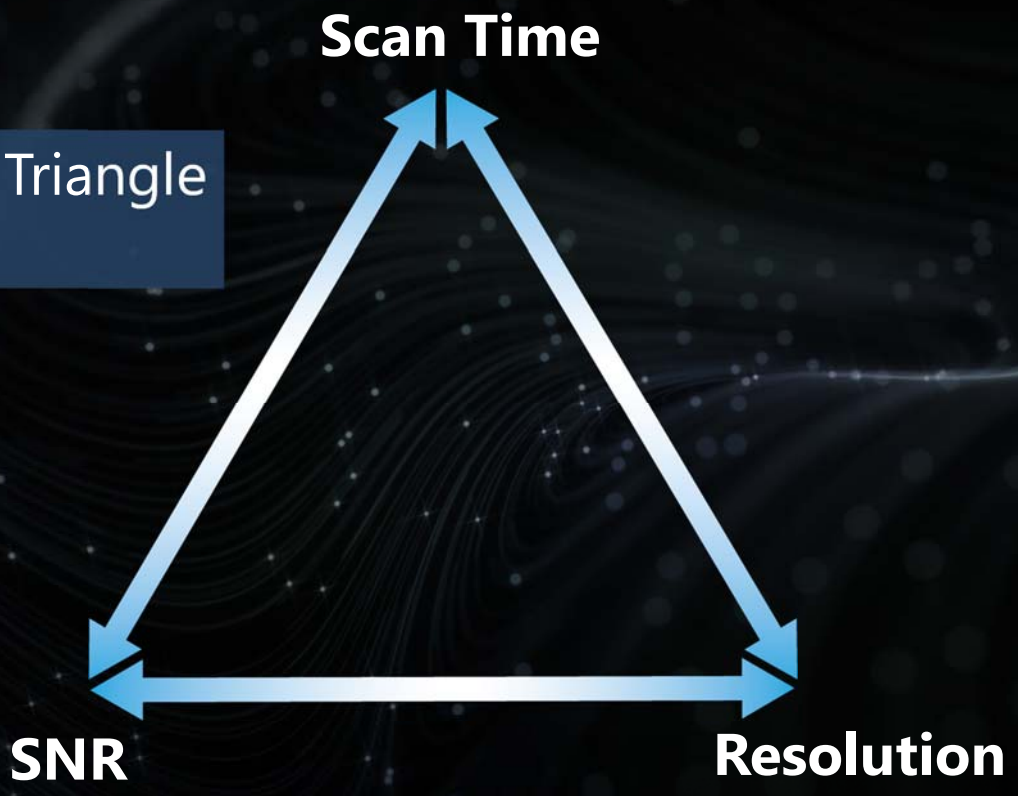
0.25 mm slice thickness,
CTDIvol: 10.2 mGy, DLP: 277.0 mGy·cm



Courtesy of National Cancer Center Hospital, Japan

The Tradeoff Triangle in MRI

Tradeoff Triangle at 1.5T



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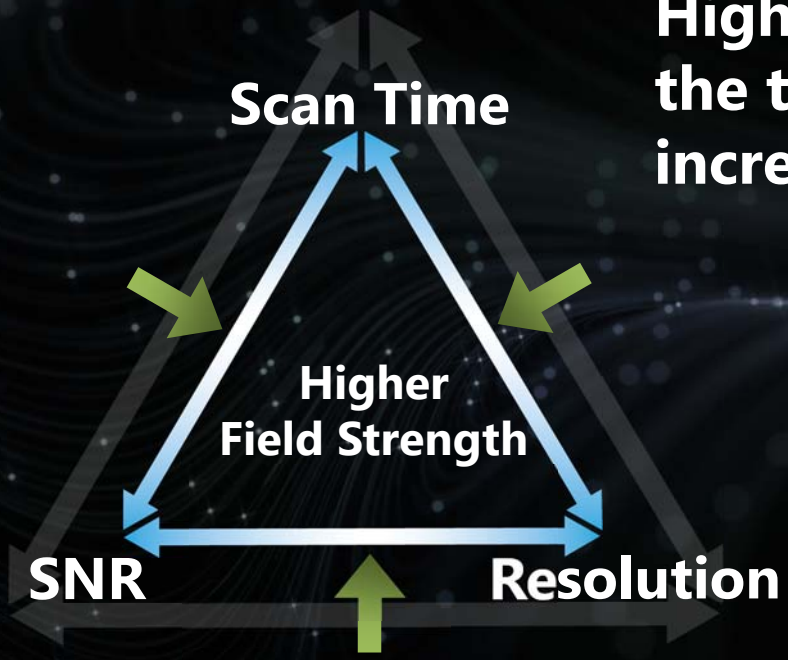
The Tradeoff Triangle in MRI



Higher field strength can reduce the triangular tradeoff, but increases

- equipment and operating cost
- safety risk due to higher heat deposition to the patient
- image artifacts due to higher field inhomogeneities

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MRI AiCE Integrated Intelligence

Tradeoff Triangle at Low Field with DLR

DLR may be able to alleviate the inherent and fundamental tradeoffs between SNR, scan time, and resolution without the challenges associated with higher field strength

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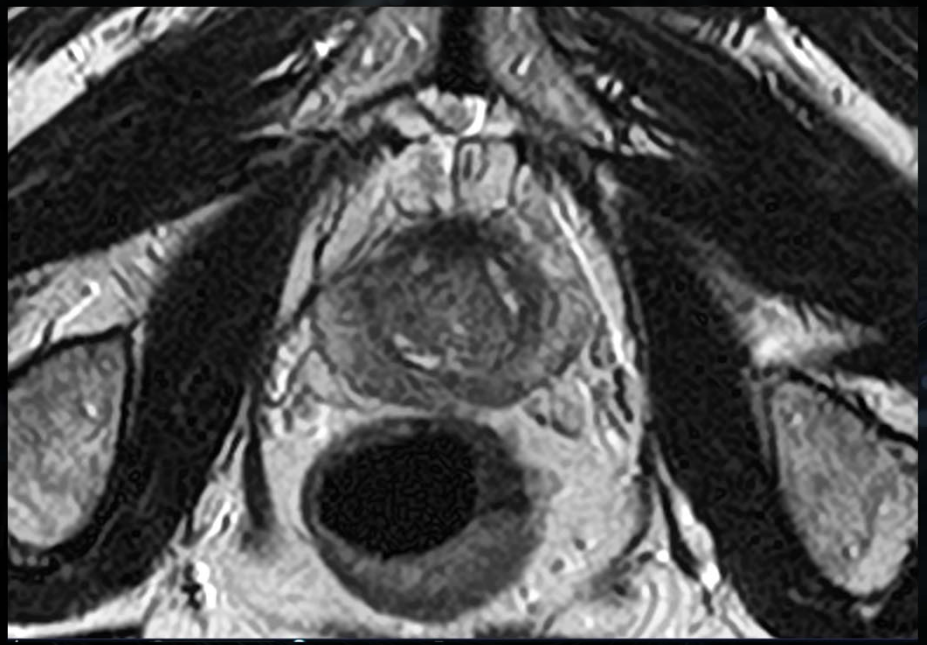
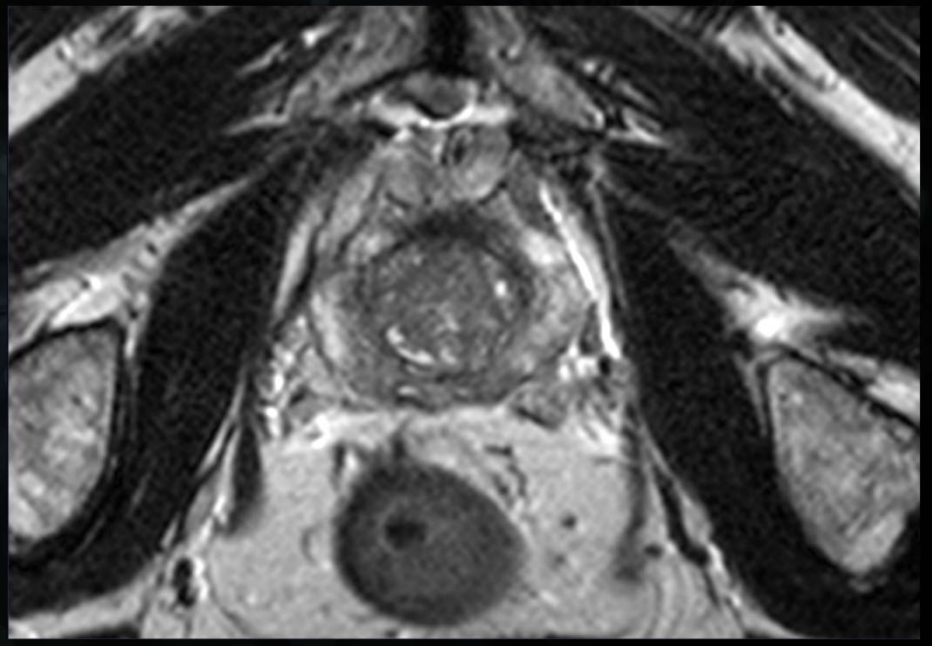
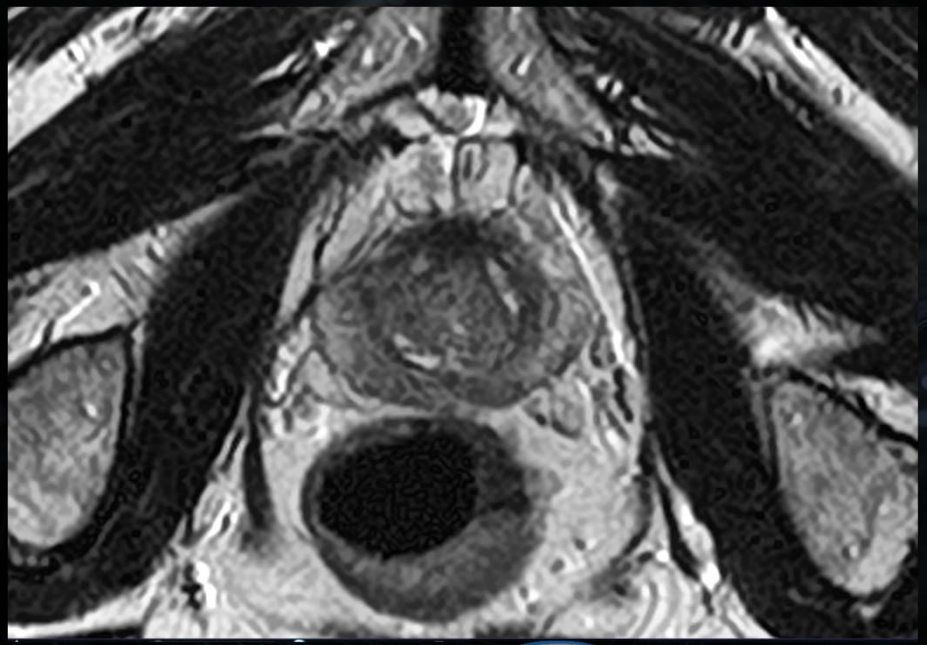
Challenge: Prostate

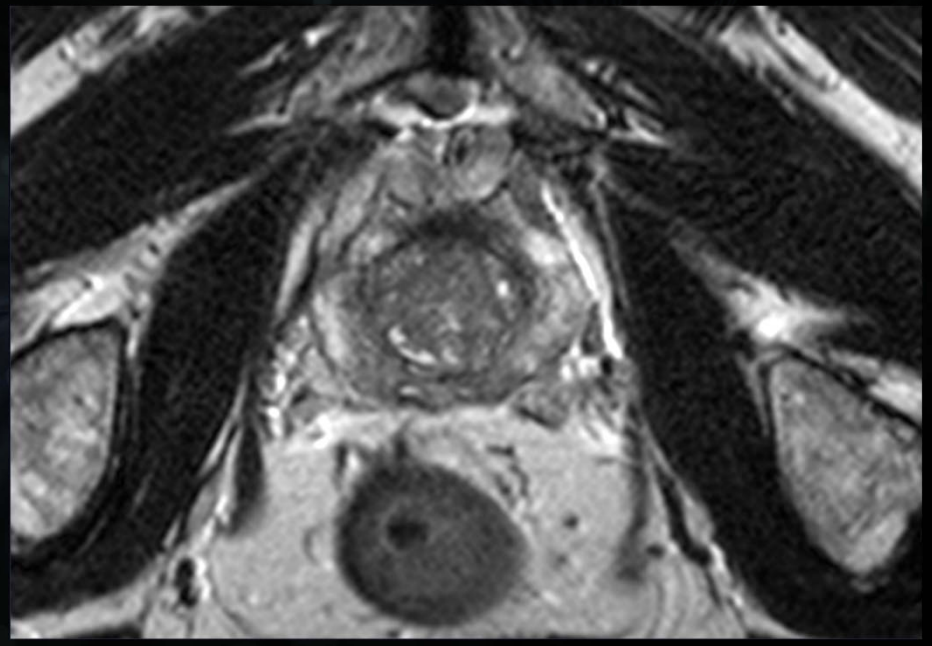




Challenge: Prostate



1.5T with AiCE Integrated Intelligence



3T

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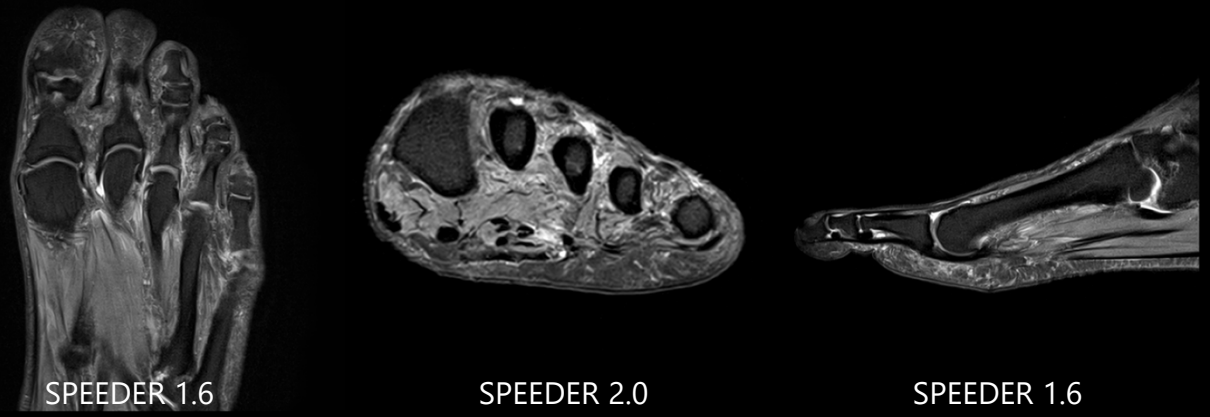
DLR and rapid scanning techniques

In combination with scan acceleration technologies like Compressed SPEEDER and Fast 3D, you have the ability to focus on fast scans and restore SNR by removing noise during image reconstruction

Conventional Imaging



SPEEDER 1.6
3:15

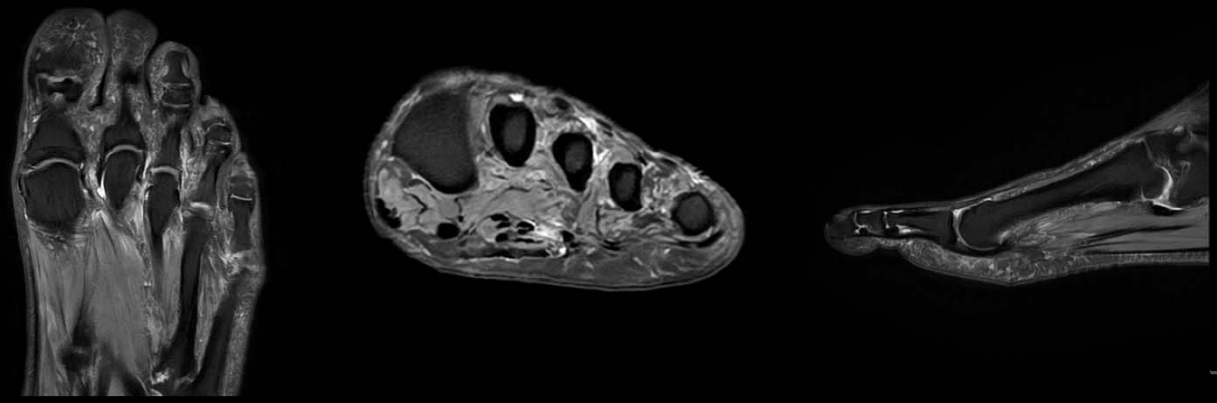
SPEEDER 2.0
3:24

SPEEDER 1.6
3:28

10:07

Compressed SPEEDER

AiCE Integrated Intelligence



Compressed SPEEDER 2.2
2:21

Compressed SPEEDER 2.0
3:08

Compressed SPEEDER 2.5
2:05

7:34

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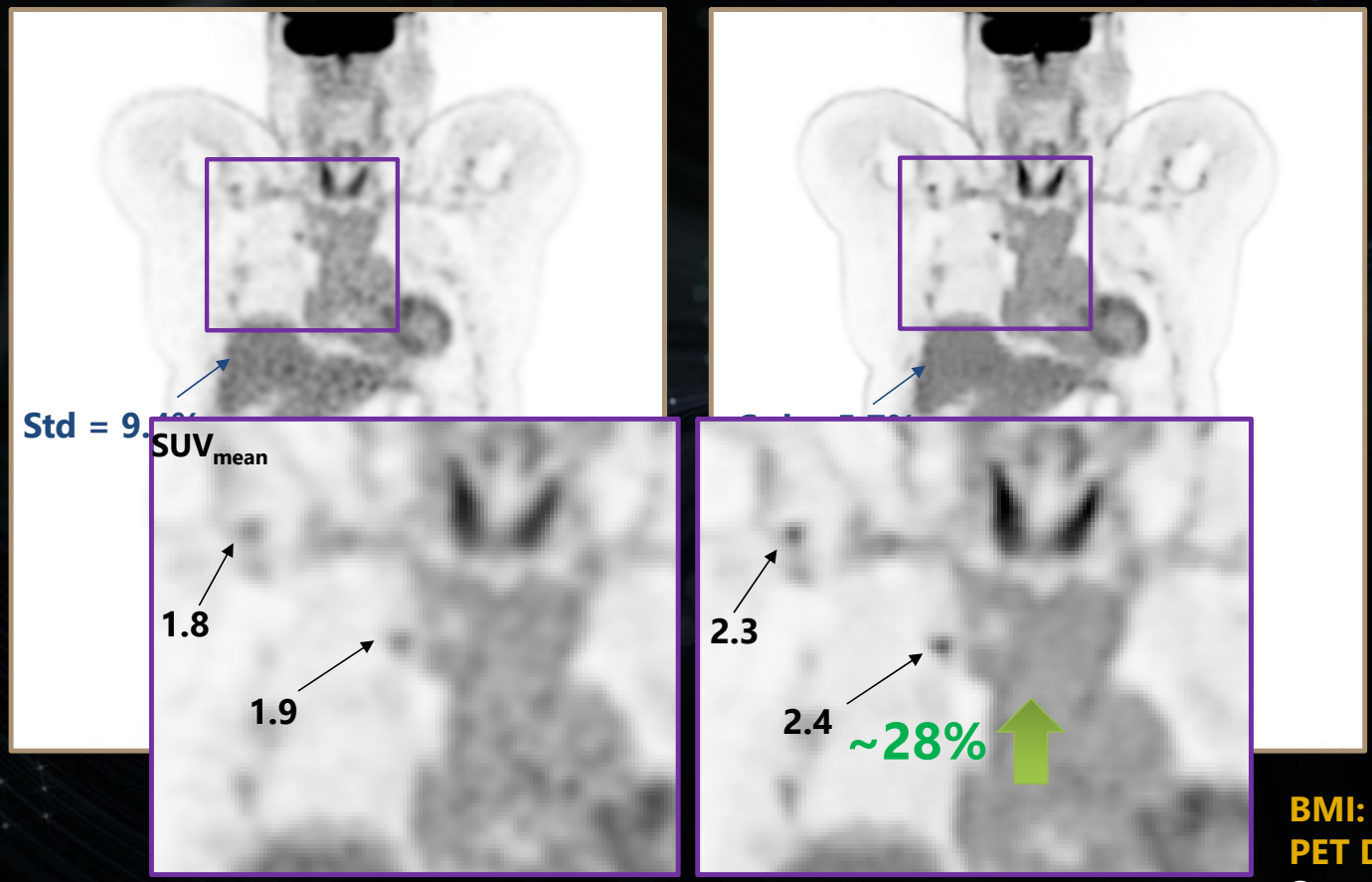
Note actual scan time reductions may vary by case

PET AiCE Integrated Intelligence

Cartesion Prime

OSEM + GF

DLR



BMI: 30
PET Dose: 7.7 mCi FDG
Scan time: 2-min /bed

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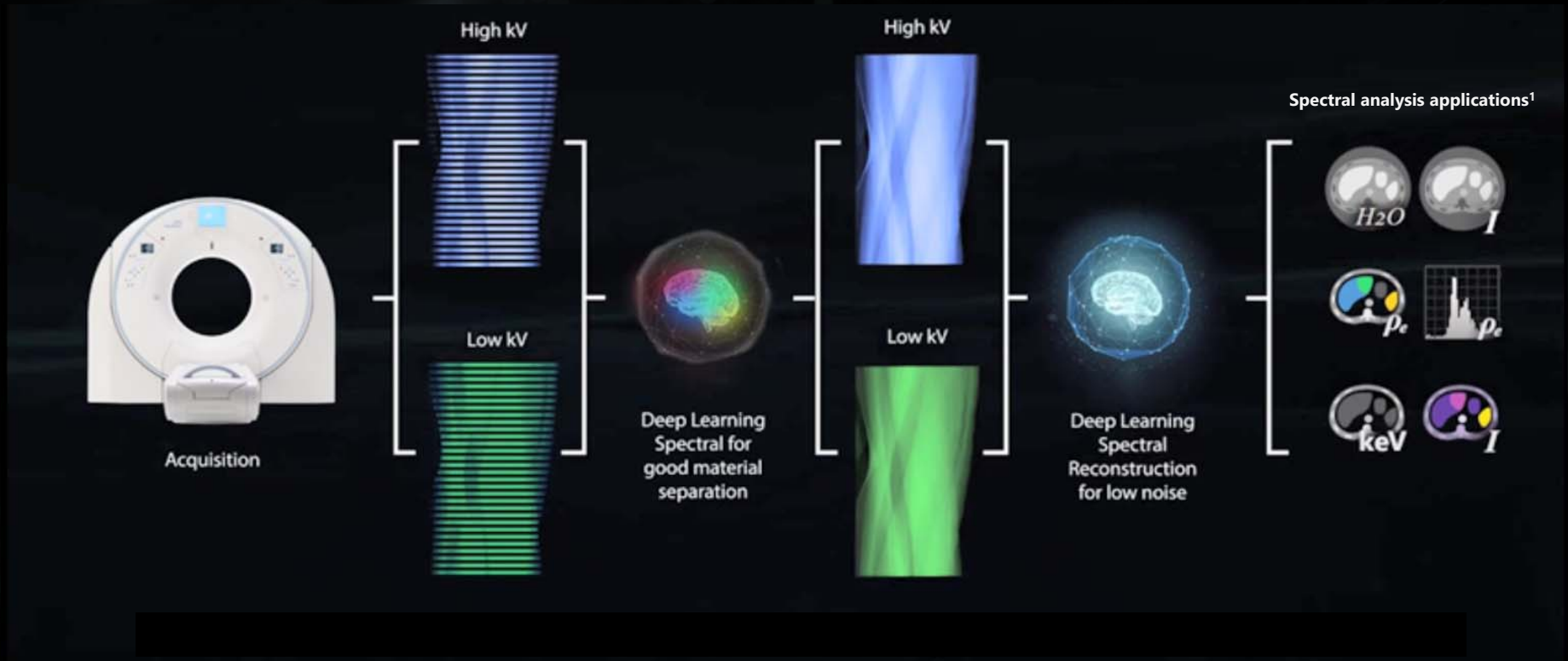
Deep Learning Spectral Reconstruction

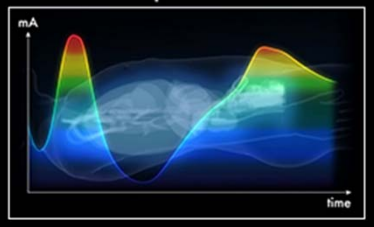


[1]In combination with Vitrea® Advanced Visualization

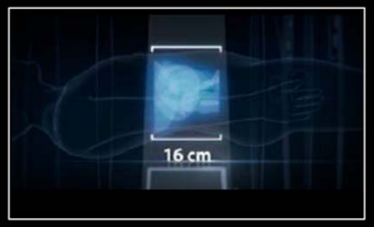
Deep Learning Spectral

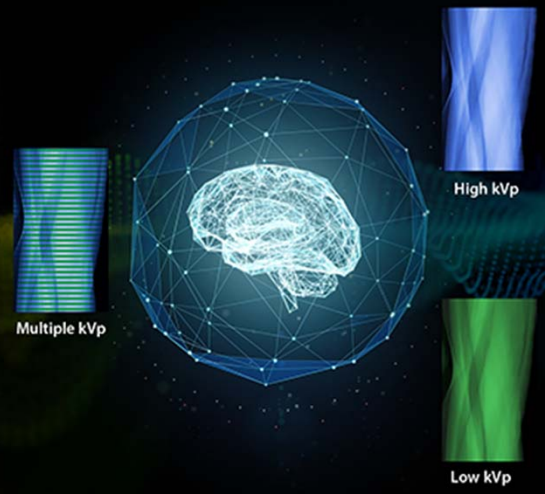
Rapid kV switching

Auto Exposure Control



16 cm volume

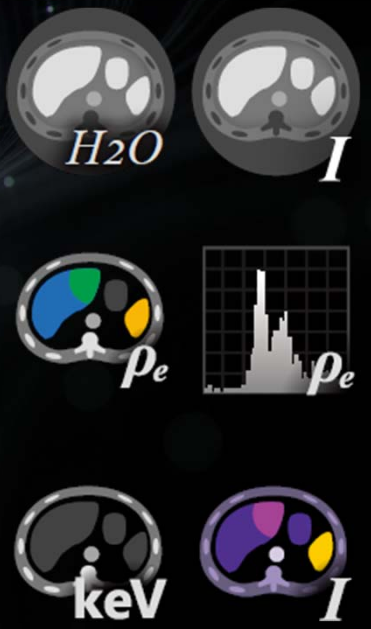




Full Spectral Transformation

The advantage of Deep Learning Spectral reconstruction is its ability to transform multi-energy raw data sets into two full high and low energy separated sinograms. This provides excellent energy separation for Spectral analysis with the high resolution and low noise properties you would expect from a routine diagnostic CT exam.

An extensive suite of Spectral analysis applications[1]



[1]In combination with Vitrea® Advanced Visualization

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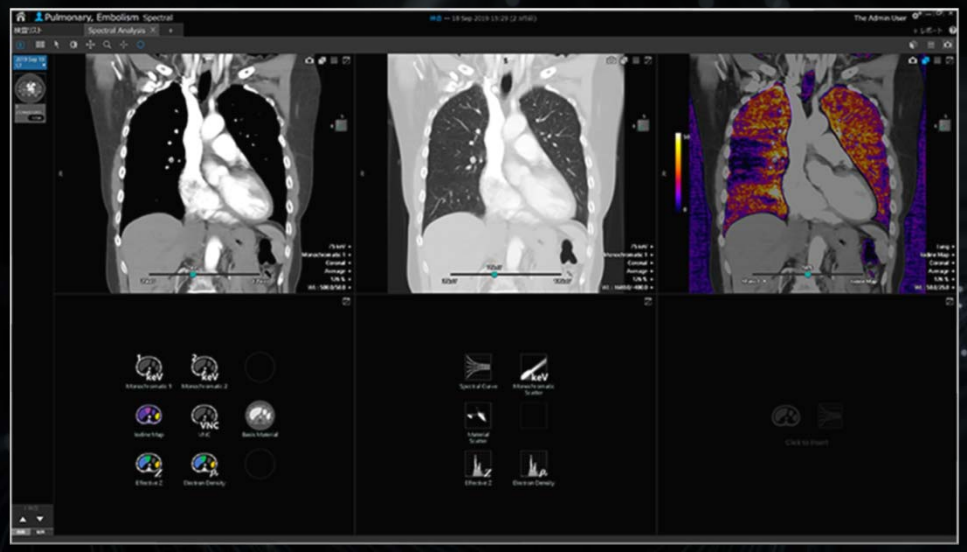
Spectral Analysis Applications



Monochromatic Images

Iodine Map

VNC

Composition Analysis

Stone Analysis

Spectral Curves

Basis Material Analysis

Electron Density Images

Effective Z Images

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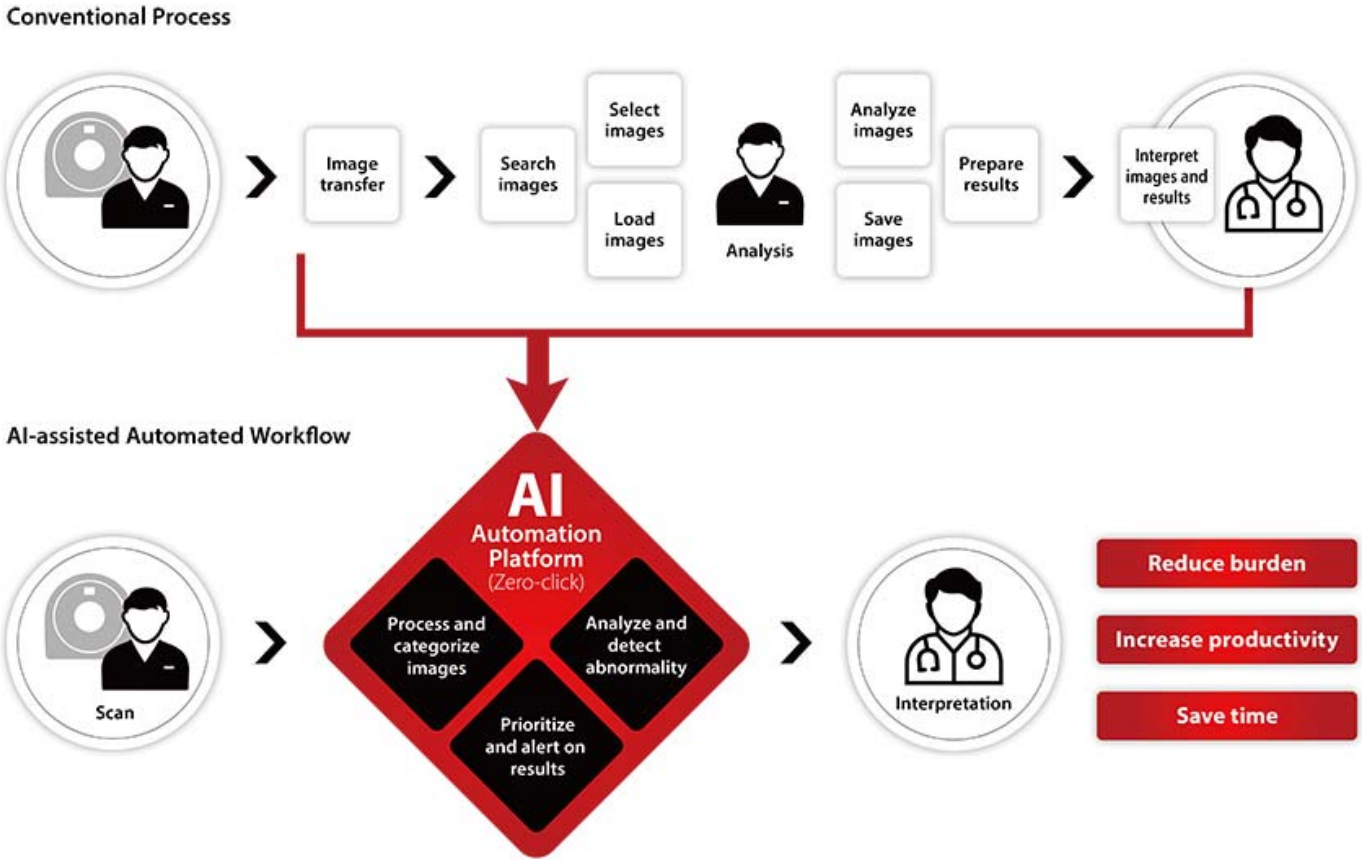
Automation Platform



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