Understanding the AI Impact in Radiography

Jordan Hermiller, MHA, RT(R)(QM), CPHQ

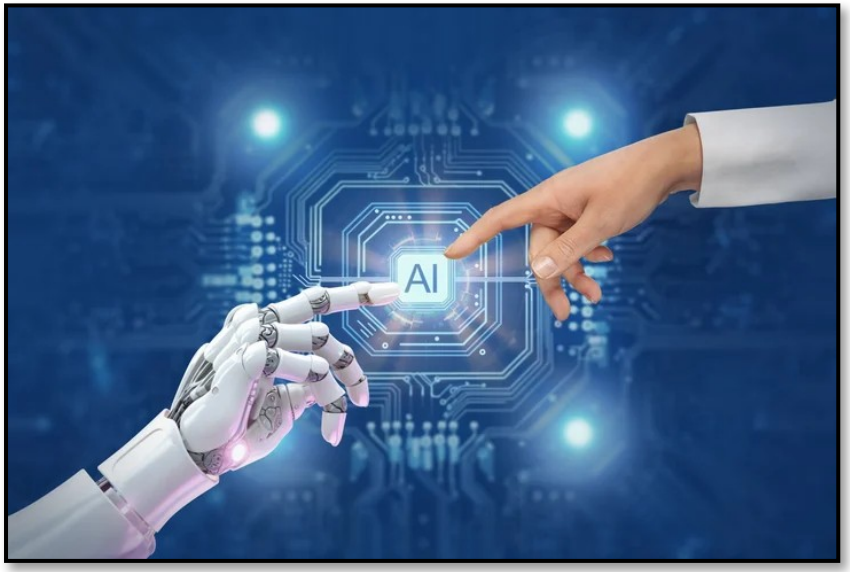
ICE IMAGING CONFERENCE & EXPO
SAN ANTONIO Texas

We transform radiology bringing **intelligent** and **definitive answers** to patients **at point of care**

A.I. in Medical Imaging

Outline

- What is (and isn't) AI?
- Recent focus on AI
- AI Along the Imaging Chain
- Examples
- Challenges & Concerns

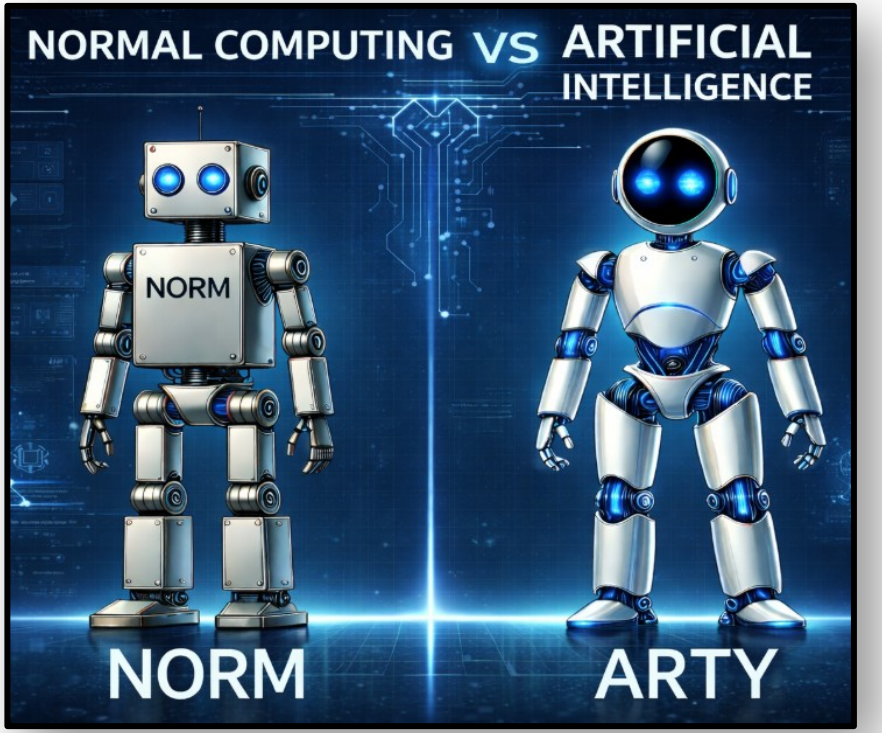


What is Artificial Intelligence

The Story of 2 Robot Friends

- NORM: The *Ruler Follower*
  - Same Input = Same Output
  - If X, then Y

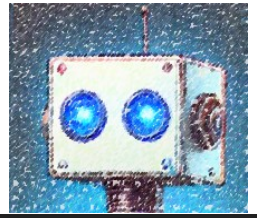
- Arty: The *Learner*
  - Discovers patterns in data
  - Performance improves with more data



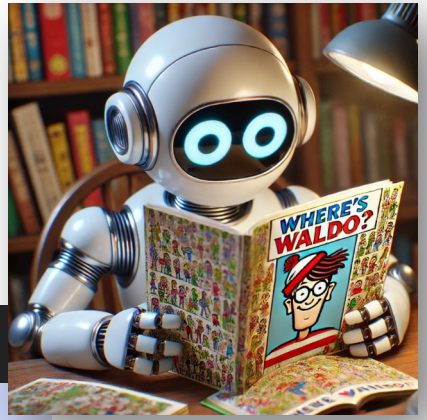
What is Artificial Intelligence

Normal Computing vs. AI

Norm



Arty

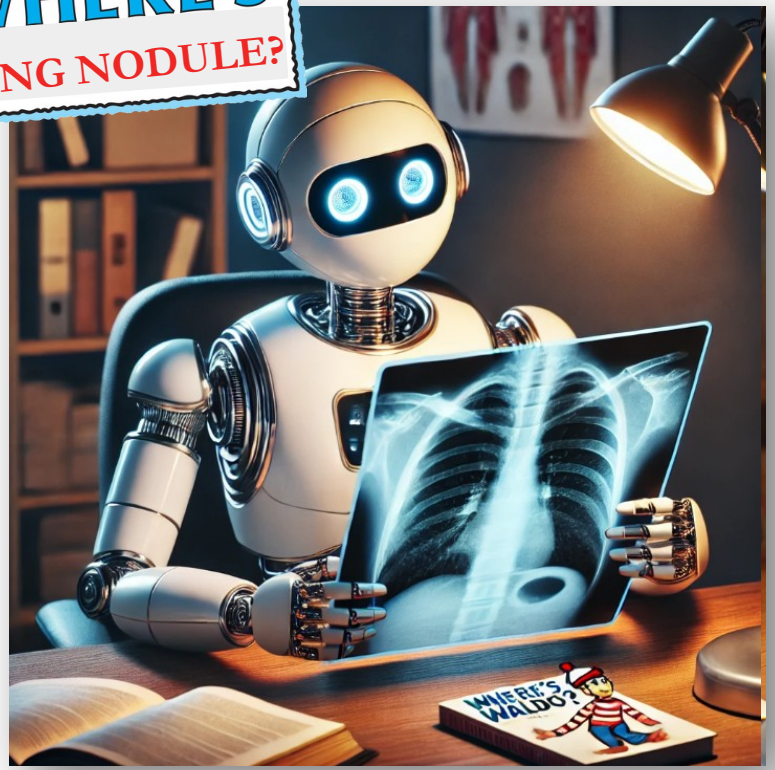


Feature	Normal Computing	Artificial Intelligence
Decision-Making	Follows programmed rules	Learns and adapts
Learning Ability	No learning	Learns from data
Flexibility	Task-specific	Can generalize
Complexity Handling	Limited	Handles uncertainty & complexity
Example Task	Math operations	Identifying objects in an image

Computer-Aided Detection

Arty Joins the Hospital

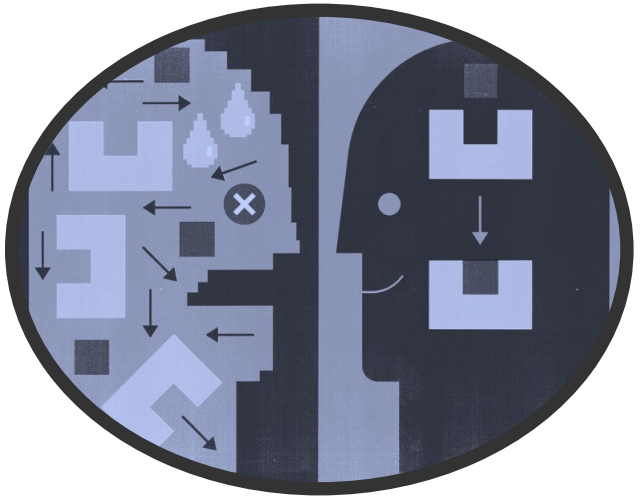
- Waldo ➔ Lung Nodule
- *Immediately identify & escalate critical findings*



Can A.I. Fool a Human?

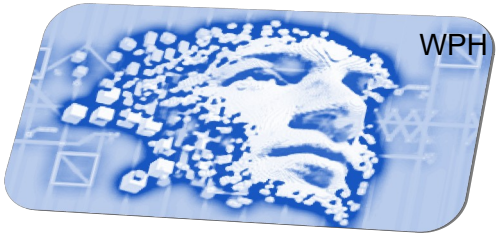
The Turing Test

1. You chat with a Human & Robot
2. Robot tries to convince you it's human
3. You decide which is the human
4. Repeat until they are indiscernible



Narrow vs. General A.I.

AI: Now & Future



Type of AI	Description	Exists?	Examples
Narrow (Weak) AI includes Generative AI	Performs specific tasks, but can't reason beyond its programming	**Yes** widely used	- Pathology Detection - ChatGPT, Alexa, Self-driving cars
General (Strong) AI NOT the same as *Generative* AI	Human-like intelligence, reasoning & learning	**No** theoretical	- A single system that can interpret all imaging modalities - Can handle diagnostics, workflow, etc. like a radiologist
Super AI Superintelligence	Smarter than humans; capable of self-improvement, creativity & strategy	**No** hypothetical	- Reads images, and predicts diseases before imaging, invents new diagnostic techniques, and revolutionizes radiology

Arty Revisits the Hospital

He's Smart, But No Radiologist

AI Supporting Radiologists

Narrow AI — exists today

- ✓ Detect specific pathologies (nodules, fractures, pneumothorax)
- ✓ **Accuracy:** Up to 99.1% sensitivity in studies
- ✓ **Speed:** 15-25% faster than manual review
- ✓ Can learn numerous pathologies over time

General AI Required For — doesn't exist

- ✗ Full diagnostic workup across all pathologies
- ✗ Integrating patient's full medical history
- ✗ Nonverbal cues and clinical context
- ✗ Creating comprehensive treatment plans

How AI Learns

From Data to Decisions

Machine Learning

Learns from data without explicit programming

Supervised Learning

How: Trained on **labeled data** with known inputs/outputs

Think: Learning with an answer key

Ex: Fracture detection – "fracture" or "no fracture"

Unsupervised Learning

How: Trained on **unlabeled data** – no answer key

Think: Find patterns, figure out what's normal

Ex: Bone density – learns "normal," flags deviations

Deep Learning

Advanced ML using neural networks

Neural Networks

Design: Layers of interconnected nodes (like neurons)

Think: Mimics how the brain processes information

What It Enables

Processes **complex, unstructured data** (images, audio, text)

Integrates multiple data sources (history, labs, notes)

Ex: Comprehensive treatment planning

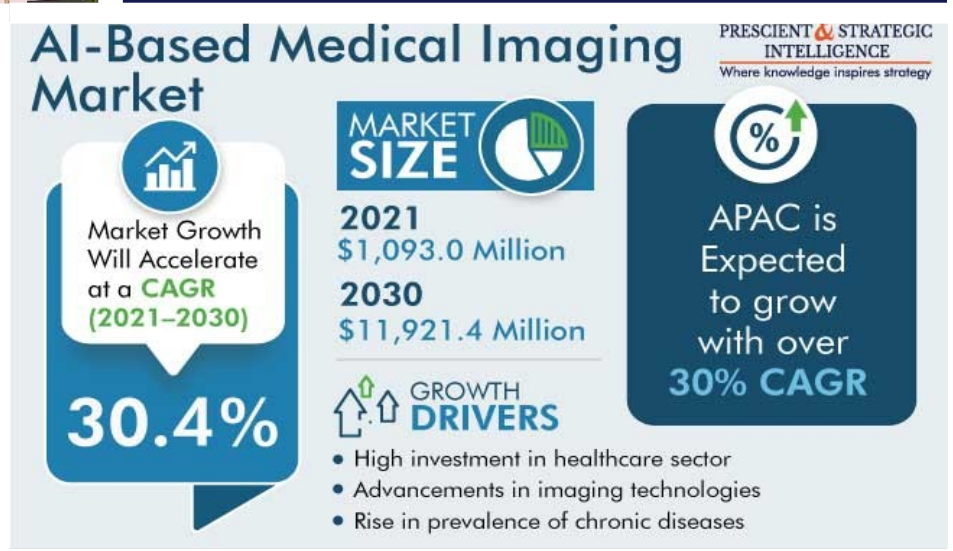
Key distinction: ML detects patterns in structured data. DL handles complexity for comprehensive decision-making.

Why is AI Booming Now?

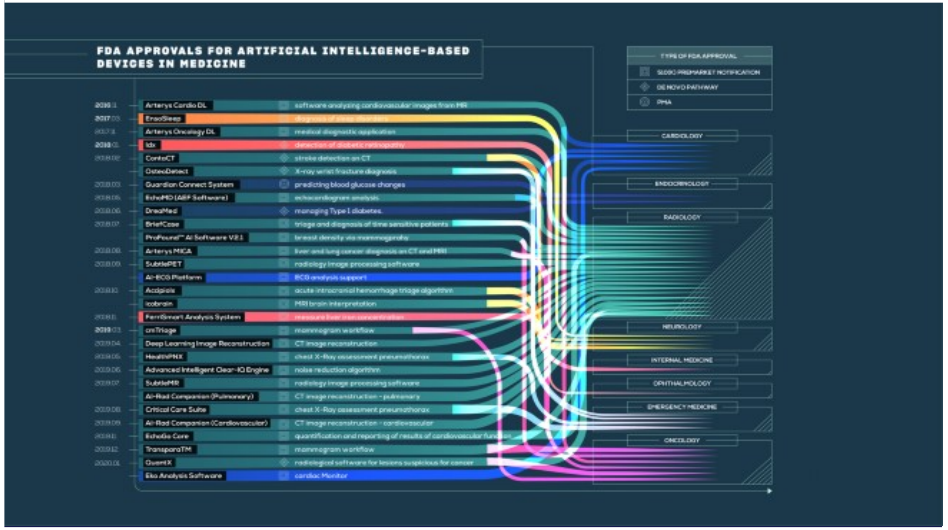
3 key Factors

1. Deep Learning Breakthroughs
2. *'Big Data' Explosion*
3. *Increased Computing Power*


RSNA AI
SHOWCASE

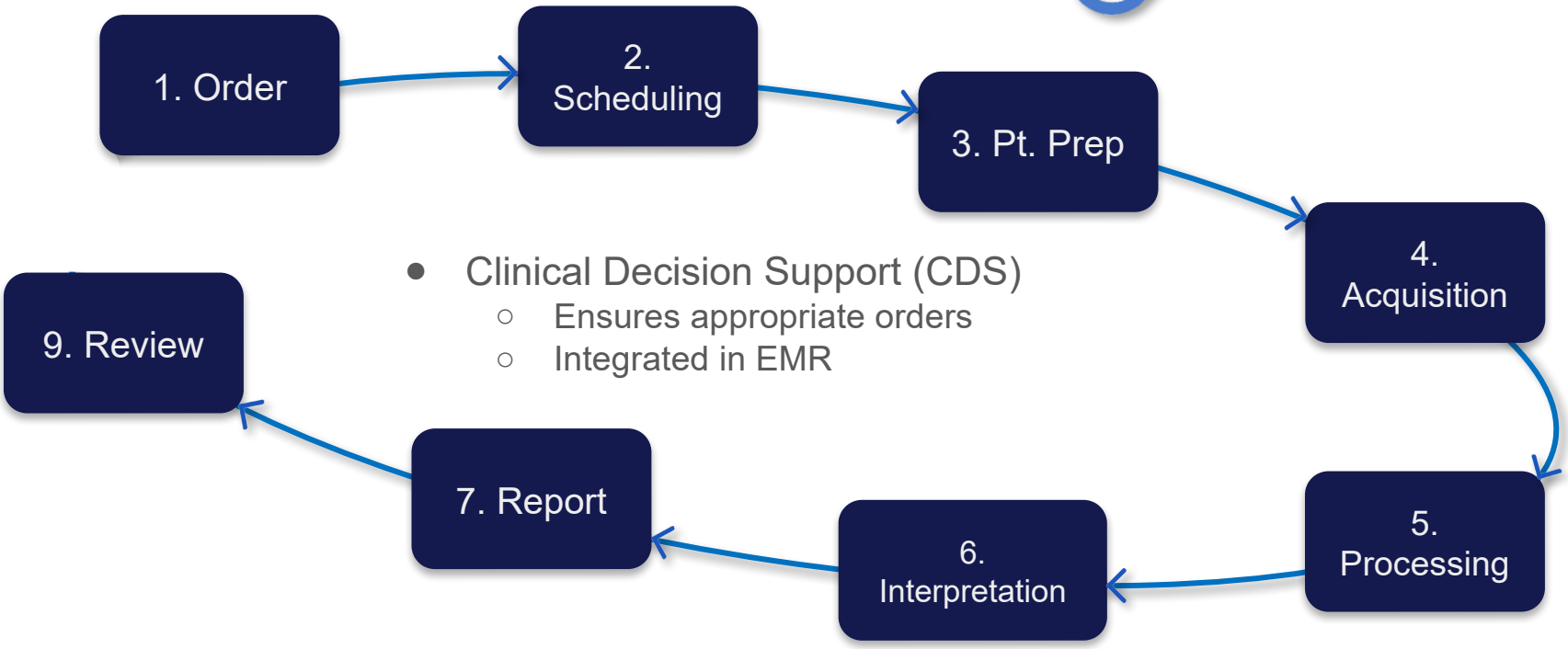

AI-Based Medical Imaging Market
PRESCIENT & STRATEGIC INTELLIGENCE
Where knowledge inspires strategy
Market Growth Will Accelerate at a CAGR (2021–2030)
30.4%
MARKET SIZE
2021
$1,093.0 Million
2030
$11,921.4 Million
APAC is Expected to grow with over 30% CAGR
GROWTH DRIVERS
High investment in healthcare sector
Advancements in imaging technologies
Rise in prevalence of chronic diseases


SMART REPORTING
Medexprim
商汤 sensetime
median
OSIMIS
QLARITY IMAGING
image biopsy lab
i2sigma
Therapixel
seno
CuraCloud
enlitic
QMENTA
PaxeraHealth
qure.ai
ai analysis inc.
Blackford
CureMetrix
JLK INSPECTION
quibim
zebra
WEKA.io
teraracon
VAREX IMAGING
ADVANTIS
ANYMEDI
BOLD BRAIN VENTURES
DNP
FLYWHEEL
INTELLIGENT ULTRASOUND
PHILIPS Healthcare
CORTECHS Labs
aidence
CAIDE
CAIDE Systems
DDH
VARIAN
TOMTEC
imbio
PVmed
Sorna
aidoc
Cercare Medical
DEEP VOXEL
Yitu Healthcare
依图医疗
INCEPTO
Perspectum Diagnostics
SUBTLE MEDICAL
AIRS
circle
iz.ai
inferVISION
Quantib
DEEP NOID
FOVIA
Google Cloud Platform
KHEIRON MEDICAL TECHNOLOGIES
Rad AI
ONEMEDNET
DIA
IMAGING ANALYSIS
COGNEX
OXIPIT
PURESTORAGE
VUNO
ARTERYS
GE Healthcare
koios
BAYER
iCADX
COMBINOSTICS
DeepRadiology
HEALTHMYNE
MEDICVISION IMAGING SOLUTIONS
RADLogics
VIDA
DeepTek
BioMind
onyx
BALZANO
contextflow
densitas
IBM Watson
mirada
Fraunhofer MEVIS
icometrix
macadamian
RADIOBOTICS
COLLECTIVE MINDS RADIOLOGY
深睿医疗
deepwise
CORELINE SOFT
HEARTFLOW
Lunit


FDA APPROVALS FOR ARTIFICIAL INTELLIGENCE-BASED DEVICES IN MEDICINE
TYPE OF FDA APPROVAL
510(K) PREMARKET NOTIFICATION
DE NOVO PATHWAY
PMA
Arterys Cardio DL
software analyzing cardiovascular images from MR
EnvoiSleep
diagnosis of sleep apnea
Arterys Oncology DL
medical diagnostic application
IDx
detection of diabetic retinopathy
ContaCT
stroke detection on CT
OsteoDetect
X-ray wrist fracture diagnosis
Guardian Connect System
predicting blood glucose changes
EchoMD (AEF Software)
echocardiogram analysis
DreaMed
managing Type 1 diabetes
BriefCase
triage and diagnosis of time sensitive patients
ProFound™ AI Software V2.1
breast density via mammographs
Arterys MICA
liver and lung cancer diagnosis on CT and MRI
SubtlePET
radiology image processing software
AI-ECG Platform
ECG analysis support
Accipiolx
acute intracranial hemorrhage triage algorithm
icobrain
MRI brain interpretation
FerriSmart Analysis System
mammogram workflow
Deep Learning Image Reconstruction
CT image reconstruction
HealthPNX
chest X-Ray assessment pneumothorax
Advanced Intelligent Clear-IQ Engine
noise reduction algorithm
SubtleMR
radiology image processing software
AI-Rad Companion (Pulmonary)
CT image reconstruction - pulmonary
Critical Care Suite
chest X-Ray assessment pneumothorax
AI-Rad Companion (Cardiovascular)
CT image reconstruction - cardiovascular
EchoGo Core
quantification and reporting of results of cardiovascular function
TransparaTM
mammogram workflow
QuantX
radiological software for lesions suspicious for cancer
Eko Analysis Software
cardiac Monitor
CARDIOLOGY
ENDOCRINOLOGY
RADIOLOGY
NEUROLOGY
INTERNAL MEDICINE
OPHTHALMOLOGY
EMERGENCY MEDICINE
ONCOLOGY

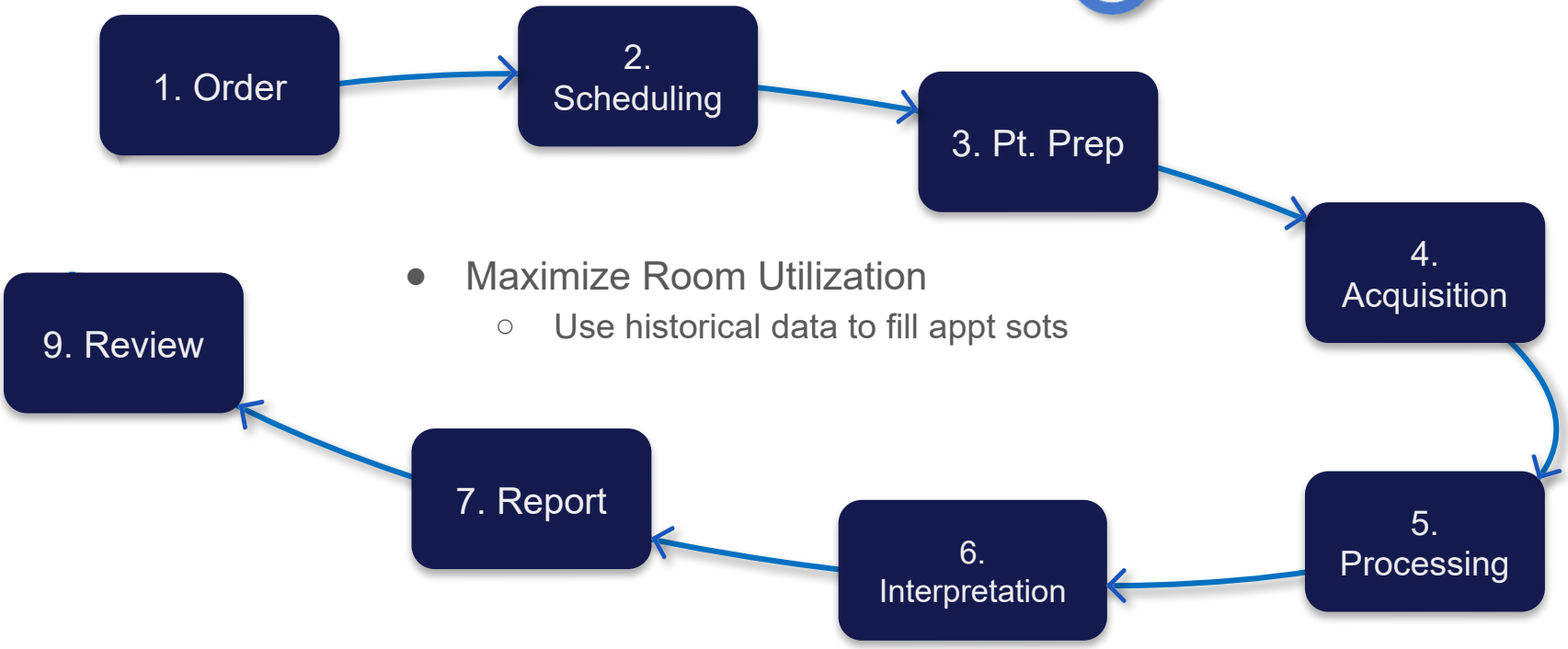
AI Along the Imaging Chain

From order to report, AI enhances every step



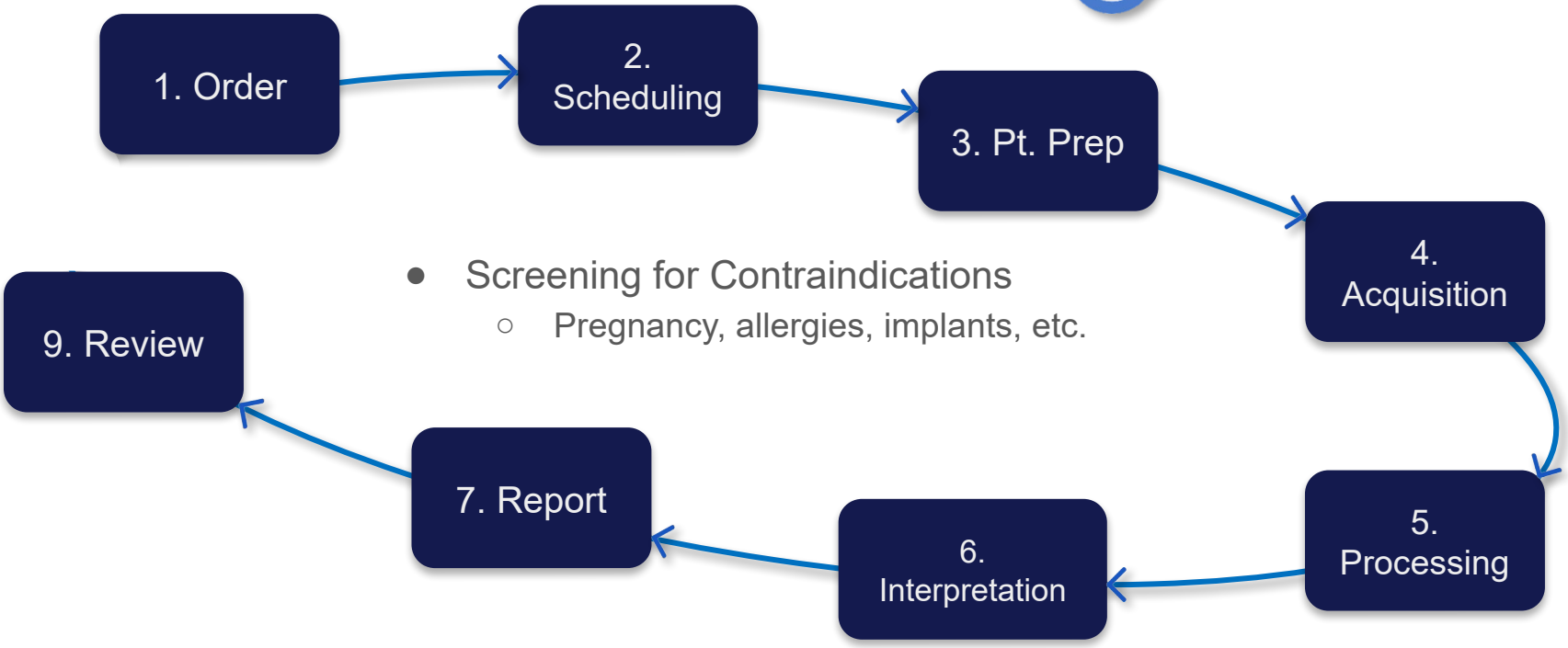
AI Along the Imaging Chain

From order to report, AI enhances every step



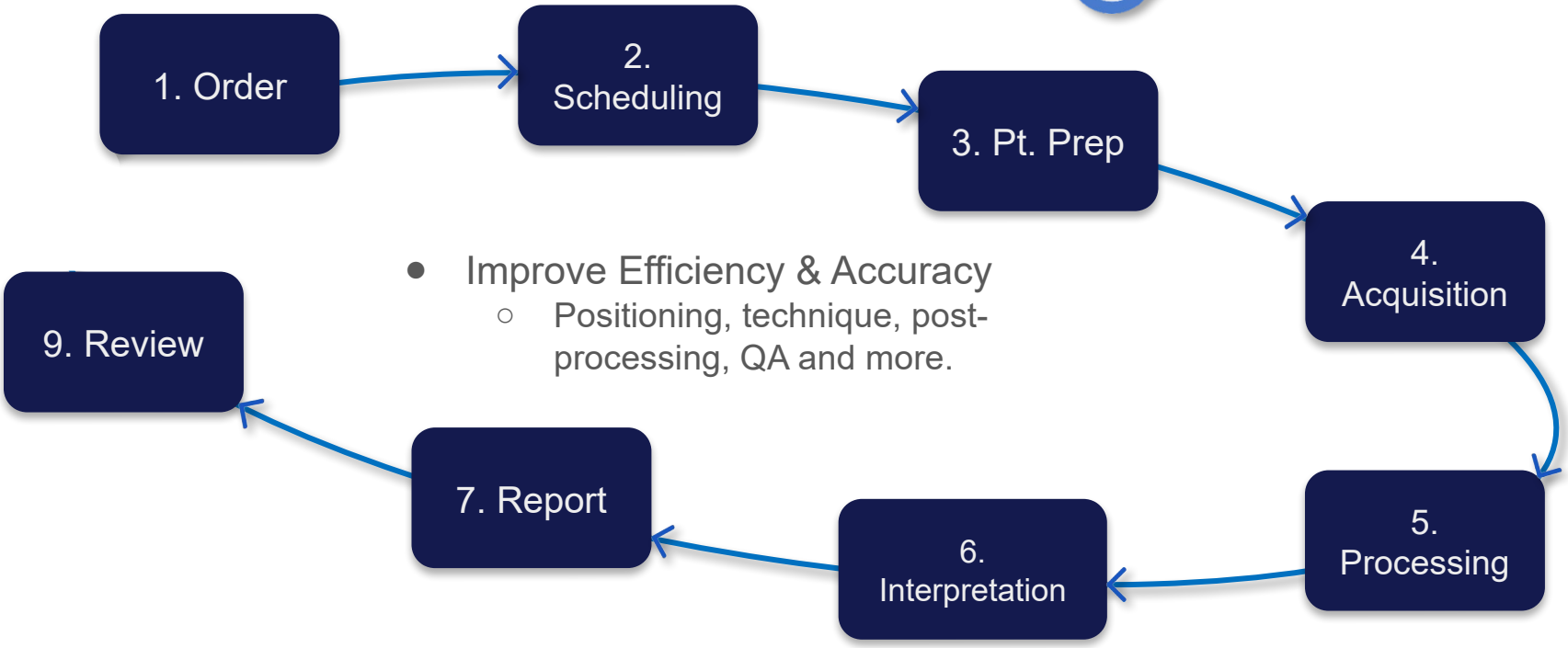
AI Along the Imaging Chain

From order to report, AI enhances every step



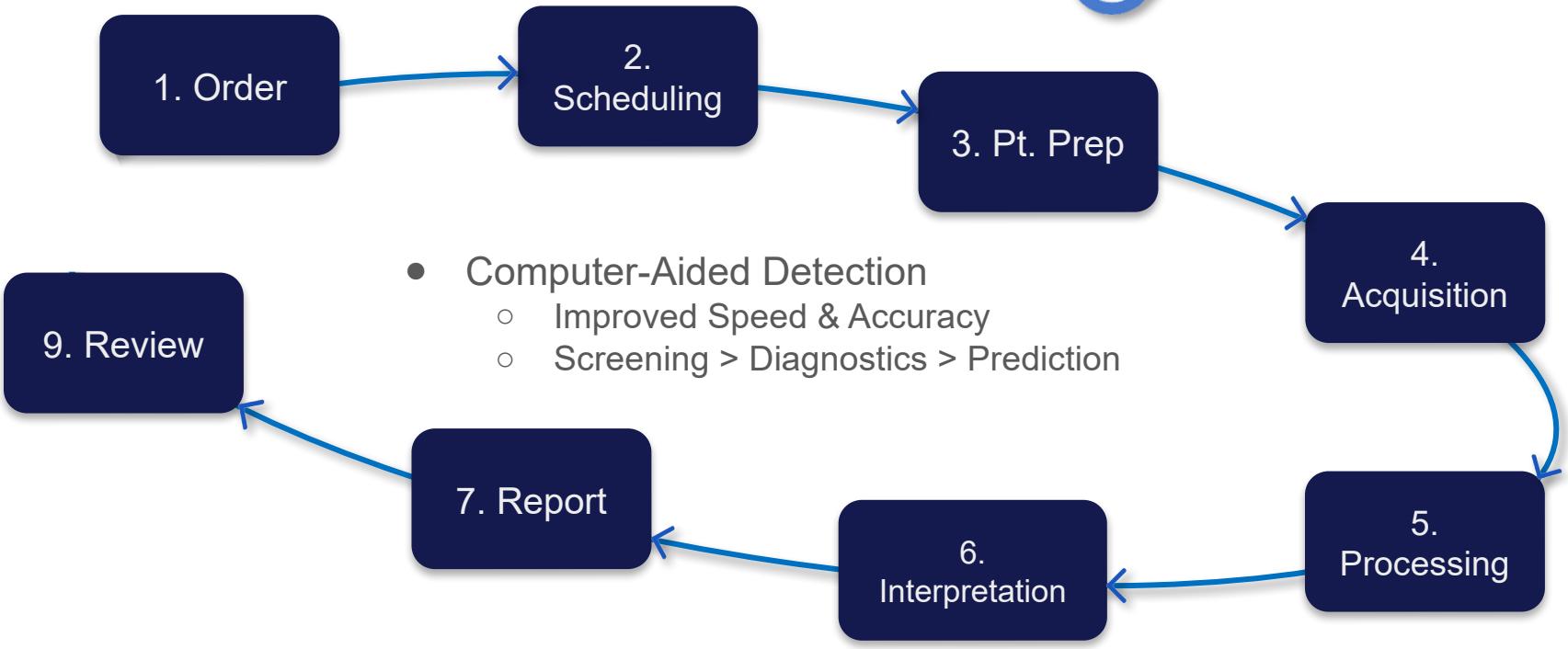
AI Along the Imaging Chain

From order to report, AI enhances every step



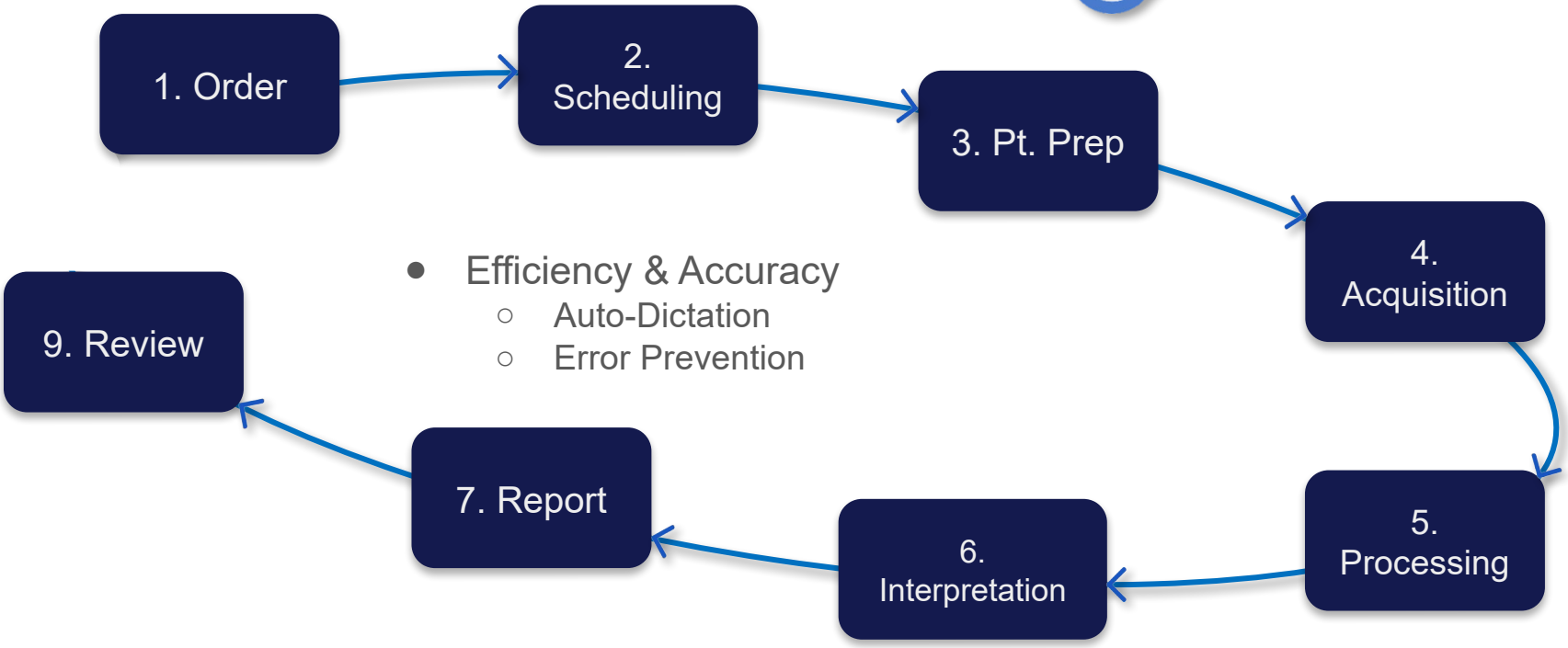
AI Along the Imaging Chain

From order to report, AI enhances every step



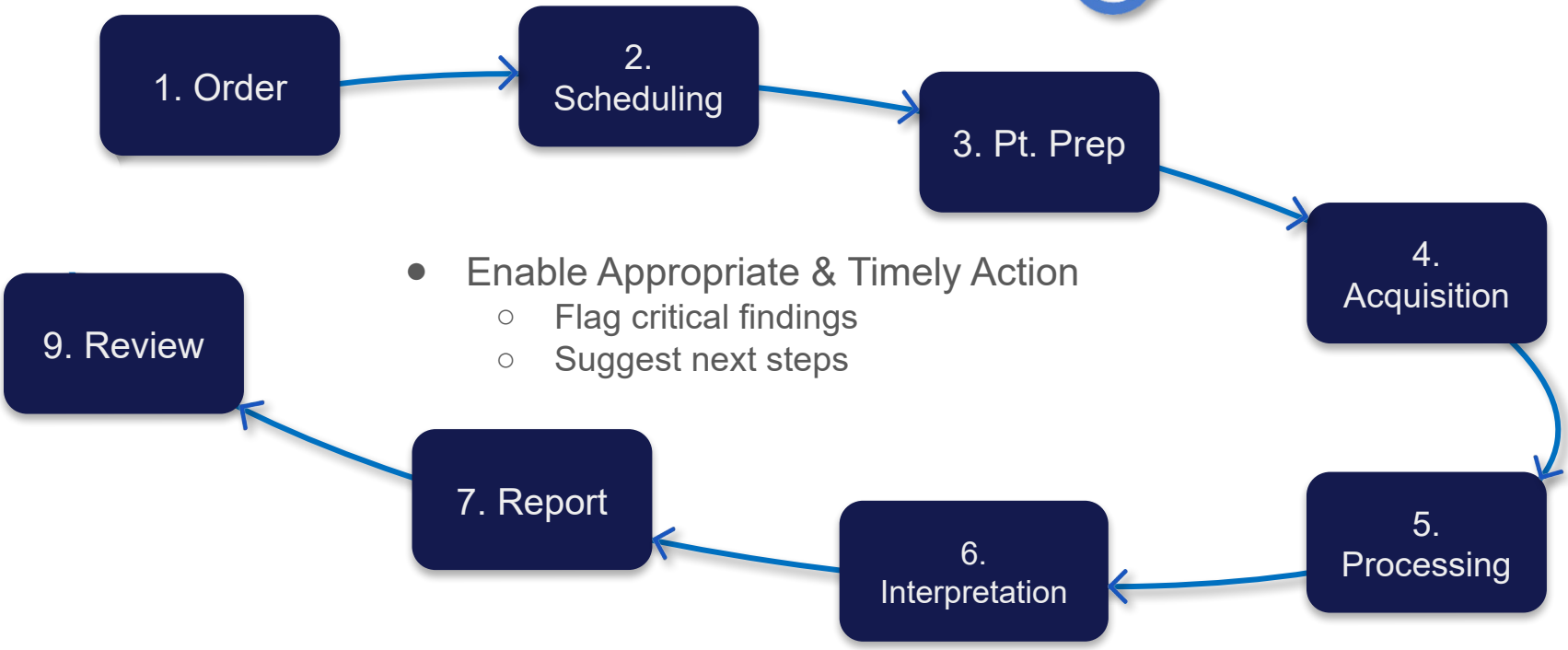
AI Along the Imaging Chain

From order to report, AI enhances every step



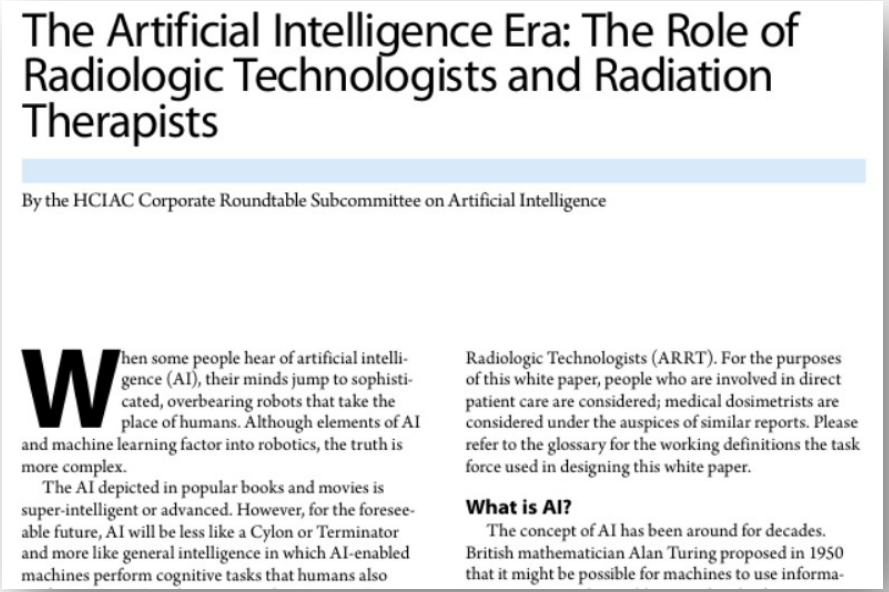
AI Along the Imaging Chain

From order to report, AI enhances every step



AI & Rad Techs

Future Impact



The Artificial Intelligence Era: The Role of Radiologic Technologists and Radiation Therapists

By the HCIAC Corporate Roundtable Subcommittee on Artificial Intelligence

When some people hear of artificial intelligence (AI), their minds jump to sophisticated, overbearing robots that take the place of humans. Although elements of AI and machine learning factor into robotics, the truth is more complex.

The AI depicted in popular books and movies is super-intelligent or advanced. However, for the foreseeable future, AI will be less like a Cylon or Terminator and more like general intelligence in which AI-enabled machines perform cognitive tasks that humans also

Radiologic Technologists (ARRT). For the purposes of this white paper, people who are involved in direct patient care are considered; medical dosimetrists are considered under the auspices of similar reports. Please refer to the glossary for the working definitions the task force used in designing this white paper.

What is AI?

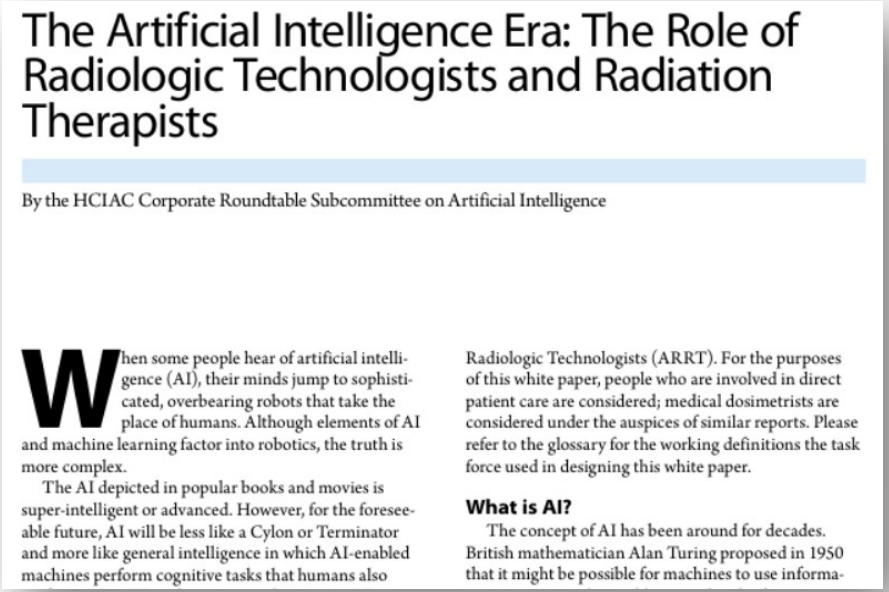
The concept of AI has been around for decades. British mathematician Alan Turing proposed in 1950 that it might be possible for machines to use informa-

Key Takeaways

1. *AI seen as next logical step*
2. *OEMs should work closely to educate technologists*
3. *AI expected to improve safety, consistency, and quality*
4. *Medical imaging AI market expected to grow significantly*

AI & Rad Techs

Future Impact



The Artificial Intelligence Era: The Role of Radiologic Technologists and Radiation Therapists

By the HCIAC Corporate Roundtable Subcommittee on Artificial Intelligence

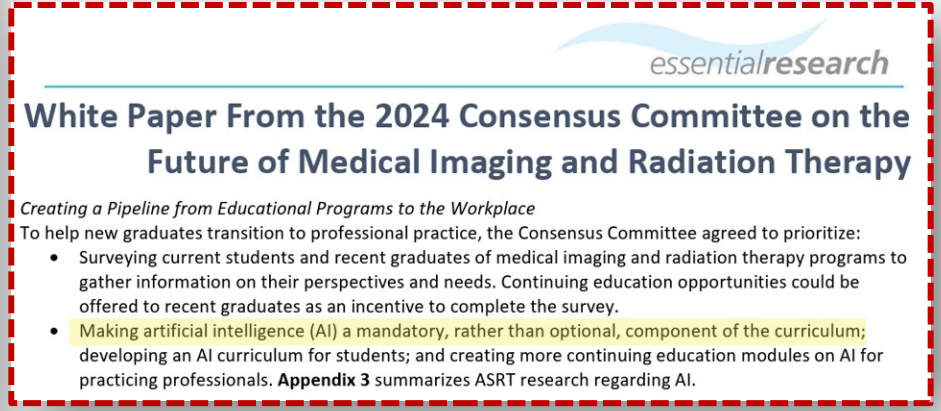
When some people hear of artificial intelligence (AI), their minds jump to sophisticated, overbearing robots that take the place of humans. Although elements of AI and machine learning factor into robotics, the truth is more complex.

The AI depicted in popular books and movies is super-intelligent or advanced. However, for the foreseeable future, AI will be less like a Cylon or Terminator and more like general intelligence in which AI-enabled machines perform cognitive tasks that humans also

Radiologic Technologists (ARRT). For the purposes of this white paper, people who are involved in direct patient care are considered; medical dosimetrists are considered under the auspices of similar reports. Please refer to the glossary for the working definitions the task force used in designing this white paper.

What is AI?

The concept of AI has been around for decades. British mathematician Alan Turing proposed in 1950 that it might be possible for machines to use informa-



essentialresearch

White Paper From the 2024 Consensus Committee on the Future of Medical Imaging and Radiation Therapy

Creating a Pipeline from Educational Programs to the Workplace

To help new graduates transition to professional practice, the Consensus Committee agreed to prioritize:

- Surveying current students and recent graduates of medical imaging and radiation therapy programs to gather information on their perspectives and needs. Continuing education opportunities could be offered to recent graduates as an incentive to complete the survey.
- Making artificial intelligence (AI) a mandatory, rather than optional, component of the curriculum; developing an AI curriculum for students; and creating more continuing education modules on AI for practicing professionals. **Appendix 3** summarizes ASRT research regarding AI.

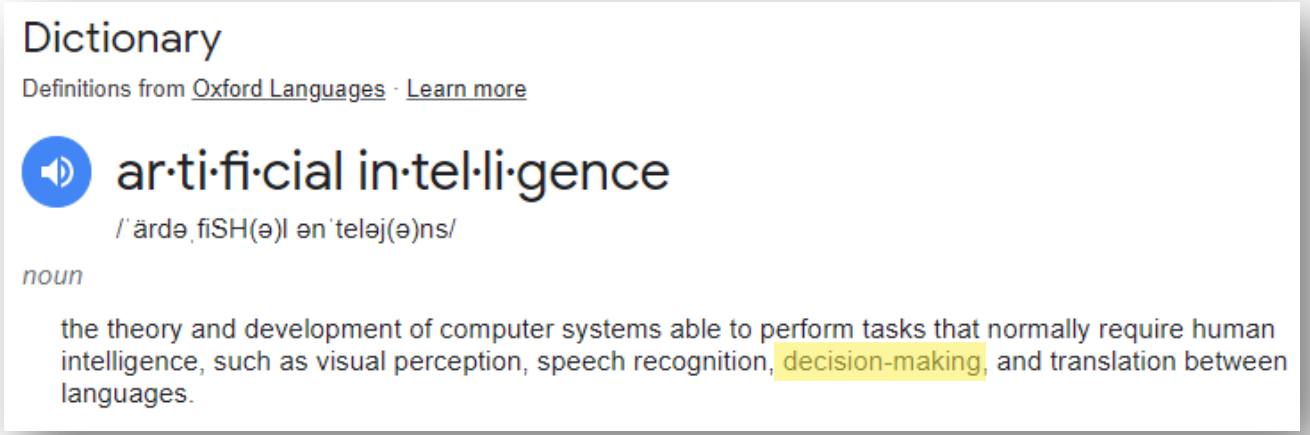
Is it AI?

Wide Range of Definitions

Mimic human decision-making?

OR

Machine learning?



Dictionary

Definitions from Oxford Languages · Learn more

ar·ti·fi·cial in·tel·li·gence

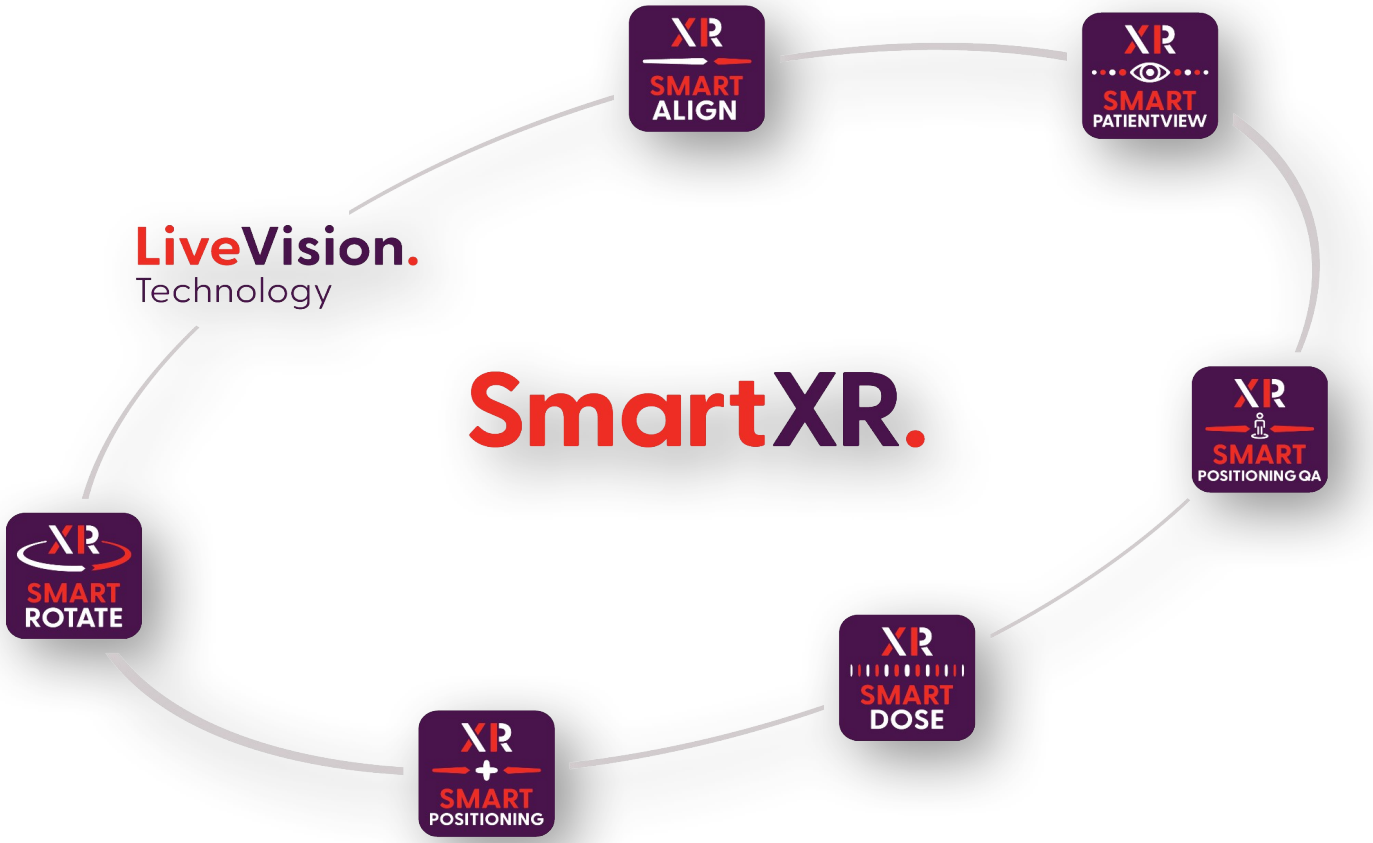
/ˌärdəˌfiSH(ə)l ənˈteləj(ə)ns/

noun

the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.

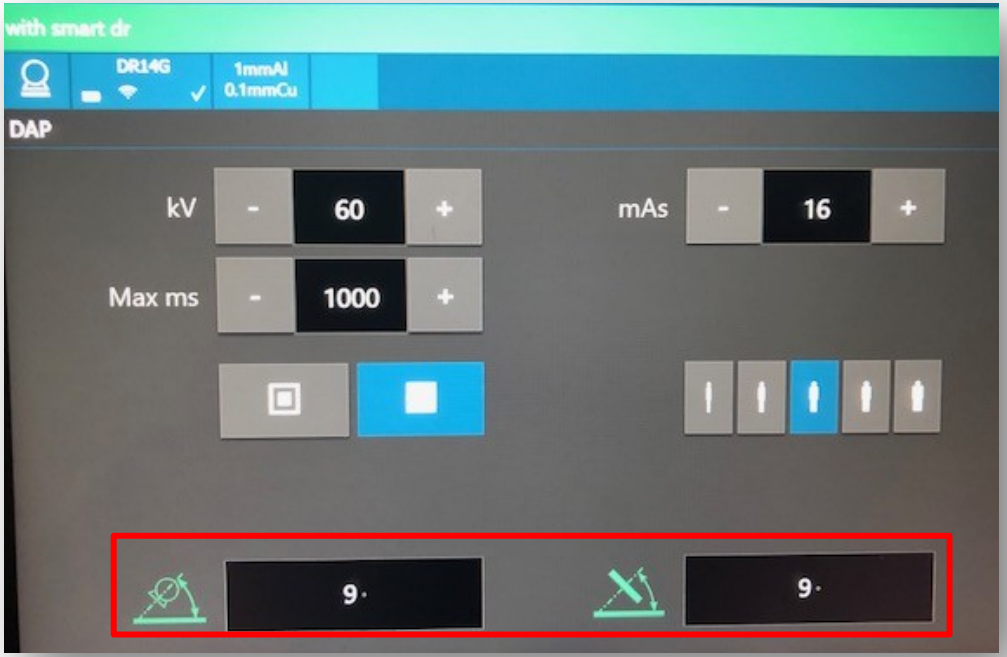
Is it AI?

The Game


XR SMART ALIGN
XR SMART PATIENTVIEW
XR SMART POSITIONING QA
XR SMART DOSE
XR SMART POSITIONING
XR SMART ROTATE
LiveVision. Technology
SmartXR.

Is it AI?

SmartAlign



SDR Detector Angle (°)	(0019,1062)
SDR Patient Thickness (cm)	(0019,1060)
SDR Radiation UID	(0019,1061)
SDR Tube Angle (°)	(0019,1063)

Is it AI?

Is it AI?

Smart PatientView

Is it AI?

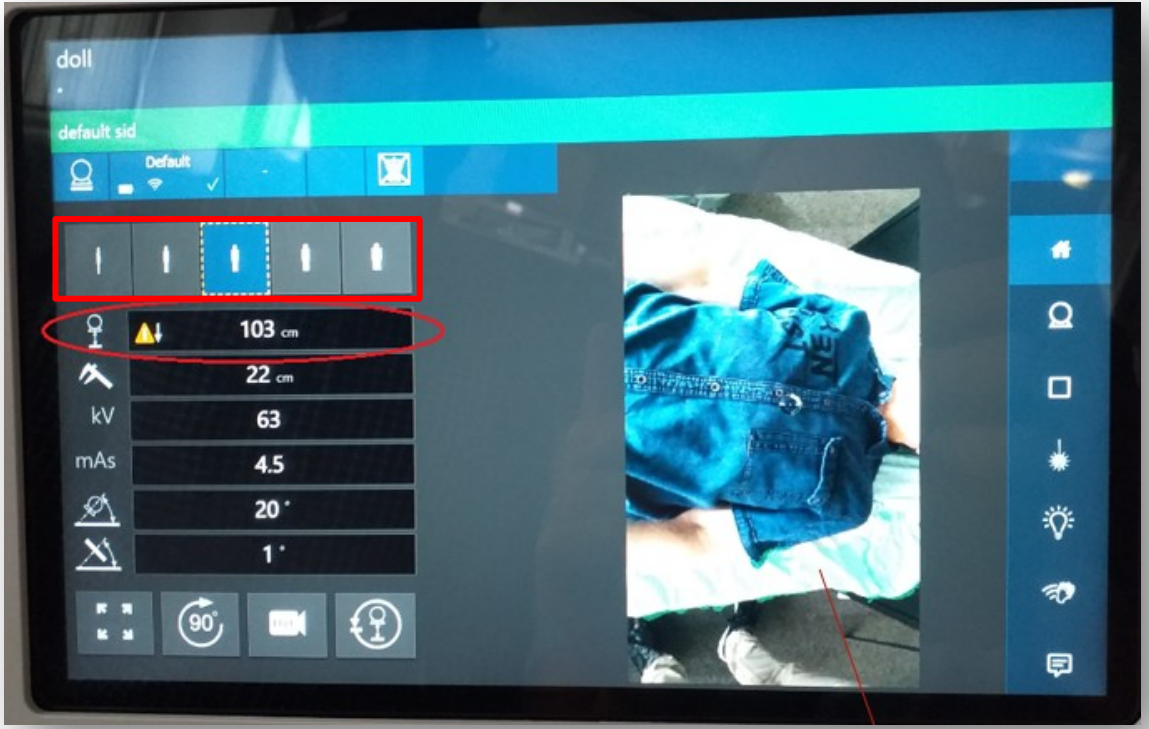
Is it AI?

SmartPositioning

Is it AI?

Is it AI?

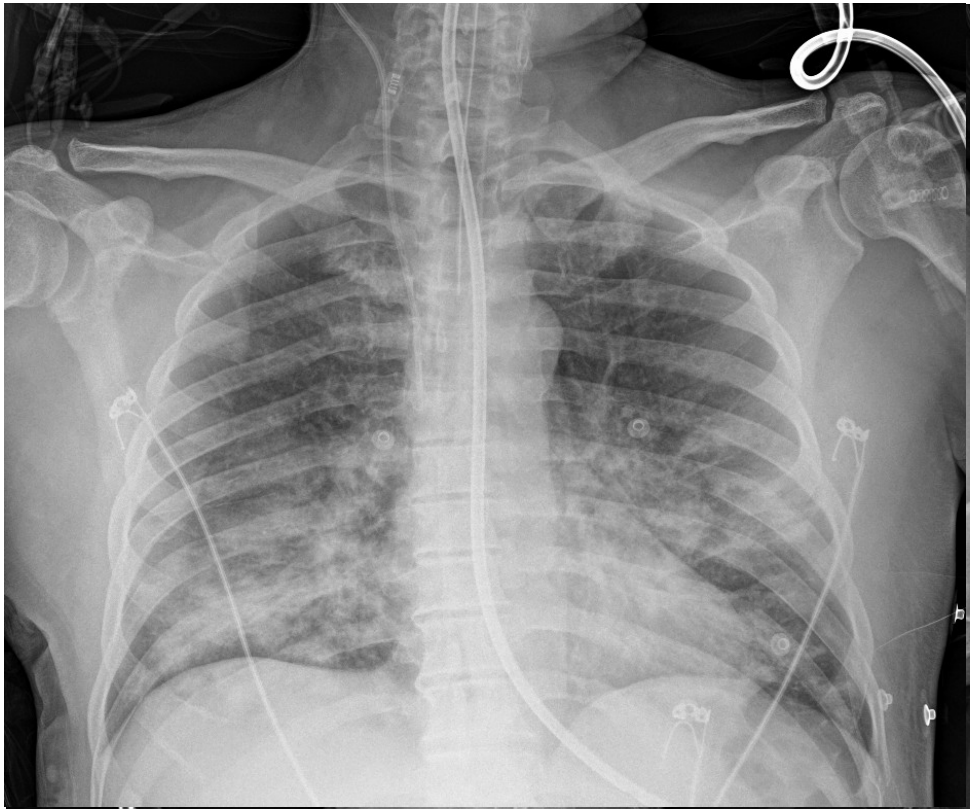
SmartDose



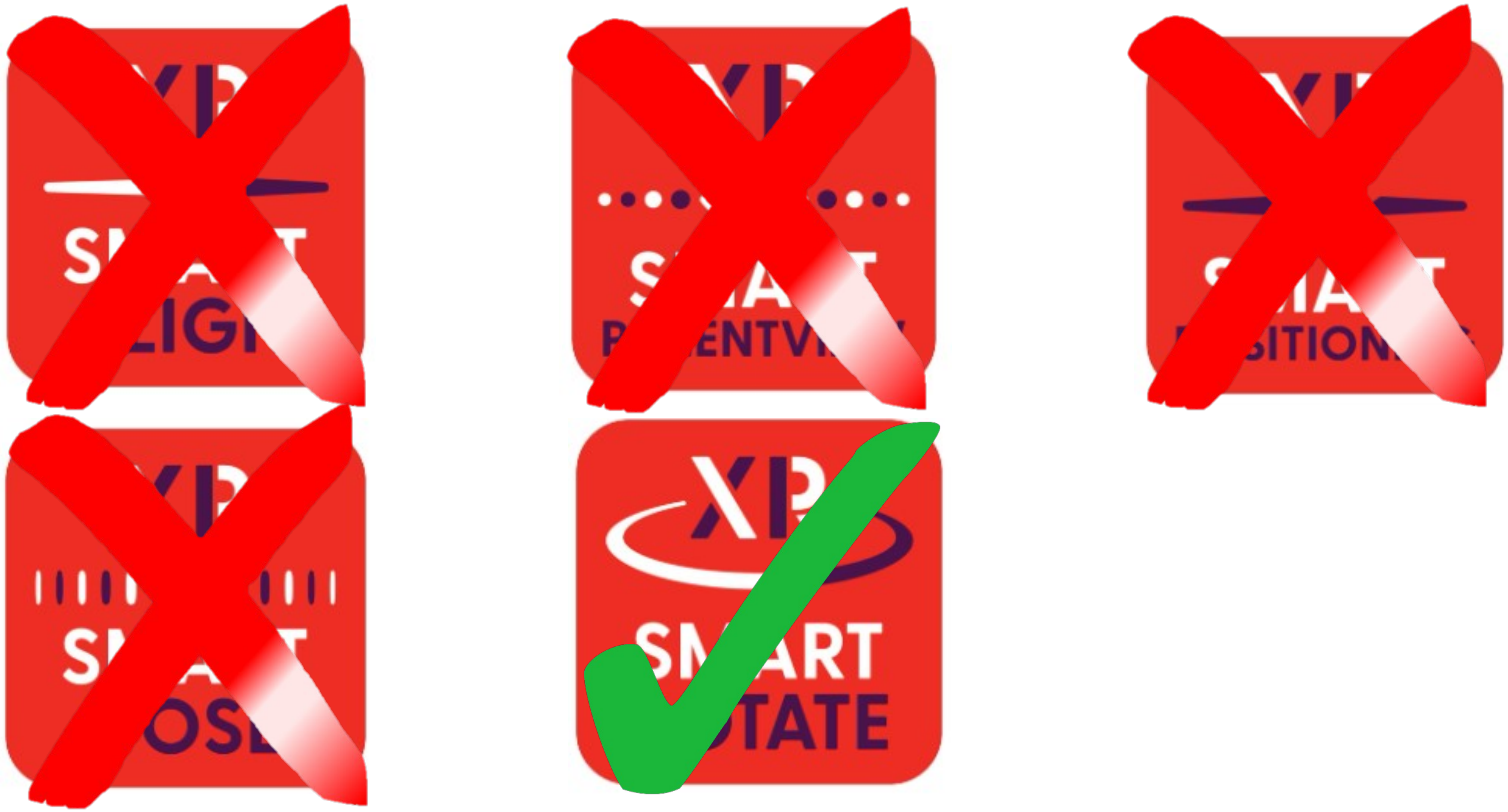
Is it AI?

Is it AI?

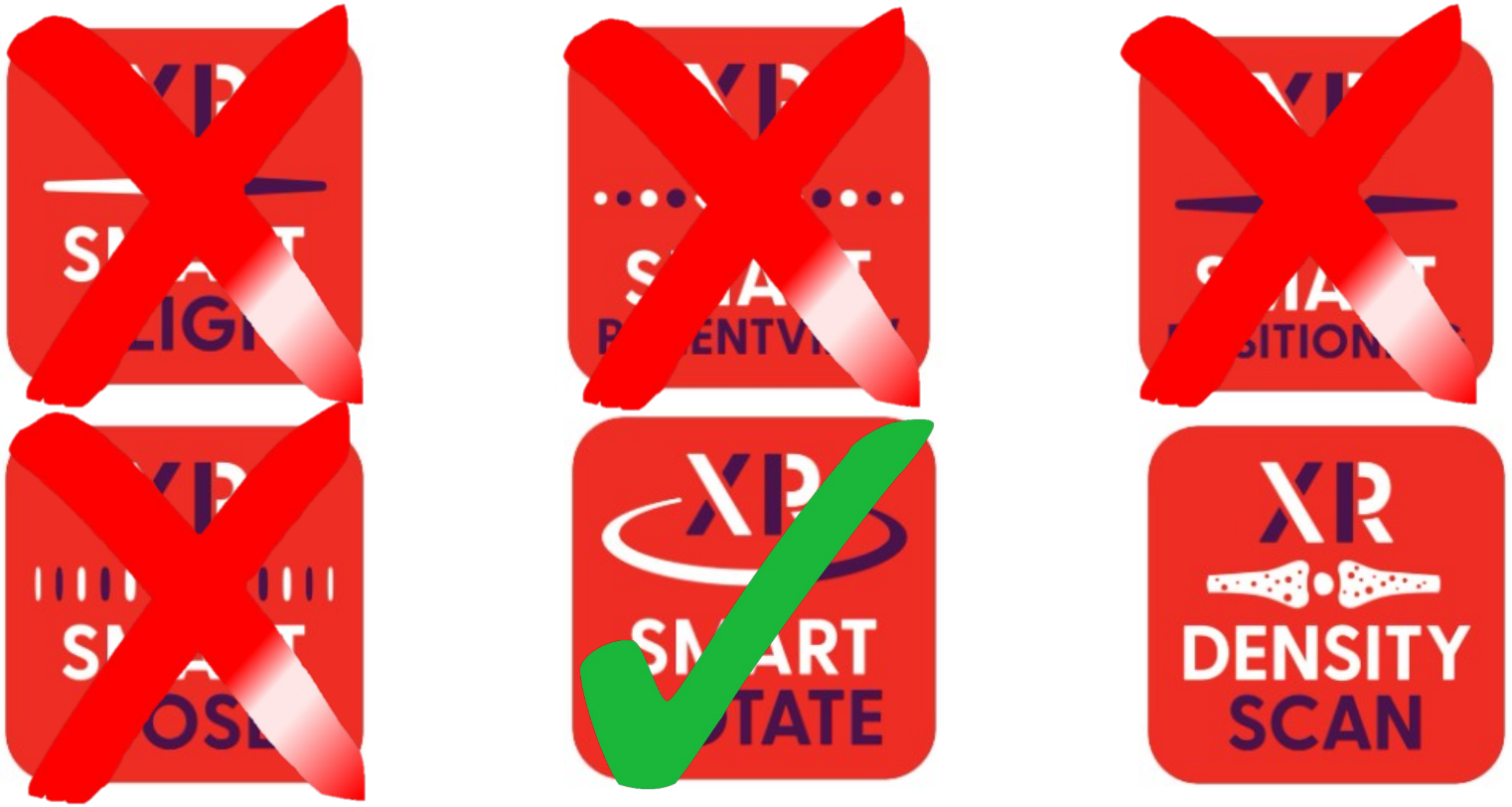
SmartRotate



Is it AI?



Is it AI?



DensityScan

Bone Health Report

Example Hospital
Hospital City, Postcode

Patient

Patient:	John Doe			Patient ID:	M01011943
Birth Date:	01/01/1943	78 years		Attendant:	EMS
Height/Weight:	180.0 cm	68.0 kg		Measured:	05/07/2022
Sex/Ethnicity:	Male	White			12:21:52

Left Forearm Radiograph

Areal Bone Density

Measurement[1]

Probability of Osteoporosis (T-Score <-2.5 at the femoral neck)

High Risk: Osteoporosis Likely. Consider Treatment

Low Risk: Osteoporosis not likely. Give lifestyle advice

Results[2]

Patient ID :	M01011943		
aBMD Radius UD:	0.277	T-Score Radius UD:	-3.50
aBMD Radius 33%:	0.477	T-Score Radius 33%:	-4.13
Osteoporosis Identified at the Wrist			
Probability of Osteoporosis (T-Score <-2.5 at Femoral Neck): 49%		High Risk of Osteoporosis	

Guidance

RISK OF POOR BONE HEALTH

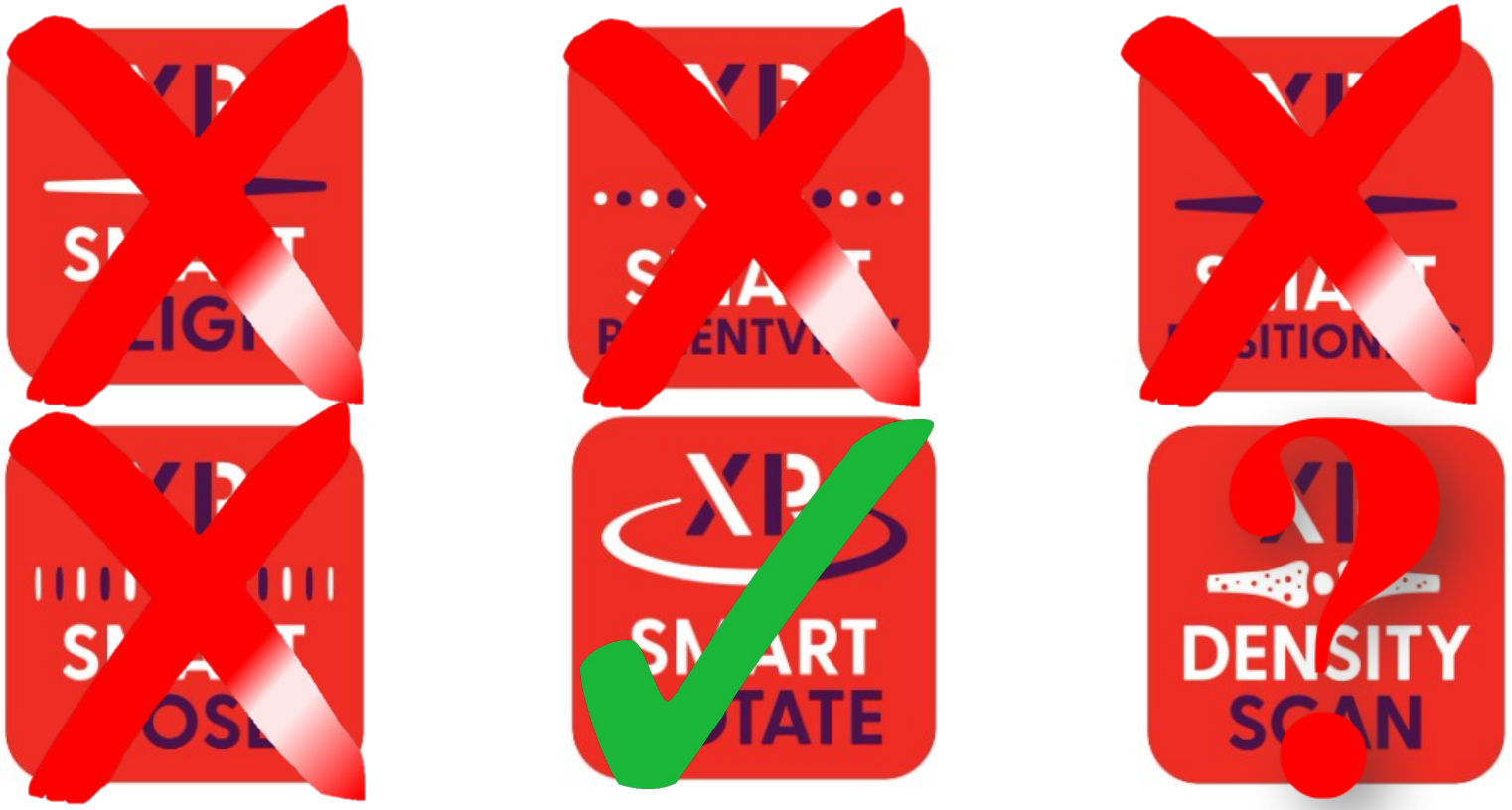
High risk: Consider referral to osteoporosis specialist for assessment. Offer treatment to reduce fracture risk.

Probablity of osteoporosis at the femoral neck

aBMD & T-Score

Clear guidance to referring physician

Is it AI?



AGFA & AI at point of care

3 Categories of AI Products

	1. Ordering Provider	2. Technologist assistance	3. Radiologist assistance
Current	Chest critical findings screening *"CriticalScan"*	Automatic image orientation *"SmartRotate"* Lead Marker Detection	Image quality & consistency improvement *"Musica"*
Research		▪ Radiation incident prevention ▪ Collimation errors warning ▪ Active Positioning assistance	

Disclaimer: AI roadmap is AGFA RSD internal & non-binding

Critical Finding Alerts at PoC

Accelerating communication between radiology and clinical teams

AI for...

Clinician assistance

Technologist assistance

Radiologist assistance

Current

Problem Solved

- x Critical findings require immediate care
- x Delayed care prolongs LOS and negatively impacts health outcomes
- x Some OP pathologies require urgent f/u exams

What It Does

- x Automatically detect critical abnormalities in chest AP/PA x-rays using Lunit Insight CXR*
- x Alerts the technologist to follow the local notification protocol 30s after exposure e.g. call doctor, "red dot" x-ray

Benefits: quality of care & clinical efficiency

*AGFA RSD integrates today *Lunit INSIGHT CXR. Lunit INSIGHT CXR Triage* for US can also be integrated.

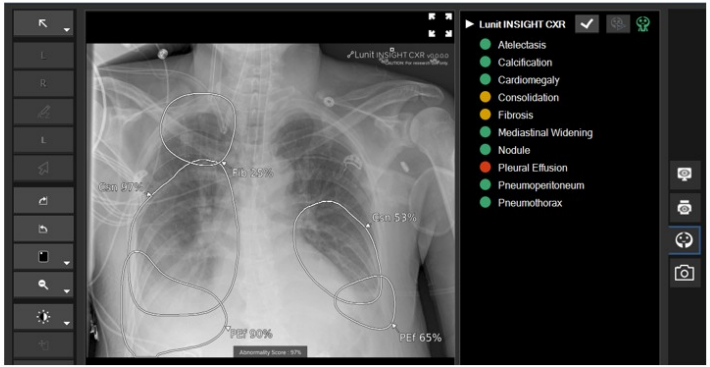


Fig 1. Secondary Capture view in workstation with AGFA **CriticalScan** product

XR CRITICAL SCAN

Automatically Rotating X-Ray Images

Keeping the focus on the patient

AI for...

Clinician assistance

Technologist assistance

Radiologist assistance

Current

Problem Solved

- Technologist has to care about how the panel is oriented behind the patient during free exposures
- If panel not properly oriented, technologist has to click 1 to 2 times to correct

What It Does

- Workstation instantly auto-rotates image into the correct orientation after the exposure
- 16 body parts covered

Benefits: technologist experience & productivity

- Enables technologist to be more focused in emergency e.g. multi trauma patients in ED
- Improves efficiency by reducing manual rotation clicks

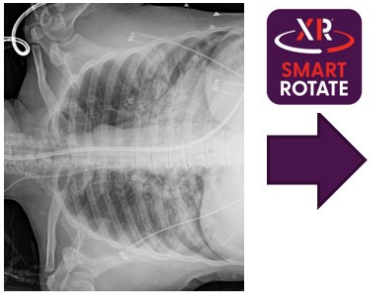


*Fig 2. 90° chest AP rotation with AGFA **SmartRotate** product*

Avoiding Mis-Marked Images

Lead Marker Detection

AI for...

Clinician assistance

Technologist assistance

Radiologist assistance

Current

Problem Solved

- It takes 2 extra steps/clicks to place a digital marker
- Technologist can forget to place a marker or mistakenly place the incorrect marker

What It Does

- Automatically places a digital laterality marker based on the order
- Automatically detects the laterality of the lead marker placed and warns the technologist if it doesn't' match the order

Benefits: safety & clinical efficiency

- Reduce errors (e.g. misdiagnosis)
- Less legal claims for hospital
- Less paperwork for radiology administrator / team leader

Fig 3. Preplaced Digital marker

Fig 4. Right Marker

Radiation Incident Prevention

Avoiding wrong events

AI for...

Clinician assistance

Technologist assistance

Radiologist assistance

Research

Problem Solved : human mistakes

- After a long shift, technologist exposes a chest instead of an abdomen
- Technologist is confused by the patient indicating wrong body part, or wounds on the other laterality

What It Does

- Pre-exposure visual warning in case camera detects collimation on wrong body part
- Pop-up on the workstation for technologist acknowledgment

Benefits: safety & clinical efficiency

- Lower dose for patients
- Less legal claims for hospital
- Less paperwork for radiology administrator / team leader

Fig 5. Laterality error detection

Active Quality Assurance

Continuous improvement for technlogists

AI for...

Clinician assistance

Technologist assistance

Radiologist assistance

Research

What It Does

- Performs image quality analysis immediately follow exposure
- Indicates to the technologist why & how to correct the image

Problem Solved : human mistakes

- Diagnostically limited or non diagnostic images from being sent to radiologist
- Meaningful and actional QA related to poor image quality and how often diagnostically limited images are sent

Benefits: safety & clinical efficiency

- Real-time feedback and learning for technologist
- Reduce patient recalls
- Avoids misdiagnosis

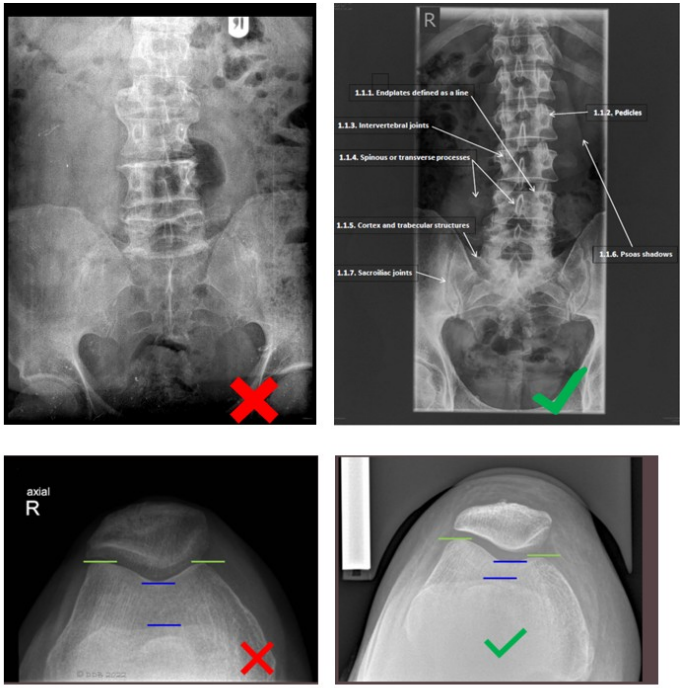


Fig 6. x-ray quality Assessment

Lung Clipping Detection

Avoiding patient recalls

AI for...

Clinician assistance

Technologist assistance

Radiologist assistance

Research

Problem Solved : human mistakes

Prevents images being sent to radiologist that exclude anatomy potentially necessary for a diagnosis

What It Does

- Detects if pertinent anatomy is clipped immediately following the exposure
- Pop-up on the workstation for technologist acknowledgment

Benefits: safety & clinical efficiency

Lower dose for patients

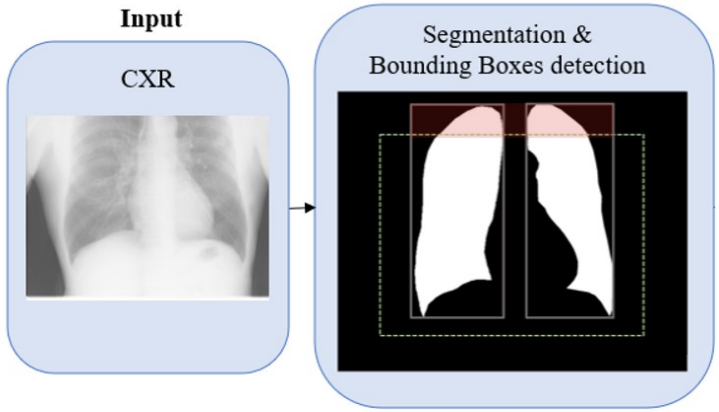


Fig 7. Lung clipped in radiograph

Image Quality Improvement

Standardizing x-rays to facilitate reporting

AI for...

Clinician assistance

Technologist assistance

Radiologist assistance

Current

Problems Solved

- Techs and radiologists sometimes need to adjust the imaging parameters (e.g. Window – Level) to see all areas of the anatomy (e.g. bone vs. soft tissue) in an image

Automatic cropping methodologies fail in 15% of exposures

What It Does

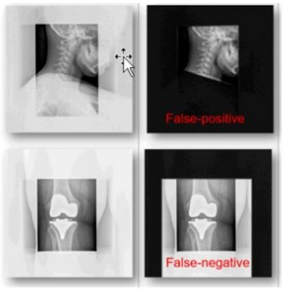
AI has made advanced segmentation possible.

We increase the success rate of the collimation border darkening from 85 to 97%

All areas of the image are optimized, giving the radiologist the full context of the image w/o post-processing

Benefits: productivity

Reduces the need for manual correction before reporting, over a wide range of applications and imaging conditions



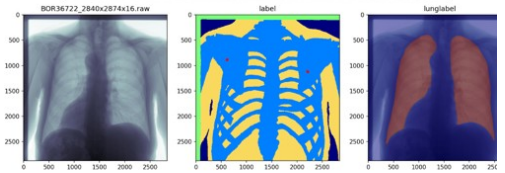
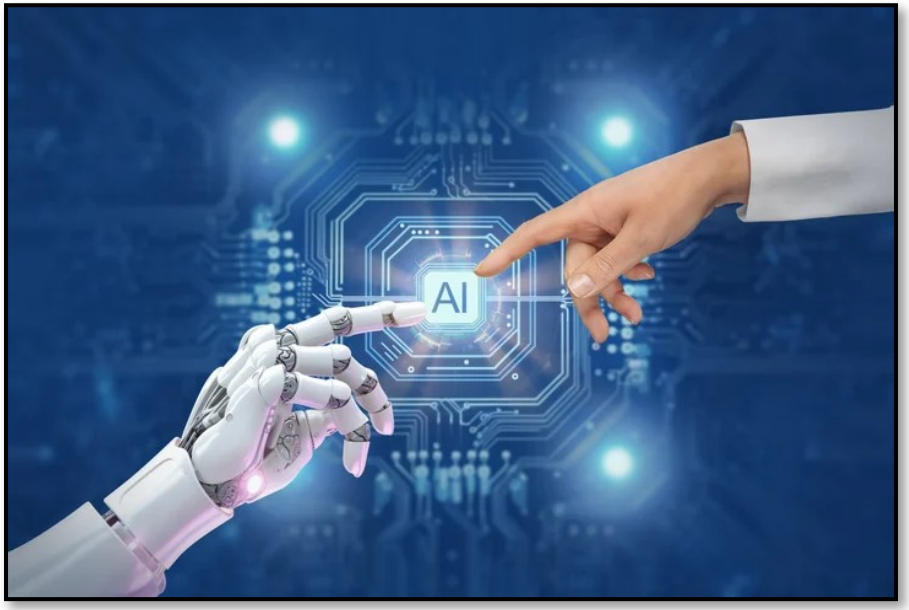


Fig 8. Borders & tissue type detection in AGFA MUSICA product

MUSICA

Challenges & Limitations

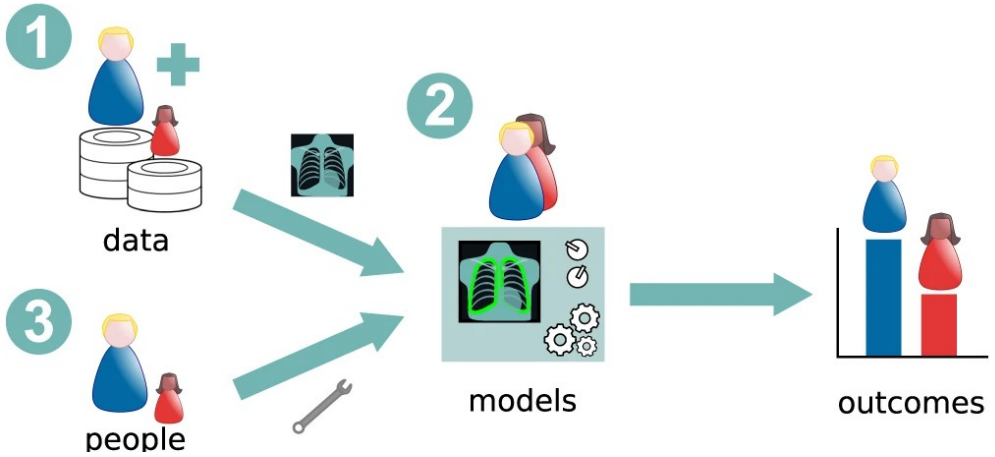
- Accuracy & Reliability
- Trust & Acceptance
- Regulatory
- Cost
- Workflow Disruptions
- Job Displacement
- Taking over the human race ;-)



Challenges & Limitations

Accuracy & Reliability

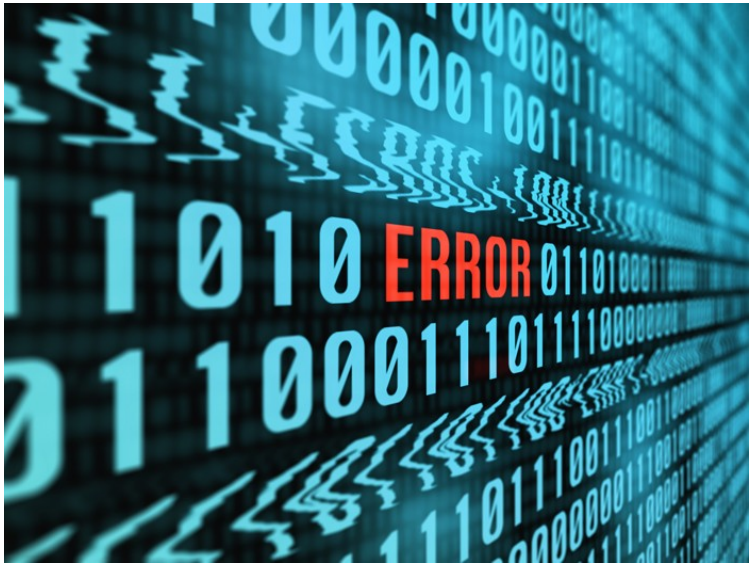
- Poor Training Data
  - Population Bias



Challenges & Limitations

Accuracy & Reliability

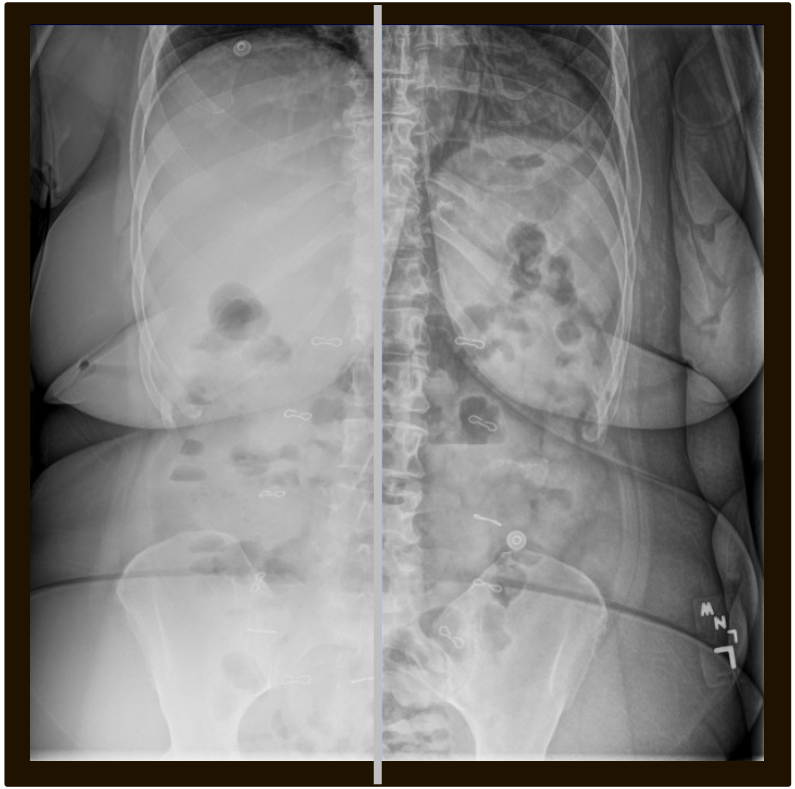
- Poor Training Data
  - Population Bias
  - Quality
    - Mislabeled Inputs



Challenges & Limitations

Accuracy & Reliability

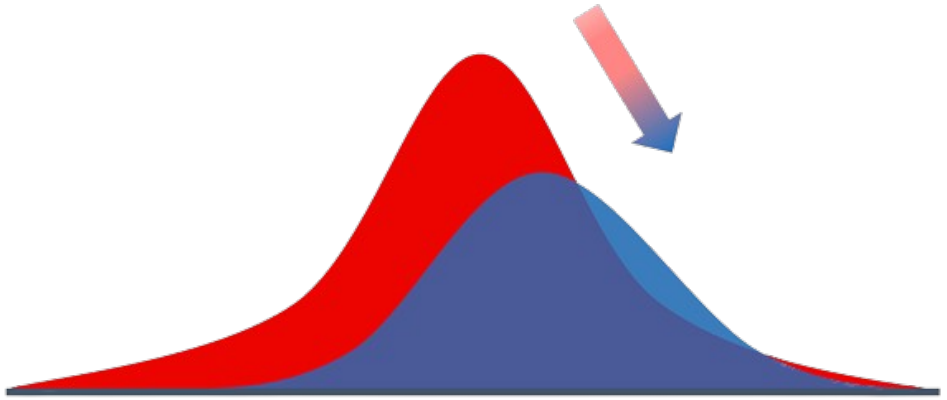
- Poor Training Data
  - Population Bias
  - Quality
    - Mislabeled Inputs
    - Image Quality



Challenges & Limitations

Accuracy & Reliability

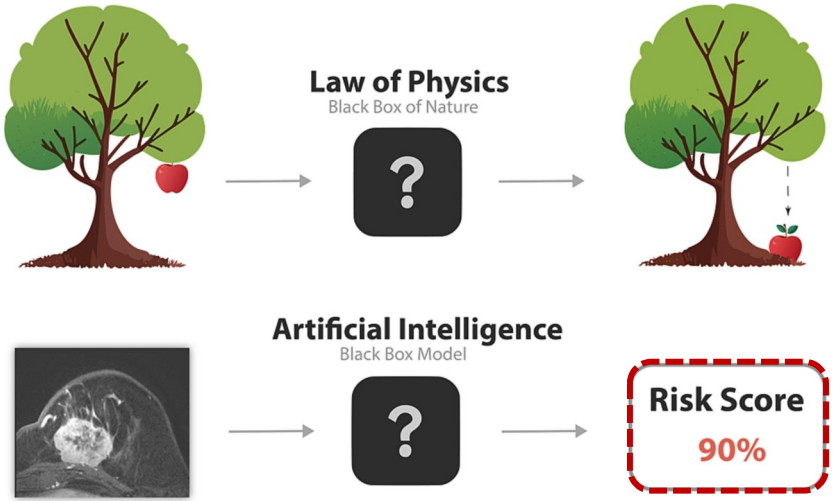
- Poor Training Data
  - Population Bias
  - Quality
    - Mislabeled Inputs
    - Image Quality
  - Data Drift



Challenges & Limitations

Trust & Acceptance

- Lack of *Explainability*
  - Black Box Theory
- Solutions
  - Explainable AI Models
  - Confidence Scores
  - Use as an Assistive Tool



Challenges & Limitations

Regulatory

- Approval Process
  - FDA: SaMD required 510(k)

Challenges & Limitations

Regulatory

- Approval Process
  - FDA: SaMD required 510(k)
- Liability Concerns
  - Who's at fault?

Challenges & Limitations

Regulatory

- Approval Process
  - FDA: SaMD required 510(k)
- Liability Concerns
  - Who's at fault?
- Privacy Concerns
  - Large data sets of patient info

Challenges & Limitations

Cost Considerations

UNDERSTANDING AI COSTS

Software
Licensing fees (per-study, subscription, or enterprise)

Hardware
GPU servers, storage, infrastructure upgrades

Ongoing
Updates, support, training, integration maintenance

Did you know? 75% of facilities haven't yet measured their AI ROI

JUSTIFYING THE INVESTMENT

RETURN ON INVESTMENT FORMULA

$$ROI = \frac{(Savings + Revenue\ Gains) - AI\ Costs}{AI\ Costs} \times 100$$

SAVINGS	REVENUE	AI COSTS
$75K	$100K	$150K
Efficiency gains, fewer errors, reduced litigation	Higher throughput, downstream treatments	Software, hardware, maintenance

YEAR 1 RESULT
ROI = 16.7%

RESEARCH SHOWS
Up to 451% over 5 years*

*Source: Journal of the American College of Radiology, 2024 – ROI study of AI platform in stroke management-accredited hospital

Challenges & Limitations

Workflow Disruptions & Job Displacement

- Workflow Disruptions
  - More Steps
  - Second Guessing
- Job Displacement
  - Supportive Tool
  - Eliminate Routine Tasks
  - Shift Focus

Conclusions & Key Takeaways

1. AI is seen as the next logical step
2. Vendors should work closely to educate technologists
3. AI is expected to improve safety, consistency and quality
4. Medical Imaging AI market expected to grow significantly

Thank You

Jordan Hermiller

Jordan.Hermiller@Agfa.com

ICE IMAGING CONFERENCE & EXPO
SAN ANTONIO Texas
FEBRUARY 20-22, 2026