Update on AI products within Acute Radiology

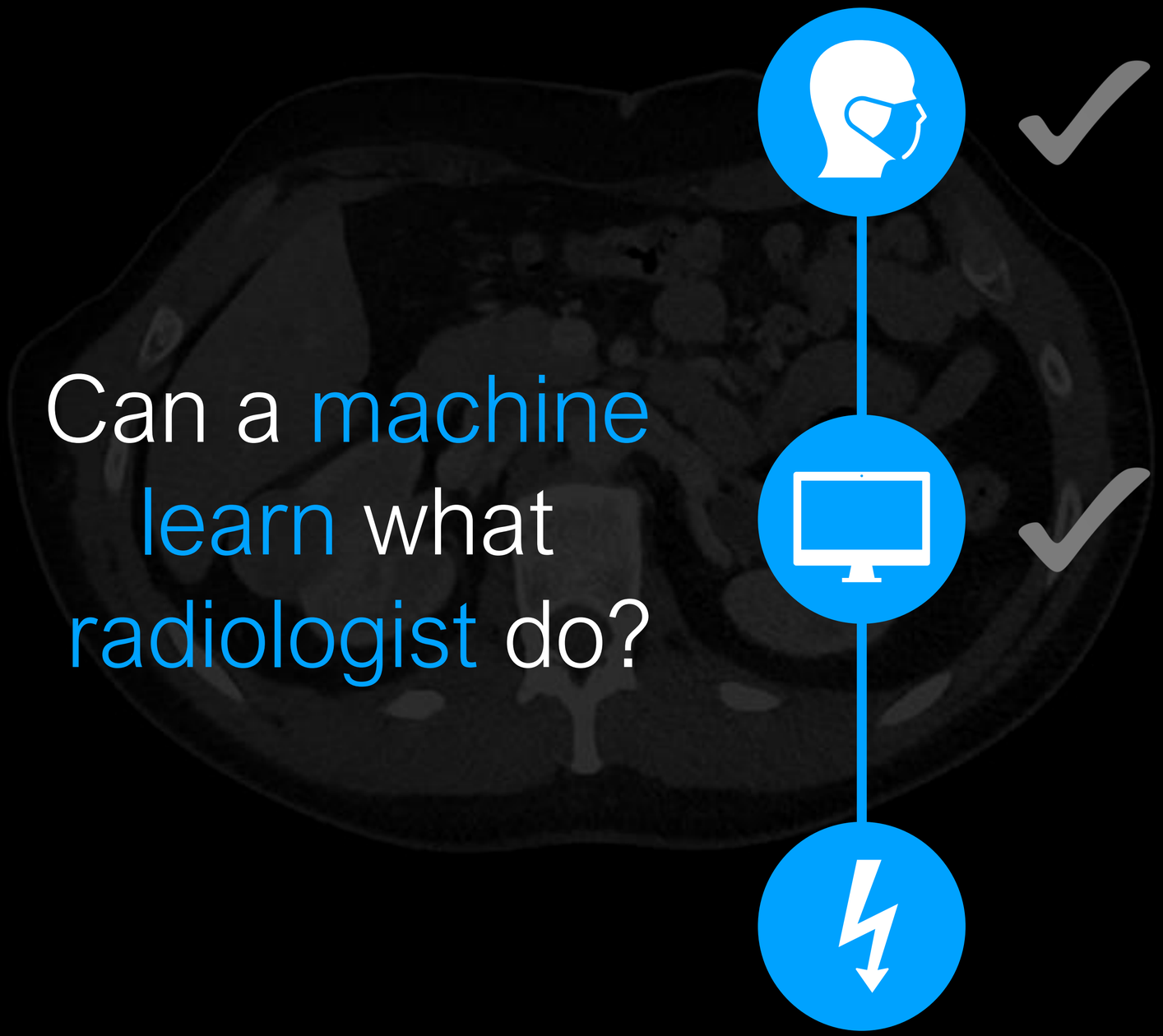
Translation of deep learning technology to the clinic

What deep learning technology do the clinic need?

Professor Ole Graumann

How *can* we use Artificial Intelligence in Radiology?

ARTIFICIAL INTELLIGENCE



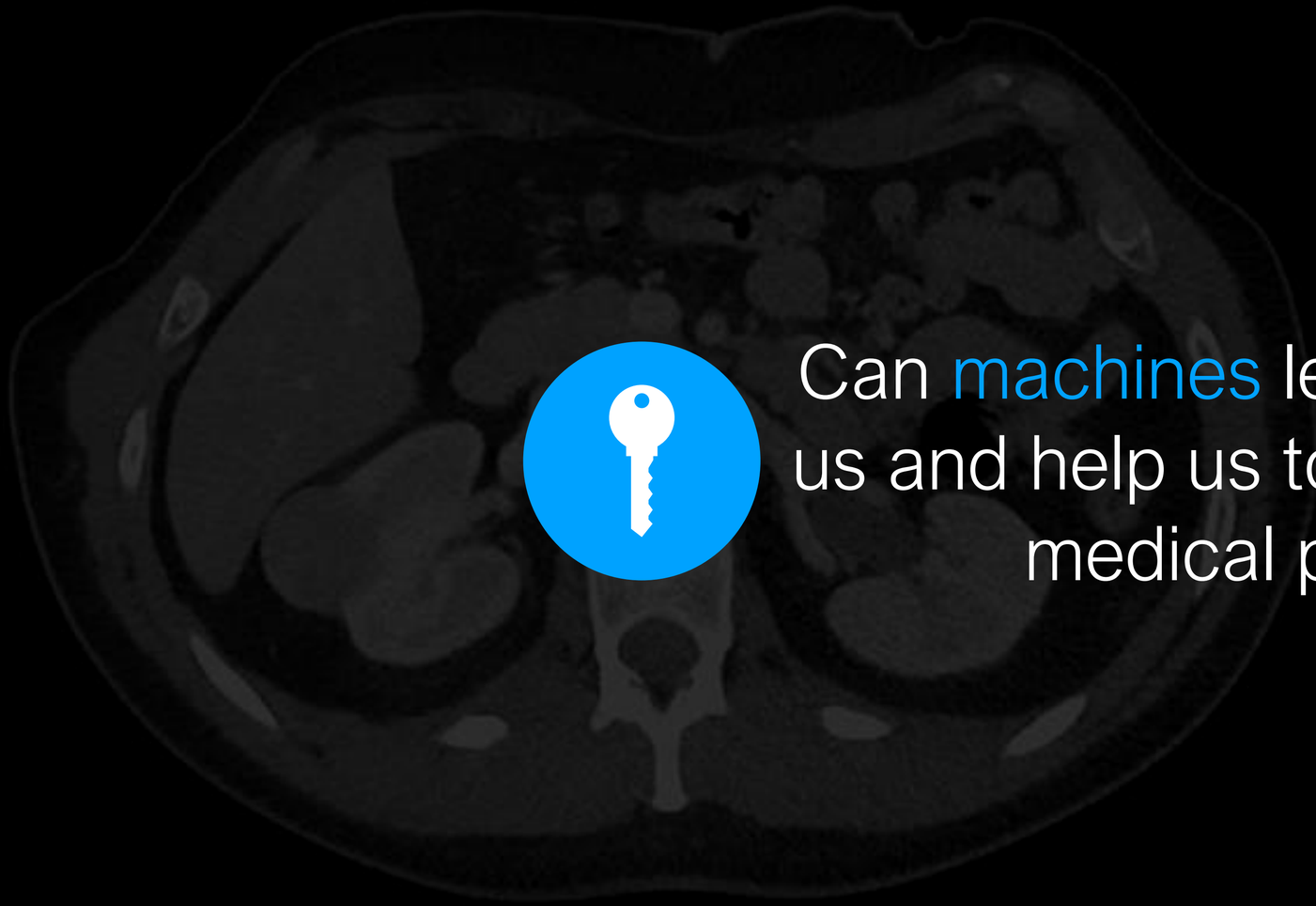
Can a machine learn what radiologist do?

Can we teach a machine what we know and do?

Can machines, by themselves, learn what we know and do?

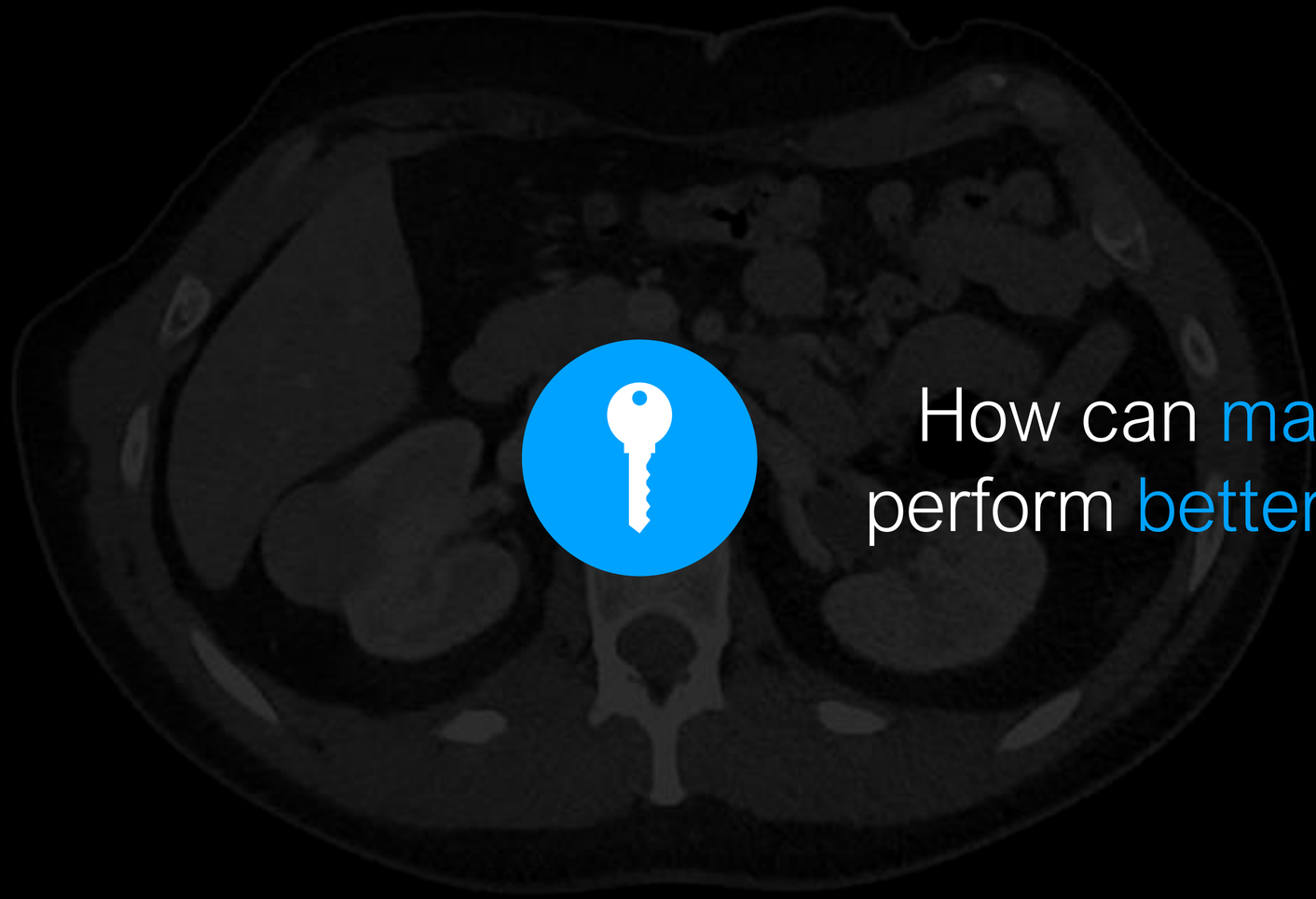
Can machines learn more when us and help us to perform better medical practice?

ARTIFICIAL INTELLIGENCE

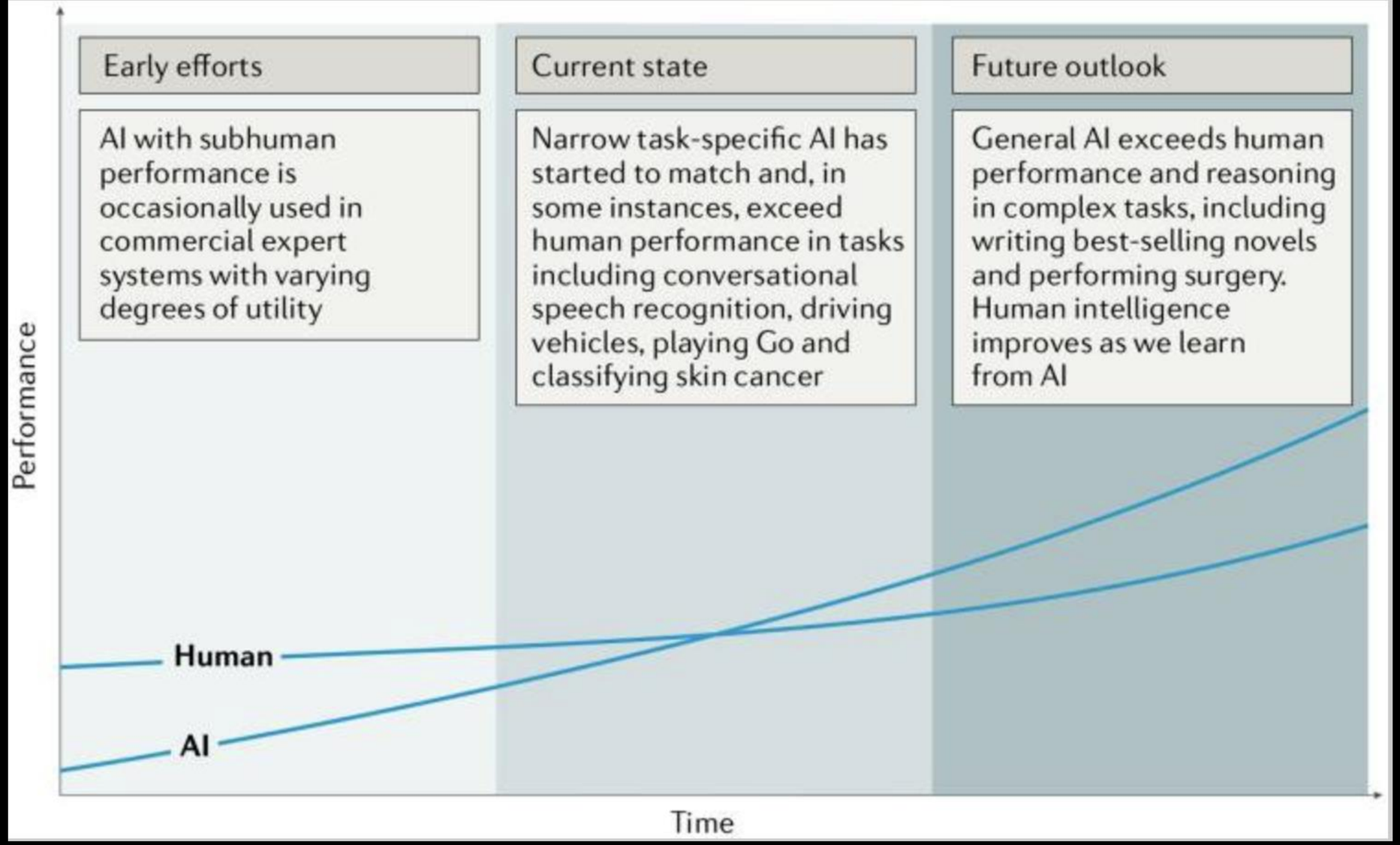


Can machines learn more when us and help us to perform better medical practice?

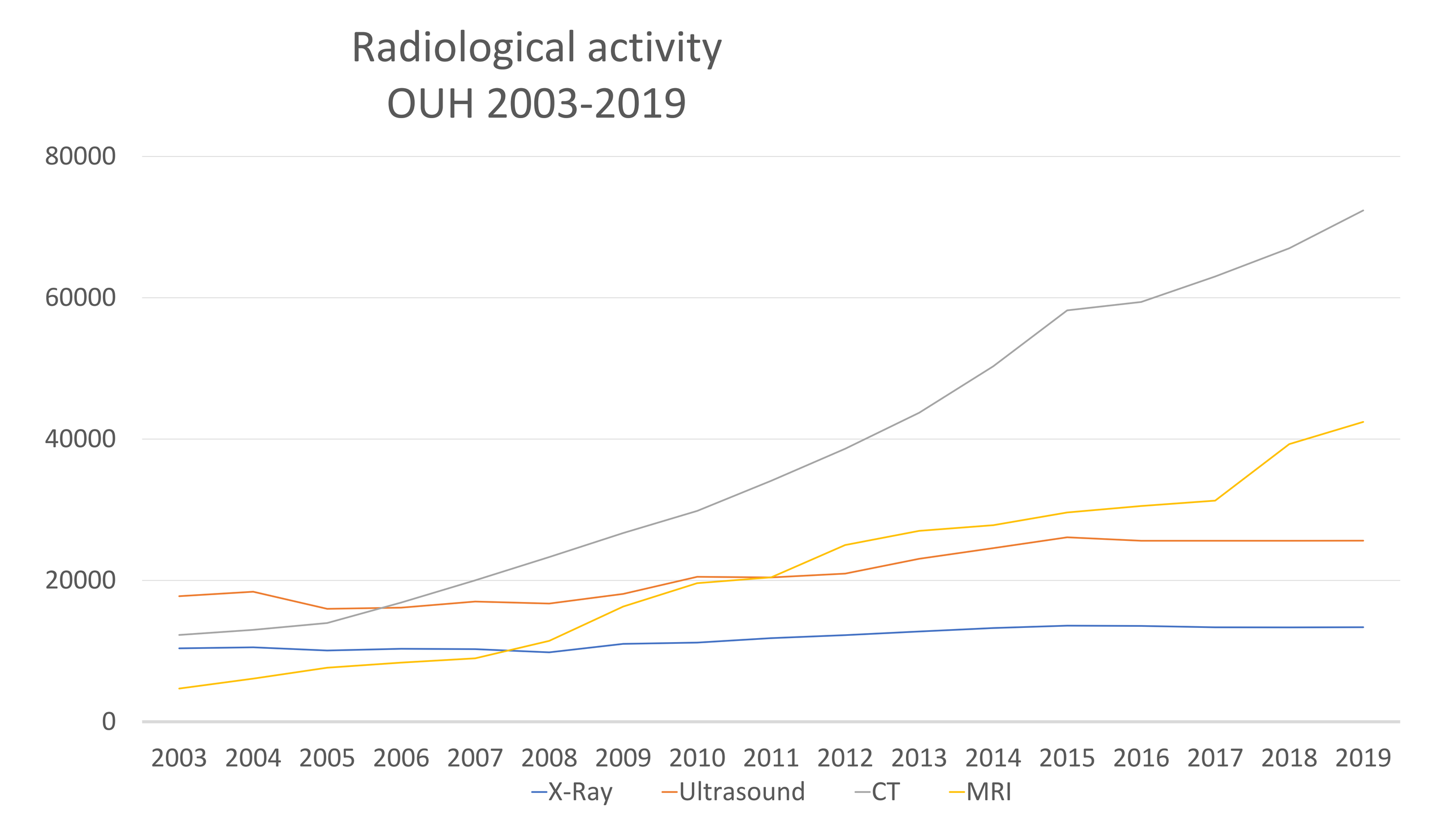
ARTIFICIAL INTELLIGENCE



How can machines help us to perform better medical practice?



Hosny et al.
Artificial intelligence in radiology.
Nat Rev Cancer.
2018 Aug;18(8):500-510.


Radiological activity
OUH 2003-2019
80000
60000
40000
20000
0
2003
2004
2005
2006
2007
2008
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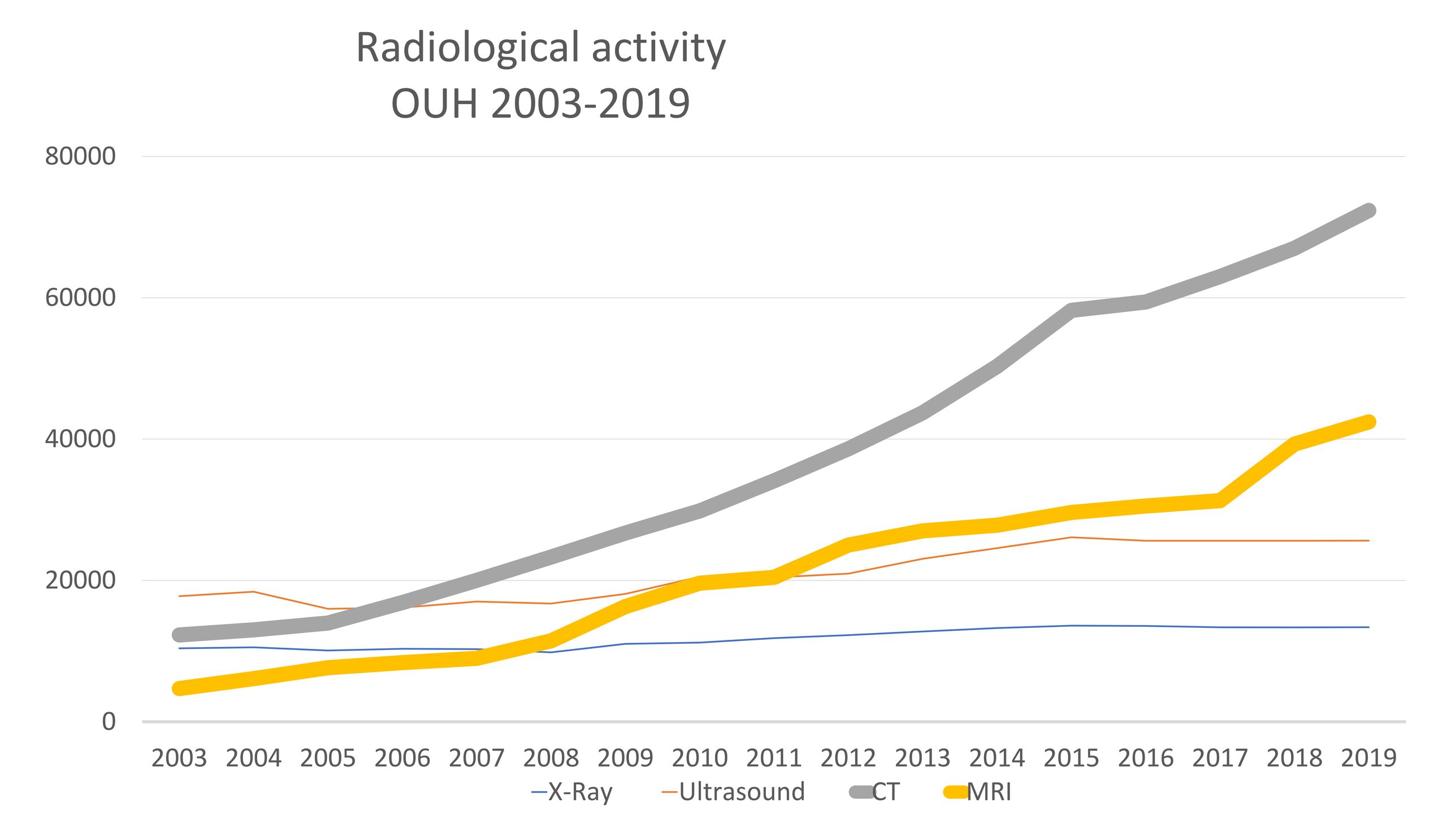
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
X-Ray
Ultrasound
CT
MRI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OUH 2003-2019
80000
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Ultrasound
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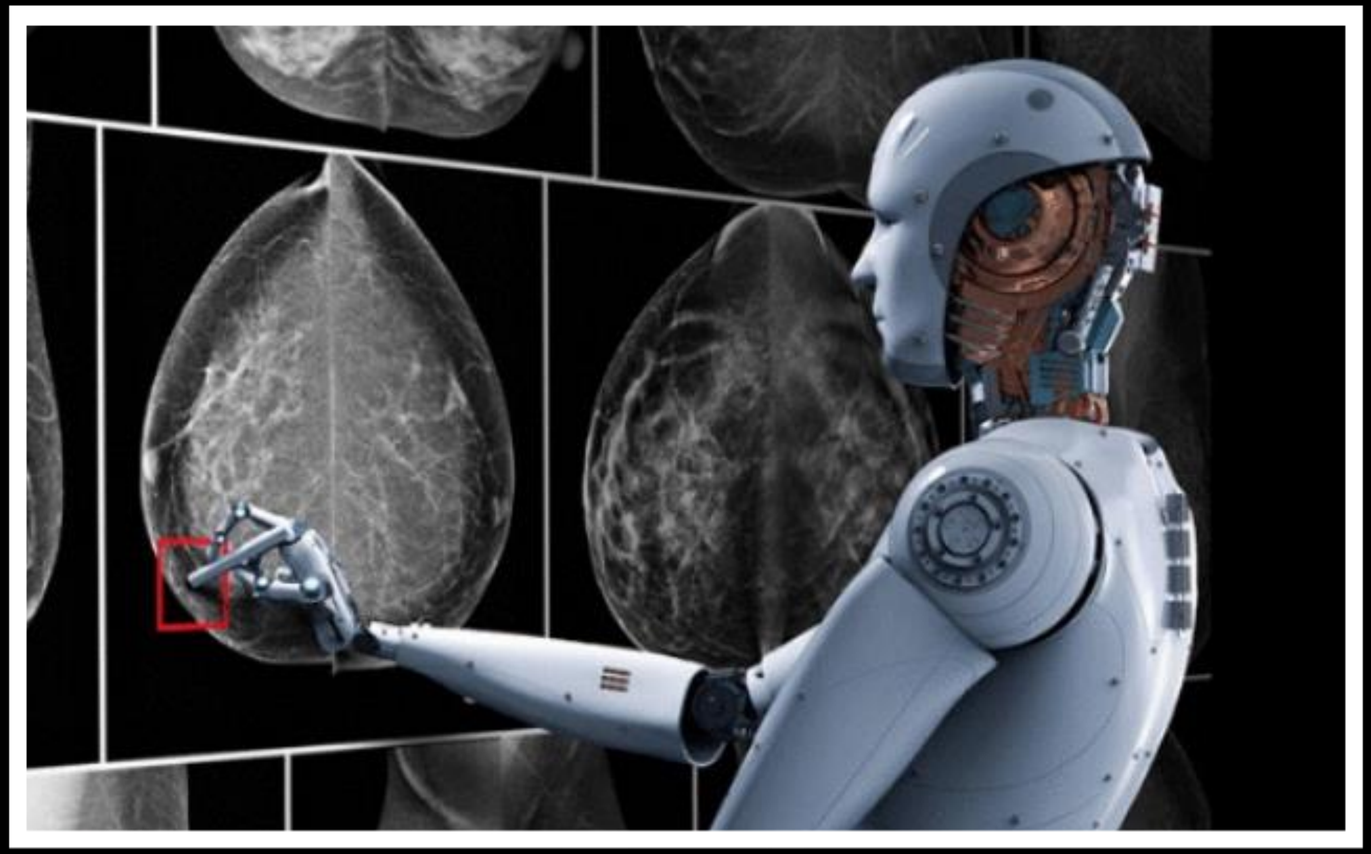
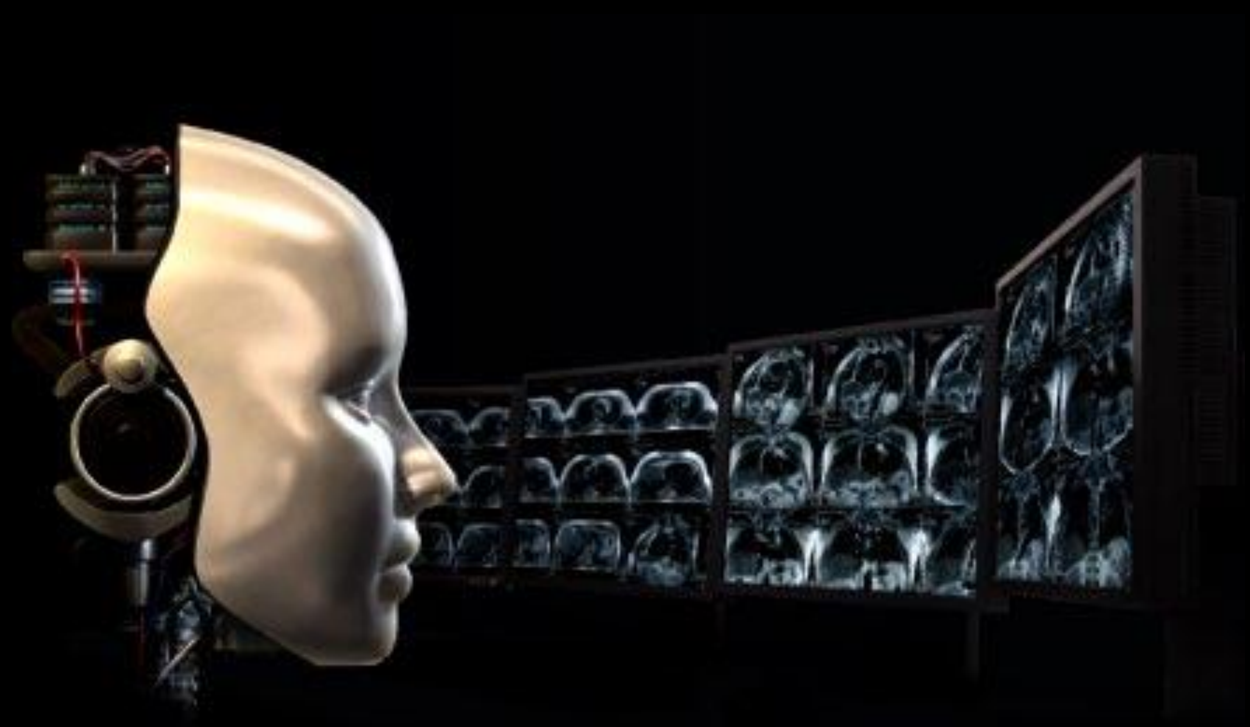


What deep learning technology do the clinic need?



EUROPEAN CONGRESS OF RADIOLOGY

ECR 2023

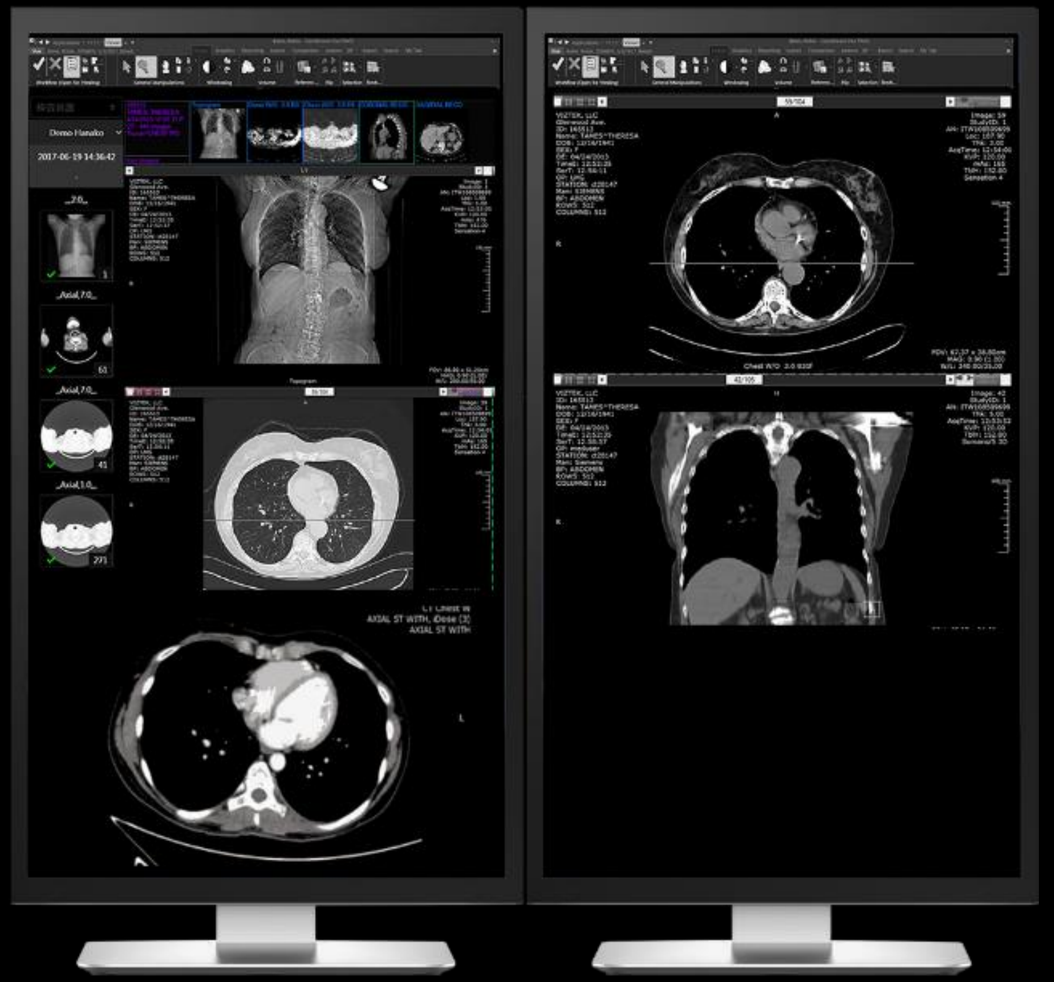
THE CYCLE OF LIFE

VIENNA IN MARCH 1–5 | 2023

MYESR.ORG

EUROPEAN SOCIETY OF RADIOLOGY · EFRS European Federation of Radiographer Societies · ESHI MT Molecular Translational Hybrid Imaging

PACS & Worklist Integration



Radiology Workstation App

The enterprise AI of choice
10 CE-marked radiology solutions

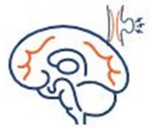
CT

ICH

CT

M1 LVO

CT



Brain aneurysm

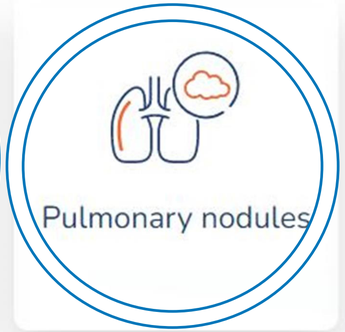
CT

C-spine fracture

CT

PE

Incidental PE



Pulmonary nodules

CT

Intra abdominal free gas

CT

Pneumothorax (X-ray)

CT

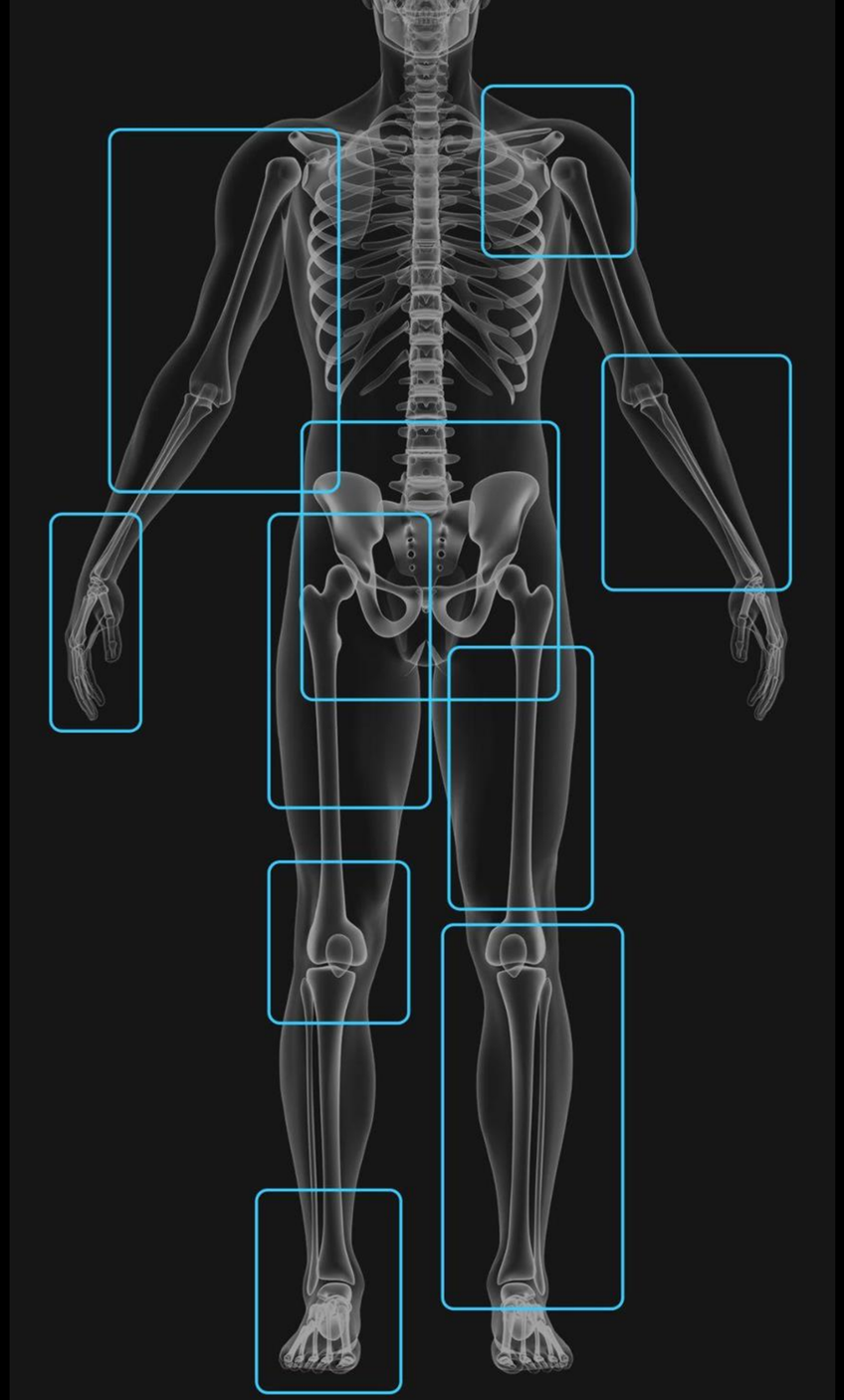
Rib fractures

aidoc

RBfracture™

CE-marked

2023



RBfracture covers the most common MSK areas; Hip, Pelvis, Femur, Knee, Tibia and Fibula, Hand, Wrist, Fingers, Elbow, Humerus, Foot, Ankle, Toes, Forearm & Shoulder

Radiobotics®

νRad®

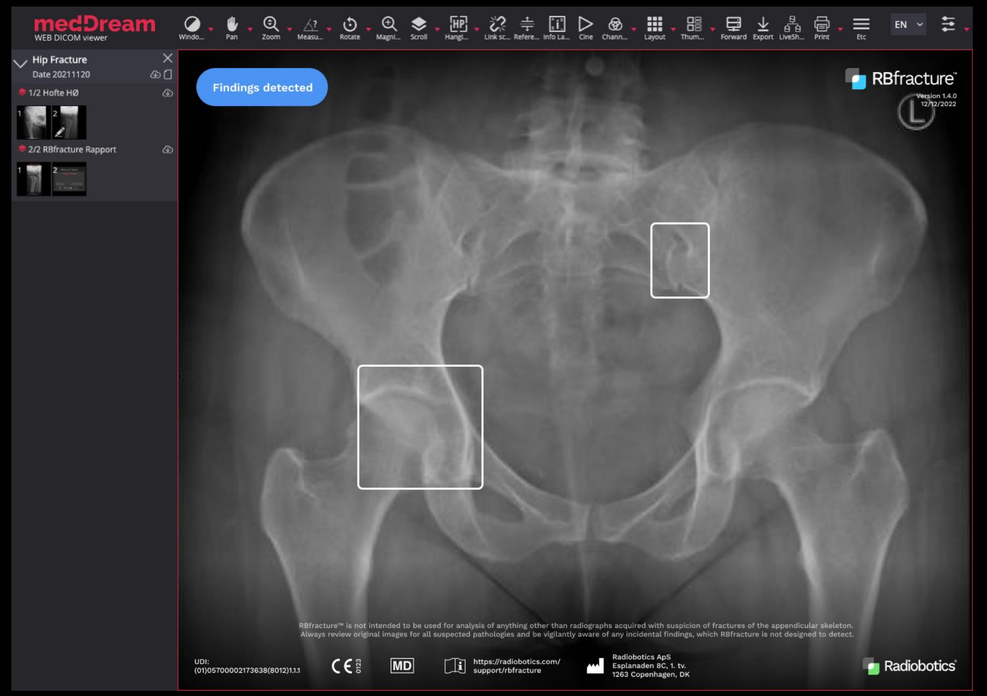
RBfracture™

CE-marked

2023

Fracture detection

Input



Output

Radiobotics®

Improving diagnostic performance

Retrospective evaluation, Bispebjerg, Copenhagen, Denmark

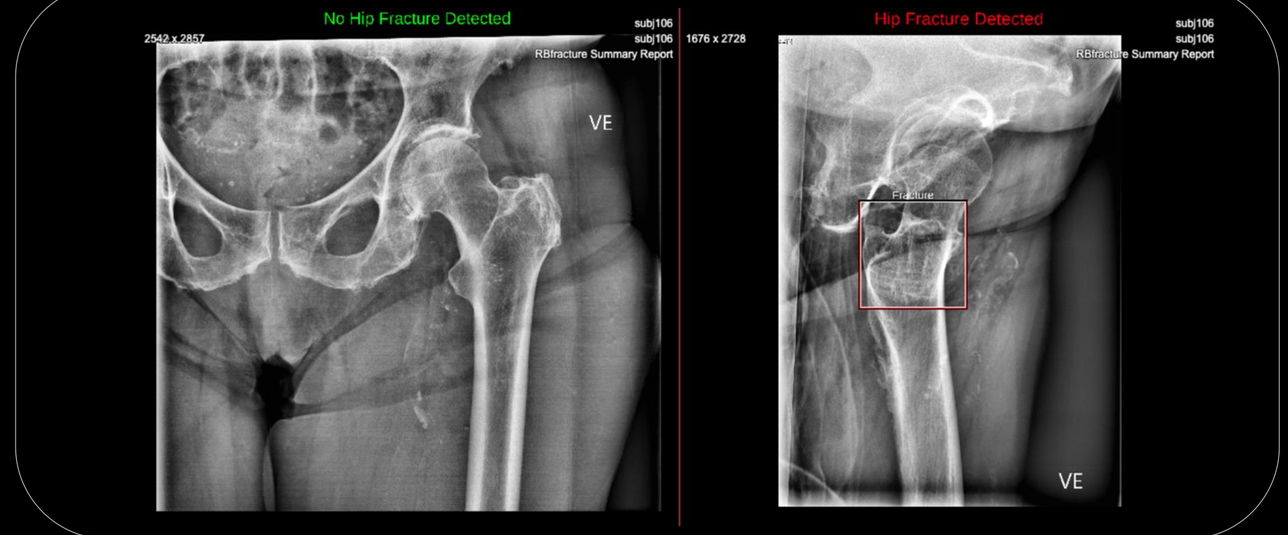
per-case analysis

Residents alone
Sensitivity: 89%
Specificity: 90%

AI alone
Sensitivity: 99%
Specificity: 73%

Combined
Sensitivity: 94%
Specificity: 91%

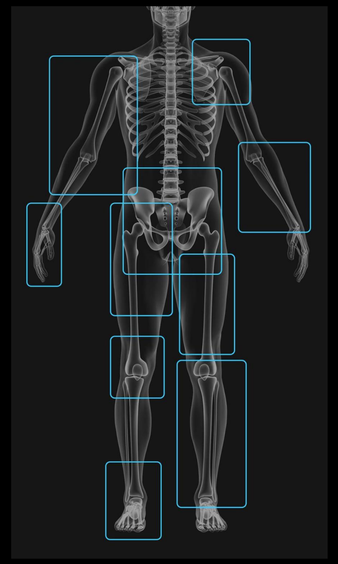
Representative examples



Improve diagnostic performance

Internal reader study

per-case analysis



Rep. Rad alone
Sensitivity: 81%
Specificity: 94%

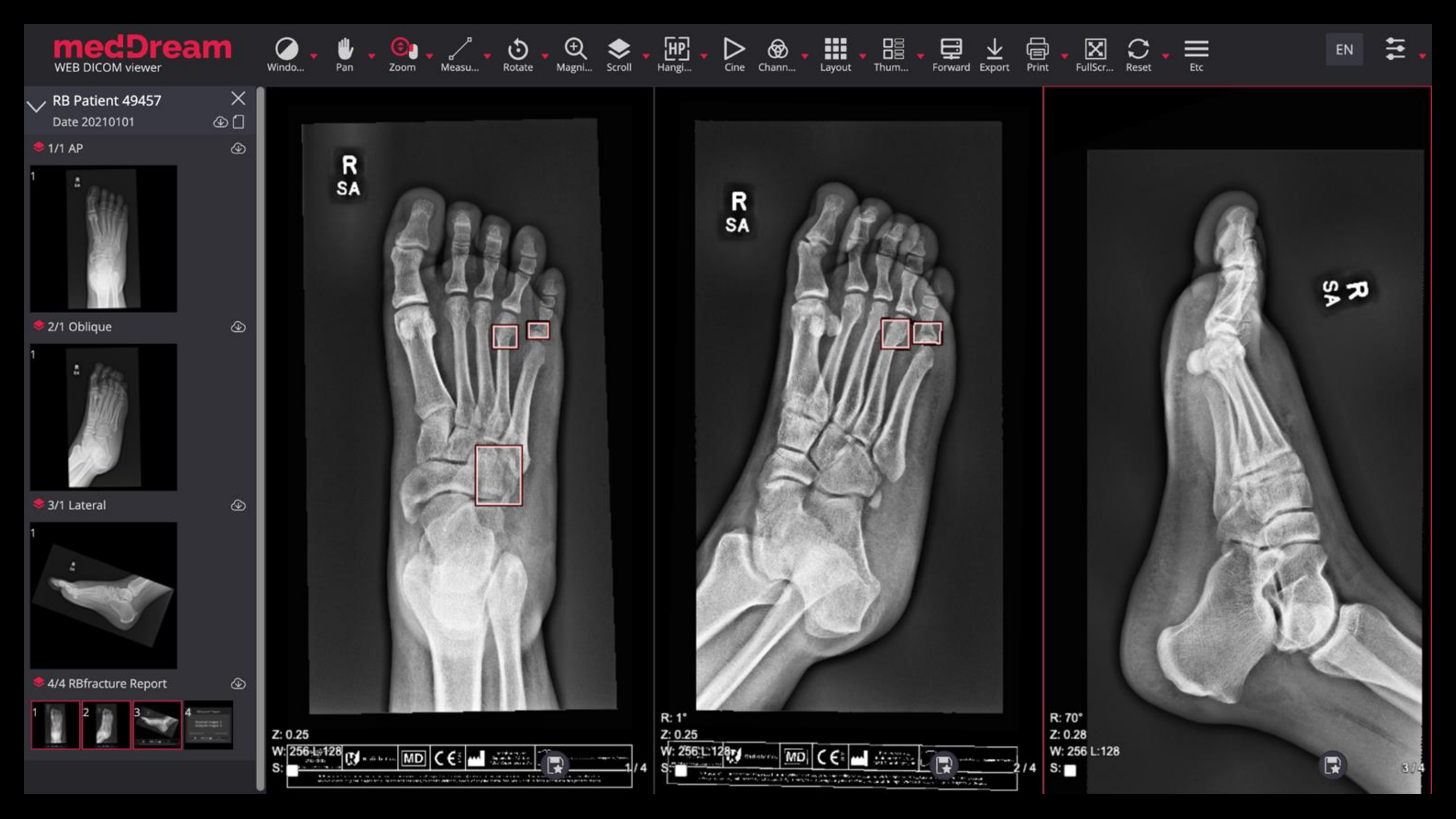
Rep. Rad w. AI
Sensitivity: 89%
Specificity: 94%

42% reduction in missed fractures

40% reduced times use per case

Link


medDream
WEB DICOM viewer
Windo...
Pan
Zoom
Measu...
Rotate
Magni...
Scroll
Hangi...
Chann...
Layout
Thum...
Export
Print
FullScr...
Reset
DICOM
Theme
Etc
EN
RB Patient 49457
Date 20210101
1/1 AP
2/1 Oblique
3/1 Lateral
4/4 RBfracture Report
1431 x 2589
RB Patient 49457
RBP_49457
AP
2021-01-01
Z: 0.42
W: 4096 L:2048
S:
1 / 1
1424 x 2539
RB Patient 49457
RBP_49457
Oblique
2021-01-01
Z: 0.46
W: 4096 L:2048
S:
1 / 1
2913 x 2187
RB Patient 49457
RBP_49457
Lateral
2021-01-01
R
SA
R: 69°
Z: 0.29
W: 4096 L:2048
S:
1 / 1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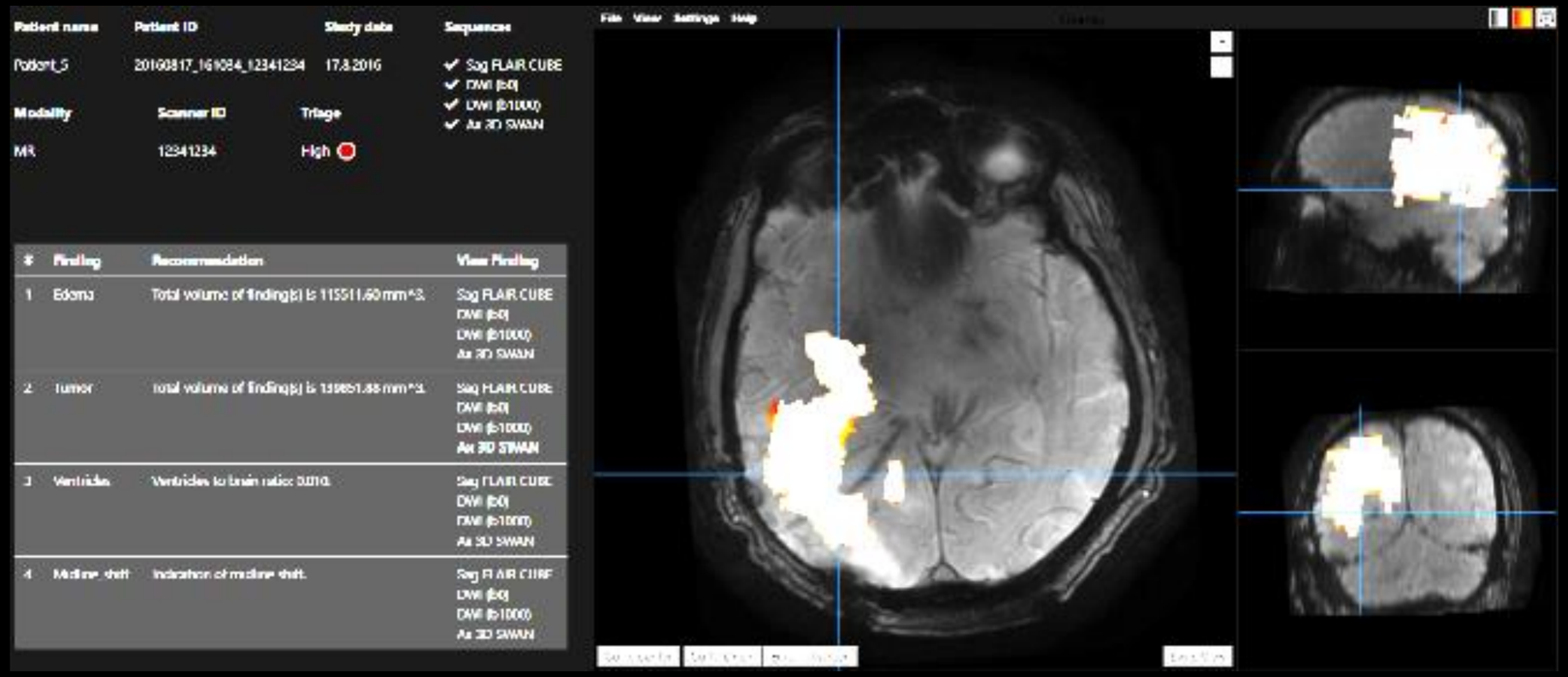
RB Patient 49457
Date 20210101
1/1 AP
2/1 Oblique
3/1 Lateral
4/4 RBfracture Report
R
SA
Z: 0.25
W: 256 L:128
S:
1 / 4
R: 1°
Z: 0.25
W: 256 L:128
S:
2 / 4
R: 70°
Z: 0.28
W: 256 L:128
S:
3 / 4

STROKE


SIEMENS
Healthineers
MAGNETOM Aera


CEREBRIU
STROKE MR SUITE
STROKE
FASTER CONFIDENT
PATIENT SELECTION
NO STROKE

Artificial intelligence for magnetic resonance imaging to acute stroke patients



Jonas Asgaard Bojsen
MD, PhD student

GS STROKE og andre studier relateret til Cerebriu udført i Danmark

	Prospektiv/retrospektiv	Antal cases	Beta	Test	Reference	Patientgruppe	Trombolysekandidater
Herlev:							
● Malini							
○ Studie 1	Retrospektiv	800	nej	Apollo Detect	**Klinisk diagnose**	Obs iskæmisk stroke?	nej
○ Studie 2	**Prospektiv**	?	nej	Apollo Detect	**Klinisk diagnose**	Obs iskæmisk stroke?	nej
● Christian							
○ Studie 1	Retrospektiv	1000	nej	Apollo Detect	Radiologisk diagnose re-eval neuroradiolog	Obs stroke	nej
Rigshospitalet							
● Jacob							
○ Studie 1	Retrospektiv	?	**ja**	**Apollo DWI-FLAIR**	Radiologisk diagnose	Obs stroke	**ja**
Odense:							
● Jonas							
○ Studie 1	Retrospektiv	1000	nej	Apollo Detect	Radiologisk diagnose	Obs stroke	**ja**
○ Studie 2	**Prospektiv**	?	nej	Apollo Detect	Radiologisk diagnose	Obs stroke	**ja**
● Anton							
○ Studie 1	Retrospektiv	300	**ja**	**Apollo Microbleed**	Radiologisk diagnose re-eval reservelæge med radiologisk rapport	**Kendt ICH, obs CAA**	nej
● stud.med?							
○ Studie 1	Retrospektiv	1000	nej	**Apollo Smart Protocol**	Udførte sekvenser/ Radiologisk diagnose	Obs stroke	**ja**

Domain	Topics
1. Health problem and application	Health problem of individuals Description of the application
2. Safety	Clinical safety Technical safety (technical reliability)
3. Clinical effectiveness	Effects on mortality, morbidity, QoL,… Behavioural outcomes (e.g., exercise) Utilization of health services
4. Patient perspectives	Satisfaction and acceptance Access and accessibility Empowerment, self-efficacy
5. Economic aspects	Economic evaluation: Programme costs Economic effects **Business case**: Expenditures and revenue per year
6. Organizational aspects	Process Structure Culture – perception of staff Management
7. Socio-cultural, ethical and legal aspects	Ethical, legal and social issues

Benjamin S Rasmussen, Ass. Professor, PhD, MD

Benjamin has a PhD within the field of innovative medical technologies and worked intensively with the MAST model. In his Post Doc he will among other things development the MAS-AI (Model for Assessment of Artificial Intelligence) together with Kristian Kidholm

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