


# Mesterséges intelligencia a radiológiai gyakorlatban

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## Artificial intelligence

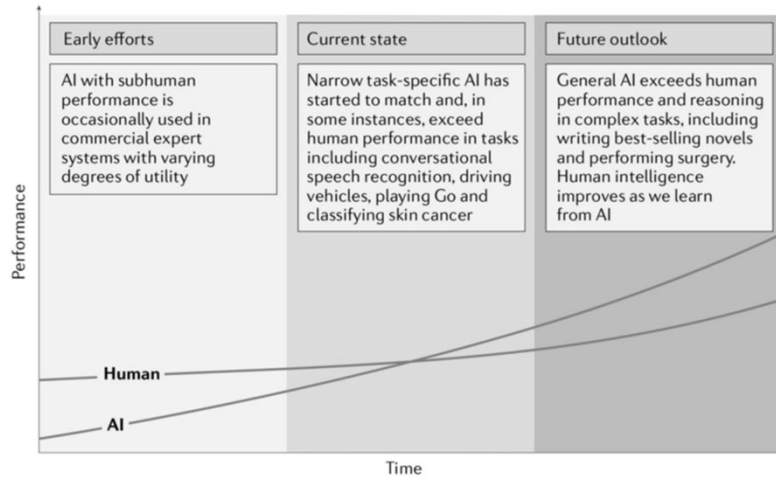
- made major development in perception
- web search
- self-driving vehicles
- natural language processing
- playing chess or go
- computer vision – image recognition -  
<https://cloud.google.com/vision/>

Input	Output
	Domestic dog: 92%
	Wolf: 7%
	Fox: 0.2%
	Horse: 0.01%

AJR:208, April 2017

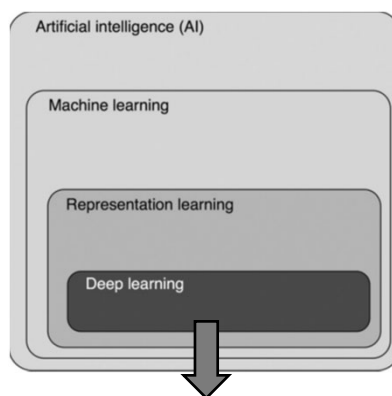
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## Artificial vs. human intelligence



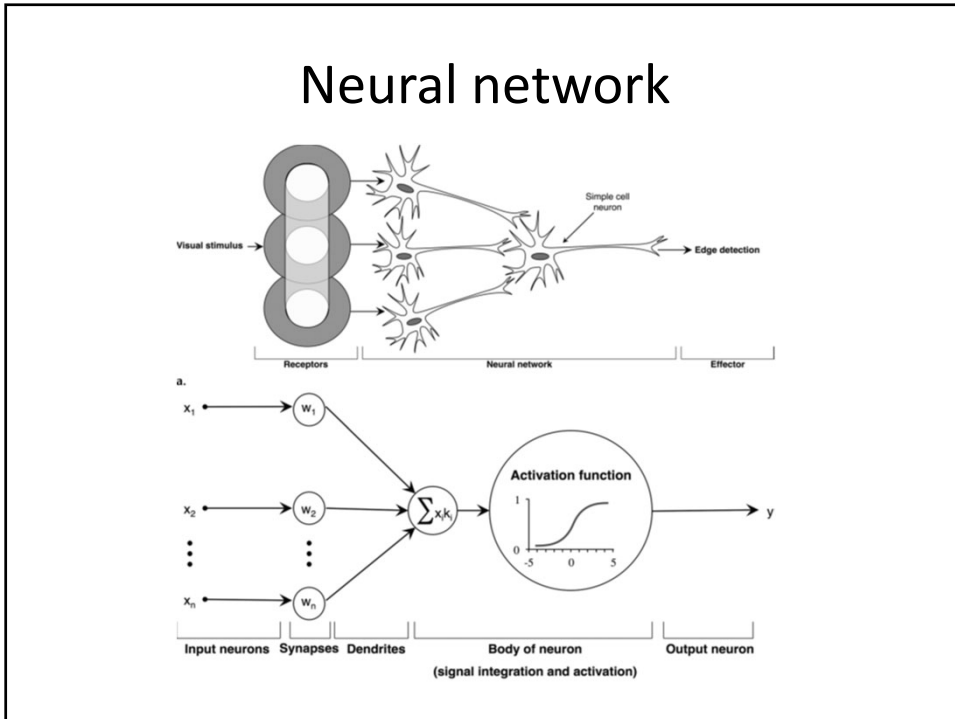
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## Subtypes of AI

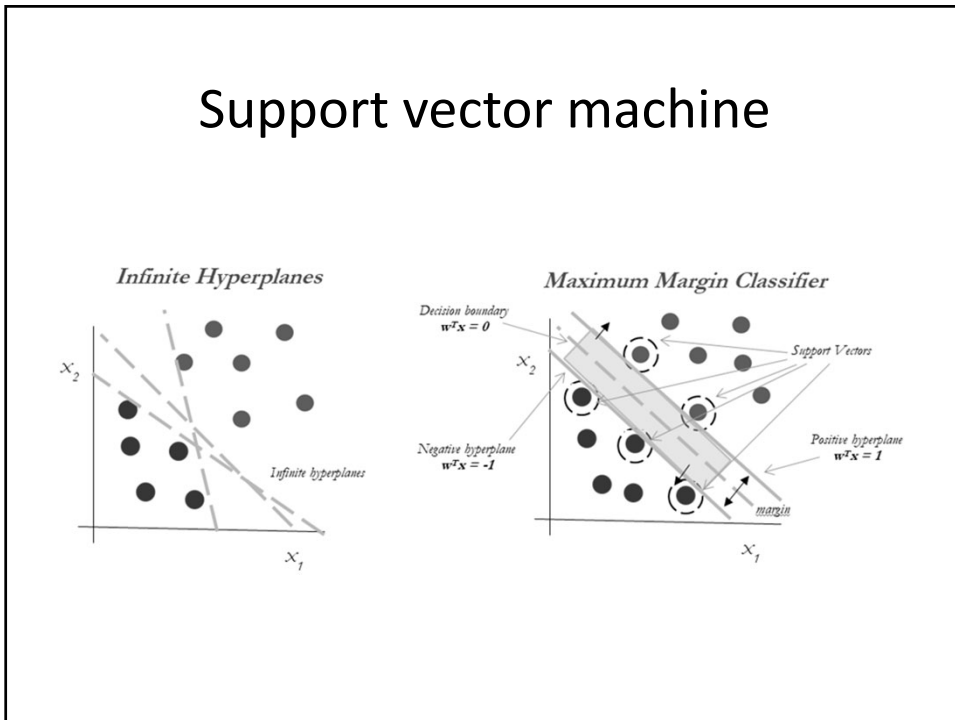


- learns composition of features that reflect a hierarchy of structures
- complex representations are expressed in terms of simpler representations
- simple features: signal intensity, edges, texture
- complex features: shape, lesion, organ

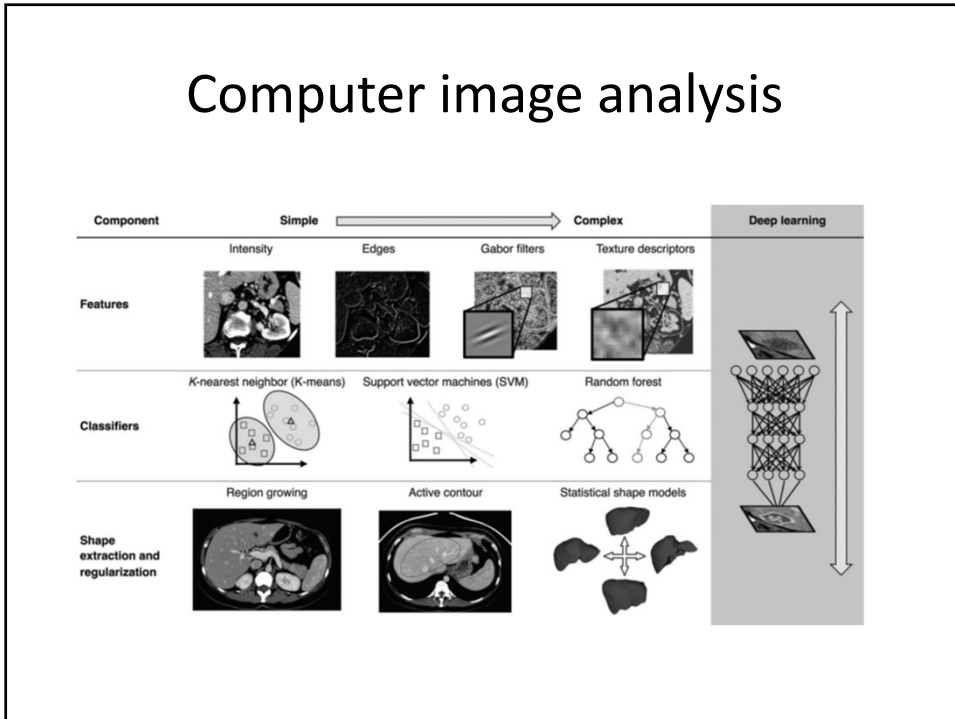
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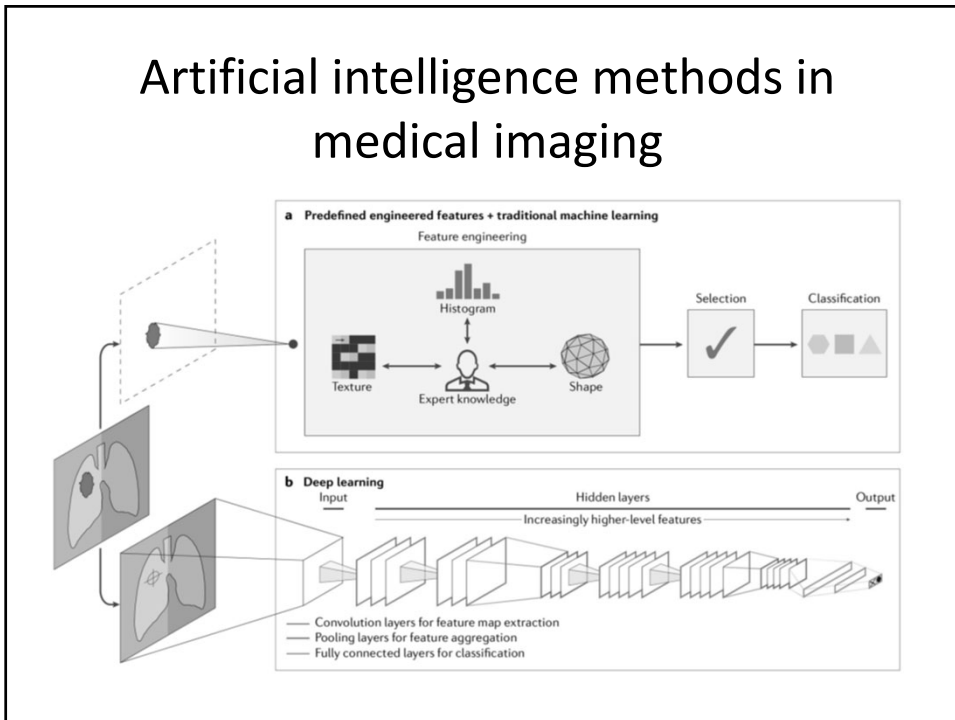
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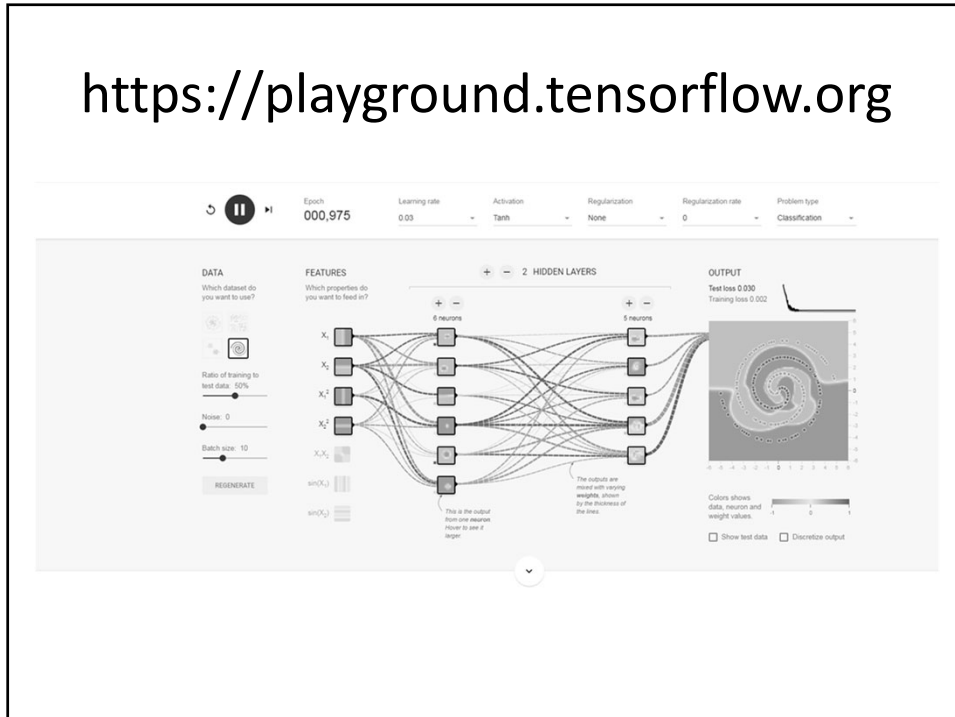


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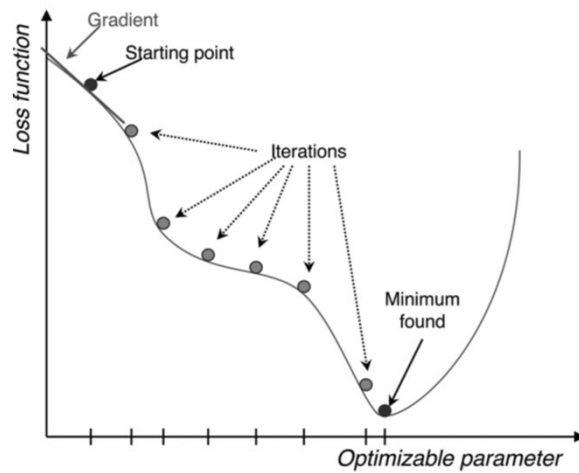
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<https://playground.tensorflow.org>



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## Gradient descent



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## The road to AI

- digitalization
- image communication – LAN, WAN
- subspecialty reading
  - precision medicine, more knowledge
- QA – peer review
- electronic health record
- big data
- value based health care
- increasing role of imaging in medicine

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## Use of AI in radiology

- speech recognition
- repair image quality
- enhance contrast – reduced dose
- image recognition
- radiologist should train AI algorithms
- AI help shoulder the increasing workload
- triage – priority assessment

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## Use of AI in radiology

- visually assess medical images and report findings to detect, characterize and monitor diseases
- detection: predict location of potential lesions
- classification
  - software training: deep learning algorithms are data hungry – labeled, annotated datasets
  - evaluation: performance of these models is typically assessed using accuracy
- segmentation: can be considered as a pixel-level classification task

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## Pitfalls and limitations

- black box nature of AI – difficult to validate
- „hallucination, poisoning...”
- change of medical data
- insufficient labelled data – e.g. rare diseases
- discrepant finding
- ethical issues

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## Advantages

- better radiologist performance
- greater interrater reliability
- improved workflow




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## Stroke CT


- automated support for fast and consistent interpretation
- Brainomix-Olea solutions:
  - eASPECT
  - eCTA
  - eCTP

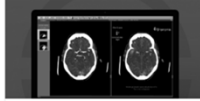
**e-STROKE SUITE**  
Integrated. Intuitive. Immediate.  
From non-contrast CT to CTA and CT perfusion.

e-STROKE SUITE is much more than an imaging software package. It combines:





**eASPECTS**  
To assess the ASPECTS score and volume of ischemia in non-contrast CT images.

[READ MORE](#) 




**eCTA**  
To standardize the assessment of collaterals in CTA scans.

[READ MORE](#) 



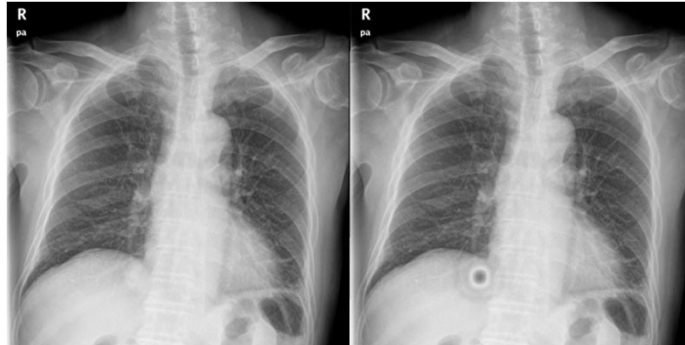
**Olea Sphere®**  
To automatically compute core, penumbra and mismatch ratio in CT Perfusion images.

[READ MORE](#) 

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CASE #. A nodule, diagnosed as lung cancer, hidden behind the diaphragm is properly detected, with an abnormality score of 96%. This case was missed by 5 out of 9 radiologists.



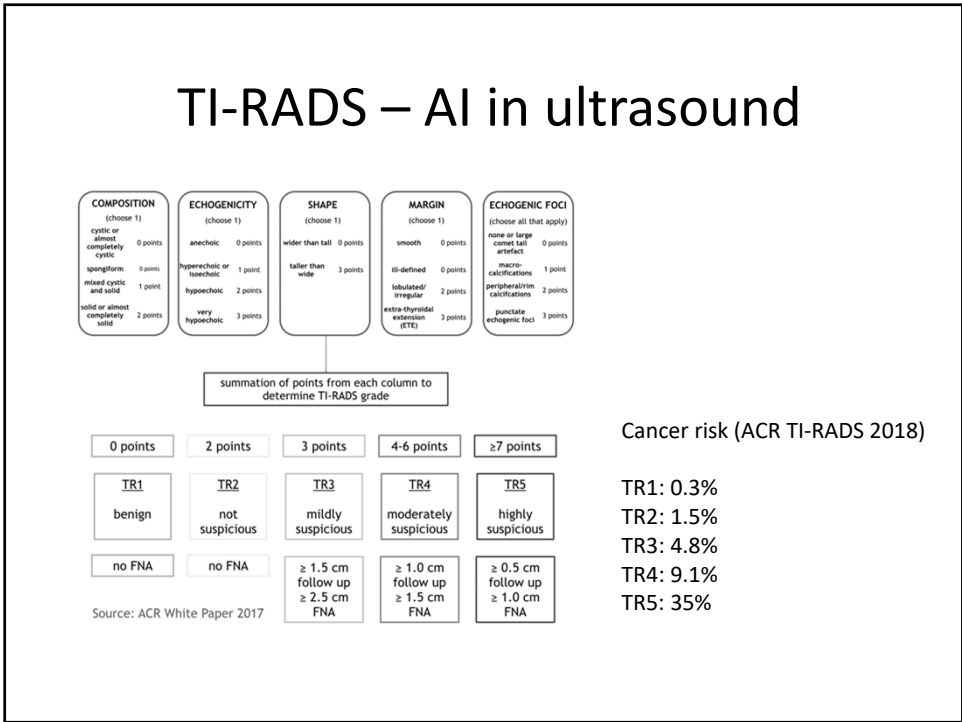
Lunit INSIGHT for Chest Radiography Nodule Detection

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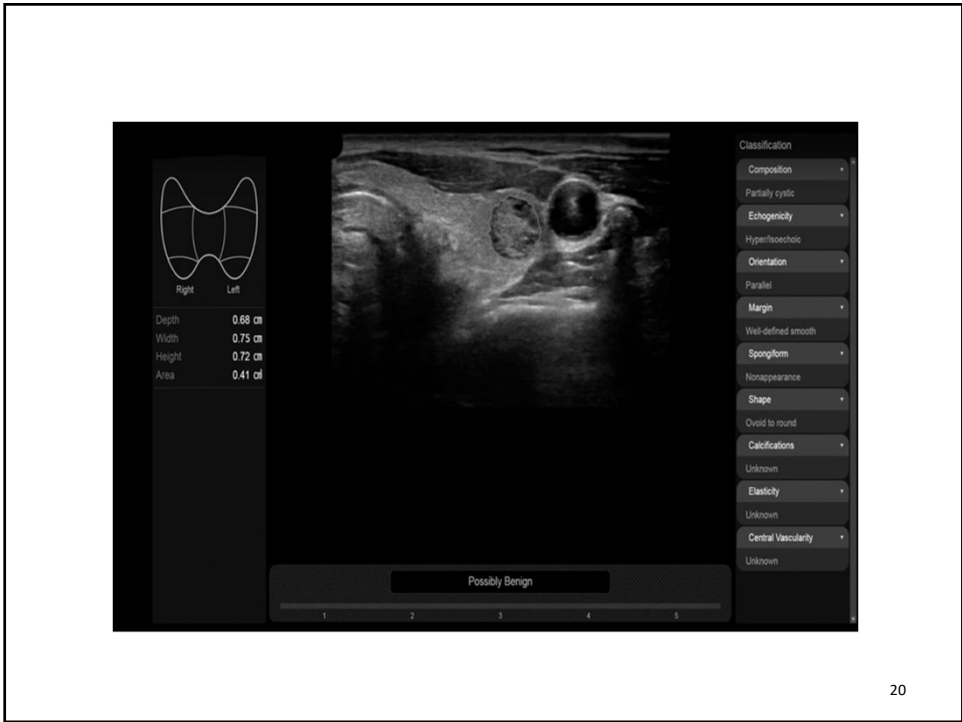
## Oxipit – ChestEye (AUC 87%)

- Linear Atelectasis, Lobar Collapse, Enlarged Heart, Edema, Pleural Effusion, Loculated Effusion, Fissural Thickening, Bullous Emphysema, Pulmonary Emphysema, Subcutaneous Emphysema, Consolidation, Pneumothorax, Tuberculosis, Hypoventilation, Lymphadenopathy, Hypertension, Granuloma, Lymph Node Calcification, Elevated Diaphragm, Dislocated Mediastinum, Widened Mediastinum, Congestion, Fibrosis, Interstitial Markings, Pleural Adhesion, Hilar Prominence, Mass, Cyst, Pulmonary Cavity, Sarcoidosis, Hernia, Removed Lung, Enlarged Aorta, Goitre, Thymus, Aortic Sclerosis, Respiratory Distress Syndrome, Retrosternal Airspace Obliteration, Pleural Thickening, Pneumomediastinum, Pericardial Effusion, Pleural Plaque, Pneumoperitoneum, CV Catheter RA Placement, CV Catheter SVC Placement, HD Catheter RA Placement, HD Catheter SVC Placement, Catheter Malposition, Intubation, Intubation Malposition, Chest Tube, Sternal Wires, Endovascular Stent, Tracheal Stent, Esophageal Stent, Artificial Heart Valve, Intra Aortic Balloon, Ventricular Assist Device, Nasogastric Tube, Pacemaker, Spinal Implant, Azygos Lobe, Gastric Bubble, Bowel Gas, Barium Swallow, Abnormal Rib, Rib Resection, Spinal Compression Fracture, Spinal Degenerative Changes, Spondylosis, Osteoporosis, Kyphosis, Scoliosis, Ligament Ossification, Spinal Enthesopathy.
- + STRUCTURED REPORT!!

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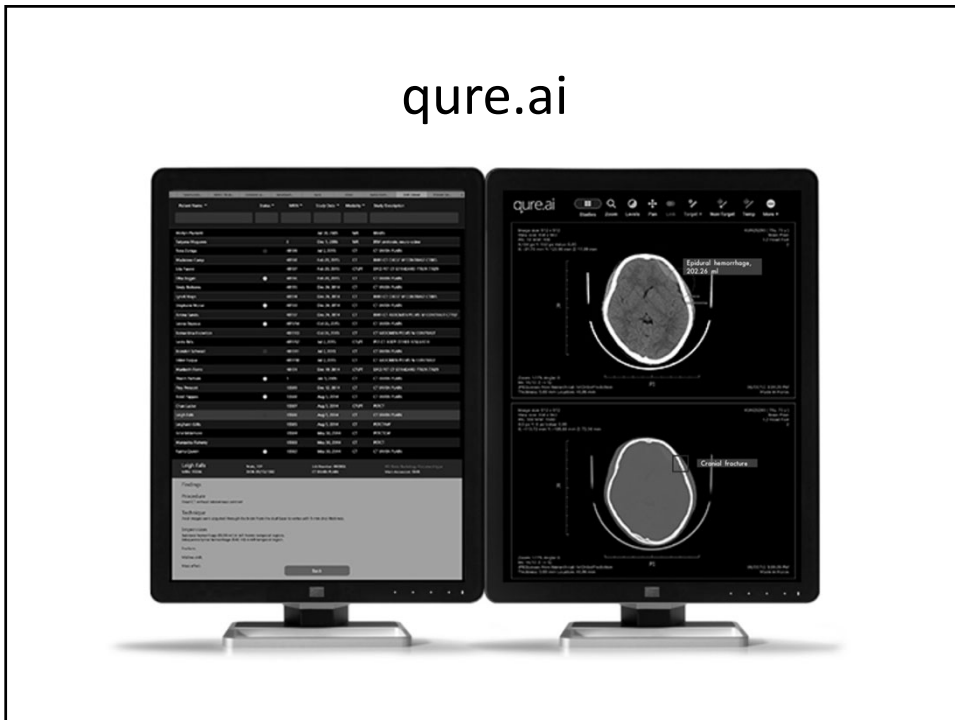


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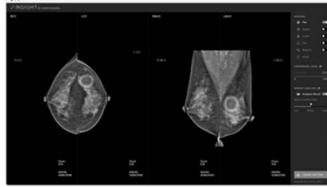
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## AI + mammography

- abnormality localizaiton
- probability score for malignancy
- assist to mammography
- AUC 96%
- improves medical capacity by 10%



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**aidence**  
human sense in artificial intelligence

**Meet Veye Chest.**  
Your automated pulmonary  
nodule management  
assistant.





**An AI assistant to give you more time for your patients**

Detecting, measuring and tracking nodule growth are crucial but time-consuming steps in the diagnosis and treatment of lung cancer patients.

Through automated measurements, Veye empowers you to focus on complex cases and patient care.

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## Further AI applications

- liver mass (CT)
- MR knee abnormality
- cerebral aneurysm (MRA)
- microbleed detection (SWI)
- coronary calcification
- prognosis of non-small cell lung cancer
- genomic status of glioma
- liver fibrosis staging
- lymph node detection
- bone age
- bone fracture detection
- degenerative bone changes – extremity + spine
- etc.

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- <https://youtu.be/nt00QzKuNVY>