University of Southampton

The Alan Turing Institute

Clinical Artificial Intelligence

Dr Nicholas Fuggle

Associate Professor in Rheumatology

Honorary Consultant Rheumatologist

Clinical AI Interest Group Co-Organiser

NIHR | National Institute for Health Research

UKRI MRC Lifecourse Epidemiology Centre

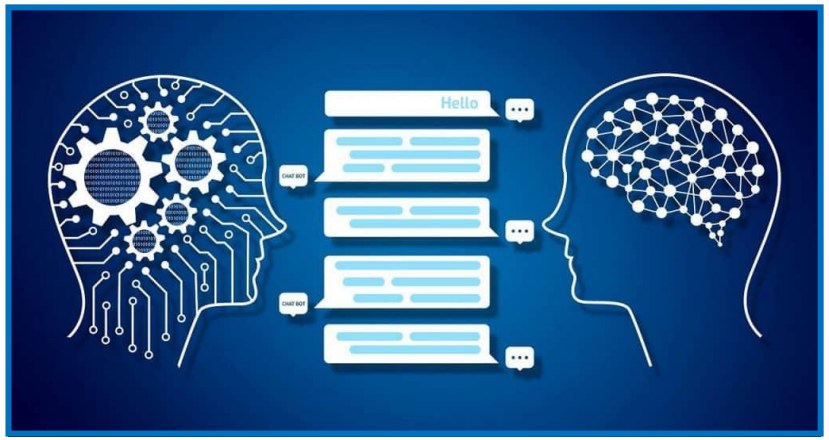
Remarkable research for healthy ageing

THE DUNHILL MEDICAL TRUST

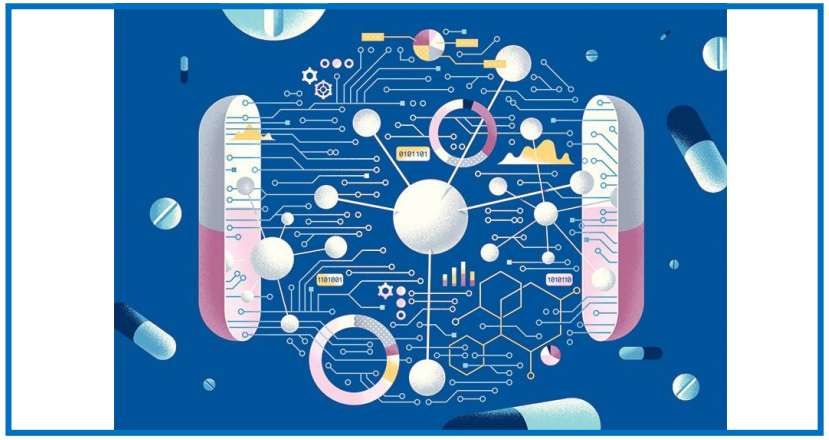
Clinical AI: Areas of interest

Computer vision

Natural language processing



Drug discovery



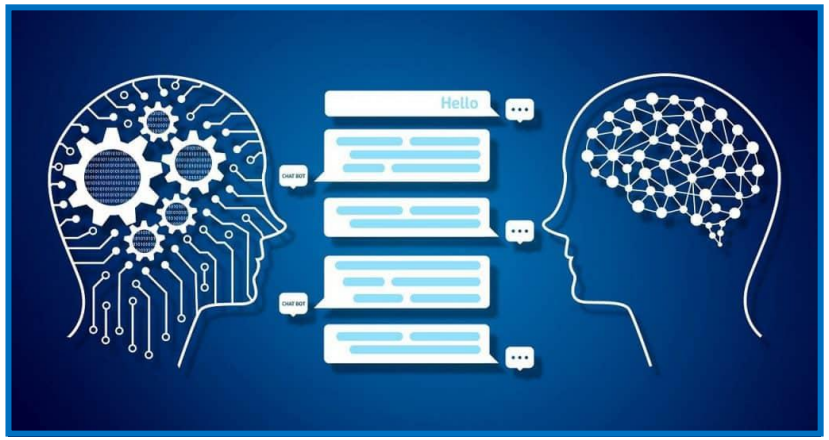
Electronic health records

Clinical AI: Areas of interest

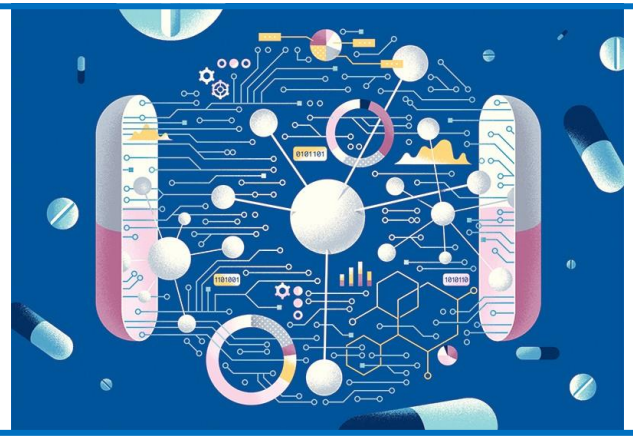
Computer vision

- Radiology
- Pathology
- Ophthalmology

Natural language processing



Drug discovery

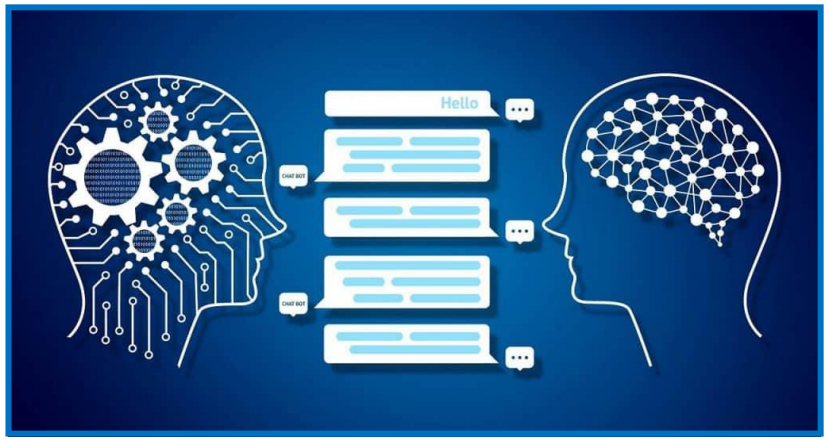


Electronic health records

Clinical AI: Areas of interest

Computer vision

Natural language processing



Drug discovery

- Protein folding
- Molecular analysis
- Literature reviews

Electronic health records

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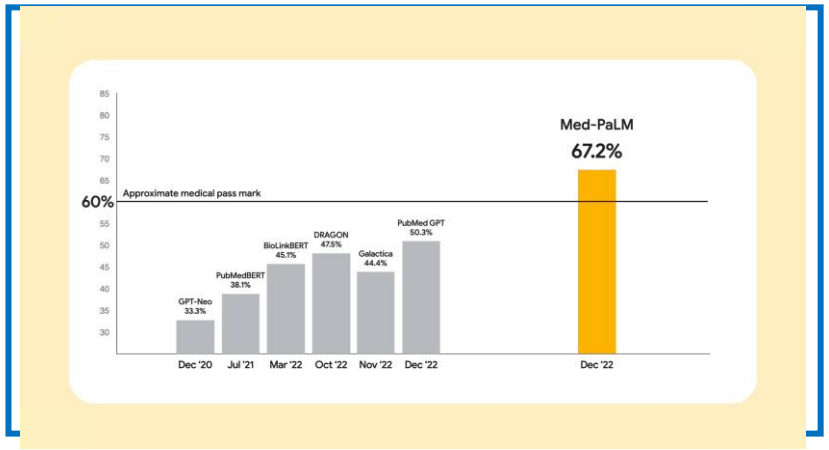
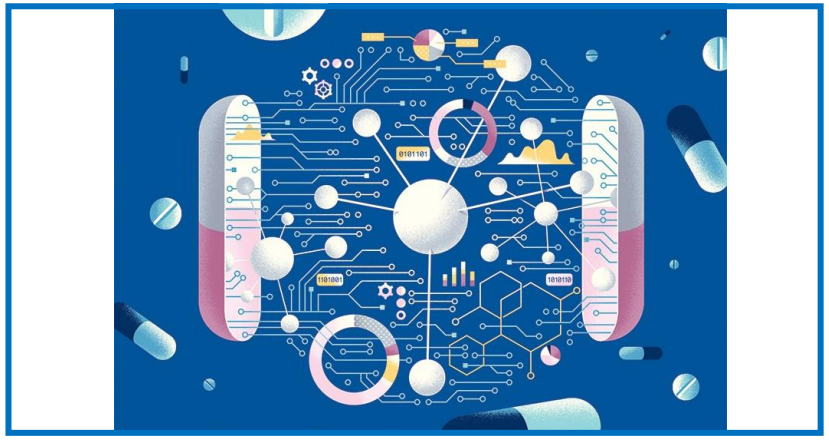


Drug discovery



Electronic health records

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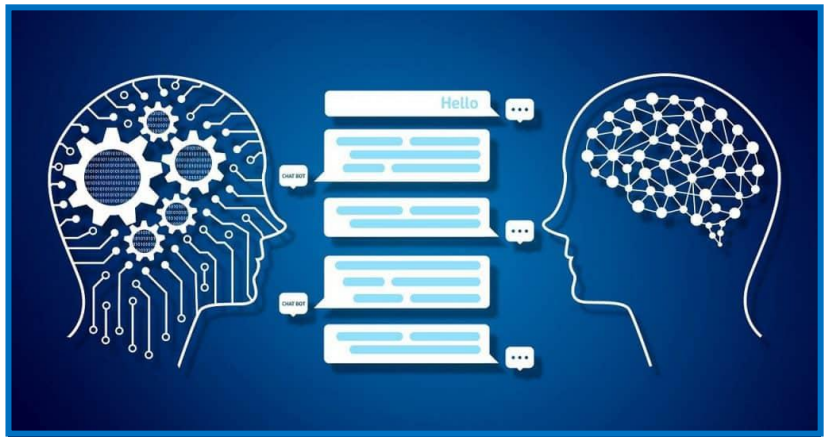
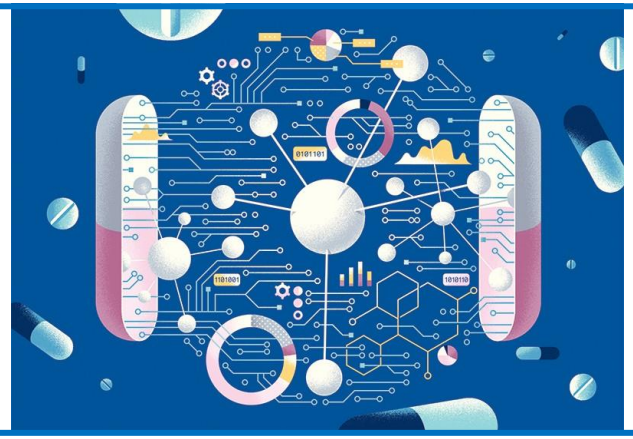


Drug discovery



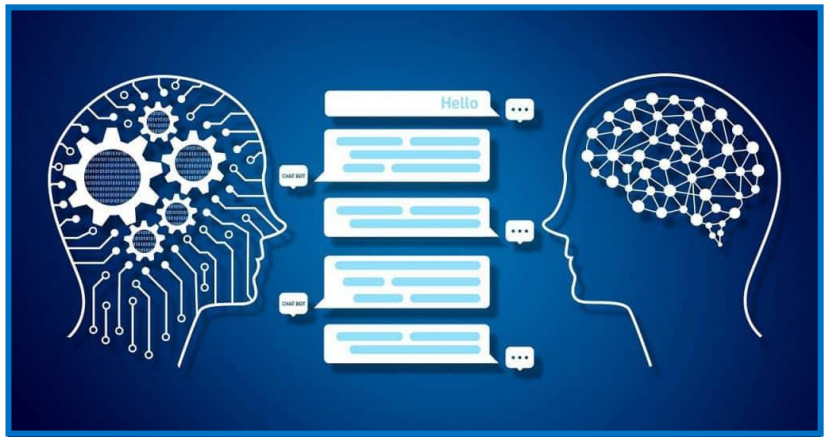
Electronic health records

- Introducing structure
- Predicting outcomes

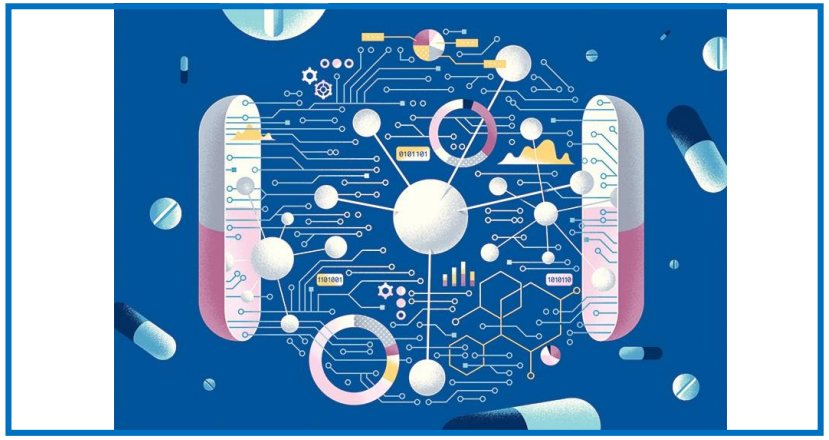
Clinical AI: Areas of interest

Computer vision

Natural language processing



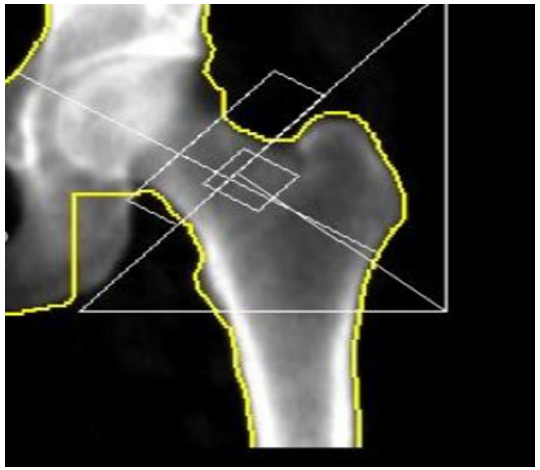
Drug discovery

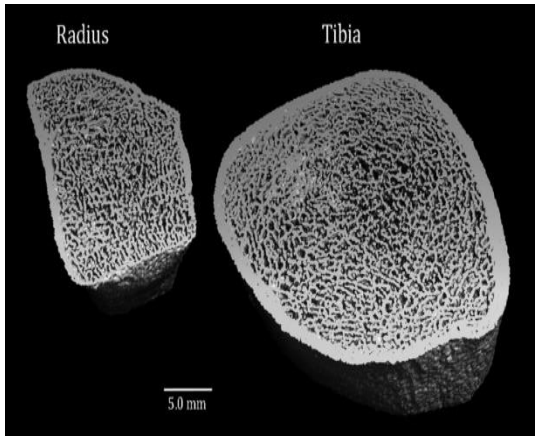


Electronic health records

Background

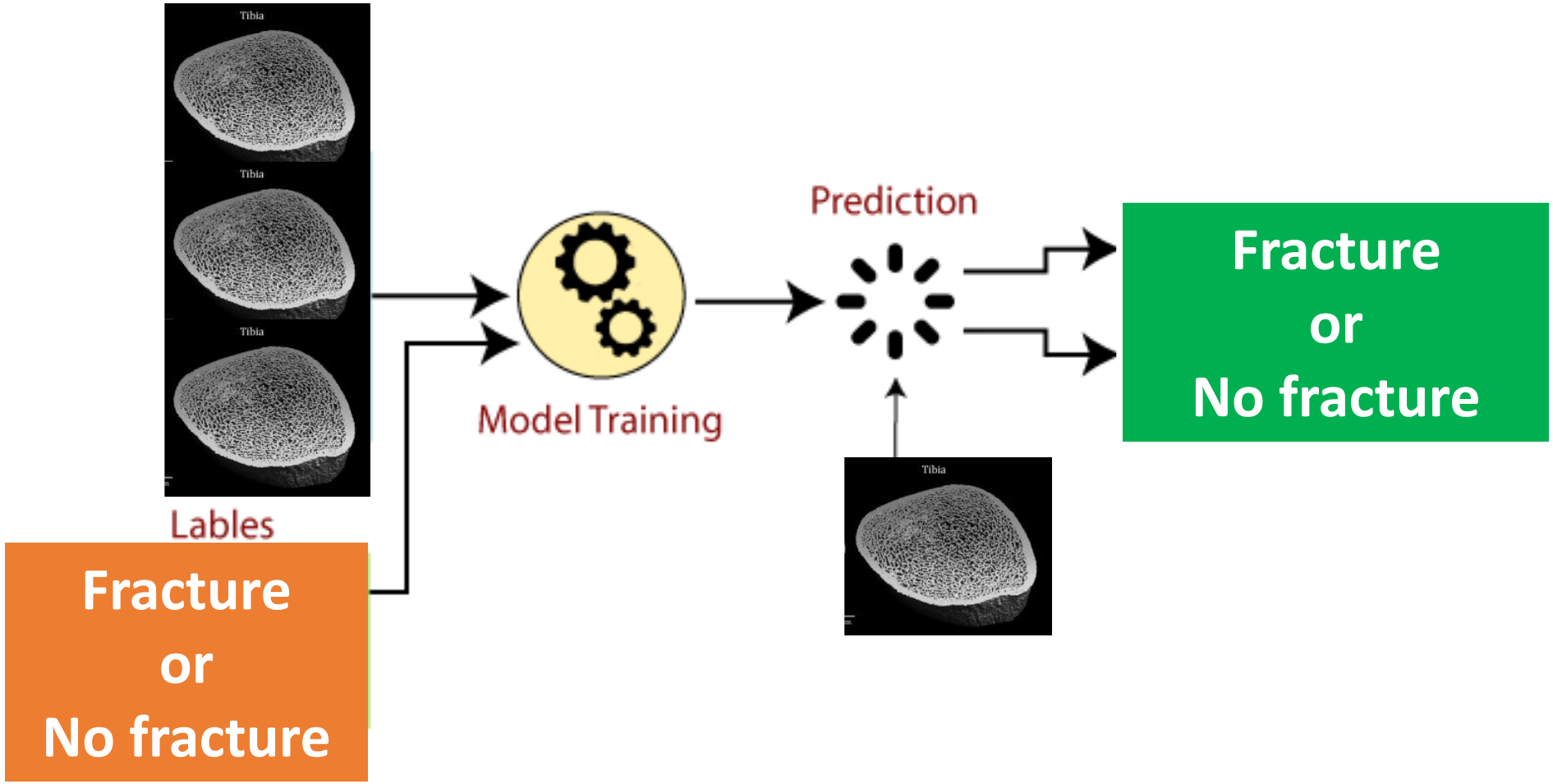
- Osteoporosis
  - Highly prevalent
  - Difficult to identify
  - Current imaging practice: DXA
- Bone microarchitecture:
  - **HR-pQCT** (High-resolution peripheral quantitative computed tomography)
  - “Virtual bone biopsy”
  - Plethora of parameters
- More user-friendly method?





Supervised Machine Learning

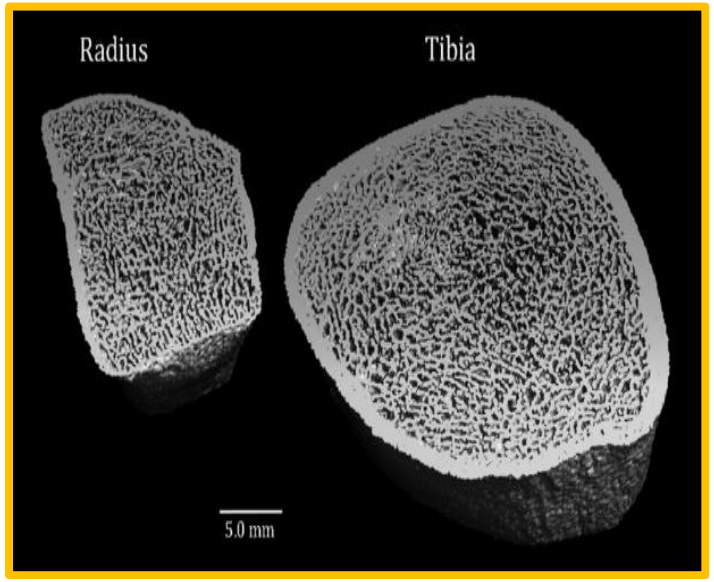
MRC Lifecourse Epidemiology Centre

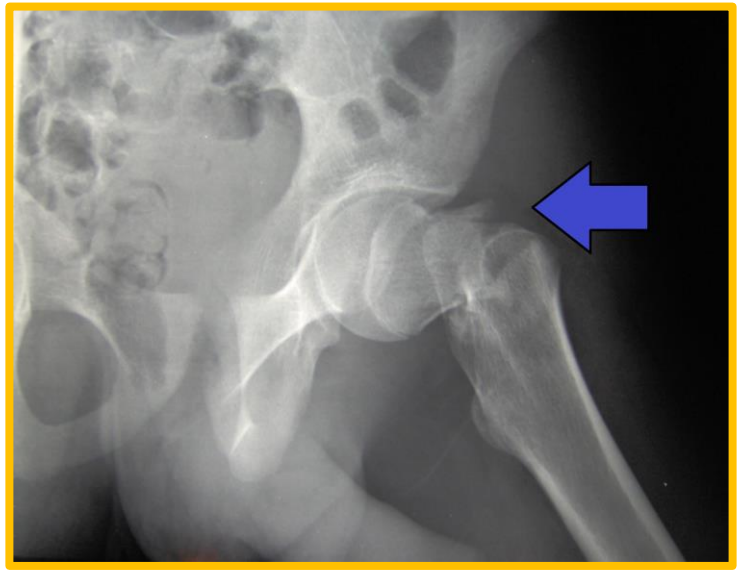


Lu S, Bone, 2023

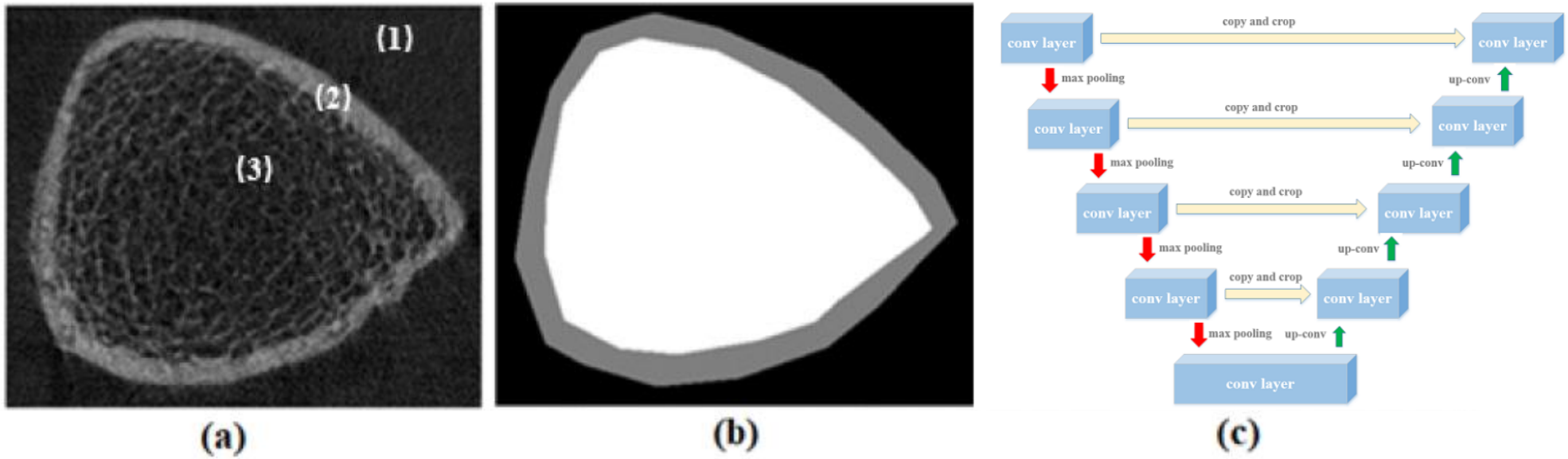
Objective

- Can computer vision and machine learning be to segment bone compartments
- Does this approach add to fracture discrimination?





Automatic segmentation

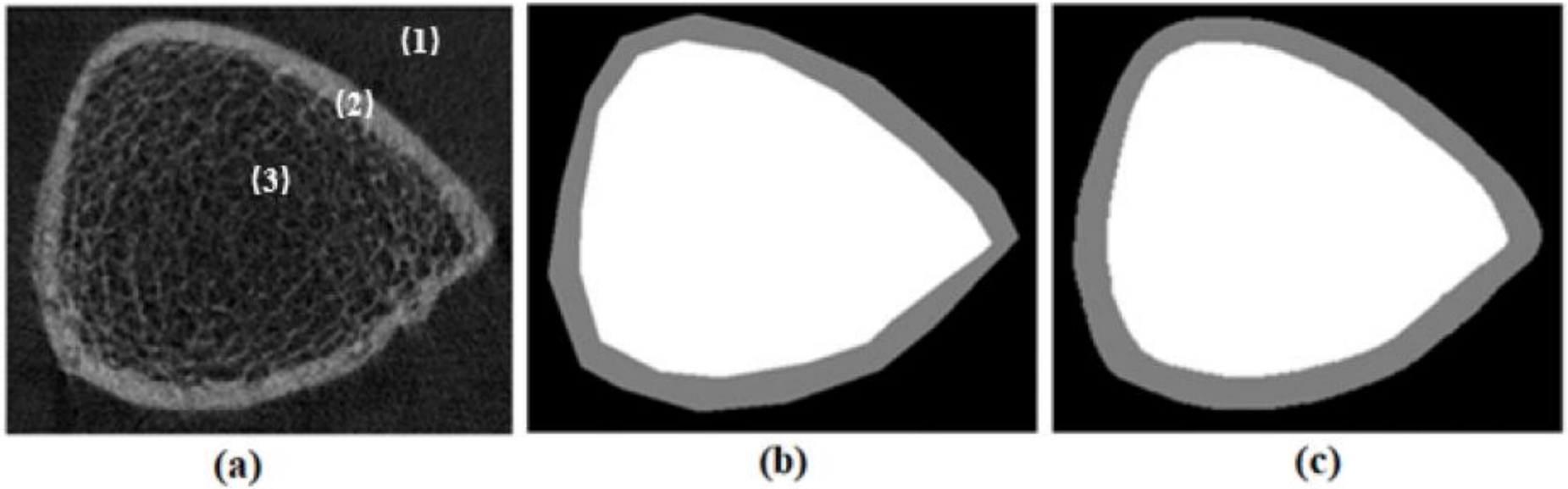


Original

Manual
(47 scans)

Automatic
(U-Net)

Automatic segmentation



Original

Manual
(47 scans)

Automatic
(U-Net)

Intersection over union (IoU) = 96.5%

Automatic segmentation: Results

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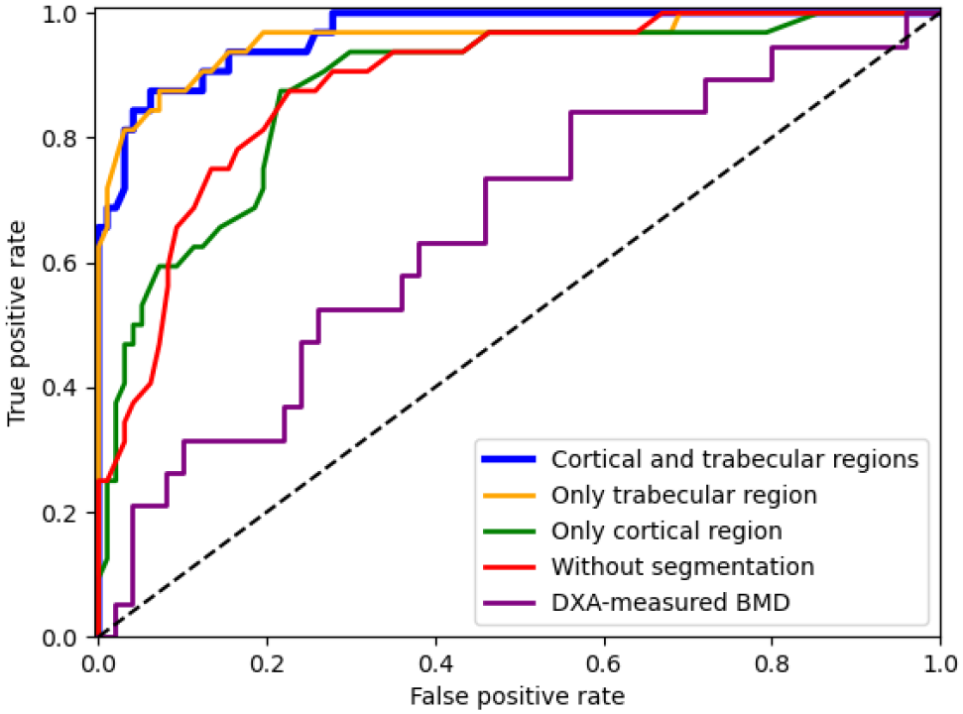
Input data	AUC (95% CI)	Sensitivity	Specificity
Cortical	0.88 (0.81-0.95)	0.72	0.80
Trabecular	0.95 (0.91-1.00)	**0.94**	0.84
Cortical and trabecular	**0.97 (0.94-1.00)**	0.88	**0.87**



Conclusion

- Deep learning method for performing 3D segmentation is effective

- Segmentation and feature fusion of cortical and trabecular compartments has greater association with fracture

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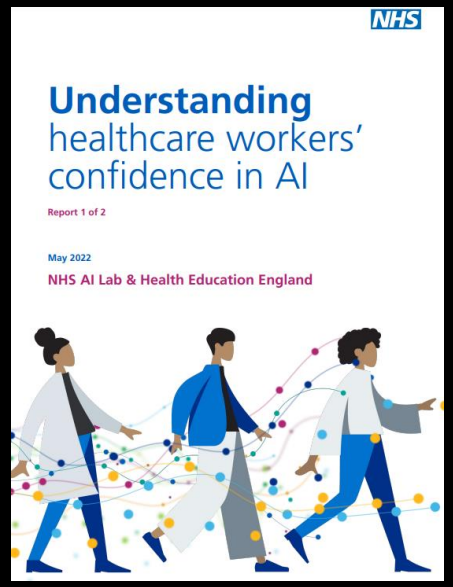
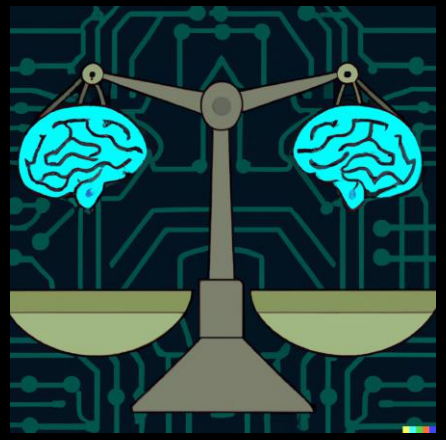
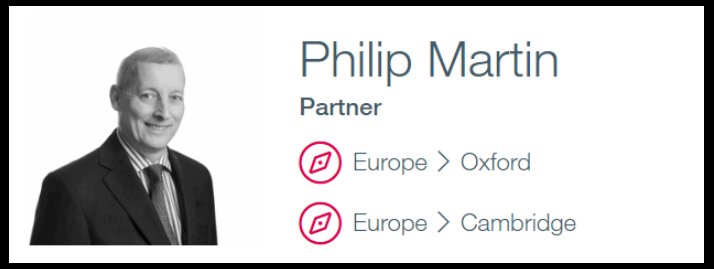
Sharing

Sharing

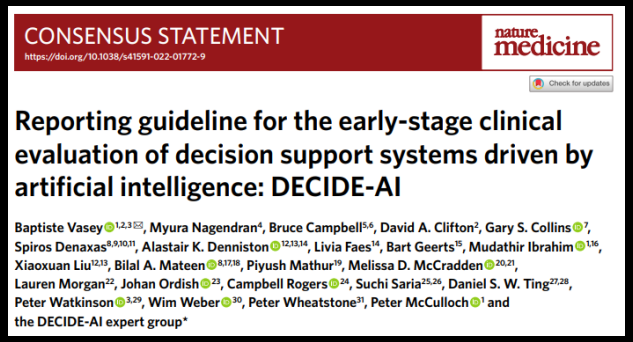




Health Equity



Marks & Clark

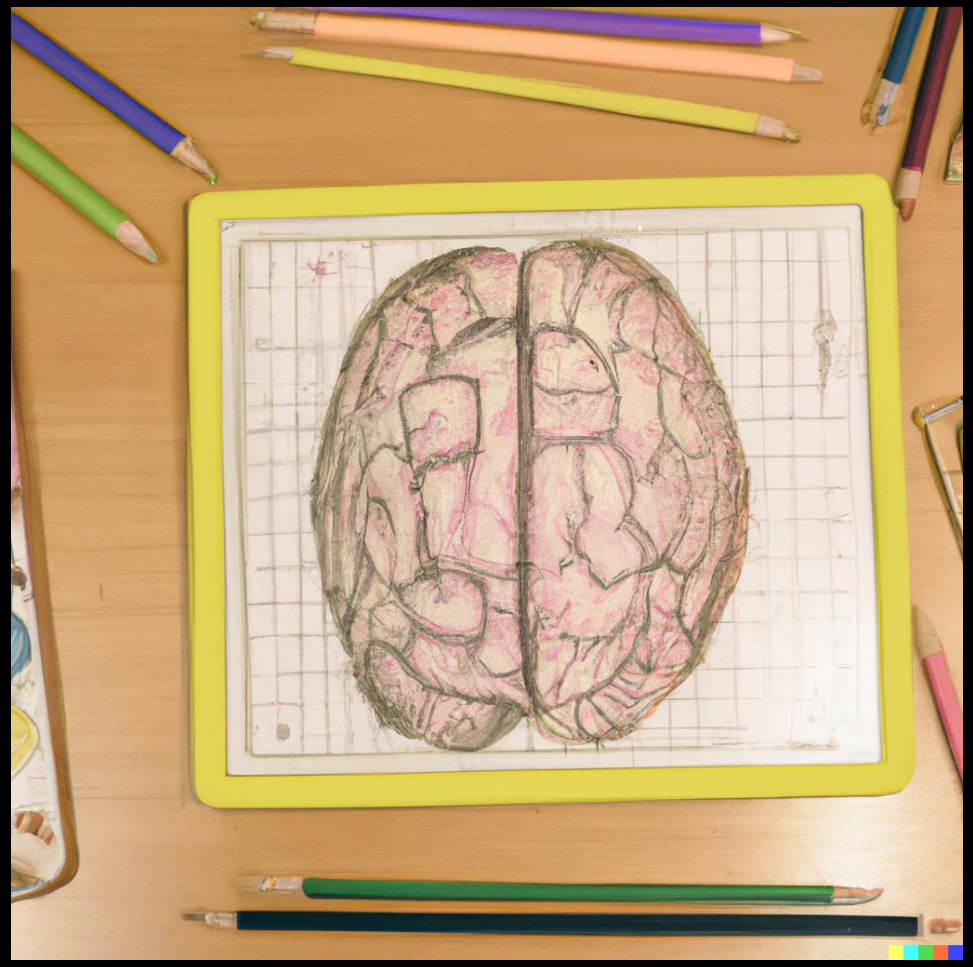


Dom Cushnan
NHS AI Lab

Alastair Denniston
RHC Report

Educating

Summer School



Pooling

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Next meeting: Wednesday 21st June, 12pm