digitalhealth

AI + DATA

Keynote: unlocking the future of AI in the NHS

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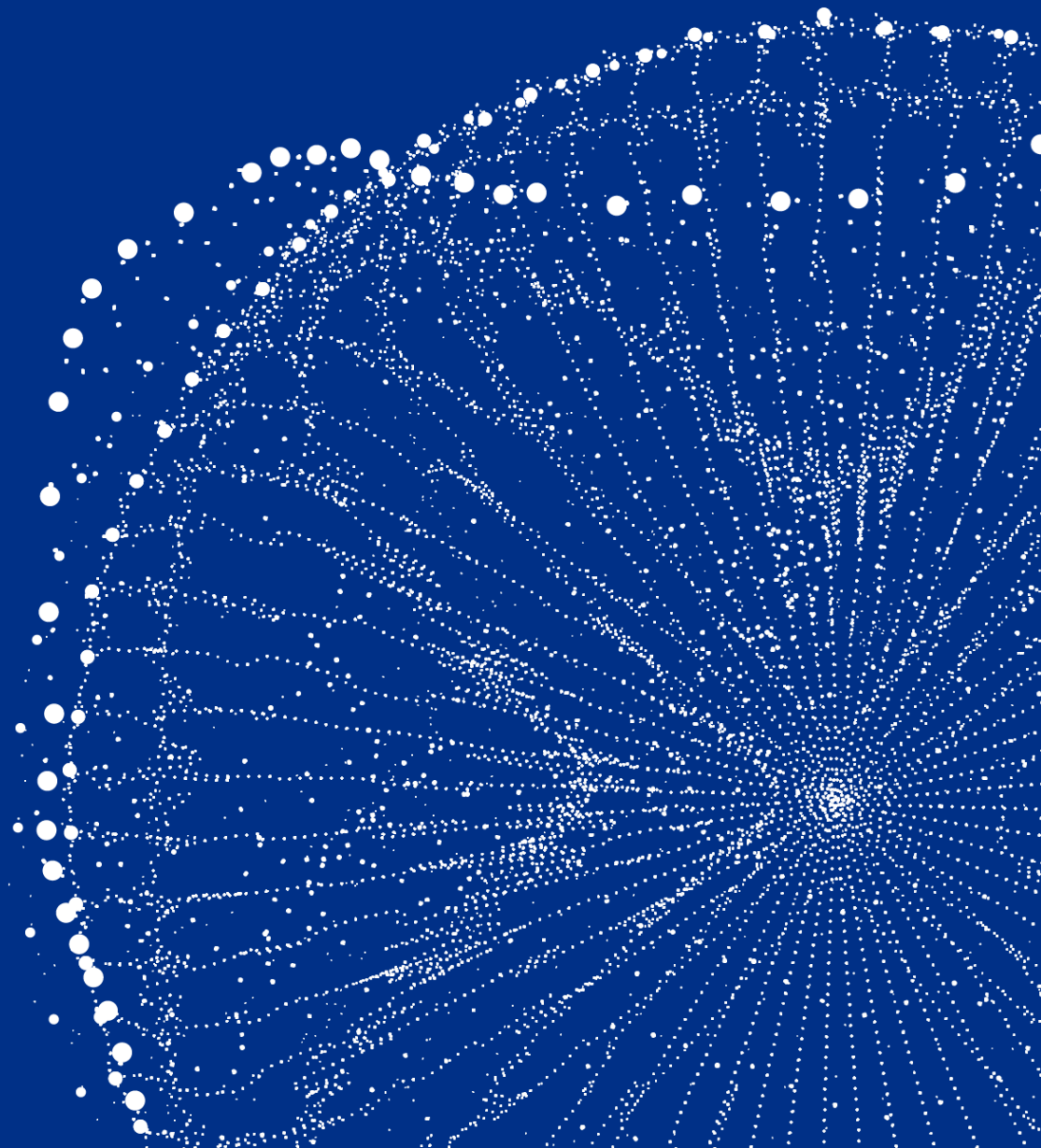
#AIDATA23

Unlocking the future of AI in the NHS

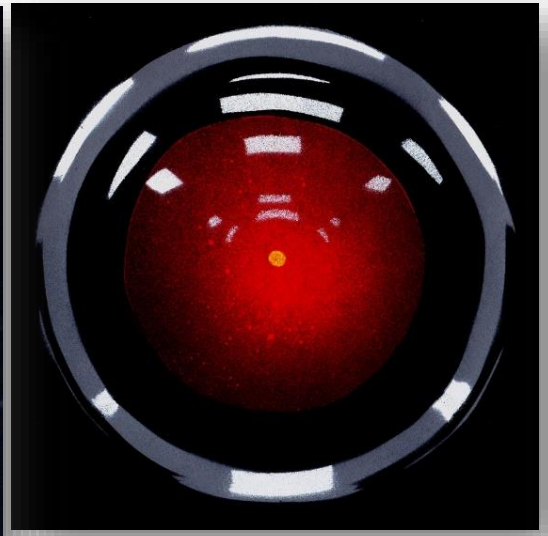


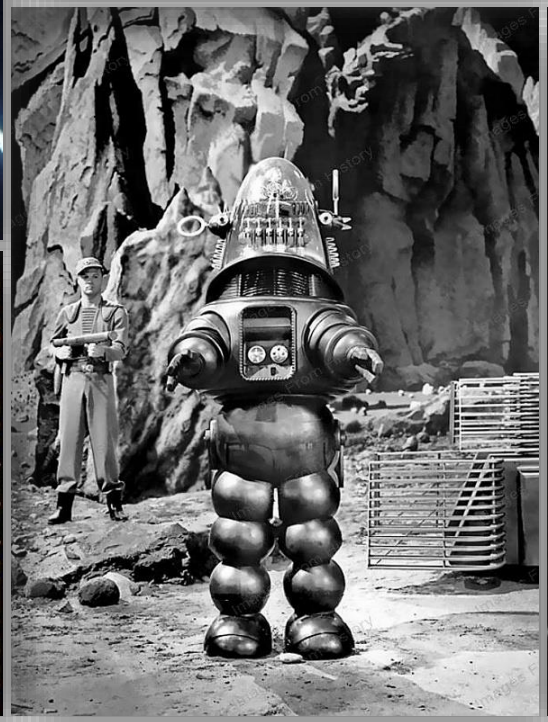
Dom Cushnan

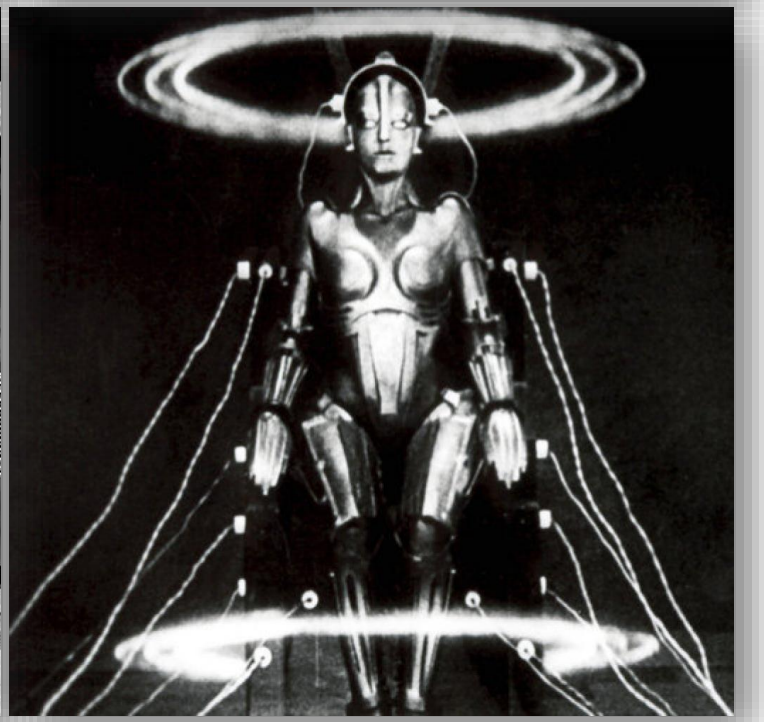
Artificial intelligence

The past, the present and the future

Artificial intelligence







Artificial intelligence

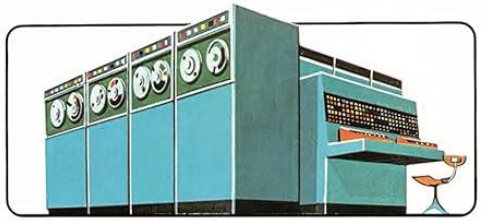
SCIENCE AND TECHNOLOGY

ARTIFICIAL INTELLIGENCE

Many computer engineers are convinced that we are seeing the evolution of a new species – that of the intelligent machine.

Already chess-playing computers can beat all but a handful of human opponents. Although computers have to be programmed with instructions by people, it is possible to foresee the time when they will learn and react without instruction – then it will be one small step to 'intelligence'.

It took Nature many millions of years to evolve the human brain. Now that same biological creation is creating an offspring. The process may take just a few decades. Then the first true robots may walk the Earth.

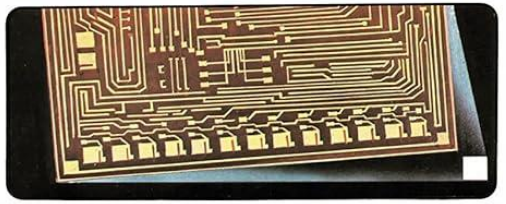


▲ The first electronic computer went into operation in 1943. Using bulky valves in its circuits it sprawled across 160 square metres. In the 1950s small transistors replaced valves and a modem computer like the one above takes up only a few metres. The latest computers have transistors in 'micro-chip' form reducing the size of their electronic 'brains' thousands of times. Computers are good at arithmetic, but they cannot (as yet) think for themselves.

Computer counting

1	1	110	6
10	2	111	7
11	3	1000	8
100	4	1001	9
101	5	1010	10

Computers count in binary code. The binary equivalents of decimal numbers are shown here. See if you can work out this word, coded into binary – 1010 110. Answer, page 97.



▲ Smaller and smaller is the trend in computer design. This picture, looking a bit like an aerial view of a city, is in fact an enlarged view of a micro circuit infused on a wafer-thin chip of silicon just 63 mm across. Silicon chips are already used in, for example, calculators and clocks. In the future, chip equipped machines are going to take over routine jobs from humans on a massive scale in the same way that machines took over from human muscles 200 years before.

▲ This picture shows a computer at work in the car industry. Designers have the car's shape displayed on a TV screen. The image can be viewed from any angle and changed easily until the body style is decided upon, making designing quicker and cheaper.

▲ Civilization is becoming increasingly dependent on computers. As machines take over, society becomes more vulnerable to natural or man-made disasters. If power supplies are interrupted, industries and cities, like the blacked-out town above, grind to a halt. Unless people retain basic skills and crafts, parts or all of civilization could perish. Perhaps groups of craft workers could be set up as an insurance policy against global disaster.

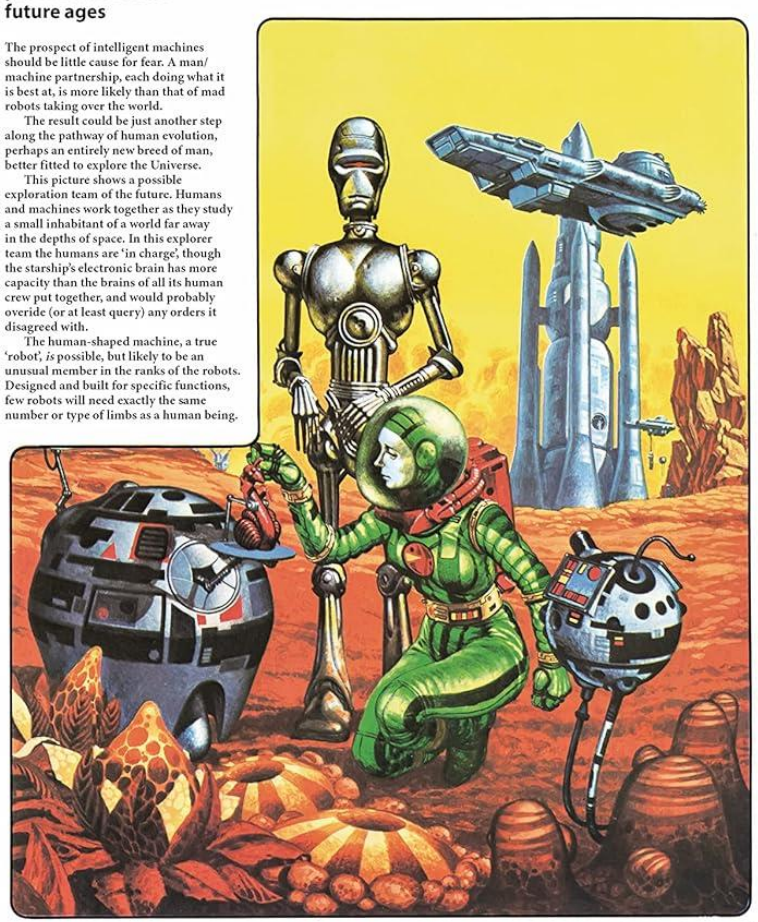
Man and machine – partners down the future ages

The prospect of intelligent machines should be little cause for fear. A man/machine partnership, each doing what it is best at, is more likely than that of mad robots taking over the world.

The result could be just another step along the pathway of human evolution, perhaps an entirely new breed of man, better fitted to explore the Universe.

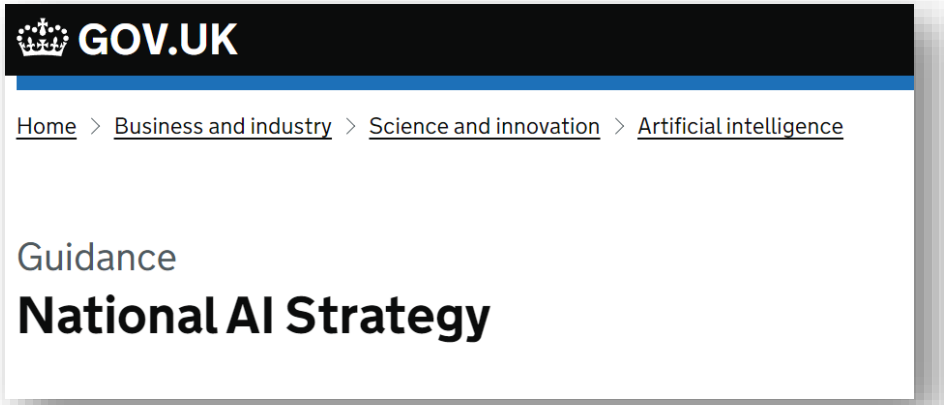
This picture shows a possible exploration team of the future. Humans and machines work together as they study a small inhabitant of a world far away in the depths of space. In this explorer team the humans are 'in charge', though the starship's electronic brain has more capacity than the brains of all its human crew put together, and would probably overide (or at least query) any orders it disagreed with.

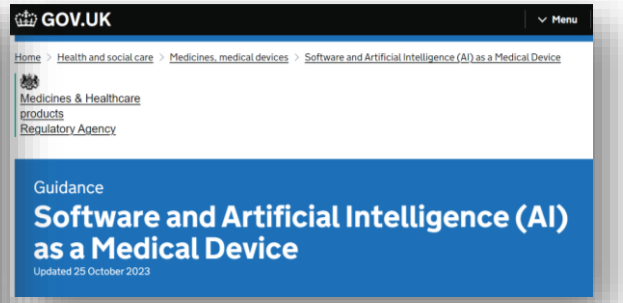
The human-shaped machine, a true 'robot', *is* possible, but likely to be an unusual member in the ranks of the robots. Designed and built for specific functions, few robots will need exactly the same number or type of limbs as a human being.

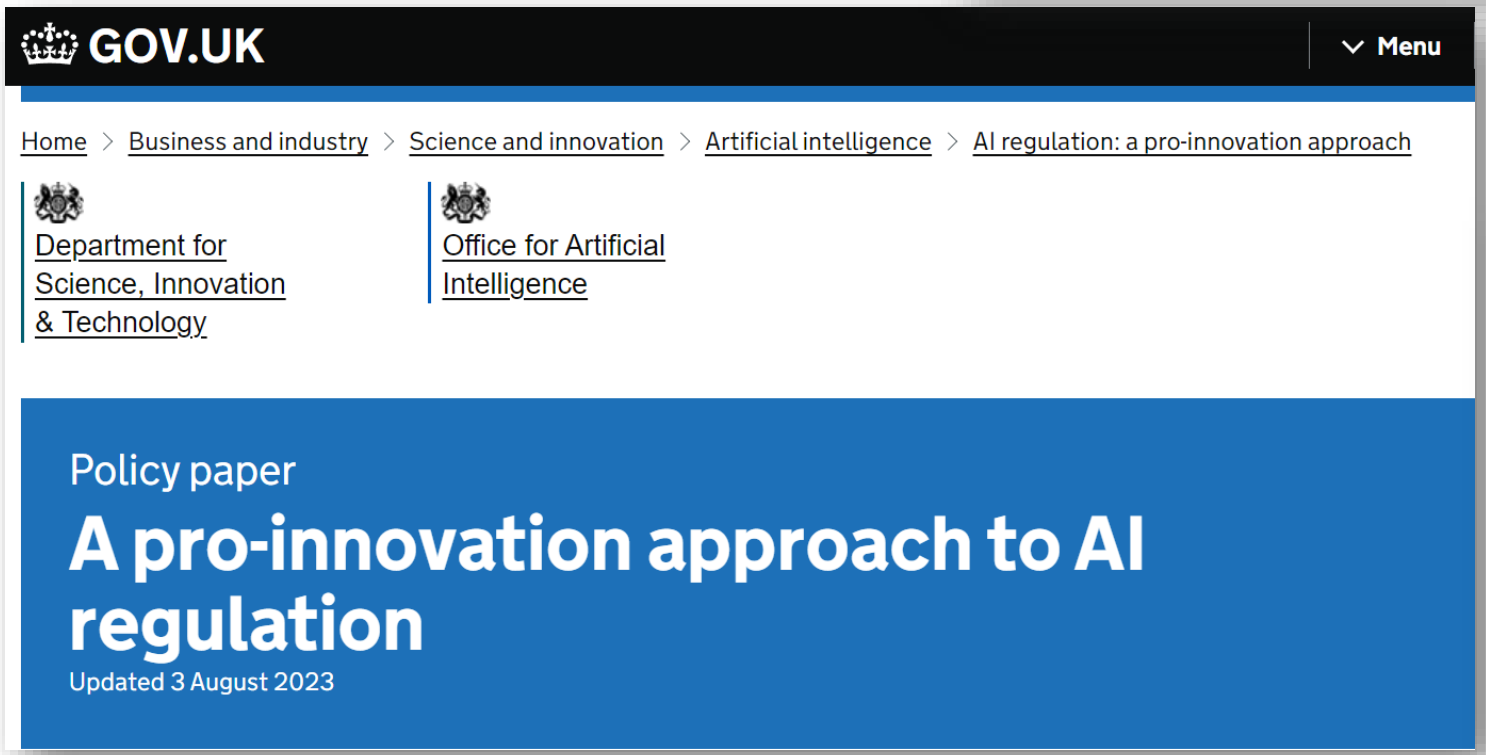


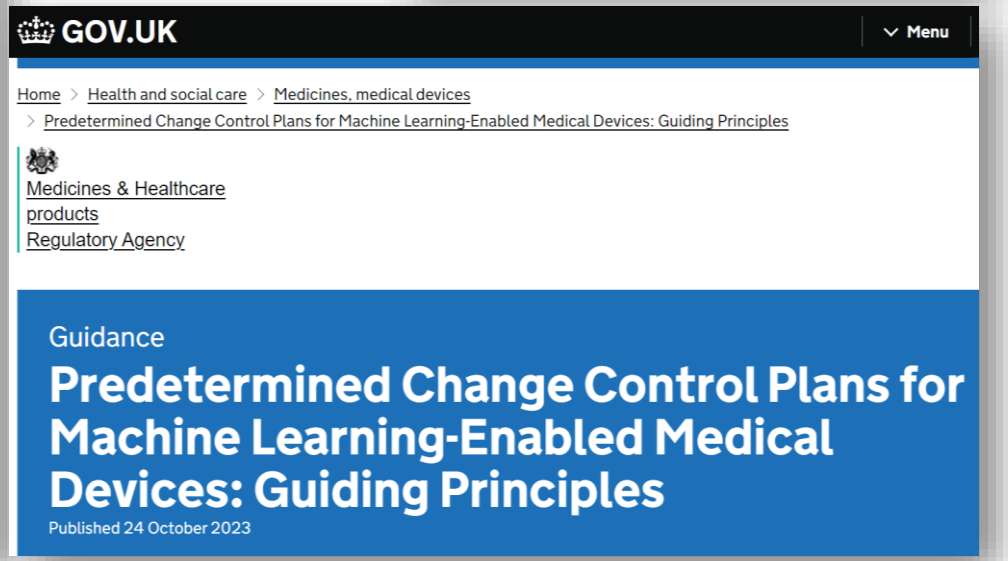
Work across government

Work across government

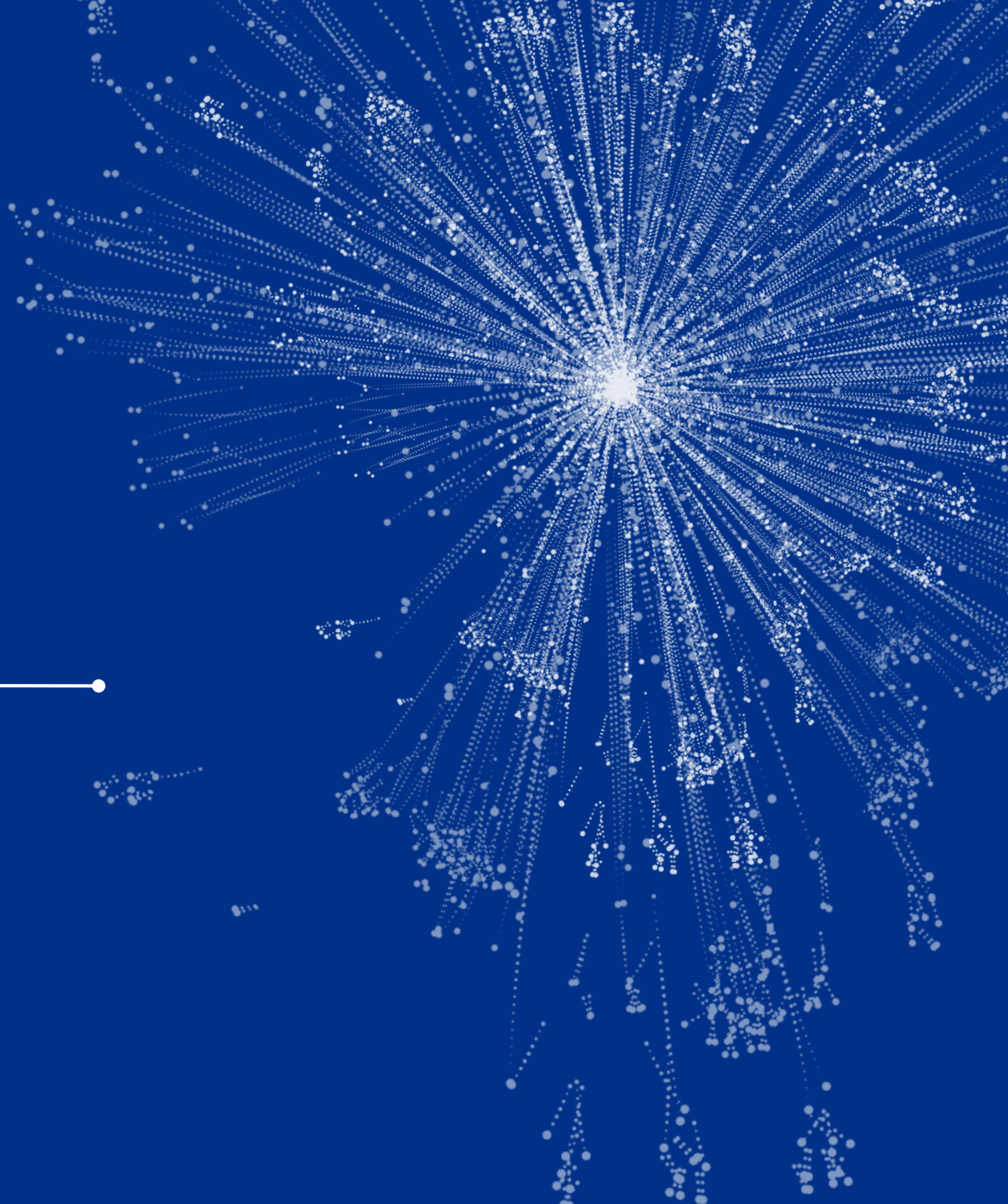








NHS AI Lab



SAFETY

SAFETY

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NHS AI Lab

The NHS AI Lab supports health and care organisations to understand how to develop or adopt **safe, effective and ethical** AI technologies to improve the quality and experience of care and improve productivity.

Our mission is to accelerate deployment based on evidence, ensure that AI works for all, and create the right conditions for the development and deployment of AI.

AI ethics – a responsible approach

What the AI Ethics Initiative does

- Invests in research and practical interventions
- Encourages proactive approaches to countering inequalities
- Supports projects that are patient-centred, inclusive and impactful

AI projects to tackle racial inequality in UK healthcare, says Javid

Exclusive: health secretary signs up to hi-tech schemes countering health disparities and reflecting minority ethnic groups' data

AI robot, specialised for traditional Chinese medicine, shown in Beijing, 2020. In the UK, the government hopes new AI technology will lead to better healthcare training. Photograph: Xinhua/Rex/Shutterstock

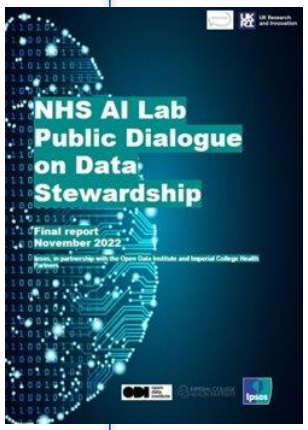
Governing the use of data for AI

Improving how decisions about data access are made

- We have partnered with the Ada Lovelace Institute to design a model for an Algorithmic Impact Assessment (AIA)
- The AIA will be trialled as part of the data access process for national medical imaging assets

Honing approaches to data stewardship

- We have partnered with Sciencewise (UKRI) and held a public dialogue on how the public feel decisions should be made about access to their personal health data for AI purposes.



Advancing regulation

Refreshing evidence standards framework

NICE's Evidence Standards Framework to now include standards for AI enabled technologies so that decision makers can identify AI techs that are likely to offer benefits to users and to the health and care system.

AI and Digital Regulations Service

By developing an AI and Digital Regulations Service, we have given innovators and health and care providers a one stop shop for support, information and guidance on the regulation and evaluation of AI technologies. It brings together the main bodies involved in AI regulations, MHRA, NICE, CQC and the HRA.

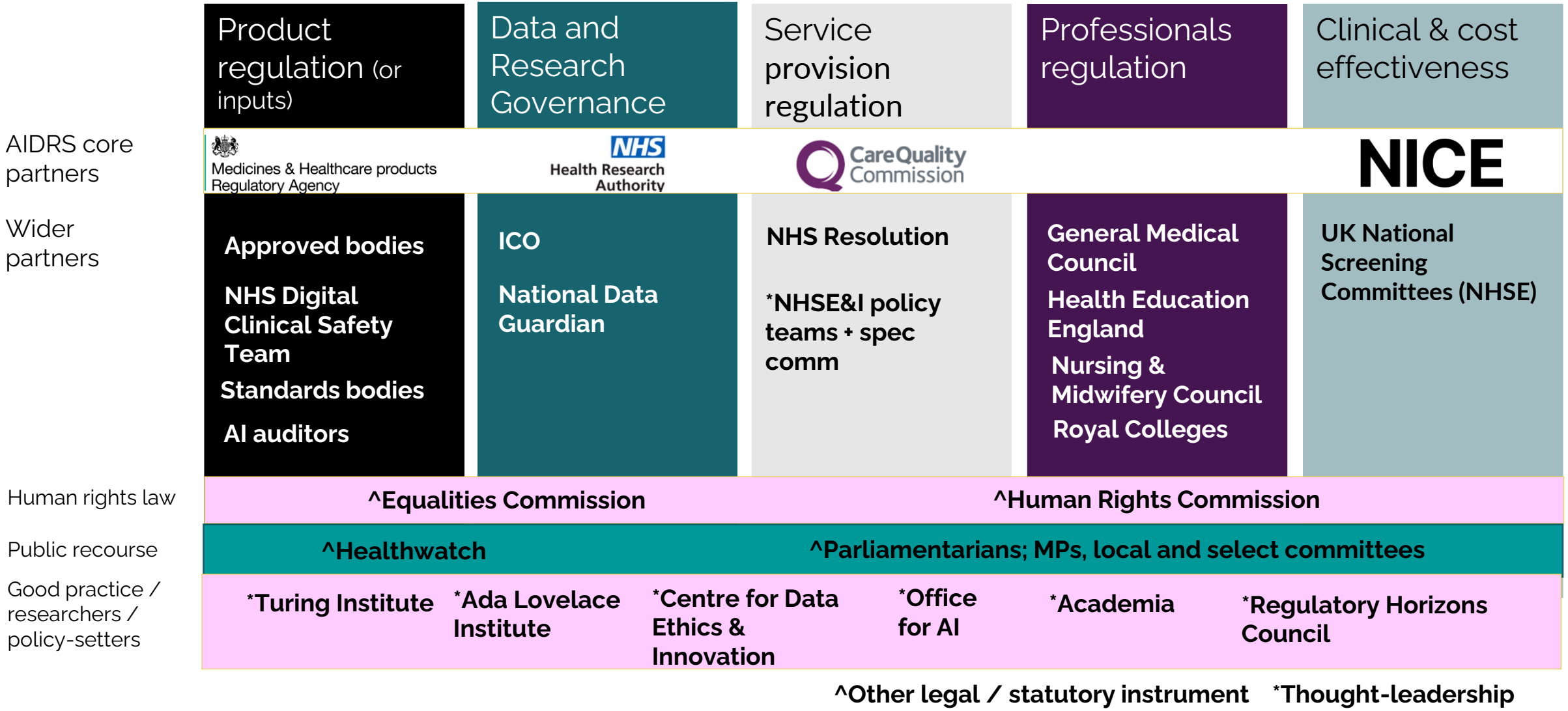
By consolidating guidance from these four partners, this service will ensure there is a feedback loop to help test, adjust and improve AI technologies.

Legal liability of using AI in clinical settings

We are working with NHS Resolution to provide clarity and guidance on the legal liability considerations around using AI in clinical settings, to increase confidence with both AI vendors and adopters.

A cross-regulatory perspective

The breadth of on AI & digital tech in health and care necessitates a cross- regulatory approach



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AI Regulation	AI Ethics	The AI Awards	The AI DP	The AI DF
Working with regulators to ensure AI is safe and streamline processes to enable innovation	Building confidence among workforce and the public by addressing ethical concerns around the use of AI	£123 million invested to test and evaluate 86 AI technology projects	Launching a large-scale trial of a centralised deployment platform for AI products across 12 trusts	£21 million ring-fenced fund for NHS trusts to procure AI diagnostic imaging technologies

The Royal College of Radiologists

Dr Katharine Halliday

Unlocking the future of AI in the NHS

30 October 2023

The RCR

- Supports and educates doctors training and working in clinical radiology and clinical oncology
- 15,500 members from over 70 countries
- CRs use medical imaging techniques to diagnose, monitor and treat diseases
- COs treat cancer using radiotherapy, chemotherapy and immunotherapy

The potential of AI

- Huge attention
- Potential to increase accuracy, efficiency and improve patient outcomes
- Needs careful work to ensure maximise benefits and avoid harms

AI in clinical radiology

The Royal College of Radiologists

- “Wild west"
- Many AI products …
- Don’t know what or where
- The AI Diagnostics Fund
- AI deployment platform pilot

RCR AI Imaging Registry

- A comprehensive directory all AI tools in NHS imaging
- Data collection phase underway
- Streamline and facilitate adoption via shared learning
- Increase trust in specific AI solutions
- Basis for audit

Overcoming barriers to implementation

- **Stakeholder day: overcoming barriers to implementation in AI imaging**
  - Information governance
  - Lack of evidence
  - IT systems
  - Staff capacity and staff expertise
  - Funding

Solutions

- A single set of information governance policies
- Education for NHS clinical staff
- Utilise imaging networks
- Pre-deployment testing
- Shadow mode
- Evidence on patient outcomes
- IT infrastructure

NICE Early Value Assessment

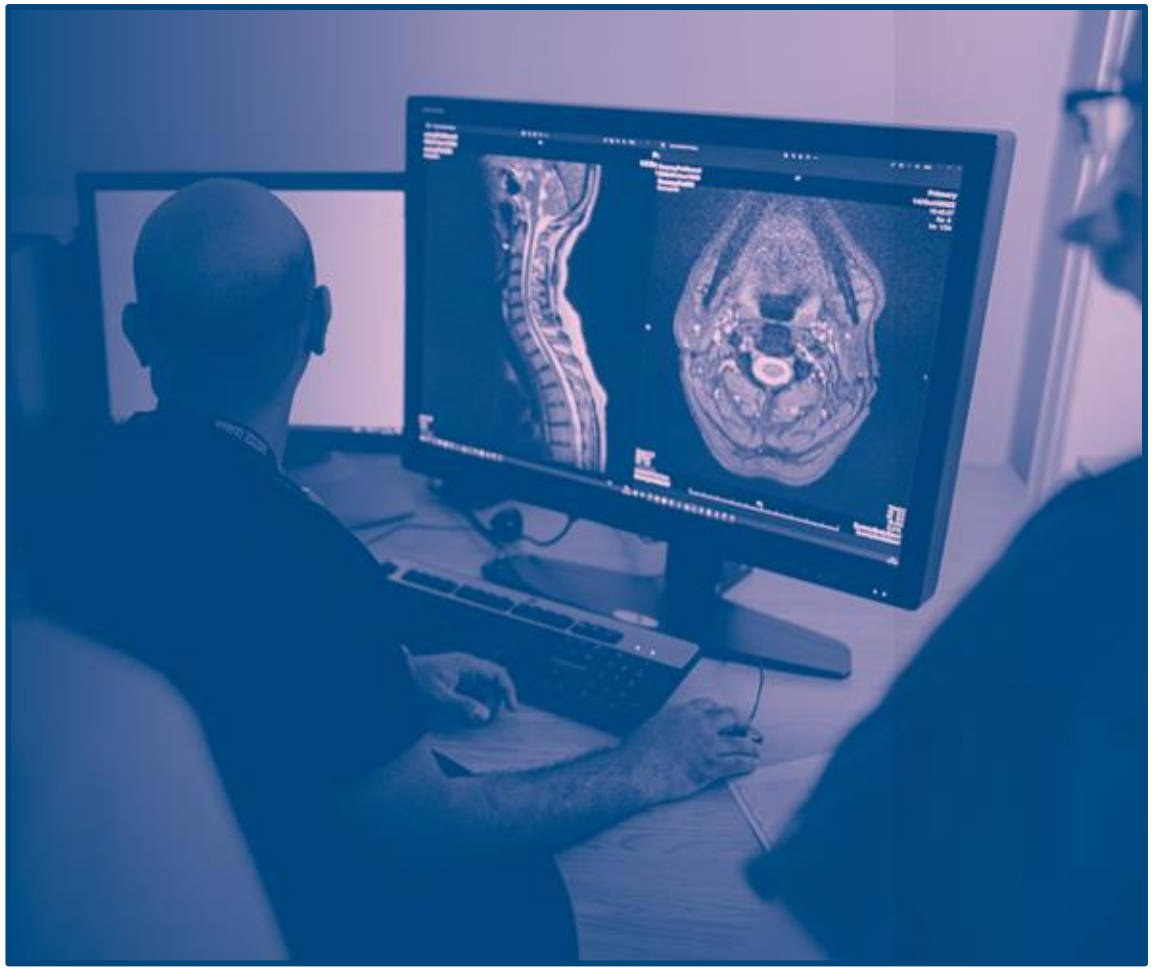
The Royal College of Radiologists

- Overview | Artificial intelligence-derived software to analyse chest X-rays for suspected lung cancer in primary care referrals: early value assessment | Guidance | NICE
- Recommendations: more research needed before recommended for widespread adoption
- Identify key outcomes that need measuring
- RCR working with NICE to suggest next areas of focus

NHS AI Diagnostics Fund

The Royal College of Radiologists

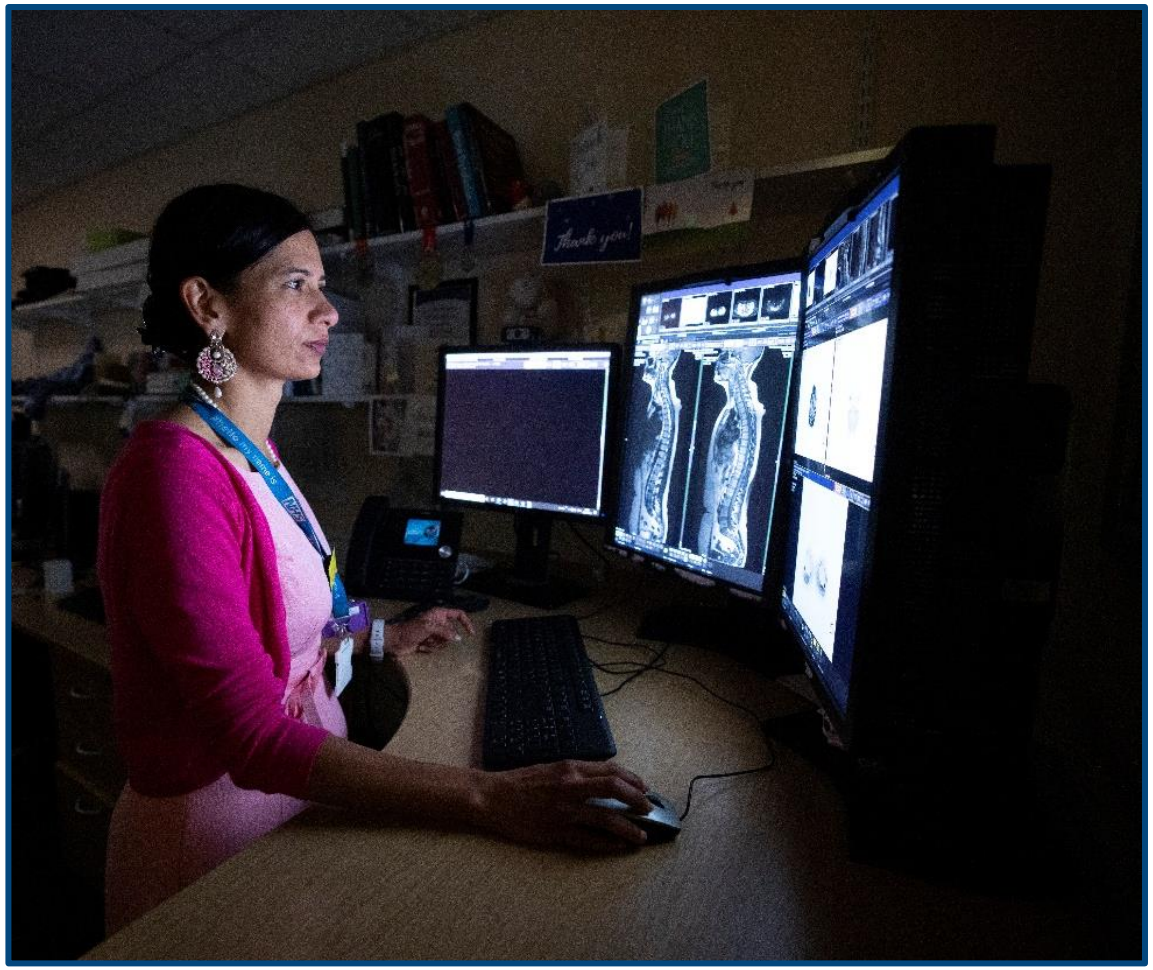
- £21M funding
- Network deployment of algorithms
- Mainly focussed on CXR
- Opportunity for learning re. deployment and evidence (NICE EVA)



AI Deployment platform

The Royal College of Radiologists

- 2 networks
- Cloud based solution
- Facilitate rapid deployment at scale
- Oversight group

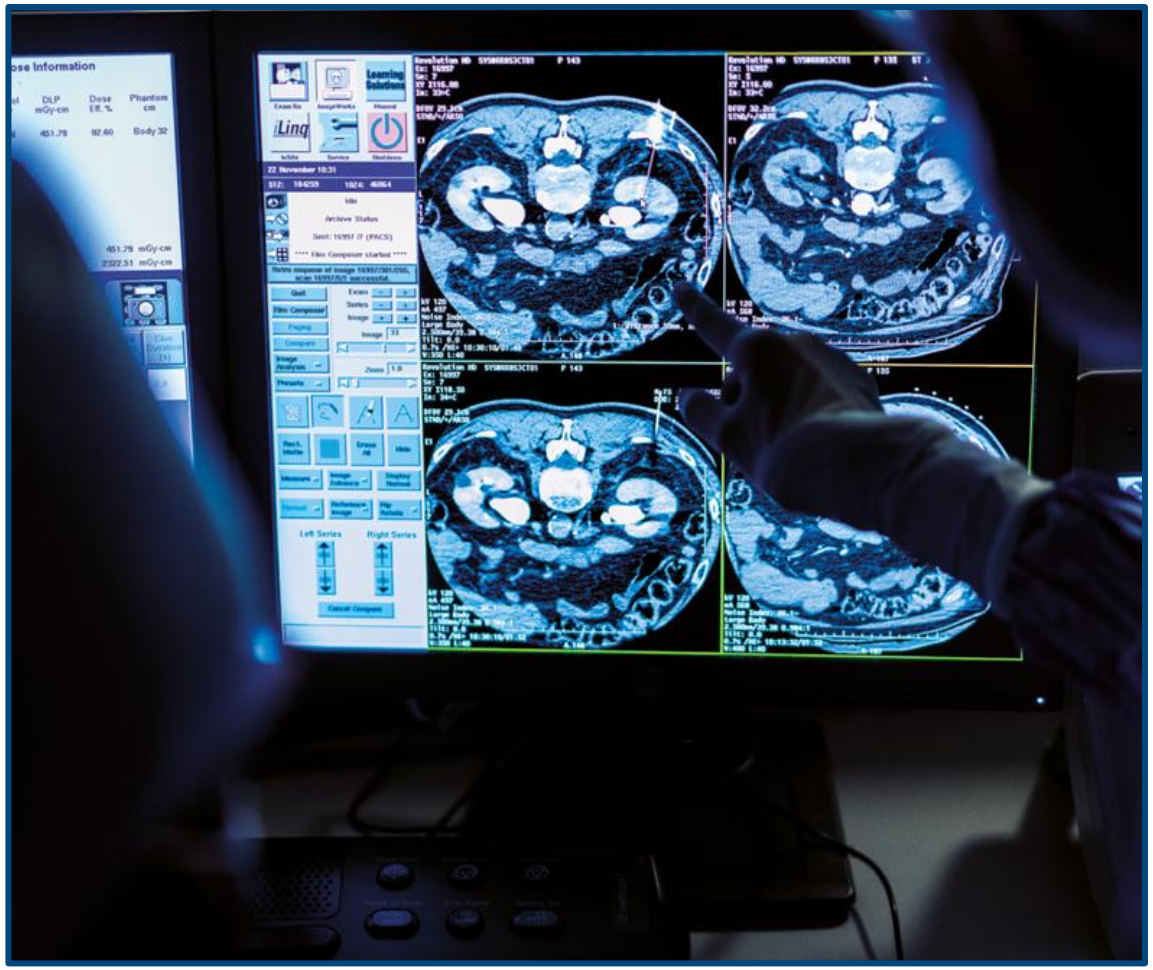


Workforce training and retention

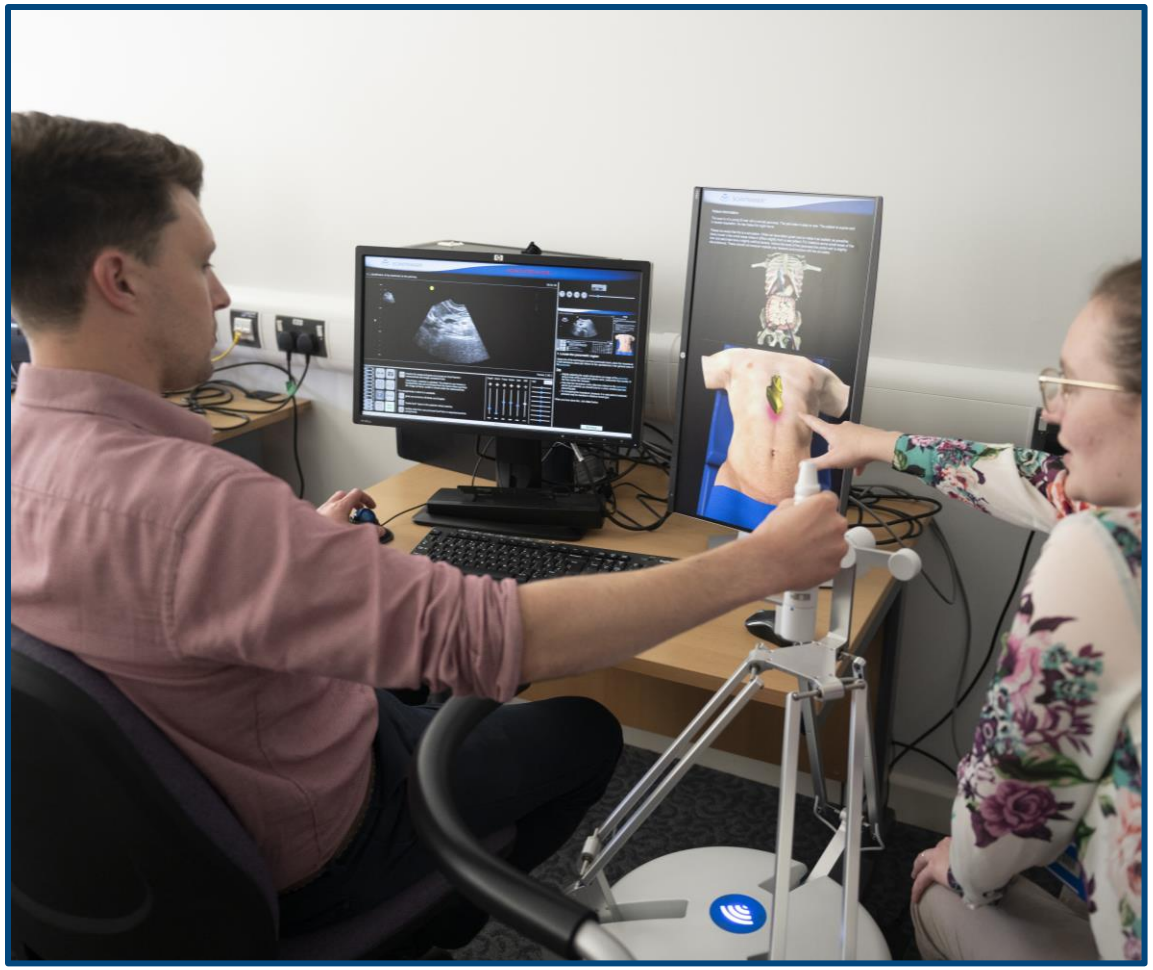
The Royal College of Radiologists

- Existing staff often don't have enough time for large AI implementation projects
- And/or they don't have the confidence or expertise in dealing with AI

- Training and time for understanding/influencing innovation
- Explore how existing staff can be retained



Validation and Audit



- Need to ensure AI algorithms will work as intended with patient populations and IT
- Risk of disparities in outcomes, e.g. if not validated on scans of individuals from certain ethnic groups
- Pre-deployment testing
- Secure data environments
- Shadow mode- does it work in your environment?
- Regular testing for drift (SDE)

Maximising the value of AI

- Many AI tools are developed without clinicians' input…
- Not ideal for task at hand
- Need greater engagement between radiologists and developers

Where are we now?

- **Huge interest and investment**
- **Areas that need work**
  - shaping which tools are available
  - regulation → implementation
  - quality assurance
  - audit
  - education and training
- **AI assessment/audit unit**

Thank you

- Contact the President: **president@rcr.ac.uk**
- Contact the RCR at any time: **enquiries@rcr.ac.uk** or **equality@rcr.ac.uk**
- Follow **@rcradiologists** on Twitter, Facebook, Instagram, LinkedIn and YouTube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PROFESSOR STEFAN ZOHREN

CHIEF DATA SCIENTIST

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REVOLUTIONISING MATERNITY CARE: THE FAVOM EDD SOLUTION

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MODELLING PATIENT FLOW IN EMERGENCY DEPARTMENTS

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THE RISE OF LARGE LANGUAGE MODELS

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Chat

Generative

Pre-Trained

Transformer

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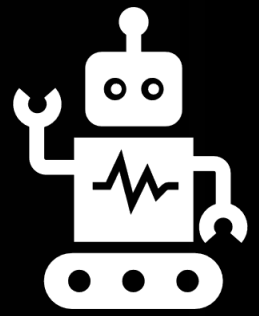
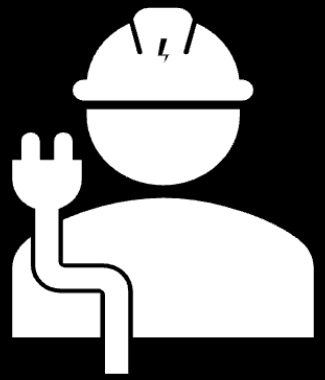
Transformer



Transformers are a computationally efficient way to use a technique called '**attention**'

Attention helps LLMs to **learn** importance weights to other words which help the model to gain a better **understanding of words** and later also whole sentences from **context**



Transformers **pre-trained** on large corpuses of text can then be **fine-tuned** for specific **down-stream tasks**, such as sentiment classification

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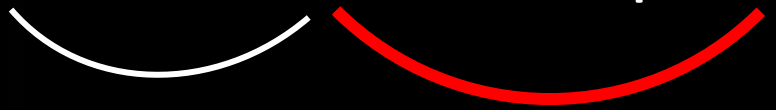
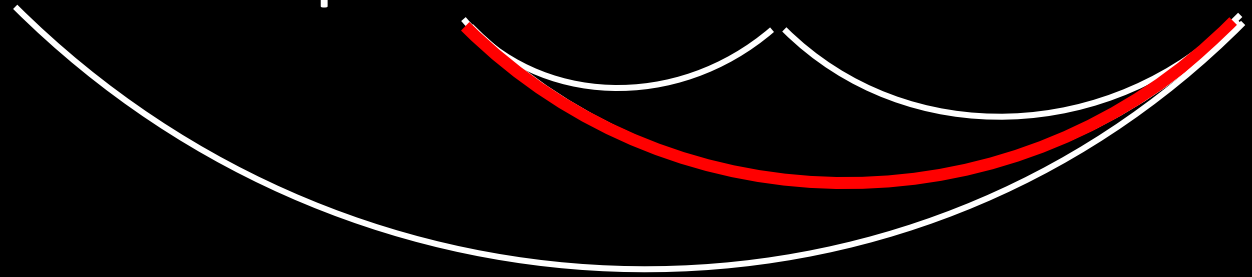
PREDICTIVE DATA · PROACTIVE AI

Transformer

"The patient's results were positive.“



"The patient had a positive outlook on their recovery."



Transformers in other domains

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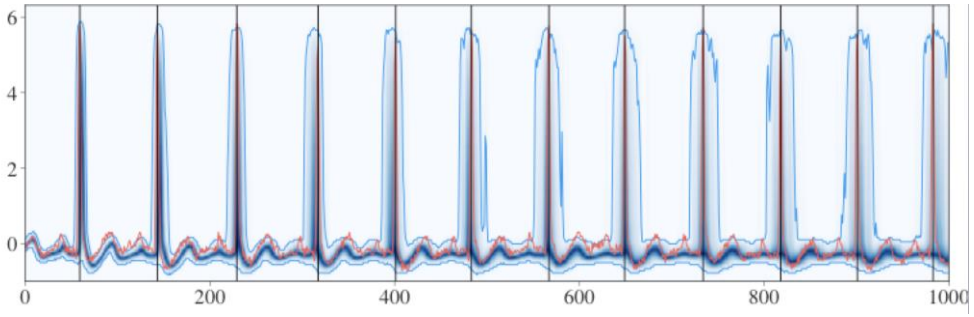
Me: What are symptoms of sepsis?

1. Fever, chills, or a high body temperature; 2. rapid heart rate

TEXT



NUMERICAL TIME-SERIES

Forecasting COVID-19 Caseloads Using Unsupervised Embedding Clusters of Social Media Posts

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*Department of Engineering Science, University of Oxford
†The Alan Turing Institute
‡Faculty of Linguistics, University of Oxford

TEXT AND NUMERICAL DATA

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FAVOM IS DEDICATED TO DELIVERING HEALTHCARE EQUALITY

1) improving patient outcomes
2) delivering greater operational efficiency
3) improving population health

digitalhealth

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Chair: Jon Hoeksma

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