mjmedical

mjmedical

Artificial Intelligence and Diagnostic Radiology

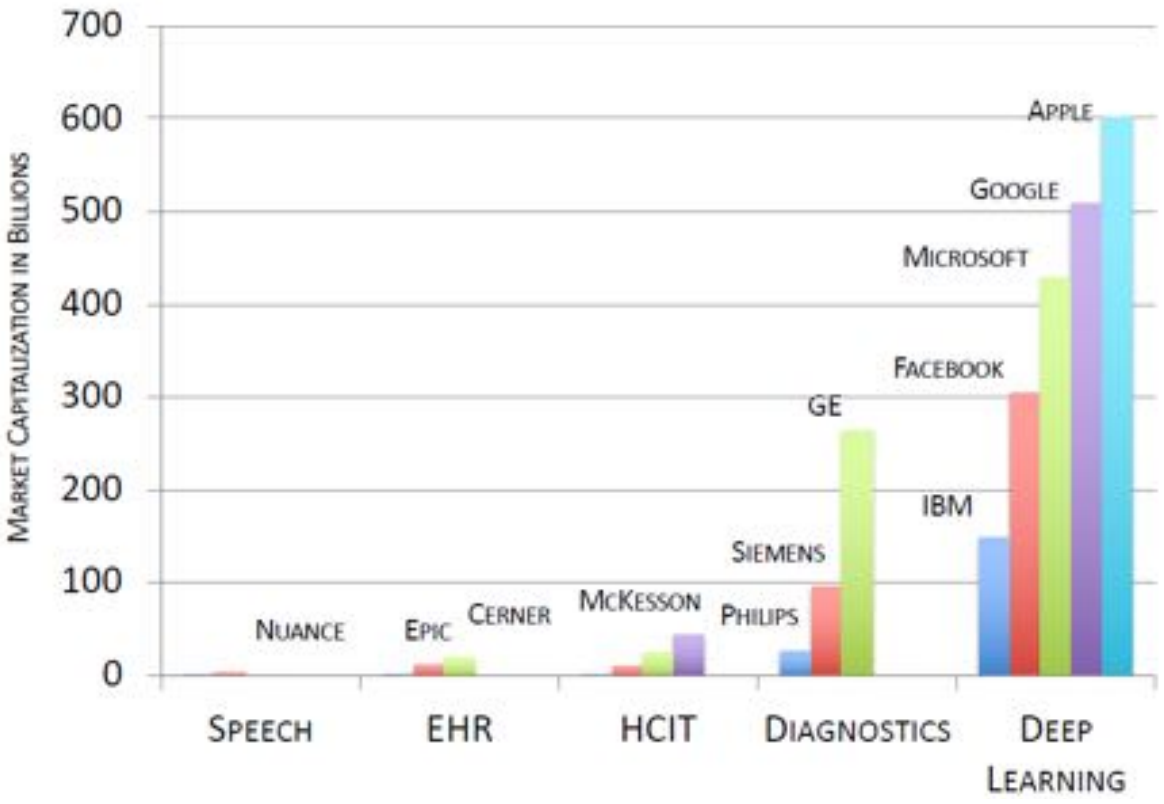
mjmedical

facebook

mjmedical

AI is big business

Corporate Valuations by Sector

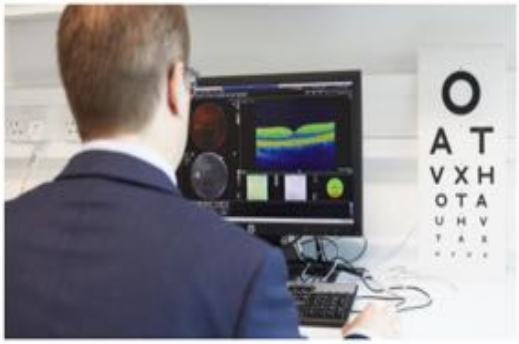


mjmedical

Beginning to make an Impact in Health

Breakthrough in AI technology to improve care for patients

Two years ago, Moorfields Eye Hospital NHS Foundation Trust and DeepMind Health, came together to announce a five-year partnership to explore whether artificial intelligence (AI) technology could help clinicians improve the care for our patients.



Researchers from Moorfields and the UCL Institute of Ophthalmology have had a recent breakthrough in this research, published on Nature Medicine's website, which describes how machine learning technology has been successfully trained on thousands of historic de-personalised eye scans to identify signs of eye disease and recommend how patients should be referred for care.

The AI system can recommend the correct referral decision for over 50 eye diseases with 94% accuracy, matching world-leading eye experts. It is hoped that the technology could revolutionise the way professionals carry out eye tests, allowing them to spot conditions earlier and prioritise patients with the most serious eye diseases before irreversible damage sets in.

BBH building better healthcare building better healthcare awards

Home Hospitals Events Mental Health Social Care Suppliers Awards

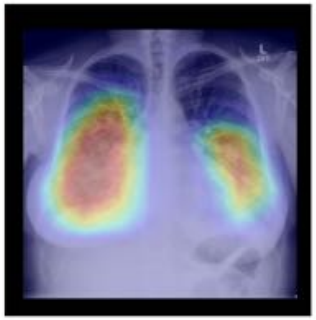
Building and Design Facilities Patient Experience Technology Infection Cont

Dartford and Gravesham NHS Trust implements AI in radiology

14-Jun-2019

TECHNOLOGY

Trust partners with Behold.ai to support quicker diagnosis workflows



The new technology helps to immediately pinpoint abnormal radiology scans

Densitas and Leeds Teaching Hospitals sign partnership to bring innovative, personalized breast screening technologies into their routine clinical workflow.

HALIFAX, Nova Scotia, July 24, 2018 /PRNewswire/ -- Densitas, Inc., a breast imaging analytics innovator based in Halifax, Nova Scotia, announces a recently formalized partnership with the Leeds Teaching Hospitals NHS Trust in the UK. The partnership seeks to introduce innovative personalized breast screening technologies, including our **densitas**density™ and **densitas**quality™ products, into routine clinical workflow. The goal is to ultimately enable population level stratified breast screening and mammography quality improvement and stimulate research in the area of breast health.

"Our partnership with Leeds Teaching Hospitals, NHS Trust is the first of its kind in the UK and represents an alignment of vision that is intended to improve appropriateness of care in breast cancer screening through innovation in technology and service delivery," says Mohamed Abdolell, CEO of Densitas. "We are excited to collaborate with Dr. Nisha Sharma, Director of Breast Screening, and her team at Leeds Teaching Hospital's NHS Trust breast screening program to introduce our machine learning powered breast imaging analytics platform into a clinical care setting."

mjmedical

NHS aims to be a world leader in artificial intelligence and machine learning within 5 years

5 June 2019

Digital | Innovation | Long Term Plan

NHS chief Simon Stevens today called on tech firms to help the health service become a world leader in the use of artificial intelligence (AI) and machine learning.

He also asked staff to work with us and share ideas on reforms to the payment systems that would help encourage and facilitate quicker adoption and expansion.

The technology can help speed up diagnosis of cancer and other diseases and deliver more convenient care by revolutionising outpatient services.

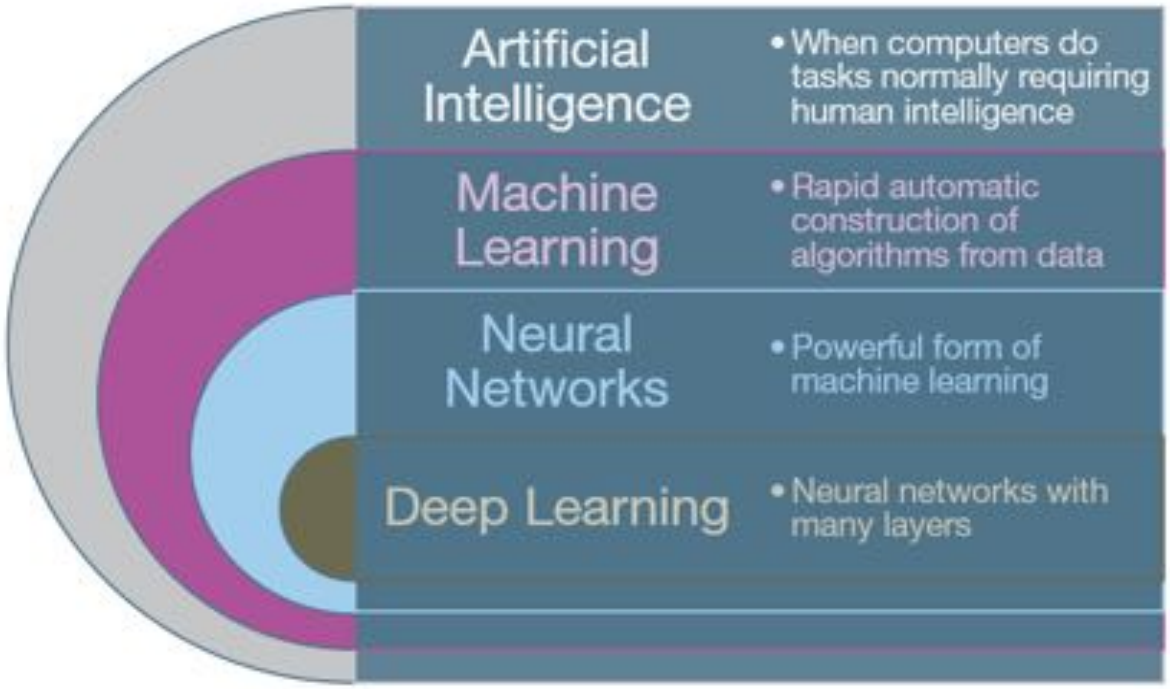
Speaking at the Reform Health Conference today, NHS chief executive Simon Stevens announced a global call for evidence from technologists for how the NHS can best incentivise the use of carefully targeted AI across the NHS from April 2020 and beyond.

The NHS boss challenged tech innovators to come forward with proposals for how the NHS can harness innovative solutions that can free up staff time and cut the time patients wait for results.

At the same time he pledged to consider reimbursement reforms to the NHS tariff and other payment systems to incentivise quick and safe adoption across the NHS.

Exploiting the boom in AI technology will help to meet the NHS Long Term Plan's target of making up to 30 million outpatient appointments unnecessary, saving over £1 billion in what would have been increasing outpatient visits which can then be reinvested in front line care, saving patients unnecessary journeys to hospitals.

mjmedical


Artificial Intelligence
• When computers do tasks normally requiring human intelligence
Machine Learning
• Rapid automatic construction of algorithms from data
Neural Networks
• Powerful form of machine learning
Deep Learning
• Neural networks with many layers

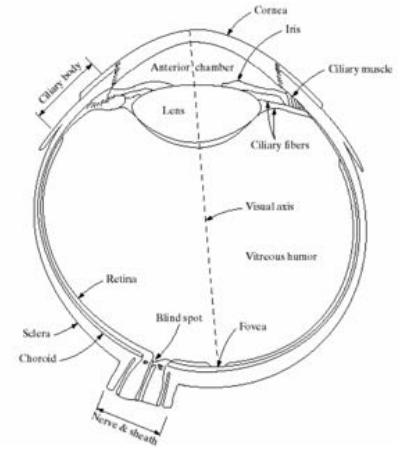
mjmedical

Machine Learning Needs Lots of Data

Deep learning requires around 1000 positive examples and 1000 negative examples to learn – by contrast a human needs 3 examples

mjmedical

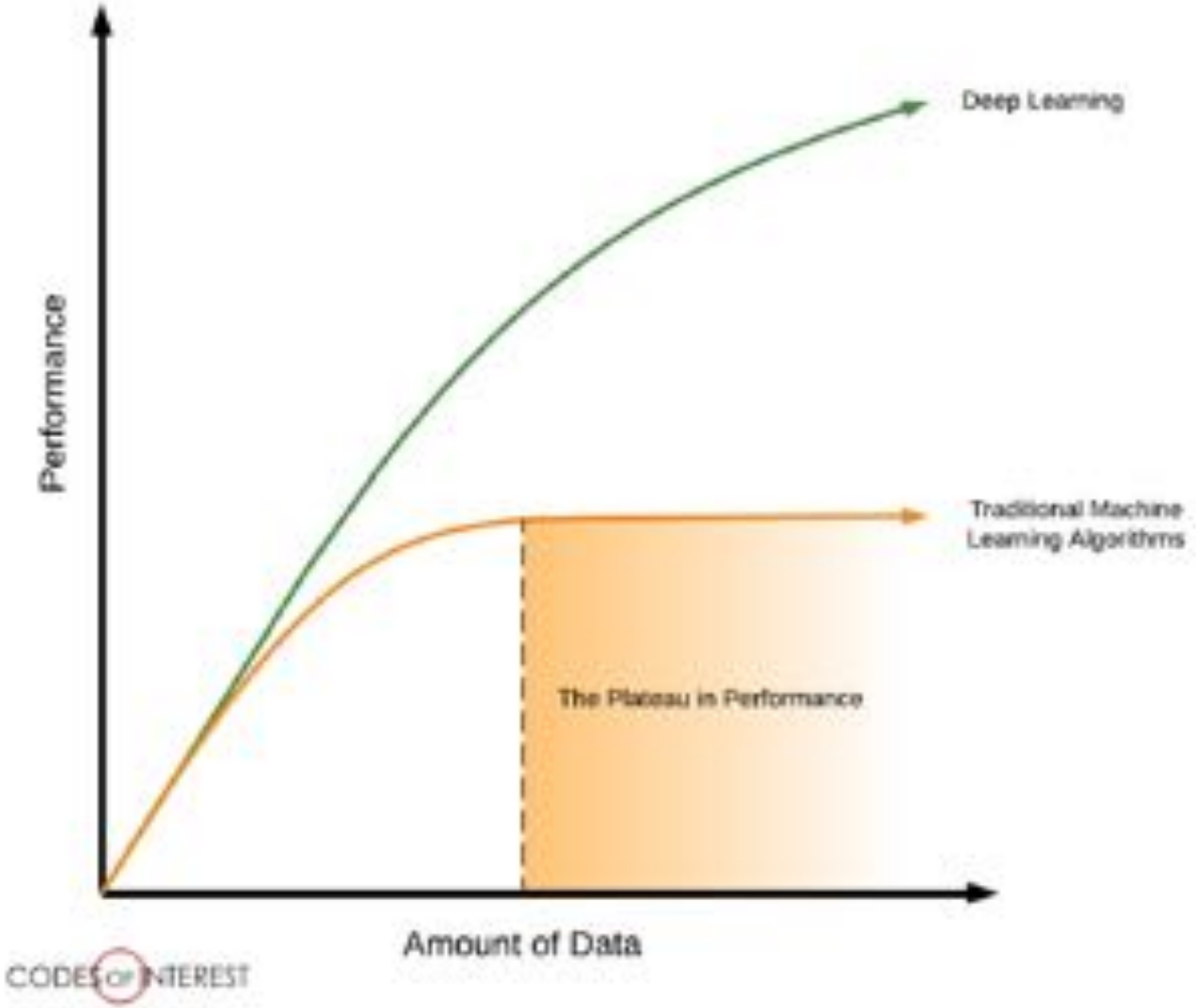
Neural Networks simulate the way neural impulses are sent to the brain from human eyes



What we see → What the computer sees

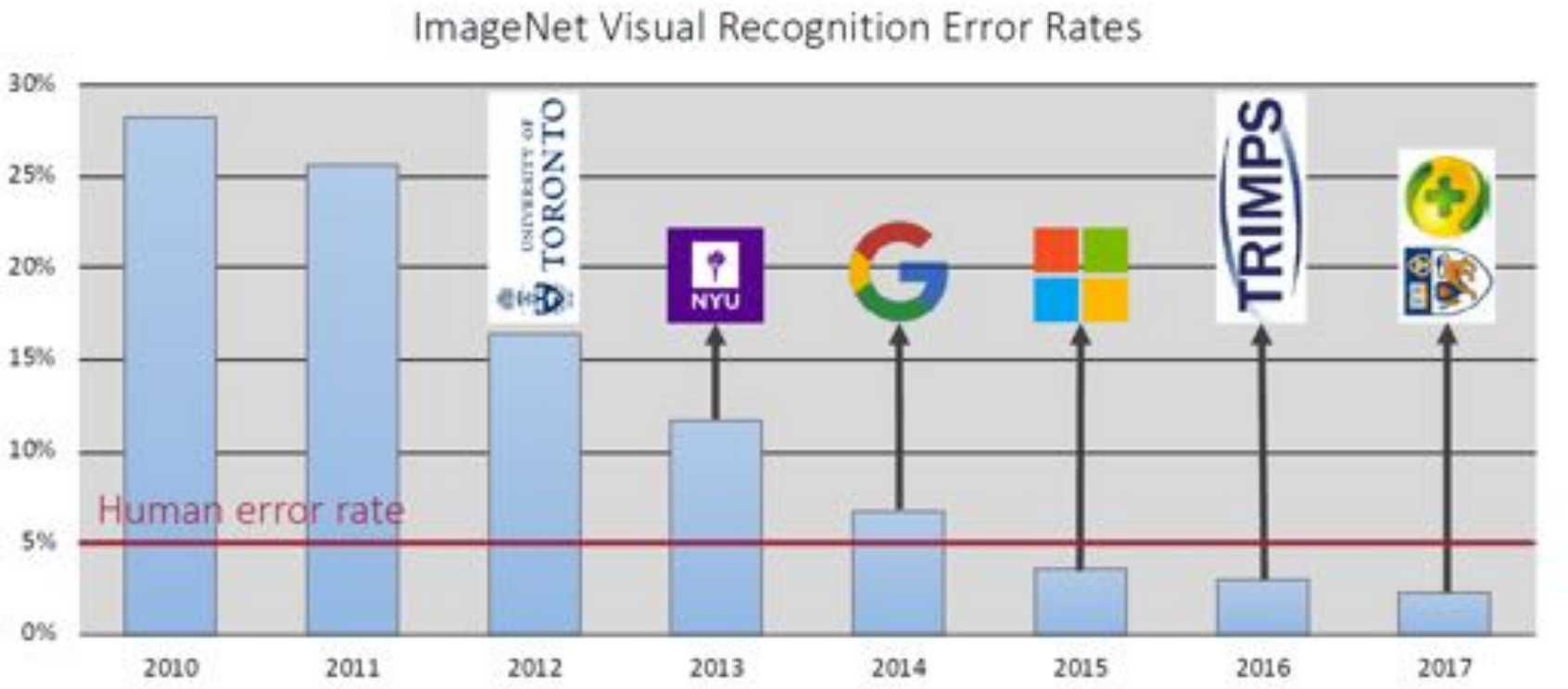
- Contrast
- Size
- Shape
- Boundary
- Texture

141	168	204	237	245	254	255	255	255	255	255	255	255	255	255
85	95	118	174	195	236	249	252	255	255	255	255	255	255	255
84	88	99	130	148	191	222	233	248	251	251	251	251	252	253
89	89	90	92	103	139	184	200	230	238	240	240	241	244	246
99	102	108	107	104	95	104	118	157	185	191	193	197	207	218
103	103	104	104	99	87	84	89	106	129	139	146	159	172	185
105	102	99	99	95	81	69	65	58	72	86	100	119	133	148
104	99	94	90	86	74	64	57	40	42	54	68	89	101	113
102	95	89	86	84	79	66	56	34	27	36	49	71	79	85
101	93	87	83	83	81	66	56	32	25	32	43	65	72	77
95	87	82	83	84	83	66	55	30	28	36	47	65	72	78
87	80	75	79	81	82	65	53	26	34	42	49	62	69	78
83	76	71	75	77	79	66	53	24	34	43	50	58	66	74
80	72	64	65	67	74	66	54	22	33	42	48	49	58	67
84	74	61	61	63	67	59	48	16	26	36	45	45	54	63
90	79	61	59	61	65	59	48	16	22	31	41	42	51	61
104	92	67	58	59	67	67	56	19	15	24	34	36	47	59
120	113	87	65	64	71	78	70	41	19	24	33	34	42	51
116	113	93	67	65	70	81	75	48	22	25	32	35	42	49
97	103	102	73	68	67	83	80	64	27	26	31	37	42	47
59	75	96	77	70	61	77	79	75	31	28	31	42	43	42
36	55	90	79	72	58	72	73	67	29	27	32	41	42	42
21	42	84	79	73	57	67	66	59	26	27	32	41	42	42
20	33	67	71	67	55	66	63	49	21	22	28	41	42	42
32	40	56	57	55	49	67	64	48	28	27	29	43	43	42


Deep Learning
Traditional Machine Learning Algorithms
The Plateau in Performance
Performance
Amount of Data
CODES OF INTEREST

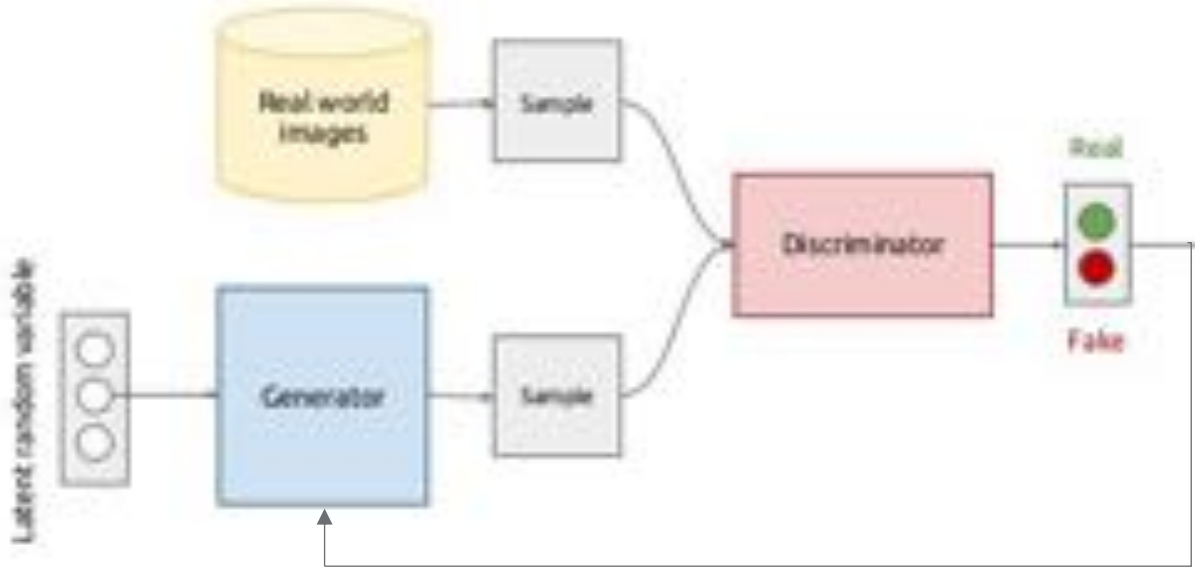
mjmedical

The Rapid Development of Machine Learning



mjmedical

Machine Learning - Adversarial Training



mjmedical



Adversarial images from thisfacedoesnotexist.com

mjmedical

AI and Radiology

upstream → downstream

mjmedical

AI and Radiology

upstream

- Patient positioning
- Patient movement prediction
- Error correction
- Image processing & reconstruction
- Modality optimisation & predictive maintenance

mjmedical

AI and Radiology

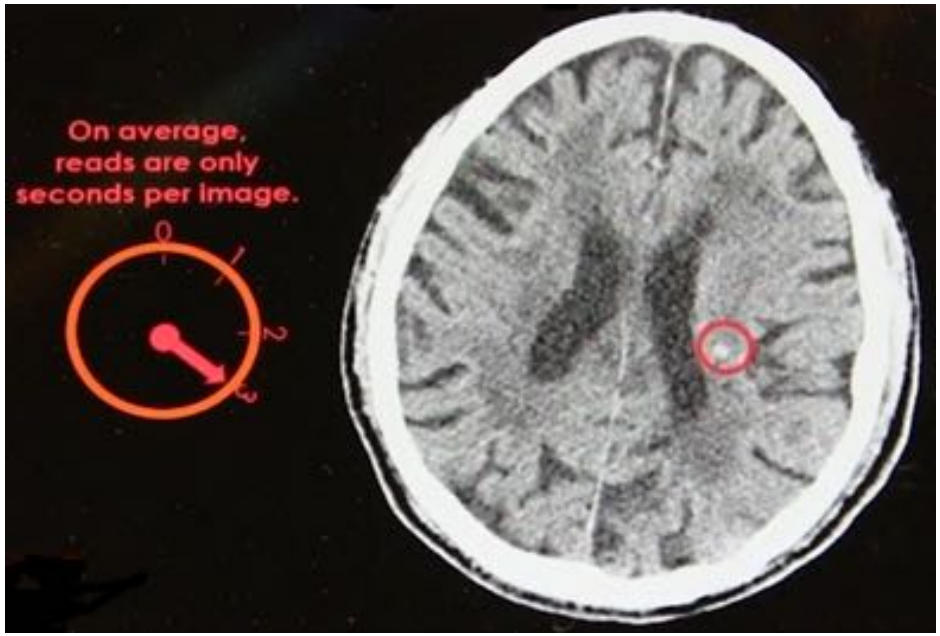
downstream

- Regression
  - Developmental Question – Bone Age / Brain Age
- Classification
  - Tumour / No Tumour
  - Improvement or regression
  - Normal / abnormal
  - Fracture
  - Haemorrhage
- Segmentation
  - Volume of Tumour
  - Malignant / Benign
  - Organ Segmentation & Analysis
  - Predictive Analysis

mjmedical

AI and Radiology

- Intra Cranial Haemorrhage
  - Identification
  - Classification
  - Triage & Prioritisation
  - Review of EPR to appraise risk factors and develop treatment plan

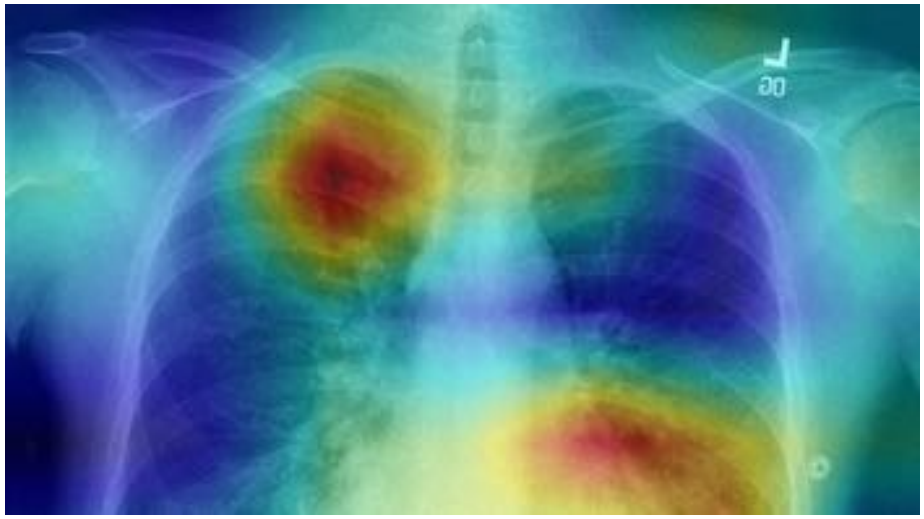


Example from MaxQ AI

mjmedical

AI and Radiology

- Chest X-Ray
  - Pneumonia and more than 13 other common diseases
  - Identification
  - Classification
  - Triage / Prioritisation
  - AI Reading time <2 minutes compared with Radiologist Reading time >4hrs



Example from Stanford University MLG – CheXnet (112,120 learning set)

NHS Dartford and Gravesham NHS Trust

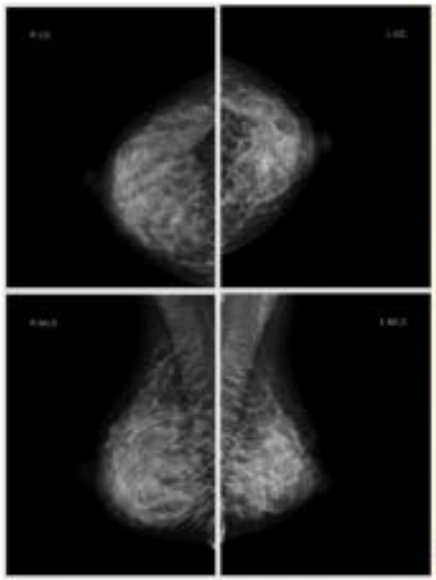
In the U.K. there are an estimated 330,000 X-rays at any given time that have been waiting more than 30 days for a report – Warwick University

mjmedical

AI and Radiology

- Breast Screening
  - Upstream patient position
  - Downstream Identification
  - Classification
  - Density Adjustment
  - Automated Quality Assessment

NHS
The Leeds Teaching Hospitals
NHS Trust



Example from Densitas

According to the Royal College of Radiologists, two million breast screen's are done each year in the UK, requiring a review by two radiologists. Consistency can vary with visual reporting being subjective, not reliably reproducible and not standardised.

mjmedical

AI and Radiology

- Vertebral Compression Fracture
  - Identification
  - Classification
  - Triage / Prioritisation

DR. KASSIM JAVAID
UNIVERSITY OF OXFORD

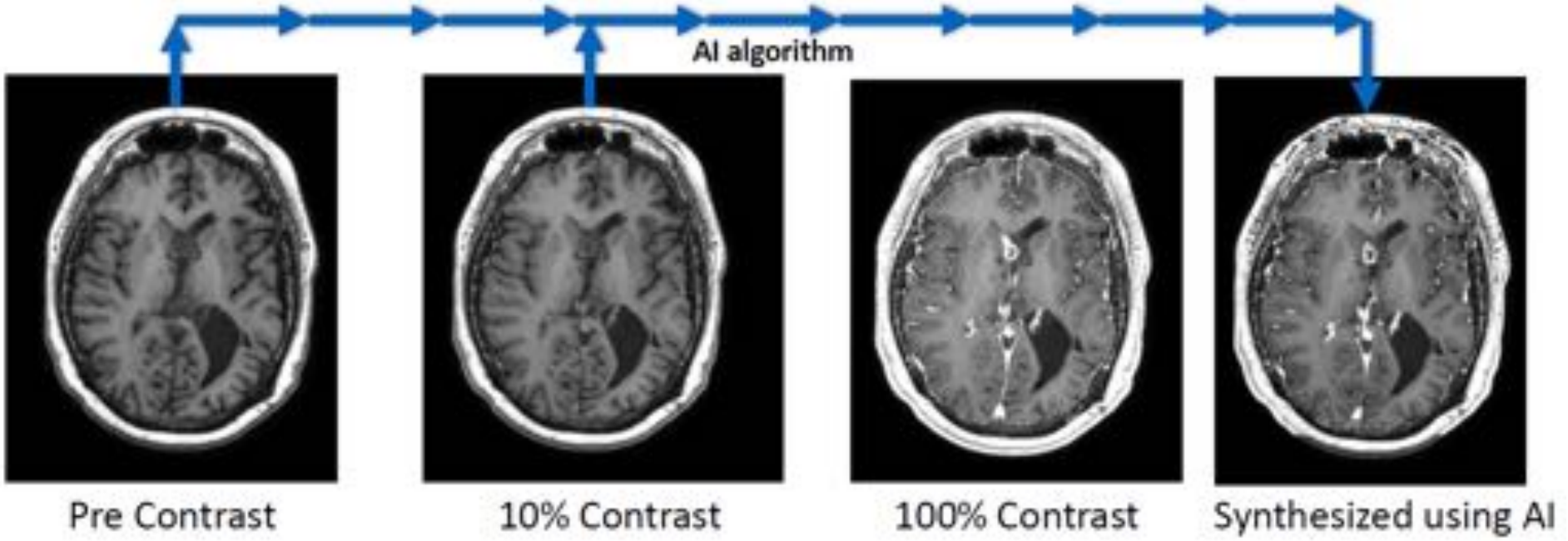
*We successfully ran a pilot with Zebra Medical Vision's vertebral compression fracture algorithm with the purpose of evaluating how AI based technology can help increase patient flow into Oxford's Fracture Liaison Service. The pilot was successful, **as accuracy was above 90%**. Dr. Javaid states, "We were quite pleased with the Zebra pilot and results, and as such are **expanding our use of the technology to increase the patient flow** into our FLS program in 2018 and 2019."*

Example from Zebra Medical AI

mjmedical

AI and Radiology

Adversarial AI – Lower IV Contrast Media Dose

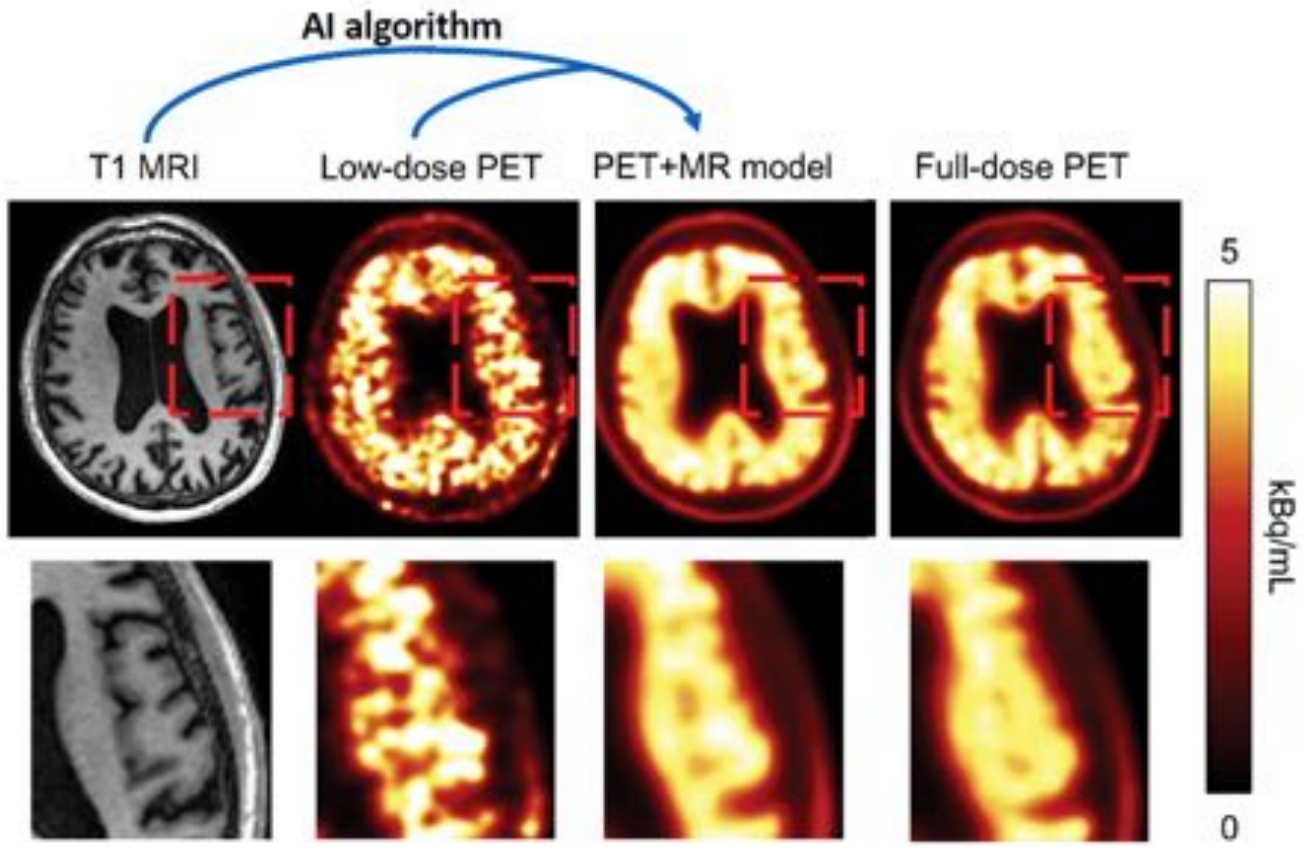


Gong E et al. J Magn Reson Imaging. Aug 2018

mjmedical

AI and Radiology

Adversarial AI – Reduce PET Radiation Dose



Chen KT et al. Radiology, 290, 2018

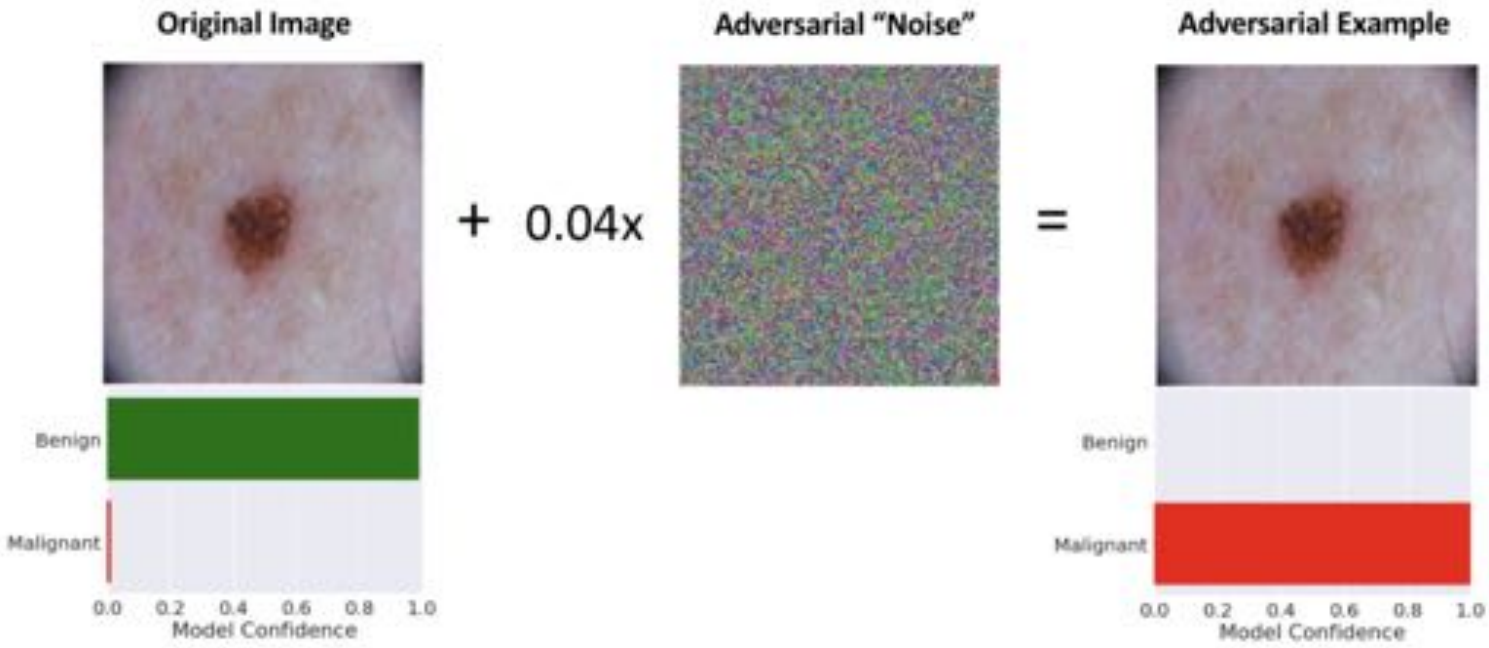
mjmedical

Challenges

- Peer reviewed papers – hard to come by
- Requirement for lots of data
- Rarer conditions harder to find training data
- Over-fitting – AI only learning the data set
- Potential for genetic or regional bias in the data
- GDPR
- Silo development - tailored for individual manufacturers or systems
- Common interface
- ICT infrastructure

mjmedical

Challenges

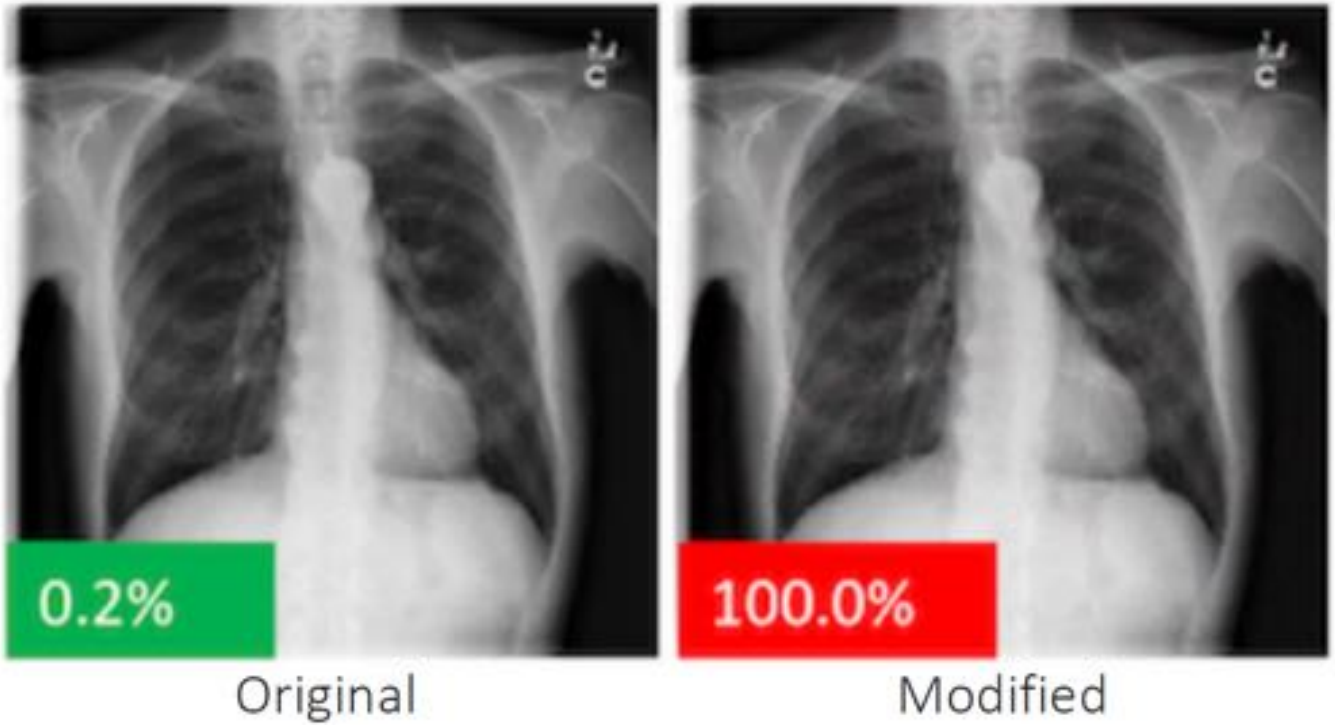


Finlayson SG, Kohane IS, Beam AL. Adversarial Attacks Against Medical Deep Learning Systems

mjmedical

Challenges

Radiology Example: Pneumothorax Detection



Finlayson SG, Kohane IS, Beam AL. Adversarial Attacks Against Medical Deep Learning Systems

mjmedical

Challenges – Liability and ethics

Liability for decisions made about patient care almost exclusively rests with the healthcare practitioner.

AI models have large amounts of data, some of which are not perceptible to humans, will liability be shared between:

- The healthcare practitioner
- Hospital Management
- The company which developed the AI tool.

Could the radiologist be made liable for NOT having used AI or going against its analysis?

mjmedical

GOV.UK

Search

Departments Worldwide How govern
Consultations Statistics News and co

Tell us what you think of GOV.UK

Take a short survey to give us your feedback

Home

Guidance

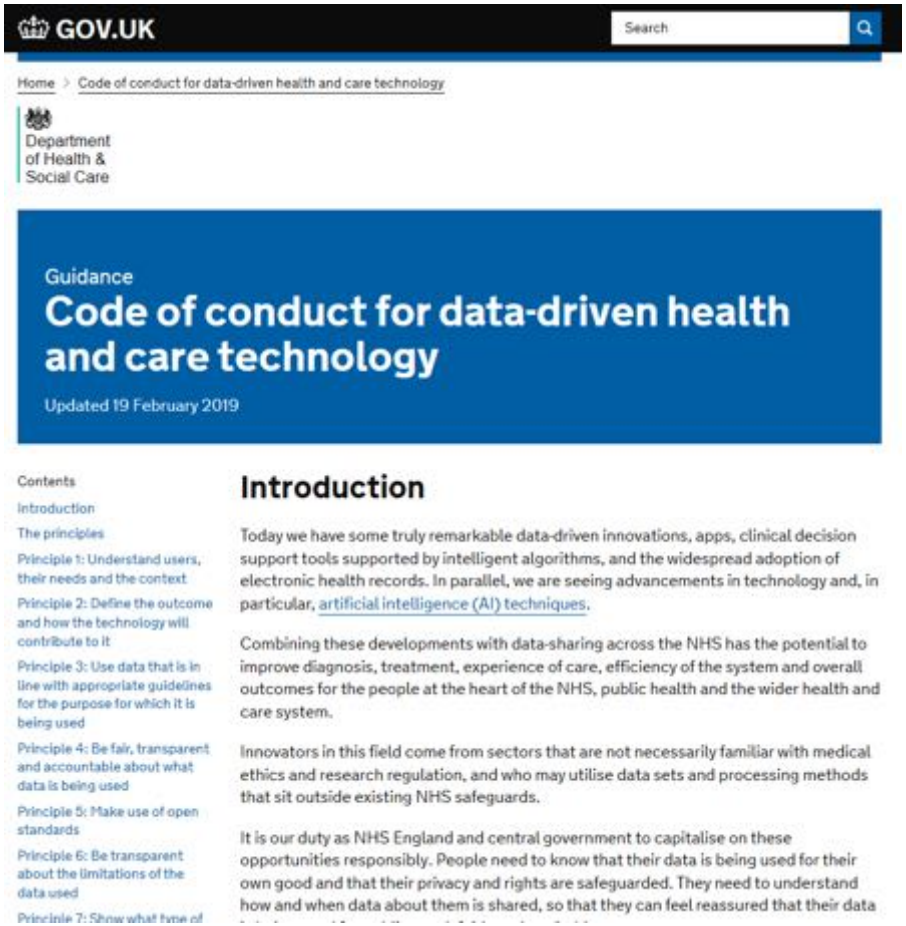
Understanding artificial intelligence ethics and safety

Understand how to use artificial intelligence ethically and safely

Published 10 June 2019
From: Government Digital Service and Office for Artificial Intelligence

Contents

- Who this guidance is for
- Understanding what AI ethics is
- Varying your governance for projects using AI
- Establish ethical building blocks for your AI project
- Start with a framework of ethical values
- Establish a set of actionable principles
- Related guides



GOV.UK

Search

Home > Code of conduct for data-driven health and care technology

Department of Health & Social Care

Guidance

Code of conduct for data-driven health and care technology

Updated 19 February 2019

Contents

- Introduction
- The principles
- Principle 1: Understand users, their needs and the context
- Principle 2: Define the outcome and how the technology will contribute to it
- Principle 3: Use data that is in line with appropriate guidelines for the purpose for which it is being used
- Principle 4: Be fair, transparent and accountable about what data is being used
- Principle 5: Make use of open standards
- Principle 6: Be transparent about the limitations of the data used
- Principle 7: Show what type of

Introduction

Today we have some truly remarkable data-driven innovations, apps, clinical decision support tools supported by intelligent algorithms, and the widespread adoption of electronic health records. In parallel, we are seeing advancements in technology and, in particular, artificial intelligence (AI) techniques.

Combining these developments with data-sharing across the NHS has the potential to improve diagnosis, treatment, experience of care, efficiency of the system and overall outcomes for the people at the heart of the NHS, public health and the wider health and care system.

Innovators in this field come from sectors that are not necessarily familiar with medical ethics and research regulation, and who may utilise data sets and processing methods that sit outside existing NHS safeguards.

It is our duty as NHS England and central government to capitalise on these opportunities responsibly. People need to know that their data is being used for their own good and that their privacy and rights are safeguarded. They need to understand how and when data about them is shared, so that they can feel reassured that their data

mjmedical

Positive Trend or Travesty?

- Within the next 2 to 5 years the majority of MRI, CT, X-Ray and Ultrasound will be segmented by AI in Acute Hospitals
- Optimise workflow and reduce demand on radiologists
- It will reduce the number of scans, improve prevention of disease and diagnosis, reduce radiation and harm, reduce clinical errors, improve patient outcomes and enable precision / tailored health
- Deep Learning Algorithms will identify anomalies humans cannot or have not previously recognised.
- Care pathways will be optimised with preventative screening and diagnosis happening more rapidly and in new locations
- Still many questions to answer

mjmedical

The Utopia – the digital twin

mjmedical

Machines will not replace humans in healthcare practice, but they will remove “machine tasks” from clinical workflow.

In Radiology AI will offer an army of highly trained radiologists with photographic memories and no need to eat or sleep.

Ultimately:

“Radiologists who use AI will replace those who don’t”

mjmedical