AI CENTRE
for Value Based
Healthcare

Transforming patient outcomes and clinical workflows with AI

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World Summit AI

NHS

Mission

The National Health Service (NHS) is the publicly funded healthcare system in England. It is the second largest single-payer healthcare system in the world. The NHS provides healthcare to all residents, with most services free at the point of use . The NHS also conducts research through the National Institute for Health and Care Research (NIHR).

The AI Centre for Value Based Healthcare is pioneering AI technology for the NHS. AI will help the NHS increase efficiency, improve therapies, drive safety, and reduce costs all of which benefit patients, medical staff, and the wider society.

AI Centre Partners

AI CENTRE for Value Based Healthcare

- 10 NHS organizations
- 17 Industry partners
- 4 Universities

Queen Mary University of London
UCL
Health Innovation Network South London
KiTEC

AINOSTICS
Biotronics 3D Analyze · Collaborate · Discover
brainminer
Cydar Medical

GE Healthcare
gsk
IBM
innersight

NHS Guy's and St Thomas' NHS Foundation Trust
NHS Barts Health NHS Trust
NHS Brighton and Sussex University Hospitals NHS Trust
NHS East Kent Hospitals University NHS Foundation Trust

KHEIRON MEDICAL TECHNOLOGIES
MIRADA The Imaging Software People
NetApp
NVIDIA

NHS Imperial College Healthcare NHS Trust
NHS King's College Hospital NHS Foundation Trust
NHS Lewisham and Greenwich NHS Trust
NHS Royal Brompton & Harefield NHS Foundation Trust

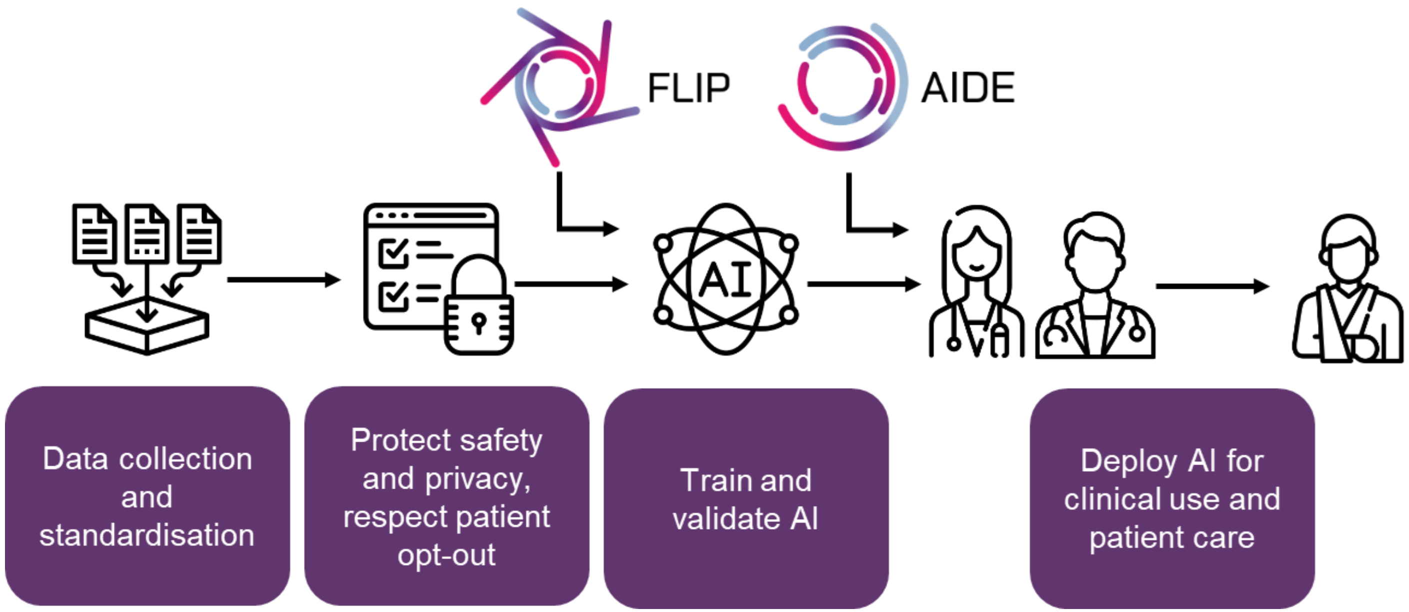
Perspectum
SIEMENS Healthineers
Thames Mammography

NHS South London and Maudsley NHS Foundation Trust
University College London Hospitals NHS Foundation Trust
King's College London
Imperial College London

Supporting the whole AI lifecycle

These in-house capabilities in our network and through the AI Centre - established a pipeline for supporting the end-to-end AI lifecycle. As part of our commitment to supporting the development and implementation of robust, secure, and trustworthy clinical AI we are also carrying out pioneering work in establishing ethics and data governance models.

- Collect and Standardise Data
- Safety and Privacy, respecting patient opt-out
- Training and Validating AI
- Deploying AI for patient care
- AI marketplace
- Standards (MHRA/BSI/MONAI)
- Scaling across the NHS



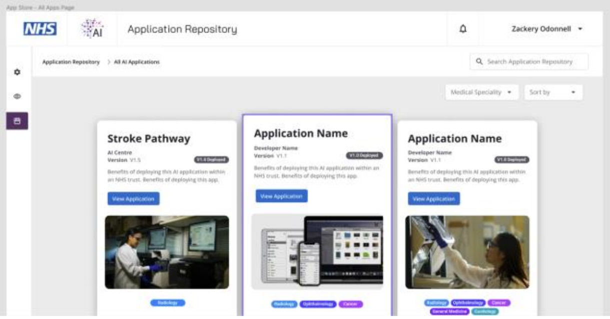
Infrastructure

1) Hardware Infrastructure

Hardware already installed in 7 NHS orgs for training and running AI models

2) Software Infrastructure

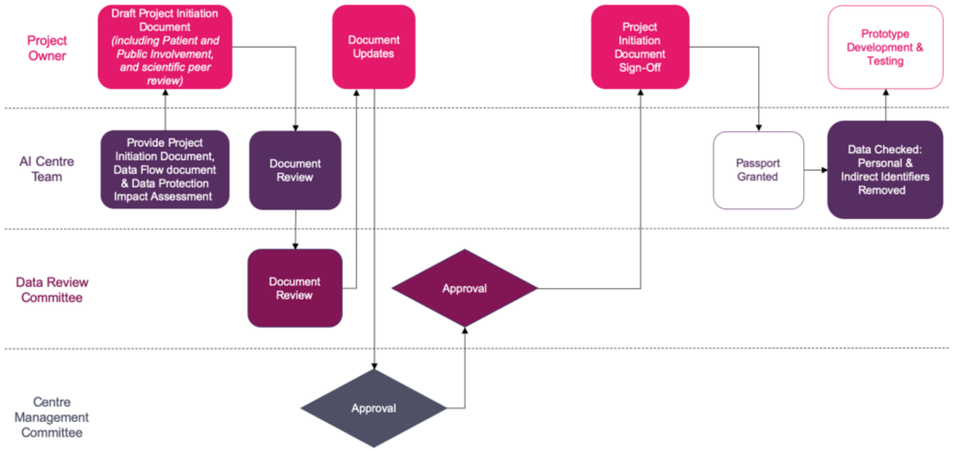
FLIP AIDE



CogStack

Software platforms developed and installed to enable Federated learning and AI deployment

3) Regulatory Infrastructure



Approval processes for access to patient data for research purposes for our partners

Developing standards and policies

As AI technologies are still emerging – standards are being developed and shared across the healthcare ecosystem to ensure consistency, interoperability and security.

KCL and GSTT had been part of setting up the international collaboration with industry, academia and healthcare organisations - for *Medical Open Network for Artificial Intelligence* – [MONAI](https://docs.monai.io).

MONAI aims to close the gap from research and development to clinical production environments by bringing AI models into medical applications and clinical workflows -to improve patient care.

https://docs.monai.io/projects/label/en/latest/whatsnew.html

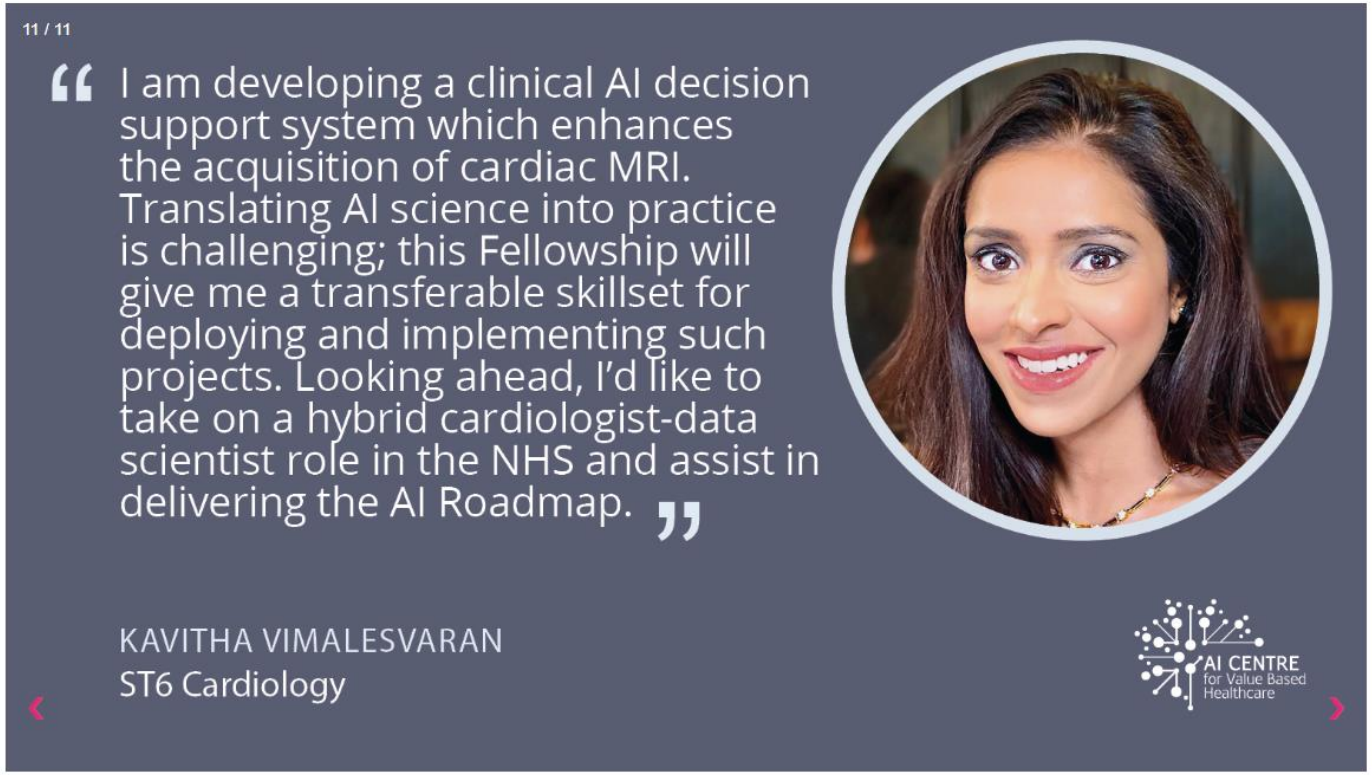
Fellowship in Clinical Artificial Intelligence

Technical skills, and data science/AI expertise in the workforce, are essential to a data enabled future for healthcare services.

Increasing numbers of clinicians are looking for ‘portfolio’ careers alongside their medical practice.

Funded by Health Education England, the Fellowship in Clinical AI is a year long programme which is integrated part-time alongside clinical work.
Fellows are recruited from a diverse clinical workforce including: medical and dental specialty trainees, nurses & midwives, allied health professionals, and pharmacy professionals.

Fellows learn to adopt clinical AI technology, they gain experience deploying AI in clinical workflows in 12-month project placements, under expert supervision in multidisciplinary teams.

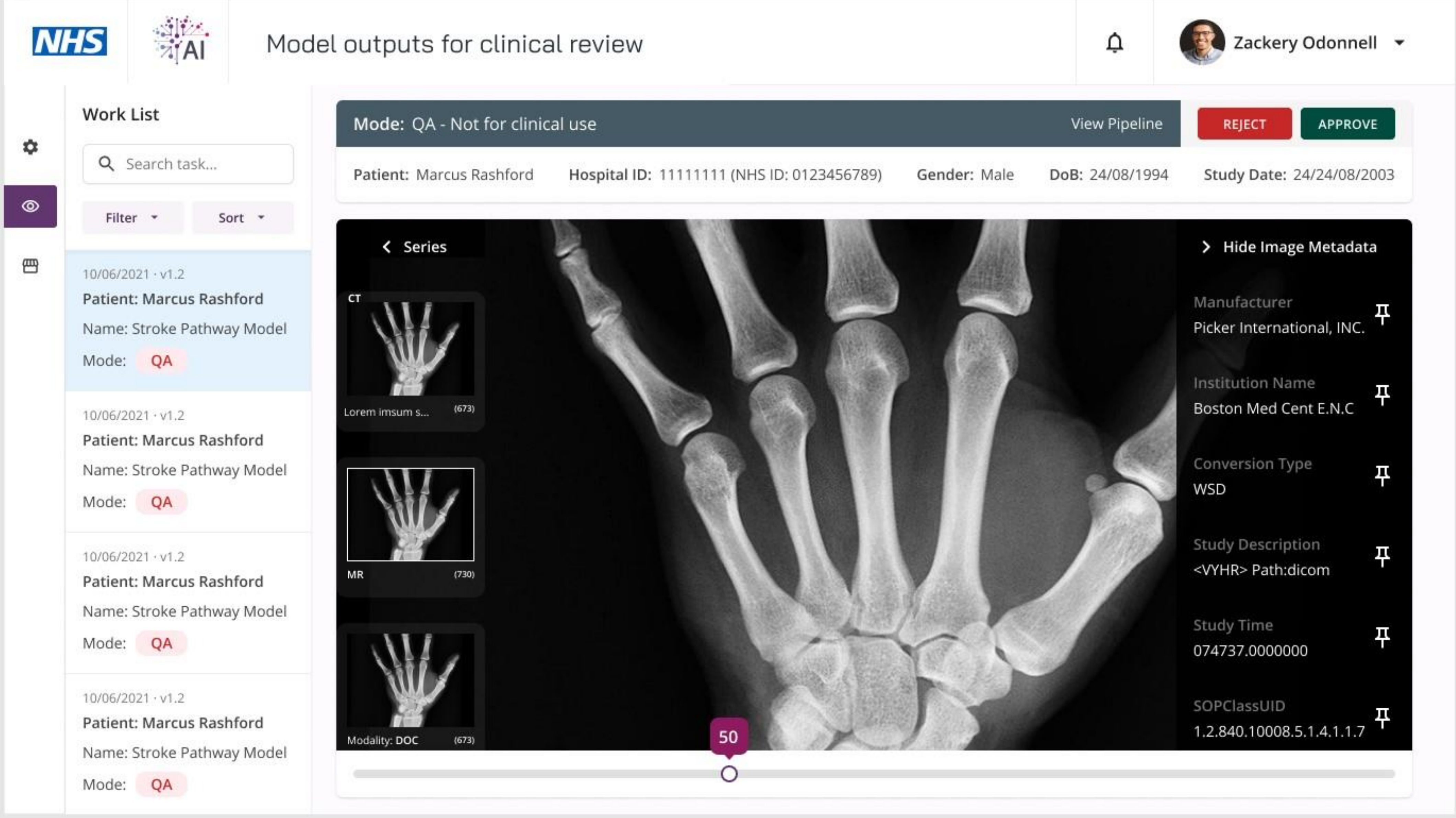


Transforming Patients outcomes

AI technologies provide opportunities to target diverse clinical pathways, from head to toe, in early life and old age. Our AI interventions create applications that enable faster and earlier diagnosis, automation of reporting, improved patient screening for disease, and personalised therapies.

AIDE platform

https://www.youtube.com/watch?v=7R2dLu2iG_s
start 9:33 ends 11:28



AI assisted Stroke Detection

Intracerebral haemorrhage Phenotyper (ICH)

Problem

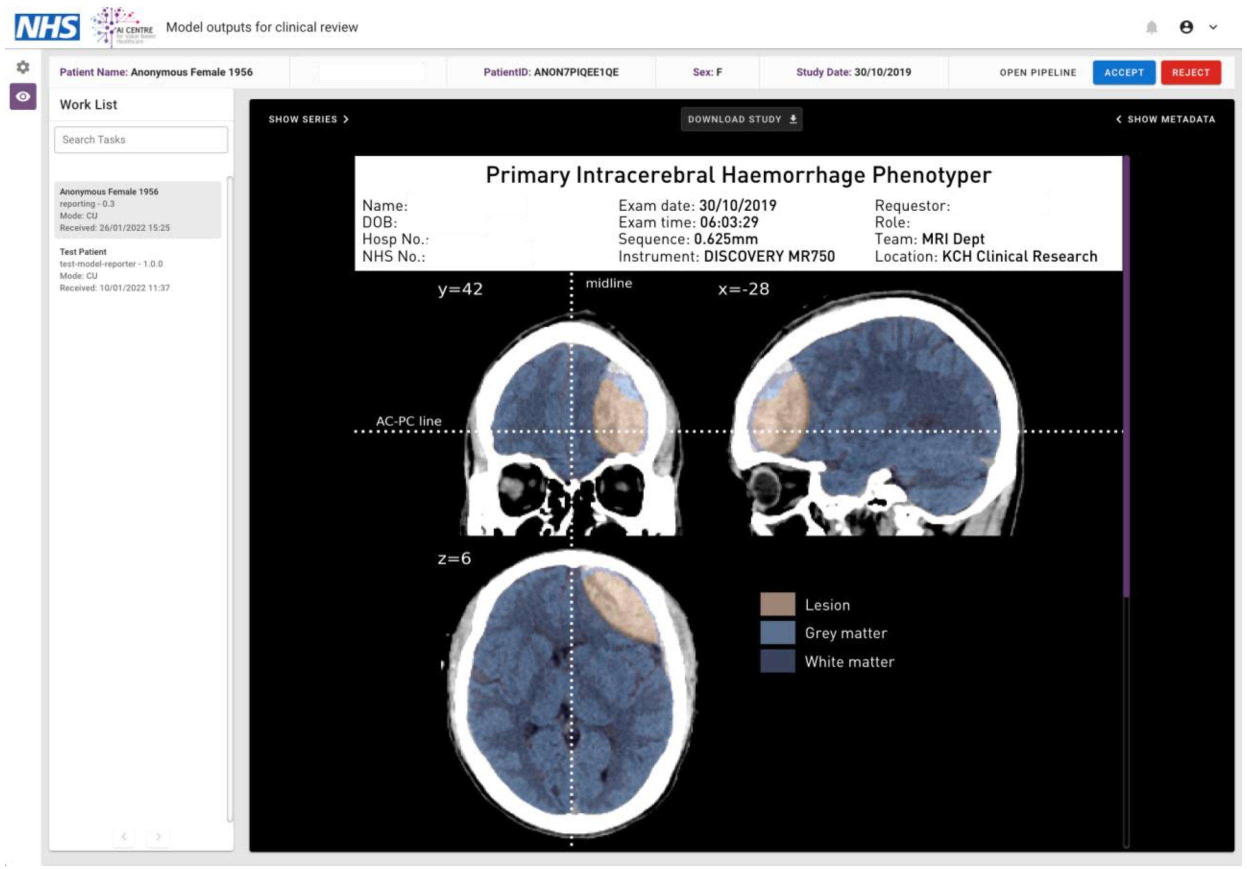
The severity of a stroke is highly dependent on which part of the brain is damaged. Simple measurements like stroke size are insufficient to predict outcomes. The complex relationship between stroke anatomy and outcome is a major obstacle to optimal care, especially in the initial hospital phase of most critical interventions.

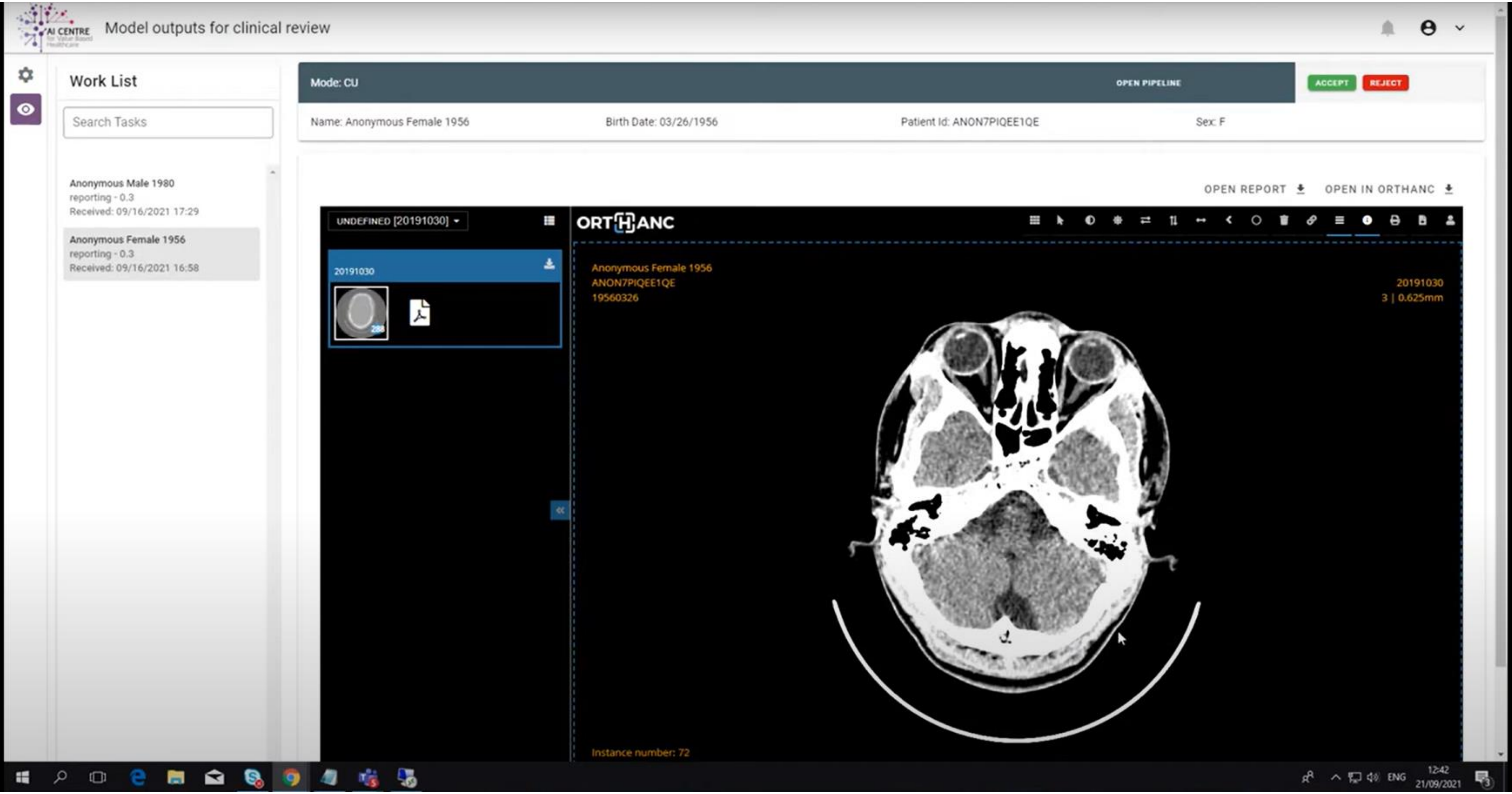
Solution

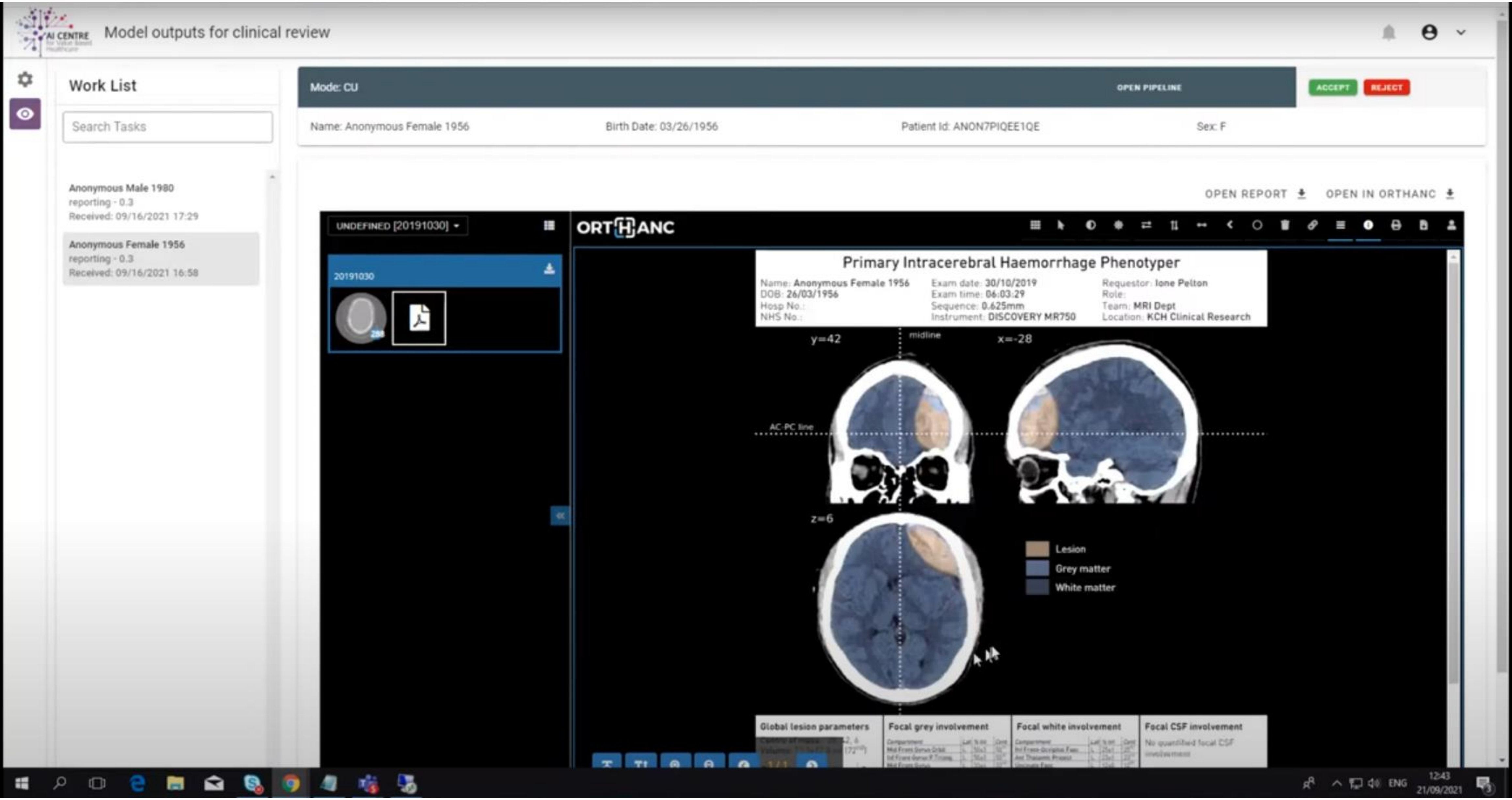
Developed in-house by KCL and KCH - Detects which parts of the brain are affected by the haemorrhage and the likely side effects, as a way to inform downstream treatment, including specific therapies needed for stroke rehabilitation.

Status

It has been used in KCH hospitals for decision support since 2022, currently in use by clinical teams.




AI CENTRE
Model outputs for clinical review
Work List
Search Tasks
Anonymous Male 1980
reporting - 0.3
Received: 09/16/2021 17:29
Anonymous Female 1956
reporting - 0.3
Received: 09/16/2021 16:58
Mode: CU
OPEN PIPELINE
ACCEPT
REJECT
Name: Anonymous Female 1956
Birth Date: 03/26/1956
Patient Id: ANON7PIQEE1QE
Sex: F
OPEN REPORT
OPEN IN ORTHANC
UNDEFINED [20191030]
20191030
ORTHANC
Anonymous Female 1956
ANON7PIQEE1QE
19560326
20191030
3 | 0.625mm
Instance number: 72
ENG
12:42
21/09/2021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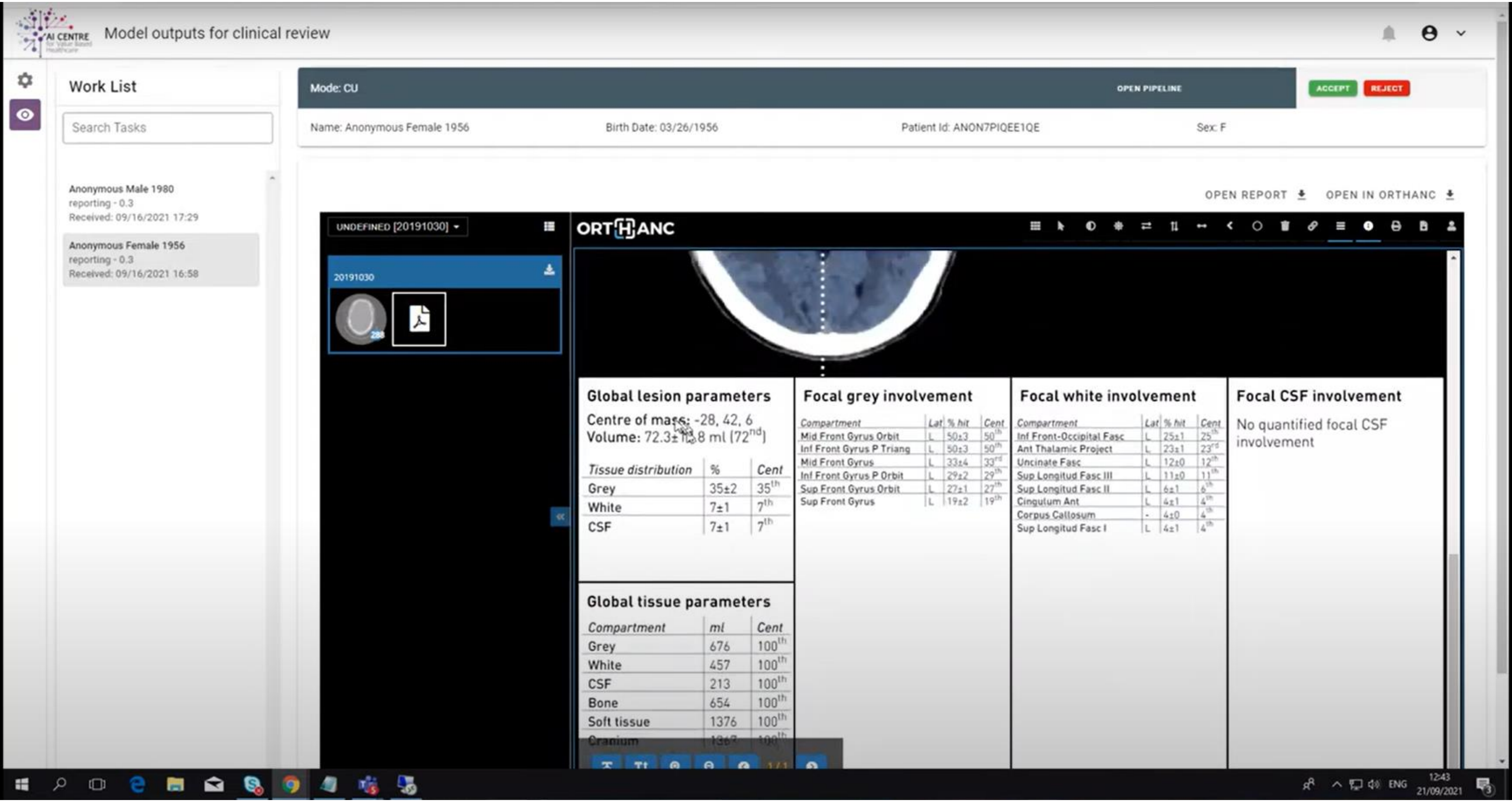
OPEN REPORT
OPEN IN ORTHANC
UNDEFINED [20191030]
20191030
ORTHANC
Primary Intracerebral Haemorrhage Phenotyper
Name: Anonymous Female 1956
DOB: 26/03/1956
Hosp No.:
NHS No.:
Exam date: 30/10/2019
Exam time: 06:03:29
Sequence: 0.625mm
Instrument: DISCOVERY MR750
Requestor: Ione Pelton
Role:
Team: MRI Dept
Location: KCH Clinical Research
y=42
midline
x=-28
AC-PC line
z=6
Lesion
Grey matter
White matter
Global lesion parameters
Focal grey involvement
Focal white involvement
Focal CSF involvement
No quantified focal CSF involvement
ENG
12:43
21/09/2021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Patient Id: ANON7PIQEE1QE
Sex: F
OPEN REPORT
OPEN IN ORTHANC
UNDEFINED [20191030]
20191030
ORTHANC
Global lesion parameters
Centre of mass: -28, 42, 6
Tissue distribution | % | Cent
Grey | 35±2 | 35th
White | 7±1 | 7th
CSF | 7±1 | 7th
Focal grey involvement
Compartment | Lat | % hit | Cent
Mid Front Gyrus Orbit | L | 50±3 | 50th
Inf Front Gyrus P Triang | L | 50±3 | 50th
Mid Front Gyrus | L | 33±4 | 33rd
Inf Front Gyrus P Orbit | L | 29±2 | 29th
Sup Front Gyrus Orbit | L | 27±1 | 27th
Sup Front Gyrus | L | 19±2 | 19th
Focal white involvement
Compartment | Lat | % hit | Cent
Inf Front-Occipital Fasc | L | 25±1 | 25th
Ant Thalamic Project | L | 23±1 | 23rd
Uncinate Fasc | L | 12±0 | 12th
Sup Longitud Fasc III | L | 11±0 | 11th
Sup Longitud Fasc II | L | 6±1 | 6th
Cingulum Ant | L | 4±1 | 4th
Corpus Callosum | - | 4±0 | 4th
Sup Longitud Fasc I | L | 4±1 | 4th
Focal CSF involvement
No quantified focal CSF involvement
Global tissue parameters
Compartment | ml | Cent
Grey | 676 | 100th
White | 457 | 100th
CSF | 213 | 100th
Bone | 654 | 100th
Soft tissue | 1376 | 100th
ENG
12:43
21/09/2021

AI for automated radiotherapy contouring

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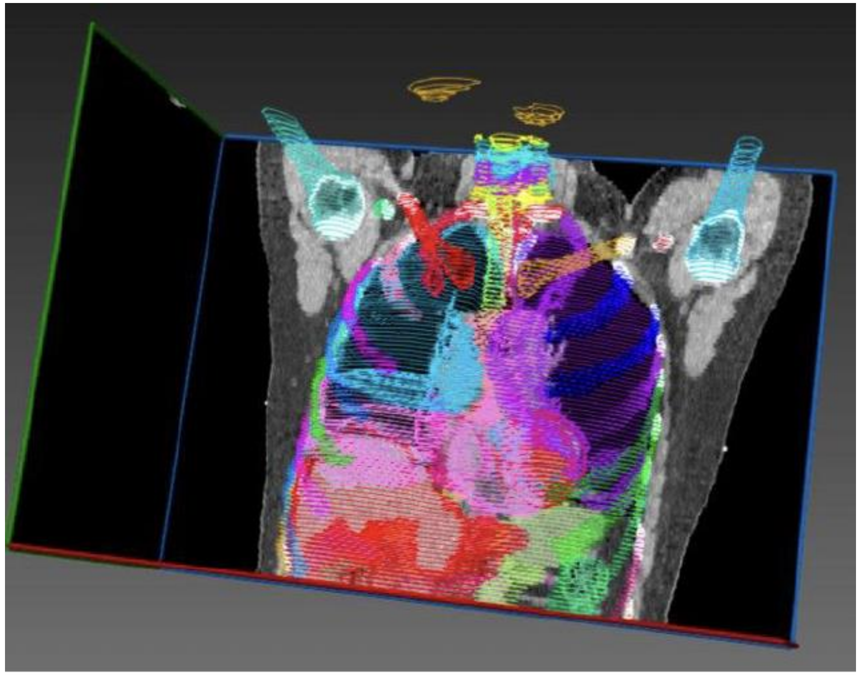
AutoSegCT–*Auto-contouring for radiotherapy*

Problem

Manual contouring can take 30mins –3 hours and is heavily reliant on staff focus and time.

Solution

AutoSegCT tool is developed based on open-source code. It enables robust segmentation of >100 important anatomical structures in CT images. The resulting RTStructureSet DICOM is returned to the radiotherapy treatment planning system (TPS) within 20 mins of receiving the original CT. they are subsequently used for radiotherapy treatment planning purposes, such as beam optimisation to target dose only at the tumour and high-risk regions of interest and minimise the dose to healthy organs.



Status

Used in Radiotherapy Oncology at Guy's and St Thomas since July 2024 by radiotherapy teams – significantly reducing clinician workload and contouring turnaround time by 75%.

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NLP for epilepsy predicted medication effectiveness

Guy's and St Thomas' NHS Foundation Trust

Natural Language AI to identify predictors of refractory epilepsy in NHS Electronic Health Records

Problem

Refractory epilepsy is poorly understood, with limited success in identifying predictors due to reliance on small, non-interoperable datasets.

Solution

Utilize CogStack-MedCAT to extract and standardize extensive EHR data into SNOMED-CT formats, enabling detailed predictive analytics.

Impact

Improved identification of risk factors for refractory epilepsy through advanced AI models, leading to enhanced patient management and outcomes across a wide population of patients.

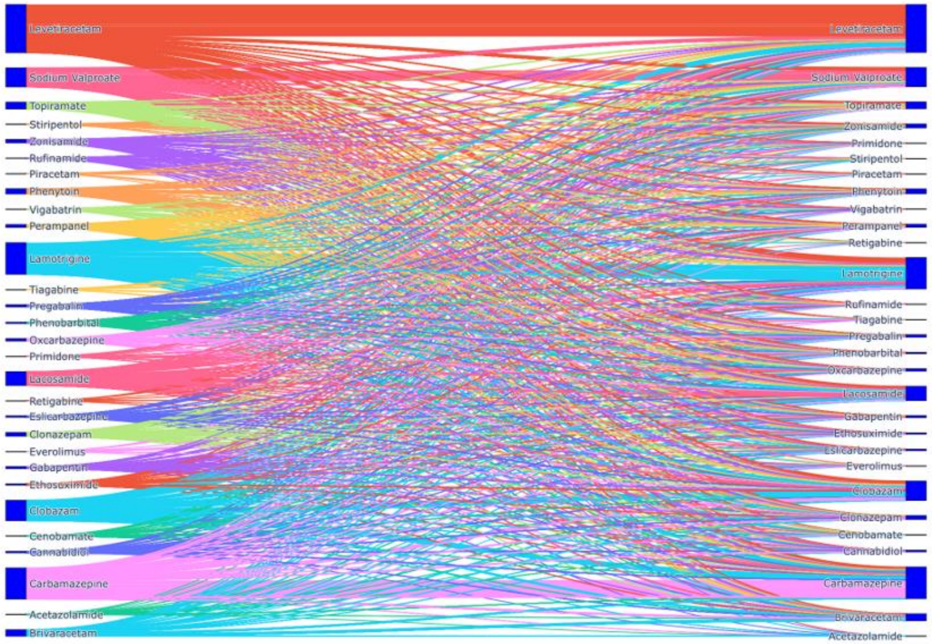


Image: Drug switching of anti-epileptic drugs across 10 years >40,000 patients

Population health: What works historically on patients population – to support future treatment. Cogstack technology is used in UMC Amsterdam and UMC Utrecht

Automated clinical trials feasibility

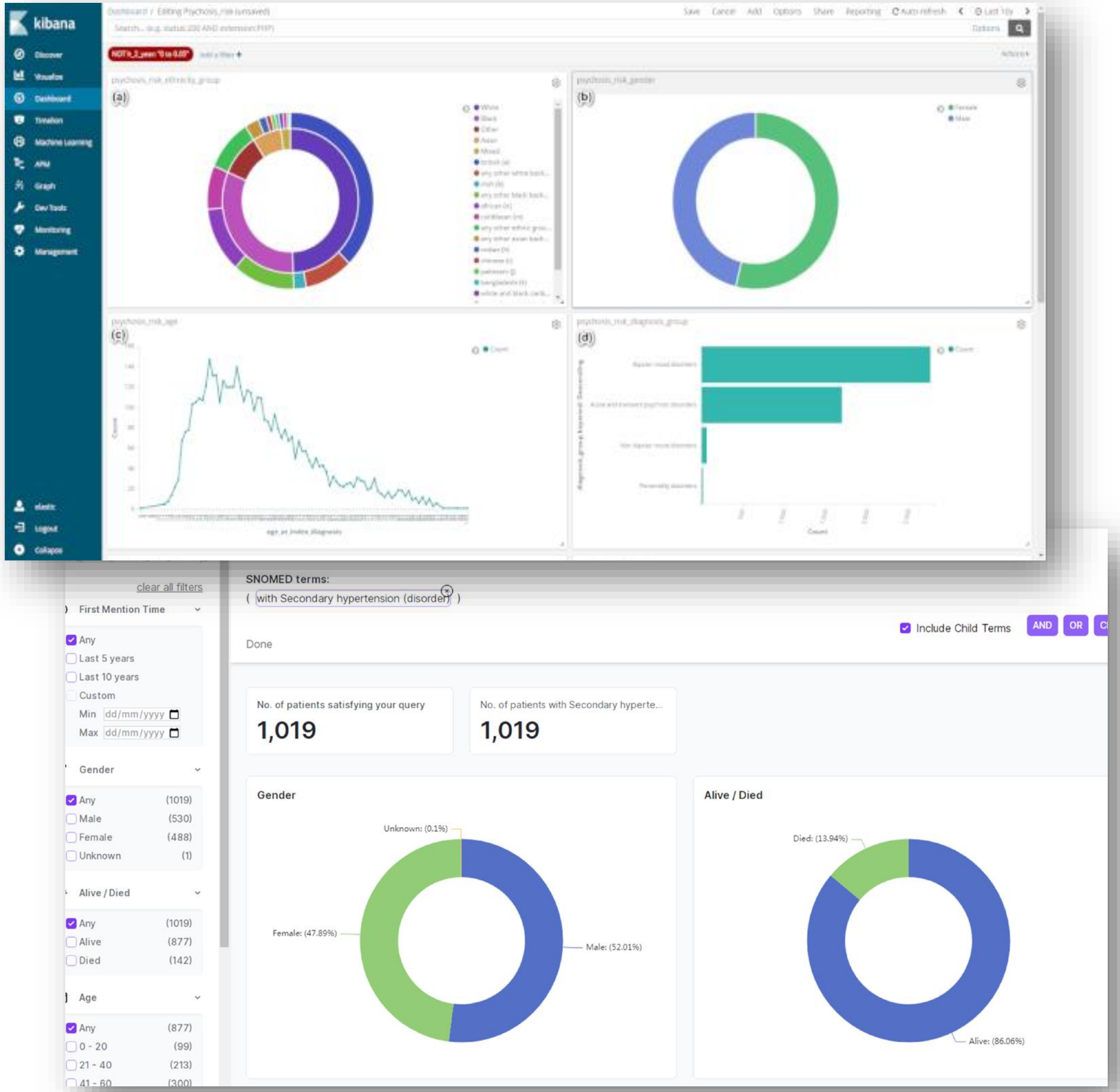
Guy's and St Thomas' NHS Foundation Trust

Problem

For clinical researchers and pharma companies, finding the patients that are eligible to participate in trials is critical Patients have specific inclusion criteria, which include structured data findings and indicators that are typically found in the unstructured data.

Solution

We use 'CogStack Watcher' model to track defined criteria, and surface as dashboards or fed back to the Electronic Health record (EHR) to be flagged automatically.



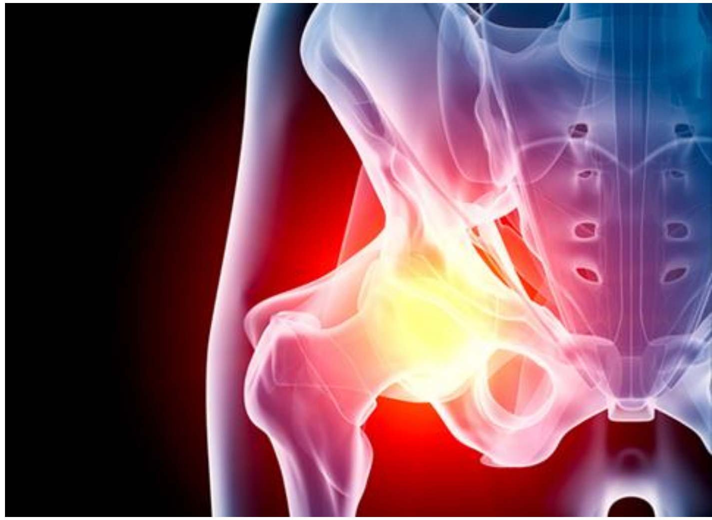
Impact

A large and more accurate cohort of patients are identified, enabling 'instant feasibility' and shortening lead times for patients participating and benefitting from new drugs and treatments.

Waiting List Prioritization- Rheumatology

Guy's and St Thomas' NHS Foundation Trust

Analysis of Clinical Documentation to enhance structured data



Problem

- Demand for Rheumatology Service review outstrips capacity, the patient scheduling processes are not robust enough to ensure patients who are clinically in need of follow up are prioritized for booking.
- Structured data held on hospital core systems is not complete enough to provide reliable scoring for prioritization.

Solution

- Clinical Prioritization Tool has been developed enabling scoring of patients based on the clinical priority criteria.
- Series of diagnosis terms and vulnerable patients are flagged in the system.
- Clinic letters are analyzed for presence of the flags enabling more accurate classification of patients

Impact

- Patients with urgent needs are priorotised and are seen and treated quicker
- The automation enables clinicians to spend more time delivering direct patient care.

NHS ‘in-house’ AI capabilities

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NHS Foundation Trust

“GSTT is a leading centre of tertiary neonatal care and looks after (approximately) 250 very preterm infants every year. All of whom are at risk of abdominal pathology.

X-ray is our current best imaging modality for diagnosis. Abdominal x-rays are interpreted by neonatal staff in urgent medical situations, but reported non-urgently by radiologists.

We want to build a machine learning model using large data sets of neonatal abdominal x-rays for the most common diagnoses – i.e. NEC, perforation.

Having our in-house clinical data scientists, means we are able to create an algorithm that identifies the abdominal perforation and alerts clinical teams straight away.”

Dr Hammad Khan, Neonatologist
Guy's and St Thomas' NHS Foundation Trust