Accelerating the safe adoption of AI in the National Health Service

Learnings from the National Covid Chest Imaging Database (NCCID)

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15 March 2022

- **Context (NCCID and how it relates to the AI lab goals)**

- **What is validation and why is it important?**

- **A shallow-dive into our validation process**

- **Learnings and next steps**

NCCID GitHub page: https://nhsx.github.io/covid-chest-imaging-database/

Context: what is the NCCID?

The National Covid Chest Imaging Database (NCCID) is a collection of digital images of the chest (X-ray, CT scans, MRIs). The aim was to safely and securely share medical imaging data to support AI algorithm development.

- **27 NHS hospital Trusts** have now shared data with the NCCID.
- **Data access** is managed by a Clinical Access Group.
- Researchers have access to **over 60,000 images (pseudonymised)** from **over 22,000 patients.**
- **Partnered with Royal Surrey** (data controller)
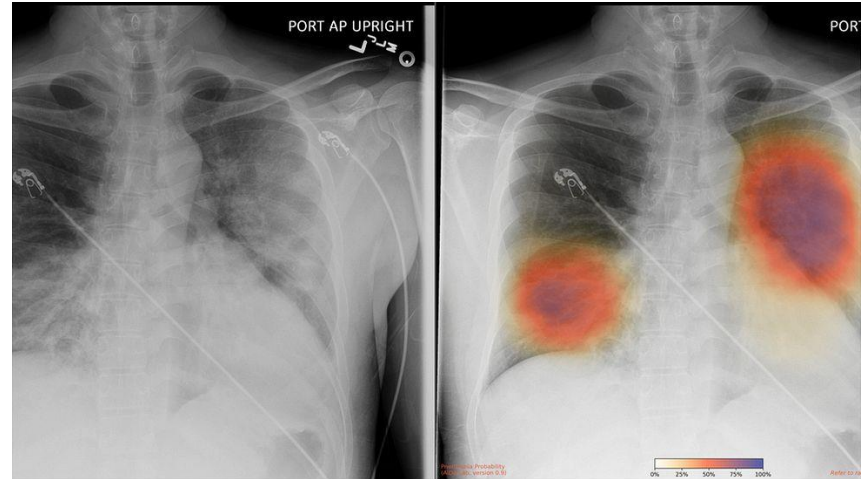
NCCID process:

Data collection → Data access → *Retrospective validation* → Prospective evaluation and deployment

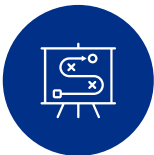# Alignment with NHS AI Lab goals

Demonstrate potential
of AI-driven technologies for health and care to build understanding among the public and healthcare professionals

Build trustworthiness of AI and confidence
in its use among the public and healthcare professionals

Advance regulation
with steps to ensure that health AI is safe, ethical and effective

Validating 'performance'?

Bias

AI models can have variable performance for different demographics (e.g. sex, ethnicity, age, patients with pre-existing conditions, etc)

Clinical use

One review of AI models developed to detect COVID-19 in medical images found **no models**[1] were of potential clinical use due to 'methodological flaws and/or underlying biases'
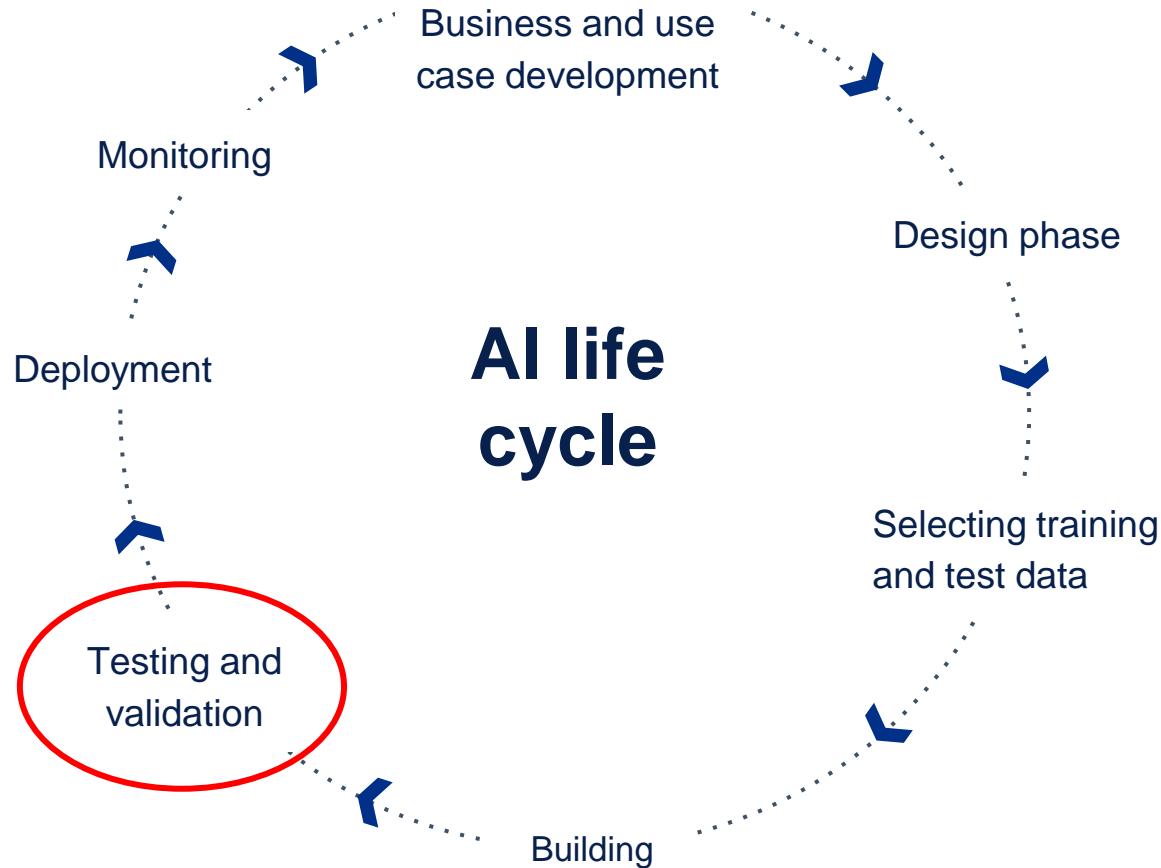
Regulation

Currently, AI models are regulated as any other medical device. However some specific questions we still to address (e.g. over-fitting)

Where does 'validation' sit in the AI life-cycle?

AI life cycle

- Business and use case development
- Design phase
- Selecting training and test data
- Building
- Testing and validation
- Deployment
- Monitoring

*Example of a simplified AI product life cycle. Image based on and reproduced with permission from the **UK's Information Commissioner's Office***

NCCID validation programme
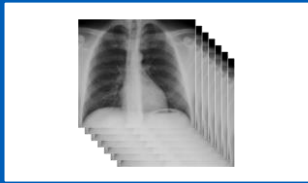
1. Curate validation dataset

Used the validation dataset in the NCCID

Tailored the validation dataset - data the AI model hasn't been trained or tested on - to models' input requirements

2. Deploy AI models in the cloud

Used NHSX cloud infrastructure to deploy AI models

Set-up deployment environment to protect the intellectual property of model vendors

3. Run AI model on the curated validation dataset

Checked model outputs to ensure run was successful

Protected validation set details from vendors to safeguard against future 'gaming' of results

4. Assess model performance

Performed statistical tests to assess model performance

Tested model robustness and compared model performance in different demographics (e.g. sex, age)

5. Report results

Share findings with vendors to drive future model improvements

Made results accessible and understandable

Useful learnings and things to think consider

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Design

Defining 'ground truth'
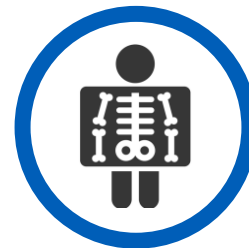
Designing statistical tests to calculate performance

Implementation

Hardware

Software

Images

Process

Key takeaways

NHS

01
Assessing the performance of AI-technologies is incredibly important

02
We have designed and tested a validation process you can learn from and adapt (GitHub)

03
More real-world research is needed in this field
(e.g. scale-up, trust, ethics, regulation, utility etc.)

If you want to find out more

NHS^x

1 Join the **NHS AI Lab Virtual Hub** via the FutureNHS Collaboration Platform

2 Find out more about our work on the **NHS AI Lab website**

3 Join us on **LinkedIn** and **Twitter @NHSX**

4 Email the AI lab imaging team imaging@nhsx.nhs.uk and look at our GitHub page.