



Are we ready to embrace Machine Learning in clinical practice?

Part of:

AI and Secure Health Data:

Bridging the Methodological Gap

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Wednesday 20th November 2024

About me



Research experience



Research Interests

- Machine Learning
- Uncertainty quantification
- Optimal decision making
- Real-world applications
- Healthcare



AI vs ML

Artificial Intelligence (AI)

Less data requirements



Machine Learning (ML)



Deep Learning



More data



Healthcare regulations affecting AI

- **Market** (AI Act, Digital Services Act, Digital Markets Act, Cyber Resilience Act)
- **Biopharma** (European Health Data Space, General Pharmaceutical Legislation, Clinical Trial Regulations)
- **Data** (GDPR, Data Act, Data Governance Act)

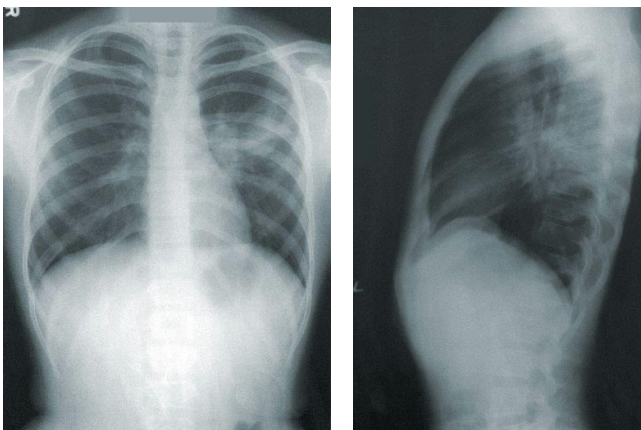
Five key principles for regulatory use of AI for medical products

1. Safety, security and robustness
2. Transparency and explainability
3. Fairness
4. Accountability and governance
5. Contestability and redress

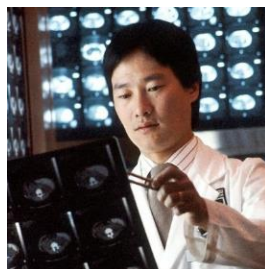
**Research is not affected
by some of these
regulations.**

Examples of medical data

Unlabelled data



Annotators

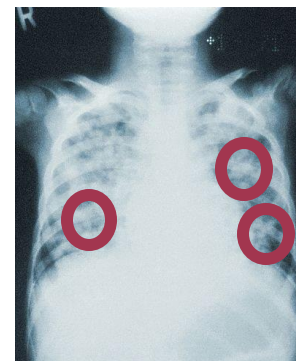


Expert



Groups
Crowd

Labelled data



Pneumonia



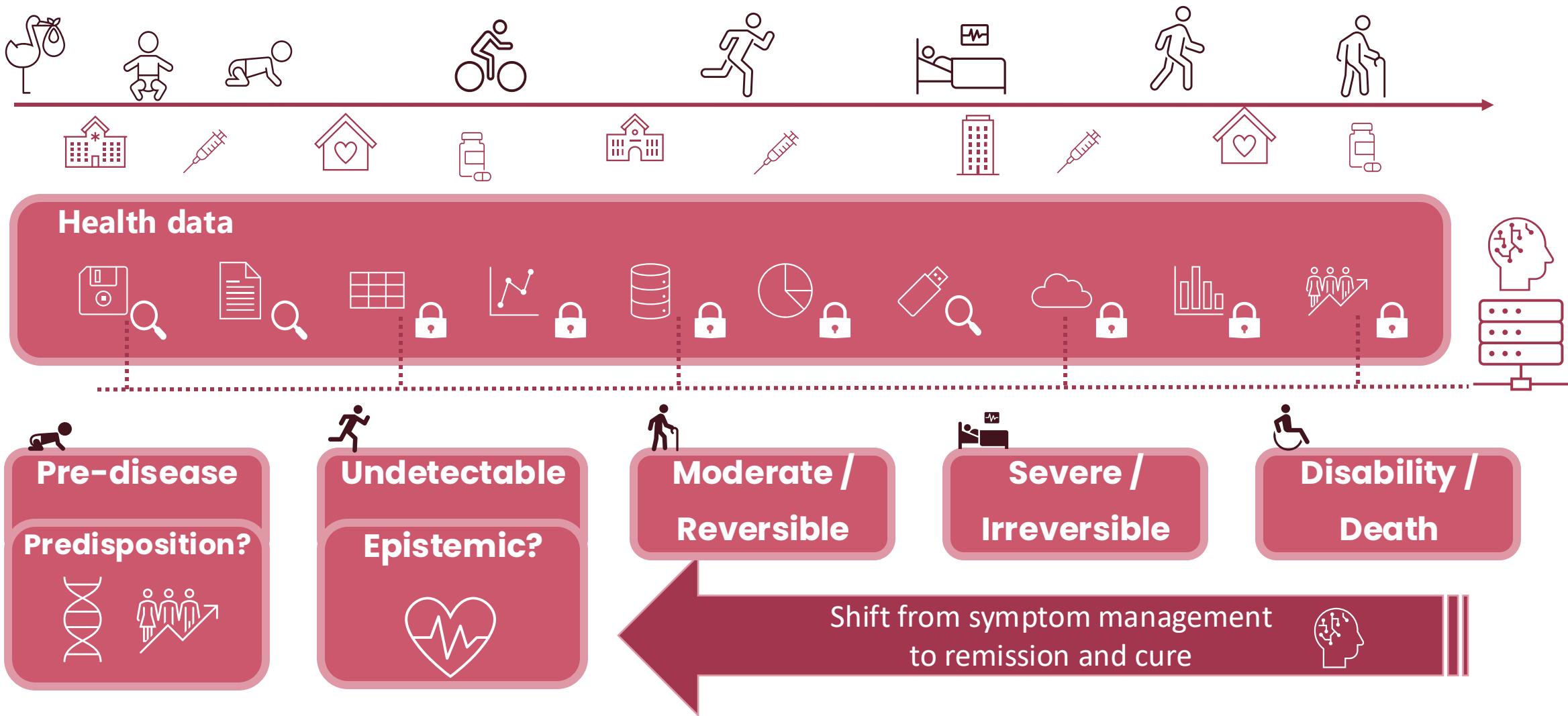
Fracture

- Classification
 - Detection
 - Segmentation
 - Multilabel
- Regression
- Clustering
- Dimensionality Reduction
- Generation

Reducing costs:

- Unsupervised
- Semi-supervised
- Weak labels
- Active learning
- Crowdsourcing

Digital health footprint and ML



Pre-disease
Predisposition?

Undetectable
Epistemic?

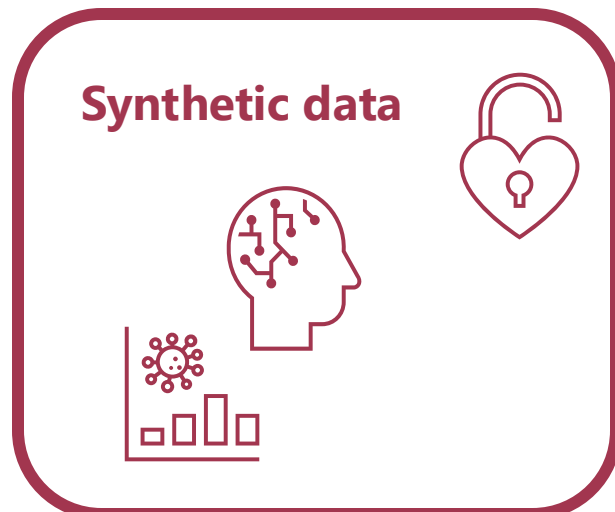
Moderate / Reversible

Severe / Irreversible

Disability / Death

Shift from symptom management to remission and cure

Safety and security

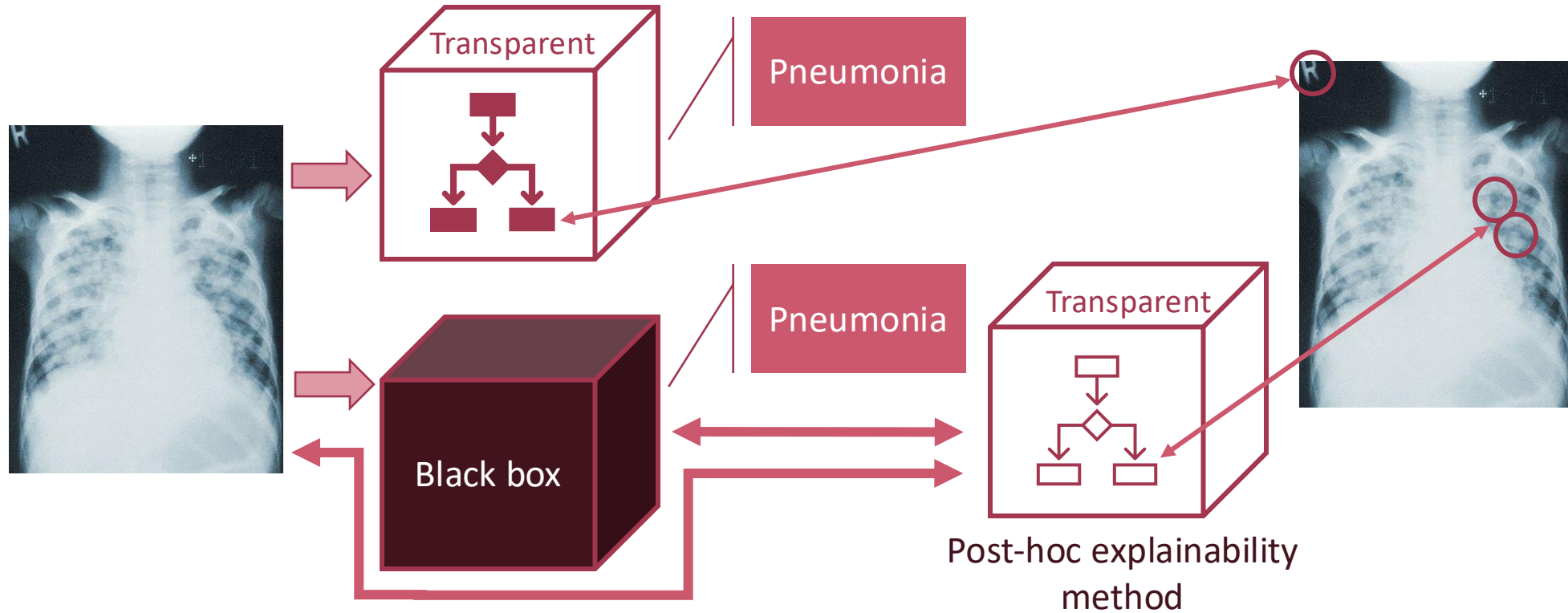


- Federated learning
- Synthetic data
- Foundation models
- Differential privacy

Requirements:

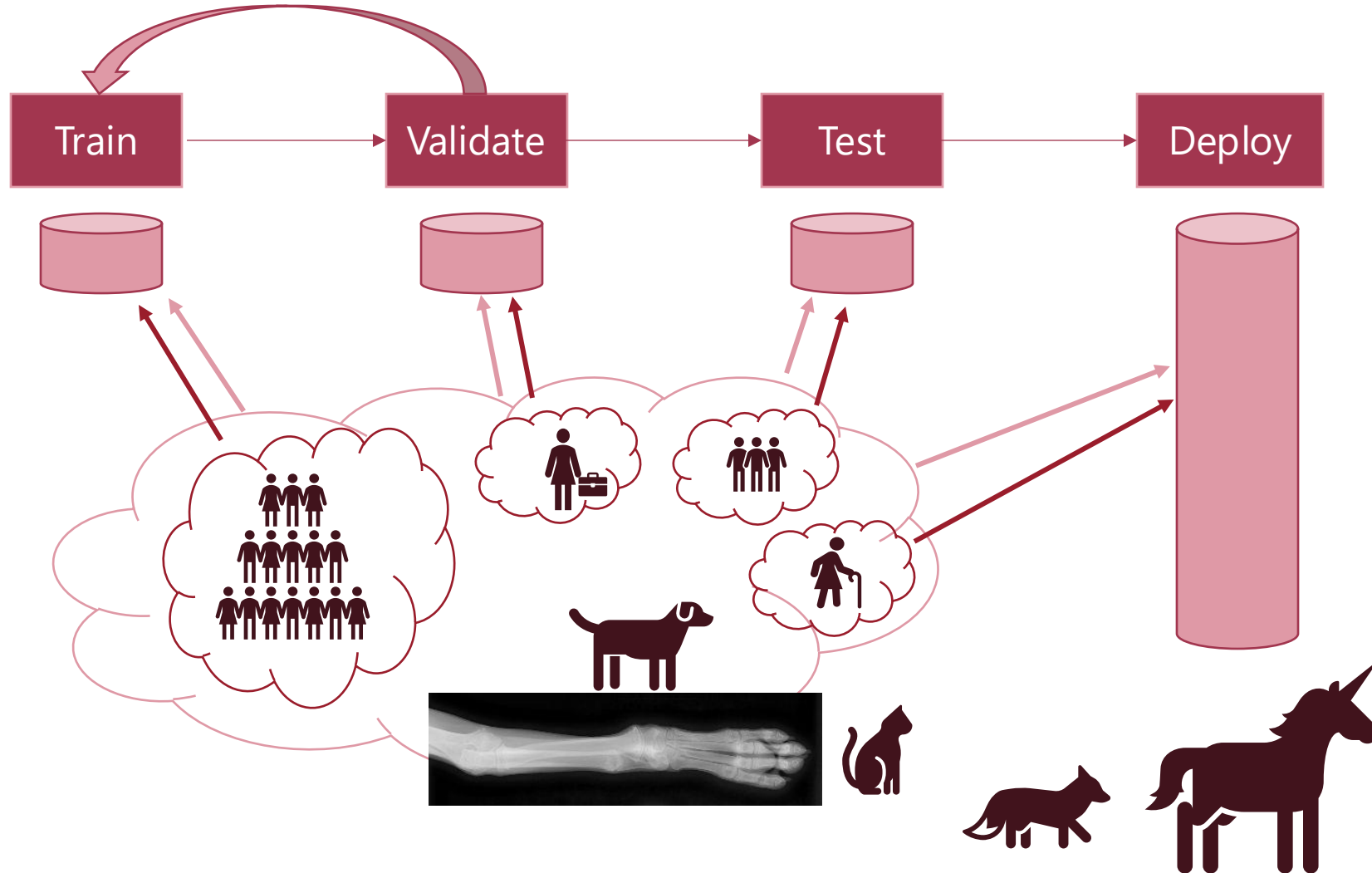
- Standardisation
- Infrastructure

Transparency and explainability

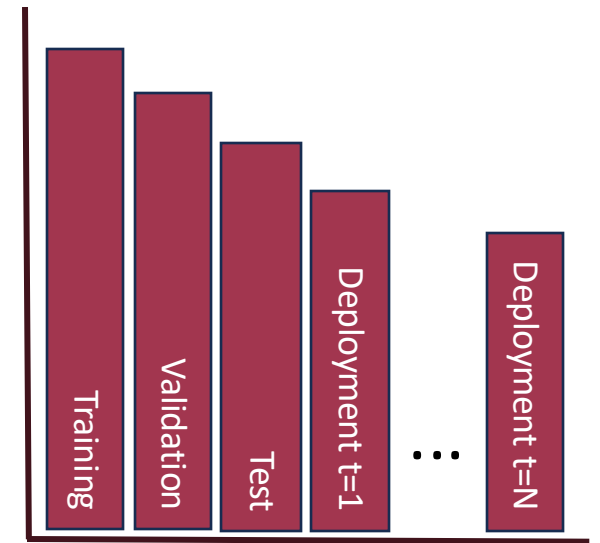


- Identify dataset biases, or model problems
- Model complexity vs transparency vs performance

Robustness and fairness



Performance



Requires
constant
monitoring

Conclusion

Reminder of the key principles

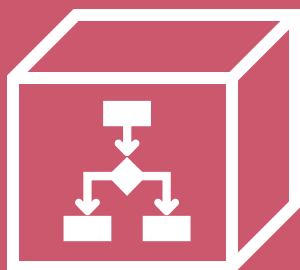
1

**Safety,
security and
robustness**



2

**Transparency
and
explainability**



3

Fairness



4

**Accountability
and
governance**







5

**Contestability
and
redress**



**Thanks for
listening!**

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Collaborative research
funding in 4 key themes



**Ways to get
involved**



Programme of short
courses for
professionals involved
in digital health



Funded fellowships,
internships, networking
and development
opportunities