Generative AI in the NHS

Presenter: Simon Ellershaw
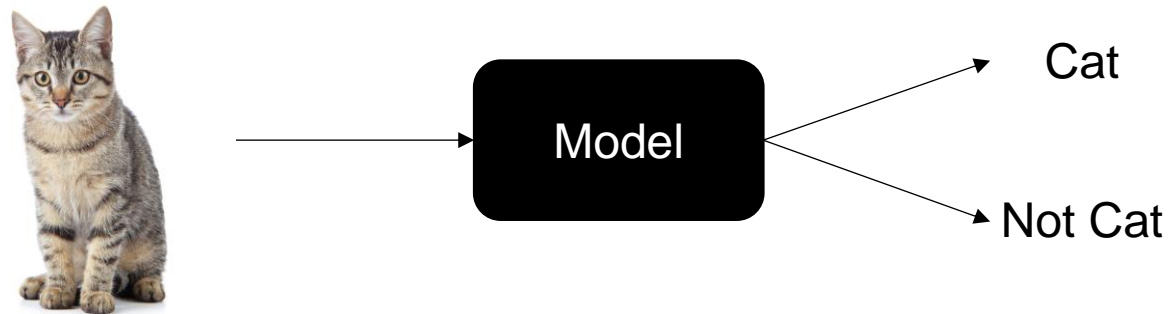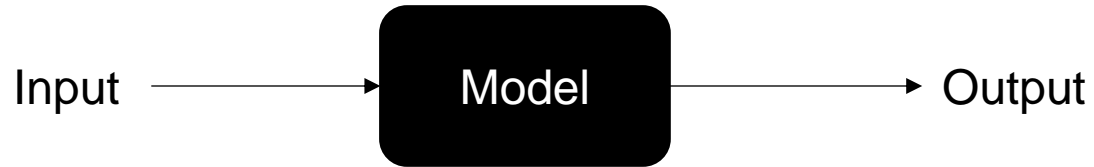
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Content

- What are Large Language Models (LLMs)?

- Current Status of AI in NHS

- What is the future?

- Promise no maths and only 3 graphs!

What is an AI model?

Input ———→ [Model] ———→ Output

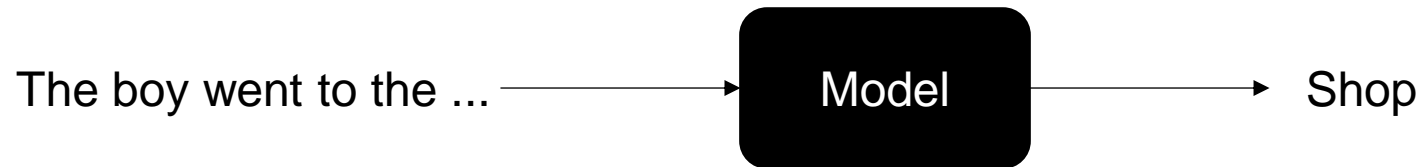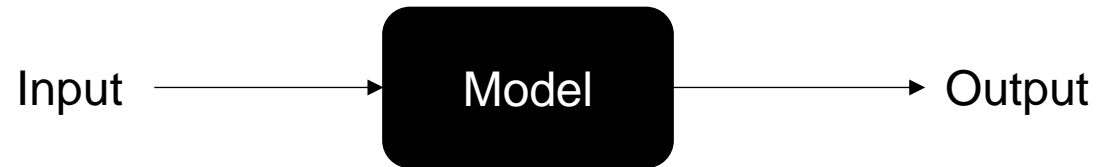[Model] ———→ Cat
           ———→ Not Cat

1. Get a large dataset of input -> outputs

2. Define a model which handles input and output format

3. Define a score of how far apart model outputs are from the true outputs (loss)

4. Loop through
      1. Make predictions
      2. Evaluate loss
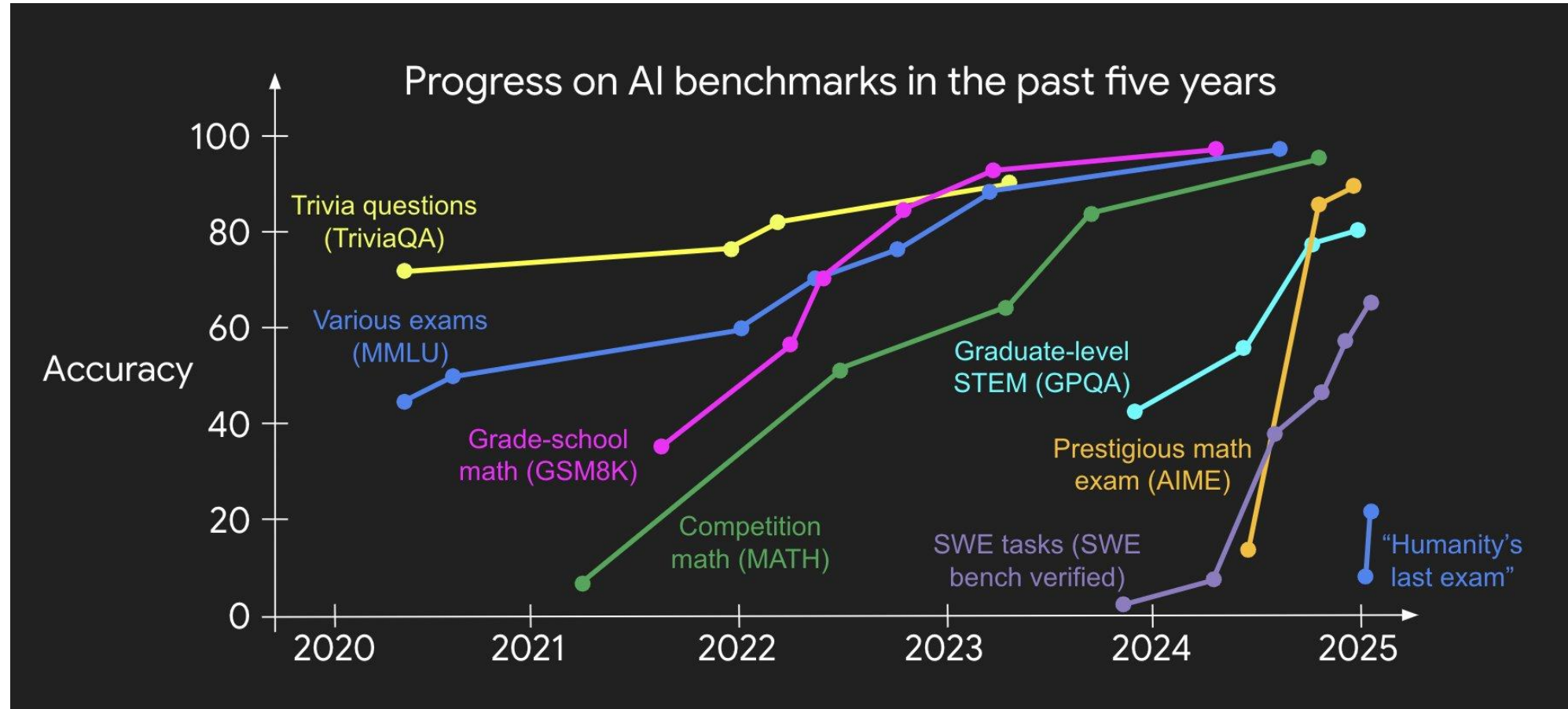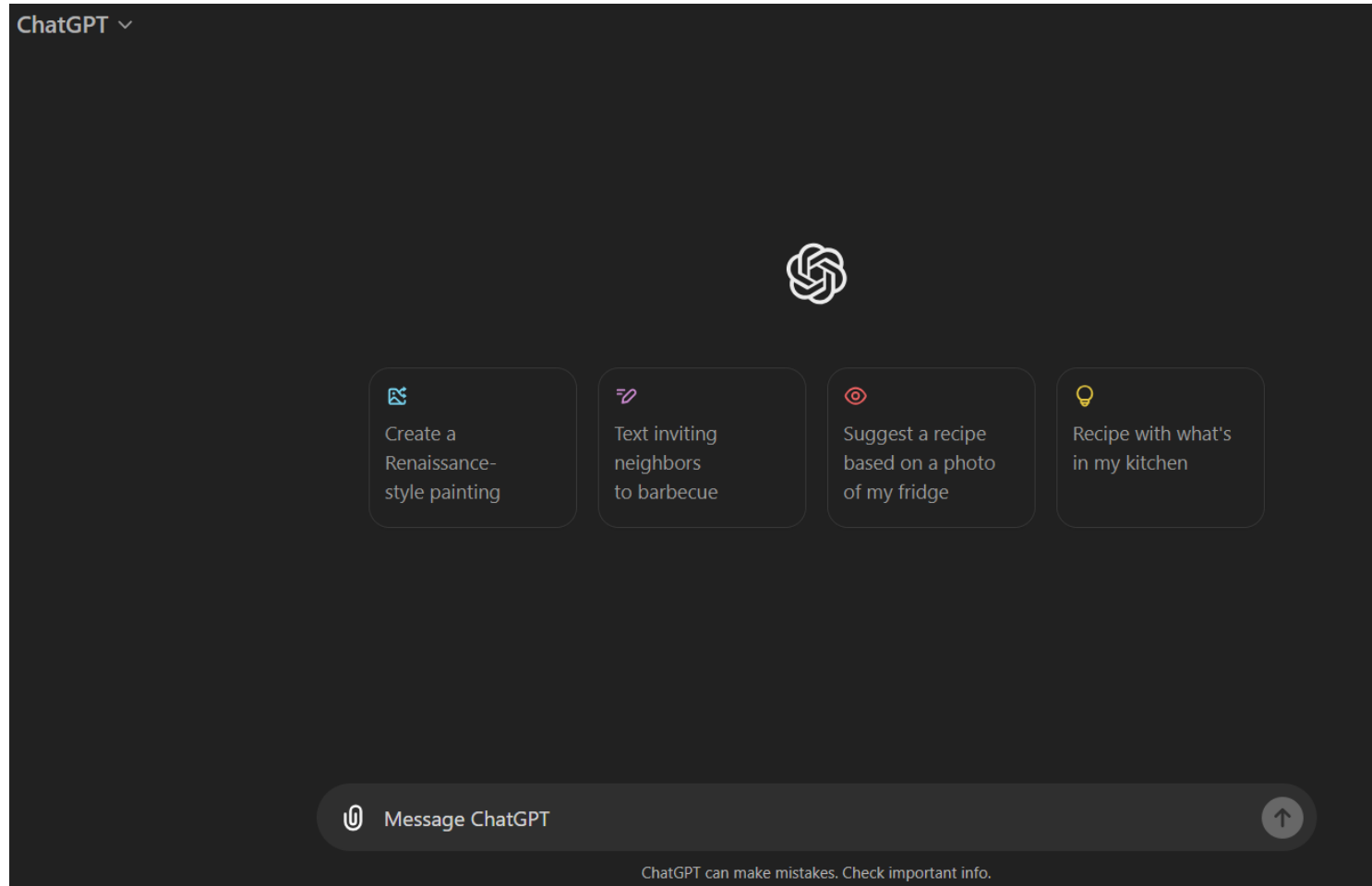   3. Update model to reduce the loss (with some maths)

But…

All Available Data   Labelled Data

Unsupervised Language Modelling

Input → **Model** → Output

The boy went to the ... → **Model** → Shop

Scale!!! -> Large Language Models

Next word prediction -> Zero-Shot Learning

Progress on AI benchmarks in the past five years

"ChatGPT Moment"
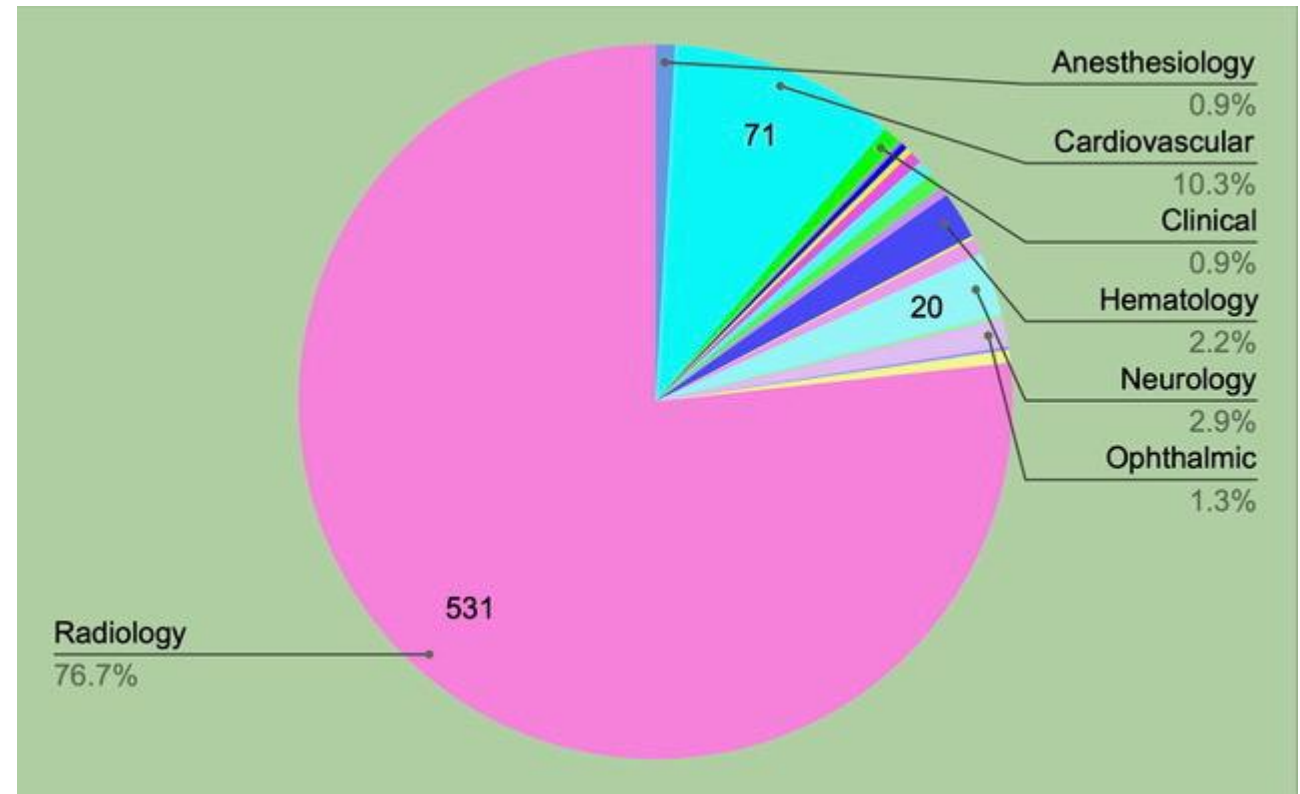
Multi-Modal

What does this mean for the NHS?

"People should stop training radiologists now. It's just completely obvious that within five years deep learning is going to do better than radiologists."
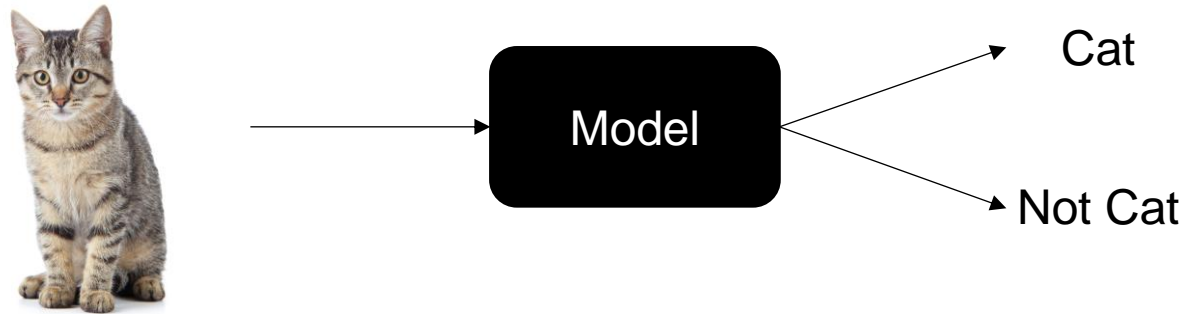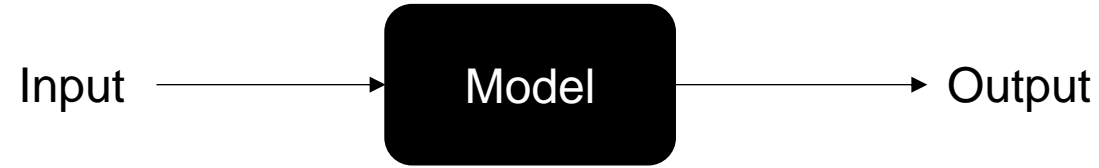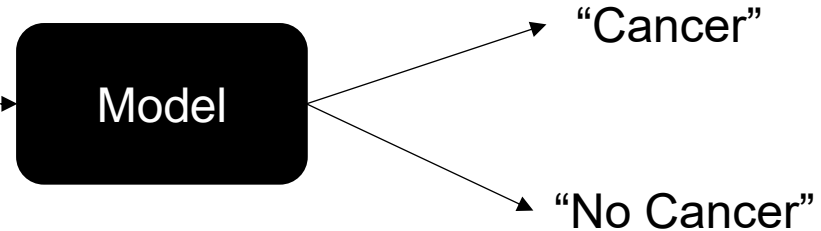
Geoffrey Hinton

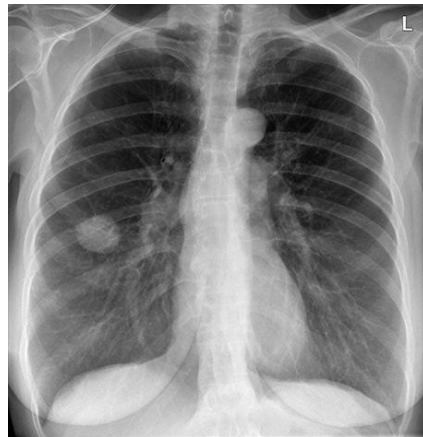# FDA Approved AI Medical Devices 2023

- 692 regulated devices

- 171 added in 2023

AI Progress -> AI in Healthcare Progress

Input ⟶ **Model** ⟶ Output

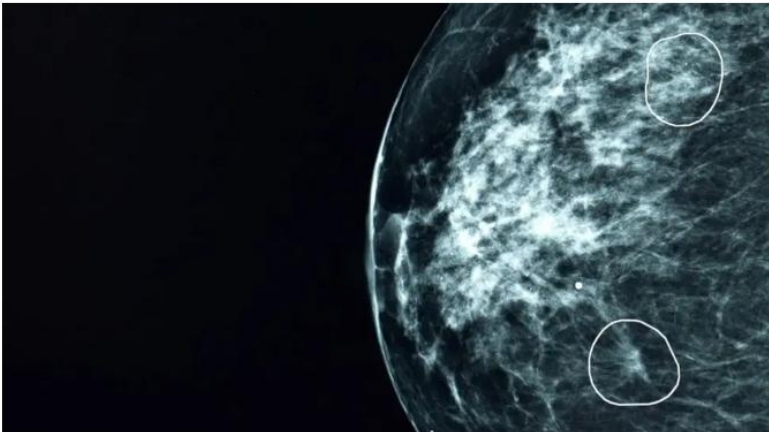⟶ **Model** ⟶ Cat

Model ⟶ Not Cat

AI Progress -> AI in Healthcare Progress

AI Progress -> AI in Healthcare Progress

Economic Value?

But...

All Available Data   Labelled Data
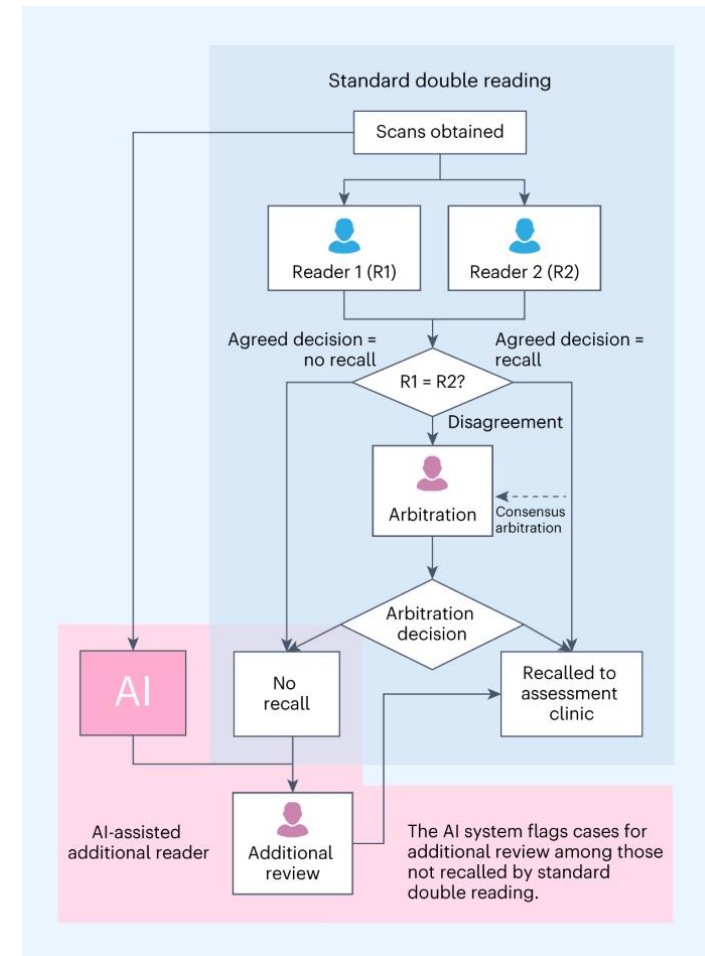
LLMs as Admin Assistants
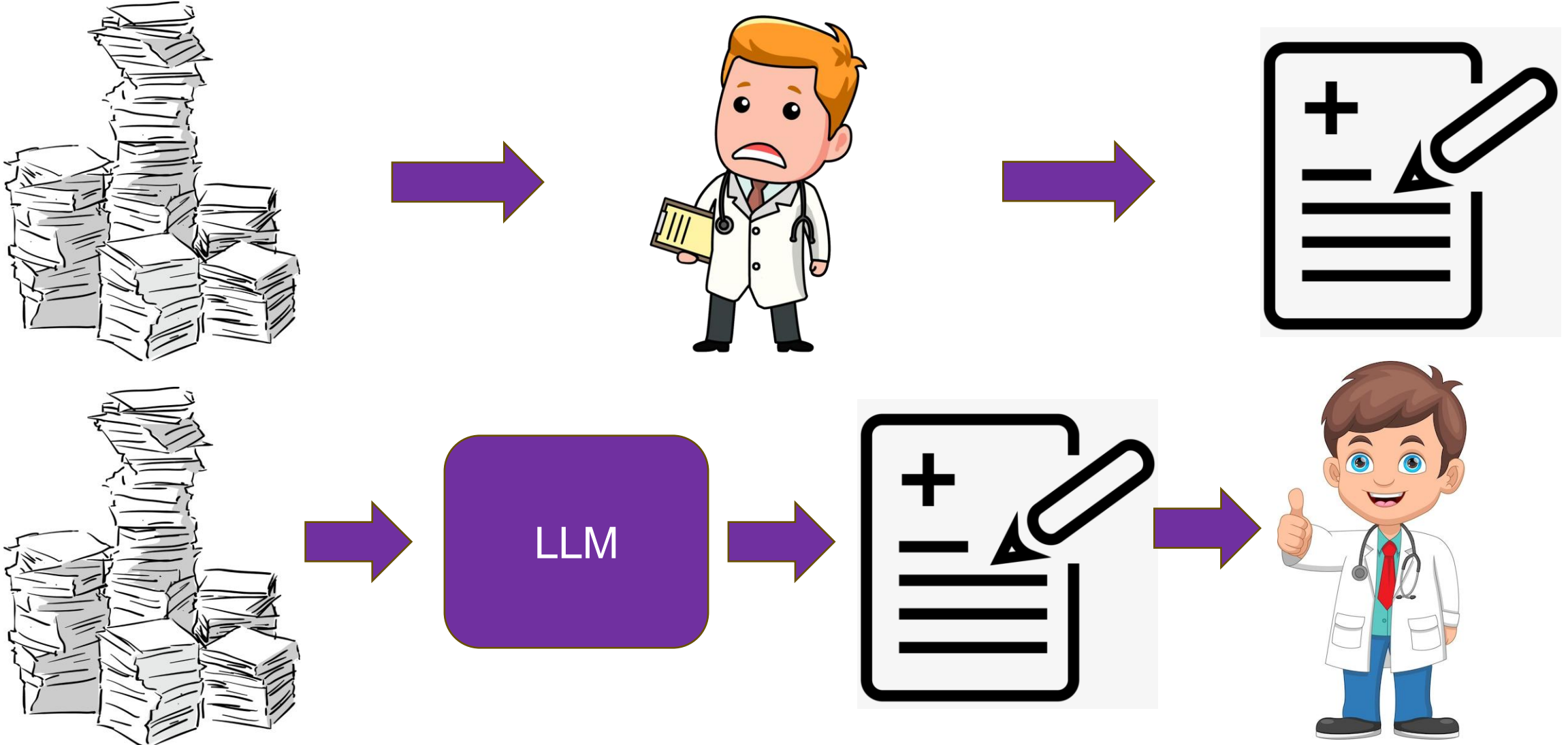
Automated Discharge Summaries
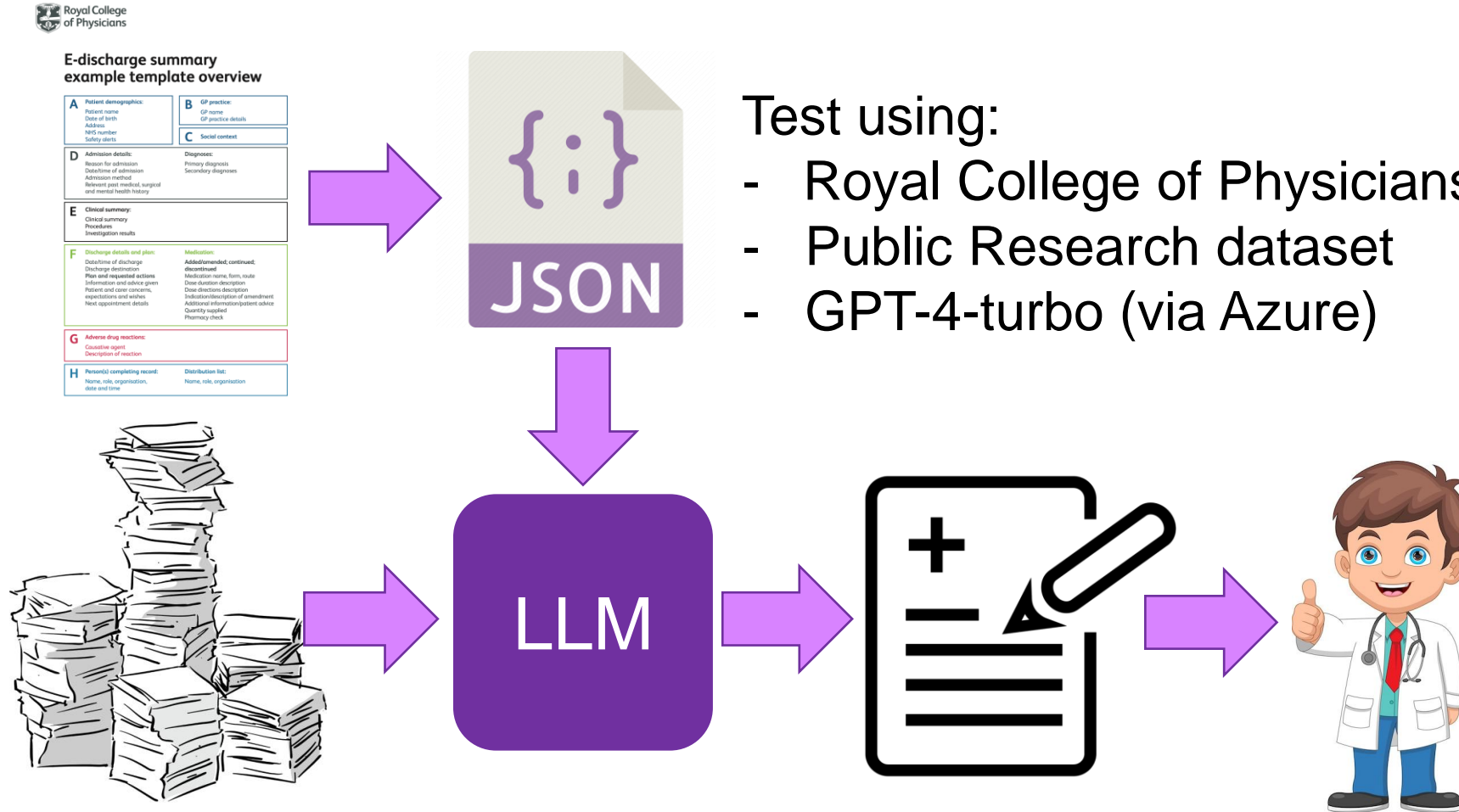
Input → Model → Output

Model → 📝
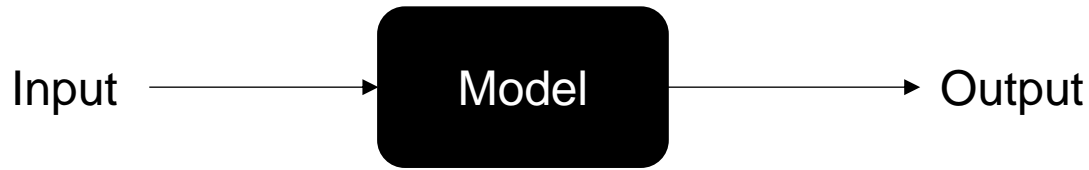
Where do you get the data from?
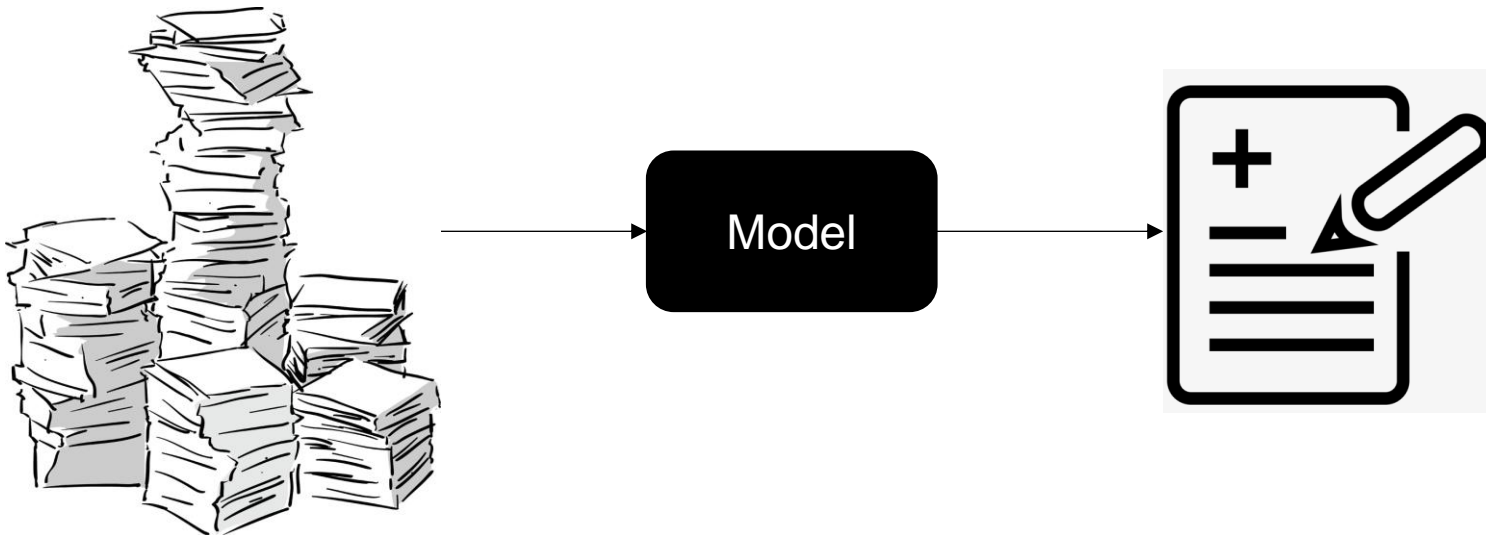
How to define loss?

Generalize across clinics, hospitals etc…

LLM Discharge Summaries

Test using:
- Royal College of Physicians guidelines
- Public Research dataset
- GPT-4-turbo (via Azure)

LLM Discharge Summaries

Section	Recall	Precision	Acc
Admission Details	0.90	0.95	0.85
Allergies And Adverse Reaction	0.98	1.00	0.98
Clinical Summary	0.76	0.92	0.71
Diagnoses	0.84	0.94	0.80
Discharge Details	0.93	0.96	0.89
Patient Demographics	1.00	0.84	0.84
Plan And Requested Actions	0.90	0.88	0.80
Social Context	0.96	0.88	0.84
Macro Average	0.91	0.92	0.84
Micro Average	0.86	0.92	0.81

Challenges of LLMs in Healthcare

- Deployment of LLMs on hospital digital infrastructure

- Robust evaluation -> Regulation?

- Integration with Electronic Health Records

What is the Next Word Prediction of Healthcare?

The boy went to the ... → Model → Shop

White, Male, 65, Obese, High Blood Pressure… → Model → Diabetes
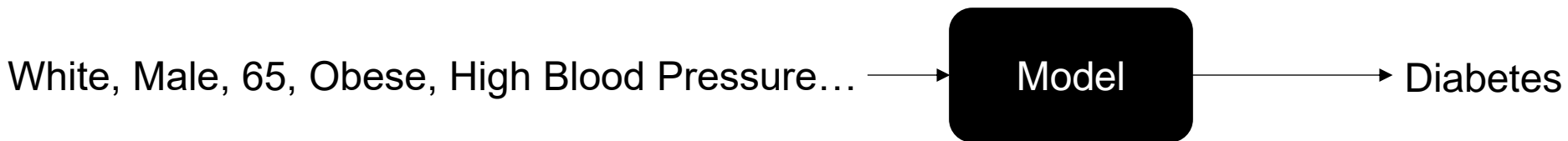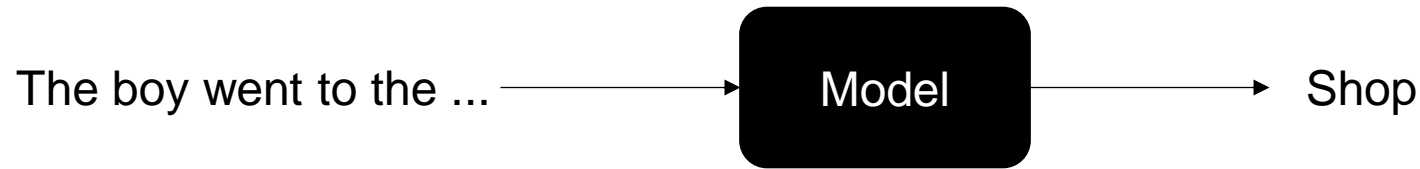
Foresight-SDE: a national-scale foundation model of 51 million patients for generative medical event prediction

How to use NHS data?

Health Data Research (HDR UK)

UK National Data Library: Technical Architecture

White Paper

Take aways

- Huge progress has been made in AI over the last decade

- Supervised learning healthcare models being approved but still need to show $$$ value

- Generative AI use cases in their infancy (~5 years behind)

- How the NHS uses its data as a resource in the future TBC