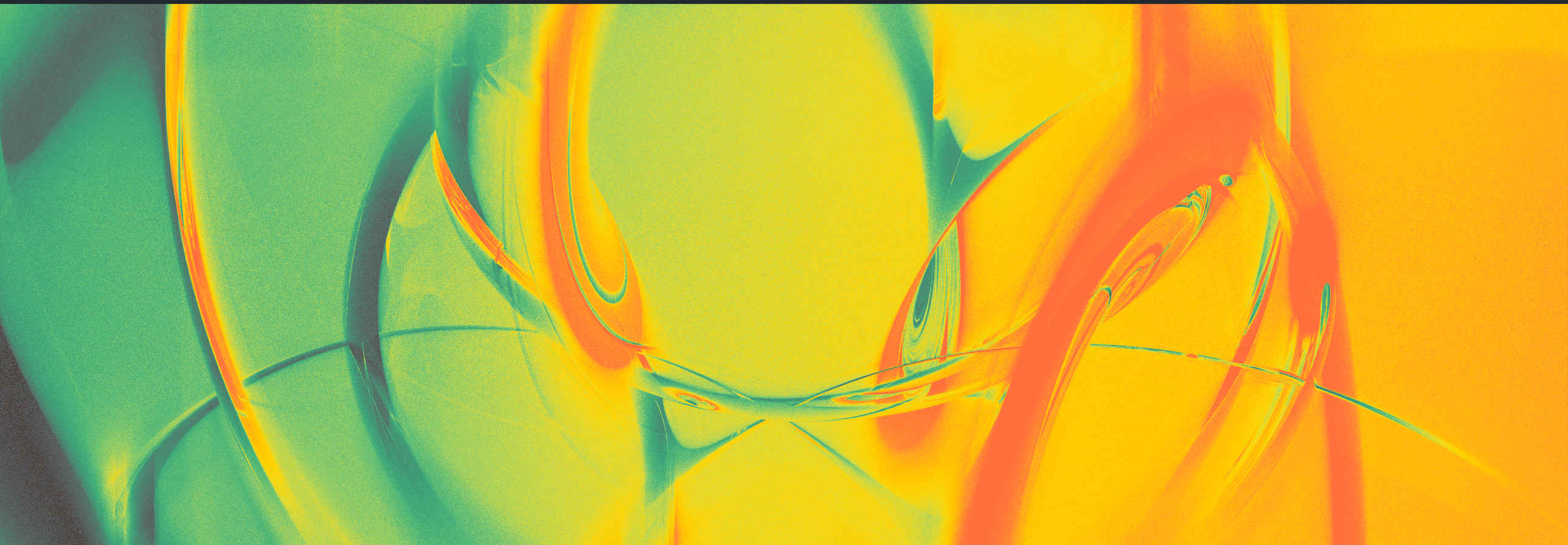
# AI Evals in Vertical Industries

Guest lecture for “AI Evals For Engineers & PMs” course

Dr Christopher Lovejoy, MD
Head of Clinical AI

2025-08-07
Anterior



# OUTLINE

- Why is it harder to do evals for specialized verticals?
- Empowering domain experts to look at your data
- Principles for building an effective domain expert review dashboard
- Using review data to power your system
- How to hire the right domain experts

# What defines a “specialized vertical”?

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Could a lay person develop “top tier” judgment
after working on this for 2 months?

# Why is it harder to do evals for specialized verticals?

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1. It's harder to define quality / correctness

# Q: Does the patient have a prior brain MRI suspicious for Multiple Sclerosis?

Florence:

The medical record shows a brain MRI from 17/5/2022 that demonstrates 'multiple foci of T2/FLAIR hyperintensity in the infratentorial, juxtacortical and periventricular white matter' which is noted to be 'consistent with multiple sclerosis.' This confirms prior brain MRI findings suspicious for MS.

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# Why is it harder to do evals for specialized verticals?

1. It's harder to define quality / correctness
2. It's harder to define failure modes

# Example failure modes: clinical reasoning

| Failure Mode | Description |
| --- | --- |
| *Retrospective reasoning* | Incorrectly using evidence that became available after the decision point to justify whether the patient should have had the procedure in the first place. |
| *Under-inference* | Not making valid inference, e.g saying something ‘needs to be explicitly stated’ when it could be reasonably inferred |
| *Over-inference* | Drawing conclusions that go beyond what the evidence supports. Making assumptions without sufficient basis. |
| *Misunderstanding chronology* | Incorrect interpretation or application of the sequence of events (reading events in wrong order) |
| ... | ... |

# Why is it harder to do evals for specialized verticals?

1. It's harder to define quality / correctness
2. It's harder to define failure modes
3. It's harder to write prompts
    a. Prompts in your main pipelines
    b. LLM-as-judge prompts to evaluate your pipelines

# Why is it harder to do evals for specialized verticals?

Error analysis

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Implementing Automated Evaluators

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Improvement

Implementing Automated Evaluators

# The solution: bring domain experts into the loop

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But where? and how?

“look at your data”

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# “look at your data”

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# “but what does this mean?”

“look at your data” ⟶ “empower domain experts to look at (and translate) your data”

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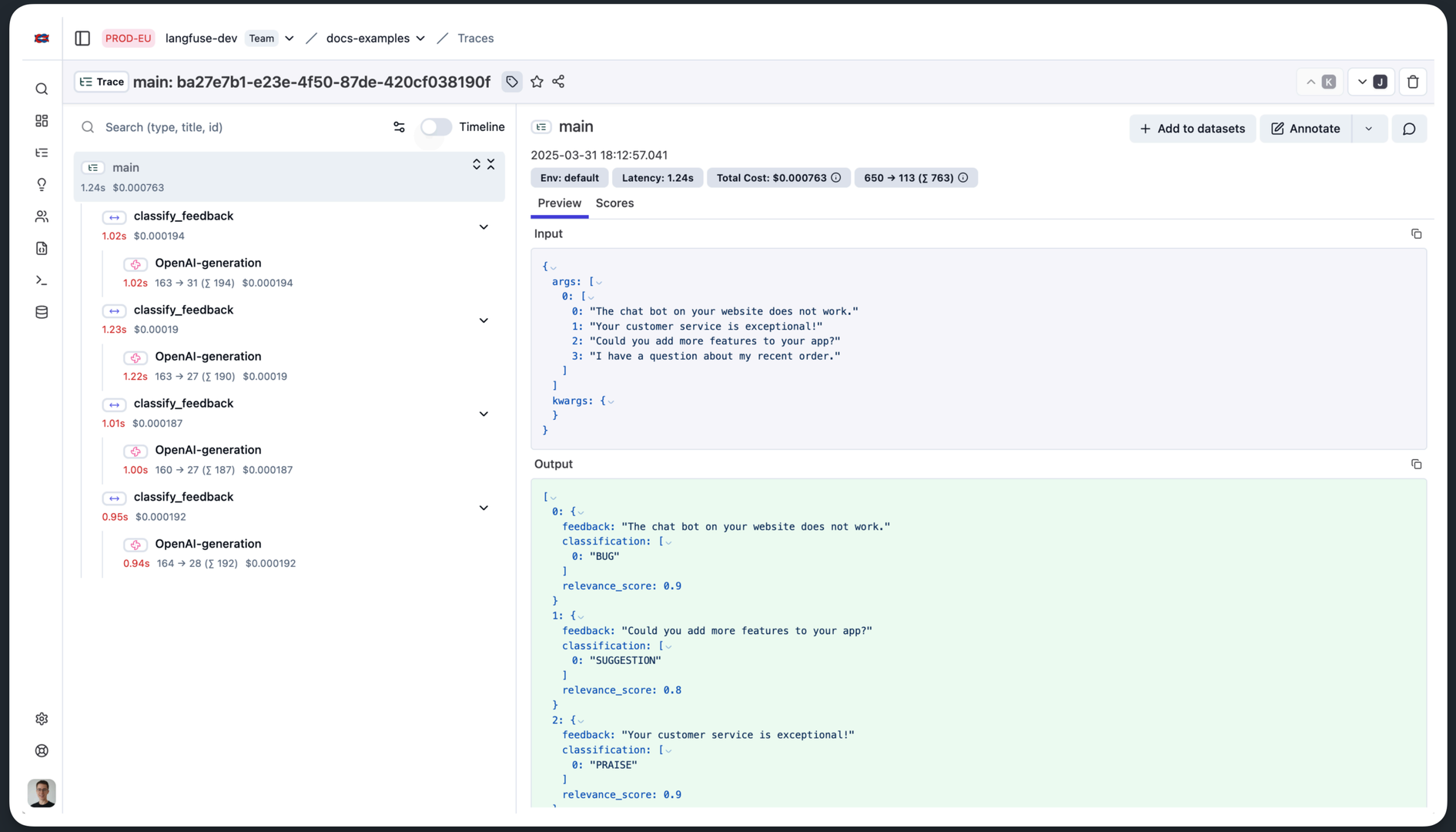
“but what does this mean?”

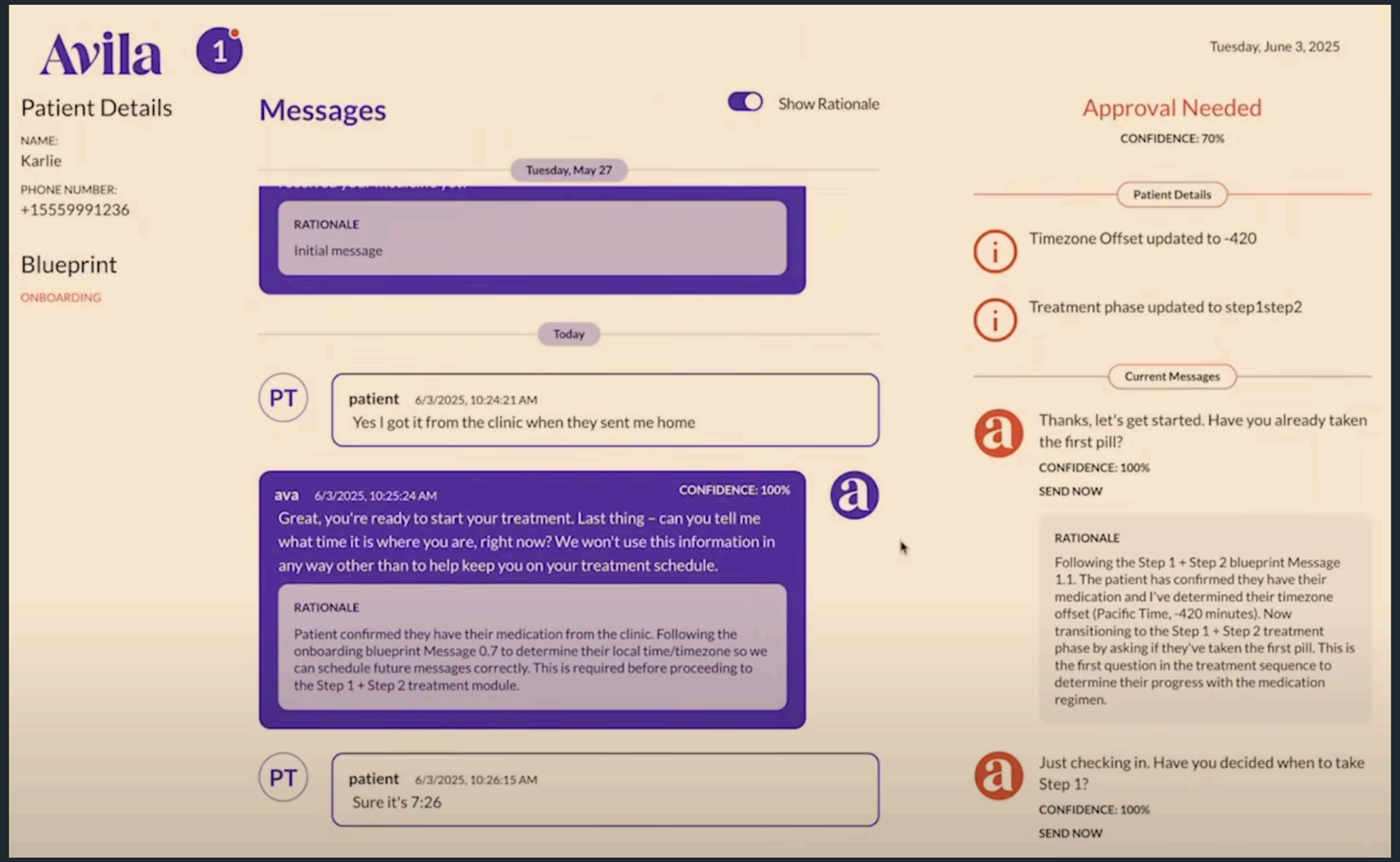
# Empowering domain experts to look at your data

# Example 1: Raw traces



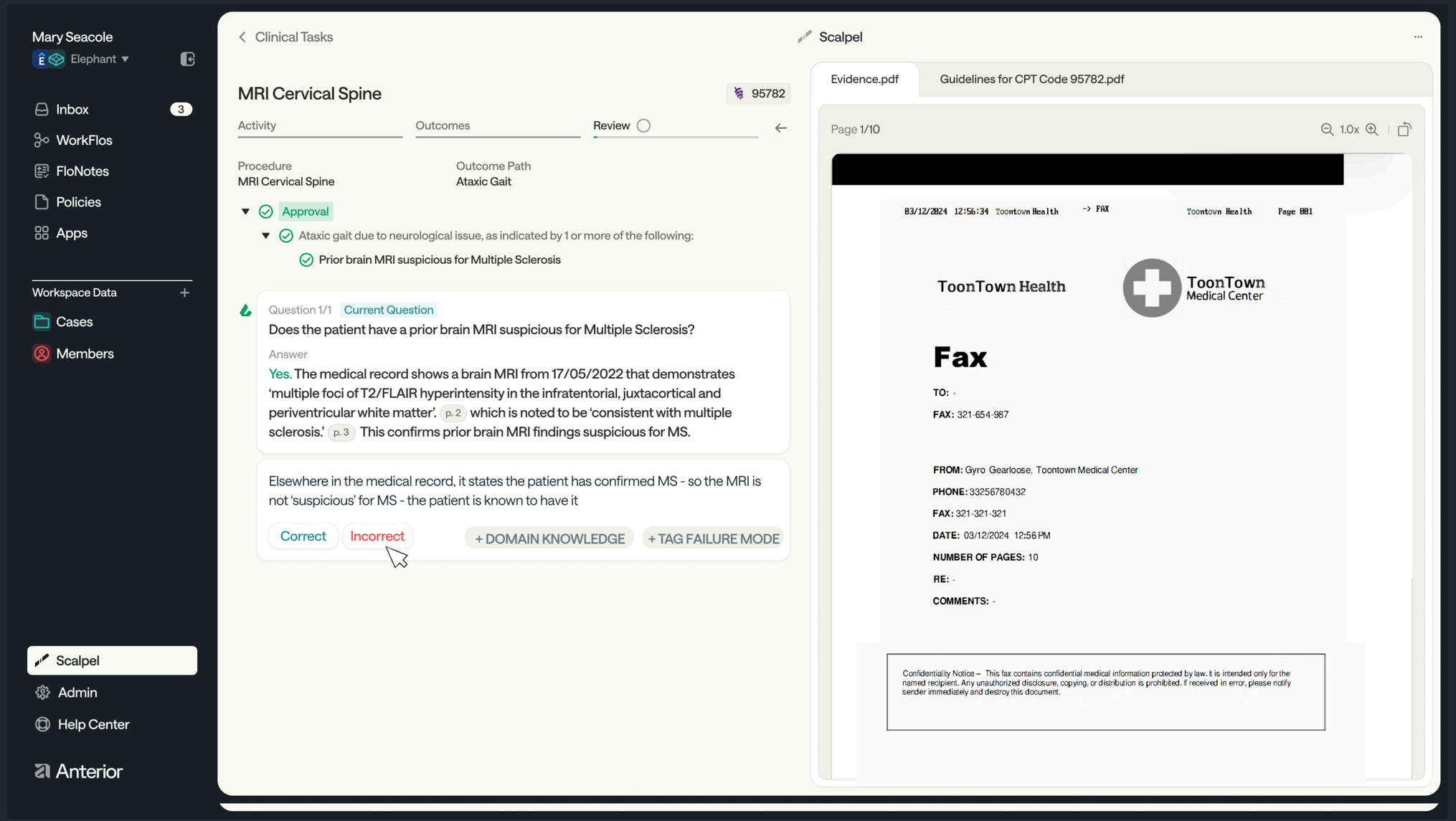

**Source:** *https://langfuse.com/images/docs/instructor-trace.png*

# Example 2: A custom view within the product




**Source:** *https://www.youtube.com/watch?v=sn79oS4MZFI*

# Example 3: A custom review dashboard




**Source:** *https://chrislovejoy.me/llm-native-expert-system*

# Principles for building an effective domain expert review dashboard

# Optimise for 3 things:

1. High quality reviews
2. Minimise time per review
3. Generate actionable data

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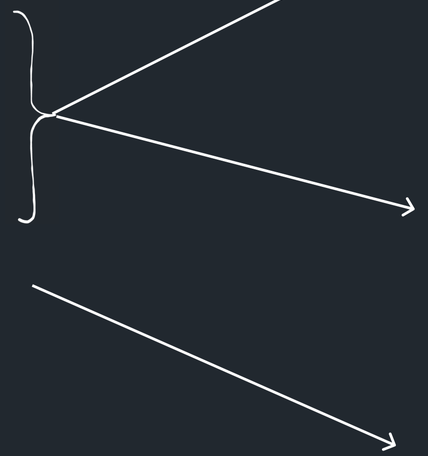
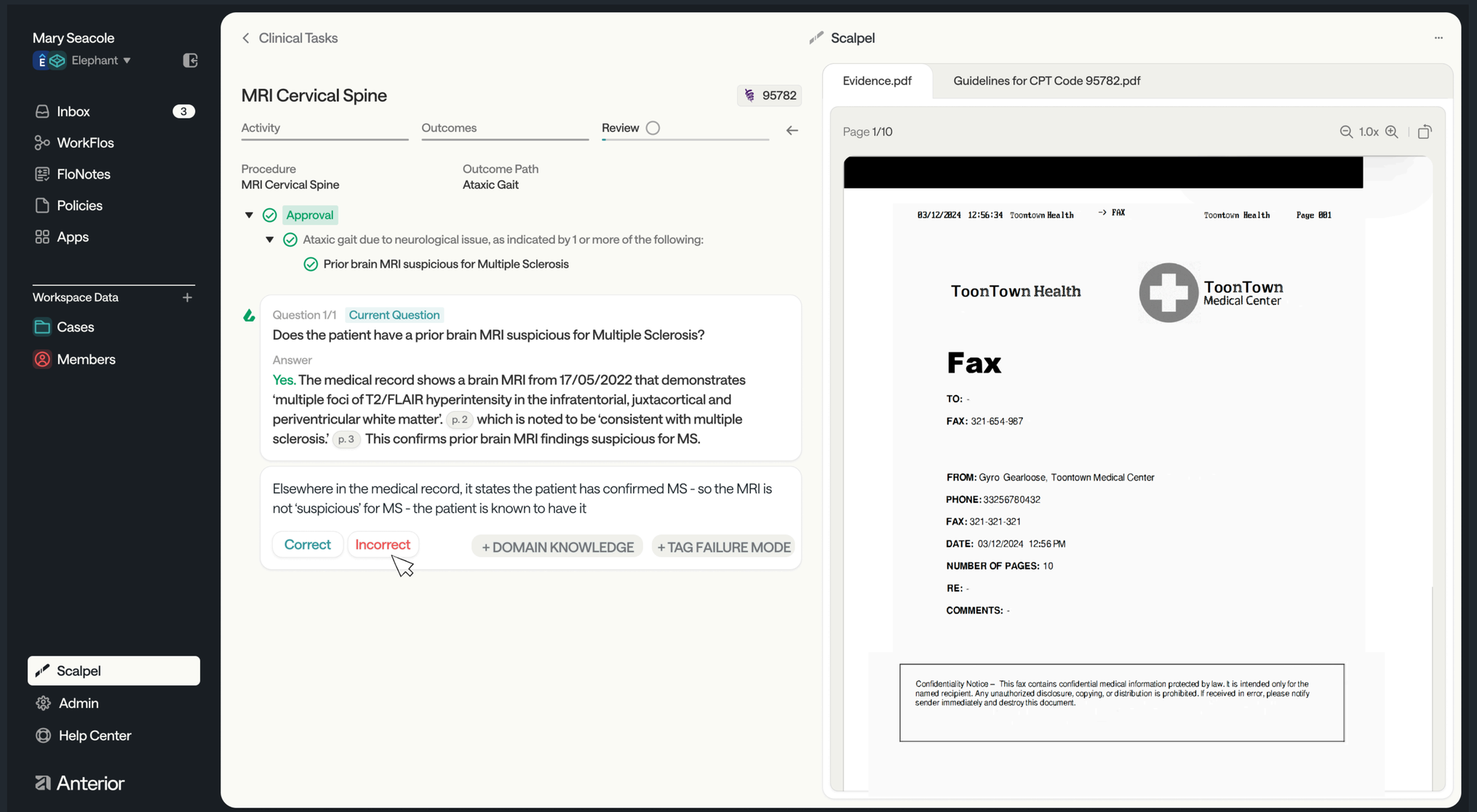


Principle 1: Optimise for clearly surfacing all required context

Principle 2: Optimise the review flow sequence

Principle 3: Design reviews that give the data you need

# Principle 1: Optimise for clearly surfacing all required context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MRI Cervical Spine
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Activity
Outcomes
Review
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MRI Cervical Spine
Outcome Path
Ataxic Gait
Approval
Ataxic gait due to neurological issue, as indicated by 1 or more of the following:
Prior brain MRI suspicious for Multiple Sclerosis
Question 1/1
Current Question
Does the patient have a prior brain MRI suspicious for Multiple Sclerosis?
Answer
Yes. The medical record shows a brain MRI from 17/05/2022 that demonstrates 'multiple foci of T2/FLAIR hyperintensity in the infratentorial, juxtacortical and periventricular white matter'. p. 2 which is noted to be 'consistent with multiple sclerosis.' p. 3 This confirms prior brain MRI findings suspicious for MS.
Elsewhere in the medical record, it states the patient has confirmed MS - so the MRI is not 'suspicious' for MS - the patient is known to have it
Correct
Incorrect
+ DOMAIN KNOWLEDGE
+ TAG FAILURE MODE
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# Principle 2: Optimise the review flow sequence

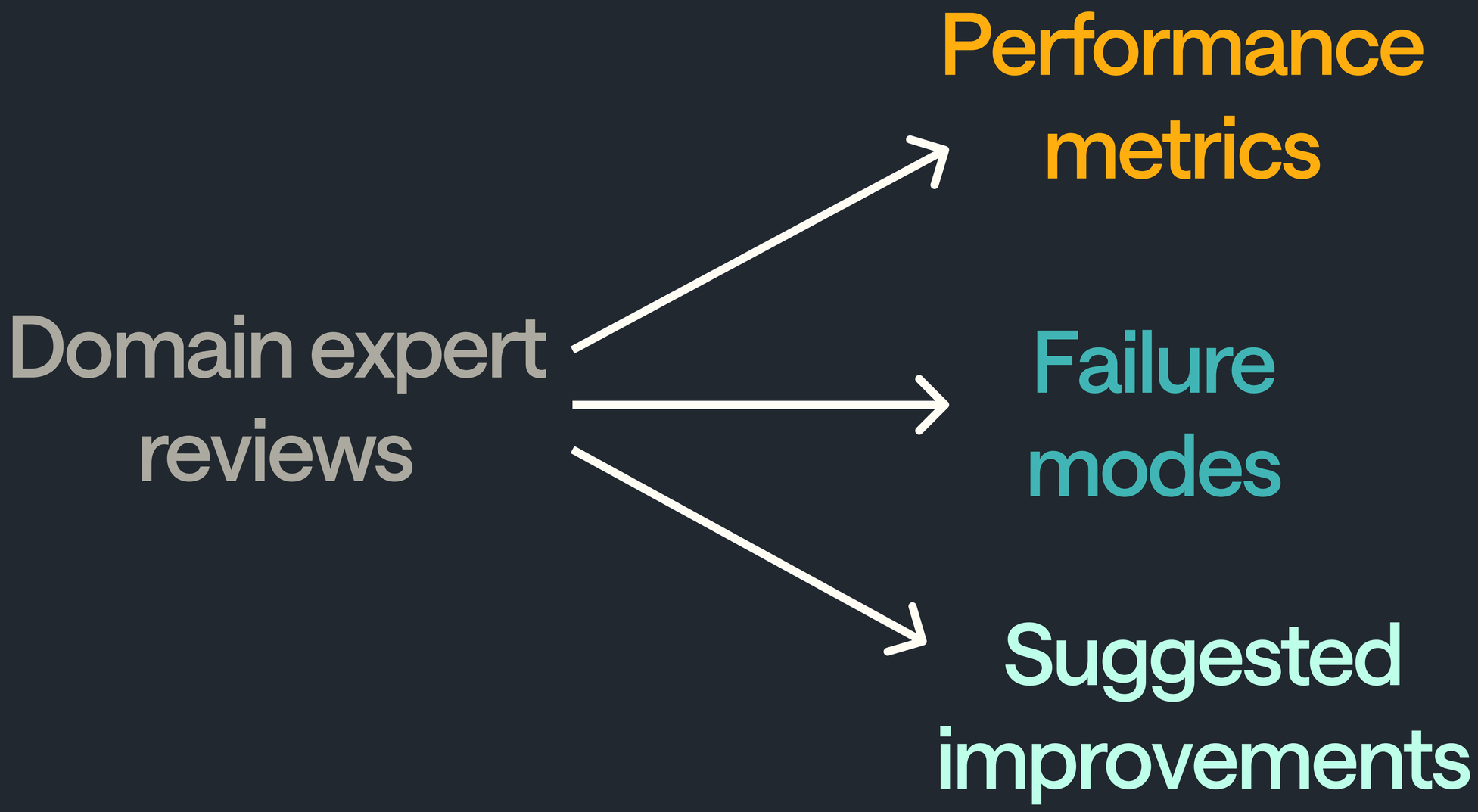
Review case summary

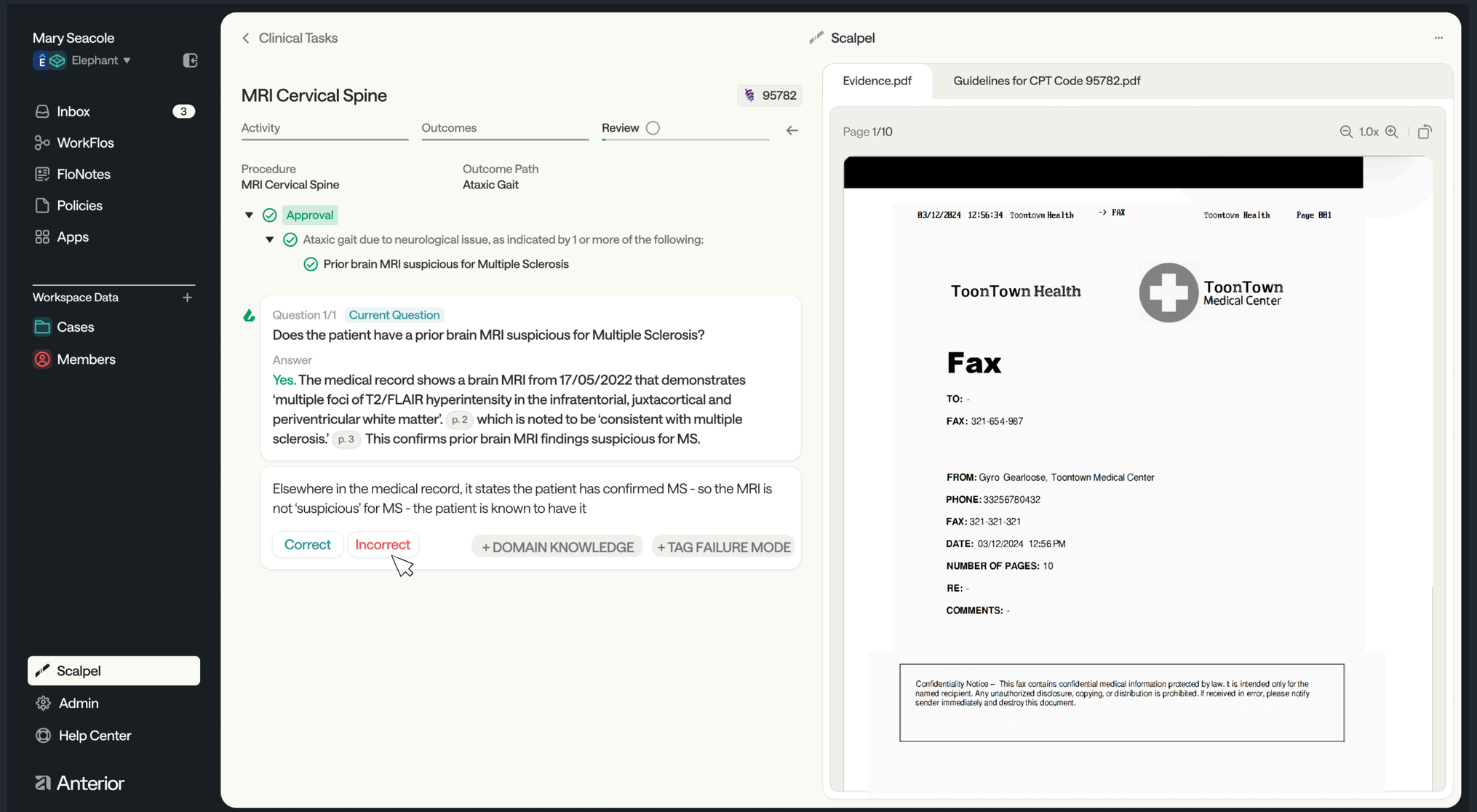
Understand current decision point

Review the relevant medical evidence

Appraise the AI output

# Principle 3: Design reviews that give the data you need


Domain expert reviews
Performance metrics
Failure modes
Suggested improvements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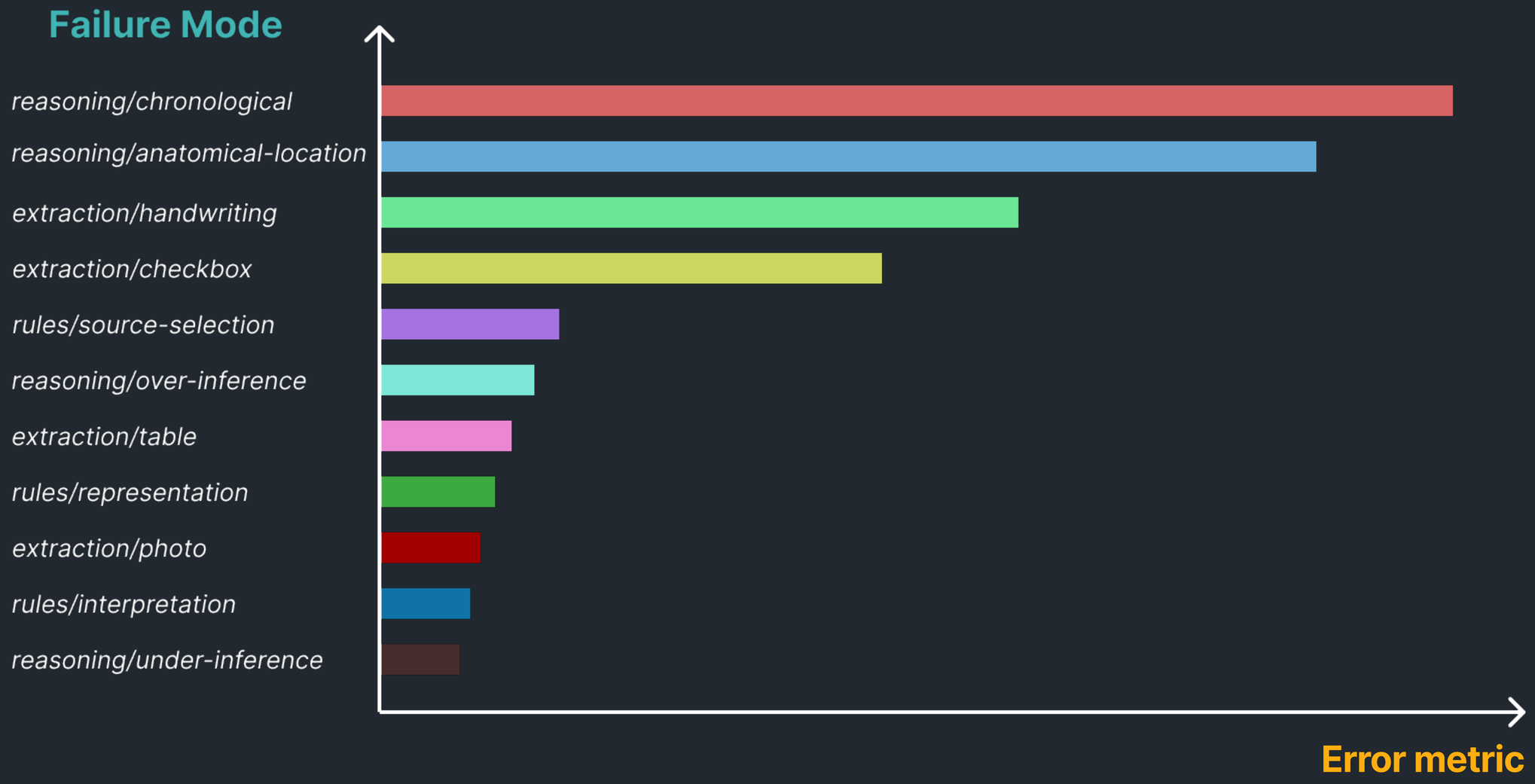
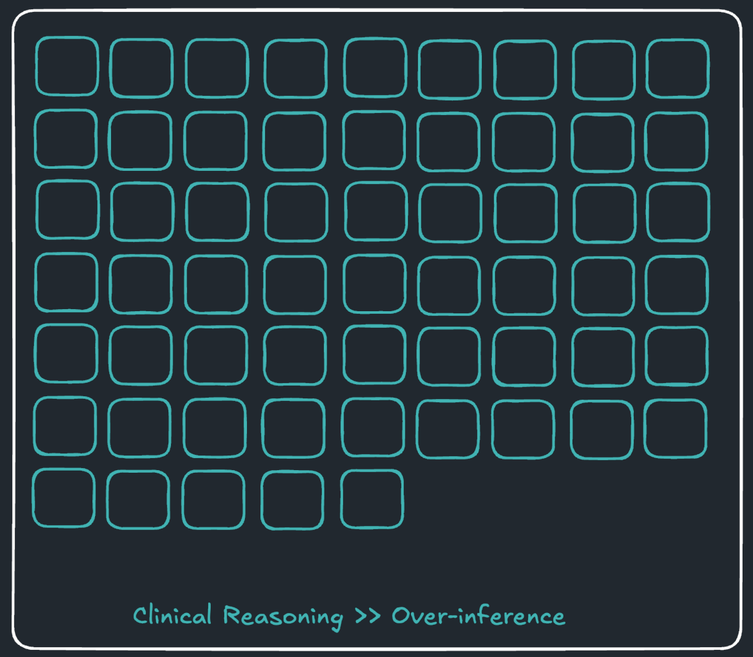
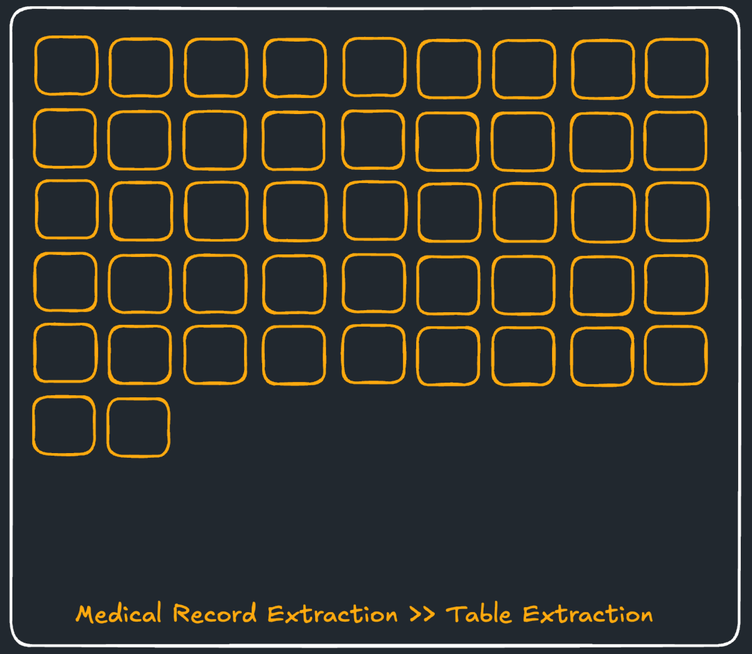
# Using review data to power your system

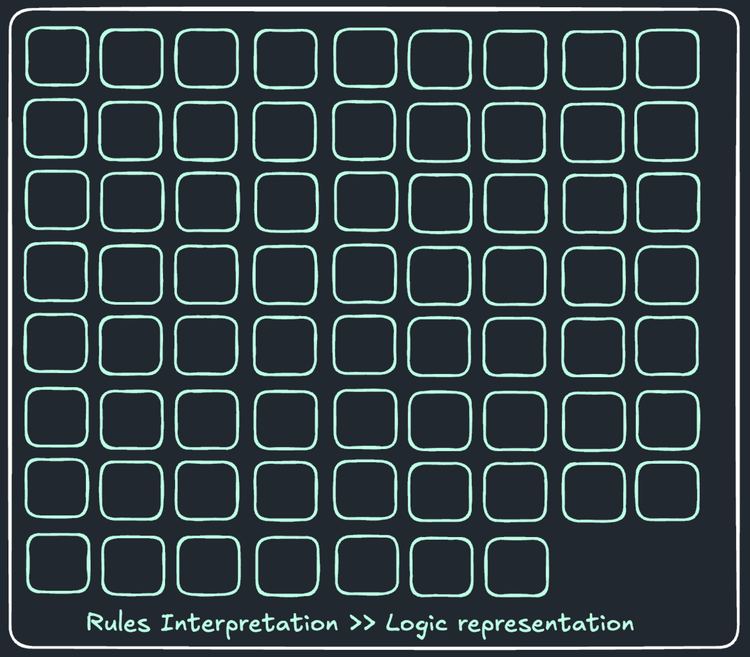
# (1) Use metrics and failure modes from production data to prioritise work



# (2) Use failure mode datasets to test the impact of changes



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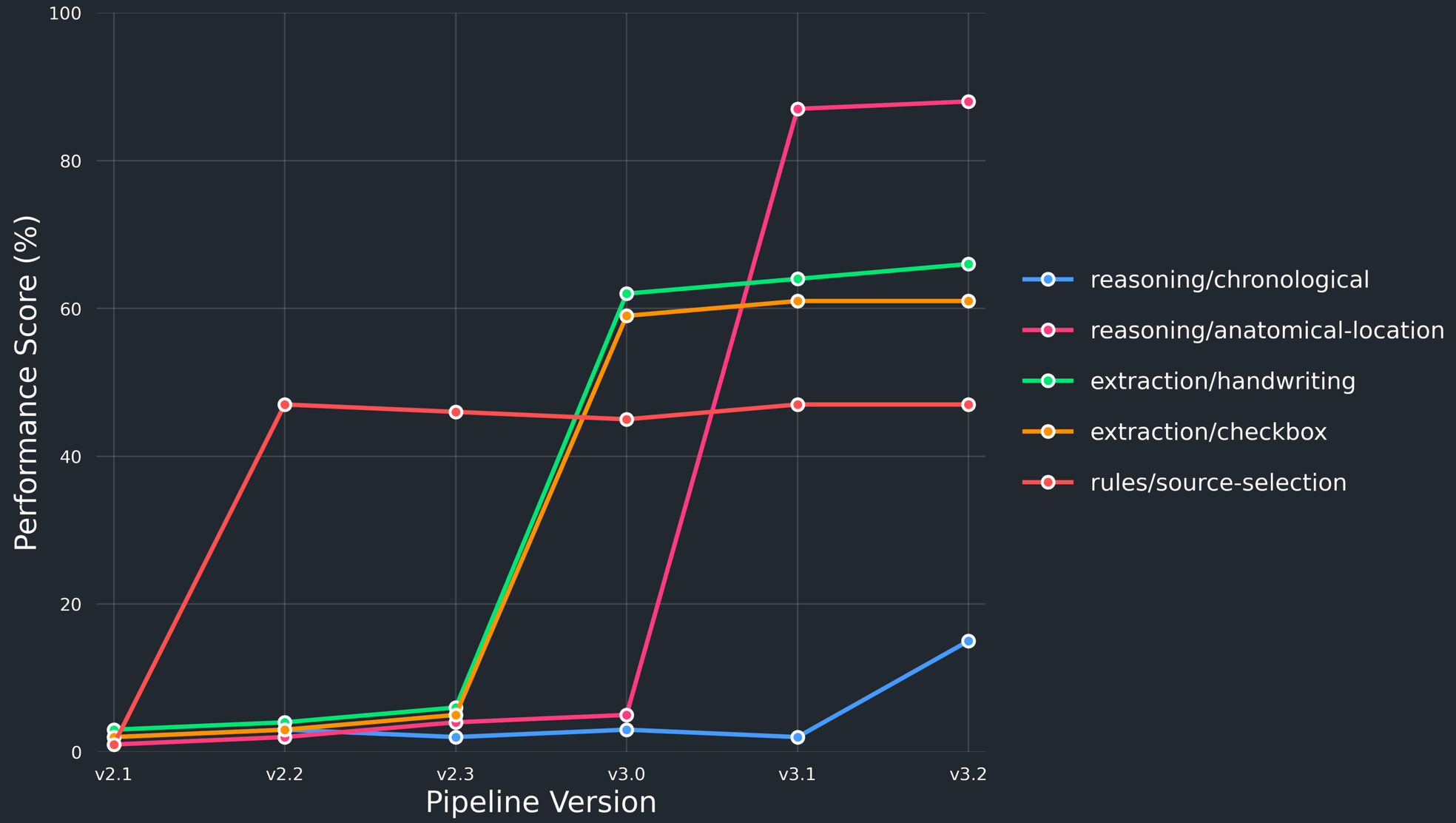
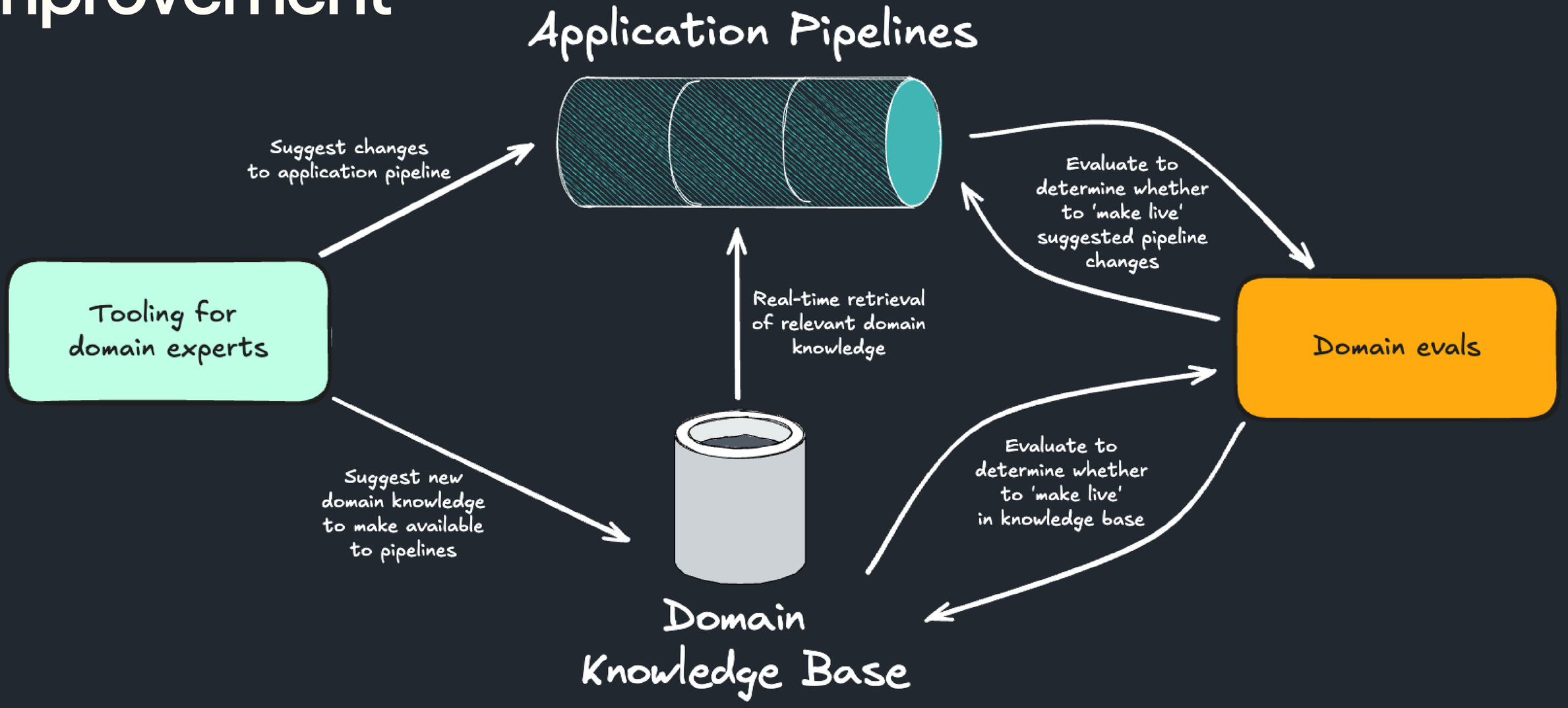


# (3) Create mechanisms for automated improvement



# Hiring domain experts

# It helps to have a **principal domain expert**

- Having a **directly-responsible individual (DRI)** helps you move faster
- They can build the best intuition for how your AI system performs
- Hire them as early as possible and given them ownership
- Your expert should do more than just look at data - they should help design and create your system

# Hire more than “just” a domain expert

**Your principal domain expert can also help with:**

- hiring out a team of reviewers
- defining your sampling strategy for reviews
- analysing review data
- monitoring performance of reviewers
- steering product development
- prioritising eng work to improve AI performance
- talking to customers
- improving AI performance (through prompts, domain knowledge)

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**So it can be helpful if they have the following skills and experiences:**

management/leadership

industry connections

statistics/data science

product skills/experience

communication skills

# In Summary

- Most of the general eval principles apply to specialized verticals. There are added challenges with (i) defining quality and/or correctness, (ii) defining failure modes and (iii) writing prompts
- Domain experts perform a critical ‘translation’ step by looking at your data and converting it into actionable insights
- You can empower them through custom review dashboards which optimise for quality and speed of reviews and generate helpful review data
- That review data can prioritise work, facilitate AI iteration and even make automated improvements
- Hire a principal domain expert early, ideally with a breadth of skills beyond their domain expertise so they can drive the development of this system

# Thank you


*Dr Christopher Lovejoy, MD*

*Head of Clinical AI, Anterior*

*hi@chrislovejoy.me*

*www.chrislovejoy.me*