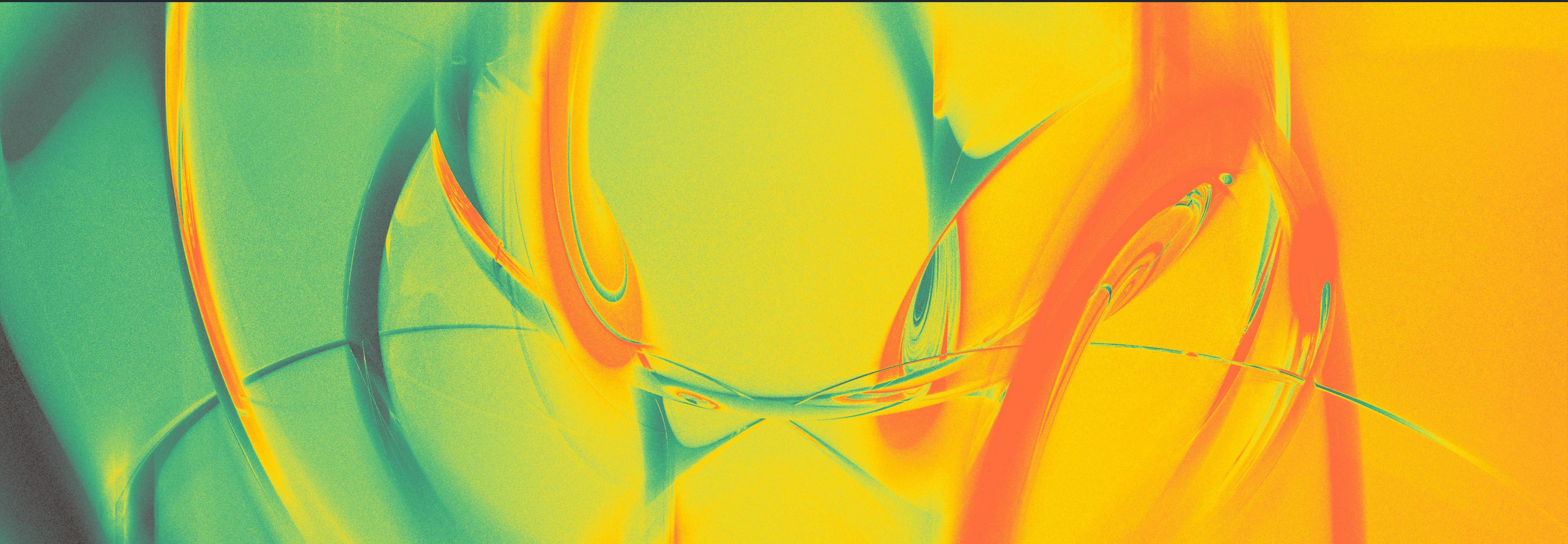


AI Eval in Vertical Industries

Guest lecture for “AI Eval 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?

Why is it harder to do evals for specialized verticals?

- 1 . It's harder to define quality / correctness

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



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
<i>Retrospective reasoning</i>	Incorrectly using evidence that became available after the decision point to justify whether the patient should have had the procedure in the first place.
<i>Under-inference</i>	Not making valid inference, e.g saying something ‘needs to be explicitly stated’ when it could be reasonably inferred
<i>Over-inference</i>	Drawing conclusions that go beyond what the evidence supports. Making assumptions without sufficient basis.
<i>Misunderstanding chronology</i>	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

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

Error analysis

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]

Implementing Automated Evaluators

Why is it harder to do evals for specialized verticals?

Error analysis

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
- Improvement

Implementing Automated Evaluators

The solution: bring domain experts
into the loop

The solution: bring domain experts into the loop

But where? and how?

“look at your data”

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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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“but what does
this mean?”



“look at your data”



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

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.

“but what does
this mean?”



Empowering domain experts
to look at your data

Example 1: Raw traces

The screenshot shows a trace visualization interface for a system named 'main'. The trace ID is `ba27e7b1-e23e-4f50-87de-420cf038190f`. The main panel displays the trace details for the 'main' component, which ran at 2025-03-31 18:12:57.041. The environment was 'default', latency was 1.24s, total cost was \$0.000763, and there were 650 → 113 (Σ 763) events.

The interface includes a sidebar with search, filter, and timeline controls. The main content area is divided into 'Input' and 'Output' sections. The 'Input' section shows a JSON object with 'args' and 'kwargs' fields containing customer feedback. The 'Output' section shows a list of classification results for each piece of feedback.

Input:

```
{  
  "args": [  
    0: [  
      0: "The chat bot on your website does not work."  
      1: "Your customer service is exceptional!"  
      2: "Could you add more features to your app?"  
      3: "I have a question about my recent order."  
    ]  
  ],  
  "kwargs": {}  
}
```

Output:

```
[  
  0: {  
    "feedback": "The chat bot on your website does not work.",  
    "classification": [  
      0: "BUG"  
    ],  
    "relevance_score": 0.9  
  },  
  1: {  
    "feedback": "Could you add more features to your app?",  
    "classification": [  
      0: "SUGGESTION"  
    ],  
    "relevance_score": 0.8  
  },  
  2: {  
    "feedback": "Your customer service is exceptional!",  
    "classification": [  
      0: "PRAISE"  
    ],  
    "relevance_score": 0.9  
  }  
]
```

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

Example 2: A custom view within the product

The screenshot shows the Avila mobile application interface. At the top, the Avila logo is displayed with a notification badge showing the number '1'. The top right corner shows the date 'Tuesday, June 3, 2025'. On the left side, there's a sidebar with 'Patient Details' (Name: Karlie, Phone Number: +15559991236), 'Blueprint' (ONBOARDING), and a toggle switch for 'Show Rationale'. The main area is titled 'Messages' and shows a conversation between 'patient' and 'ava'. The messages are timestamped: 'Initial message' (Tuesday, May 27), 'Yes I got it from the clinic when they sent me home' (Today), 'Great, you're ready to start your treatment. Last thing - can you tell me what time it is where you are, right now? We won't use this information in any way other than to help keep you on your treatment schedule.' (6/3/2025, 10:25:24 AM, CONFIDENCE: 100%), and 'Sure it's 7:26' (6/3/2025, 10:26:15 AM). Below the messages, there's a 'Rationale' section for the last message from 'ava'. On the right side, there's a sidebar titled 'Approval Needed' with a confidence level of 70%. It lists two items: 'Timezone Offset updated to -420' and 'Treatment phase updated to step1step2'. There are also sections for 'Patient Details' and 'Current Messages'. A large blue letter 'a' is overlaid on the sidebar area.

Tuesday, June 3, 2025

Patient Details

NAME: Karlie

PHONE NUMBER: +15559991236

Blueprint

ONBOARDING

Show Rationale

RATIONALE

Initial message

Tuesday, May 27

PT

patient 6/3/2025, 10:24:21 AM

Yes I got it from the clinic when they sent me home

ava 6/3/2025, 10:25:24 AM CONFIDENCE: 100%

Great, you're ready to start your treatment. Last thing - can you tell me what time it is where you are, right now? We won't use this information in any way other than to help keep you on your treatment schedule.

RATIONALE

Patient confirmed they have their medication from the clinic. Following the onboarding blueprint Message 0.7 to determine their local time/timezone so we can schedule future messages correctly. This is required before proceeding to the Step 1 + Step 2 treatment module.

PT

patient 6/3/2025, 10:26:15 AM

Sure it's 7:26

Approval Needed

CONFIDENCE: 70%

Patient Details

i Timezone Offset updated to -420

i Treatment phase updated to step1step2

Current Messages

a Thanks, let's get started. Have you already taken the first pill?

CONFIDENCE: 100%

SEND NOW

RATIONALE

Following the Step 1 + Step 2 blueprint Message 1.1. The patient has confirmed they have their medication and I've determined their timezone offset (Pacific Time, -420 minutes). Now transitioning to the Step 1 + Step 2 treatment phase by asking if they've taken the first pill. This is the first question in the treatment sequence to determine their progress with the medication regimen.

a Just checking in. Have you decided when to take Step 1?

CONFIDENCE: 100%

SEND NOW

Example 3: A custom review dashboard

Mary Seacole
Elephant ▾

Inbox (3)
WorkFlos
FloNotes
Policies
Apps

Workspace Data +
Cases
Members

Scalpel Admin Help Center Anterior

Clinical Tasks

MRI Cervical Spine

Activity Outcomes Review

Procedure: 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

Evidence.pdf Guidelines for CPT Code 95782.pdf

Scalpel

95782

ToonTown Health
ToonTown Medical Center

Fax

TO: -
FAX: 321-654-987

FROM: Gyro Gearloose, Toontown Medical Center
PHONE: 33256780432
FAX: 321-321-321
DATE: 03/12/2024 12:56 PM
NUMBER OF PAGES: 10
RE: -
COMMENTS: -

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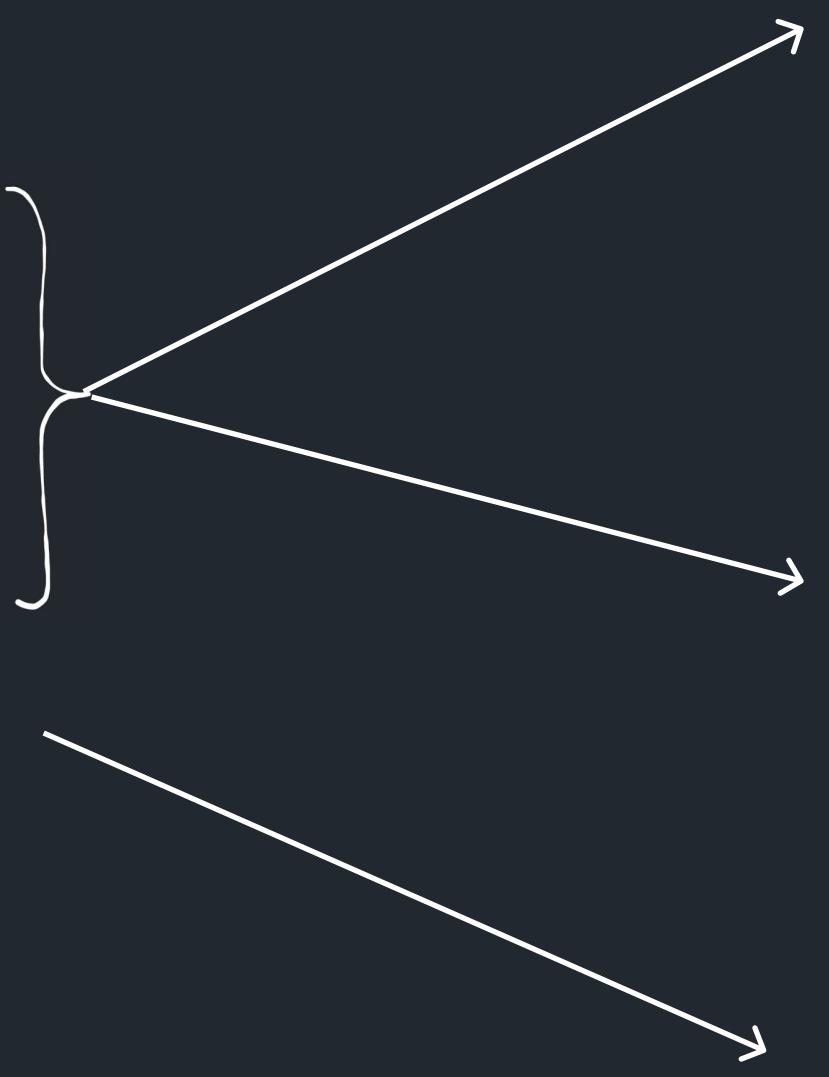
Principles for building an effective domain expert review dashboard

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

Mary Seacole

Elephant

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< Clinical Tasks

MRI Cervical Spine

Activity Outcomes Review (0) ←

Procedure: 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.

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95782

Page 1/10 1.0x ↗

83/12/2024 12:56:34 Toontown Health → FAX Toontown Health Page 001

ToonTown Health ToonTown Medical Center

Fax

TO: -
FAX: 321-654-987

FROM: Gyro Gearloose, Toontown Medical Center
PHONE: 33256780432
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Principle 2: Optimise the review flow sequence

Review case summary

Understand current
decision point

Review the relevant
medical evidence

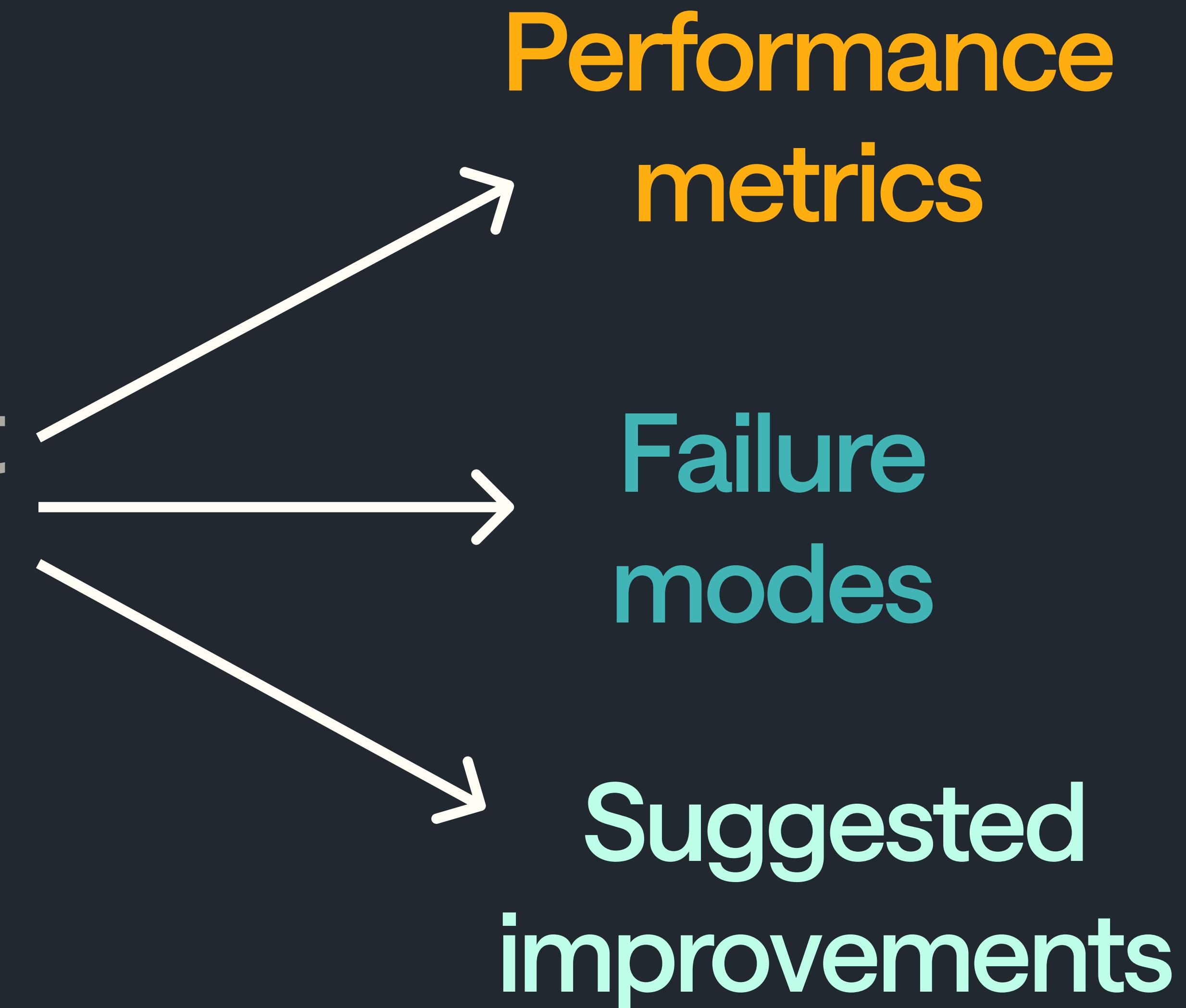
Appraise the AI
output



Principle 3: Design reviews that
give the data you need



Domain expert
reviews



Mary Seacole

Elephant

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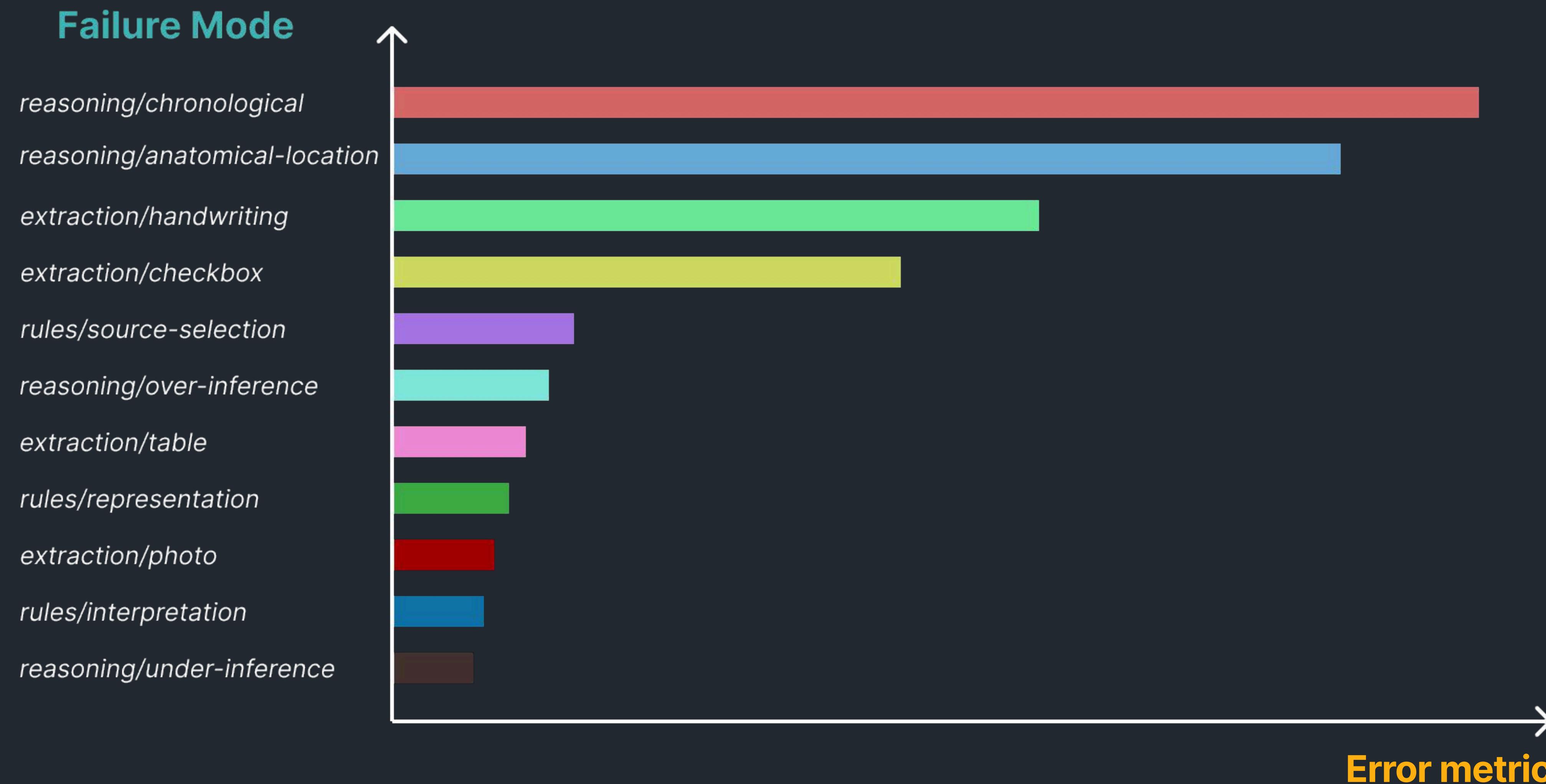
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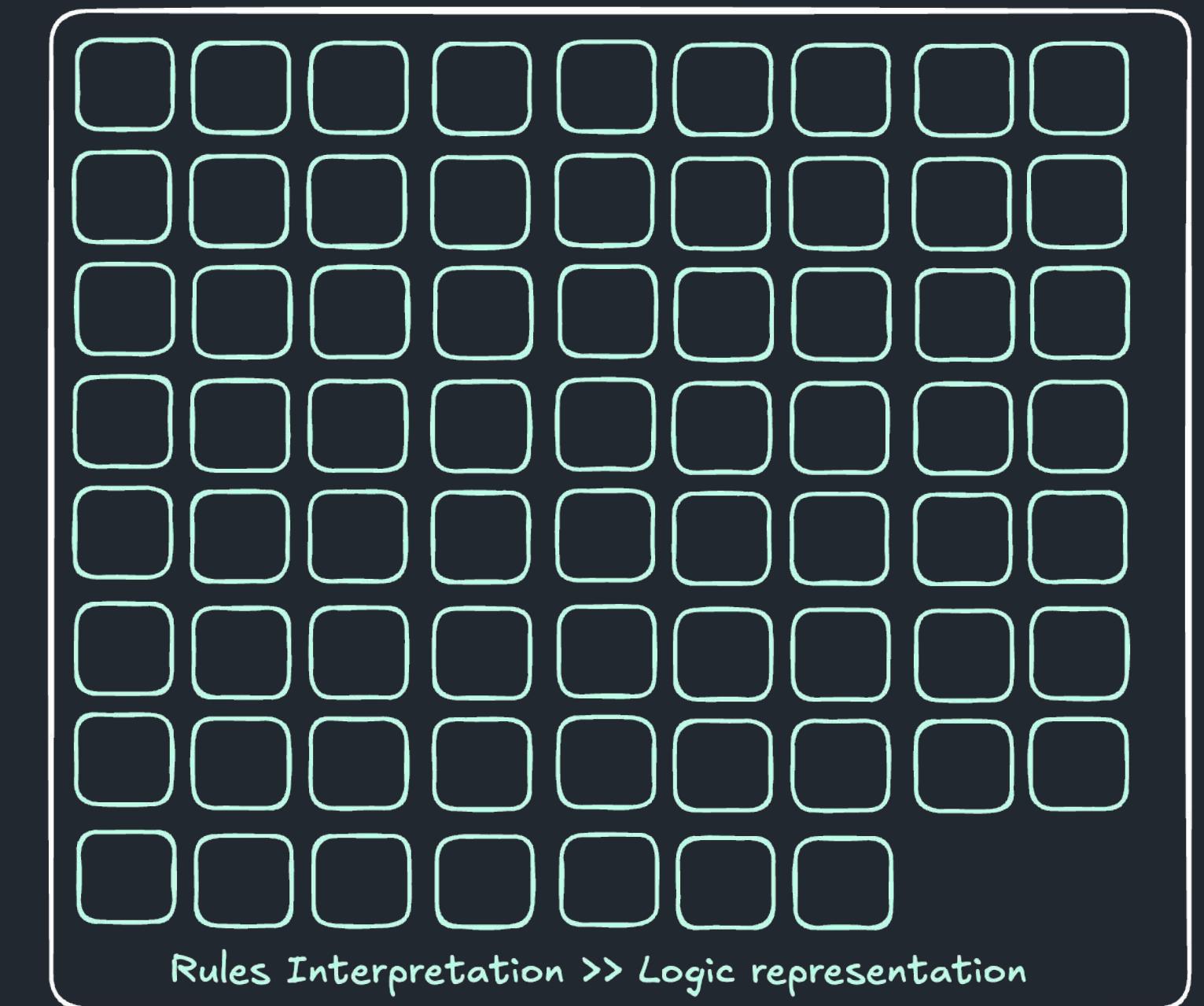
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Using review data to
power your system

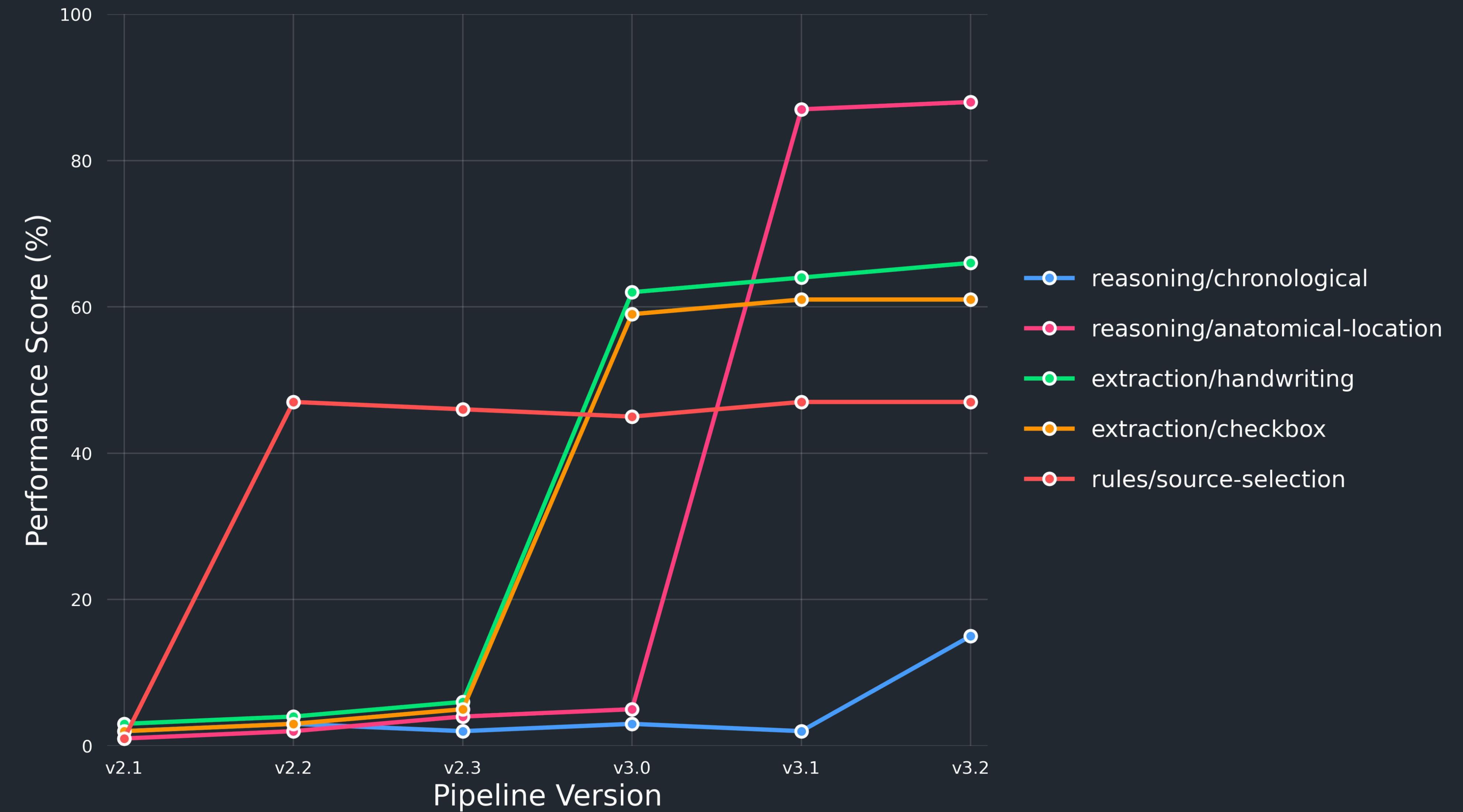
(1) Use metrics and failure modes from production data to prioritise work



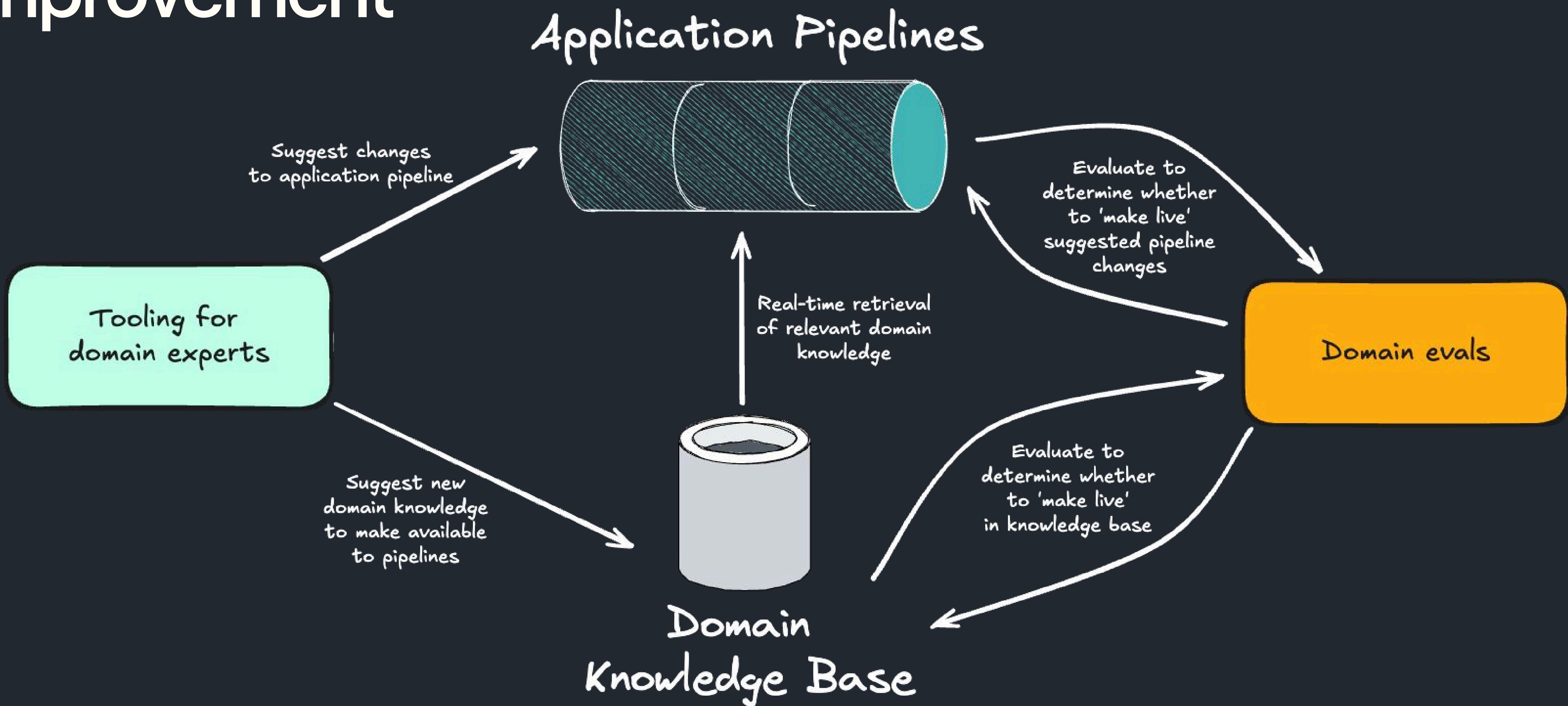
(2) Use failure mode datasets to test the impact of changes



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



(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 give 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

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