# Mining Dairy Data with AI Agents

Pádraig Lucey

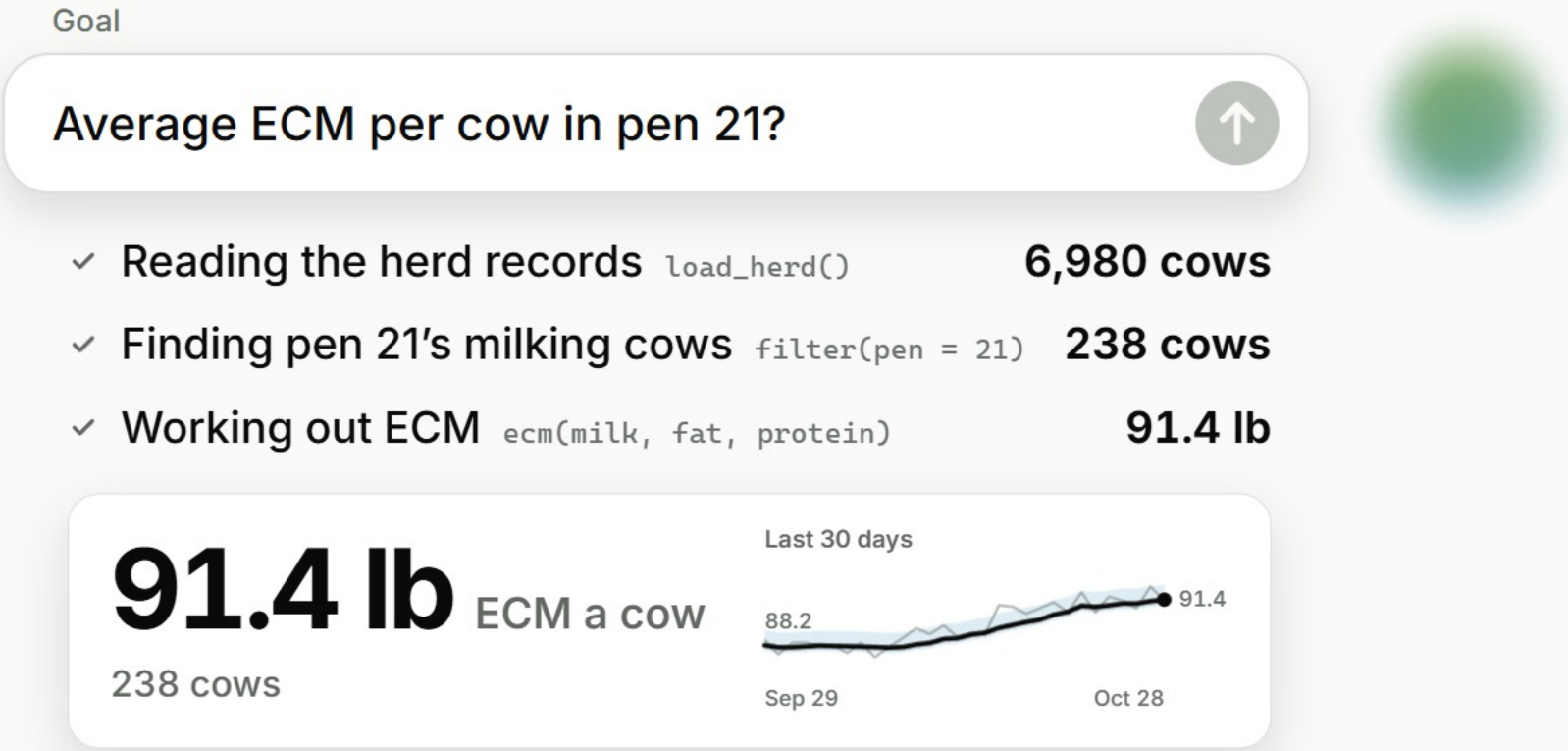
# What is an agent?

[An automation that] runs tools in a loop to achieve a goal.

Simon Willison

‘AI’ is not a tool.

Rich Hickey



Goal

Tell me about pen 21's intake over the last month, what's changed, and how the cows are responding.

Worked for 4 s · 3 steps | New corn silage pile | + ½ lb more bypass fat | − ½ lb less rolled corn

✓ Opening pen 21 `open_pen(21)` 75 days

# Pen 21

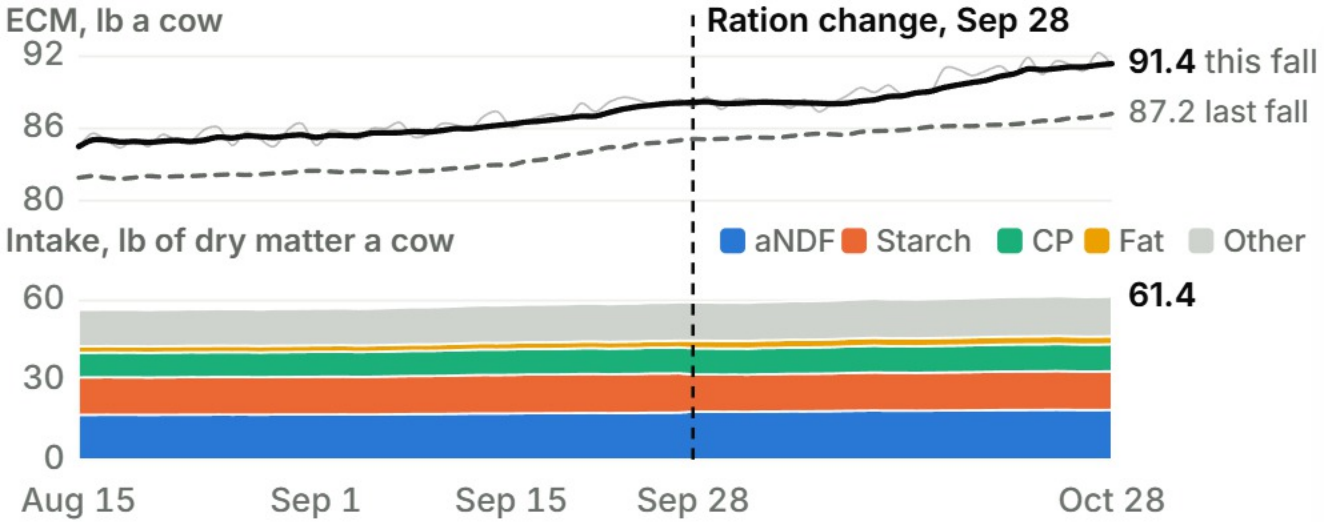
238 cows · High cows · Aug 15 to Oct 28

Milk a cow, last test
**90.6 lb** Highest of 12 pens
Middle 80%: 73–108 lb

Days in milk
**52** median
Middle 80%: 31–74 days

Lactation
**3rd** median
2nd 84 · 3rd 51 · 4th+ 103

Intake, last 7 days
**61.4 lb** formulated 63.0
Daily, the last 30 days




Maybe this change is just seasonal?

Checking the same weeks last fall.

**ECM is up 3.3 lb since Sep 28. Last fall, same weeks, no ration change: up 2.2 lb.**

Goal

Tell me about pen 21's intake over the last month, what's changed, and how the cows are responding.

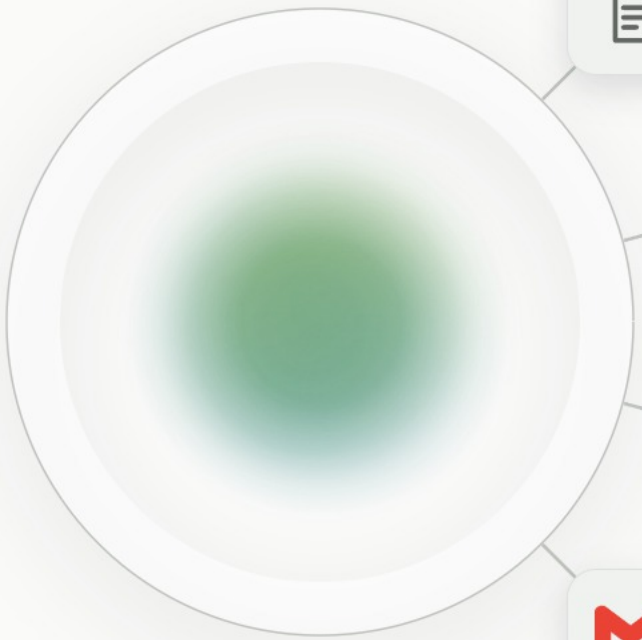
# Model, harness, agent

## The model

Reads your prompt and predicts the words that come next.

## The harness

Gives the model its tools, and runs them.



### Tools

**Read a data file**
↩ Cow file and feed report

**Weather station** API
↩ Temperatures, both weeks

**Run statistics**
↩ A difference from Sep 28

**Email** MCP
↩ 2 lab reports

After Harness Engineering 101, Isuru Wijesiri, 2026

AGENTS

● Nutrition  Herd A · close-up pen

## No Close Up Mineral in the 13 Oct premix

| | |
|---|---|
| Close Up Mineral | **0** of 1,410 lb |
| Fed to the close-up pen | **14–16** Oct |
| The 12 batches before | 1,450–2,110 lb |




HOW WE KNOW

The wagon scale gained 0 lb during the Close Up Mineral step. EZfeed loading records.

Close-up minerals often carry the anionic salts that lower milk fever risk.
Santos et al., J Dairy Sci 2019

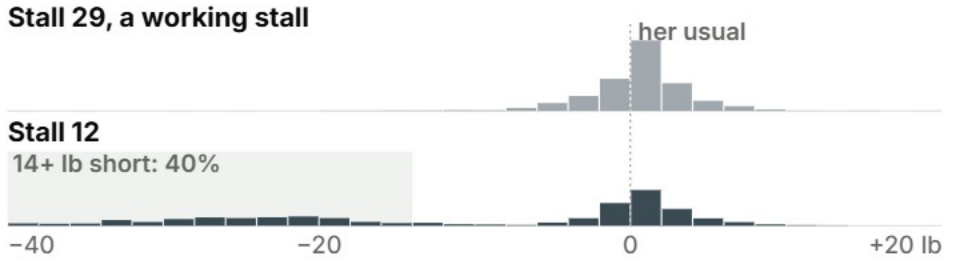
**Did the 13 Oct batch get its Close Up Mineral?**

Yes | No | Don't know

● Milk  Herd B · rotary parlor

## 3 stalls milk low

| | |
|---|---|
| Stall 12 | **−10.2** lb a milking |
| Stall 57 | **−8.9** lb |
| Stall 73 | **−7.8** lb |
| The other 77 stalls | −2.9 to +2.4 lb |




HOW WE KNOW

**40%** of stall 12's milkings came in 14 lb or more short of the cow's usual; 1% in a working stall.

Meter or milking unit? A meter reading short loses nothing; a unit not milking out leaves about 1,300 lb a day in the cows.
Andreen et al., J Dairy Sci 2020

**Have stalls 12, 57 and 73 been checked?**

Yes | Not yet | Don't know

AGENTS

# Two different harnesses

🧩 **Mini Crossword**

Fill in the squares using the clues below. Each number marks the beginning of a word.

Plain text

| | | |
|---|---|---|
| 1 | 2 | 3 |
| 4 | | |
| 5 | | |

➡️ **Across**

**1.** A small feline pet (3 letters)
**4.** To exist, as in "you ___ here" (3 letters)
**5.** The number after nine (3 letters)

⬇️ **Down**

**1.** A small feline pet (3 letters)
**2.** A word meaning "to exist", used with "you" (3 letters)
**3.** The number after nine (3 letters)

Here's the completed crossword with the answers filled in. 🧩

Plain text

| | | |
|---|---|---|
| C | A | T |
| E | S | T |
| T | E | N |

**Across**

1. CAT 🐱
2. EST (short for "exists")
3. TEN

**Down**

1. CET
2. ASE
3. TTN

**Note:** The original puzzle's down clues don't produce valid English words, so this isn't a properly constructed crossword. I can make you a proper crossword with interlocking words and a complete, correct solution instead!

August 2026

## Riemann's 167-year-old problem: two-thirds proven

Claude proved more than two-thirds of the zeta zeros lie on the line: 60 sub-agents, a day and a half

The first 15 zeros of the zeta function, on the critical line



Share of all its zeros proven to lie on the line




@alexanderrX_ on X · 19 Oct 2026

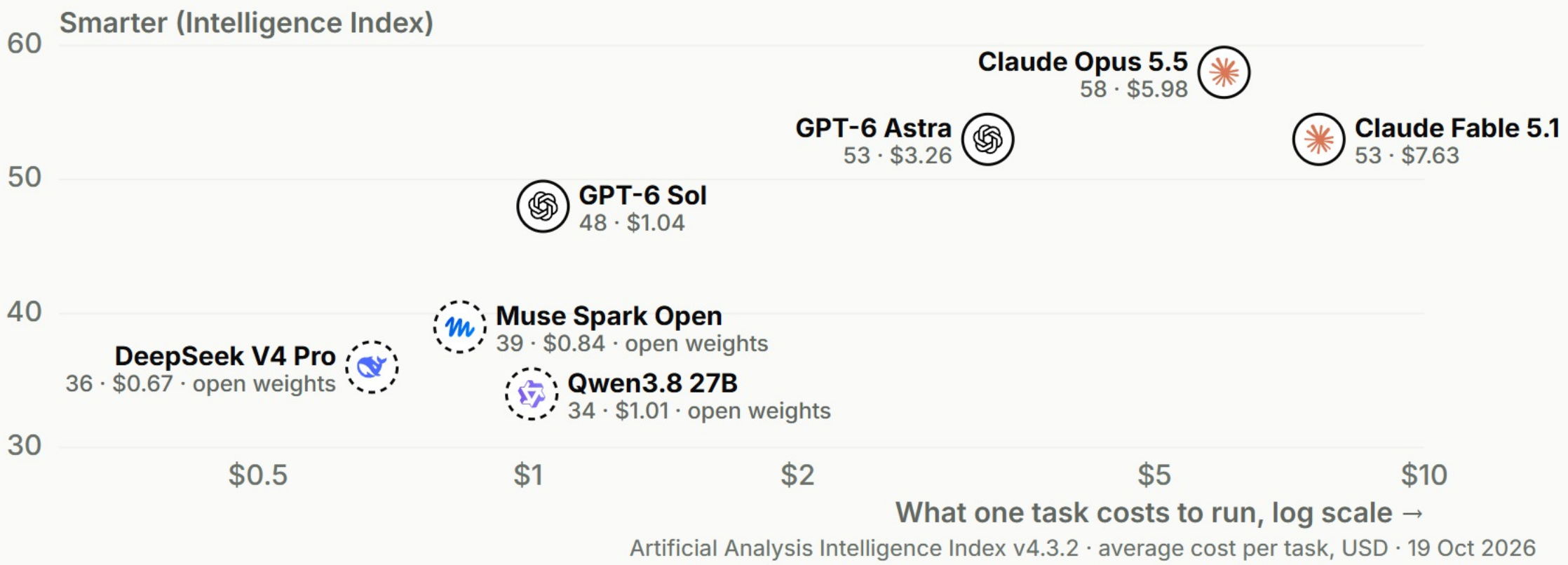
Claude, with L. Alpöge and R. Furman · arXiv 2608.13637 · Aug 2026

MODELS

# Cloud access or locally hosted

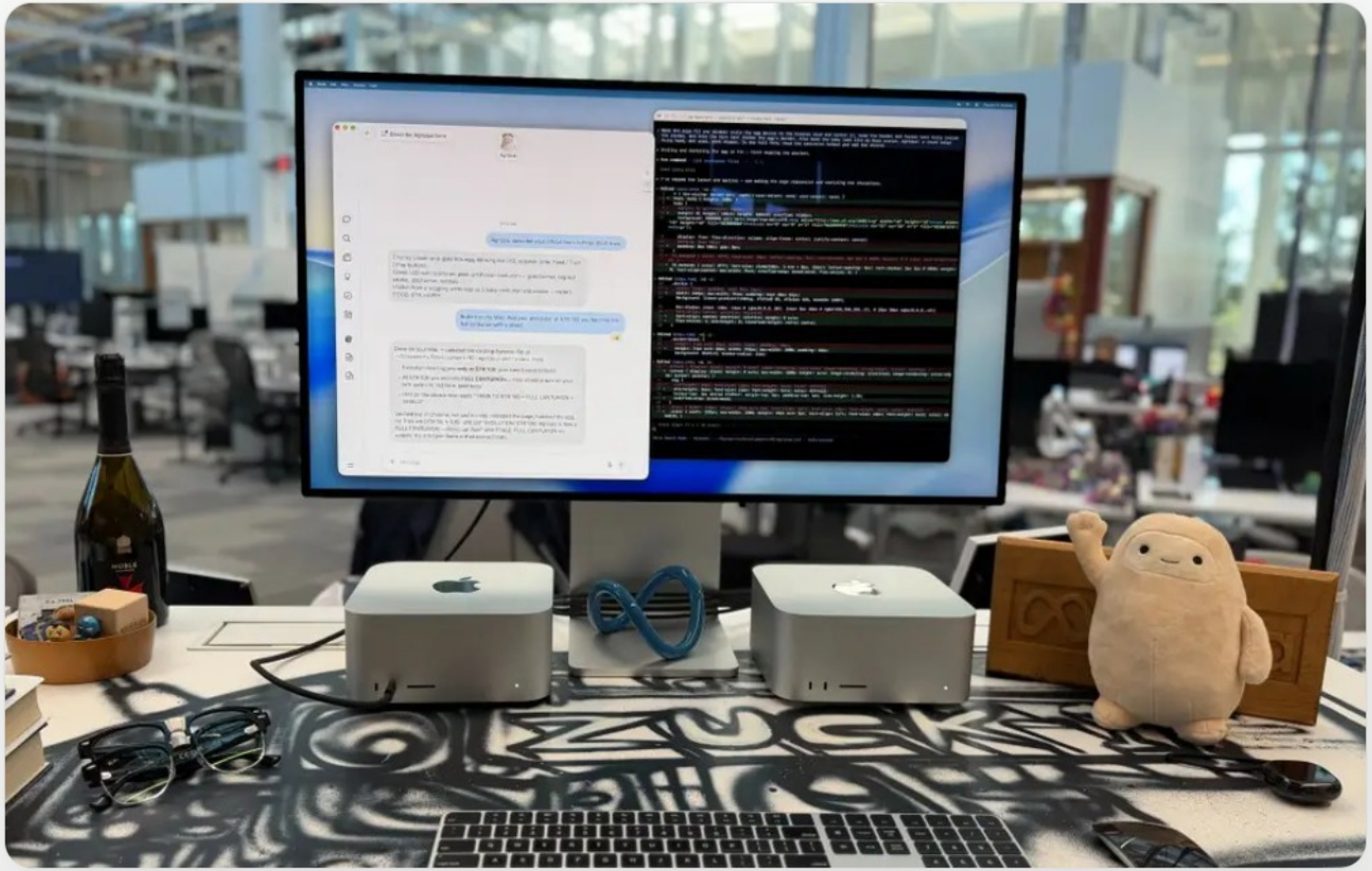
CLOUD ACCESS, ON THEIR SERVERS

LOCALLY HOSTED, ON YOUR MACHINE




Artificial Analysis Intelligence Index v4.3.2 · average cost per task, USD · 19 Oct 2026

MODELS

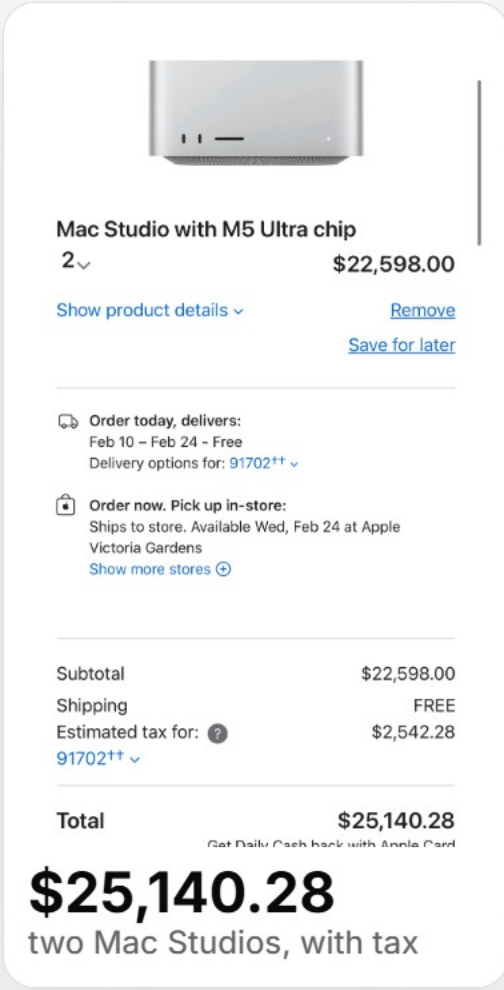


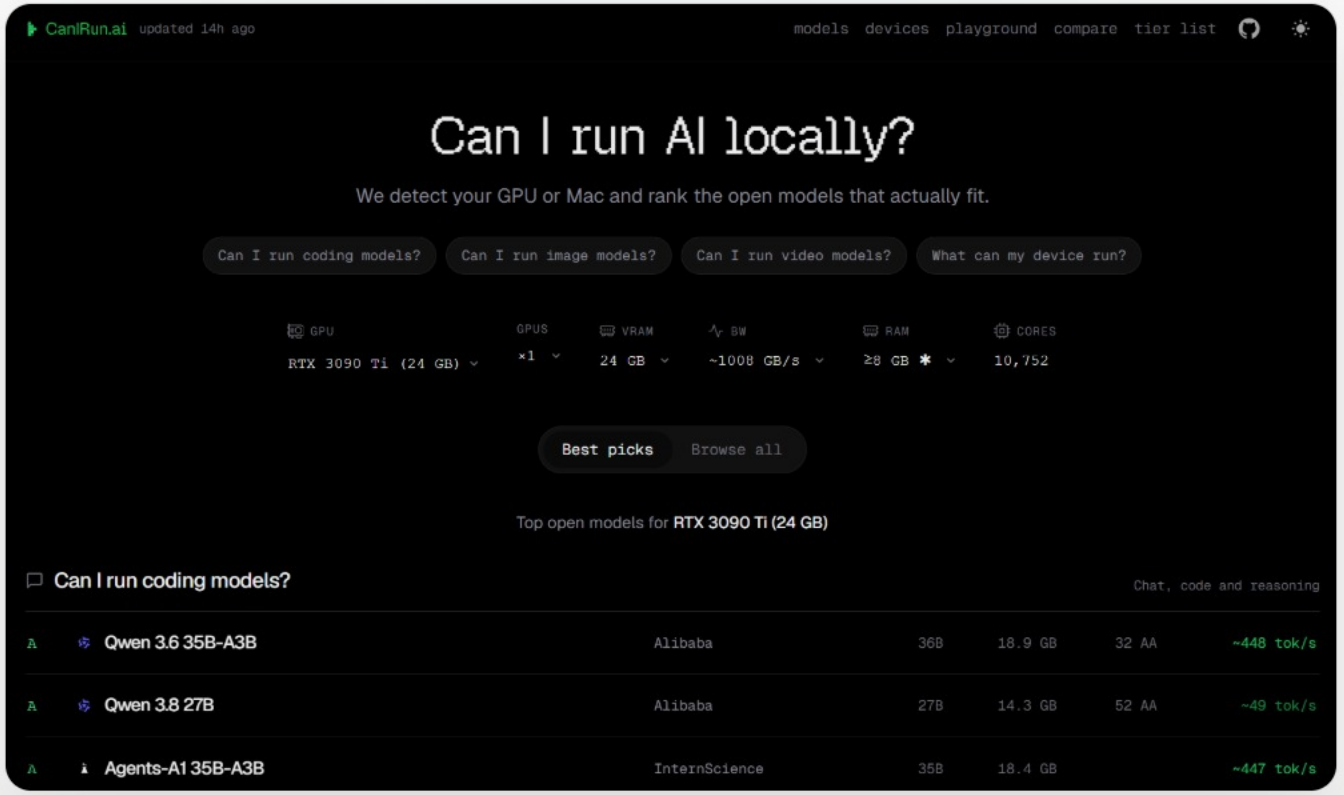

**Muse Spark Open**
Meta, 15 Oct 2026

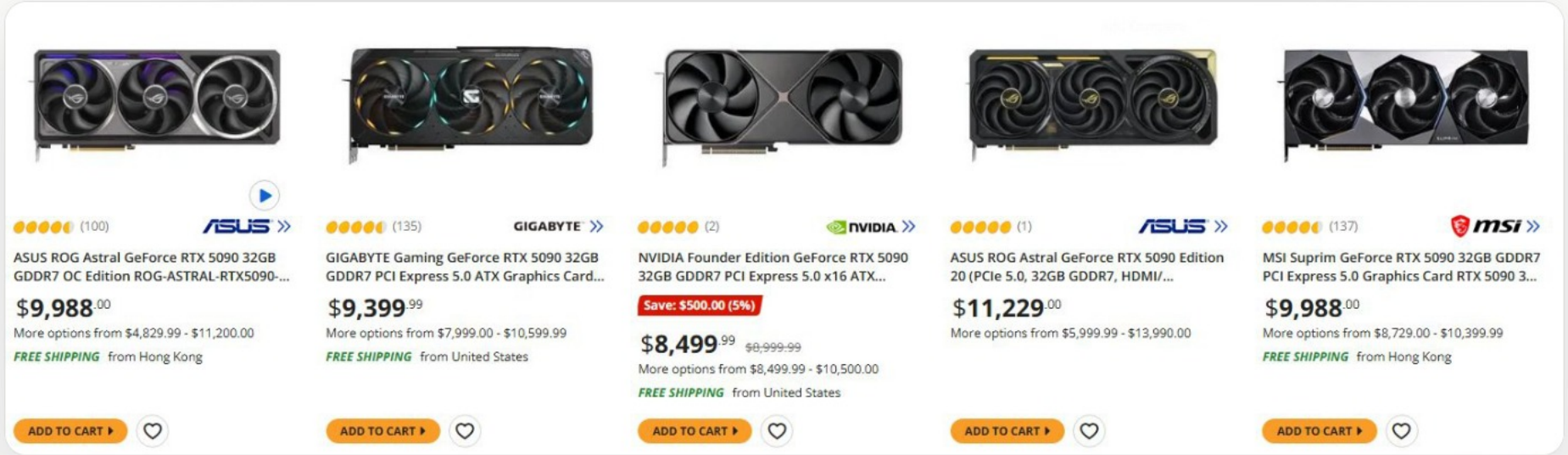
**816B parameters**

**Two Mac Studios**
512 GB of memory each

**16–25**
tokens a second






canirun.ai, for an RTX 3090 Ti (24 GB) · Newegg, RTX 5090, Oct 2026

## Assistant

Qwen3.6 35B-A3B

```
herd <- load_herd("data/clean")   # your DairyComp exports, cleaned

fresh <- c("milk_fever", "retained_placenta", "metritis",
           "ketosis", "displaced_abomasum")
cases <- subset(herd$events, std_event %in% fresh & dim_at_event <= 60)
cases$dim <- cut(cases$dim_at_event, c(-1, 7, 14, 21, 30, 60),
                 labels = c("0-7", "8-14", "15-21", "22-30", "31-60"))
table(cases$std_event, cases$dim)
```

Output

| | 0-7 | 8-14 | 15-21 | 22-30 | 31-60 |
|---|---|---|---|---|---|
| displaced_abomasum | 0 | 6 | 8 | 7 | 0 |
| ketosis | 13 | 30 | 27 | 0 | 0 |
| metritis | 27 | 61 | 0 | 0 | 0 |
| milk_fever | 17 | 0 | 0 | 0 | 0 |
| retained_placenta | 55 | 0 | 0 | 0 | 0 |

Milk fever and retained placenta are all in the first week; metritis peaks in week two, ketosis in

Message the assistant

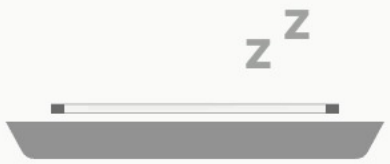
HARNESS

# Where it runs

5:00 am

HARNESS Installed on the machine or In a sandbox

MODEL On the machine, like the Rossow lab or A frontier model, through its API



## Your laptop

Only while it's open

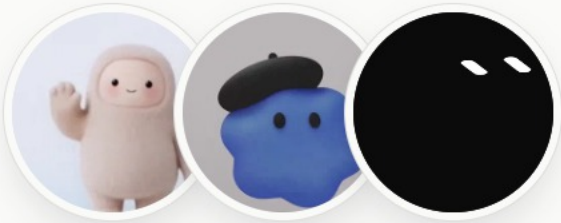
○ Lid shut, asleep



## A box in the office

A Mac mini, or a $5 Ubuntu server

● Running



## Their cloud

Muse, dots, Grok Bot

● Running

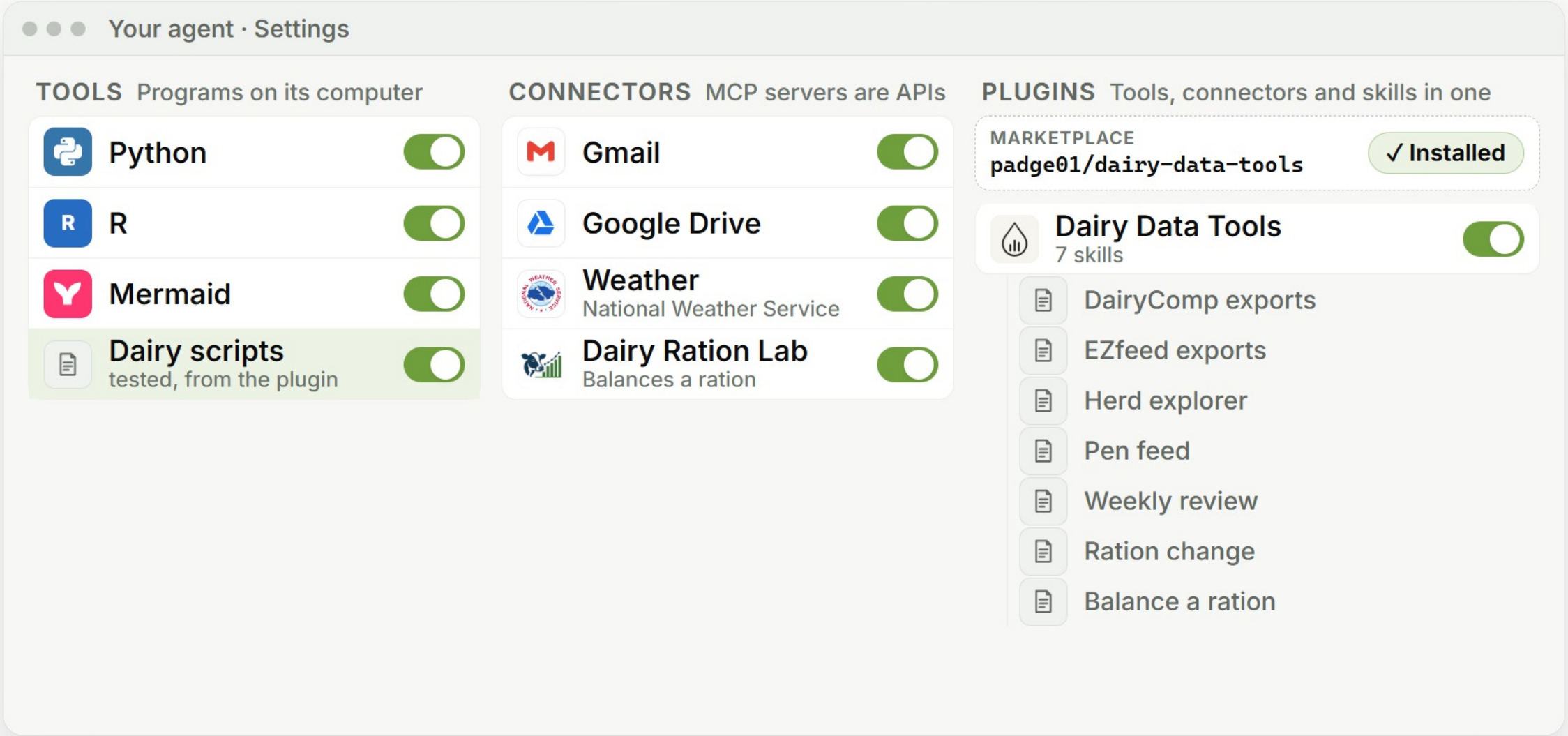
FOUND AT 5:00

NUTRITION New haylage sample added to your feed library

MILK Bulk tank SCC up from 180,000 to 260,000 this week

HARNESS

# Tools, connectors and plugins



TOOLS

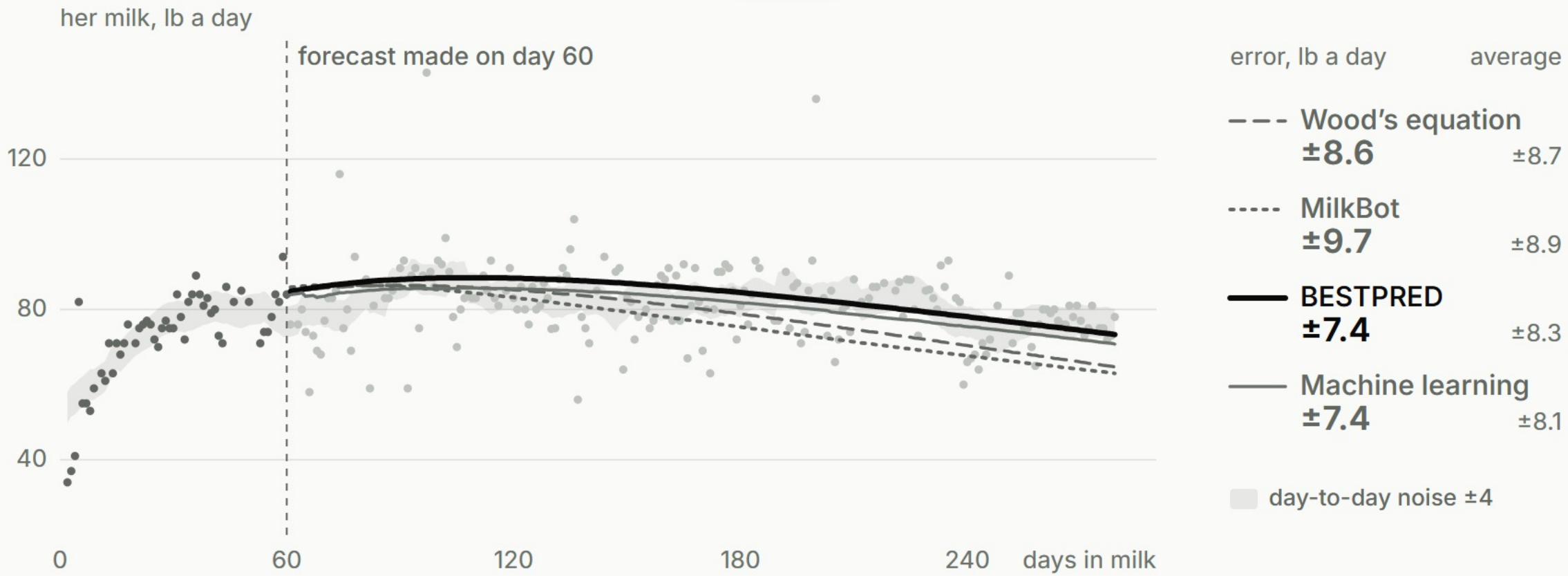
# BESTPRED

```
$ claude plugin marketplace add padge01/bestpred-python
```

```
$ pip install bestpred
```

## Python port of the USDA lactation curve model

Her test days (milk, fat, protein) · calving date · lactation · age · breed




BESTPRED: Cole and VanRaden, USDA-ARS Animal Genomics and Improvement Laboratory (2008) · Python port: doi.org/10.5281/zenodo.23425506

TOOLS

# Dairy Data Tools

```
$ claude plugin marketplace add padge01/dairy-data-tools
```

```
$ pip install dairy-data-tools
```

## Pen feed

3 milking pens · 7 days to Oct 28

### Pen 1

15 cows

| ECM per lb DM | DM fed | Feed per cwt |
|---|---|---|
| **1.62** | **44.6** lb | **$10.58** |

| | |
|---|---|
| FORAGES | |
| Corn silage, 2025 pile | **13.8** lb |
| Alfalfa hay | **9.8** lb |
| MINERALS AND ADDITIVES | |
| Lactation mineral | **1.2** lb |
| BY-PRODUCTS | |
| Almond hulls | **1.5** lb |
| PROTEINS | |
| Canola meal | **4.9** lb |
| Soybean meal | **2.9** lb |
| GRAINS AND ENERGY | |
| Rolled corn | **8.9** lb |

### Pen 11

82 cows

| ECM per lb DM | DM fed | Feed per cwt |
|---|---|---|
| **1.20** | **46.3** lb | **$14.15** |

| | |
|---|---|
| FORAGES | |
| Corn silage, 2025 pile | **12.1** lb |
| Alfalfa hay | **6.4** lb |
| Wheat silage | **1.9** lb |
| MINERALS AND ADDITIVES | |
| Lactation mineral | **1.1** lb |
| FATS | |
| Bypass fat | **0.4** lb |
| BY-PRODUCTS | |
| Whole cottonseed | **3.0** lb |
| Almond hulls | **2.6** lb |
| PROTEINS | |
| Canola meal | **4.5** lb |
| Soybean meal | **1.9** lb |
| Distillers grains | **1.5** lb |
| GRAINS AND ENERGY | |
| Rolled corn | **9.4** lb |
| Molasses | **0.4** lb |

### Pen 21

129 cows

| ECM per lb DM | DM fed | Feed per cwt |
|---|---|---|
| **1.43** | **63.0** lb | **$12.34** |

| | |
|---|---|
| FORAGES | |
| Corn silage, 2026 pile | **17.0** lb |
| Alfalfa hay | **8.7** lb |
| Wheat silage | **2.4** lb |
| MINERALS AND ADDITIVES | |
| Lactation mineral | **1.5** lb |
| FATS | |
| Bypass fat | **1.0** lb |
| BY-PRODUCTS | |
| Whole cottonseed | **3.9** lb |
| Almond hulls | **3.4** lb |
| PROTEINS | |
| Canola meal | **6.8** lb |
| Soybean meal | **2.4** lb |
| Distillers grains | **1.9** lb |
| GRAINS AND ENERGY | |
| Rolled corn | **11.7** lb |
| Molasses | **0.5** lb |

## Cow 3256

Pregnant 147 d

Pen 21 · Holstein · 5th lact

**77** lb, last test — **245** DIM

**Bottom 40%** of pen 21, last test (129 cows)

Her milk against pen 21, last test (lb)



Lowest 16 · her 77 · highest 162

Her milk this lactation, lb by days in milk (each test)




| Fat · protein | ECM, last test | SCC |
|---|---|---|
| **3.9% · 3.6%** | **85 lb** | **138k** |

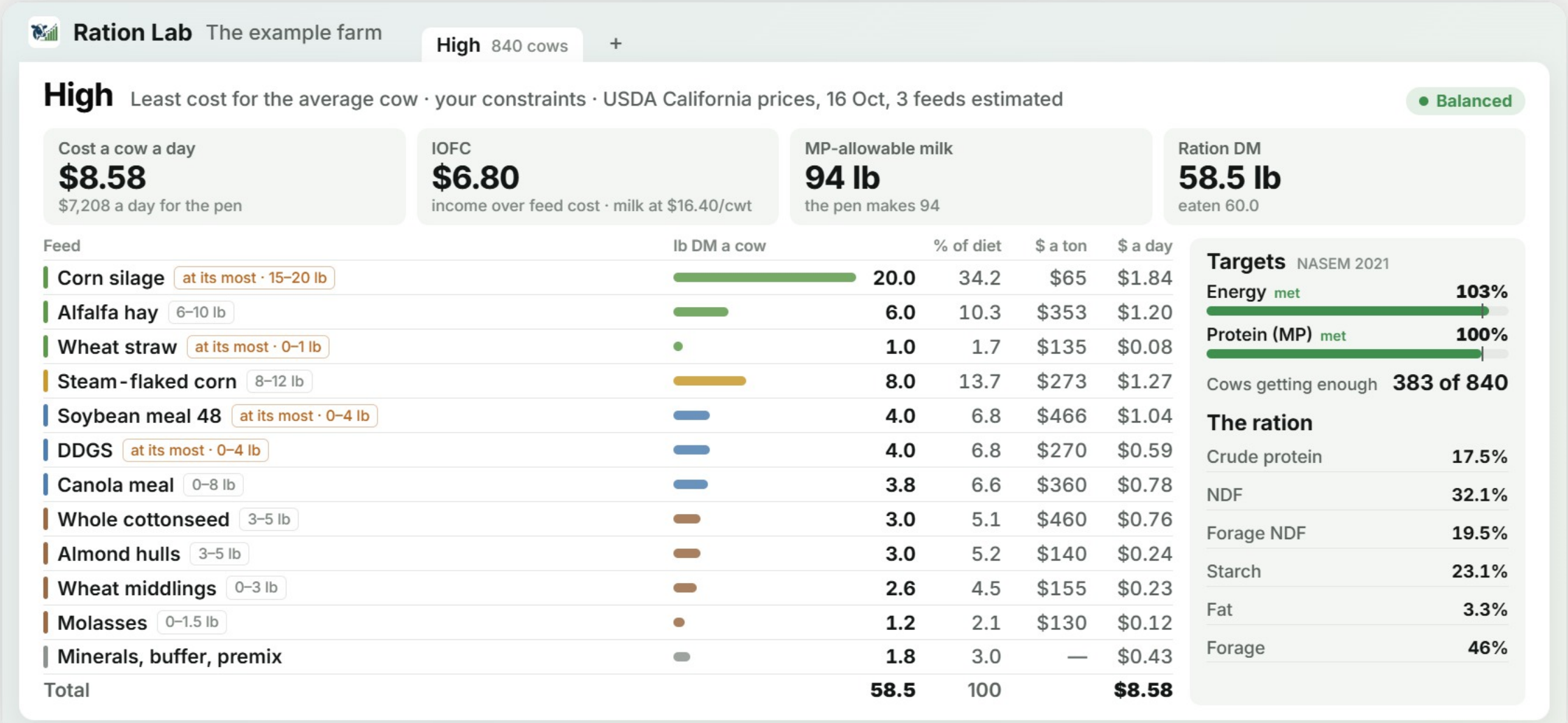
| | |
|---|---|
| Jul 30 | **Footbath** |
| Jul 29 | **Lameness** |
| Jul 6 | **Checked pregnant** |
| Jun 3 | **Bred** |

+4 earlier this lactation

MCP AND API

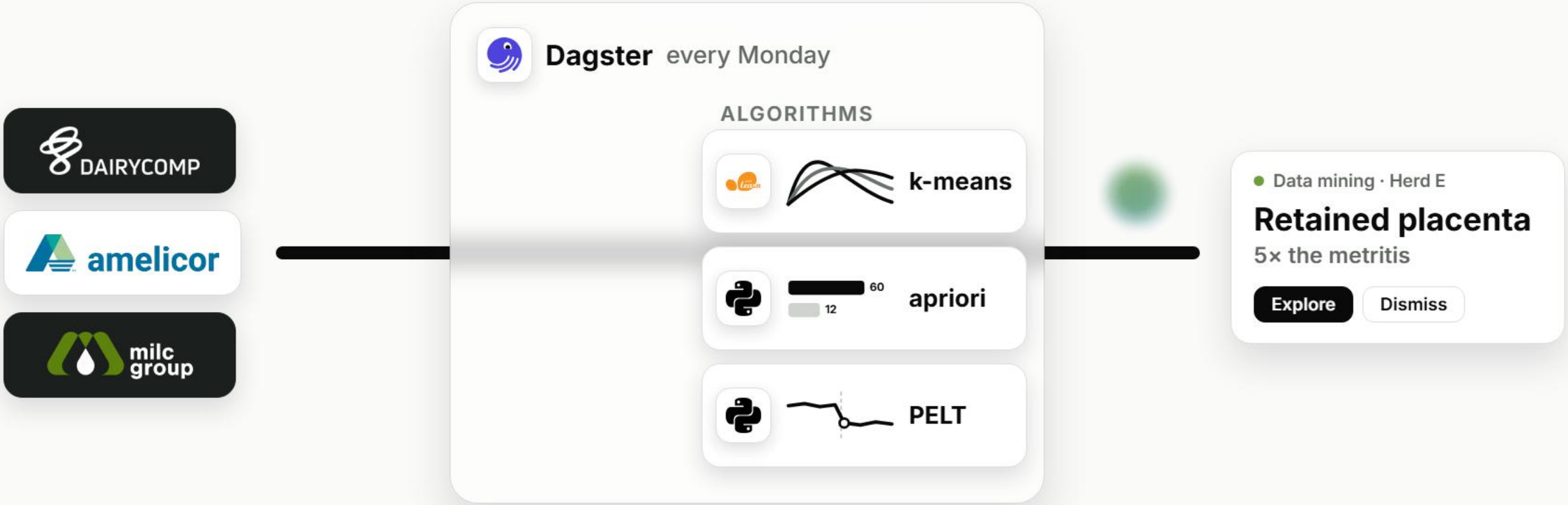
# Dairy Ration Lab

```
$ claude mcp add --transport http ration-lab \
  https://mcp.dairydatascience.com
```



DATA MINING

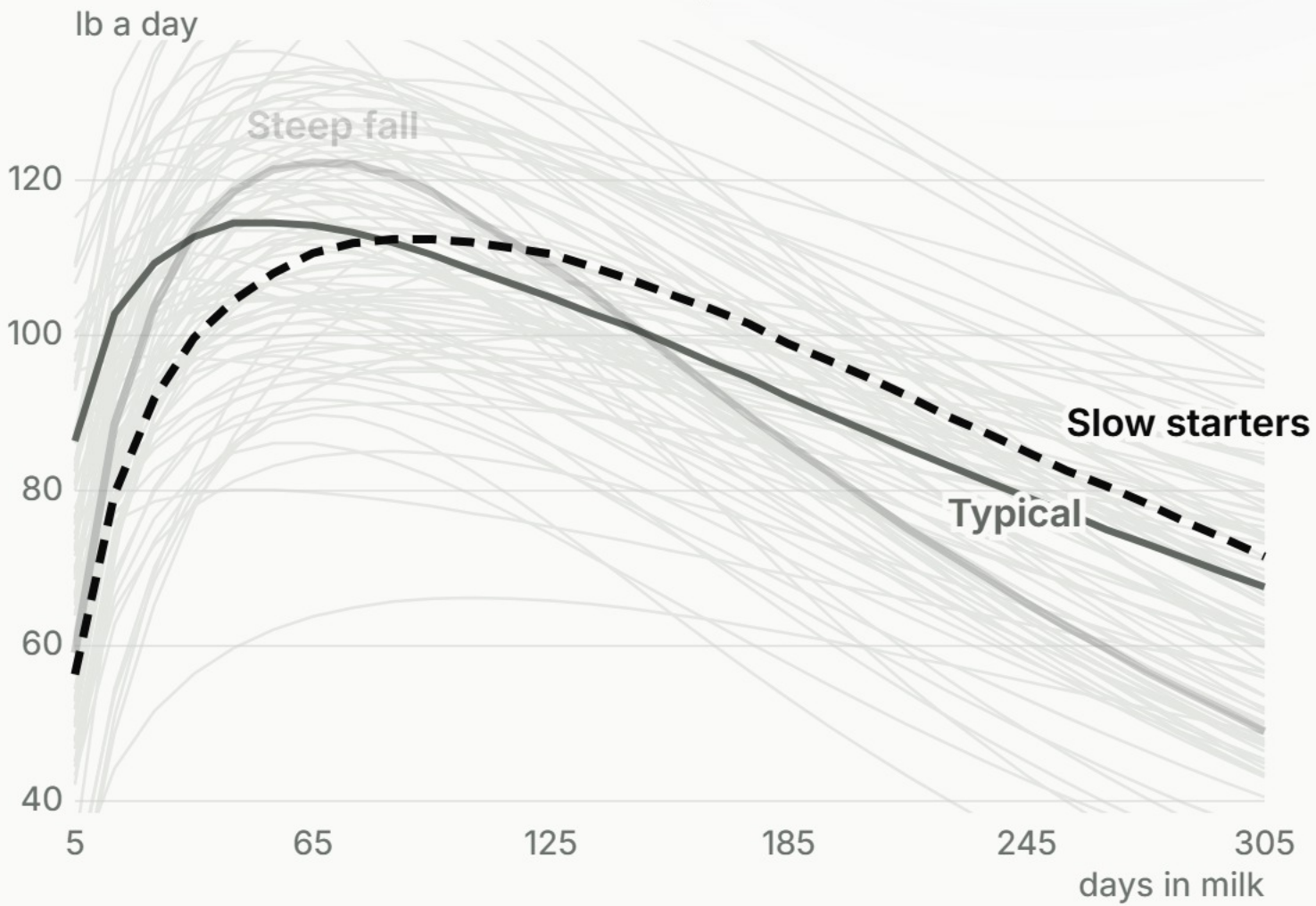
# Agent-run ML pipelines



DATA MINING

# Three shapes of lactation

The median curve of each shape




MASTITIS, FIRST 30 DAYS · HERD A

**Slow starters**
396 cows

6.8 in 100

**Typical**
1,037 cows

3.1 in 100

`k-means, 4 groups → 3 shapes`
`2,706 lactations · 6 dairies`

DATA MINING

# A missed pregnancy check

PREGNANCY CHECK
**Bred again after she conceived**

→

HER RECORD
**Due date 3 weeks late**

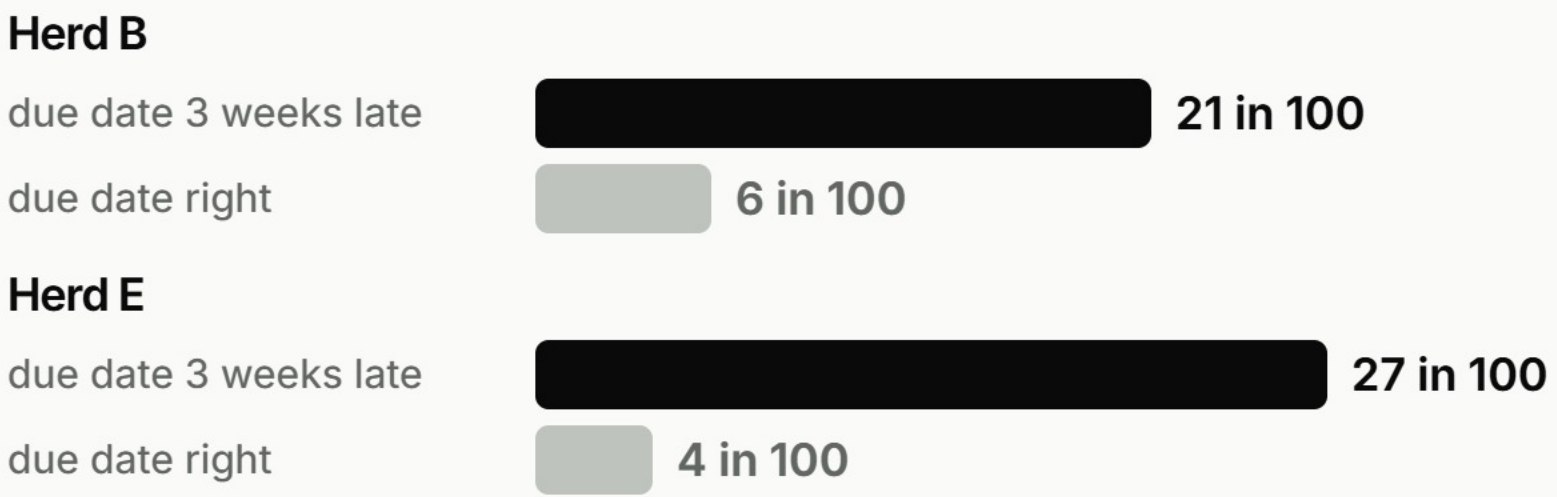
→

SO
**Short dry period and close-up**

→

THEN
**Retained placenta**

COWS WITH A RETAINED PLACENTA




THE OPPORTUNITY

**Right pregnancy dates, right dry-off**

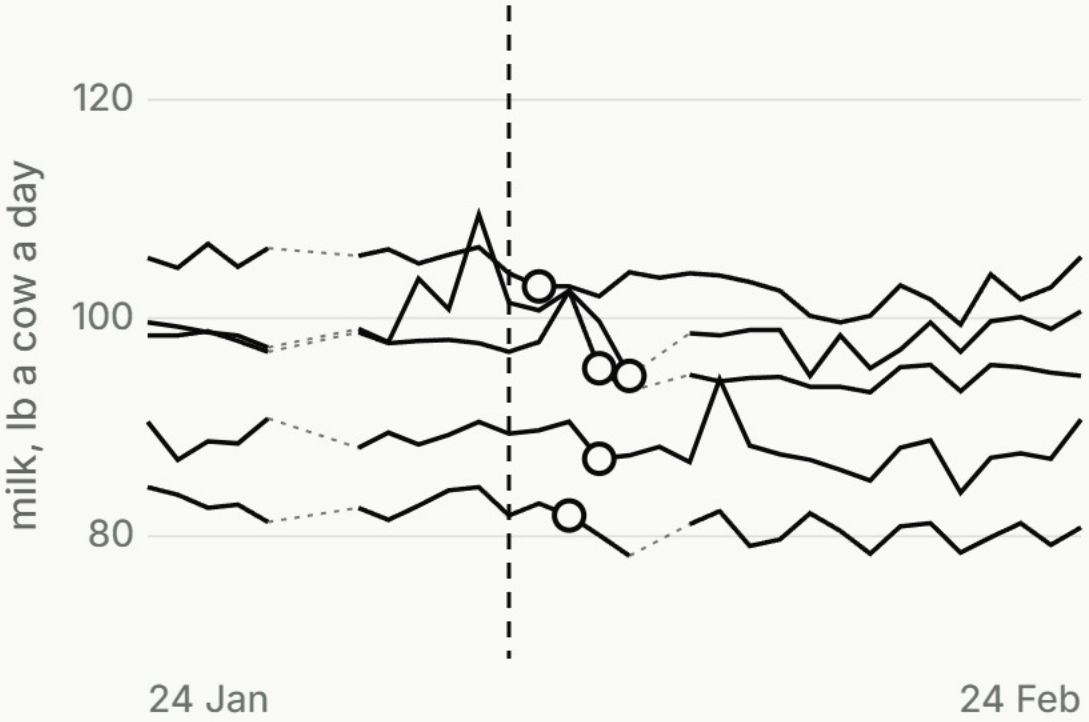
DATA MINING

# Feed switches, milk response

Herd A: 39 of the 59 shifts came after a ration change in that pen

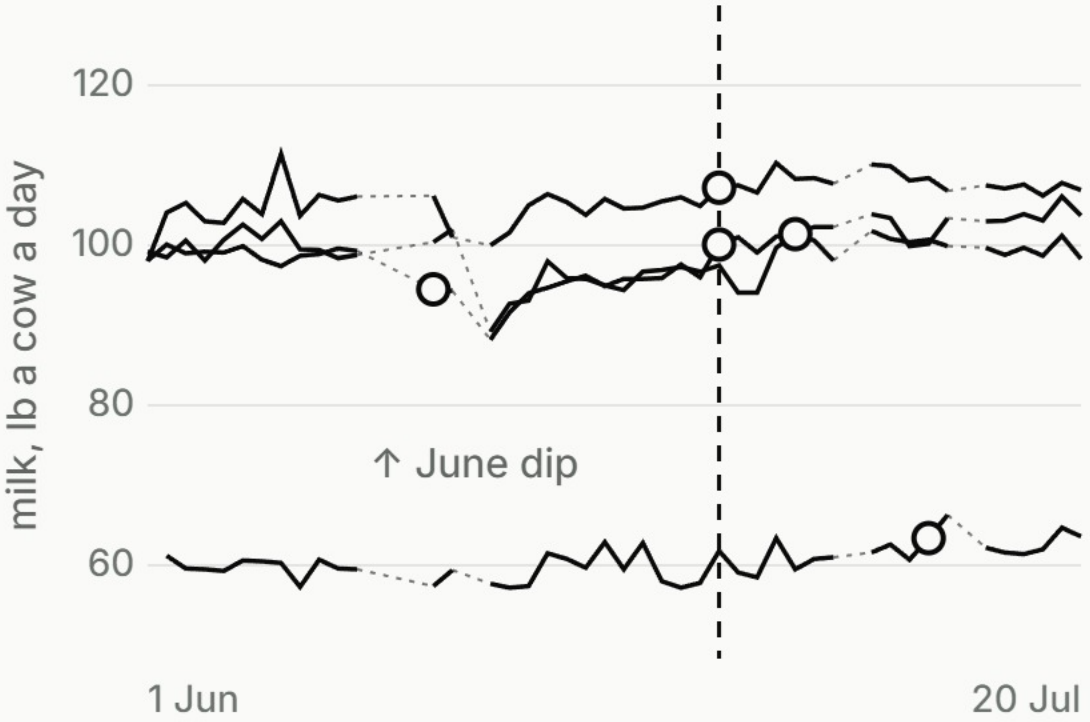
**Sorghum for wheat silage, 5–10 Feb**

5 pens: −2 to −4 lb




**Dry distillers for wet, 1–3 Jul**

4 pens: +3 to +7 lb

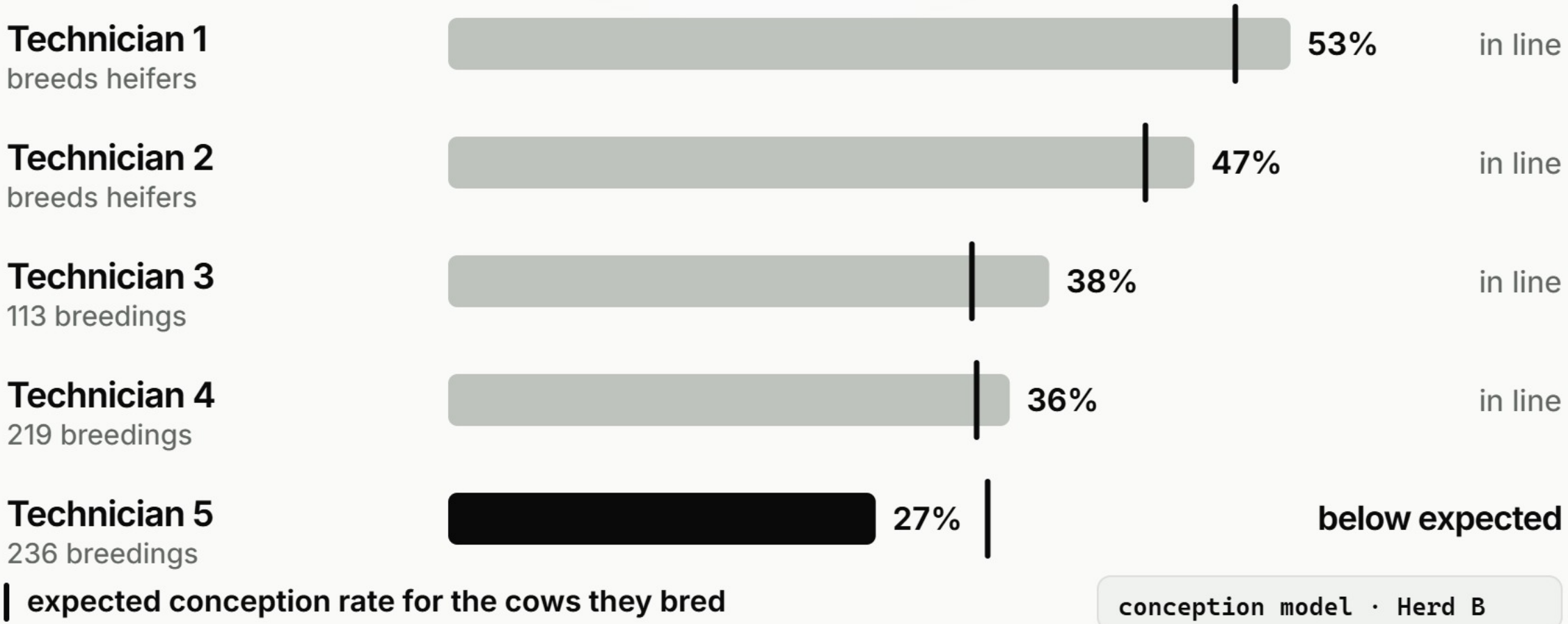



`PELT change points · Herd A`

DATA MINING

# Technicians, on the cows they bred

Herd B · pregnant per breeding



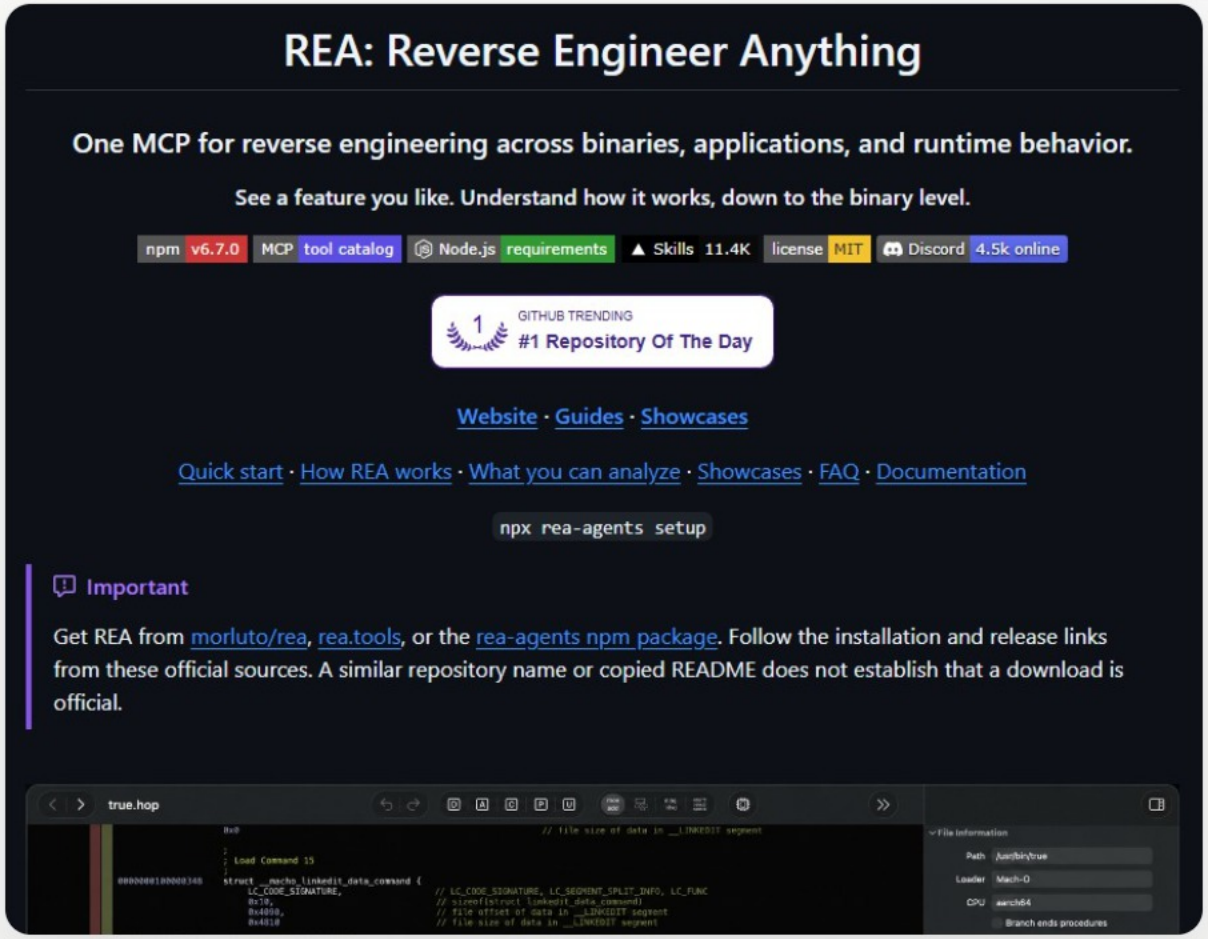

conception model · Herd B

REVERSE ENGINEERING

# Reverse engineer anything

`github.com/morluto/rea`

One install line gives an agent the tools to take software and machines apart.




github.com/morluto/rea, 27 Oct 2026

## ★ 397,785

stars in six months

**99,759** copies people took to build on

- Old hardware
- Smart TVs
- Apps
- Farm machines

REVERSE ENGINEERING

# The calf milk pasteurizer

THE NEED

## Its alerts only reach a phone standing next to it

The machine talks Bluetooth, to its own phone app

HOW WE READ IT

## A Raspberry Pi listens for the same Bluetooth signal

The temperature and minutes left, decoded from the bytes, every few seconds

WHAT IT DOES

## Works out each cycle and texts the crew when bags are ready

In English or Spanish. Controls cycles remotely.

SINCE 31 JULY

## 227 cycles and 1,833 texts at two dairies

The machine is untouched





GUARDRAILS

# When agents go wrong

**Summer Yue**
@summeryue0 · Follow

Nothing humbles you like telling your OpenClaw "confirm before acting" and watching it speedrun deleting your inbox. I couldn't stop it from my phone. I had to RUN to my Mac mini like I was defusing a bomb.

**matt.j.robb** · Follow

View on Threads

So muse handled my Facebook marketplace today. Just found out it told people my address and agreed a lowball price and then they showed up without it even telling me until late tonight that it messed up.

Absolutely wild.



# Thank you

**Pádraig Lucey** MVB, MPVM, Ph.D., DACVPM-Epi, PAS
Dairy Technical Consultant, Elanco Animal Health



**dairydatascience.com**
padraig.lucey@elancoah.com




## Dairy Data Tools
Skills and cards for your agent
`github.com/padge01/dairy-data-tools`

## BESTPRED
USDA lactation records
`bestpred.dairydatascience.com`

## Dairy Ration Lab
Balance a ration
`lab.dairydatascience.com`