



NexWelfare
Science • Advice • Decision

AI-assisted Animal Welfare

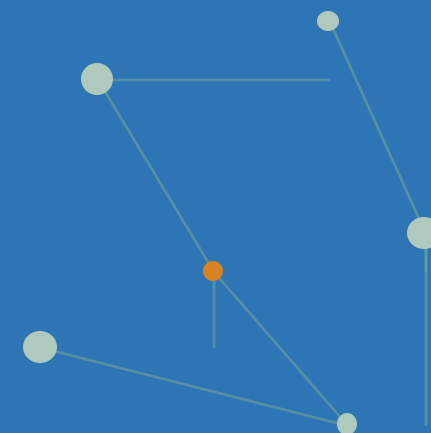
potential and applications

Jean-Loup Rault^{1,2} and Peta Taylor³

¹ University of Veterinary Medicine Vienna

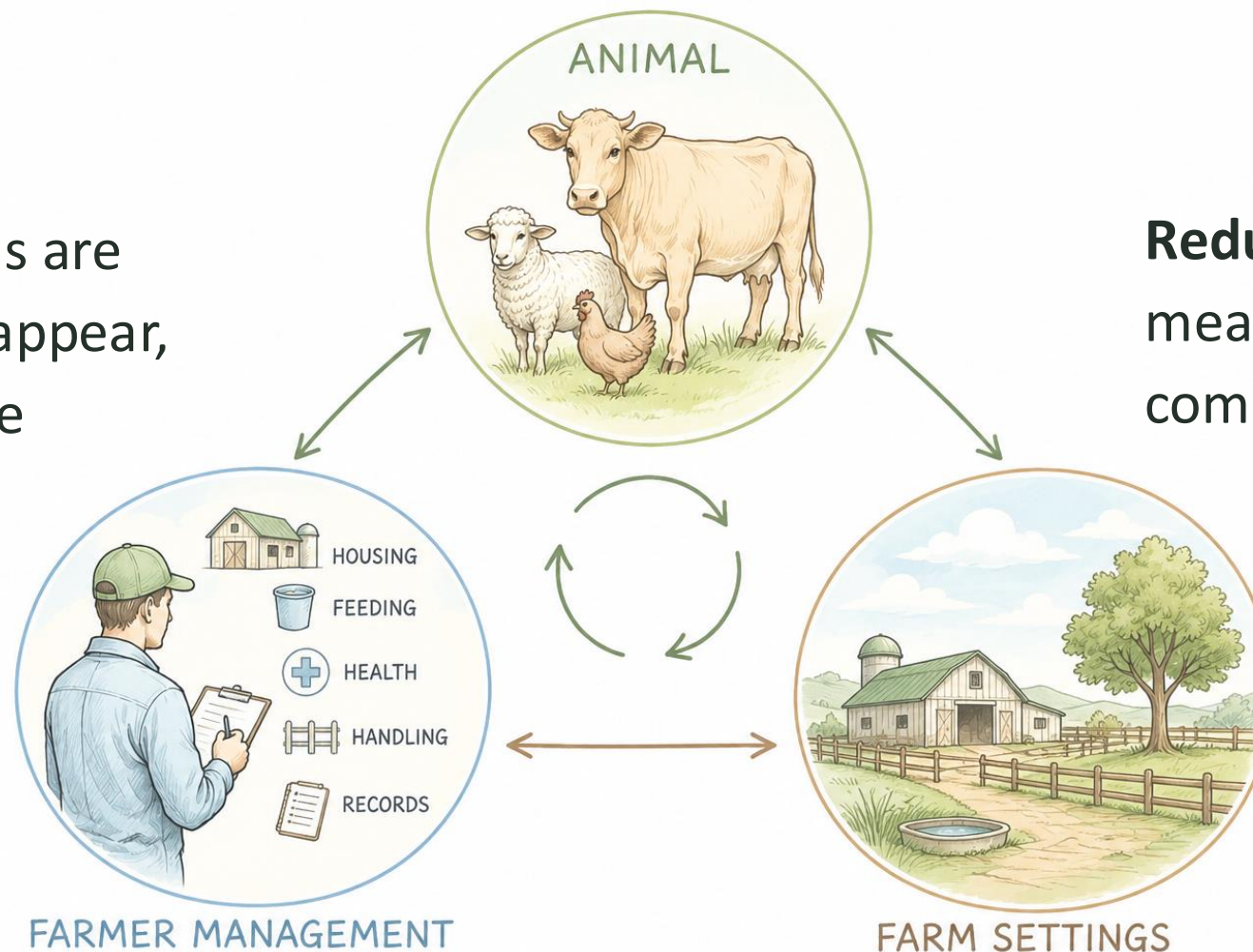
² NexWelfare consulting, Tallinn

³ University of Melbourne



Welfare is dynamic and multidimensional

Reactive: problems are caught after they appear, sometimes too late



Reductionist: single measures cannot capture complex interactions

Welfare management = assessment + decision

SEEING the problem

- **Attention & timing**

checked at the wrong moment, or not closely enough

- **Experience**

telling normal from abnormal; knowing if it can be fixed

- **Reference range**

no colleague to ask, no reference point



ACTING on it

- **Consistency & records**

different people, no notes, no clear instructions

- **Correct intervention**

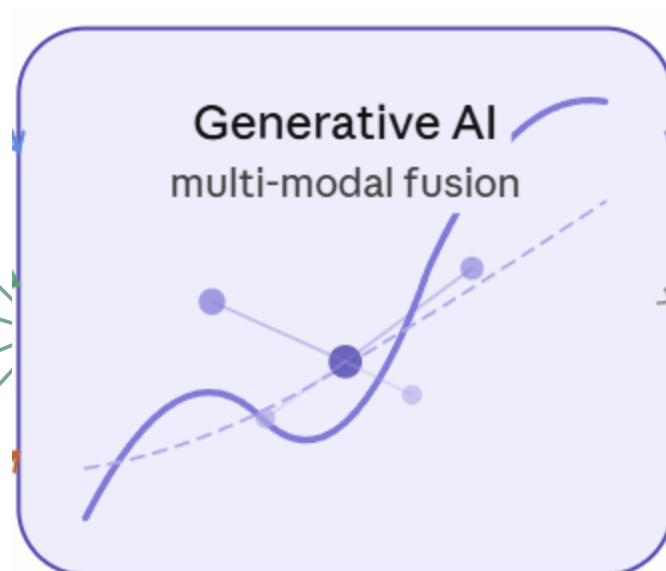
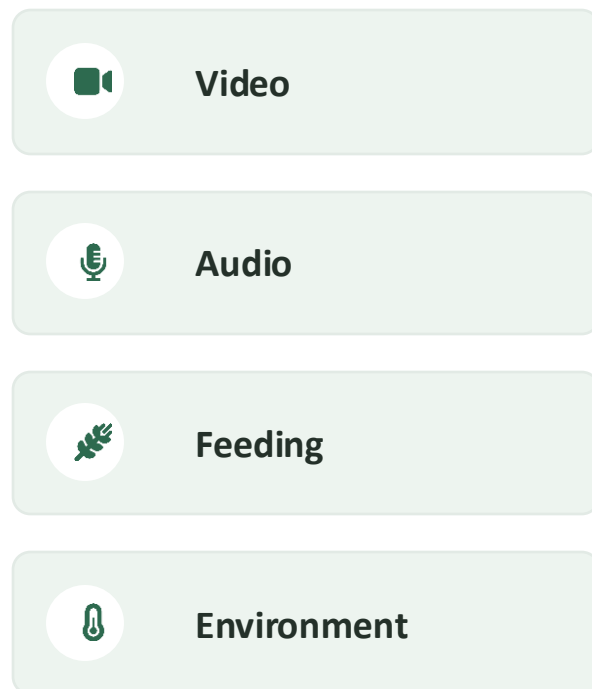
most effective treatment fitted to the problem

- **Pressure to delay**

Economic, time social pressure (e.g. euthanasia)

From information to decision: a new chain

PLF



Farmer

Decision A

Decision B

Decision C

- Animal welfare data various, complex (various indicators)
- Unsupervised learning + generalisation
- Flexible options



A longitudinal broiler dataset

- Commercial free-range broilers
- Continuous RFID ranging data at individual level
- Welfare scored weekly 1 → 6

Week	ID	Sex	Weight	GS_RoundedUP	Lame	HighestFF	HighestHE	Latency	OverallFreq
2	SADA7600B5	1	0,52	1	1	0	1	2	86
2	SADA7600B6	1	0,43	1	1	0	0	2	76
2	SADA7600C5	2	0,61	1	1	0	0	9	19
2	SADA7600CB	2	0,57	1	1	1	0	7	9
2	SADA7600D5	1	0,53	0	1	0	0	6	76
2	SADA7600DD	1	0,48	0	1	0	0	2	132
2	SADA7600DE	2	0,61	1	1	0	0	7	15
2	SADA7600E0	2	0,6	1	1	0	0	7	76
2	SADA7600E3	1	0,53	0	1	1	1	6	93
2	SADA7600F1	2	0,61	1	1	0	1	2	19
2	SADA7600F7	1	0,54	0	1	0	0	10	53
2	SADA7600F8	2	0,53	1	1	0	0	4	50
2	SADA7600FA	2	0,57	1	1	0	0	2	79
2	SADA7600FE	2	0,6	1	1	0	1	9	17
2	SADA760103	2	0,52	0	1	0	0	2	74
2	SADA760106	2	0,55	0	1	0	1	3	79
2	SADA760107	1	0,55	1	1	0	0	6	67
2	SADA760109	1	0,49	0	1	0	0	17	5
2	SADA76010B	2	0,54	1	1	0	0	2	55
2	SADA760112	1	0,44	0	1	0	0	6	91
2	SADA760114	2						7	64
2	SADA760117	1	0,5	0	1	0	0	2	98
2	SADA760119	1	0,48	0	1	2	0	3	155
2	SADA760121	1	0,5	0	1	0	0	14	2
2	SADA760122	1	0,54	1	1	0	1	24	1

- Chat GPT-5.5 Thinking, as a model of off-the-shelf publicly available AI
- Prompt (31.03.2026): “Here is a dataset. Could you predict the future health consequences based on the individual bird ranging pattern?”

Ranging predicts later welfare

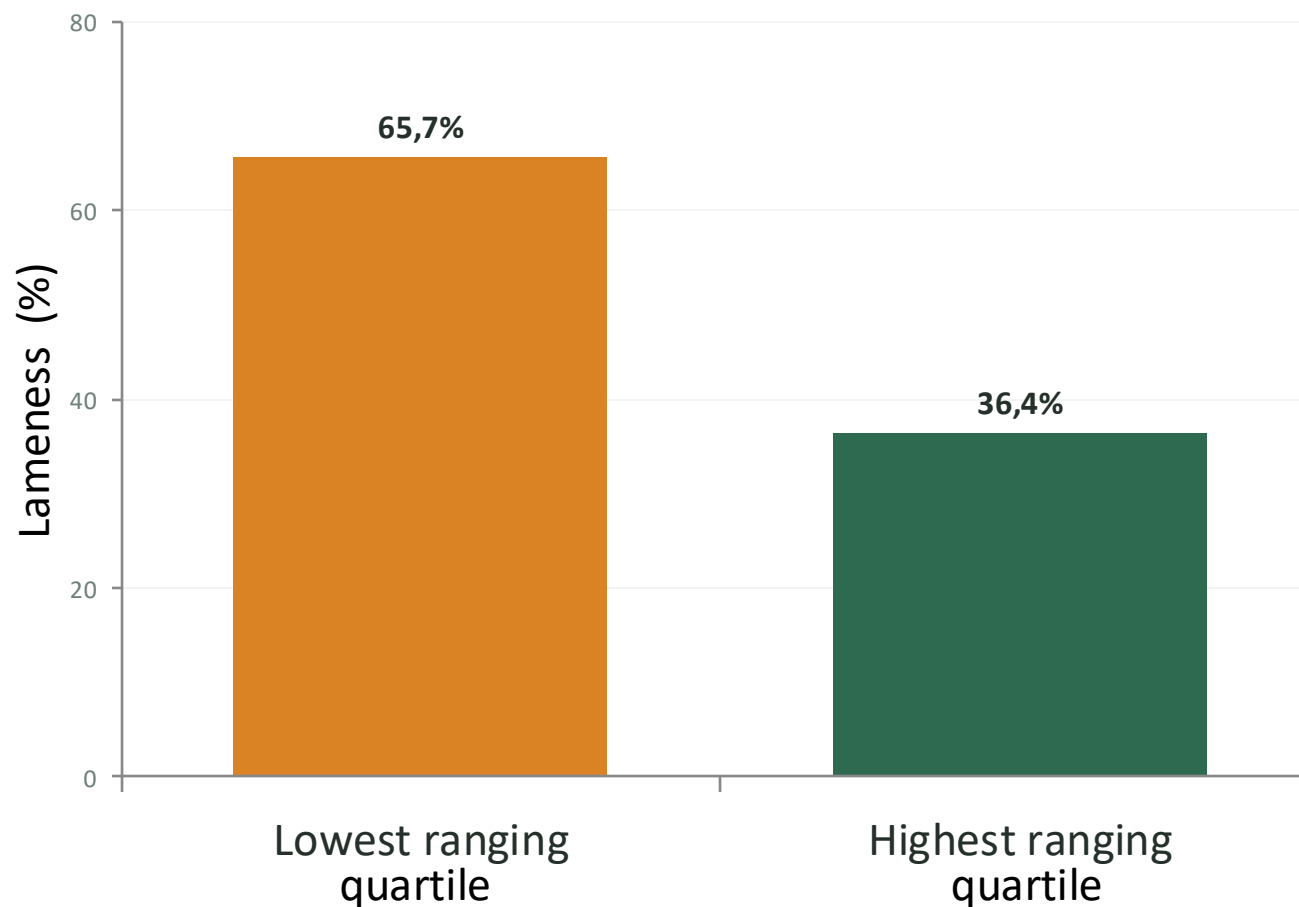
At bird level, using week 6 gait score as the later outcome:

- higher OverallFreq predicted **lower week 6 gait score**
- this remained significant after adjusting for **sex** and **day 7 weight**
- model result: $\beta = -0.0089$, $p < 0.001$, $R^2 = 0.23$

Week 6 lameness as a binary outcome:

- higher OverallFreq also predicted **lower odds of lameness**
- adjusted for sex and baseline weight
- **odds ratio per +10 units of ranging frequency = 0.895**
- **95% CI: 0.807 to 0.992**
- **p = 0.034**

Distinct ranging profiles, different outcomes



But... same prompt, same data - different answers

1st analysis · 31 Mar

65.7%

lowest-range birds lame (wk 6)

Gait $R^2 = 0.23$

Binary outcome: higher
OverallFreq predicted
lower odds of lameness
 $p = 0.034$

Re-run · 21 Jun

≈69%

lowest-range birds lame (wk 6)

Gait $R^2 = 0.24$

Re-run · memory wiped · 22 Jun

42.4%

lowest-range birds later lame

Binary outcome: higher
OverallFreq predicted
lower odds of lameness
 $p = 0.037$

⇒ non-deterministic LMMs – unstable outcomes

Predictive scenarios

Scenario 1: Do nothing

Welfare outcomes become increasingly unequal between individuals.

Scenario 2: Increase ranging in all birds

More attractive outdoor environment. Better pop-hole access. Shelter and cover. Earlier range training.

Scenario 3: Target only the low-ranging birds

Additional enrichment near exits. Modified indoor resource placement. Encouraging early exploration.

Scenario 4: Treat ranging as an early warning indicator

Use early ranging behaviour as a biomarker of good health.

Scenario 5: Selection scenario

Suppose breeding companies selected for birds that naturally range more frequently.

From reactive monitoring to preventive, evidence-based management



Interpretable assessment

- Integrate multiple data source
- Big data pattern
- Filter and synthesise in plain language
- Detection



Adaptive decisions

- Scenario simulation
- Anticipate likely outcomes
- Decision support
- Adjust management

⇒ Sound analyses & responses, but still critical human evaluation needed