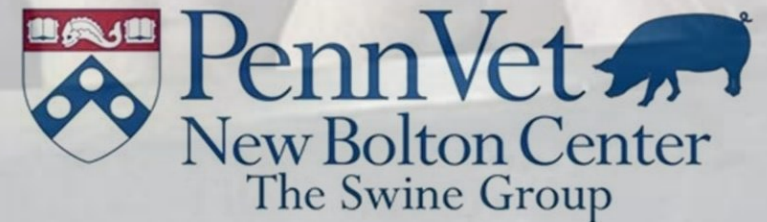


Validation of computer vision for the automated extraction of pig behaviour in the OF/NO tests

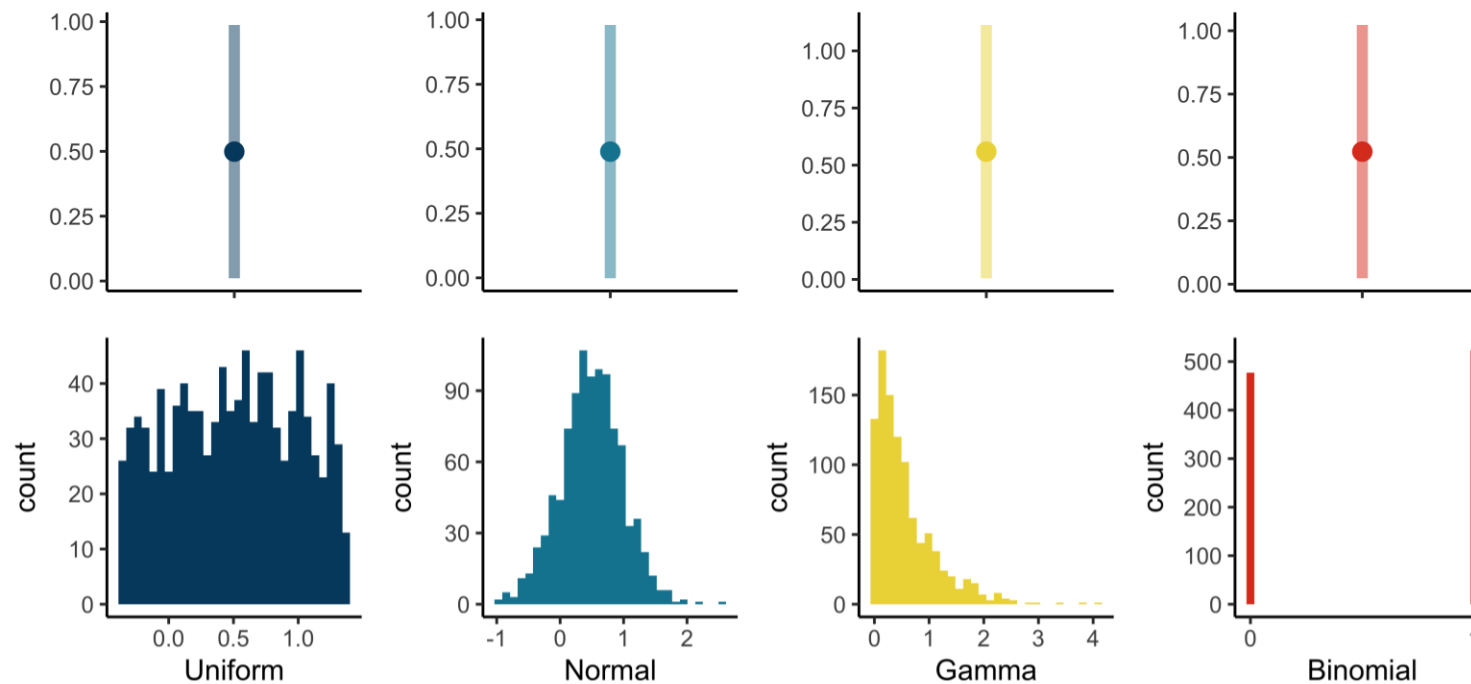
Thomas Ede, Marisol Parada Sarmiento, Leandro Sabei, Thomas Parsons
School of Veterinary Medicine, University of Pennsylvania



AI4AS Conference, June 2026



Individuality



Applied Animal Behaviour Science

Volume 212, March 2019, Pages 1-8



From the individual to the population – and back again?
Emphasising the role of the
individual in animal welfare science

Sophie Helene Richter^a , Sara Hintze^b

Front. Vet. Sci., 01 December 2022
Sec. Animal Behavior and Welfare
Volume 9 - 2022 |
<https://doi.org/10.3389/fvets.2022.1102122>

This article is part of the Research Topic
Captive Animal Behavior: Individual
Differences in Learning and Cognition,
and Implications on Animal Welfare

[View all 10 articles >](#)

Editorial: Captive animal behavior: **Individual differences** in learning and cognition, and implications on animal welfare



Jan Langbein*



Christian Nawroth*

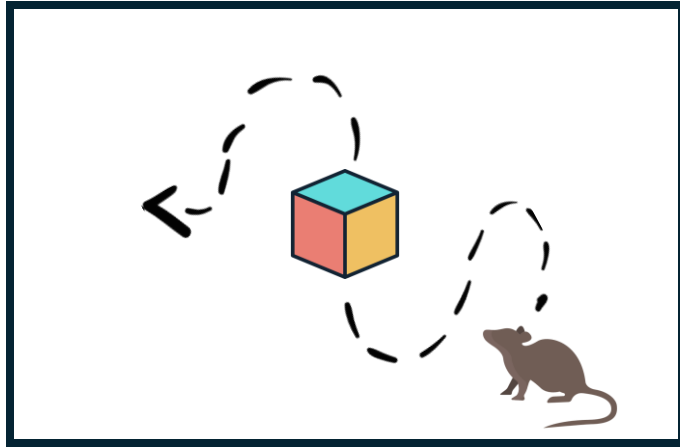
VETERINARY QUARTERLY
2023, VOL. 43, NO. 1, 1–5
<https://doi.org/10.1080/01652176.2023.2270653>

LETTER TO THE EDITOR

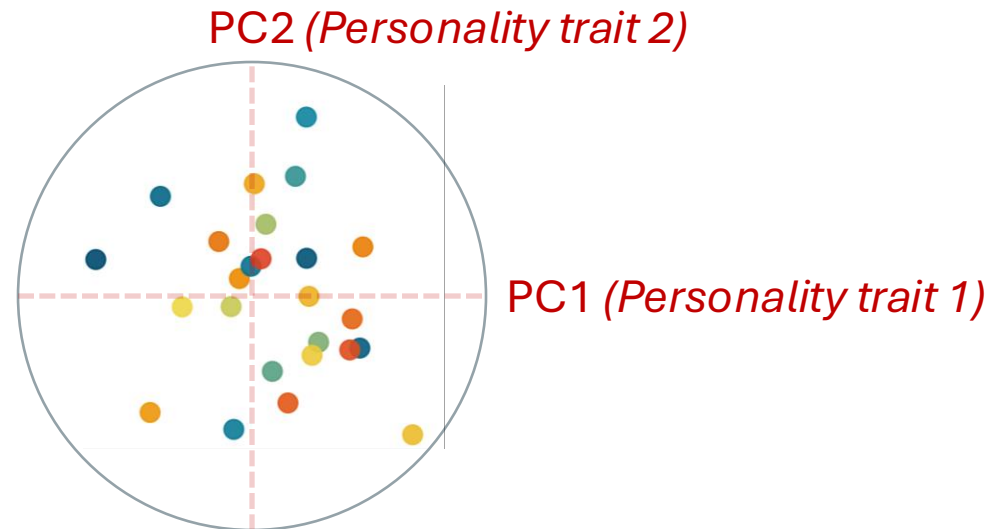
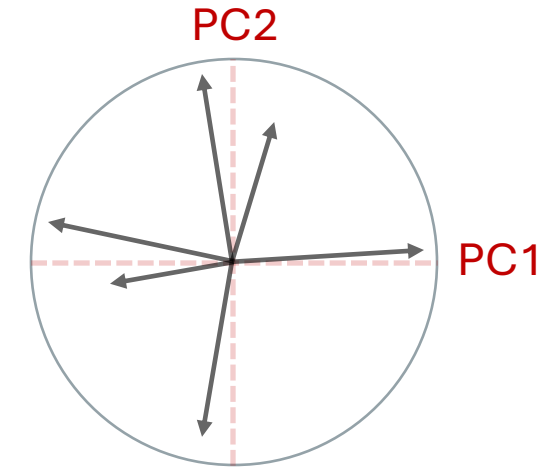
Individuality really matters for fish welfare

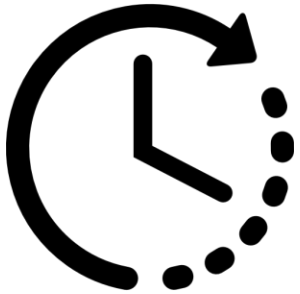
Caroline Marques Maia^{a,b}

Open Field / Novel Object tests

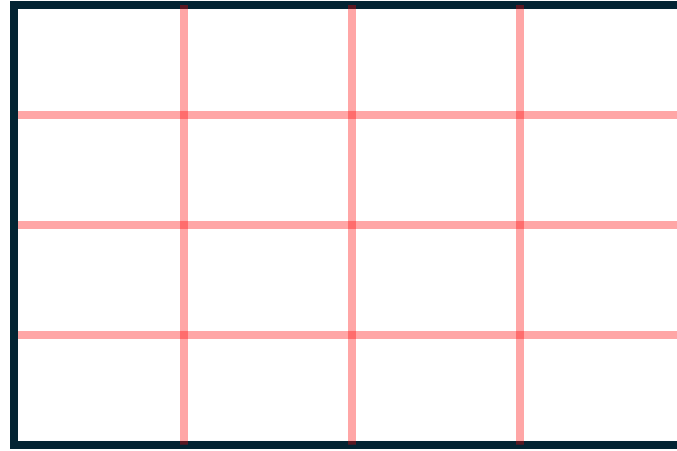


Ethogram
Behaviour 1
Behaviour 2
Behaviour 3
...

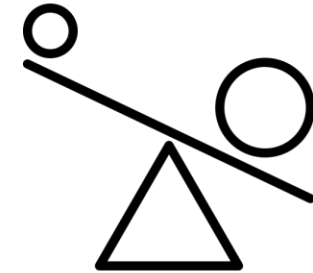




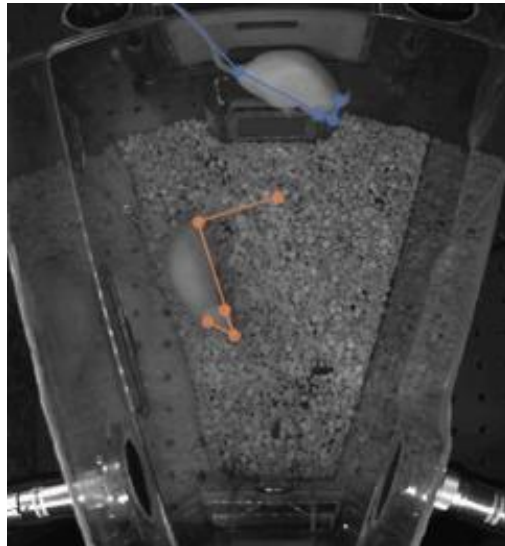
Time consuming



Coarse measures



Bias



SLEAP, Pereira et al. 2022

Objective: Apply CV to OF/NO in pigs

1/ Correlations between Manual and CV

2/ Individuality with CV

Animals

26 Large White x Landrace gilts
27.5 ± 0.5 weeks old

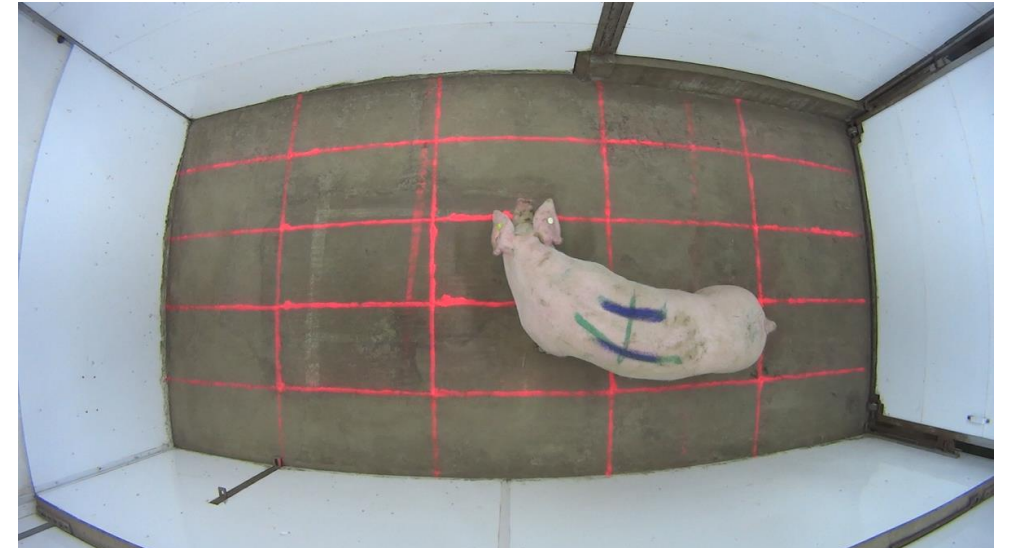


Open Field / Novel Object test

Unfamiliar 5.2 x 2.1 m arena
5 min OF + 5 min NO (PVC cone)



Sony AS30V



Manual coding

1 trained Observer
Duration and bouts:

- Moving
- Still
- Contact NO (+ latency)



BORIS

Computer vision

SLEAP

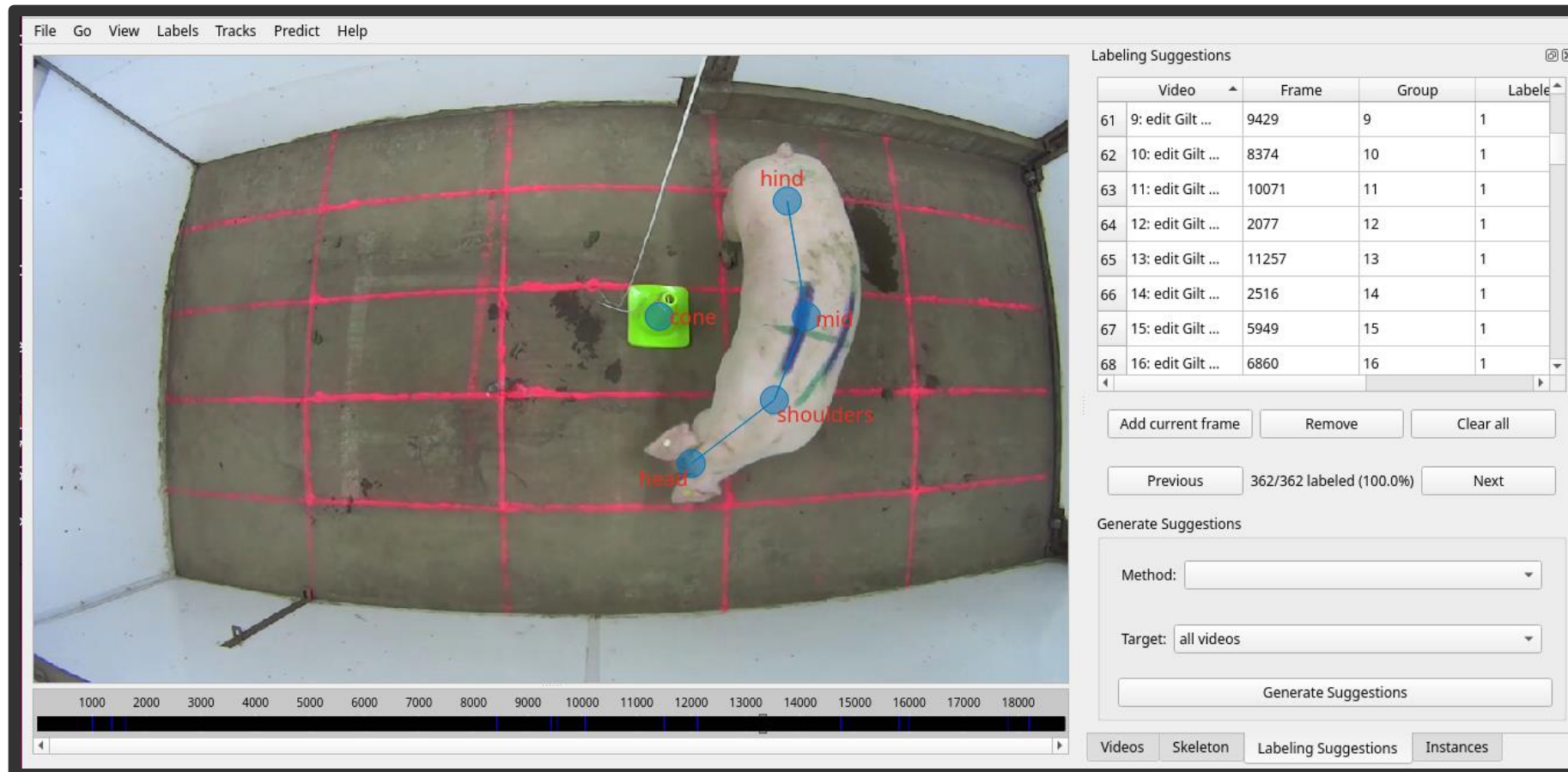
Keypoints: hind, midsection, shoulders, and head

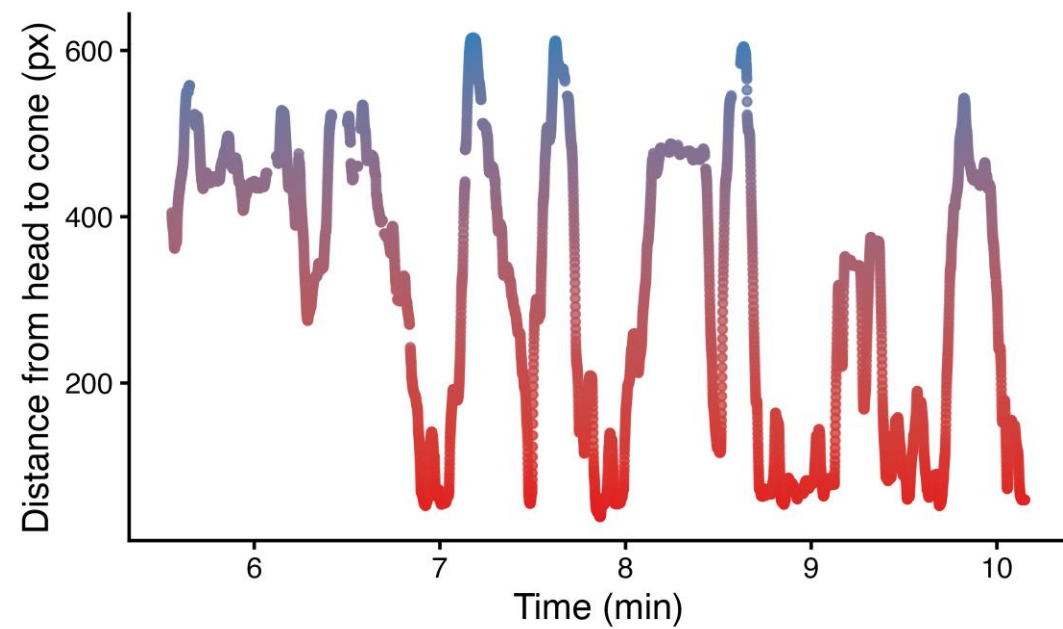
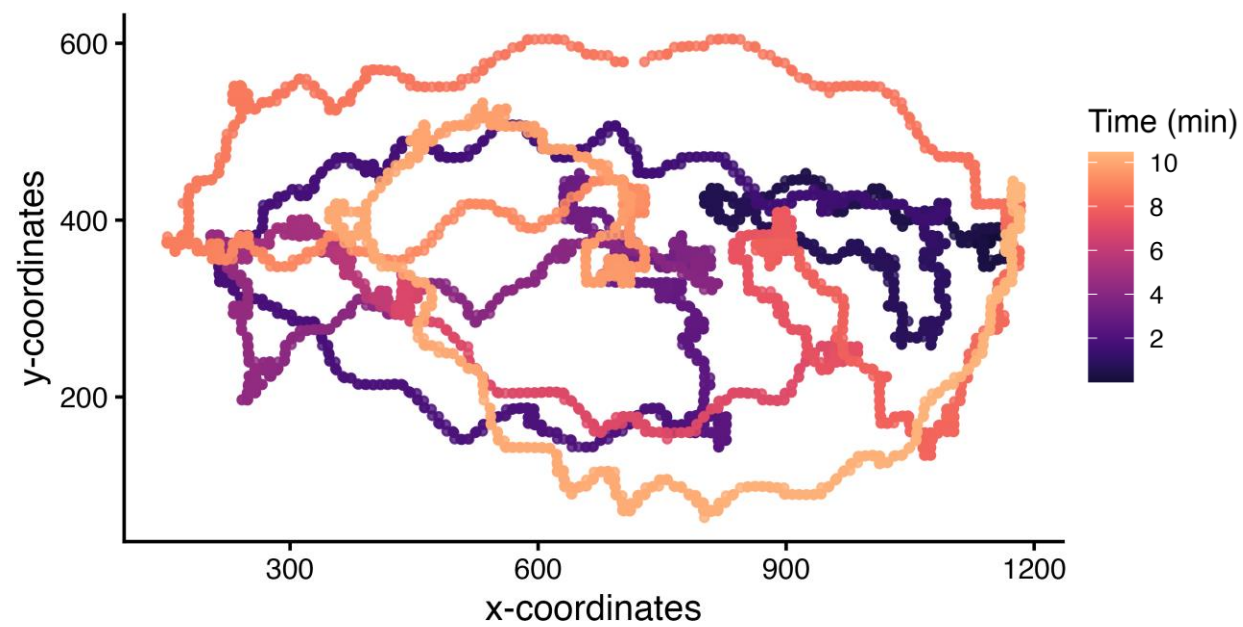
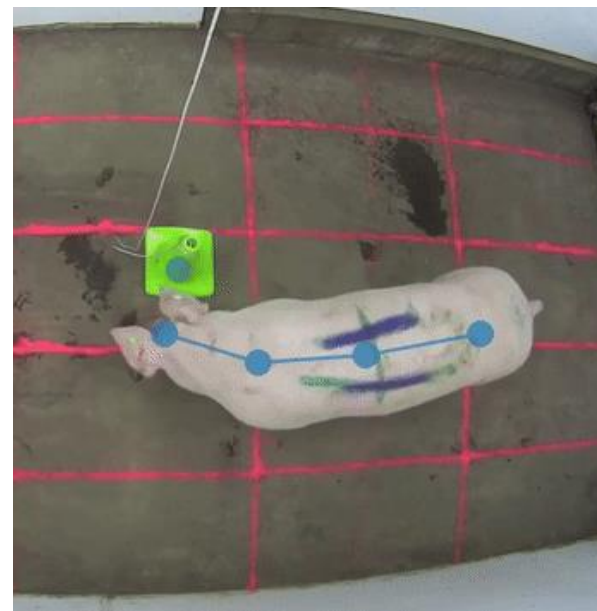
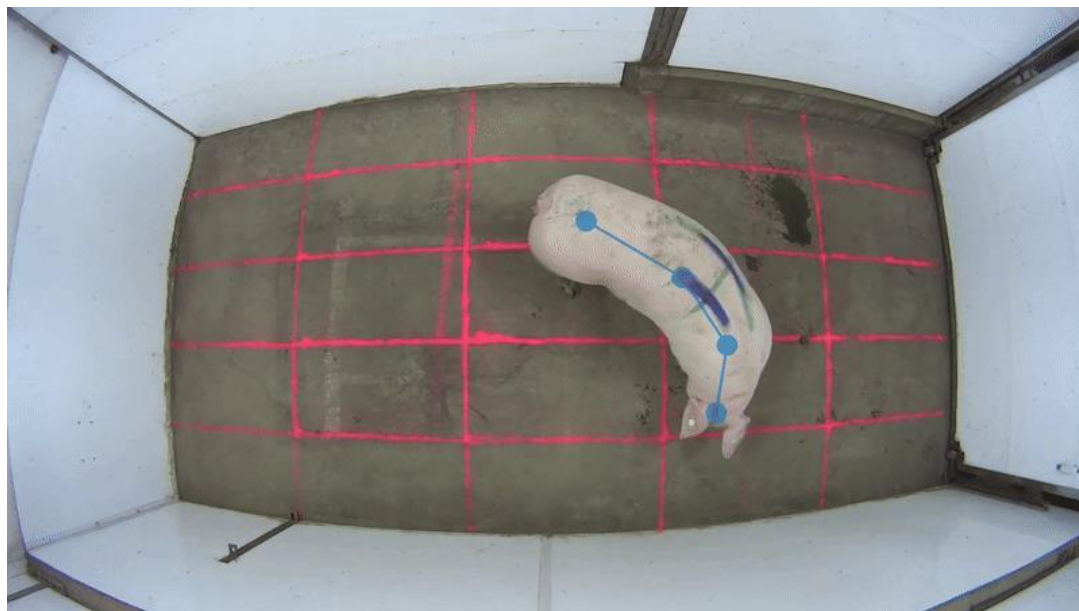
362 labelled frames (326 training)

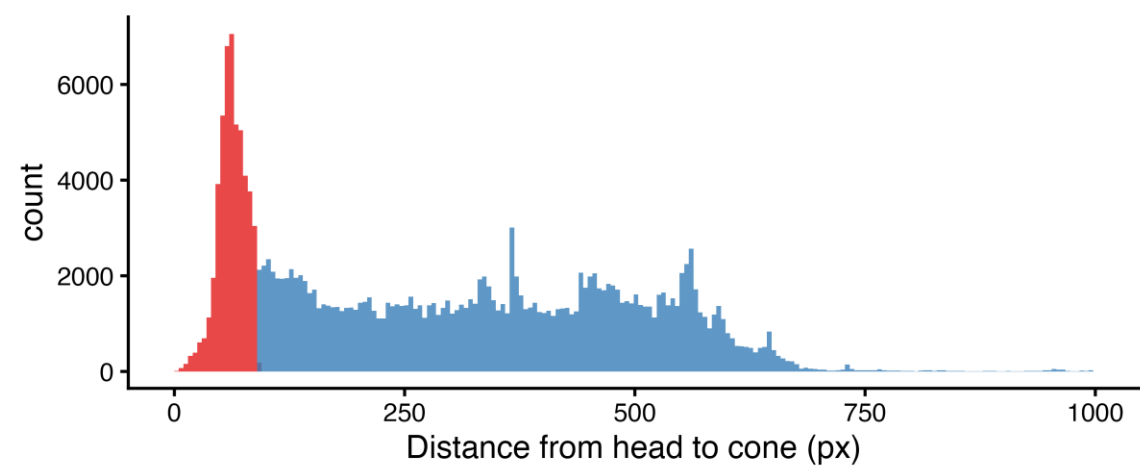
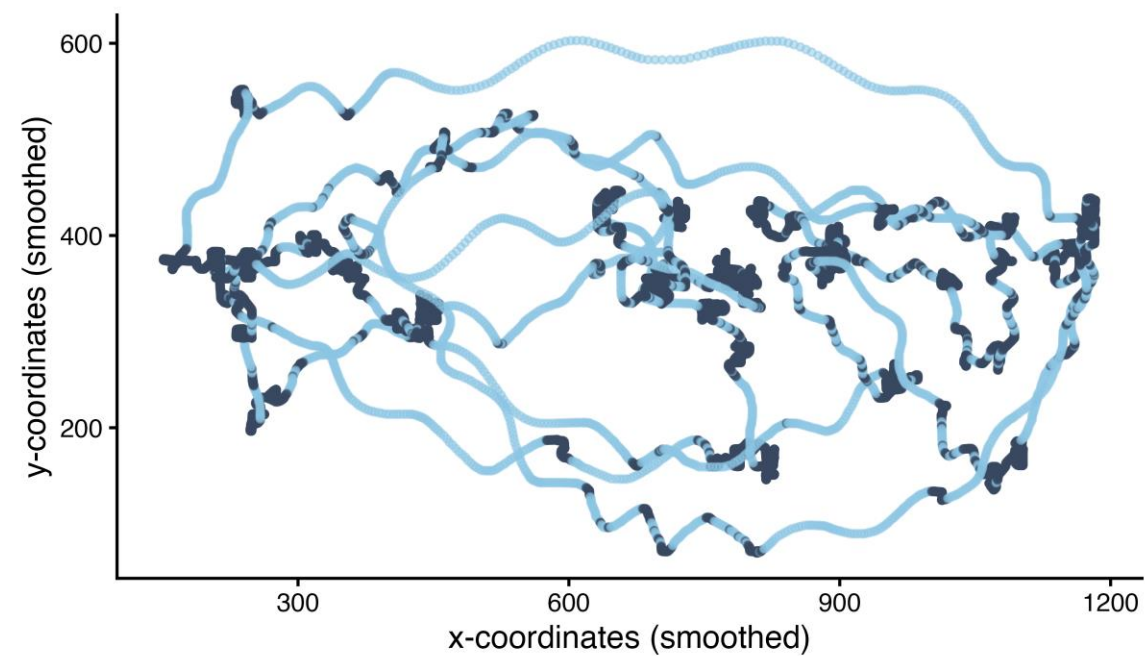
Average ground truth-prediction: 11 px

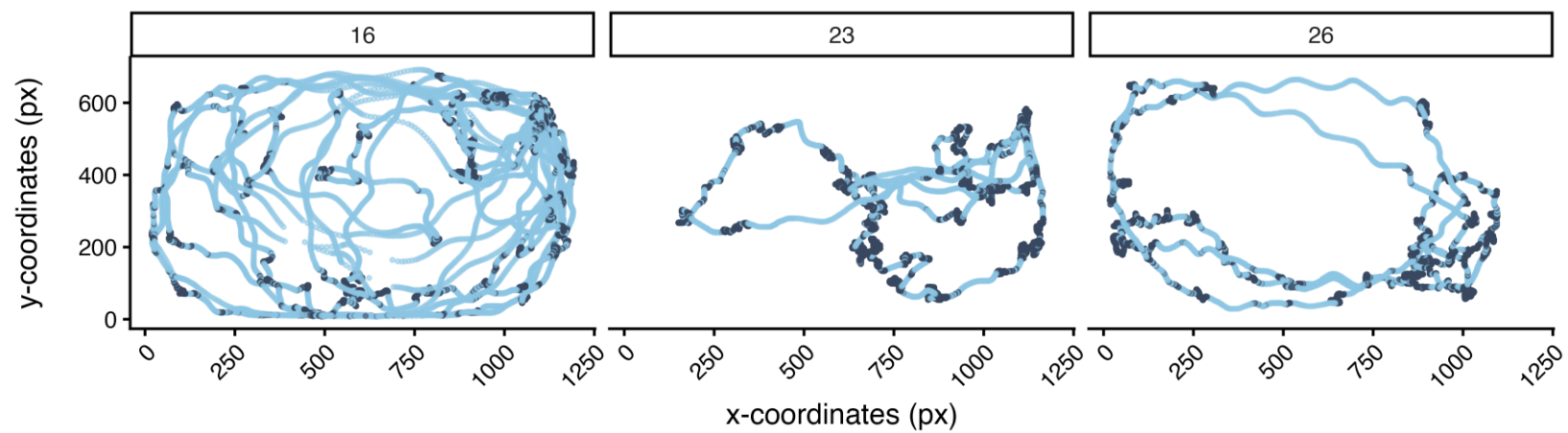
98.7% visibility precision

100% visibility recall

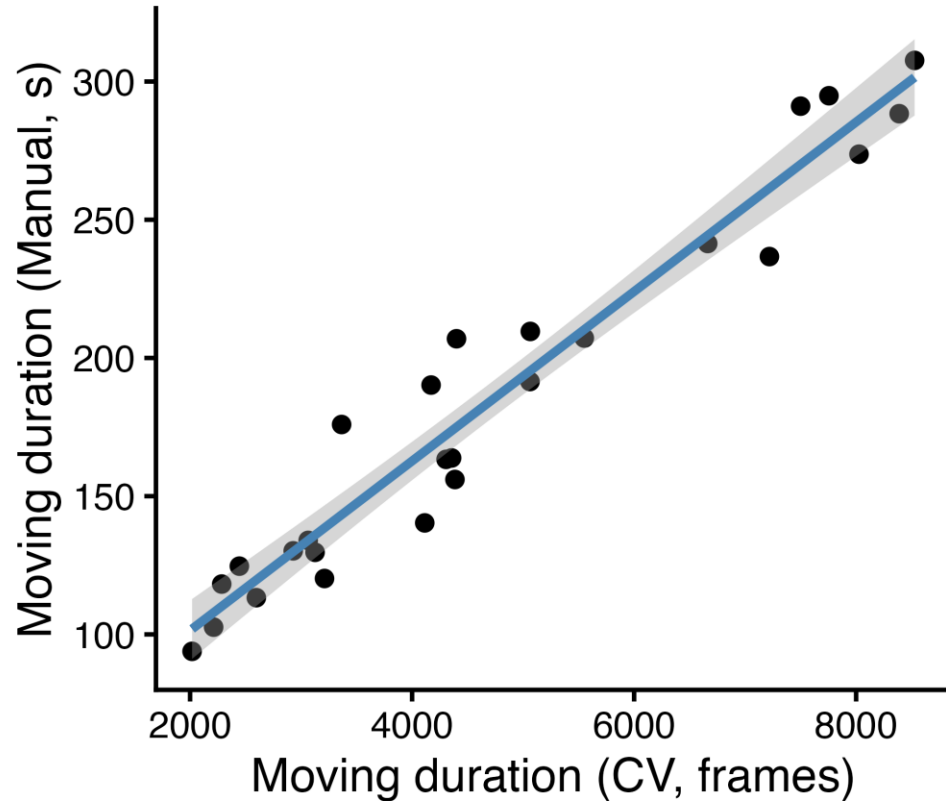








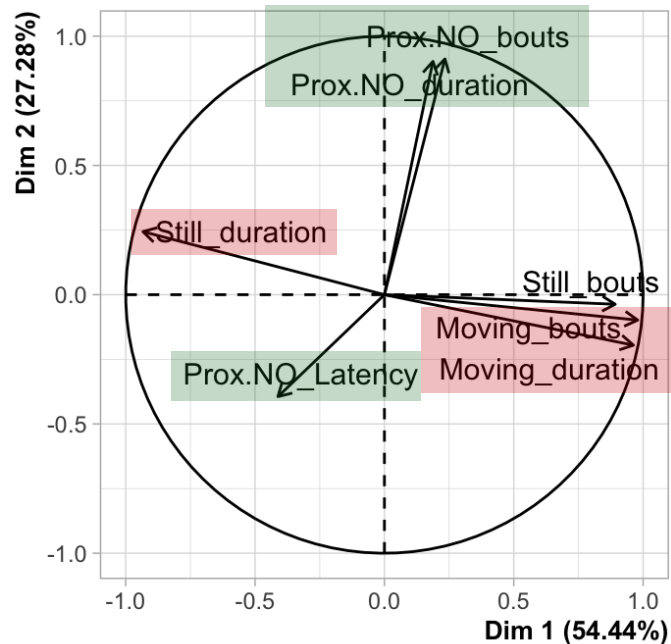
Obj.1: Correlation Manual-CV



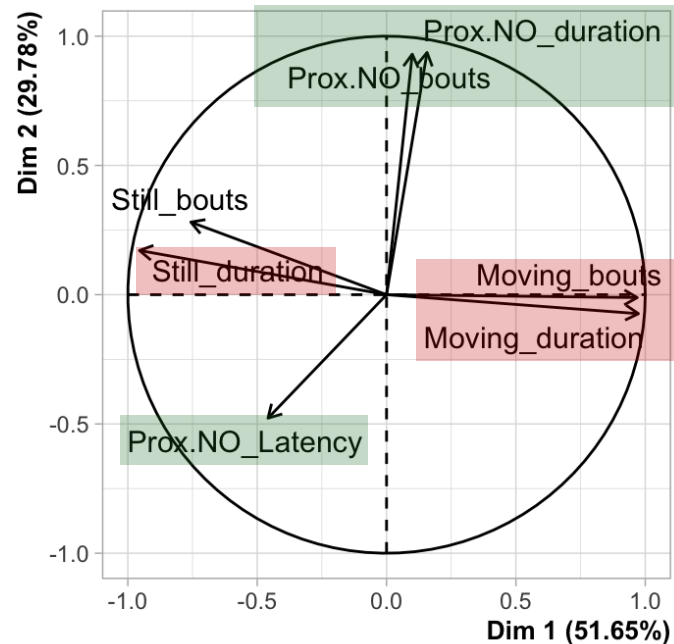
Behaviour	Outcome	R	P
Moving	Duration	0.97	<0.001
	Bouts	0.90	<0.001
Still	Duration	0.94	<0.001
	Bouts	-0.25	0.21
Proximity NO	Duration	0.87	<0.001
	Bouts	0.80	<0.001
	Latency	0.98	<0.001

Obj. 2: Individuality via PCA

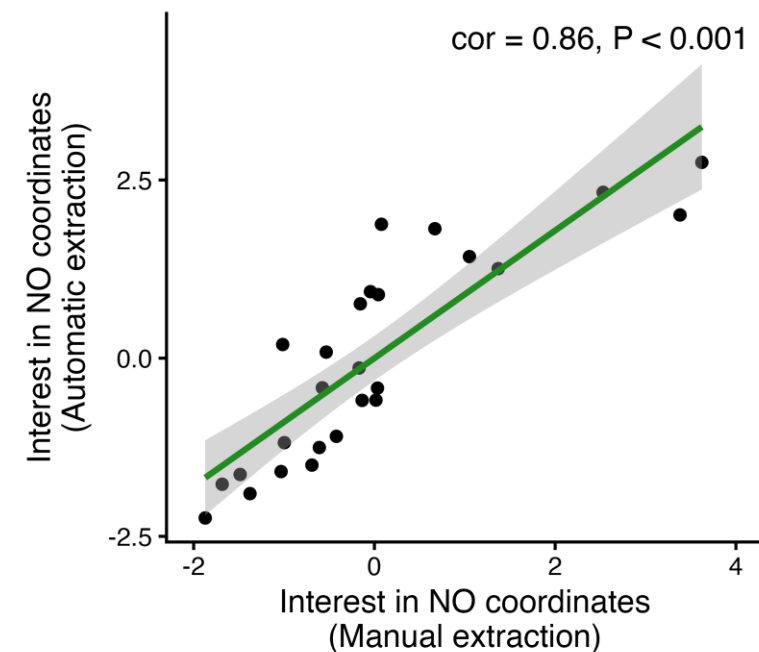
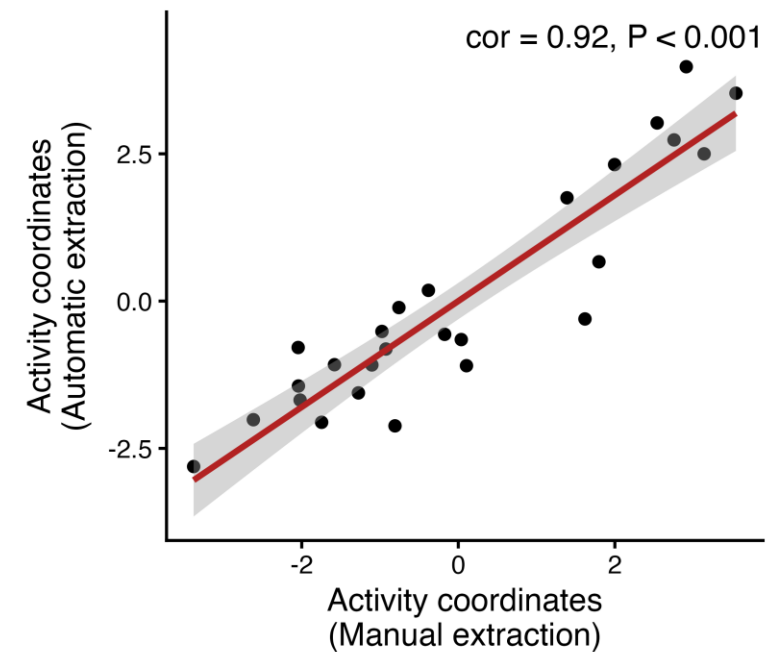
PCA Manual



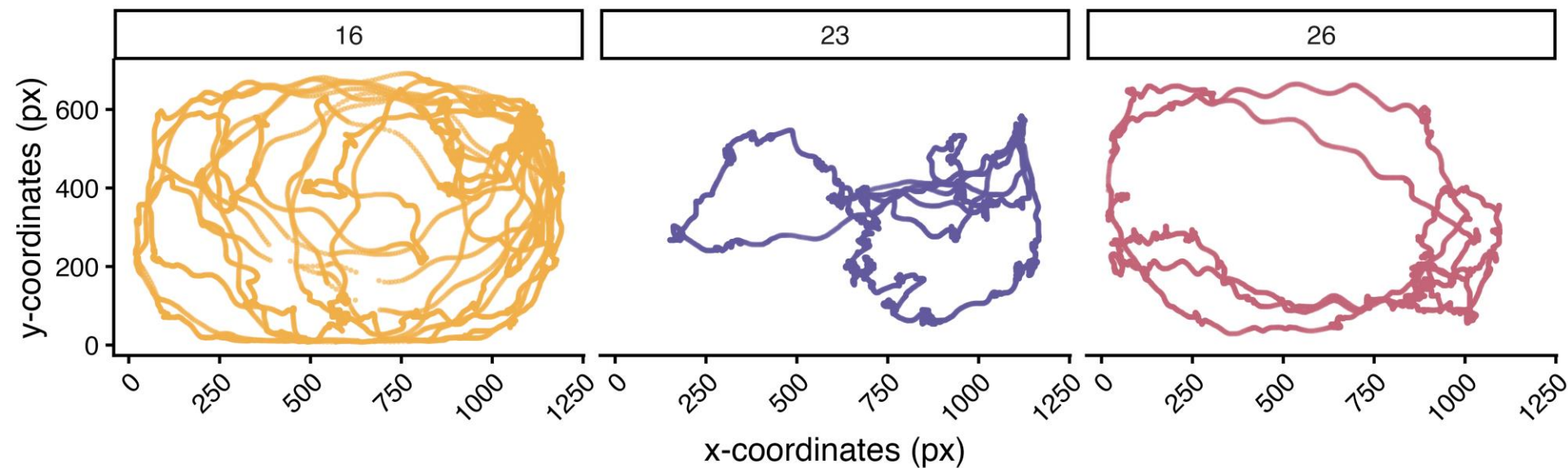
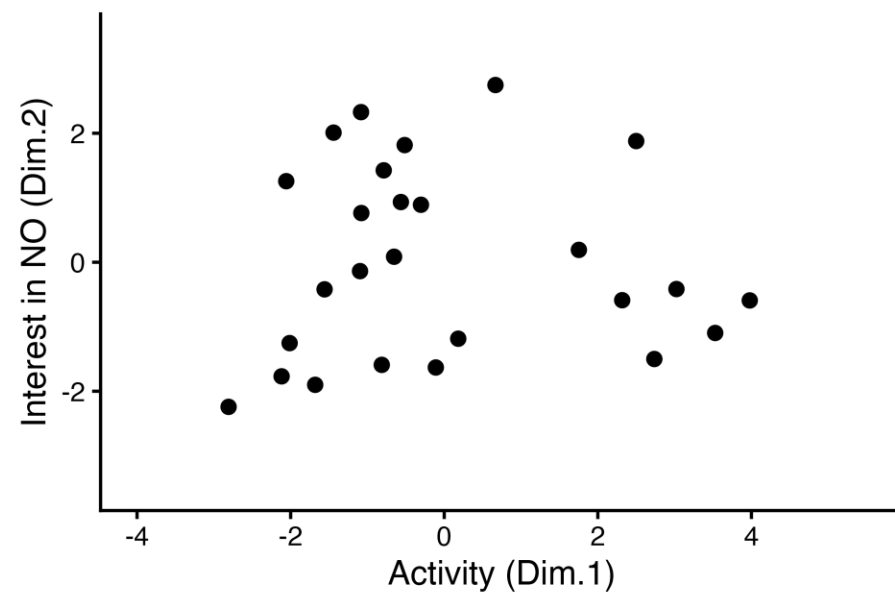
PCA CV



- Dimension 1: Activity
- Dimension 2: Interest in NO



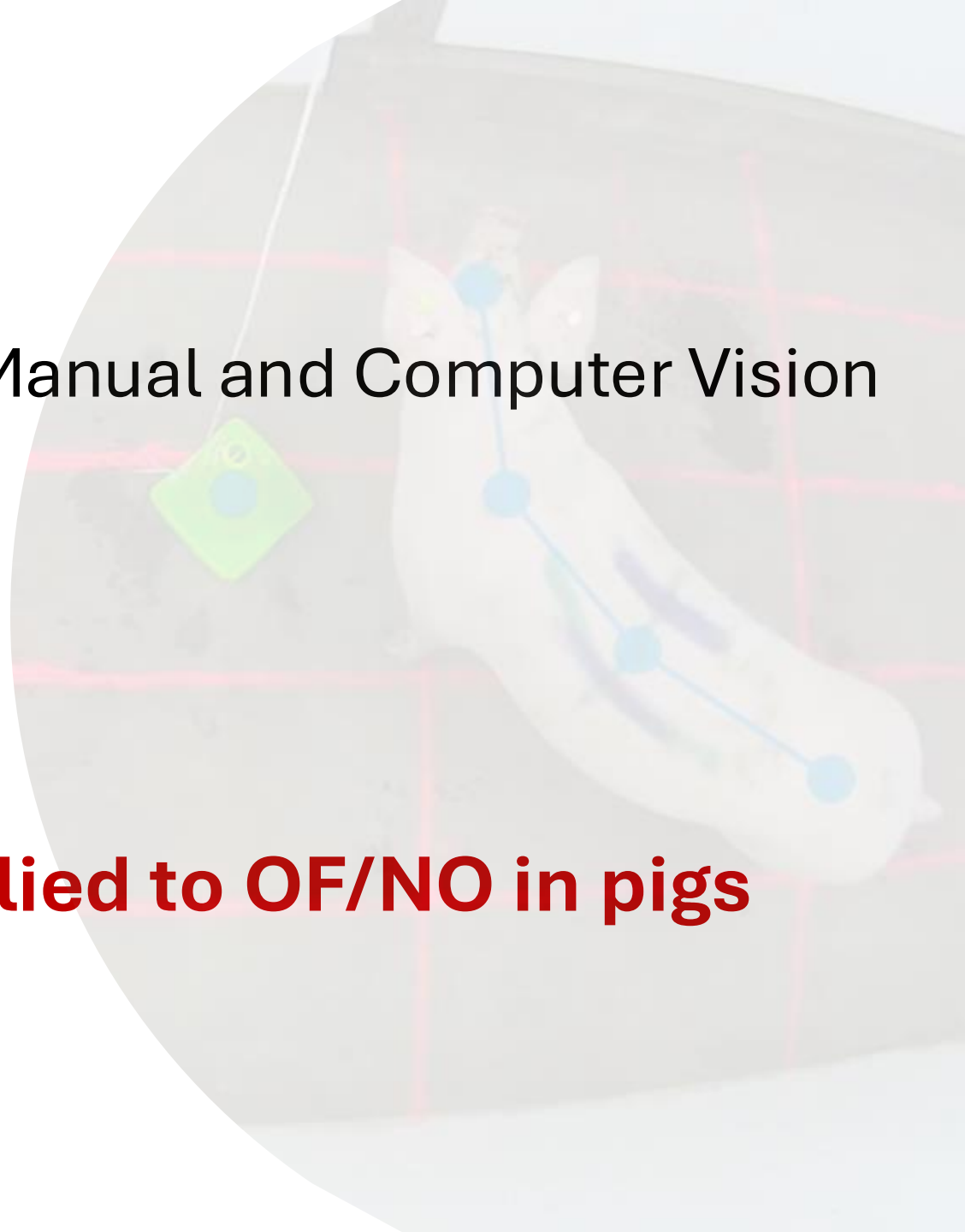
Obj. 2: Individuality via PCA



Take home points

- Excellent correlations between Manual and Computer Vision
- Consistency in PCA structures
- Reflects individual differences

CV can be successfully applied to OF/NO in pigs



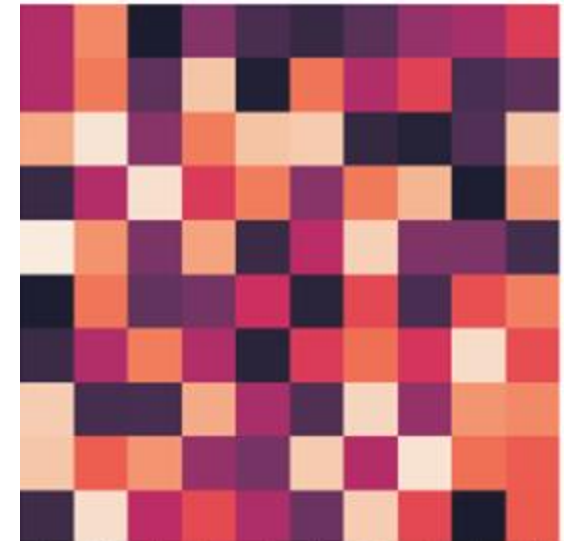
What's next?

- Easier implementation of Personality tests
- New measures

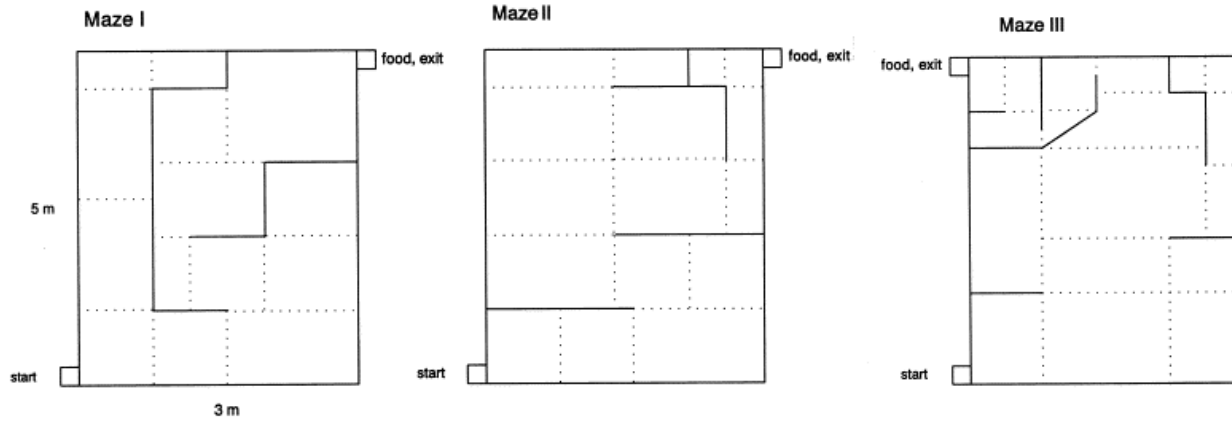
SYSTEMATIC REVIEW | APRIL 20 2023

The Open Field Test as a Tool for Behaviour Analysis in Pigs: Recommendations for Set-Up Standardization – A Systematic Review

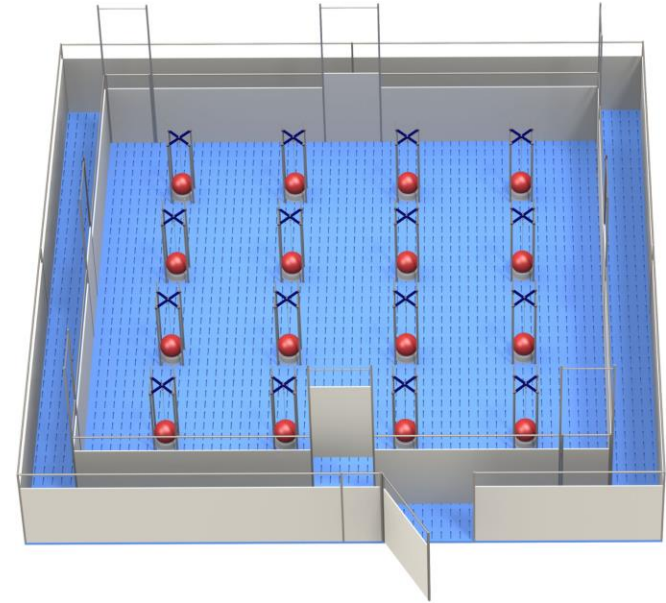
Mareike Schulz^a Leonie Zieglowski^a Marcin Kopaczka^b René H. Tolba^a



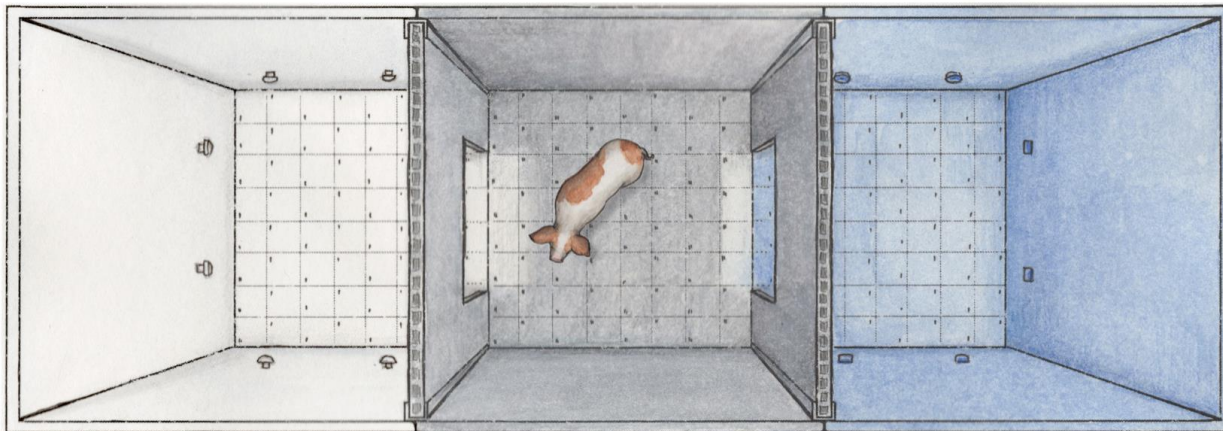
What's next?



De Jong et al. 2000



Van Der Staay et al. 2016



Ede et al. 2024



Hintze et al. 2025

Acknowledgments

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Jared Sabre

Lori Stone

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and Ethics Research Fund**



Penn
UNIVERSITY of PENNSYLVANIA



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Thank you for your attention!

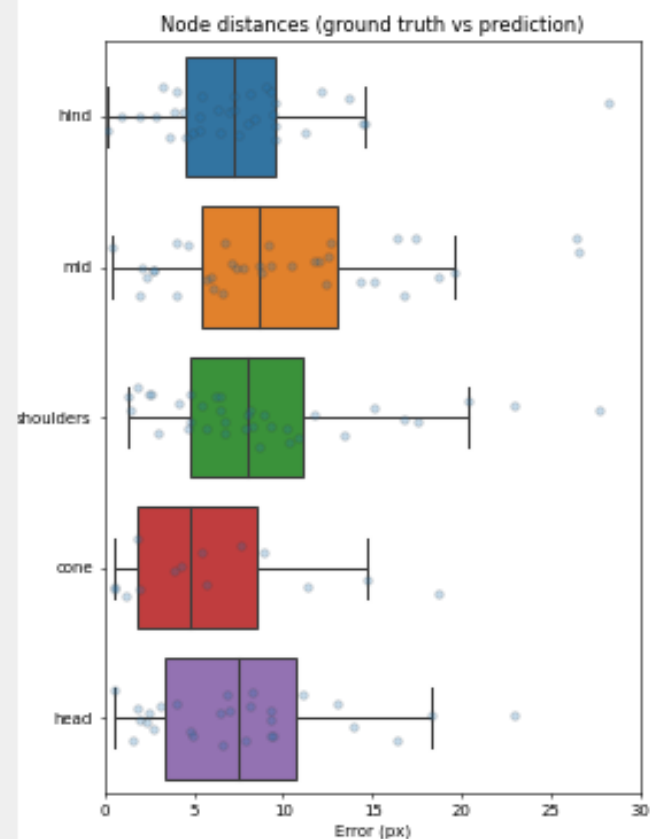
tede@vet.upenn.edu

Model configuration

Data	Augmentation	Model
Validation fraction: 0.10 Input Scaling: 0.20 Crop Size: 0 ☒ Auto	Rotate: ☒ Rotation Min Angle: -180.00 Rotation Max Angle: 180.00 Scale: ☐ Scale Min: 0.90 Scale Max: 1.10 Random flip: none Uniform Noise: ☐ Uniform Noise Min Val: 0.00 Uniform Noise Max Val: 10.00 Gaussian Noise: ☐ Gaussian Noise Mean: 5.00 Gaussian Noise Stddev: 1.00 Contrast: ☐ Contrast Min Gamma: 0.50 Contrast Max Gamma: 2.00 Brightness: ☐ Brightness Min Val: 0.00 Brightness Max Val: 10.00	Backbone: unet Stem Stride: 0 ☒ None Max Stride: 16 Filters: 16 Filters Rate: 2.00 Middle Block: ☒ Up Interpolate: ☒ Heads: single_instance Sigma: 5.00 Output Stride: 2
Optimization Batch Size: 16 Epochs: 200 Initial Learning Rate: 0.0001 Stop Training on Plateau: ☒ Plateau Min. Delta: 1e-08 Plateau Patience: 10 Online Mining: ☐ Min Hard Keypoints: 2 Max Hard Keypoints: 2 ☐ None		

Model diagnostics

Visibility - True Positives:	152
Visibility - False Positives:	2
Visibility - True Negatives:	26
Visibility - False Negatives:	0
Visibility - Precision:	0.987012987012987
Visibility - Recall:	1.0
Average Distance (ground truth vs prediction):	11.074311650773415
Distance for 50th percentile:	7.402829240725983
Distance for 75th percentile:	11.496890530470198
Distance for 90th percentile:	17.530638682017024
Distance for 95th percentile:	24.4971409774524
Distance for 99th percentile:	112.50788258800047
Mean Percentage of Correct Keypoints (PCK):	0.30166666666666664
Mean Object Keypoint Similarity (OKS):	0.5784145134255579
VOC with OKS scores - mean Average Precision (mAP):	0.30438037368883175
VOC with OKS scores - mean Average Recall (mAR):	0.3722222222222222
VOC with PCK scores - mean Average Precision (mAP):	0.00837034252875837
VOC with PCK scores - mean Average Recall (mAR):	0.025



PCA structures

