

Reduced Labelling Effort with Generalisable Computer Vision Models for Pigs, Cattle, and Poultry

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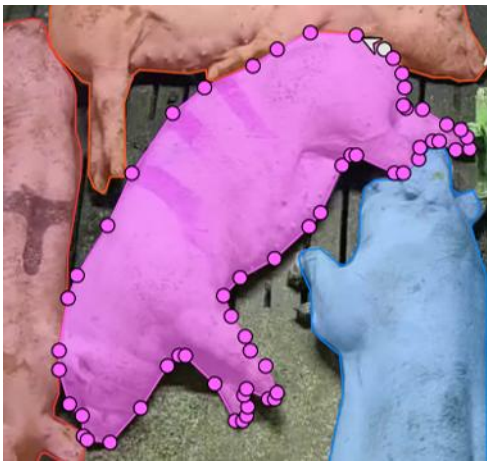
Introduction

- Flanders Research Institute for Agriculture, Fisheries and Food (ILVO)
- AI &PLF research group in Merelbeke, Belgium
- Varying research questions, housing and animals.



What is labelling effort?

- The number of clicks on images to get a labelled dataset.
- Animal Segmentation:



Polygon segmentation
20-50 clicks per animal



Segment anything 2
1-2 clicks per animal

2024

<https://universe.roboflow.com/poultry-farm-chicken-health-0ncjv/chicken-segmentation>

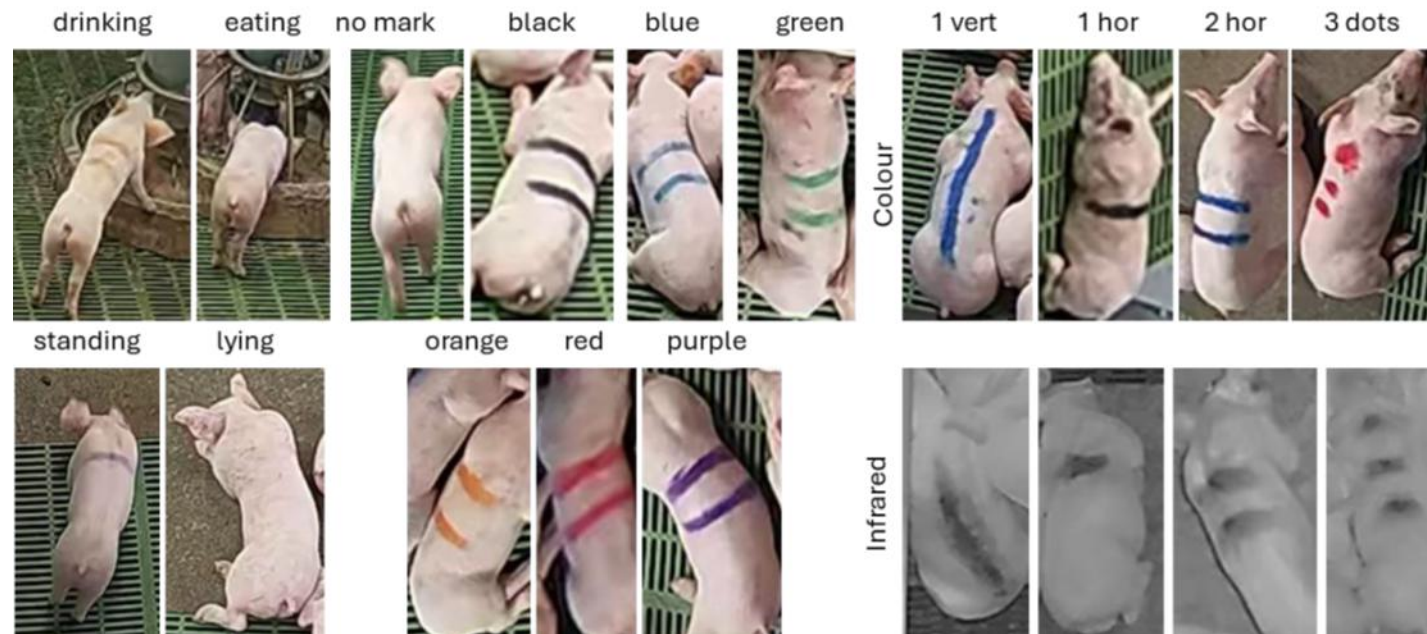


Segment anything 3:
1-2 clicks for multiple animals

2026

Behaviour Classification

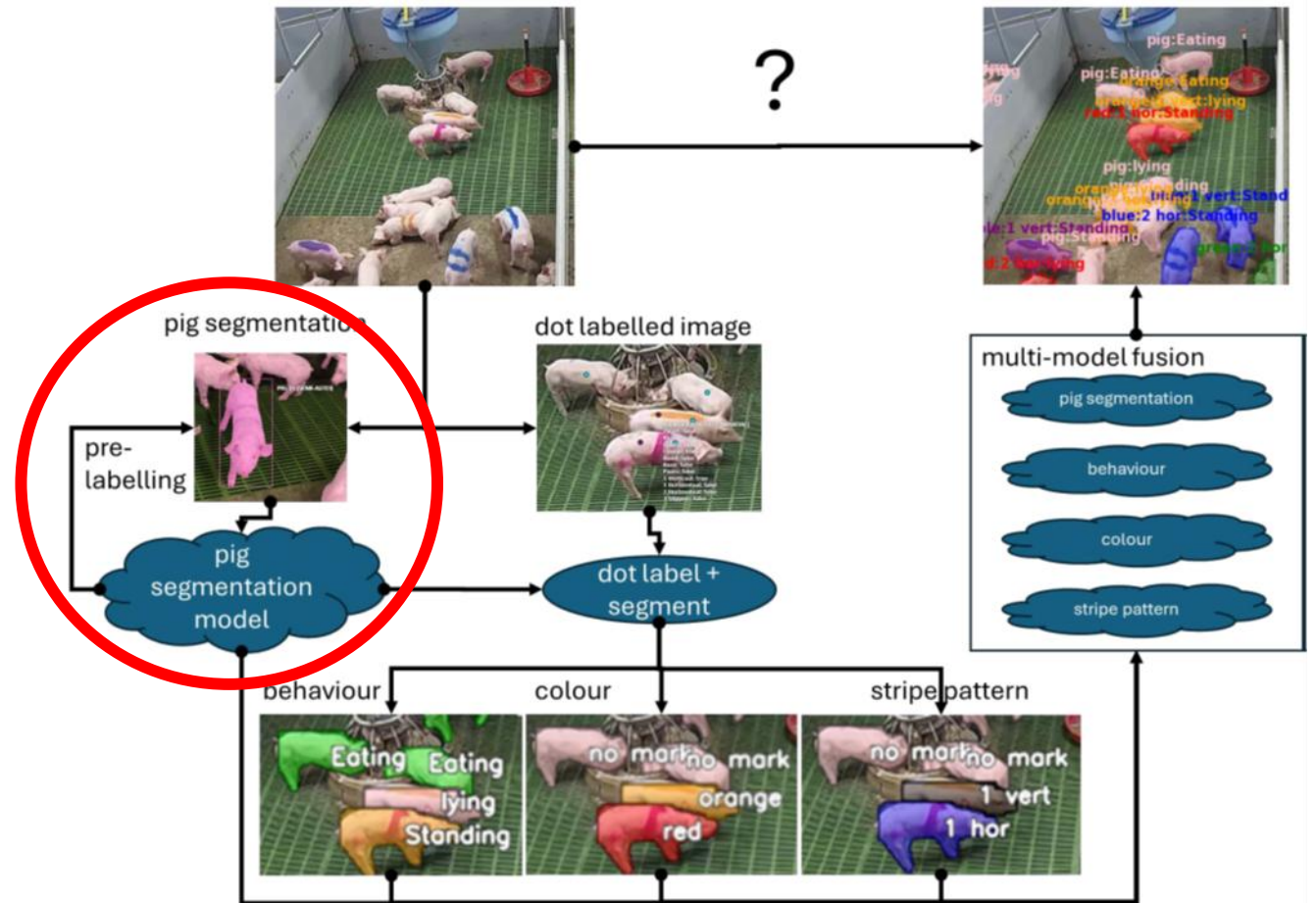
- Poster AI4AS 2025 Zurich
- “ Reducing Annotation Effort with Multi-Layered Labels and a Pig Segmentation Model: A Case Study on Pig Behaviour and Identification “



P. J. De Temmerman, J. Defoort, L. Ingelbrecht, M. Aluwé, D. Maes, J. Maselyne

Reducing labelling effort

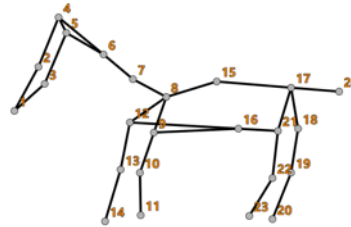
- Targeted labelling: Only label pigs with behaviour
 - Colour & Pattern (Day): labelled 20/35 pigs (40% reduction)
 - Stripe Pattern (Night): labelled 4/35 pigs (90% reduction)
- Stop labelling when model predictions are accurate (for segmentation, behaviour, colour and stripe pattern)



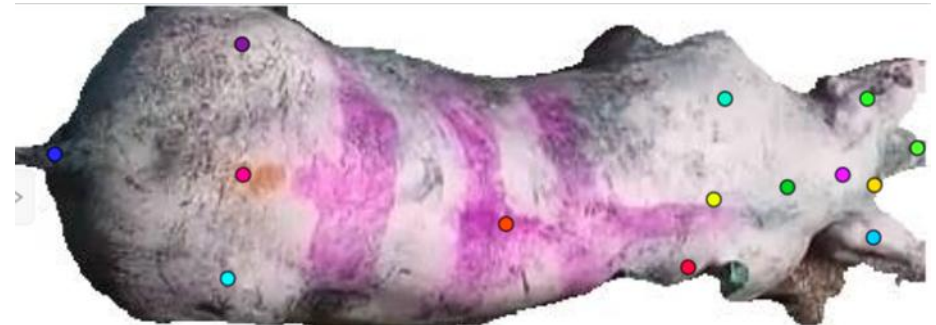
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Pose estimation

- Still labour intensive
- Hundreds of clicks per image
- Skeleton labelling
 - Drag and drop
 - Hide and unhide keypoints
- Keypoint labelling
 - One keypoint per animal part
 - Only label visible parts



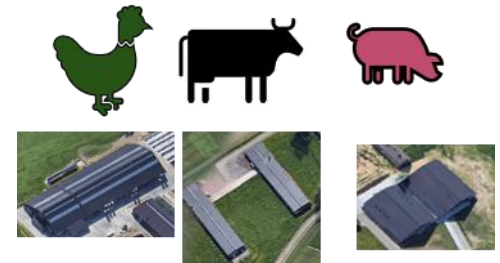
Full image skeleton labelling
> 24 clicks per animal



Cropped animal keypoint labelling
< 24 clicks per animal

Generalisability

- Segmentation, classification and pose estimation labelling becomes quite efficient for a specific farm and experimental set-up.
- Transferability of expertise and models from one experiment, animal and farm to another?

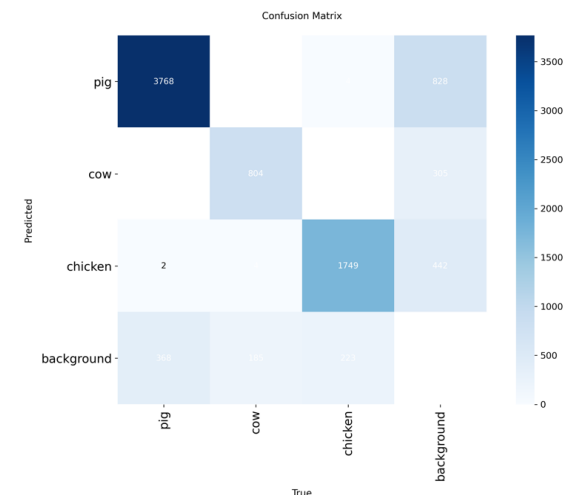


Generalisable Animal Segmentation model

- Cross species: Pigs, Poultry and Cattle in all backgrounds
- 1-50 objects per image if more => cropping images
- YOLOv11 segmentation model

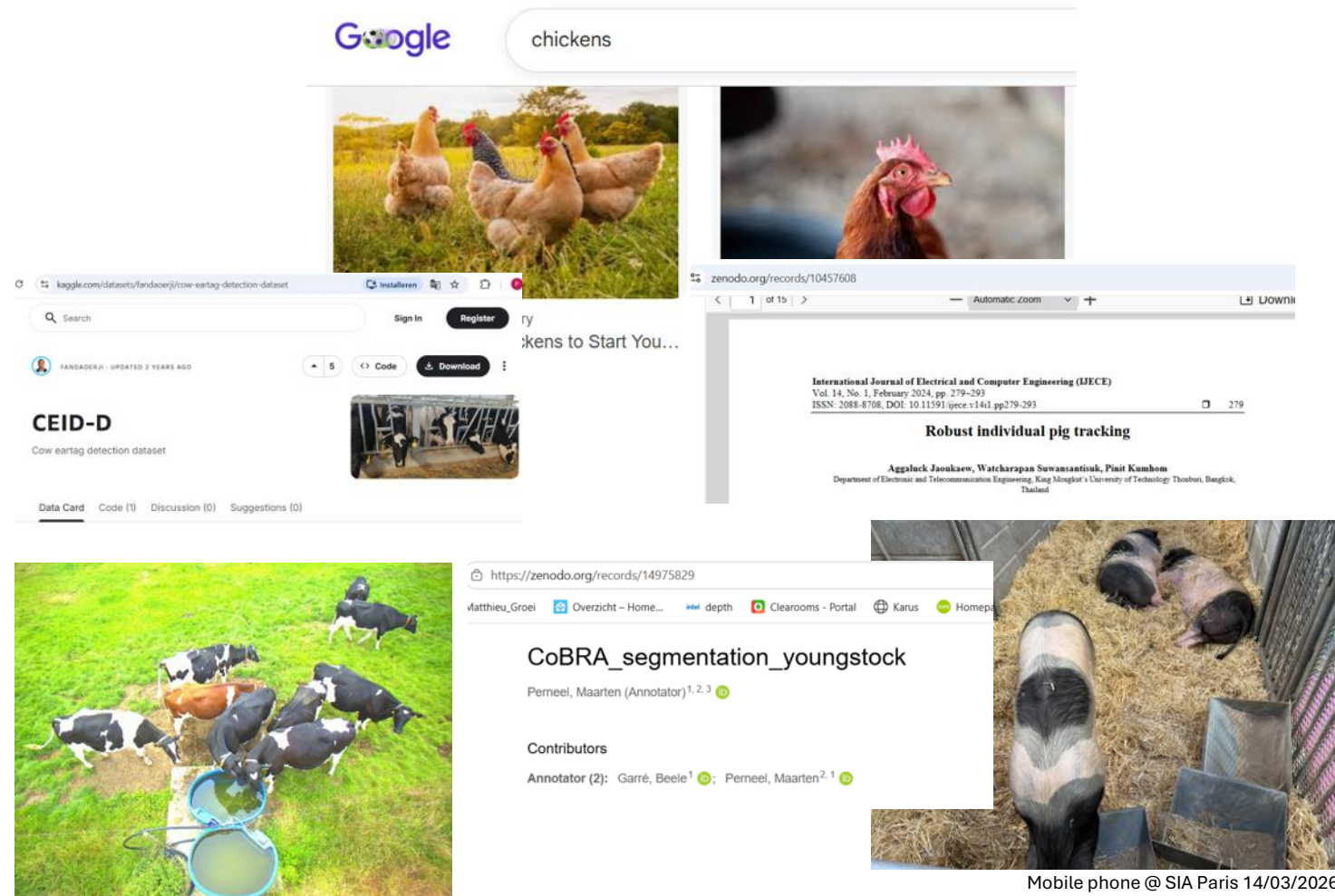


Segmentation
model



Capturing farm and animal variability

- Data from ILVO farms
- Data from ILVO projects
- Own pictures
- Open data
 - apt-36k_cow
 - Kaggle
 - Zenodo
- Web scraping (Google)



Mobile phone @ SIA Paris 14/03/2026

Generalisable pose estimation model

- Spine (Axis)
- Extremities (OffAxis)
- Left/right (Side)
- Not labelled keypoints => Auto “hidden”
- ViTPose Vision Transformer model



Label configuration

Side	Radio	☒ central ☐ left ☐ right
Axis	Radio	☐ head ☐ neck ☒ torso ☐ back ☐ hip ☐ tail ☐ belly
OffAxis	Select	☒ 0 ☐ 1 ☐ 2 ☐ 3

Data and model characteristics

Yolov11

- **Dataset**

- **1,662** training images
- **472** validation images
- **250** testing images
- **34,902** animals labelled

- Species distribution:

- **40% pigs**
- **30% cattle**
- **30% poultry**

ViTPose

Dataset:

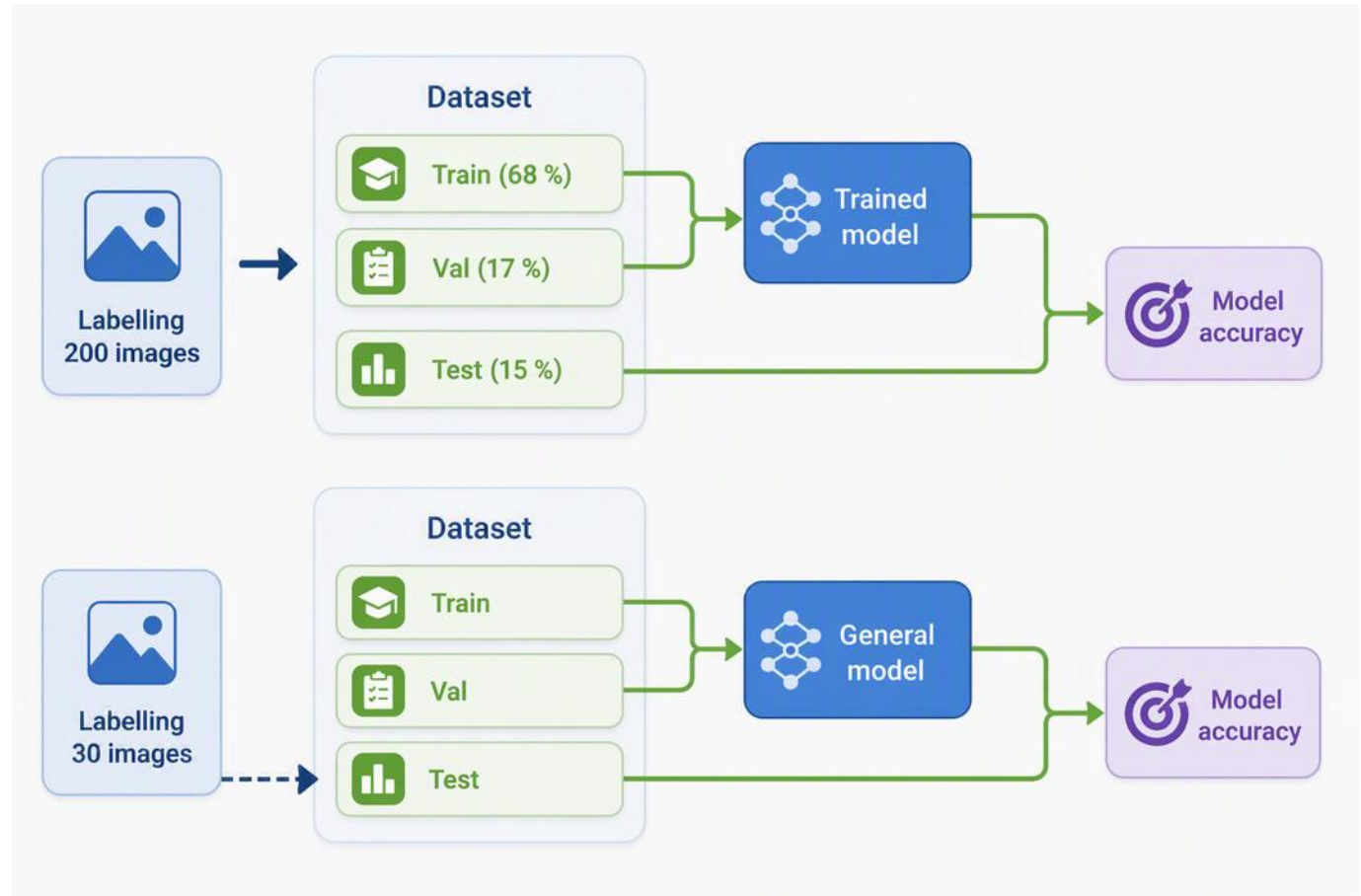
- **262** images
- **1,136** animals labelled
- **24 keypoints**
- Keypoints represent:
 - Head landmarks
 - Body landmarks
 - Distal landmarks

Visibility statistics:

- Body keypoints visible in **>80%** of animals
- Head keypoints visible in **~60%**
- Distal extremities visible in **~20%**

Reduced labelling effort with generalisable models

- Model accuracy evaluation
- Same 30-image test dataset
- Trained and General model cannot be compared directly
- You know faster whether you have a model that is good enough.



Made image look nicer using MS Copilot

Examples segmentation and pose models



<https://www.kaggle.com/datasets/fandaoerji/cbvd-5cow-behavior-video-dataset/>

Conclusions

- Reducing Labelling effort:
 - Segmentation labelling with Segment Anything 3.0
 - Behaviour classification with targeted labelling
 - Only label visible keypoints in pose labelling
- Generalisability
 - Including open data allows including farm variability
 - Same pose labelling scheme applicable for chicken, pigs and cattle
 - Less labelled images required to test model accuracy

Acknowledgments and Questions?

