In-house Developed Mobile Monitoring System for Sow and Piglet Behaviour in Commercial Farming Environments

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ILVO

Goal

Reduce piglet mortality by using novel tools to give farm specific advice

=> Develop a Mobile Monitoring System for Sow and Piglet Behaviour in Commercial Farming Environments

=> Apply in 20 farms during the PigLife Project, as a plug and play system for shorter term measurements

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Piglet mortality: current -> target

6-14% -> 7%

mummies = 2,5%
stillborn = 8,7%
perinatal = 11,2%

8-20% -> 12%

mortality of live-born piglets = 13,5%

0,5-6% -> 2%

mortality of weaned piglets = 2,7%

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Restrictions mobile monitoring system

Connectivity locations

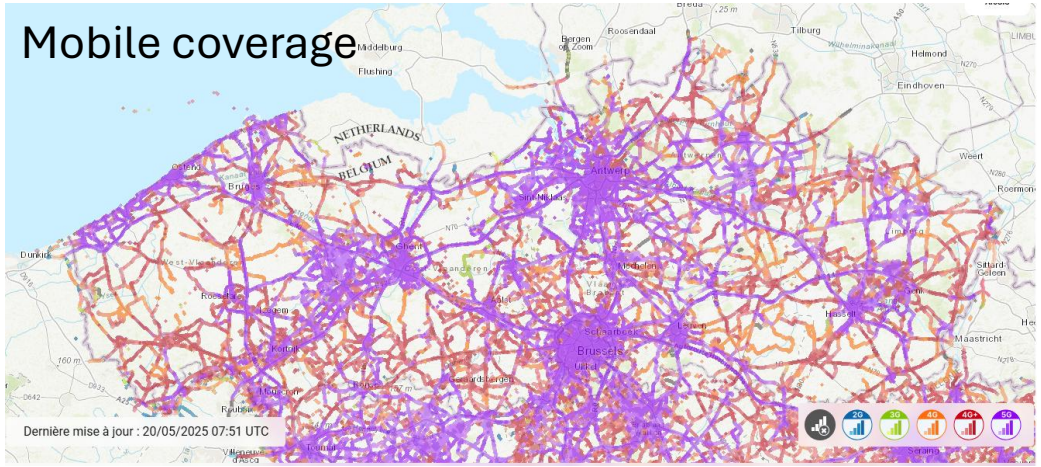
- Only 5G coverage around cities
- 4G in pig farm areas

Inside the pig stable

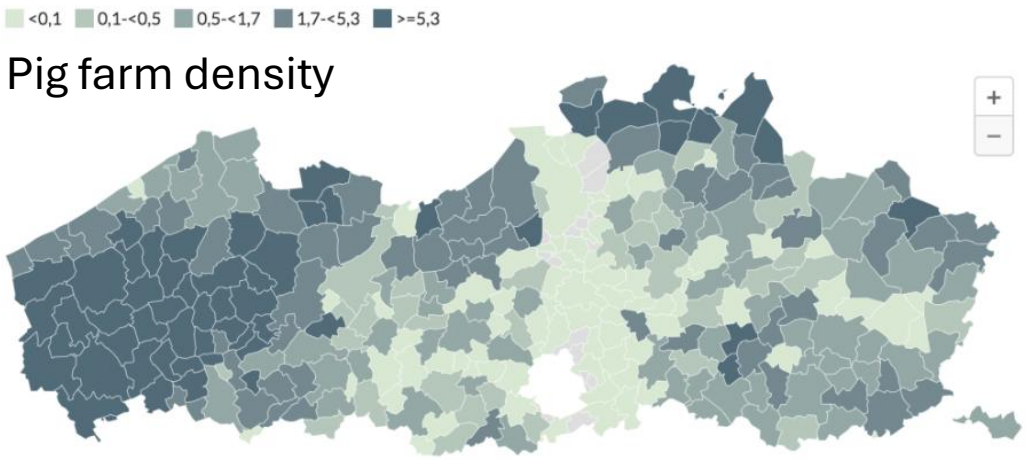
- Low connectivity
- Wifi or ethernet?
- One power plug near the entrance or in the corridor

Requirements

- Pig-Proof => Components out of reach
- Air tight => corrosive gasses
- Water tight => Pen cleaning
- Day and night recording



https://www.nperf.com/



https://vilt.be/

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In-house development

- IP66 enclosure and cameras
- Screen for easy interaction
- Lamp (red = recording, green = not)
- 1 power connection
- Supporting up to 8 PoE camera’s
- Ethernet connection
- Wifi and mobile connectivity
- Edge computing (mini PC)
- Local storage (> 4GB)

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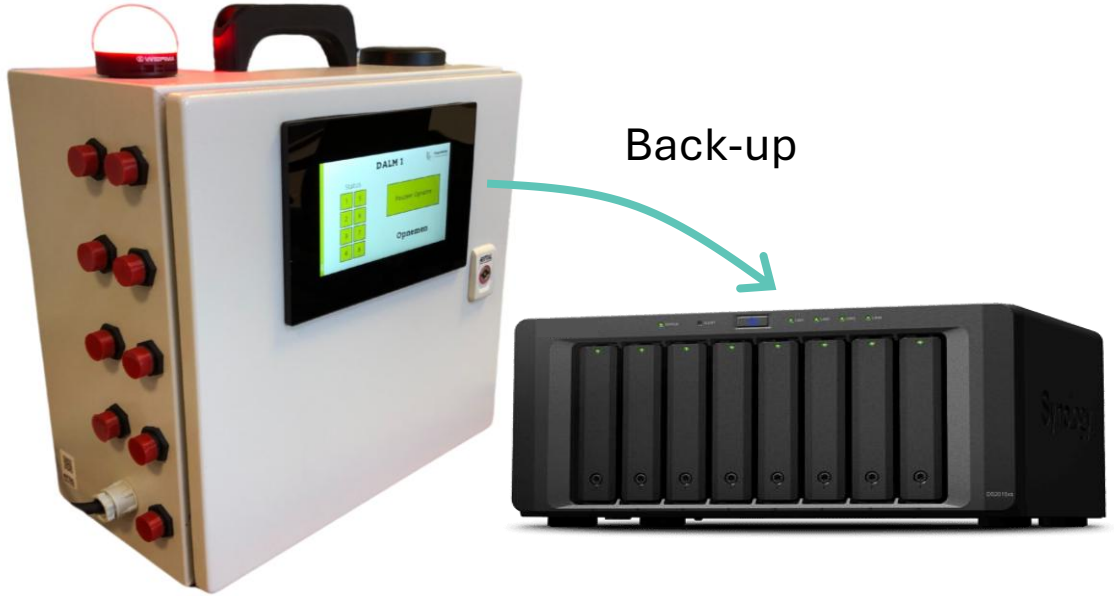
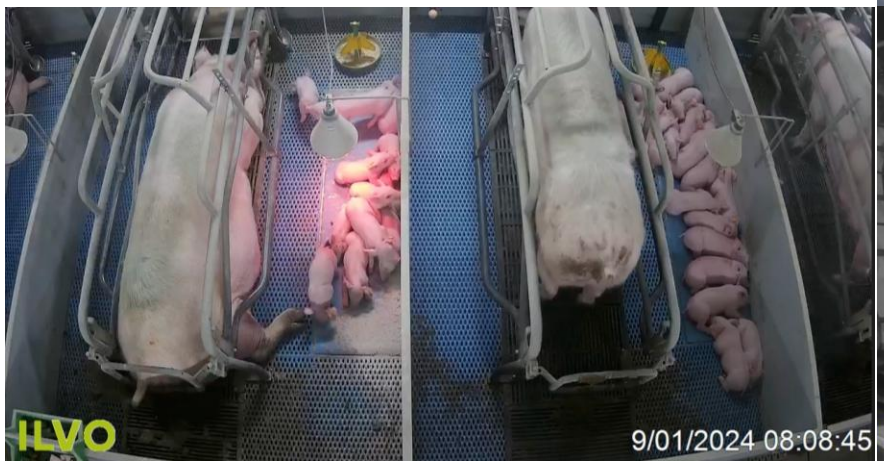
Set-up

- Plug and Play
- Base unit in the barn or in the corridor close to the power plug
- Mounting of the camera's: ceiling, wall, barn infrastructure or individual mounting system
- Reducing occlusion as much as possible
- RJ45 cables to each camera (PoE)
- Wifi/mobile/ethernet connection for data transfer and remote checks.



Methodology - Data Collection for AI

- Collected at 2 farms at ILVO
- 240 sows with their piglets
- Local storage for farrowing period (4 weeks)



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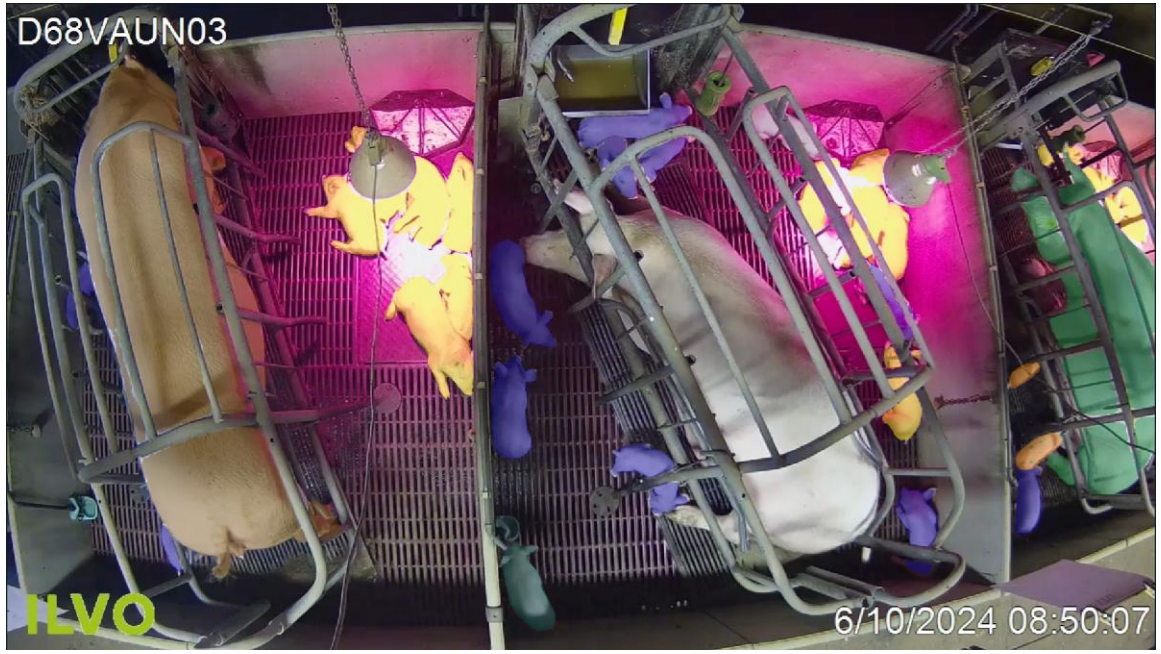
AI Model Training and Performance

- 15,387 labelled instances on 845 images.
  - Sows: Eating, Drinking, Standing, Kneeling, Sitting, Lying on the side or belly, Udder availability and away/towards the nest
  - Piglets: Standing, Moving, Sitting, Lying, Sleeping, Suckling, Drinking water/artificial milk, Eating
- A Yolov8 segmentation model
- 676 training images and 169 validation images
  - precision 80.3%, accuracy 88.2%, F1 score 77.0%



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Video predictions

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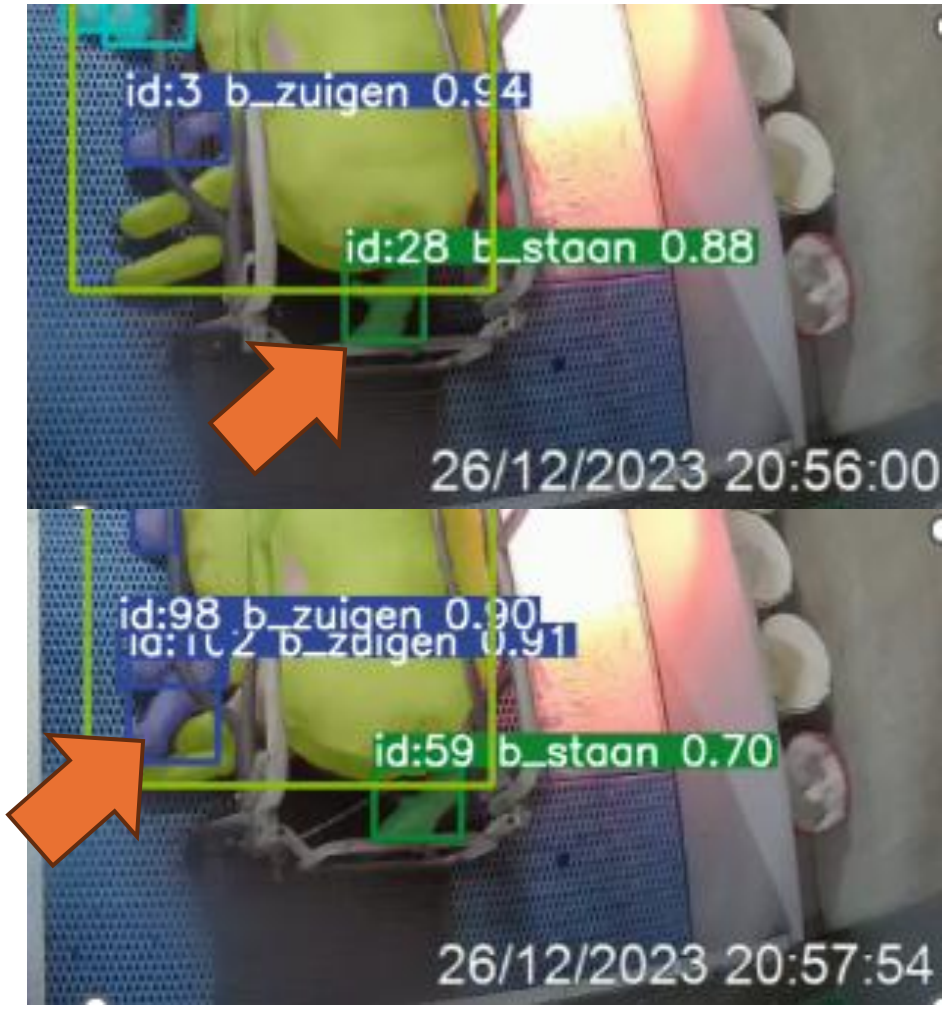
Relating behaviour to piglet mortality

- Piglet Behaviour
  - Time between birth and start suckling
  - Time between birth different piglets
  - Overall farrowing duration
  - Mobility and suckling duration
  - Start drinking water
  - Start eating solid food
- Sow Behaviour
  - Availability of the udder
  - Restlessness:
    - Rolling from side to side
    - Standing and lying down



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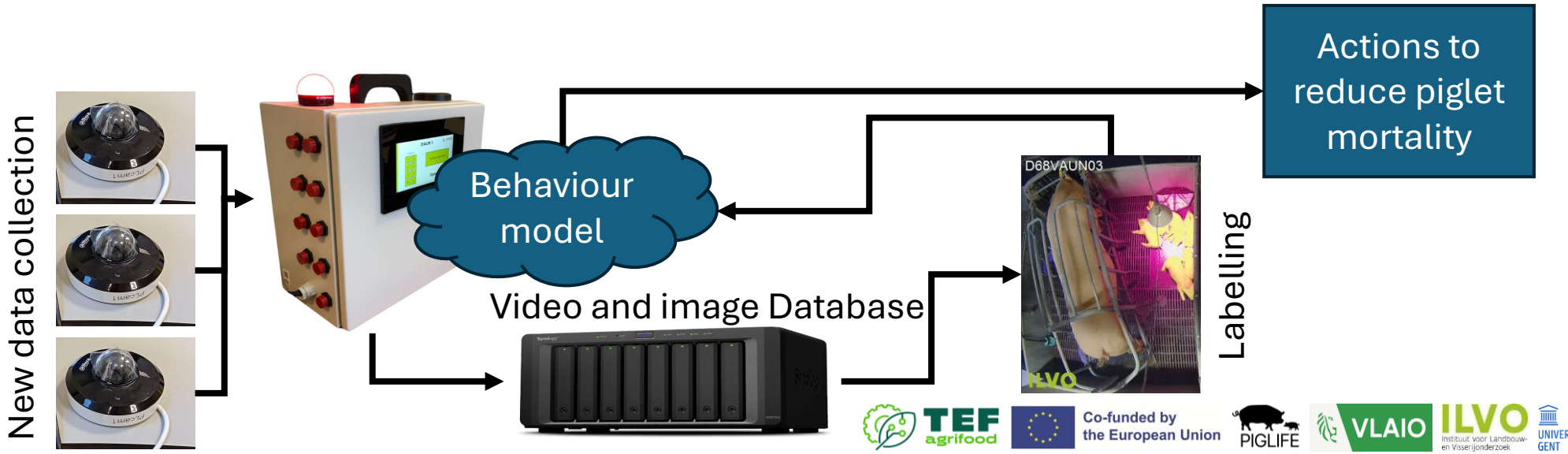
Preparation new farms and edge computing

- Including other farrowing pen (e.g. Open data) designs like free farrowing pens in behaviour model.
- Running behaviour models in real time on the edge device
- Retraining models with collected data
- Convert behaviour measurements to feedback to the farmer
- Some MLOPS loops for application across 20 farms



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Only Piglet and Sow behaviour?

- Also usable for monitoring piglet mortality of weaned piglets
- Plug and play RFID system for measuring feeding behaviour piglets
- Expand to
  - Piglet identification: Visual markings and link to RFID identification
  - Other behaviour: playing, biting, mounting

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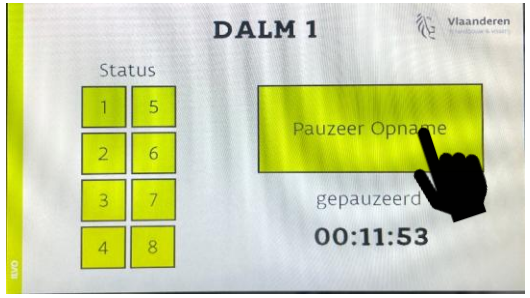
Valorization of research in AgrifoodTEF

AgrifoodTEF enables ILVO to translate research and developed POCs in collaboration with companies into market-ready solutions.

Outputs of this research:

- Mobile monitoring system
- Equipped stables
- AI models
- Video and image datasets
- Farmer feedback and actions to reduce piglet mortality

Behaviour model



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Acknowledgments and Questions?

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