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Computer vision based monitoring of fattening pigs

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Fattening pig monitoring

- Focussed on production parameters
 - E.g.: Weight, feed intake, water intake
- Cameras offer new opportunities
 - → Computer vision models
 - → Pig behaviour

Computer vision models

M3PIG: a modular system



M3det



- Lesion
- Body condition
- Weight estimation
- Body cleanness
- Posture
- Activity
- Tail biting
- Ear biting
- Fighting
- Replacement

No identification
required

M3keypoints

M3id

M3posture

M3track

M3seg

M3behaviour

Identification
required

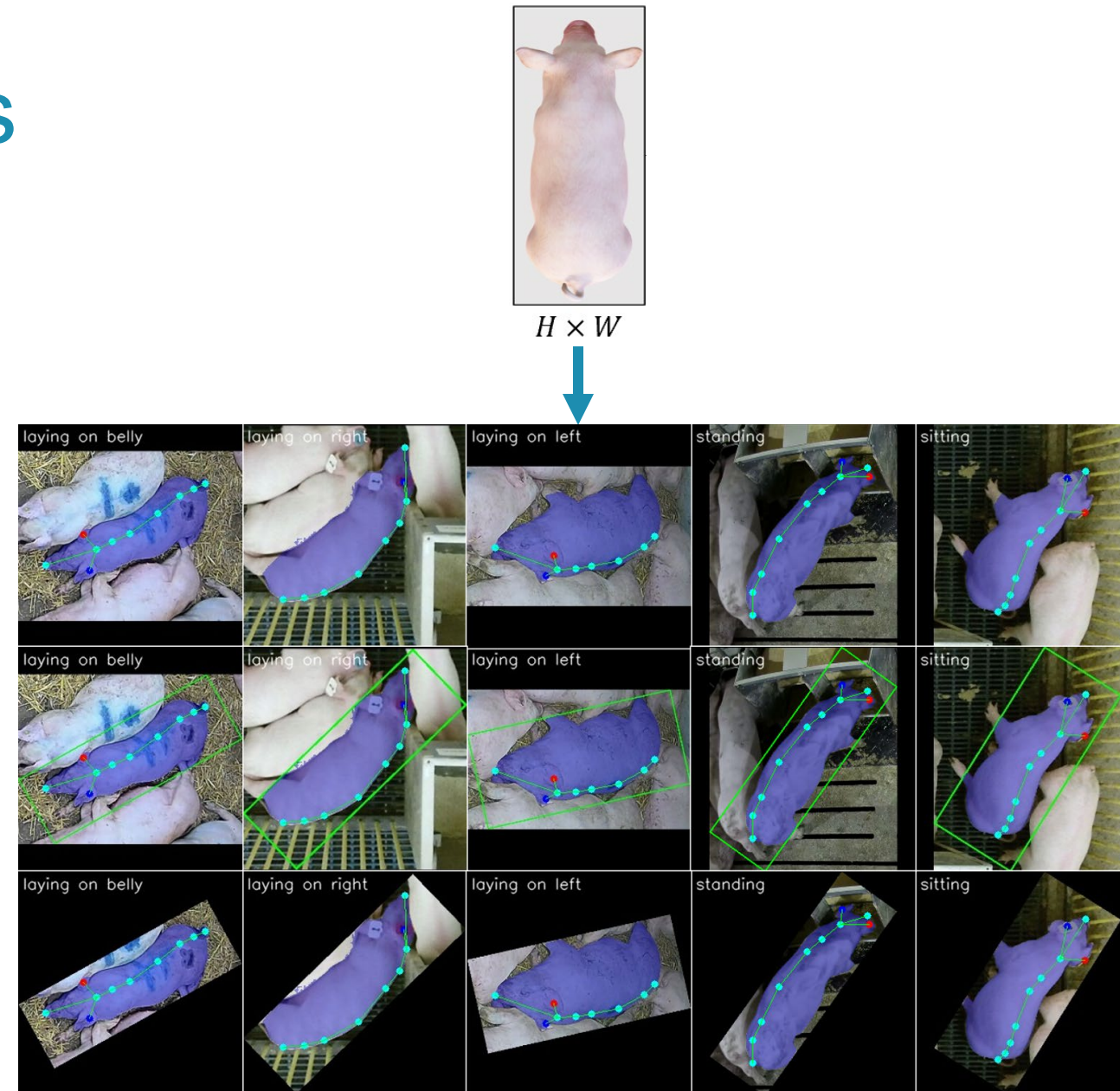
Computer vision models

- M3det pig **detection** model
 - Rotated bounding boxes
 - Direction vector (snout)
 - YOLOv5 based architecture
 - 1.7 million parameters



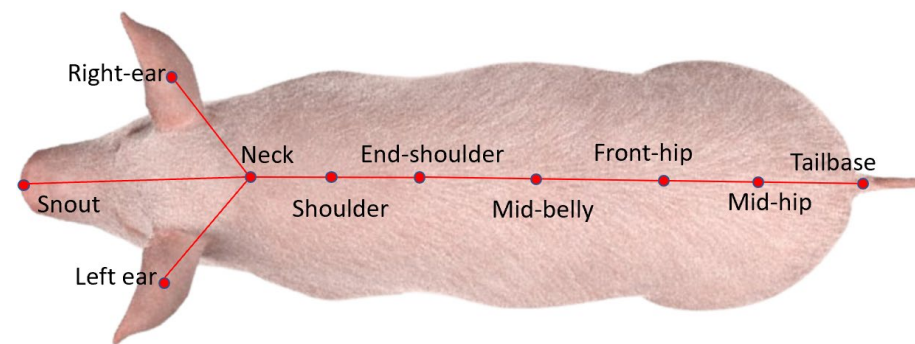
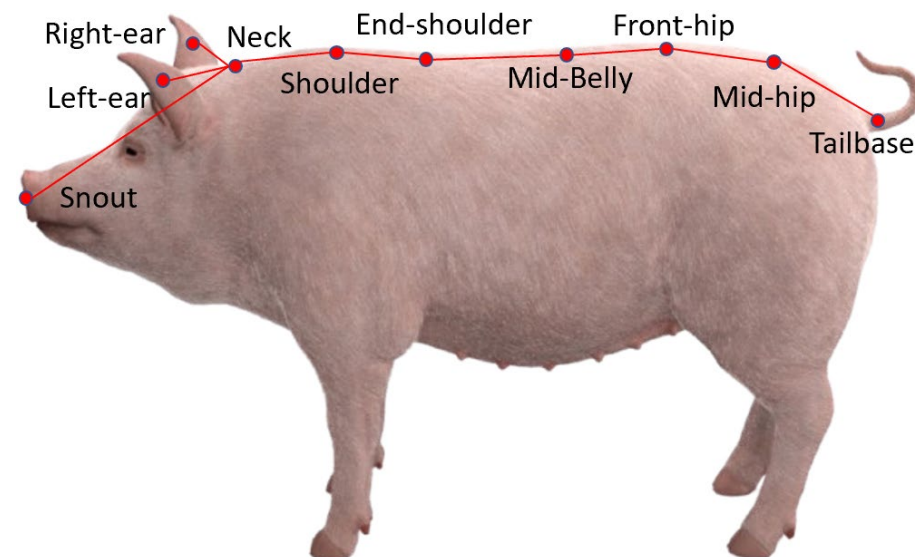
Computer vision models

- M3det pig **detection** model
- M3keypoints **keypoint** detection
- M3posture **posture** estimation
- M3seg pig **segmentation**
 - Cropped detection as input
 - Multi-task model
 - 2 million parameters



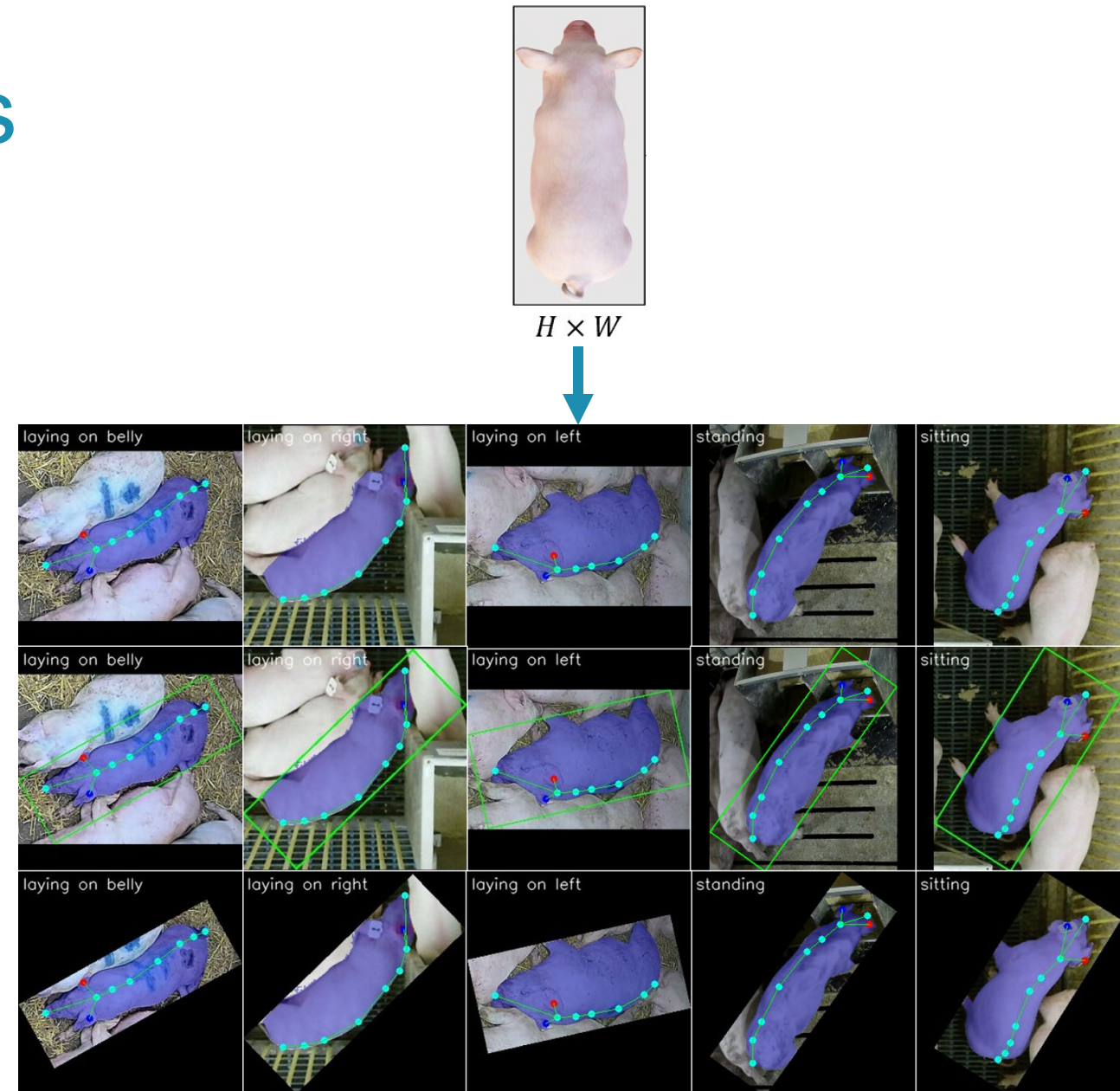
Computer vision models

- M3det pig **detection** model
- M3keypoints **keypoint** detection
- M3posture **posture** estimation
- M3seg pig **segmentation**
 - 10 keypoints
 - Visible from top view



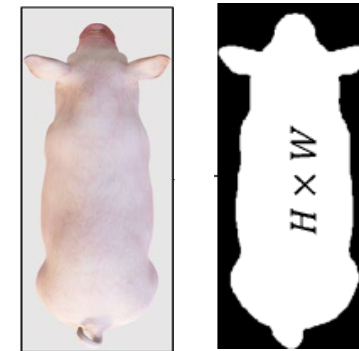
Computer vision models

- M3det pig **detection** model
- M3keypoints **keypoint** detection
- M3posture **posture** estimation
- M3seg pig **segmentation**
- 5 postures
 - Lying sternally
 - Lying on right side
 - Lying on left side
 - Standing
 - Sitting

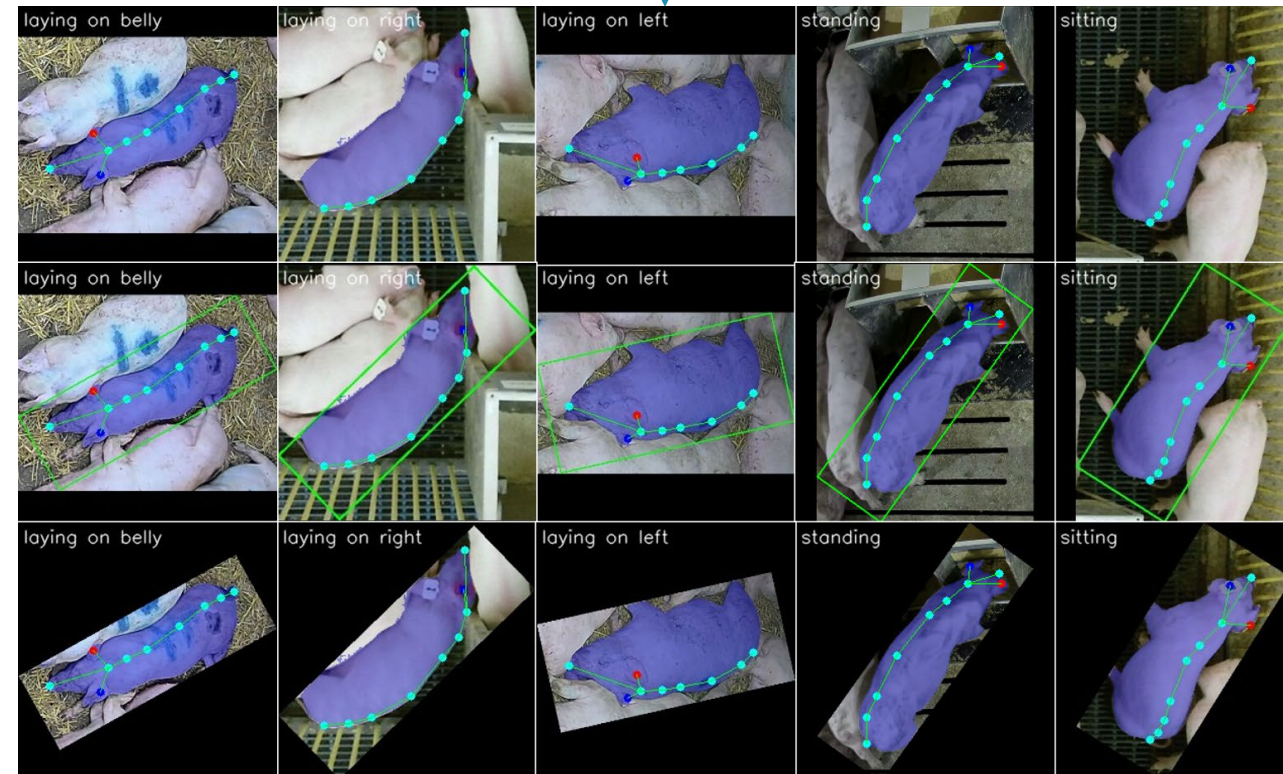


Computer vision models

- M3det pig **detection** model
- M3keypoints **keypoint** detection
- M3posture **posture** estimation
- M3seg pig **segmentation**
 - Mask



$H \times W$



Methods

- 1 pen
- 12 pigs
- Get group level information
 - On position (4 areas)
 - Drinker
 - Feeder
 - Left side of the pen
 - Right side of the pen



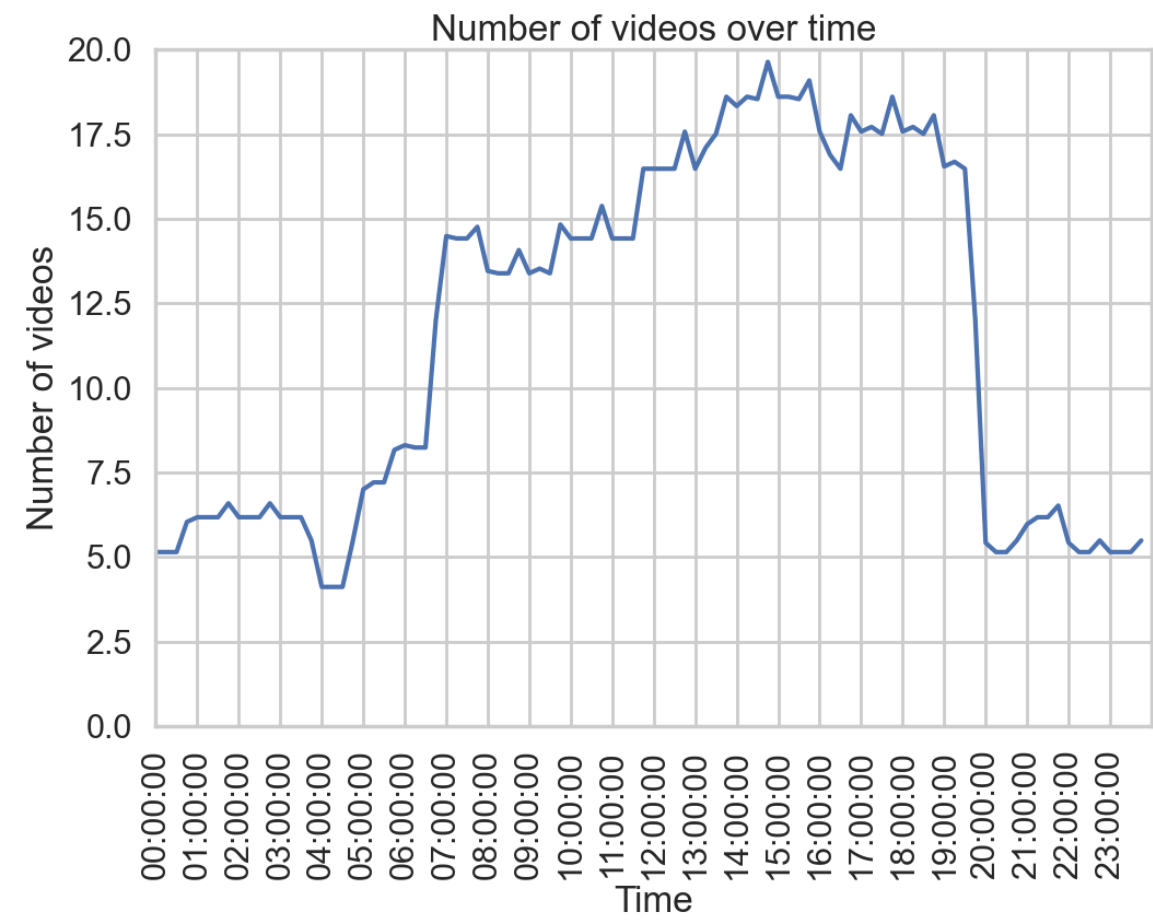
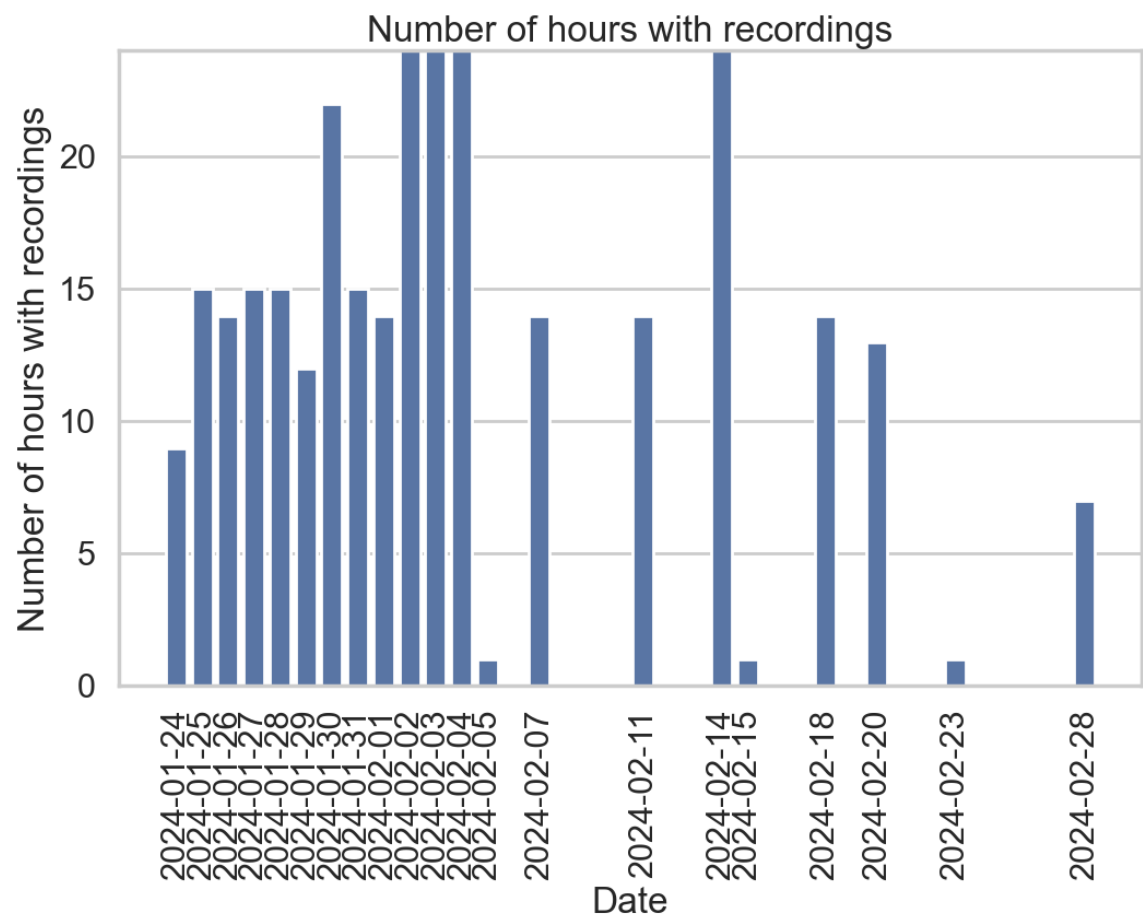
Methods

- 1 pen
- 12 pigs
- Get group level information
 - On position (4 areas)
 - On posture (3 postures)
 - Standing
 - Sitting
 - Lying (left, sternal, right)



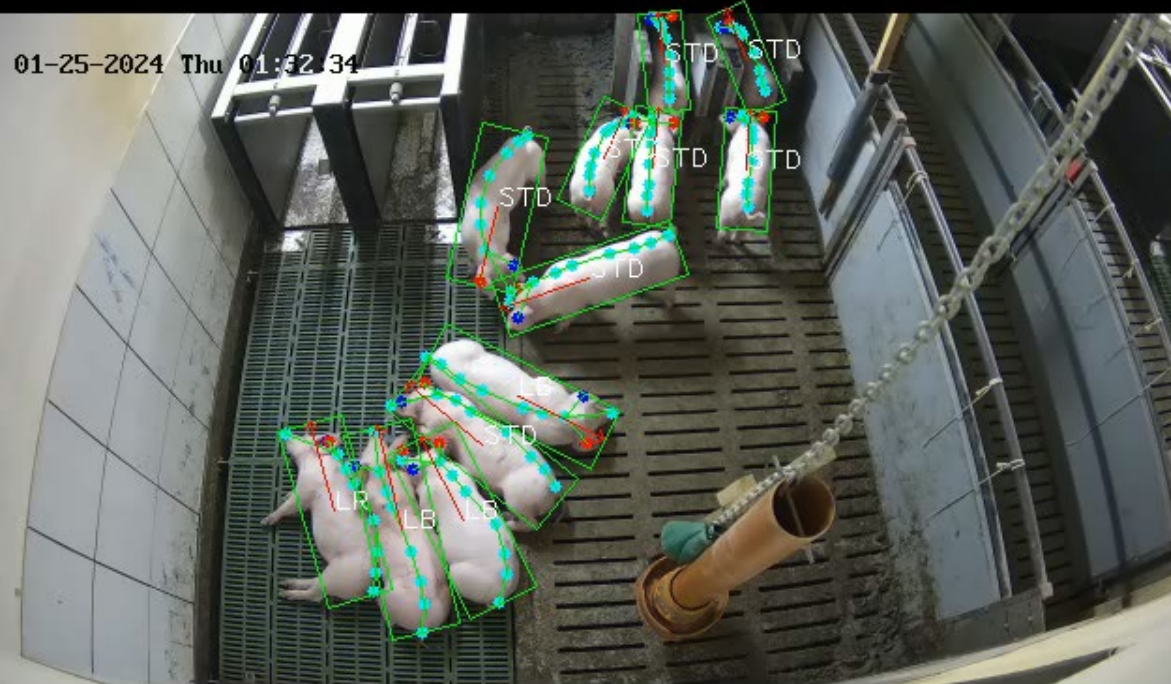
Results: when recorded?

282 videos
273.78 hours @ 15 FPS = 14.783.850 frames



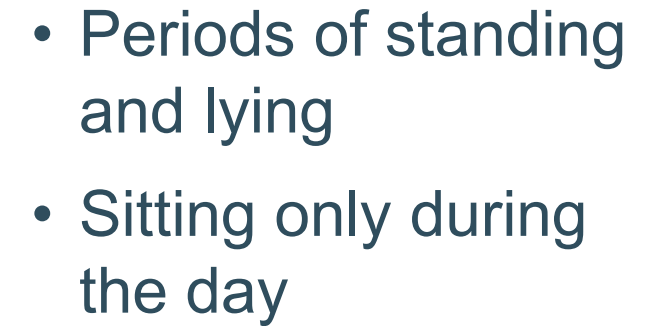
Example video

26269

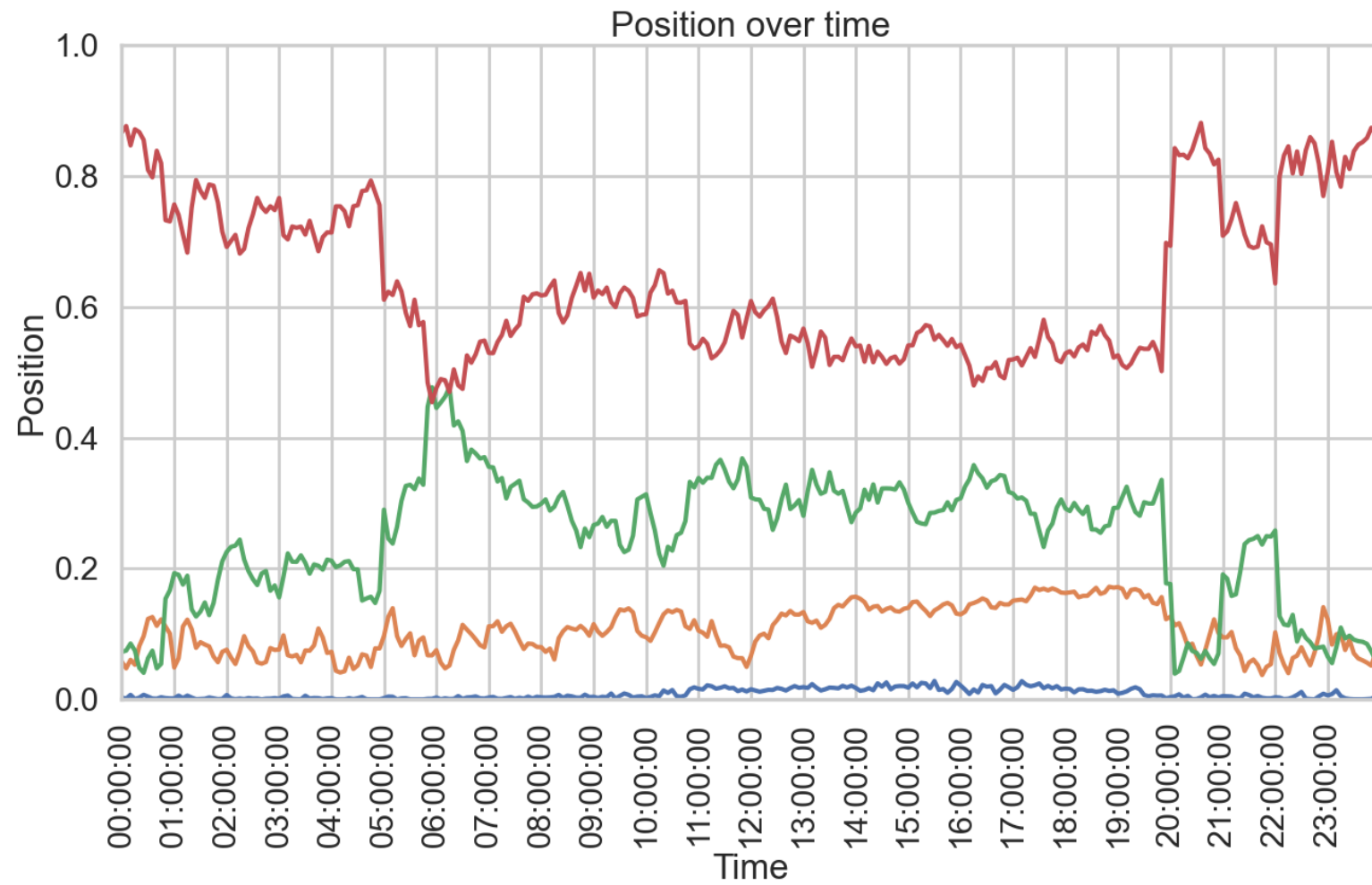


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Results: positions



- Preferred right side during night
- Always pigs in feeder

Future outlook

- How do patterns change over time?
- Combine postures and position: similar postures left and right?
- Analyse more pig pens
- Use other M3PIG computer vision models → individual tracking
 - M3track Pig tracking model
 - Reidentification with RFID or Visual tags
 - M3ethology Pig interactions
 - Head tail interactions

A photograph of several pink pigs lying on a wooden slatted floor in a barn. The pigs are looking towards the camera. The text "Thanks for your attention" is overlaid in white.

Thanks for your attention

And many thanks to

- ILVO and KUL colleagues
- Carekeepers
- Technicians
- VSC (Flemish Supercomputer Center)

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