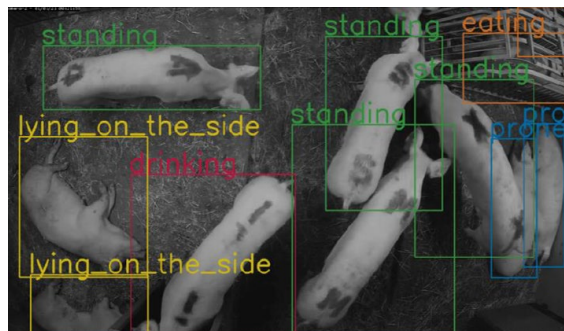


➤ Improvement of an algorithm performance to estimate the physical activity of group-housed sows based on videos

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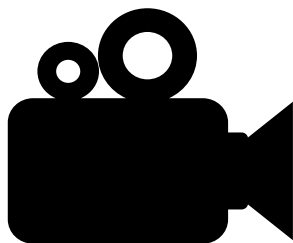
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> Context

Monitoring physical activity to improve feed efficiency and welfare



Sensors:

- + automatic
- Invasive (ear attached)
- Fragile
- Expensive

Video analysis:

- + few cameras / group = cost ↓
- + non invasive
- Manual analysis = time consuming

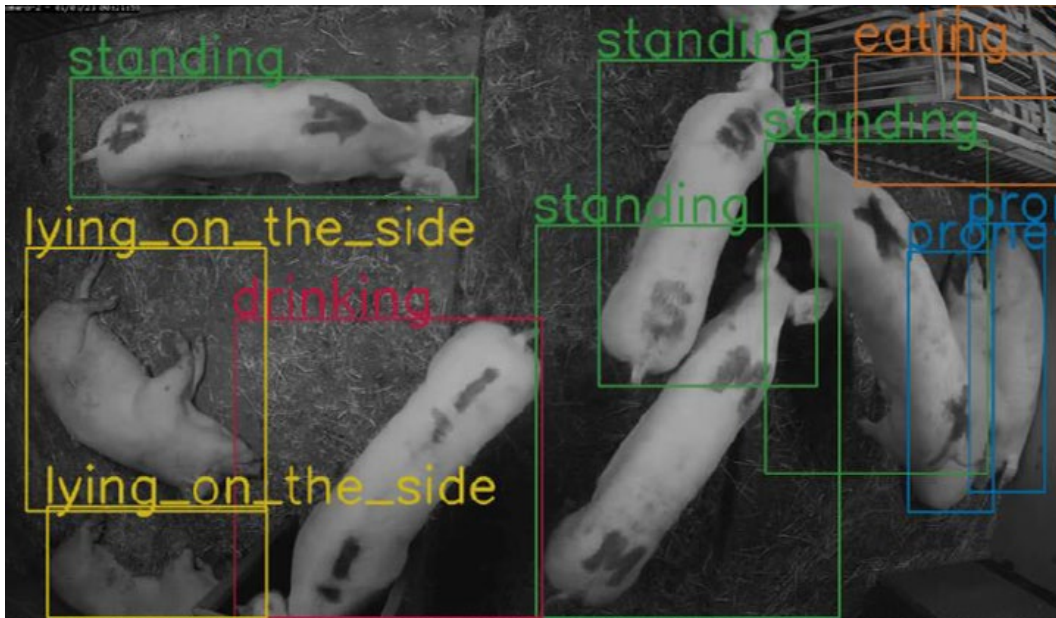


Need to be automatized

> Context

Previous work...

- Deep-learning algorithm developed to automatically detect sows + their different activities on images
- However the classification accuracy varied regarding the activity detected :



Activity	Accuracy
Lying laterally	0.61
Lying ventrally	0.76
Sitting	0.23
Standing	0.79
Eating	0.86
Drinking	0.71

Overall accuracy of 66%

➤ Objective



To improve this algorithm

How ? By using a **more recent architecture** for the neural network
(**yolo v8** instead of the initial Faster R-CNN with Inception v2)

> Excuse me... what ?



Faster R-CNN

“Object detection algorithm of the R-CNN (Region-based Convolutional Neural Network) family that uses a region proposal network (RPN) with the CNN model”

In short: Tool that can identify and localize objects in an image or a video.

YOLOv8

“(You Only Look Once version 8) is a state-of-the-art. real-time object detection algorithm designed to identify and locate objects within images and videos quickly and accurately”

In short: very fast and efficient tool that can look at pictures or videos and tell you what objects are in them such as cars, people, animals, and more



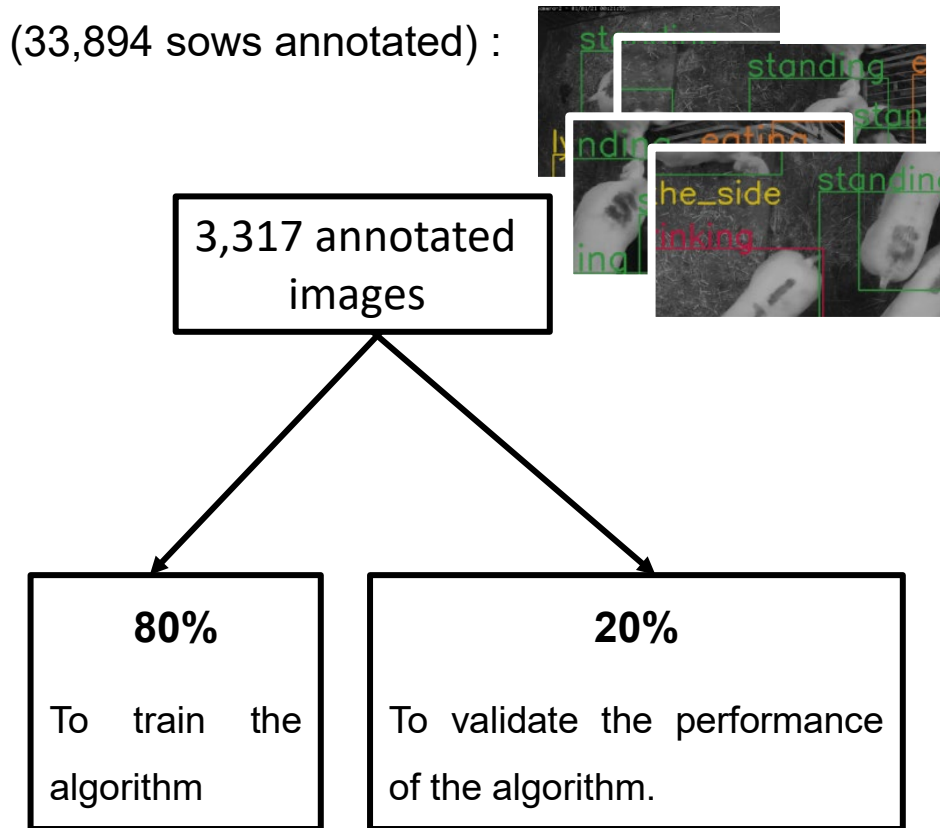
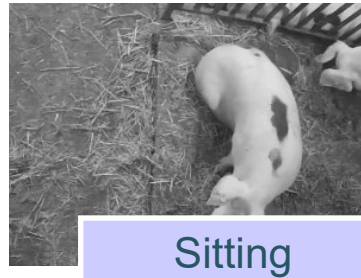
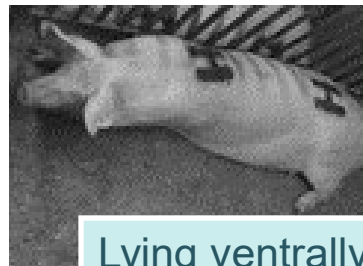
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Improvement of an algorithm performance to estimate sows physical activity
EAAP 2024 – Charlotte Gaillard



➤ Material and methods

6 activities manually annotated on 3,317 images extracted from videos (33,894 sows annotated) :



> Results

*NB/ mistake in abstract
number 2211704*



Activity	Accuracy	
	Initial structure	New structure yolo v8
Lying laterally	0.61	0.86
Lying ventrally	0.76	0.86
Sitting	0.23	0.46
Standing	0.79	0.89
Eating	0.86	0.99
Drinking	0.71	0.49

under-represented
in the dataset

Tools of YOLOv8 that
counteract (partly)
this problem – still lack
of images

Accuracy of the new algorithm = 74% (on average).

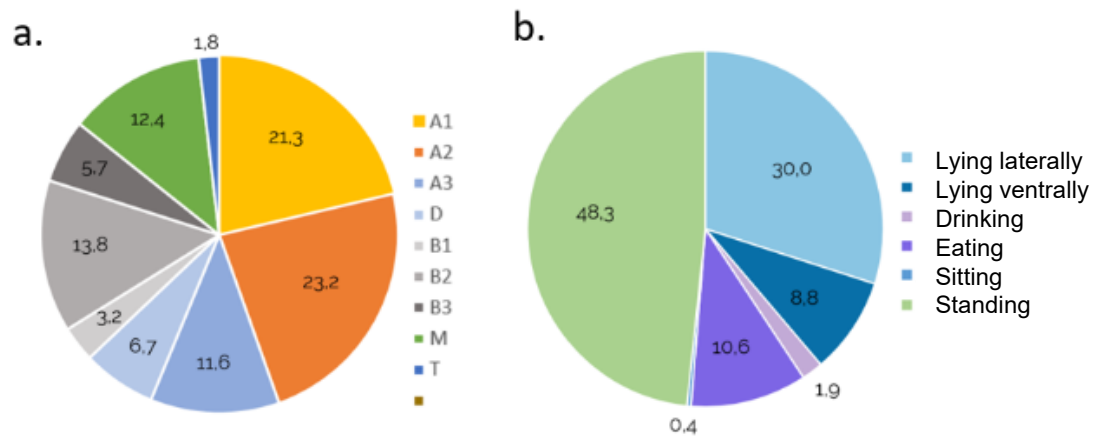
Huge improvement as well as the accuracies for all the activities detected.



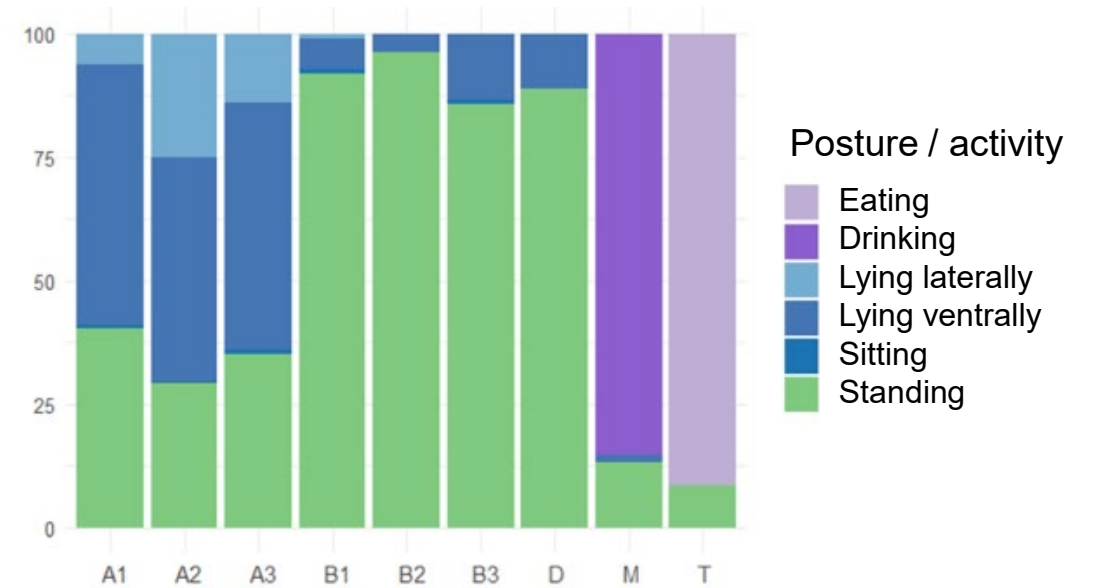
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➤ Exemple of use of these data

Time budget (activity of localisation) over a period



Average time (%) spent in each
a. Area of the gestation room
b. Posture or activity



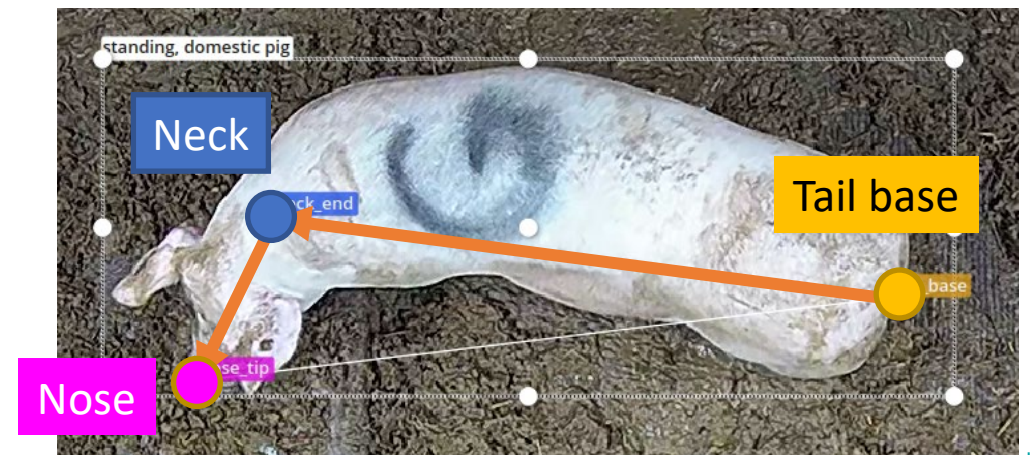
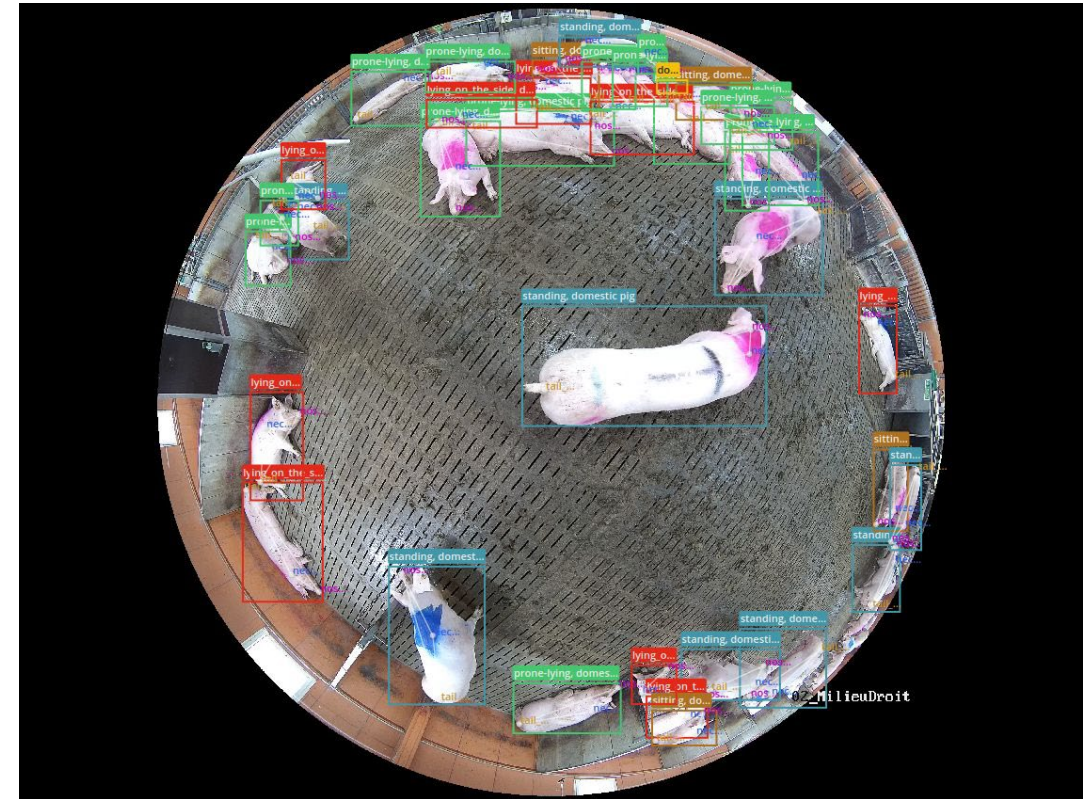
Average time (%) spent in each area of the
gestation room and posture/activity

Used to calculate energy requirements, detect disturbances associated to health issues or events.

➤ Perspectives

- Evaluation of the algorithm on another set of images (***different cameras and environment***). and adjustments to reach similar accuracies.
- ***Tracking module*** : Link RFID to get stable ID & individual information
- 3 coordinates of the animals are being recorded continuously and interpreted to identify and quantify the number and type (positive vs. negative) of ***interactions between sows***.

Poster "Determination of social interactions in a group of gestating sows based on location, posture and orientation
Blanc et al. Abstract 2213490





➤ ANNEXES



➤ DILEPIX performances

Activity	Faster R-CNN			Yolo		
	Accuracy	Recall	F-measure	Accuracy	Recall	F-measure
Lying laterally	0.61	0.67	0.64	0.86	0.75	0.80
Lying ventrally	0.76	0.68	0.72	0.86	0.75	0.80
Sitting	0.23	0.23	0.23	0.46	0.13	0.20
Standing	0.79	0.90	0.84	0.89	0.79	0.84
Eating	0.86	0.92	0.89	0.99	0.59	0.74
Drinking	0.71	0.40	0.51	0.49	0.39	0.44
Average	0.66	0.63	0.64	0.74	0.56	0.64

Accuracy vs Recall : ex : **86%** of sows detected « lying laterally »
but recall = % of sows **really** lying laterally (**75%**)

