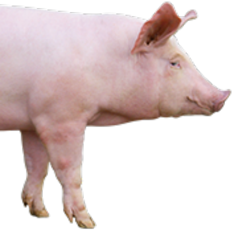

Relationships between sow activity and litter weight gain over the days after farrowing

Océane Girardie

Denis Laloë, Mathieu Bonneau, Yvon Billon, Jean Bailly, Ingrid David, Laurianne Canario

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
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INRAE

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Early growth determines growth to weaning

Fraser and Thompson, 1986

Little is known about its determinism

Piglet growth depends on Piglet + Sow

Physiology
Behavior
Genotype

Rydhmer, 2000

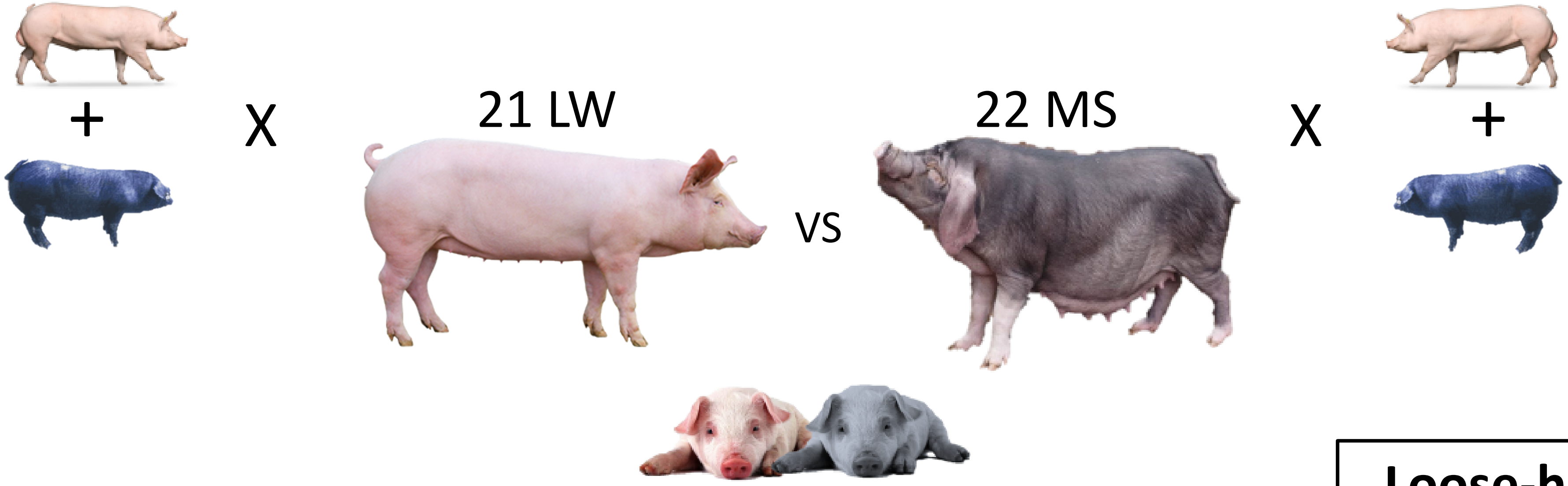
Sow

Milk production *Hojgaard et al., 2020*
Feed intake *Hurley, 2001*
Teat functionality *Balzani et al., 2016*
Nursing behavior
Number of postural changes *Illmann et al., 2015*

Objective : Identify sow behaviors correlated with early litter growth

Crossbreeding of Large-White and Meishan pigs

To explore the diversity of behavior response that exist in a population



21 LW

vs

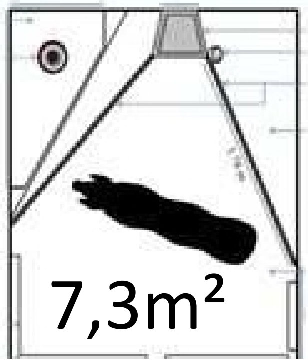
22 MS

LWLW LWMS

MSLW MSMS

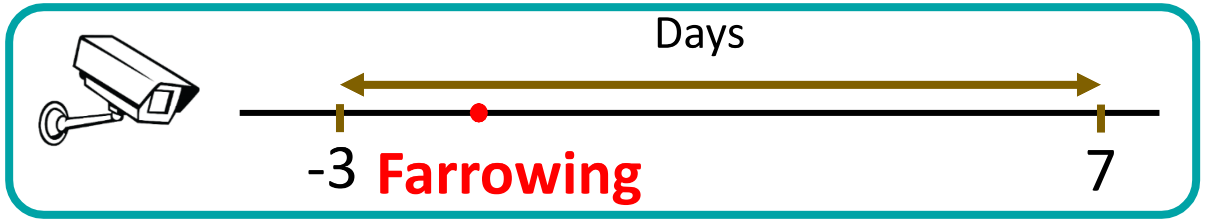
Loose-housed sow

Alternating MS and LW in adjacent pens



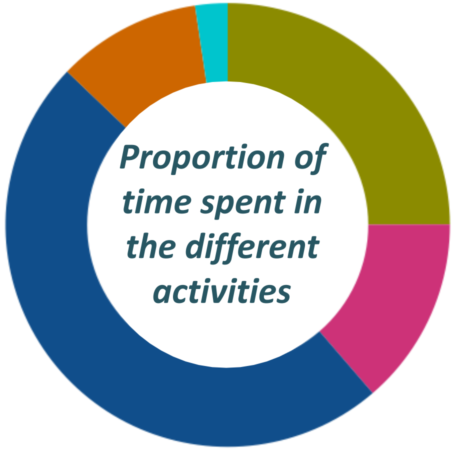
INRAE Experimental Unit GenESI Le Magneraud

- ✓ no adoption
- ✓ Limited human intervention around farrowing


Days

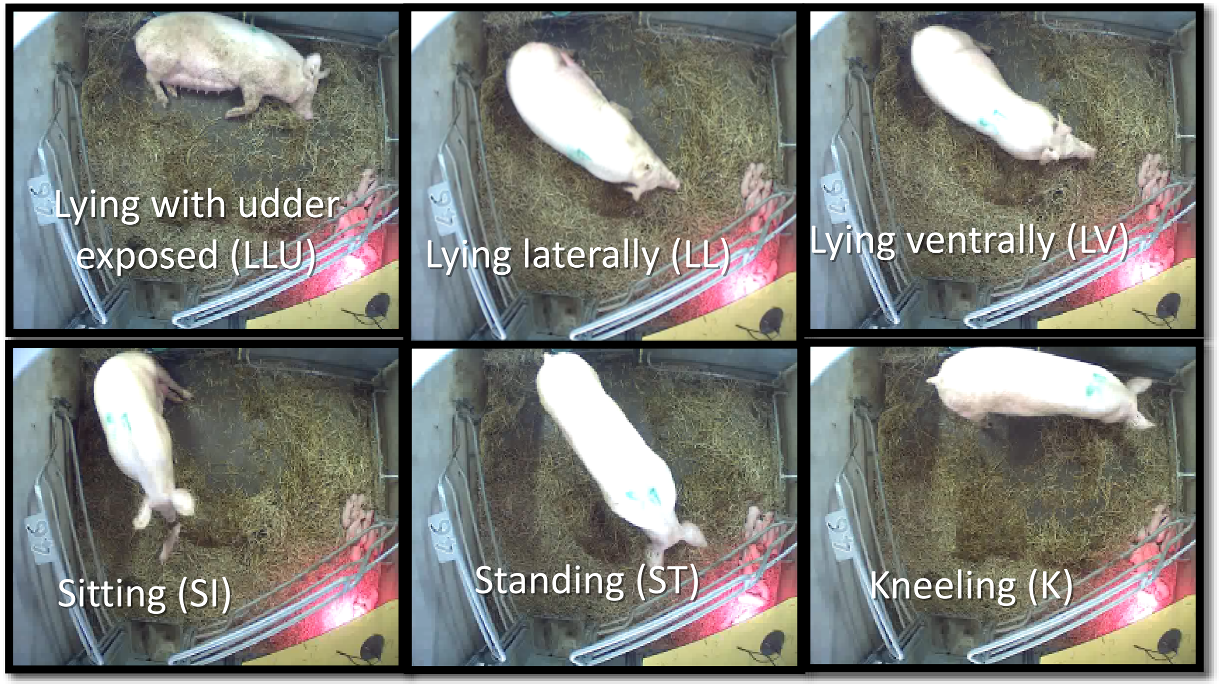
-3 **Farrowing** 7

Time-budget/ Day



Postural activity
&
Standing activity

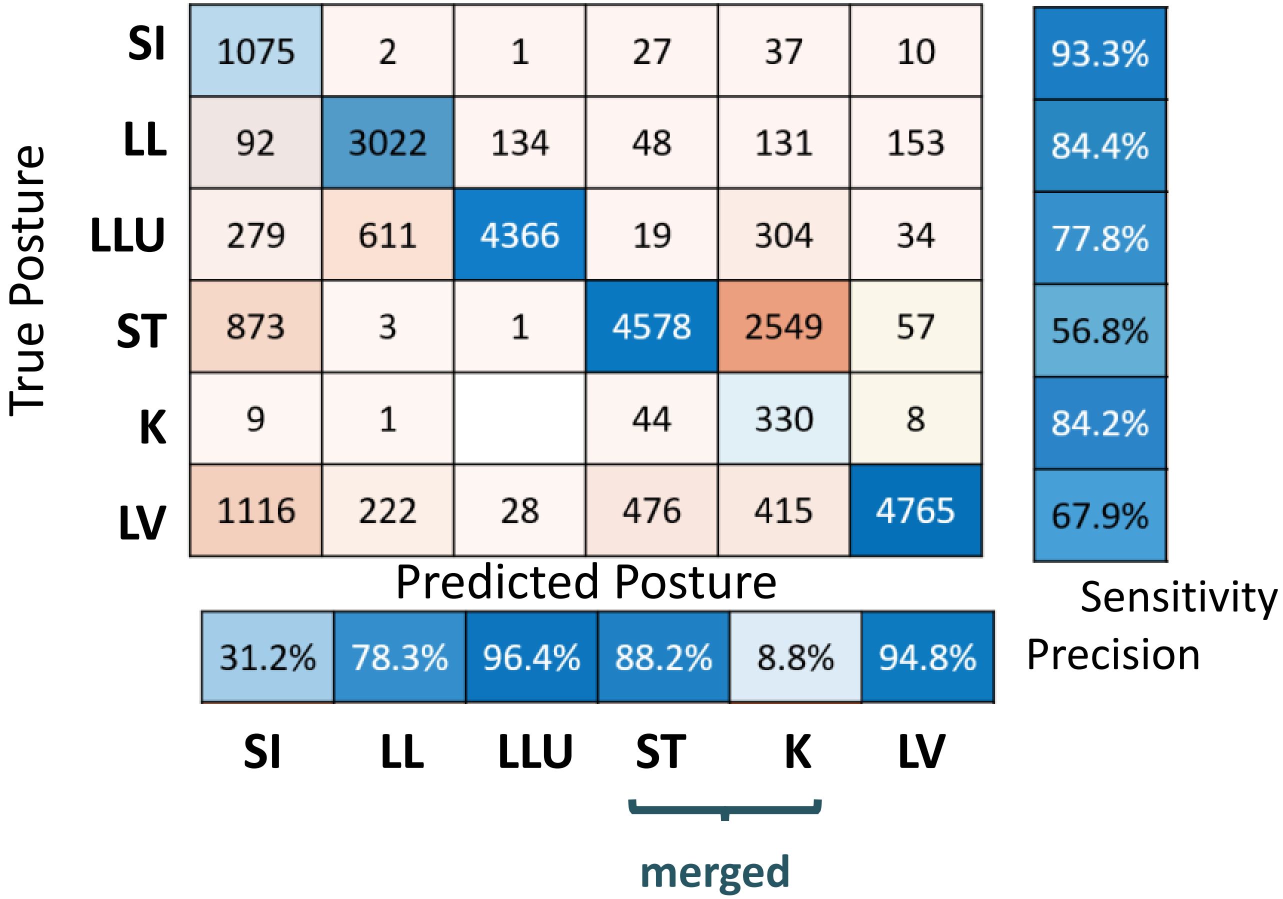
Convolutional Neural Network **YOLO**



8,400 images randomly chosen from the entire database

Postural activity

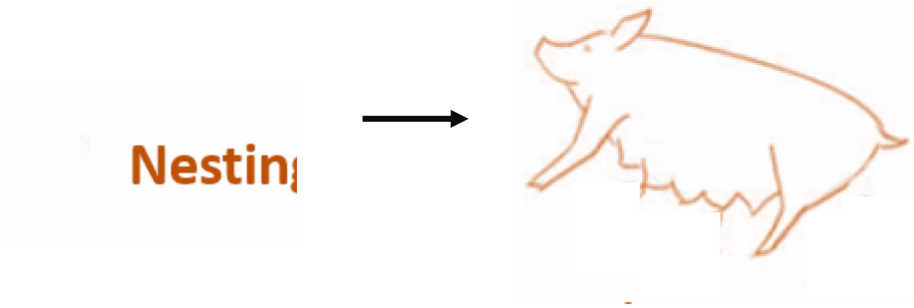
Verification → **25,830** annotated images



	SI	LL	LLU	ST	K	LV	Sensitivity
SI	1075	2	1	27	37	10	93.3%
LL	92	3022	134	48	131	153	84.4%
LLU	279	611	4366	19	304	34	77.8%
ST	873	3	1	4578	2549	57	56.8%
K	9	1		44	330	8	84.2%
LV	1116	222	28	476	415	4765	67.9%
Precision	31.2%	78.3%	96.4%	88.2%	8.8%	94.8%	

Accuracy = 80%

Postural changes/ Day

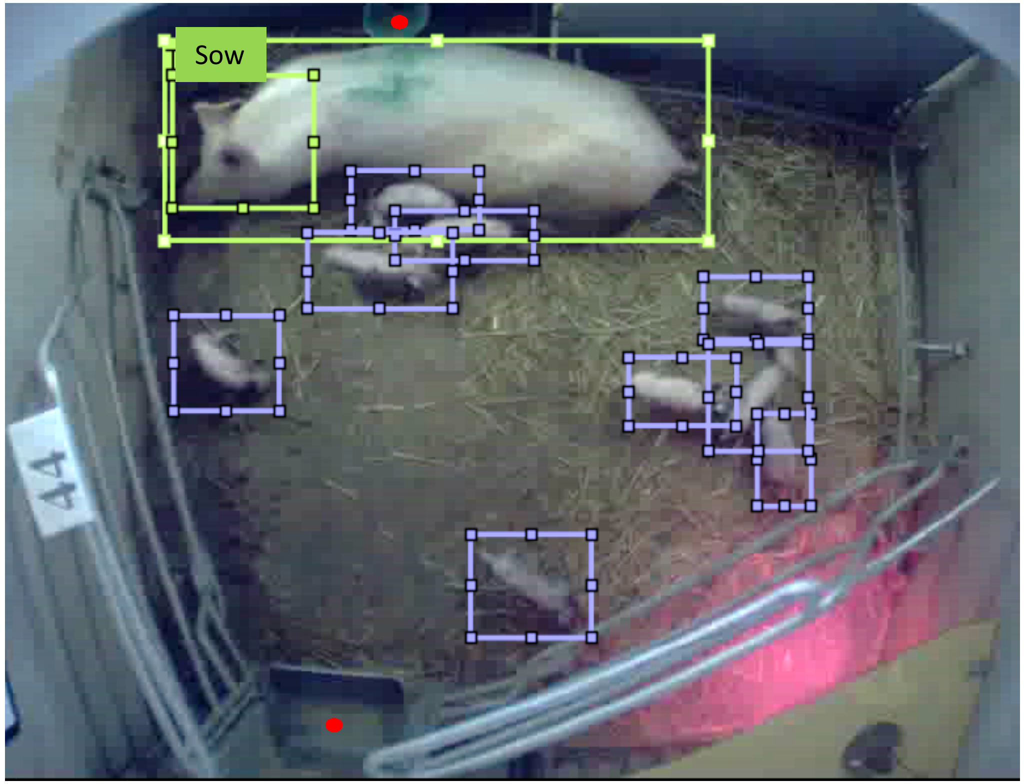


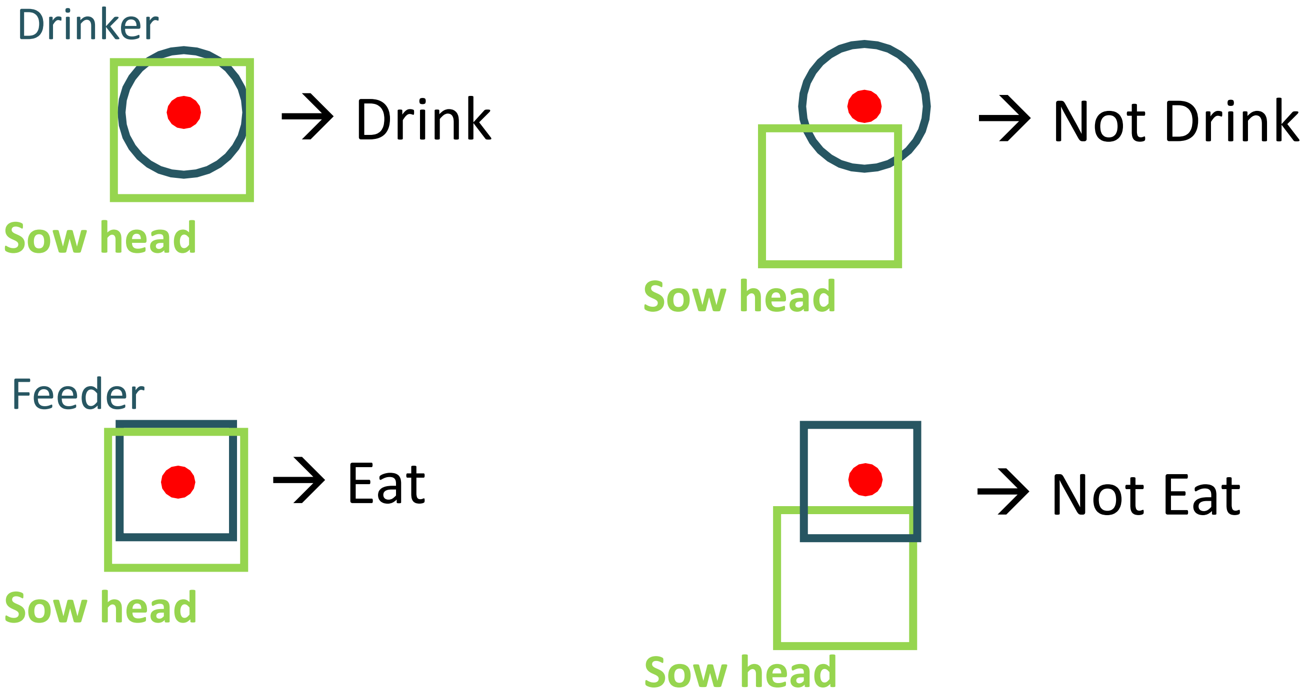
Total number of postural changes (PCAll)

&

Postural changes hiding teats (PCStopNurse)

Standing activity





Drinker

Sow head → Drink

Sow head → Not Drink

Feeder

Sow head → Eat

Sow head → Not Eat

→ Other (exploring, rooting)

Learning **YOLO** Random selection → 860 images

Girardie et al. 2023 https://doi.org/10.3389/fvets.2022.1051284

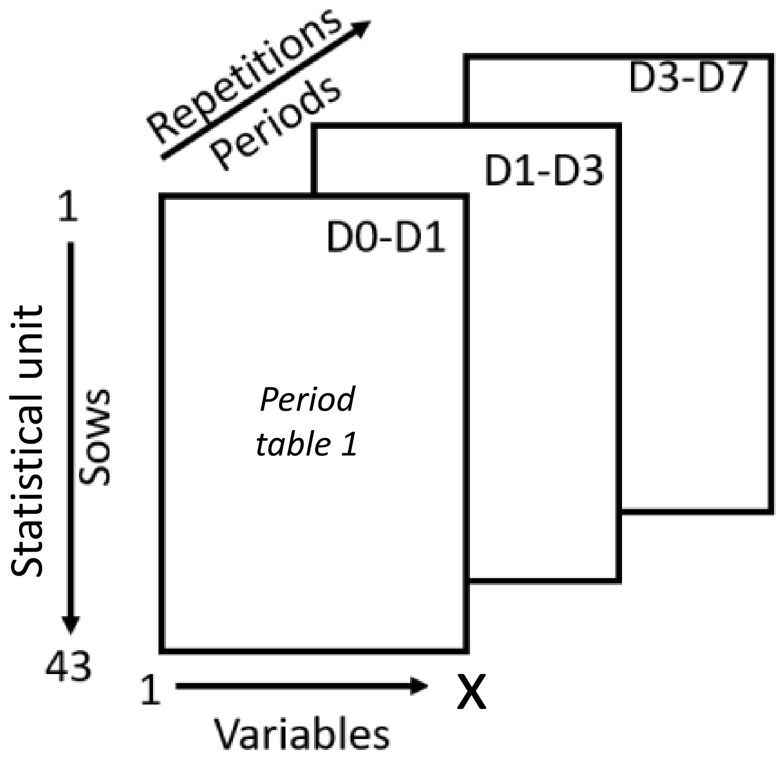
Piglet average daily gain

$$ADG = mean((Pweight_{end} - Pweight_{start}) / \, number\ of\ days_{end\ -\ start})$$

P = piglet

- ➢ Estimate the associations between sow behavior and early growth within each of these three periods
- ➢ Establish whether these relationships between sow behavior and early growth are stable over time

Partial triadic analysis



Correlation analyses

Compromise : average relationships between variables

Intrastructure : projection of each period table on the compromise

Analyses

1 Standing activity + daily feed intake

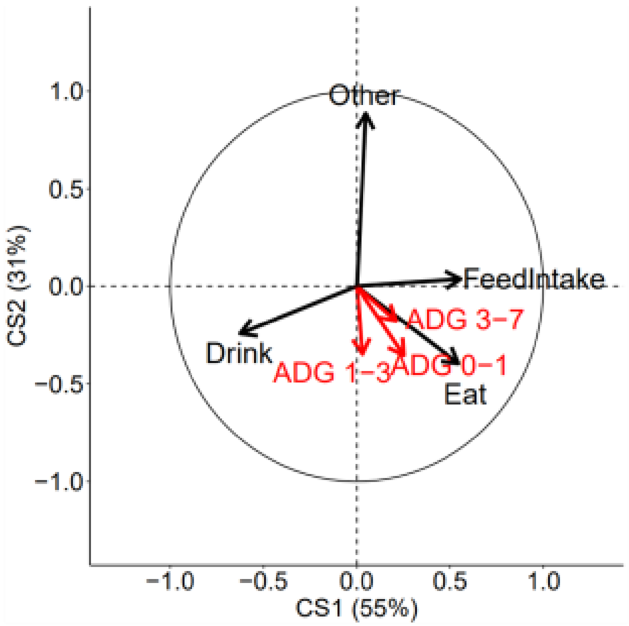
2 Postural activity + Number of postural changes

Supplementary variables : 3 ADG

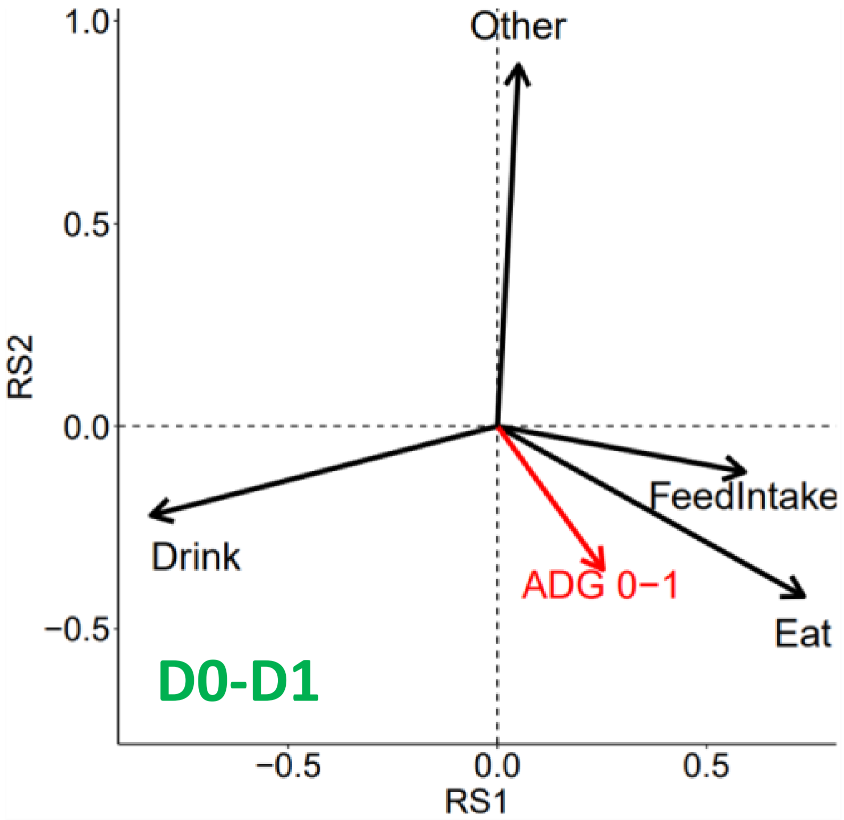
Standing activity + feed intake

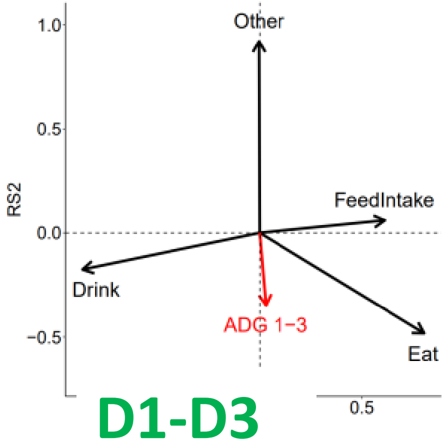
3 Intrastructures

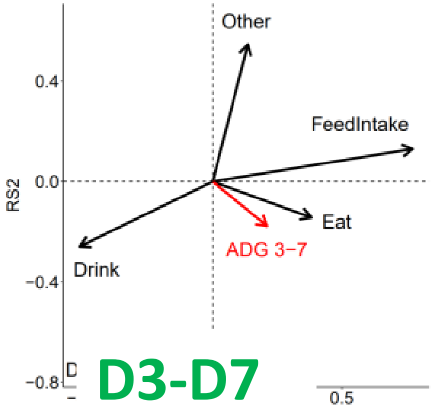
Compromise



First 2 axes : 86% of variation



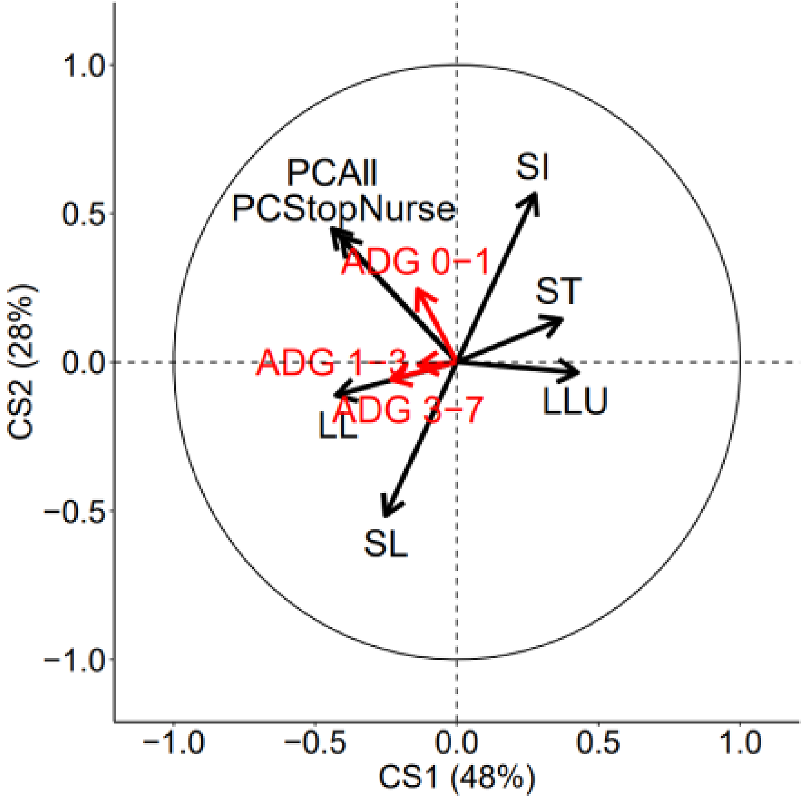




Higher correlation on the first-day of lactation between ADG and sow feeding activity

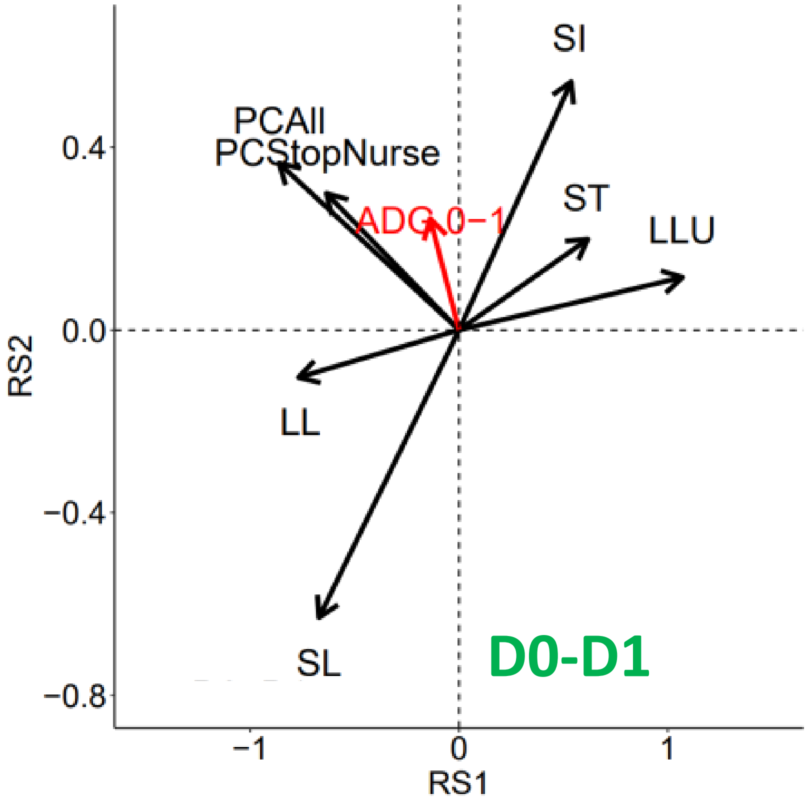
Postural activity + Number of postural changes

Compromise

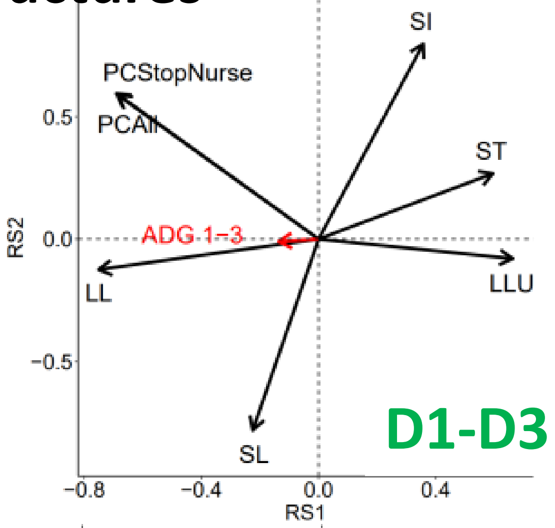


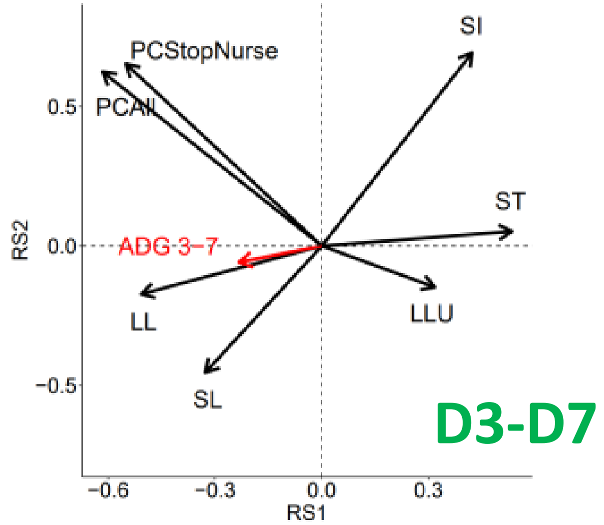
First 2 axes : 76% of variation

3 Intrastructures



Higher correlation on the first-day of lactation between ADG and sow restlessness (postural change)





Conclusion

Early growth is higher in litter reared by sows that are more **restless** and spend more time **eating in early lactation**

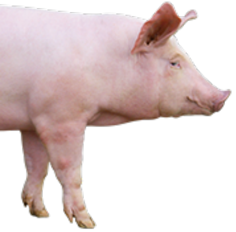
CNN are tools to access fine behaviors automatically
Partial triadic analyses allow identifying a period of time when sow behavior has the greatest influence on piglet performance

Additional results

- Explanatory analysis with other maternal traits ***ISAE 2023*** → importance of sow behavior
- Same study was carried out on piglet mortality

Perspective

- Including sow behavior in selective schemes to improve maternal abilities



Thank you

oceane.girardie@inrae.fr océane-girardie-348258173/ Looking for a post-doc ☺