Assessment of piglet maturity at birth using computer vision

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CCSI · CCAP

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BACKGROUND

- R&D project '*New selection tools to improve piglet pre-weaning survival*'

- Pilot studies on novel technologies to automate the collection of new phenotypes:
  - ➢ Piglet traits
    - ➢ maturity at birth
    - ➢ Birth to weaning growth
  - ➢ Sow traits
    - ➢ Behaviour around farrowing
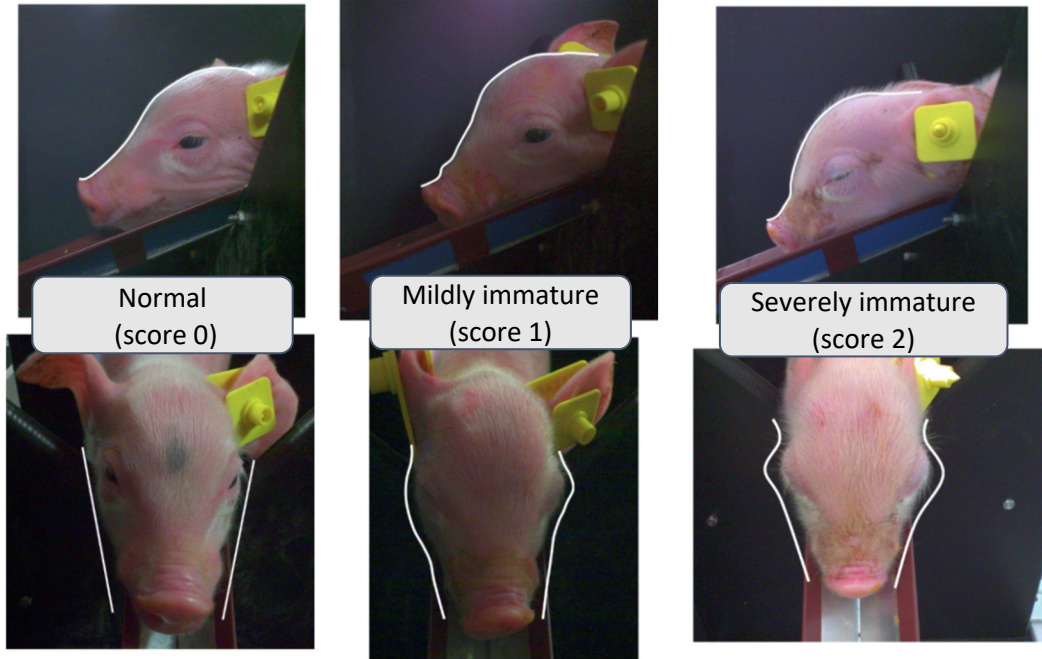   - ➢ Behaviour during lactation

WHY FOCUS ON PIGLET MATURITY?

- Improvement in litter size → ↖ number of small piglets

- 2 types of small piglets:
  - SGA = Small for gestational age
  - IUGR = intra-uterine growth retardation (=immature) – specific head characteristics

- Maturity = complete development allowing survival at birth

- Most immature piglets have a low birth weight, but not all small piglets are immature!

- Heritable (sow trait and piglet trait)

Normal piglet   IUGR piglet
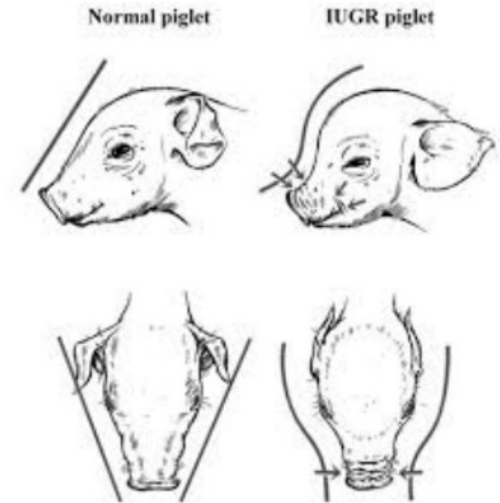
Maturity at birth: visual scoring (as suggested by IFIP)

Normal (score 0)

Mildly immature (score 1)

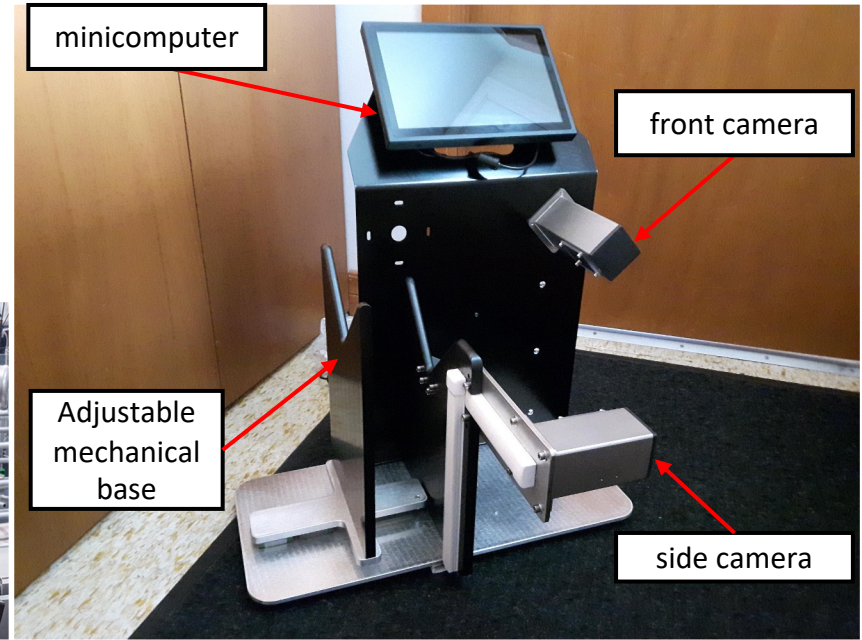Severely immature (score 2)

3 levels : 0/1/2

For experienced workers, the scoring takes about 13 seconds/piglet + data entry

PIC'LET (PICture of pigLET)

- Computer vision system developed to automatically assess piglet maturity using deep learning

- Collaboration between NeoTec Vision and IFIP

PIC'LET PROTOTYPE
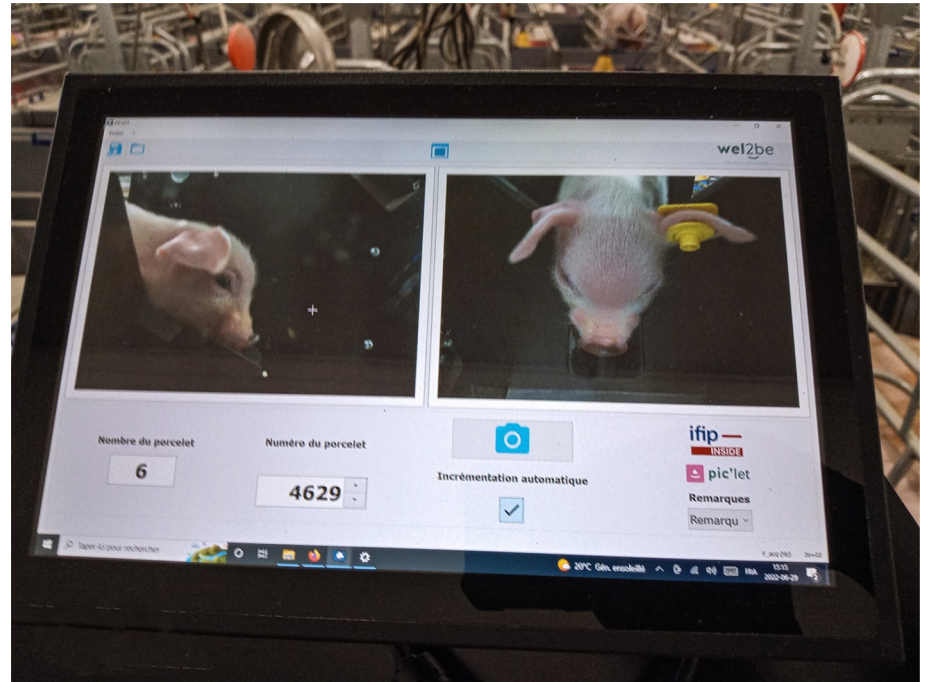
Three levels of maturity - similar to visual scoring:

- 0 = Normal (mature)
- 1 = Mild (mildly immature)
- 2 = Severe (severely immature)

CDPQ RESEARCH AND TRAINING SOW BARN

- Located in Armagh (Quebec)
- Inaugurated in 2020
- 675 head sow barn – farrow to wean
- 4-week batch management
- 1 large farrowing room with 135 crates
- Novel technologies in all sections

Testing the Pic'let prototype at the CDPQ sow barn

- Objective = test a tool developped on other populations and a different environment to see if it is directly transposable or requires adjustments

- Testing of 47 litters (692 newborn piglets)
  - Pic'let classification (0/1/2)
  - Visual scoring (0/1/2)
  - Body measures
    - body length
    - head length
    - between-eye distance
    - chest circumference
    - femur length

RESULTS

Birth weight vs maturity score (visual)
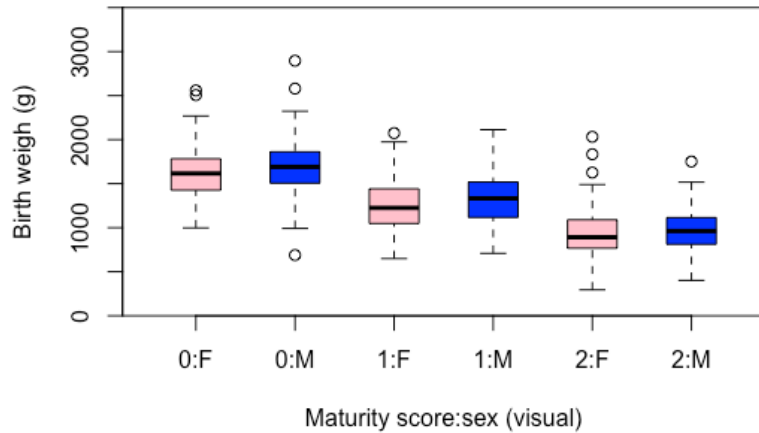
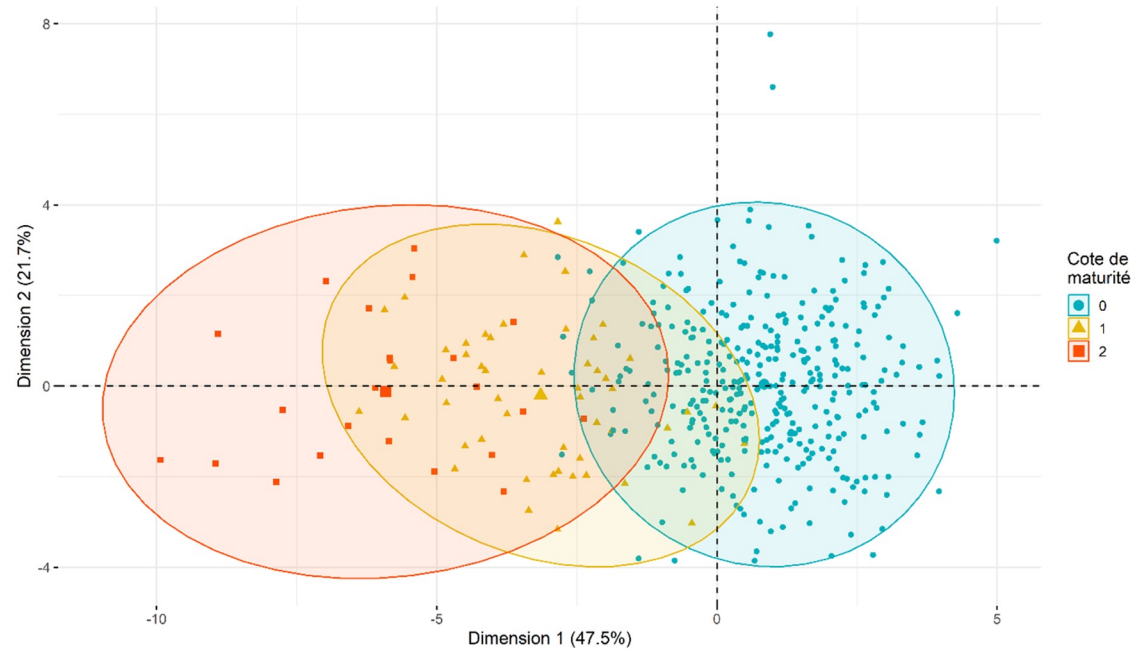|	#obs	Results		
		0 Normal	1 Mild	2 Severe
Pic'let	692	46.1%	41.5%	12.4%
Visual scoring	692	51.9%	33.7%	14.5%

Only 59% of matching scores

RESULTS - PRINCIPAL COMPONENT ANALYSIS

1st dimension:

• Weight

• Circumference

• Body length

• Femur length

2nd dimension:

• Body Mass Index (BMI)

• Body Weight Index (BWI)

• Head length : body length

Reference dataset

426 observations with matching visual score for all scorers (CDPQ+IFIP)

		Pic'let			
		0	1	2	
Reference	0	235	3	0	99 %
	1	93	41	4	30 %
	2	24	7	19	38 %
		66.8 %	80.4 %	82.6 %	69 %

PIC'LET prototype evaluation summary

😊

- Robust and compact
- Easy to install and use
- Well adapted to farm conditions
- Automates scoring and data entry
- Scoring can be done at the same time as weighing

🤨

- Some camera issues (especially on side camera)
- All images are scored (good or not)
- Moderate concordance in our trial – need to improve the image database
- Cost?

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TAKE HOME MESSAGE

- Preliminary results on only 47 litters

- Device well designed for barn conditions

- Room for improvement in prediction accuracy

  - Communication with the developers to improve the picture database

- Future projects including piglet activity tracking during the first hours of life and video analysis of farrowing

Report available

For all questions:
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Utilisation du système Pic'Let pour l'évaluation automatisée de la maturité des porcelets à la naissance

Auteur (s)

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New selection tools to improve piglet pre-weaning survival

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