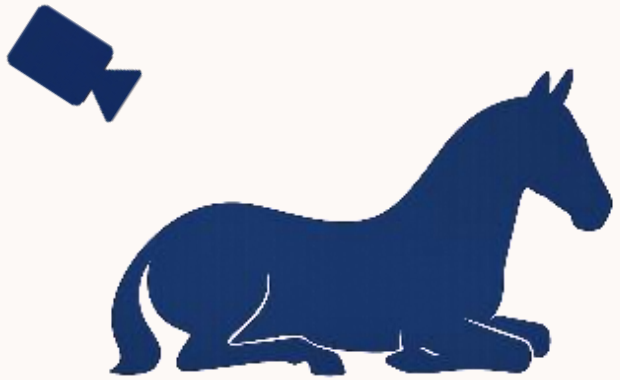
Monitoring foaling mares' behavior using computer vision

A. Eerdekens , M. Papas, J. Govaere , W. Joseph , L. Martens, M. Deruyck
WAVES Research Group – Ghent University
EAAP Conference on Artificial Intelligence 4 Animal Science
Abstract number: 74777497

Foaling in mares: unpredictable, fast & hard to monitor



Stage II < 30 min

Variable gestation

- 320–360 days
- Timing differs across individuals

Behavioral signs

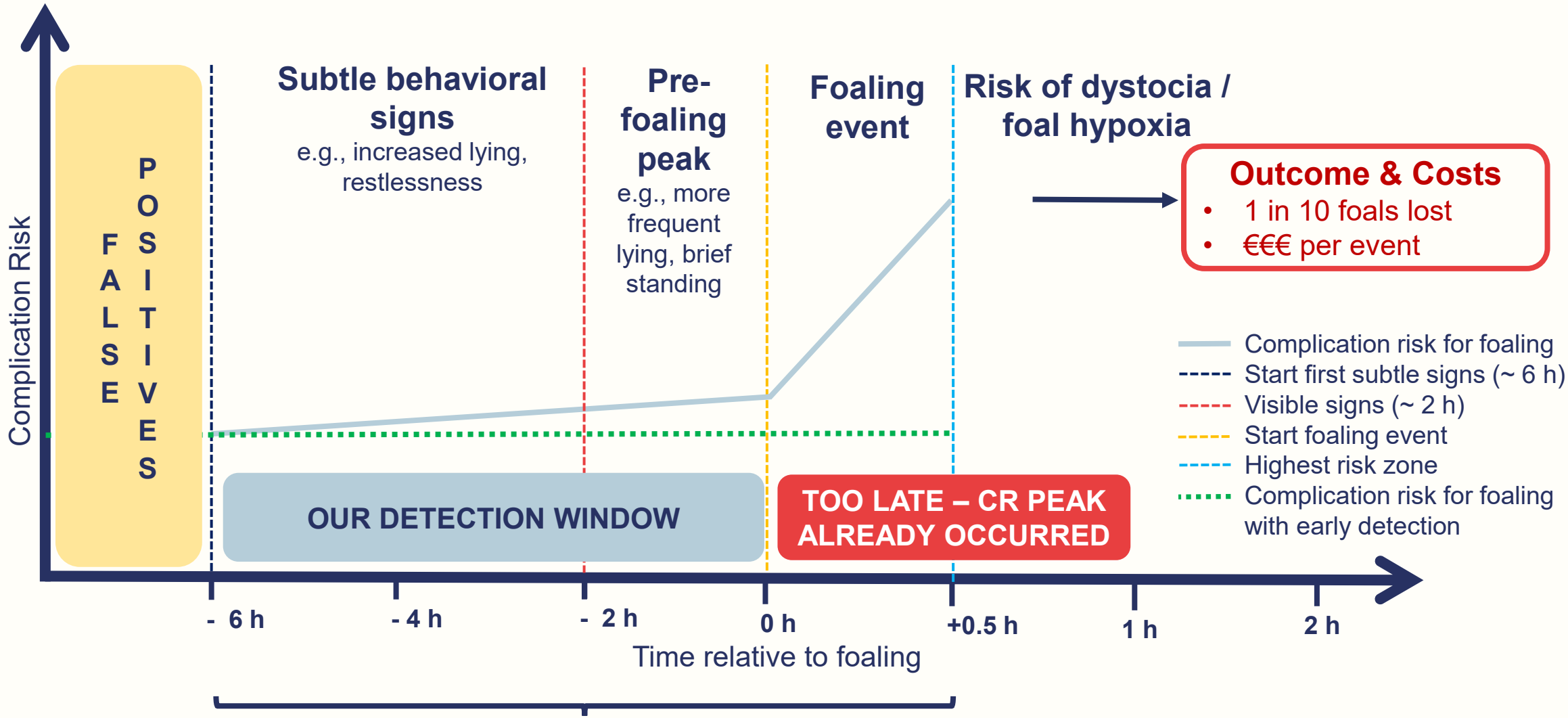
- Increased lying and restlessness
- Vary in pattern and intensity
- Often occur at night

Current limitations

- Manual observation = subjective
- High false alarm rate with current tools
- Wearables = not always practical

GHENT UNIVERSITY

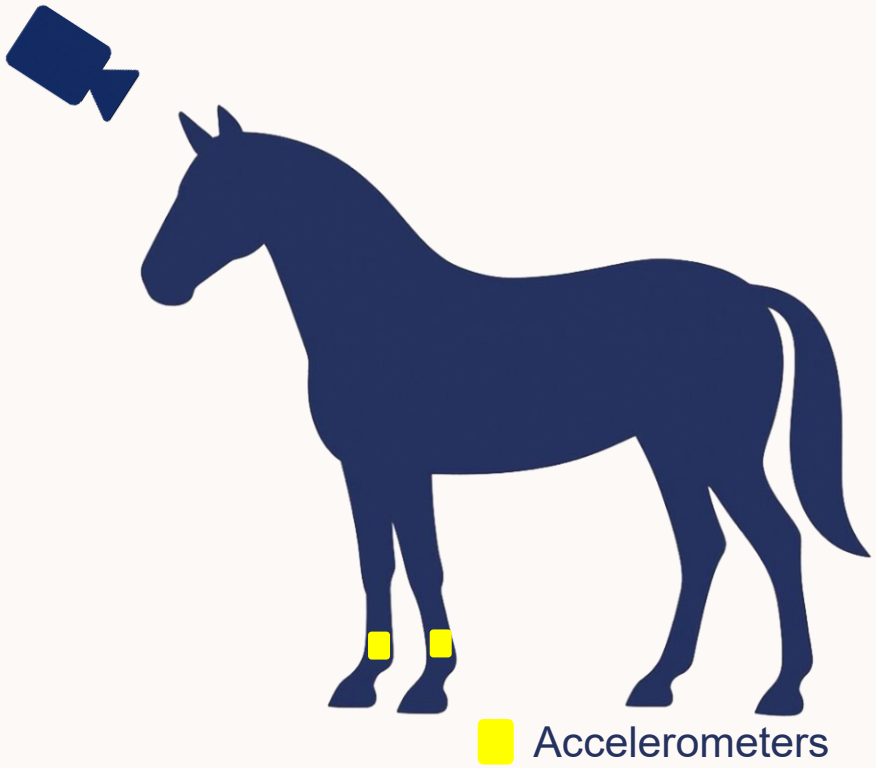
Detection window



75% of foalings occur at night (10 pm and 6 am)

GHENT UNIVERSITY

Data gathering and preprocessing



34 mares in the veterinary clinic

Videodata

- 4332 h video
- 12568 labeled normal and pain-related behavior events
- bounding box information (h, w, x, y)

Accelerometer data

- 1546 hours
- 50 Hz sampling
- 2 sensors attached to the front legs
- used for pain-related behavior detection (*)

Timestamps were aligned using OCR-extracted video timecodes and accelerometer timestamps.

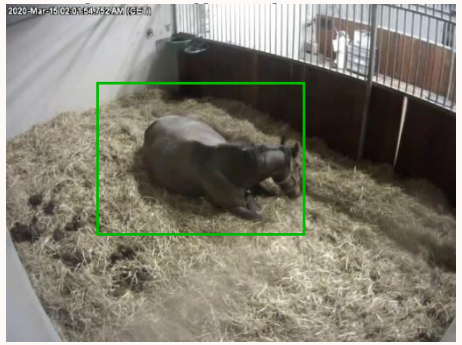
GHENT UNIVERSITY

*Eerdekens, Anniek, et al. "Automatic early detection of induced colic in horses using accelerometer devices." Equine Veterinary Journal 56.6 (2024): 1229-1242.

Video-based detection pipeline

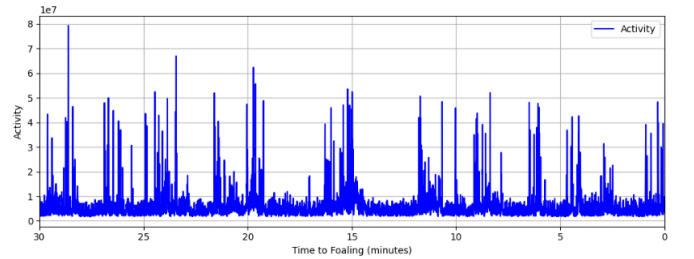
Input & Model & Output

YOLOv8
trained to detect
pain-related
behaviors and

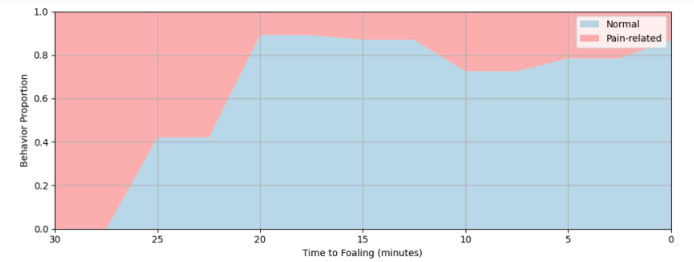


Activity features

BBOX input aligned with accelerometer-derived ground truth for activity classification



Behavioral features



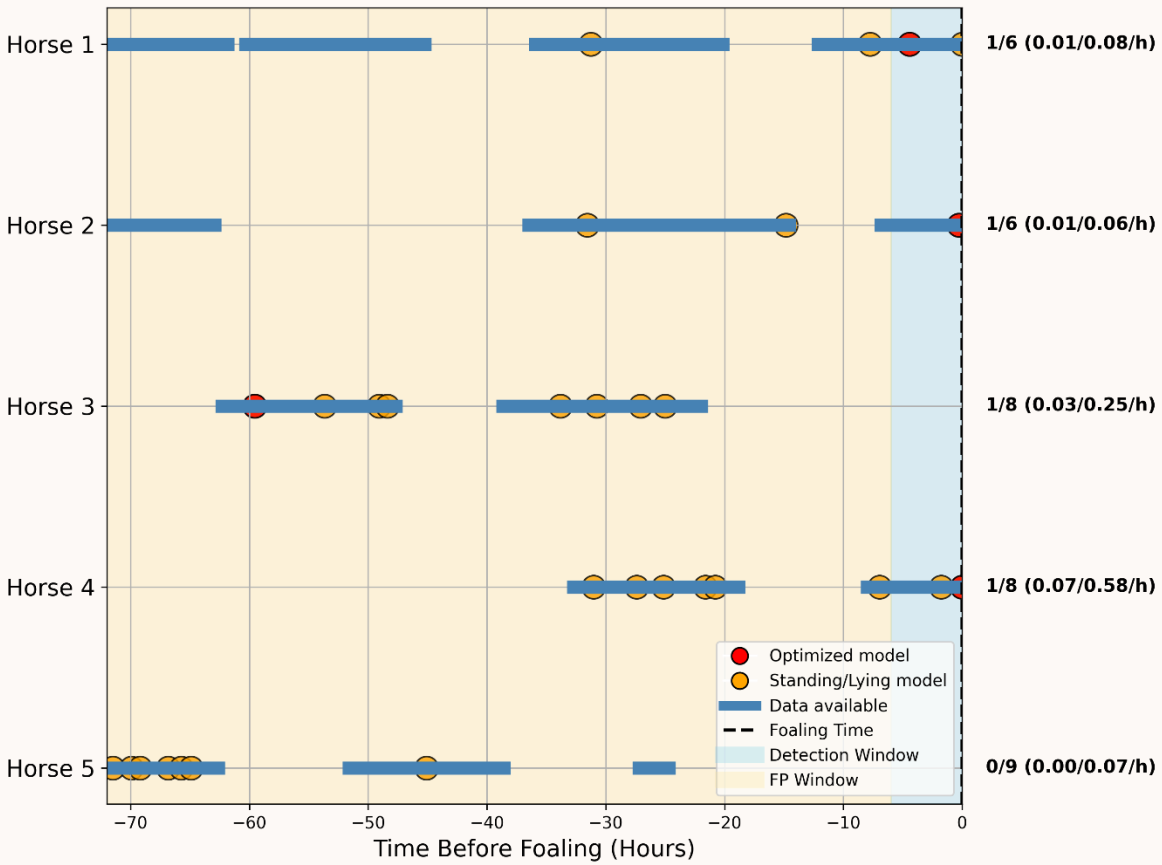
Validation

Behavior and activity features over 30 minute time windows are labeled.

- TP: Alarm correctly predicted foaling < 6 hours.
- FP: Alarm triggered too early (> 6h before foaling).
- FN: Alarm goes off after foaling.

GHENT UNIVERSITY

Results

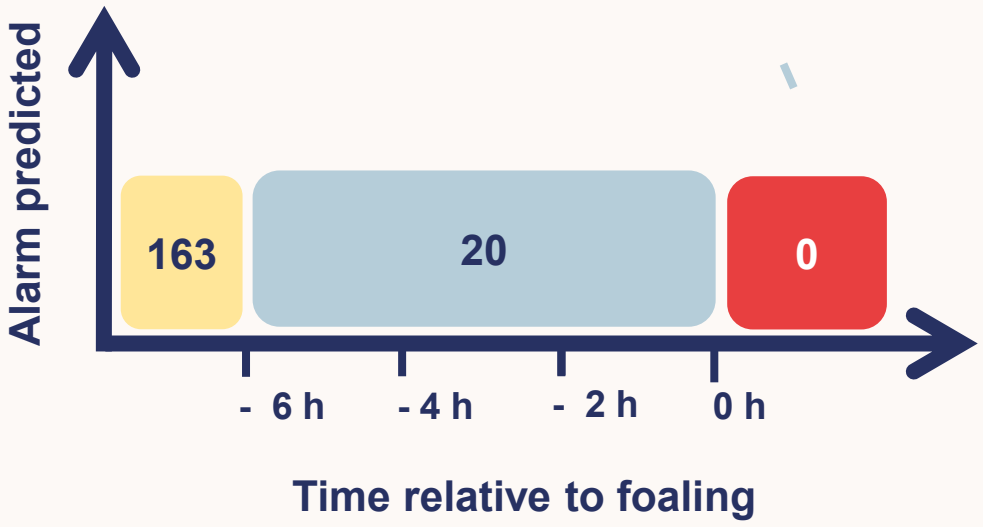


- Foaling dataset: 34 mares
  - 20 True Positives (TP)
  - 9 False Positives (FP)
  - 0 False Negatives (FN)
- Alarm timing: TP red alarms triggered ~1 hour before foaling (on average)
- All 20 mares with data in final 6h were detected→ no missed detections
- 14 mares without foaling data, 4 triggered false alarms (FP), 10 had no alarms

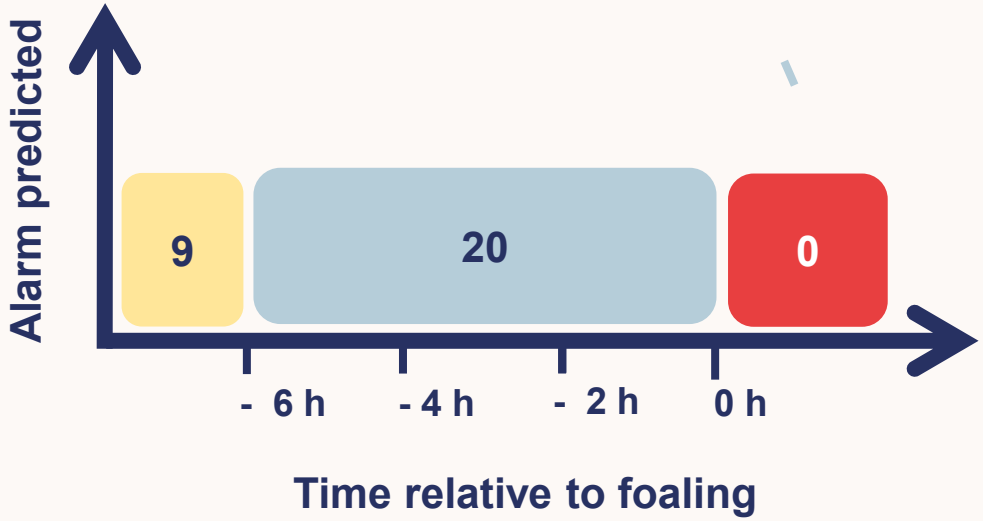
GHENT UNIVERSITY

Standard standing/lying detection vs proposed model

Precision: 0.11, Recall: 1.00, F1 score: 0.20



Precision: 0.69, Recall: 1.00, F1 score: 0.82



False Positives: 94.5% ↓

F1 Score: 314.7% ↑

GHENT UNIVERSITY

Practical implementation

Video data

Video snapshots

VM with ML
Behavior and activity detection

Alerts

Stables to monitor

AWS DB

Alerts

User inputs (e.g., foaling notes, stable configs)

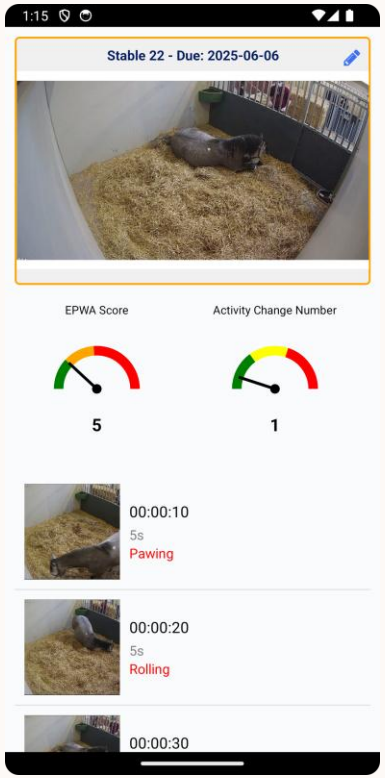
Video snapshots of interest

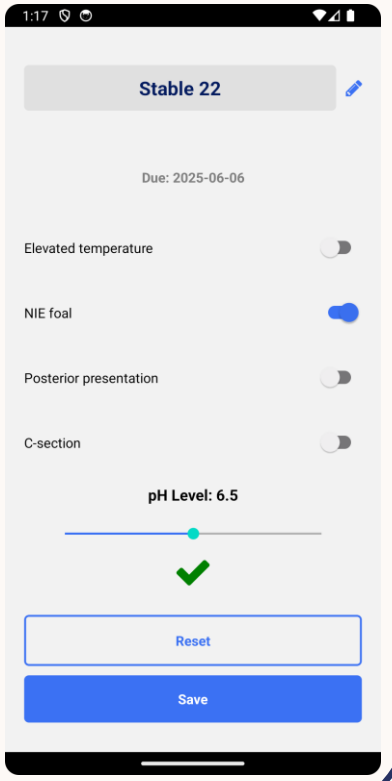
Object Storage

Pre-signed URL
Securely deliver snapshots

App

Veterinarians can monitor stables in real time, receive foaling alerts, and log foaling-related details directly in the app.





GHENT UNIVERSITY

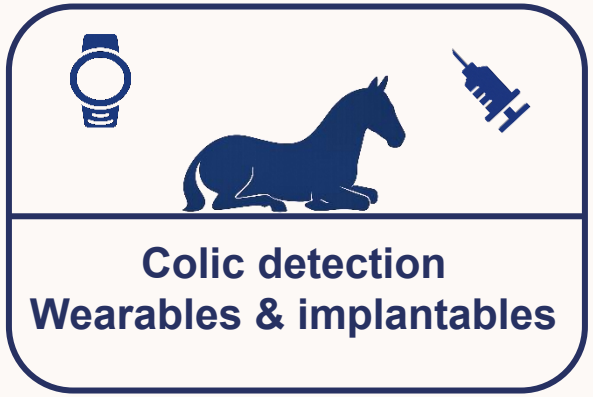
Take-home messages

- Timely foaling detection is critical
- Pre-foaling behaviors are detectable
- Computer vision reliably tracks pain-related behaviors and activity

Next steps

- Integrate wearable data for multimodal prediction
- Extend and diversify the dataset
- Validate system performance in new environments

Animal IoT at WAVES



Colic detection
Wearables & implantables

Foaling detection
Wearables & computer vision

Goat gut health
Ingestibles

Thank you for listening! Any questions?

Anniek.Eerdekens@ugent.be

Animal IoT Lead, WAVES Research Group: Margot.Deruyck@ugent.be

GHENT UNIVERSITY

References

McCue, P. M., & Ferris, R. A. (2012). Parturition, dystocia and foal survival: a retrospective study of 1047 births. Equine Veterinary Journal, 44, 22-25.

Heck, L., Clauss, M., & Sánchez-Villagra, M. R. (2017). Gestation length variation in domesticated horses and its relation to breed and body size diversity. Mammalian Biology, 84, 44-51.

Hartmann, C., Lidauer, L., Aurich, J., Aurich, C., & Nagel, C. (2018). Detection of the time of foaling by accelerometer technique in horses (Equus caballus)—a pilot study. Reproduction in domestic animals, 53(6), 1279-1286.

Sendelbach, S., & Funk, M. (2013). Alarm fatigue: a patient safety concern. AACN advanced critical care, 24(4), 378-386.

Wessel, M. (2005). Staging and prediction of parturition in the mare. Clinical Techniques in Equine Practice, 4(3), 219-227.

FACULTY OF ENGINEERING
AND ARCHITECTURE

Dr. ir. Anniek Eerdekens

Department of Information Technology
Research group IMEC INTEC-WAVES

E anniek.eerdekens@ugent.be
M +32 456 15 26 40

www.ugent.be

Universiteit Gent
@ugent
@ugent
Ghent University

GHENT
UNIVERSITY

waves
wireless, acoustics, environment & expert systems