Sow activity patterns elaborated from computer vision data are associated with piglet growth in early lactation

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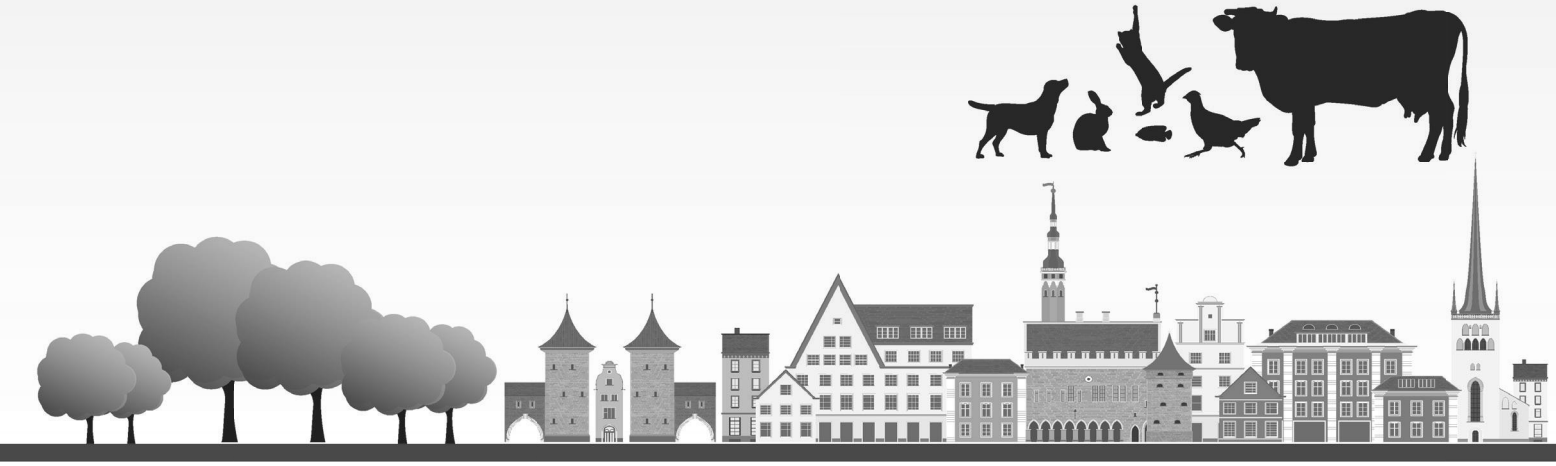
BOOK OF ABSTRACTS



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Tuesday, 1st August - 11:45: PLF and Other New Techniques for Measuring Animal Behaviour (Pigs and sheep) (Bolero hall) - Oral

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Recent advances in deep learning enable the automatic analysis of video images and thereafter the analysis of behavioural traits over extended periods of time. We collected data to compute 101 maternal ability traits for 21 Large-White and 22 Meishan primiparous sows housed in individual farrowing pen. Sows were filmed continuously around farrowing. Three periods were considered: pre-farrowing (D-3 to D-1), at farrowing (D0) and post-farrowing (D1 to D7). Sow traits were grouped in 11 blocks of data: predicted posture activity (incl. posture changes) pre, at and post-farrowing, predicted standing activity (plus daily feed consumption) pre, at and post-farrowing, farrowing performance, ease at handling and adaptation to the farrowing unit, reactivity at farrowing, teats functionality and body reserves. To obtain sow behaviour, we used 8,400 annotated images to train the convolutional neural network (CNN) Yolo-v2. Sow postures (standing, sitting, lying sternally, lying laterally with udder hidden or not) were predicted. The five postures were combined in a daily posture budget. The CNN accuracy calculated from the use of 25,830 randomly chosen images was 80%. Another Yolo-v2 CNN was trained to detect the sow's head to analyse the standing activity budget as the time spent eating, drinking and doing something else. The numbers of postural changes in total, risky for piglets and hiding the udder were calculated. Variations in behaviour within each breed and between breeds was large. Analyses were corrected for the breed effect. Three successive piglet average daily gains were calculated from D0 to D7. The number of posture changes in the three periods influenced piglet growth ($p<0.001$). The number of posture changes hiding the udder was favorable to growth (+71g/d). Multifactorial analyses enabled to quantify the contribution of each block of data to piglet growth. Growth was significantly explained at 14% (95%CI: 10-25) by sow pattern of standing activity on D0. Although not significant, the contributions of farrowing reactivity (12%, 95%CI: 3-19), body reserves (10%, 95%CI: 4-18), postural activity at D0 (9.9%, 95%CI: 2.4-15.4) and teat functionality (9.5%, 95%CI: 4.6-12.8) were also substantial. A partial triadic analysis of early growth and standing activity highlighted an evolution in the correlation structure between those traits, from D0 to D4-D7. On average, piglet growth was correlated positively to drinking and negatively to feeding duration and consumption. To conclude, standing activity on the day of farrowing is one of the main maternal factors for early piglet growth.