

Does lameness detection improve with a multi-sensor system?

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The objective of this study was to evaluate if a multi-sensor system (milk, activity, body posture) was a better classifier for lameness than the single-sensor-based detection models. Between September 2013 and August 2014, 3629 cow-observations were collected on a commercial dairy farm in Belgium. Human locomotion scoring was used as reference for the model development and evaluation. Cow behaviour and performance was measured with existing sensors that were already present at the farm. A prototype of 3D-based video recording system was used to quantify automatically the back posture of a cow. For the single predictor comparisons, a receiver operating characteristics curve was made. For the multivariate detection models, logistic regression models were developed. The best lameness classification model was obtained by the multi-sensor analysis (AUC = 0.757 ± 0.029), containing a combination of milk and milking variables, activity and gait and posture variables from videos. Second, the multivariate video based system (AUC = 0.732 ± 0.011) performed better than the multivariate milk sensors (AUC = 0.604 ± 0.026) and the multivariate behaviour sensors (AUC = 0.633 ± 0.018). The video-based system performed better than the combined behaviour and performance based detection model (AUC = 0.669 ± 0.028), indicating that it is worthwhile to use a video-based lameness detection system, regardless the presence of other existing sensors in the farm. The results suggest that Theta2 as one measure for back posture with an AUC of 0.719 is the best single predictor variable for lameness detection based on locomotion scoring). In general, this study showed that a video-based system for back posture measurements is outperforming the behaviour and performance sensing techniques measured in this farm for lameness detection based on locomotion scoring.

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