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Can artificial intelligence be used on historical cow data to improve data quality and standardization of disease records.

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The common currency in developing solutions to sustainable dairy production are often focusing on increased animal production efficiency through improved animal health. In particular, the use of data driven technologies for early disease detection has shown a lot of promise. One crucial part of dairy cow disease monitoring and prediction, is the existence of high quality labeled datasets which are often missing. The need for a standardized data input regarding disease and fertility events has already been recognized for a long time. However, effective implementation in current farming software is still lacking. The reason for this is that in contrast with production data generated by automated monitoring systems, fertility and especially disease records are much harder to capture, as they are mainly recorded in an unstructured, user-dependent and hence non-standardized format.

In this study, a multi-class prediction model which forecasts the probability distribution over 12 possible life events using historical cow data was developed. Traditional techniques such as Markov for discrimination models can use historical sequences of disease and fertility records in order to predict a cow's future state. Additionally, we investigated whether more advanced recurrent neural network algorithms are better able to uncover the complex data patterns hidden in the event sequences. Finally, we examined if augmenting a cow's history of events with pictures take by the farmer can further enhance the predictive performance by making use of convolutional neural network models. While most picture studies are conducted as experimental designs using complex video camera setups and expensive equipment such as thermal scanners, we worked with pictures taken by the farmers and personel their smartphones, which to our most recent knowledge, has not yet been applied in the context of animal monitoring systems.

While the Markov for discrimination models their Percentage Correctly Classified (PCC) and Top-3 PCC ranged from 67% to 68% and from 87% to 88% respectively, the neural network models achieved a PCC of 75% and a Top-3 PCC of 95%. Results show that an ensemble model incorporating sequential as well pictorial information performs best and that the model is able to accurately predict future states such as calving, mastitis, pregnancy and death with an accuracy of 97%. The framework presented in this study can be used to enhance data quality of producer collected records by providing a guidance framework towards the correct disease event which allows more consistency in producer collected disease events.

Keywords: artificial intelligence, disease recording