RESEARCH ABSTRACT
ANIMAL SCIENCE

Title: Adaptation of Machine Learning Technologies to Predict Swine Production Outcomes to Assist in Disease Detection – NPB **#: 19-109**

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Abstract:
The intersection of animal health and production is crucial as animal production systems strive to maximize overall farm efficiency. Production is a function of genetics, management, nutrition, and health. Human management decisions determine genetics, management, and nutrition—each which can be readily observed and measured. Health remains the primary source of unknown variation in production systems. Therefore, variation from the expected level of production serves as a proxy for the population's health. The prediction of production has been unreliable with the accuracy of models low and the application of traditional statistical methods difficult with a high number of predictor variables. Machine learning allows complex relationships of many variables to be identified and used to make such predictions. In total data was collected from a total of ~250,000 individual sows, over a timeframe of 5 years. This represents >1.1million recorded service events. The data was composed of 62 unique variables, routinely collected on the sow farms represented. After data processing, 885824 instances, service events, remained and 655 variables representing the original 62 and an additional 593 generated through feature engineering. Machine learning predictive models utilizing both gradient boosting and neural nets were generated for gestation length, farrowing, and total born for an individual sow at the time of service. Accuracy of the classification model for if a sow would farrow was the most accurate model with an accuracy of >98%. >91% of sows gestion length could be predicted within a day of farrowing. The number of piglets born by a sow also could be predicted with a mean squared error of <0.1 piglets. Monte Carlo simulations of individual sows within a breed group could be added together a serve as a method to generate a 95% confidence interval of wean piglets per week. These results demonstrate that machine learning may be a valid method to predict production and in turn monitor variations in the health of large groups of animals.

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