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Media contact:

Brittany Morstatter

+1-217-356-3182 ext. 143

ARPAS@assochq.org

Using artificial intelligence (AI) in dairy farms

Examples and opportunities for AI and machine learning in the dairy sector are provided in a recent review in Applied Animal Science

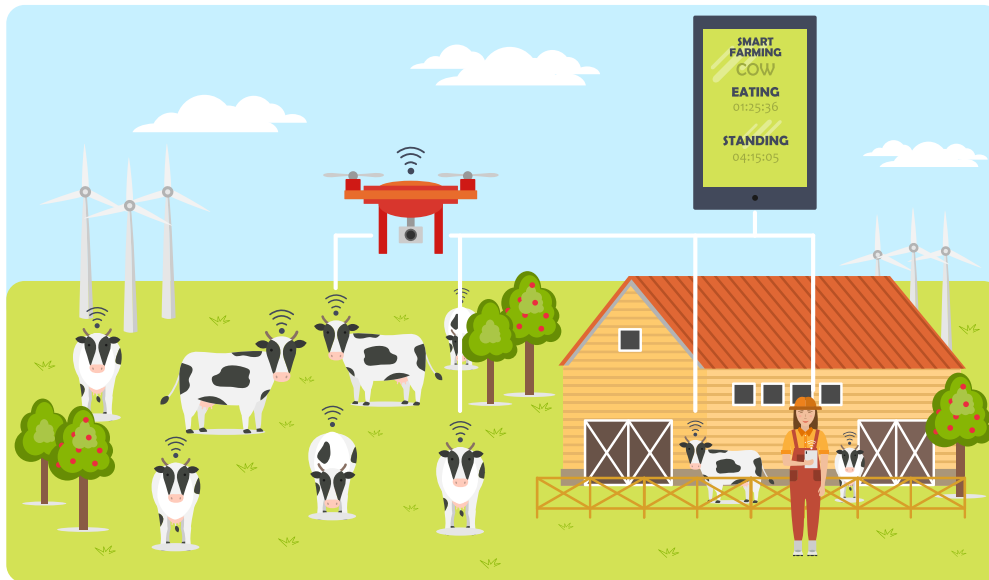
Champaign, IL, February 6, 2023—Artificial intelligence (AI; the ability of computers or robots to perform reasoning tasks) is a popular topic today, so many are investigating how it can be used to assist dairy farms. “Artificial Intelligence and Machine Learning in Dairy Production Systems” was the title of the American Registry of Professional Animal Scientists symposium that was held in June 2022 at the annual meeting in Kansas City, Missouri. A new [invited review](#) in [Applied Animal Science](#) resulted from a presentation that was given at this symposium.

“Our goal was to show the variety of settings in dairy farms where AI is being applied and discuss some strengths and weaknesses of the applications,” said lead author Albert De Vries, PhD (Department of Animal Sciences, University of Florida, Gainesville, FL, USA). De Vries and his coauthors reached this goal by supplying an overview of AI and machine learning (ML), discussing 5 published review articles about ML use in dairy farms, and providing examples of AI applied to animal performance.

The article begins by discussing the broad field of AI, detailing the theory and models currently used and touching on expert systems used in the 1980s and 1990s. Analytics offered by AI include descriptive, predictive, and prescriptive analyses, but the authors state that applications on dairy farms most often involve predictive analytics. “Predictive analytics uses historical data with the aim of understanding future performance through statistical modeling, for example estimating which cows are at risk of disease given their historical data,” said De Vries.

The researchers then cover what findings have been reported in the literature and highlight five reviews that focus on ML applications in dairy or livestock farms. They said that one review reported that most studies they reviewed used tree-based algorithms and an increasing number used neural network algorithms (deep learning), usually focusing on ML and the physiology and health of dairy cows. Another study reviewed articles about ML applications to a wide variety of areas important to dairy farming, although implementation was not recommended because of the limited quantity of data available. The third review that the authors focused on addressed the use of ML for disease detection and quantifying

milk production and milk quality, with most articles using decision tree–based algorithms and others using artificial neural network–based, regression-based, or other algorithms. Another survey looked at deep learning and precision cattle farming, found that convolutional neural networks were the most frequently used models, and listed challenges faced. The final review that the authors highlighted studied ML applications for precision livestock farming but concluded that ML is not overly useful yet in precision livestock farming because it is at such an early stage of development.



Caption: Much research has investigated various machine learning applications in the dairy farm. Data derived from sensors are often used in these applications (Credit: iStock.com/Alisovna).

Numerous specific examples of the use of AI in dairy farms are described in the article. “Because of advances in both hardware and software, intelligent use of new big data is possible, fostering improved decision making and processing using robots especially for repetitive manual and computational tasks,” said David K. Beede, PhD, Editor in Chief of *Applied Animal Science*. The review describes the use of ML for crop yield prediction, disease and estrus detection, prediction of insemination success and onset of calving, estimation of future milk yield and feed intake, employee training, and more. The use of robotics and even virtual reality goggles for dairy cows are mentioned. De Vries said that in the future, “AI will change the dairy sector by enabling improved work environments (all facets including decision making and robots) and removing or minimizing the need for manual human processing of repetitive tasks.”

The article appears in the February issue of *Applied Animal Science*.

Notes for editors

“Invited Review: Examples and opportunities for artificial intelligence (AI) in dairy farms,” by A. De Vries, N. Bliznyuk, and P. Pinedo (<https://doi.org/10.15232/aas.2022-02345>), *Applied Animal Science*, volume 39, issue 1 (February 2023), published by FASS Inc. and Elsevier.

This article is openly available at <https://doi.org/10.15232/aas.2022-02345>.

Full text of the article is also available to credentialed journalists upon request; contact Brittany Morstatter at +1-217-356-3182 ext. 143 or ARPAS@assoqh.org to obtain copies. To schedule an interview with the author(s), please contact Albert De Vries at devries@ufl.edu.

About *Applied Animal Science*

Applied Animal Science (AAS) is a peer-reviewed scientific journal and the official publication of the American Registry of Professional Animal Scientists (ARPAS). In continuous publication since 1985, AAS is a leading outlet for animal science research and is indexed by Scopus and ESCI (Clarivate's Emerging Sources Citation Index). The journal welcomes novel manuscripts on applied technology, reviews on the use or application of research-based information on animal agriculture, commentaries on contemporary issues, short communications, and technical notes. Topics that will be considered for publication include (but are not limited to) feed science, farm animal management and production, dairy science, meat science, animal nutrition, reproduction, animal physiology and behavior, disease control and prevention, microbiology, agricultural economics, and environmental issues related to agriculture. Themed special issues also will be considered for publication. www.appliedanimalscience.org

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