322 Real-time continuous decision-making using big data.
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We are developing a real-time, data-integrated, data-driven, continuous decision-making engine, a Dairy Brain. We illustrate the concept with 3 practical applications. (1) Precision feeding: all lactating cows (N~1,898 ± 115) in a farm are housed in 14 same-sized pens and fed 7 diets. Cows are allocated to each pen only according to DIM and lactation number. Every week employees move cows in and out of pens (N~256) following lists manager generates from printouts of disjointed data. A continuous, more systematic cows' allocation to pens according to nutritional requirements is possible by automatically aggregating data streams from management, feed, DHI, and parlor records. Algorithms can provide more precise diets to more homogeneous clusters of cows allocated to pens. Preliminary results indicate the farm could increase net margin by $67,834/yr when providing pen-based more precise diets. (2) Early risk of clinical mastitis (CM): first-lactation cows under risk of developing CM can be identified by analyzing integrated data from their genomic traits scores such as Genomic Total Performance Index (GTPI), management, and laboratory results. The risk can be reassessed at every DHI report or GTPI score variation. This integrated continuous algorithm allows to identify high-risk CM cows even when their SCC is low (<200,000 cells/mL); for example, cows with GTPI > 2,000 report the lowest SCC during the entire lactation. However, animals within this category and SCC > 115,000 cells/mL should be carefully monitored because they might already be infected. (3) Predicting CM: Cows at risk of CM show higher milk conductivity and milk production than healthy cows. Continuous, integrated data could be used to permanently predict the onset of CM. The difference on milk production and conductivity between milkings analyzed with gradient boosting machine learning algorithms can predict CM 5 milkings earlier with a sensitivity of 0.82, a specificity of 0.58, and a prediction accuracy of 0.81. Farmers can count with a monitoring tool to flag cows at risk of contracting CM and follow up them closely in a preventive way. More data for training the machine learning algorithms and integration of other data streams such as genetics, sensors, and diet changes, will improve the prediction accuracy.

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