Towards a validation protocol for sensor information in dairy herd management

Amira Rachah, Olav Reksen, Dan Christoffer Jansen, Peter Løvendahl
Norwegian University of Life Sciences, Faculty of Veterinary Medicine, Department of Production Animal Clinical Sciences, PO Box 8146 Dep., N 0033 Oslo, Norway   amira.rachah@nmbu.no

A growing variety of sensor-based technologies are finding their way into modern cow barns, claiming to be helpful in dairy herd management. Although developed with the best of intentions, many technologies fail to fulfil the promises for some reasons. Those reasons range from technical breakdowns, short battery life, hardware failure over user-unfriendly interfaces to missing integration with other technologies. A protocol for testing devices on a range of performance indicators that jointly describe quality and reliability would be very helpful for users of the technology. In this study, we focus on the description of the quality and reliability of a Body Condition Score (BCS) camera, in order to establish a validation protocol. Data were obtained from 3D overhead camera system from DeLaval.   As an animal passes under the camera, it collects an image and analyzes it using the company's proprietary algorithms to assign a score on the traditional 5-point BCS scale to 0,1 point increments. We investigated the performance of BCS Cameras on performance indicators such as sensor drift, variability in BCS within and between measurement days and handling of missing observations, outliers, randomness and trend. Several errors were detected in the BCS camera data. These errors were illustrated not only in the instrumental side but also in the BCS profile at the cow level. Time series model was used to develop forecasts with instrumental errors before and after correction. Forecasting model showed the importance of instrumental error correction in describing and predicting the correct profile of BCS at cow level.
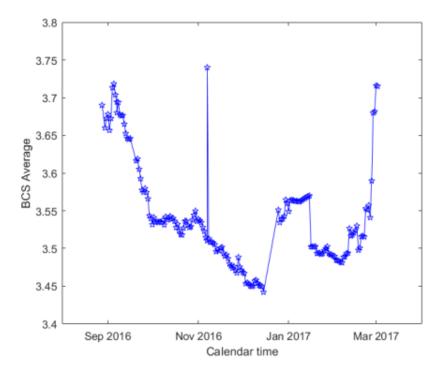
Figure1. BCS average over calendar time, showing intrumental errors : outliers, randomness, baseline, missing period.

Acknowledgements