Deep Learning-based Weight Estimation of Small Ruminants

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Abstract:

Accurate and non-invasive weight estimation in small ruminants is crucial for optimizing livestock management, including nutritional planning, health monitoring, and breeding strategies. This study explores the potential of deep learning methodologies to estimate the weight of small ruminants from image data. The biggest criterion that causes error in weight estimation from images in small ruminants is the wool of the animal. Therefore, images were taken from 3 directions (side, top, back). We investigate convolutional neural network (CNN) architecture, training strategies, and image processing techniques to develop robust and precise weight prediction models. The model is called MobileNetV2 and includes three convolution layers and max-pooling method. The input image size is 128x128 pixels and 50 epochs are run for training the model. Learning parameter details are presented in the material and methods section. The models are trained and validated on a comprehensive dataset of images of small ruminants with corresponding weight measurements. Experimental studies implemented the colored images taken from 191 small ruminants. The comparison was made between real weights and calculated weights obtained from the CNN model. The results demonstrate the efficacy of the proposed deep learning-based approach, offering a promising alternative to traditional, labor-intensive methods of weight determination.