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Meat@ppli, a smartphone application to predict fat content of beef*J. Normand¹, B. Meunier², M. Bonnet² and B. Albouy-Kissi³**¹Institut de l'Élevage, Carcass and Meat Quality, 69007 Lyon, France, ²INRAE, Université Clermont Auvergne, VetAgro Sup, UMR Herbivores, 63122 Saint-Genès-Champanelle, France, ³Institut Pascal, Université Clermont Auvergne, 43009 Le-Puy-en-Velay, France; jerome.normand@idele.fr*

Fat has a major economic importance in the beef sector. It affects all the meat food chain steps: from the farmer to the consumer. However, nowadays, the monitoring of fat, and especially marbling, in beef is difficult, due to the lack of a suitable assessment tool, i.e. reliable, simple, fast, non-destructive and inexpensive. The exponential growth of smartphones equipped with high quality imagers and high computing power has provided tremendous opportunities for measuring fat on bovine carcasses. The Meat@ppli project aimed: (1) to predict intramuscular and total fat content of 6th rib from its image captured under non-standardized and uncontrolled conditions, using image analysis methods and deep learning; (2) to embed the algorithms in a smartphone application. For this purpose, cross section images of the 6th rib of 164 carcasses chosen to be representative of the beef marbling variability, were captured with a smartphone Samsung® Galaxy S8 fitted with polarizing filters. The ribs were then removed to determined gold standard measures: total fat content by dissection and weighing, and intramuscular fat content (IMF) by the Soxhlet method. From more than 3,500 images of 6th ribs and gold standard measures, several artificial neural networks were trained to segment the rib, the ribeye, IMF in the ribeye and total fat in the rib. The correlations between the gold standards and the parameters from the image analysis were strong, with correlation coefficients of 0.91 and 0.79 for IMF and total fat content, respectively. The prediction models were then embedded in the Meat@ppli application. The application starts by taking a picture of the cross section of the 6th rib. The captured image is then displayed and submitted for validation. In less than 10 seconds, the application calculates IMF and total fat content. The Meat@ppli application remains a proof-of-concept that, in the future, could be used by the beef industry to route carcasses to the most suitable distribution channels and to perform massive phenotyping for the selection of bovines with appropriate marbling.
