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## A Data-Driven Prototype for Animal Grading Systems

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The non-orthogonality of the United Nation's Sustainable Development Goals (SDG), their spatio-temporal variations and complex interactions entail concerted interdisciplinary efforts to identify and address triggers of their indicators. As the SDG span across the entire spectrum of human existence, they are naturally associated with data deluge—hence the likelihood of operating around unseen, ignored or difficult knowledge gaps is high. For example, the complex interactions of the SDG imply that part of the solution to poverty (SDG #1), say, may rely on the health and wellness of the population (SDG #3), its level of education and innovation (SDGs #4 and #9), societal equality schemes in place (SDG #10) and other subtle factors within the SDG domain set. In many developing countries, shortage of resources in the veterinary–extension network leads to poor farmer outcomes in terms of animal health and productivity. The animal products value-chains tend to be fragmented and disconnected, leading to a number of steps to market and poor prices for farmers. Overall investment in animal farming that could lead to innovation and increased productivity is largely inhibited by the lack of reliable market and logistical information sharing infrastructure. We propose a prototype for extracting potentially valuable data for assessing the value, health and general condition of animals. The prototype is powered by onsite generated and remotely modelled structured and unstructured data using adaptive machine learning techniques—a hybrid of statistical pattern recognition methods and image analysis. Structured data is generated by a scale-invariant slider, repeatedly applied to animal images of interest, hence providing triangulating data for the images, which are camera-captured from specific distances and angles. The novelty of the approach derives from the foregoing data generation mechanics and its adaptation of existing technologies in large scale animal farming to provide scalable solutions to small and medium scale animal farming practices. We discuss how its application can enhance productivity among small-scale animal farmers by empowering them to make more effective decisions and benefit from reduced risk and enhanced profitability. We show how pre-market estimation of animal weights and their potential market value, directly or indirectly, aligns with the SDG agenda. Finally, we demonstrate potential extensions into video monitoring and classification of animals.

**Key Words:** Animal Grading System, Association Rules, Big Data, Body Condition Score, Convolutional Neural Networks, Data Science, Data Visualisation, Interdisciplinarity, Predictive Modelling, Sustainable Development Goals

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