

Andrological Classification of Bulls evaluated by Machine Learning

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The study was conducted with the aim of verifying the behavior of the classification of Andrological Exams (AE) of bulls used in natural mating through Machine Learning (ML). A database of AE of 2308 bulls was used, with the following attributes for each examination: region, breed, genotype, age class, testicular consistency, scrotal circumference, semen volume, sperm swirl, sperm motility, sperm vigor, acrosome defect, proximal cytoplasmic drop, head defect, midpiece defect, total major defects, distal cytoplasmic drop, normal isolated head, tail defects, total minor defects, total defects and total normal sperm. The classification of these animals for each test was made as fit (n = 1088), unfit (n = 672) and questionable (n = 548). This database was submitted to the ML tool Waikato Environment for Knowledge Analysis (WEKA) through its tool Auto Weka, which suggested the Random Forest algorithm, a collection of decision trees. ML was able to identify results similar to AE for most bulls, especially for animals classified as fit (94.1% - 1024/1088) and unfit (95.2% - 522/548). For animals classified as doubtful, the results of the ML matched those of the AE in only 59.5% (400/672) of the bulls. Thus, in general, 84% (1946/2308) of the bulls have the same results using ML or AE, with a mean absolute error of 0.1651 and a root mean square error of 0.2761. We concluded that ML can be used to assist andrologists in classifying the results of AE. Further studies could increase the accuracy and even determine which features best represent the classes in the final classification using ML.

Keywords: Andrological Exams, Natural Mating, Random Forest, WEKA.

Acknowledgements: To the Coordination for the Improvement of Higher Education Personnel (CAPES) and the Foundation for the Development of Education, Science and Technology in Mato Grosso do Sul (FUNDECT/SECTEI, process 16/2016).