Chapter 21
Application of Neural Networks in Animal Science

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ABSTRACT

Stock breeding has been one of the most important sources of food and labour throughout human history. Every advance in this field has always led to important and beneficial impacts on human society. These innovations have mainly taken place in machines or genetics, but data analysis has been somewhat ignored. Most of the published works in data analysis use linear models, and there are few works in the literature that use non-linear methods for data processing in stock breeding where these methods have proven to obtain better results and performance than linear, classical methods. This chapter demonstrates the use of non-linear methods by presenting two practical applications: milk yield production in goats, and analysis of farming production systems.

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INTRODUCTION

The use of neural networks (NN) has undergone an exponential increase during the last few years due to the different types of problems that can be solved; they can be successfully applied to classification, modelling and prediction problems. Their inherent characteristics when compared to other methods make them especially suitable in data analysis problems where some of the following conditions occur:

1. It is unclear or very hard to find out the rules that relate the target variable to the other variables considered in the model.
2. Data are incomplete, imprecise or noisy (statistically perturbed).
3. The problem requires a great number of dependant variables (problems with high dimensionality).
4. The model to be applied is non linear.
5. There exists a great amount of data.
6. The environment of the variable or variables to model changes with time.

The above-mentioned characteristics are quite common and representative in a great number of knowledge areas, but in accordance with the experience of the authors, animal science fits these characteristics particularly well for several reasons:

1. Any animal and its possible interactions with the different elements in its environment constitute a complex system with a large number of plausible relationships. In principle, it would be natural to assume these relationships as non linear, due to the inherent complexity of living beings.
2. There are many variable to determine the state/behaviour of an animal or to model one of the variables that characterizes the animal. Therefore, an excessive simplification of the problem may yield too many errors in the model. Consequently, this is a non-linear, high dimensionality problem.
3. Data gathering is performed, in most of the cases, by the farmer himself, so incomplete data or errors in measures can arise.
4. Since this kind of data comes from a daily event (i.e., feed amount, dairy amount, ...), growth over time, a system that can adapt to new data gathered, and can also bring reliability and performance to the new yielded results would be a desirable choice.

The above information suggests not only the possibility of applying neural networks in this field but also their suitability for problems of this kind. In this chapter, we will present two applications based on these models. The first one is a problem of time-series prediction, where the target is to predict goat milk production; the second one is a data clustering application: the farm milk and meat productions are analyzed and characterized. The results obtained, which are compared with other classic approaches, demonstrate the validity of the neuronal models in animal science.

WEEKLY MILK PREDICTION ON DAIRY GOATS

The aim of this problem is to predict the milk production in a goat herd. It should be taken into account that farmers' income comes from milk production and composition; therefore, the accurate measurement