Horse Racing Prediction Using Artificial Neural Networks

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Abstract: - Artificial Neural Networks (ANNs) have been applied to predict many complex problems. In this paper ANNs are applied to horse racing prediction. We employed Back-Propagation, Back-Propagation with Momentum, Quasi-Newton, Levenberg-Marquardt and Conjugate Gradient Descent learning algorithms for real horse racing data and the performances of five supervised NN algorithms were analyzed. Data collected from AQUEDUCT Race Track in NY, include 100 actual races from 1 January to 29 January 2010. The experimental results demonstrate that NNs are appropriate methods in horse racing prediction context. Results show that BP algorithm performs slightly better than other algorithms but it needs a longer training time and more parameter selection. Furthermore, LM algorithm is the fastest.

Key-Words: - Artificial Neural Networks, Time Series Analysis, Horse Racing Prediction, Learning Algorithms, Back-Propagation

1 Introduction

Artificial Neural Networks (ANN) were inspired from brain modeling studies. Implementations in a number of application fields have been presented ample rewards in terms of efficiency and ability to solve complex problems. Some classes of applications that ANNs have been applied to include classification, pattern matching, pattern completion, optimization, control, data mining and time series modeling [1]. Time series analysis is used for many applications such as predictions [2].

Prediction is making claims about something that will happen, often based on information from past and from current state. One possible way for predicting future events is finding approximations, for example regression of a predicted variable on other events that is then extrapolated to the future. But finding such approximation can be difficult, too [3]. Also, the relationship chosen for regression tends to be linear. The other difficulty with regression is that, the regression equation applies across the entire span of input space [4]. So, we use NN for prediction, a general method of prediction which avoids these difficulties.

ANNs have been employed to predict weather forecasting, traveling time, stock market and etc. Also, ANNs have been applied in predicting game results, such as soccer, basketball, animal racing, etc.

Some works were done in predicting animal racings. Chen *et al* [5] investigated greyhound racing, it was a very similar environment to horse racing. In their research, they investigated the use of BPNN in predicting races. After that, Jannet Williams and Yan Li in [6] used BPNN to predict horse racing by a network with one hidden layer. Nowadays, horse racing software products, such as Brain Maker, are very popular [7].

In this paper, ANNs have been applied to predict the horse racing in AQUEDUCT Race Track, USA, and acceptable predictions were made. ANN has been used for each horse to predict the finishing time of each horse participating in a race. The best architecture of NN has been investigated by trial and error and different architectures have been compared according to MSE (Mean Squared Error) measure of ten times of running NN for each horse. Therefore, the best architecture is the one which has the minimum MSE measure.

The rest of the paper is organized as follows: The structure of NN and its training algorithms are presented in Section 2. In Section 3 we briefly presented the concept of prediction and some common methods for prediction. Experimental results are presented in Section 4. Finally the paper is concluded in Section 5.

2 Artificial Neural Networks

The brain consists of a large number of highly connected elements called neurons. These neurons have three principal components: the dendrites, the cell body and the axon.

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