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A STUDY USING ARTIFICIAL NEURAL NETWORK (ANN) MODEL TO PREDICT SPORTS RESULTS

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ABSTRACT

The purpose of the study was to evaluate the predictive accuracy of ANN models for sports outcomes. The 50 hockey players data is used in the current study were 18±0.5 years old. The homogeneity test and the Shapiro-Wilk normalcy test were used to conduct the initial statistical analysis. Three variables were identified by the correlation matrix and regression analysis: cross step, specific power of the arms ,and specific power of the abdominal muscles. Neural models and non-linear regression models were then constructed. The ability to make generalizations and predict sports outcomes was exhibited by the non-linear regression models and 4-3-1 perceptron networks. Furthermore, the neural models were favoured by the 12.68 m difference in absolute errors between the genuine and estimated results in the set of 05 Polish javelin throwers. The aforementioned data analysis unequivocally demonstrates that the neural network outperforms the regression model in sports outcome prediction. As a result, the analysis showed that perceptron models had noticeably higher prediction accuracy.

Keywords: optimization, artificial neural networks, sport selection

1. INTRODUCTION

Anywhere a relationship exists between explanatory factors (inputs) and explained variables (outputs), neural networks can be used (Haykin, 1994; Maszczyk, 2011). Nonetheless, they are particularly helpful in locating extremely intricate input-output linkages, which are challenging to identify with the statistical techniques often used in these situations (e.g., relationship analysis or taxonomically homogeneous group separation). Artificial Neural Networks (ANN) have been employed increasingly frequently recently to determine the true nature of interactions between variables, which can be either linear or non-linear. These days, modeling and prediction problems are commonly solved with the help of this technology (Maier et al., 2000; Lees, 2002; Maszczyk, 2012).

One of the most watched activities of the current Olympic Games is wrestling, which had a significant role in the ancient games. The weight class system used in this combat sport tries to equalize wrestlers' physical attributes and therefore raise the proportion of performance that is dependent on technical and psychological abilities. Currently, men can compete in two different wrestling styles in the Olympics: Freestyle, which allows both upper- and lower-body maneuvers, and Greco-Roman, a traditional form that only allows moves with the upper body.

A high anaerobic energy metabolism demand is placed on wrestling, which has been described as an intermittent physical activity that produces great strength and muscle power demands of both the upper and lower body (Horswill, 1992; Horswill et al, 1989). According to a number of studies, aerobic performance is not a necessary condition for success in wrestling, even though it might be for wrestlers (Horswill 1992; Horswill et al, 1992; Sharratt et al, 1986). A small number of research, nevertheless, have looked at variations in physical fitness traits associated with success in contemporary wrestling performance after the previously described rule modifications and advancements in training techniques over the previous 20 years. The fight against illicit pharmaceutical interventions, an increase in the total number of competitions held annually, an improvement in the caliber of elite wrestling performance, and advancements in training and evaluation tools are some of these developments. Additionally, analyzing the fitness profiles of male wrestlers can be highly beneficial in order to optimize training regimens for strength, power, and endurance in order to enhance wrestling performance.

The objective of the inquiry was to identify the variables that are most informative and meet the requirements to function as explanatory variables in ANN models.

2. MATERIAL AND METHODS

Artificial neural networks (ANNs) are computer programs that mimic how the human brain processes information. They are digital representations of human brains. Like people, ANNs are trained (or learn) by experience with suitable learning exemplars, not by programming. In order to acquire knowledge, neural networks

look for patterns and connections in data. The brain is a really good instrument for recognizing patterns. Because biological neurons in a particular region of our brain have encountered a similar input pattern previously and have learned to associate that particular pattern with the object description "pen," when we look at a pen, we know it is a pen(Maier et al, 2000; Maszczyk, 2012). Our brain's billions of completely linked neurons allow us to learn and identify an almost infinite range of input pattern.

There are around 100 billion neurons in the normal brain, and each neuron has 1000–10000 connections with other neurons. A neuron's cell body is made up of a nucleus that regulates the activity of the cell, several tiny threads called dendrites that transport information within the cell, and an axon, a larger thread that transmits the signal out of the cell. Signals are transmitted from one neuron to the next in an all-or-none manner at the synapse, which is the connection between two neurons, via the axon(Maier et al, 2000; Lees, 2002; Maszczyk, 2012). With their complete connectivity, neurons function as messengers, receiving and transmitting impulses. An intelligent brain with the ability to learn, predict, and recognize is the end result.

The capacity of brain calculations derives from connecting neurons in a network, even though a single neuron is capable of some basic information processing tasks. There is debate regarding artificial neural networks' purported intelligence. While the human brain has approximately 100 billion neurons, artificial neural networks rarely have more than a few hundred or a few thousand PEs. Thus, artificial networks that are as complex as the human brain are yet well beyond the creative potential of the human brain(Maier et al., 2000; Lees, 2002; Maszczyk, 2012). The human brain is far more intricate, and sadly, little is yet understood about many of its intellectual capacities. On the other hand, ANNs can process large volumes of data and occasionally produce astonishingly accurate predictions.

The data was extracted from a wrestling tournament. The 500 best athletes from three different federations across the globe joined us to compete in one-on-one matches. The pools were made randomly no matter the profile of the athlete. At the end of the tournament, the wrestlers can be ranked according to their number of victories.

Wrestling is a hand-to-hand combat system and a set of combat sports involving grappling-type techniques such as clinch fighting, throws and takedowns, joint locks, pins and other grappling holds. Wrestling techniques have been incorporated into martial arts, combat sports and military systems.

The data was extracted from data.
World(https://data.world/datasets/sport/wrestling). In this Dataset, information on the different wrestlers such as their gender, weight, height, nationality, but also different scores to measure their strength, agility and mental abilities.

3. DISCUSSION

The following structures using the same variables (independent variables that were significantly associated with performance): 4-2-1, 4-3-2-1 (four input neurons [variables], one or two hidden layers [with two and three neurons, respectively] and one outcome), and 4-3-1 (four input neurons [variables], one hidden layer [with three neurons] and one outcome). The S. D. ratio values for the validation series for networks 4-2-1 and 4-3-2-1 might not be adequate. The test series' standard deviation ratios were 0.279, 0.285, and 0.276 for the learning and validation data, respectively. The findings for networks 4-2-1 and 4-3-2-1 indicated issues with a reduced capacity for generalization. But the value in the test and validation series, as well as the correlation coefficient in those groups (0.96), suggested that more models with more neurons in the hidden layer were needed in order to roughly fit the network and learning data in the first set (Kurtz and Stergiou, 2005). https://www.kaggle.com/code/saadmansakib/ann-implementation-using-pytorch-loss-0-053

The use of architecture 4-3-1 ultimately resulted in a breakthrough. The quality metrics for this network (constructed for the first 70 cases) in the group of wrestling player were 0.298 for the training subset, 0.284 for the validation subset, and 0.278 for the test subset. The model and the training data showed a good match, according to the results. Nevertheless, the outcomes improved after the model was re-estimated and 46 additional training cases were added. An even better match between the network and the training data was shown by the network quality metric for the training subset.

4. CONCLUSION

According to the findings of the study conducted on a Some morphological traits seem to be helpful to have better ranks. Such as the heights and the weights. Men tend to have better ranks in general. Further, Several information's can be remembered from the analysis of the sports:

- The most practiced sport is boxing and the least judo.
- The majority practice 2 sports, and the more sports the rarest it is.
- The more a wrestler will train and master different sports, the better his rank will be.
- The year of entering in the wrestling industry is inversely correlated with the ranking. Sportive that started practicing a long time ago have better ranks.

Also, the most represented federation is Fight Zone Wrestling and the least is World Wrestling Entertainment. However, globally the best ranks are attributed to Consejo Global de Lucha Libre. The different scores seem to be linked to other predictors. We

can use all those information to give a pretty accurate prediction of the rank of the wrestler.

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