ISSN 2278-3091
Volume 9, No.3, May - June 2020
International Journal of Advanced Trends in Computer Science and Engineering
Available Online at http://www.warse.org/IJATCSE/static/pdf/file/ijatcse103932020.pdf
https://doi.org/10.30534/ijatcse/2020/103932020

# Machine Learning and Data Mining Activity Results when using Projectiles in Different Sports

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**ABSTRACT**

The factor that determines the structure of competitive activity of athletes is the focus on achieving the highest result, which reflects the specific nature of the sport. The system-forming factor for all levels is the product of activity-sports result. At the same time, in competitive activity, the athlete must take into account the factors of development and implementation.
At the General level, the security factors are the functional capabilities of the athlete's body, which ensure its specialized activities. The implementation factors are physical, technical, tactical and psychological readiness of the athlete.
Here is an example of generalized characteristics of the structure of competitive activity in rowing. The result in rowing consists of: starting speed, distance speed, and finishing speed. Factors in the structure of generalized characteristics of girls' competitive activity include: muscle strength impulse, muscle contraction rate, anaerobic-aerobic capabilities of energy supply systems, and strength endurance. Implementation factors include: technique, stroke amplitude, maximum effort on the stroke, the pace of passing the distance, mental readiness for competitive activity, etc.

**Key words:** Machine learning, sports, activity, neural network.

## 1. INTRODUCTION

Currently, after analyzing the literature sources, we can say that in modern sports theory, one of the important places is occupied by the problem of managing the training process, and the analysis of competitive activity, which helps to achieve high sports results, is not an independent task, although it serves as the basis for the implementation of a promising program of training athletes. Despite the importance of determining the structure and content of competitive activity, its detailed characteristics in certain sports, such as athletics [9]; speed skating [4, 7]; swimming [1, 2], in the scientific and methodological literature on rowing, these issues are considered only in fragments, there is a broader consideration of issues related to the content of the training process and training methods [3, 6, 10].

In the theory and practice of sports, an important place is occupied by the problem of managing the training process. At the same time, competitive activities that contribute to achieving high sports results should be considered as an independent branch of sports science [17]. After all, effective competitive activity is the basis for creating a promising training program for athletes. The main task of this area is to improve the effectiveness of training programs, and for this purpose it is necessary to obtain objective information about the management object [3, 8].

## 2. MATERIALS AND METHODS

The performance of an athlete (along with specialized technical, physical, tactical, and psychological training) depends on the nature of the perceived information, its processing time, and its implementation in the appropriate responses. The information background is an integral part of all stereotyped sensory externo -, proprio- and interoreceptive stimuli that affect the central nervous system, determine the nature of an athlete's activity and determine its effectiveness in competitions [10].
Activity in competitions requires an athlete not only to have well-developed autonomic functions and motor apparatus, but also to have fast and adequate specific thinking. The adequacy of perception and speed of information processing, decision-making, and choice of means to achieve the goal are important prerequisites for effective competitive activity of an athlete [9, 10].
For many years, a large number of studies have been directed at solving the problems of optimizing the structure of competitive activity in order to use it as a reference point in the construction of various structural units of the training process in cyclic sports. It was noted that when building a training process, it is necessary to proceed from the need to achieve not only the planned sports result, but also the planned structure and size of individual components of competitive activity of athletes [8]. At the same time, in the process of training athletes, in contrast to the constantly increasing sports result, the structure of competitive activity changes ambiguously [16]. Such changes in the structure of competitive activity are not covered in the scientific and methodological literature on rowing, as well as methodological techniques that allow forming the structure of competitive activity in the process of training athletes [15].

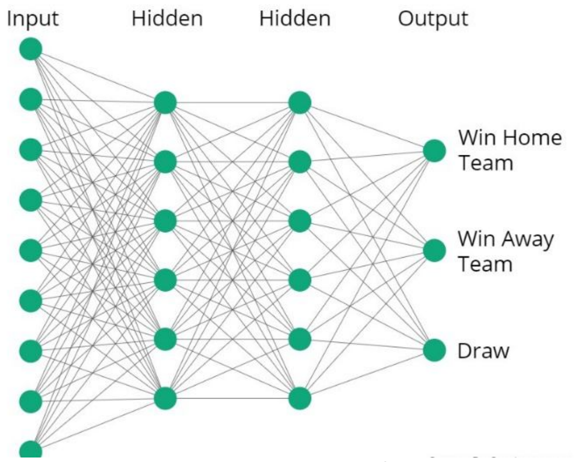


**Figure 1**: Machine learning algorithm for any sport game

In figure 1 we see a simple neural network for machine learning. Therefore, scientists have proposed the use in practice of methodological methods of applying the method of forming urgent adaptive reactions of the athlete's body and its structure of competitive activity [4].
Modeling is also one of the main ways to improve competitive activity in rowing. Modeling includes the development of model characteristics, a qualitative description of the athlete's condition, the structure and content of training loads and competitive activities that ensure high sports achievements [8, 9].

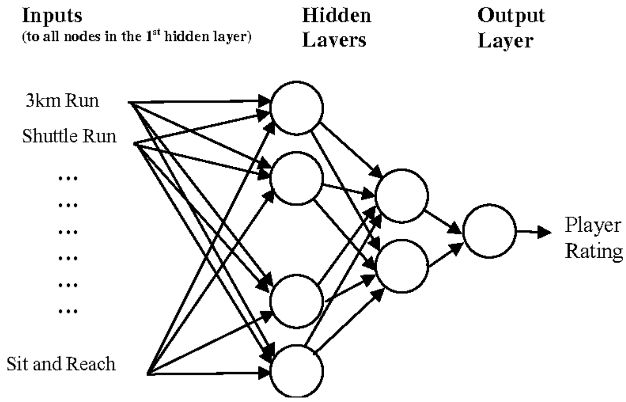


**Figure 2:** Neural Network showing the inputs and output for the AFL draft problem

In figure 2 we see neural network showing the inputs and outputs for the AFL draft problem for sport games.
Focusing on the model characteristics of competitive activity allows you to analyze the state of fitness and identify shortcomings in the level of preparedness of the athlete, make adjustments to training plans taking into account the individual characteristics of the athlete, predict his possible achievements in competitions, improve the efficiency of selection and recruitment of national teams from among the most promising athletes [8, 9, 17-20].
Model characteristics of fitness are used to determine opportunities for achieving the necessary indicators of competitive activity and sports results in General [11-14]. These models are divided into: 1) reflecting the structure of athletes ' fitness depending on the chosen sport, competitive discipline or role; 2) reflecting the development of motor function components that affect the achievement of planned sports results [2, 8].
Also widely used in the practice of training athletes model characteristics that are developed based on the analysis of morpho-functional indicators of leading athletes. This allows you to focus on achieving this level, using these indicators as control standards [11-13].
Comparison of individual data of individual athletes with normative data allows us to assess the strengths and weaknesses of the athlete's fitness and on this basis to determine the main and auxiliary tasks, means and methods of training, to carry out planning and correction of the training process [2, 8].

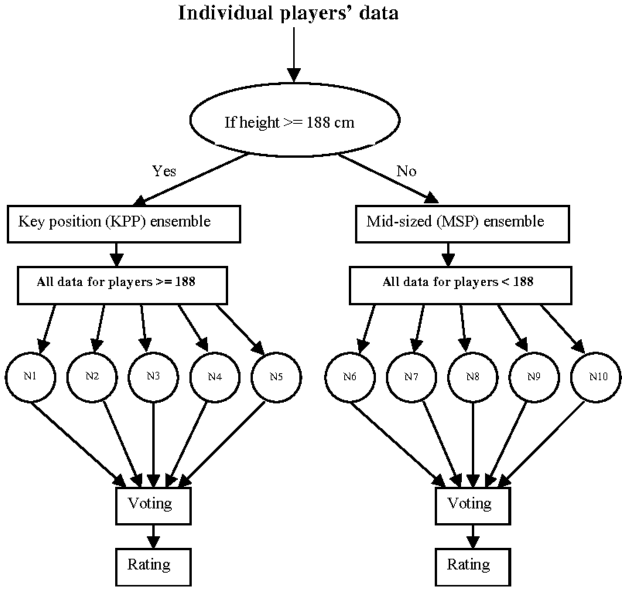


**Figure 3:** Process to estimate player ratings from neural network ensembles.

In figure 3 we see the process to estimate player ratings from neural network ensembles for sport games.
Problems of rational construction of the training system in rowing can be divided into the following blocks [4-7]:
1. Physical training of rowers requires the development of strength, speed, and endurance. It was found that the development of maximum and special strength can be carried out in parallel, by using exercises with weights on land (gradual mode) and performing large amounts of work on water. This contributes to an increase in absolute strength and an increase in the level of functional readiness [10].
We have also developed systems for correcting physical activity that take into account the individual level of fitness of rowers [2,10]. Also, in the method of physical training, it is necessary to take into account the complex and differentiated development of physical qualities. Thus, the effectiveness of the methodological approach to the development of a differentiated physical training program for young girls has been experimentally proved. it consists in a combination of complex (70% of the total time for physical training) and personalized (30% of the time) development of those physical qualities that are 10% or more behind the model ones [10].

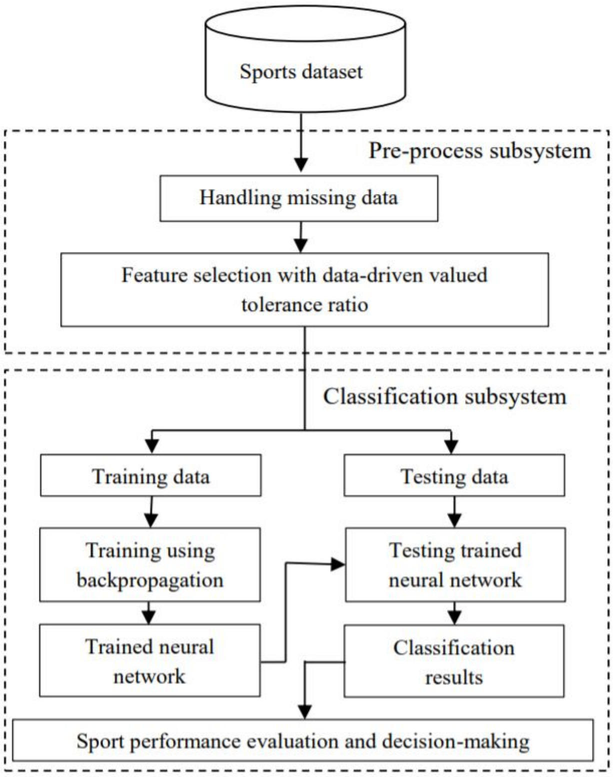


**Figure 4:** System architecture

In figure 4 we see the system architecture for testing and training data, which are used by neural network.

2. Technical training is an integral part of sports training. In the process of technical training, it is necessary to note the smallest details of the athlete's movements, in particular:

the condition for the promotion of the athlete and the boat is to create a resistance force of the paddle blade, which occurs as a result of the interaction of the blade with the water;

the next component of the technique is the process of transferring the force to the support; stabilization of the athlete's position and the boat's course.

The coordination of technical elements with the athlete's physical fitness reflects not only the process of technical improvement, but also the level of training in General [2].

3. Tactical training of rowers takes into account the degree of preparedness of the athlete (physical, technical, mental); individual data of rowers (body weight, height, experience of participation in competitions); knowledge of competitors; features of passing the distance by the opponent and the task that stands in these competitions and in the race; the length of the distance. Among all the tactical options for conducting races used in rowing, the following varieties can be distinguished:

- passing the distance on segments;
- the track "on the margin"; on the distance of the spurts; for a uniform course [3].

The importance of determining the structure and content of competitive activity in rowing is indicated by the fact that individual scientists have begun research in this direction [8-11].

The analysis of numerous literature sources shows that the problem of model characteristics of physical fitness of girls is insufficiently developed and requires further experimental justification and verification. In Particular, scientist determined the model characteristics of the physique, physical and technical readiness according to the following indicators: physique – body length, body weight, arm length, shoulder width, arm span, body length; physical fitness – maximum isometric force when simulating a stroke, maximum and average efforts, pace of movements, power on a rowing simulator; technical readiness – the maximum and average effort on the paddle blade, boat speed, rowing power, the number of struhal (reflects the economy of movement techniques for rowers) [6]. On the basis of this, the main provisions of the methodology for teaching kayaking techniques were developed and tested, namely, the expansion of the Arsenal of special initial training tools and the range of mastering technical skills through the use of various rowing options, simulated exercises on land, and the use of a “water” simulator.

To control the quality of the start, models of the rational start option have been developed.

Also, some authors suggest using a model of functional readiness, which allows you to control the effectiveness of training and prevent forcing training. However, the definition of a number of functional indicators implies the presence of certain tools, which not every coach can afford.

## 3. CONCLUSION

The analysis of special literature shows that the development of models is relevant for improving the system of training athletes. But at this stage of development of rowing there is a problem of individualization of training process with use of models of competitive activity of girls. In the literature there are no clear recommendations for correcting the training process taking into account the model characteristics of competitive activity of rowers of various sports qualifications.

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