



Level of Long and Short Service Skills in Badminton Students at Public High School 1 West Telukjambe with Machine Learning

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Abstract. This study investigates the skill level in short and long serves amongst young badminton players from SMAN 1 Telukjambe Barat. Focusing on 20 student athletes, the researchers employed a quantitative approach that involved testing and data analysis. They see potential in leveraging new technologies like Artificial Intelligence (AI), particularly Machine Learning (ML), to gain deeper insights from badminton performance data. Machine Learning's ability to categorize athletes based on various factors allows coaches to tailor training plans to individual needs. This study specifically explored the impact of such a learning model on the basic techniques of these teenage athletes. The analysis revealed a range of skill levels in both short and long serves. Descriptive statistics were used to examine the data, showing a distribution of skill levels for short serves: very good (15%), good (10%), and satisfactory (50%). Long serves displayed a similar distribution with athletes categorized as very good (10%), good (10%), satisfactory (50%), and unsatisfactory (30%). These findings suggest that the badminton players at SMAN 1 Telukjambe Barat possess varying skill levels in these fundamental techniques, highlighting the potential benefits of implementing personalized training strategies informed by data analysis.

Keywords: Ability Level; Long and Short Serve; Machine Learning.

1 Introduction

1.1 Background

In order for students to actively develop their potential and arm themselves with the religious and spiritual strength, self-control, personality, wisdom, noble character, and skills required by both themselves and society, education must intentionally and deliberately create a learning atmosphere and process (Harry et al., 2019). Education should be conceptualized as lifelong as a continuous process in life. This education starts early, including children. Good management and treatment of children will increase the chances of achieving the progress of a nation and the future. In addition, there are also aspects of physical development that are also contained in Physical Education, Sports

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and Health which are priorities to be managed properly and optimally (Kurniawan et al., 2018). Abdul Gani (2019) states that physical education is an integral part of the overall education process and is concerned with a process and results. Physical education and health (*penjaskes*) are an educational process through physical activity, games or selected sports to achieve educational goals (Destiawan et al., 2020). The purpose of PE is to provide opportunities for children to learn activities that foster and develop children's potential, both in physical, mental, social, emotional and moral aspects (Fajriyudin et al., 2021). In simple terms, the purpose of PE includes three domains as a unit, namely cognitive, affective and psychomotor aspects (Mustafa, 2021). Utami (2021) suggests that physical education sports and health in schools contains several physical education materials, which include development activities, gymnastic activities, rhythmic activities, aquatic activities, out-of-class education, self-test, games and sports. One of the sports that can improve physical fitness is Badminton. The development of Badminton is currently growing rapidly. In terms of quality, almost all levels of society recognize Badminton and are able to play this sport. To become a more talented athlete also requires mastery of mature techniques and tactics because it is important in developing a badminton game. Badminton sports can also provide a variety of benefits for someone both young and old including, namely in good physical, social and mental growth (Marwan et al., 2022).

According to Aisyah & Himawan (2021) A good player in the Badminton game is a player who understands and can perform the Badminton game technique itself. So to be able to play Badminton well, you must first learn the basic techniques of the game. In the Badminton game there are basic techniques that must be learned and mastered. Each technique in the Badminton game has a very important role in the Badminton game. Players who have good hitting skills, but are not supported by other techniques or abilities such as footwork, then the player is still less than perfect. This is where one of the roles of Badminton coaches will support maturation in mastering training techniques in students and is one of the solutions to minimize student imperfections. According to Kurnia (2021) the various basic techniques of hitting in badminton games are long serve, short serve, lob, smash, dropshot, chop, drive, and netting. To be able to master these basic techniques, it is necessary to follow the rules that must be implemented in practice, so as to master a good level of skill. The basic technique of hitting is the heart of badminton because the goal of badminton is to hit the shuttlecock with a racket with certain techniques and try to drop the shuttlecock in the opponent's game area and try to prevent the opponent from dropping the shuttlecock in his own game area. According to (Nur, 2016) "Long serves are usually used for singles play, targeting the shuttlecock near the back line and diving sharply straight down, this service stroke is done with a forehand". According to (Tony, 2019) "short serve is a serve where the shuttlecock passes thinly over the net. The punch directs the shuttlecock to the corner, the intersection of the front service line with the center line". A short service stroke is a racket stroke that flies the shuttlecock to the front service line, center service line, and edge service line. According to (Muhtadis et al., 2020) "overhead lob is a blow that is hit from above the head by flying the shuttlecock soaring towards the back. Overhead lob is a ball hit from above the head". According to (Darussalam, 2019) "smash shots in badminton games are a fast, sudden hand swing motion, producing a hard blow, and

dropping the kock steeply. smash shots are swung by using a mature calculation to use this shot". Based on the results of initial observations, the badminton learning process of 7th grade students at SMPN 5 West Karawang is going well, but there are still many students who have not properly performed the basic techniques of Badminton games, especially short serves and long serves. In the learning process of playing Badminton, many students are not active in participating in the learning process, there are still many mistakes made by students in performing badminton serve and lob technique movements. Teachers are less creative and innovative in applying learning methods, approaches, and models because in learning Badminton game activities students tend to get bored quickly and the lack of teacher supervision of students during the learning process because during the learning process many students do not pay attention. In previous research with the title of research on the basic technical skills of serving, lob and smash badminton at extracurricular si SMP Negeri 18 Pontianak (Akbar et al., 2020) the results of his research were to show the skill level of students who participated in badminton extracurriculars at SMPN 18 Pontianak as many as 20 students for long serves, short serves, lob, and smash were in the GOOD category with an average value of 59.88. Based on this, in this study the authors will examine the skill level of the basic techniques of serve and lob in accuracy in badminton learning for students of SMPN 5 West Karawang. The novelty in this study lies in the object under study, namely students of SMPN 5 West Karawang, as well as the time of the research conducted, namely after the co-19 pandemic. The purpose of this study was to determine the level of ability of basic freestyle swimming techniques of VII grade students at SMPN 5 West Karawang, and the findings of this study can be used as reference material and input for pjok teachers in badminton learning.

1.2 Theory

Badminton is a game of hitting a shuttlecock using a racket, over the net into the opponent's territory, until the opponent cannot retrieve it. Badminton games are practiced by two parties who hit each other shuttlecock alternately and aim to drop or place the shuttlecock in the opponent's area to get points. Equipment in badminton games: (a) racket (bat), (b) ball (shuttlecock), and (c) court.

Basic skills in badminton games have a variety of things that need to be understood and mastered, such as physical skills, techniques, and tactics effectively and efficiently. Every sport, especially badminton, must master these basic skills to be able to play badminton. The basic skills of badminton according to (Setiawan et al., 2020) into four parts, namely the racket grip (grip), the first blow (service), the overhead stroke (overhead stroke) and the stroke with a low swing (underhand stroke). (Iswardhani & Nurhasan, 2019) also expressed an opinion about the short serve, which is a blow that is done in a backhand manner, the player takes a ready position in good body balance, the ball hitter holds the racket with the strongest hand where the surface of the racket faces forward slightly upward and the position of the ball is above the surface of the racket. Short Service is a service by directing the shuttlecock with the aim of both targets, namely to the corner of the intersection point between the service line in front with the center line and the service line with the edge line, while the course of the shuttlecock

strokes thinly over the net (Ardyanto, 2018). (Tony, 2019) Short serve is defined as a service stroke that directs the shuttlecock near the net and lands as close as possible to the opponent's service line and requires good concentration so that the service can run well. A long serve is a serve shot that soars high to the back. The player takes a position ready to serve, one hand holding the racket and the other holding the ball. The body position is in a state of readiness and full balance by stepping one foot forward, the eyes focus on the ball, then on the opponent's position (Susilo, 2019). According to (Sugiyanto & Yuliawan, 2014) Long serve is a basic serve. This serve directs the ball high away, and the ball must turn and fall as close as possible to the back boundary line of the opponent's area. And as explained by (Karyono, 2016) a long serve is "a service stroke performed by flying the shuttlecock as high as possible and falling to the back line of the opponent's field. Mainly directed at the corners of the intersection between the edge line for single games with the back line for single player services "

2 Research Methods

The type of research used in this study is quantitative research. According to Arikunto, this approach uses numbers starting from data collection, interpretation of the data, and appearance of the results (Muthiarani, 2017). According to Sugiyono, it defines that population is a generalization area consisting of objects / subjects that have certain qualities and characteristics that are applied by researchers to study and then draw conclusions (Arifin, 2020: 3). The above opinion is one of the references for researchers to determine the population. The population of this study were all students in classes VIII A to VIII K of SMPN 5 West Karawang, totaling 390 students. The sample is part of the population that the researcher wants to study. According to Sugiyono, the sample is part of the population, the population, for example, the population of a particular region, the number of employees in a particular organization, the number of teachers and students in a particular school and so on (Ramadhan, 2021). The sampling technique used in this study uses cluster random sampling, according to Sugiyono in Dwihandaka (2020: 196) cluster random sampling is a sampling technique used to determine the sample when the object to be studied or the data source is very broad. Researchers will determine the sample to be used by drawing, namely shuffling the numbers of each class, the class that comes out first will be the sample (Unaradjan, 2019).

Research involves several crucial phases, one of which is data analysis or classification. The data analysis method employed in this study is the computation of descriptive statistical analysis, and the data was processed using the Statistical Product and Service Solutions (Version 26) software programme facility for Windows. Sugiyono (2017) defines descriptive statistics as statistics that are used to analyse data without the intention of drawing broad conclusions or generalisations. The data is described or described as it has been gathered. The goal of descriptive data analysis is to obtain a summary of research findings. A descriptive analysis was performed on the skills data related to badminton games. Total value, average, standard deviation, minimum data, and maximum data are all included in descriptive analysis. It is intended that these statistics data will give a general idea of the badminton service method talents of the class VIII pupils

at SMPN 5 West Karawang. For parametric statistics to be applied in research, it is necessary, among other things, that the data have a normal distribution. To determine the distribution of badminton service technique data skills among SMPN 5 West Karawang eighth grade pupils, and then use statistical tests to determine whether the data are normal. The dataset of shuttlecock thrower predictions that have been obtained from the results of data collection is then modeled with the linear regression method through the research stages in the figure above. all this process is done by artificial intelligence (see **Error! Reference source not found.**).

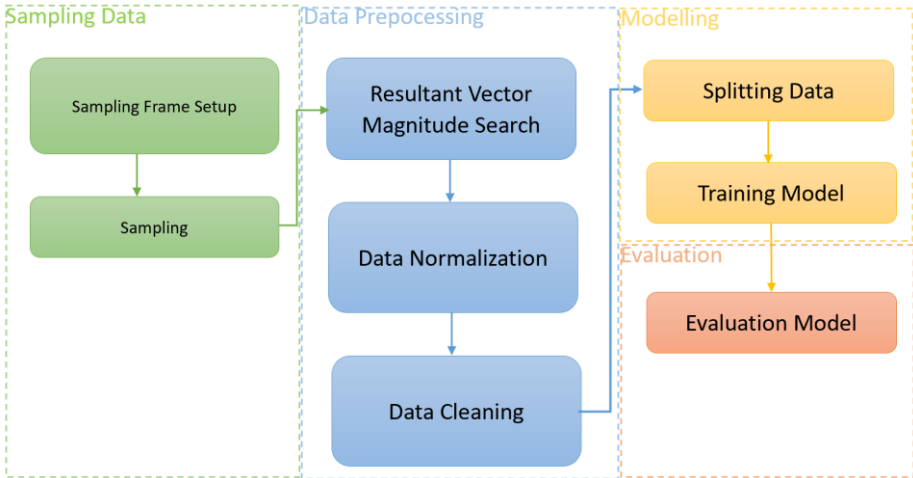


Fig. 1. The dataset of shuttlecock thrower predictions

3 Research Results

Based on the graph on the side, it consists of several parameters that aim to obtain information on the prediction data of the shuttlecock throw according to the random coordinate points that will be determined by the user. The first parameter is the vertical angle (VA) which plays a role in adjusting the height of the cock throw angle, while the HA (Horizontal) angle is a horizontal angle setting to adjust the direction of the cock throw and the Speed Motor parameter is the motor speed setting value according to the coordinates specified by the user. If the user sets the X coordinate of 228 Cm and the Y coordinate of 753 Cm on the field, the motor will automatically have a speed of 100 PWM and has a vertical angle of 35 degrees with a horizontal angle of 130. (see Fig. 2).

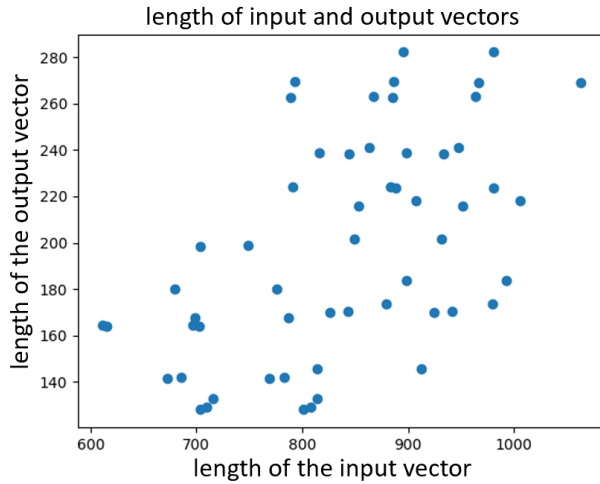


Fig. 2. Data distribution of resultant length of system input and output vectors

The process of determining the vector magnitude is carried out to determine the deviation of the vector resultance between each input and output. The input variables that are calculated are the vertical coordinates of the ejection machine, the horizontal coordinates of the ejection machine, and the engine speed. While the output variables that are calculated are the coordinates of the length and width of the falling ball and the height of the ball during measurement. The process of measuring the size of the vector is done using excel through the 3-Dimensional vector length equation in the following equation.

$$|\vec{z}| = \sqrt{\alpha^2 + \beta^2 + \gamma^2}$$

Where z is the resultant 3-dimensional vector and α is the vertical coordinate of the throwing machine at the system input and the coordinate of the field width at the system output. β is the horizontal coordinate of the ejection machine at the system input and the field length coordinate at the system output. While γ is the rotational speed of the ejection motor at the system input and the height of the shuttlecock fall position at the system output. After the resultant vector is known in each sample, data cleaning is then carried out so that data with deviations that are too high and are not linear to the increase in the length of the resultant input vector can be normalized again by finding the middle value between the input vectors in samples that are one level higher and one level lower. The normalization process is only applied to data with large error values of input vectors that still satisfy the equation below. If the processed data does not meet the following equation, then the data is cleaned.

$$\frac{|\overrightarrow{z_{n+1}}| - |\overrightarrow{z_{n-1}}|}{2|\overrightarrow{z_n}|} \leq 0,1$$

After the data is successfully completed at the preprocessing stage, the data is then tested with a dataset that is split into 80% training data and 20% testing data. So with this the data used for testing is 45 samples and the testing data is 16 samples. The model results obtained after training and testing the model show quite good results with a correlation coefficient (R2) value of 0.507 with the average value of the model error is 258, 89 and the average value of the absolute error of the model is 13.19.

4 Conclusions

If the user sets the X coordinate of 228 Cm and the Y coordinate of 753 Cm on the field, the motor will automatically have a speed of 100 PWM and have a vertical angle of 35 degrees with a horizontal angle of 130. The process of determining the magnitude of the vector is carried out to determine the deviation of the vector resultance between each input and output. The input variables that are calculated are the vertical coordinates of the ejection machine, the horizontal coordinates of the ejection machine, and the engine speed. The model results obtained after training and testing the model show quite good results with a correlation coefficient (R2) value of 0.507 with the average value of the model error is 258, 89 and the average value of the absolute error of the model is 13.19.

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