A STUDY ON OPTIMIZING ERROR DETECTION AND CORRECTION STRATEGIES IN PHYSICAL EDUCATION AND SPORT TEACHING USING DATA MINING ALGORITHMS

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Abstract. In the fiercely competitive realm of sports and physical education, the application of data mining algorithms has emerged as a vital solution. Machine learning has streamlined processes, offering a seamless means of elevating the quality of education and training provided to students, particularly in the context of sports. This technological support empowers the sports education system to make more informed decisions pertaining to the physical development of aspiring athletes. In this comprehensive study, a blended approach of qualitative methods has been leveraged to gather intricate insights, enriching the overall understanding of the subject. Additionally, an in-depth exploration of articles and journals has been undertaken to scrutinize the practical implementation of data algorithm techniques geared towards enhancing physical training. The resultant findings underscore a substantial and tangible nexus between data algorithms and the domain of sports education. Of paramount significance is the central role played by data mining algorithms in augmenting performance. Notably, the National Sports Board (NSB) has extensively harnessed this technology to meticulously monitor players' on-field performance, ultimately leading to a granular comprehension of each player's capabilities. This paper emphasizes the methods of optimizing mistake detection and its joining systems for increasing the punishment in the operational procedures.

Key words: Optimizing Error Detection, Data mining algorithm, sports teaching, physical education

1. Introduction. Optimization is a methodological act and process of developing a functional and fully effective source. The increased implementation of technology has developed the internet-based education system and increased the growth of physical education. According to, Alamiedy et al. (2020), the development of network technology and information technology helps to achieve high convenience in performing the algorithms of data mining. An algorithm of machine learning (ML) or data mining is a set of calculations and heuristics that develops a data model. Furthermore, to develop the algorithm must scrutinize the provided data after analyzing the trends and patterns.

In the area of information, the knowledge and skills of people have been enhanced rapidly with data mining algorithms (DMA). Nowadays, the requirement of technology has been in high demand in sports teaching (SP) and physical education (PE). DMA tackles the challenge of flossing information in the education sector. In recent times, the importance and function of data mining have been highly released mainly in the sports field.

This paper highlights the processes of optimizing error detection and its associated strategies for enhancing the correction in the operational processes. These processes are generally implicated in physical education and sports teaching utilizing the algorithms of data mining approaches. In addition to this, it helps to implicate data mining tools to direct sports training and related physical sports. Moreover, optimizing error detection and strategic Eros detection techniques promotes physical education and boosts the tactic and strategic analysts. Furthermore, the tools of the logarithms of data mining help to optimize error detection in the field of education and sports. As per the view of Alamiedy et al. (2020), these tools are sent to be used in competitive sports to mine out the informational data from the massive datasets directing the sports trainers to focus on physical education growth and development.

The lack of authentic and more informative information about the data Ming algorithm is the limitation

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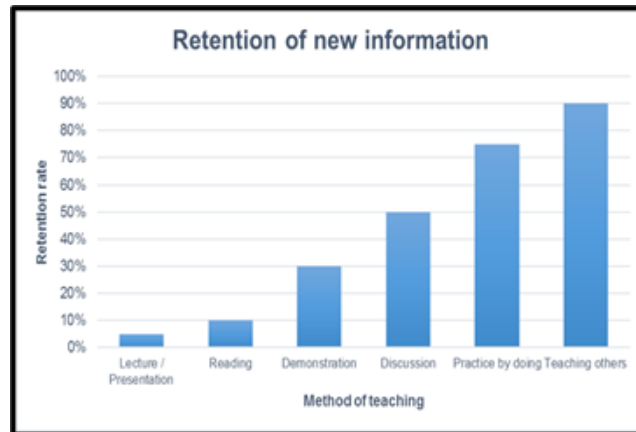
Fig. 1.1: Rate of using data mining algorithm in physical education

of the study. Further, all aspects of the technology of data mining have not been evaluated in the study. In addition, this study consumes lots of time to collect more informative data on physical education development.

1.1. Motivation . In the modern era, physical education and sports hold a pivotal place in individual development and overall well-being. However, to maximize the benefits of physical education, it is imperative to embrace technological advancements. This study is motivated by the realization that data mining algorithms and machine learning can revolutionize the way physical education is administered and enhance the outcomes for students and athletes. The motivation behind this research is to explore the synergies between data mining algorithms and physical education, harnessing the power of technology to optimize training, skill enhancement, and mental well-being.

The research contributes,

1. By integrating data mining algorithms, physical education programs can be tailored to individual needs, optimizing training regimens for each student or athlete.
2. The study sheds light on how data-driven approaches can be used for mental training, helping individuals build resilience, focus, and emotional well-being alongside physical prowess.

2. Optimizing Error Detection and Correction . Error identification and correction are strategies used to recognize and precise the faults that arise at the time of storage and transmission of data. Hence, some algorithms are designed to identify the error because of interference and the factors that influence data corruption. As suggested by Shahid et al. [8], Error detection is the process of identifying the errors at the time of transmitting and to the transmitters. Furthermore, error correction is the reconstruction of the error-free and original data.

In today's highly interconnected and data-driven world, the need for robust error detection and correction methods is paramount. From critical systems like financial transactions to everyday tasks such as communication, errors can have far-reaching consequences. The motivation behind this research is to harness the power of advanced technologies to optimize error detection and correction processes, ensuring the integrity and reliability of data and systems.

3. Strategies of optimization error correction or detection. It includes several techniques such as simple parity check, checksum, hamming code, and cyclic.

Parity check: It is the method the network develops to analyze the errors and evaluate the data received integrity at the side of the receiver. Of At the time of event parity, if the 1s number is even, the value of the partial bit is 0. Further, if the other number is odd then 1 is the value of the party

Checksum: It is the method that helps to detect the data which has been transmitted. The procedure includes the data dividing into even segment sizes.
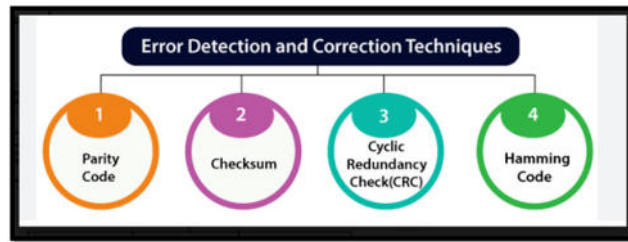
Fig. 3.1: Strategies of optimization error correction or detection

Hamming code: It is a system that identifies and detects errors at the time of storing data or transmitting. It is highly used in the ECC RAM and enhances the processing.

Cyclic Redundancy Check (CRC): It is the method of knowing the details of the transmitted data in the network.

3.1. Impact of Data mining algorithm on sports and physical education. As per the comment of Wang et al.[**?**], the implication of data mining has improved sports functions and other physical education activities. Moreover, it is one of the effective approaches in the field of educational systems that help in the improvement of the physical health of the students and players in the education system. Physical education involves a series of theoretical as well as practical knowledge to improve the efficiency of sports. A big database can be achieved through the implication of data mining algorithms.

Data mining algorithms allow for in-depth performance analysis in sports. They enable coaches and athletes to dissect various aspects of performance, such as speed, agility, endurance, and accuracy. By analyzing data from wearable devices, video footage, and performance metrics, patterns and trends can be identified, leading to targeted improvements.

3.2. Application of data mining algorithm on physical education and sports teaching. The sports sectors and physical education are required to fulfill the qualification, informatization, and automation based on big data performance. As per Haoxiang & Smys [2], For sport and education data mining relies on a multimedia base of data of high value and importance. For instance, in physical education, the reliable data collected by the professor is very big and the authentic vital detail included in the data cannot be easily gotten as the noise of the students throughout the class. Further, the management of sports systems optimizes and obtains the resources of data. Besides this, the mining of data of different aspects influences the knowledge of the students and evaluates the overall result of sports teaching.

Evaluation of student's performance

Data mining tools refer to predictive modeling that has largely helped to predict the performance of students. To develop this many processes have been fulfilled including the regression and classification of different data. In addition, major classification has been used to estimate the performance of the students. SPSS, Rapid Miner, KEEL, and Orange are some tools that help to evaluate the performance.

Providing training and guiding the students

The data of the competitors can be evaluated by associating and putting rules with the features of the ball to identify the interconnection between the technical action and the players. It is a helpful tool for giving training and guiding through the physical process of physical Nationalon. The National Board Association (NBA) has recently implemented a data mining tool in conjunction with the recording of the image of the game of basketball.

Comparing the performance of various candidates

Different students' performance can be evaluated with various tools and the monitoring process can also be performed with the development of strategies to mitigate the challenges. According to Gunawan,[1], There have been various tools that help to develop a high insight into the performance of the students. Different situation views can be perceived with these tools that help in the future enhancement of the performance.
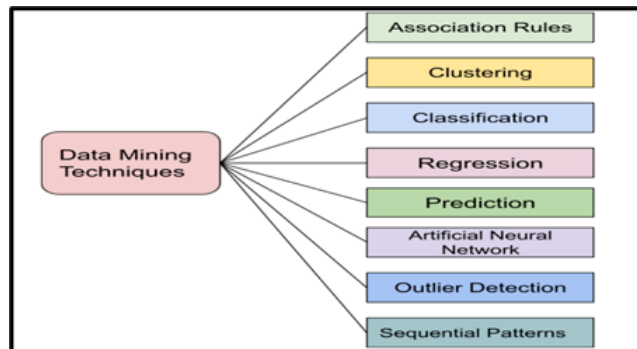
Fig. 3.2: Theory of data mining technology

Fig. 4.1: Technologies of data mining

4. Techniques of Data Mining. There have been Various techniques have been used in data mining which involve correlation analysis; classification, clustering Outlier detection and the induction of the decision tree have been analyzed below:

Correlation analysis

Correlation analysis is an extension of the rules of the association, often the confidence and support parameters can be analyzed and the pattern can be detected. It is the method of statistical support to evaluate the linear linking between the variables and identify the relations. Sports and education teaching data mining helps to optimize the optimize.

Induction of decision tree

Decision-making is the method of learning the prospects of decision administration from the training sets. As stated by Lee, [4], a decision tree is used in the classification of data mining which creates a classification of regression and tree structure. The goal of the decision tree is to build a model that can function the databases effectively and help in splitting the data into distinctive classes. The scalability of the database are measured in the detection of inductive reasoning.

Outlier Detection

The local outlier detection in the algorithm is analyzed to compute the viability of the local density practices with respect to the substantial practices. An outlier detection has the significance of identifying the bad data and the good data that probably helps in meeting the central distribution. As per the critical analysis by

Maximov & Weslye, [5], sorting out the values administers progress towards checking interquartile takeaways depending on the respective data. The four major techniques are the Z-score, Numeric outlier, DBSCAN and the isolation forest respectively. Outlier detection has enabled the course of algorithmic actions to take place in prerequisites of Python detection.

Regression

Regression analysis is the concept of determining the course of actions corresponding to independent variables. Building a valid algorithm is a mandate that helps in functioning the training practices based on valid testing techniques. As opined by Ranjan & Avasthi, [7], after diving the data into testing and training, the model is learnt by following various samples that are relative to the linear regression object. In addition to that, plotting and visualizing the predicted data can contribute to accomplishing certain factors that are imported from both the simple and multiple variations respectively. As a result of this, the corresponding modules are associated with numeric values.

Clustering Analysis

Cluster analysis in data mining mainly refers to the group of objects that are associated with different grouping elements in data analytics. The clustering process is a multivariate data mining that is accustomed to measuring the user's attributes and characteristics in a significant manner. As per the critical analysis by Križanić, [3], identifying discrete and sales transactions, it is important to measure the resources that are available in an ample amount. Clustered analyses are applied in the form of image processing and pattern recognition. The strategic resources are put forward to configure the clustered methods that are related to machine learning.

Sequential pattern

Sequential patterns are the frequent patterns that are prosecuted to several input devices to clarify the courses of algorithm and data mining. Initially, the user needs to specify the parameter called minimum support threshold to acknowledge the application of subsequent networks. As mentioned by Pavithra, [6], an instance of the sequential pattern is that it helps in modifying the occurrence of networking practices thereby administering the successive outlets to deliver data effectively. The generalized sequential pattern is associated with learning possibilities to identify the pattern from a large set of databases.

Interconnection between the sports teaching and data mining algorithm

Physical training has been likely to improve with the algorithms of data mining. Scores of the student least in the database of the teaching has been reflected in the understanding of the situation (Zeng, et al. 2020). Further, the overall plans and strategies can be implemented to improve the advanced technologies. In addition, the record of each student's performance can be easily accessed with the algorithms of data mining.

5. Methodology. Secondary qualitative method has been follow in the study to collect detail about the data mining tools in the physical training and sport. The data has been collected through the articles, books and magazines. It is more reliable source to gather the data and enhance the more information about the reseaechr topic.

6. Result. According to Shakya, [9], different students' learning capacity can be identified and the tendencies to sustain in the long term have been evaluated. The data mining of education aims at building the techniques for explaining virus data kinds occurring in the context of education.

The above figure states that the sport and education sector has been highly using the data mining tools to increase the efficiency level.Data mining efficiently enhances the team performance by matching players to some particular situation. Furthermore, each player's contribution can be analyzed and the opposition's tendency in the match has been evaluated to exploit the weak point of the players. It involves different actions such as knowing the extraction and function at the ground of the match.

The above figure states that there are different correction strategies and error detection optimization processes in the area of physical education den sports teaching or training in which the algorithms of data mining can be used. The techniques of data have the potential to recognize the performance levels of the players (Lopes, et al. 2020). Application of the training sets comprises class labels and attributes that are implemented in the algorithm
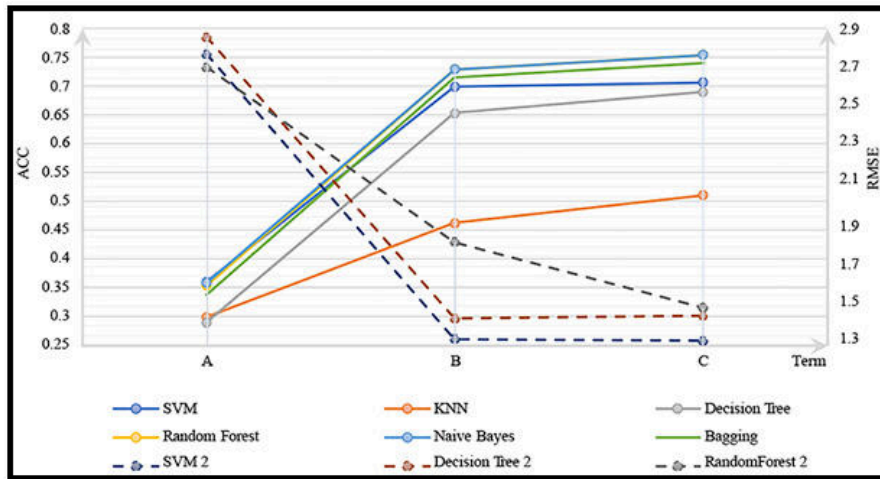
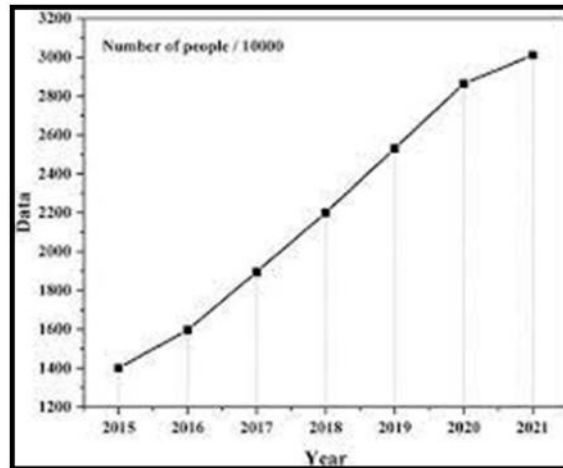Fig. 6.1: Data driven mining impact on physical education

Fig. 6.2: Growth due to Data mining techniques in the educational systems

7. Conclusion. The overall research concludes that there is a positive impact of the data mining method on the sports and teaching sector. Furthermore, several algorithms have been used in this process to increase the potential impact. Nowadays, internet technology and computer technology have a higher influence on the physical fitness of students. Big data analysis, statistics, algorithms, and some advanced technologies are linked to developing the mode of information sports tactics and techniques in the education sector. With the help of tools of mining valuation detail can be extracted from large data such efficient and fast methods can assist the teacher as well as the students to fulfill the academic goals. The objective talent identification facilitated by these methods ensures that deserving individuals receive recognition and opportunities irrespective of biases or preconceptions. The implementation of data mining in strategic game planning elevates the competitiveness of teams, enhancing their chances of success. As the demand for sports analytics professionals grows, future research can focus on developing and enhancing educational programs in this field. This would help meet the increasing need for experts who can effectively leverage data for sports performance and strategy.

REFERENCES

[1] D. Gunawan, *Classification of privacy preserving data mining algorithms: a review*, Jurnal Elektronika dan Telekomunikasi, 20 (2020), pp. 36–46.

[2] W. Haoxiang, S. Smys, et al., *Big data analysis and perturbation using data mining algorithm*, Journal of Soft Computing Paradigm (JSCP), 3 (2021), pp. 19–28.

[3] S. Križanić, *Educational data mining using cluster analysis and decision tree technique: A case study*, International Journal of Engineering Business Management, 12 (2020), p. 1847979020908675.

[4] H. S. Lee and J. Lee, *Applying artificial intelligence in physical education and future perspectives*, Sustainability, 13 (2021), p. 351.

[5] I. I. Maximov, D. Alnæs, and L. T. Westlye, *Towards an optimised processing pipeline for diffusion magnetic resonance imaging data: Effects of artefact corrections on diffusion metrics and their age associations in uk biobank*, Human Brain Mapping, 40 (2019), pp. 4146–4162.

[6] M. Pavithra, A. Sindhana, T. Subajanaki, and S. Mahalakshmi, *Effective heart disease prediction systems using data mining techniques*, Annals of the Romanian Society for Cell Biology, (2021), pp. 6566–6571.

[7] R. Ranjan and D. Avasthi, *Enhanced edge detection technique in digital images using optimised fuzzy operation*, Webology, 19 (2022), pp. 5402–5416.

[8] H. Shahid, H. Ashraf, H. Javed, M. Humayun, N. Jhanjhi, and M. A. AlZain, *Energy optimised security against wormhole attack in iot-based wireless sensor networks*, Comput. Mater. Contin, 68 (2021), pp. 1967–81.

[9] S. Shakya, *A self monitoring and analyzing system for solar power station using iot and data mining algorithms*, Journal of Soft Computing Paradigm, 3 (2021), pp. 96–109.