# Human–Computer Interaction on IoT-Based College Physical Education

Yong Che[1] · C. B. Sivaparthipan[2] · J. Alfred Daniel[3]

**Abstract**

College physical education system is an essential component of the national health plan. Promoting the technical and modernized construction of the physical education curriculum in colleges and universities is crucial to enhance higher education's science and performance. In this technological era, the Internet of Things (IoT) is used in physical education to train and record physical activities. In this research, the AI-based IoT system (AI-IoTS) Wearable technology is promoted for IoT-based Human–Computer Interaction for College Physical education. This AI-IoTS consist of a Cloud Platform and three layers of AI. The AI-IoTS recognizes the data required for the student. Collect the data from the cloud using an IoT platform and processes it with the help of AI. The student can train themselves using wearable technology without the help of the Physical instructor. The simulation method of the proposed framework "AI-IoTS" proved that it could collect and teach students independently. The proposed AI-based IoT System (AI-IoTS) Wearable technology for IoT-based Human–Computer Interaction for College Physical education has been validated based on the optimization parameter, which outperforms conventional methods.

**Keywords** Human–computer interaction · Artificial intelligence · Physical education · Cloud · Wearables · Internet of things

## 1 Basic information About Human-Computer interaction in Physical Education Based on IoT

Higher education policy has been deepened and expanded in [1] recent years, with the growth of higher [2] education and the deepening of reform and opening. Physical education's

teaching influence is closely linked to the [3] potential growth of domestic and national health education as an integral part [4] of the college system. In university-level education, there are challenges, such as a single-mode [5] of instruction, a lack of distance education, and a lack of rigorous review of technical measures [6]. The full advancement of society is continuously raising the need for [7] university students to quality and type of physical education. With the continuing development [8] in virtual reality, internet of things technology, the cloud-based platform, the mobile internet, and other advanced [9] IT technologies, it offers an opportunity for the creation of an internet-based system for virtual reality physical education in the college [10].

The IoT (Internet of Things) provides a link to the internet for [11] everyday objects with computation and communications. The Internet of Things is a [12] new paradigm that provides a range of interactions and [13] cooperation between objects or things through the internet. Internet of Things [14] the upcoming Internet rollout of things over the current Internet infrastructure promises to extend the interaction by offering applications and services [15] that

✉ Yong Che
  cheyong2006@163.com

  C. B. Sivaparthipan
  sivaparthipan.cse@adhiyamaan.in

  J. Alfred Daniel
  85.alfred@gmail.com

1 Department of Public Education, Anyang Preschool Teachers College, Anyang 455000, Henan, China

2 Department of Computer Science and Engineering, Adhiyamaan College of Engineering, Hosur, India

3 Department of Computer Science and Engineering, SNS College of Technology, Coimbatore, India

allow the interaction of the human/computer to integrate an integrated daily [16] customization. The internet of things technology has made it more [17] necessary to communicate more emotionally with the human–computer [18]. The lower network latency and longer battery life mean that human/computer interface mechanisms in environments continue and operate in real-time [19].

Physical education depends on the relationship between [20] humans and computers to visualize a range of information [21]. The only interface between person and machine is the human–computer interaction [22]. An appropriate human–computer interface framework for athletic activity has to be user-friendly and multifunctional [23]. Such a device gives education the interactivity and functionality required [24]. This creates a practical atmosphere, changes students' passion for [25] the relationship between person and machine and offers visual education benefits from students' viewpoint, such as interaction, simulation, and autonomy.

The main contribution of this paper is as follows:

1. The interface with Human Computers is used primarily for solving problems and identifying the areas for improving physical education for students.
2. Targeted at issues relating to teaching single teaching approaches and long-term teaching skills of universities and schools based on technologies for virtual reality.
3. Using the internet to make the students creative approaches possible and to monitor their physical activity.
4. The AI-IoTS and Wearable technologies are used for encounters with human computers to enhance physical education for the pupils.

The rest of the paper is discussed as Sect. 2 is Literature Survey for IoT and AI-based Physical education of Human–Computer Interaction, Sect. 3 is College Physical Education on IoT and Artificial Intelligence in Human–Computer Interaction, Sect. 4 is Experimental analysis of physical education, Sect. 5 as the final concludes of the physical education based on HCI with IoT.

## 2 Literature Survey for IoT and AI-Based Physical Education of Human–Computer Interaction

Chao gong et al. (2019) mentioned that [26] technological stuff on the Internet intensified the need for emotionally linked interactions between humans and computers. Interactions between humans and computers in IoT for mathematical modelling, stability analysis using the BERQ methodology. A new need for more sophisticated artificial intelligence

capable of compliance in embedded settings with heavy human contact has been brought on by the lower latency and longer battery life in the green IoT network.

Ya-Wen Cheng et al. (2020) says that [27] IoT-driven training framework builds an immersive learning experience based on scenarios. The DBR approach is an established approach in education, promoting our expertise in designing an education intervention. It may replicate the actual world or thing using human–computer interaction to create a simulation environment with its many perceptions, interactions, immersion, and other characteristics.

Yu ding et al. (2020) explained that [28] the higher education system and public health programmes represent essential physical education elements. Virtual Reality (VR) science is a modern technology that blends computing technology and simulation technology. Promoting the technical and modern construction of universities and colleges' teaching system contributes to higher education research and effectiveness.

Zhang Yangheng et al. (2020) mentioned that [29] Physical education at college is so unilateral, making the appraisal of the teaching method pointless. This basis incorporates an artificial intelligence education framework to develop a neural network-based model to assess artificial intelligence sports. The artificial intelligence paradigm continues with the method assessment and the final assessment.

Shuanhu Li et al. (2020) says that [30] User knowledge of the research process is the key factor for assessing the effectiveness of the Synthetic Apertural Radar (SAR) technology design to improve the performance of the human–computer interaction process. This allows creators to share the best ideas through the HCI process and develop meaningful interactions for consumers. This knowledge allows the programmers to give the customer a customized interface and subsequent iterations to be useful and flawless.

Duc Son Nguyen et al. (2020) explained that [31] Interactions with human machines boost customer good attitudes while recruiting, promoting, and educating the public. However, its use demands that students remain in one place to control their computer to prevent peer-to-peer contact and cooperation within the classroom.

Vicente López Camacho et al. (2020) says that [32] uses wearable technology and the Internet to provide user-friendly, tangible interfaces for all-embracing services. The wearable and IoT technology integration network specifically designed to deliver and promote teaching and training programmes Wearable and IoT technology will change the classroom in which the intelligent entity becomes an element in the wearable and IoT vision.

Mostafa Al-Emran et al. (2020) mentioned that [33] the internet of things enables everyday objects linked to the internet, networking, and connectivity capabilities. The Internet of Things Systems possesses qualitative features

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like ubiquitous systems for human–computer interaction. The objects can communicate with each other and cooperate across the internet. The Internet of things is the most difficult medium that identifies the connection between physical objects shortly.

Peng Ding (2019) says that [34] the internet of things via the new network system promises to broaden this connectivity by delivering human–computer interaction software and services. The internet in physical education focussed on the relationships between human computers to build cooperation in classrooms. A level of understanding which is equivalent to the level of educational settings would be of considerable importance.

Amon Rapp (2020) explained that [35] Interaction between human and computer (HCI), to consider regular behaviour of humans to create applications that can satisfy consumer needs. The concept "design ethnography" unites design and education precisely, referring to a range of methods, assumptions, and skills used to gather and interpret information to understand people's specific environment for the specific purpose of developing new technologies.

Fuji Ren et al. (2020) mentioned that [36] Human-computational interface technology is important and fascinating research material for educational purposes, along with its associated intelligent robot technologies. Reading, writing, and other senses, commonly used in the contact of humans. This tries to grasp the nature of knowledge and creates smart machinery that can be used in education.

Conghua Pan et al. (2021) says that [37] the growth of IT and expanded physical education classes is students' major requirements. This is particularly urgent to offer students personal education in physics by converting environments into more intelligent environments through the interactions of human computers centred on the web of object systems. The work allows a person to work independently.

## 3 College Physical Education on IoT and Artificial Intelligence in Human–Computer Interaction

College physical fitness is an integral part of the system and the national wellness programmes of higher education. Promoting the technical and modern construction of universities and colleges' teaching system contributes to higher education research and effectiveness. To maximize the HCI methods effectiveness, study comprehension is essential for determining physical learning success. The definition and framework for artificial intelligence experts' decision-making framework have been accomplished by considering the sports teaching assessment system's current condition. The intelligent evaluation system calculated the weight of the assessment metric for physical education. The concepts

and features of the concept were discussed and examined. The findings show that the intelligent assessment framework for sports education based on artificial intelligence experts' decision-making system provides a new growth approach to introduce and advance contemporary PE technologies and.

In Fig. 1, Fitness in the university is that college students are less likely to gain weight by exercising has been demonstrated. Many students worry about weight gain due to stress and unhealthy diets at school. Regular aerobic workouts can assist. Regular tasks tend to enhance equilibrium, motor control, brain, and cognition. Blood and oxygen circulation, which has a beneficial impact on cognitive growth, physical well-being and mental health, are being improved as the science trend increases. Teaching life skills through physical education, such as self-respect, team bonding, and criticizing and innovative thinking, will promote a more inclusive and supportive physical education atmosphere. Student Assessment, collecting proof of student success and information on students' development, is one of the basic physical education components. Strategies and tactics show that teachers apply a variety of instructional strategies. This involved seminars, individualized preparation, co-operation and problem-solving. Students can gain general physical education from social experiences, especially if they have comprehensive, regular, significant, and positive interactions. The games would be of great value to university students. Physical fitness, cognitive skills, ingenuity, innovation, and competitiveness, were required.



**Fig. 1** General physical educational activities

$$T_k = \gamma(j)S'(k) + \int_{-\infty}^{\infty} m(k+1)\,dk \qquad (1)$$

Equation 1 denotes that $T_k$ for teaching evaluation of athletes, $\gamma(j)$ is that $j$th dimensions of the data onto a hyperplane of education, $S'(k)$ for social environment changes of them, $m(k+1)$ is the movements of every activity. The current problems are as follows for the testing methodology for PE teaching assessment in colleges. The limits of inter-domain machine thought and conventional techniques in social science study are adopted largely with little to little regard to recent research findings in the computing field, so it is difficult to improve precision greatly.

Figure 2 says that the physical activity in university pupils' lifestyle is a behaviour that is narrowly characterized as any physical movement induced by muscle contraction, which greatly raises energy costs. Anaerobic sport can improve respiration and heart rhythm for pupils. Muscles are used for muscle strength testing. Muscles. The ability of the muscles to work consistently without fatigue is muscular resistance. The versatile exercise will allow students to relieve their daily stress. Aerobic activity increases the heart rhythm of pupils, working muscles, and increasing the respiratory rate.

$$P = \left(1 + \frac{f_i - \propto}{m_i + \beta}\right) * \left(1 + \frac{as_i - \propto}{aa_i + \beta}\right) + r \qquad (2)$$

Equation 2 says that $P$ is the perfection of physical education in various activities $i$, $f_i$, $as_i$ is the flexible movements and aerobic sports like basketball, rugby or running, skipping $\propto$ activities, $m_i$, and muscle movements and aerobic activity like swimming, shaking of leg and hands $\beta$ activities, $r$ is taking restorative effort made in their performance in PE. In individuals, the quality of life and efficient operation of the everyday lives are calculated as the absence of illness and the optimum structure and work. In children, it is possible to assess brain health in terms of good focus growth, job behaviour, memory, and academic achievement in an educational setting.

In Fig. 3 describes Any framework that stores and retrieves the information to the student to enhance comprehension, communication and method alignment as a knowledge management system. The Integrated Management System is drafted by a computer relational database system programme that can produce, scan, erase, alter, input, and create data statistics in a certain format, to allow physical education students to compose physical qualifications. Models base management method is a groundbreaking approach to physical education and other physical active situations for the teaching and learning
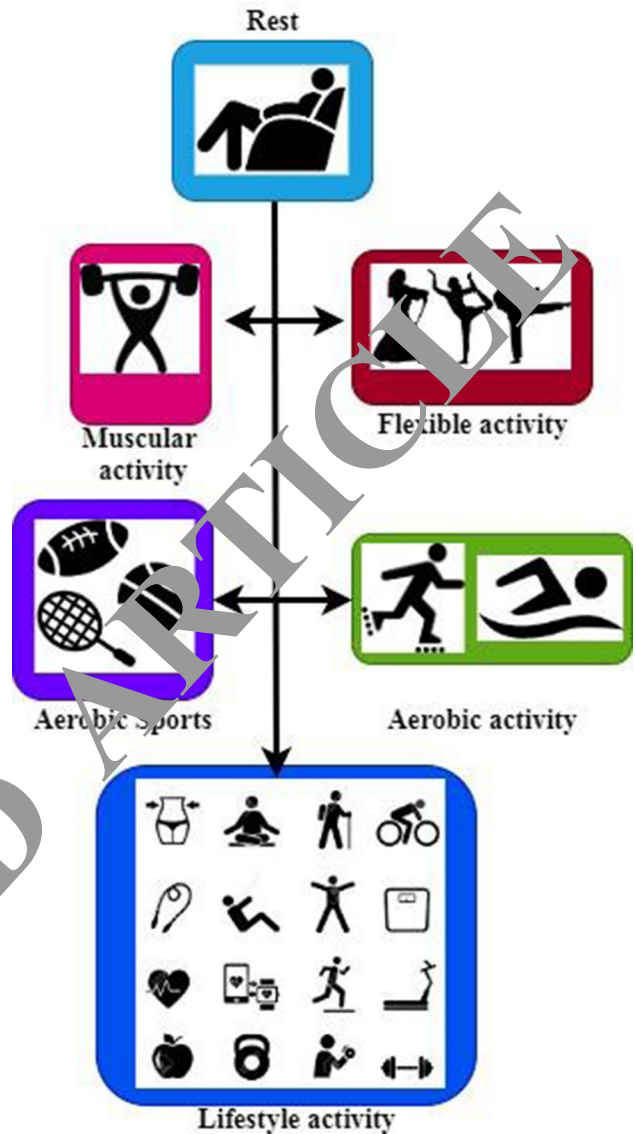
**Fig. 2** Various physical activities of education

of better adaptations to learners' needs in all learning fields. Combining virtual reality technologies with college physical education and training will make students more immersed and enhance the impact of education and training in some circumstances. HCI is a multidisciplinary area of research that focuses on games, learning, and curriculum for students. Physical exercise users may assist children and young people in reaching the recommended regular energy or moderation intensity. The quality of life and the effective operation of daily life in persons is calculated as the lack of disease and the optimal structure and work. For youngsters, a healthy attention, behaviour, memory and academic success may be appraised in terms of brain health in educational environments.
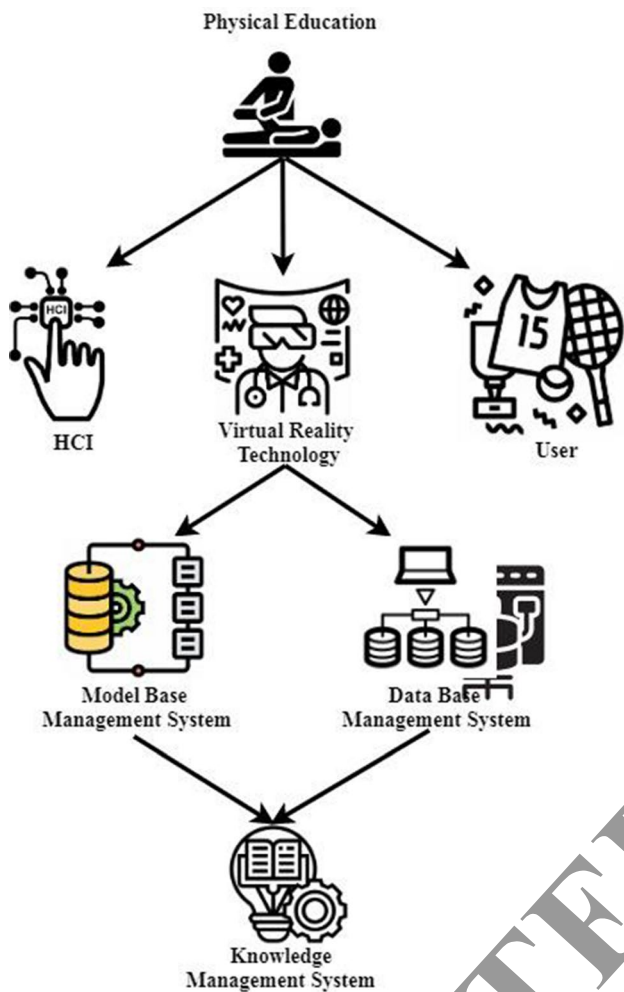
**Physical Education**



**Fig. 3** Interaction of human and computer with artificial virtual technology

$$F = \frac{h_l}{h_t}\left(e^{\left(-\frac{h_1 l}{t}\right)} - e^{\left(-\frac{h_2 l}{t}\right)}\right) + V_r\left(e^{\left(-\frac{m_b l}{t}\right)}\right) * e^{\left(-\frac{d_b l}{t}\right)} + k\right)$$

(3)

Equation 3 refers to $F$ is final fitness value of learners, $\frac{h_l}{h_t}$ is the human interaction with computers for health data of learners and teachers, $h_1$, $h_2$ are the number of health data of learners, $V_r$ for virtual reality technology for learners in physical education, $m_b$, $d_b$ are the model base system and database system of fitness concerning the learners and teachers, $k$ is that knowledge system of education. The application of virtual reality is a modern technology for computer-based real-life simulation. Via terminal devices and computer interfaces, a combination of software and hardware is integrated to replicate the human sense to feel immersed and have a more accurate view of the situation. Combining virtual reality technologies with college physical education and training will make students more

immersed and enhance the impact of education and training in some circumstances. As shown in Fig. 3, the structure collects information for students as a knowledge management system to increase understanding, communication, and method alignment. The computer relational database system is developed by a programme that allows the students of physical education to produce, scan, delete, and modify data statistics in a specified manner.

A mix of software and hardware is combined through terminal devices and computer interfaces to imitate the sensation of humankind to be immersed and to give a better picture. The merging of technologies of the virtual reality with physical training and university training will increase the immersion of students and improve the effect on certain situations of education and training.

Figure 4 says that technology in virtual reality may allow students to be immersed and teach through college physical education and training. The instruction will significantly enhance the teaching impact in particular cases. The sports organizations' user management role provides sports creation, general sport organizing practices and organizes all related tools, processes and functions. The role of physical education helps to improve skills and trust. It encourages participation in a wide variety of important physical activity in life. To ensure that the current curricula principles are analysed non-functionally and physical, educational philosophy demands a relentless commitment to persons. The teaching style in physical education and the physical learning mode in universities offers students an excellent learning atmosphere, science, and efficient learning using server technologies, and the best advantage in information technology. The behaviour that promotes fitness encourages its customers to adopt them through their students. The merging of virtual reality technologies with physical training and university training will increase students' immersion and improve the effect on certain situations of education and training. HCI is a diverse field of study focussed on student games, learning and curricula. Physical users can help children and young people to achieve the needed regular energy or intensity of moderation.

IoT is a worldwide network of physical instruments and objects. Universities or some other education establishment have enormous promise. Educators have resources for immersive learning and virtual instruction. The protection and welfare of students were highly worried about the abroad and sexual harassment in classrooms. Students may be performed in real-time to review their results. The growth of student trust and colleges in physical education is critical to support the continuity of student health and student spirit. The practice's knowledge encourages students to partake in daily physical activity associated with greater focus and good compositional behaviour. The method of education

**Fig. 4** Virtual reality system of physical education for demand analysis
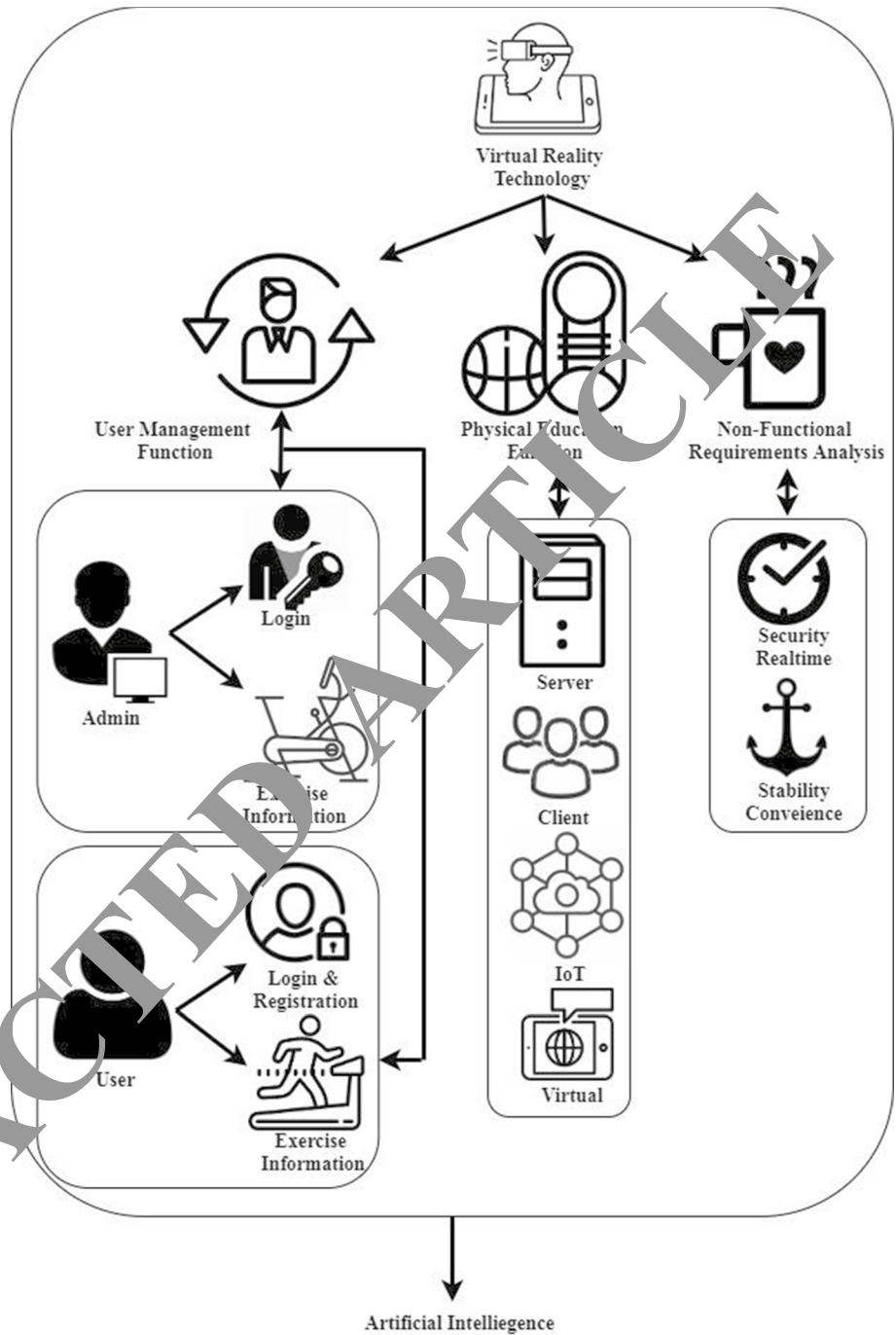


invokes the development and maintenance of the human body Physical activity.

$$U = \left( \frac{a(l) * d}{e_i} \right) * \left( \frac{u(l) * r}{e_i} \right) + \log \left( \sqrt{1 + m} \right) \quad (4a)$$

Equation 4a says that $U$ user management systems, $a(l), d, e_i, u(l), r$ are the admin login details with corresponding personal data for exercise information, user login details with real information of their activities, respectively,

$\log \left( \sqrt{1 + m} \right)$ for the log-likelihood function of the management. Before testing administration, however, the teachers mentioned some directives to the students about the testing purposes; none of them informed students that the exam aimed to promote a physically active lifestyle. Just half of the teachers reported giving test results to the students during testing, and it was usually short whether the students were explained the test results. The rise in physical education of the students and colleges is essential for the

continuity of the students' health and the students. Understanding this technique allows pupils to participate with better attention and excellent compositional behaviour in their everyday physical activities. The education technique comprises developing and maintaining physical activity of the human body.

$$PE_f = \frac{1}{T} ((s(e) + i(d) + c(d)) * v)^2 + (i(d) * c(d)) \qquad (4b)$$

In Eq. 4b denotes that $PE_f$ physical education functional system, $T$ is a teaching method, $s(e), i(d), c(d), v$ are the server connection between teacher and learner, IoT computing for learners' data, client data from server access and virtual reality of their activities. The learning sub-platform key features include online learning, teaching from remote settings, remote discussions, and scoring inquiries. The management sub-platform plays a role in teaching administration, student management, and sports selection management. The three sub-platforms are for instructors, students and managers, respectively. They are autonomous and will exchange data to meet the teaching aims of the remote PE teaching network. They are independent.

$$N_f = s_r^2(t) + (\varepsilon - y^2) * \sum st(t,l)\mathrm{con}(l) \qquad (4c)$$

The above Eq. 4c denotes that $N_f$ for non-functional analysis of teaching quality, $s_r^2(t)$ is the secure students' data in real-time processing during teaching, $\varepsilon, y^2$ are the vector quantity and evaluation of methods handling, respectively, $st(t,l), \mathrm{con}(l)$ is the stability of teacher & learner and convenience for learner making any mistakes in their activities. In the assessment of physical education at school, the definition of different metrics is somewhat chaotic, and the formal evaluation and uniformity of the physical education at the school are a little insufficient. With this in mind, it is necessary to promote the benefit of physical education in schools and to harmonize the physical and mental development of participating groups, reasonable aid for various resources in the school physical education environment and to provide evidence-based and systematical assessment system for tonnes of participants.

In Fig. 5 says that artificial intelligence can provide solutions for students in practical problems for physical education technology development. Cloud service networking is a way of delivering device and internet benefits to the full. The excellent physical learning tools from different locations and colleges into physical education to build a teaching experience focussed on knowledge. Smart technology in university physical education will increase the viability of teaching for learners, rebuild physical education and foster ongoing growth. Computer Vision seeks to mimic some of the students' human vision system's intricacies and visual experience by using deep study models to identify and distinguish stimuli correctly from

the dynamic and diverse physical environment. Centred on data mining, students have evaluated their physical education success and have made useful assessments of their performance. The statistical study on the students' quality of life is deeply embedded in university education's human self-perception. Physical exercise enhances the synaptic transfer and purchasing of students and allows them to create physical potential. Development often involves students at the college acquiring and transmitting their refined behaviour. The instructor will allow the students to track the running rate, energy expenditure, quantify lift distances, record calories and control the heart rate using cell telephones in the physical education course. Development of the physical education database appraisal framework to promote sports techniques and tactics teaching through data analysis, a database system has been set up to improve education system. The back-drop propagation method was developed to promote sporting technologies and strategies through a review of results. Students help sequenced model data in a recurring neural network from log data stored in the educational systems. The definition of different metrics in the assessment of school physics is rather chaotic and the formal assessment, together with a consistent physical education, is somewhat inadequate. Because of the above, it is important to promote the advantage of physical education in schools, appropriate aid to different resources in the physical education environment, and provide a scientific and systemic assessment system for tonnes of people. It is also necessary to harmonize the physical and mental development of participant groups.

Cloud networking is the metric which is used for providing complete device and Internet advantages. The finest physical learning instruments for building a teaching experience that focuses on information from many places and universities. Intelligent physical education technology will enhance instructional viability for learners, reconstruct physical education and encourage continuing progress.

$$C_s = \frac{1}{2} y^3 + \left( \int_0^y d_m(\rho)\mathrm{d}\rho * y \cos^2 \emptyset \right) \qquad (5a)$$

Equation 5a says that $C_s$ is Cloud sharing the data of students, $y$ is the small of network connection, $d_m(\rho)$ for data mining collections of the statistical report, $\cos^2 \emptyset$ is the angular velocity of movements. Data statistics are part of large-scale research, and big data analysis involves using different algorithms to measure data objectively and then generate high-level data for the real need based on the large volume of data processing available.

$$\emptyset = \frac{\sin^2 \emptyset * 3at \, \cos \emptyset}{\sqrt{C_s \, d_m(\rho)}} \qquad (5b)$$

**Fig. 5** Technology framework
of artificial intelligence
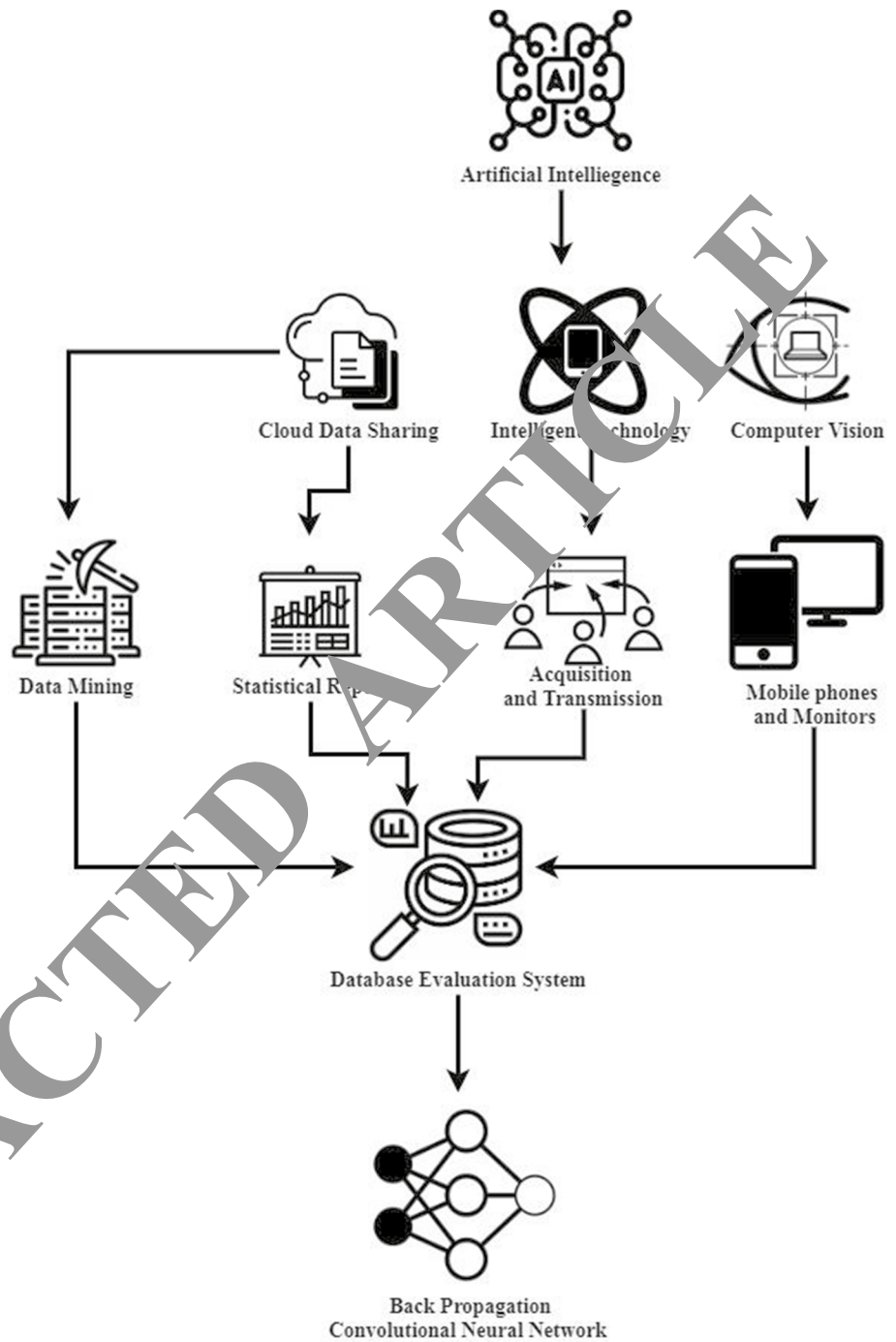


In Fig. 5b and Fig. 6 denotes that Ø is the angle, $\sin^2$ is the second order deviation of students movements. First, conventional paper documents are applied in scientific statistics, which cannot be easily transported and transported, resulting in a great deal of workload for data processing and, second, traditional tactical analysis is carried out using fast video forward and reverse reproduction, which makes it hard to collect and compare video clips reliably.

In Fig. 7 says that physical feedback specifically includes the knowledge and expertise required to work with others and presents the potential to improve those skills. This allows leadership and teamwork skills to be developed and helps students transfer experience to other educational fields. In the form of impulse response and feedback, Convolution shows us the output of physics education. A subsampling of students from the intervention and the test classes using the machines would be carried out using the physical exercise behaviour.
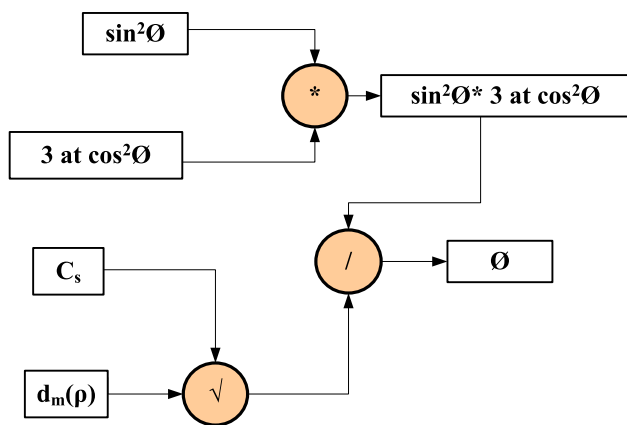
**Fig. 6** Processing of data sharing in physical education report

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Algorithm: BP CNN Algorithm for Physical Education

Input: a,b,c,d

Output: P, Q

For (l = 1)

c = (fl + 1) (b ∧ a)

For (m = 1)

t = t1 ≤ 0 ≤ t2 + t3 ≤ 0 ≤ t4 ..... tr ≤ 0 ≤ ts

For (n = 1)

t(gh) = M(gh) (1) * ( M(gh)(1) + M(gh)(−1))

For (o = 1)

v = (v1, v2, v3, ... vm)(v = v (gh) ∈ [0,5]

If (m > o)

S = (S1, S2, ... SQ),

q∑j = 1

Sj = 1

Else (k > l)

Q = {score, a1, a2, ..... b1, b2, ... a5}

End if

End for

End for

Return
```

The above algorithm suggests that the algorithm has been recommended for the measurement of physical education. The BP algorithm was used to identify students in university PA. If big dataset data changes and the progressive networking algorithm, just upgrade the results to part data changes and use the previous networking results to increase performance. The ranking principle is that the closest the team is to the position. The networking outcomes are excessively dependent on the initial networking core due to the random initial network centres leading to network results and imbalances in sample distribution, and the networking is optimum in the local state. Computer vision attempts by using profound study models to accurately recognize and differentiate inputs from a dynamic and diverse physical world to imitate several of the complexities of the student's human system of vision and vision. Data mining centred on the success of physical training for pupils and their performance assessments. The statistical study on the quality of life of students is profoundly integrated in the human perspective of university education. Physical exercise improves student synaptics and purchasing and makes physical potential possible for students.

Figure 8 says that Scientific and engineering advancement, the design of smart wearable equipment and more detailed and responsive and precise physiological and biochemical research functions. It may guide in real-time athletes' physical activities and aid in the standardization of technical movements in sports. Micron thickness strain sensor with extreme sensitivity and ductility, a low detection limit, retractable and adjustable range. These features allow detecting the body's big muscle motion sensor signals while walking, running, and jumping, providing real-time input about muscle work during exercise, and monitoring, interacting, and evaluating exercise fitness. Lower limb movement tracking by cameras in real-time. Students acquire and communicate their sophisticated behaviour at college are commonly involved in development. In the physical education, your instructor will allow you to follow the course rate, energy consumption, measure elevation distances, register calories and monitor your heart rate using mobile phones. Development of the framework for assessing physical education A database system has been established to boost sport skills and tactics education by analysing data.

Educational philosophy needs a constant commitment to people to guarantee that present curriculum concepts are assessed in a non-functional and physical way. The physical education teaching style and physical learning methods in colleges provide the students an outstanding learning environment, science, and efficient server technology learning and the greatest advantage of IT. The fitness-promoting conduct urges its clients to use their pupils.

## 4 Experimental Analysis of Physical Education Based HCI in IoT

The compilation of data and the entire training record is analysed at the competition. The data where registered in the script, divided and processed for each batting. The programme analyses the action and the score point of the player automatically. Through analysing competition results, the keywords can be found in the positions. Comparative
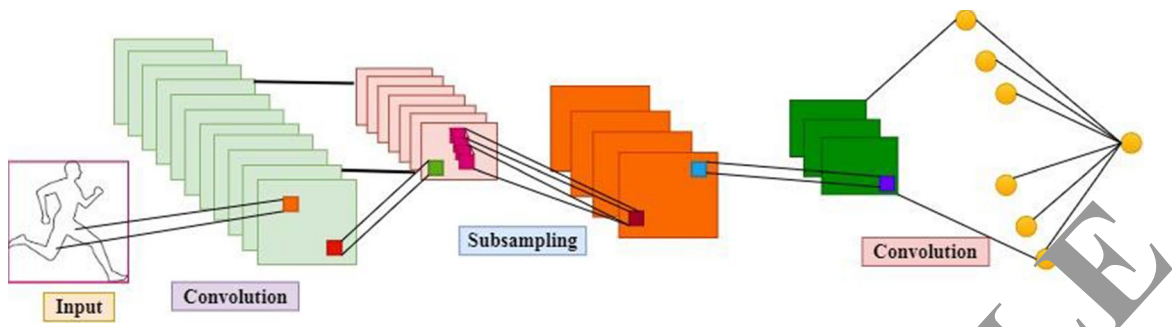
**Fig. 7** Deep convolutional neural network frames

analysis may be done if the data were contained in the string. Analysis of effect can easily find the mechanical and habitual movements of the athlete. The experimental findings show that the proposed sensor is successful in ensuring a precise accuracy rate in the sports recognition challenge with the profound learning-dependent sports BPCNN algorithm of various data set [38, 39] are as follows:

(i)   Analysis of running test

In Fig. 9, the running test analysis mentioned that Student running is an educational organization founded in organized athletic sport. Students had to practise hard at running competitions or on the fields. The running test strengthens the enthusiastic feeling of the students and desires to succeed. Every prestigious university is looking for well-rounded student classes with high quality and excellent test scores.

(ii)   Determination of rope skipping

Figure 10 Determination of Rope Skipping says that the rope skipping is known to be a running equivalent, and the effect of each spring or step on both legs is absorbed; jumping ropes may have a lower risk than running for a knee injury. The skipping section is a perfect student aerobic workout. It will keep heart and lung safe, help keep weight healthy and improve bones and muscles. The skipping rope increases balance and serves as a technique for relaxing.

(iii)   Analysis of participation ratio

In Fig. 11, analysis of participation ratio says that Increased risk of cardiovascular disease and rising rates of diseases such as heavyweight and obesity in life are linked to physical exercise. Thus, most students try to take part in physical work. The best benefits are for students participating in modest physical exercise. Physical exercise can increase cardiorespiratory health, develop healthy bones and muscles, and weight management.

(iv)   Analysis of energy expenditure

In Fig. 12, an Analysis of energy expenditure explained that energy expenditure is incredibly significant for the attempt to lose students' weight. The energy consumption of players with varying playback expertise during the physically immersive video game. For adults to sustain a balanced lifestyle, Sports Medicine advises energy consumption of 150—400 Kcal a day. Students investigate the energy spending from restful metabolism to the intense exercise of varying types of physical activity.
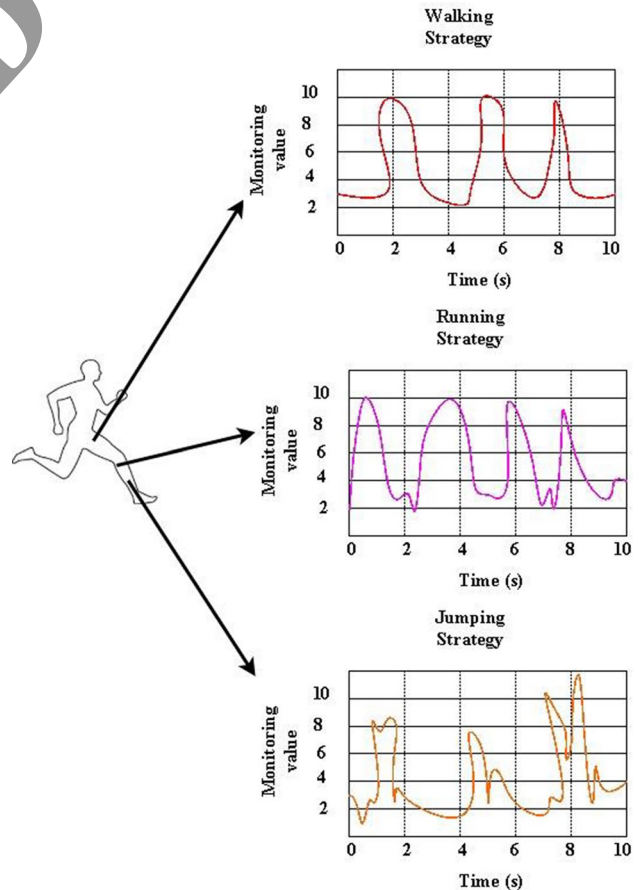


**Fig. 8** Movements of athletes in training real-time monitoring
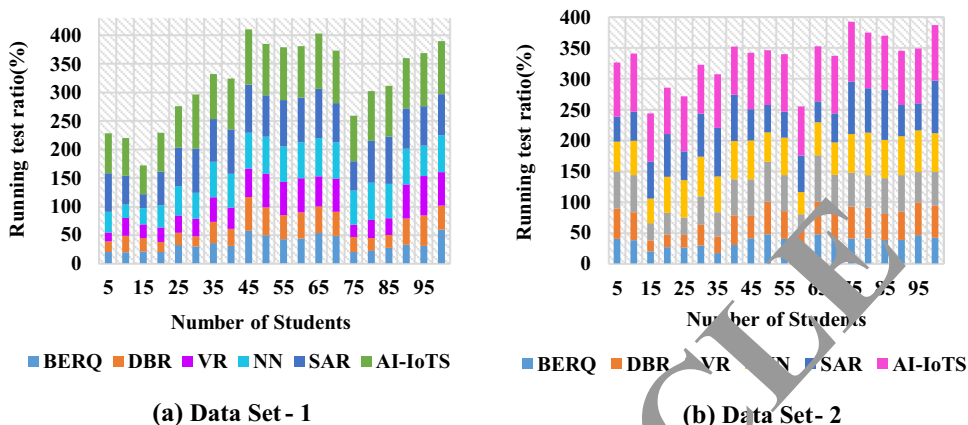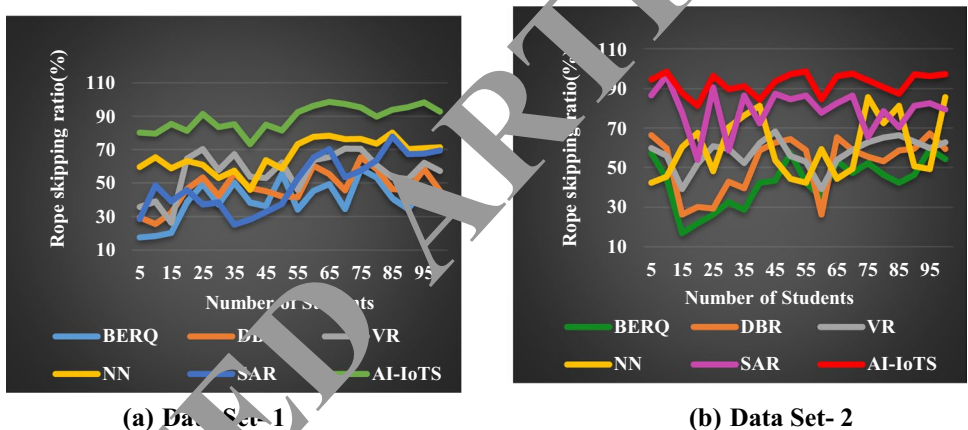
**Fig. 9** Analysis of running test



**(a) Data Set - 1**



**(b) Data Set- 2**

**Fig. 10** Determination of rope skipping
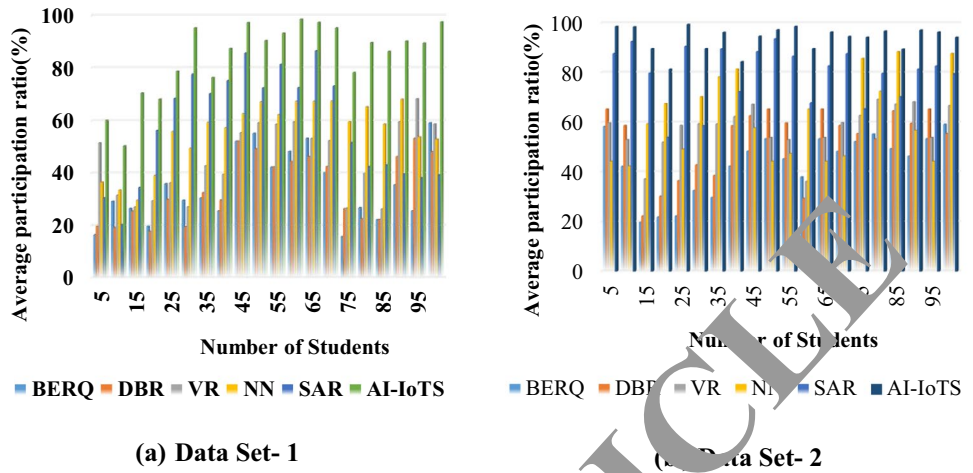


**(a) Data Set - 1**



**(b) Data Set- 2**

(v)  Determination of physical fitness

In Fig. 13, determination of physical fitness mentioned that, Really can students have time to work develop their physical fitness, and they will have an immense effect on other aspects of their life. The students continue to follow the same patterns of physical exercise they build over their college year. The first and clearest benefit of the fitness are that one is less likely to add weight. Many students worry about weight gain due to stress and unhealthy diets at school. The exercise will increase the circulation of the student's blood and influence their brain's oxygen amount. The physical fitness of AI-IoT has 98.7% for dataset-1 and 97.7% for dataset-2. Further the energy rate would be 99.5% for dataset-1 and 98.5% for dataset-2. Through several metrics has been taken for analysis. The metrics as mentioned earlier are the primary metric used in the experimental analysis.
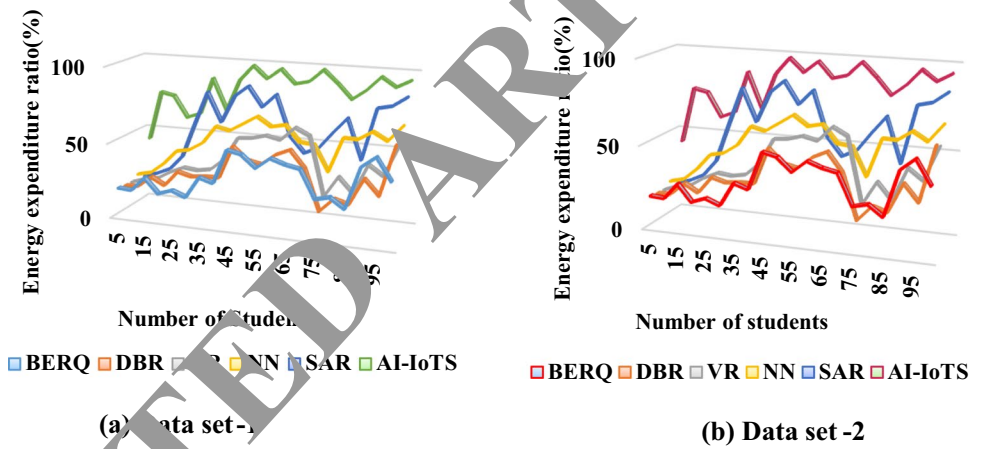
## 5 Conclusion of IoT and Human–Computer Interaction of Physical Education

Considering large-scale sporting knowledge and diverse data forms in professional sports, sport scholars aim to gather useful information and synthesize the rules using new technologies. This report will analyse the IoT Data to direct physical training and scientific and tactical study. The key findings have been that, in combination with the hierarchical management model, math statistics, big data analysis, statistical algorithms and other new information systems were mixed with a computerized data basket of professional sporting techniques. The sport has been taken as an example based on the BPCNN. Data exchange methods have been used to easily define and collect useful information from vast data on sports competition. Data to obtain useful knowledge from IoT can allow the coaches to perform their physical learning and preparation difficulty and help them build strengths and prevent deficiencies, strengthening competitive abilities and strategies.
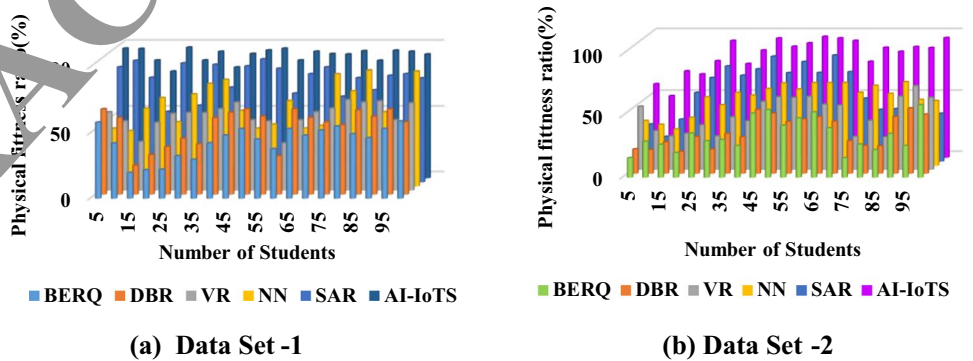
**Fig. 11** Analysis of participation ratio



**(a) Data Set- 1**

**(b) Data Set- 2**

**Fig. 12** Analysis of energy expenditure



**(a) Data set -1**

**(b) Data set -2**

**Fig. 13** Determination of physical fitness



**(a)  Data Set -1**

**(b) Data Set -2**

## References

1. Dong, W.; Yu, J.: Explore an evolution of physical education based on virtual reality lab for traditional ethnic minorities' sports.

In: International Conference on Human-Computer Interaction, pp. 394–401. Springer, Cham (2020)

2. Manogaran, G.; Shakeel, P.M.; Fouad, H.; Nam, Y.; Baskar, S.; Chilamkurti, N.; Sundarasekar, R.: Wearable IoT smart-log patch: an edge computing-based Bayesian deep learning network system for multi access physical monitoring system. Sensors **19**(13), 3030 (2019)

3. Abdel-Basset, M.; Manogaran, G.; Gamal, A.; Chang, V.: A novel intelligent medical decision support model based on soft computing and IoT. IEEE Internet Things J. **7**(5), 4160–4170 (2019)

4. Li, Y.: Visual education of music course for college students based on human-computer interaction. Int. J. Emerg. Technol. Learn. (iJET) **15**(2), 175–186 (2020)

5. Bera, B.; Saha, S.; Das, A.K.; Kumar, N.; Lorenz, P.; Alazab, M.: Blockchain-envisioned secure data delivery and collection scheme for 5G-based IoT-enabled internet of drones environment. IEEE Trans. Veh. Technol. **69**(8), 9097–9111 (2020)

6. Huifeng, W.; Kadry, S.N.; Raj, E.D.: Continuous health monitoring of sports person using IoT devices based wearable technology. Comput. Commun. **160**, 588–595 (2020)

7. Dong, P., et al.: Simulation of physical education teaching based on FPGA and wearable VR equipment. Microprocessors Microsyst. **81**, 103773 (2021)

8. Zhang, Y.; Li, S.; Kadry, S.; Liao, B.: Recurrent neural network for kinematic control of redundant manipulators with periodic input disturbance and physical constraints. IEEE Trans. Cybern. **49**(12), 4194–4205 (2018)

9. Zhou, H.; Montenegro-Marin, C.E.; Hsu, C.H.: Wearable IoT based cloud assisted framework for swimming persons in health monitoring system. Current Psychol. 1–10 (2020)

10. Leilei, W., et al.: Physical education image analysis based on virtual crowd simulation and FPGA. Microprocessors Microsyst. **79**, 103319 (2020)

11. Al-Turjman, F.: Energy-aware data delivery framework for safety-oriented mobile IoT. IEEE Sens. J. **18**(1), 470–478 (2017)

12. Sheron, P.F.; Sridhar, K.P.; Baskar, S.; Shakeel, P.M.: Projection-dependent input processing for 3D object recognition in human robot interaction systems. Image Vis. Comput. **106**, 104089 (2021)

13. Zhang, Z., et al.: Analysis on the Construction of personalized physical education teaching system based on a cloud computing platform. Wirel. Commun. Mob. Comput. **2020**, 2020 (2020)

14. Shakeel, P.M.; Baskar, S.: Automatic human emotion classification in web document using fuzzy inference system (FIS): human emotion classification. Int. J. Technol. Hum. Interact. (IJTHI) **16**(1), 94–104 (2020)

15. Gandhi, U.D.; Kumar, P.M.; Varatharajan, R.; Manogaran, G.; Sundarasekar, R.; Kadu, S.: HIoTPOT: surveillance on IoT devices against recent threats. Wirel. Pers. Commun. **103**(2), 1179–1194 (2018)

16. Feng, C.: Research on the application of computer virtual reality technology in college physical education teaching. In: Journal of Physics: Conference Series, Vol. 1648, No. 2, p. 022035. IOP Publishing (2020)

17. Niu, X.; Fan, T.; Wang, B.; Li, Z.; Shankar, A.; Manickam, A.: Big Data analytics and IoT in Operation safety management in under Water Management. Comput. Commun. **154**, 188–196 (2020)

18. Rizzo, L., et al.: Self-reported data for mental workload modelling in human-computer interaction and third-level education. Data Brief **30**, 105433 (2020)

19. Gaona-García, P.; Mendoza, D.; Vargas, F.; Montenegro-Marin, C.: Evaluation of a medical alert communication infrastructure based on fuzzy logic and IoT devices. Adv. Sci. Lett. **25**(1), 21–24 (2019)

20. Ma, Y. et al.: Designing heart rate feedback for playful and social physical education. In: Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society, pp. 1–4 (2020)

21. Ogudo, K.A.; Muwawa Jean Nestor, D.; Ibrahim Khalaf, O.; DaeiKasmaei, H.: A device performance and data analytics concept for smartphones' IoT services and machine-type communication in cellular networks. Symmetry **11**(4), 593 (2019)

22. Niu, X. et al.: Financial shared course design based on human-computer interaction. In: International Conference on Human-Computer Interaction, pp. 493–505. Springer, Cham (2020)

23. Jurewicz, K.A. et al: A longitudinal study investigating the effects of workload and exposure of 3D gestural human computer interaction. In: Proceedings of the Human Factors and Ergonomics Society Annual Meeting, Vol. 64, No. 1, pp. 390–394. Sage CA: Los Angeles, CA: SAGE Publications (2020)

24. Jie, P. et al.: Online evaluation system of students' daily emotional intervention effect based on human computer interaction platform. In: 2020 IEEE International Conference on Industrial Application of Artificial Intelligence (IAAI), pp. 339–344. IEEE (2020)

25. Azimzade, M. et al.: Employing eye tracking in quantifying and qualifying visual attention of web site viewers (physical education faculty). J. Adv. Sport Technol. **4**(1), 9–19 (2020)

26. Gong, C., et al.: A novel emotion control system for embedded human-computer interaction in green iot. IEEE Access. **2019**(7), 18.1–18.5156 (2019)

27. Cheng, Y.W., et al.: Designing an authoring system of robots and IoT-based toys for EFL teaching and learning. Comput. Assist. Lang. Learn. **2020**, 1–29 (2020)

28. Ding, Y., et al.: Application of Internet of Things and virtual reality technology in college physical education. IEEE Access. **2020**(8), 96065–96074 (2020)

29. Yangsheng, Z.: An AI based design of student performance prediction and evaluation system in college physical education. J. Intell. Fuzzy Syst. 1–9

30. Li, S., et al.: Research on 3D international river visualization simulation based on human-computer interaction. Wirel. Commun. Mob. Comput. **2020**, 2020 (2020)

31. Nguyen, D.S. et al.: Hacking user in human-computer interaction design (HCI). In: 2020 3rd International Conference on Information and Computer Technologies (ICICT), pp. 230–234. IEEE (2020)

32. Camacho, V.L. et al.: WIoTED: an IoT-based portable platform to support the learning process using wearable devices

33. Al-Emran, M. et al.: A survey of internet of things (IoT) in education: opportunities and challenges. Toward social internet of things (SIoT): enabling technologies, architectures and applications 197–209 (2020)

34. Ding, P.: Analysis of artificial intelligence (AI) application in sports. In: Journal of Physics: Conference Series, Vol. 1302, No. 3, p. 032044. IOP Publishing (2019)

35. Rapp, A.: In search for design elements: a new perspective for employing ethnography in human-computer interaction design research. Int. J. Hum.-Comput. Interact. **2020**, 1–20 (2020)

36. Ren, F.: A review on human-computer interaction and intelligent robots. Int. J. Inf. Technol. Decis. Mak. **9**(01), 5–47 (2020)

37. Pan, C.: Design of sports course management system based on Internet of Things and FPGA system. Microprocessors Microsyst. **80**, 103357 (2021)

38. https://www.kaggle.com/harti28/independence-and-interdependence-in-sports

39. https://www.kaggle.com/mathurinache/nbaalltimescoringleaders