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PHYSICAL EDUCATION TEACHING QUALITY EVALUATION METHOD USING MOBILE EDGE COMPUTING IN THE ONLINE AND OFFLINE ENVIRONMENT

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Abstract. The development of different technology has impacted the different stages of human life. Additionally, with the implication of computing technology sports and physical education can be improved. The use of mobile edge technology aids in gathering precise data related to physical education. Therefore, a specific improvement is possible. This following analysis has looked into the factor of mobile edge computing that aids in the evolution of physical education teaching. Moreover, the study has focused on developing an appropriate path for the integration of MEC into PE education. By utilising Mobile Edge Computing (MEC) technologies in both online and off-line learning contexts, this study offers a thorough way for assessing the quality of sports teaching. The suggested approach integrates multiple characteristics and performance measures to evaluate the efficacy of physical education instruction and participation, taking into consideration the changing educational landscape.

Key words: Mobile edge technology, Physical education, issues in implementing MEC for PE

1. Introduction. The development of physical education (PE) teaching has a vast number of factors. For instance, there are physical as well as mental benefits of quality PE training [4]. Therefore, the following empirical analysis has looked into the factor of physical education teaching quality evaluation method using mobile edge computing in the online and offline environment [19]. Furthermore, through a systematic analysis all the possible factors of the same are discussed and the results are developed based on the analysis of secondary information. Therefore, a detailed analysis is presented in the following study.

Physical education plays a fundamental role in promoting physical health and well-being. It helps individuals develop fitness, strength, and endurance, reducing the risk of health issues such as obesity, heart disease, and diabetes [3]. It provides a platform for students to acquire and refine a wide range of motor skills, from basic movements to more complex sports-specific techniques. These skills contribute to overall physical competence. Physical education instills the importance of regular physical activity, encouraging students to adopt and maintain a healthy lifestyle throughout their lives. It fosters habits of exercise and fitness. Regular physical activity is associated with improved mental health [5]. Physical education can reduce stress, anxiety, and depression while enhancing mood and overall psychological well-being. Physical education fosters social interaction and teamwork. Participation in sports and group activities helps students develop essential social skills, such as communication, cooperation, and sportsmanship. It teaches discipline, responsibility, and time management. Students learn the importance of punctuality, preparation, and adhering to rules, which are valuable life skills [22].

The research offers a comprehensive approach to assess the quality of sports teaching. By integrating multiple characteristics and performance measures, it provides a robust framework for evaluating the effectiveness of physical education instruction and participation. This contribution is valuable for ensuring that the evolving educational landscape is well-catered to.

This research contributes as follows,

1. The study recognizes the impact of technological advancements on various aspects of human life and extends this impact to sports and physical education.
2. The research identifies the utility of MEC technology in gathering precise data related to physical education. This contribution underscores the significance of data-driven insights in enhancing the teaching and learning experiences in sports and physical education.

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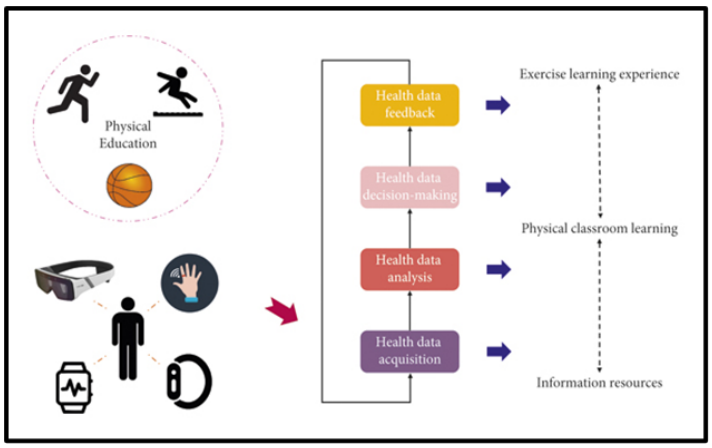

Fig. 1.1: Framework for technology-based PE education

2. Objectives. In order to develop the analysis in a coherent manner following objectives were followed:

1. To discuss the possible factors related to the development of Physical education using mobile edge computing
2. To look into different technology that aids in the development process of Physical education teaching
3. To analyse possible issues in the implication of mobile edge technology in the development process of Physical education teaching
4. To discuss the possible solution for the identified problems

3. Methodology. The methodology of the following analysis deals with different elements and strata of the empirical analysis. Moreover, all the techniques used in the process are depended on the methodology of the study [5]. For the comprehension of factors and issues related to physical education, all the possible factors are analysed through the collection of secondary information. Secondary data aid in the development of research which is ethically sound and delta oriented [22]. Moreover, the process of developing a reliable result is supported by the use of qualitative analysis. Therefore, for the holistic development of the study, a secondary qualitative method was employed.

3.1. Elements related to the evolution of PE teaching using mobile edge computing . At the time of analysing past literature related to computing technology for PE education, it was observed that there are certain factors that directly or indirectly impact the implication. Following are some of the factors that are related to the implication of computing technology for the evolution of PE teaching:

Collection and processing of real-time information. MEC enables real-time data collection and analysis of the same [23]. Therefore, enabling the gathering and analysis of movement data from students during workouts aid to contemplate the issues in the training.

Moreover, such information can be utilized to deliver individualized feedback, monitor development, and instantly change the complexity of tasks [14] Additionally, classified training programs can be formulated with the help of such specified information.

Interactive session for teaching PE. MEC is a whole system that has interactive elements such as augmented reality (AR) and virtual reality (VR) experiences. In addition, with the implication of MCA for PE education having a realistic experience is possible [16]. Hence, by generating realistic virtual settings in which students may partake in a variety of physical activities, these technologies might increase students' motivation and engagement.

The effect of the interactive session between the PE teacher and the students is undeniable for the physical and mental growth of the students. With the help of proper integration and communication, the issues and problems of the students can be determined properly. The issues for the lack of understanding of the students can be find by integrating with the students. The use of the mobile computing programming and online sources

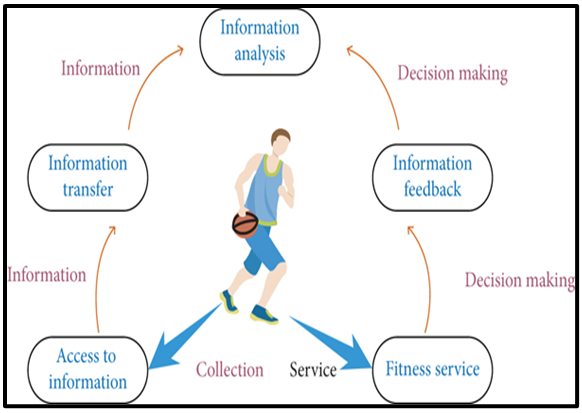

Fig. 3.1: Process of data collection and decision making for PE

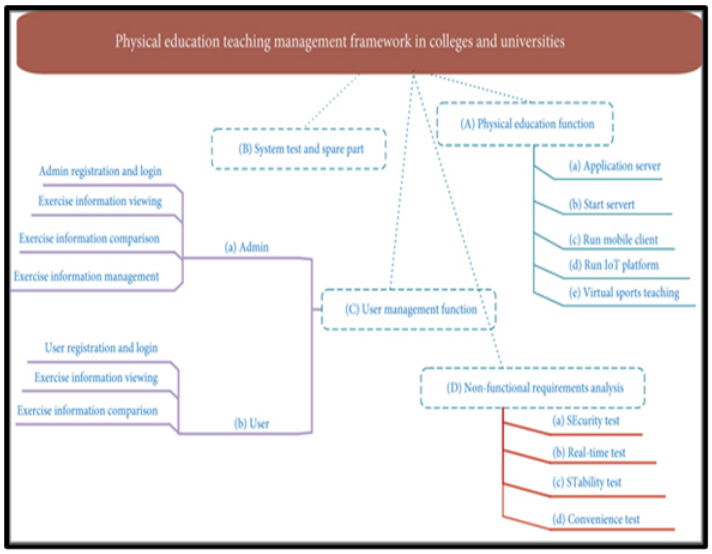

Fig. 3.2: Framework for implementing MCE technology in universities and colleges

help to determine the personal issues of the students [25]. Giving the examples using the virtual tools attract the students to see the examples and sometimes the examples help the students to come out from the mental disorder. The use of the online system in the educational department increases the level of attraction of the students and this effects on the willingness of the students. Therefore, the application of the online and offline strategies are helpful for the growth and development of the students.

Appropriate resource allocation. During the analysis of the past literature, it was noted that process resource allocation is a major factor that influences the MEC implication for PE. Moreover, it was noted that appropriate

Teachers' knowledge and understanding. It was noted that the technological understanding of teachers or coaches is essential for the effective implication of MEC technology [20]. Moreover, making decisions based on the information collected from the MEC technology is an important part of the evolution of teaching. Hence, training of the teachers in relation to technology is essential.

Data security. During the past data analysis it was noted that the data is an essential aspect of the evolution and implication of MEC technology [2]. Moreover, the data breach can damage the implication of the evolution of teaching. Therefore, securing the information is essential for such instances.

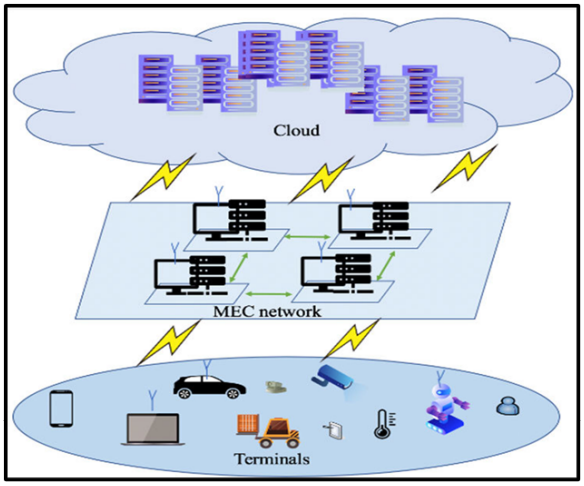

Fig. 3.3: Architecture of MEC-based IoT technology

3.2. The real-time implication of MEC in physical education. The implementation of the MEC in the section of the physical education helps the students for their better improvement and grow. The development of the physical growth of the students also includes the growth of the physical, mental and emotional. One of the most vital and important factors of the physical department is the maintenance of the discipline of the students. Discipline is the most vital and important factor for the growth and development in the life of every individual [19]. The practice of uncontrolled behavior becomes one of the effected on the future of the students. Therefore, the controlling of uncontrolled behavior can be done by the application of the physical training and discipline of the students.

The concept of physical movements is affected by the exploration of the awareness of the body and increases the relationship among the different parts of the body. The use of the mobile device and the internet system in the physical education system helps to increase awareness among the students [16]. The increment of awareness about physical movement is a helpful and effective process for the future growth of the students.

The figure 3.3 of the empirical analysis shows a detailed working process of MEC technology. All of the components of the technology can be seen in action in the above illustration. MEC technology works with integration with IoT devices in order to work in an appropriate manner [6]. Moreover, the network can be divided into three layers that are cloud storage, MEC networks, and terminals. The terminal works as a mediator station and provides actionable data in the terminals where actions are taken [19]. In addition, the server of an MCE technology acts as a storage for the data. Moreover, the server stores information thus accurate historical data aids in the comparison of information.

Moreover, the process of simulation data indicated the accuracy of the system in order to improve training for PE education [13]. Therefore, it can be contemplated that with the implication of MEC technology improvement in the development process is possible. Therefore, developing an accurate system in online as well as offline mode is possible. Moreover, the process aids to determine the vulnerability of an athlete and points out the gaps for the player.

3.3. Issues related to the implication of MEC for the evolution of PE training. Through the analysis of past information, it was noted that there are certain issues related to the implication of MEC for PE education. Such issues hinder the development of PE training and resource wastage is common in such situations [12]. Following is a coherent discussion of the issues related to the implication of MEC for PE education

Financial resources and accessibility. One of the major issues that can hinder the implication of MEC for PE education is found to be financial resources [25]. The development of MEC infrastructure requires different elements which are expensive and expensive. Lack of funding makes it difficult for institutions or schools to

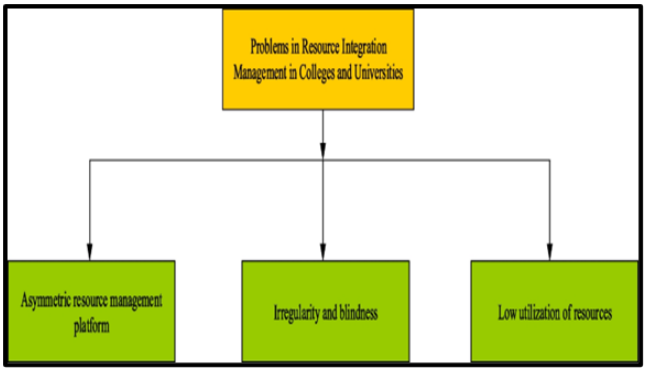

Fig. 3.4: Problems of resource allocation for MEC-based PE education

purchase the required tools and technology, which might result in an uneven distribution of MEC-enhanced PE activities [1].

Lack of adequate knowledge of human resources. To utilize MEC-based machines and platforms successfully, both teachers and students need to get training [11]. Moreover, a basic meaning for handling systems and comprehending information is essential for human resources. Thus, the lack of training can hamper the appropriate use of such technology [18]. In addition, the influence on PE instruction can be limited by a lack of technical skills.

Infrastructure development. The network infrastructure that MEC depends required to be strong and dependable [7]. Network coverage issues in some areas might result in differences in who has access to MEC-based PE instruction. For a flawless experience, it is crucial to have good connectivity [21]. Hence, it was noted that infrastructure is the basic issue that needs to be improved for an effective evolution of the PE system.

The development of the infrastructure of the education institute and the schools helps the students in their future growth. Developing the infrastructure of the educational institute helps the students to understand the usefulness of the learning capabilities and activities. The recruitment of the skilled and experience PE instructors in the educational department helps the students to grow the physical skilled. For the physical improvement of the students, the implementation of the modern and innovative tools is very much important for the students of the physical department [22]. Thus, the value and effect of the improvement of the infrastructure of the educational sectors is helpful for the growth and development of the students.

Real-time information. One of the major benefits of MEC technology is that it provides a real-time perspective for PE education [6]. In addition, real-time information aids to analyse gaps and adapt to the situation based on real-time data. Therefore, it can be contemplated that real-time information provided by the MEC technology aid in the evolution of PE education teaching.

4. Results. In order to understand the impact of MEC technological enhancement on the evolution of PE teaching a secondary analysis was conducted. Moreover, through the systematic analysis of past information, it was contemplated that there is a high chance of improvement in PE education [24]. It was noticed that there are certain elements in the possess of implementing MEC technology for PE education. For instance, the collection and processing of real-time information is a major factor in the evolution. Similarly, it was noted that training and understanding of the teachers influence the decision-making process for PE education [15].

As a result, it can be said that the use of the HBCR to assist the wearable sensors has a positive effect on the increment of the quality of teaching. Application of the aerobic training is the most beneficial and helpful for the educational growth of the students of physical education. The comparison between the CRF and CBCR has no significance difference and the limitation of the symptom helps to test the observe group [9]. From the whole study, this can be said that the outcomes of the use if CPET for the students of the physical education made a great difference between the other students. The unusual participation of the students in the aerobic training decreases the specification and intensity of the students. For analysing the information related to the

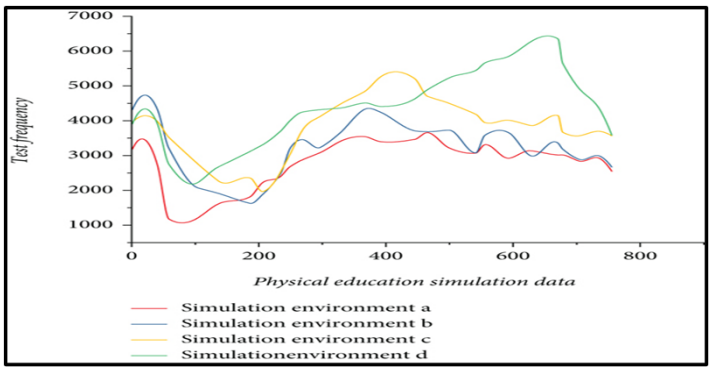

Fig. 4.1: Simulation data of different environments

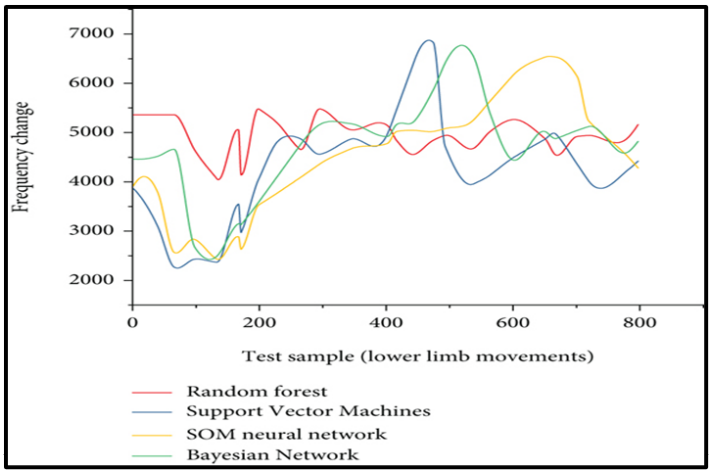

Fig. 4.2: Simulation data of lower limb

implication of MEC for PE a real-time analysis was conducted. For the study, it was noted that their different environments have different implications for the MEC system for PE education [17]. At the moment, migration learning is required to make edge computing end servers cooperate [9].

The application of the mobile edge computing and the online system increase the capacity of the understanding of the students. For the students of the physical education, the proper demonstration of the physical activity and the outcomes of the activity helps to increase the attention of the students. With the help of the use of the mobile edge and the internet process, the education authority can be able to demonstrate the effect and impact of the practice of the activity of the physical department of education [1]. The use of the offline training physical students is the most effective to improve the quality of the teaching learning process. The self-learning is the most effective and valuable for the growth and development of the students who studied the physical education.

The figure 4.1 depicts the simulation information related to physical education. For the study, 4 different environments subjugated the overall test. Moreover, the implication of simulation data shows that the majority of the system's functionalities can satisfy the system requirements [7].

The figure 4.2 is related to the low limb movement frequency changes. It can be seen that the development of the system's fundamental purpose can handle the administration of physical education [7]. Additionally, it can be contemplated that a lot of sports event publicity can be immediately published to the system with the aid of such a method. Therefore, the value of the sports education management system is progressively represented

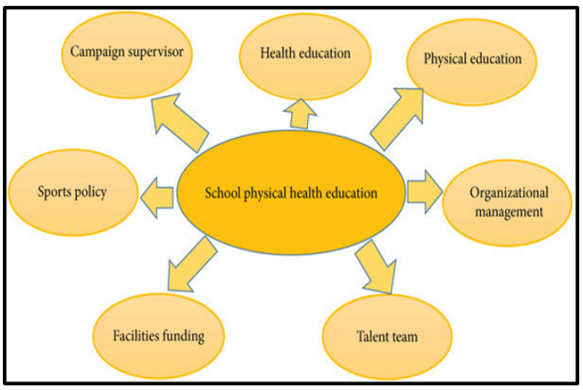

Fig. 4.3: Different dimensions of PE in schools

in terms of sports event registration, score entry, and associated sports event publicity [10]. Moreover, with the implication of complex algorithms, a better perspective can be achieved for the test.

The simulation of the use of the offline environment in the physical education institute effect on the future development of the children. Sometimes the teachers and mentors of the educational institute takes the students in a educational excursion which boost the experience of the students and improve the level of understanding of the students. The application of the super vector machine in the educational department is the one of the most helpful and effective process and strategies for the betterment of the students [17]. The neural network is the most beneficial for the implementation of the innovative technology in the physical department of the physical educational institute. Thus, in the present days, the use of the online and offline computing practice helps to increase the skilled of the students.

The figure 4.3 provides a detailed illustration related to PE in school. It can be seen that the impact of physical education can be traced to different aspects of school education. Furthermore, through the secondary analysis of environmental simulation, it was observed that the environment has a major impact on the implication process [8]. Moreover, the efficiency of the evolution process for the teaching of PE education has a direct relation with the environment. It was analysed that there are certain aspects that create a hindrance to the evolution process. Moreover, such hindrances have an influence on online as well as offline mediums [9]. For instance, understanding the staff member has a major influence on the implication process. Additionally, the expensive nature of the system influences the process of implication

5. Conclusion. Thus, the above analysis has coherently discussed information related to the use of MEC technology in order to develop the PE educational strategy. Moreover, the process has highlighted various factors related to the technology and its implication. It was established that various environments have various impacts on the implication of MEC. Furthermore, it was established that the factors such as cost and efficiency of human resources have a direct impact on the implication. Therefore, with effective use of the system it was noted that certain evolution for the PE training is possible. Additionally, both online and offline modes of training are impacted by such factors. The study emphasizes the potential positive impact of MEC technology on the evolution of PE education. It highlights the role of real-time data collection and processing as a crucial factor in this evolution. This implies that the use of MEC can enhance the quality and effectiveness of teaching in the field of physical education. The study points out the effectiveness of utilizing Heart Rate-Based Cognitive Radio (HBCR) in conjunction with wearable sensors for improving the quality of teaching. In particular, the application of aerobic training is highlighted as a valuable educational tool. Real-time analysis is identified as a critical tool for understanding the implications of MEC for PE education. The study recognizes that different environments can have varying effects on the MEC system's performance, indicating the need for adaptability and customization.

REFERENCES

[1] M. Aazam, S. Zeadally, and E. F. Flushing, *Task offloading in edge computing for machine learning-based smart healthcare*, Computer Networks, 191 (2021), p. 108019.

[2] M. G. R. Alam, M. M. Hassan, M. Z. Uddin, A. Almogren, and G. Fortino, *Autonomic computation offloading in mobile edge for iot applications*, Future Generation Computer Systems, 90 (2019), pp. 149–157.

[3] K. Bajaj, B. Sharma, and R. Singh, *Implementation analysis of iot-based offloading frameworks on cloud/edge computing for sensor generated big data*, Complex & Intelligent Systems, 8 (2022), pp. 3641–3658.

[4] L. Bao and P. Yu, *Evaluation method of online and offline hybrid teaching quality of physical education based on mobile edge computing*, Mobile Networks and Applications, 26 (2021), pp. 2188–2198.

[5] A. Bourechak, O. Zedadra, M. N. Kouahla, A. Guerrieri, H. Seridi, and G. Fortino, *At the confluence of artificial intelligence and edge computing in iot-based applications: A review and new perspectives*, Sensors, 23 (2023), p. 1639.

[6] Y. Chen, Z. Liu, Y. Zhang, Y. Wu, X. Chen, and L. Zhao, *Deep reinforcement learning-based dynamic resource management for mobile edge computing in industrial internet of things*, IEEE Transactions on Industrial Informatics, 17 (2020), pp. 4925–4934.

[7] Q. Cui, Z. Gong, W. Ni, Y. Hou, X. Chen, X. Tao, and P. Zhang, *Stochastic online learning for mobile edge computing: Learning from changes*, IEEE Communications Magazine, 57 (2019), pp. 63–69.

[8] X. Deng, Z. Sun, D. Li, J. Luo, and S. Wan, *User-centric computation offloading for edge computing*, IEEE Internet of Things Journal, 8 (2021), pp. 12559–12568.

[9] A. Dev et al., *Iot and fog computing based prediction and monitoring system for stroke disease*, Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12 (2021), pp. 3211–3223.

[10] B. Fan, Y. Wu, Z. He, Y. Chen, T. Q. Quek, and C.-Z. Xu, *Digital twin empowered mobile edge computing for intelligent vehicular lane-changing*, IEEE Network, 35 (2021), pp. 194–201.

[11] S. Iftikhar, S. S. Gill, C. Song, M. Xu, M. S. Aslanpour, A. N. Toosi, J. Du, H. Wu, S. Ghosh, D. Chowdhury, et al., *Ai-based fog and edge computing: A systematic review, taxonomy and future directions*, Internet of Things, (2022), p. 100674.

[12] F. Lin, Y. Zhou, I. You, J. Lin, X. An, and X. Lü, *Content recommendation algorithm for intelligent navigator in fog computing based iot environment*, IEEE Access, 7 (2019), pp. 53677–53686.

[13] T. Long, Y. Ma, Y. Xia, X. Xiao, Q. Peng, and J. Zhao, *A mobility-aware and fault-tolerant service offloading method in mobile edge computing*, in 2022 IEEE International Conference on Web Services (ICWS), IEEE, 2022, pp. 67–72.

[14] Y. Nan, W. Li, W. Bao, F. C. Delicato, P. F. Pires, Y. Dou, and A. Y. Zomaya, *Adaptive energy-aware computation offloading for cloud of things systems*, IEEE access, 5 (2017), pp. 23947–23957.

[15] A. Shahidinejad, F. Farahbakhsh, M. Ghobaei-Arani, M. H. Malik, and T. Anwar, *Context-aware multi-user offloading in mobile edge computing: a federated learning-based approach*, Journal of Grid Computing, 19 (2021), pp. 1–23.

[16] J. Sheng, J. Hu, X. Teng, B. Wang, and X. Pan, *Computation offloading strategy in mobile edge computing*, Information, 10 (2019), p. 191.

[17] M. S. Sofla, M. H. Kashani, E. Mahdipour, and R. F. Mirzaee, *Towards effective offloading mechanisms in fog computing*, Multimedia Tools and Applications, 81 (2022), p. 1997.

[18] O. Tao, X. Chen, Z. Zhou, L. Li, and X. Tan, *Adaptive user-managed service placement for mobile edge computing via contextual multi-armed bandit learning*, IEEE Transactions on Mobile Computing, (2021).

[19] L. Wang and Z. Xu, *An english learning system based on mobile edge computing constructs a wireless distance teaching environment*, Mobile Information Systems, 2021 (2021), pp. 1–9.

[20] T. Wang, Y. Liang, Y. Zhang, X. Zheng, M. Arif, J. Wang, and Q. Jin, *An intelligent dynamic offloading from cloud to edge for smart iot systems with big data*, IEEE Transactions on Network Science and Engineering, 7 (2020), pp. 2598–2607.

[21] Z. Wang, T. Lv, and Z. Chang, *Computation offloading and resource allocation based on distributed deep learning and software defined mobile edge computing*, Computer Networks, 205 (2022), p. 108732.

[22] X. Xu, Q. Liu, Y. Luo, K. Peng, X. Zhang, S. Meng, and L. Qi, *A computation offloading method over big data for iot-enabled cloud-edge computing*, Future Generation Computer Systems, 95 (2019), pp. 522–533.

[23] A. Yousafzai, I. Yaqoob, M. Imran, A. Gani, and R. M. Noor, *Process migration-based computational offloading framework for iot-supported mobile edge/cloud computing*, IEEE internet of things journal, 7 (2019), pp. 4171–4182.

[24] S. K. u. Zaman, A. I. Jehangiri, T. Maqsood, N. u. Haq, A. I. Umar, J. Shuja, Z. Ahmad, I. B. Dhaou, and M. F. Alsharekh, *Limpo: Lightweight mobility prediction and offloading framework using machine learning for mobile edge computing*, Cluster Computing, 26 (2023), pp. 99–117.

[25] L. Zhang, P. Wei, Y. Zhang, N. Wang, et al., *Artificial intelligence and edge computing technology promote the design and optimization of flipped classroom teaching models for higher vocational, ideological, and political courses*, Mobile Information Systems, 2022 (2022).

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