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Exploration on human resource management and prediction model of data-driven information security in Internet of Things

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ABSTRACT

The advent of the Internet of Things (IoT) has accelerated the pace of economic development across all sectors. However, it has also brought significant challenges to traditional human resource management, revealing an increasing number of problems and making it unable to meet the needs of contemporary enterprise management. The IoT has brought numerous conveniences to human society, but it has also led to security issues in communication networks. To ensure the security of these networks, it is necessary to integrate data-driven technologies to address this issue. In response to the current state of human resource management, this paper proposes the application of IoT technology in enterprise human resource management and combines it with radial basis function neural networks to construct a model for predicting enterprise human resource needs. The model was also experimentally analyzed. The results show that under this algorithm, the average prediction accuracy for the number of employees over five years is 90.2 %, and the average prediction accuracy for sales revenue is 93.9 %. These data indicate that the prediction accuracy of the model under this study's algorithm has significantly improved. This paper also conducted evaluation experiments on a wireless communication network security risk prediction model. The average prediction accuracy of four tests is 91.21 %, indicating that the model has high prediction accuracy. By introducing data-driven technology and IoT applications, this study provides new solutions for human resource management and communication network security, promoting technological innovation in the fields of traditional human resource management and information security management. The research not only improves the accuracy of the prediction models but also provides strong support for decision-making and risk management in related fields, demonstrating the great potential of big data and artificial intelligence technology in the future of enterprise management and security.

1. Introduction

At this stage, there are many problems in the traditional HRM, such as the complicated work of the HRM department, the weak teamwork of the enterprise, and the imperfect employee incentive mechanism, which restrict the overall development of the enterprise. In the new era, the traditional HRM simply cannot meet the new needs of enterprise management, so it needs to change this status quo in line with the development of the times. The arrival of the IoT era has connected the world as a whole, which not only provides many conveniences for human society, but also promotes the economic development of all walks of life. Therefore, this paper proposed to apply IoT technology to enterprise HRM, so as to promote the overall development of enterprise HRM.

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This research leverages IoT technology and radial basis function neural networks to significantly enhance the predictive modeling of enterprise human resource needs, outperforming traditional algorithms in accuracy and efficiency. Our model not only predicts employee numbers with an impressive 90.2 % accuracy (compared to the traditional 83.9 %) but also excels in forecasting sales revenue, achieving a remarkable 93.9 % accuracy against the conventional 85.2 %. These advancements highlight our model's capability to provide more reliable and actionable insights for human resource planning and sales forecasting. Further extending our research's applicability, we delved into the realm of wireless communication network security, achieving prediction accuracies ranging from 90.29 % to 92.85 % in various tests. This high level of precision in security risk prediction underscores the potential of IoT and data-driven approaches in addressing complex challenges in both human resources and information security management. The comprehensive examination and validation of our predictive models across different domains underscore their significant contribution to enhancing strategic decision-making and risk management in an increasingly digital and interconnected business environment.

The uniqueness of this research lies in its innovative application of IoT technology and radial basis function neural networks to address the complexities of human resource management (HRM) and security risk prediction in the IoT era. Unlike previous studies that focused on traditional HRM challenges, such as complex HRM workflows, weak enterprise teamwork, and flawed employee incentive mechanisms, this study proposes a novel approach to transform HRM practices. By integrating IoT into HRM, the research offers a forward-looking solution that aligns with contemporary enterprise management needs, significantly advancing beyond traditional methodologies. The scientific achievements of this work, particularly the high predictive accuracies in employee numbers and sales revenue, as well as the precision in wireless communication network security risk assessments, set it apart from prior publications. These outcomes not only demonstrate the effectiveness of combining IoT with data-driven technologies but also underscore the potential of such integrations to enhance strategic decision-making and risk management in a digitally interconnected business landscape.

2. Related work

In recent years, HRM has aroused widespread concern in the academic community, and scholars have carried out research on it. Boon Corine system outlined many empirical studies on more than 500 HRM systems, and analyzed the development process of HRM systems. He pointed out that the conceptualization and measurement of the system should be organically combined [1]. Troth Ashlea C system elaborated the benefits of work and organizational psychology to HRM research. In order to promote the sustainable development of HRM research, he also advocated other disciplines to conduct multi-level and multi method research [2]. Markoulli Maria Panayiota summarized the field of HRM with the help of scientific atlas, and analyzed a large number of research papers on HRM. To this end, he also proposed a thematic map of human resources management [3]. Yabanci Orhan explored the evolution of HRM, which focused on the application and development of computer technology in HRM and pointed out some new issues [4]. Pak Karen explored the issue of how to extend the work life in HRM activities. The analysis of a large number of articles on HRM found that the provision of work resources has a positive effect on the ability to continue working [5]. Roscoe Samuel pointed out that the implementation of green HRM can effectively improve the environmental performance of enterprises, and analyzed the relationship between green HRM, the promoter of green organizational culture, and enterprise environmental performance [6]. However, these scholars' researches on HRM are not comprehensive enough. Based on the IoT, the researches on HRM can play a better role.

Some scholars have also conducted corresponding research on the IoT and HRM. Strohmeier Stefan explored the future application and consequences of the IoT in HRM by conducting a Delphi experiment with several IoT experts. The results showed that the application of the IoT in HRM is the direction of future development, and explained various possible consequences [7]. Liu Yishu proposed to integrate cloud edge computing into the IoT, and apply it to HRM to build an optimization model for HRM of the IoT. Through testing the model, it was found that the model can effectively reduce the allocation cost and increase the number of allocated human resources [8]. In general, there are not many studies on the IoT and HRM. In order to improve the relevant research on HRM and integrate the IoT, it is necessary to study HRM and prediction models.

In light of COVID-19, the convergence of HRM and IoT technologies takes on new dimensions, with an enhanced focus on remote work, health monitoring, and secure data handling. Studies now also consider the pandemic's impact on workforce management, emphasizing IoT's role in supporting remote employee engagement, health surveillance through wearable technologies, and ensuring data privacy in a more digitally-dependent work environment. This period has accelerated the adoption of IoT solutions in HRM, offering insights into managing workforce challenges during health crises and highlighting the importance of sustainable and inclusive HR practices facilitated by advanced technologies. Exploring the convergence of HRM and IoT technologies, recent studies shed light on the transformative implications and emerging challenges in this domain. Kambur Emine [9] emphasized the transformative potential of IoT in enhancing HRM efficiency through smart data analytics. Sadeeq Mohammed Mohammed [10] focused on privacy and security challenges within IoT-enabled HRM systems, suggesting robust frameworks for data protection. Guan Allen Lim Chong [11] explored IoT's role in facilitating remote work, enhancing employee engagement and productivity through connected environments. Garg Swati [12] provided insights into using IoT for talent acquisition and management, showcasing a model that leverages IoT data to predict recruitment needs. Mejia Cynthia [13] discussed the application of wearable IoT devices in monitoring and improving employee health and wellness programs. Siripongdee Kobchai [14] analyzed the impact of IoT on employee training and development, introducing adaptive learning environments. Sangalang Raven Marie F [15] presented a case study on IoT-driven performance management, illustrating how real-time feedback mechanisms can improve employee performance. Irani Foad [16] explored the integration of IoT with HRM in the context of sustainability, emphasizing how IoT can drive green HRM practices. Sahoo Sushil Kumar [17] highlighted the role of IoT in enhancing workforce diversity and inclusion through accessible technologies. Lastly, Segkouli Sofia [18] reviewed the legal implications of IoT in HRM, focusing on compliance and ethical considerations in the digital workplace. These contributions underline the broad spectrum of opportunities and considerations IoT brings to HRM, from operational efficiencies and enhanced employee engagement to privacy, security, and legal challenges. This expanding body of work demonstrates the rich potential for further research and practical implementation in combining IoT with HRM to address contemporary organizational challenges.

3. Data driven information security and enterprise HRM based on the IoT

Radial Basis Function (RBF) neural networks are a type of artificial neural network that use radial basis functions as activation functions. They are particularly well-suited for function approximation, classification, and pattern recognition tasks. The basic structure of an RBF network consists of three layers: an input layer, a hidden layer with RBF neurons, and an output layer. The uniqueness of RBF networks lies in the hidden layer, where the activation of neurons is determined by the distance between the input vector and a center vector associated with each neuron. The closer the input is to the center, the higher the neuron's output.

In the context of data-driven information security and HRM in IoT environments, RBF neural networks can be applied to predict human resource needs and identify security risks. For HRM, an RBF network can analyze historical data on employee performance, sales revenue, and other relevant metrics to forecast future HR requirements. This allows for more precise planning and resource allocation, enhancing the efficiency of HR processes.

For information security within IoT systems, RBF neural networks can be utilized to model normal behavior patterns of network traffic and device interactions. By learning these patterns, the network can detect anomalies that may indicate security threats, such as unauthorized access or data breaches. This predictive capability enables proactive measures to safeguard sensitive information and ensure the integrity of communication networks.

The application of RBF neural networks in these areas leverages their ability to process complex, nonlinear relationships within large datasets, offering a powerful tool for enhancing both HR management and information security in the rapidly evolving IoT landscape.

3.1. Information communication network security

When carrying out information communication network security management, the first priority is to ensure the security of data information. Therefore, the application of big data technology can not only provide data support for management, but also improve the intelligent level of information communication application system, so that all aspects of the system functions are optimized. At the same time, it also promotes the construction of intelligent management mode of information communication network. The information communication network security processing scheme integrating big data technology is shown in Fig. 1.

3.2. Information security problems in the IoT

From the perspective of application, the IoT can be divided into the perception layer, the network layer, the application layer, and the IoT layer. The model is shown in Fig. 2. The emergence and application of the IoT has opened a convenient door for human beings. However, network information security problems also come one after another, mainly including the following problems.

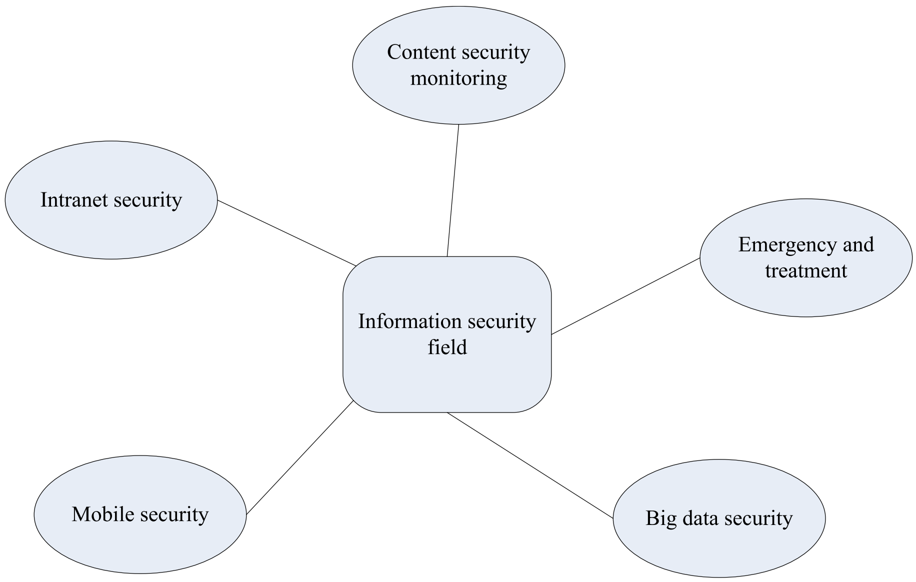

Fig. 1. Information communication network security processing scheme.

(1) Security of sensor body

When the IoT acquires data at the sensing layer, the transmission of information is mainly completed through wireless networks. However, the security of wireless networks in public places is low, and they are easy to be used by criminals to conduct illegal operations on user equipment. In the application of the IoT, many devices are marked by sensor technology and remotely operated by computers. These devices are basically set up in an unattended place, so attackers can easily find these devices and destroy them. What's more, they would crack the sensor communication protocol and conduct illegal operations. The sensor itself has very simple functions and limited energy storage, and lacks the ability of security protection. In addition, the variety of communication networks covered by the IoT is so rich that it is unable to provide a unified security defense system, so the security of the sensor ontology is very low. The hidden danger of RFID (Radio Frequency Identification) system is shown in Fig. 3.

(2) Security of core network

When the IoT is acquiring information, it would generate many nodes that can perceive, acquire and monitor information. At present, the security performance of the Internet is relatively perfect. However, there are many nodes in the IoT. When data in so many nodes are transmitted at the same time, it is easy to cause network congestion.

(3) Security issues in the application of the IoT

The core security problem of the IoT is to effectively determine and deal with problems. The layout and connection of the IoT are carried out in a cross way. During operation, the topology is constantly changing, which easily makes it difficult for the application equipment to control the input and output. In the environment of the IoT, if the viruses spread on the Internet break through the barriers of relevant security protection technologies, they are likely to maliciously tamper with the authorization management of the IoT, thus violating the personal privacy of users and stealing other people's funds.

3.3. Key technologies of data-driven network information security

3.3.1. Data acquisition

In the process of data driven security, the first step is to obtain data, which can be divided into internal data and external data according to the source of data. When acquiring data, because the content of the original data is relatively diverse, it is necessary to filter the data and remove some redundant information to facilitate subsequent operations. After filtering and processing, the operational status of information systems can be mastered in conjunction with correlated information at the point in time, thus achieving the purpose of data-driven network security.

3.3.2. Data persistence

Data persistence achieves the actual needs by analyzing the depth relationship. In the process of data persistence, relational databases are generally used to store data, and the storage is complex. The main reason is the variety of initial data and the large proportion of unstructured data in these data. Therefore, it is necessary to analyze the distributed database in depth, so as to solve the data persistence problem efficiently. When operating the distributed database, if the physical storage mode increases, the cost would rise.

3.4. HRM in the era of IoT

3.4.1. Process of enterprise HRM

The enterprise HRM process is shown in Fig. 4. It is usually based on the enterprise strategy to formulate the human resources strategy and relevant plans, and then analyze the work according to the organizational structure and positions [19]. After that, the staff is recruited and staffed according to the analysis. Next, the performance of employees would be evaluated, and regular training would be provided for employees who fail to meet the performance standards. After performance appraisal, it is the setting of salary system and benefits, and finally the handling of employee relations.

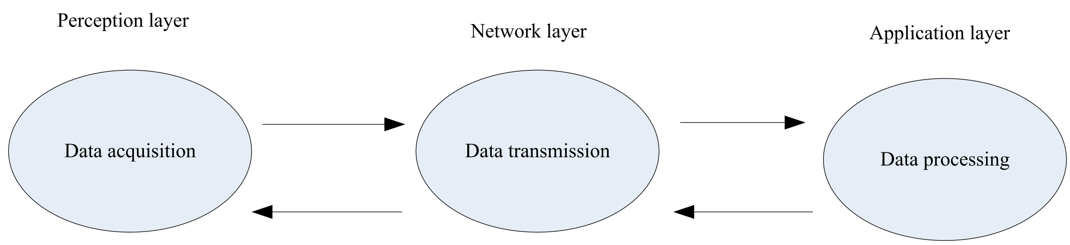

Fig. 2. Hierarchical model of the IoT.

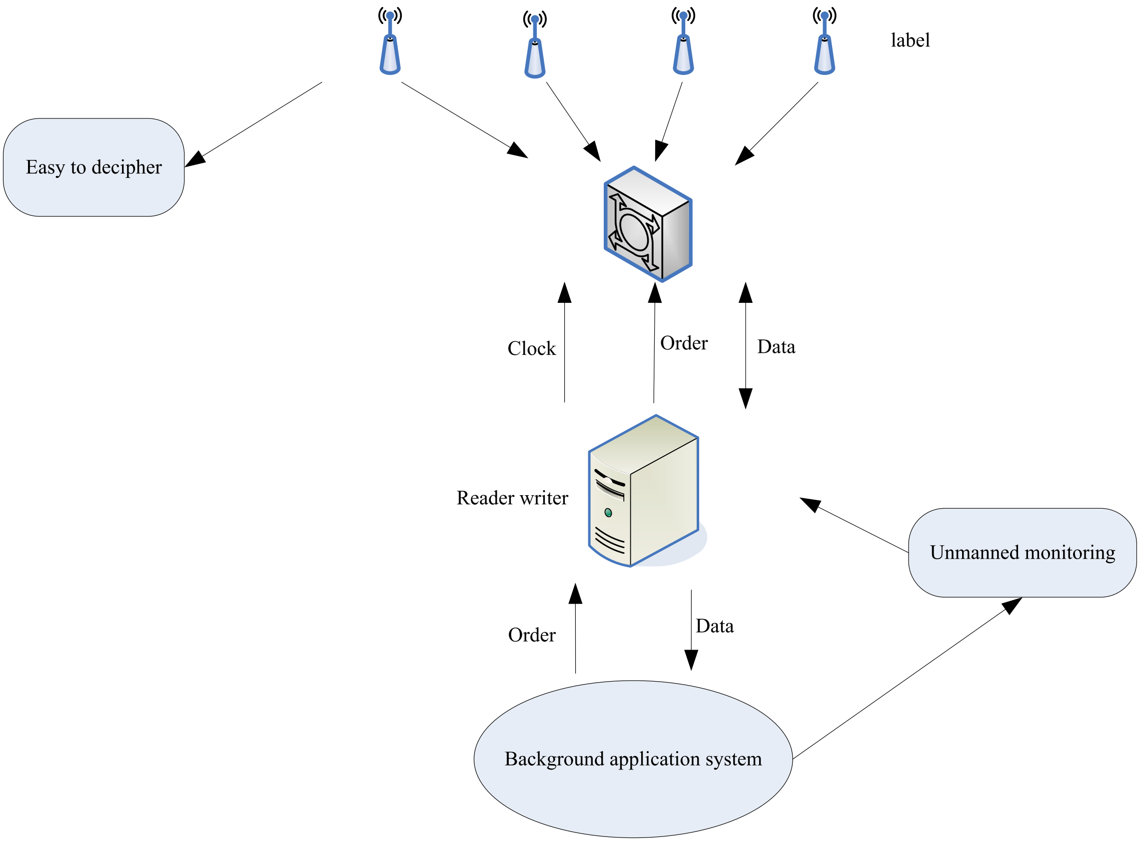

Fig. 3. Potential safety problems of RFID system.

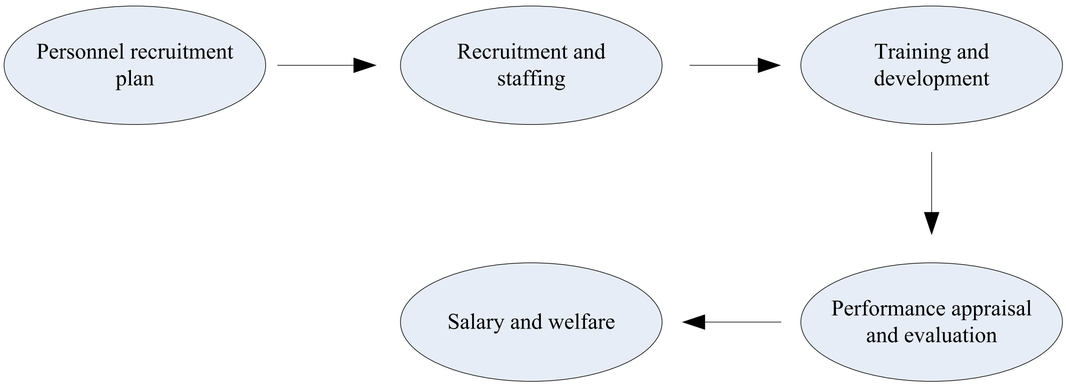

Fig. 4. HRM process.

3.4.2. Current situation of traditional HRM

(1) Emphasis on taking work as the core of the enterprise

In terms of management, leaders emphasize the control of personnel, but lack enterprise care and humanization, so the enthusiasm and work efficiency of employees would be affected to some extent, which seriously violates the people-oriented management concept in modern HRM.

(2) Theory of manpower quantity

Many enterprises now believe that the primary indicator to measure the effectiveness of human resources management is the number of employees with high diplomas [20]. In fact, this is only one of the indicators, and the per capita labor productivity of enterprises is the most important indicator. Less capital investment and more work completed are the goals that HRM has been trying to achieve. The highest level of organizational management is to give full play to the talents of each employee, so as to maximize the value of employees.

3.4.3. Problems in traditional HRM

(1) Poor teamwork

In traditional HRM, although more attention is paid to employees themselves, in the actual management process, there is often a phenomenon that employees are unwilling to cooperate with each other to complete their work [21,22].

(2) Complexity of department work

The workload of the enterprise's human resources management department is quite complex, and it needs to be responsible for employee attendance, salary calculation and payment, personnel recruitment and other work. A lot of work makes the staff of the department spend very limited time on HRM, which is not conducive to the achievement of the strategic objectives of the enterprise.

(3) Lack of employee incentives

In traditional HRM, although the incentive management theory would be applied to daily management, the incentive effect is not ideal [23]. In the final analysis, it is because the incentive method is too monotonous, which basically means material rewards for employees, but does not pay attention to the spiritual needs of employees.

3.4.4. Changes in HRM in the IoT era

(1) Intelligent recruitment

The primary task of enterprise management is external recruitment. The emergence of the IoT provides enterprises with rich talent information resources for external recruitment. The advantage of the IoT is that it has a large amount of information and can provide users with convenient and fast services. According to the relevant needs of each department of the enterprise, personalized recruitment can be conducted on the IoT. Intelligent recruitment with the help of IoT can effectively improve the efficiency of both recruiters and job seekers.

(2) Strengthening of online training

In the traditional way, human resource managers generally conduct training activities for employees in the form of reports, speeches and on-site teaching [24]. However, the training effect of these methods is not ideal, and the IoT can effectively improve this situation. Enterprises should keep pace with the times and carry out training work with the help of the IoT.

(3) Take full advantage of big data

In the era of big data, enterprise human resource managers need to change their inherent way of thinking in a timely manner, and maintain avant-garde ideas and positive attitudes, so as to promote the organic integration of information technology and HRM.

(4) Establishment of new incentive mechanism

If leaders want to make the incentive mechanism play the largest role, they need to understand the essence of incentive, that is, timeliness, clarity, and differences between people. If an enterprise wants to mobilize the enthusiasm of employees by means of incentives, it is necessary to deeply explore the practical incentive elements. In the management process, it is necessary to be good at grasping the essential desires of employees and maximizing their inner potential, so as to achieve a significant increase in productivity.

4. Enterprise human resource demand forecasting model based on radial basis function neural network

4.1. Human resource demand forecast

There are two types of demand forecast indicators for human resources, namely, target indicators and basis indicators. Object indicators are used to set the number of employees, management and professional technicians according to the needs of the enterprise. In the analysis of human resource demand forecasting, a semi quantitative method needs to be established. By analyzing the structure and elements of the forecasting model, this paper proposed an application system of human resource forecasting model. The system is shown in Fig. 5.

4.2. Radial basis function neural network

RBF (Radial Basis Function) neural network is a special feed-forward neural network [25]. The approximation performance of the network is very strong and its construction is simple. Its learning speed and training speed are very fast. The radial basis function neural network is divided into three layers. The input layer is the first layer, which contains many neurons. It inputs training samples, and the formula is as:

$$T = (t_1, t_2, \cdots, t_n) \tag{1}$$

Among them, n groups of input training samples are represented by T.

The invisible layer is the second layer, which is a nonlinear transformation function, and its formula is as:

$$F_j(t) = exp\left(\frac{\|t - r_j\|^2}{2\delta_j^2}\right), j = 1, 2, \cdots, k \tag{2}$$

The training sample is represented by t; the center of the j-th sample is represented by r_j, and the number of neurons in the invisibility layer is represented by k. $F_j(t)$ represents the maximum length distance of the j-th neuron.

The output layer is the third layer. After the nonlinear conversion of the upper layer, the linear change result is obtained. The formula is as:

$$W_a = \sum_{j=1}^{k} Q_j F_j(t) \quad j = 1, 2, \cdots, h \tag{3}$$

4.3. Construction of enterprise human resource demand forecasting model

4.3.1. Formulation of prediction objectives in line with the specific situation of the enterprise

Before building the prediction model of human resource demand, it is necessary to clarify the current situation of human resources. According to the development concept and goal of the enterprise, the post function plan is formulated, and then the prediction target that conforms to the specific situation of the enterprise is formulated. When confirming the objectives, it is also necessary to collect data on the economic development activities of enterprises in recent years and conduct statistical analysis on these data. These data are the basis for determining different prediction objects and important indicators for achieving specific prediction objectives.

4.3.2. Establishment of enterprise human resource demand forecasting model

The training weight value of the radial basis function neural network is required to be combined to build the human resource demand forecasting model. This is done by binary coding, and the weight value of training samples is:

$$Y_{ck} = (c = 1, 2, \cdots, n, k = 1, 2, \cdots, n) \tag{4}$$

Among them, the number of training sample weight groups is represented by c.

The weight of training samples is initialized, and then the parameters of relevant input data are set. The formula is:

$$L = \frac{1}{e}\sum_{r=1}^{x} (A_r - Y_r)^2 \tag{5}$$

The weight value is expressed as Y_r, and the actual input value is expressed as A_r. When $A_r \in (0,1)$, the error value of 3 reaches the minimum. The nonlinear conversion function in Formula (2) is used to define the class of input data, and the distance between data c_j and sample center r_j is expressed as $\|c_j - r_j\|$. If $\|c_j - r_j\| \le F_j$, the distance between c_j and r_j is the shortest; if $\|c_j - r_j\| > F_j$, it is necessary to rebuild a sample center for c_j and allocate new invisible data. The output value is established according to the above process, and the formula is:

$$Y(c) = \frac{\sum_{j=1}^{r} Y_{jr}(\|c_j - r_j\|)}{\sum_{j=1}^{r} r(\|c_j - r_j\|)} \tag{6}$$

Among them, the output value is expressed as $Y(c)$; the weight value is expressed as Y_{jr}, and the data sample value is expressed as c_j.

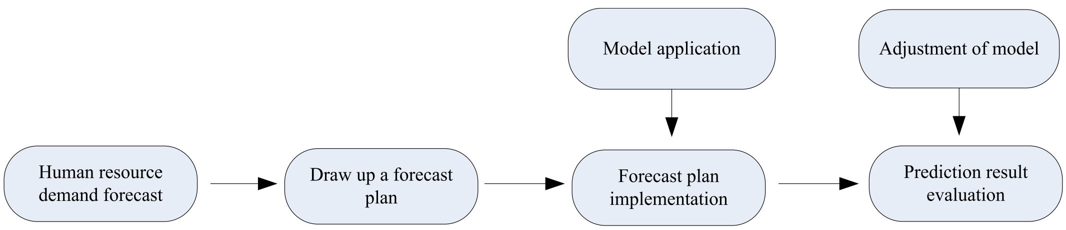

Fig. 5. Application system of human resources forecast model.

In the human resource demand forecasting model, the data associated with the radial basis function neural network can be transformed through numerical functions to generate estimators, and then calculated through algorithms. The formula is:

$$NET = newrb(T, S, GOAL, SPREAD, FK, BX) \tag{7}$$

Among them, T and S represent neurons, and GOAL represent average required error. In newrb algorithm, the maximum number of neurons generated is expressed as FK, and the number of new neurons is expressed as BX.

4.4. Experimental evaluation of enterprise human resource demand forecasting model

This study collected data on a company's sales revenue and employee numbers from 2016 to 2020, leveraging the power of IoT technology for enhanced analysis. By applying a radial basis function neural network algorithm, we conducted an experimental analysis to forecast human resource needs, contrasting our findings with those derived from traditional algorithms. The data, meticulously curated from public records and the company's annual reports, provided a comprehensive view of its financial health and workforce dynamics, allowing for a nuanced understanding of the relationship between sales performance and staffing requirements [26].

In this study, the traditional algorithm utilized for comparison with the radial basis function neural network approach is a linear regression model, a fundamental statistical method for predicting a quantitative response. This model assumes a linear relationship between the input variables (such as time and other quantifiable factors influencing sales and employee numbers) and the output predictions. Linear regression is widely used for its simplicity and ease of interpretation, making it a common baseline for predictive modeling. However, its main limitation lies in its assumption of linearity, which may not adequately capture the complex, nonlinear patterns often present in real-world data related to sales revenue and human resource fluctuations. This contrasts with the more advanced radial basis function neural network, which can model complex nonlinear relationships, leading to the observed improvements in prediction accuracy.

4.4.1. Prediction accuracy of the number of employees

This experiment used two algorithms to calculate the prediction model from the number of employees, and compared it with the actual number of employees. The calculation results are shown in Fig. 6.

It can be seen from Fig. 6 that from 2016 to 2020, the number of employees showed an overall upward trend. In 2016, the predicted number of employees in this algorithm was 320, and the actual number was 357, with a difference of 37; the predicted number of employees by traditional algorithm was 291, which was 66 people different from the actual number. In 2018, the predicted number of employees in this algorithm was 403, and the actual number was 449, with a difference of 46; the predicted number of employees by traditional algorithm was 387, which was 62 people different from the actual number. To sum up, the predicted number of employees in this algorithm was closer to the actual value, and the prediction effect was better than the traditional algorithm.

Combined with the data in Fig. 6, this paper made statistics on the prediction accuracy of the two algorithms in terms of the number of employees. The statistical results are shown in Fig. 7.

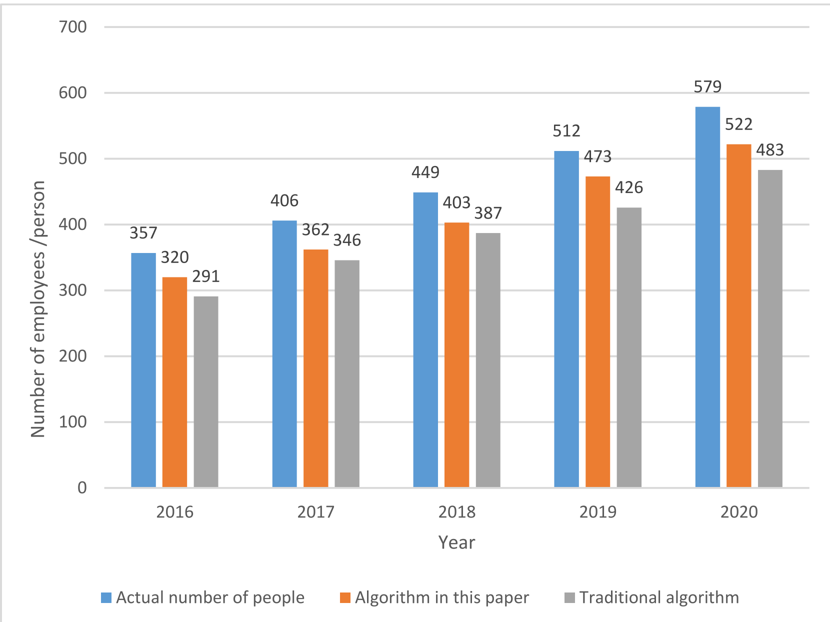

Fig. 6. Comparison of employee headcount forecasts.

It can be seen from Fig. 7 that in 2016–2020, the prediction accuracy of the number of employees under the two algorithms was different. Under this algorithm, the prediction accuracy of the number of employees in different years was about 90 %. The highest prediction accuracy was 92.4 %, and the lowest was 89.2 %. It can be calculated that the average prediction accuracy of the number of employees in five years was 90.2 %. Under the traditional algorithm, the prediction accuracy of the number of employees in different years was slightly lower. The highest prediction accuracy was 86.2 %, and the lowest was 81.5 %, so the average prediction accuracy of the number of employees in five years was 83.9 %. It can be seen from the above data that the prediction accuracy of the algorithm in this paper was higher and the prediction effect was better.

4.4.2. Accuracy of sales revenue forecast

In order to further highlight the advantages of the algorithm in this paper, this paper combined the two algorithms to calculate the prediction model from the aspect of sales revenue, and compared it with the actual sales revenue. The calculation results are shown in Fig. 8.

According to Fig. 8, in 2016, the actual sales revenue was 8.93 million yuan; the predicted value of sales revenue of this algorithm was 8.34 million yuan, while that of traditional algorithm was 7.56 million yuan. In 2018, the actual sales revenue was 11.34 million yuan; the predicted value of sales revenue by this algorithm was 10.69 million yuan, while the predicted value of sales revenue by traditional algorithm was 9.73 million yuan. From the above data, it can be concluded that the predicted value of sales revenue under the algorithm in this paper was closer to the actual sales revenue, and the prediction effect of sales revenue was better.

By combining the data in Fig. 8, this paper made statistics on the prediction accuracy of the two algorithms in terms of sales revenue. The statistical results are shown in Fig. 9.

According Fig. 9, there was a significant difference in the accuracy of sales revenue forecast between the two algorithms. Under this algorithm, the overall accuracy of sales revenue forecast was above 90 %. The highest prediction accuracy was 94.6 %, and the lowest was 93.4 %; the average forecast accuracy of sales revenue in five years was 93.9 %. Under the traditional algorithm, the accuracy of sales revenue forecast was generally low. The highest prediction accuracy was 85.8 %, and the lowest was 84.6 %; the average forecast accuracy of sales revenue in five years was 85.2 %. In general, the sales revenue forecast accuracy of this algorithm was higher and the forecast effect was better.

4.5. Evaluation experiment of wireless communication network security risk prediction model

From the vast datasets stored in computer databases, we selected a substantial number of records as our training sample set for the prediction model. Specifically, we carried out four rounds of evaluation experiments on the predictive accuracy of our wireless communication network security risk model. The experimental setup was designed to rigorously test the model's reliability across different scenarios, utilizing a diverse range of indicators such as historical security breaches, network traffic anomalies, and predictive analytics to gauge the potential risk levels effectively [27]. The results, as illustrated in Fig. 10, underscore the model's high accuracy and its potential to significantly improve security risk management in wireless networks.

In Fig. 10, the detailed examination of prediction accuracies across four tests reveals the nuanced performance of our wireless

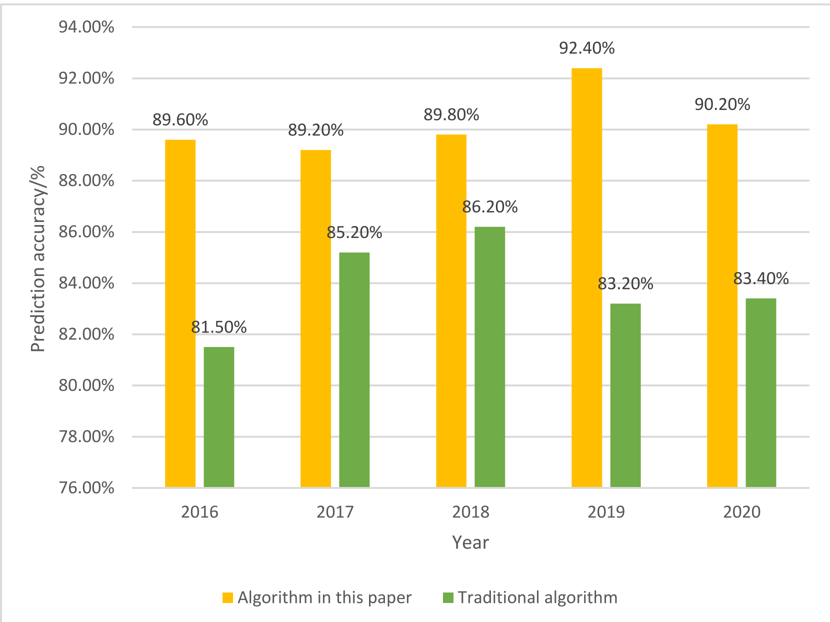

Fig. 7. Comparison of forecast accuracy of the number of employees.

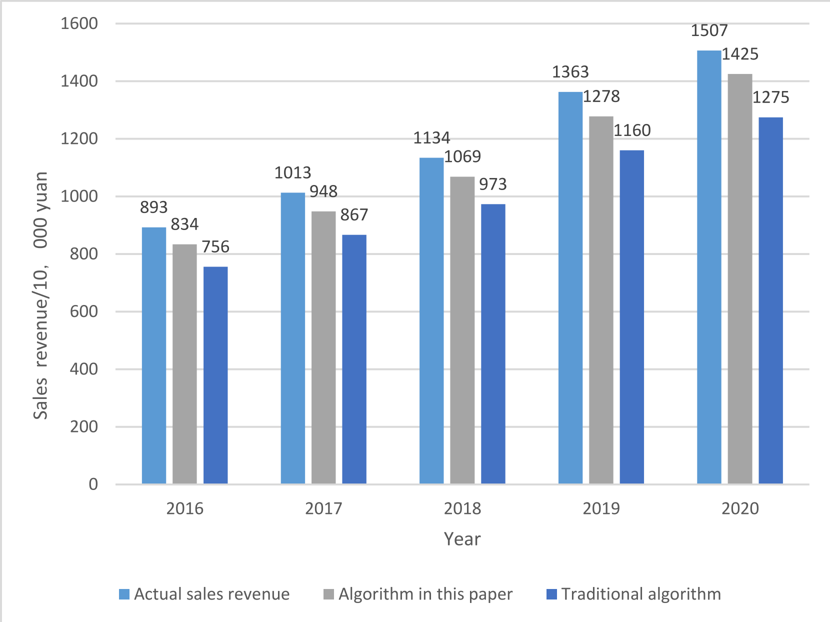

Fig. 8. Comparison of sales revenue forecasts.

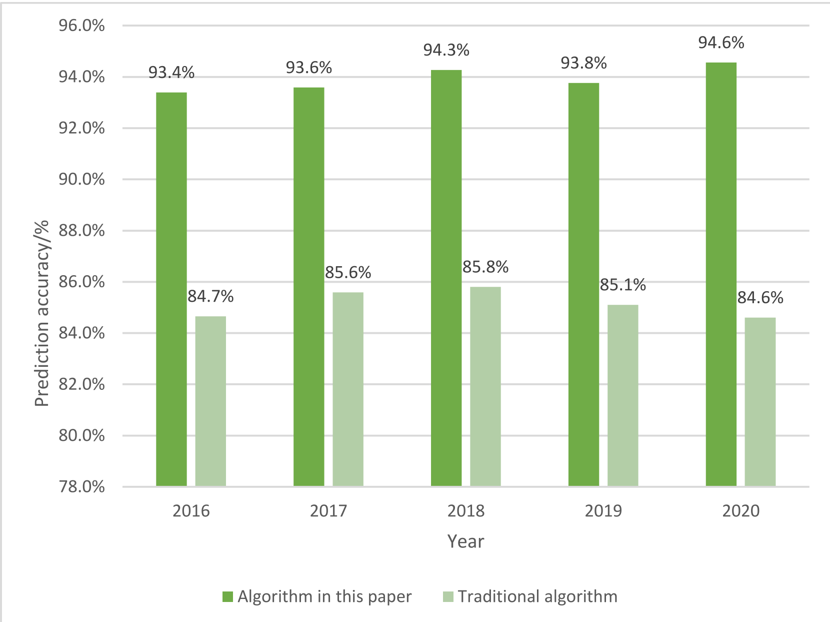

Fig. 9. Comparison of sales revenue forecast accuracy.

communication network security risk prediction model. The third test, presenting the lowest accuracy at 90.29 %, highlights areas for potential refinement, particularly in adapting to complex or unexpected risk patterns. Conversely, the fourth test achieved the highest accuracy at 92.85 %, demonstrating the model's capability to accurately assess threats under varying conditions. With an average accuracy of 91.21 % across the tests, these figures not only underscore the model's overall reliability but also its effectiveness in predicting security risks within wireless networks. This granular analysis allows future researchers and practitioners to appreciate the robustness of the model and its utility in enhancing network security protocols.

Table 1 further shows how the radial basis function neural network predictor compares to other models.

Table 1 compares the radial basis function neural network predictor against other algorithms like Markov predictors, linear regression models, support vector machines (SVM), and decision trees in terms of prediction accuracy for sales revenue and employee

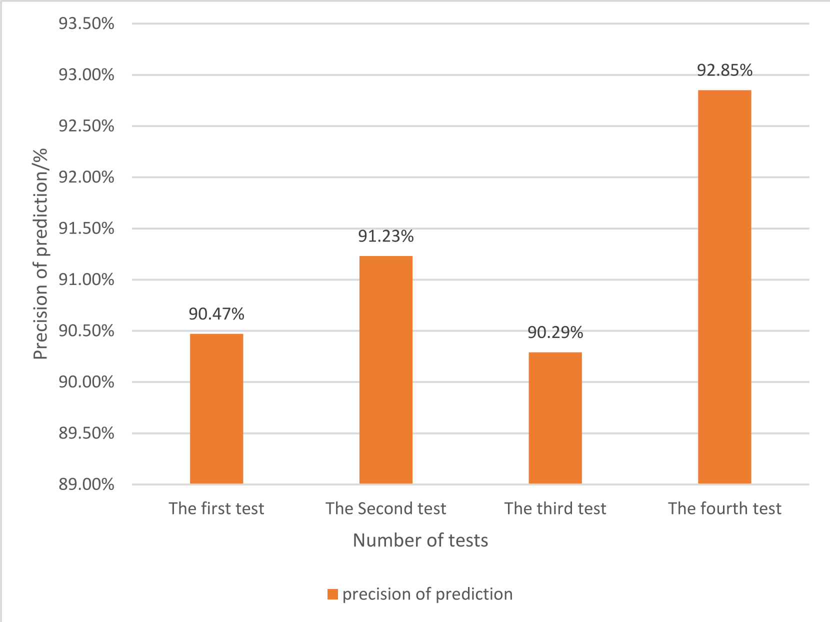

Fig. 10. Model prediction accuracy test.

numbers. The radial basis function neural network outperforms others with accuracies of 93.9 % for sales and 90.2 % for employees, significantly higher than the rest. For instance, Markov predictors score 85.5 % and 82.3 %, while linear regression models are at 83.9 % and 81.7 %, respectively. Although SVMs and decision trees show improvements, they still fall short compared to the radial basis function neural network. Additionally, this comparison highlights the computational efficiency of each algorithm, with the radial basis function neural network excelling in both accuracy and efficiency. This underscores its superiority in human resource demand forecasting, emphasizing its effectiveness and precision in handling complex data patterns.

4.6. Future opinion

Given the remarkable findings and the advanced methodological approach utilized in this study, there is a clear pathway for future research to further refine and expand upon the predictive capabilities of IoT and radial basis function neural networks within the realm of human resource management and communication network security. The diverse design parameters present in the work—ranging from algorithmic adjustments to data selection and model structuring—offer ample opportunities for optimization and experimentation. Future endeavors could explore the integration of additional variables or alternative neural network architectures to enhance prediction accuracy and adaptability. Moreover, the exploration of real-time data processing and the incorporation of machine learning techniques could yield more dynamic and responsive models, catering to the evolving needs of enterprises and the complexity of security challenges. This forward-looking perspective not only underscores the importance of continuous innovation in the field but also highlights the potential for these technologies to revolutionize traditional practices, contributing to more efficient, secure, and data-driven organizational strategies.

5. Conclusions

In the era of the IoT, there are many problems in the traditional enterprise HRM, which is difficult to meet the new needs of enterprise strategic development, and needs to follow the pace of the times to make changes. The IoT not only brings a lot of convenience to human beings, but also brings some hidden dangers to the security of communication networks. It also needs to combine data driven technology to improve the security of communication networks. In order to promote the development of enterprise HRM, this paper

Table 1
Model comparison.

Predictor Type	Prediction Accuracy (Sales Revenue)	Prediction Accuracy (Employee Numbers)	Computational Efficiency
Radial Basis Function Neural Network	93.9 %	90.2 %	High
Markov Predictor	85.5 %	82.3 %	Moderate
Linear Regression Model	83.9 %	81.7 %	High
Support Vector Machine (SVM)	88.2 %	86.5 %	Low
Decision Tree	87.0 %	85.0 %	Moderate

proposed to apply the IoT to enterprise HRM, and combined radial basis function neural network to build a prediction model of enterprise human resource demand. Finally, the model was tested. Under this algorithm, the prediction accuracy of the enterprise human resource demand prediction model for sales revenue and the number of employees was very high, and the prediction accuracy had been significantly improved. This paper also evaluated the wireless communication network security risk prediction model, and the experimental results showed that the prediction accuracy of this model was high.

Given the increasing complexity and strategic importance of human resource management in the IoT era, our research has taken significant strides toward addressing these challenges. We've innovated by integrating IoT technology with radial basis function neural networks, creating a predictive model that significantly enhances the accuracy of forecasting enterprise human resource needs and sales revenue. This model not only showcases a marked improvement over traditional methods but also emphasizes the necessity of adopting data-driven approaches to secure communication networks amidst the pervasive spread of IoT devices. Looking forward, the continuous evolution of IoT applications and their integration into enterprise systems demands further refinement of our predictive models. Future research must focus on enhancing the adaptability and performance of neural network algorithms to keep pace with the dynamic requirements of HRM and network security. Additionally, exploring the scalability of these models to accommodate the growing data volumes and complex network architectures inherent in IoT ecosystems will be crucial. Moreover, given the critical importance of cybersecurity, further studies should delve into advanced predictive models for identifying and mitigating potential security threats, thereby ensuring robust and resilient enterprise operations in an increasingly connected world.

CRediT authorship contribution statement

Xuejie Niu: Writing – original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] Corine Boon, Deanne N. Den Hartog, David P. Lepak, A systematic review of human resource management systems and their measurement, J. Manag. 45 (6) (2019) 2498–2537.
[2] Ashlea C. Troth, David E. Guest, The case for psychology in human resource management research, Hum. Resour. Manag. J. 30 (1) (2020) 34–48.
[3] Maria Panayiota Markoulli, Mapping human resource management: reviewing the field and charting future directions, Hum. Resour. Manag. Rev. 27 (3) (2017) 367–396.
[4] Orhan Yabanci, From human resource management to intelligent human resource management: a conceptual perspective, Hum. Intell. Syst. Integr. 1 (2) (2019) 101–109.
[5] Karen Pak, Human Resource Management and the ability, motivation and opportunity to continue working: a review of quantitative studies, Hum. Resour. Manag. Rev. 29 (3) (2019) 336–352.
[6] Samuel Roscoe, Green human resource management and the enablers of green organisational culture: enhancing a firm's environmental performance for sustainable development, Bus. Strat. Environ. 28 (5) (2019) 737–749.
[7] Stefan Strohmeier, Smart HRM–a Delphi study on the application and consequences of the internet of things in human resource management, Int. J. Hum. Resour. Manag. 31 (18) (2020) 2289–2318.
[8] Yishu Liu, An optimized human resource management model for cloud-edge computing in the internet of things, Cluster Comput. 25 (4) (2022) 2527–2539.
[9] Kambur Emine, Yildirim Tulay, From traditional to smart human resources management, Int. J. Manpow. 44 (3) (2023) 422–452.
[10] Mohammed Mohammed Sadeeq, Nasiba M. Abdulkareem, Subhi Rm Zeebaree, Dindar Mikaeel Ahmed, Ahmed Saifullah Sami, Rizgar R. Zebari, IoT and Cloud computing issues, challenges and opportunities: a review, Qubahan Acad. J. 1 (2) (2021) 1–7.
[11] Allen Lim Chong Guan, Manavalan Mani, Alim Al Ayub Ahmed, Mir Mohammad Azad, S. Miah, Role of internet of things (IoT) in enabling productive work from home (wfh) for environmental volatiles, Acad. Market. Stud. J. 26 (1) (2022) 1–11.
[12] Swati Garg, Shuchi Sinha, Kar Arpan Kumar, Mani Mauricio, A review of machine learning applications in human resource management, Int. J. Prod. Perform. Manag. 71 (5) (2022) 1590–1610.
[13] Mejia Cynthia, Ciarlante Katherine, Chheda Kinjal, A wearable technology solution and research agenda for housekeeper safety and health, Int. J. Contemp. Hospit. Manag. 33 (10) (2021) 3223–3255.
[14] Siripongdee Kobchai, Pimdee Paitoon, Tuntiwongwanich Somkiat, A blended learning model with IoT-based technology: effectively used when the COVID-19 pandemic? J. Educ. Gift. Young Sci. 8 (2) (2020) 905–917.
[15] F. Sangalang Raven Marie, C. Ancla Lawrence Xavier, L. Chong Miko Dominic, Jason Chester S. Wang, L. Morales Retchell Rubin, Joliber M. Caminong, et al., Unlocking internet of things (IoT) for enhanced knowledge management and organizational performance: a case study of diverse industry players in the Philippines, Int. J. Multidiscipl. 5 (1) (2024) 352–374.
[16] Irani Foad, Kilic Hasan, An assessment of implementing green HRM practices on environmental performance: the moderating role of green process innovation, J. Glob. Hospital. Tour. 1 (1) (2022) 16–30.
[17] Sushil Kumar Sahoo, Bibhuti Bhusan Choudhury, Wheelchair accessibility: bridging the gap to equality and inclusion, Decision Mak. Adv. 1 (1) (2023) 63–85.
[18] Segkouli Sofia, Giakoumis Dimitrios, Votis Konstantinos, Triantafyllidis Andreas, Paliokas Ioannis, Tzovaras Dimitrios, Smart Workplaces for older adults: coping 'ethically'with technology pervasiveness, Univers. Access Inf. Soc. 22 (1) (2023) 37–49.
[19] Meryem Aybas, Ahmet Cevat Acar, The effect of human resource management practices on employees' work engagement and the mediating and moderating role of positive psychological capital, Int. Rev. Manag. Market. 7 (1) (2017) 363–372.
[20] Kaifeng Jiang, Understanding employees' perceptions of human resource practices: effects of demographic dissimilarity to managers and coworkers, Hum. Resour. Manag. 56 (1) (2017) 69–91.
[21] C. Scott Rigby, Richard M. Ryan, Self-determination theory in human resource development: new directions and practical considerations, Adv. Develop. Hum. Resour. 20 (2) (2018) 133–147.
[22] David E. Guest, Human resource management and employee well-being: towards a new analytic framework, Hum. Resour. Manag. J. 27 (1) (2017) 22–38.
[23] Ludivine Adla, Virginie Gallego-Roquelaure, Ludivine Calamel, Human resource management and innovation in SMEs, Person. Rev. 49 (8) (2019) 1519–1535.
[24] Mario Silic, The effects of a gamified human resource management system on job satisfaction and engagement, Hum. Resour. Manag. J. 30 (2) (2020) 260–277.

[25] Chengqi She, Battery aging assessment for real-world electric buses based on incremental capacity analysis and radial basis function neural network, IEEE Trans. Ind. Inf. 16 (5) (2019) 3345–3354.
[26] Nica Elvira, Stehel Vojtech, Internet of things sensing networks, artificial intelligence-based decision-making algorithms, and real-time process monitoring in sustainable industry 4.0, J. Self Govern. Manag. Econ. 9 (3) (2021) 35–47.
[27] Shuyan Hu, Xiaojing Chen, Wei Ni, Ekram Hossain, Xin Wang, Distributed machine learning for wireless communication networks: techniques, architectures, and applications, IEEE Commun. Surv. Tutor. 23 (3) (2021) 1458–1493.

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