

Retraction

Retracted: Optimal Allocation Method of 5G Communication System Resources Assisted by Artificial Intelligence Technology

Wireless Communications and Mobile Computing

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] H. Liu, "Optimal Allocation Method of 5G Communication System Resources Assisted by Artificial Intelligence Technology," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 1419930, 9 pages, 2022.

Research Article

Optimal Allocation Method of 5G Communication System Resources Assisted by Artificial Intelligence Technology

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5G technology has been rapidly developed under the trend of utilization in various countries. It is an information dissemination technology with faster and more stable transmission speed. Compared with 4G technology, 5G technology has a low delay rate and higher transmission speed, and it can be applied in tasks such as the Internet of Vehicles and the transmission of 3D images. For 5G technology, the communication system is a huge challenge. It not only needs to deal with the transmission speed between users and users but also needs to deal with the efficiency between users and channels. 5G researchers will spend a lot of material and financial resources to solve these problems. This study uses artificial intelligence technology to analyze its application in resource allocation of 5G communication systems. It also uses the collaborative filtering algorithm to realize the automatic recommendation and matching problem of 5G communication system resources. The research results show that artificial intelligence technology has good feasibility in the resource allocation problem of 5G communication system. It can achieve the resource allocation task of 5G technology communication system with high efficiency and accuracy, and all prediction errors are within 3% for the characteristics of the three 5G communication systems in this study.

1. Introduction

5G technology has been supported by the state, and it has been rapidly developed. 5G is not just an application of information technology; it is also an important national strategy. This is because 5G technology can have a higher transmission rate and a higher image presentation form, which has a greater guarantee for the military field [1, 2]. Information technology has been updated in many rounds, from the original virtual technology to digital technology. At the beginning of the 21st century, although 2G and 3G technology can transmit data, it has a slow transmission speed, which also limits the application of 3G and 2G technology in life and production. 4G technology is a new round of technological update, which has allowed the fast transmission of video and images, which has changed people's lives [3, 4]. For example, 4G technology can carry out voice transmission and video transmission. However, 4G technology still has a slower speed in the field of virtual reality and 3D transmission, which also limits the progress of science and

technology and lifestyle. 5G technology can realize faster virtual reality and 3D transmission technology. Therefore, 5G technology will change the way people live and produce [5, 6]. China is a country that develops 5G technology relatively rapidly, and it mainly relies on the technology and layout of Huawei Technologies. In the process of developing 5G technologies, Huawei has also been sanctioned and hindered by many countries, which is enough to show the importance of 5G technology. It has also threatened the interests and military power of many countries. Although 5G technology has not been applied in most life scenarios, it already has 3D technology transmission and virtual reality technology transmission [7, 8]. 5G technology also has faster transmission speed compared to 4G technology. In most cases, its transmission speed can reach 10 M, and in special cases, its transmission speed can even reach 100 M. It can enable more rapid remote work and accelerate the realization of autonomous driving technology. This has accelerated the realization of automated production and life. However, the communication system of 5G technology is relatively

cumbersome, which needs to reasonably handle user resource requirements and maximize the energy efficiency of the channel system. This is not only to maximize the utilization of channels and resources but also to avoid channel congestion, which is a big problem for technicians. The main limitation of communication resources of 5G technology is reflected in the constraints between user resource sharing, which is the problem of speed and channel utilization between most users. The channel resources of 5G technology need to be fully utilized by users to achieve the goal. There are energy efficiency issues within the channel system. The most critical issue should be user association and resource allocation strategy. This will limit researchers' resource allocation for 5G technology communication systems.

There are thousands of 5G communication systems in China, and each system will have thousands of users. This forms a more complex network of relationships. If you rely on 5G R&D personnel to manually handle these complex correlation issues and complex data relationships, it will not only cause huge waste of human resources and financial resources [9, 10]. There is also lower efficiency in this way. The communication speed of 5G technology is much faster than that of 4G, which means that manual processing will reduce the processing speed of 5G. This requires finding an intelligent automatic processing method. No matter how congested the channel of 5G technology is and there are many congested channels, this automated technology will automatically associate users with channels, and it can also be processed into optimal operating efficiency. It can also make full use of the channel of 5G technology. This will save a lot of human and financial resources, and this method will not limit the operation of 5G technology, nor will it limit the transmission speed of 5G technology. The resource allocation of the 5G communication system will avoid the congestion between users and users and between users and channels, which can also maximize the utilization of 5G channels, which can also improve the stability and speed of information transmission.

For automation and intelligence problems, artificial intelligence technology is a relatively feasible strategy. Artificial intelligence technology can assist people's life and production to achieve automatic processing [11, 12]. The main reason why it can be automated is that it can use a large amount of data to learn the relationship between the data, and it will grasp the behavior of the research object. The rapid development of artificial intelligence technology is mainly due to the development of computer performance and hardware devices such as graphics cards [13, 14]. GPU will also improve the speed of artificial intelligence computing. It generates a lot of data for different industries. This also provides data support for artificial intelligence technology. The fundamental of artificial intelligence technology is to learn the correlation of research objects from a large amount of data, whether it is spatial correlation or temporal correlation. It can use these data relationships to deduce some unknown operating conditions. For artificial intelligence technology, the more popular algorithms are mainly CNN, LSTM, and GAN networks. Although the resource optimization problem of the communication system of 5G

technology will involve more complex characteristics. However, 5G technology can provide more data support for artificial intelligence technology. No matter in the testing process of 5G technology or the application process of 5G technology, there will be many data between users and channels and between channels, which is also the learning basis of artificial intelligence technology. Collaborative filtering algorithm is mainly used in recommender systems, which can make effective recommendations based on users or objects. This study uses the coordinated filtering algorithm to recommend the features extracted by CNN to the resource allocation system of the 5G communication system.

This study uses artificial intelligence technology to study the optimization problem of communication resource allocation in 5G technology. These communication resource optimization problems mainly include the optimization of resource sharing between users, the optimization of resource sharing between users and channels, and the problem of maximum benefit of channels. The artificial intelligence methods used in this study are mainly CNN and collaborative filtering algorithms. This study investigates the feasibility of artificial intelligence technology for the resource optimization problem of 5G communication system from five aspects. Section 1 introduces the importance of 5G technology development and the development history of artificial intelligence technology. It also introduces the optimization problem of communication resource allocation for 5G technology. Section 2 describes the current state of research related to 5G technology. The research scheme of CNN and collaborative filtering algorithm in the optimization of communication resource allocation in 5G technology is analyzed in Section 3. The optimization accuracy of CNN and collaborative filtering algorithms for relevant features of 5G communication systems is analyzed in Section 4. Section 5 summarizes and analyzes the entire study.

2. Related Work

5G technology is already a technology in urgent need of rapid development, both for people's lives and for military purposes. The communication system is the key to the development of 5G technology. The communication system of 5G technology also has relatively big challenges in order to balance the capacity and the speed of users. Many researchers have done a lot of research on the communication system of 5G technology. Xu et al. [15] mainly use mobile phones as research objects to study the communication technology of 5G. It has found that millimeter wave has been widely used in 5G communication technology, especially the communication technology of mobile phones. It mainly analyzes several design schemes of millimeter wave communication and the possibility of its realization in mobile phone communication. It also improves some applications and challenges in the development of 5G technology for millimeter wave technology. This research has certain guiding significance for the development of 5G communication technology, and it can also better guide the rapid development of 5G communication technology for mobile phones. Fang and Qian [16] have also considered 5G

technology to be a wireless communication technology that surpasses 4G technology. This technology not only enhances the frequency of broadband communication but also has lower delay rates. However, 5G communication technology may have privacy issues, mainly due to the existence of a large amount of personal information in the process of network transmission. 5G technology will transmit more and faster personal information than 4G technology. This research has certain guiding significance for the protection of personal information in the process of 5G communication technology. Mikami and Yoshino [17] believed that 5G technology contains enhanced broadband communication functions and machine-type communication functions, which can make better use of 5G technology in the field of intelligent transportation and autonomous driving, because these fields require reliable and low-latency communication technology. This study mainly analyzes the experimental system of V2N communication in fleet network. It verifies the fundamental performance of 5G technology utilized for communication between fleets of trucks. The research results show that the V2N communication structure can be better utilized in formation communication. Uusitalo et al. [18] mainly analyzed the application feasibility of 5G technology in the field of port automation. It believes that 5G technology can improve the flexibility, safety, and predictability of port work, which are the advantages of 5G technology. It analyzes the communication technology and other objective factors of 5G technology required by the port. Port missions require a low-latency, high-capacity communication technology. It verifies the feasibility of 5G communication technology based on the actual measured propagation model and the actual port environment. This research can provide more reference for port operations to realize the utilization of 5G technology. Liu et al. [19] believed that communication technology is an important part of the development of 5G. This not only affects the user experience but also affects the efficiency of channel usage. It uses the calculation function and the modified calculation function to study the influence of the channel slot array in the 5G communication process. It also uses a rectangle to establish a waveguide array for 5G communication technology research. The research results show that this method can ensure the transmission speed and stability of 5G communication technology. This rectangular waveguide can also be used in 5G communication technology. Roger et al. [20] believed that the thematic challenge of 5G technology is enhanced car networking technology. This 5G technology will mainly use cellular communication technology. Existing technologies have also shown that antenna communication is also more suitable for the 5G communication system of the Internet of Vehicles. It studies the feasibility of communication systems using context-aware antennas and programming techniques. It also analyzes the wireless resource control and management system in the 5G communication process. Although researchers have done a lot of research on the communication system of 5G technology, these studies rarely involve the resource allocation of the communication system of 5G technology. This research mainly uses artificial intelligence technology to study the problem of automatic resource allocation of 5G communication system.

3. Application of Artificial Intelligence Technology in Resource Allocation of 5G Communication System

3.1. The Significance of Artificial Intelligence for 5G Systems. It can be seen from the above description that the communication system in 5G technology is the most important part. The communication system of 5G technology will affect the stability and speed of network transmission. In real life, some research objects have higher requirements on the stability and speed of 5G technology, such as car networking technology, and smart medical care. This also puts forward higher requirements for the communication system of 5G technology. This study mainly analyzes three influencing factors in the 5G communication system: resource allocation between users, resource allocation between users and channels, and optimal resource allocation between channels [21]. These three characteristics are also elements that directly affect the communication system. There will be thousands of users and channels of 5G technology, which will generate huge amounts of data. These data are difficult for researchers to process, which requires an intelligent means of resource allocation in communication systems. Artificial intelligence technology is good at dealing with data with nonlinear relationships, and it will use a large amount of data to find correlations between data. This relationship will be mapped by an activation function. Artificial intelligence technology contains a variety of algorithms for researchers to choose. For the resource allocation of the 5G communication system, artificial intelligence can use the data relationship between users and users and between users and channels to find some relationships.

3.2. 5G Communication System Resource Allocation Scheme and Related Processes. This study will use the collected data on the relationship between a large number of users and channels to conduct a research on the allocation of 5G communication system resources. This mainly involves data processing, data conversion, and data prediction processes. The artificial intelligence methods utilized in this study are mainly convolutional neural network (CNN) techniques, which require input data and corresponding label data. When the model is trained, it can rely on weights and biases to make predictions for unknown variables. The correlation of resource allocation of 5G technology communication system will be included in the distribution of weights and biases of the CNN algorithm. At the same time, in order to realize the automatic allocation function of 5G communication system resources, this research also adopts an active recommendation algorithm, which will recommend the appropriate allocation method of the communication system to the control system of 5G technology, which is the so-called collaborative filtering algorithm. Figure 1 shows the application scheme of CNN and collaborative filtering algorithm in the resource allocation and active optimization of 5G technology communication system. The relevant characteristics of 5G cell towers are collected in the form of data. These data will also go through the preprocessing stage before being input to the CNN neural network. First, it will collect user and

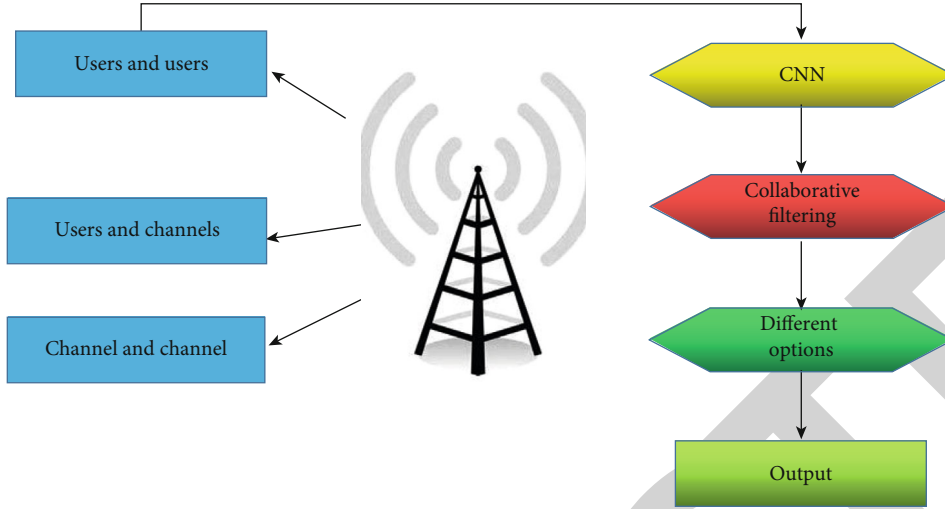


FIGURE 1: Design scheme of CNN and collaborative filtering algorithm in resource allocation of 5G communication system.

channel-related data, which will be divided into three types according to different characteristics: data between users and users, data between users and channels, and data within channels. The data will then be passed through CNN and collaborative filtering algorithms. These data will output the corresponding recommendation plan through these two algorithms. Option 1 and Option 2 are used here instead. The detailed scheme is not discussed in detail here. These specific program data will be the output data of CNN and the label data of this system. This is the standard by which the system performs error calculations.

For the resource allocation problem of 5G communication system, this study also designs a specific workflow. CNN methods look for relationships between schemes and features. However, there is also a corresponding relationship and order in the optimization of these three resources. Figure 2 shows the flow of resource allocation in a 5G technology communication system. Figure 3 shows the transmission process of 5G technology signals. In the first step, it needs to establish a resource demand relationship according to the speed and stability requirements between users, which will find the optimal matching relationship. The needs of users are also fundamental to the development of 5G technology. In the second step, it needs to find an optimal matching strategy according to the relationship between users and channels and supply and demand. This not only meets the needs of users but also maximizes the occupancy rate of the channel. Through this optimized matching relationship, it will not cause waste of channel resources, and it is also timely to meet the needs of users during peak periods. The third step is the optimal matching problem within the 5G technology communication system. This ensures maximum channel-to-channel energy efficiency. In the end, this will be an overall limiting measure for the 5G communication system. The resources of the communication system are not unlimited, which requires imposing a limit on the optimal matching of the three. This also means that the optimal matching of the three is carried out under certain constraints.

3.3. Introduction to CNN and Collaborative Filtering Algorithms. The CNN algorithm contains a convolutional layer and a pooling layer, which will sample the three features of the 5G communication system. At the same time, it also allows to build a deeper network according to the needs of the communication system resources to allocate characteristic data. This is mainly because it can implement a weight sharing mechanism, which is an advantage that does not exist in fully connected neural networks. A collaborative filtering algorithm is also a common recommendation algorithm, which can implement autonomous recommendation according to the attributes of objects or users. This research mainly adopts a user-based collaborative filtering algorithm. It will recommend the corresponding object according to the user's habits. The CF algorithm can actively recommend the features learned by CNN to researchers of 5G communication systems, and it can also be recommended to computer systems, which can ensure that the optimal 5G resource allocation method can be obtained quickly.

For collaborative filtering algorithms, it generally measures the correlation between features by calculating the distance between data. Equation (1) shows the way to calculate the distance of the resource allocation feature of the communication system in terms of the cosine of the angle. This is a basic distance method.

$$\cos \theta = \frac{\sum_{k=1}^n x_{1k} x_{2k}}{\sqrt{\sum_{k=1}^n x_{1k}^2} \sqrt{\sum_{k=1}^n x_{2k}^2}}. \quad (1)$$

In the collaborative filtering algorithm, Equation (2) presents a correlation index to measure the accuracy of the recommender system. Equation (3) shows the distance calculation formula for n samples.

$$P_{u,i} = \frac{(s_i * R_{u,N})}{|s_{i,N}|}, \quad (2)$$

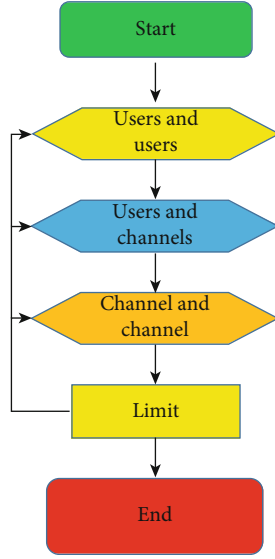


FIGURE 2: Resource allocation process and constraints of 5G communication system.

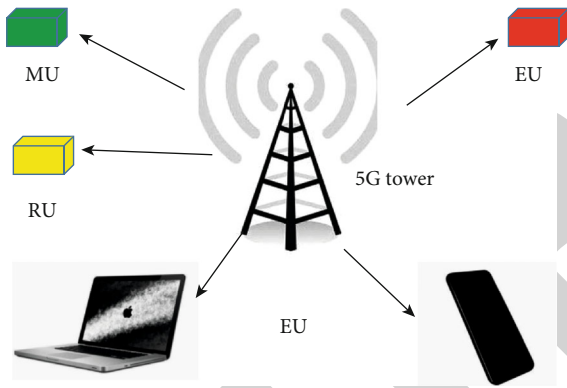


FIGURE 3: The transmission process of 5G technology signals.

$$\text{sim}(i, j) = \frac{\sum_{u \in U} (R_{u,i} - R_u)(R_{u,j} - R_u)}{\sqrt{\sum_{u \in U} (R_{u,i} - R_u)^2} \sqrt{\sum_{u \in U} (R_{u,j} - R_u)^2}}. \quad (3)$$

For the CNN, this is also a basic perceptron structure. It also follows the forward and back propagation mechanism of the perceptron. This involves the calculation of the derivation of the weights. Equations (4) and (5) show how the weights and biases are calculated for the weights. In a deep learning platform, it will perform automatic differentiation calculations.

$$\Delta \omega_{ji} = -\eta \frac{\partial E}{\partial \omega_{ji}}, \quad (4)$$

$$\Delta u_{ij} = -\eta \frac{\partial E \partial}{\partial u_{ij}}. \quad (5)$$

Equation (6) shows the calculation criteria for the input

layer of the CNN. The difference between it and the full connection is that it will use the convolution operator to perform the convolution operation, so there will be some factors that will not perform matrix operations for the hidden layer factors.

$$a^2 = \sigma(z^2) = \sigma(a^1 * W^2 + b^2). \quad (6)$$

The activation function is an important part of CNN, which will perform nonlinear operations on the corresponding data of the matrix operation. Equation (7) shows the calculation method of the activation function in this study.

$$a^l = \text{ReLU}(z^l) = \text{ReLU}(W^l a^{l-1} + b^l). \quad (7)$$

Equation (8) shows the calculation method of the fully connected layer in CNN. This is a layered network that exists selectively. It will do probability calculations.

$$a^l = \text{soft max}(z^l) = \text{soft max}(W^l a^{l-1} + b^l). \quad (8)$$

Equations (9) and (10) correspond to Equations (4) and (5). Since the CNN will contain many hidden layers, Equations (9) and (10) show the expansion of the weights and biases in the hidden layers. It also shows an automatic differentiation method.

$$E = \frac{1}{2} \sum_{k=1}^m [d_k - f(\text{netw}_k)]^2 = \frac{1}{2} \sum_{k=1}^m \left[d_k - f\left(\sum_{j=0}^n \omega_{jk} y_j\right) \right]^2, \quad (9)$$

$$\begin{aligned} E &= \frac{1}{2} \sum_{k=1}^m [d_k - f(\text{netw}_k)]^2 \\ &= \frac{1}{2} \sum_{k=1}^m \left[d_k - f\left(\sum_{j=0}^n \omega_{jk} y_j\right) \right]^2 \\ &= \frac{1}{2} \sum_{k=1}^m \left[d_k - f\left[\left(\sum_{j=0}^n \omega_{jk} f\left(\sum_{j=0}^q u_{ij} x_j\right)\right)\right] \right]^2. \end{aligned} \quad (10)$$

4. Result Analysis and Discussion

The intelligent allocation system of 5G communication system resources designed in this study is mainly divided into two workflows. The first is to use CNN to extract the characteristics of user and user energy efficiency, user and channel energy efficiency characteristics, and channel and channel energy efficiency characteristics of the 5G communication system. The basis of CNN feature extraction is a large amount of data. This study selected the relevant characteristic data of the 5G communication system in a certain area of Dalian as the research basis. Before the relevant feature data of the three 5G communication systems are input to the CNN, it needs to normalize the data. This is mainly to make the data of the three characteristics of the communication system have the same interval and corresponding

distribution, which is beneficial to the training process of CNN. The second will be the collaborative filtering algorithm to autonomously allocate 5G communication system resources based on the results of CNN feature extraction. Through the related algorithms of these two artificial intelligences, the resource allocation task of the 5G communication system will be autonomous. This method will also have better efficiency compared to the manual method. This ensures the high speed and stability of 5G technology transmission.

First, this study firstly analyzes the correlation coefficient of the collaborative filtering algorithm applied in 5G communication system. When the correlation coefficient is close to 1, it means that the collaborative filtering algorithm has higher accuracy in the allocation method recommended for the 5G communication system. Generally speaking, the correlation coefficient of the CF algorithm is required to exceed 0.95. This shows that the CF algorithm achieves better accuracy. Figure 4 shows the correlation coefficient of the collaborative filtering algorithm applied in the communication system. The black line in Figures 4 and 3 represents the value of the prediction error within 0.5% of the three characteristics of the 5G communication system. A represents the energy efficiency characteristics between users. B represents the energy efficiency characteristic between the user and the channel. C represents the channel-to-channel energy efficiency characteristic. In general, the three characteristics of 5G communication system resources have met the needs of resource allocation, and the correlation coefficients of these three characteristics are all above 0.95. The lowest correlation coefficient is 0.953, and this part of the feature is the user-to-user energy efficiency feature in the communication system. The number of users of the 5G system is huge, and it is difficult to predict either from a time perspective or a usage perspective. The distribution of this correlation coefficient can better guide the automatic allocation of resources in the 5G communication system, which also shows that the collaborative filtering algorithm can be used in the resource allocation of the communication system.

In general, the average error can reflect the overall prediction level of the algorithm, and it will not only consider the extreme cases of prediction. Figure 5 shows the distribution of prediction errors for three features related to resource allocation in 5G communication systems. The prediction errors of these three features will be related to the accuracy of the collaborative filtering algorithm recommendation. V1 represents the prediction error of the energy efficiency characteristics from channel to channel. V2 represents the prediction error of energy efficiency characteristics between users and channels. V3 represents the prediction error of energy efficiency characteristics between users. In general, the prediction errors of the three characteristics of the resource allocation of the communication system are all within 2.5%. This error distribution can more accurately reflect the distribution and usage of the relevant characteristics of the 5G communication system resource allocation. Whether for researchers or collaborative filtering algorithms, it can better guide the resource allocation of communication systems. The largest part of the prediction error is about

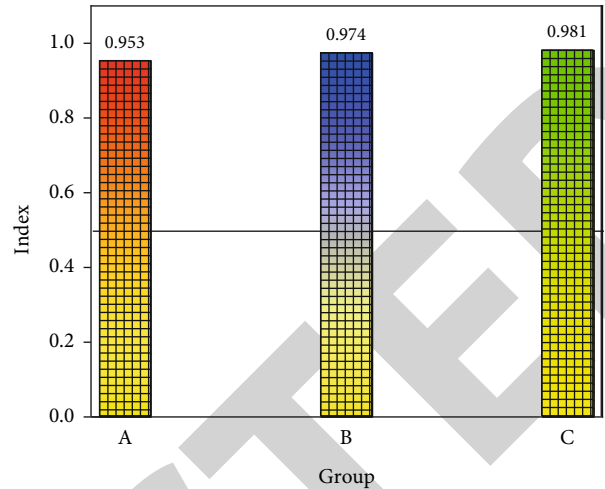


FIGURE 4: Application relevance of collaborative filtering algorithm in communication system.

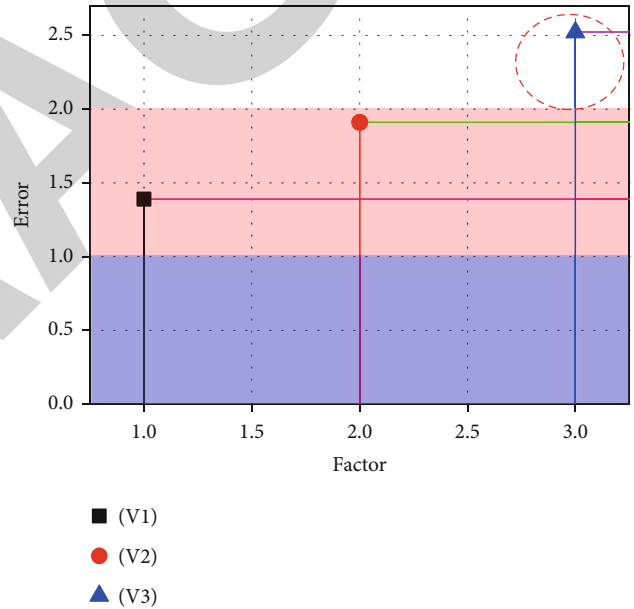


FIGURE 5: Prediction error distribution of three characteristics related to resource allocation in 5G communication system.

2.48%. There is a complex relationship network between users and energy efficiency characteristics, which also has relatively large fluctuations. This part of the error is enough to make use of the 5G communication system resource allocation decision. The smallest error is only 1.47%. This has demonstrated the utility of CNN in resource allocation for 5G communication systems.

It can be seen from the description in Figure 4 that the prediction error of the energy efficiency feature between users has the lowest prediction error among the resource allocation features of the 5G communication system. In this study, 20 groups of related communication system resource allocation characteristics were selected for research. Figure 6 shows the prediction error distribution of energy efficiency

characteristics between users. The green area indicates that the prediction error between users and user characteristics of the 5G communication system is 1%-2%. It means that most of the forecast errors are distributed within this interval. This also proves the effectiveness of CNN and CF algorithms in the application of 5G communication systems. Overall, CNN can predict user-to-user energy efficiency characteristics relatively well, because most of the prediction errors are distributed between 1% and 2%. A small fraction of forecast errors are also distributed below 1%. Only one set of users has an error value of more than 2% with respect to the user's energy efficiency characteristics. But it also does not exceed 3%. The red dotted line marks the eigenvalues with a prediction error of more than 2%, and there is only a distribution of large errors here. This is a normal prediction effect, which does not affect the average prediction error of users versus user characteristics. This is enough to show that CNN has high enough accuracy in predicting users and user energy efficiency characteristics of 5G communication system resource allocation.

The user and channel energy efficiency characteristics of 5G communication systems are also key factors. The 5G communication system will contain thousands of users and channels. This ensures that the user experience has the characteristics of low latency and high speed. It also ensures that the channel is fully utilized. It cannot occur that some channels are idle and some channels are congested. This requires the resources of the 5G communication system to be reasonably allocated. Figure 7 shows the distribution of predicted and actual values of energy efficiency characteristics of users and information in the 5G communication system. In Figure 7, the area of the green area represents the prediction error distribution of users and channel characteristics. The smaller the area of this area, the smaller the prediction error. The eigenvalues of energy efficiency between these 20 groups of users and channels have relatively large fluctuations, which causes it to have relatively many peaks and valleys. In the CNN, the peaks and troughs are generally difficult to predict. However, the CNN can better predict the eigenvalues of user and channel energy efficiency, whether it is the peak of energy efficiency or the fluctuation of energy efficiency characteristics. The green area represents the predicted error value of the user and channel energy efficiency characteristics. Overall, the area of the green area is relatively small in the 20 sets of data. This can also illustrate that the CNN can meet the needs of the task when predicting the user and channel characteristics of the 5G communication system. Larger green areas generally appear in places with high volatility, which is consistent with the prediction performance of CNN and CF algorithms. This may have a greater correlation with the dataset of channel and user characteristics.

There is also a certain amount of interference between the channels of the 5G communication system, which is to ensure that the energy efficiency between channels is maximized. Energy efficiency between channels is also an important part of resource allocation in 5G communication systems. Figure 8 shows the distribution of predicted correlations between channels and channel energy efficiency

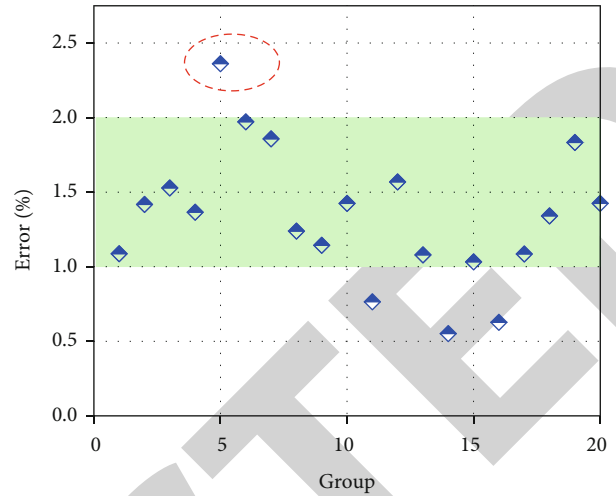


FIGURE 6: Prediction errors of users and user energy efficiency characteristics of 5G communication systems.

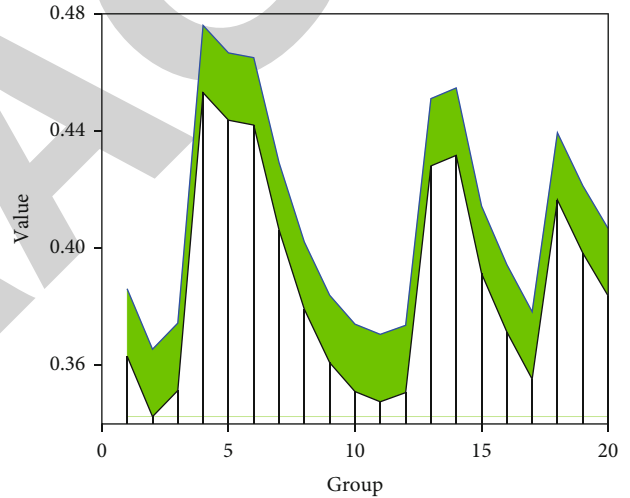


FIGURE 7: Prediction errors of user and channel energy efficiency characteristics of 5G communication systems.

characteristics of a communication system. The red line represents the linear correlation function, which measures the correlation of the channel with the predicted value of the channel resource allocation feature. In most descriptions of linear dependencies, it is critical. In general, the channel and channel energy efficiency characteristics have a good linear correlation, because the 20 sets of data are well distributed on both sides of the linear function. If the blue data points appear above the linear function, this means that the predicted value of the channel and channel energy efficiency characteristics is larger than the actual value. For most linear correlation studies, as long as the value of the linear correlation coefficient exceeds 0.95, this achieves the purpose of prediction. The linear correlation between the channel and the channel feature prediction value has exceeded 0.97. Conversely, the predicted value of the channel and information energy efficiency eigenvalues is smaller

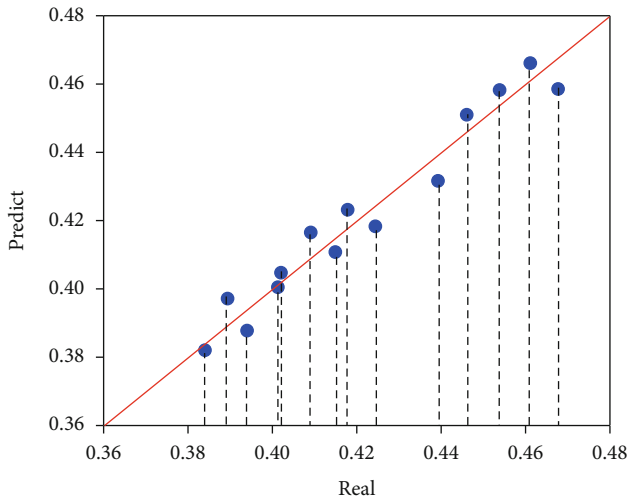


FIGURE 8: Predicted distribution of channel and channel energy efficiency characteristics.

than the actual value. In general, both cases will appear, and the distribution is relatively uniform. This also shows that CNN has good stability in predicting the channel and channel characteristics of 5G communication system resource allocation.

5. Conclusions

5G technology has been rapidly developed under the support of the state and has higher propagation speed and lower latency compared to 4G technology. Although 4G technology can already transmit images and videos, it still has the characteristics of delay. It is also difficult to apply in places with higher requirements such as Internet of Vehicles and telemedicine. Although 5G technology is developing rapidly, the resource allocation of 5G technology communication system has always been a big challenge. 5G technology has a huge number of users and channels, which will generate a huge amount of data. Only relying on researchers to deal with these complex energy efficiency relationships will not only cost money and material resources, but it is also unfriendly to the transmission speed of 5G technology. In order to realize the task of intelligent allocation of 5G communication system resources, this research uses a CNN in artificial intelligence technology and collaborative filtering algorithm to process the relevant characteristics of the communication system.

The characteristics of 5G communication system resource allocation involved in this study mainly include user and user energy efficiency characteristics, user and channel energy efficiency characteristics, and channel and channel energy efficiency characteristics. The collaborative filtering algorithm has high accuracy in actively allocating communication system resources. The correlation coefficients of these three features all exceed 0.95. Although there are thousands of users in the 5G communication system, there is also a complex network of relationships between users. This means that there is a large mutation in the energy

efficiency characteristics between users. However, the correlation coefficient of energy efficiency characteristics between users and users also reached 0.953, and the correlation coefficient between users and channels also reached 0.974. This shows that the collaborative filtering algorithm can better guide the resource allocation task of the 5G communication system. For the CNN, it can also better predict three characteristics of resource allocation of communication system. The prediction errors for all three features are distributed within 2.5%. User and user energy efficiency characteristics are the most difficult to predict. The prediction error of this part of the features is only 2.49%. The prediction error of channel and channel energy efficiency characteristics is only 1.48%. These three error distributions illustrate the feasibility and reliability of CNN in the task of resource allocation in 5G communication systems. This research uses the CNN and CF algorithm to realize the resource allocation problem of 5G communication system, which also has certain self-recommendation ability. For the practical application of 5G, it can save a lot of time and human resources, which is a valuable study.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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