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*Article*

# Research on a Fog Computing Architecture and BP Algorithm Application for Medical Big Data

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**Abstract:** Although the Internet of Things has been widely applied, the problems of cloud computing in the application of digital smart medical Big Data collection, processing, analysis, and storage remain, especially the low efficiency of medical diagnosis. And with the wide application of the Internet of Things and Big Data in the medical field, medical Big Data is increasing in geometric magnitude resulting in cloud service overload, insufficient storage, communication delay, and network congestion. In order to solve these medical and network problems, a medical big-data-oriented fog computing architecture and BP algorithm application are proposed, and its structural advantages and characteristics are studied. This architecture enables the medical Big Data generated by medical edge devices and the existing data in the cloud service center to calculate, compare and analyze the fog node through the Internet of Things. The diagnosis results are designed to reduce the business processing delay and improve the diagnosis effect. Considering the weak computing of each edge device, the artificial intelligence BP neural network algorithm is used in the core computing model of the medical diagnosis system to improve the system computing power, enhance the medical intelligence-aided decision-making, and improve the clinical diagnosis and treatment efficiency. In the application process, combined with the characteristics of medical Big Data technology, through fog architecture design and Big Data technology integration, we could research the processing and analysis of heterogeneous data of the medical diagnosis system in the context of the Internet of Things. The results are promising: The medical platform network is smooth, the data storage space is sufficient, the data processing and analysis speed is fast, the diagnosis effect is remarkable, and it is a good assistant to doctors' treatment effect. It not only effectively solves the problem of low clinical diagnosis, treatment efficiency and quality, but also reduces the waiting time of patients, effectively solves the contradiction between doctors and patients, and improves the medical service quality and management level.

**Keywords:** Medical big data; IoT; fog computing; distributed computing; BP algorithm model

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## 1 Introduction

In large hospitals, service platforms based on medical Big Data are increasingly adopted, and the processing, analysis, and mining of medical Big Data have been greatly improved. Yet, the current medical system needs to address some problems. To improve the diagnosis efficiency and quality, it needs to make full use of the information acquired from the medical service platform to support doctors. Cloud computing is the central platform for the analysis and processing of medical Big Data and provides technical support and improved management for the construction of the hospital's smart medical service platform.

In recent years, many experts and scholars at home and abroad have proposed cloud computing-based medical Big Data mining platforms and algorithms [1–5]. Fog computing is an extension of cloud computing, not a replacement. It is a concept first proposed by Cisco in 2012 to address the problem of lacking cloud computing in Big Data processing in the Internet of Things [6]. Its extensive application has become a research hotspot in recent years, especially for medical Big Data processing services. The technical application of these platforms and algorithms promotes the construction of medical service informatization. However, with more applications of the Internet of Things in medical care, the edge devices of the medical Big Data platform in the Internet of Things system generate a large amount of data. If these data are stored and processed in a cloud server, there will inevitably be problems such as overloaded cloud centers, insufficient storage, and communication delay, which will lead to congestion or paralysis of the entire network system, reducing the efficiency of doctors' diagnosis, and even failing doctors to diagnose or increasing the waiting time of patients.

For these practical problems, it is proposed to introduce a layer of fog computing in the Internet of Things architecture, structural advantages and characteristics of distributed models using fog computing, namely, decentralization, with its low latency and low power consumption effectively solving the problem based on cloud computing. As the fog computing layer is a near-edge device, the proposed computing method in the fog computing system architecture adopts a distributed node (edge) computing scheme, although the computing power of the edge device is relatively weak. As such, it can give full play to the computing function of each edge device, which relieves the burden on cloud computing servers and improves the computing efficiency of the overall medical Big Data system. At the same time, it also saves the system's storage room, because after the data is processed at the fog service layer, much data is directly fed back. It goes to the edge device for user service and skips going around the cloud center server, so it can save communication time and effectively guarantee the smooth communication of the Internet of Things, greatly reducing communication delay, ensuring system stability and doctor's diagnosis efficiency, and reducing patients' waiting time to improve the quality and efficiency of medical services. The research results provide theoretical support and practical experience for the informatization and intelligence of medical services. This project is innovative, forward-looking, and practical, and the research has great significance in the application.

The medical diagnosis model is one of the important organizations of the medical Big Data fog computing architecture. That's where BP algorithm model comes in. It is an autonomous learning model based on the medical Big Data training set, which can effectively improve the diagnosis results and reduce the rate of misdiagnosis.

## 2 Medical Big Data and Fog Computing

Big Data and fog computing occupy an important position in the modern smart medical service system, especially since the application has been greatly developed.

### *2.1 Medical Big Data*

Medical Big Data is a kind of Big Data application type for medical treatment, which generally refers to all data collections related to activities of medical care and health status, covering the entire life cycle from birth to death, including the data of immunization, physical examination, treatment, exercise, and diet. The Big Data generated by health-related activities includes medical services, disease prevention and control, health protection and food safety, health care, and other aspects.

Medical Big Data plays an important role in Big Data application, which is mainly reflected in two aspects. On the one hand, personal health is the most important thing, and so is its data; the daily use by patients, doctors, enterprises, and governments generates massive amounts of medical data. These Big Data can be divided into data of medical records and nonmedical records.

A. Big Data of medical records refers to words, symbols, charts, images, slices, and other data produced by hospitals in the process of medical activities, that is, medical records.
B. Big Data of nonmedical records refers to other medical Big Data other than medical records, including:
a. Medical Big Data from nonmedical records formed in the process of disease diagnosis and treatment, such as: CT, hemodialysis, renal dialysis, electrocardiogram, X-ray films, and other inspections. There are also related data from treatment. It is related to body health, but is not stored in medical records;
b. Transaction data formed by patients buying and selling drugs;
c. Medical Big Data formed by public health, such as nucleic acid testing;
d. Medical Big Data formed in clinical trials and applications of drugs and equipment, etc.

How should we collect, mine, analyze and apply these medical Big Data? On the basis of consulting relevant information, we use fog computing architecture to collect data from each node and use BP algorithm for internal calculation and analysis.

### *2.2 Fog Computing*

A. Concept

Fog computing is an infrastructure for distributed computing services for the Internet of Things. It extends applications such as data computing, analysis, storage, and intelligent control to every corner of the network edge, enabling users to manage, analyze, and apply data on local devices, and it gets instant service through the network. It is between cloud computing and personal computing, composed of various functional devices with weak performance and scattered at the edge of the network. It is a para-virtualized service computing architecture model and a new generation of distributed computing. It is compatible with "decentralization" features of the Internet, with quantity as its advantage as no matter how weak the capability of a single computing node is, it can play an important role [7]. It is widely used in smart medical service systems based on the Internet of Things.

B. Features

Features such as low latency, low power consumption, wide distribution, a large quantity of nodes, strong mobility, weak computing, strong location awareness, and strong data confidentiality and security are more convenient for mobile deployment to meet a wider range of requirements, especially for the 5G business. Node access, especially the wide application of a large number of apps in smart medical services.

C. Application

Fog computing is best suited for critical IoT applications that are time-sensitive and require real-time responses, such as medical Big Data acquisition and preprocessing, short-term data storage, condition monitoring, and rule-based decision-making. The goal of medical-oriented fog computing equipment is to analyze and signal data with strict timing requirements, such as surgical platform, equipment status, fault alarm, warning status, voice control, medical interaction platform [8], as well as the real-time acquisition of an individual's health status, which can minimize network delay, and improve the efficiency of individual health diagnosis, occupying an important role in disease prevention.

## 3 Application Advantages of Fog Computing Architecture in Smart Medicine

In the smart medical IoT architecture, millions of medical devices are interconnected, and massive data in each medical device is rapidly generated and gathered. Cloud computing confronts the explosive growth of data, and the calculation, storage, and management of data within the system are greatly affected. This kind of cloud center service technology is based on the centralized computing model stores, calculates, and manages data. This computing model is not flexible and not easy to expand, and it is far away from each node of the medical Internet of Things. The traditional technologies and methods are not suitable for the needs of the rapid development of the smart medicine Internet of Things nowadays, especially the Big Data service system for clinical medical care based on the Internet of Things [9]. Fog computing technology will be the best option and will be rapidly developed and applied because fog computing technology is a decentralized computing model, that is to say, distributed computing. It is a localized data processing method. It is processed, stored, intelligently controlled, and managed around data devices. Its elastic structure extends cloud computing service technology to every corner of the Internet. Therefore, it shortens the distance across the network, reduces network latency, improves the efficiency of data processing, and increases the amount of data that needs to be transmitted to cloud servers for processing, analysis, and storage [10].

With the rapid development of sensor application, the current Internet of Things application is sweeping (impacting) almost every industry, especially the application of smart medical Big Data. The number of smart terminals and the scale of collected data are increasing drastically. For digital enterprises using cloud computing, storage and management all bring great pressure. Through fog computing technology, a large amount of real-time data does not need to be transferred to the cloud for storage and computing, requiring certain data sent back to the cloud. Instead, data stored at the edge of the network can be processed directly. It greatly improves efficiency. In short, it can reduce the pressure of cloud computing and ensure the smooth operation of the entire system.

Based on the analysis above, Fog computing architecture technology, namely distributed computing technology, has the following advantages:

A. Reducing Energy Consumption

Cloud computing services store a large amount of data in a "cloud center" for computing, and its core is a "data center" with numerous servers and adequate storage room. Since semiconductor chips and other supporting hardware are still power-hungry, it is hard for heat dissipation. According to the relevant data, the power consumption of global data centers is equivalent to the power supply of 30 nuclear power plants, of which 90% of the power consumption is wasted and the efficiency is very low. For example, Google's data centers around the world use 300 million watts of electricity, with more than 30,000 U.S. households consuming electricity. It can be foreseen that the data transmission volume will further increase exponentially in the future, and the cloud computing service center will no longer be able to sustain, and the use of fog computing technology is a good solution to this problem. It is also a good way to reduce the consumption of the smart medical service system.

B. Improving Efficiency

As IoT applications are being used, increasingly, various industries including medical equipment, home appliances, wearable devices, automobiles, industrial, agricultural, commercial equipment, and other terminal devices that need to be connected to the Internet will increase, which will generate a very large amount of data transmission and reception. It may cause input and output bottlenecks between the data center and the terminal, greatly reducing the transmission rate, and even leading to a great delay. And some devices that require a real-time response will not be able to ensure normal operation, such as medical monitoring equipment, drones, security alarms, etc. Using fog computing technology can effectively solve these problems.

C. Easy for Big Data Processing

The solution for a large number of enterprises and institutions to collect massive data is to reduce the frequency and decrease the total amount of data collection. For example, sampling every 10 min may take hundreds of times a day. The accuracy and efficiency will be greatly reduced. Devices requiring massive, uninterrupted data collection will lower their service value, while some devices that require timely decision-making need to wait for all data to be uploaded to the cloud computing service center for computing and decision-making before returning to the device, which will greatly reduce service capabilities. For the real-time intelligent medical service system, fog computing technology can effectively solve these problems.

D. Reducing the Burden on Cloud Servers

The fog computing layer is located in the middle of the cloud computing layer and the terminal layer. The data is in the communication between the user terminal and the data center. Since the terminal sensor generates a large amount of data and needs to be transmitted, the fog computing technology effectively filters and processes the large amount of data unnecessary to the cloud. It only sends the needed data to the cloud, which greatly reduces the burden on the core network bandwidth. In the intelligent medical service system, the edge equipment of each department has the function of data processing, and unimportant data can‘t be uploaded to the central server.

E. Highly Reliable Network Service

In the Internet of Things, for users in different areas, the same or similar services are deployed to the fog nodes in each area, and each node provides corresponding services with independent functions, which makes high network reliability an inherent attribute of fog computing. If the service in a certain area of the Internet of Things is abnormal, the user request service can be quickly transferred to the fog nodes in other nearby areas. For example, in medical image processing, if node A fails and is unable to store or recall images, adjacent node B can be used.

F. Ensuring the Safety of Equipment Upgrades

At present, the application of medical devices has been updated rapidly. There are many devices in the intelligent medical system based on the Internet of Things. When there is no mature technology platform, how to calculate most of the devices has been finalized when they leave the factory unless a very important method is used to remotely upgrade its entire system. But this upgrade is inefficient and dangerous. It is possible to change the operating system and millions of devices may lose connectivity. Architecture technology of Fog computing can solve these problems.

Architecture technology of Fog computing not only promotes the expansive use and enhancement of cloud computing technology but also proposes a "decentralized" distributed computing solution in the medical system integrating the Internet of Things and Big Data. When the device is completed, the cloud computing resources are released, so that it can better complete other more important computing tasks. At the same time it can alleviate the problems of insufficient network bandwidth resources and network delay, and improve the quality and management of medical services.

## 4 Fog Computing Architecture and Diagnostic Computing Model for Medical Big Data

Architecture technology of Fog computing has been widely used in medical Big Data systems. With the rapid development and wide application of Internet of Things technology, medical Big Data and related technologies of the Internet of Things are deeply integrated, which puts forward new functional requirements for Architecture technology of Fog computing, especially for the medical application of 5G mobile terminals. The data processing volume is large, and the data structure of each sensor is different. If it continues to be processed by the cloud, it may easily make the system overloaded and paralyzed. In addition, the storage capacity of cloud services is limited. Therefore, the practice has shown that Architecture technology of Fog computing can effectively solve such problems.

### *4.1 Medical Big Data Processing Architecture*

The medical Big Data processing architecture mainly includes data collection, data processing, data analysis, explain and application scenarios, as shown in Fig. 1.

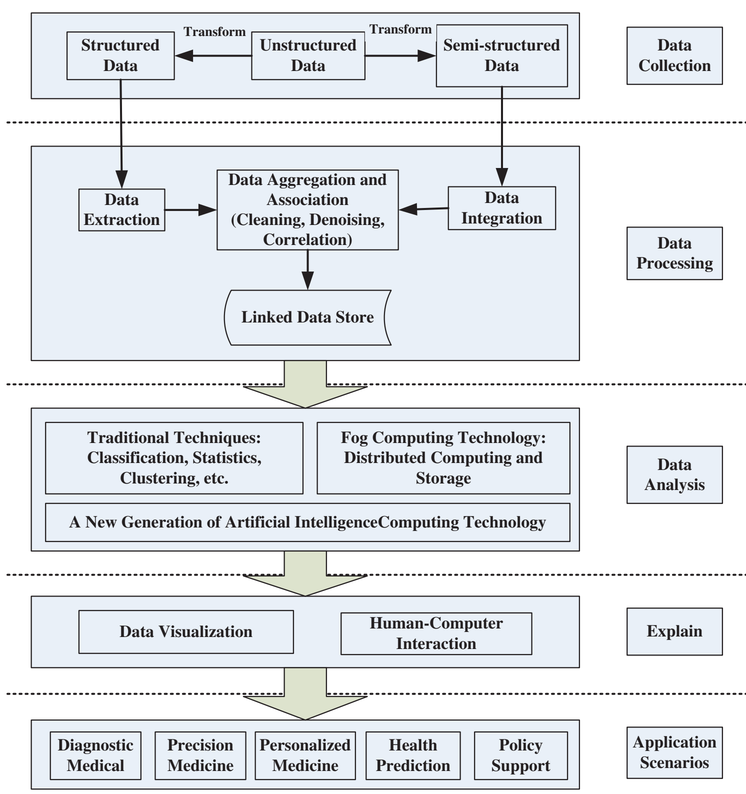


**Figure 1:** Medical big data processing architecture

### *4.2 Fog Computing Architecture*

The fog computing architecture uses Big Data such as APache Pig and APache HBase to collect and store massive sensor data generated from different sensor devices. It uses a distributed architecture. It is located at the edge of the network, very close to end users. The service requirements of users' computing resources are processed in time, such as access network in the Internet of Things or near-field gateway devices, local devices or communication modules connected to the devices, more specifically, routers, switches, servers, APs, PCs, mobiles, etc. They form the network edge [11,12], and these devices that provide fog computing capabilities are usually called fog nodes. For the medical system, it can improve the situation of insufficient bandwidth or excessive delay caused by the transmission of a large amount of data to the cloud computing center in the medical system and can take advantage of local computing resources to reduce the network time delay. These are great advantages to medical care in network real-time computing and decision-making [13]. At the same time, it deepens the integration of medical Big Data and the Internet of Things.

#### *4.2.1 Architecture Composition and Working Mode*

Due to the flexibility of fog computing infrastructure deployment, the fog computing architecture is also flexible. It consists of an edge layer (user layer), fog layer, and cloud layer, and its architecture is layered. Among them, the structure of the fog layer is constructed by completing the abstraction of the physical resources (including computing, storage, and network) of the fog nodes and the coordination of applications or services (such as various IoT applications) [14]. In addition, it is inevitable to provide a computing platform for various functional modules. It is shown in Fig. 2.

A. The Internal Hardware Architecture of the Fog Layer is shown in Fig. 3.
B. The Internal Software Architecture of the Fog Layer is shown in Fig. 4.
C. The Internal Implementation of the Fog Layer

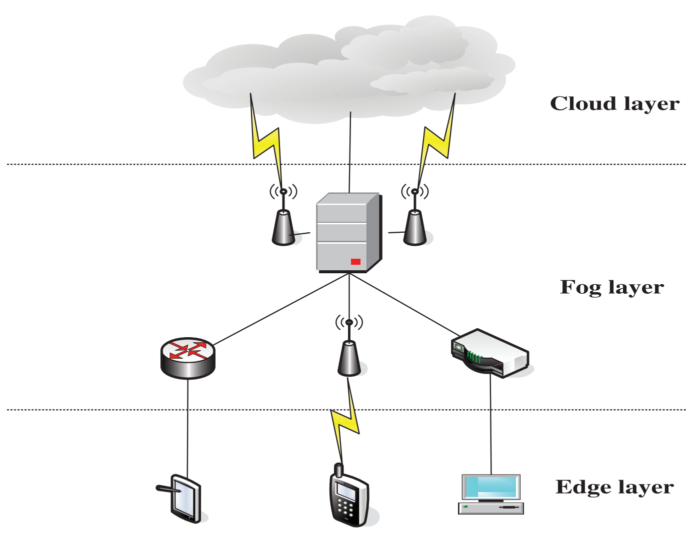


**Figure 2:** Fog computing architecture

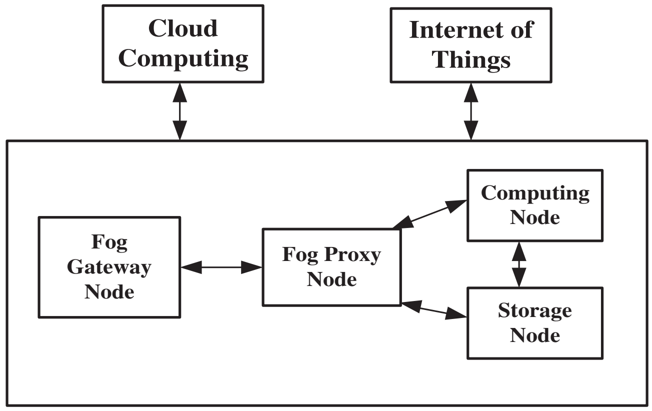


**Figure 3:** The internal hardware architecture of the fog layer

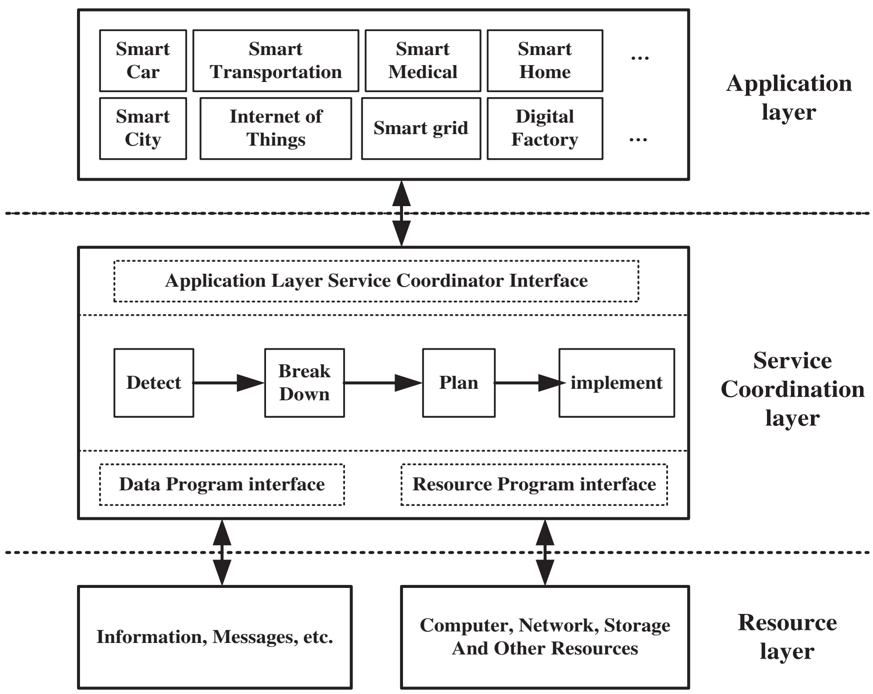


**Figure 4:** Internal software architecture of fog layer

The Abstraction Layer of fog computing provides unified resource access, monitoring, and management in heterogeneous infrastructures through customizable APIs and UIs, while ensuring multitenant security and privacy. The Orchestration Service Layer is mainly used for lifecycle management and coordination of upper-layer applications or services. Due to the distributed nature of fog computing infrastructure, this layer needs to implement many distributed components to meet the dynamic requirements and management of resources for various applications, such as distributed databases, various software middleware, and policy management components.

D. The Operation of Fog Computing

In the medical service system, the cloud center sends medical data to the fog server. The fog device obtains medical data from its server. Users (doctors or patients) obtain medical data through the nearest fog device. The fog only stores the recently used medical data. The edge layer is connected to the Internet. Similarly, the data generated by the edge medical device is transmitted to the nearest fog device through the Internet, and the data is processed and stored by fog computing, and the necessary data is uploaded to the cloud center.

In addition to the above architecture, there is another architecture called M2M architecture, which is a machine-to-machine communication architecture. Since the significance of cloud computing and fog computing is to make full use of idle resources, sharing can be realized.

#### *4.2.2 Architectural Features*

There are three nodes in the fog computing architecture: edge nodes, fog nodes, and cloud nodes. One fog node can be arranged on each connection point of the Internet of Things. One fog node serves multiple edge nodes, and multiple fog nodes are provided service by a cloud node. The architectural advantage of fog computing lies in the releasing and sharing of computing resources, which effectively improves the utilization of IoT resources. Compared with the centralized architecture of cloud computing, fog computing adopts a distributed architecture, which is closer to users, thus reducing network access delay and improving the flexibility and capacity of resource management.

### *4.3 Fog Service Diagnosis Calculation Model*

In the fog computing architecture, the diagnostic computing model of medical Big Data adopts the artificial intelligence BP neural network model. The model uses the patient's medical records and the condition of the disease as the input and output of the training to optimize the connection weights, making the function correspond to the output of model neurons. When training the neural network, it will predict the output based on its connections and weights. The learning processes algorithm of artificial intelligence BP neural network:

A. Initialize Weights

In the input layer, random data is generated according to the situation and assigned to the weight, which is used as the initial training value.

B. Calculate the Weights Forward

After the initialization data is input into the input layer, it enters the hidden layer through weighted summation. Here, the input layer node i, the hidden layer node j and its input value $I_j$, and the calculation formula of its output value $H_j$ (1):

$$H_j = f\left(I_j - \theta_j\right); I_j = \sum_{i=1}^{n} w_{ij} x_i \tag{1}$$

where $W_{ij}$ is the connection weight from the input layer node i to the hidden layer node j, $\theta_j$ is the threshold value of the hidden layer node j, the BP heuristic function is a continuously differentiable logarithmic sigmoid function, and its function formula is (2):

$$f(x) = \frac{1}{1 + e^{-\mu x}} \tag{2}$$

where μ is the controllable slope parameter.

Calculate the formula for the value $Y_k$ of the output layer node k (3):

$$Y_k = f\,(I_k - \theta_k); I_k = \sum_{j=1}^{m} w_{jk} H_j \tag{3}$$

where $W_{jk}$ is the weight from the hidden layer node j to the output layer node k, and $\theta_k$ is the threshold value of the output layer node k.

C. Backpropagation of the Error Signal

If the data output by the output layer does not meet the requirements, the process of back propagation will occur, the error signal will be returned along the original connection path, and the error signal will be minimized by modifying the connection weights of neurons in each layer, by iterating and performing these steps to minimize the error between the network output and the desired output using the incremental rule. The calculation formula of total error E of artificial intelligence BP neural network is (4):

$$\mathrm{E} = \frac{1}{2} \sum_{k=1}^{l} (D_k - Y_k)^2 \tag{4}$$

Among them, $D_k$: the target value of the output node k of the output layer; $Y_k$: the actual value of the output node k of the output layer.

D. Error Calculation and Weight Correction

a. If node k is the output layer node, then the error signal $\delta_k$ calculation formula is (5) and the weight adjustment calculation formula between the output to the hidden layer node j is (6):

$$\delta_k = (D_k - Y_k)\,(1 - Y_k)\;\; Y_k \tag{5}$$

$$w_{jk}\,(t+1) = w_{jk}\,(t) + \varepsilon \delta_k H_j \tag{6}$$

where $\varepsilon$ is the gain factor, which is a positive number in the [0, 1] interval.

b. If node k is the hidden layer node, it means that the connection weight is acting on the node on the hidden layer, so $\delta_k = \delta_j$. Therefore, the calculation formula (7) of the error signal $\delta_j$ of the hidden layer and the difference between the input node weight adjustment calculation formula (8).

$$\delta_j = H_j \left(1 - H_j\right) \sum_{i=1}^{l} \delta_k w_{jk} \tag{7}$$

$$w_{ij}\,(t+1) = w_{ij}\,(t) + \varepsilon H_j \left(1 - H_j\right) x_i \sum_{i=1}^{l} \delta_k w_{jk} \tag{8}$$

At present, the application technology of the fog computing diagnosis model for medical Big Data in the Internet of Things architecture is of high complexity and great commercial value, and it mainly exists in the fog server. Recording Big Data can infer personal eating habits, and its models can predict some potential health risks, especially diet-related diseases such as obesity, hypertension, diabetes, and gout. In addition, taking into account the characteristics of an individual's physiology, immunity, and constitution, personalized treatment simulations can be used to predict an individual's health risks and make optimal treatment plans and health plans to improve individual health ecosystems.

## 5 Organic and Deep Integration of Fog Computing Framework Technology and Medical Big Data Technology

Fog computing framework is a distributed computing structure that makes full use of the advantages of surrounding edge devices to effectively process, store, and intelligently control data.

This advantageous structure extends fog computing services to all corners of the Internet of Things, reducing unnecessary data flow. The cloud center uses the advantages of local computing and storage to reduce the burden of the cloud center and network latency and improve the operation efficiency of the medical system.

With the advent of the digital economy era and the improvement of people's requirements for quality of life, the requirements for medical services have also increased accordingly. It is difficult for traditional medical information services to meet people's needs [15], such as 5G, intelligent speech recognition, Big Data, and other technologies. Therefore, under the integration and development of fog computing and Big Data, the use of fog computing framework and Big Data to construct the informatization of the medical department is the main development direction of the medical department. Fog computing framework can effectively reduce costs in the medical sector and can provide better security and stability, as well as a better user experience. The sources of medical Big Data mainly include medical laboratory data, clinical medicine, nursing and rehabilitation, pharmaceutical companies, as well as social networks. As the Internet of Things and 5G era is coming, the distributed computing model of fog computing has become widely used in the development and application of medical Big Data, and it is shown very effective. In particular, its application can change the business model of the medical service industry. It can improve the monitoring of public health and the algorithm of clinical trial design quality, realize personalized treatment mode, and improve the integration of fog computing technology and medical Big Data, etc.

The fog layer in the medical system is mainly composed of edge devices with certain computing and storage capabilities, such as gateways, switches, routers, signal transmitters, etc. Such edge devices are usually called fog devices, which are mainly deployed in various departments in hospitals. Through the wired connection with the wireless access device, the data can be forwarded quickly; at the same time, the fog device downloads medical information such as medical images and other medical information from the cloud server through active caching according to the characteristics of the surrounding departments. Statistics and analysis results of Big Data and storage of medical information will be transmitted through it. In addition, the fog device also receives and stores medical data from medical sensors and then compares and calculates with the medical data according to the analysis results of its cached medical information such as medical images and other medical Big Data. At the same time, the cached medical information and diagnosis and treatment records and other data are uploaded to the cloud server to achieve global data sharing. Due to the large amount of data and different structures of medical information like medical images, fog equipment performs distributed computing to balance the load, so that the Internet of Things information can be exchanged smoothly, avoiding medical network delay or blockage, and ensuring diagnostic results within a short time. It can be used for reference by doctors, and the results can be quickly fed back to doctors, which greatly reduces the time of diagnosis and treatment of doctors and the waiting time of patients, and improves the level and quality of medical services.

The medical Big Data acquisition layer in the fog computing architecture is composed of data nodes and adapters, providing a unified system access interface for multisource heterogeneous data from the hospital, Internet, or user-generated content. The role of the adapter is to preprocess the raw data into various structures and formats, while ensuring the security and availability of data transmission. The goal of the distributed computing mode of fog computing is to improve the capacity and efficiency of the medical system and to reduce the delay of network communication, using network edge technology to effectively process data, reduce the amount of bandwidth required for transmission through cloud channels, and ensure the security, confidentiality and reliability of data.

## 6 Conclusion

This paper proposes a fog computing framework for medical Big Data in view of the current cloud computing in the application of medical Big Data, such as the heavy burden of cloud servers, serious network delay and other shortcomings, which lead to low efficiency of medical diagnosis. It also studies the scheme of? The framework and BP algorithm fusion application to effectively solve the low efficiency of medical diagnosis. The scheme uses the distributed computing mode technology of fog computing architecture to achieve remarkable results in Big Data computing analysis, storage, intelligent control and other services in the medical system, improve the stability and practicality of the intelligent medical system based on the Internet of Things and fog computing framework, improve the diagnostic efficiency, effectively expand the computing resources and application services of cloud computing, ensure smooth network communication of the intelligent medical system, reduce network latency Make full use of network bandwidth to ensure the security and confidentiality of smart medical Big Data. Especially, the advantages and characteristics of fog computing model are fully applied to the smart medical diagnosis system to effectively solve the reliability, accuracy, and expertise of the medical diagnosis system. Artificial intelligence BP neural network algorithm is used in the core computing model of the medical diagnosis system to enhance medical intelligence-aided decision-making and improve clinical diagnosis and treatment efficiency. In a word, the integration of fog computing framework technology and BP algorithm has high research value and practical significance in the application of medical Big Data.

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