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Computer-Aided Design AND APPLICATIONS

Internet of Things and Big Data based Analytics on Consumer Psychology and Behavior

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Abstract. Over time, the Internet has spawned Internet of Things and big data analysis tools that can solve human problems more quickly, followed by relevant research on the mass consumer population. Before starting the study, a large amount of sample data is needed for data support to ensure the accuracy and authenticity of the study. However, studying human psychological behavior is not an easy event to analyze, and how to correctly analyze consumer psychology and behavior is a major challenge in construction. Based on the above situation, this article systematically constructs consumer psychology and behavior under the background. Analytics, and further explores human psychological and behavioral activities. First, it discusses the development in various countries, as well as the current social situation of IoT and Big Data. Analytics. Analyze and organize relevant data on consumer psychology and behavior through the system constructed under IoT and Big Data. Analytics. The optimization of the overall analysis system was also studied by adding the growth curve function Sigmaid and the activation function Tanh. The research results show that after optimizing the consumer psychology and behavior analysis system based on IoT and Big Data. Analytics and big data analysis, the specific application results show that it has good use effects.

Keywords: IoT and Big Data; Analytics; Deep learning; Function learning; Network structure
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1 INTRODUCTION

With the progress and development of to the times, the economy has reached a new height. In the continuous development of various business industries, in order to further understand consumers' purchasing psychology and behavior, and thereby promote product sales [1]. Due to the existence of erratic phenomena in the psychological and behavioral factors of consumers, and the fact that consumers themselves are human beings, it is particularly difficult to avoid jumping between ideas. Andronie et al. [2] analyzed real-time production logistics and network physical processes based on

the Internet of Things. By connecting various devices, sensors, controllers, and other IoT devices in production logistics and network physical processes through IoT technology, remote monitoring and control of these devices can be achieved, thereby achieving real-time monitoring and control of logistics and network physical processes. Andronie et al. [3] installed sensors in production lines and warehouses to monitor the status of material procurement, processing, storage, transportation, and other processes in real time, including information on material inventory, transportation speed, production progress, and alarm and handling of abnormal situations. At the same time, various visualization tools are used to display the collected and processed data in a graphical and visual manner, in order to better understand the status and trends of production logistics and network physical processes. There are many uncontrollable internal factors, so it is also difficult to analyze them. The study of consumers' purchasing inner activities and behaviors has also been the research direction of relevant researchers to overcome the above difficulties. Turksayar et al. [4] analyzed computer-aided design and computer-aided manufacturing (CAD/CAM) composite materials. The results indicate that the volume loss value in glass ceramics is between CAD/CAM composite materials and polyether ether ketone. Han and Ge [5] believe that applying computer assisted virtual reality to the design of psychological experimental teaching systems has positive significance. Consumers can generate many psychological and behavioral activities in the process of selecting goods. Compared to studying psychology and behavioral behavior alone, research and analysis during the purchase process requires an excellent system for analysis. From the perspective of the analyzed system model itself, when processing data about consumers' inner thoughts and behaviors, data transmission errors often occur, ultimately leading to deviations in system results. Mathieu et al. [6] applied a method based on deductive content validity to construct a human dimension CATA dictionary. Mohai et al. [7] External Environmental Aspects of the analyzed system model, variable weather and temperature can also have some impact on certain aspects of the model system. Therefore, in the process of constructing an analysis system, it is necessary to integrate the above factors, and then construct the model. Rocha et al. [8] compared the different results of different restoration materials. It believes that it is necessary to consider the overall performance of the system in terms of the Internet of Things and big data. Analysis, and whether it can truly be practical. Therefore, it is necessary to comprehensively consider a system based on building an environment for consumer psychology and behavior to maximize system capabilities.

In order to better integrate the modeled model system into the psychological and behavioral analysis of consumers, we should correctly grasp the key points of the problem. And then conduct one-on-one research on key issues through the overall system interior and optimize them. Analytics itself covers a variety of content, with the continuous improvement and upgrading of the construction of analysis systems, the system model constructed with its own background also has a huge data system. Initially, the psychological and behavioral analysis of consumers only relied on the experience of shopping guides and their ability to observe behavior. Rojewska et al. [9] explored the application of computer assisted diagnosis and treatment of anorexia nervosa. This paper introduces the methods that can strengthen the work of psychologists by using natural language processing. Stearns et al. [10] tested the psychological analysis of depression symptoms in military personnel. Acceptability analysis was conducted before and after the experiment. The main reason for using IoT and Big Data. Analytics is that the things analyzed by the system are abstract and changeable, which cannot be achieved in ordinary environments. Only with a huge backing can it pave the way for researching the system. In the analysis system under study, a big amount of data information is collected for preliminary processed [9]. After systematic learning, analyze and organize the data to obtain ideal result information. During the operation of the analysis system, its main purpose is to strengthen data analysis capabilities and improve data processing accuracy. Tsourela and Nerantzaki [11] believe that IoT product perception applications are widely applied in various fields, enabling the perception and collection of various information in the physical world, thereby achieving remote monitoring and control of the physical world. Xu et al. [12] utilized technologies such as sensors and intelligent sensing devices to perceive and collect various information in the physical world, thereby achieving remote monitoring and control of the physical world. Xu and Zheng [13] introduced theoretical knowledge of design and psychology. Through the in-depth analysis of the visual

presentation and interaction factors of data visualization expression, the depth association with image graph sub mode is established. At the same time, seven types of abstract sub patterns that have been systematically studied and validated were visually validated. On this basis, the design enlightenment of data visualization is proposed for basic mode, force mode, control mode, spatial mode, process composite mode and attribute mode. Common IoT product perception applications include: intelligent door locks: remote switch control of door locks is achieved through intelligent perception devices such as fingerprint recognition and facial recognition. Smart home: Through intelligent perception devices such as smart speakers, smart light bulbs, smart televisions, etc., remote control and intelligent management of smart home devices are achieved. the depth association with image graph sub mode is established. From the above content, it can be seen that the system constructed for the psychological and behavioral analysis of consumers in the context of the Internet of Things and big data analysis has considerable application prospects. This article conducts optimization research by optimizing the overall analysis system and adding algorithms and functions.

2 ANALYSIS OF THE CURRENT SITUATION OF BIG DATA IN THE INTERNET OF THINGS

As network informatization in life becomes increasingly inseparable from people's lives, the behavior of ordinary human resources to conduct various types of data analysis and processing is becoming increasingly distant from people's lives. Nowadays, the Internet of somethings and big numbers analysis has been widely used within All kinds of the fields, and are continuously integrated into systems in various fields. The research in this article is to systematically model consumer psychology and behavior based on IoT and Big Data. Analytics, and then conduct preliminary research on people's psychology and behavior. In the process of model construction using the IoT of big data analysis methods, deep learned algorithms, are added to the IoT the model to enable the system to have the correct data analysis process and enter the correct operating state, and have the ability to learn information data. Only by ensuring the correct operation of internal data analysis in the analysis model system can this acc of data processing in the overall system be accurately improved, and can it be applied to people's lives. Only when the analysis system is running and there are no research errors in the system itself can the system be kept running normally. However, in different application fields, the system requirements for analyzing and processing data will also be different. The analysis and processing system model studied in this article has been upgraded and optimized when processing a series of data about consumers' psychology and behavior.

The United States is one of the countries where The System are most widely used, and the methods are mostly used in the financial field. For example: stock, banking, and other financial industries. This System methods have also been applied to other industries, such as food production. When a big amount of information and Data processing required, systems will emerge in the context of the Internet of Things and big data analysis. Using powerful networking as the processing background, various control terminals within the system are combined to perform classification processing operations on data. Through the huge internal storage structure of the system, data is ultimately transmitted to achieve the purpose of use. Compared to manual data collection and analysis, it not only directly replaces people, but also can obtain amazing data results in the shortest time, maximizing the cost of employing labor, and saving costs. Moreover, in the process of human data collection and analysis, it is inevitable to avoid the occurrence of errors in judgment caused by uncontrollable third-party factors due to long-term working conditions. The method of combining IoT and Big Data. Analytics can save costs and work for a long time. The fundamental purpose of this is to maximize the data analysis capability under IoT and Big Data. Analytics.

In order to accelerate the speed of China's economy, China has begun to conduct research on consumer behavior, with the aim of quickly understanding consumers' inner trends and improving the sales rate of goods. Under the premise of ensuring that the operation of the analysis system for IoT and Big Data. Analytics is not affected, the analysis system. Analytics is subjected to repeated data processing. Then, based on the results and data, the overall analysis system was optimized and improved to achieve the assumption of replacing human resources with information products. This

article also conducts corresponding research on a series of data on consumers' psychology and behavior.

3 SYSTEMATIC RESEARCH ON CONSUMER PSYCHOLOGY AND BEHAVIOR UNDER THE IOT AND BIG DATA ANALYTICS.

3.1 Research on Systematic Construction of Consumer Psychology and Behavior

After constructing the system under the Internet of Things, when the system enters the operational state, whether the internal consumer psychological and behavioral data can be correctly analyzed and collated is the key direction of this study. In the specific implementation of a well-constructed model system, it is mainly to allow psychological and behavioral related data to undergo internal data screening and comparison, and automatically determine whether it conforms to reality. When the system is in running state, it is necessary to provide algorithms and functions for functional modules, so that the overall analysis system can correctly process data. In the specific application of the system, the first step is to extract data information, and then analyze and calculate the data. Therefore, in what state the constructed analysis system is in, we can only minimize the error, but not completely avoid the resulting error. Due to the high complexity of the corresponding data for consumers' psychology and behavior, it is necessary for the analysis system under study to have strong data receiving and processing capabilities. By building a complete Internet of Things architecture through IoT and Big Data. Analytics within the system model, complex data information can be better analyzed. The architecture process of the Internet of Things is shown in Figure 1:

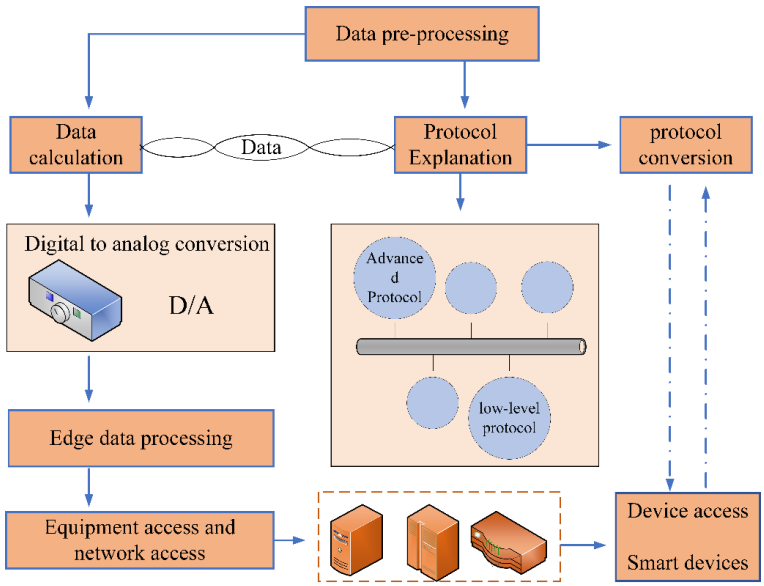

Figure 1: System internal IoT architecture flow chart.

As can be seen from Figure 1, the architecture process of the Internet of Things within the system we are studying. The internal construction of the overall model cannot be separated from the two major modules of the Internet of Things and big data. Through the mutual cooperation between various modules within the model, whether the analyzed data can be accurately analyzed depends entirely on the internal stability of the overall design system. To solve the above problems, the following formula is added:

$$MRE(k,k') = \frac{\sum_{i=1}^{a} k - k'}{a} \tag{1}$$

$$\begin{cases} W = \beta_i W_{i-1} + (1+\beta)\nabla L_i(W_{i-1}) \\ V = \beta_i V_{i-1} + (1-\beta)\nabla L_i(W_{i-1})^2 \end{cases} \tag{2}$$

$$\begin{cases} W_Y = W_Y / (1-(\beta_1)^Y) \\ V_Y = V_Y / (1-(\beta_2)^Y) \end{cases} \tag{3}$$

From the above formula, it can be seen that by adding a pair of excellent function algorithms, the analysis system under study can process data faster and more efficiently, and also provide the internal system with the ability to learn data. After the subsequent internal calculation of data, certain internal data will be generated. In order to effectively control the internal data, a controllable range has been added. The formula is as follows:

$$\omega_i = W - \alpha \frac{F_Y}{\sqrt{V_Y - \varepsilon}} \tag{4}$$

From the above formula, it can be seen that the system is given a controllable result data range, so that even if there is an error analysis situation during data analysis, data will be cleared due to non-compliance with the range. The simple structure of each module within the system is shown in Figure 2:

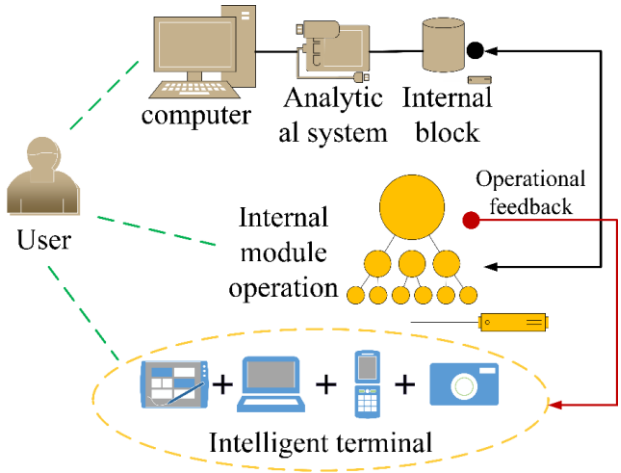

Figure 2: Simple construction of various modules within the system.

As can be seen from Figure 2, the internal construction process of the overall analysis system model we studied is summarized and four modules are added. The above four modules transmit and store data through the reception and scheduling of data information. In order to enable the system to have a deeper level of data learning capabilities, it is also necessary to add algorithms for the calculation and transmission of data within the analysis model system under study. The relevant formulas are as follows:

$$f = \sigma(M_f . [h_{j-1}, x] + b_f) \tag{5}$$

$$s = \tanh(M_s.[h_{j-1}, x] + b_s) \tag{6}$$

Through the introduction of the above formula, the overall analysis and research system model is endowed with the calculation functions of data forward propagation and data backward transmission. It also adds data forgetting, which allows you to automatically select the data to be deleted at any time for deletion operations, making it more valuable for applications. Moreover, it can smoothly activate the input data into the data storage module, during the backward transmission of the data. The data lost due to forgotten data can be automatically supplemented with blank data and automatically marked, so that the system can avoid analyzing and processing blank data. After in-depth learning of a series of classes, in order to more intuitively display the overall system performance, we have set the evaluation parameters and indicators of the model and system's ability to predicted data. The internal calculation formula is as follows:

$$Rmse = \sqrt{\frac{1}{n}\sum_{a=1}^{a}(predict - real)^2} \tag{7}$$

$$Mae = \frac{1}{n}\sum_{a=1}^{a}|\ predict - real\ | \tag{8}$$

After adding the above formula, the system can automatically conduct a comprehensive analysis of the speed and accuracy of processing data during operation and transmit it to the computer. Both the learning and computing aspects of highly complex data in analytical modeling systems have been addressed. The waveform data generated by the above computer terminal is shown in Figure 3:

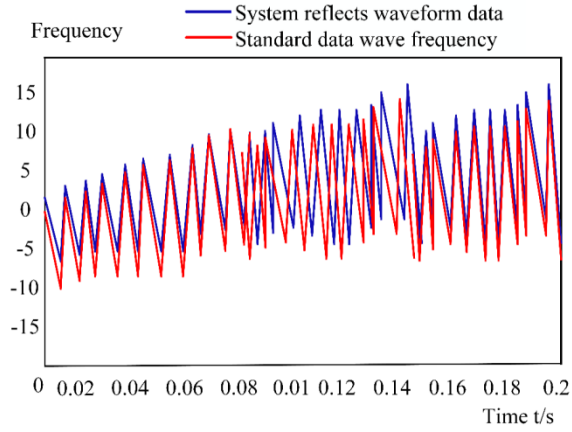

Figure 3: Efficiency data wave frequency generated during system operation.

It can the sea from Figure 3 that the constructed analytical model system does not produce significant waveform changes during operation. Moreover, the predicted value of the system is similar to the actual information data. In terms of the fluctuation amplitude of the overall waveform data, the model system exhibits strong information processing capabilities, and does not deviate from the standard wave frequency.

3.2 Research on System Optimization of Consumer Psychology and Behavior under the Internet of Things and Big Data Analysis

The above content has been systematically studied and constructed on consumer psychology and behavioral activity data based on the IoT and Big Data. Analytics. Next, we will upgrade and optimize the performance of the internal analysis system. It is known that IoT and Big Data. Analytics are

already powerful and have the widest coverage, so the sigmoid function and Tanh function have been added to the next optimization and upgrade process. The sigmoid function belongs to the data activation function, and data activation is also included in the above content. However, after research and analysis, it is found that the sigmoid function is more suitable for the analysis system studied in this article. The addition of this function can enable more comprehensive activation of internal data in the system. The relevant formula is as follows:

$$f(z)=\frac{1}{(1+e^{-n})} \tag{9}$$

$$f(z)=\frac{e^{n}-e^{-n}}{e^{n}+e^{-n}} \tag{10}$$

$$f(z)=\max(z,0) \tag{11}$$

From the above formula, it can be seen that both linear and nonlinear factors can be integrated into the sigmoid function, and the sigmoid function can calculate the output result value. When the numerical result calculation approaches zero, it will be omitted, but it will not have an impact on the data content studied in this article. The application of the Tanh function can also perform faster data analysis on particularly complex and difficult data information, effectively reducing the number of iterations of the data. The above two functions added in this article are applicable to a wide range of data types, and the referenced function calculation theory is also applicable. The data activation performance IoT and Big Data. Analytics model system on the computer side after adding the sigmoid function and the Tanh function is shown in Figure 4:

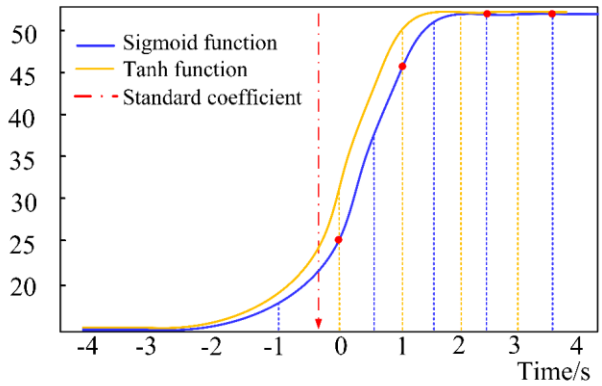

Figure 4: Data trend of efficiency curves for two types of functions within the system.

From Figure 4, we can see the specific trend of the efficiency curve of the sigmoid function and the Tanh function within the system. The curve data reflected in the graph exhibits a symmetric phenomenon over time, and the symmetric phenomenon of the curve also represents that both types of functions are normally activating the data without any activation errors. This phenomenon can also be understood that the addition of the sigmoid function and the Tanh function is very suitable for the systematic research of consumer psychology and behavior based on IoT and Big Data. Analytics studied in this article. The activation is normal and the system is stable, so that the final transmitted data can be trusted by people.

By adding the above equation, the parameters that generate errors can automatically adjust the position and weight ratio in a timely manner. Instead of deleting the errors, they can be recycled and continue to participate in the entire system operation process. By adding the above functions and

equations, the analysis and processing system we have studied has all been optimized. In order to further reflect whether the optimized analysis system can analyze and process relevant parameter data, we have inputted some numerical values into it, and the results are shown in Figure 5:

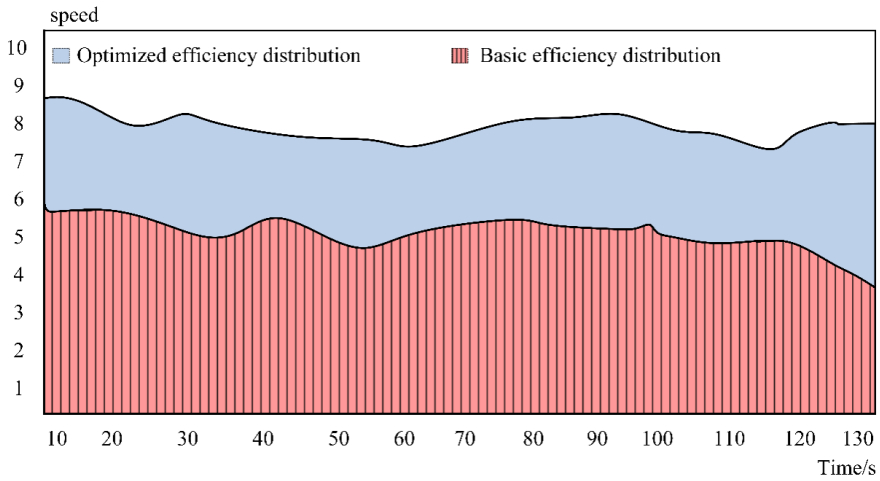

Figure 5: Efficiency distribution of the optimized I IoT and Big Data. Analytics system when processing data.

As can be seen from Figure 5, the optimized IoT and Big Data. Analytics system can maintain a stable data analysis speed when processing data. The overall processing efficiency is also very high, which shows that the internal performance of IoT and Big Data. Analytics system is stable, and the optimized system upgrade is also successful.

4 ANALYSIS OF SYSTEMATIC RESEARCH RESULTS ON CONSUMER PSYCHOLOGY AND BEHAVIOR UNDER IOT AND BIG DATA. ANALYTICS

4.1 Analysis of Research Results on the Systematic Construction of Consumer Psychology and Behavior Under IoT and Big Data.

In the process of constructing a system based on IoT and Big Data. Analytics of consumer psychology and behavior, this article aims to achieve correct information transmission, information processing, and information calculation through the model analysis system studied in order to be able to properly analyze the corresponding data information generated by consumer psychology and behavior. Select 100 sets of data for the completed analysis and processing system, and analyze and calculate the data through the analysis and processing system. In order to ensure the credibility and accuracy of this experiment, we will avoid high-temperature operation of the system model as much as possible, achieve a stable system environment as much as possible, and conduct repeated experiments. Finally, by comparing the results of each experiment, comparing and analyzing the previously proposed results parameters with their current ones, and finally determining the appropriate parameters to evaluate the experiment. When the system enters the working state, it is necessary to input 100 sets of data into the system, activate data, and learn data. When analyzing data, data processed beyond the range will be automatically deleted, retaining meaningful data information. If, during the experiment, the constructed model system can effectively avoid the analysis of invalid data, greatly improve the operational efficiency of the system, and ultimately achieve higher reliability of the results. The final performance data results summarized on the computer side of this experiment are shown in Figure 6.

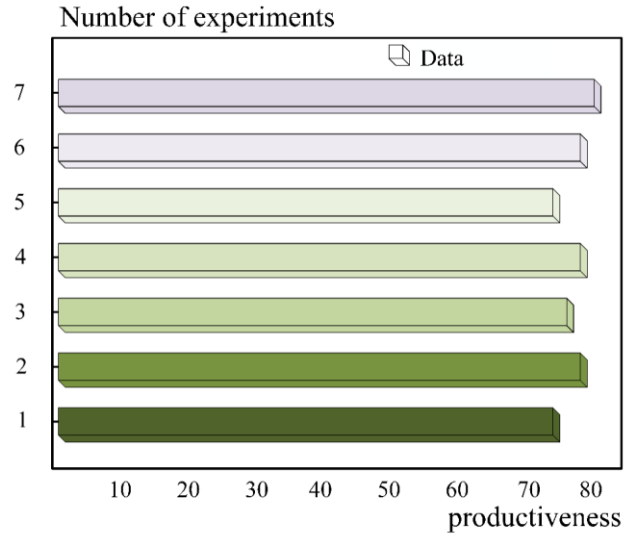

Figure 6: System efficiency data chart constructed under 100 sets of data.

As can be seen from Figure 6, during the operation of the model system constructed under the Internet of Things and big data analysis, 100 sets of data are repeatedly processed, and the overall system performance efficiency remains mostly within 60% to 75%. In the face of repeated experiments with 100 sets of data information, the system can still maintain a stable state. Such research results have verified the experimental purpose. In summary, the system under IoT and Big Data. Analytics studied in this article has certain practical application value.

4.2 Research on System Optimization of Consumer Psychology and Behavior under IoT and Big Data Analytics

Based on building a complete model system for IoT and Big Data. Analytics, this article has optimized and upgraded its internal performance. In order to further verify whether the optimized analysis system can better process data, it is necessary to first confirm the information data to be processed, and this part of data is very important. Then, it is necessary to input such data into the optimized and upgraded analysis system for monitoring. Finally, it is necessary to collect the specific information collected for lateral analysis of the overall analysis model system. The experimental operation steps described above can enable this experiment to perform data validation using the fastest method. However, during the monitoring process, the internal modules of the system need a certain amount of time to calculate and operate the corresponding data. In order to ensure the correctness of this experiment, this experiment adopts multiple and non-repetitive verification operations. The reason why the system is not allowed to perform repetitive operations is that the experimental parameter data are preset data, and system operation requires time. Once the optimized system can accurately calculate and operate the input data, it only needs to collate the data information obtained from the system. During this experiment, in order to avoid the occurrence of problems caused by the analysis system itself, which may affect the overall experimental results, external factors were still controlled over the environment in which the analysis system is located, to avoid the internal short circuit phenomenon caused by excessive high temperature when the system enters the high-speed processing of information. The final experimental result information is shown in Figure 7. As can be seen from Figure 7, the constructed system model under IoT and Big Data.

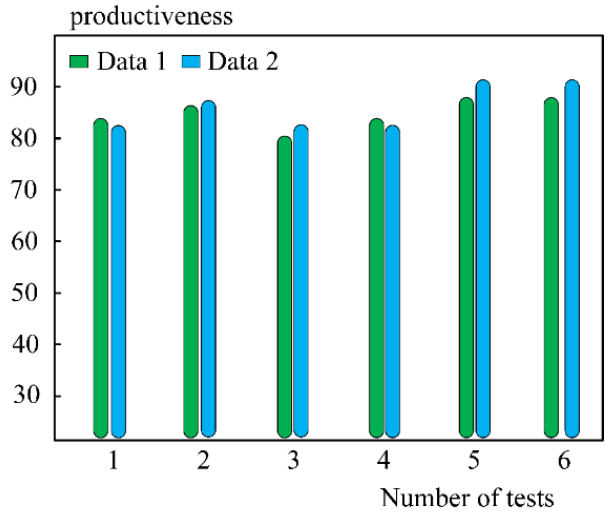

Figure 7: Data processing capability within the system after upgrading fixed data.

Analytics has been optimized, and when it comes to the most important data analysis operations and operational processing, it ultimately demonstrates the excellent ability of the analysis system to handle data. From the perspective of the efficiency presented during the internal operation of the system, the system efficiency has been significantly improved compared to the efficiency of the non-upgraded system, and it is not simple data. Overall, the analysis system based on the Internet of Things and big data that we have designed and studied can be applied to analyze consumer psychology and behavior, better conduct sales, promote economic development, and have certain use value.

5 CONCLUSION

With the advent of the network era, various related technologies have been derived, such as IoT and Big Data. Analytics technology in this article. Moreover, the big data analysis are widely used in the aviation and military fields. This article focuses on the construction of a system model for consumers' psychology and behavior based on the Internet of Things and big data analysis, as well as the upgrading of the internal functions of the system. Only by modeling the system in the context of the Internet. Analytics can we ensure that the system can transmit, activate, calculate, and learn data information, truly achieving efficient and high-precision completion. When optimizing the constructed model system, we also added the sigmoid function and the Tanh function, and added relevant equations for processing errors to the completed system. The purpose of adding functions and equations is to enable system models. Analytics to operate on data more accurately, without generating excessive errors, and to maintain the stable operation of the system in a long-term manner. Achieve unlimited possibilities and produce more value in limited time. The system model for classifying consumer psychology and behavior in the context of the Internet of Things and big data analysis studied in this article, and the final results show that the overall analysis system is optimized and well designed, and both have good performance in data analysis, but they have not yet risen to perfection. If the system runs longer than during the experimental study, it is also a mystery whether the system can still maintain stability. This is also the difficulty that we need to solve in the near future, and we still need to make continuous efforts to pursue a more complete system.

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