Research on Integration Management of Big Data Application Precision Portrait Marketing Resources based on Cloud and Edge Collaborative Computing

Zhuli Wei[1*] and Yuankui Ma[2]

{*Corresponding author: w239338@163.com}
{2865296128@qq.com}

[1]Guangdong Baiyun University, Guangzhou, Guangdong, 510450, China

[2]University of San Carlos, Cebu City, 6000, Philippines

Abstract: The application of big data accurate portrait marketing is a kind of big data technology and analysis methods, through the collection, collation, analysis of user behavior and preferences and other data, the user segmentation and portrait, in order to achieve more accurate marketing strategy and resource management. The biggest concern here with large-scale data is to provide support for the decision-making process [1].Cloud and edge collaborative computing is a new computing model that combines cloud and edge computing, aiming to improve the utilization efficiency of computing resources and real-time data processing. This paper aims to study how to apply cloud and edge collaborative computing to the integration management of big data application precision portrait marketing resources. The goal of the research is to explore the application of cloud and edge collaborative computing in the management of marketing resources for big data applications, so as to improve the effectiveness of marketing strategies and the efficiency of resource utilization.

Keywords: Cloud and Edge Computing, Big Data Application, Accurate Portrait, Marketing Integration

1. Introduction

With the continuous development of technologies such as the Internet of Things and the continuous increase of data, cloud-based Internet of Things solutions are gradually unable to meet the growing needs of people, and more and more enterprises have begun to turn their attention to edge computing and use it as an extension of the cloud to accelerate the speed of data analysis and facilitate enterprises to make faster and better decisions. So what do businesses need to do in iot solutions to best harness the power of the edge and cloud[2]?Gross James et al(2023) analyzed that edge computing will be the initial dominant form of this new computing paradigm in the next decade [3]. In

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order to clarify this issue, the article will first introduce the roles played by edge computing and cloud computing, and then explain why enterprises need edge computing and how to choose the solution of big data precision portrait marketing resource integration of edge cloud collaboration, and finally explain the complexity of edge computing. Edge computing is an architecture of distributed processing and storage that is closer to the source of the data[2]Kim SeongHyun & Kim Taehong(2023) proposed a local scheduling scheme to process user traffic locally at each edge node [4]. A mix of edge and cloud computing is often considered a best practice for building enterprise-class iot solutions as opposed to cloud computing.Figure 1 shows the key components that are often used in edge computing.

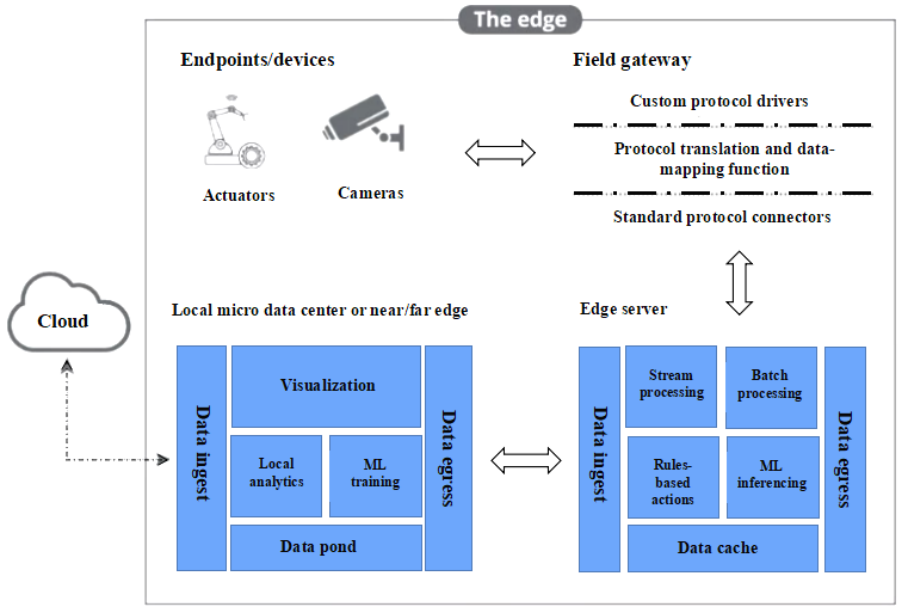

Fig.1 Key components of edge computing

2. Accurate Portrait Marketing Resource Management Demand Analysis

Requirements analysis is an important step in any project, and it is no exception for precision portrait marketing resource management. For accurate portrait marketing of big data applications, it is necessary to clarify the needs of resource management, including data collection, storage, processing and analysis. Specific presentation: (1) Data collection and integration. To understand the needs of users, it is necessary to collect and integrate data from different channels, including personal information, interests, purchasing behaviors, and so on. This data should be able to be quickly captured, collated, and updated for subsequent analysis and utilization. (2) User portrait construction. By analyzing and mining the collected data, the user portrait is constructed. The user profile should accurately describe the characteristics and behaviors of each user, which will help to further accurately push relevant content,

products or services. (3) Data analysis and prediction. Conduct in-depth analysis of the collected data, including user characteristics, behavior patterns, purchasing habits, etc. At the same time, statistical analysis and machine learning algorithms are combined to make predictions and speculations to identify potential user needs and market opportunities. (4) Resource management and optimization. Manage and optimize different resources based on user profiles and data analysis results. This includes content resources, advertising resources, marketing strategies, and so on. Resource management needs to be adjusted and optimized according to the actual situation to maximize the marketing effect. (5) Cross-channel promotion and interaction. Precision portrait marketing resource management needs to cover multiple channels, including social media, search engines, email, etc. The management system should be able to integrate and coordinate promotional activities across different channels to provide a consistent and effective promotional and interactive experience. (6) Data privacy and security The collected user data must comply with the relevant privacy and security regulations to ensure the confidentiality and security of user data. Systems should have data encryption, access control, and risk assessment to protect user privacy and corporate interests.

Enterprises for accurate portrait marketing resource analysis, complete on the cloud or largely rely on the cloud. At the same time, the number of sensor devices and the amount of data they generate is also growing rapidly, not only from a wide range of data sources and large amounts of data, the data they collect often changes significantly within milliseconds, so the speed at which companies can convert data into insight and then into execution is particularly critical. In a "cloud-only" world, where data may travel hundreds or even thousands of miles, latency is inevitable, and edge computing can effectively solve this problem. Low latency and bandwidth optimization are key drivers shaping the importance of edge computing. Low latency and bandwidth optimization are key drivers in shaping the importance of edge computing. Figure 2 The rise of the edge

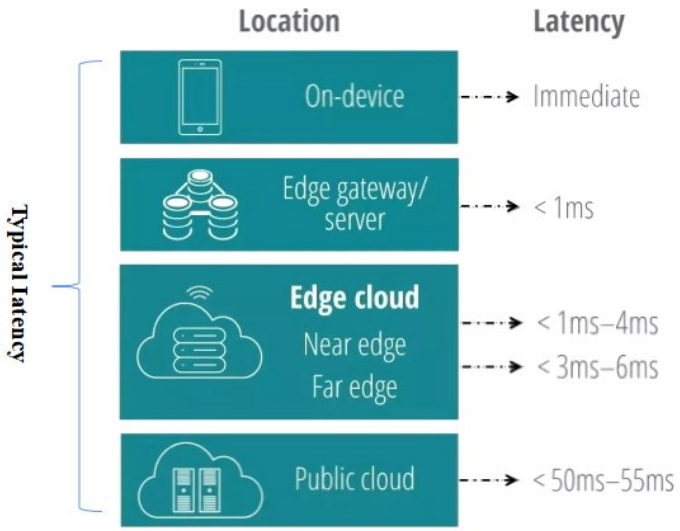

Fig.2 The rise of the edge

In summary, there are some possible demand analysis aspects of accurate portrait marketing resource management, and the specific needs will be customized according to the actual situation and objectives of the enterprise.

3. Cloud and Edge Collaborative Computing Framework Design

Aldinet al (2020) Cloud computing is a model of distributed system [5].Cloud and edge collaborative computing framework is designed to meet the needs of transferring part of computing tasks from the cloud to edge devices in some scenarios. A cloud and edge collaborative computing framework is designed for accurate portrait marketing in big data applications. The framework can realize real-time data acquisition, processing and analysis, and provide basic functions of portrait marketing. Main examples: (1) Task distribution and scheduling: The cloud, as the task management center, is responsible for receiving task requests and distributing tasks to appropriate edge devices for processing. Task distribution and scheduling should consider factors such as the load of edge devices, network conditions, and task types. Edge computing is the distributed deployment and unified management of infrastructure resources. The more concentrated resources are called "central cloud"[6], and there are a few central clouds and most edge clouds in the edge computing cloud platform, so how to schedule the resources of the platform becomes very important. Figure. Tanuja Kumari Sharma,,and Hemraj Saini(2019) The participation of central cloud helps to minimize the storage space of data in the cloud environment while reducing the redundancy factor [7].3 shows the mechanism of edge action.

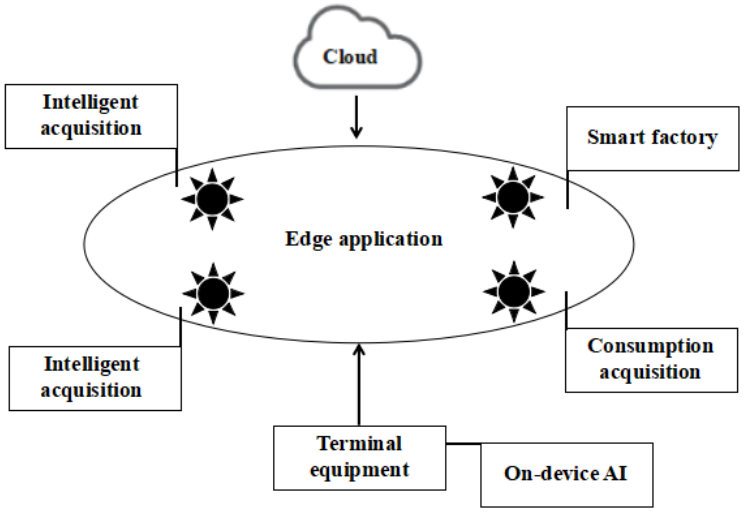

Fig.3 Edge application mechanism

(2) Edge device management: Edge devices need to register with the cloud and provide their own computing resources, network status and other information. The cloud can manage and schedule edge devices according to their characteristics,

ensuring that tasks can be distributed to the most suitable edge devices for execution. In the edge cloud, there are a large number of edge servers and edge terminals, which need to be managed in a unified manner through the edge cloud to support edge applications[8]. The central cloud exists to manage multiple edge clouds and provide sufficient virtualization resources for edge clouds.Figure 4 shows edge device management.

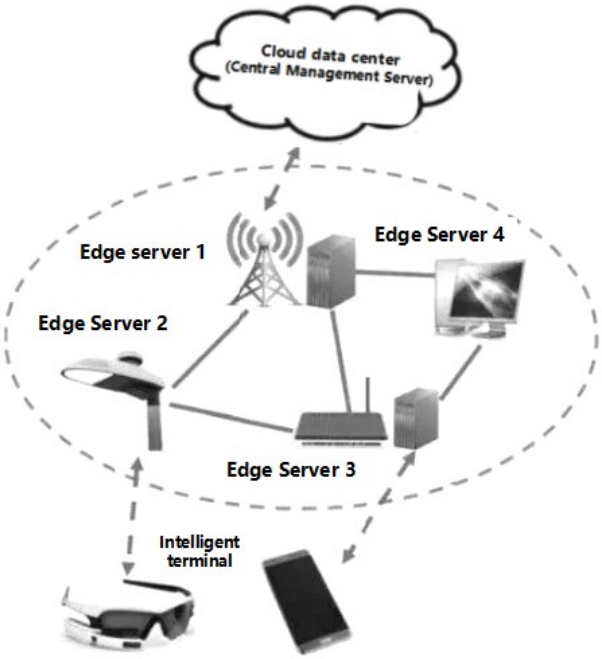

Fig.4 Edge device management

(3) Data transmission and synchronization: In the process of task execution, a large amount of data transmission and synchronization may be involved. Efficient and reliable communication channels need to be established between cloud and edge devices, and technologies such as data compression and incremental transmission are used to reduce the amount of data transmission.

(4) Edge computing capability improvement: Edge devices usually have limited resources. In order to improve edge computing capability, some commonly used computing models and algorithms can be pre-deployed to edge devices so that they can be quickly executed during task execution.In the field of Internet of Things, Edge Computing emerged as a revolutionary paradigm that provides unprecedented benefits by serving iot at the edge of the network [9].The edge computing model is shown in Figure 5

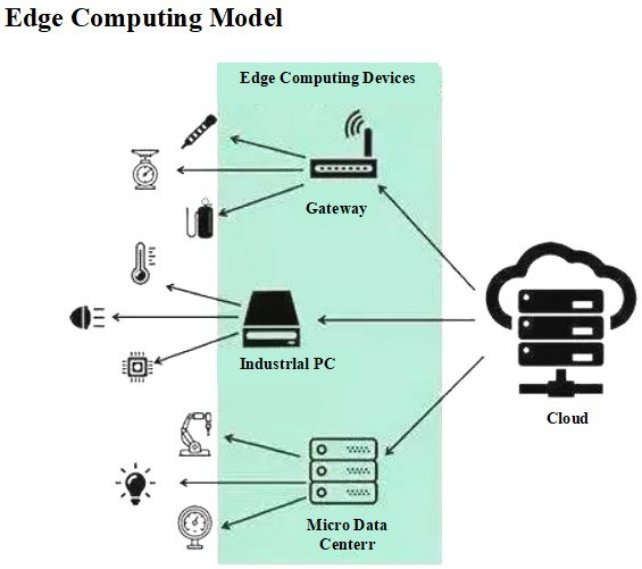

Fig.5 Edge computing model

(5) Security and privacy protection: In the cloud and edge collaborative computing framework, security and privacy protection is very important. Measures such as encrypted transmission, identity authentication, and access control are required to ensure data security and user privacy protection.(6) System monitoring and management: In order to ensure the reliability and stability of cloud and edge collaborative computing framework, it is necessary to establish a sound system monitoring and management mechanism. Including the edge equipment status monitoring, task execution monitoring, fault processing and so on.The above is only an example of the design framework, the specific cloud and edge collaborative computing framework design will be customized according to the actual scenario and needs. When designing the framework, factors such as different application scenarios, network environments and hardware resources need to be taken into account to achieve the best performance and user experience.

4. Research on the Integration Management Strategy of Marketing Resources with Accurate portrait Application of Big Data

Mohammed et al(2022) proposed the impact of the quality of big data marketing analysis on market and financial performance, emphasizing how technology and information quality are related to market and financial performance, with high predictive power and strength [10].The application of big data plays an important role in the management of precision portrait marketing resources. This paper studies how to integrate cloud and edge computing resources, including data storage and transmission, allocation and scheduling of computing tasks. In the research and discussion of

precision portrait marketing resource integration management strategy is mainly manifested in: (1) data integration and cleaning: big data applications need to integrate data from multiple channels, including user behavior data, social media data, purchase records, etc. Studying how to efficiently integrate and clean this data to ensure the accuracy and integrity of the data is an important management strategy. (2) User portrait construction: Based on big data analysis and machine learning algorithms, research on how to build accurate user portraits, subdivide user groups, and gain insight into user needs and behavioral characteristics. Through in-depth understanding of users' interests, preferences, purchasing behaviors, etc., precise push and customized marketing can be better carried out. (3) Data analysis and prediction: Using big data analysis technology to study how to deeply mine user data, conduct user behavior analysis, trend prediction, etc. By analyzing user data, we can predict user needs and market trends to provide decision-making basis and guidance for accurate portrait marketing. (4) Cross-channel marketing integration: Study how to integrate and optimize marketing resources of different channels through big data analysis. For example, integrate social media marketing with email marketing, search engine advertising and other channels to achieve a full range of accurate promotion. (5) Real-time personalized push: Based on big data analysis and real-time computing, research on how to achieve personalized real-time push. Through real-time monitoring of user behavior and preferences, combined with personalized recommendation algorithms, timely push relevant content and offers to users to improve user experience and conversion rates. Data privacy and security: In big data applications, data privacy and security is an important consideration. Study how to protect the privacy of user data, formulate appropriate data collection and use policies, and take appropriate security measures to ensure the security and compliance of user data. In the specific research, the corresponding strategies can be further explored and optimized according to the actual needs and situations.

5. Experiment and Evaluation

In the research of precision portrait marketing resource integration management strategy, experiment and evaluation are very important links, which can help to evaluate the effectiveness and performance of the strategy. Experiments were designed to verify the effect of cloud and edge collaborative computing in big data application precision portrait marketing resource management, and to evaluate its performance in resource utilization efficiency and marketing strategy effect. (1) A/B testing: Users are randomly divided into different experimental groups and control groups to compare the effects of different strategies. For example, you can compare the difference between a marketing resource management strategy using precision profiling and a traditional marketing strategy, and evaluate its impact on metrics such as user engagement and conversion rates. (2) Indicator evaluation: Evaluate the performance of different strategies on key indicators according to the experimental results. For example, metrics such as user engagement, conversion, and sales can be an important basis for evaluating the effectiveness of a strategy. (3) User survey and feedback: Collect users' subjective evaluation and feedback on different strategies through user survey and feedback. Questionnaires, in-depth interviews and other methods can be designed to understand

users' satisfaction with different strategies and experience feelings, so as to obtain more comprehensive evaluation results. (4) Simulation experiment: Using the method of simulation experiment, build appropriate models and scenarios to evaluate the performance of different strategies under ideal conditions. Simulation experiment can provide a kind of experimental environment, more flexible control of variables and parameters, system performance analysis and comparison. (5) Evaluation of the actual promotion effect: In the actual promotion, the effect of marketing activities using different strategies can be compared. Evaluate the impact of different strategies on engagement, conversion, and sales by comparing actual promotion data. (6) User satisfaction survey: Through the satisfaction survey of users, to understand users' satisfaction with different strategies, recommendation intention, etc. The results of user surveys can be used to assess the impact of different strategies on user satisfaction. At the same time, it is necessary to select suitable methods for experiment and evaluation according to specific research objectives and strategies, so as to draw accurate and reliable conclusions.

6. Conclusion

Through the above research content, this study aims to provide an effective resource integration management method for the application of big data precision portrait marketing, so as to improve the marketing effect and resource utilization efficiency, and promote the refined and personalized development of enterprise marketing.

References

[1] Abdiaziz Omar Hassan,and Abdulkadir Abdulahi Hasan. "Simplified Data Processing for Large Cluster: A MapReduce and Hadoop Based Study." Advances in Applied Sciences,2021,6(3).

[2] Artificial intelligence scientist. On edge computing and edge cloud collaboration[EB/OL].https://blog.csdn.net/cf2SudS8x8F0v/article/details/100840604 ,2019-09-14.

[3] Gross James et al."TECoSA – Trends, Drivers, and Strategic Directions for Trustworthy Edge Computing in Industrial Applications." INSIGHT,2023, 25(4).

[4] Kim SeongHyun,and Kim Taehong."Local Scheduling in KubeEdge-Based Edge Computing Environment." Sensors,2023,23(3).

[5] Aldin S N H,Deldari H,Moattar H M, et al. Strict Timed Causal Consistency as a Hybrid Consistency Model in the Cloud Environment[J]. Future Generation Computer Systems,2020,105(C).

[6] Cao Yong, Cui Zhiguo, Yu Xiaolong. Research and application of building intelligent operation management technology system [J]. Construction Science and Technology,2020(16):55-59+63.

[7] Tanuja Kumari Sharma, ,and Hemraj Saini. "State of art on efficient document co-editing in cloud collaboration." Int. J. of Spatio-Temporal Data Science,2019,1(1).

[8] Liu Sifang, Wang Xiaodong, SHENG Xiaoning. Analysis of edge Cloud Collaborative Application for Power System Business [J]. Inner Mongolia Electric Power Technology,2022(06):51-56.

[9] Mohammed M,Ehzaz M,Junaid S, et al. Dependent task offloading with deadline-aware scheduling in mobile edge networks[J]. Internet of Things,2023,23.

[10] Muhammad M,Zhan S,Matti H, et al. The Impact of Quality of Big Data Marketing Analytics (BDMA) on the Market and Financial Performance[J]. Journal of Global Information Management (JGIM),2022,30(1).