Talking About the Application of Big Data Technology in Power Industry

Talking About the Application of Big Data Technology in Power Industry

Tang Tao

Jiangsu Finance and Accounting Vocational College, Lianyungang, China

303396052@qq.com

Abstract. Big data has great research value because of its large data size, fast data flow, multiple data types and large potential value of data. This paper introduces the concept and characteristics of big data, compares big data with power big data, expounds the key technologies of power big data, and analyzes the application of big data technology in the power industry.

1. Introduction

Big Data Application In recent years, information technology in the power industry has developed rapidly. The information technology of the power company originated in the 1960s, from the beginning of power production automation to the management informationization construction represented by financial computerization in the 1980s, in recent years, large-scale enterprise information construction, especially with the comprehensive construction of the next generation intelligent power grid, the widespread application of a new generation of IT technology represented by the Internet of Things and cloud computing in the power industry, Power data resources began to grow dramatically and began to take shape. With the rise of big data, big data technology is becoming more and more widely used in power data. The effective application of power big data can provide a large number of high value-added value-added service services inside and outside the industry, which has high value for the improvement of the profitability and control level of power companies. Therefore, it is of great significance to study the application of big data technology in the power industry.

2. Overview of big data

2.1. Big data definition

The definition given by the McKinsey Global Institute is a collection of data that is large enough to capture, store, manage, and analyze the capabilities of traditional database software tools. It has four characteristics: massive data size, fast data flow, diverse data types and low value density.

2.2. Big data features

It is generally believed that big data has the following four typical characteristics: Volume, Variity, Velocity, and Value, the so-called "4V".

(1) Scale. The characteristics of big data are first expressed as "a large number", and the storage unit is from the past GB to TB, to PB, EB. With the rapid development of information technology, data began to grow explosively. Social networks (microblogging, Twitter, Facebook), mobile networks, and

various smart terminals have become sources of data. Nearly 400 million members of Taobao.com generate about 20 TB of commodity transaction data per day; about 1 billion Facebook users generate more than 300 TB of log data per day. Intelligent algorithms, powerful data processing platforms, and new data processing technologies are urgently needed to count, analyze, predict, and process such large-scale data in real time.

(2) Diversity. A wide range of data sources determines the diversity of big data forms. Big data can be roughly divided into three categories: one is structured data, such as financial system data, information management system data, medical system data, etc., which is characterized by strong causal relationship between data; second, unstructured data, such as video and pictures. , audio, etc., which is characterized by no causal relationship between data; third is semi-structured data, such as HTML documents, mail, web pages, etc., which is characterized by weak causality between data.

(3) High speed. Unlike traditional data carriers such as archives, radio, and newspapers, the exchange and dissemination of big data is achieved through the Internet and cloud computing. It is far faster than traditional media. The important difference between big data and massive data, in addition to the larger data size of big data, big data has more stringent requirements on the response speed of processing data. Real-time analysis, not batch analysis, data input, processing, and discarding are immediately effective, with almost no delay. The growth rate and processing speed of data is an important manifestation of the high speed of big data.

(4) Value. This is the core feature of big data. Among the data generated by the real world, the proportion of valuable data is small. Compared with traditional small data, the greatest value of big data lies in mining valuable data for future trends and pattern prediction analysis from a large number of unrelated types of data, and through machine learning methods and artificial intelligence methods. Or in-depth analysis of data mining methods, discover new laws and new knowledge, and apply them to various fields such as agriculture, finance, medical care, etc., and ultimately achieve the effects of improving social governance, improving production efficiency, and promoting scientific research.

3. Power big data

3.1. Power Big Data Concept

Power big data mainly comes from power generation, transmission, substation, power distribution, power consumption and dispatching. It can be roughly divided into three categories: one is power production operation data; the other is power enterprise operation data; the third is the management data of power companies. For the power grid, by collecting the line data of the entire power system, the collected power big data is systematically processed and analyzed, thereby realizing real-time monitoring of the power grid. Further, combined with big data analysis and power system model, it can diagnose, optimize and predict grid operation, and provide guarantee for safe, reliable, economical and efficient operation of the grid.

Power Big Data can draw on the analysis process and technology of big data to realize the collection, processing, storage, analysis and visualization of power data. For example, big data technology is used in the integration and storage of power big data to support high real-time acquisition, large data storage and fast retrieval; distributed high-performance computing power of big data processing technology, query and retrieval of massive data Algorithm processing provides performance guarantees. Secondly, high-quality power big data is needed in the power production process, and the power data assets can be effectively managed by referring to the governance mechanism of big data.

3.2. Differences between power big data and traditional big data

Although power big data is based on big data technology, there are certain differences between traditional big data (Internet big data) in terms of links and applications, as shown in Table 1.

Table 1. Comparison of Internet Big Data and Power Big Data.

Links and applications	Internet big data	Power big data
collection	Collect transactions, preferences, browsing and other data through interactive channels; timeliness of data collection is not high	Through sensor and sensing technology, collecting IoT equipment, business data of production and operation process, external Internet data, etc.; has high real-time requirements for data collection
deal with	Data cleaning, conversion, statutes, removal of large amounts of irrelevant, unimportant data	Emphasis on the transformation of data formats; low data-to-noise ratio, requiring data to be authentic, complete and reliable, and more concerned with the quality of processed data
Storage	Data is not relevant, storage is free	Data correlation is very strong, storage is complicated
analysis	Use common big data analysis algorithms; perform correlation analysis; do not absolutely accurately determine the efficiency of the analysis results	Data modeling and analysis are more complicated; algorithms in specialized fields are required, and algorithms in different industries and different fields are very different; high precision and reliability are required for analysis results.
Visualization	Data result display visualization	Visualization of data analysis results and visualization of 3D scenes; strong real-time requirements for data visualization, near-real-time warning and trend visualization

3.3. Power Big Data Key Technology

(1) Multi-data fusion

Power Big Data Fusion is a multi-level, multi-layered data processing process that mainly performs automatic detection and correlation of data from multiple sources. Estimate and combine processing. In the industry, power big data mainly involves the integration of data in all aspects of power production and power services, and realizes analysis and sharing of data across units, departments and business.

(2) Power Big Data Analysis Mining

Power Big Data Analysis and Mining is mainly for structured data and unstructured data, and solves the problem of effective processing of complex data structures, multiple types, and massive data. The statistical analysis, feature extraction and mining of structured data are relatively mature and unstructured data such as video, audio and text is a research hotspot. Algorithms for statistical analysis, data mining, correlation analysis, machine learning, modeling and simulation are used in both structured and unstructured power big data processing. The number of statistical samples in the era of power big data has increased rapidly, providing a lot of space for the improvement of algorithm models, and even caused the emergence of new algorithms.

(3) Power big data visualization

Power Big Data visualization graphically describes complex information in power data. Good power big data visualization design requires both artistic design and elegant display of data details, as well as insight and new understanding of the data. The visualization of power big data meets the needs of two aspects: power production, enterprise management, and external communication.

(4) Power big data storage and processing technology

Power big data storage and processing technology mainly solves real-time processing and batch processing of power big data. The integration of in-memory computing technology and Hadoop technology is an effective way to solve the problem of power big data storage and processing.

The memory computing technology puts all the data into the memory for calculation, which is an effective way to improve the calculation speed of the single machine, and is an acceleration of the traditional processing method. With the continuous decline of memory prices, memory computing has a material basis, which solves the real-time processing of massive data to a certain extent. For example,

in the past 10 years, all the financial marketing, market and other aspects of the power company's data are stored in the memory at one time, and data analysis is performed on this basis. From an application perspective, in-memory computing technology combines a transactional database and an analytical database into an in-memory database, and both applications. Memory computing can improve the processing speed of traditional information systems.

4. Application of power big data in marketing

With the rapid advancement of the marketing informationization work of the State Grid Corporation, the collection range and acquisition success rate of electricity consumption information have been gradually expanded and improved, and the sales business data such as electricity consumption information collection, electricity tariff data, and 95598 data have been developed to a large scale. The characteristics of big data are becoming more and more obvious, and the demand for direct marketing of big data is becoming more and more urgent.

In order to give full play to the basic supporting role of the marketing information system, to meet the deepening application of marketing data and the need for data storage, query, statistics, analysis and deep data mining, through leading data fusion, data cleaning, data governance and big data It is imperative to explore relevant technical means and improve the application value of marketing data. The research framework of power marketing big data is shown in Figure 1.

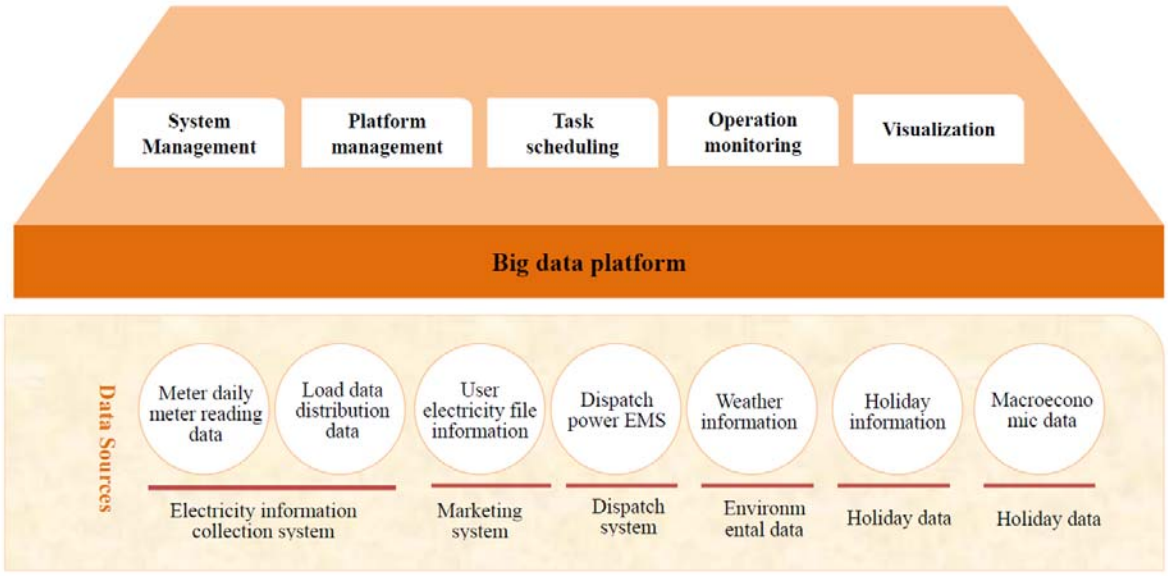

Figure 1. Research framework for power marketing big data

By analyzing the massive data of marketing information system (electricity information collection system, marketing system, etc.), at the same time, combined with external social data (meteorological, economic, public opinion, holiday, etc.), the application of big data technology to deeply explore the value of data, to achieve the purpose of improving power supply service and marketing management level, to provide support for service power users and improve management level.

New information technology with big data as the core will definitely activate the value contained in power big data. Therefore, analyzing big data of power is to provide information for enterprise development, optimize the efficiency of its operation, and provide power for the development of power enterprises. The wide application of big data technology will certainly promote the transformation and upgrading of the power industry, promote energy conservation and university utilization, and play a positive and important role in serving economic and social development.

References

[1] Zheng Haidong, Yi Wu, Sun Weiting et al. Big data and its application in the power industry [J]. Rural Electrification, 2015 (09): 34-35.
[2] Qin Xiaoqiang, Shang Bao. Discussion on the Application of Big Data in Power Industry [J]. Information Systems Engineering, 2018 (8): 110-111.
[3] Xu Yunfeng. Big data technology and industry application [M]. Beijing University of Posts and Telecommunications Press, 2016.