An overview of the application of data mining in the campus

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Abstract. With the advent of campus informatization, it has been observed that the utilization of big data has the potential to facilitate the integration of education and enhance students' learning efficiency. The utilization of big data technology has been increasingly prevalent in contemporary society, leading to a growing reliance on its applications by the general population. Consequently, there is a rising need for educational platforms that can cater to this evolving demand. In the present scenario, China is persistently augmenting the development of campus infrastructure with the aim of attaining modern education objectives and ushering in a new era of educational facilities. The utilization of big data technology, its current status in contemporary usage, and the strategies for achieving widespread adoption have emerged as crucial concerns within the present wave of information technology throughout educational institutions. Simultaneously, the utilization of data mining technology enhances the learning environment for students, mitigates the constraints of campus intelligence, and offers substantial assistance for many educational endeavours inside the campus setting. The application of data mining technology for the advancement of campus management has emerged as a pivotal focal point and a significant breakthrough. This research examines the concept of the convenience zone in data mining and explores its application policy by conducting a comprehensive assessment of relevant literature. The study reveals that there is a lack of widespread awareness and adoption of big data in various contexts where it is necessary. Additionally, the potential utilization of big data at educational institutions, namely on campus, is explored.

Keywords: Big Data, Information Technology, Campus Management.

1. Introduction

The pervasive advancement of science and technology has resulted in the ubiquitous presence of information and data across several domains of human existence. The term "big data" typically encompasses the utilization of algorithms to extract latent information from vast quantities of data. Big Data mining is closely associated with the field of computer science and is accomplished by various methodologies, including statistics, online analytical processing, information retrieval, machine learning, expert systems, and modular pattern recognition [1]. In summary, data mining technology is utilized to efficiently analyze vast amounts of data, enhance data visualization, and offer valuable support for many professional endeavours.

The advent of big data has led to the abandonment of traditional constraints in numerous industries. Previously, projects often suffered from excessive scale and quantity, leading to unpleasant information transmission characteristics. The aforementioned process frequently results in the

suboptimal utilization of human resources across many industries, hence causing delays in the transmission of diverse information. In contemporary times, organizations have become increasingly proficient in the administration of engineering projects. This proficiency is achieved through the utilization of data mining technology, enabling the scientific and rational comprehension of data generated during the course of engineering construction. Consequently, these data serve as informative indicators for project managers, enabling them to gain specific insights into the project's status [2]. Data mining extends beyond the scope of corporations. Libraries employ data mining technology to conduct thorough collection and analysis of readers' borrowing habits and usage of online library resources. This enables libraries to gain comprehensive and profound insights into the specific needs of individual readers. Consequently, libraries establish personalized databases for each reader, facilitating the implementation of personalized message push strategies and other techniques. In order to offer readers with lending services that are more specific and tailored to their individual needs [3]. The ongoing advancement of data mining technology necessitates regular adjustments to its structure. Therefore, it is imperative to employ a combination of relational and non-relational databases, such as document databases, in order to mitigate variables contributing to instability [4]. Hence, it is evident that data mining technology amalgamates the analytical capabilities of conventional computers while employing a comparable cognitive approach to effectively and simply process vast amounts of data. Hence, with the anticipated influx of digital files in the future, it is inevitable that this phenomena would extend to the realm of smart campuses. Simultaneously with the proliferation of data, the utilization of data mining technology mitigates the challenges posed by unstructured data in information processing, thereby ensuring the efficacy of students' learning.

This study employs a literature review methodology to examine the implementation policies of big data in educational institutions. Hence, the utilization of data mining can facilitate a thorough data analysis for the school, enabling the borrowing or utilization of user data within the school community. This approach allows for a better understanding of the individual needs of each student and facilitates the development of an intelligent campus.

2. Introduction of Smart Campus Life application

The incorporation of campus life is a crucial component in the development of intelligent campus infrastructure. The utilization of data mining in the context of smart campus life centres around enhancing the quality of campus life by offering intelligent services to both educators and students. For instance, the introduction of an all-in-one card system can effectively address a range of issues pertaining to student consumption and administration within educational institutions, thereby catering to the interests of both teachers and students seeking a comprehensive service solution. The implementation of a smart library infrastructure can offer a range of book services to cater to the mobile reading requirements of both teachers and pupils, thereby addressing their respective needs. In the majority of contemporary conventional libraries, administrators possess less knowledge regarding the specific book requirements of pupils. The library possesses the capability to consistently modify the quantity of books within its collection or incorporate additional books. However, there remains a deficiency in terms of enhancing convenience for students. The library is unable to provide assurance regarding the quantity of highly sought-after books on its shelves. Conversely, a significant number of less popular books are prominently displayed. Furthermore, despite the widespread adoption of electronic networks, which has facilitated the borrowing and returning of books for students, the fundamental nature of this process remains largely unchanged from previous registration methods. Consequently, the library does not utilize modern data mining technology for student implementation. A portion of the library has implemented the Huiwen document information service system, which offers readers relevant recommendation services. The system is additionally equipped with data mining tools that utilize algorithms to provide readers with matching full-text links and special reports. It also employs data analysis and associated algorithms. Conduct basic statistical analysis on the data within the existing system. Nevertheless, the current state of data mining and statistical analysis in this field is rather limited, which has not been completely demonstrated in practical applications and user

experiences. Additionally, the extent to which information retrieval capabilities have been enhanced remains uncertain. Data mining can also gather information on students' educational advancement and suggest appropriate reading materials, so aiding students in completing academic tasks or expanding their knowledge.In the realm of healthcare, the integration of smart medical services through the utilization of the smart campus online clinic function enables prompt medical assistance for students [5].

Simultaneously, the utilization of data mining technology enables the integration of diverse educational technologies across various schools. This facilitates the evaluation of educators' proficiency levels and aids in the selection of highly skilled teachers for specialized positions. Consequently, this approach effectively mitigates the educational disparities prevalent in different regions of the country. Moreover, it fosters the development of young teachers' learning experiences and contributes to the enhancement of educational standards in underprivileged areas. Data mining is a process that involves the collection of data specifically tailored to address the educational requirements of teachers and students in order to address their shared demands. In the realm of academia, data mining has the potential to investigate shortcomings in the invigilation process through the analysis of teachers' requirements and the integration of past instances of academic misconduct. This can ultimately facilitate the development of more empirically grounded invigilation protocols for educators.

3. The guarantee of food safety in canteen by data mining

Simultaneously, data mining technology can be employed to generate statistical analyses pertaining to the campus food environment. The analysis of symptom data mining in relation to incidents of disease response among middle school students in campus food safety can provide valuable insights. By examining statistics on the most prevalent illnesses, this analysis can offer guidance for the supervision of campus food safety issues. Additionally, it can contribute to the establishment of standardized practices in campus cafeterias. Table 1 presents the outcomes of the APriori algorithm, with a minimum support threshold of 0.04. The analysis reveals that the item set support for the two symptomatic words "vomiting and abdominal fouling" is the highest. This indicates that a significant number of individuals experience these symptoms in campus food safety incidents. Consequently, it is advisable to promptly consider food poisoning factors when students in educational institutions exhibit symptoms of vomiting and abdominal fouling [6].

Table 1. Campus food safety incident analysis based on Data mining [6]

frequency	Support degree	frequency	Support degree
Vomiting, diarrhea	0.31	Vomiting, diarrhea	0.08
Vomiting, abdominal pain	0.23	Vomiting, fever	0.08
Vomiting, nausea	0.22	celialgia, dizziness	0.07
Vomiting, dizziness	0.18	Diarrhea, stomachache	0.07
Abdominal pain, diarrhea	0.14	Diarrhea, fever	0.07
Abdominal pain, nausea	0.11	Diarrhea, dizziness	0.06
Vomiting, stomachache	0.11	Vomiting, headache	0.06
Fever, vomiting	0.10	Diarrhea, diarrhea	0.06
Fever, diarrhea	0.10	Headache, nausea	0.05
Diarrhea, nausea	0.10	Stomachache, nausea	0.05
Nausea, dizziness	0.08	Vomiting, vomiting and diarrhea	0.04

4. The effect of data mining on canteen optimization

Data mining can be effectively employed in the context of campus cards due to the substantial amount of data they encompass, such as records of canteen usage and book borrowing activities, among others. Simultaneously, the study focuses on the consumption data recorded on the campus card used at the canteen. This analysis aids managers in making necessary adjustments to optimize the cafeteria operations and enhance its profitability. For this study, we collected campus card flow data for all undergraduate students between the months of March and July 2014 [7]. The student ID was designated as the unique primary key, and various data tables were linked accordingly. This study examines various statistical indicators related to consumption patterns, including the proportion of monthly consumption in restaurants, the distribution of consumption among different student grades, the frequency of daily consumption, the distribution of consumption across different canteens, the average number of meals consumed by each student, and the average consumption level per student [8].
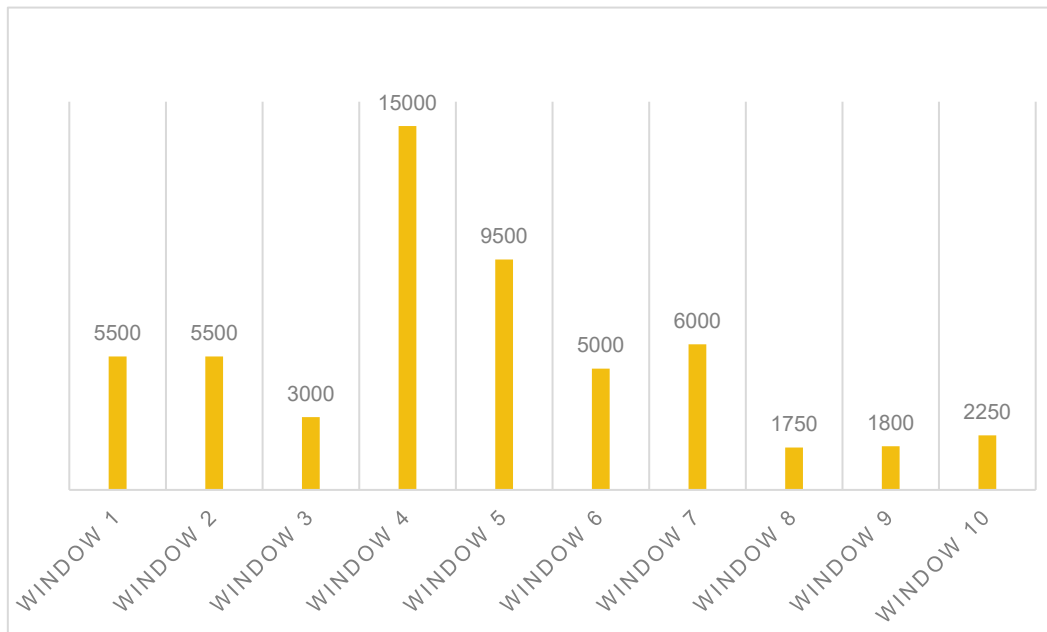

Figure 1. The proportion of monthly consumption in restaurants [8].
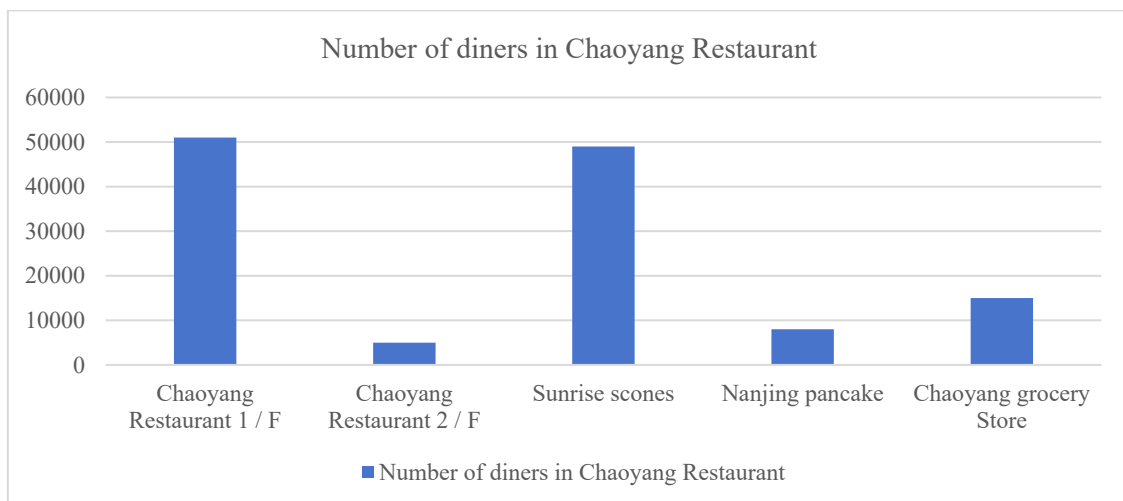

Figure 2. Numbers of diners in Chaoyang Restaurant [8].

As seen in Figures 1 and 2, the establishment under consideration is a restaurant situated within a recently constructed cafeteria. The cafeteria comprises three levels, each of which is further subdivided into northern and southern sections, as indicated by the windows. The bar chart illustrates a higher proportion of students consuming meals on the first floor. This can be attributed to the prevalence of fast food and breakfast options, such as steamed buns and scones, available on the first level. Students have the convenience of purchasing breakfast in the morning and opting for fast food during lunch breaks, so facilitating their daily routines. Additionally, there is a notable concentration of student apartments in close proximity to Baiyuan Restaurant, the nine teaching buildings on campus, and the school family areas. As a result, a majority of students opt to dine at this particular establishment. The Chaoyang restaurant accommodates a substantial number of individuals, ranking second in terms of its capacity. The first floor of the establishment mostly features quick food options and scones. Additionally, the proximity of the restaurant to many educational facilities, particularly school teaching buildings, is noteworthy. Among the various dining establishments available to students, it is noteworthy that the number of student restaurants is quite minimal. Specifically, Sanjiaju and Lianyouju are the primary establishments that predominantly offer rice-based dishes [8].
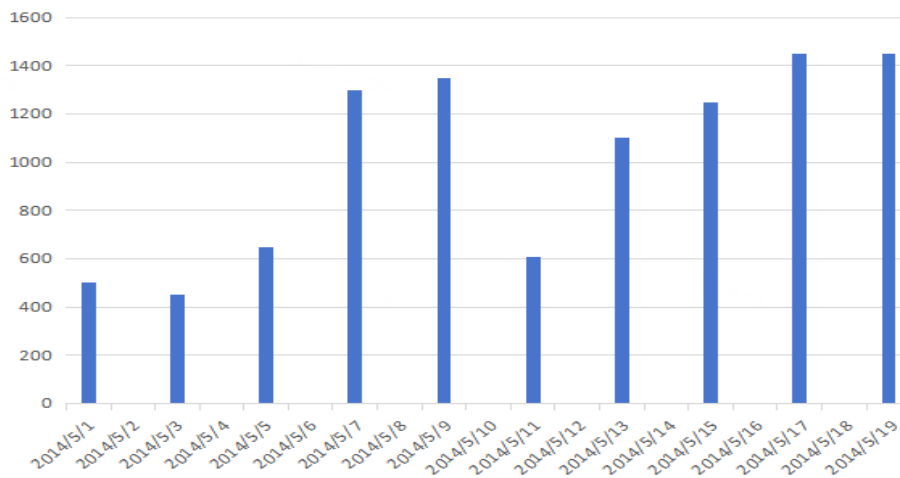

Figure 3. The number of students in the canteens within a month [8].
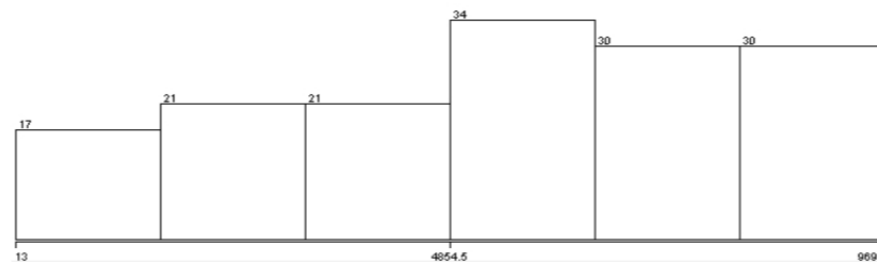

Figure 4. Research and Application of Data Mining in Campus card consumption [8].

According to the data presented in Figure 4, it is evident that there are a total of 34 days falling within the range of [4854,6468], constituting 22% of the overall number of days. Similarly, there are 30 days falling within the range of [6468,8082], accounting for 20% of the total days. Additionally, there are 30 days falling within the range of [8082,9696]. The frequency of daily meals consumed in the canteen reaches its highest point for approximately 66% of the semester [8].

The aforementioned bar chart (4) and (5) demonstrate that the consumption patterns of students in the canteens exhibit noticeable fluctuations with a clear regularity. Figure 3 illustrates a noticeable

decrease in the number of students present in the canteens over weekends. This observation can be attributed to the regular schedule of students attending classes from Monday to Friday. During the designated five-day period, students have the option to avail themselves of the canteen facilities for the purpose of convenience and optimizing their study time. However, during weekends, students are not obligated to attend courses, so granting them additional leisure time to venture outside of the college premises. Consequently, students opt to dine in restaurants located off-campus, resulting in a significant decrease in the patronage of on-campus dining facilities. Hence, it is imperative for the school administration to implement a rational system for food allocation based on the date, thereby mitigating the issues of food waste and inadequate distribution arising from the varying number of students consuming meals in the school cafeteria.

5. Conclusion

Hence, data mining holds considerable importance in the development of smart campuses, as it has the potential to significantly enhance the educational and infrastructural aspects of these campuses. The utilization of data mining technologies enables the comparison and analysis of recurring cases of poisoning over an extended period. This facilitates the identification of potential causes underlying these incidents, thereby offering valuable insights and guidance for enhancing campus food safety measures. Simultaneously, data can be gathered from the data storage devices within the campus premises, such as the campus card utilized by prominent educational institutions. The process of data mining involves extracting the necessary information from unstructured or disorganized data, with the aim of offering more effective recommendations to school administrators. Nevertheless, it is important to acknowledge that the utilization of data mining technology in smart campus settings is currently in its nascent phase. In order to facilitate the advancement of data mining technology in the context of smart campus construction, it remains imperative to continuously investigate the potential applications of data mining technology within the smart campus domain. This exploration is essential for enabling data mining technology to effectively identify and address various challenges and issues prevalent in campus environments. Furthermore, it serves as a catalyst for fostering the advancement of the academic institution. This study provides a concise overview of the literature on data mining in the context of food safety. It highlights the potential implications of data mining for school management by facilitating data gathering and offering valuable insights. Data mining has the capability to gather additional data for research purposes, including data pertaining to students borrowing books from the school library, evaluations of teachers' classes, and other important data related to campus energy use.

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