Research on Computer Aided Information Analysis Technology Based on Data Mining and Social Network Analysis

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Abstract: With the ever more rapid development of information technology, computer and network infrastructures have become an indispensable part of modern life and work. In this evolving context, the importance of computer-assisted information analysis is increasingly evident, highlighting the need for a solid framework to support its further development. This paper attempts to establish a comprehensive, multi-dimensional technological framework to improve capacity in this crucial area. The proposed framework covers core technology areas such as databases, data warehouses, online transaction processing (OLTP), business intelligence (BI), online analytical processing (OLAP) and decision support systems (ss). By combining these fundamentals with cutting-edge technologies, including data extraction, social network analysis, and massive data analysis and advanced online analytical processing, the framework aims to create a holistic system for computer-aided information analysis. The system aims not only to optimize the efficiency and effectiveness of data processing and analysis, but also to promote innovation in the way information is used for decision-making and strategic planning, contributing to the continued development and impact of all industries.

1. Introduction

As information technology continues to advance at an unprecedented pace, cutting-edge innovations like artificial intelligence, big data, and cloud computing have become integral components of computer-aided analysis tools. These integrations empower computers to handle increasingly complex datasets and extract highly valuable insights, thereby greatly enhancing the scope and depth of information analysis. This evolution has enabled organizations to process and analyze data on a scale previously unimaginable, allowing for more informed decision-making and strategic planning. However, the intricacies of social network relationships and the vast diversity inherent in large datasets present significant challenges. These complexities make it difficult to effectively manage and analyze large-scale data, particularly when it involves multifaceted tasks that require nuanced understanding and precise interpretation. Significant technological advances have been made, but overcoming these barriers remains a key focus area, and the ability to

effectively analyze and interpret complex information is essential to harness the full potential of these powerful tools; In order to more effectively address the challenges posed by the dynamic and expansive nature of the contemporary data environment, continuous research and development efforts are essential to improve these technologies.

The rapid evolution of information technology has led to the convergence of emerging innovations such as artificial intelligence, big data and cloud computing, which have dramatically reshaped the landscape of computer-aided analysis tools. These advanced technologies allow computers to process increasingly complex information and obtain valuable information from large and complex data issues, thereby expanding the scope and depth of information analysis. The complex nature of social media relationships, coupled with the absolute quantity and diversity of data, continues to pose enormous challenges in the field of large-scale data analysis. Effective management of these complex tasks requires continuous adaptation and innovation to ensure analytics tools deliver accurate and actionable results in an ever-changing data environment. The field must constantly evolve to meet these challenges, leveraging technological advances to improve its ability to process and analyze an increasingly complex modern data landscape.

Solving the complexity of social media dynamics remains a central challenge for computer aided analysis techniques. The optimization of human-machine collaboration - using the unique strengths of machine and man to solve complex analysis tasks together – is a key area of development. The development of computer aided analysis techniques can be traced back to four different stages, each reflecting advances in applications and functions. From its early basic data processing capabilities to today's sophisticated intelligent analysis, the trajectory of this technology is marked by an increase in efficiency and intelligence. In the future, improving human-machine collaboration mechanisms will be essential to further improve information analysis capabilities, ensuring that the synergy between human intuition and computing power continues to drive innovation and efficiency in solving complex problems.

2. Related Research

In recent years, significant advances have been made in the techniques of computer-assisted information analysis, particularly in the integration of methods of data extraction and analysis of social networks. FZY Bettadj and W Benchouk have successfully combined key technologies such as molecular docking of the cox-2 receptor (5F1A), pharmacokinetic parameters of the admit, drug similarity rules and molecular electrostatic potential (MEP) to optimize the data based drug discovery process[1]. CM Pappalardo innovated by imagining a drone system for the delivery of objects. The system is structured in quadcopter with four arms connected to a central trunk, illustrating the application of advanced data processing in real-life situations[2]. Zhang's work on brain-machine interface analysis, which USES computer-aided measurement modelling to better understand behavioral psychology, shows that data analysis and cognitive science are increasingly interfacing[3]. Y Wang and Y Tang discussed the challenges posed by the diversity of embedded models of different heterogeneous information networks (HIN). Using sophisticated benchmarking techniques, the complex and hidden problems of model evaluation have been resolved[4]. Together, these efforts highlight the importance of refining data structures, optimizing analytical methods and integrating various technical approaches to improve the accuracy and efficiency of computer-assisted information analysis in theoretical and applied contexts.

3. CAIA Technology Core Characteristics and Application Prospect Analysis

CAIA technology has demonstrated superior scalability and analysis capability, greatly improving the efficiency and accuracy of information processing. In the domestic market,

supermarkets began to deploy and test a SAS module software based on CAIA technology, capable of processing large amounts of information in real time, automating complex batch processing tasks and improving the efficiency of business process processing. CAIA technology allows powerful visual analysis. The search engine developed by Microsoft Asia research makes it possible to search large sets of data and present analysis results dynamically and intuitively, using deep algorithms to store data and process it in the background[5].

In the field of decision making and intelligent analysis, computer-aided information analysis (aic) techniques have demonstrated a wide range of applications that effectively improve operational efficiency and strategic understanding. In the context of real-time trend monitoring, platforms such as weibo are using CAIA to assess and determine whether particular topics should be on their most popular search lists. This is achieved by quantifying the frequency of search terms, identifying and displaying trend content quickly through keyword queries, analyzing comprehensive data and compiling statistics from user interactions. In addition to instant analytics, CAIA technology has demonstrated strong predictive capability, such as the Google valley flu trends project, launched in 2008. This initiative is successfully harnessing the power of the aaic to significantly improve the accuracy of disease prediction models by aggregating and analyzing health data from the network. The application of this advanced information analysis technology in the medical field not only has the potential to further improve forecast accuracy, but it also fosters continued innovation and development across the industry, laying the foundation for a more proactive and informed healthcare strategy. As CAIA evolves, its integration into industries will revolutionize traditional practices, provide unprecedented information, and promote more dynamic decision-making and forecasting methods.

4. Construction of CAIA Technical Framework and Analysis of Key Technologies

The technical structure of computer-aided information analysis, including a wide range of components from infrastructure to complex application, is designed to provide the necessary physical support for computing and storage operations at the basic level to ensure the stability and scalability of the system; This is called including a key hardware element in the seb server and network devices, it is necessary for processing more information efficiently. In a file infrastructure system, database Dan and storage Dan are important components to support, enabling components in managing Dan and organizing, storing, searching and processing information efficiently and in quality. Human-vehicle communication systems have been further enhanced, enabling users to directly and effectively participate in higher levels of data use. Business intelligence tools and decision support systems (DSS), where data is thoroughly analyzed and redirected to business ideas and informs strategic decisions. Seamless integration of these components creates a strong structure that supports complex analysis of complex information and greatly improves the overall efficiency of the data-driven process.

As an integral part of the operating system, the file system has the important task of storing and managing the data and ensuring that the data is organized and accessed efficiently. Databases and data warehouses as important tools of computer-assisted information analysis technology are particularly suitable for handling real-time business processing and online transaction processing. They can also be used with various data analysis software (such as CAD, CAM, CAPP, ERP, etc.); Specialized in the extraction, transformation and aggregation of data, the data warehouse supports online analytical processing (OLAP) and generates dashboards of key indicators that support decision support systems (DSS) and executive information systems (eis), essential for making informed business decisions.

By efficiently organizing and analyzing data, business intelligence plays a key role in

transforming processed data into thematic information with higher application value. The integration of advanced human-machine interaction systems enables further exploration of data stored in databases and data warehouses. Through intelligent processing techniques, the information obtained from this analysis can be visually presented to customers or fed back into business intelligence systems, allowing more complete use and interpretation of the information. This process improves the efficiency of data collection and the ability of computers to adapt to learning, thus better meeting and anticipating future data analysis needs. The organization could make wiser decisions by using those technologies to discover deeper ideas and optimize their operations.

As the environment and data types become more complex, research is gradually shifting to technologies such as distributed databases, parallel databases and programming models mapreduce, which become centres of scientific research and are widely used in practical applications. These innovations have greatly enhanced the effectiveness of large-scale data analysis, highlighting the key role of data extraction technology in extracting valuable information from large and complex data concentrations. By combining advanced computing techniques, modern frameworks can now find subtleties in complex data structures, providing users with deeper and faster information to enable them to make wise decisions. As technology evolves, it is expected that the framework will continue to evolve to improve its reliability and effectiveness to meet the increasingly complex data analysis needs. This evolution will enable managers to adapt and respond to increasingly complex analytical needs to ensure their relevance and effectiveness in an expanding data environment.

4.1 Advancing Multidimensional Data Processing in Computer-Aided Analysis

Joint analytical processing (olap) was introduced in 1993 by the innovator of the relational database system, e.f. codd, with the aim of providing a quick interface to visualize responses to queries and friendly users, radically changing the area of integrated data analysis and decision support systems; Since its birth, olap has developed a technology that has become indispensable and characterized by a unique ability to process data.It can be divided into three main types: relational OLAP (ROLAP) which is based on a relational database; Multidimensional OLAP (MOLAP) using multidimensional databases; And hybrid models combining ROLAP and molap elements - leading to widespread adoption of various OLAP tools such as oracle's Hyperion Essbase, IBM's DB2 OLAP Server, Microsoft's Plato, and other business intelligence platforms, such as MicroStrategy, in many areas, they offer advanced analytics capabilities and enable valuable insights to be extracted from complex data issues.

In the realm of large-scale data analysis, the benefits of OLAP technology become particularly apparent, as exemplified by its application in urban traffic management, where OLAP's capacity to systematically monitor and evaluate vehicle movements provides critical insights that support real-time decision-making and enhance traffic management; by analyzing extensive datasets within a multidimensional framework, OLAP facilitates the integration of complex patterns and trends, which is essential for addressing the intricacies of modern urban environments, and through the establishment of a standardized framework for data, data warehouses aggregate and store traffic data while employing real-time visualization tools to present this information, thereby enabling managers to gain an accurate understanding of traffic conditions, which not only improves the effectiveness of data analysis but also delivers substantial support for strategic decision-making, and as technological advancements continue, the potential applications of OLAP are projected to expand significantly, with its integration with additional data processing tools expected to further elevate the sophistication and efficiency of data analysis.

4.2 Future Potential and Obstacles in Data Mining and Knowledge Extraction

Data Mining (DM) encompasses the process of uncovering hidden information and patterns from existing datasets, with the aim of revealing underlying insights rather than generating new data, and employs a wide range of techniques, including artificial intelligence, interactive data exploration, statistical methods, and various rule-based approaches such as association rules, anomaly detection, and clustering, which together enable a thorough examination of data and the extraction of critical insights that enhance decision-making and advance Knowledge Discovery in Databases (KDD); by systematically analyzing and integrating extensive datasets, KDD facilitates the extraction of knowledge with significant practical implications, and within the realm of Computer-Aided Information Analysis (CAIA), databases and data warehouses serve as essential foundations for data mining activities, with traditional database systems, primarily used for transaction processing, continuing to play a key role in data management, while data warehouses are specifically engineered to create environments conducive to complex analytical tasks by systematically organizing and archiving data to support detailed analysis, and as the data landscape evolves, the emergence of new technologies such as parallel databases and the MapReduce programming model becomes increasingly critical for advancing data processing and analytical capabilities; additionally, sophisticated FGHI functionalities are indispensable for managing databases and performing comprehensive analyses within data warehouses, thereby enhancing the effectiveness of business intelligence and decision analytics, and despite ongoing technological advancements, the fundamental structure and principles of the CAIA framework have remained robust, providing a comprehensive top-level design and strategic perspective that underpins effective information analysis, thus ensuring that as technological innovations and practical applications continue to evolve, the CAIA framework is well-positioned to retain its crucial role in data mining and knowledge extraction, driving sustained progress in these vital areas.

5. Conclusion

As emerging technologies such as big data and cloud computing continue to evolve, computer-aided information analysis (CAIA) technology faces increasingly complex challenges, and the sheer size of big data poses significant obstacles to CAIA's ability to effectively process and manage large amounts of information, with initial systems often struggling to handle large data sets. Contributing to significant technological advances aimed at improving the efficiency and capacity of data processing systems; The escalating diversity and complexity of data further compounds the difficulties of analysis, traditional relational databases often lack the flexibility needed to handle a wide range of data formats and structures, and their inherent 'patternfirst' approach can hinder comprehensive and accurate data analysis, requiring innovation within CAIA to expertly manage heterogeneous data and meet different analytical needs.

Furthermore, the challenge of optimizing the utility of data remains pressing, as addressing the complexities associated with expansive and diverse datasets has led to the integration of classification and optimization techniques within data warehouse technologies aimed at enhancing database efficiency, yet these advancements must continue to evolve to more closely align with user requirements and further improve the effectiveness of data processing; despite the significant strides CAIA has made in advancing information analysis and markedly enhancing analytical capabilities, it remains a supplementary tool that cannot entirely replace human judgment and decision-making, and as we look to the future, the development of CAIA technology is anticipated to increasingly concentrate on enhancing intelligence and adaptability, necessitating ongoing modifications to address progressively complex data environments in order to sustain its relevance and prominence in the field of information analysis.

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