Software Engineering Department Database System Project

Artificial Intelligence Database (AI/DBS)

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Abstract:

The combination of AI and DBMS advancements ensure to assume a huge part in forming the eventual future of computing. Database and Artificial Intelligence (AI) can prove to be beneficial for each other. Database can be used to highlight importance of AI more efficiently. Artificial intelligence/DB integration is significant for next generation computing as well as for the advancement of DBMS innovation. Both DBMS and AI frameworks address well established technologies, innovative work in the space of AI/DB combination is near. The inspirations driving the integration of these two advances incorporate the requirement for (a) admittance to shared information for information handling, (b) Effective management of information (c) insightful preparing of information. A few general ways to deal with AI/DB integration and different improvements in the field of astute data sets have been explored and revealed in this research. Database can also be used for optimization of AI model. For Example: Deployment of AI in the applications is difficult because programmers have to write complex and lengthy course. Using database strategies complexities of AI models can be decreased, improve AI algorithms and make it accessible. The IDI (Intelligent Database Interface) is an interface that enables AI systems to connect to one or more Database Management Systems. Implementations of IDI give a high rate of portability. The outcomes of IDI are organized in one tuple and stores result relations, increase the efficiency of the system. IDI is one of the important components of ISS (Intelligent System Server) information maintenance.

Introduction:

Databases are widely used in both private and public information systems for a wide range of purposes. These systems establish a link between data representation at the user or programmer level and data storage at the logical level. The same can be seen in knowledge discovery in databases and data mining. Database Management Systems are software tools that are designed for the correct and safe manipulation of databases. Codd created the Relational Data Model in 1970, with the goal of creating a data representation that was totally decoupled from storage structures. Data management necessitates database technique support. For effective issue solving and decision making, it is critical to administrate and use the valuable data resource. The Relational Data Model is used by the majority of database management systems.

Database management systems provide for efficient task management and a significant increase in productivity. Databases have become the repositories of vast volumes of data as a result of the advancements and in-depth applications of computer technologies,

as well as the broad applications of web technology in numerous fields. Data models are designed to represent information from real-world situations. They are used by DBMS to represent data at the user or programmer level. Intelligent database research and development has recently arisen as a new discipline that has gained a lot of attention. Data models with a low abstraction level denoted data with structures that were close to the physical storage level. In the application of data management, database systems are critical. Database technology is, by definition, application-oriented.

Over the last five decades, artificial intelligence (AI) and databases (DB) have been widely investigated. On the one hand, AI has the potential to make databases more intelligent. Learning-based strategies, on the other hand, can help in tuning database knobs. Database can be used to simplify the use of AI models and to speed up AI algorithms. Three factors have recently pushed AI forward: massive data, novel methods, and high processing power. The problem of tweaking database knobs can be solved using learning-based strategies. The database and DB4AI can both benefit from each other. Traditional empirical database optimization strategies can't keep up with large-scale database instances' high performance demands. Deep learning, for example, can help with cost estimation and deep reinforcement learning can be used to fine-tune database knobs. Recent research has focused on AI4DB. Database techniques, on the other hand, can be used to improve AI models (DB4AI). For starters, database systems have been widely employed in a variety of projects because they are simple to use and provide user-friendly declarative query paradigms as well as encapsulation of complex query optimization mechanisms. Because AI requires developers to write sophisticated routines and train intricate models, it is difficult to implement in real-world applications. The influence of Artificial Intelligence (AI) on databases is evident. Microsoft, for example, is using artificial intelligence to continually analyses Azure SQL database workload trends and apply automated tuning when it detects chances to improve database performance. Oracle has also announced the Oracle Autonomous Database Cloud, which use Machine Learning to allow a database to upgrade, patch, and adjust itself while in operation. Regardless of the database settings in your organization, AI may be used as part of a Database Management system to help with security, capacity planning, and workload management. Microsoft and Oracle are utilizing artificial intelligence (AI) and machine learning to guarantee that their products are built and utilized as intended, which is critical in decreasing technical support calls for setup issues.

An intelligent database gives you additional options and flexibility when it comes to querying. A user may, for example, enter an inquiry as a whole phrase. The database then returns a list of hits ranked by the likelihood (from highest to lowest) that the resultant data contains an answer to the inquiry. The users suspected faults (such as incorrect spelling) may be corrected by Artificial Intelligence (AI). Synonyms for keywords and phrases are displayed in certain

intelligent databases. To get the most out of an intelligent database, the user must plan ahead of time and carefully phrase questions, just like he or she would while interrogating a person. In order to get the most out of an intelligent database, the user must plan ahead of time and carefully phrase queries, much as if they were interrogating a human.

Literature Review:

The combination of AI and DBMS plays an important role in forming the future of advance computing. It is necessary not only for the advanced computing but also for the optimization and simplicity of database embedded AI system. AI and DBMS, individually, are quite expert systems but their integration forms whole new system. This integration aims to perform following task:

- Accessing massive amount of data for information processing
- Management of data and information
- Intelligent processing of information

Usually the AI systems are connected to DBMS capabilities in order to provide efficient access to management of massive stored data. Generally, AI systems do not fully contained DBMS technology. The main focus is on the AI system and the DBMS characteristics are used to implement algorithms that help in accessing data.

The Intelligent Database Interface (IDI) is a portable, cache-based access designed to give effcient access to one or more databases on one or more global database management systems (DBMS) that support SQL to artificial intelligence systems in general and expert systems in particular. The Intelligent Database Interface Language (IDIL) is the IDI's query language, which is based on a restricted subset of function-free Horn clauses, with the head of a clause representing the target list (i.e., the form of the result relation) and the body being a conjunction of literals denoting database relations or operations on the relations and/or their attributes (e.g., negation, aggregation etc.). The Intelligent System Server (ISS), which is built on Protem and provides a mixed logic-based and frame-based knowledge representation system that supports forward-chaining, backward-chaining, and truth maintenance, includes the IDI as one of its essential components. The IDI was created to work with the ISS's logic-based knowledge representation system and its tuple-at-a-time inference methods. Current address: IBM, Research Triangle Park, North Carolina The IDI has also been used to create a query server that supports a database for an Air Travel Information System that is accessed using a Prolog-based spoken language system.

The IDI offers several significant features in addition to enabling efficient access to remote DBMSs. Because SQL is used to communicate with the remote DBMS, it may be used to interface with a broad variety of DBMSs with little or no modification. Because connections to distant DBMSs are abstract objects maintained as resources by the IDI, several connections to the same or different DBMSs can exist at the same time and be kept active over any number of queries. Finally, the IDI handles accessing schema information automatically,

thus the application is not required to keep up-to-date schema information for the IDI. This greatly decreases the risk of errors caused by outdated schema information or manually input data. The IDI can be thought of as a standalone DBMS interface that receives IDIL clauses as queries and provides the result relation as a set of tuples (a list of Lisp atoms and/or strings). IDIL queries are converted to SQL and transmitted to the appropriate database management system (DBMS) for execution. The IDI converts the DBMS results into tuples of Lisp objects. Although the IDI was not designed to be used directly by a user, the following descriptions will be written in the context of utilising the IDI as a stand-alone system to avoid becoming bogged down in the complexities of an AI system like the ISS.

Integrity constraints are an important technique for describing the well-formedness and semantics of data in databases. In this regard, intelligent database management systems must provide automatic support to their users in order to effectively and efficiently preserve the semantic accuracy of data in relation to the supplied integrity constraints. Many writers presented an overview of effective integrity verification and maintenance for relational and deductive databases. It addresses both theoretical and practical aspects of integrity control, as well as active rules for maintaining integrity. The authors propose new research directions, notably for two subjects that are predicted to have a significant impact on future developments: integrity in XML data sets and distributed databases. Both present the database community with a slew of new and very important research issues.

Methodology:

Over the last few decades, AI methodology and approaches have been applied to medicine and health in general. AI medical applications include diagnosis, categorization, therapy, and robotics, among others. To date, neural networks and fuzzy logic (FL) are the most widely utilised AI technologies of the many available.

Medicine's Expert Systems

Expert systems (ES) are the most frequent type of AI system used in daily clinical practise. They are defined as systems that may capture expert knowledge, facts, and reasoning skills in order to assist caregivers in their daily work.

The most prevalent ES utilised in the diabetes area are rule-based reasoning (RBR), case-based reasoning (CBR), and fuzzy systems.

RBR

RBR is based on the transmission of knowledge from a human to a machine. As a result, the computer must be able to handle difficulties that would normally require the assistance of a professional. Knowledge is expressed in the form of "if-then" statements, which allow the path of reasoning to be articulated.

CBR

CBR develops novel answers to challenges by adapting previously successful solutions to similar issues. To aid in the retrieval of

other examples, case study features must be given. At the same time, features must be discriminative enough to prevent the retrieval of case studies that may result in incorrect solutions due to their differences.

FL

Fuzzy ES are used to describe expert knowledge that uses ambiguous phrases in a computer-readable format.

Machine Learning

The ability of machine learning (ML) algorithms to learn over time without being explicitly programmed is what distinguishes them. The primary characteristics of ML include problem solution, which is frequently based on data classification. A progressive shift away from heuristic approaches and toward machine learning techniques has occurred. In the discipline of data mining, machine learning techniques are used to extract useful information from massive databases, such as electronic medical records, which may contain latent regularities.

Decision trees (DT), artificial neural networks (ANN), genetic algorithms (GA), and support vector machines are examples of ML methods (SVM). They've all been tried and tested in the realm of diabetes.

Deep Learning:

Deep learning is a new branch of machine learning that is based on the activity of neurons in the human brain. It can be regarded a development of ANN because it does classification using a hierarchical level of ANN. Deep learning algorithms are very effective in learning processes and give systems based on them a high level of intelligence. The deep in deep neural networks refers to the fact that numerous layers of processing transform input data (whether it's images, audio, or text) into a meaningful output for decision-making.

Result & Discussions:

Result:

Researchers from Imperial College in London conducted one of the most relevant experiences on the application of ES to patient decision assistance. They created and tested a CBR-based bolus calculator algorithm. This technology, which is incorporated on the patient's smartphone, employs continuous glucose monitoring data. A preliminary feasibility study has been published, demonstrating the tool's potential advantages over traditional bolus calculators.

FL-based algorithms have been effectively employed for closed-loop investigations, even in the ambulatory context, in addition to proportional derivative integral (PID) and model predictive control (MPC). Deep learning ANN has recently been shown to accurately detect diabetic retinopathy or diabetic macular edema in retinal fundus images with excellent sensitivity and specificity.

Discussion:

Diabetology must undergo a period of transition in order to absorb new diabetes control methods. For both health care practitioners and patients, technology, particularly sensors and computer

applications, has become an important tool in diabetes treatment. Despite the fact that current diabetes care units should have a diabetes technologist on staff to deal with technology, doctors and nurses cannot overlook the basics in order to better identify answers to each patient's unique situation. Although understanding of insulin pumps and, more recently, glucose sensors has improved, understanding of AI and smart application performance remains essentially poor. This article gives a general overview of the basic principles, terminologies, and terminology commonly used in AI-related applications, as well as a collection of significant AI-related diabetes papers.

Conclusion & Future Work:

Future Work:

In future the following two aspects can help in the uplift of AI (Artificial Intelligent).

1. Processing of data in AI Database

2. Intelligent aspects of databases

Processing of data in AI Database

Artificial intelligent methods can be helpful in processing of data. These types of systems can be embedded in search engines which helps in data mining, interpreting internet extracted material and many other areas. The areas in AI Database which needs attention and future work are algorithms which assumes that all the item are related positively only. Existence of negative correlation in between the items is often neglected. Therefore by taking valuable data from rejected items and by proposing alternative methods can help in taking the item into consideration effectively.

Another area that requires efforts is performance of data mining. Outlier detection is a way in which number of cells increases exponentially and this affects the performance. By using a CD-Tree structure non-empty cells are utilized and to store the data objects clustered method/technique is used.

In the field of data mining efficient technique to store massive amount of data is required without deleting records in database. This requirement can be fulfilled by using such algorithms which maintains discovered association rules for deletion of records as new information is inserted in database.

Intelligent aspects of Database Systems:

In information systems including their core databases need changes according to user requirement and according evolving business strategies. Traditional database evolution techniques focus on reaction of change to perform schema evolution operations and to update the data effectively. These solutions cause high costs in human resources and financial support. Despite of these solutions to prevent high cost such approaches should be used in which future changes can be anticipated during requirement analysis phase of schema development. This able the database schema to adapt to future changes and to estimate their relative costs.

Conclusion:

In this paper, we have presented an approach to build an intelligent database system by integrating Artificial Intelligence with Database System. AI techniques provide semantic support to a DB system and DB techniques to aid an AI system to deal with large amount of information. Our approach to AI/DB integration conforms to the belief that one of the key factors for this integration resides in exploitation of the equivalence between data models developed in DB field and knowledge representation systems of AI.p85

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