Adaptation of Artificial Intelligence for Intelligent Library Services

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Abstract:-

With introducing and developing Artificial Intelligence logic, this science as a branch of computer science could impact and improve all sciences which used computer systems. Library and Information Science also could get benefit from Artificial Intelligence in many areas. This paper survey applications of Artificial Intelligence in a library and information science and introduce the potential of the library system to apply Artificial Intelligence techniques. Intelligent systems have contributed to many librarian purposes like cataloging, indexing, information retrieval, reference, and other purposes.

Introduction:

Artificial Intelligence has come a long way from its early roots, driven by dedicated researchers. The expression "artificial intelligence" was introduced as a 'digital' replacement for the analog 'cybernetics'. Artificial intelligence began as an experimental field with pioneers like George Boole (1815-1864), Allen Newell & Herbert Simon, who founded the first artificial intelligence laboratory. In general Artificial Intelligence is the subfield of Computer Science concerned with understanding the nature of intelligence and constructing computer systems capable of intelligent action. Artificial Intelligence involves following areas of researches: ***(1)*** expert system, ***(2)*** fuzzy logic, ***(3)*** artificial neural network, ***(4)*** evolutionary algorithms, ***(5)*** case base reasoning, ***(6)*** image processing, ***(7)*** natural language processing, ***(8)*** speech recognition and ***(9)*** robotic. These areas are not separate and in many intelligent systems at the same time two or more Artificial Intelligence techniques are contributed to solvingthe problem. Artificial Intelligence techniques or tools has utilized in many areas such as business, management, medicine, military and etc.It also has developed in using intelligent systems. The Ideas of utilization intelligent system instead of a classic system in libraries started in 1990. Intelligent library systems utilize Artificial Intelligence technologies to provideknowledge-based services to library patrons and staff Artificial Intelligence is a broad, complex area of study, which can bedifficult for non-specialists to understand. Artificial Intelligence will come bundled with OPAC's, online services and communications networks. It is a commercial knowledge-based industry rather than local development efforts. Through the application of artificial intelligence technologies numerous prototype intelligent library systems have been created for the library routine work like cataloging, indexing, information retrieval, Reference and other purposes. To build an intelligent computer system we need to collate, organize, represent and use human expert knowledge in a narrow vertical domain Yet, its ultimate promise is to create computer systems that rival human intelligence, and this clearly has major implications for librarianship. Different studies are about Artificial Intelligence applications in library systems such as: descriptive cataloging, technical services, collection development, subject indexing, reference services, database searching, and document delivery. Some papers deal with the underlying design issues of knowledge representation and natural language processing. Many authors have previously provided in-depth overviews of Artificial Intelligence technologies. There have also been several reviews of research and development efforts relevant to librarianship based on a review of major models of human intelligence.

Areas of Artificial Intelligence: -Artificial Intelligence focuses on symbolic, non-algorithmic problem-solving methods. Intelligence relies on the ability to manipulate symbols. Artificial Intelligence though is a young discipline, has transformed the society beyond imagination. The goal of its sub-areas i.eexpert system, pattern recognition, is to simulate human intelligence with computers. Some of the recent computational techniques and areas that are utilized in developing fields of Artificial Intelligence are discussed below;

Expert System: -Expert System is the knowledge-based computerized systems which play a role of intelligence interface or gateway for providing access to the database and to obtain relevant information. They range in scale from simple rule-based systems with flat data to very large scale, integrated developments taking many people, years to develop. An expert system is a computer program that provides expert advice, decisions or recommended solutions for a given situation.(Wikipedia/expertsystem,2014) The different components of expert systems are: Knowledgebase, Inference Engine, and User Interface.

Pattern Recognition: -It is the process of establishing a close match between some new stimulus and previously-stored stimulus patterns. This process is being performed continually through the lives of all living things. Pattern recognition is studied in many fields, including psychology, ethnology, cognitive science and computer science. Pattern recognition is based on either a priori knowledge or on statistical information extracted from the patterns. The patterns to be classified are usually groups of measurements or observations, defining points in an appropriate multidimensional space.(Wiki,2014) The components of pattern recognition are; data acquisition, pre-processing, feature extraction, model selection and training, and evaluation.

Application IS/AI/ES in the Library System: -ESs consist of two main elements: a knowledge base and an inference engine. The knowledgebase is involving all information needed in which human/librarian experts are using them to make a decision. This information present in the knowledge base as facts and rules. ESs can make a much better decision than librarian decision makers because their knowledge base can involve the experiences of a team of best experts. To design rules of the knowledge base, the manner of librarian experts to make a decision is emulated. The rules are consisting of two main phases: If phase and then phase. If the phase is consisting of conditions and then the phase is consisting of results. The only thing which distinguishes ESs from other computer systems is the inference engine. The inference engine simulates human decision makings based on the knowledge base and rule base. An obvious potential application of ES within libraries is for the selection of booksellers or other vendors of library materials carried to its logical conclusion, a system might be developed to select a vendor to automate ethical based on past performance in the supply of publications of a particular type such a capability would be especially valuable in the acquisition of material that is less routine-conference proceeding. Certain technical reports, publications in certain languages, publications from certain countries, and soon.

Other ESs, designed to help library user satisfy their own needs, have also include document-orders aid. Systems have also been designed within the library community to aid in the selection process systems of this type have been discussed by some of the researchers. The term "referral system", as used here, relates to systems that & are designed to refer library users to information sources likely to provide the answer to a particular question of the factual of "information" type within the library community more work has been done on system of this kind than on any other ES.

Intelligent resource system: -With the development of big data and artificial intelligence technology, the intelligent resource procurement system can automatically collect and integrate all users' personalized demand information and various types of document resource information through deep learning mechanisms. Therefore, it is possible to construct an intelligent document resource procurement decision system. Intelligent procurement system construction needs to pay attention to two key points. (1) It is necessary to scientifically and reasonably determine influencing factors. The library can establish a scientific and objective decision-making model by combining the comprehensive factors such as user group characteristics (such as gender, age, educational background, occupation, etc.), user personalized information (such as in colleges and universities, the number of teachers and students of various majors, subject setting, subject status ranking, school key construction disciplines, teachers and students hobbies, school opening Course name), recommendation and purchase of books (related to professional degree, popularity or utilization of books, book prices, etc.), expert advice (discipline construction, book utilization rate, book reproduction rate, etc.) and annual budget, so as to complete the book ordering plan and optimize the allocation of book purchasing funds. (2) To comprehensively collect and analyze open resources. Through intelligent collection and analysis of open resources, the intelligent procurement system can provide a reference for procurement librarians to make a decision.

Intelligent management

- **Intelligent warehouse management**

Intelligent warehousing management has several distinct characteristics: (1) realize the self-service management of the book library with the goal of automatic book circulation and paper document management; (2) the books can be stored randomly on the bookshelf, no need for the book number, reducing the multifarious bookshelf arrangement; (3) Introduce a robot system to realize the management of automatic and unmanned counting, checking and sorting of book storage. There are many successful cases in the library intelligent warehouse management system.

- **Intelligent Security Management**

The library's daily services include seat management, lending management and identity management and other security management, while face recognition, fingerprint recognition and other artificial intelligence technology can further solve the library's security management. For example, face recognition technology specially designed by artificial intelligence technology is used to collect students' face information and bind it with students' information. After binding, students no longer need to carry student identification information, but can directly enter and exit the library through face brushing.

The identity authentication module uses face recognition technology as technical support. Previous face recognition technologies are mostly traditional statistical methods such as Adaboost and PCA (Principal Component Analysis). After the deep development of artificial intelligence, deep learning algorithms such as CNN (Convolutional Neural Networks) and RCNN (Region CNN) have emerged. Such algorithms have been qualitatively improved in recognition accuracy and speed. With the improvement of these core algorithms, the application of face recognition technology has algorithm support in the construction of smart libraries. Face recognition technology is mainly composed of four parts: face image acquisition and detection, face image preprocessing, face image feature extraction, matching and recognition.

Intelligent services

- **Intelligent application service**

At present, the technology of library self-service application service is relatively mature, and the forms and contents of services are also rich and diverse. The main representatives are: Self-service seat management system, self-service library ATM, self-service print copy management, lecture training appointment management system, etc. Self-service applications have the following advantages over traditional application services: (1) Breakthrough the space-time boundary with artificial intelligence to realize instant service in no-show; (2) Extend the service form of library services and expand the scope of service targets, thereby reducing the logistics and labor costs of library services; (3) Enhance the user's willingness to participate and protect the service application privacy of reader users; (4) Promote the rational allocation of service resources and reduce the probability of service errors caused by manual services. The above intelligent application services are visible in the general smart library.

- **Intelligent consulting service**

Consulting services are an important part of library services. Traditional consulting services are inevitably insufficient, such as the limited number of consulting librarians, the low efficiency of manual consultation, and the time limit for consulting work, etc. The emergence of intelligent consulting services can effectively meet the needs of users' consulting services, make up for the above shortcomings, and realize the library's independent, instant, and convenient and alloweither intelligent consulting services. The working mode and process of intelligent consulting service at present, intelligent consulting service plays an important role in "consulting librarian" in many libraries.

Intelligent knowledge service

Knowledge service is the core of library service, and intelligent knowledge service is the new positioning of library service innovation, with a strong vitality and broad prospects. The rapid development of artificial intelligence technologies such as cross-media awareness, big data management, deep autonomous learning, virtual bionic functions and simulation language interaction provides convenient conditions for the intelligentization and specialization of knowledge services. The patterns and deep knowledge mining processes of intelligent knowledge service are mainly embodied in the intelligent analysis of user behavior, intelligent management of information data and intelligent operation of service business, etc., which are realized through knowledge analysis tools, knowledge presentation methods, conceptual research models and analytical research methods. Specific as follows:

- **Intelligent analysis of user behavior**
  From theperspective of the user, the user's application behavior is analyzed through artificial intelligence, and the required knowledge is actively recommended to meet the individualized needs of the user and improve the utilization of knowledge resource
- **Intelligent management of information data**
  Use literature, patents, science, and personal data to conduct intelligent analysis and forecasting, establish knowledge-related networks, and provide a reference for knowledge services
- **The intelligent operation of the service**

From the service business and management process, to enhance the core competitiveness of knowledge services, On the one hand, optimizing the knowledge service process can improve service efficiency. On the other hand, it can also provide decision-making and strategic planning for knowledge service.

Application of Expert System in Library Activities: -Library activities related to the reading materials, users and staff. The application of Expert Systems where dialogue between staff and users, users and database appears quite promising. An Expert System will help the librarian in realizing the need for an improvement in productivity. A well-programmed Expert System will also improve the quality.

Applications of Expert Systems in Reference Service: Reference service is a prime activity of any library and the Expert System will work as a substitute for a reference librarian. The following are some of the examples of Expert Systems used for Reference Service.

RESEARCH: It is a system that supplies patrons, the recommended sources to lookup for certain questions. The system can be used to teach students reference skills or as a computerized aid for practicing reference librarians and information specialists.

Online Reference Assistance (ORA): This system intended to stimulate the services of an academic reference Librarian for questions of low and medium level, by using several technologies: a videotext like a database, computer-assisted instruction modules, and knowledge-based system.ORA consists of Directional transactions like library locations, services and polices.

Application of Expert System in Cataloguing Cataloguing is one of the oldest library crafts. Recent attempts to automate cataloging through Expert Systems have focused on descriptive cataloging because it is considered rule-based(AACR2).There are two approaches for applying artificial intelligence techniques to cataloging a) A human-machine interface, where the intellect effort is divided between the intermediary and the support system; and b) An Expert System with full cataloging capability linked into electronic publishing system, so that as a text is generated on-line, it can be passed through knowledge-based systems and cataloging process is done without any intellectual input from an intermediary. There has been a problem in every attempt to convert AACR2 into the highly structured rules necessary to run the Expert System.

Application of Expert System in Classification: Classification is the fundamental activity in the organization of knowledge. For this reason it is prominent in all systems for organizing knowledge in libraries and information centers. Application of Expert System in the area of classifications in libraries.

Advantages of Artificial Intelligence

a) Can take on stressful and complex work that humans may struggle /can not do;
b) Can complete the task faster than a human can most likely?
c) To discover unexplored things. I.e. outer space;
d) Fewer errors and defects;
e) The function is infinite.

Disadvantages of Artificial Intelligence

a) Lacks the "human touch"
Can malfunction and do the opposite of what they are programmed to do
d) Can be misused leading to mass-scale destruction
e) May corrupt younger generation

Conclusion: -The numerous applications of Artificial Intelligence have been deployed, which demonstrated for the time saving, money to Business sectors, Industrial sectors, Military sectors, scientific sectors, Academic and Research organizations. AI applications and their utilities will be increasing day by day in many IT-oriented educational Institutions, which are contributing to AI-related recorded information on its AI technology and its utilities in various areas/subject fields. The success in Expert systems field, Natural Language Processing field, Pattern Recognition field, Robotics field has precipitated substantial commercial activity, including the formation

of many ventures. The practicability of artificial intelligence in areas such as cataloging, classification, documentation, collection development etc appears to be improving year after year. It is sure that in the near future artificial intelligence will occupy all the spheres with the introduction of competent models with AI techniques. Library and Information Science will be greatly benefited by the development of the efficient expert system for technical services as well as Information processing and management.

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