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Invigorating Libraries with Application of Artificial Intelligence

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Abstract

"Survival of the Fittest" as quoted by Charles Darwin fits and suits in all walks of life. As on date, big debate is on regarding the existence and survival of libraries. Libraries need to adopt emerging tools and technologies to provide best services to the users on time with precision. Artificial intelligence has placed itself everywhere in everyday life. This paper is an attempt to expedite AI applications in libraries, not only for providing services to the existing users but also finding innovative ways to attract new users. The paper discusses AI, basic requisites, its applications in libraries, and barriers in its implementations. The paper concludes that AI is the need of today for libraries.

1. INTRODUCTION

We have often seen that in our e-mail account there are spam mails, promotion mails, inbox mails, etc., in our inbox and wondered how they get separated. That is mainly due to artificial intelligence running behind our mail system. We are often seeing application of artificial intelligence in our day to day life such as Siri/Alexa with which we interact and ask queries and seek replies in our mobiles. Our Facebook feed also uses artificial intelligence where it predicts the content we may be interested and send it to us.Libraries have always existed with the sole purpose of serving its users and providing information. There has been phenomenal growth in information. The users' needs are also changing rapidly. They now have new modes of access to their desired information. With change in existing information structure and delivery mechanism, the library and information professionals are adopting new techniques and technologies to sustain and provide best services to their patrons. Libraries are progressing towards adoption of AI to provide services to the users.

2. LITERATURE REVIEW

Artificial intelligence is the use of computer science programming to imitate human thought and action by analysing data and surroundings, solving or anticipating problems and learning or self-teaching to adapt to a variety of tasks[1].

Charles W. Bailey[2], Jr. in his paper has outlined some of the major limitations of selected AI technologies of particularinterest to libraries and suggested some possible strategies for making progress in buildingintelligent library systems.

Cox, AM[3], *et al.,* in their paper captured a snapshot of perceptions of the potential impact of AI on academic libraries and to reflect on its implications for library work. The authors interviewed 33 library directors, library commentators and experts in education and publishing and elaborated Interviewees identified impacts of AI on search and resource discovery, on scholarly publishing and on learning. Challenges included libraries being left outside the focus of development, ethical concerns, intelligibility of decisions and data quality. Some threat to jobs was perceived. A number of potential roles for academic libraries were identified such as data acquisition and curation, AI tool acquisition and infrastructure building, aiding user navigation and data literacy. In this study, the requisite of AI systems have been derived, which are as follows:

2.1 Requisite of AI System

- There has to be a strategic approach towards adoption of AI. It should fulfill the expectations of its users (both those who are deploying and those who are using)

- The system should be capable for natural language processing and show characteristic same as human intelligence and beyond

- The system should process fast and give response quickly

- The results of the queries have to be precise as per seeker requirements

- The system should be like that the user can be dependent on its working and should not fail.

- Personnel have to well trained in dealing with data (which could be text, audio, video, images, graphs, equations, tables, etc.,) as well as its processing, program development, integration, etc., to deploy and operate AI solutions.

3. ARTIFICIAL INTELLIGENCE IN LIBRARIES

Libraries are creating new operating models. It is important for any library to adapt new tools and techniques to serve their users better for their sustainability. The sources and services, being the major focus of a library, need to have great attention towards innovations to provide users what they have not expected and surprise them. The field of Artificial intelligence in the area of library and information can't remain untouched. Following are some areas where the AI can be used potentially.

3.1 Acquisition Services

3.1.1 *Decision Making Tool*

The AI system will process the circulation data of the library which will help in analyzing the prominent authors and publishers to the librarians which can be decision making tool for the library authorities. The AI will not only suggest readers for books authored by same author but also will help librarian to identify the books of same author for further procurement at his end.

3.2 Technical Services

When the books are procured in the library, the AI system will help in automatically floating the data and details like vendor, purchase history, etc. about the books. Classification and cataloguing of the book will also be done by the AI system and details will be updated in the OPAC.

3.3 Circulation Services/Help Desk

The AI system can understand the users' need and behavior and help in decision making in providing relevant and timely services. For example, if a user has been issued no. of books, the AI system can suggest regarding sending reminders, calculation of fine, alert librarian regarding no further issuing, and if the books are lost, the system can also suggest the possible places from where purchase can be made.

3.4   Information Services

3.4.1 *Recommendations As per Reading Habits*

Library can develop AI system which can understand the reading habits of users and recommend relevant books and other documents such as journal articles, patents, standards, etc., accordingly.

3.4.2 *Recommendation Regarding Highly Read Books*

The AI can also analyse the highly read books in a subject through data mining in the library and can recommend to the readers interested in that subject.

3.4.3 *Conversational AI*

Conversational AI[4] refers to the use of messaging apps, speech-based assistants and chatbots (computer programs which conduct a conversation via auditory or textual methods) to automate communication and create personalized customer experiences at scale. A library can answer query through chatbots and serve its users better. This will be highly useful in reference services of the library."Microsoft has created technology that uses AI to read a document and answers questions just like human.SQuAD (Stanford Question Answering Dataset) is such a machine reading comprehension dataset that is made up of questions about a set of Wikipedia articles"[5].

3.4.4 *Image Recognition*

Image recognition system may find its importance in libraries also. For example, in a library dealing with defence science and technology, a scientist brings an image of a weapon and requires details such as specifications, reports, applications, etc. In such scenario image recognition AI can help to identify and understand the weapon, and produce the results such as its make, evolvement, specifications, etc.

3.4.5 *Text Detection*

There are AI system where on feeding an image or document, all the text can be read out which can be of any length (words).

3.4.6 *Location Detection*

Suppose there is satellite image of certain strategic weapon available at some unknown place and a user wants to know about the location, area and objects present in the image and their names, etc. The AI system will analyse the location and produce the results.

3.4.7 *Enhanced Understanding*

Human can't read very fast and can't mentally mine and structure the large quantity of data available in the text form in the libraries. But new with advanced artificial intelligent system that reads and understands large no. of articles can help scientists to recommend highly relevant information for new inventions. For example, a scientist working in defence science can develop new weapons systems using recommendations provided by such AI system.

3.4.8 *Summarizing Text*

For text document, AI not only can understand the text but can also summarize, which is a prime job of librarians. So it will be helpful for librarians who can give summaries of large text in advance and if user is interested, he can provide the full text.

3.5 Service for Visually Challenged People

The 'Seeing AI' app of Microsoft[6], is a useful app for people who are vision impaired. It's a smartphone-based narrator that can be used anywhere: people can point their smartphone at the pantry to find the vegemite, or use it to narrate a child's homework questions. "It does a whole set of AI capabilities around facial recognition. In library scenario, visual impaired can point their mobile, and can get information regarding signage displayed in the libraries such as enter-exit, books, periodicals, reference books, circulation counter, washrooms, silence zones, cafeteria, etc.

3.6 Human Resource Development in Library

3.6.1 *Recruitment and Placement*

AI can help in screening large no. of curriculum vitaes (CVs) and will also be useful in selection of suitable candidate based on the decided parameters in CVs. The

further analyses of AI will place suitable candidate at the right place based on work profile and experience.

3.6.2 *Manpower Training*

AI can help in training programs and sill development activities for the library staff. It can analyse the competency and skills of the staff and can further suggest relevant and required course and programme.

4. BARRIERS IN IMPLEMENTING AI IN LIBRARIES

Libraries are working towards adopting AI in libraries. But they have to face certain challenges in creating and deploying them. Some of the challenges the libraries are facing are:

- Management of the organisation has to first understand the need of AI in libraries and be willing to develop and use it.

- Planning about what is to be done for adopting AI, who will do the work, who will be potential stakeholders, what will be the work flows, proper scheduling, how and when to implement, etc., is to be done with finer details.

- High end technology, coding, large data, servers, databases, communication system, networking, etc., will be required

- The implementation of AI system can be very expensive so sufficient budget is required. In low-budget the AI system may lack advanced features

- As the field of AI is still an emerging area for library and information professionals, they have to clearly define their requirements to the developers and have to be participative in the designing of the AI systems

- As the technology keeps on changing with fast speed and new version keep arriving, there will be requirement of upgradation to complete switch over from obsolete technology

- There is requirement of training and upgrading the skills of staff regarding the use of AI system.

5. INITIATIVES AT DESIDOC

DESIDOC, being the central information centre for DRDO, has taken few but significant steps towards modernizing its library services through the use of AI.

Recently a new DRDO e-library has been set up to provide "Anywhere-Anytime" accessibility to the library resources of DESIDOC to the complete DRDO community. This e-Library has been equipped with an interactive Chatbot called ILA (Integrated Library Assistant). ILA is an AI tool, which also uses NLP (Natural Language Processing) in it backend to understand the variety of users' query and respond accordingly. The best part of this tool is that besides responding to written query, it also responds to verbal queries of users; that too in English as well as in Hindi language.
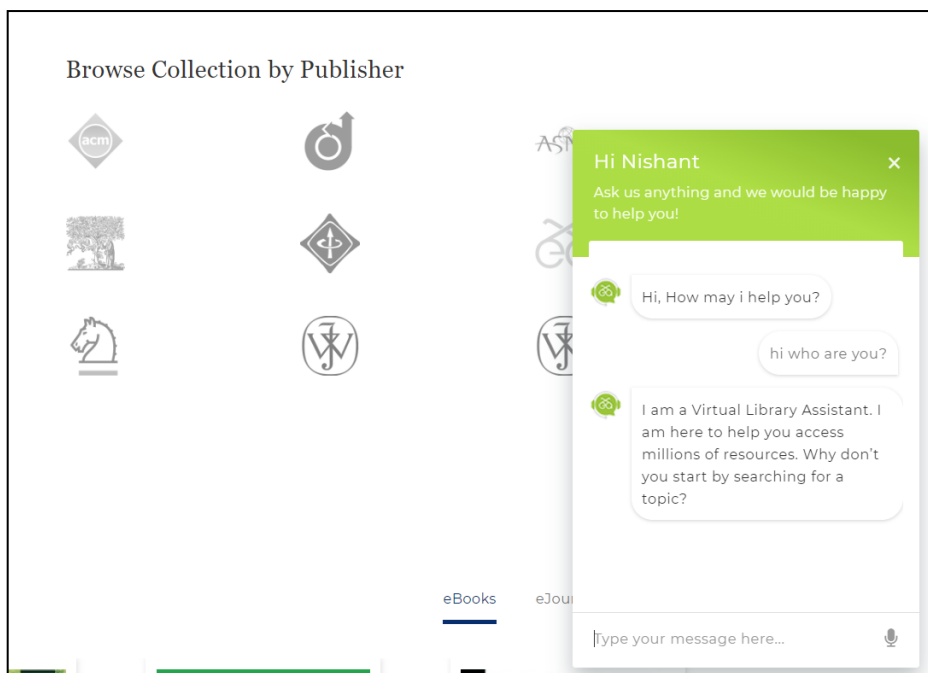
Integrated Library Assistant (ILA) : Chatbot

Another major application of AI in library services, as mentioned in section 3.4.7, is extracting the most relevant information from huge information repositories and providing it to the users in the simplest possible way. Since DESIDOC has vast pool of information resources in terms of content as well as formats, for a user to get relevant and accurate information, that too in minimum possible time, remains a challenge. To meet this challenge and to free the users using different search engines for different repositories, an integrated Open Source discovery tool 'VuFind' has been implemented which also uses AI techniques in the backend. It not only provides article level search and discovery to the user from variety of library platforms like catalog records, locally cached

journals, digital library items, institutional repositories/ bibliography and other variety of resources. Not only this, it uses AI techniques not only to enhance precision and recall of the results but also to provide the users search-suggestions/ recommendations, search histories, etc.

6. CONCLUSIONS

The AI applications in the libraries are at nascent stage. AI has vast applications which will help the users in their information needs. Preparation of robust systems need technologies like AI software, large amount of data, databases, their integration interface, storage, communication and network technologies. The library and information professionals can use the existing systems such as chatbots, Cloud

Vision by Google, Amazon Rekognition, OpenCV, etc., to serve their users. There are AI solutions available "as-a-service" which will require less workforce. The library professionals can also work with IT departments for development of customised systems, which will be helpful for users. It is not an easy task but the library professionals have always kept themselves abreast and keen to use and develop new technologies for libraries. The AI has potential use in libraries and the professional are committed and have taken steps to develop and use it for the benefit of the society.

REFERENCES

1. https://www.thestreet.com/technology/what-is-artificial-intelligence-14822076 (accessed on 10 August 2019)
2. Charles W. Bailey, Jr. Intelligent Library Systems: Artificial Intelligence Technology and Library Automation Systems.*In* Advances in Library Automation and Networking, vol. 4, edited by Joe A. Hewitt, 1-23. Greenwich, CT: JAI Press, 1991.http://digital-scholarship.org/cwb/intlibs.pdf
3. Cox, AM; Rutter, S.&Pinfield, S. The intelligent library: Thought leaders' views on the likely impact of Artificial Intelligence on academic libraries. Library Hi Tech, 2018. http://eprints.whiterose.ac.uk/136552/
4. https://en.wikipedia.org/wiki/Chatbot (accessed on 15 October 2019)
5. https://blogs.microsoft.com/ai/microsoft-creates-ai-can-read-document-answer-questions-well-person/ (accessed on 15 October 2019)
6. https://www.huffingtonpost.com.au/2017/11/15/artificial-intelligence-is-helping-blind-people-to-see_a_23278974/ (accessed on 15 October 2019)