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Opportunity and Challenges of Artificial Intelligence (AI) and Machine Learning in Agricultural Libraries Research Data Management

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***Abstract*-- This paper discusses the opportunities and challenges of artificial intelligence (AI) and machine learning in agricultural libraries research data management. Agricultural research data management is becoming very important due to the increase in agricultural research in the coming years. Indian Council of Agricultural Research (ICAR) support for this purpose under Library Strengthening and Development is a great opportunity for converting agricultural libraries research data into digital forms for managing agricultural knowledge in a better way. Agriculture libraries and information centers have done a tremendous job managing agricultural research data with the help of automation, digitization, and resource sharing. In this regard, artificial intelligence and its tools machine learning are a great opportunity for managing agricultural research data in the digital era. Agricultural librarians, information officers and documentalists can help researchers with the latest resource platforms, ONOS, CeRA, Krishikosh repositories, etc. They can provide guidance, training, awareness programs, and help from experts for agricultural research data management effectively. There is a lot of opportunity, but some challenges are also observed. The need for library professionals to change themselves to manage agricultural research data in a better way as the scenario changes.**

***Keywords*-- ICAR, Agricultural Research Data Management, Agricultural Libraries, CeRA, Krishikosh Repositories, ONOS Artificial Intelligence, AI Tools, Open AI, ChatGPT, Research Rabbit, Natural Language Processing Machine Learning,**

I. INTRODUCTION

Agriculture is the heart of our national economy. Most of the people's livelihood depends on agriculture-based produce and agriculture-based industry. Indian Council of Agricultural Research is doing a tremendous job for the strengthening of agricultural education & research in India. In this regard, ICAR has maintained a standard for Agricultural Research Database Managementfor their research institutes and State Agricultural Universities.

Under the ICAR umbrella with the help of Indian Statistical Research Institute, New Delhi manage agricultural research database of more than 77 agricultural universities and more than two hundred and above agricultural research institutes & constituent colleges across the country for uplift agricultural research. All have a separate agricultural knowledge bank individually for agricultural research data management.

II. AGRICULTURAL LIBRARY AND INFORMATION CENTERS/ KNOWLEDGE BANK

Nowadays, Agricultural libraries and information centers are playing a vital role in supporting agricultural education research and extension activities. They provide quickly reliable information at a huge level with the help of information technology and support of Agricultural Research Database management System. They manage agricultural knowledge in the digital era with the help of automation, digitization, and resource sharing, using online document delivery, open source software, consortiums, creating institutional repositories, etc. Agricultural libraries are coming forward to improve agricultural education and research using artificial intelligence in their services. Similarly, to encourage agricultural education in Chhattisgarh day by day opening a new agricultural college, etc. More than fifty colleges are smoothly working in three state Agricultural universities with their libraries. i.e. Agriculture, Horticulture, and Veterinary & Animal Husbandry. In Chhattisgarh, more than ten thousand students from across the country studying in various faculties like Agriculture, Horticulture, Forestry, Agriculture Engineering, Food Science, Veterinary & Animal Husbandry, Dairy Technology, and Food The University Library known as Nehru Library *is* the main agricultural library of Chhattisgarh. The University Library Nehru Library of IGKV is well equipped with modern automated services.

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The Library and its constituent college have good collection of agricultural research database. For its management lot of work are doing with the support of ICAR, journals database, Consortium for e-Resources in Agriculture (CeRA), Jgateplus, IGKV Theses Database, Krishikosh national institutional repository. The library has millions electronic resources database on various aspects of agricultural. Similarly Constituent College Libraries of Indira Gandhi Krishi Vishwavidyalaya, Raipur Agriculture**:** Library, College of Agriculture &Research Station, Raipur, Library, RMD College of Agriculture &Res.StationAmbikapur, Library, BTC College of Agriculture & Res. Station, Bilaspur, Library, SG College of Agriculture & Res. Station, Jagdalpur, Library, College of Agriculture & Research Station, Raigarh, Library, College of Agriculture & Research Station, Kanker, Library, SK College of Agriculture & Res. Station, Kabirdham, Library, College of Agriculture & Research Station, Korea, Library, College of Agriculture & Research Station, Janjgir Champa, Library, College of Agriculture & Res. Station, Bemetara, Library, DKS College of Agriculture & Res. Station, Bhatapara, Library, Pt. SKS College of Agriculture & Research Station, Rajnadgaon, Library, College of Agriculture, & Research, Naryanpur, Library, College of Agriculture & Res. Station, Gariyaband, Library, College of Agriculture, & Research, Korba, Library, College of Agriculture & Res. Station, Kurud, Library, College of Agriculture & Res. Station, Mahasamund, Library, College of Agriculture, & Res. Station, Chhuikhadan, Library, College of Agriculture, & Research Station, Jashpur, Library, College of Agriculture & Res. Station, Saja, Library, College of Agriculture & Research Station, Marra, Library, College of Agriculture & Research Station, Mungali Agricultural Engineering Library, BRSM College of Argil. Engg., and Tech. & RS, Mungeli, Library, SV College of Agril. Engg., and Tech. & Research, Raipur, Food Engineering, Library, College of Food Technology, Raipur Affiliated Private College of Indira Gandhi Krishi Vishwavidyalaya, Raipur: Library, Bharti College of Agriculture, Padmanbhpur, PulgonChouk, Durg, Library, Bhoramdeo College of Agriculture, Kawardha, Library, Chhattisgarh College of Agriculture, Risali (Bhilai), Durg, Library, College of Agriculture, AmbagarhChwoki, Distt.-Rajnandgaon, Library, College of Agriculture, In front of Collector Office, Dantewada, Library, College of Agriculture, Jorapali (Kenapali) Road, Raigarh, Library, Mahamaya College of Agriculture, Nagri Road, Village-Siyadehi, Dhamtari, Library, MardarshanSansthan College of Agriculture, Ambikapur, Sarguja, Library, Shriram College of Agriculture, Shriram Prisar, Rajnandgaon, Agricultural Engineering, Library, Bharti College of Agricultural Engineering, Padmanbhpur, Durg, Library, Chhattisgarh College of Agricultural Engineering, Risali, Durg. Shri Dau Vasudev Chandrakar Chhattisgarh Kamdhenu Vishwavidyalaya, Anjora Durg: Chhattisgarh Kamdhenu Vishwavidyalaya University Library is envisaged for the collection, organization and dissemination of information on agriculture. CGKV consists of the University Central Library, libraries in all constituent Colleges, and Research Stations which spread all over Chhattisgarh. Library, College of Veterinary and Animal Husbandry, Anjora (Durg), Library, College of Dairy Science and Food Technology, Raipur, Library, College of Fisheries, Kawardha Horticulture and Forestry University:Library, Mahatma Gandhi Horticulture and Forestry University, Sankra Patan, Durg, Library, Pt. KLS College of Horticulture & RS Rajnandgaon, Library, College of Horticulture & RS, Jagdalpur, Library, College of Horticulture,& RS Balod, Library, College of Horticulture & RS Dhamrari, Library, College of Horticulture & RS, Jashpur, Library, College of Horticulture & RS, Saja, Library, Danteshwari College of Horticulture, Mana Basti, Raipur, Library, Gayatri College of Horticulture, Gokulpur Rudri Road, Dhamtari, Library, Kanhaiya Lal College of Horticulture, Dhamtari, Library, Rani Durgawati College of Horticulture, Meduka, Bilaspur, etc.have a good agricultural research database.

III. Artificial Intelligence and Machine Learning in Agricultural Research Data Management

Artificial intelligence (AI) is concerned with technologies that enable computers to perform a variety of advanced functions, including the ability to see, understand, and translate spoken and written language, analyze data, make recommendations, and more. Artificial intelligence acts that normally require human intelligence, i.e., mind theory, possibilities, self-awareness, deep learning, using reactive machines, machine learning, limited memory, and stimuli-based programming. The use of artificial intelligence and its tools provides great help in improving the quality of library services. There is a lot of opportunity and few challenges are coming in using artificial intelligence in agricultural libraries but no doubt agricultural libraries may play a vital role in changing the education & research environment in the country as well as Chhattisgarh.

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IV. Opportunities of Artificial Intelligence and Machine Learning in Agricultural Research Data Management

There is lot of opportunities in using artificial intelligence in the library services

- Helpful in library operation helpful in automation of routine work of the library.
- Automated, storage and retrieval system of library.
- Helpful in user services. Role play as real time information provider in the library
- Information access is enhanced in libraries.
- Artificial Intelligence-based libraries can retrieve books on demand.
- Works as data analytics: Analyze library usage data to identify patterns, such as popular resources and times of high usage. This information can help with resource allocation and collection development. Helpful in readers' advisory, writing, summarizing books and information resources, and displays library resources, titles, etc. on a particular subject.
- ChatGPT: This AI bot can provide code from a text prompt, troubleshoot code, and generate a starting point for a report.
- Robots are used in libraries to answer questions, shelve books, and perform stocktaking.
- Works as conversational assistants: Provide virtual reference services and help users locate books in libraries. Managing Big Data of libraries on library server or cloud.
- Marinating library statistics, Library Circulation, Automatic Check, Check-in (RFID), Footfall, etc.
- Artificial intelligence is used in libraries by QR code, Bar Code, pattern recognition, and image processing.
- AI is used in libraries to create images library data, and archival image preservation (3Dpriners)
- AI algorithms analyze the content of resources and match them to users' interests.
- AI algorithms analyze user behavior and preferences to suggest items that users with similar tastes have found valuable.
- AI is helpful in combining content-based and collaborative filtering techniques to provide more accurate and diverse recommendations.
- AI can be used to create virtual reality tours, holograms, and interactive exhibits.
- AI is helpful in bibliometric analysis and visualization of research activities.
- Efficiency in data-heavy tasks. Time savings. Sustainability, Process optimization.
- AI is helpful in Customization and personalization.
- AI is helpful for virtual assistantscan provide uninterrupted 24/7 library services.

V. Artificial Intelligence and Machine Learning Tools for Agricultural Research Data Management

There are few tools of AI that use library services for machine learning platforms, automated indexing, user behavior analysis, digital repository, and natural language processing *i.e.*

- AI use in libraries for Information Literacy.
- Perplexity: Assist librarians in staying up to date with the latest research trends.
- Research Rabbit Librarians can use *Research Rabbit* to uncover the latest and greatest ideas that will truly transform our libraries.
- QuillBot Librarians: Helps ensure our writing is clear, concise, and correct
- Scite is used in the library as a search tool tailored for academic research that helps users find relevant scientific papers.
- Natural Language Processing, Library Book Processing, Classification, Voice assistance
- AI copywriting tools are helpful to keep work organized, to identify themes, and to help with referencing.
- Conker AI specialized tools for Librarians, Educators, and Researchers
- Elicit market to process knowledge.
- Copilot (Microsoft)
- Chat GPT Designed to understand and generate human-like text responses based on the input it receives,
- ChatPDF is Helpful to librarians for quickly summarizing lengthy research papers without reading them in full.
- Chatbot Arena's favorite chatbots in a large language model
- Consensus.app Creative Writing Class, Elicit, generative ai, GPT, language model, Large Language Models, literature review, Machine learning,
- Coral AI like ChatGPT can change how researchers work, from literature searches to data analysis and publishing.

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- Connected Papers: Visualization tool used for graphic charts of research papers allowing for visualizing trends.
- Tutor.AI: Useful in libraries for connecting students with qualified tutors.
- Claude AI Chatbot is designed to be more ethical and safer.
- Gemini G*emini* features multimodality and performance,
- Character personalized AI characters and tutors used for tasks such as teaching,
- Futurepedia: The AI tools directory is the largest which is updated daily.
- Augmented Reality (AR), Virtual Reality (VR), Internet of Things (IoT), Drones.
- Google Scholar is a good source for academic research, students and scholars can consider *Google Scholar* in their topmost favorite list, etc.
- Google Cloud AI is a suite of cloud-based artificial intelligence (AI)
- Google Translate is used for learning and translating text in other languages and Netflix Uses machine learning algorithms etc.

VI. Challenges of Artificial Intelligence& Machine Learning in Agricultural Research Data Management

Some challenges and disadvantages are also observed in using artificial intelligence and machine learning tools in agricultural research data management i.e., Limited Resources Funding, Infra redata availability, diversity, selecting and digitizing, sharing, data linking data privacy and security, quality, Legal issues, responsibility, ethical issues, biasness, integration, transparency, regulatory standards, technically difficult, etc.

*Overcome the Challenges in **Artificial Intelligence& Machine Learning in Agricultural Research Data Management***

To overcome the artificial intelligence and machine learning in agricultural research data management **c**hallenges, establish guidelines to minimize the various issues by the organization i.e. creating a committee to develop bias mitigation measures, work on enhancing transparency and communication, adopting the legal framework, policies and liability, realistic expectations, capabilities and limitations, and data security for maintaining confidentiality.

VII. Conclusion

Agriculture libraries and information centers have done a great job in the management of agricultural research databases. In this regard, the use of artificial intelligence and machine learning is a great opportunity, and its tools have been found very useful for the technological transformation in agricultural libraries and information centers in the digital era. We need awareness programs and professional development with recent IT based emerging technologies. The integration of artificial intelligence and machine learning in agricultural libraries enhances knowledge accessibility with the help of AI support, and the information retrieval systems of agricultural libraries are improving.

Certainly, the future of artificial intelligence (AI) and machine learning based agricultural libraries (Agricultural Research Database Management) are bright. Such types of libraries will play a great role in improving the agricultural education & research standards in the country as well as in Chhattisgarh with the adoption of artificial intelligence and machine learning based agricultural research data base services.

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