Redefining Research and Innovation Towards Digital Humanities

Shivarama Javarabhovi   Jenny Prisca Barla

Abstract

Humanities, an academic discipline, studies about the human culture. Fields under Humanities are Classics, History, Languages, Law, Literature, Performing Arts, Philosophy, Religion, and Visual Arts. Traditionally, the humanities discipline uses critical or hypothetical methods that include substantial historical elements. Critics say that humanities are the foundation of the scientific fields; it has paved the way by teaching history and discussions by describing which method is right and which is not. Applying digital technologies to the humanities is a modern approach to solving and advancing research problems.

With the transformation of libraries to digital libraries, artificial intelligence can also enormously impact libraries. By integrating AI into libraries, the efficiency and effectiveness of services increase. Libraries may increase productivity, improve user experiences, and keep ahead of technology changes in the information and knowledge management domains by incorporating intelligent technologies into their operations.

Keywords: Digital Humanities, Research and Innovation, Knowledge Creation, Artificial Intelligence, People Network

1. Digital Humanities

Digital Humanities is an interdisciplinary domain which utilizes technologies and leverages the traditional humanities. It integrates digital technologies such as digitalization, geographic information systems, statistical analysis, and visualized computing into humanities research and teaching. It is a growing concept; with the development of technology, the specific definition of digital humanities keeps evolving. Outdated definitions can limit the potential for future implementation.

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Figure 1: Projects under Digital Humanities

Many Society organizations for Digital Humanities have been established (Wang, 2018), such as the Yale Digital Humanities Lab, the Department of Digital Humanities at King's College London, and 'The Coordinated Innovative Center for Cultural Heritage and Digital Preservation' in China. Researchers are the primary users of the digital humanities. These digital tools provide new affordances and approaches for humanities researchers' study, altering their research practices and allowing them to conduct various research tasks.

1.1. Need And Benefits

Humanities scholars require digital humanities for a variety of reasons:

❖ **Enhanced Access** - Digital humanities improves and simplifies access to digital texts, allowing researchers to study online and use specialized analysis tools that bring distinct benefits not available with physical texts.

❖ **Collaborative Research** - The discipline of digital humanities promotes collaborative research design, in which humanities academics collaborate with computing scientists, information scientists, and scholars from other disciplines in big groups. This collaborative strategy can result in innovative research findings.

❖ **Novel Scholarly Practices** - Digital technologies complement traditional ways of working in the humanities while opening up new scholarly practices, such as tool development and data processing. Many humanities scholars work on tool creation, which is considered research.

❖ **Data Creation and Accessibility** - Digital humanities make gathering data easier and essential for making texts useful with digital technologies. While time and resource-consuming, this task is a

significant element of humanities scholars' research processes and is required to use digital resources successfully.

❖ **Impact on Research Procedures** - The use of technology in humanities study has changed how academics operate, modifying the technological tools and assistance they need. It has also changed the nature of scholarly identity, with tool development becoming deemed study in and of itself.

1.2 Disadvantages of Digital Humanities

The disadvantages of digital humanities are the following:

❖ **Limited Institutional Support** - Technical skills are frequently gained sporadically, and institutional support for digital research practices can be erratic, impeding the development of critical tools and infrastructure.

❖ **Lack of Suitable Tools** - Humanities scholars frequently need help to locate digital tools that match their research demands, leading to dissatisfaction with available tools. As a result, academics may turn to ad hoc solutions based on pre-existing digital technologies.

❖ **Challenges in Tool Development** - Creating new tools has only sometimes been welcomed within humanities studies, which has impacted tenure and promotion assessments. Furthermore, developing new tools involves technical skills, which may only sometimes be available.

❖ **Skepticism and Practicality** - Humanities scholars may be cautious about whether technology can sufficiently meet their research objectives, and they will only use technologies if they see a clear advantage.

❖ **Limitations of Digital Sources** - While digital texts improve access and offer specialized analysis tools, they can only sometimes replace physical artifacts. The challenges include poor image quality, homogeneous output, and difficulty identifying and keeping papers.

2. Significance of Digital Humanities Tools

2.1 Advancement of Research Outlook.

Implementing technologies in humanities has improved the focus area for less-known fields. A wider audience can be drawn towards the field of study by unfolding knowledge. For example, Using the Text Encoding Initiative (TEI), Ming Yeung Cheung and Yi-Fu Chen have successfully tried to transform "Religious Research" into "Digital Religious Research" (Yuting et al., 2023). With the advent of digital humanities, less considered fields are getting more attention.

2.2 Unstructured Data to Structure Data Using Text Tools

More and more unstructured data is generated which needs to be documented and standardized. To transform unstructured data into structured data NLP(natural natural language processing) tools are to be applied. For this purpose, keyword analysis is the first step in analyzing unstructured data, to do so TF-IDF (Term Frequency–Inverse Document Frequency) can be conducted. Other methods are the "information marking system for biographical texts" by Alvin Cheng-Hsien Chen's team, "computer-aided full-text marking, and the information semi-automatic extraction system" developed by Wai-Him Pang.

2.3 People Network

Identifying people relations and networks are the critical findings elements for historical fields. Network analysis tools can be implemented to ascertain the complex relationship between social networks among people, communities, and historical periods. The "common characteristic value" by Xie Shunhong focuses on guiding specific characteristics of computers to aid in establishing relationships. Chen Zhiming and Zhang Zhong constructed the "historical data character relationship map tool" to provide users with an interactive interface describing characters' relationships.

Figure 2: Character Relationship Map (Character Relationship Map Template & Example - Milanote, n.d.)

2.4 Combining Historical Content and Geographical Concepts

GIS-based digital humanities assist researchers in understanding the geographical and historical content. An electronic map can be produced using time and spatial data to extract age, dynasty, region, and area information, allowing researchers to visualize historical changes in spatial coordinates. It promotes an intuitive feel among researchers and maintains their focus and understanding by combining AR (Augmented

Reality), VR (Virtual Reality), and other visualization tools. For example, Shih-Chueh Kao and Vince Briffa combined picture data with AR technology to reproduce prehistoric buildings visually. 'Taiwan Biographical Database (TBDB),' created by Zhang Sufen, uses face recognition to analyze social networks.

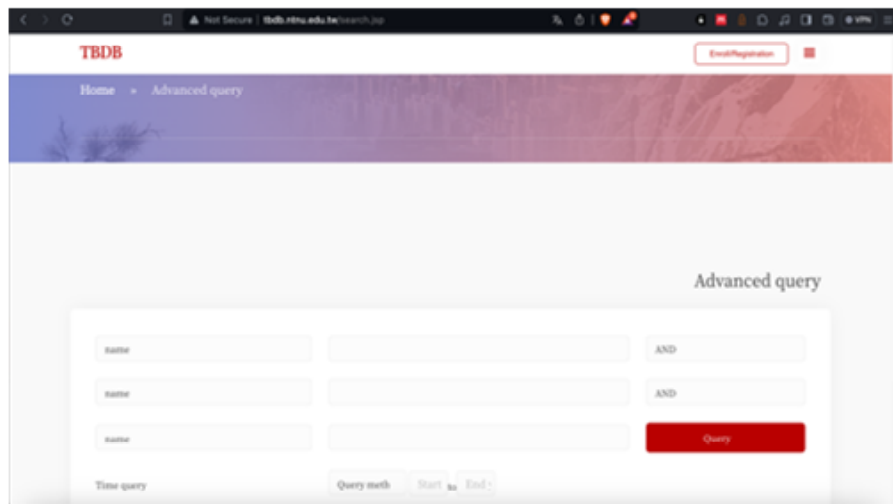**Figure 3: The Taiwan Biographical Database, TBDB (Home Page)**

Figure 4: The Taiwan Biographical Database, TBDB (Advanced Search)

2.5 Mobile Learning

Subject domains like Geography are challenging to comprehend in which names of places, rivers, state capitals, mountains, etc. are difficult to memorize and tend to be uninteresting. To address this issue, the trendy development of information and communication can be proposed by using smartphones.

For example, Riko Arrasyid et al. (2024) proposed a mobile learning application called 'GeoLab' using the DSR-Design Science Research framework. The application uses blended learning methods to teach and facilitate large groups of students in Geography Education to visualize and improve their optimization and provide them with a real-life scenario.

Figure 5: Home Screen and display of GeoLab (Riko Arrasyid et al., 2024)

Table-1: Mobile-Based Learning Platforms

Tools	Application
VirTEd	to support students with experiencein learning tourism geography
COMPASS	to support learning to guide tourist sites
Social Media Marketing	To support active involvement in travelpromotion through apps
M Traveling	To provide students with experiencein learning travel management.

Other mobile applications similar to GeoLab are shown in Table 1. They include VirTEd, COMPASS, Social Media Marketing, and M Traveling

3.   Digital Humanities in Library Context

Libraries, Museums, and Archives are the main sources of digital collections and technological implementations. It plays an important role in providing digital resources, building databases and tools, and participating in various digital humanities projects. Humanities scholars frequently need more high-tech skills, as digital humanities are interdisciplinary. This is where libraries come into the picture, by developing a single tool or platform for academics in the general humanities they lower the barrier to digital humanities researchers.

3.1. Role of Library

❖   **Data Navigation System** - The library incorporates a data navigation system to give Digital Humanities academics interactive services such as downloading, analysis, modeling, and visualization.

❖ **Digital Excavation** - The library collects and analyzes data, including information extraction, document categorization, and statistical analysis.

❖ **Metadata Management** - The library manages metadata in a standard and consistent manner to guarantee that research data can be read and explained. This comprises consulting metadata, describing basic data attributes, and organizing data.

❖ **Data Publishing Support** - The library helps with digital archive generation, text scanning, Optical Character Recognition (OCR), Extensible Markup Language (EML), XML editing, and text encoding.

❖ **Data Security and Retention** - The library provides security recommendations, raises copyright awareness, and collaborates with developers to optimize data retention and assure the long-term use and dissemination of Digital Humanities outputs.

❖ **Data Literacy Education** - The library educates researchers in relevant subjects through lectures, workshops, and online classes.

3.2. Digital Humanities Case Studies

❖ **Perseus Project** - Tufts University developed the Perseus Project 1.0, launched in 1987 as an experiment to explore the role of the electronic environment on libraries. The Perseus Project is presently at the 4.0 version.

❖ **Voyage Databases** - Voyage Databases, a project that aims to create a "single multisource dataset for trans-Atlantic slave voyages, was developed by Emory University in 2013. The database consists of archival records from various European governmental archives, which are very useful for educational purposes.

❖ **EEBO-TCP** - The EEBO-TCP data set makes datasets openly available for humanities research. It makes texts available for scholars in a clean dataset. It includes over 130,000 titles and was made public in December 2014. EEBO-TCP captures the full text of each unique work in EEBO by manually keying the full text of each work and adding markup to indicate the structure of the texts.

4. AI in Libraries

Libraries are the cornerstone of society which help in disseminating information to all sectors and fields. With libraries undergoing a digital transformation, novel technologies encompass the library's functionalities. The main goal of library professionals is to assist patrons in information retrieval resource discovery and other specialized services.

Figure 6: Example of AI Technologies (Karjian, 2023)

❖ **Expert Systems** – AI tools like chatbots can be integrated with libraries to create expert systems platforms. It provides users with expert opinions and performs decision-making processes. It can undertake tasks such as informing libraries when a new book becomes available or recommending appropriate books on the themes requested.

❖ **Knowledge Discovery** - Intelligent systems can support knowledge discovery by facilitating information retrieval, recommending relevant resources, and assisting users in navigating complex information landscapes within the library.

❖ **Improved Search and Discovery** - AI-powered search algorithms can improve the search capabilities of library catalogs and databases, delivering more accurate and relevant results to users.

❖ **Personalized recommendations -** AI can evaluate user behavior and preferences to provide tailored suggestions for library resources, allowing users to locate relevant content more effectively.

❖ **Text Understanding -** AI technology assists accessibility projects in libraries by offering tools for text-to-speech conversion, picture identification for visually impaired users, and other assistive technologies to make library materials more accessible to all users.

❖ **Automation of Repetitive Operations -** AI technology could automate regular library technical operations, such as cataloging, indexing, collection development, and circulation management, freeing up staff time for more complicated and valuable functions like professional development and library improvement. By implication of AI, the tasks can be gained accuracy.

❖ **Problem-Solving and Feedback -** Intelligent systems (Asemi et al., 2020) continually learn from user interactions and input, therefore improving their performance over time and responding to changing user demands and preferences. It enhances their effectiveness over time and responds to changing consumer demands and preferences

❖ **Data-Driven Insights** - Intelligent systems can analyze enormous amounts of data to derive useful insights about library usage trends, user preferences, and collection performance, allowing libraries to make data-driven decisions and plan strategically.

❖ **Resource Management -** Intelligent systems can help libraries optimize resource management by anticipating user demand, analyzing resource consumption patterns, and aiding collection development decisions.

❖ **Enhanced Resource Management** - AI systems could aid libraries optimize resource management by anticipating demand for certain resources, analyzing resource consumption trends, and aiding with collection development choices.
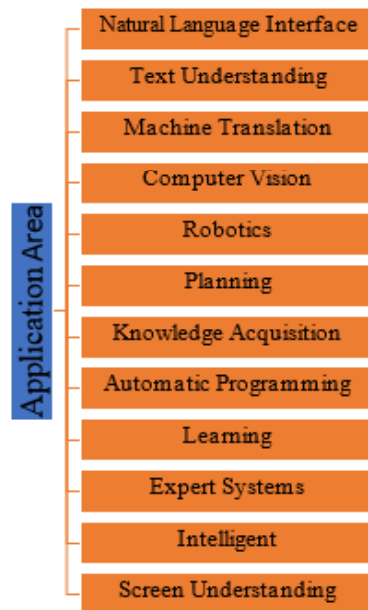

Figure 7: AI Application Area

Other areas in libraries where the implications of artificial intelligence can be seen are showcased in Figure 7. AI can be seen in natural language interfaces, text-speech understanding, machine translation, computer vision, and robotics to assist library processes. Accuracy in planning, knowledge acquisition, formulating learning experiences, utilizing expert systems, and creating screen understandings.

4.1 Challenges from a Librarian Perspective

Some possible issues that librarians may encounter (Ajani et al., 2022) while integrating AI in library settings are:

❖ **Funding** – Funding issues are the main concerns in any library. Limited financial resources may impede the procurement of AI technology and the infrastructure required for their application.

❖ **Inadequate Experts** - A lack of AI knowledge may make it difficult to successfully develop and maintain library AI systems.

❖ **Limited Power Supply** - As a developing country, many rural and urban areas need more energy supply, which might jeopardize the constant running of AI systems, which frequently require steady power sources.

❖ **Limited Budget for Technology Acquisition** - Libraries may need help to assign enough funding for obtaining AI technology, which can be expensive to adopt and maintain.

❖ **Training Personnel** - Specialized training programs may be necessary to provide library personnel with the skills to properly run and maintain AI systems.

❖ **Resistance to Change** - Some librarians may need to be more open to adopting new technologies like AI, which might complicate the adoption and integration of these systems.

❖ **Technophobia** - A general fear or aversion to technological progress might impede the successful application of AI systems in libraries.

❖ **Skills Inconsistencies** - Libraries may need help to match their staff's talents to the technical needs of AI implementation, resulting in inefficiencies.

These problems underscore the significance of overcoming financial, human resource, and technological constraints to integrate AI into library operations successfully.

5. Conclusion

To summarize, Digital Humanities has arisen as a transformative force, bringing technology into conventional humanities fields. It has advantages include improved research access, collaboration opportunities, creative academic methods, faster data generation, and accessibility. However, challenges remain, such as inadequate institutional backing, a lack of appropriate tools, and distrust among the academic community. Despite these challenges, Digital Humanities tools significantly facilitate research perspectives and the education system. It has focus on technology, which undoubtedly provides numerous benefits to humanities research. However, it can be said that if humanities scholars rely solely on "Computational Thinking," they will lose their rich subjective experience.

Libraries play an essential role in supporting Digital Humanities activities by laying the groundwork for digital collections, creating tools, and contributing to diverse projects. As DH evolves, collaboration between humanities academics and libraries becomes increasingly essential, providing the path for new research, multidisciplinary cooperation, and the continuous improvement of digital tools in the humanities.

The potential impact of artificial intelligence on digital transformation in libraries is enormous. AI can automate mundane jobs, allowing librarians to focus on professional growth and service enhancement. It can also facilitate information exchange via expert systems and robotics, resulting in an environment that extends beyond the local community. AI may also be applied in various applications, including machine learning-based discovery, data visualization, security, self-check-in/out, citation, and research analysis. Furthermore, AI may help libraries build resources, organize material, and provide information services. However, there are worries regarding the harm that AI may represent to the librarianship profession. Overall, integrating AI into libraries can increase efficiency, improve services, and accelerate information diffusion.

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About Authors

Shivarama Javarabhovi, Assistant Professor, Tata Institute of Social Sciences, Mumbai
Email: j.shivarama@tiss.edu
ORCID: https://orcid.org/0000-0001-9185-6653

Jenny Prisca Barla, Student, Tata Institute of Social Sciences, Mumbai
Email: jprisca01@gmail.com
ORCID: https://orcid.org/0009-0002-2076-6575