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Development of an Advanced Sanskrit Research Database:

A Robust Tool for Facilitating Literature Review and Scholarly Research

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Abstract: *This paper presents the development and implementation of an advanced Sanskrit research database tailored to meet the specific needs of Sanskrit and Indian Knowledge Systems (IKS) research scholars. The scope of Sanskrit is vast, encompassing a wide range of domains and subdomains, from literature and scientific texts to Parā Vidyā texts. Traditional research databases often fall short in providing comprehensive, domain-specific resources for Sanskrit studies, particularly in facilitating literature reviews. Addressing this gap, the proposed database offers a robust platform with detailed thesis records tagged with keywords and domain classifications. The database is designed with advanced search techniques, enabling precise retrieval of relevant literature, thereby enhancing the efficiency and effectiveness of scholarly research in Sanskrit. This paper details the methodologies used in the development of the database, its key features, and its potential impact on the field of Sanskrit and IKS studies.*

Keywords: Sanskrit Research Database, Indian Knowledge Systems (IKS), Domain Classification, Keywords Tagging, Advanced Search Techniques.

1. **Introduction** - Sanskrit, originating in the Vedic period, has been central to Indian intellectual and cultural life, serving as the liturgical language of the Vedas and evolving into a refined medium for classical literature, grammar, and philosophy by the post-Vedic period. Its influence peaked during the Gupta period (4th-6th centuries CE), fostering advancements in literature, science, and arts, and serving as the lingua franca across the Indian subcontinent. The spread of Sanskrit across Asia, particularly between 200 and 1300 CE, created a cohesive cultural landscape, evident in shared practices across regions, including Southeast Asia (Pollock 1998b).

Throughout history, Sanskrit maintained a symbiotic relationship with regional languages, influencing and integrating without linguistic tensions.(Srinivas 2005) This dynamic persisted even as regional languages like Tamil and Kannada developed their own technical literature (Pollock 1998a). The period from 1550 to 1750 marked significant intellectual activity in disciplines like Vyakarana, Mīmāṁsā, and Ayurveda, challenging the notion of pre-colonial stagnation in Indian knowledge systems(“Sanskrit Knowledge Systems on the Eve of Colonalism,” n.d.). Despite the twentieth-century resurgence of Indian languages, Sanskrit’s influence remains strong in education and culture, underscoring the importance of its promotion to preserve India's intellectual and cultural heritage (“Report of the Sanskrit Commission” 1956).

Sanskrit's vast literature spans numerous disciplines, including philosophy, architecture, grammar, mathematics, astronomy, medicine, etc. These fields are rooted in the 18 major vidyās (theoretical disciplines) and 64 kalās (applied and vocational disciplines), which collectively form the core of ancient Indian knowledge. Sanskrit literature is categorized into primary texts (śāstra), compendiums (samgraha), and commentaries (tīkā), ensuring the preservation and transmission of knowledge (Kapoor 2005). The rich theoretical discourse within Sanskrit literature, including verbal communication and text classification, highlights its enduring relevance in contemporary scholarship, making it a fertile ground for research across multiple disciplines. Despite the presence of eight specialized Sanskrit universities and numerous departments globally, existing research databases like Shodhganga inadequately address the needs of Sanskrit studies. Shodhganga categorizes Sanskrit research under a single domain without proper sub-classifications or keyword functionalities, failing to reflect the diverse nature of the field. Additionally, it lacks robust search capabilities, particularly in Sanskrit or other Indian languages.

To address these gaps, a more sophisticated database is needed. This database should offer detailed classification and sub-classification of research domains within Sanskrit, keyword generation in Devanagari and English, and advanced search functionalities, including filters for university, domain, supervisor, year, and state. Such enhancements will create a robust tool, significantly improving the efficiency and effectiveness of scholarly research in Sanskrit.

2. Research Problem and Objectives

Research Problem - Sanskrit, as outlined in the introduction, is a vast repository of Indian Knowledge Systems (IKS), encompassing a wide range of diverse fields. However, current research databases, such as Shodhganga—the main repository for Indian university theses—fail to adequately capture this diversity. These databases treat Sanskrit as a single, undifferentiated field, lacking the necessary classification and sub-classification that reflects the complexity of Sanskrit studies ("Shodhganga : A Reservoir of Indian Theses @ INFLIBNET," n.d.). This oversimplification significantly hinders scholars' ability to effectively access and utilize the wealth of Sanskrit research available. Furthermore, the keywords associated with Sanskrit research in these databases are often too generic, making it difficult to retrieve specific, relevant results. The advanced search functionalities are not user-friendly, posing challenges in locating particular theses or dissertations. This is compounded by the lack of detailed classifications and inadequate keyword tagging, resulting in a research process that is inefficient and cumbersome (Ganesan, Mangai, and Deepa 2016).

While other research databases may offer marginally better user experiences and keyword tagging, they still suffer from significant limitations. These platforms often lack a comprehensive collection of data, offer limited keyword diversity, and are inadequate in supporting searches in Indian languages, particularly Sanskrit. The search functionality for Sanskrit is particularly problematic, making it difficult for scholars to find precise and relevant information.

Research Objectives - The primary objective of this research is to develop a specialized Sanskrit research database tailored to address the specific shortcomings of existing platforms, such as Shodhganga and others that lack in-depth classification and multilingual support. This database will comprehensively catalog the diverse disciplines within Sanskrit studies, with a particular emphasis on implementing a detailed classification and sub-classification system. This system will meticulously organize the vast corpus of Sanskrit research, ensuring precise representation of each subfield, from Vedic studies to modern interpretations. The database will incorporate advanced search functionalities, allowing users to filter results by specific criteria, including supervisor, department, university, state, and year, thereby enabling more precise and efficient research queries. Additionally, the interface will be designed for optimal user accessibility, featuring multilingual support to facilitate searches in English, Hindi, and Sanskrit, thus extending its utility to a broader academic audience. Furthermore, the database will actively support interdisciplinary research by creating structured connections between various fields within Indian Knowledge Systems, thereby fostering collaboration and enhancing the scope of Sanskrit research across disciplines.

3. **Research Methodology** - The development of the Advanced Sanskrit Research Database was guided by a structured methodology, meticulously designed to meet the specific needs of Sanskrit scholars. The process began with a comprehensive requirement analysis and design phase, during which existing research databases, including Shodhganga, Google Scholar, and Research Gate, were thoroughly reviewed. This analysis

identified critical limitations in classification systems, keyword tagging, and search functionalities. Based on these findings, a database structure was meticulously designed, incorporating 15 primary domains, each manually tagged to ensure accuracy. Subdomains were incorporated as keywords, enhancing search precision. Additionally, AI tools were employed to accurately tag keywords, thereby facilitating the efficient retrieval of relevant literature.

The subsequent development and implementation phase involved constructing the database and its user interface using a technical stack comprising HTML, CSS, JavaScript, Python (Flask), and a DBMS framework. This work could be done using PHP and MySQL (Surjandari et al. 2017). Still, this combination was selected to ensure that the platform was robust, scalable, user-friendly (Suraya and Sholeh 2022) and aligned with the framework on which the website of Sanskrit Computational Linguistics of the University of Delhi is built. Moreover, multilingual support was integrated to accommodate searches in English, Hindi, and Sanskrit, thus addressing the linguistic diversity of the research community.

Data collection was a critical component of this methodology. The primary data source for this endeavour is the Saṃskṛta Anuśandhāna Kośa, prepared by the Central Sanskrit University, which covers research conducted across Indian universities from 2001 to 2015 and includes approximately 4,500 theses (Shastri and Pandey 2015). Additional data was gathered from the University of Delhi, covering the period from 2009 to 2024, and from Jawaharlal Nehru University, spanning from 2007 to 2018. Moreover, data from the platform 'Sanskrit World,' which

includes MPhil theses from 19 universities, was integrated into the database (Sanskritworld.in, 2024). This comprehensive approach ensures a robust and representative collection of research within the database, while ongoing efforts continue to expand its scope. Finally, the testing and deployment phase focused on validating the functionality of the database, with particular attention to the accuracy of keyword tagging, search efficiency, and the usability of the user interface. After extensive testing, the database was successfully deployed at www.cl.sanskrit.du.ac.in. A feedback mechanism was also implemented, enabling continuous improvements based on user input, thereby ensuring the database remains responsive to the evolving needs of the scholarly community.

4. **Key Features of the Database** - The Advanced Sanskrit Research Database is meticulously designed with several key features aimed at enhancing the research experience for scholars in Sanskrit studies. Central to the database is its comprehensive repository, which encompasses a wide range of Sanskrit research materials from multiple (approximately 100) universities, covering various disciplines within Sanskrit studies. A significant feature is the domain classification system, which organizes research into 15 primary domains, supplemented by additional subdomains tagged as keywords. This detailed classification ensures a structured and comprehensive reflection of the field, making it easier for researchers to navigate and locate specific areas of interest.

The database also boasts extensive keyword tagging, with a significant number of keywords tagged using AI tools. This approach ensures precise and relevant search results, allowing

scholars to retrieve specific research materials efficiently based on detailed criteria. To cater to the linguistic diversity of the research community, the database supports multilingual searches in English, Hindi, and Sanskrit, thereby enhancing accessibility and usability for a broader range of scholars. The user interface is designed to be intuitive and accessible, facilitating easy navigation for both novice and experienced researchers. The platform also includes an advanced search facility, enabling users to filter results by various parameters such as university, supervisor, keyword, domain, year, and department. This feature significantly enhances the efficiency and precision of the research process.

In addition to these features, the database is structured to promote interdisciplinary research, fostering connections between various fields within Indian Knowledge Systems and encouraging scholarly collaboration. Looking to the future, a chatbot integration is planned, which will further enhance user interaction and knowledge retrieval. Once developed, this chatbot will assist users in navigating the platform and locating relevant information more efficiently, making the research process even more streamlined.

5. Impact and Applications

The Advanced Sanskrit Research Database is designed to make a significant impact on the field of Sanskrit studies and academic research. Key impacts and applications include:

- **Enhanced Research Efficiency:** The database improves access to Sanskrit research materials, allowing scholars to efficiently find relevant resources through advanced search features and comprehensive keyword tagging.

- **Promotion of Interdisciplinary Research:** By connecting various fields within Indian Knowledge Systems, the database fosters interdisciplinary studies and encourages collaboration across academic disciplines.
- **Preservation and Accessibility of Sanskrit Knowledge:** The database plays a crucial role in preserving Sanskrit literature and research, ensuring that these resources are easily accessible for future scholars.
- **Educational Resource:** The database serves as a valuable tool for scholars and students, supporting learning and teaching by providing access to a wide range of research materials.
- **Global Scholarly Collaboration:** Increased visibility of Indian Sanskrit research fosters global collaboration and enhances integration within the international academic community.
- **Encouragement of Underexplored Fields:** By providing domain-wise knowledge of existing research, the database highlights less-explored fields, encouraging scholars to pursue new and innovative areas of study.
- **Prevention of Topic Repetition:** The database helps prevent the repetition of research topics, guiding scholars to focus on original and unexplored areas, thus improving the overall quality of research.
- **Support for Literature Reviews:** The comprehensive organization of research materials aids scholars in conducting thorough literature reviews, streamlining the research process and enhancing the depth of academic work.

6. Conclusion

The Advanced Sanskrit Research Database represents a significant advancement in the field of Sanskrit studies. By addressing the shortcomings of existing platforms, it offers a comprehensive, user-friendly, and efficient research environment. The database's meticulous classification system, advanced search functionalities, and multilingual support empower scholars to navigate the vast corpus of Sanskrit research with precision and ease. A key contribution of the database lies in its ability to foster interdisciplinary research. By connecting various fields within Indian Knowledge Systems, it encourages collaboration and innovation across academic disciplines. This interdisciplinary approach has the potential to unlock new insights and perspectives on Sanskrit studies, enriching the field as a whole. Moreover, the database plays a vital role in supporting new research scholars. By providing a centralized platform for Sanskrit research, it helps them identify relevant research topics, conduct thorough literature reviews, and avoid duplication of work. The database's advanced search functionalities and comprehensive keyword tagging facilitate efficient literature searches, ensuring that scholars can access the most relevant and up-to-date information. Furthermore, the database promotes proper citation practices, ensuring that scholars acknowledge the work of others and maintain academic integrity. By providing clear guidelines and examples, the database helps researchers to cite sources accurately and avoid plagiarism. In conclusion, the Advanced Sanskrit Research Database is a valuable tool for scholars, students, and researchers interested in Sanskrit studies. It offers a comprehensive, user-

friendly, and efficient research environment that supports the preservation, dissemination, and advancement of Sanskrit knowledge. As the database continues to evolve and expand, it has the potential to make a lasting impact on the field of Sanskrit studies and contribute to a deeper understanding of India's rich intellectual and cultural heritage.

7. Future Directions

Looking ahead, the database's continuous updating with the latest research outputs—including theses, dissertations, project work, books, and articles from institutions in India and globally—remains a primary focus. Key improvements will involve integrating data mining techniques to automate data collection, the development of automatic domain tagging for more accurate searches, and making the database system more advanced and scalable (Tarapanoff et al. 2001). Plans are in place to expand the search functionalities, offering more sophisticated filtering and retrieval options to further refine the user experience. A particular focus will be given to the inclusion of research from universities and institutions worldwide, contributing to the creation of a truly global Sanskrit research repository. Additionally, the integration of a chatbot will be pursued to provide real-time assistance, enhancing user interaction and accessibility.

Furthermore, future research possibilities include conducting bibliometric studies and trend analyses on the collected data. These analyses will offer a comprehensive view of the ongoing research efforts in Indian universities, helping to identify under-researched areas in Sanskrit studies (Naidu 2017). By highlighting gaps in scholarship, these studies will guide scholars to

focus on less-explored fields, enhance productivity and ensure a balanced and informed development of future research endeavors (Ramkumar 2020).

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