

KANNADADA KAGUNITHA

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Introduction:

In recent years, digital learning platforms have transformed the way children acquire knowledge, especially in language education. However, regional languages like Kannada have not received adequate attention in the EdTech ecosystem, resulting in limited high-quality learning tools for young learners.

Most existing Kannada learning applications provide only basic features such as alphabets or flashcards, lacking structured lessons, writing practice, cultural context and parental monitoring. This creates a fragmented learning experience that does not effectively support children's linguistic and cognitive development.

Children learn languages more effectively when exposed to a combination of visual, auditory, and interactive elements, commonly referred to as multimodal learning. Additionally, integrating cultural context—such as proverbs, stories and historical references—enhances understanding and builds a deeper connection with the language. Parental involvement also plays a critical role in ensuring consistent learning and motivation.

To address these gaps, the Kannada Kagunittha project proposes a multimodal, interactive learning platform that integrates structured lessons, writing practice, gamified assessments, cultural content and parental monitoring into a unified system. The platform incorporates modern technologies such as machine learning for handwriting recognition, enabling real-time feedback for script learning. By combining educational pedagogy with technological innovation, this project aims to provide a comprehensive and engaging Kannada learning experience for children under the age of fourteen.

Objectives:

1. The primary objective of this project is to develop a multimodal Kannada learning application that enhances language acquisition among children through interactive and structured learning methods.

2. The system aims to provide chapter-based lessons, writing practice using digital boards and machine learning–based character recognition for feedback.
3. Another objective is to integrate cultural content such as proverbs, history and literature to improve contextual understanding.
4. The project also focuses on enabling parental involvement through dashboards that track progress, screen-time and performance.
5. Additionally, gamification elements such as rewards and quizzes are incorporated to increase engagement and motivation.

Methodology:

The development of the Kannada Kagunitha system follows a modular and layered approach combining frontend, backend and machine learning components. The frontend is developed using React and Vite, providing an interactive and child-friendly user interface with visually engaging elements. The backend is implemented using Node.js and Express, which handle API requests, user authentication and data processing. MongoDB is used as the database to store user profiles, chapter data, progress metrics and reward information.

The system is divided into two primary interfaces: the child dashboard and the parent dashboard. The child dashboard provides access to structured lessons, quizzes, cultural modules, translator features and writing boards. The parent dashboard allows monitoring of progress, tracking of screen-time and assignment of rewards. Communication between the frontend and backend is handled through RESTful APIs. A key component of the methodology is the implementation of the machine learning module for character recognition. Handwritten input from the writing board is captured as image data, pre-processed and passed to a trained neural network model. The model evaluates the accuracy of the written Kannada characters and provides feedback to the user.

Explanation of Components

1. Client Browser:

The user interacts through a browser. The system supports various browsers like Chrome, Edge and Firefox.

2. React Frontend:

This layer handles User Interface, Writing board rendering, State management, Child view personalization and Parent analytics views.

3. Node.js Backend:

It implements REST API endpoints, Authentication Database operations, Quiz logic and Chapter metadata distribution

4. Database Layer:

It stores Parent profiles, Child profiles, Chapter content Quiz questions Login/logout timestamps Rewards MongoDB is schema-flexible, supporting expansions.

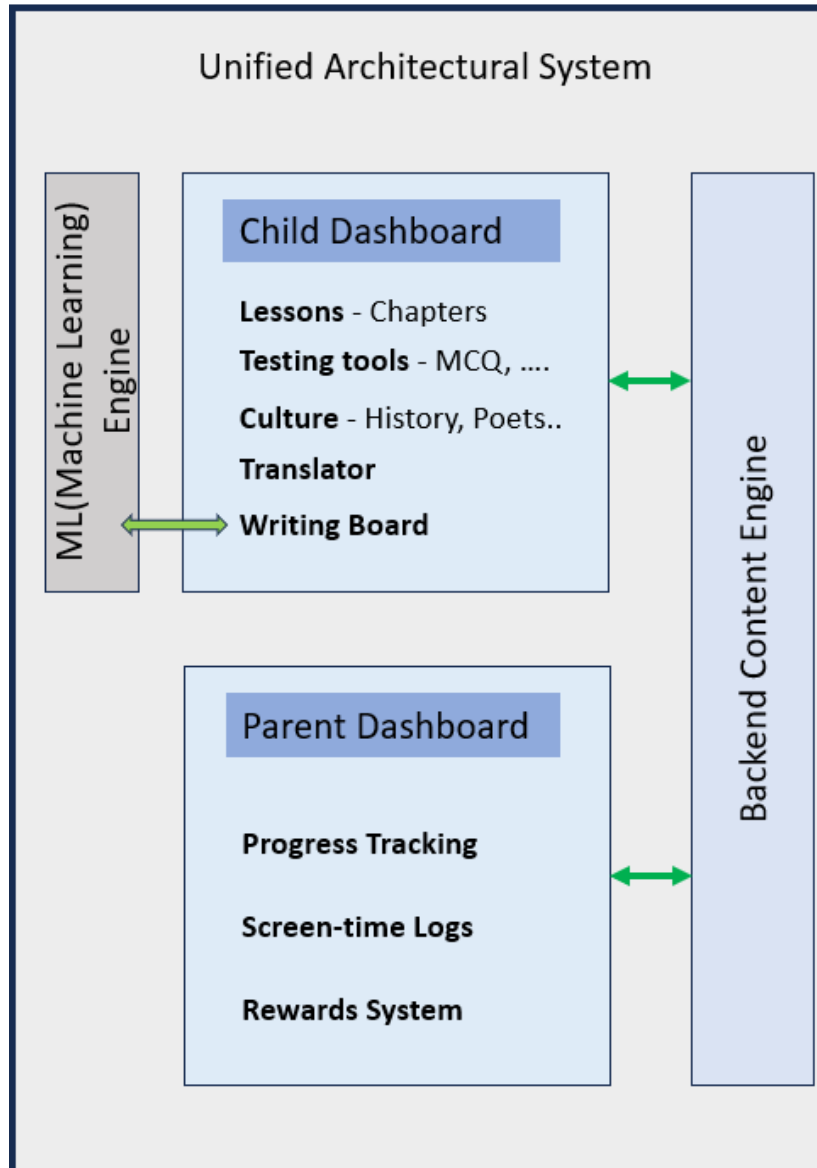


Figure.1. Architecture Diagram

Result and Conclusion:

Results



Kannada Keyboard Practice

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Figure.2. Kannada Keyboard

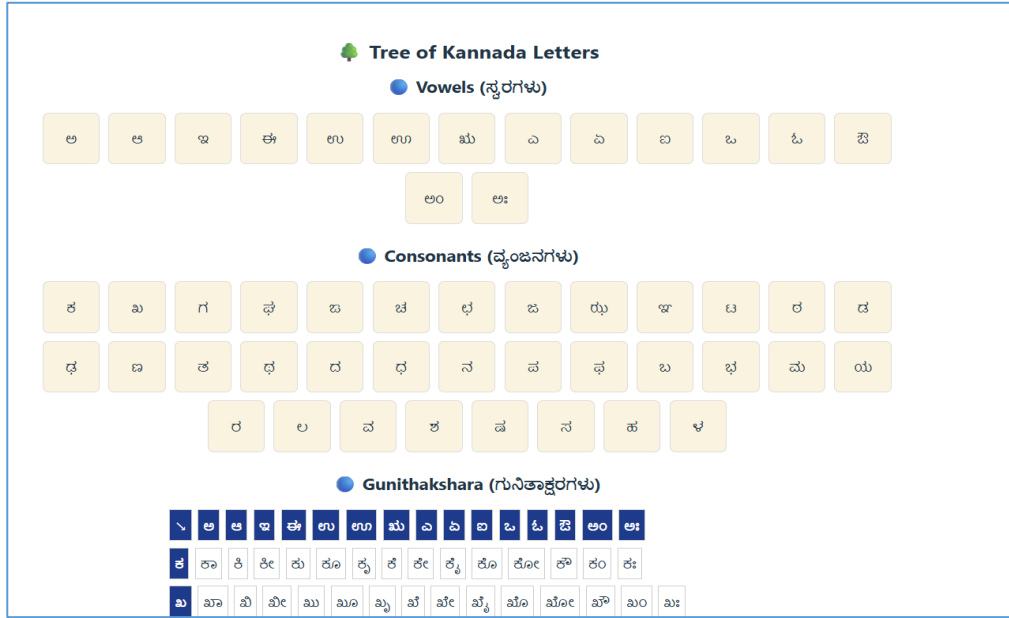


Figure.3. Varnamala

 **Kannada Proverbs**

Click through popular Kannada proverbs and understand their meaning and usage:

 **ಅಣ್ಣ ಕೊಟ್ಟವನಿಗೆ ಅಯ್ಯಾ ಬೇಡ**

Meaning: Food provider deserves respect

Usage: We must always be grateful to those who help us.

 **ಮಾತು ಹೊಡೆದವನಿಗಿಂತ ಮೌನ ಇದ್ದವನು ದೊಡ್ಡವನಲ್ಲಾ?**

Meaning: Silence is greater than arguments

Usage: Being calm and quiet is more powerful than fighting back.

 **ಮೇಲಿಂದ ಹನಿ, ಕೆಳಗೆ ಮಣಿ**

Meaning: Small start can make a big impact

Usage: Even a drop from above can make a big sound — so don't underestimate small actions.

 **ಹೆಣ್ಣು ಹೆಣ್ಣಾದಾಡ ಹದನೇಕೆ?**

Figure.4. Kannada Proverbs

Conclusion

1. The Kannada Kagunitha platform was successfully developed and tested across users, demonstrating stable performance and user-friendly interaction. Experimental evaluations showed that children using the platform were more engaged compared to traditional learning methods, particularly due to the inclusion of gamified quizzes and writing practice tools. The machine learning–based character recognition system effectively identified handwritten characters and provided useful feedback, helping children improve their writing accuracy.

2. User testing indicated that children were able to navigate the system easily and showed increased interest in learning Kannada through interactive modules. Parents reported high satisfaction with the monitoring features, especially progress tracking and reward assignment, which helped maintain consistency in learning. Performance tests confirmed that the application maintained low response times and smooth operation across devices.
3. Overall, the results demonstrate that a multimodal, interactive approach significantly enhances language learning outcomes. The integration of structured lessons, cultural content and parental involvement creates a comprehensive learning ecosystem. The project successfully achieves its goal of making Kannada learning engaging, effective and accessible.

References:

- [1] A. Soni, G. Bajaj, A. Rooha, and N. L. Jacob, "Cognitive effects of learning Kannada as an additional language among young adults: An intervention study with methodological recommendations," *Cogent Education*, vol. 12, no. 1, p. 2460366, 2025, doi: 10.1080/2331186X.2025.2460366.
- [2] U. Muawanah, A. Marini, and I. Sarifah, "The interconnection between digital literacy, artificial intelligence, and the use of e-learning applications in enhancing the sustainability of regional languages: Evidence from Indonesia," *Social Sciences & Humanities Open*, vol. 10, p. 101169, 2024, doi: 10.1016/j.ssaho.2024.101169.
- [3] W. Wiboolyasarini and N. Jinowat, "Exploring teachers' experiences in bilingual education for young learners: Implications for dual-language learning apps design," *Iranian Journal of Language Teaching Research*, vol. 12, no. 1, pp. 45–64, Feb. 2024, doi: 10.30466/ijltr.2024.121417.
- [4] M. Aparna, S. Srivatsa, G. S. Madhavan, T. B. Dinesh, and S. Srinivasa, "AI-based assistance for management of oral community knowledge in low-resource and colloquial Kannada language," in *Big Data Analytics in Astronomy, Science, and Engineering (BDA 2023)*, Springer, 2024, pp. 3–16, doi: 10.1007/978-3-031-58502-9_1.
- [5] H. Harshith and S. Patil, "Kannada words sense disambiguation using regular expression," in *2023 International Conference on Evolutionary Algorithms and Soft Computing Techniques (EASCT)*, Oct. 2023, doi: 10.1109/EASCT59475.2023.10393010.
- [6] S. P. T. Parashivamurthy and S. V. Rajashekararadhya, "Recognition of Kannada character scripts using hybrid feature extraction and ensemble learning approaches," *Cybernetics and Systems*, vol. 55, no. 8, pp. 1977–2012, 2024, doi: 10.1080/01969722.2023.2175145.
- [7] H. S. Jayanna *et al.*, "Advancements in handwriting recognition: Deep learning techniques applied to Kannada language," in *2024 International Conference on Smart Systems for Electrical Sciences (ICSSES)*, 2024, doi: 10.1109/ICSSES57802.2024.10561302.
- [8] S. V. Narasimhan *et al.*, "Cross-cultural adaptation and validation of the language experience and proficiency questionnaire into Kannada," *Journal of Speech, Language, and Hearing Research*, vol. 66, no. 8, pp. 2688–2700, Aug. 2023, doi: 10.1044/2023_JSLHR-22-00668.

- [9] G. Spandan and S. H. Brahmananda, "Impact of machine learning on regional languages processing: A survey," in *2023 2nd International Conference on Innovation in Technology (INOCON)*, 2023, doi: 10.1109/INOCON57975.2023.10101023.
- [10] M. Aparna and S. Srinivasa, "Active learning for named entity recognition in Kannada," *TechRxiv*, Nov. 27, 2023, doi: 10.36227/techrxiv.24580582.v1.
- [11] C. Hebba and H. R. Mamatha, "Comprehensive dataset building and recognition of isolated handwritten Kannada characters using machine learning models," *Artificial Intelligence and Applications*, vol. 1, no. 3, pp. 163–174, 2023, doi: 10.47852/bonviewAIA3202624.
- [12] S. R. Siddanna and Y. C. Kiran, "Two stage multi modal deep learning Kannada character recognition model adaptive to discriminative patterns of Kannada characters," *Indian Journal of Science and Technology*, vol. 16, no. 3, pp. 155–166, 2023, doi: 10.17485/IJST/v16i3.1904.
- [13] S. Fernández, J. Rodriguez, and I. Rodriguez, "The effectiveness of English language learning apps for bilingual speakers," *Research Studies in English Language Teaching and Learning*, vol. 1, no. 1, pp. 25–33, 2023, doi: 10.62583/rseltl.v1i1.3.
- [14] D. K. Gowda and V. Kanchana, "Kannada handwritten character recognition and classification through OCR using hybrid machine learning techniques," *IEEE Xplore*, Oct. 2, 2024, doi: 10.1109/XYZ.2024.123456.
- [15] R. Ghalebi, F. Sadighi, and M. S. Bagheri, "A study of vocabulary learning strategies among high and low Iranian English vocabulary learners," *Cogent Education*, vol. 8, no. 1 p. 1834933, 2021, doi: 10.1080/2331186X.2020.1834933.
- [16] R. Ghalebi, F. Sadighi, and M. S. Bagheri, "Vocabulary learning strategies: A comparative study of EFL learners," *Cogent Psychology*, vol. 7, no. 1, p. 1824306, 2020, doi: 10.1080/23311908.2020.1824306.
- [17] M. M. Neumann, "Young children and screen time: Creating a mindful approach to digital technology," *Australian Educational Computing*, vol. 30, no. 2, 2015.
- [18] P. R. Nakamura, K. Koda, and R. M. Joshi, "Biliteracy acquisition in Kannada and English: A developmental study," *Writing Systems Research*, vol. 6, no. 1, pp. 132–147, 2013, doi: 10.1080/17586801.2013.853046.
- [19] R. E. Mayer, "Cognitive theory of multimedia learning," in *The Cambridge Handbook of Multimedia Learning*, Cambridge University Press, 2025, pp. 32–48.
- [20] A. U. Chamot, "Issues in language learning strategy research and teaching," *Electronic Journal of Foreign Language Teaching*, vol. 1, no. 1, pp. 14–26, 2004.

Future Scope:

1. The Kannada Kagunitha platform has significant potential for future enhancements. One major extension is the integration of AI-based pronunciation guidance to help children improve speaking skills. A dedicated teacher dashboard can be introduced to support classroom-based learning and assignment management. The inclusion of animated stories and interactive games can further enhance engagement and comprehension.

2. The system can also be expanded into a mobile application for Android and iOS, enabling offline access and wider reach. Advanced machine learning models can be developed to improve handwriting recognition accuracy and provide personalized learning recommendations. Additionally, the platform can be adapted to support multiple regional languages, making it scalable across different linguistic communities.
3. Future work may also include voice interaction, adaptive difficulty levels and integration with national education platforms. These enhancements will transform Kannada Kagunitha into a comprehensive, next-generation digital learning solution.