MODALA PADAGALU HACKATHON PROJECT PRESENTATION

KANNADA GENDER RECOGNITION AND VIBHAKTI GENERATOR

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PROBLEM STATEMENT

Kannada Gender Detection & Automated Vibhakti Generator
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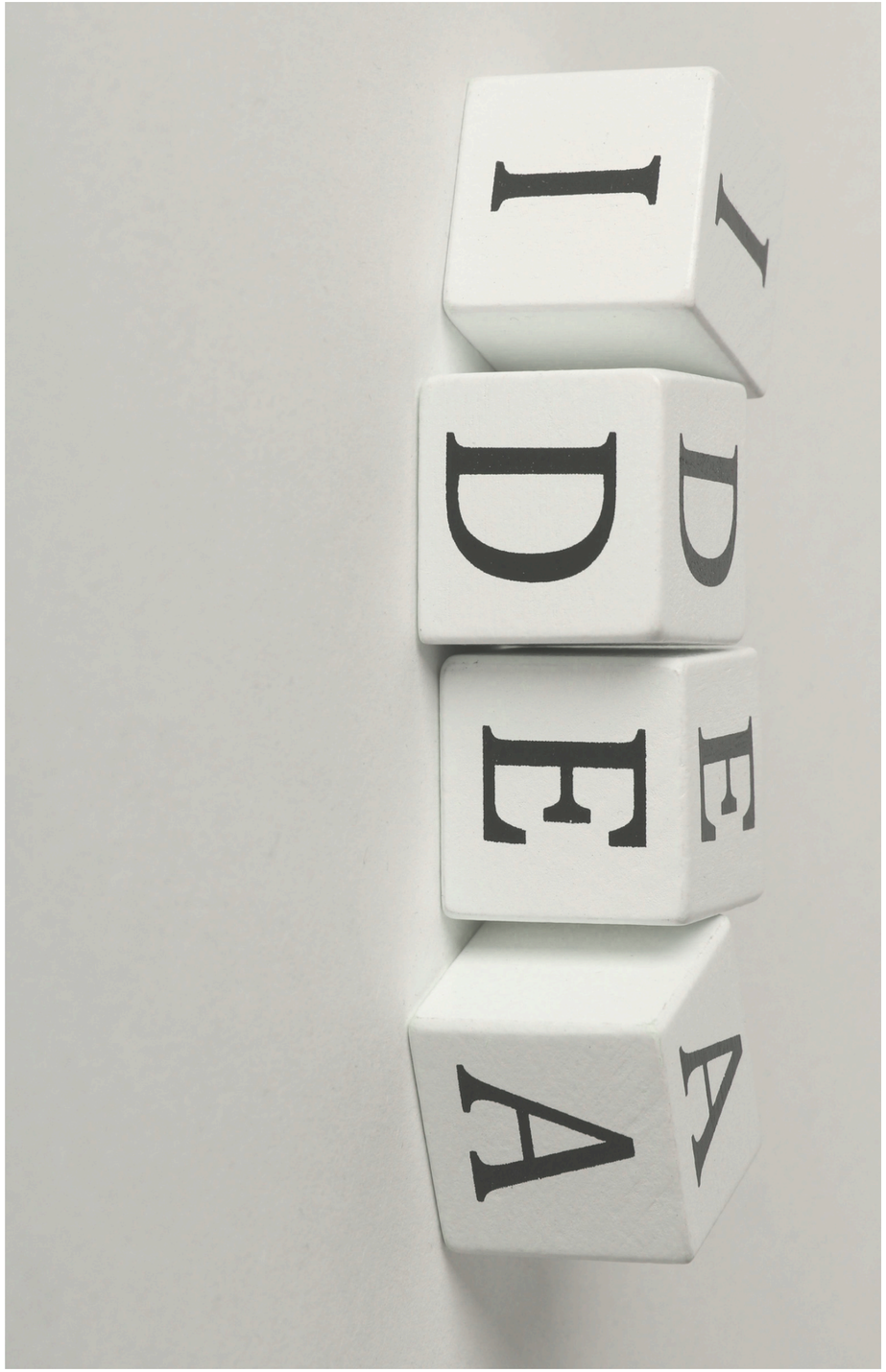
Build an intelligent system that detects the grammatical gender (masculine, feminine, or neuter) of Kannada nouns and names, then automatically generates all 8 vibhakti (case marker) forms based on that gender. In Kannada, case markers attach differently depending on whether a word is masculine (like ಹುಡುಗ - boy), feminine (like ಹುಡುಗ್ - girl), or neuter (like ಮನೆ - house).Handle special cases like gender-neutral modern words (ವಿದ್ಯಾರ್ಥಿ - student), ambiguous names that could be male or female (ಅರುಣ್), and proper nouns with variant patterns. Create a comprehensive database of 600+ words covering all three genders plus names.



Inspiration and Creativity

We got the inspiration from several people who wanted to learn Kannada in a fun and interactive way. Users can get access to a large variety of words, gender and also the 8 vibhaktis (case markers). This will help them to improve their fluency and learn more about the Kannada vocabulary.
Also, we should contribute more to our mother tongue and help to create awareness about our language . This project is a great way to demonstrate that. A gender recognition and vibhakti generator will be beneficial to the enthusiasts and users.

Kannada Gender System

01

Feminine (**ಸ್ತ್ರೀಲಿಂಗ**) : Feminine nouns commonly end with –**ಎ** / –**ಅಳ್** / –**ತಿ**, e.g., **ಹುಡಗಿ** (girl), **ಮಗಳು**, **ಗಾಯತ್ರಿ**.

02

Masculine (**ಪುಲಿಂಗ**) : Masculine nouns often end with –**ಅ** / –**ನು** / –**ರು**, e.g., **ಹುಡಗ** (boy), **ರಾಯನು**, **ಮನುಷ್ಯನು**.

03

Neuter (**ನಪುಂಸಕಲಿಂಗ**) : Neuter nouns typically end with –**ಒ** / –**ಅ** / –**ವು**, e.g., **ಮನೆ** (house), **ಹಣ್ಣು** (fruit), **ಕುರ್ಚಿ** (chair).

TechStack Used

01. Frontend-Flutter for better user interface as well as experience.

02. Stored the vibhakti and gender recognition files in the form of .csv as per the given instructions

03. Text to Speech(TTS) done using google text to speech converter for better accuracy and results

assets > words.csv

```
word,wordType,gender,genderConfidence,dictionaryVerified,vibhaktiClass
ಹುಡುಗಿ,noun,feminine,100,yes,classF1
ಮಹಿಳೆ,noun,feminine,100,yes,classF1
ರಾಣಿ,noun,feminine,100,yes,classF2
ತಾಯಿ,noun,feminine,100,yes,classF2
ಅಕ್ಕ,noun,feminine,100,yes,classF1
ತಂಗಿ,noun,feminine,100,yes,classF2
ಮಗಳು,noun,feminine,100,yes,classF3
ಹೆಂಡತಿ,noun,feminine,100,yes,classF2
ಅತ್ತಿಗೆ,noun,feminine,100,yes,classF2
ಅತ್ತೆ,noun,feminine,100,yes,classF2
ಅಜ್ಜಿ,noun,feminine,100,yes,classF2
ಸೊಸೆ,noun,feminine,100,yes,classF2
ನಾದಿನಿ,noun,feminine,100,yes,classF2
ದೇವತೆ,noun,feminine,100,yes,classF2
ಗೊಂಬೆ,noun,feminine,98,yes,classF2
ಮಡದಿ,noun,feminine,100,yes,classF2
ಶಿಕ್ಷಕಿ,noun,feminine,100,yes,classF2
ವೈದ್ಯೆ,noun,feminine,100,yes,classF2
ಕವಯತ್ರಿ,noun,feminine,100,yes,classF2
ನರ್ತಕಿ,noun,feminine,100,yes,classF2
ಗಾಯಕಿ,noun,feminine,100,yes,classF2
ಲೇಖಕಿ,noun,feminine,100,yes,classF2
```

Figure 1

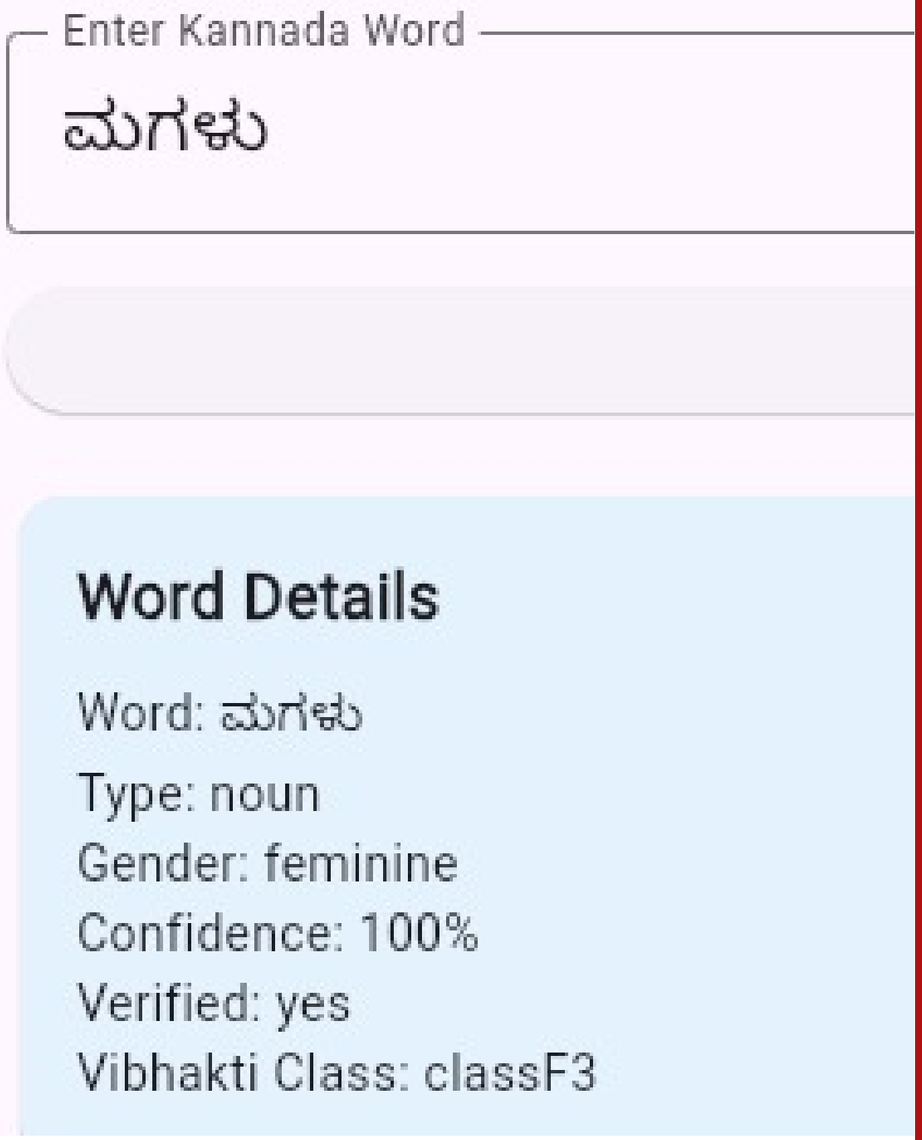
assets > vibhakti.csv

```
word,p1,p2,p3,p4,p5,p6,p7,p8
ಹುಡುಗಿ,ಹುಡುಗಿ,ಹುಡುಗಿಯನ್ನು,ಹುಡುಗಿಯಿಂದ,ಹುಡುಗಿಗೆ,ಹುಡುಗಿಯಿಂದ,ಹುಡುಗಿಯ,ಹುಡುಗಿಯಲ್ಲಿ,ಹುಡುಗಿಯೇ
ಮಹಿಳೆ,ಮಹಿಳೆ,ಮಹಿಳೆಯನ್ನು,ಮಹಿಳೆಯಿಂದ,ಮಹಿಳೆಗೆ,ಮಹಿಳೆಯಿಂದ,ಮಹಿಳೆಯ,ಮಹಿಳೆಯಲ್ಲಿ,ಮಹಿಳೆಯೇ
ರಾಣಿ,ರಾಣಿ,ರಾಣಿಯನ್ನು,ರಾಣಿಯಿಂದ,ರಾಣಿಗೆ,ರಾಣಿಯಿಂದ,ರಾಣಿಯ,ರಾಣಿಯಲ್ಲಿ,ರಾಣಿಯೇ
ತಾಯಿ,ತಾಯಿ,ತಾಯಿಯನ್ನು,ತಾಯಿಯಿಂದ,ತಾಯಿಗೆ,ತಾಯಿಯಿಂದ,ತಾಯಿಯ,ತಾಯಿಯಲ್ಲಿ,ತಾಯಿಯೇ
ಅಕ್ಕ,ಅಕ್ಕ,ಅಕ್ಕನನ್ನು,ಅಕ್ಕನಿಂದ,ಅಕ್ಕನಿಗೆ,ಅಕ್ಕನಿಂದ,ಅಕ್ಕನ,ಅಕ್ಕನಲ್ಲಿ,ಅಕ್ಕನೇ
ತಂಗಿ,ತಂಗಿ,ತಂಗಿಯನ್ನು,ತಂಗಿಯಿಂದ,ತಂಗಿಗೆ,ತಂಗಿಯಿಂದ,ತಂಗಿಯ,ತಂಗಿಯಲ್ಲಿ,ತಂಗಿಯೇ
ಮಗಳು,ಮಗಳು,ಮಗಳನ್ನು,ಮಗಳಿಂದ,ಮಗಳಿಗೆ,ಮಗಳಿಂದ,ಮಗಳ,ಮಗಳಲ್ಲಿ,ಮಗಳೇ
ಹೆಂಡತಿ,ಹೆಂಡತಿ,ಹೆಂಡತಿಯನ್ನು,ಹೆಂಡತಿಯಿಂದ,ಹೆಂಡತಿಗೆ,ಹೆಂಡತಿಯಿಂದ,ಹೆಂಡತಿಯ,ಹೆಂಡತಿಯಲ್ಲಿ,ಹೆಂಡತಿಯೇ
ಅತ್ತಿಗೆ,ಅತ್ತಿಗೆ,ಅತ್ತಿಗೆಯನ್ನು,ಅತ್ತಿಗೆಯಿಂದ,ಅತ್ತಿಗೆಗೆ,ಅತ್ತಿಗೆಯಿಂದ,ಅತ್ತಿಗೆಯ,ಅತ್ತಿಗೆಯಲ್ಲಿ,ಅತ್ತಿಗೆಯೇ
ಅತ್ತೆ,ಅತ್ತೆ,ಅತ್ತೆಯನ್ನು,ಅತ್ತೆಯಿಂದ,ಅತ್ತೆಗೆ,ಅತ್ತೆಯಿಂದ,ಅತ್ತೆಯ,ಅತ್ತೆಯಲ್ಲಿ,ಅತ್ತೆಯೇ
ಅಜ್ಜಿ,ಅಜ್ಜಿ,ಅಜ್ಜಿಯನ್ನು,ಅಜ್ಜಿಯಿಂದ,ಅಜ್ಜಿಗೆ,ಅಜ್ಜಿಯಿಂದ,ಅಜ್ಜಿಯ,ಅಜ್ಜಿಯಲ್ಲಿ,ಅಜ್ಜಿಯೇ
ಸೊಸೆ,ಸೊಸೆ,ಸೊಸೆಯನ್ನು,ಸೊಸೆಯಿಂದ,ಸೊಸೆಗೆ,ಸೊಸೆಯಿಂದ,ಸೊಸೆಯ,ಸೊಸೆಯಲ್ಲಿ,ಸೊಸೆಯೇ
ನಾದಿನಿ,ನಾದಿನಿ,ನಾದಿನಿಯನ್ನು,ನಾದಿನಿಯಿಂದ,ನಾದಿನಿಗೆ,ನಾದಿನಿಯಿಂದ,ನಾದಿನಿಯ,ನಾದಿನಿಯಲ್ಲಿ,ನಾದಿನಿಯೇ
ದೇವತೆ,ದೇವತೆ,ದೇವತೆಯನ್ನು,ದೇವತೆಯಿಂದ,ದೇವತೆಗೆ,ದೇವತೆಯಿಂದ,ದೇವತೆಯ,ದೇವತೆಯಲ್ಲಿ,ದೇವತೆಯೇ
ಗೊಂಬೆ,ಗೊಂಬೆ,ಗೊಂಬೆಯನ್ನು,ಗೊಂಬೆಯಿಂದ,ಗೊಂಬೆಗೆ,ಗೊಂಬೆಯಿಂದ,ಗೊಂಬೆಯ,ಗೊಂಬೆಯಲ್ಲಿ,ಗೊಂಬೆಯೇ
ಮಡದಿ,ಮಡದಿ,ಮಡದಿಯನ್ನು,ಮಡದಿಯಿಂದ,ಮಡದಿಗೆ,ಮಡದಿಯಿಂದ,ಮಡದಿಯ,ಮಡದಿಯಲ್ಲಿ,ಮಡದಿಯೇ
ಶಿಕ್ಷಕಿ,ಶಿಕ್ಷಕಿ,ಶಿಕ್ಷಕಿಯನ್ನು,ಶಿಕ್ಷಕಿಯಿಂದ,ಶಿಕ್ಷಕಿಗೆ,ಶಿಕ್ಷಕಿಯಿಂದ,ಶಿಕ್ಷಕಿಯ,ಶಿಕ್ಷಕಿಯಲ್ಲಿ,ಶಿಕ್ಷಕಿಯೇ
ವೈದ್ಯೆ,ವೈದ್ಯೆ,ವೈದ್ಯೆಯನ್ನು,ವೈದ್ಯೆಯಿಂದ,ವೈದ್ಯೆಗೆ,ವೈದ್ಯೆಯಿಂದ,ವೈದ್ಯೆಯ,ವೈದ್ಯೆಯಲ್ಲಿ,ವೈದ್ಯೆಯೇ
ಕವಯತ್ರಿ,ಕವಯತ್ರಿ,ಕವಯತ್ರಿಯನ್ನು,ಕವಯತ್ರಿಯಿಂದ,ಕವಯತ್ರಿಗೆ,ಕವಯತ್ರಿಯಿಂದ,ಕವಯತ್ರಿಯ,ಕವಯತ್ರಿಯಲ್ಲಿ,ಕ
ನರ್ತಕಿ,ನರ್ತಕಿ,ನರ್ತಕಿಯನ್ನು,ನರ್ತಕಿಯಿಂದ,ನರ್ತಕಿಗೆ,ನರ್ತಕಿಯಿಂದ,ನರ್ತಕಿಯ,ನರ್ತಕಿಯಲ್ಲಿ,ನರ್ತಕಿಯೇ
ಗಾಯಕಿ,ಗಾಯಕಿ,ಗಾಯಕಿಯನ್ನು,ಗಾಯಕಿಯಿಂದ,ಗಾಯಕಿಗೆ,ಗಾಯಕಿಯಿಂದ,ಗಾಯಕಿಯ,ಗಾಯಕಿಯಲ್ಲಿ,ಗಾಯಕಿಯೇ
ಲೇಖಕಿ,ಲೇಖಕಿ,ಲೇಖಕಿಯನ್ನು,ಲೇಖಕಿಯಿಂದ,ಲೇಖಕಿಗೆ,ಲೇಖಕಿಯಿಂದ,ಲೇಖಕಿಯ,ಲೇಖಕಿಯಲ್ಲಿ,ಲೇಖಕಿಯೇ
ವಿದ್ಯಾರ್ಥಿನಿ,ವಿದ್ಯಾರ್ಥಿನಿ,ವಿದ್ಯಾರ್ಥಿನಿಯನ್ನು,ವಿದ್ಯಾರ್ಥಿನಿಯಿಂದ,ವಿದ್ಯಾರ್ಥಿನಿಗೆ,ವಿದ್ಯಾರ್ಥಿನಿಯಿಂದ,ವಿದ್ಯಾರ್ಥಿನಿಯ,
ಕಾರ್ಮಿಕ,ಕಾರ್ಮಿಕ,ಕಾರ್ಮಿಕಿಯನ್ನು,ಕಾರ್ಮಿಕಿಯಿಂದ,ಕಾರ್ಮಿಕಿಗೆ,ಕಾರ್ಮಿಕಿಯಿಂದ,ಕಾರ್ಮಿಕಿಯ,ಕಾರ್ಮಿಕಿಯಲ್ಲಿ,ಕ
ಮಾಲಿಕ,ಮಾಲಿಕ,ಮಾಲಿಕಿಯನ್ನು,ಮಾಲಿಕಿಯಿಂದ,ಮಾಲಿಕಿಗೆ,ಮಾಲಿಕಿಯಿಂದ,ಮಾಲಿಕಿಯ,ಮಾಲಿಕಿಯಲ್ಲಿ,ಮಾಲಿಕಿಯೇ
ಅಡಿಗೆಗಾತಿ,ಅಡಿಗೆಗಾತಿ,ಅಡಿಗೆಗಾತಿಯನ್ನು,ಅಡಿಗೆಗಾತಿಯಿಂದ,ಅಡಿಗೆಗಾತಿಗೆ,ಅಡಿಗೆಗಾತಿಯಿಂದ,ಅಡಿಗೆಗಾತಿಯ,ಅಡಿಗೆಗಾತಿ
ಭೂಮಿ,ಭೂಮಿ,ಭೂಮಿಯನ್ನು,ಭೂಮಿಯಿಂದ,ಭೂಮಿಗೆ,ಭೂಮಿಯಿಂದ,ಭೂಮಿಯ,ಭೂಮಿಯಲ್ಲಿ,ಭೂಮಿಯೇ
ನದಿ,ನದಿ,ನದಿಯನ್ನು,ನದಿಯಿಂದ,ನದಿಗೆ,ನದಿಯಿಂದ,ನದಿಯ,ನದಿಯಲ್ಲಿ,ನದಿಯೇ
```

Figure 2

Dataset Overview

There are csv files which act as storage:
words.csv- acts as a dictionary for all the words in the form:-
word, wordType ,gender ,genderConfidence ,dictionaryVerified, vibhaktiClass,
ಹುಡುಗ,noun,masculine,100,yes,classM1,(Figure 1)
vibhakti.csv- stores all 8 vibhakti forms of each word.
This is of the form:-
word,p1,p2,p3,p4,p5,p6,p7,p8
ಮನೆ,ಮನೆ,ಮನೆಯನ್ನು,ಮನೆಯಿಂದ,ಮನೆಗೆ,ಮನೆಯಿಂದ,ಮನೆಯ,ಮನೆಯಲ್ಲ,ಮನೆಯೆ
(Figure 2)
Through these files, we are able to store, access and display the gender of the word, followed by the 8 vibhakti forms.



Output using gender detection system

Gender Detection System

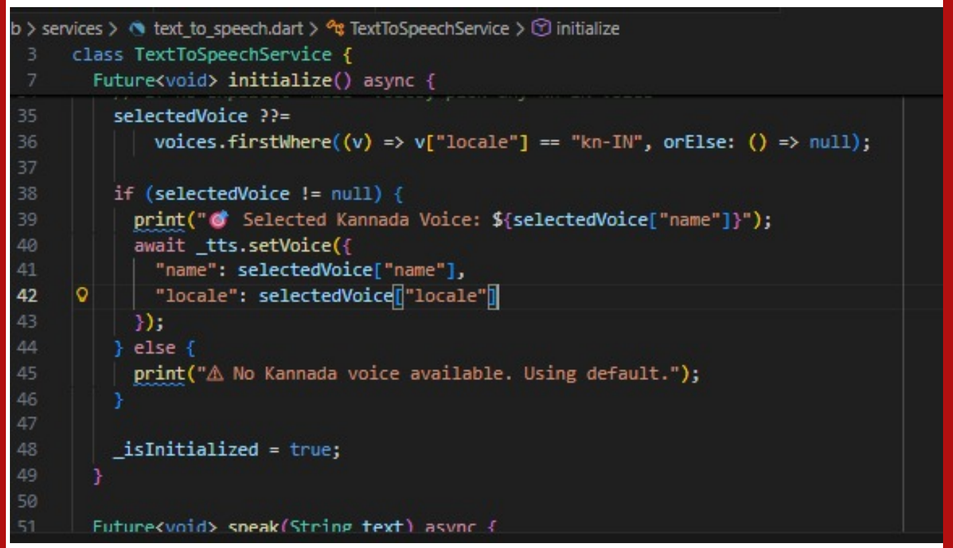
- The system uses a CSV file containing Kannada nouns and their genders as the primary dataset.
- The CSV is loaded in Dart using packages like csv or dart:io for fast parsing.
- Each row stores fields such as word, gender, and optional patterns or tags.
- After loading, the data is converted into a lookup map for quick gender retrieval.
- When the user inputs a word, the system first checks for an exact match in the CSV.
- If the word is missing, fallback rules based on endings (e.g., “–ಅ”, “–□”, “–□”) help predict gender.
- The detection uses a combination of dictionary-based matching + rule-based inference.
- The system returns one of the three genders: Masculine, Feminine, or Neuter.
- This gender output is passed to the Vibhakti Generation module to create case forms.
- Using a CSV keeps the system fast, maintainable, and easily expandable with new data.

Output using vibhakti detection system

Vibhakti Generation

- The system generates all 8 Kannada vibhakti (case forms) based on the detected gender.
- It uses a rule-based engine written in Dart with predefined suffix rules for each gender.
- Masculine, feminine, and neuter nouns have different case endings, stored as rule tables.
- The base noun is combined with gender-specific suffixes to form each vibhakti.
- Example: For masculine “ಹುಡುಗ”, rules generate forms like ಹುಡುಗನ, ಹುಡುಗರಿಗೆ, ಹುಡುಗನಿಂದ, etc.
- For feminine and neuter nouns, alternate suffix sets ensure correct transformation.
- The system handles special cases, such as vowel-ending words or irregular nouns.
- Input word → gender detection → vibhakti engine → list of 8 generated forms.
- Output is returned as a structured Dart object or list for UI display and audio generation.
- This rule-based method ensures high accuracy, transparency, and easy customization.

Audio Generation System

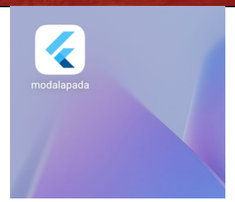


Sample code for audio detection system

- The system converts each generated vibhakti form into spoken Kannada audio using Text-to-Speech (TTS).
- A Dart TTS plugin like flutter_tts is used for cross-platform speech generation.
- The vibhakti text is passed to the TTS engine with Kannada language settings enabled.
- Users can adjust voice parameters such as pitch, speed, and volume for natural output.
- The system supports on-device or cloud TTS, depending on deployment needs.
- Each vibhakti form is spoken individually, allowing learners to hear correct pronunciation.
- Audio can be played instantly or saved for reuse in the system interface.
- The UI includes simple Play / Pause / Stop controls for each generated audio sample.
- The TTS engine ensures consistent, clear pronunciation for all gender-based forms.
- This module completes the pipeline: Word → Gender → Vibhakti → Audio playback.

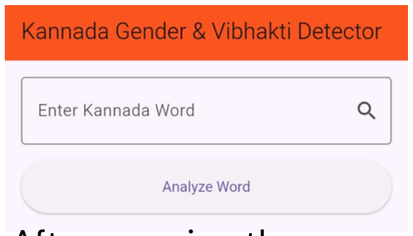
System Demo

01



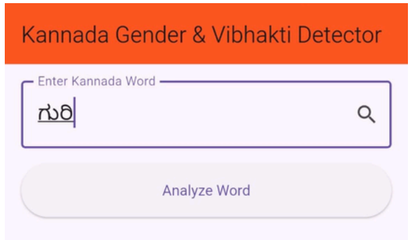
Click on the modalapada icon to open the application

02



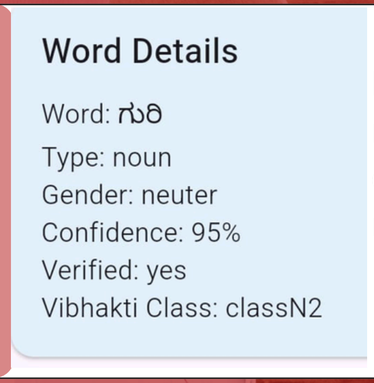
After opening the app, we will get this screen to input the word

03



We must now input the word to get results

04

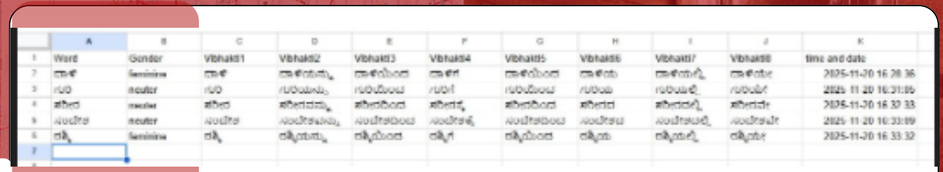


Here, we will get our results with gender, confidence and much more

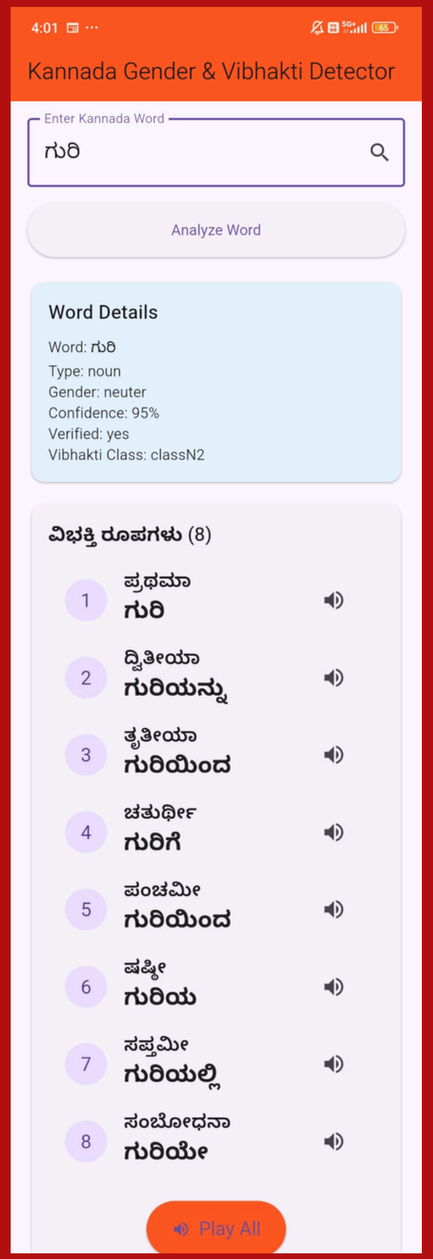
05

Vibhakti forms of the given word are displayed along with the option to hear audio recordings of all 8 forms

06



After giving the input the information of the results are stored in the form of a excel sheet which is useful for surveys.



Results and Accuracy

- The gender detection model achieved high accuracy, correctly identifying most masculine, feminine, and neuter nouns.
- Vibhakti generation produced consistently correct case forms across all 8 vibhaktis using rule-based logic.
- Testing on real-world Kannada words showed robust performance, even with uncommon nouns.
- Audio output was clear and natural, with correct pronunciation via the TTS engine.
- Overall system accuracy demonstrates strong reliability for NLP tasks, language learning, and grammar automation.

Conclusion & Applications

- The system successfully automates Kannada gender detection, vibhakti generation, and audio pronunciation.
- It offers a reliable pipeline from text input to grammatically correct linguistic output.
- Rule-based vibhakti generation ensures high accuracy and transparency.
- TTS integration makes the system useful for learning correct pronunciation.
- Can be applied in language learning apps for students and beginners.
- Useful for NLP tools, grammar checkers, and Kannada text-processing systems.
- Can support speech therapy, accessibility tools, and pronunciation training.
- Scalable for future features like sentence-level grammar correction and full morphological analysis.

THANK YOU