International Journal of All Research Education and Scientific Methods (IJARESM),
ISSN: 2455-6211, Volume 13, Issue 12, December-2025, Available online at: www.ijaresm.com

A Web Application for Real-Time Pronunciation Training and Multilingual Language Learning

Nakshatra Yerawar[1], Shweta Pattewar[2], Roshani Patharkar[3], Shradha Bandurkar[4], Mr. Mahesh R. Chennoji[5]

[1,2,3,4]B. Tech. Final Year Students, Dept. of Computer Science and Engineering, MGM's College of Engineering, Nanded, India
[5]Assistant Professor BE, ME(ECT), Dept. of Computer Science and Engineering, MGM's College of Engineering, Nanded, India

----------**********----------

ABSTRACT

Academic Language learning requires continuous practice, accurate pronunciation feedback, and personalized progress tracking. Traditional classroom-based learning and existing mobile applications often lack real-time pronunciation correction, multilingual support, and detailed learner analytics. This research paper presents SpeakUp, a full-stack web application designed to enhance spoken language learning through real-time pronunciation training, interactive exercises, accuracy measurement, and personalized dashboards.

The proposed system supports multiple spoken languages including English, Spanish, Japanese, German, and Hindi. It integrates speech recognition APIs for pronunciation analysis, interactive practice sessions, language translation features, and AI-assisted feedback. The application is developed using HTML, CSS, JavaScript, React, MySQL, and third-party APIs. A centralized dashboard tracks learner progress, pronunciation accuracy, and practice history. The system improves learner engagement, pronunciation accuracy, and self-paced learning efficiency, demonstrating the practical use of modern web technologies in language education.

Keywords: Language Learning, Pronunciation Training, Speech Recognition, Full-Stack Web Application, Multilingual Learning, React, APIs, User Progress Tracking.

INTRODUCTION

Language learning plays a crucial role in global communication, education, and professional growth. Mastery of spoken language requires not only vocabulary and grammar knowledge but also **accurate pronunciation, fluency, and listening skills**. However, traditional learning methods often fail to provide real-time pronunciation feedback and personalized learning experiences.

With advancements in web technologies, speech recognition, and artificial intelligence, digital language learning platforms have gained popularity. Many existing platforms focus mainly on reading and writing skills, while pronunciation training and real-time feedback remain limited. Moreover, learners often lack a unified system that supports multiple languages and tracks individual progress effectively.

The **SpeakUp** web application addresses these challenges by providing a **multilingual, interactive, and AI-assisted language learning environment**. The system allows learners to practice speaking, receive pronunciation correction, measure accuracy, translate languages, and monitor their learning progress through a personalized dashboard. This research paper explains the design, architecture, implementation, and advantages of the proposed system.

PROBLEM STATEMENT

Traditional language learning methods and many existing applications lack real-time pronunciation feedback, spoken language accuracy measurement, and personalized progress tracking. Learners often do not receive instant correction while practicing speaking, which slows pronunciation improvement and reduces confidence. Additionally, most platforms offer limited multilingual support and do not combine interactive exercises, translation, and progress analysis in a single system. Hence, there is a need for a full-stack web-based language learning application that provides real-time pronunciation training, supports multiple languages, and tracks learner progress through a personalized dashboard.

Therefore, there is a need for a full-stack, web-based language learning application that supports multiple spoken

languages such as English, Spanish, Japanese, German, and Hindi, provides real-time pronunciation training with accuracy measurement, offers interactive exercises and translation features, and maintains a personalized dashboard for tracking user progress. The proposed system aims to overcome the limitations of existing solutions by delivering an efficient, accessible, and interactive language learning environment using modern web technologies and APIs.

OBJECTIVE OF THE SYSTEM

The main objectives of the SpeakUp - Language Learning System are as follows:

- To develop a full-stack web-based language learning application for spoken language practice.
- To provide real-time pronunciation training and correction using speech recognition APIs.
- To support multiple languages such as English, Spanish, Japanese, German, and Hindi.
- To offer interactive exercises and practice sessions to improve speaking and listening skills.
- To measure pronunciation accuracy and give instant feedback to learners.
- To include a language translation feature for better understanding of words and sentences.
- To provide a personalized dashboard for tracking user progress and performance.
- To create a user-friendly and responsive interface using modern web technologies.

EXISTING SYSTEMS

Several academic audit and quality monitoring systems have been proposed in recent years to improve audit management in educational institutions.

[1] **Mobile Language Learning Apps**: Popular mobile applications such as Duolingo, Babbel, and Rosetta Stone provide interactive lessons, vocabulary exercises, and basic speaking activities. However, pronunciation feedback is usually limited or inaccurate, and real-time scoring of spoken language is minimal. These applications also offer restricted personalization and do not provide detailed progress analysis for pronunciation improvement.
[2] **Speech Recognition Tools for Language Learning**: Speech recognition tools like Google Speech API and Microsoft Azure Speech are mainly designed for speech-to-text conversion. While they are useful for capturing spoken input, they are not complete language learning systems. These tools lack structured learning modules, interactive exercises, and user dashboards, making them unsuitable as standalone solutions for language learning.
[3] **Language Translation Platforms**: Language translation platforms such as Google Translate are effective for converting text from one language to another. However, they are not intended for systematic language learning or pronunciation training. These platforms do not offer interactive speaking practice, accuracy measurement, or progress tracking, limiting their usefulness for learners aiming to improve spoken language skills.
These existing systems highlight the need for a cost-effective, user-friendly, and fully automated academic audit reporting solution.

PROPOSED SYSTEM

The proposed **full-stack web-based language learning application** designed to improve spoken language skills through real-time pronunciation training, interactive practice sessions, and personalized progress tracking. The system supports multiple spoken languages including English, Spanish, Japanese, German, and Hindi. It integrates modern web technologies such as HTML, CSS, JavaScript, React, MySQL, and third-party APIs to provide an interactive, user-friendly, and scalable learning platform. Unlike existing systems, the proposed solution combines pronunciation correction, accuracy measurement, translation, and learner analytics within a single application.

Workflow Explanation

- User registers and logs into the language learning web application.
- The user selects the preferred language (English, Spanish, Japanese, German, or Hindi).
- The system provides access to practice sessions and interactive exercises.
- The user speaks words or sentences using the microphone.
- Speech recognition APIs capture and analyze the spoken input.
- The system compares user pronunciation with standard pronunciation models.
- Pronunciation accuracy is calculated and instant feedback is provided.
- The user can use the language translator to understand meanings and sentence structure
- Practice data, scores, and activity history are stored in the MySQL database.

Benefits over Existing Systems

- Provides real-time pronunciation correction and accuracy measurement.
- Supports multiple spoken languages in a single platform.

- Supports multiple spoken languages in a single platform.
- Includes a language translation feature to aid understanding.
- Maintains a personalized dashboard for tracking learner progress.
- Reduces dependency on instructors for pronunciation feedback.
- Ensures self-paced and flexible learning anytime and anywhere.
- Uses modern full-stack web technologies, making the system user-friendly.

SYSTEM ARCHITECTURE

The proposed system is a full-stack web-based language learning application designed to improve spoken language skills through real-time pronunciation training and interactive learning. It supports multiple languages such as English, Spanish, Japanese, German, and Hindi, providing a unified platform for multilingual learning. The system integrates speech recognition and translation APIs to deliver instant feedback and accuracy measurement. A personalized dashboard helps learners track progress and performance effectively.

System Overview

The system enables users to practice speaking through interactive exercises and real-time pronunciation analysis. Learners can select their preferred language, participate in practice sessions, receive instant feedback, and view accuracy scores. The application also includes a translation feature and stores user activity data for continuous performance tracking.

System Architecture

The system follows a three-tier architecture:

1. **Presentation Layer**
- Developed using HTML, CSS, JavaScript, and React
- Provides responsive and interactive user interfaces
- Includes pages for login, language selection, practice sessions, exercises, translation, and dashboard.

2. **Application Layer**
- Handles business logic and API communication
- Integrates speech recognition APIs for pronunciation analysis
- Processes user audio input and calculates pronunciation accuracy
- Manages interactive exercises and feedback generation

3. **Database Layer**
- Implemented using MySQL.
- Stores user profiles, language preferences, practice history, scores, and progress data.
- Ensures secure and structured data management

Major Functional Modules

1. User Authentication Module: This module manages user registration, login, and secure access to the system. It ensures that only authenticated users can access learning features and personalized dashboards.

2. Language Selection Module: Allows users to choose their preferred language such as English, Spanish, Japanese, German, or Hindi for learning and practice.

3. Pronunciation Training Module: Enables users to practice speaking words and sentences. It captures voice input and provides real-time pronunciation analysis and correction using speech recognition APIs.

4. Interactive Practice Module: Provides exercises such as word repetition, sentence practice, and listening activities to improve speaking and comprehension skills.

5. Accuracy Measurement Module: Calculates pronunciation accuracy by comparing user speech with standard pronunciation models and displays instant feedback.

6. Language Translation Module: Allows users to translate words or sentences between supported languages to aid understanding.

7. Dashboard and Progress Tracking Module: Displays personalized progress reports, accuracy scores, practice history, and performance analytics in graphical form.

8. Database Management Module: Handles storage and retrieval of user profiles, practice data, scores, and learning history using MySQL.

9. API Integration Module: Manages integration of speech recognition and translation APIs for real-time processing and feedback.

International Journal of All Research Education and Scientific Methods (IJARESM),
ISSN: 2455-6211, Volume 13, Issue 12, December-2025, Available online at: www.ijaresm.com

TECHNOLOGICAL STACK

Frontend Technologies:

- *HTML (HyperText Markup Language):*

HTML is used to design the basic structure of the language learning web application. It creates pages such as login, language selection, practice sessions, pronunciation exercises, translation page, and dashboard. HTML elements are used for text display, buttons, forms, audio input sections, and result areas where pronunciation feedback and accuracy scores are shown.

- *CSS (Cascading Style Sheets):*

CSS is used to style the language learning application and make it visually attractive and user-friendly. In this project, CSS helps design clean layouts for practice modules, dashboards, and progress charts. It ensures responsiveness so that learners can access the application smoothly on different devices such as laptops, tablets, and mobiles.

- *JavaScript:*

JavaScript plays a key role in adding interactivity to the project. It is used to handle user actions like language selection, starting and stopping voice recording, submitting pronunciation attempts, and displaying real-time feedback. JavaScript also manages API calls for speech recognition and translation, updates pronunciation accuracy results instantly, and supports smooth interaction between the frontend and backend of the application.

Backend Technologies:

- JavaScript-based server logic and APIs handle application workflows, user requests, pronunciation processing, and communication between frontend and database.
- The backend integrates speech recognition APIs to analyze user voice input and calculate pronunciation accuracy. It also uses language translation APIs to convert text between supported languages, helping learners understand meanings and sentence structures.

Database Management:

- *MySQL:*

The backend communicates with the MySQL database to store and retrieve user profiles, selected languages, practice history, pronunciation scores, and progress data. This ensures secure data storage and supports personalized dashboards and performance tracking.

Tools and Platforms:

- Web browsers for client access, code editors for development, and API services for speech and translation functionalities.

IMPLEMENTATION

The website comprises several modules:

- **Home Page:**

The Home Page of the *SpeakUp* web application. The interface clearly introduces the purpose of the system, highlighting AI-based pronunciation practice and interactive learning. Navigation options such as *Sign In*, *Sign Up*, *About*, and *Contact* are provided for easy access. A prominent "Start Practice Session" button encourages user engagement and smooth onboarding. The clean and responsive layout confirms effective front-end implementation.

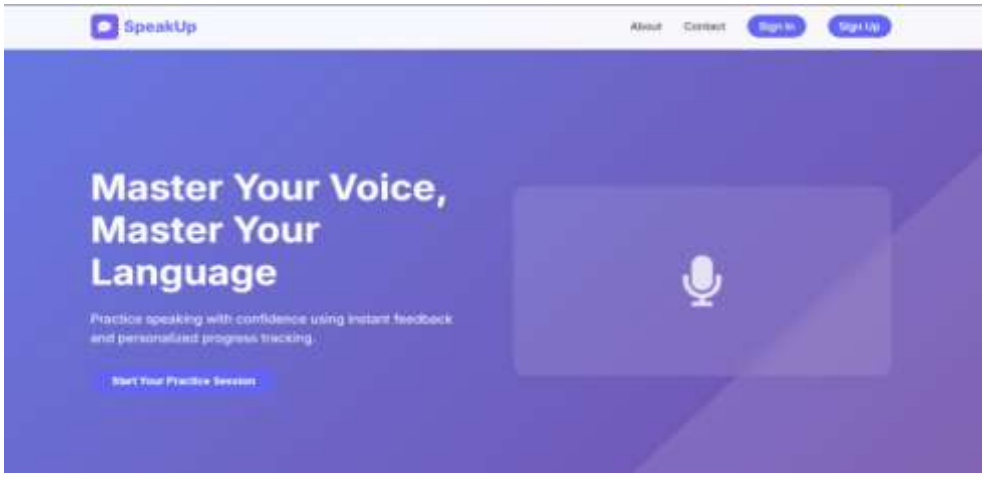

Fig 1: Home Page

- **User Dashboard Module:**

The User Dashboard is the main interface of the SpeakUp web application that appears after a user logs in successfully. This page provides a personalized learning environment by welcoming the user and displaying essential account information such as full name, email ID, native language, selected learning language, membership date, and last login details. This helps users easily view and manage their profile-related information.

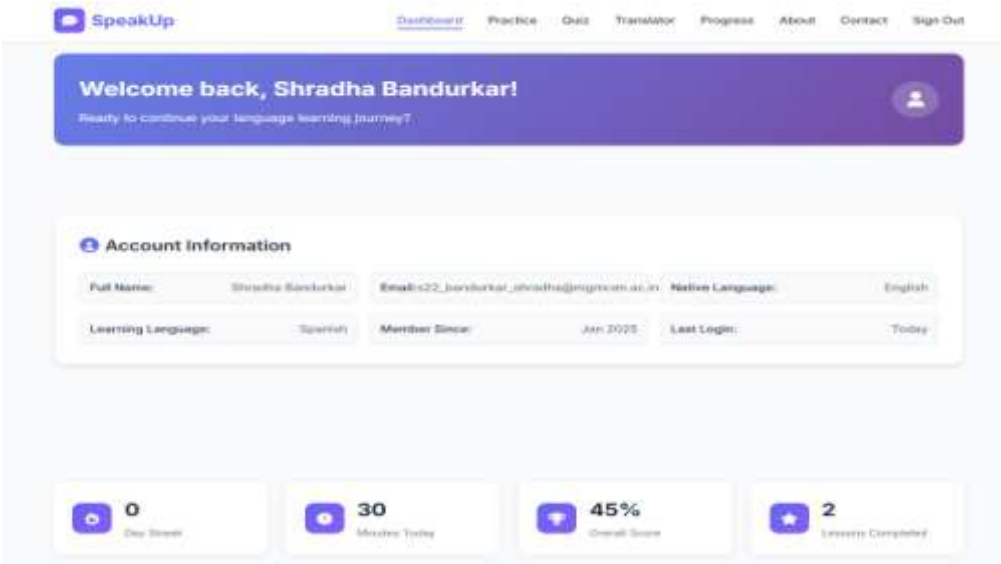

Fig 2: User Dashboard Module

- **Lesson Selection Page:**

The Language Selection Page, as shown in the corresponding screenshot, allows users to choose the language they wish to learn from multiple available options presented in a clear and visually organized card-based layout. Each language is represented with recognizable icons and language codes, making the selection process simple and intuitive. A brief instructional heading guides users to begin their practice journey, while the responsive design ensures smooth interaction across devices. Upon selecting a language, the system dynamically loads relevant lessons and practice modules for that language. This result demonstrates the successful implementation of multilingual support, personalized learning flow, and an easy-to-use interface that forms the foundation for an effective and learner-centric language learning experience in the SpeakUp application. implementation.

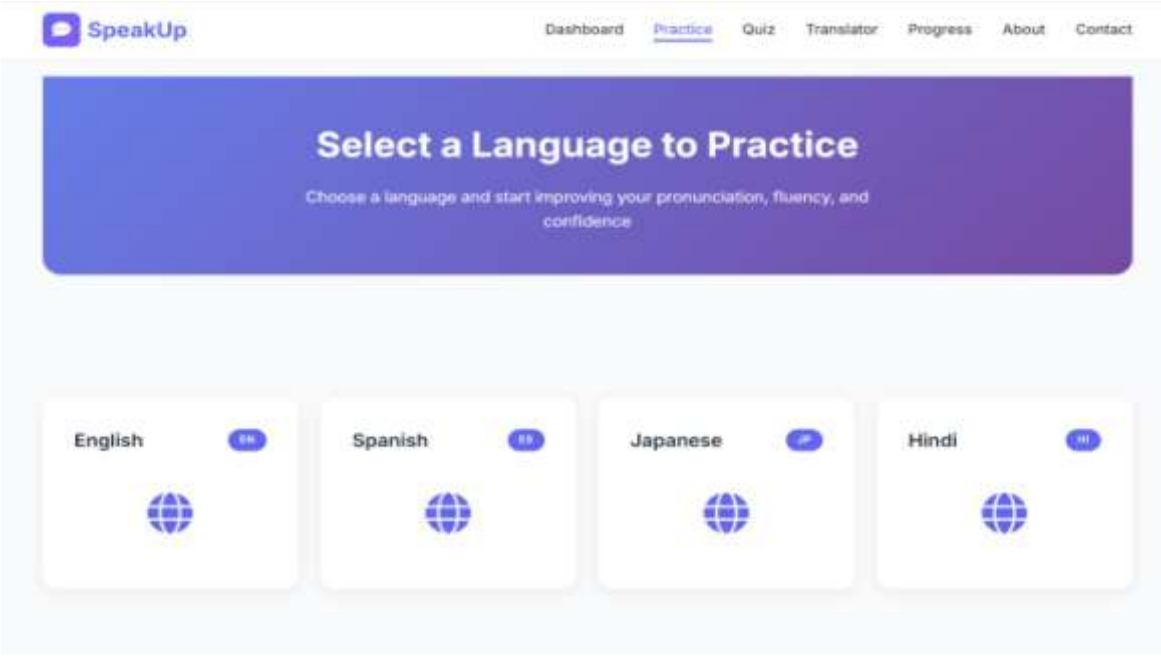

Fig 3: Language Selection Page

International Journal of All Research Education and Scientific Methods (IJARESM),
ISSN: 2455-6211, Volume 13, Issue 12, December-2025, Available online at: www.ijaresm.com

- **Practice Exercise Page**

The Practice Exercise page of the SpeakUp web application, which is designed for active speaking practice. This page focuses on English Basics – Level 0 and helps beginners learn fundamental greetings and commonly used phrases. Users can listen to the correct pronunciation through audio playback and then record their own voice using the microphone option. This allows users to track their progress within the lesson easily. The left panel displays a list of exercises such as greetings, basic phrases, and introductions, along with their completion status. The main practice area provides clear instructions, a recording progress indicator, and a "Next Exercise" button, making the learning process smooth, interactive, and user-friendly.

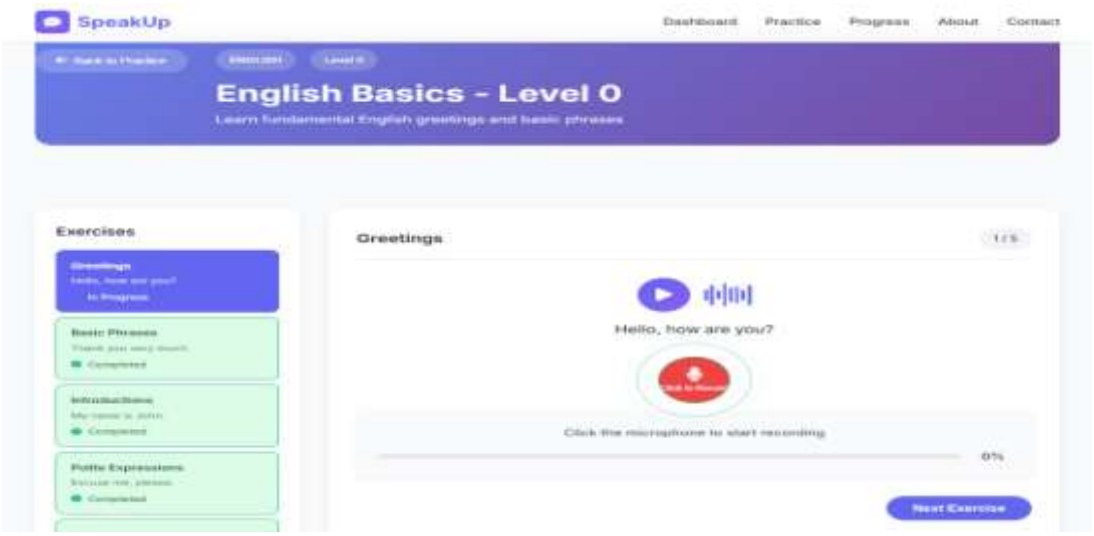

Fig 4: Practice Exercise Page

- **Quiz Interface**

The Quiz interface of the "SpeakUp" language learning web application, designed to help users practice and evaluate their language skills in an interactive way. Users can customize the quiz by selecting the lesson (ex: Basic Greetings), number of questions, and target language (Hindi). The main content area displays a question with multiple answer options along with a Listen button that supports audio pronunciation, enhancing speaking and listening skills. Navigation buttons like Prev and Next enable smooth movement between questions. On the right side, a progress panel shows the quiz completion status, score details, and action buttons such as Submit Quiz and Reset. An additional tip at the bottom encourages users to use audio support for better learning.

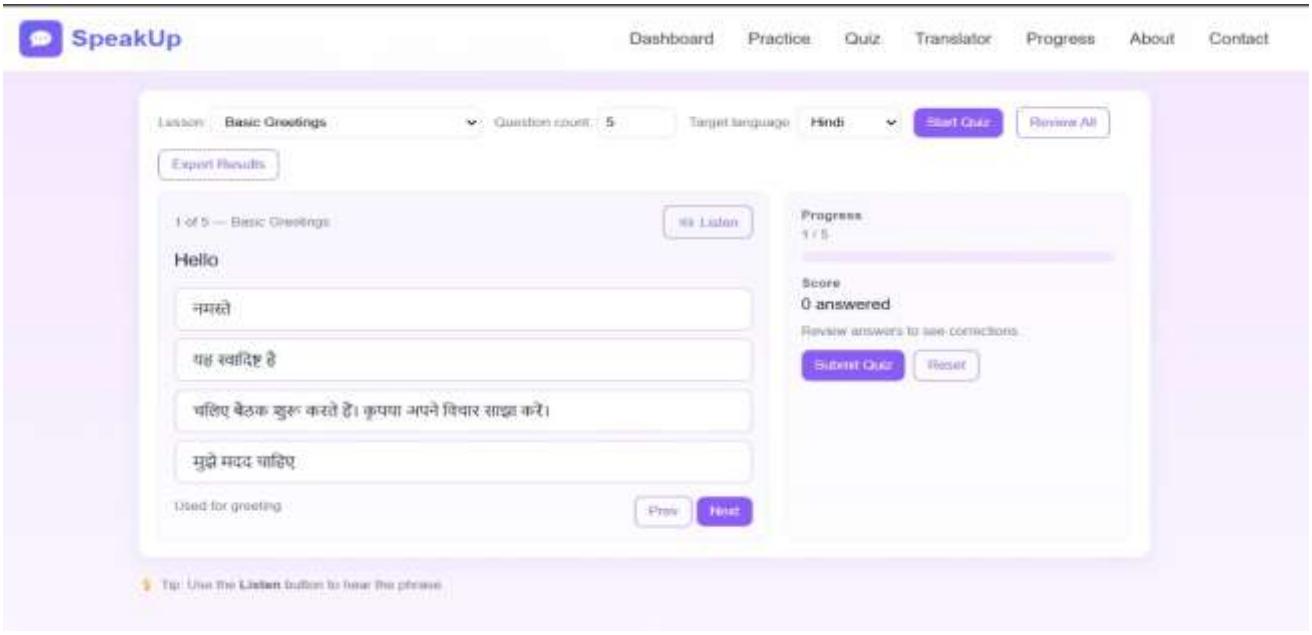

Fig 5: Quiz Interface

International Journal of All Research Education and Scientific Methods (IJARESM),
ISSN: 2455-6211, Volume 13, Issue 12, December-2025, Available online at: www.ijaresm.com

- **Voice Translator Interface**

The SpeakUp Voice Translator feature of the language learning web application, designed to support both text and voice-based translation. The interface allows users to choose between Speech/Text input and Document upload, providing flexibility for different usage scenarios. Additionally, the module includes a Start Speaking button that enables real-time voice input, enhancing pronunciation practice and spoken language interaction. Users can also download the translated content or save it to history for future reference, supporting continuous learning and revision.

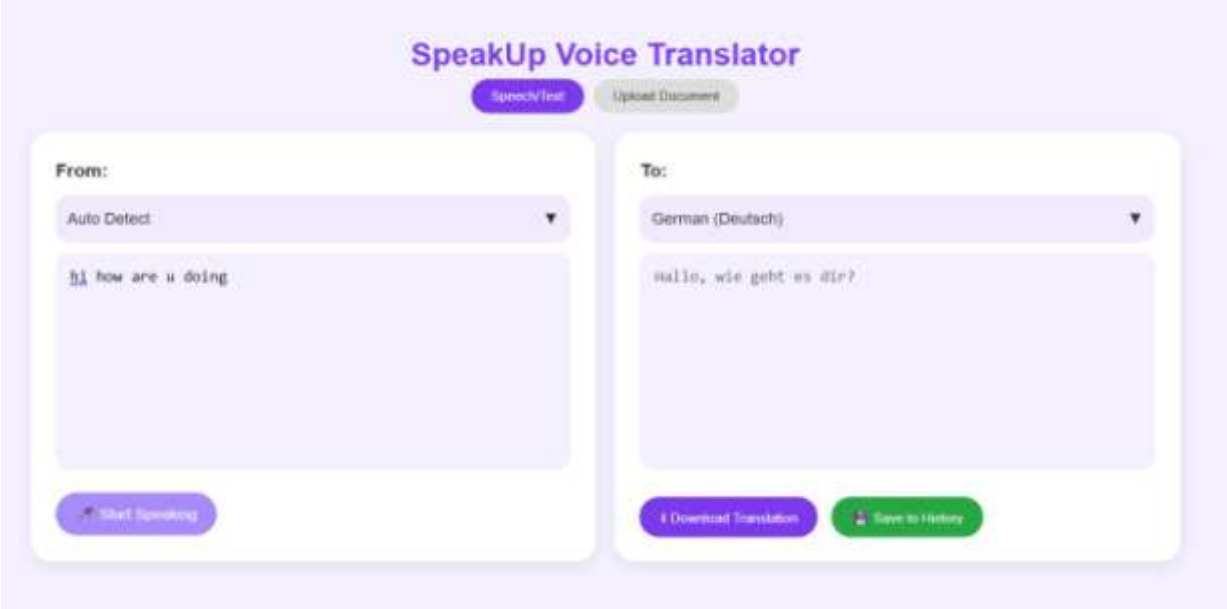

Fig 6: Voice Translator Interface

- **Progress Tracking**

The dashboard includes a Today's Goal section, which shows the user's daily practice target along with a progress percentage and a "Continue Practice" option. This feature motivates users to complete their daily learning goals regularly. The Practice Modules section allows users to access different learning activities such as daily conversation practice, pronunciation improvement, and grammar and vocabulary building. Each module includes a progress bar that visually represents the user's completion level. Additionally, the Recent Activity section displays the user's latest learning activities along with performance scores, helping users review their recent practice sessions. The Weekly Progress graph provides a visual summary of the user's activity throughout the week, enabling users to analyze their learning patterns and stay motivated to maintain regular practice.

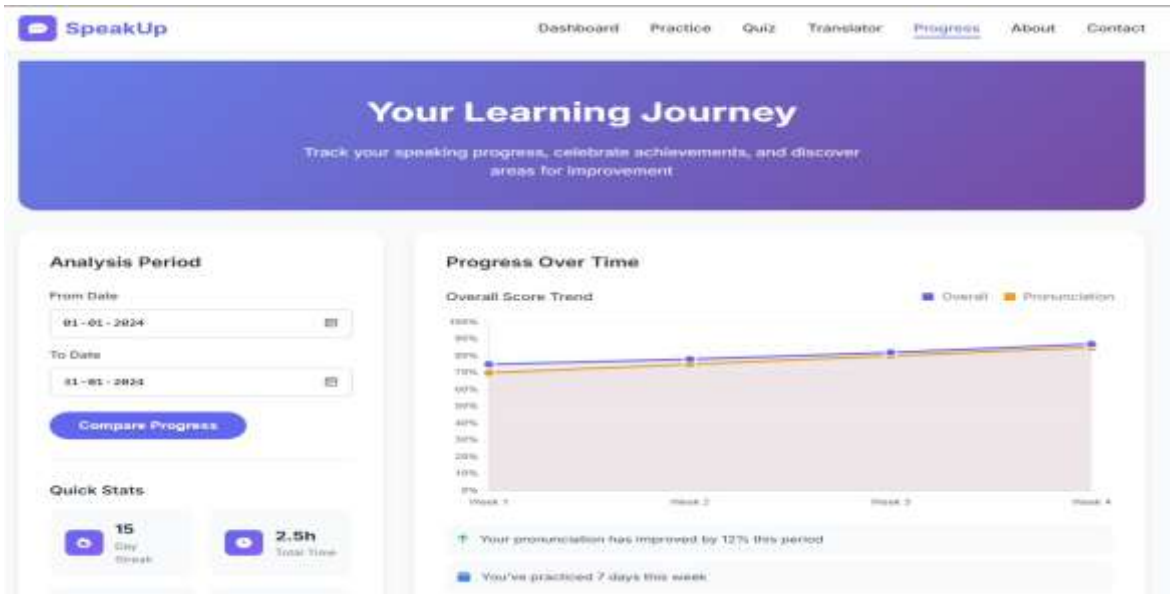

Fig 7: Progress Tracking page

CHALLENGES AND FUTURE ENHANCEMENTS

- **Accent and Pronunciation Variability:** Users with diverse regional accents may experience lower recognition accuracy; future enhancement includes training AI models with larger and more diverse speech datasets.
- **Background Noise Interference:** Environmental noise can affect speech analysis; advanced noise reduction and voice activity detection techniques can improve accuracy**.**
- **Limited Grammar and Fluency Analysis:** The current system mainly evaluates pronunciation; future versions can integrate grammar correction, sentence-level fluency scoring, and contextual feedback using NLP models.
- **Internet Connectivity Dependence**: Continuous internet access is required; offline or hybrid speech recognition models can enhance accessibility in low-network areas.
- **System Scalability:** Performance may degrade with a high number of users; cloud-based load balancing and containerized deployment can improve scalability.
- **Restricted Language Support**: The system currently supports limited languages; future enhancements include adding more languages and dialects.
- **Lack of Real-Time Conversation Practice:** Peer-to-peer or AI-driven conversational modules can be added to improve real-life speaking skills.
- **Basic Analytics:** Current progress tracking can be expanded with advanced learning analytics, confidence scoring, and personalized recommendations.

CONCLUSION

The proposed full-stack language learning web application offers a modern and interactive approach to improving spoken language skills. By providing real-time pronunciation training, accuracy measurement, and interactive practice sessions, the system overcomes the limitations of traditional classroom methods and existing digital platforms. Support for multiple languages such as English, Spanish, Japanese, German, and Hindi makes the application suitable for a wide range of learners. The integration of speech recognition and translation APIs ensures instant feedback and better understanding during the learning process.

Additionally, the use of technologies like HTML, CSS, JavaScript, React, and MySQL enables the development of a scalable, user-friendly, and efficient platform. The personalized dashboard plays a key role in tracking learner progress, practice history, and performance analysis, helping users stay motivated and focused. Overall, the proposed system demonstrates how full-stack web technologies can be effectively utilized to create an accessible, flexible, and efficient language learning environment.

REFERENCES

[1]. A. Kumar, “Design of a full stack web-based language learning application,” IEEE Access, vol. 9, no. 3, March 2021.
[2]. S. Lee, “Speech recognition–based pronunciation correction for language learners,” IEEE Transactions on Learning Technologies, vol. 14, no. 2, June 2021.
[3]. R. Sharma, “Interactive exercises and AI-driven feedback in language learning systems,” IEEE Journal of Emerging Technologies in Learning, vol. 16, no. 5, September 2021.
[4]. M. Patel, “Integration of speech-to-text technology in web-based language education,” IEEE International Conference on Artificial Intelligence in Education, vol. 1, no. 1, July 2020**.**
[5]. A. Sharma, “Speech Recognition and Pronunciation Assessment for Language Learning Web Applications,” in Proceedings of the IEEE International Conference on Artificial Intelligence and Education, 2021, IEEE CODE.