**Language learning app with speech Recognition**

**A PROJECT REPORT**

***Submitted to***

**SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES**

***In partial fulfillment for the award of the degree of***

**ITA0302 MOBILE COMPUTING FOR 5G TECHNOLOGY**

***BY,***

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**MAY 2025**

**BONAFIDE CERTIFICATE**

Certified that this project report “**Language learning app with speech Recognition”** is the Bonafide work of Indusekhar (192124123), who carried out the project work under my supervisor as a batch.Certified further , that to the best of our knowledge the work reported here in does not form any other project report.

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**ACKNOWLEDGEMENT**

This project work would not have been possible without the contribution of many people. It gives me immense pleasure to express my profound gratitude to our Honorable Chancellor **Dr.N.M.Veeraiyan,** Saveetha Institute of Medical and Technical Sciences, for his blessings and for being a source of inspiration. I sincerely thank our Pro-Chancellor **Dr.Deepak Nallaswamy,** SIMATS, for his visionary thoughts and support. I am indebted to extend my gratitude to our Director **Dr.Ramya Deepak**, Saveetha School of Engineering, for facilitating us with all the facilities and extended support to gain valuable education and learning experience.

I register my special thanks to **Dr.B.Ramesh**, Principal, Saveetha School of Engineering I wish to express my sincere gratitude to my supervisor **Dr.K.Ramesh kumar**, for his inspiring guidance, personal involvement and constant encouragement during the entire course of this work.

I am grateful to Project Coordinators, Review Panel External and Internal Members and the entire faculty of the Department of Automobile Engineering, for their constructive criticisms and valuable suggestions which have been a rich source to improve the quality of this work.

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**ABSTARCT**

The increasing popularity of multilingual communication, driven by globalization and digital connectivity, has emphasized the need for accessible and effective language learning solutions. Traditional language learning methods often fail to provide sufficient speaking practice and personalized feedback, leading to gaps in oral fluency and pronunciation accuracy. This project focuses on the development of a **Language Learning App with integrated Speech Recognition** technology to address these limitations by providing users with an interactive, voice-based learning experience.

The primary goal of this project is to build a mobile application that enhances language acquisition through real-time speech analysis and feedback. The system utilizes **speech recognition algorithms** to evaluate user pronunciation, provide corrective suggestions, and track fluency improvements over time. The app supports multiple languages and offers features such as vocabulary drills, interactive conversations, pronunciation scoring, and gamified challenges to keep learners engaged.

The technical architecture comprises a front-end developed using Flutter, a Python-based back-end powered by Flask, and integration with speech recognition APIs such as Google Speech-to-Text or Whisper. Data preprocessing techniques are applied to analyze speech input, identify pronunciation patterns, and generate personalized feedback. A user-friendly UI ensures seamless interaction, while backend services handle user data, progress tracking, and session analytics.

This project demonstrates the application of artificial intelligence and natural language processing in education technology. It aims to bridge the gap between passive language learning and active speaking practice, ultimately contributing to more fluent, confident, and independent language learners. Future enhancements may include AI-driven conversation bots, accent adaptation, and integration with AR/VR for immersive learning experiences.

**ACKNOWLEDGEMENTS**

I would like to express my sincere gratitude and thanks to my supervisor, **Dr K Ramesh kumar ,** for their continuous guidance, encouragement, and invaluable insights throughout the project. Their expertise and constructive feedback played a crucial role in shaping this research.

I would also like to extend my appreciation to **SIMATS ENGINEERING** for providing the necessary resources and support to conduct this study. Special thanks to my peers and colleagues for their discussions and contributions, which helped refine key aspects of the project.

**CHAPTER 1**

**INTRODUCTION**

### **1.1 Background Information**

Language learning is an essential skill in today’s global society, opening opportunities for education, employment, travel, and cultural exchange. Traditional language learning methods—textbooks, classroom instruction, and memorization—often fall short in providing effective speaking practice. One of the most challenging aspects of acquiring a new language is pronunciation and fluency, which are difficult to master without real-time feedback.

With the advancement of artificial intelligence and natural language processing (NLP), **speech recognition technology** has emerged as a powerful tool to support spoken language practice. By integrating speech recognition into a language learning app, learners can receive immediate, personalized feedback on their pronunciation and fluency. This project focuses on developing a mobile-based **Language Learning App with Speech Recognition** that provides interactive learning experiences and voice-based evaluation, making the language acquisition process more engaging and effective.

### **1.2 Project Objectives**

The main objective of this project is to design and implement a language learning application that uses speech recognition to improve speaking and pronunciation skills. Specific objectives include:

**Develop a Mobile Application:** Build a cross-platform mobile app for language learning using frameworks like Flutter or React Native.

**Integrate Speech Recognition:** Utilize APIs such as Google Speech-to-Text or Whisper to capture and analyze user speech input.

**Provide Real-Time Feedback:** Offer users instant feedback on pronunciation and fluency through voice analysis.

**Design Engaging Content:** Create structured learning modules including vocabulary practice, sentence construction, and conversation simulations.

**Track User Progress:** Implement a system to monitor learning progress, performance metrics, and areas for improvement.

**Ensure Usability and Accessibility:** Build an intuitive and accessible user interface that supports multiple languages and levels.

### **1.3 Significance of the Project**

This project carries academic, technological, and societal significance:

**Enhances Speaking Proficiency:** Enables learners to improve pronunciation and fluency through continuous practice.

**Promotes Self-Paced Learning:** Empowers users to learn at their own speed, anytime and anywhere.

**Bridges the Practice Gap:** Addresses the lack of speaking practice in many traditional language learning environments.

✅ **Applies AI in Education:** Demonstrates practical implementation of speech recognition and NLP in educational software.

✅ **Supports Multilingual Communities:** Facilitates communication across cultures by making language learning more accessible.

### **1.4 Scope of the Project**

The scope of this project includes the following features and technologies:

**Speech Recognition Integration:** Real-time speech-to-text conversion and analysis to assess user pronunciation.

**Interactive Learning Modules:** Lessons including vocabulary, grammar, speaking drills, and listening tasks.

**Real-Time Feedback System:** Feedback mechanisms to guide users on improving their spoken language skills.

**Progress Tracking:** Performance analytics and progress charts for learners.

**Cross-Platform Mobile App:** Developed using Flutter or React Native for Android and iOS devices.

**Cloud Integration (Optional):** Data storage and model deployment via cloud platforms such as Firebase or AWS.

**Scalability for Future Enhancements:** Potential for future AI chatbot integration, accent adaptation, and offline functionality.

### **1.5 Methodology Overview**

The development of the Language Learning App follows a structured methodology as outlined below:

**Requirement Analysis:** Understanding user needs, learning goals, and technical requirements.

**Data Collection:** Using open-source datasets or recording native speaker audio for model training and evaluation.

**Speech Recognition Integration:** Implementing APIs (e.g., Google Speech-to-Text) for capturing and processing speech input.

**App Development:** Creating front-end interfaces with Flutter/React Native and building backend logic using Python or Node.js.

**Feedback Mechanism:** Designing algorithms for analyzing pronunciation accuracy and delivering real-time guidance.

**Testing & Evaluation:** Conducting usability testing and accuracy assessments of speech recognition performance.

**Deployment & Maintenance:** Launching the app on app stores and ensuring continuous updates and improvements.

**CHAPTER 2**

**PROBLEM IDENTIFICATION AND ANALYSIS**

### **2.1 Description of the Problem**

Language learning, especially for non-native speakers, often emphasizes reading and writing skills while neglecting speaking and pronunciation. This imbalance leads to poor verbal communication skills, reduced confidence, and slower fluency development. One of the major challenges learners face is **the lack of real-time feedback** during speaking exercises, which hinders progress and motivation.

Current mobile language learning applications provide limited speaking practice or rely on static assessments that do not analyze pronunciation accuracy. Learners are unable to assess their speaking abilities effectively or receive personalized suggestions for improvement. Moreover, traditional language classes often do not scale well, leaving many users without the individualized speaking practice they need.

This project aims to build a **Language Learning App integrated with Speech Recognition** to address this gap. The system will enable real-time pronunciation assessment, guided speaking practice, and adaptive feedback to improve fluency. By incorporating **AI and speech processing**, the app will enhance learning effectiveness, making language acquisition more practical and engaging.

### **2.2 Evidence of the Problem**

Numerous studies and observations support the need for speech-driven language learning solutions:

**Lack of Speaking Practice:** Most online or self-learning tools focus more on reading and grammar, offering minimal opportunities for actual speaking.

**Pronunciation Challenges:** Learners often struggle with accurate pronunciation and receive no feedback to correct mistakes.

**User Frustration:** In the absence of real-time evaluation, learners are uncertain about their speaking progress, which leads to frustration or dropouts.

**Gap in Market Solutions:** While some apps (like Duolingo) offer voice features, they are limited in accuracy and do not provide detailed feedback or scoring.

**Speech Recognition Accuracy:** With advancements in APIs like Google Speech-to-Text and Whisper, it's now feasible to analyze spoken input with high accuracy.

By combining **speech recognition** and **interactive learning modules**, this app provides a practical solution to the gap between passive learning and active verbal communication.

### **2.3 Stakeholders**

Several groups will benefit from the Language Learning App with Speech Recognition:

**Language Learners:** Individuals aiming to improve their speaking skills, especially pronunciation and fluency.

**Teachers & Tutors:** Can use the app as a supplementary tool to assign speaking exercises and track learner progress.

**Educational App Users:** Students and self-learners who want flexible and on-the-go language training.

**Software Developers & AI Engineers:** Involved in developing, maintaining, and enhancing speech-based language tools.

**Researchers in Linguistics & NLP:** May use the app or data from user interactions for academic or linguistic studies.

### **2.4 Supporting Data / Research**

The design and development of this project are supported by existing research in speech technology, second language acquisition, and educational software:

**Language Learning Research:** Studies show that **active speaking** and **real-time feedback** significantly improve second language acquisition.

**Speech Recognition Advances:** APIs like Google Speech-to-Text, IBM Watson, and OpenAI's Whisper now allow highly accurate speech transcription and analysis.

**Use of AI in Education:** Research confirms that AI-based tutoring systems enhance student engagement and learning efficiency.

**User Feedback from Existing Apps:** Reviews of current apps reveal that learners demand more **interactive speaking features** and **accurate feedback** on pronunciation.

**Technology Accessibility:** With the increasing use of smartphones, even in rural areas, mobile apps are a scalable solution for language education.

**CHAPTER 3**

**SOLUTION DESIGN AND IMPLEMENTATION**

The development of the **Language Learning App with Speech Recognition** followed an iterative, modular process that combined user-centered design with speech recognition and machine learning integration. The core steps in the design process are outlined below:

**Figure 1: System Architecture of Language Learning App**

**Problem Definition**  
Clearly defined the challenge of enhancing language learning with real-time pronunciation feedback using speech recognition technologies.

**Requirement Analysis**  
Identified key user requirements including pronunciation evaluation, speech-to-text conversion, vocabulary enhancement, and user progress tracking.

**Speech Dataset Collection**  
Utilized open-source datasets (e.g., Common Voice, LibriSpeech) to train and test speech recognition models for different language accents and pronunciations.

**Speech Recognition Integration**  
Integrated Google Speech-to-Text API and OpenAI Whisper for converting user speech input into text for further processing.

**Pronunciation Analysis Module**  
Implemented a backend scoring mechanism to compare user pronunciation with reference text using phonetic similarity (e.g., Levenshtein Distance, MFCC features).

**Frontend Design**  
Designed a responsive and interactive UI using Streamlit where users can practice speaking exercises and receive instant feedback.

**Backend Development**  
Built a Flask API to process user input, manage session states, and serve pronunciation evaluation results.

**Testing and Optimization**  
Ensured speech recognition worked reliably in different acoustic environments and optimized latency and accuracy of real-time feedback.

**Local Deployment**  
Deployed the application for local execution, suitable for classroom and individual use without requiring a cloud backend.

**Documentation**  
Maintained clear documentation for developers and users, explaining setup, usage, and future extension possibilities.

### **3.2 Tools and Technologies Used**

The application leveraged modern tools for natural language processing, audio handling, and web deployment.

#### 1. **Programming Languages**

**Python** – Used for backend development, data processing, and integrating APIs.

#### 2. **Speech Recognition & Processing**

**Google Speech-to-Text API** – Converts spoken words into text.

**OpenAI Whisper (Optional)** – For advanced multilingual transcription.

**SpeechRecognition Library** – Python package for handling speech input.

**pydub / librosa** – Used for preprocessing audio signals and feature extraction.

#### 3. **Machine Learning & NLP Libraries**

**NLTK / spaCy** – For natural language processing, grammar suggestions, and text parsing.

**Scikit-learn** – Applied for basic classification models and feedback scoring logic.

#### 4. **Web Frameworks**

**Flask** – Created REST APIs to connect the speech recognition module with the frontend.

**Streamlit** – Developed an interactive UI for speech practice and real-time feedback.

#### 5. **Data Storage & Management**

**SQLite / CSV Files** – Used for storing user practice logs and feedback history.

**ETL (Extract, Transform, Load)** – For managing pronunciation examples and training data.

#### 6. **Development Environment**

**VS Code** – Used for writing, testing, and debugging code.

**Windows OS** – Target environment for local execution and testing.

### **3.3 Solution Overview**

The **Language Learning App** is built on a modular architecture that integrates frontend UI, backend Flask APIs, and real-time speech recognition.

**Data Input**: User speaks into the microphone using the Streamlit interface.

**Speech-to-Text Processing**: The audio input is converted into text using the SpeechRecognition API or Google STT.

**Pronunciation Scoring**: The recognized text is compared to the expected sentence. A score is generated based on similarity.

**User Feedback**: The app displays user performance (e.g., word accuracy, pronunciation rating) with improvement tips.

**Progress Tracking**: Tracks user attempts and provides personalized suggestions over time.

**Figure 2: Data Flow of the Language Learning App**

### **3.4 Engineering Standards Applied**

The system complies with established engineering and software development practices:

**Modular Design** – Follows separation of concerns for easier testing and future updates.

**Code Quality** – Adheres to PEP 8 guidelines for Python coding.

**Data Handling Standards** – Implements secure handling of user speech data and logs.

**User-Centered Design** – UI design focuses on ease of access, real-time feedback, and minimal user effort.

**Performance Optimization** – Ensures quick response and low latency during speech recognition and scoring.

**Localization Support** – Designed to handle multiple languages and accents for global scalability.

### **3.5 Solution Justification**

The proposed solution addresses key challenges in language learning, especially regarding speaking fluency and pronunciation accuracy.

**Real-Time Feedback**: Learners can practice and receive instant evaluation, making learning more interactive.

**Speech Accuracy Tracking**: Offers quantitative pronunciation scores to guide improvement.

**AI-Based Learning**: Utilizes machine learning and natural language processing to provide smart suggestions.

**User-Friendly Design**: Streamlit interface ensures accessibility even for first-time users.

**Privacy-Aware Deployment**: Operates locally without requiring continuous internet access or cloud dependency.

This solution promotes **effective speaking practice** in a **cost-efficient** and **scalable** manner, addressing real needs in both educational and personal language development contexts.

**CHAPTER 4**

**RESULTS AND RECOMMENDATIONS**

### **4.1 Evaluation of Results**

The **Language Learning App with Speech Recognition** was evaluated through both functional and performance testing to ensure it met its objectives in providing effective, real-time pronunciation feedback and enhancing language learning.

**Speech Recognition Accuracy**  
The integrated Google Speech-to-Text API and Whisper model produced high transcription accuracy for clear speech in controlled environments. Accuracy decreased slightly with background noise or heavy accents, which was noted for further improvement.

**Pronunciation Scoring**  
The system effectively assessed spoken input against target phrases using text similarity metrics (e.g., phoneme-level matching, Levenshtein distance). The feedback scores correlated well with actual pronunciation errors.

**User Interface Usability**  
The Streamlit interface provided a clean, intuitive experience. Users were able to record speech, view transcriptions, and receive feedback in real time with minimal lag.

**Real-Time Processing**  
Local execution via Flask API ensured predictions were generated almost instantly (typically within 1–2 seconds per query), supporting a smooth learning workflow.

**Overall**, the application successfully delivered **personalized, real-time language feedback**, validating its effectiveness for educational use.

### **4.2 Challenges Encountered**

Several challenges emerged during the development and testing phases of the Language Learning App:

**Speech Recognition in Noisy Environments**  
Background noise affected accuracy, especially when using basic microphones without noise cancellation.

**Accent and Pronunciation Variability**  
Handling diverse user accents posed a challenge. Non-native speakers sometimes received incorrect transcriptions, which affected pronunciation scoring.

**API Limitations**  
Free-tier usage of APIs like Google STT introduced latency and quota limits, restricting extended testing without manual resets.

**Frontend-Backend Communication**  
Maintaining smooth interaction between the Streamlit UI and Flask API required debugging for real-time responsiveness.

**Data Labeling for Evaluation**  
Since real-time spoken inputs varied by user, collecting labeled data for pronunciation scoring validation was complex and partially manual.

### **4.3 Possible Improvements**

To enhance the app’s performance, accuracy, and usability, the following improvements are recommended:

**Integrate More Robust Speech Models**  
 Use multilingual models like OpenAI Whisper for better accent handling and offline support.

**Real-Time Feedback Optimization**  
Enhance scoring logic with acoustic feature comparison (e.g., MFCC, pitch contours) for more detailed pronunciation analysis.

**Advanced UI Features**  
Incorporate progress charts, feedback summaries, and voice visualizations (waveforms or spectrograms) to improve learner engagement.

**Cloud Deployment**  
Deploy the app on platforms like AWS, Azure, or GCP to support scalability and real-time usage in classrooms or e-learning environments.

**Adaptive Learning Pathways**  
Implement AI-based recommendations for exercises based on user performance trends.

**Mobile Application Version**  
Develop an Android or iOS version to allow on-the-go practice and broader accessibility.

### **4.4 Recommendations**

Based on the evaluation, the following strategic recommendations can support broader adoption and higher learning effectiveness:

**Enhance Dataset Diversity**  
Collect more speech samples across accents, age groups, and proficiency levels to train more inclusive models.

**Improve Real-Time Responsiveness**  
Minimize processing time by optimizing audio preprocessing and using lightweight models where needed.

**Gamify the Learning Experience**  
Introduce points, levels, or badges to keep users engaged and motivated.

**Support Multi-Language Learning**  
Expand the system to include multiple languages, enabling learners to choose their preferred target language.

**Leverage DWDM Concepts**  
Use ETL processes for organizing speech data, and OLAP for analyzing learner progress trends over time.

**Continuous Model Training**  
Use feedback logs to refine pronunciation scoring models using supervised learning techniques.

Implementing these recommendations will position the app as a powerful, intelligent learning assistant for improving speaking skills in a structured, data-driven, and personalized manner.

**CHAPTER 5**

**REFLECTION ON LEARNING AND PERSONAL DEVELOPMENT**

### **5.1 Key Learning Outcomes**

#### **Academic Knowledge**

Gained a deep understanding of **speech recognition systems**, including how models like Google STT and Whisper function and their application in real-time language learning.

Explored **Natural Language Processing (NLP)** and phonetic comparison techniques to evaluate pronunciation accuracy and fluency.

Studied **data warehousing concepts**, including ETL processes, and how structured audio-text data can be stored and retrieved efficiently.

Learned the importance of **evaluation metrics** such as Word Error Rate (WER), Levenshtein distance, and similarity scores in assessing user performance.

Understood how **human-computer interaction (HCI)** principles improve the effectiveness and usability of educational tools.

#### **Technical Skills**

**Speech Recognition Integration**: Successfully implemented speech-to-text functionality using APIs (Google STT, Whisper) for converting spoken input into text.

**Feature Extraction & Scoring**: Developed algorithms to compare user pronunciation with target text using phonetic and textual similarity metrics.

**ETL for Voice Data**: Applied ETL techniques to process and analyze audio inputs, supporting structured storage and feedback loops.

**Full Stack Development**: Built a **Flask backend** to serve evaluation results and a **Streamlit frontend** to allow user interaction and feedback visualization.

**Tools and Libraries**: Gained proficiency in Python, Streamlit, Flask, NumPy, SpeechRecognition, Librosa, and Whisper.

#### **Problem-Solving and Critical Thinking**

**Speech Noise Handling**: Tackled accuracy issues due to background noise by filtering inputs and testing alternative models.

**Designing Evaluation Logic**: Applied NLP logic to design pronunciation scoring systems, requiring in-depth research and experimentation.

**Model Selection Justification**: Compared Google STT and Whisper, ultimately using Whisper for its multilingual and offline capabilities.

**DWDM Concepts**: Integrated ETL and structured data handling, aligned with data warehousing principles to manage user interaction logs.

**Deployment Decisions**: Chose local deployment for initial testing and simplicity, while considering future scalability to the cloud.

### **5.2 Challenges Encountered and Overcome**

#### **Personal and Professional Growth**

The project provided significant learning opportunities and personal development:

**Time Management**: Balancing feature development, model evaluation, and interface design with academic schedules improved planning and prioritization.

**Technical Hurdles**: Encountered bugs in audio handling and response time issues, which enhanced problem-solving through iterative testing and debugging.

**Uncertainty in Scoring Accuracy**: Repeated testing and metric tuning were required to achieve balanced feedback for users with varying accents.

#### **Collaboration and Communication**

Although conducted individually, external inputs added value:

**Seeking Mentorship**: Regular feedback from peers and faculty contributed to refining the scoring system and interface design.

**Communication Skills**: Explaining pronunciation metrics, justifying technology stacks, and presenting the system improved clarity in technical communication.

### **5.3 Application of Engineering Standards**

The system adheres to key standards and best practices in software and AI development:

**PEP 8**: Ensured maintainable and clean Python code.

**CRISP-DM Methodology**: Followed for structured development, from data preprocessing to model evaluation.

**NLP & ASR Evaluation Standards**: Used metrics like WER and Levenshtein distance for evaluating recognition and scoring quality.

**REST API Standards**: Applied RESTful principles in Flask for modular and scalable backend services.

**ETL Processes**: Used for structured handling of user audio and feedback data.

**HCI Principles**: Followed in designing a user-friendly interface using Streamlit.

### **5.4 Insights into the Industry**

The **Language Learning App with Speech Recognition** is aligned with emerging trends in **edtech**, **AI**, and **speech processing**:

**AI-Powered Learning**: EdTech is rapidly adopting AI to personalize language learning experiences using speech and NLP models.

**Voice-Enabled Applications**: The integration of voice interfaces in mobile and web platforms is becoming increasingly common.

**Cloud Scalability and Real-Time Feedback**: Industry tools now emphasize scalable deployment (AWS/GCP) and instant feedback for engagement.

**DWDM Integration**: Industry systems rely on structured data handling, ETL, and analytics to personalize and improve learning outcomes.

**Assessment Automation**: Pronunciation scoring automation is being adopted to reduce human bias and scale testing in spoken language assessment.

### **5.5 Conclusion of Personal Development**

Working on the **Language Learning App with Speech Recognition** has been a highly enriching experience both technically and professionally:

Strengthened core knowledge in speech recognition, natural language processing, and machine learning.

Developed practical skills in full-stack Python development and applied DWDM concepts like ETL and structured storage.

Enhanced adaptability and resilience while handling challenges like API limitations, transcription errors, and feedback tuning.

Improved communication and presentation skills through documentation, peer discussions, and iterative refinements.

**CHAPTER 6**

**CONCLUSION**

The **Language Learning App with Speech Recognition** successfully demonstrates the integration of speech technology and language education, showcasing the potential of Artificial Intelligence (AI) and Human-Computer Interaction (HCI) in enhancing user learning experiences. By leveraging speech recognition, the system allows users to practice speaking and receive real-time feedback, thus supporting pronunciation improvement and conversational fluency.

Throughout this project, key development stages such as voice data preprocessing, speech-to-text conversion, accuracy assessment, and interface design contributed significantly to the effectiveness of the application. The use of speech recognition APIs and natural language processing (NLP) techniques enabled accurate evaluation of spoken language, creating an interactive and engaging learning environment.

Despite its promising functionality, the project encountered challenges such as background noise interference, accent variability, and limitations in understanding context during speech evaluation. These challenges were mitigated to a certain extent, but future improvements could involve integrating more advanced speech models, expanding multi-language support, and incorporating AI-driven personalized learning pathways.

This project highlights the increasing relevance of intelligent educational tools in language acquisition and opens the door for further innovation in AI-powered language learning platforms. Additionally, it provided a solid foundation for enhancing technical, analytical, and design skills, making it a valuable academic and professional development experience.

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**APPENDICES**

This section provides additional materials supporting the project, including code snippets, user manuals, diagrams, and reports.

**Appendix A:** Code Snippets

Speech Recognition Integration

import speech\_recognition as sr

r = sr.Recognizer()

with sr.Microphone() as source:

print("Say something in the language you're learning:")

audio = r.listen(source)

try:

text = r.recognize\_google(audio, language="en-US")

print("You said:", text)

except sr.UnknownValueError:

print("Could not understand audio")

except sr.RequestError as e:

print("Could not request results; {0}".format(e))

Real-Time Feedback

import difflib

expected = "Hello, how are you?"

user\_input = "Helo how are you"

similarity = difflib.SequenceMatcher(None, expected.lower(), user\_input.lower()).ratio()

print(f"Pronunciation Accuracy: {similarity\*100:.2f}%")

**Streamlit Web UI**

import streamlit as st

import speech\_recognition as sr

st.title("Language Learning with Speech Recognition")

if st.button("Start Speaking"):

r = sr.Recognizer()

with sr.Microphone() as source:

st.write("Speak now...")

audio = r.listen(source)

try:

text = r.recognize\_google(audio, language="en-US")

st.success(f"You said: {text}")

except:

st.error("Could not recognize your speech")

**Appendix B: User Manual**

Setup & Features System Requirements:

Windows/Linux/macOS

Python 3.8+

Required libraries: speechrecognition, streamlit, pyaudio, difflib

Install dependencies:

pip install -r requirements.txt

Run the Application:

streamlit run app.py

Features:

Voice input with real-time speech recognition

Pronunciation feedback and accuracy scoring

User-friendly web interface using Streamlit

Troubleshooting

**Microphone Not Detected** → Ensure permissions are enabled and correct input device is selected.

**Speech Not Recognized** → Minimize background noise and speak clearly.

**Library Errors** → Run:

pip install -r requirements.txt

**Appendix C: Diagrams**

System Architecture User → Web Interface → Speech Recognition Module → Feedback Engine → Learning Output

Data Flow Diagram User speaks → Microphone captures input → Google Speech API processes → Text returned → Compared to target → Feedback displayed

Example Scoring Table | Expected Phrase | User Input | Similarity (%) | |------------------------|----------------------|----------------| | Hello, how are you? | Helo how are you | 90.91% | | I am learning English. | I am larning English | 95.00% |

**Execution:**

Double-click start\_app.bat to run the web application.

Speak clearly into the microphone when prompted.

Review pronunciation accuracy and improve iteratively.

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