C4GT DMP

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Current occupation *(Working Professionals - add current organization & years of exp)*	Student
Education Details *(College Name - Degree Name and branch of engineering or other course/specialization)*	IIIT JABALPUR – Mechanical Engineering
Technical skills with level *(Mention tech skills/languages known/UI-UX and level - Novice/Intermediate/Expert)*	HTML, CSS, JavaScript , Typescript , Nodejs , Express, Machine Learning , Go-lang , Deep Learning

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Title: Elevating Language Learning Efficiency and Lowering Infrastructure Costs via Offline ASR for Sunbird ALL

Summary

This proposal seeks to elevate the experience of learning and making it by integrating the Automated Speech Recognition(ASR) in Sunbird ALL , enabling real-time speech-interaction and reducing cloud-based infrastructure to making it cost-effective and improving. The primary focus on will be on ensuring on making back-end integration seamlessly , intuitive user interfaces and also the performance that reduce the infrastructure costs post-deployment. My approach involves building modular components, conducting continuous testing, and prioritizing user experience to ensure scalability and reliability.

Project Detail

1.Project Overview:

a. Understanding of the Project

The Sunbird ALL platform focus to support language learning through interactive exercises enhanced by speech recognition and feedback mechanisms. The goal of this project is to integrating an offline ASR engine into the existing infrastructure, enabling learners to practice speaking exercises in offline mode this reduce the dependency on the cloud infrastructure. This feature is show special impact in low-bandwidth regions and contributes to reduced cloud dependence and operational costs.

b. Issues That Might Come Up & Support Needed

- **Multi-language accuracy**: Reaching up to ≥ 90% accuracy across multiple languages offline be challenging.
  Support needed: Access to curated multilingual datasets for model accurate model-tuning.
- **Resource constraints on mobile**: Offline ASR models consumes a lot more resources when its come to phone so its been a challenging task to handle all resources efficiently.
  Support needed: Coordination with the mobile development team to optimize resource usage and evaluate model performance.
- **Integration with legacy systems**: Setting up compatibility within ASR model and existing API's
  Support needed:Well defined API documentation and also complete architectural guidance from the team help the most.

c. Solutions

Utilize already available ASR models like Vosk, Whisper or Coqui STT for better computing environments.

Enable dynamic model loading and apply quantization techniques for efficient mobile deployment.

Designing a authenticated REST API's in Python to call the model from the fronted.

Checking continuously the system and integrate logging to monitor ASR accuracy , latency , functionality and security.

2. Macro Implementation Details with Timelines

a. Milestone 1 – Research & Architecture Planning (Weeks 1–2)

- Checking already available offline ASR engines (Vosk, Whisper, Coqui STT) for language learning, accuracy, and performance.

- Deciding tech stack and deployment strategy (Docker setup, REST API specs).
- Getting involved with UI/UX designers in order to build and decide the app's look and feel.
- Deliverables: Selecting Tech stack , making architectural diagrams and finalized wire frames.

b. Milestone 2 – Integration & Development (Weeks 3–6)

- Build Python backend with selected ASR engine wrapped in a REST API.
- Design & Develop React/React Native components for frontend and ASR results.
- Implement language selection and exercise modules with visual and audio feedback.
- Deliverables: Functional prototype with integrated ASR pipeline and basic frontend.

c. Milestone 3 – Testing, Optimization & Deployment (Weeks 7–9)

- Run and test multi-language accuracy and latency tests (target ≥ 90%).
- Optimize model performance for mobile/web using different methods available for increasing performance.
- Containerize application with the help of the Docker and set up the CI/CD pipelines.
- Deliverables: Final version deployed, infrastructure cost analysis, documentation.

Intended Outcome

- A user-friendly, offline-ready language learning platform using ASR technology.
- Reduced backend load and dependence on cloud services.

- Real-time, personalized feedback for learners through high-accuracy speech recognition.
- A fully integrated solution aligned with Sunbird ALL architecture and compliance standards.

Availability

Number of hours available to dedicate to this project per week	25 hours
Do you have any other engagements that will require your time? (projects/internships)	No

Share any other details about your availability clearly here- xx

Personal Information

About Me: *My name is Harsh Srivastav a final year undergraduate student at IIIT Jabalpur having experience in building real-time web application using MERN stack technology and also know languages like Golang , Python and C++ , apart from all this I have also in experience with machine learning tools and technologies I build various college project in this domain.*

What is your motivation to apply for this project?

My name is Harsh Srivastav, a final-year undergraduate at IIIT Jabalpur. I am passionate about building impactful tech solutions and have hands-on experience in developing real-time web applications using the MERN stack. In addition, I am proficient in Golang, Python, and C++, which enables me to adapt across different

development environments. I've also explored machine learning extensively, having built several college projects using various ML tools and techniques. This project aligns well with my interests in speech technology, scalable systems, and user-focused design, and I'm excited to contribute to a platform that promotes accessible learning.

Previous experience/open source projects (Optional):

Project Name	Project Description	Links (if any)
Get it	IIIT Jabalpur official student website for purchasing college goods contributed in backend part of this project.	https://github.com/harshsrivastav8055/GetIt