Requirements Gathering
(Version 1.0)

- **PROJECT NAME: Sign Language Detector**
- **PHASE: Requirements Gathering**
- **DATE: 03/08/2024**
- **PREPARED BY Syed Muhammad Zaid**

VERSION HISTORY

VERSION #	IMPLEMENTED BY	APPROVED BY	APPROVAL DATE
v1.0	Syed Muhammad Zaid	Sitwat Ashraf	03/08/2024

1. Project Plan

1.1 DESCRIPTION/PURPOSE OF PROJECT:

The **SignLanguageDetector** is a tool for better understanding and communication between the **normal people and deaf/dumb people** or between those who do not use the sign language and those who do. This project **detects and interprets sign language gestures in real time,** translating them into **understandable language for deaf and hearing individuals**. Also, hearing individuals can communicate by **interpreting their voices to human readable/ text-based subtitles** making the communication effective.

1.2 SCOPE OF PROJECT:

- This project will focus on developing a deep learning model using YOLOv8 for detecting sign language gestures from the hearing-impaired.
- The system will translate the detected gestures into text and spoken language using speech recognition.
- A user-friendly interface for both individuals will be made. The hearing-impaired people can use the software with the help of a camera and the hearing people can see or listen directly from the application.
- A mobile application is required to be made for easier and more accessible communication.
- Testing and validation will be conducted to ensure the accuracy and reliability of the system. Real-world testing with diverse users, including individuals fluent in sign language, will be performed to gather feedback and make necessary improvements.

1.3 TIMELINE AND METHODOLOGY

DATE	MILESTONES	GOAL	DEPENDENCIES	RESOURCES	OUTCOME
03/22/2024	Milestone - 1	Data collection	Sign language resources	Sign language experts & dataset sources.	Dataset ready for model training
03/29/2024	Milestone - 2	Model selection & setup	GPU resources for training & model configuration	Deep learning & YOLOv8 expertise.	Model configured and ready for training
04/05/2024	Milestone - 3	Model Training	Annotated dataset	GPU resources	Trained model
04/19/2024	Milestone - 4	User interface design	Front-end & Backend of mobile applications.	Front-end development resources and UI/UX.	User interface and mobile app
05/19/2024	Milestone-5	Speech Recognition Integration	Speech recognition libraries	Speech recognition experts and backend developers.	Speech recognition is integrated into the system.
05/30/2024	Milestone-6	Testing and Deployment	Test plans, diverse user feedback, and bug fixing	Testing experts and sign language resources	Validated system with high accuracy and user satisfaction.

2. Project Description

2.1 PROJECT STAKEHOLDER SCENARIOS

Deaf Individual (Stakeholder):

Scenario: Alice, a deaf individual, wants to communicate with her hearing friends without relying solely on written text.

Goal: Alice aims to use the SignLanguageDetector to express herself through sign language and have her gestures translated into spoken language for her friends to understand.

Objective: Alice seeks a seamless and accurate translation of her sign language gestures into spoken language, enabling effective communication with her hearing peers.

Hearing Individual (Stakeholder):

Scenario: Bob, a hearing individual, wants to learn sign language to communicate with his deaf colleague at work.

Goal: Bob aims to use the SignLanguageDetector to learn and understand sign language gestures by observing and receiving real-time translations.

Objective: Bob desires a clear and accurate translation of sign language gestures into spoken language, facilitating his learning process and enabling effective communication with his deaf colleague.

Sign Language Instructor (Stakeholder):

Scenario: Claire, a sign language instructor, wants to incorporate technology into her teaching methods to enhance the learning experience for her students.

Goal: Claire aims to utilize the SignLanguageDetector as a teaching aid to demonstrate sign language gestures and their corresponding meanings in spoken language.

Objective: Claire seeks a reliable and user-friendly tool that accurately translates sign language gestures into spoken language, assisting her in teaching sign language effectively to her students.

2.2 CONSTRAINTS & RESTRICTIONS

CONSTRAINT	ISSUE/SOLUTION
1. Users with varying levels of technological proficiency may find it challenging to use the system, impacting accessibility and usability.	Conduct user research and usability testing with diverse user groups
2. Users from diverse cultural backgrounds and sign language communities may have unique linguistic variations and cultural sensitivities that need to be considered in the development of the system.	Collaborate with sign language experts, linguists, and cultural advisors from different communities.

3. Project Requirements

3.1 USER REQUIREMENTS

- Real-Time sign language detection
- Accurate Interpretation of gestures

- User-friendly interface
- Privacy and Data Security
- Performance and reliability
- Feedback and support

3.2 FUNCTIONAL REQUIREMENTS

- Real-time sign language gesture detection.
- Gesture interpretation.
- Support for multiple spoken languages.
- Easier user interface.
- Multiple input methods.
- Customizable settings.
- Clear speech output.
- Privacy and data security measures.
- Accessibility features.
- Reliable performance.
- Feedback and support channels.

3.3 SYSTEM REQUIREMENTS

Hardware:

- CPU: Intel Core i5 or equivalent
- GPU: NVIDIA GeForce GTX 1060 or equivalent (for training)
- Memory: 8GB RAM
- Storage: Minimum 100GB free disk space

Software:

- Operating System: Windows 10, macOS, or Linux
- Python 3.11
- Deep learning framework (TensorFlow & PyTorch)
- CUDA Toolkit (for GPU acceleration)
- Web development frameworks (React & Vue.js for frontend)
- Speech recognition library or API (Google Speech API)
- Database management system (MySQL)
- Version control system (Git & GitHub)

3.4 USER INTERFACE REQUIREMENTS

- [list interface requirements with mockups and examples as needed]
- []
- []

3.5 WORKFLOW AND ACTIVITIES

- Data Collection and Annotation
- Model Training and Optimization
- User Interface Design and Development
- Speech Recognition Integration
- Testing and Validation
- Documentation and Support
- Deployment and Launch

3.6 CHANGE MANAGEMENT

- **Change Request Submission:**
  Users can submit change requests through a designated channel, providing details of the proposed change and its impact.
- **Change Evaluation:**
  Change requests will be evaluated by the project team to assess their feasibility, and impact on project scope, schedule, and resources.
- **Approval Process:**
  Approved changes will be reviewed by the project stakeholders, including project sponsors and key stakeholders, for final approval.
- **Implementation:**
  Changes approved by stakeholders will be implemented by the project team according to the agreed-upon schedule and prioritization.
- **Communication:**
  Regular communication will be maintained with stakeholders to keep them informed about the status of change requests and their impact on the project.
- **Documentation:**
  All approved changes, including their rationale and implementation details, will be documented for future reference and audit purposes.
- **Training and Support:**
  Training and support will be provided to project team members and end-users affected by the implemented changes to ensure smooth transition and adoption.

3.7 RISK MANAGEMENT

- **Risk Identification:**

  Identify potential risks and uncertainties that may affect project objectives, such as data availability, technical challenges, and resource constraints.

- **Risk Assessment:**

  Evaluate the likelihood and impact of identified risks on project success, prioritizing them based on severity and probability.

4. High-Level Tech Architecture

- Yolov8
- Neural Networks / Deep learning
- React JS
- Speech recognition APIs
- MySQL
- Git and GitHub

5. Maintenance & Support

- Bug fixes and troubleshooting
- Software updates and patches
- Performance optimization
- Security audits and enhancements
- User support and training
- Documentation updates

6. User Testing & Evaluation

- **TEST #1**

  Objective: Evaluate the usability of the user interface.

  Users: 10 participants from diverse demographics, including both deaf and hearing individuals.

  Tasks:

  1. Navigate to the sign language input screen.
  2. Perform a sign language gesture for "hello."
  3. Verify that the translated text or spoken language output is accurate.
  4. Explore customization options such as language settings and interface themes.
  5. Provide feedback on overall ease of use and any issues encountered.

- **TEST #2**

  Objective: Assess the accuracy and real-time performance of sign language gesture detection.
  Users: 15 participants, including individuals proficient in sign language.

  Tasks:

  1. Perform various sign language gestures representing common words and phrases.
  2. Evaluate the system's ability to accurately detect and interpret the performed gestures.
  3. Note any instances of misinterpretation or delay in recognition.
  4. Provide feedback on the system's responsiveness and accuracy in translating sign language gestures into spoken language.
  5. Suggest improvements or additional features to enhance the overall usability and effectiveness of the system.

7. Sign-Offs

Signature:		Date:	03/09/2024
Print Name:	Sitwat Ashraf		
Role:	Project Manager		
Signature:		Date:	03/09/2024
Print Name:	Syed Muhammad Zaid		
Role:	Technical Writer		

8. Appendixes

REFERENCES

DOC NAME/VERSION	DESCRIPTION	LOCATION
Requirements Gathering for SignLanguageDetector	Describes the technicalities, dependencies, scope and workflows of the project.	https://docs.google.com/document/d/17Yx1MRVhHWlo6HMKiZypfd58EEAeBChch1gvDpfji6k/edit?usp=sharing