

Solution Architecture:

1. Best tech solution to solve existing problems:

- We've identified the business problem of bridging the communication gap between the deaf and hearing communities using ASL Alphabet Image Recognition. Our solution involves training a AI model (CNN with transfer learning using VGG16) on the ASL alphabet dataset from Kaggle.

2. The structure, characteristics, behaviour, and other aspects of the software to project stakeholders:

- Machine Learning Model:
 - Structure:
 - Convolutional Neural Network (CNN) architecture.
 - Transfer learning using the VGG16 model.
 - Characteristics:
 - Trained on the ASL alphabet dataset from Kaggle.
 - Capable of recognizing hand signs corresponding to the 26 letters of the English alphabet.
 - Includes three additional classes for "space," "delete," and "nothing."
 - Behaviour:
 - Processes input images of hand signs and produces corresponding predictions.
 - Suitable for real-time video stream applications.
 - Provides accurate and efficient ASL alphabet recognition.
- Web Application:
 - Structure:
 - Developed using the Flask framework.
 - Consists of three HTML pages: index.html, prediction.html, and logout.html.
 - Characteristics:
 - User-friendly interface for interaction.
 - Seamless integration with the machine learning model.
 - Behaviour:
 - Allows users to input and submit hand sign images for prediction.
 - Displays predictions on the prediction.html page.
 - Results are presented on the logout.html page.
- CSS and JS Files:
 - Structure:
 - CSS for styling the HTML pages.
 - JS for enhancing the functionality and interactivity of the web app.
 - Characteristics:
 - CSS for improving the visual appeal and user experience.
 - JS for handling dynamic elements and ensuring smooth interactions.
 - Behaviour:
 - CSS ensures a visually appealing and consistent design.

- JS contributes to the responsiveness and dynamic features of the web app.

3. Features, development phases, and solution requirements:

- Features:
 - ASL alphabet image recognition.
 - Real-time prediction from video streams.
 - Three additional classes for "space," "delete," and "nothing."
- Development Phases:
 - Data collection and preprocessing.
 - Model training and evaluation.
 - Flask app development.
 - Integration of the trained model into the web app.
- Solution Requirements:
 - ASL alphabet dataset.
 - Python with libraries like TensorFlow, Flask, etc.
 - VGG16 model for transfer learning.
 - HTML, CSS, and JS for web app development.

4. Specifications according to which the solution is defined, managed, and delivered:

- Data Specifications:
 - ASL alphabet dataset from Kaggle.
- Model Specifications:
 - Architecture: CNN with VGG16 transfer learning.
 - Training and evaluation metrics.
- Web App Specifications:
 - Flask framework.
 - Three HTML pages (index, prediction, logout).
 - CSS and JS for design and functionality.
- Delivery:
 - Packaged and deployed web app.
 - Documentation for stakeholders.
 - Trained model for deployment.

Solution Architecture Design:

