Project Planning Phase
Technology Stack (Architecture & Stack)

Date	27 October 2022
Team ID	592675
Project Name	ASL- Alphabet Image Recognition
Maximum Marks	4 Marks

Technical Architecture:
Technical architecture is a foundational and systematic approach to designing and organizing complex systems, including software applications and network infrastructures, with the primary objective of achieving specific technical goals. It is a crucial component in the realm of information technology, playing a pivotal role in ensuring the successful implementation of projects. Technical architects, often serving as the guiding visionaries, are responsible for overseeing the design and construction of these systems, ensuring they operate efficiently, maintain a high level of security, and are in perfect alignment with the broader objectives of the project.

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	Data Collection	Gather a diverse dataset of ASL hand sign images, including the 26 letters of the English alphabet and additional classes for "space," "delete," and "nothing."	Image Acquisition
2.	Data Preprocessing	Clean and prepare the dataset by resizing images, normalizing pixel values, and applying data augmentation techniques to enhance data quality and quantity.	Python, OpenCV
3.	Model Architecture	Design the neural network architecture for image recognition, specifying layers, activation functions, and optimizing hyperparameters for effective learning.	TensorFlow, PyTorch
4.	Training	Train the model on the preprocessed dataset, utilizing GPU/CPU resources, and fine-tune model weights to minimize classification errors.	GPU/CPU, Deep Learning Frameworks
5.	Evaluation	Assess the model's performance and accuracy through metrics like accuracy, F1-score, and confusion matrices to measure recognition effectiveness.	Metrics (e.g., accuracy, F1-score)
6.	Deployment	Integrate the trained model into applications for real-time ASL recognition, involving web and mobile app development for user accessibility.	Flask, python

7.	User Interface	Create a user interface for users to input video streams and receive real-time ASL alphabet recognition results, focusing on simple and clean UI.	Tkinter
8.	Real-time Video Input	Capture and process video input for ASL recognition, utilizing video input APIs and the OpenCV library for efficient handling of video streams.	Video Input APIs, OpenCV
9.	ASL Recognition Engine	Implement the ASL alphabet recognition logic using the trained neural network, typically in Python, and deploy it using TensorFlow Serving for efficient recognition.	Python, TensorFlow Serving
10.	Testing	Conduct extensive testing, including unit and integration testing, to ensure the reliability and robustness of the system's components and overall functionality.	Unit Testing, Integration Testing
11.	Maintenance and Updates	Plan for ongoing maintenance and model updates through DevOps practices and continuous integration/continuous deployment (CI/CD) pipelines	DevOps, CI/CD pipelines

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Image Recognition	The application can accurately recognize ASL alphabet signs from images, including the 26 English letters and additional classes ("space," "delete," "nothing").	Machine Learning, Computer Vision
2.	Real-time Video Input	The application can accept and process real-time video streams, enabling on-the-fly ASL alphabet recognition for live interactions.	Video Streaming APIs, OpenCV
3.	User-friendly Interface	The user interface is designed to be intuitive, allowing users to easily input video streams and receive real-time recognition results.	UI/UX Design, Front-end Technologies
4.	Accessibility	The application is designed to improve communication between the deaf and hearing communities by providing ASL recognition as a means of bridging the communication gap.	Accessibility Features, ASL Recognition Logic
5.	Performance Optimization	The application is optimized for speed and accuracy, with efficient algorithms and model tuning to ensure rapid ASL alphabet recognition.	Algorithm Optimization, Model Training