Project Initialization and Planning Phase

Date	15 June 2024
Team ID	SWTID1750006853
Project Title	ASL- Alphabet Image Recognition
Maximum Marks	3 Marks

Project Proposal (Proposed Solution) template

This project proposal outlines a solution to address a specific problem. With a clear objective, defined scope, and a concise problem statement, the proposed solution details the approach, key features, and resource requirements, including hardware, software, and personnel.

Project Overview	
Objective	To provide a means for users to leverage machine learning to classify hand sign images into alphabets
Scope	This project focuses on the development of a machine learning-based image recognition system designed to classify American Sign Language (ASL) alphabet hand gestures. It will involve collecting or utilizing an existing dataset of ASL alphabet images, preprocessing the data, training a classification model, and developing a user-friendly interface to allow users to upload hand gesture images and receive alphabet predictions. The project is limited to static image input (not video) and covers only the ASL alphabet (A–Z), excluding dynamic gestures or full word recognition.
Problem Statement	
Description	Communication barriers exist for individuals who rely on American Sign Language (ASL), especially when interacting with those unfamiliar with sign language. Despite advancements in technology, there remains a lack of accessible tools that can translate ASL hand gestures particularly alphabet signs into readable text in real-time using simple image inputs. This gap makes everyday communication and integration more difficult for ASL users.
Impact	Solving this problem would greatly enhance accessibility and inclusivity for the deaf and hard-of-hearing community. It would enable better communication in educational, social, and professional environments by providing a bridge between ASL users and non-ASL

	users. It can also serve as a foundational tool for further development into full ASL sentence recognition systems and educational platforms.
Proposed Solution	
Approach	The project leverages Convolutional Neural Networks (CNNs), specifically a fine-tuned VGG16 model pretrained on ImageNet, to classify ASL alphabet hand gestures from static images. The pipeline includes: • **Data Collection/Preparation:** Use of an existing ASL alphabet image dataset or creation of a custom one. • **Preprocessing:** Image normalization, resizing, and augmentation to improve model generalization. • **Model Training:** Design and train a CNN using frameworks such as TensorFlow or PyTorch. • **Evaluation:** Measure accuracy and performance using validation datasets and confusion matrices. • **Deployment:** Develop a simple interface (web or desktop) that allows users to upload an image and receive a predicted letter.
Key Features	• **Transfer Learning with VGG16:** for high-accuracy classification. • **Data Augmentation:** to improve generalization. • **t-SNE Visualization:** to explore learned features in 2D. • **Image-based Prediction Interface:** with real-time output. • **Extensible Codebase:** suitable for adapting to full ASL word recognition in future iterations.

Resource Requirements

Resource Type	Description	Specification/Allocation
Hardware		
Computing Resources	CPU/GPU specifications, number of cores	1 x NVIDIA RTX 3060 GPU, 8-core CPU
Memory	RAM specifications	16 GB DDR4 RAM
Storage	Disk space for data, models, and logs	500 GB SSD
Software		
Frameworks	Python frameworks	Flask (for web interface), TensorFlow/Keras (for model training)
Libraries	Additional libraries	NumPy, OpenCV, scikit-learn, Matplotlib
Development Environment	IDE, version control	Visual Studio Code, Jupyter Notebook, Git for version control
Data		
Data	Source, size, format	Kaggle ASL Alphabet dataset, ~87,000 labeled JPG images