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| **ISL Letter Recognition using** |

**Team:**

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**Project Title:**

Indian Sign Language (ISL) Letter Recognition using Deep Learning

**Objective:**

The objective of this project is to develop a deep learning-based system that can recognize static hand gestures representing English alphabets (A–Z) in Indian Sign Language (ISL). This will be achieved by training a Convolutional Neural Network (CNN) on a labelled image dataset of ISL letter signs.

**Problem Statement:**

Communication with hearing- and speech-impaired individuals often becomes challenging due to the lack of widespread understanding of sign language. Recognizing ISL letters using deep learning can help bridge this communication gap by enabling systems that understand signed alphabets from images.

**Methodology / Workflow:**

1. **Dataset Collection & Preparation**

* A publicly available ISL alphabet dataset containing labelled images for each number and letter (1-9, A–Z) will be used.
* The images will be pre-processed by converting them to grayscale, resizing to a fixed dimension (e.g., 64×64), and normalizing pixel values.

1. **Model Design**

* A Convolutional Neural Network (CNN) will be built from scratch without using any pretrained models.
* The model will be trained to classify input images into one of the 26 output classes corresponding to the English alphabets.

1. **Training & Evaluation**

* The dataset will be split into training and testing sets.
* The model will be trained using standard optimization techniques and evaluated using accuracy and loss metrics.

1. **Image-Based Testing**

* The trained model will be tested on new gesture images (outside the training set) to evaluate its ability to accurately recognize individual ISL letters.
* This forms the current scope of the project.

**Current Scope:**

* Recognition of individual ISL letters (A–Z) from static images.
* Model trained using CNN built from scratch.
* Testing limited to image input only.

**Scope of the Project:**

The project aims to create a practical, DSA-driven alternative to ZIP-like tools.

Designed for:

* Educational use
* Universal file compression
* Demonstrating real-world DSA applications

Future Scope:

* Add encryption to archives
* Enable cloud sync
* Integrate parallel/multi-threaded compression

**Tools & Technologies:**

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| Category | Tools & Technologies |
| Language | Python |
| Deep Learning | Tensorflow / Keras (for CNN) |
| Image Processing | OpenCV |
| Data Handling | Numpy, Pandas |
| Visualization | Matplotlib, Seaborn (optional) |
| Development Environment | Numpy, Jupyter Notebook |
| Dataset | ISL Letters Dataset |

**Deliverables:**

* A cleaned and pre-processed image dataset of ISL letter signs (A–Z).
* A Convolutional Neural Network (CNN) model trained to classify ISL letters from static images.
* Evaluation results showing model performance (accuracy and loss) on test images.
* A Python script that predicts ISL letters from new input images.
* Documentation and code explaining the data preparation, model design, training, and testing process.

**Conclusion:**

This project aims to build a foundational system for Indian Sign Language letter recognition using deep learning. By training a CNN model on image data of ISL alphabets, we enable accurate classification of static hand gestures. The current phase focuses solely on image-based recognition. In future phases, this system can be expanded to support gesture sequences, video input, and real-time applications, contributing to more accessible communication tools for the hearing- and speech-impaired community.