# README - Gesture-Based Language to Text and Audio System

## Project Title:

Empowering Communication: Gesture-Based Language to Text and Audio System for Divyang Individuals

## Description:

This project is a web-based application designed to convert hand gestures (sign language) into corresponding text and voice output. It is built using Django and machine learning technologies to help individuals with hearing or speech impairments communicate more easily. The system uses a webcam to capture gestures, processes them using a trained model, and presents the recognized signs on the screen along with a speech output.

## Technologies and Tools Used:

- Django (Python Web Framework)  
- Python Programming Language  
- OpenCV, MediaPipe, TensorFlow, NumPy, Pyttsx3 Libraries  
- SQLite Database  
- HTML, CSS, JavaScript for frontend  
- Visual Studio Code or any Python-supported IDE  
- Google Chrome or any modern web browser

## Installation and Setup Instructions:

Prerequisites:  
- Python version 3.7 or above must be installed.  
- pip package manager should be available.

Steps to Set Up:

1. Copy the entire project folder from the CD to your computer.  
2. Open the folder named "sign\_language" using Visual Studio Code or any Python IDE.  
3. Open the terminal in the project directory and run the following command to install the required libraries:

pip install django opencv-python mediapipe numpy pyttsx3 tensorflow keras

If a requirements.txt file is available, you can also run:

pip install -r requirements.txt

## How to Run the Project:

1. Open the terminal in the project folder where the "manage.py" file is located.  
2. Run the server using the command below:

python manage.py runserver

3. Once the server starts, open a browser and go to the address: http://127.0.0.1:8000/  
This will launch the web application interface where you can interact with the gesture system.

## Key Components and Files:

- app/: Contains the main Django application code  
- training.py: Used to train the machine learning model  
- add\_sign.py: Allows adding new gesture images  
- verify.py: Performs gesture recognition using the webcam  
- manage.py: Django’s management script  
- db.sqlite3: Database file used by Django

## Functionality Overview:

The webcam captures hand gestures shown in front of it. The image is then processed using MediaPipe and OpenCV to extract hand features. A trained CNN model predicts the gesture, and the application then displays the predicted gesture as text and uses text-to-speech to speak it out loud.

## Notes:

- Ensure your system has a webcam and internet browser installed.  
- Allow webcam access when prompted.  
- The machine learning model must be trained once using training.py if not already trained.  
- You can add more gesture categories using add\_sign.py and retrain the model accordingly.

## Developed By:

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