

TEAM – 10

Project Title:

“DECODING THE LANGUAGE OF HANDS - MACHINE LEARNING IN SIGN LANGUAGE”

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ABSTRACT

Sign language, a comprehensive solution aimed at revolutionizing communication for deaf and mute individuals, particularly in critical situations. We address the communication gap through a groundbreaking vision-based technique for hand gesture recognition. The core of our system lies in real-time hand gesture tracking libraries. These libraries are empowered by the YOLO (You Only Look Once) object detection algorithm, renowned for its accuracy. This translates to a system that can precisely identify and classify the various signs used in sign language. Unlike traditional methods that may require specialized equipment or specific environments, our vision-based approach boasts superior adaptability. Deaf and mute users can effectively convey messages in diverse settings, ensuring clear and unhindered communication regardless of the situation.

Our project transcends mere gesture recognition. We seamlessly integrate cutting edge voice conversion technologies, including a Text-to-Speech (TTS) system. This crucial step bridges the gap between sign language and spoken communication. The identified signs are translated into human-hearable voice (typically English), enabling effective interaction with individuals unfamiliar with sign language. This fosters a more inclusive environment where everyone can participate in the conversation. In essence, this project leverages the power of vision technology to break down communication barriers for deaf and mute individuals. By offering a system that combines accurate gesture recognition with real-time voice conversion, we pave the way for a more connected society where everyone has a voice.

Key Algorithms and Methodologies used in this Project:

- **Tkinter**

Tkinter is a graphical user interface (GUI) module for Python, you can make desktop apps with Python. You can make windows, buttons, show text and images amongst other things. The module Tkinter is an interface to the Tk GUI toolkit. Tkinter is the most commonly used library for developing GUI in Python. It is a standard Python interface to the Tk GUI toolkit shipped with Python.

To Install the Tkinter, Open up the command prompt and use the below command:

pip install tk

- **YOLO (You Only Look Once)**

You Only Look Once (YOLO) is a powerful neural network architecture that excels in real-time object detection. It is the Algorithm we used in the Project to detect the Signs with Accuracy. It Empowers:

1. Object Detection Expertise
2. Real-Time Performance

- **PIL**

It Stands for Python Imaging Library (PIL), which is now known as Pillow. It is a powerful library for working with images in Python and provides extensive image processing capabilities, file format support, and efficient internal representation for Python. The core image library is designed for fast access to data stored in basic pixel formats.

It has the Features like,

1. Image Processing: Pillow allows you to perform various image manipulation tasks, such as resizing, cropping, filtering, and more.

2. File Format Support: It can open, manipulate, and save many different image file formats.

You can install Pillow using pip:

`pip install pillow`

- **OpenCV**

OpenCV is a Python library that is used to study images and video streams. It basically extracts the pixels from the images and videos (stream of image) so as to study the objects and thus obtain what they contain. It contains low-level image processing and high-level algorithms for object detection, feature matching etc.

To install OpenCV using pip, you can run the following command in your terminal or command prompt:

`pip install opencv-python`

- **Numpy**

NumPy is a library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays.

If you use pip, you can install NumPy with:

`pip install numpy`