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Deaf Helper Using Python

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Abstract: The Deaf helper using machine learning project represents a pivotal endeavor aimed at bridging communication gaps and enhancing accessibility for the deaf and hard of hearing community. In a world where spoken language dominates, this project harnesses the power of machine learning to facilitate seamless communication for individuals who rely on sign language as their primary mode of expression. At its core, this project leverages state-of-the-art machine learning techniques, including computer vision and natural language processing, to recognize and translate sign language gestures into written or spoken language and vice versa. By fusing these technologies, the project endeavors to create an inclusive and accessible communication tool.

Keywords: Deaf Helper, Machine learning, CNN, Project, Communication.

I. INTRODUCTION

Sign language is the mode of communication which uses visual ways like expressions, hand gestures, and body movements to convey meaning. Sign language is extremely helpful for people who face difficulty with hearing or speaking. Sign language recognition refers to the conversion of these gestures into words or alphabets of existing formally spoken languages. Thus, conversion of sign language into words by an algorithm or a model can help bridge the gap between people with hearing or speaking impairment and the rest of the world.

A. Who use the Sign Language?

1) Deaf People
2) Sign language newscasters
3) Some parents also teach their babies sign language to enhance their communication skills.

B. Why is Sign Language Important?

1) Sign Language plays the major role in developing Deaf identity.
2) It is the mother tongue Language.
3) Use Sign language in education

Provides a chance to the deaf children to educate themselves. Enhances the level of confidence among the disabled. Instils a feeling of social responsibility and sensitivity among the non-deaf who volunteer to learn sign language in order to communicate with those who are disabled. Makes life easier for the deaf.

Some of the benefits of learning the sign language and its usage are as follows:

a) Helps the deaf and the dumb to communicate with the others as well as amongst themselves.
b) Helps in the process of social inclusion of those that suffer from hearing impairment.
c) Provides a chance to the deaf children to educate themselves.
d) Enhances the level of confidence among the disabled.
e) Instils a feeling of social responsibility and sensitivity among the non-deaf

II. RELEVANCE OF WORK

The existing system have been able to recognize gestures with high latency as it uses only image processing. Identification of sign gesture is mainly performed by the following methods:

1) Glove-based method in which the signer has to wear a hardware glove, while the hand movements are getting captured.
2) Vision-based method further classified into static and dynamic recognition. Statics deals with the detection of static gestures (2d-images) while dynamic is a real-time live capture of the gestures. This involves the use of the camera for capturing movements.

The Glove-based method, seems a bit uncomfortable for practical use, despite having an accuracy.

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III. LITERATURE REVIEW

Every existing Virtual Assistant in today's date is found to be Voice Automated thereby making it unusable by Deaf-mutes and people with certain disabilities. This leads to the need of a system which can help people with speaking or listening disabilities to make use of such Virtual Personal Assistants [8]. Artificial Neural Network is used in majority cases where static recognition is performed as shown in [1], but there are few drawbacks related to the efficiency of recognizing distinctive features from images which can be improved by using Convolutional Neural Network. Convolutional Neural Network when compared to its predecessors, recognizes important distinctive features more efficiently and without any human supervision. Artificial Neural Network uses one-to-one mapping which increases the number of nodes required thereby degrading the efficiency whereas Convolutional Neural Network uses one-to-many, keeping the number of nodes low and greatly improving the efficiency [5]. Many systems designed with such objectives tend to make use of more of physical hardware like the design observed in Cyber Glove thereby leading to need of manufacturing of such hardware gadgets and making it mandatory for the users to wear it while accessing the Virtual Assistants [11]. Many systems are designed in such a way that their application is limited to only certain Sign language or series of Hand gestures [9] whereas the proposed system is designed in such a way that it gives us the flexibility of changing to any standard sign language just by changing the dataset and training the model for the same.

IV. PROPOSED SYSTEM

The proposed system would be a real time system where in live sign gestures would be processed using image processing. Then classifiers would be used to differentiate various signs and the translated output would be displaying text. We will develop this application using the Machine Learning with proposed system we use CNN (Neural Network) for recognize of signs Deaf Helper using Machine Learning," which aims to address the pressing need for improved communication assistance for Deaf individuals Creating a "Deaf Helper using Machine Learning" system offers numerous advantages, both for the Deaf community and society as a whole.

Here are some key advantages of such a system:

1) *Enhanced Communication:* The primary advantage of a Deaf Helper system is its ability to bridge the communication gap between Deaf individuals and the hearing world. It enables Deaf individuals to communicate more effectively with hearing individuals, making everyday interactions, education, and employment opportunities more accessible.
2) *Inclusivity and Accessibility:* The system promotes inclusivity by providing Deaf individuals with accessible communication tools. It ensures that they can participate fully in various aspects of life, such as education, employment, healthcare, and social interactions.
3) *Real-time Communication:* Real-time communication is a crucial advantage, allowing Deaf individuals to engage in live conversations and receive immediate responses. This capability significantly improves the quality of communication experiences.
4) *Learning Support:* A Deaf Helper system can serve as a valuable learning tool. It can assist Deaf individuals in learning sign language, improving their literacy skills, and understanding spoken or written language through translation features.
5) *Independence and Empowerment:* By providing Deaf individuals with effective communication tools, the system empowers them to navigate the world independently. It reduces their reliance on interpreters or intermediaries in various situations.
6) *Flexibility and Customization:* Many Deaf Helper systems can be customized to meet individual preferences and needs. Users can adapt the system to their unique signing style and communication requirements.

V. OBJECTIVES

1) *Objective 1:* Create a user-friendly Python GUI (Graphical User Interface) for your application, allowing users to easily interact with the "Deaf Helper" technology.
2) *Objective 2:* Develop a Python-based speech recognition module that can accurately transcribe spoken language into text. *Objective 3:* Implement a natural language processing (NLP) component in Python to translate transcribed text into sign language gestures or signs.
3) *Objective 4:* Integrate Python libraries or APIs for real-time video processing and display to support sign language interpretation through video.
4) *Objective 5:* Implement machine learning algorithms in Python to improve the accuracy of speech recognition and sign language translation over time through user feedback.

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VI. METHODOLOGY

The "Deaf Helper" project employs a combination of natural language processing (NLP), machine learning, and computer vision techniques to achieve its goal of facilitating communication for individuals with hearing impairments. The project can be broken down into the following key components:

A. Data Collection and Pre-processing

1) *Sign Language Dataset:* The project starts with the collection of a comprehensive sign language dataset, which includes a wide range of signs for different words and phrases in the chosen sign language (e.g., American Sign Language, British Sign Language, etc.). This dataset should cover a broad spectrum of common and specific signs.
2) *Text and Voice Data:* The project inputs text data for the text-to-sign conversion and voice input for the voice-to-sign conversion. The voice data can be recorded from the user.
3) *Data Pre-processing:* Before training any models, the collected data is pre-processed. For text data, this may involve tokenization, removing special characters, and lowercasing. Voice data may be converted into suitable audio representations (e.g., MFCC features) for analysis.

B. Text to Sign Conversion

1) *Machine Learning Models:* The text-to-sign conversion utilizes machine learning models, such as recurrent neural networks (RNNs) or transformers, to understand the textual input. The model is trained on the text data and corresponding sign language signs. The training process involves learning the associations between words and their sign language counterparts.
2) *Prediction:* When a user provides a text input, the trained model predicts the corresponding sign language sign or gesture. If the input word is not found in the dataset, the project shows spelling mechanism for the user.

C. Voice to Sign Conversion

1) *Voice Recognition:* Voice-to-sign conversion begins with voice recognition. Automatic speech recognition (ASR) models are used to transcribe the spoken words into text. Pretrained ASR models or custom ASR systems can be employed for this task.
2) *Text-to-Sign Model Integration:* Once the spoken words are transcribed into text, the text-to-sign conversion model described earlier is used to generate the sign language signs associated with the transcribed text.

VII. RESULTS AND DESCUSSION

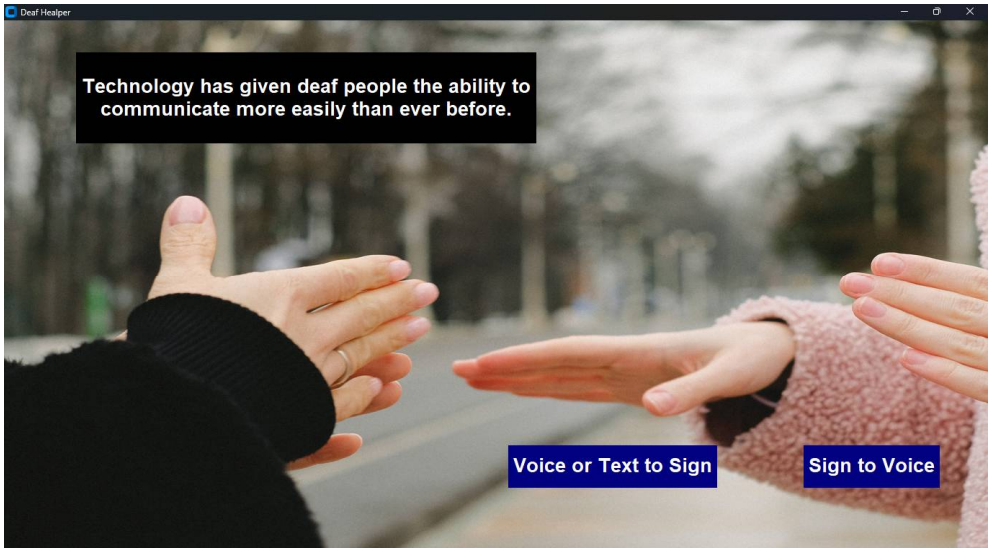


Fig. 1: Home Page

This is Home page of project. User can see two option buttons i.e., Voice or text to sign and Sign to Voice.

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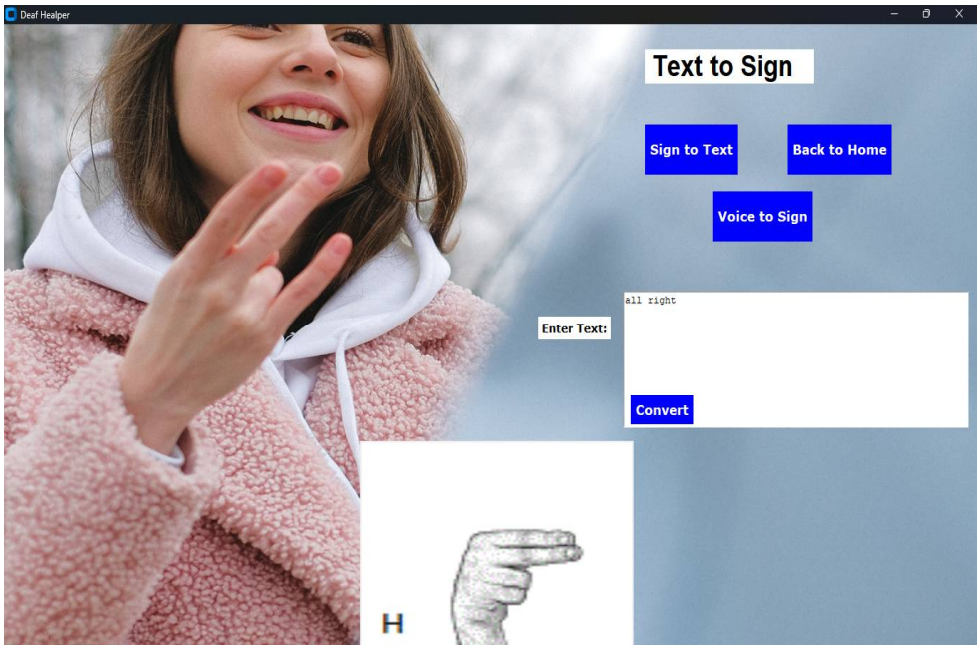


Fig. 2: Text to Sign Page

In this page user will input text and click on convert button to predict sign.

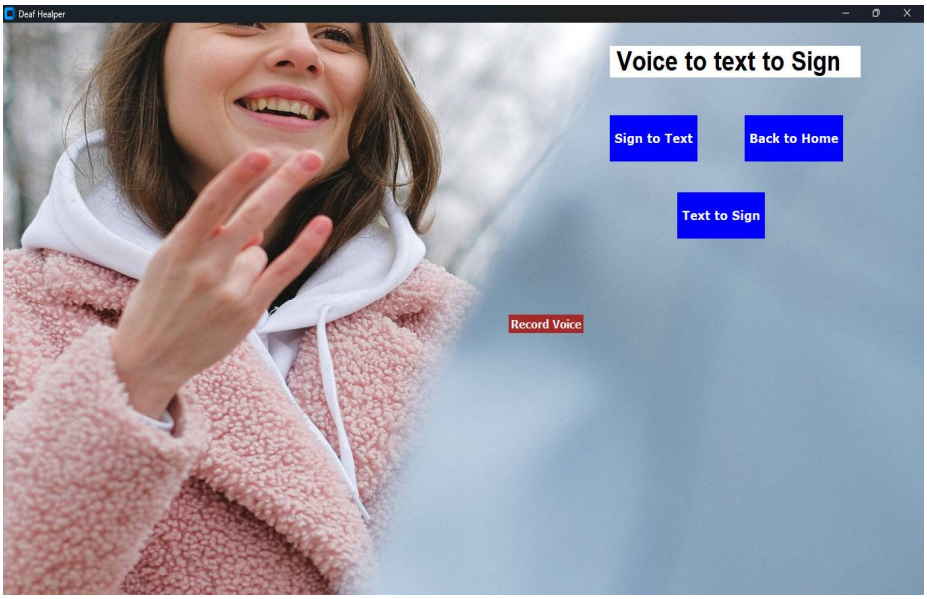


Fig 3: Voice to text to sign

In this page user will input voice and our project will show the expected output

VIII. CONCLUSION

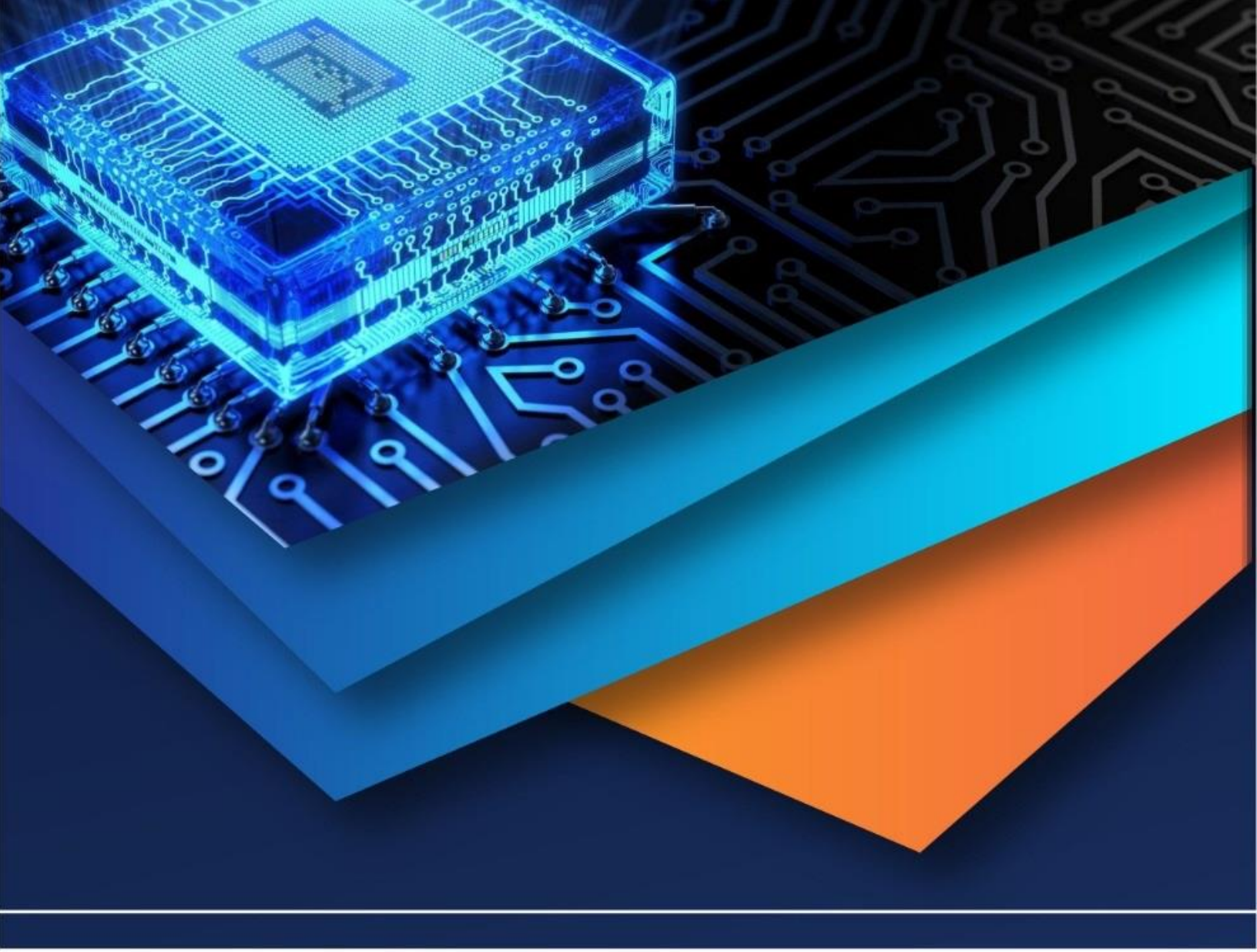
To sum up, "Deaf Helper" is a cutting-edge Python project that closes the communication gap and empowers people with hearing loss. By converting voice and text to sign language, the project provides an inclusive and accessible form of communication. The project's technique makes use of clever spell correction algorithms, machine learning models, and data preprocessing to deliver precise and effective translations from sign language. "Deaf Helper" is a positive step towards enhancing the quality of life for the hard of hearing as well as advancing accessibility and inclusivity in the digital age.

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