SignConnect

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Abstract

Millions of people with speech and hearing impairments communicate with sign languages every day. For hearing-impaired people, gesture recognition is a natural way of communicating, much like voice recognition is for most people. In this project, we look at the issue of translating/converting sign language to text and propose a better solution based on deep learning techniques. We want to establish a system that hearing-impaired people may utilize in their everyday lives to promote communication and collaboration between hearing- impaired people and people who are not trained in Sign Language. So, here we propose a system that recognizes sign language and predicts the right sign using a web camera. The system uses Deep learning techniques, Convolution neural networks, max pooling, and ReLU activation functions. We aim to create software that is both affordable, much more accessible to the users, and works without compromising the desired results.

INTRODUCTION

In today's interconnected world, effective communication is essential. Video conferencing has become a cornerstone of remote collaboration, enabling real-time interaction regardless of geographical barriers. However, ensuring inclusivity within these digital spaces remains a significant challenge, particularly for individuals who rely on sign language for communication. Sign language is a visual language that uses hand gestures, facial expressions, and body movements to convey meaning. It serves as a primary mode of communication for individuals who are deaf, hard of hearing, or have speech impairments. Unlike spoken languages, which rely on sound, sign language is entirely based on visual cues, making it uniquely suited to the needs of its users.

Video conferencing applications have revolutionized the way we communicate, breaking down geographical barriers and fostering real-time interaction among individuals and teams. The lack of built-in support for sign language recognition often leaves users with speech or hearing impairments dependent on external interpreters, limiting their ability to participate fully. Addressing this gap is crucial to creating more accessible, inclusive, and equitable digital communication platforms for all.

Proposed System

In today's interconnected world, effective communication is essential. Video conferencing has become a cornerstone of remote collaboration, enabling real-time interaction regardless of geographical barriers. It has transformed how individuals and teams connect, facilitating seamless communication across diverse locations. However, ensuring inclusivity within these digital spaces remains a significant challenge, particularly for individuals who rely on sign language for communication. The lack of built-in support for sign language recognition often leaves users with speech

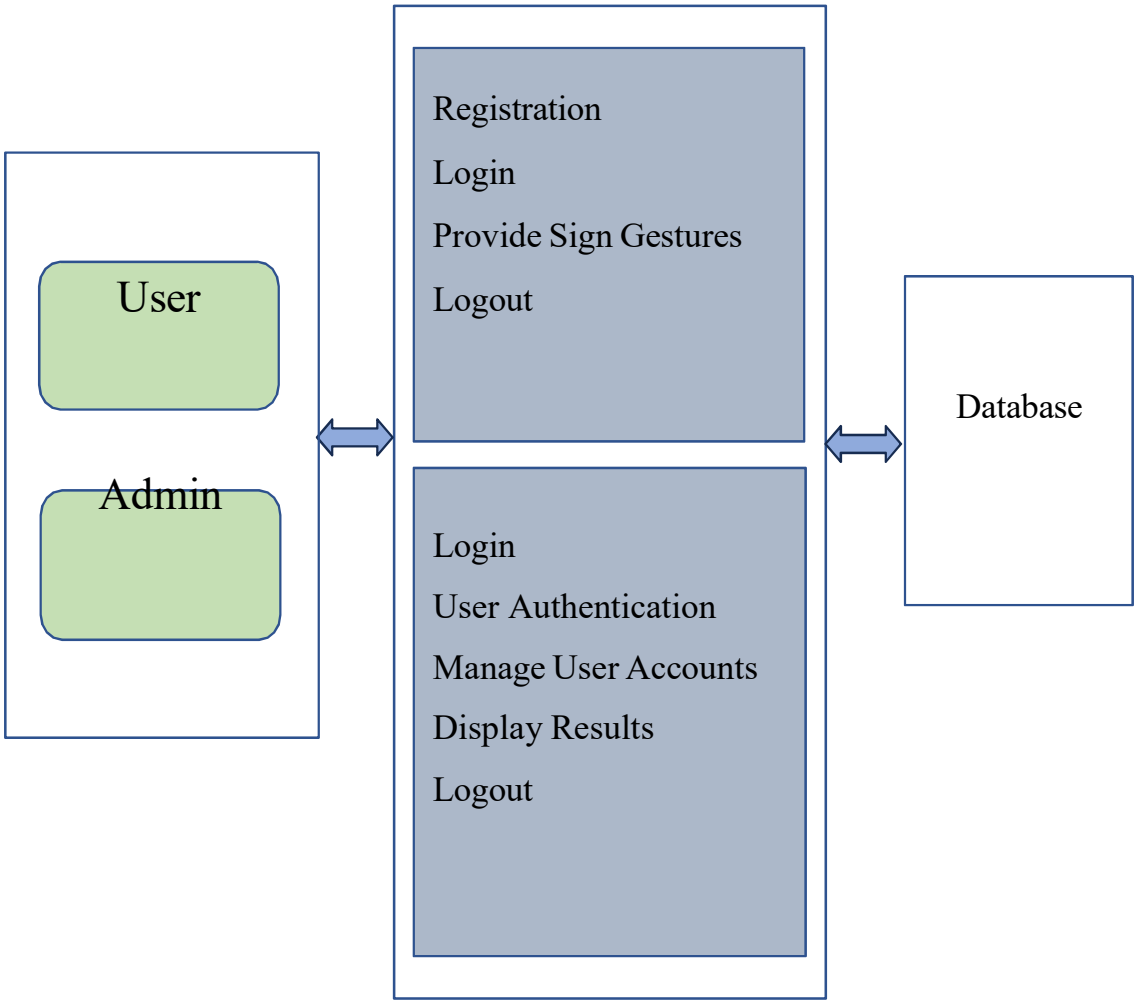
or hearing impairments dependent on external interpreters, limiting their ability to participate fully. Addressing this gap is crucial to creating more accessible, inclusive, and equitable digital communication platforms for all.

DESIGN

Architecture

Project architecture represents number of components we are using as a part of our project and the flow of request processing i.e. what components in processing the request and in which order. An architecture description is a formal description and representation of a system organized in a way that supports reasoning about the structure of the system. Architecture is of two types. They are

1. Software Architecture
2. Technical Architecture



Software Architecture:

Fig 1 Software Architecture

Technical Architecture:

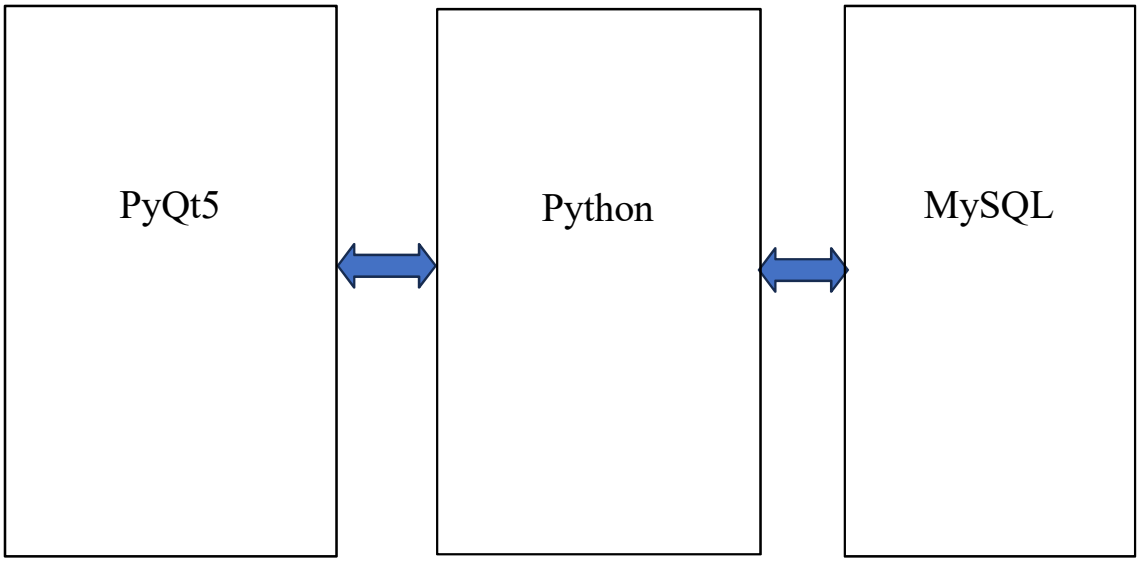


Fig 2 Technical Architecture

IMPLEMENTATION

This System is developed using python programming language in PyCharm IDE.

Python is one of the most popular programming languages now existing. The main reason for the creation of a programming language like python was to enhance the features to a large extent that were available in the present existing languages. The other reason was to invent a language which can be used easily for the developers who work a lot on media other than texts like speech, images and videos. In SignConnect, Python is used to load and preprocess images by resizing, normalizing, and applying data augmentation techniques to improve model robustness. You then define a Convolutional Neural Network (CNN) using TensorFlow or Keras, consisting of layers such as Conv2D, MaxPooling2D, Flatten, Dense, and Softmax for classification. The model is trained on the prepared dataset, and its performance is evaluated using accuracy metrics. Once trained, the model can make predictions on new images by preprocessing them and passing them through the network. For real-time predictions, OpenCV is used to capture webcam images, preprocess them, and perform classification. Lastly, the model can be deployed as a web service using Flask or Django, or as a mobile app with TensorFlow Lite.

TESTING

Software testing is a process, to evaluate the functionality of a software application with an intent to find whether the developed software met the specified requirements or not and to identify the defects to ensure that the product is defect free in order to produce the quality product. As per the current trend, due to constant change and development in digitization, our lives are improving

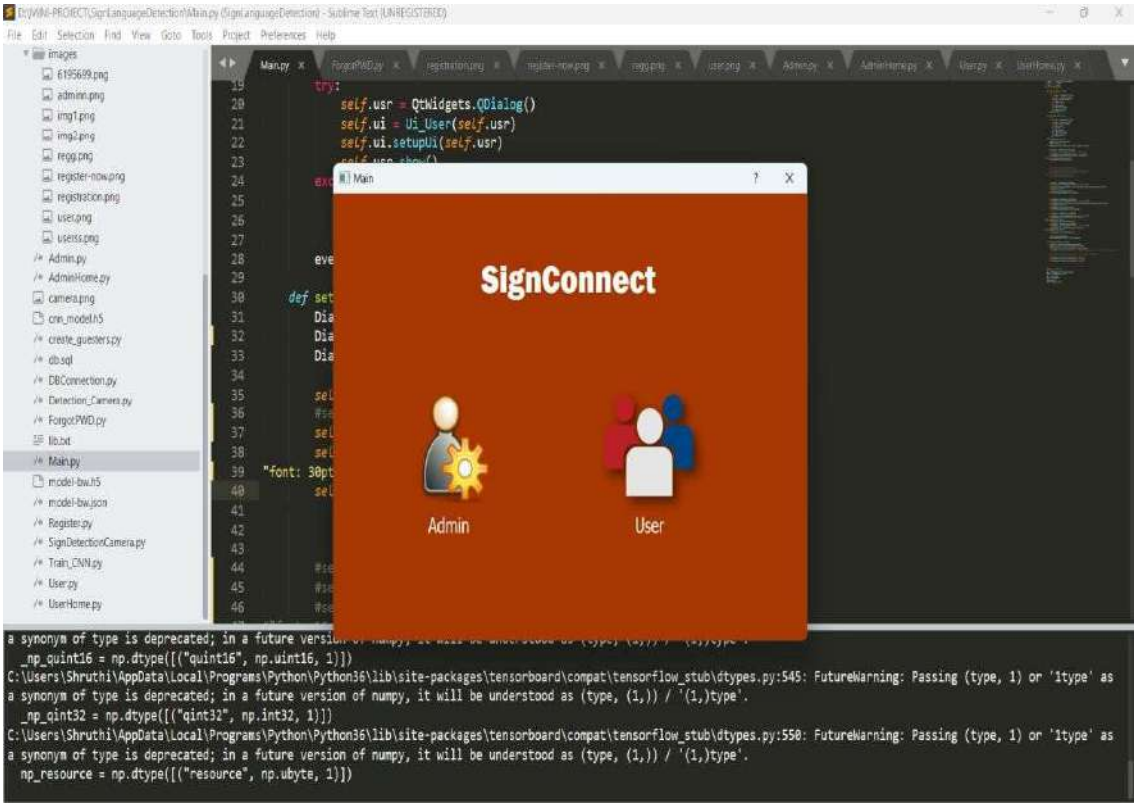
in all areas. The way we work is also changed. We access our bank online, we do shop online; we order food online and many more. We rely on software's and systems. What if these systems turnout to be defective? We all know that one small bug shows huge impact on business in terms of financial loss and goodwill. To deliver a quality product, we need to have Software Testing in the Software Development Process.

S.No	Test Case	Input	Expected output	Actual output	Result
1.	Validation	Name,User ID, Password,Mobile, Email address.	Registration Successful and get the success message	Registration Successful and get the success message	Successful
2.	Login	Username, Password	Redirects to dashboard	Redirects to dashboard	Successful
3.	Sign Recognition	Provide the hand gesture	Sign recognized Successfully	Sign recognized Successfully	Successful
4.	Sign Recognition	Provide the hand gesture	Sign recognized Successfully	Sign Not recognized	Successful
5.	Manage User Accounts	Add/Delete User	Added/Deleted Successfully	Added/Deleted Successfully	Successful

6.	User/Admin Authencation	User/Admin Credentials	User/Admin Authentication Should Succeed	User/Admin Authentication Should Succeed	Successful
7.	Logout	Click on Logout button	User/Admin Should be Logged out	User/Admin Successfully Logged out	Successful

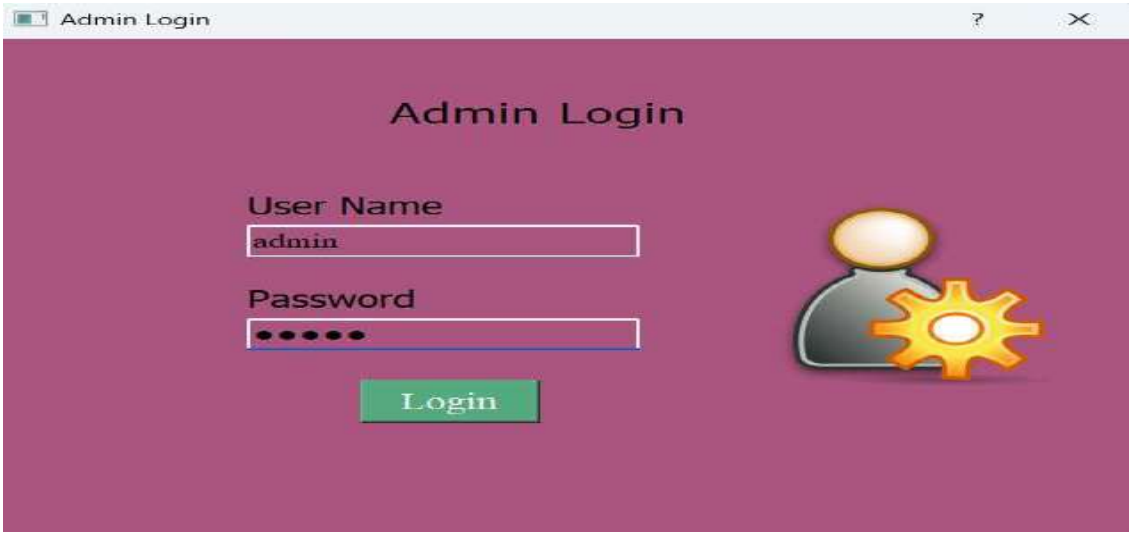
RESULTS

Home Page



Screenshot 3 Home Page

Admin Login

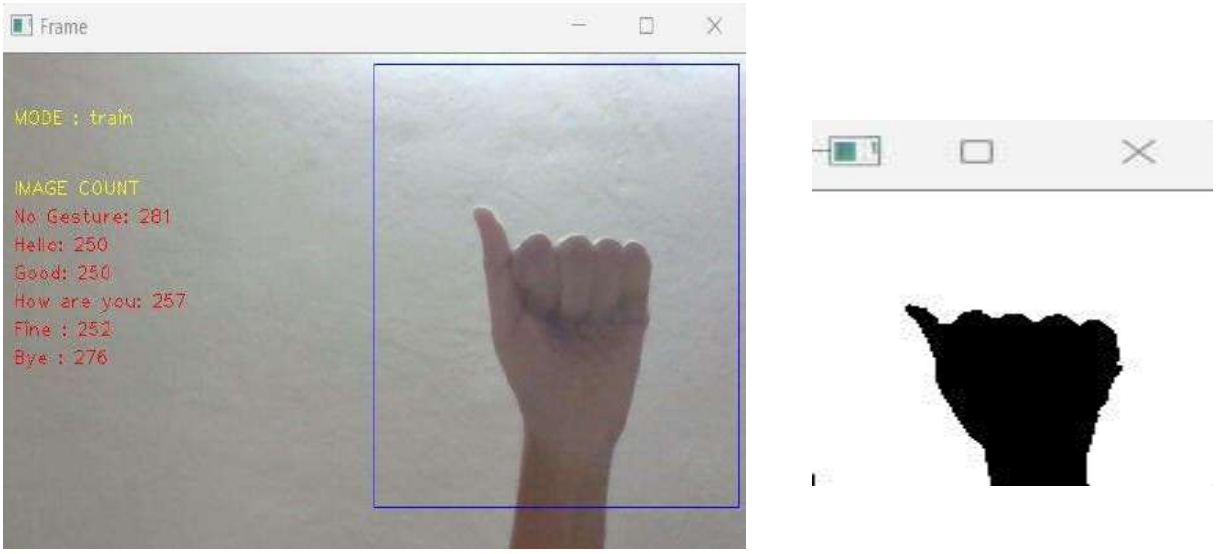


Screenshot 4 Admin Login

Admin Dashboard

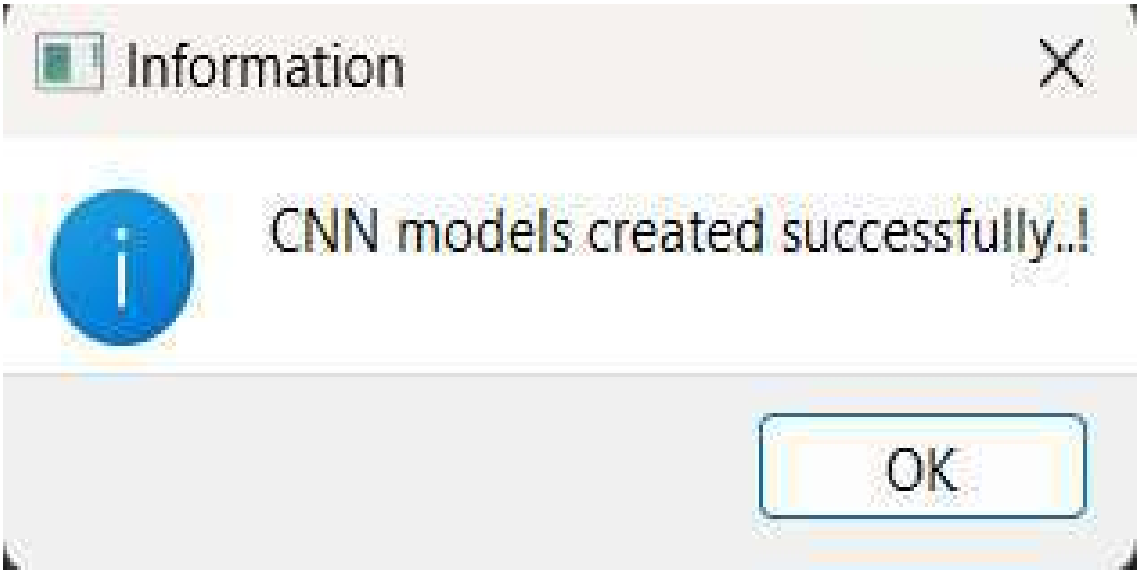
Screenshot 5 Admin Dashboard

Create Hand Gestures



Screenshot 6 Create Hand Gestures

Train Hand Gesture Model

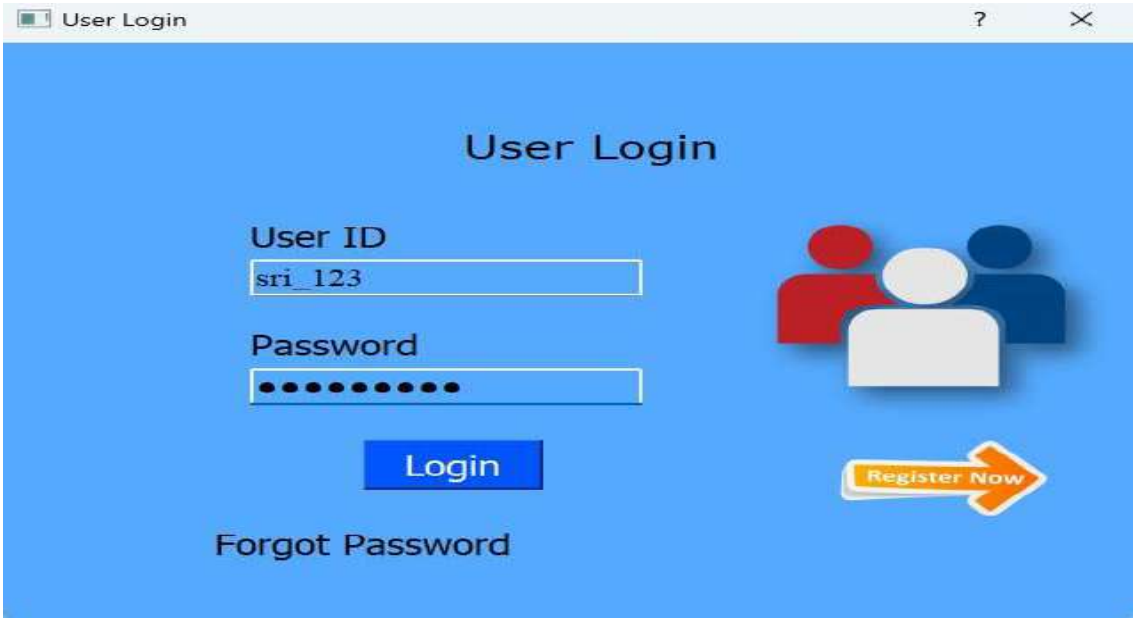


Screenshot 7 Train Hand Gesture Model

User Registration

Screenshot 8 User Registration

User Login

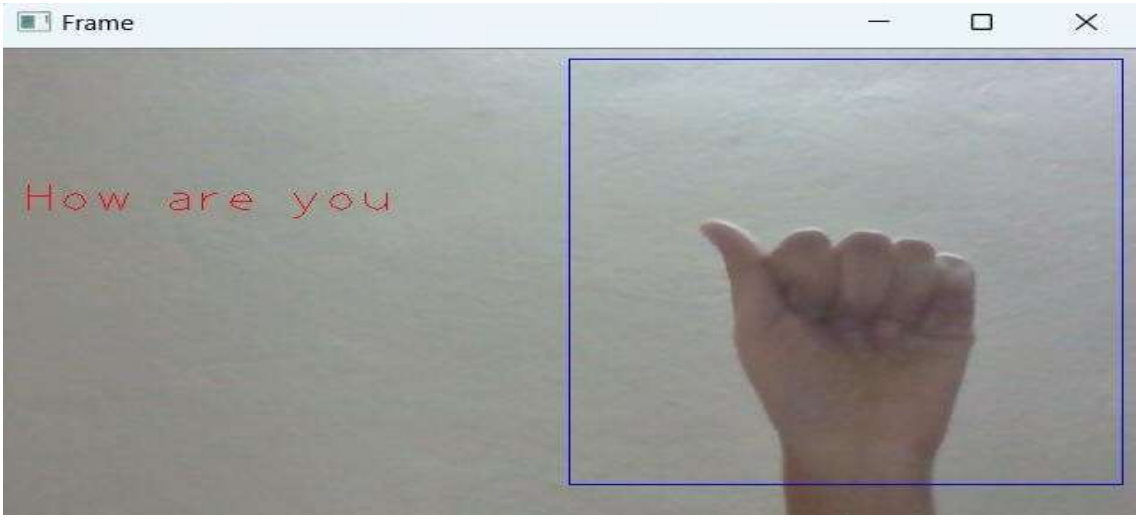


Screenshot 9 User Login

User Dashboard

Screenshot 10 User Dashboard

Hand Gesture Recognition



Screenshot 11 Hand Gesture Recognition

CONCLUSION & FUTURE SCOPE

Conclusion

The SignConnect marks a transformative step forward in improving communication accessibility within video conferencing environments. Unlike traditional sign language recognition systems that primarily focus on interpreting individual letters and

numbers, SignConnect is designed to recognize complete words and sentences. This capability allows it to capture the complexity and nuance of natural communication, making interactions more fluid and meaningful. By addressing the limitations of existing systems, SignConnect provides a practical solution for users who rely on sign language, enabling them to participate seamlessly in virtual meetings. This innovation not only enhances inclusivity but also sets a new standard for integrating advanced sign language recognition technologies into modern digital communication platforms.

Future Scope

SignConnect can be integrated into popular video conferencing platforms such as Zoom, Microsoft Teams, and Google Meet, ensuring accessibility for diverse user bases across professional, educational, and personal contexts. This integration would make the platform widely available, fostering inclusivity in virtual communication. Support for multiple sign languages, including American Sign Language (ASL), British Sign Language (BSL), and Indian Sign Language (ISL), can broaden its reach globally. This multilingual capability would allow users from different regions to benefit from the system, breaking geographical and linguistic barriers. Additionally, real-time speech-to-sign translation could be incorporated, enabling two-way communication between hearing individuals and those relying on sign language through animated avatars or visual cues.

REFERENCES

[1] W. T. Freeman and M. Roth, Orientation histograms for hand gesture recognition. International workshop on automatic face and gesture recognition. 1995, 12: 296-301.

[2] T. Starner and A. Pentland, Real-time american sign language recognition from video using hidden markov models. Motion-Based Recognition. Springer Netherlands, 1997: 227-243.

[3] L. Bretzner, I. Laptev and T. Lindeberg, Hand gesture recognition using multi-scale colour features, hierarchical models and particle filtering. Automatic Face and Gesture Recognition, 2002. Proceedings. Fifth IEEE International Conference on. IEEE, 2002: 423-428.

[4] M. Zaki and S.I. Shaheen, "Real-time American Sign Language Recognition Using Deep Learning," Journal of Communication and Applications, 2020.

[5] S. Saha and R. Shrivastava, "Sign Language Recognition Using CNN and LSTM Networks,"
International Journal of Machine Learning and Computing, vol. 10, no. 2, pp. 243-249, 2021.