Enchancing Gestures Recognition Accuracy In Sign Language Interpretation Using Adversarial Neural Networks And Augmented Data

THESIS

Submitted in partial fulfillment of the requirement for the Degree of

MASTER OF TECHNOLOGY

(Information Technology)

(Session: 2024-25)

Submitted By

SHRISHUBH SHUKLA

Roll No.: 23037105

Enrollment No.: GGV/23/01853

Under the Supervision of

DR. AMIT KUMAR DEWANGAN

Assistant Professor

And

MRS. ARADHANA SONI

Assistant Professor

Department of Information Technology

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

(A Central University established by the Central Universities Act 2009 No. 25 of 2009)

May 2025

Department of Information Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)
(A Central University established by the Central Universities Act 2009 No. 25 of 2009)

CERTIFICATE

This is to certify that the dissertation entitled **"Enchancing gestures recognition accuracy in sign language interpretation using adversarial neural networks and augmented data"** is an authentic record of dissertation writing done by **Mr. Shrishubh Shukla** a student of M. Tech. (Information Technology), 4th Semester, Department of Information Technology of the university.

Signature of Supervisor
Dr. Amit Kumar Dewangan
(Assistant Professor)

19/05/23

Signature of Supervisor
Mrs. Aradhana Soni
(Assistant Professor)

Signature of Head of the Department
Dr. Manoj Kumar
(Professor)
HEAD
Department of Information Technology
SoS, Engg. & Technology
Guru Ghasidas Vishwavidyalaya
(Central University) Bilaspur (C.G.)

ABSTRACT

This thesis presents a robust deep learning-based system for enhancing the accuracy of gesture recognition in sign language interpretation. The core objective is to bridge communication gaps for the hearing and speech impaired using an adversarial neural network combined with augmented training data. The model was trained on the American Sign Language (ASL) Alphabet dataset using a Convolutional Neural Network (CNN) architecture, with additional image preprocessing and data augmentation techniques applied to improve generalization.

A significant challenge in gesture recognition lies in maintaining high accuracy across diverse hand positions, lighting variations, and inter-class similarities. To address this, the model incorporated advanced augmentation methods such as rotation, zooming, shifting, and brightness tuning, which expanded the effective training set.

The system achieved a **training accuracy of 95.29%** and a **validation accuracy of 78.79%**, indicating a well-trained model with a notable generalization ability. The model was also tested using individual images for real-time prediction and is designed to be further extended for webcam-based gesture detection.

This work contributes to the field of human-computer interaction and accessibility tools by delivering a scalable, lightweight, and accurate gesture recognition model. Future enhancements include optimizing the model with attention mechanisms and deploying it for real-time webcam input using OpenCV.

Keywords: Sign Language, Gesture Recognition, CNN, Data Augmentation, Adversarial Network, Real-time Prediction, Accessibility.