MARATHA MANDAL'S ENGINEERING COLLEGE, BELAGAVI

R.S. No. 104, Halabhavi, P.O. New Vantmuri, Belagavi-591 113

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENIGEERNING

CERTIFICATE

This is to certify that **Gayatri M Patil (2MM21EC004), Omkar V Karbhoi (2MM21EC008), Rohan D Sutar (2MM21EC009), Yasira Z Belvadi (2MM21EC014)** has satisfactorily completed Project Work titled **" BIDIRECTIONAL SIGN LANGUAGE TRANSLATOR USING AI-ML"** in partial fulfillment of the requirement for the award of the degree **Bachelor of Engineering in Electronics and Communication Engineering** of Visvesvaraya Technological University, Belagavi during the academic year **2024-2025.**

Signature of Guide	**H.O.D.**	**PRINCIPAL**
Prof. Sandhya B	**Prof. V.K. Kakade**	**Dr. P. Y. Chitti**

EXAMINERS	**SIGNATURE**
1)……	**…….**
2)……	**…….**

Abstract

This report presents a novel bidirectional communication system designed to bridge the communication gap between individuals with hearing or speech impairments and the non-disabled community. The system integrates advanced machine learning (ML) and natural language processing (NLP) techniques to enable seamless conversion between spoken language and sign language gestures, as well as accurate recognition and translation of sign language into text or speech. This dual functionality aims to foster greater inclusivity and facilitate more natural and effective communication for all.

The system architecture comprises two core modules: Speech-to-Sign Language Conversion and Sign/Gesture Recognition and Translation. The former utilizes automatic speech recognition (ASR) and natural language understanding (NLU) to interpret spoken input and generate corresponding sign language animations or instructions, considering both lexical translation and sign language grammar. The latter employs computer vision and ML models to recognize sign language gestures from visual data, translating them into textual or spoken output via natural language generation (NLG) and text-to-speech (TTS) synthesis.

The development leverages deep learning architectures and temporal models for robust performance in both directions. Key challenges, including data scarcity, sign language variability, and the need for real-time processing and contextual understanding, are addressed in the ongoing research and development. This bidirectional system holds significant potential to enhance inclusivity in education, employment, healthcare, and social interactions, empowering individuals with communication impairments and fostering a more accessible and equitable society.