

A
PROJECT REPORT
On
“SIGN LANGUAGE TO TEXT AND
SPEECH CONVERSION USING
CNN”



For the award of degree of
Bachelor Of Technology
In
Computer Science and Engineering
By
ABHAY DHIMAN



SCHOOL OF COMPUTER SCIENCE & ENGINEERING
DEPARTMENT OF B.TECH. (CSE)
GOVT. P.G. COLLEGE DHARAMSHALA
HIMACHAL PRADESH
2020-2024

“SIGN LANGUAGE TO TEXT AND SPEECH CONVERSION USING CNN”

A PROJECT REPORT

Submitted in partial fulfillment of the Requirements
For the award of B. TECH (CSE) Degree

**HIMACHAL PRADESH TECHNICAL UNIVERSITY
HAMIRPUR (H.P.)- INDIA**



PROJECT REPORT

Submitted by
Abhay Dhiman (SEM-VIII)
Roll No.: -20010603001
Under the Guidance of

Internal Guide

Dr. Pawan Thakur

External Guide

Mr. Anil Kumar Saho



SCHOOL OF COMPUTER SCIENCE & ENGINEERING

DEPARTMENT OF B. TECH. (CSE)

GOVT. P.G. COLLEGE DHARAMSHALA

HIMACHAL PRADESH

SESSION: 2020-2024



Your Dev Partner

VERZ Technologies

B-86, Vrindawan Garden, Near SKS World School, Greater Noida, UP 201009

CERTIFICATE BY THE SUPERVISOR/CO-SUPERVISOR

This is to certify that dissertation entitled "Sign Language to Text and Speech Conversion" which is being submitted by Abhay Dhiman having university roll no. 20010603001 for the award of the degree of B.Tech (CSE) is an independent and original research work carried out by her/him in the time duration of Four/Six months from January 2024 to June 2024. The dissertation is worthy of consideration / Project for the award of B.Tech. (CSE) Degree of Himachal Pradesh Technical University, Hamirpur.

Abhay Dhiman has worked under my guidance and supervision to fulfill all requirements for the submission of this dissertation,

The conduct of the student remained excellent during the period of work

Signature of the Supervisor/Co-Supervisor

Best regards,
For VERZ Technologies





**GOVT. P.G. COLLEGE DHARAMSHALA
SCHOOL OF COMPUTER SCIENCE &
ENGINEERING**

**BACHELOR OF TECHNOLOGY
HIMACHAL PRADESH TECHNICAL
UNIVERSITY**

HAMIRPUR (H.P.)

CERTIFICATE

2020-2024



**CERTIFICATE
OF COMPLETION**



THIS CERTIFICATE IS PRESENTED TO :

Abhay Dhiman

on successfully completing 4/6 Months of training in
Machine Learning



Verz Technologies

B-86, Vrindawan Garden Greater Noida West,
Gautam Buddha Nagar, U.P. India 201309

Mob: +91-9560924896

Date of issue: 10 May 2024

✉ info@verztechnologies.in 🌐 www.verztechnologies.in



GOVT. P.G. COLLEGE DHARAMSHALA
SCHOOL OF COMPUTER SCIENCE &
ENGINEERING
BACHELOR OF TECHNOLOGY
HIMACHAL PRADESH TECHNICAL
UNIVERSITY

HAMIRPUR (H.P.)

APPROVAL CERTIFICATE

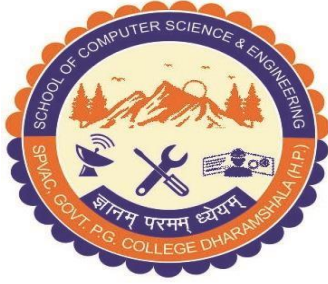
2020-2024

This foregoing project work is hereby approved as a creditable study of a Computer Application Subject carried out and presented in a manner satisfactory to warranty its acceptance as a prerequisite to the degree for which it has been submitted. This project is work entitled “**SIGN LANGUAGE TO TEXT AND SPEECH CONVERSION USING CNN**” submitted by **Mr. Abhay Dhiman (20010603001)** is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein, but approve the thesis only for the purpose for which it has been submitted.

(Internal Examiner)

(External Examiner)

Date:



**GOVT. P.G. COLLEGE DHARAMSHALA
SCHOOL OF COMPUTER SCIENCE &
ENGINEERING**

**BACHELOR OF TECHNOLOGY
HIMACHAL PRADESH TECHNICAL
UNIVERSITY**

HAMIRPUR (H.P.)

DECLARATION

2020-2024

I, **Abhay Dhiman (20010603001)**, a student of **Bachelor of Technology, Govt. P.G.College, Dharamshala** under **Himachal Pradesh Technical University, Hamirpur** with Enrollment no. **20010603001**, do hereby declare that this dissertation is an original work of mine and is result of my own intellectual efforts. I have quoted titles of all original sources i.e., original documents and name of the Authors whose work has helped me in writing this project report have been placed at appropriate places.

(Abhay Dhiman)

Roll No. 20010603001

Date: -.....



GOVT. P.G. COLLEGE DHARAMSHALA
SCHOOL OF COMPUTER SCIENCE &
ENGINEERING
BACHELOR OF TECHNOLOGY
HIMACHAL PRADESH TECHNICAL
UNIVERSITY
HAMIRPUR (H.P.)

ACKNOWLEDGEMENT

2020-2024

IT industry is the most dynamic in the present world. The pace at which it is moving ahead makes difficult for us to cope with the coding computer technology; if we climb the hills individually the efforts of colleagues and friends have helped me in achieving the desired goal. We acknowledge the able guidance in valuable suggestions, training about new technology of Project leader **Mr. Abhay Dhiman**.

I would like to give special thanks to **Principal cum Director Dr. Rakesh Pathania** of college and **Prof. Rajnish Dewan, Coordinator, Govt. P.G. College, Dharamshala**, his great support and inspiring me to complete my Project work.

I would like to give thanks to **Dr. Pawan Thakur, Dr. Satish Sood, Dr. Sachin Awasthi** for all their wisdom and guidance during my years as a undergraduate student. I want to thank everyone for having the confidence in me, to conduct my research, and for giving me the opportunity to learn from my own mistakes. Their guidance has been absolutely invaluable to me, who have been imparting their immense knowledge self-ledge for the past three years.

Abhay Dhiman

RollNo.:20010603001

ABSTRACT

This project aims to bridge communication gaps for individuals with hearing impairments by developing a comprehensive system that can detect and interpret sign language gestures, convert them into text, and then transform the text into speech. People with hearing impairments often face challenges in effectively communicating with those who do not understand sign language. This project addresses this issue by leveraging computer vision, natural language processing (NLP), and speech synthesis technologies to facilitate seamless communication between individuals who use sign language and those who do not. The key components of this project include, sign language detection, conversion to text and speech conversion. Sign language detection is used to precisely detect and recognize user-made sign language motions, the project makes use of computer vision techniques and deep learning models. It uses in-the-moment image or video analysis to record and decipher body language, face expressions, and hand movements. After the system picks up sign language signals, it is converted into text. The movements are transformed into coherent textual representations using Natural Language Processing (NLP) methods. Using sophisticated speech synthesis technology, the resulting text is subsequently converted to speech. This makes sure that people who don't understand sign language can nevertheless understand the intended message. Through the project's user-friendly interface, people with hearing loss can easily communicate with both people who use sign language and others who rely on spoken language. Additionally, it has the ability to be integrated into a variety of hardware and software, including PCs, tablets, and smartphones, making it usable and adaptable for a variety of users. By easing communication and promoting a more inclusive society, the "Sign Language Detection, Conversion to Text, and Speech Conversion Project" has the potential to greatly enhance the quality of life and social inclusion of people with hearing impairments.

TABLE OF CONTENTS

S. NO.	CHAPTER NAME	PAGE NO.
1	INTRODUCTION OF PROJECT	1-6
1.1	Introduction	2
1.2	Gesture Recognition	2
1.3	Gesture Interpretation	3
1.4	Text Generation	3
1.5	Text to Speech Conversion	3
1.6	Text Analysis	3
1.7	Phoneme Generation	3-6
2	LITERATURE SURVEY	7-9
3	METHODOLOGY	10-37
3.1	Objectives	11
3.1.1	Methodology	11
3.1.2	Technologies and Tools to be used	12
3.1.3	Drawbacks of Existing Model	12
3.1.4	Advantages	12-13
3.2	Datas to be fetched	13
3.2.1	Data Collection	13
3.2.2	Data pre-processing and Feature extraction	14-15
3.2.3	Labelling Text Data	15-18
3.3	Training and Testing	19-20
3.3.1	Camera	20

3.3.2	Media pipe Library	20
3.3.3	Feature Extraction into Array	20
3.3.4	Data Points	21
3.3.5	CNN Algorithm	21-23
3.3.6	Gesture Verification	23
3.3.7	Sign to Text	23
3.4	SELECTION OF PYCHARM TOOLS	24-28
3.5	Project Planning	29
3.6	Project Scheduling	30
3.7	Flow of Project	31
3.7.1	System Flowchart	31
3.7.2	Use-case Diagram	32
3.7.3	PERT CHART (Program Evaluation Review Technique)	33
3.7.4	GANTT CHART	34
3.7.5	Hardware and Software Specifications	35
3.7.6	Dataflow Diagram (DFD)	35-36
3.7.7	Sequence Diagram	37
4	IMPLEMENTATION	38-43
4	Proposed Work Modules	39
4.1	Data collection	39
4.2	Data Preparation	39
4.3	Model Training	39
4.4	Model Evaluation	39
4.5	Model Deployment	39-40

4.6	Algorithms: CNN (Convolutional Neural Network)	40
4.6.1	Data Collection and Preparation	40-43
5	RESULTS AND ACCURACY	44-49
5.1	Results	45-47
5.2	Effective Real-Time Communication	47
5.3	Educational Support	47-48
5.4	Significance	48-49
5.5	Strengths	49
5.6	Limitations	49
6	PROJECT CODE	50-70
6.1	main.py	51-64
6.2	data_collection_final.py	64-69
6.3	Snapshots of the Project	70
7	CONCLUSION AND FURTHER ENHANCEMENT	71-74
7.1	Conclusion and suggestion for future work	72-73
7.2	Further Enhancement for Sign Language Detection and Conversion to Text and Speech	73
7.3	References	74

