

Sign Language Recognition Using CNN

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ABSTRACT: Speech impairment is a disability which affects an individual's ability to communicate using speech and hearing. Non signers use other medium of communication such as sign language. Although sign language is ubiquitous non-signers find it challenging to communicate with signers. This paper discusses some of the methods (SVM, KNN, Logistic regression and CNN) that can be used to implement a method to help make the communication of a non-signer with a signer easy. At the end of the discussion it was found that convolutional neural network is the most effective technique among the other methods.

KEYWORDS: Speech impairment, ubiquitous nonsigners, methods SVM KNN Logistic Regression, convolutional neural network.

I. INTRODUCTION

A Sign Language (SL) is a language which instead of producing acoustic sound for communication, relies on transmission of visual sign to convey meaning, along with hands, by shaping, moving or orienting hands, arms, body and facial expression to fluidly express the communicators thoughts. As combination of the basic elements of the communication. Sign Language is developed where deaf and dumb people exist. Each and every language has its own grammar and usage, but with one common property that they all are visually perceived. There has been an increase in interest among the research in the last few years, in the field of sign language recognition to develop a means of environment from human to human.

II. RELATED WORK

- One of the related approach sign language recognition was to recognize gestures from video using naive bayes classifiers.

The drawback of this model is it's poor performance with an accuracy of 55.4828% which leads to poor recognition of gesures.

- Another one of the model was created using K nearest which offered better accuracy that the naive bayes model with an accuracy of 87.3245%.
- The conclusion is that introducing the concept of CNN would provide better accuracy and easier recognition of getsures.
- Another advantage of the model in construction is it letters corresponding to the gestures can be connected to form words and sentences.

III. METHODOLOGY

Support Vector Machine

Support vector machine is a supervised learning model that is used for analyzing the data and learning from it. This model is generally used for both classification and regression problems. SVM Model represent the elements of a group as points in space, in a way that the elements of the different clusters are divided by a space that is as wide as possible. When new elements are predicted by the model, they are categorized into one of the groups, and based on their category, they are mapped into the respective cluster in the space.



K-Nearest Neighbors

The K-Nearest neighbors algorithm(k-NN) is the simplest of all the available machine learning algorithms on a nonparametric method that is used for classification and regression problems .It works by assigning weight to the individual points based on the contribution of the neighbors in such a way that more contribution is provided by the nearest neighbors when compared to the distance neighbors this algorithm is sensitive and is influenced by the local distribution off the data in the space and hence is sensitive to the overall distribution off the data.

Logistic regression

Logistic regression is a machine learning algorithm that is used to depict the relationship between one dependent variable and one or more independent variables. In this model, the log-odds is calculated and the corresponding probability of the output is found to vary between 0 and 1 which stands for either ‘true’ or ‘false’. The Logistic function converts log-odds to Probability values. The unity of measurement for the log odds is called logit, derived from logistic unit and hence this is called as Logistic regression.

Naive Bayes

They are a family classifiers called as the “probabilistic classifiers”.They are based on Bayes theorem where the probability of an event’s condition that are related to it. Consider an event X pertaining to an environment E, where condition C generally describes the particular event in the environment. Predicting the occurrence of another event Y in E can be made more accurately if Y’s conditions C are made used, rather than to predict a new event Y without the previous knowledge of its contribution to E by means of C.

Convolutional Neural Network

A Convolutional neural network is a Deep Learning algorithm which takes images as it’s input, they then assign learnable weights and biases to various objects in the input and be able to differentiate one from the other. Other classification algorithms requires much more pre-processing as compared to ConvNet. A ConvNet is able to successfully capture the Spatial and Temporal dependencies in an image through the application of relevant filters. The network can be trained accordingly for better understanding of the image

TABLE1: Performance of different classifiers

	Accuracy	Precision	F1 Score	Recall
K-Nearest Neighbours	87.3742	87.3742	87.3742	87.3742
Support Vector Machine	90.5432	90.5432	90.5432	90.5432
Logistic Regression	83.7525	83.7525	83.7525	83.7525
Naive Bayes	55.4828	55.4828	55.4828	55.4828
Convolutional Neural Network	93.7383	93.7383	93.7383	93.7383

IV. CONCLUSION

From the analysis above it is quite clear that the performance offered by convolutional neural network is far more superior than any of the other classifiers. With CNN being in use it can be said that the model produces accurate result as well are is very simple to create and debug. The model takes real time input as a result it makes direct communication more easily and cause almost no delay. What makes the model unique is that here the alphabets recognized by model are appended together to form words which makes this model much more convenient for its users.



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