
Project Milestone: American Sign Language Recognition Leveraging Machine Learning

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Abstract

To communicate with deaf people, knowing sign language is a must. Most people in society do not know sign language, which creates problems for deaf people in day-to-day life. Modern technology can make it easier to understand sign language. Machine learning can help recognize the gestures and make it easier to translate them to text or voice.

1. Introduction

American Sign Language (ASL) is a complete, natural language with the same linguistic properties as spoken languages, with grammar that differs from English. ASL is expressed by movements of the hands and face. It is the primary language of many North Americans who are deaf and hard of hearing, and is used by many hearing people as well (Information, 2019).

This project aims to automate the recognition of signs and gestures using machine learning.

2. Methodology

2.1. Data

We used the data set from the Kaggle platform (Nagaraj, 2018). Here, each alphabet contains 3000 images for training. One challenge here is, all the data has the same person with almost same background. So, if we can find more data that will help our model to learn better.

2.2. Convolutional Neural Network (CNN)

Convolutional Neural Network (CNN) is good for feature extraction from images. CNN performs a better fitting to the image dataset due to the reduction in the number of parameters involved and the reusability of weights. In other words,

the network can be trained to understand the sophistication of the image better (Maladkar, 2018).

2.3. Transfer Learning

As transfer learning gives us the opportunity to utilize a well-trained model, I plan to use one of the well-known model 'MobileNet V2' for transfer learning. It was developed at Google, pre-trained on the ImageNet dataset with 1.4M images and 1000 classes of web images (Nair, 2019).

3. Experiments

I experimented with the CNN model using MNIST dataset that can classify dogs and cats. Currently, I am trying to do so with the ASL dataset. Once I get it working, I can introduce transfer learning to achieve a better results. After that, I will try and implement a live feed for sign language recognition.

4. Conclusion

This project is a good example of using a deep learning algorithm (CNN) for image classification to classify the sign language signs.

References

- Information, N. American sign language, mar 2019. URL <https://www.nidcd.nih.gov/health/american-sign-language>.
- Maladkar, K. Overview of convolutional neural network in image classification, jan 2018. URL <https://analyticsindiamag.com/convolutional-neural-network-image-classification-overview/>.
- Nagaraj, A. Asl alphabet: Image data set for alphabets in the american sign language, mar 2018. URL <https://www.kaggle.com/grassknotted/asl-alphabet>.
- Nair, A. A practical guide to implement transfer learning: Mobilenet v2 in tensorflow, jul 2019. URL <https://analyticsindiamag.com/a-practical-guide-to-implement-transfer-learning-in-tensorflow/>.

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