ASL Image Classification

# **Myra Rust Fall 2021 https://github.com/Myrarust/ASL-Image-Classification**

# Domain:

American Sign Language (ASL) is a fully developed natural language that uses movements of the hands and face to communicate. ASL is used throughout North America by persons who are deaf, hard of hearing, have other communication disorders, and many other persons. ASL is quite an extensive language, however, this project will focus on static image recognition of the ASL alphabet. Each letter in the English language directly correlates to a hand pose in the ASL alphabet and words can be spelled out letter by letter. This project will attempt to properly classify static images of ASL hand poses.

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# Dataset:

The dataset I am looking at has taken images that used ASL letters from the MNIST , cropped/reduced them to 28x28 grayscale images, and then flattened them. The dataset has 784 features that represent the pixels and one feature ‘label’ that is a number corresponding with the letter in the alphabet that is represented. J and Z are excluded from this project as they require movement and are not static hand poses.

The dataset has already been separated into train and test sets containing 27455 observations in the training set and 7172 in the test set.

Dataset URL: <https://www.kaggle.com/datamunge/sign-language-mnist>

# Research Questions:

Can machine learning be used to successfully classify ASL alphabet hand poses?

# Method:

The problem is one of single-label multiclass classification and I am planning on using a Convolutional Neural Network (CNN) to process the data because CNN’s are commonly used to analyze imagery data. For my loss function, I plan to use categorical crossentropy, as that is commonly used for multiclass classification problems, and I will need to make sure that I make the layers big enough to prevent information bottlenecking. I will use the Keras library with a TensorFlow backend to create the neural network, as Keras has built-in support for convolutional networks.

# Potential Issues:

Some potential issues that may present themselves with this project are hardware/computing power limitation while using neural networks. I am working on a SurfacePro tablet, so I am very limited with memory and computing power. Because of this, I plan to run this project using the Bellevue VM I have available through another class or possibly use a platform like google colab, although I have not used that platform before. Also, time constraints could be an issue as running neural network models are a lot more time consuming. If this becomes a problem, I can look into reducing the training/test datasets.

# Concluding Remarks:

The objective of this project is to properly classify static images of ASL hand poses using image recognition and machine learning. The results of this project could stand to be the foundation for further language translation of American Sign Language. For now, we’re working on static poses and letters, but if successful, with today’s technology this could be expanded to include hand and facial movement recognition and the entire ASL dictionary. From there, machine learning could be used to conduct real-time translation of ASL. How cool would it be for a person to have a virtual assistant in their home that they could interact with using ASL, just like we do with speech today.