Translating ASL Using Object Detection

—

Kyle Lindstrom

Kyle Lindstrom

Boise, Idaho

BS Physics — NAU

MS Physics — UMD

Github

LinkedIn

Agenda

Business Problem → Data Overview → Modeling → Conclusions

Understanding the Problem

The Problem

- Around 1 million ASL users in the United States
- Over 99% of the population can't understand ASL

The Stakeholder*

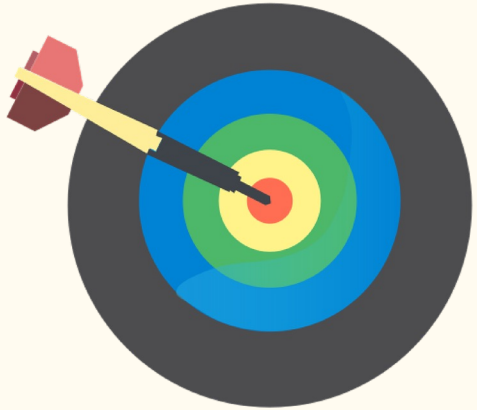
- Google translate wants to incorporate sign language
- They'd like to identify live action video phrases

The Solution

- Develop a neural network capable of the required predictions
- Identify and track still hand signals as well as more complex motions

* This project is hypothetical and not affiliated with Google

Key Performance Indicator



Accuracy

What percentage of the model's predictions are correct?

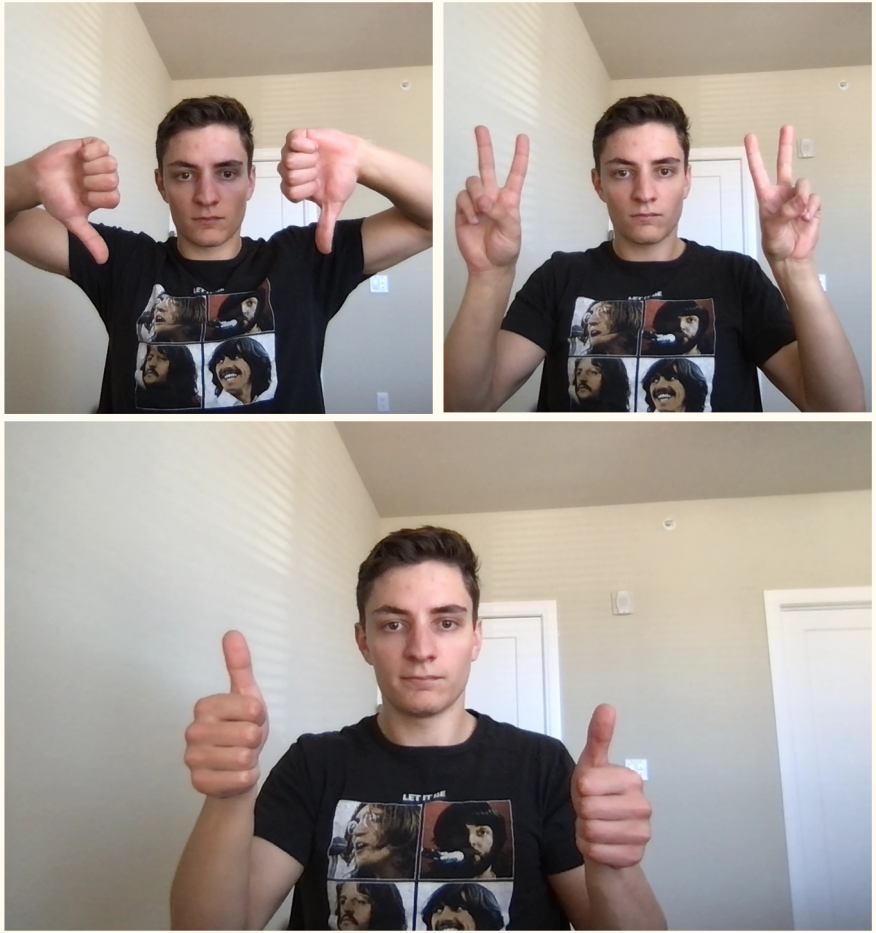
The Data

Procedure

1. Collect many images of the gestures and symbols to be translated

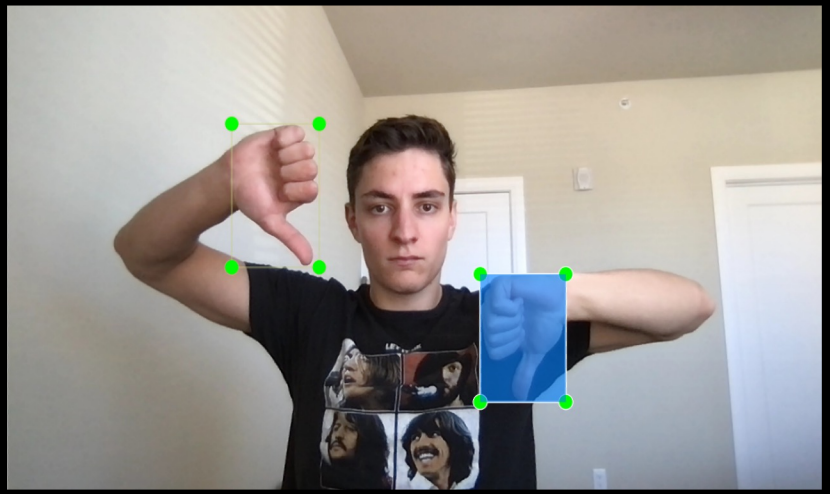
1. Annotate the data accurately using LabelImg and MediaPipe

1. Split into training, validation, and test sets



Single Frame Hand Signals

Collected using OpenCV
Annotated using LabelImg



Complex Gestures

Collected using OpenCV
Annotated using MediaPipe

Limitations

1. Only pictures of me

1. Same lighting/background

1. Single person in image

Final Dataset

Still Images	**120 total examples split into 3 categories:** Thumbs Up, Thumbs Down, Peace
Action Gestures	**240 total examples split into 4 categories:** Hello, Nice To Meet You, Thanks, Goodbye

Results

Hand Signals

Model Architecture:

SSD MobileNet V2 FPNLite

Testing Accuracy (24 Test Instances):

100%

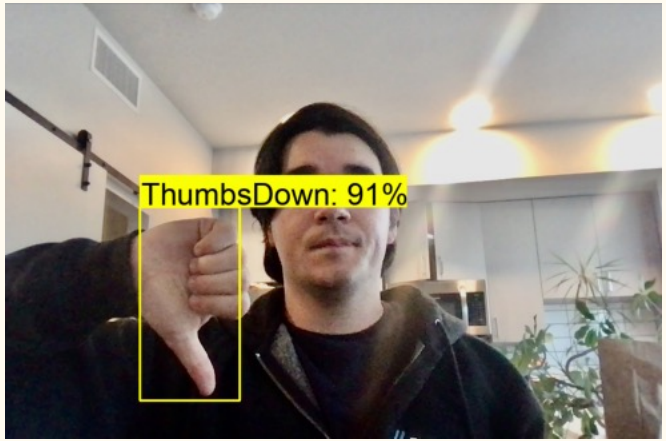
Action Gestures

Model Architecture:

Sequential with LSTM and Dense Layers

Testing Accuracy (24 Test Instances):

100%



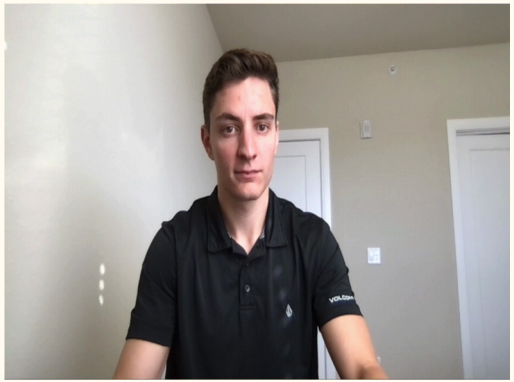
Future Insights

1. More variety in training data

1. Add a full suite of ASL gestures

1. Combine models into a single tool

Thank You!



Kyle Lindstrom

Github

LinkedIn