**Motivation and Goals**

- Develop modern and mobile method of sign language interpretation
- Concepts can be expanded to real-time gesture recognition
- Goal: Real-time implementation on Android app

**Future Work - Skin Segmentation**

- Use to expand project to cluttered backgrounds
- Likelihood model of rg chromaticity of skin pixels
- Morphological processing on likelihood image

**Future Work - Hand Model**

- Ambitious feature extraction using 20-DoF hand model
- Model extraction with a gradient descent method
- Symbol Classification in the model parameter space

**Results**

<table>
<thead>
<tr>
<th>Feature Extraction Method(s)</th>
<th>Generalization Error (5-fold cross-validation)</th>
<th>Test Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Histogram of Centroid Distances</td>
<td>0.1940</td>
<td>0.6</td>
</tr>
<tr>
<td>Gabor Filter</td>
<td>0.009</td>
<td>0.5</td>
</tr>
<tr>
<td>Histogram of Centroid Distances + Gabor Filter</td>
<td>0.0107</td>
<td>0.2</td>
</tr>
</tbody>
</table>

**Prediction Pipeline**

1. Capture image on Android app & send to server
2. Threshold, segment, and crop
3. Extract Gabor features
4. Classify using pre-trained KNN Model
5. Get letter image corresponding to predicted class
6. Display result on Android App

**Feature Extraction and Classification**

- **Histogram of Centroid Distances (HOCD)**
  - Construct a histogram of edge to centroid distances for the morphologically segmented hand image.

- **Gabor Filters**
  - Flexible gradient operator (scale, orientation)
  - Reflect shape of the segmented hand

- **KNN Classifier**
  - Multiclass classification in MATLAB
  - Using the non-parametric K-nearest neighbors algorithm.