# HandiSpeak: A Novel Approach to ASL Communication Using Machine Learning Applications

Probability of ISEF Team Canada shortlist:

3% (30 applicants shortlisted, 1000 invitations were sent).

People to ask:

* [Nigel Howard](https://linguistics.ubc.ca/profile/nigel-howard/) (ASL expert)
* [Jeff Clune](http://jeffclune.com/) (Deep learning expert, also went to OpenAI)

Media pipe algorithm:

<https://developers.google.com/mediapipe/solutions/vision/hand_landmarker>

Cool demo:

<https://codepen.io/mediapipe-preview/pen/gOKBGPN>

Important video to learn:

<https://www.youtube.com/watch?v=doDUihpj6ro>

<https://www.youtube.com/watch?v=MJCSjXepaAM>

Translator algorithms:

<https://github.com/sovit-123/American-Sign-Language-Detection-using-Deep-Learning/tree/master>

[AI????](https://www.youtube.com/watch?v=JNZ7oFaH1fg):

<https://github.com/Evilport2/Sign-Language>

Better AI (confidence, 17:02):

<https://www.youtube.com/watch?v=9MTiQMxTXPE>

<https://www.youtube.com/watch?v=ZTSRZt04JkY>

Sign to speech:

<https://github.com/DasariJayanth/Sign-to-Speech>

Display text that you are saying

Maybe include microphone on the other side to caption other side of conversation.

Maybe also use thermal camera instead of regular camera.

<https://www.kaggle.com/competitions/asl-fingerspelling/discussion/421761>

RNN (Recurrent Neural Network) vs CNN (Convolutional Neural Network):

<https://medium.com/analytics-vidhya/a-simple-word-predictor-using-rnn-460884c97e6c>

UCLA’s interesting design and a review of it:

<https://sci-hub.se/https://www.nature.com/articles/s41928-020-0428-6>

<https://sci-hub.se/https://www.nature.com/articles/s41928-020-0451-7>

Engage with the deaf population.

* Organizations
* Make sure your goal actually… helps someone??

FIRST PRIORITY:

ISEF Category: **ROBOTICS AND INTELLIGENT MACHINES (ROBO)**

Subcategory: **Cognitive Systems (COG)**; Studies/apparatus that operate similarly to the ways humans think and process information. Systems that provide for increased interaction of people and machines to more naturally extend and magnify human expertise, activity, and cognition.

SECOND PRIORITY:

ISEF Category: **BIOMEDICAL ENGINEERING (ENBM)**

Subcategory: **Biomedical Devices (BDV)**: The study and/or construction of an apparatus that use electronics and other measurement techniques to prevent and/or treat diseases or other conditions within or on the body.

## 

## Design:

FORM:

Either necklace or clip-on.

<https://www.pishop.ca/product/raspberry-pi-noir-camera-module-v2-8mp/>

Features:  
[Raspberry Pi 4 Model B](https://www.amazon.ca/CanaKit-Raspberry-Starter-Kit-4GB/dp/B07WRMR2CX/ref=sr_1_8?keywords=raspberry%2Bpi%2B4&qid=1693503566&sr=8-8&th=1), [NoIR V2 Camera](https://www.pishop.ca/product/raspberry-pi-noir-camera-module-v2-8mp/)/[OV6547 Camera](https://www.aliexpress.com/item/1005004647231020.html?spm=a2g0o.detail.1000014.4.2267jSQFjSQFFY&gps-id=pcDetailBottomMoreOtherSeller&scm=1007.40000.326746.0&scm_id=1007.40000.326746.0&scm-url=1007.40000.326746.0&pvid=95d19773-95f6-4a21-82da-718e3be1acba&_t=gps-id:pcDetailBottomMoreOtherSeller,scm-url:1007.40000.326746.0,pvid:95d19773-95f6-4a21-82da-718e3be1acba,tpp_buckets:668%232846%238111%23422&pdp_npi=4%40dis%21CAD%2120.44%2111.24%21%21%2114.77%21%21%402103201916935046769978039e21a7%2112000029968885161%21rec%21CA%21%21A), [K28 WP Speaker](https://www.digikey.ca/en/products/detail/visaton-gmbh-co-kg/K-28-WP-8-OHM/9842371), on/off button, volume dial,

Software:

MediaPipe = Camera output -> hand tracking

[Machine Learning](https://github.com/computervisioneng/sign-language-detector-python) = Hand tracking -> ASL letter detection

[Word Prediction](https://www.youtube.com/watch?v=9MTiQMxTXPE) = ASL letters -> text

TTS = text -> speech

## Need to Learn:

* Refresh Python knowledge
* How to use the Mediapipe library (commands, etc.)
* Understand CNN (Convolutional neural network)

## Introduction: