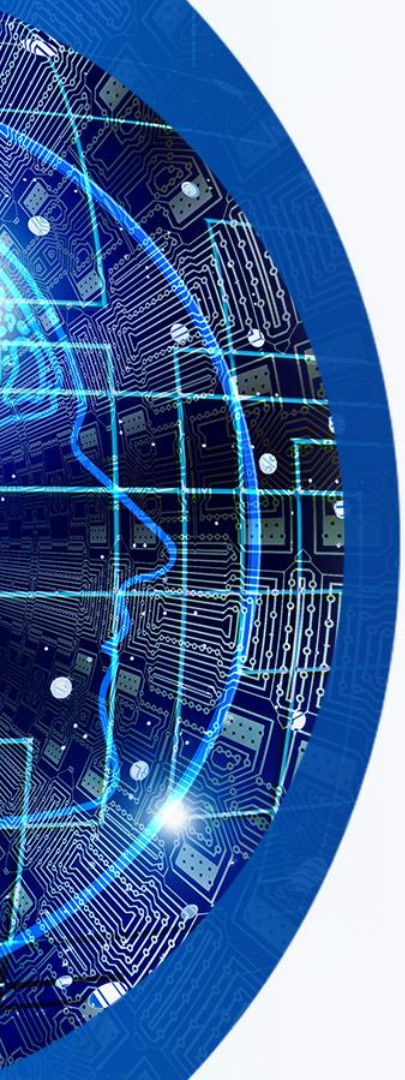
Sign Language & Surgical Object Detection

Submitted under the guidance of:
Dr Nitesh Kashyap

Abhinav Chauhan (20104004)
Devshree Singh (20104029)
Utkersh Shukla (2010113)

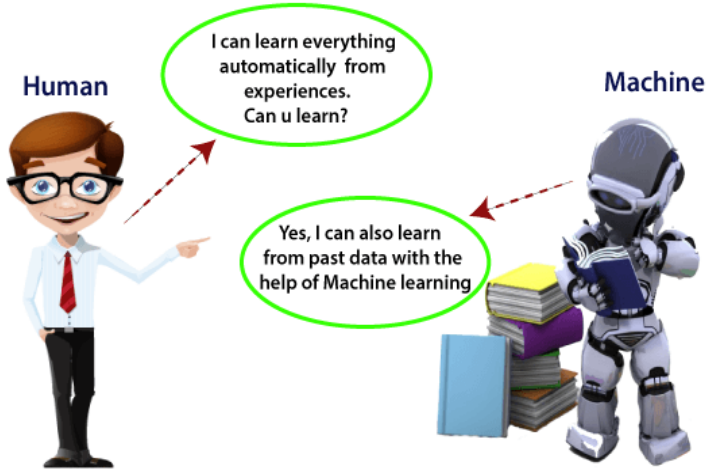
Contents

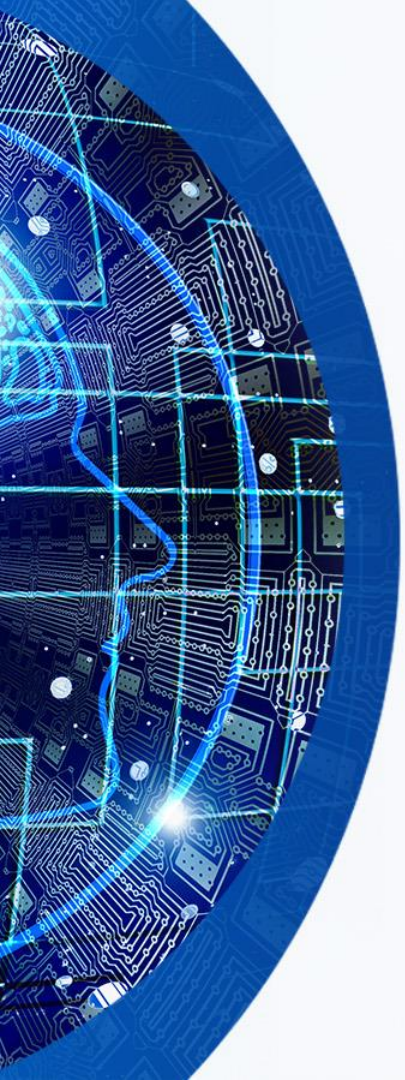
- Overview of Machine Learning
- Motivation/Vision of the project
- Technology & Algorithms Used
- Dataset Description



Machine Learning

- Branch of artificial intelligence gives computers the capability to learn without being explicitly programmed
- Involves algorithms for building mathematical models and making predictions using historical data or information
- Image recognition, speech recognition, recommender system, and many more





Machine Learning

Terminology

01

Dataset
A collection of data, used to train and test machine learning models.

02

Features
attributes of the dataset used as inputs

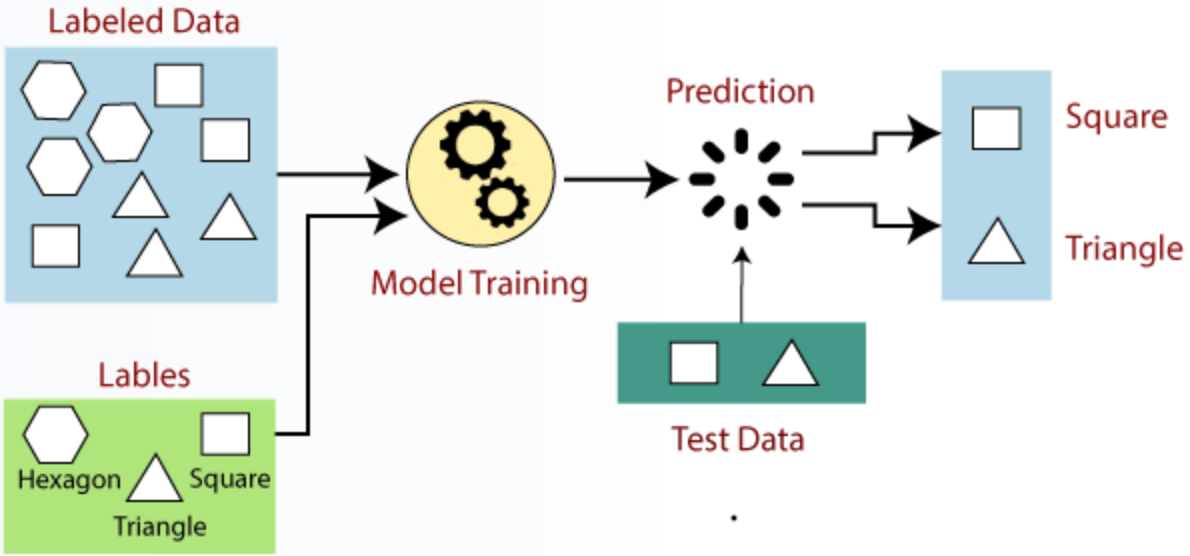
03

Label
The thing we want to predict

04

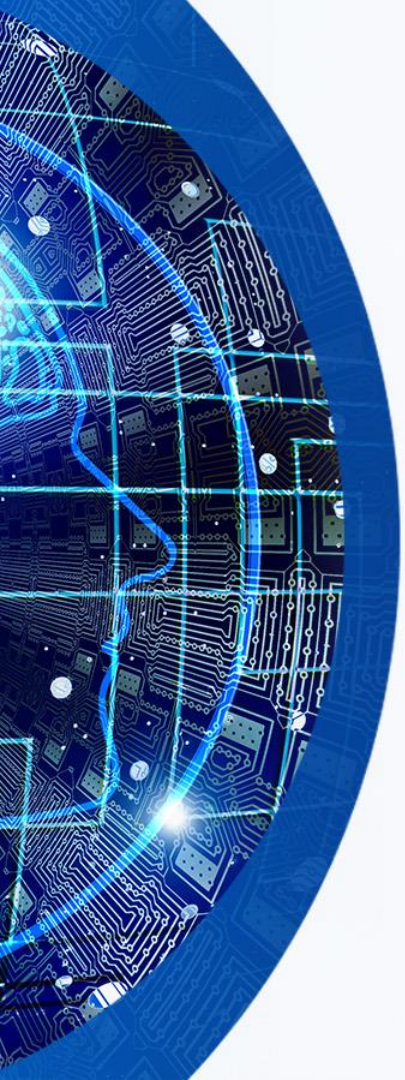
Model
Relationship between the label (y) and the features(x)

Supervised Learning



Motivation

- World is hardly alive without communication.
- Challenge for communication between a normal and hearing impaired person.
- Bridge the communication gap between hearing/speech impaired people and normal people with the help of image processing and computer vision techniques.
- The model takes an input expression and gives output in the form of text.



Proposed Work

In this work we proposed the idea of feasible communication hearing/speech impaired people and normal people with the help of-

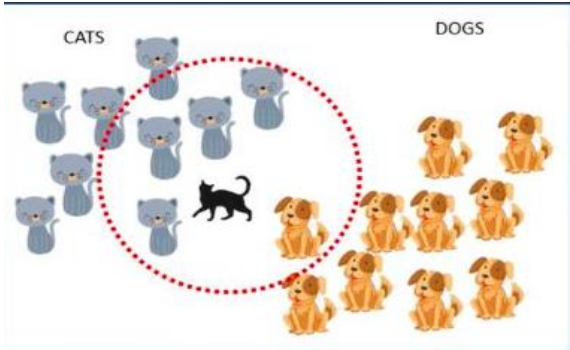
Technology

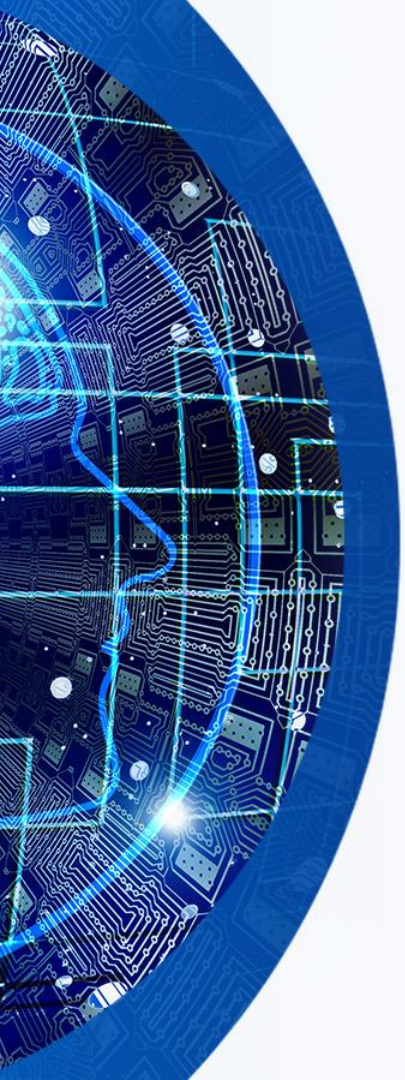
- **Python**
  - programming language
- **OpenCV**
  - open-source library for the computer vision, ML, and image processing
  - processes images and videos to identify objects, faces, or even handwriting of a human
- **TensorFlow**
  - free and open-source software library
  - focuses on training machine learning & AI models

Algorithm

- **k-NN (k-Nearest Neighbors)**

  - Supervised machine learning algorithm used to solve classification problem statements.
  - Works by finding the 'k' nearest neighbors to a given data point in the training dataset, based on some similarity metric (such as Euclidean distance). The data point is assigned to the class that is the most common among its k-nearest neighbors.
  - Our model uses k-NN on trained dataset of labeled hand gestures or signs, where each sign corresponds to a specific label. The algorithm can then be used to classify test data signs based on their similarity to the signs in the training dataset.





How it Works?

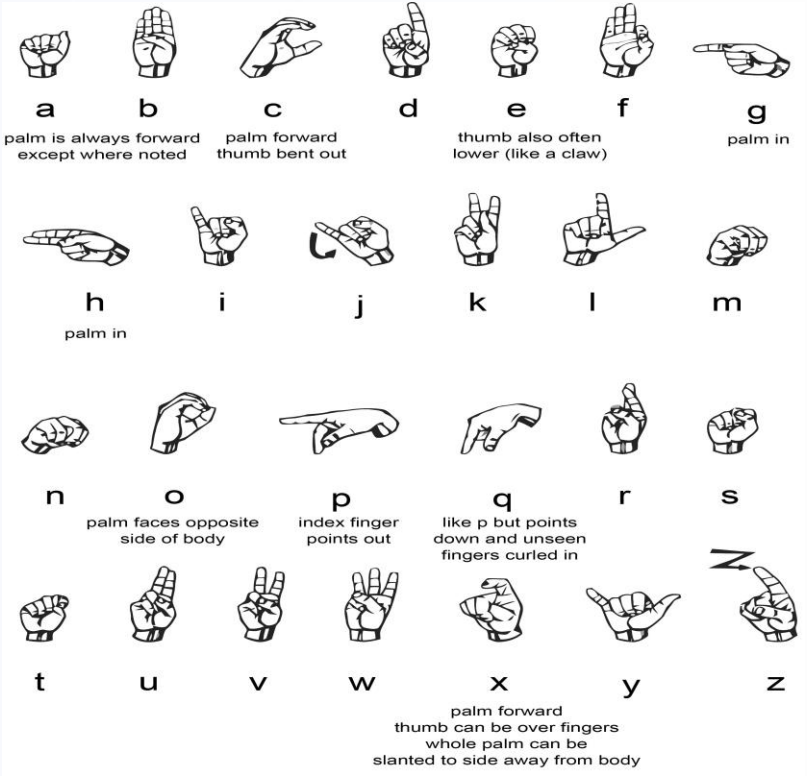
The project is divided into 2 scripts:

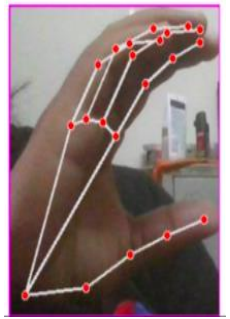
- **First part** is data collection where the hand is supposed to be detected and cropped to get images that we use to train the model.
- The captured gestures are saved into their corresponding labelled folders.
- These are now sent to TensorFlow which then trains the model.

- **Second part** is testing. Hand should be located and result should be displayed.

Dataset Description

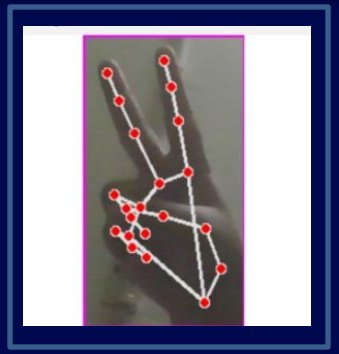
Below figure shows an example from every class of sign images dataset.

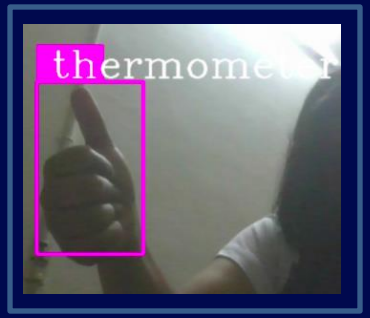




Surgical Objects Dataset

- Scissors
- Cotton
- Penlight
- Weighing Scale
- Stethoscope
- Thermometer
- Scalpel
- Forceps
- Syringe
- Saline flushes





Thank You