ABSTRACT:

This project belongs to the study of the Machine learning algorithm through the recognition of hand gestures. Many people feel lazy to get up everytime and search for the remote or controller to reduce volume manually. This project will maybe in some sort help them control the volume of their system relaxing on their couch or chair just by their hand gestures. This paper contains the introduction, code and output for the given problem. Its overall a very exciting project as a beginner of the learner for the machine learning.

INTRODUCTION:

This project is based on the human gesture recognition by the computers helping it to build a more potent link between humans and machines, rather than just text user interfaces or graphical user interfaces. This is enabled by recognition of human gesture by the computer camera. The computer then makes use of the data as input to handle the applications dynamically and will control the volume level of the system.

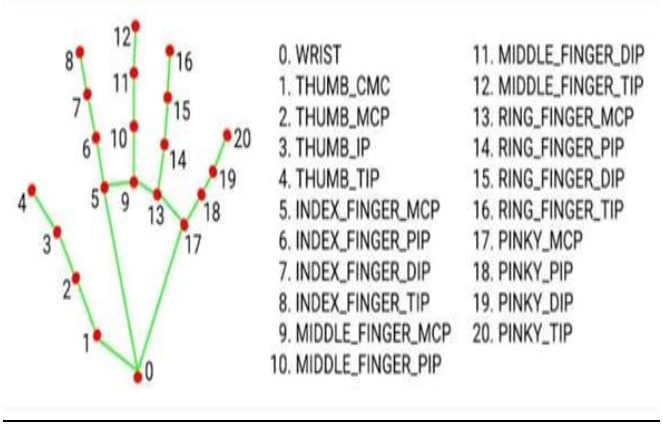
The libraries used in this project are NumPy, Pycaw and Mediapipe.

Talking about the libraries in detail:

NumPy: It's a library of Python which is used for adding support for large, multi-dimensionals arrays and matrices, along with a large collection of high level mathematical functions to operate on these arrays.

Pycaw: Python Audio Control Library

Mediapipe: Its an open-source machine learning language of Google, which has some solutions for face recognition, gesture recognition and many more. It uses Machine Learning to infer 21 key 3D hand information from just one frame.



Working Principle:

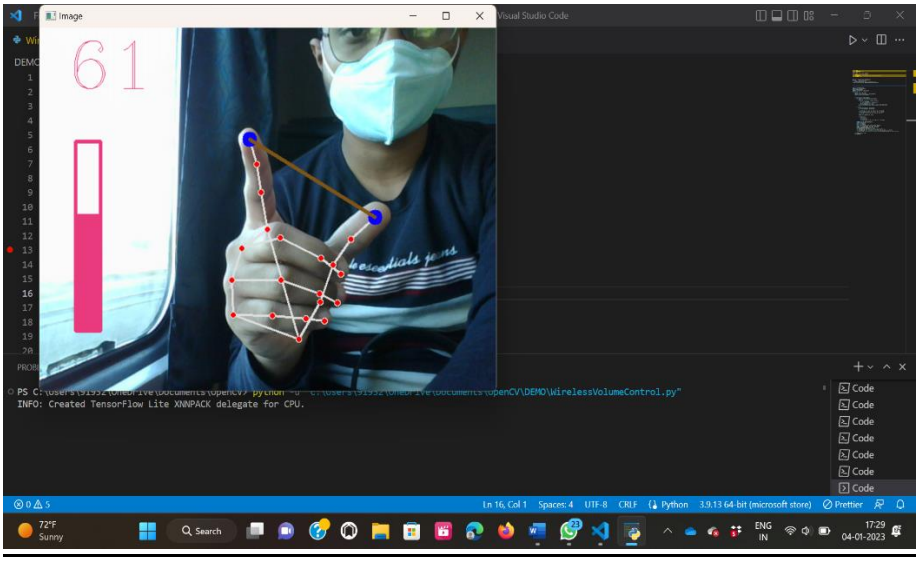
The camera of the system detects the hands with points in it so it can see the distance between the thumb finger tip and index finger tip. The distance between the points 4 and 8 of the hand is directly proportional to the volume of device.

CODE:

```
import cv2
import mediapipe as mp
import math
from ctypes import cast, POINTER
from comtypes import CLSCTX_ALL
from pycaw.pycaw import AudioUtilities, IAudioEndpointVolume
import numpy as np


devices = AudioUtilities.GetSpeakers()
interface = devices.Activate(
    IAudioEndpointVolume._iid_, CLSCTX_ALL, None)
volume = cast(interface, POINTER(IAudioEndpointVolume))




cap= cv2.VideoCapture(0)
mpHands= mp.solutions.hands
```

```
hands= mpHands.Hands()
mpDraw= mp.solutions.drawing_utils
while True:
    success, img = cap.read()
    imgRGB= cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
    results= hands.process(imgRGB)


    if results.multi_hand_landmarks:
        for handlms in results.multi_hand_landmarks:
            lmList= []
            for id, lm in enumerate (handlms.landmark):
                h, w, c= img.shape
                cx, cy= int(lm.x * w), int(lm.y * h)
                lmList.append([id, cx, cy])
            mpDraw.draw_landmarks(img, handlms, mpHands.HAND_CONNECTIONS)

        if lmList:
            x1, y1= lmList[4][1], lmList[4][2]
            x2, y2= lmList[8][1], lmList[8][2]

            cv2.circle(img, (x1, y1), 10, (255, 0, 9), cv2.FILLED)
            cv2.circle(img, (x2, y2), 10, (255, 0, 9), cv2.FILLED)
            cv2.line(img, (x1,y1), (x2, y2), (24, 86, 127), 3)

            length= math.hypot(x2-x1, y2-y1)

            if length < 50:
                z1= (x1+x2)//2
                z2= (y1+y2)//2
                cv2.circle(img, (z1,z2), 10, (255,0,9), cv2.FILLED)

        volRange= volume.GetVolumeRange()
        minVol= volRange[0]
        maxVol= volRange[1]
        vol= np.interp(length, [50, 300], [minVol, maxVol])
        volBar= np.interp(length, [50, 300], [400, 150])
        volPrr= np.interp(length, [50, 300], [0, 100])
        volume.SetMasterVolumeLevel(vol, None)
        cv2.rectangle(img, (50, 150), (85, 400), (126, 58, 234), 3)
        cv2.rectangle(img, (50, int(volBar)), (85, 400),(126, 58, 234),
cv2.FILLED)
        cv2.putText(img, str(int(volPrr)), (40, 80), cv2.FONT_HERSHEY_COMPLEX,
3, (126, 58, 234))

    cv2.imshow("Image", img)
    cv2.waitKey(1)
```

OUTPUT:



CONCLUSION:

Its an easy-to-use method for the control of volume which gives the user a small idea about the knowledge of Machine Learning. And its fun to just control the volume level of your system while you are working and listening to your favorite music by just a gesture of hand. Hoping for further improvement in the project in the coming times by like maybe controlling bass, treble and other sorts of thing alongside the volume.