

# **Progress Report**

**Group member:**

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**SUPERVISOR: DR. ABDUL HAFEEZ**

**In progress: Hand Gesture Recognition**

**Progress Report: 04**

**Data: 4/1/2022**

**Gesture control game with computer vision and  
machine learning**

## 1.1) Introduction:

The keyboard is the static and traditional method to interact with computers and games, for which players need to sit on a chair at a corner in a static position for a long time. Which affects health, especially repetitive strain injury (R.S.I) and blood circulation due to sitting on a place for a long time in a static position.

To avoid or minimize the use of Graphical User Interface (keyboard and screen-touch), we are creating gesture control With help of computer vision and machine learning, with help we could control games with human gestures and body motion/expressions.

### Benefits:

- Long time pc use but healthy
- Get enjoyment and body exercise
- Make the games more interesting
- Dynamic physical interaction with pc
- No need of extra hardware
- Less cost effective

## 1.2) Work Flow Chart

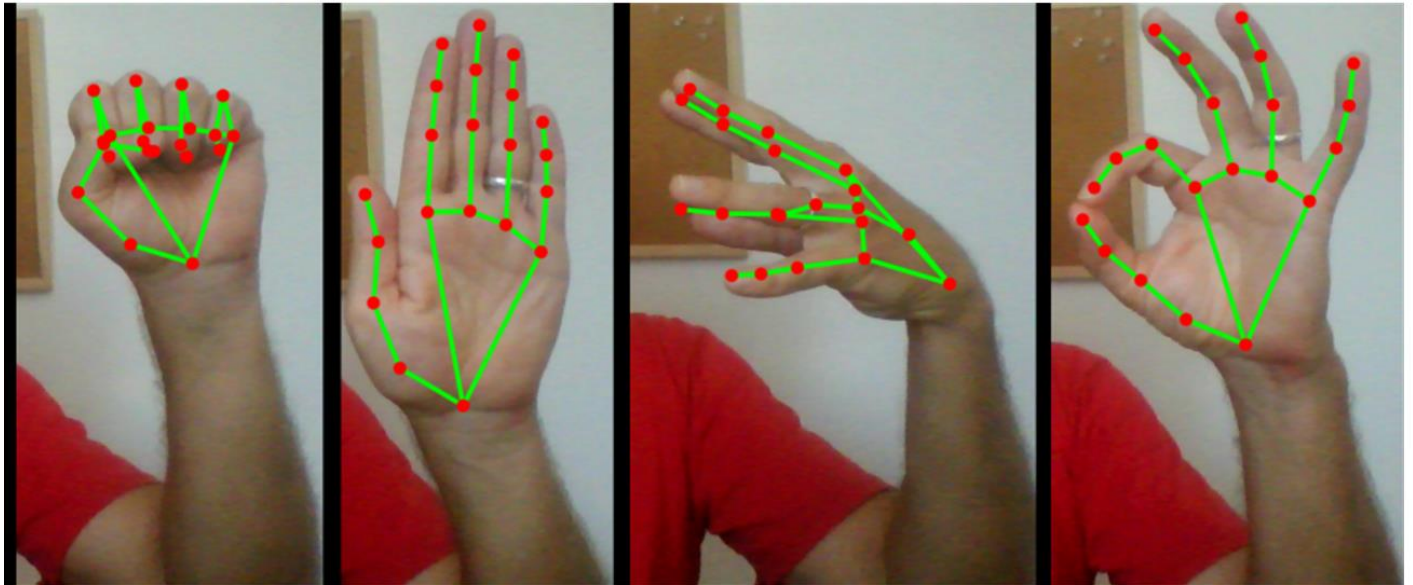
Semester weeks	Milestone	working weeks	status
6 <sup>th</sup> and 7 <sup>th</sup> Dec 06 to Dec 17, 2021	Gather dependencies +hand tracking	2 weeks	✓ Completed
Mid term Dec 20 to Dec 24, 2021	Mid term	Mid term	✓ Completed
8 <sup>th</sup> to 11 <sup>th</sup> Dec 27 to jan 21, 2022	Gesture recognitions model + deploy model ongame	4 weeks	🔄 In progress
12 <sup>th</sup> to 15 <sup>th</sup> Jan 24 to Feb 18, 2022	Website + server + database for storing playerdata + thesis	3 weeks	upcoming
Finial term exam Feb 21 to Feb 25, 2022	Finial term exam	Presentation: game controlwith hand gesture and store car break and gas data in database. Note: computer vision workalmost complete	Upcoming

8th semester	Milestone	Working weeks	Status
1 to 3 <sup>rd</sup> Mar 21 to Apr. 08, 2022	Total time taken and distance travel collect and store in database.	3 weeks	Upcoming
4 <sup>th</sup> to 7 <sup>th</sup> April 11 to May 06, 2022	Collect data (No of breaks, gas, total time taken, distance travel) and create and deploy machine learning model for next game score.	4 weeks <b>Note: project complete</b>	Upcoming
Midterm exam May 09 to May 13, 2022	Midterm exam	Midterm: present complete hand tracking and hand control game with machine learning prediction	upcoming
8th to 15 <sup>th</sup> May 16 to July 8, 2022	Maintenance + possible improvement + thesis	8 weeks	Upcoming

### 1.3) Complete Task

- GitHub project repository
- WhatsApp group
- project Virtual environment
- Hand tracking and detection
- 

#### Hand tracking



#### 1.4) **In progress task and problems** ✓ **Completed**

Project is completed up to tracking hand system, now our team working on Gesture recognition system. Which will enable our systems (PC's) to recognize and understand player gestures.

To achieve this first we will create a hand finger counting model.

### **Build the Fingers Counter** ✓ **Completed**

We will not need any expensive GPU or TPU, we will use python library known as MediaPipe. Any pc CPU will suffice as the whole code is highly optimized.

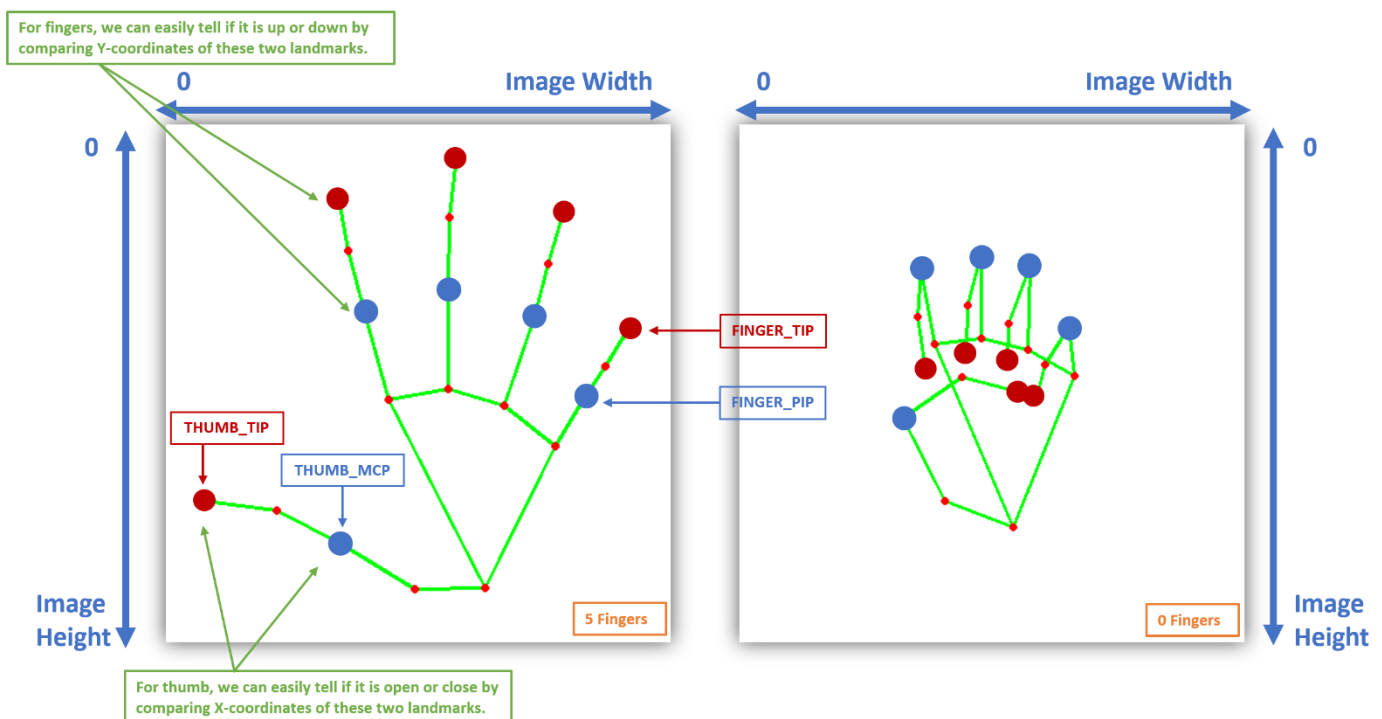
we will create a function `countFingers()` that will take in the results of the landmarks detection returned by the function `detectHandsLandmarks()` and will utilize the landmarks to count the number of fingers up of each hand in the image/frame and will return the count and the status of each finger in the image as well.



## How will it work?

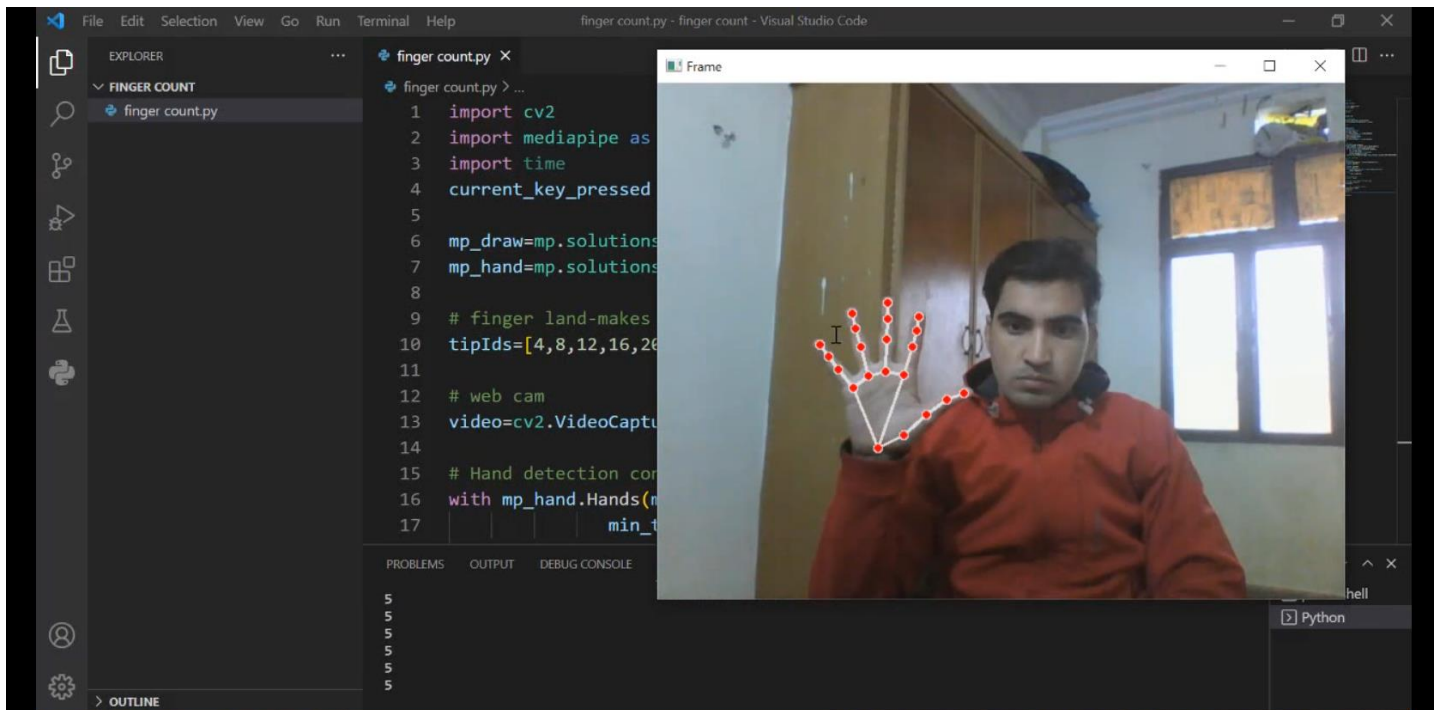
To check the status of each finger (i.e., either it is up or not), we will compare the y-coordinates of the FINGER\_TIP landmark and FINGER\_PIP landmark of each finger. Whenever the finger will be up, the y-coordinate of the FINGER\_TIP landmark will have a lower value than the FINGER\_PIP landmark.

But for the thumbs, the scenario will be a little different as we will have to compare the x-coordinates of the THUMB\_TIP landmark and THUMB\_MCP landmark and the condition will vary depending upon whether the hand is left or right.



For the right hand, whenever the thumb will be open, the x-coordinate of the THUMB\_TIP landmark will have a lower value than the THUMB\_MCP landmark, and for the left hand, the x-coordinate of the THUMB\_TIP landmark will have a greater value than the THUMB\_MCP landmark.

**In progress task ✓ Completed**



### 1.5) In progress task and problems : ✓ Completed

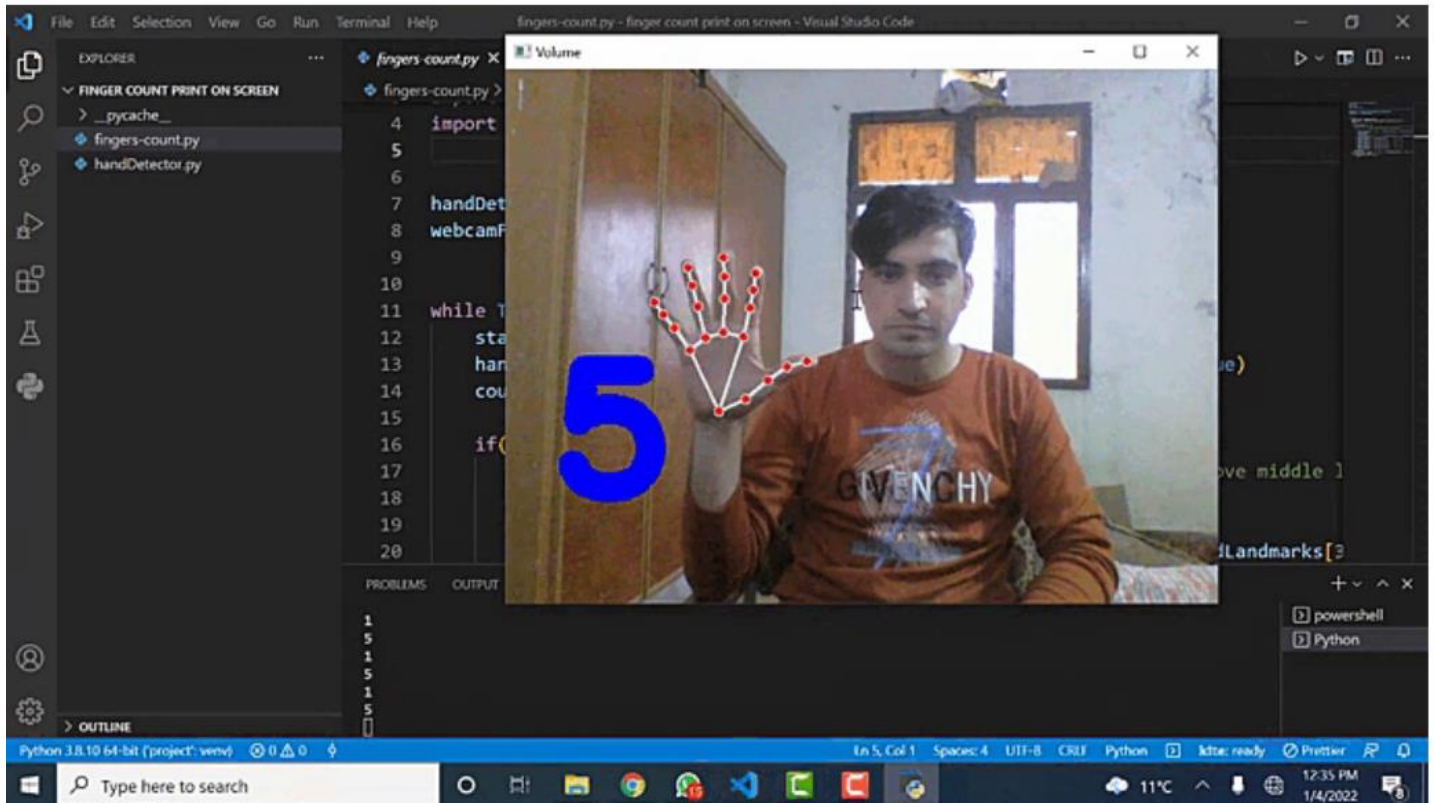
We have developed a finger count model, which is working well, in the future we will convert this finger counting into different gestures, e.g. if the player has made a victory sign (✌) then our system will perform specific functionality/tasks {break or gas of a car} to control the game.

### 1.6) Problem ✓ Completed

But Game Player does not check the command line. So we have to show this functionality on the screen. Which will be more reliable and interactive for game players.

**Note:** *player have to face the palm of your hand towards the camera.*

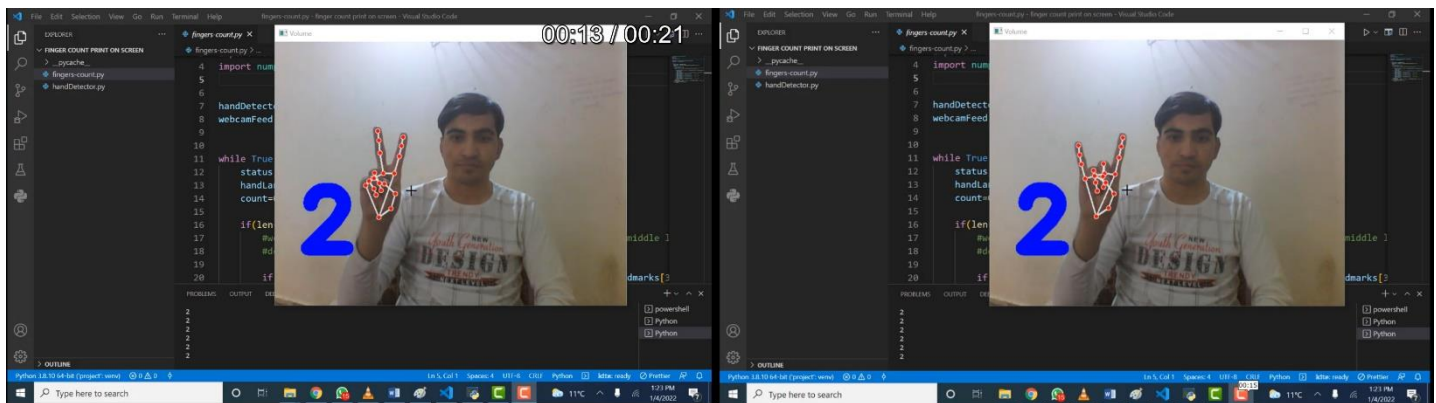




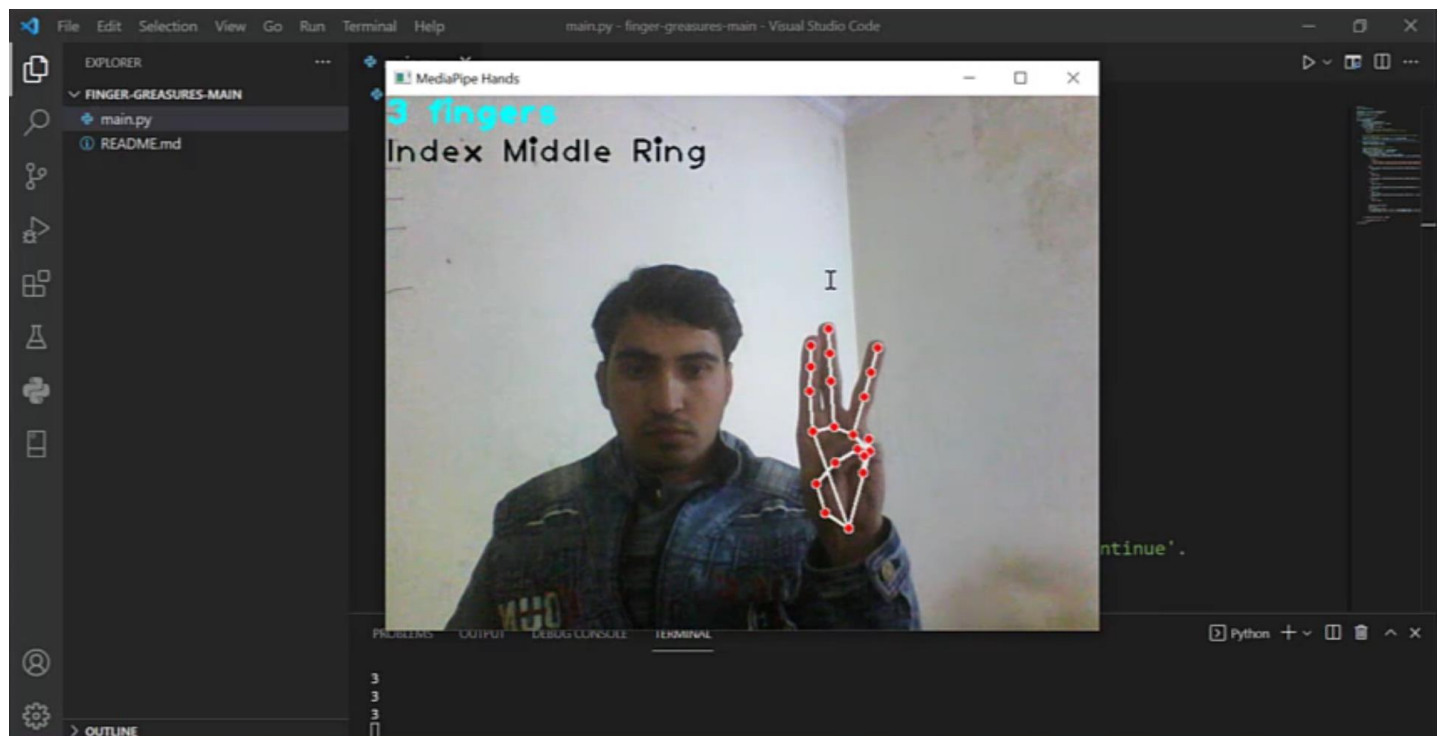
### 1.7) **Problem** ( finger name and position Rescognition ) **✓ Completed** (15/1/2021)

Our model can count fingers and can show/print the number of fingers up on the screen, but can recognize the fingers. I.e. the 'V' sign, made by holding up the index and middle fingers. Our model does know about the number and name of fingers.

We will train the model to recognize every finger. Which will lead us to feed some specific signs/gestures with some specific task/functionalities (gas and brake of a car) to control the game.



**Problem** (finger name and position Recognitions) **✓ Completed** (15/1/2021)



## 1.9 Enhancement

**Hand Detection Speed FPS (frame per second):** **🔄 in progress**

FPS (Frame per Second) defines how fast your object detection model process your video and generates the desired output. The first step for any custom object detection is to grab images for labeling.

To avoid latency and increase reliability to we have to improve the FPS of our model to make the hand detection faster and player play the in more reliable and feel dynamic.



## **1.8) Summary:**

The hand tracking model is completed. The gesture recognition model is in progress. The hand detection speed is a very important factor in our project and it's very hard to detect hands and recognize the gestures with 25 to 30 FPS. For that we are training a model with finger count and then will convert it into different gestures signs.

GitHub link:

<https://github.com/Finial-Year-Project-FYP/Hand-Gesture-Control-Game-With-CV-and-ML-FYP/pull/3>

GitHub code link:

[https://github.com/Finial-Year-Project-FYP/Hand-Gesture-Control-Game-With-CV-and-ML-FYP/tree/main/working%20weeks%20\(8th%20to%2011th\)](https://github.com/Finial-Year-Project-FYP/Hand-Gesture-Control-Game-With-CV-and-ML-FYP/tree/main/working%20weeks%20(8th%20to%2011th))

**Written By: Muhammad ijaz**