1. INTRODUCTION PROJECT

This project (Hand Gesture Volume Controller) is developed using **Python programming language**, In this **Python Project** we are going to **Building a Volume Controller with our Hand Gesture detection** , To change the volume of a computer.

We first look into hand tracking and then we will use the hand landmarks to find gesture of our hand to change the volume. This project is module based which means we will be using a previously created hand module which makes the hand tracking very easy.

•SOFTWARE/APPARATUS REQUIREMENT

S.NO	Software/Apparatus Required
1	A Laptop with Webcam or an external Webcam device for Desktop PC.
2	Windows 7/8/8.1/10 installed operating System.
3	Python 3.9.4 or earlier version installed. (To run in Windows Terminal)
4	PyCharm IDE installed in PC.

Fig.1 Webcam   Fig.2 Windows OS   Fig.3 Python   Fig.4 PyCharm

- **PROCEDURE**
 These are the following steps to create a Hand Gesture Volume Controller Project: -
  Step 1: Open PyCharm Application located on your desktop or open from desired located folder.
  Step 2: Click on File option and then click on new project.

Step 3: Select the location where you want to create your project and the click on create.
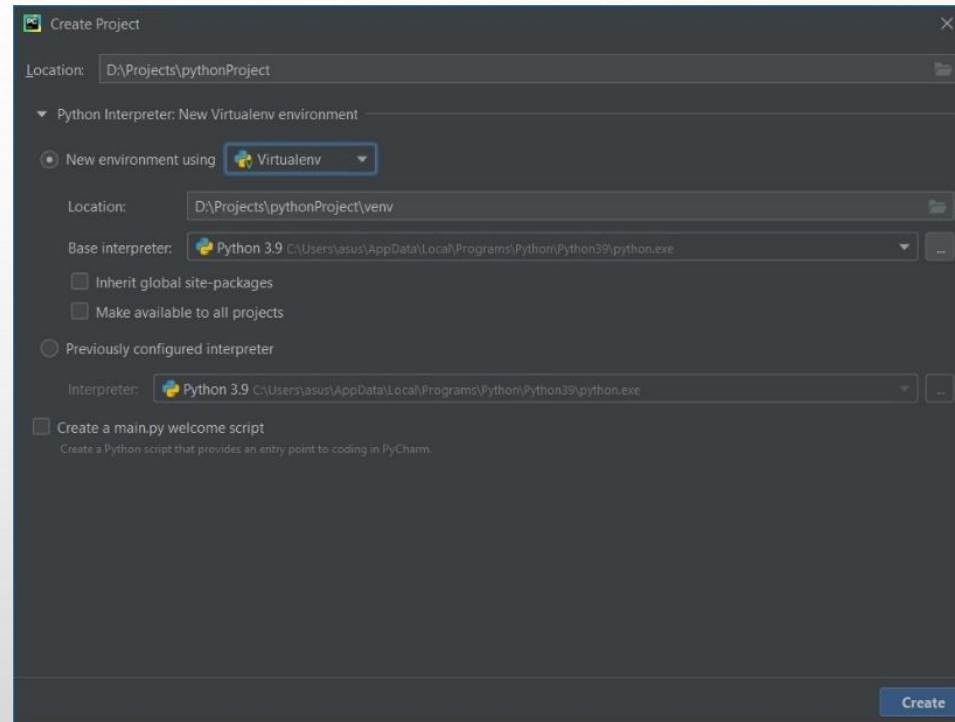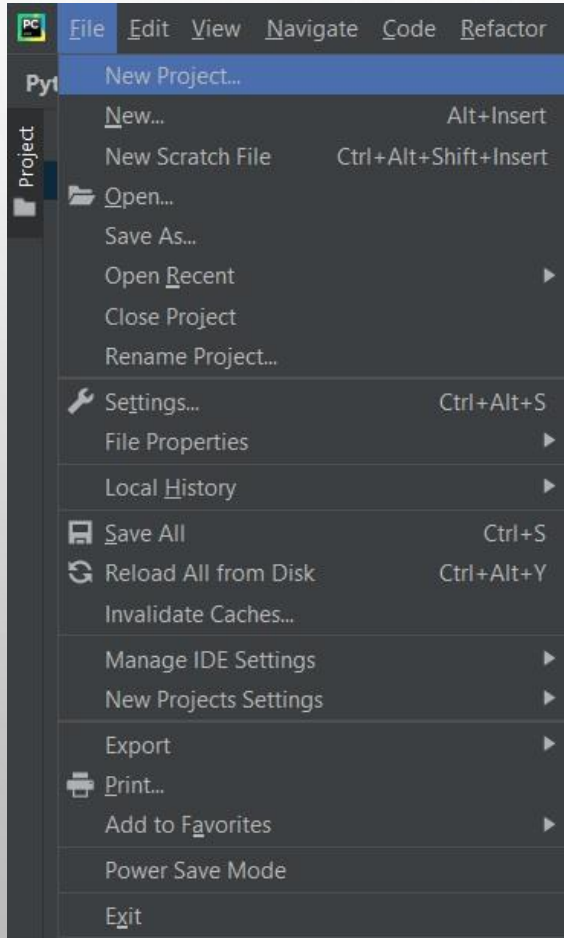
Step 4: Right Click on Project Folder → New → Python File. Name your Python file anything you want or it is main.py by default. Click on OK, New Python file will be created.
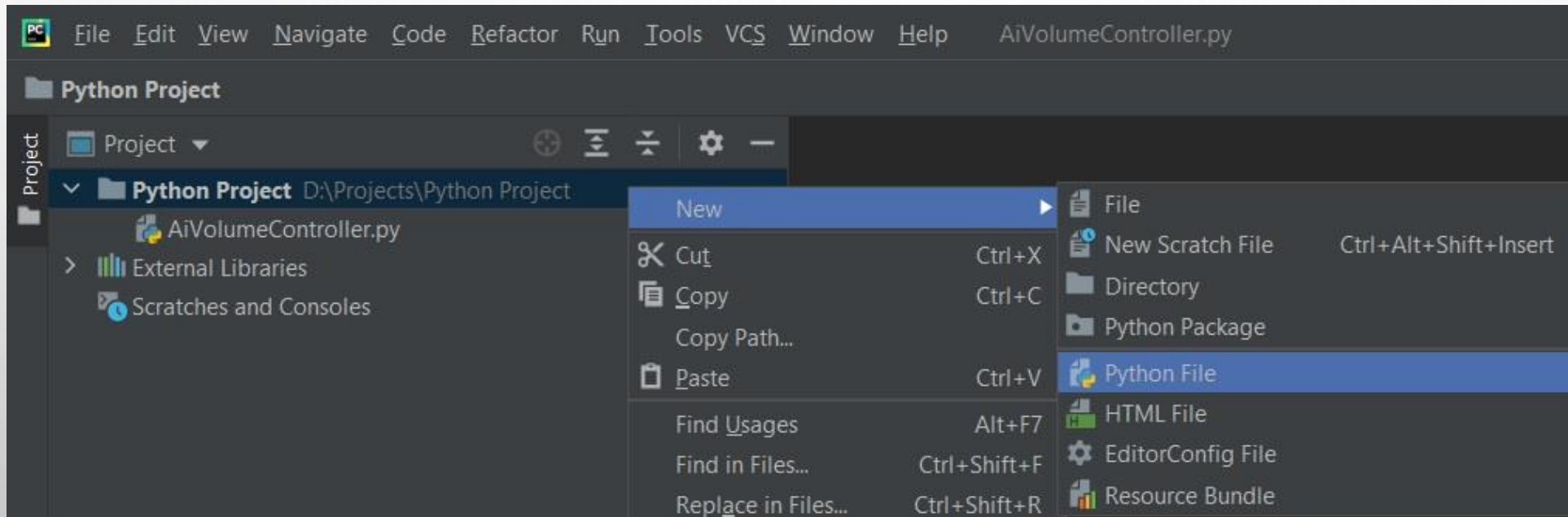
You have to import and install some Libraries to run this program:-

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

Following are the Libraries/Interpreter of Python Language: -

OpenCV- OpenCV is a cross-platform library using which we can develop **real-time computer vision applications**. It mainly focuses on image processing, video capture and analysis including features like face detection and object detection.

MediaPipe: - MediaPipe is **a cross-platform framework for building multimodal applied machine learning pipelines**. MediaPipe is a framework for building multimodal (eg. video, audio, any time series data), cross platform (i.e Android, iOS, web, edge devices) applied ML pipelines.

NumPy: - NumPy is a basic level external library in Python used for **complex mathematical operations**. NumPy overcomes slower executions with the use of multi-dimensional array objects.

Step 7: Save the Project. File → Save All (Ctrl + S)
Step 8: Run the Program {You can debug and run or directly run
 the program into the PyCharm, Run → Run/Debug (Alt + Shift+ F10 /
Alt + Shift + F9)}

You can also run the program into Windows Terminal (Command Prompt).
■ + R → Type 'cmd' and Click on OK. Go to the specific project path and run the

main file by the Command: **py**<space>**file_name.py** ↵
For Example: **py main.py** ↵