**Project Title:** Hand Gesture Recognition using MediaPipe and OpenCV

**Overview**:

This project detects and classifies basic hand gestures from a static image using Google's MediaPipe library in combination with OpenCV. The program processes a single image to detect the presence of a hand, identifies hand landmarks, and classifies gestures based on the number of fingers extended.

**Supported Gestures:**

- Fist: All fingers closed

- Thumbs Up: Only the thumb extended

- Two Fingers Up: Thumb closed, two fingers extended

- Open Hand: All five fingers extended

- Other: Any other number of fingers extended

**Project Structure:**

- gesture\_detect.py: The main Python script that performs the hand detection and gesture classification.

- thumb.jpeg (or any image): An example image file containing a hand gesture.

- README.txt: Documentation about the project.

- requirements.txt: Python dependencies required to run the project.

**Instructions:**

1. Prerequisites:

- Ensure Python 3 is installed on your machine.

- Install the required Python libraries using the command:

```

pip install -r requirements.txt

```

2. Prepare the Input Image:

- Save a clear image of a hand gesture (e.g., 'thumb.jpeg') in the same directory as the script.

- The hand should be clearly visible and centrally located for accurate detection.

3. Run the Script:

- Use the following command to run the script:

```

python gesture\_detect.py

```

4. Output:

- The program will display the original image with hand landmarks drawn.

- A text label will appear on the image indicating the detected gesture.

- The OpenCV window will remain open until a key is pressed.

**Detection Logic:**

- Uses MediaPipe to detect 21 hand landmarks.

- Thumb detection is based on the x-coordinate comparison between the thumb tip and the IP joint.

- Other fingers are considered extended if their tip y-coordinates are above their PIP joints.

- The total number of extended fingers is used to classify the gesture.

**Limitations:**

- Only one hand is detected per image (`max\_num\_hands=1`).

- Designed for static image processing, not real-time video.

- Assumes a right hand for thumb orientation logic.

**Credits:**

- MediaPipe: https://google.github.io/mediapipe/

- OpenCV: https://opencv.org/