



COMPUTER VISION

# PROJECT

**“WEB NAVIGATION  
USING REAL-TIME  
EYE TRACKING”**



# INTRODUCTION

Real-time eye tracking in OpenCV involves using computer vision techniques to locate and track a person's eyes in a live video stream. OpenCV (Open Source Computer Vision Library) provides tools and functions to perform this task.

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## Steps involved:

- Eyes landmark Detection
- Extracting Eyes using Masking Techniques
- Threshold Eyes
- Dividing Eye into Three Parts Right Center Left
- Counting Black in Each part and Estimating The Position of Eye
- Controlling Webpage scrolling With Eyes



# STEPS

01

- **Eyes Landmark detection**: The system uses a facial landmark detection model, such as MediaPipe Face Mesh, to detect the landmarks of both eyes.
- This model identifies key points on the eyes, such as corners, eyelids, and other features.

02

- **Extracting Eyes**: After detecting the eye landmarks, the system creates a mask to extract the region of interest (ROI) corresponding to each eye.
- The mask is created by filling the area around the eyes' landmarks with white, while the rest of the image is black.

03

- **Threshold Eyes**: The system applies thresholding techniques to convert the extracted eye regions to binary images.
- Thresholding helps in segmenting the eyes from the background, making it easier to analyze the eye regions.



# STEPS

04

- **Dividing Eye into Three Parts**: The binary image of each eye is divided into three parts horizontally: right, center, and left.
- This division allows the system to analyze which part of the eye has the most black pixels, indicating the direction of gaze.
- **Counting Black in Each part**: The system counts the number of black pixels in each of the three parts of the eyes.

05

- Based on the distribution of black pixels, it estimates the position of the eye gaze:
- If the right part has the most black pixels, the gaze is estimated to be towards the right.
- If the left part has the most black pixels, the gaze is estimated to be towards the left.
- If the center part has the most black pixels, the gaze is estimated to be towards the center.
- This estimation helps determine which direction the user is looking at on the screen.

06

- **Controlling Webpage scrolling With Eyes**: Based on the estimated eye position (right, left, or center), the system triggers scrolling actions on the webpage.
- For example:
- If the user looks towards the right, the webpage scrolls downwards.
- If the user looks towards the left, the webpage scrolls upwards.
- If the user looks towards the center, the scrolling stops or remains at the current position.



# LIBRARIES USED

## OpenCV

OpenCV is an open-source computer vision and machine learning software library. It provides a wide range of tools, algorithms, and functions for real-time computer vision and image processing tasks.

Common features include:

- Image processing
- Object detection
- Stereo Vision
- Optical Flow
- Contour Detection

## Mediapipe

MediaPipe is an open-source framework developed by Google that provides a comprehensive set of ML solutions for processing media data, such as images and videos. MediaPipe offers a collection of pre-built components (called "solutions") that cover a wide range of tasks, including object detection, pose estimation, face detection, hand tracking, and more.

Common features include:

- Object Detection and Tracking
- Gesture Recognition
- Biometric Authentication
- Augmented Reality (AR) and Virtual Reality (VR)

## Selenium

Selenium is a popular open-source framework primarily used for automating web browsers. It provides a suite of tools and libraries for automating web applications for testing purposes, web scraping, and web-based automation tasks.

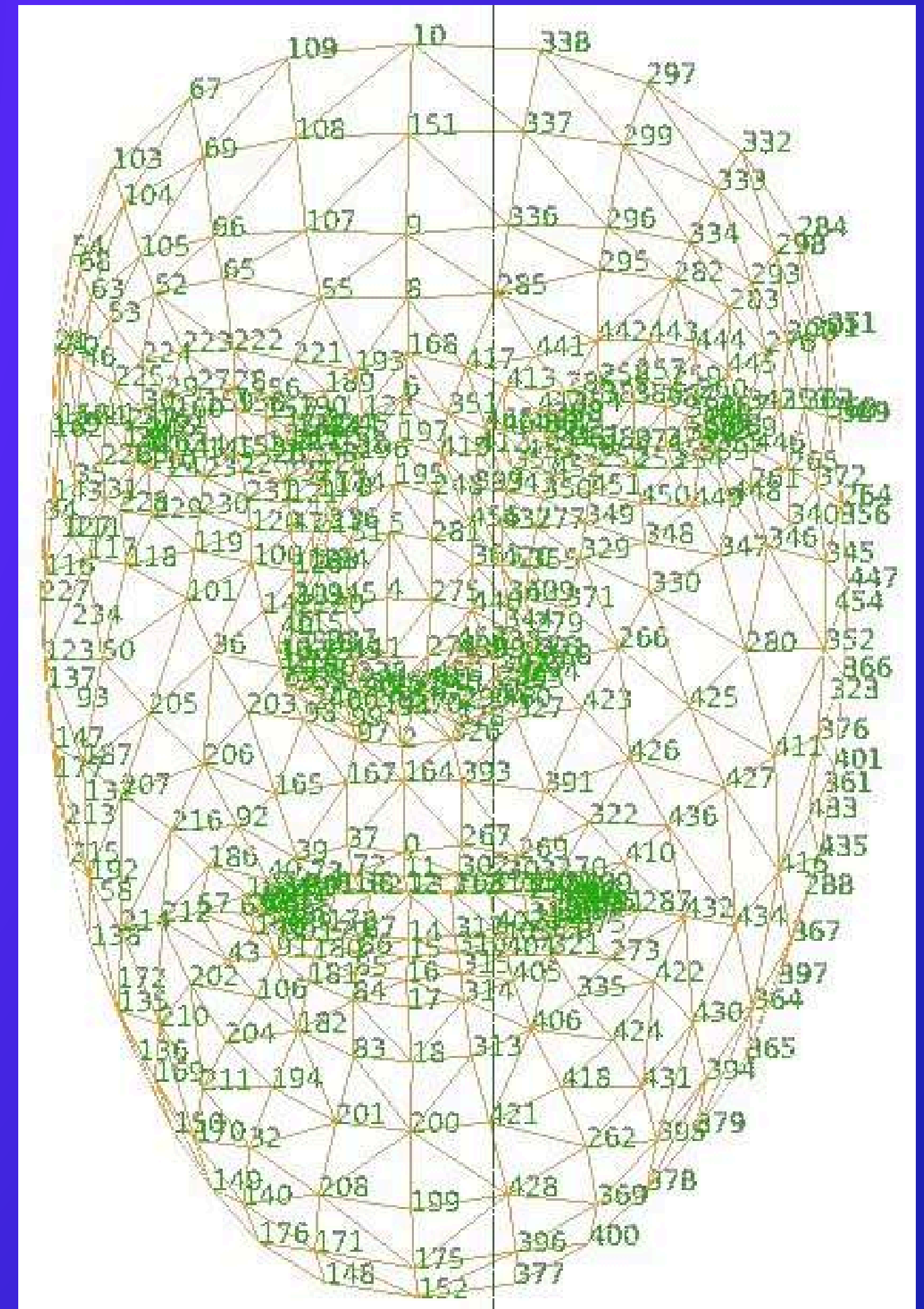
Common features include:

- Web Browser Automation
- Web Element Interaction
- Page Navigation and Control
- Headless Browser Support



# FACIAL KEYPOINT DETECTOR

A facial keypoints detector is a computer vision algorithm that identifies and locates specific points on a human face, such as the eyes, nose, mouth, and other facial landmarks. These keypoints are often represented as coordinates on the image, allowing for precise localization of facial features. Facial keypoints detection is a crucial step in tasks like face alignment, emotion recognition, face swapping, and augmented reality applications. MediaPipe Face Mesh is used to identify and track 468 unique points on a human face in real-time.



Project

eyeTrackingScroller

.venv

Lib

Scripts

share

src

gitignore

pyvenv.cfg

eye-tracking-scroller

connectionTest.py

main.py

utils.py

External Libraries

Scratches and Consoles

Run

main

C:\Users\rntwi\PycharmProjects\eyeTrackingScroller\.venv\Scripts\python.exe

main.py

connectionTest.py

utils.py

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with map\_face\_mesh

crop\_r

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Taylor Swift - Wikipedia

en.wikipedia.org/wiki/Taylor\_Swift

Chrome is being controlled by automated test software.

WIKIPEDIA

The Free Encyclopedia

Search Wikipedia

Search

Create

Taylor Swift

Article

Talk

Read

View source

V

From Wikipedia, the free encyclopedia

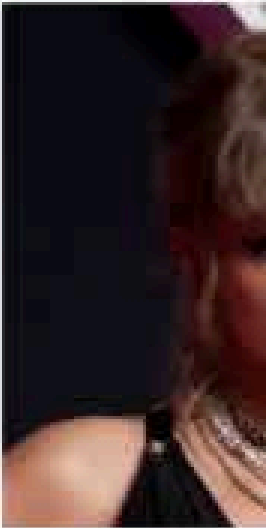
For the album, see [Taylor Swift \(album\)](#).

Taylor Alison Swift

(born December 13, 1989) is an American singer-songwriter, record producer, actress, and businesswoman. With a [vast fanbase](#) and [widespread public interest](#), she has significantly impacted not only the [music industry](#) but also [popular culture](#) and [politics](#) through [her songwriting](#), artistic endeavors, entrepreneurial spirit, and advocacy efforts.

Swift began professional songwriting at age 14. She signed with [Big Machine Records](#) in 2005 and achieved prominence as a [country pop](#) singer with the albums *Taylor Swift* (2006) and *Fearless* (2008). Their singles "Teardrops on My Guitar", "Love Story", and "You Belong with Me" were [crossover](#) successes on [country](#) and [pop](#) radio formats and brought Swift mainstream fame. She experimented with [rock](#) and [electronic](#) styles on her next albums, *Speak Now* (2010) and *Red* (2012), respectively; *Red* featured her first [Billboard Hot 100](#) number-one single, "[We Are Never Ever Getting Back Together](#)". Swift recalibrated her image from country to pop with *1989* (2014), a [synth-pop](#) album containing the chart-topping songs "[Shake It Off](#)", "[Blank Space](#)", and "[Bad Blood](#)". Media scrutiny inspired the [hip-hop-](#)

Taylor



Born

Swift

Taylor Al



## HANDS FREE WEB BROWSING

- Users with physical disabilities or limited mobility can navigate and consume web content without using traditional input devices.
- Particularly useful for individuals with motor impairments, allowing them to browse the web using only their eyes.

## HEALTHCARE APPLICATION

- In healthcare, eye tracking can assist in assessing cognitive function and attention.
- Used for diagnosing neurological conditions like attention deficit disorder (ADD), autism spectrum disorders (ASD), or traumatic brain injuries (TBI).

## GAMING AND INTERACTIVE CONTENT

- Eye-tracking can be integrated into games and interactive content to control in-game actions or character movements.
- Enables gaze-based interactions in virtual reality (VR) and augmented reality (AR) applications.

## ASSISTIVE TECHNOLOGY

Enables these users to access online resources, read articles, and interact with web applications without physical interaction

## IMPROVED ACCESSIBILITY

- Enhances accessibility for elderly users or those with limited dexterity.
- Allows users to scroll through webpages, click on links, and interact with web elements using eye movements, making the web more inclusive.

## HOME AUTOMATION

- Eye tracking can complement voice assistants like Siri or Google Assistant, providing an additional input method.
- In smart home systems, users could control devices and appliances by looking at specific areas or icons on a webpage.





# THANK YOU!

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