

Suspicious Face Recognition

in computer-based academic lab monitoring



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The Problem

- ▶ Majority of computer-based labs
- ▶ Compact Seating arrangements
- ▶ Higher manpower for monitoring
- ▶ Real-Time Detection
- ▶ Immediate Action



Sub Problems to be solved

01

Good quality video capturing

02

Accuracy of the Detection systems

- Lighting
- Pose

03

Real-time and push notifications

04

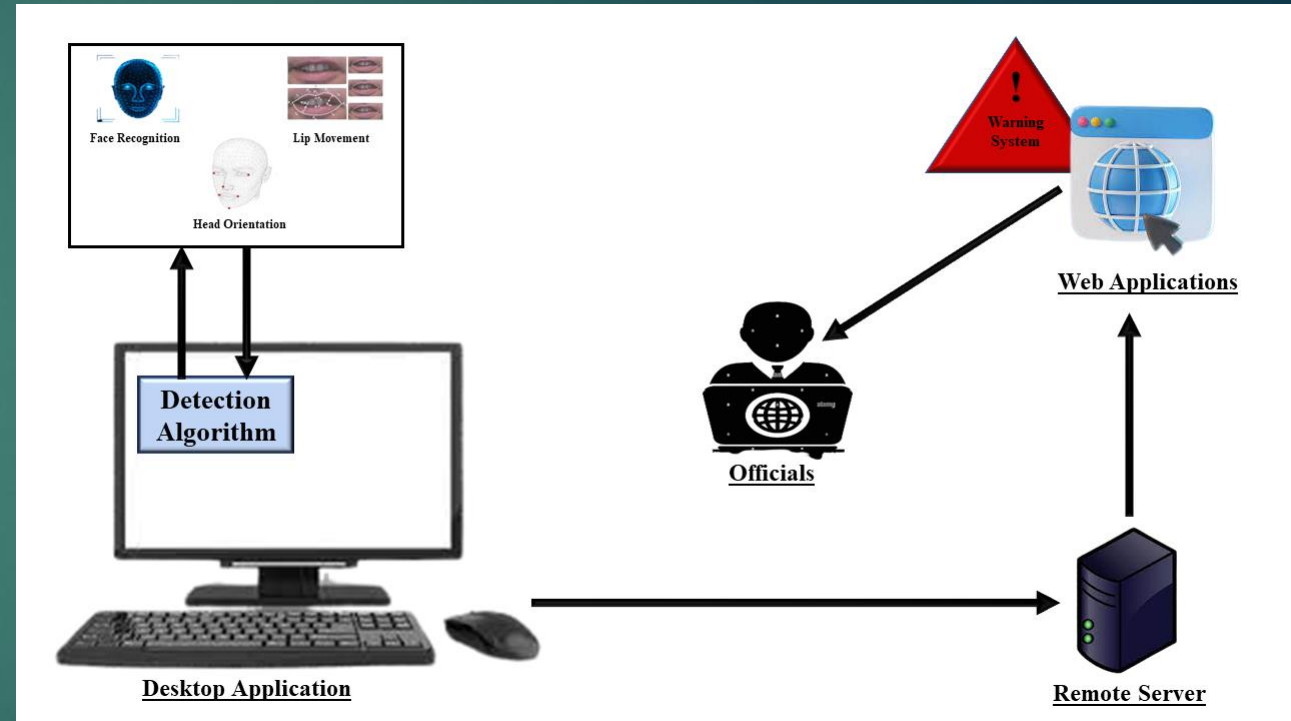
Multiple detections notified



SCREEN									
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
G1	G2	G3	G4	G5	G6	G7	G8	G9	G10

The Proposed System

- ❑ Student Monitoring
- ❑ Suspicious Activity Detection Algorithm
 - Face Detection
 - Head Orientation Detection
 - Lip Movement Detection
- ❑ Remote Server
- ❑ Graphical User Interface



Face Detection

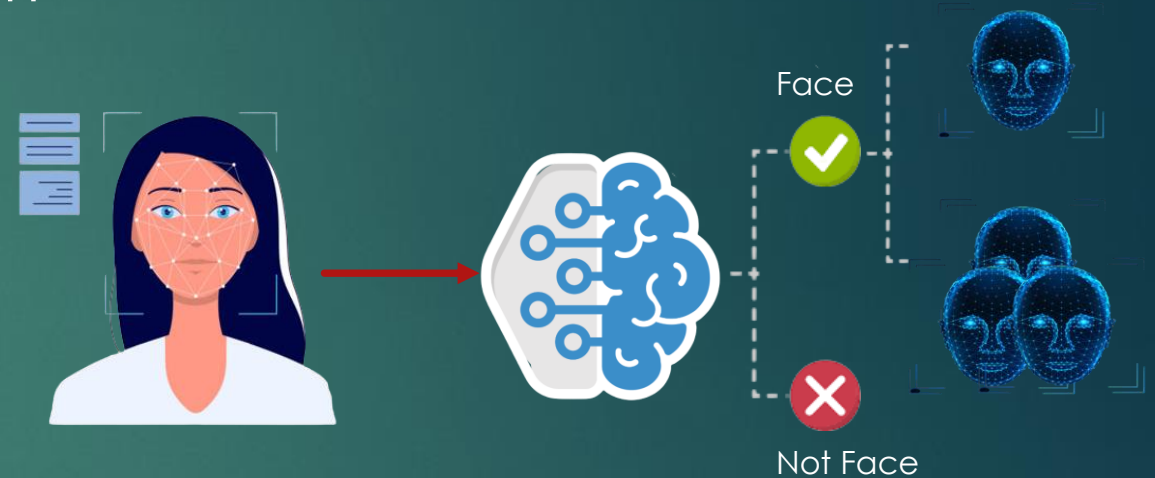
❑ Suspicious Activity Detection Algorithm

- 'No-Face' Detection
- 'Multi-Face' Detection

❑ Tested Algorithms and Models

- Haar feature classifier
- MTCNN

❑ MediaPipe Face Detection Model



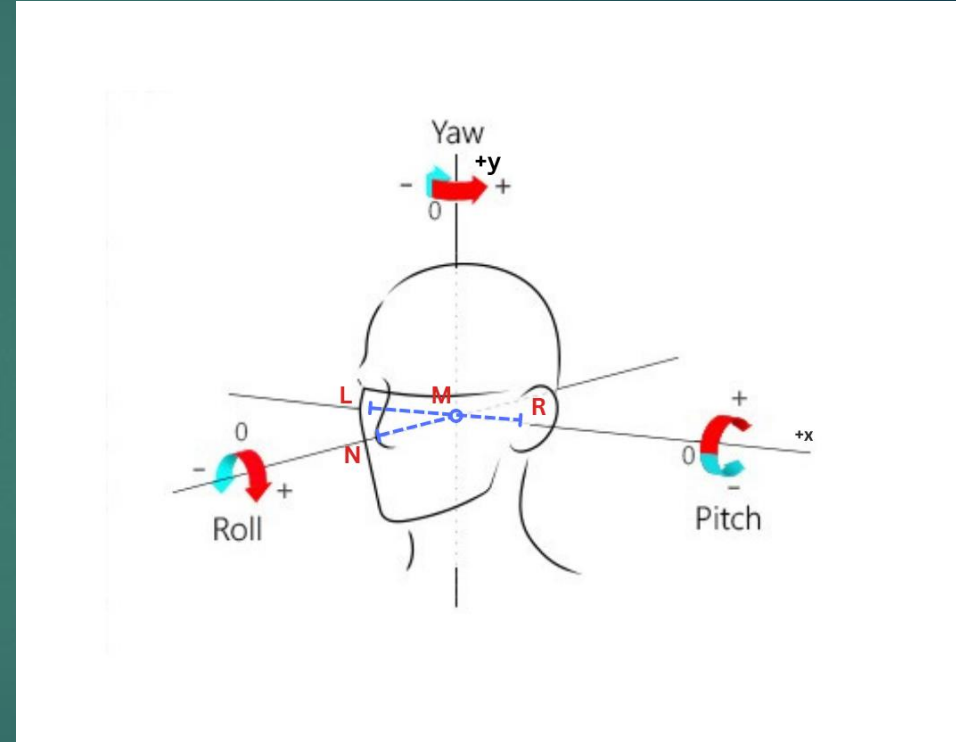
Head Orientation Detection

❑ 3D Coordinate Plane

- MediaPipe Pose Estimation Model

❑ Algorithm

- Get Nose point coordinates (**N**)
- Get Left and Right Ear point coordinates (**L** & **R**)
- Get 3D line vector (**LR**)
- Get 3D point (**M**)
- Get 3D line vector (**NM**)
- Get 3D Plane perpendicular to Camera (**P**)
- Find angle between line **NM** & plane **P**



Lip Movement Detection

❑ Collect sequence of frames

- 'Speaking' Detection

❑ Recurrent Neural Network

- 'Speaking' Detection
- Model pretrained using **dlib** face detector

❑ Basis of Model

- Consider 25 frames of the input webcam video
- Fetch the points that mark the inner edges of the top and bottom lip.
- Get the average pixel separations of A, B, C
- Feed the lip separation sequence into the RNN model



Demonstration of this project...



Suspicious Activity Detection Algorithm as a background application.



The **Remote Server** to which the information (time, pc info) related to the detected Suspicious Activity is sent in real-time.

SCREEN									
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
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The **GUI of the App** to show the detected suspects to the lab assistant or any other official.

Thank You!