

# IAPM: Intelligent Attendance and Participation Monitoring

## DESIGN REVIEW

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Team CA

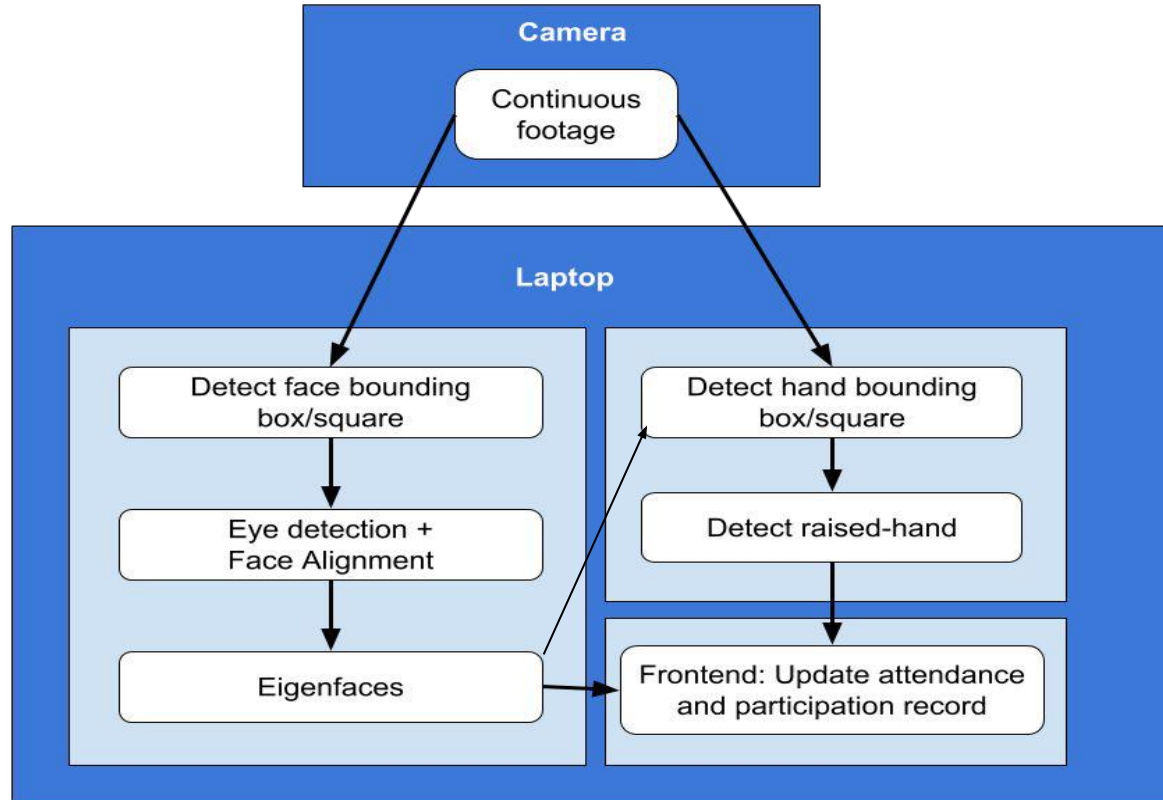


# Application Area

- Computer vision based attendance and participation system
- System will detect when students enter/leave the classroom
- System will keep track of participation by detecting when students raise their hands and speak.

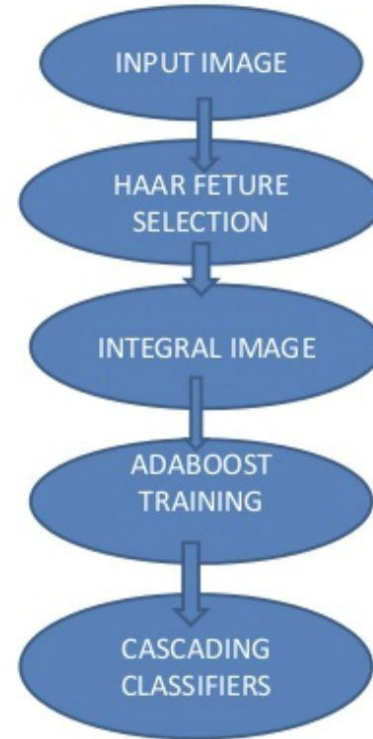
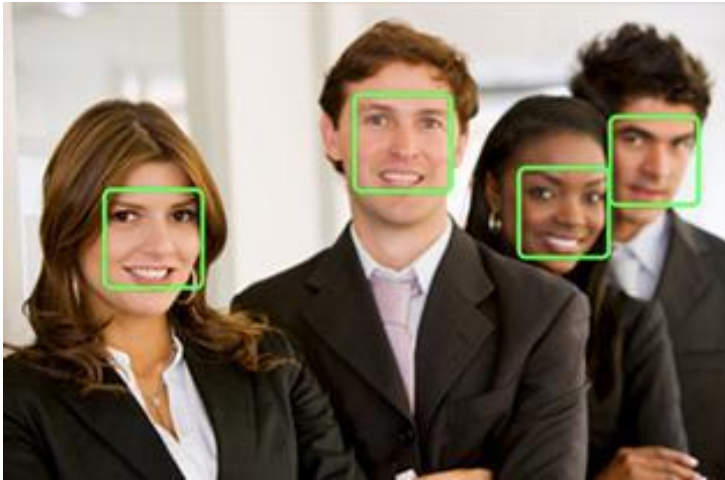


# System Specification



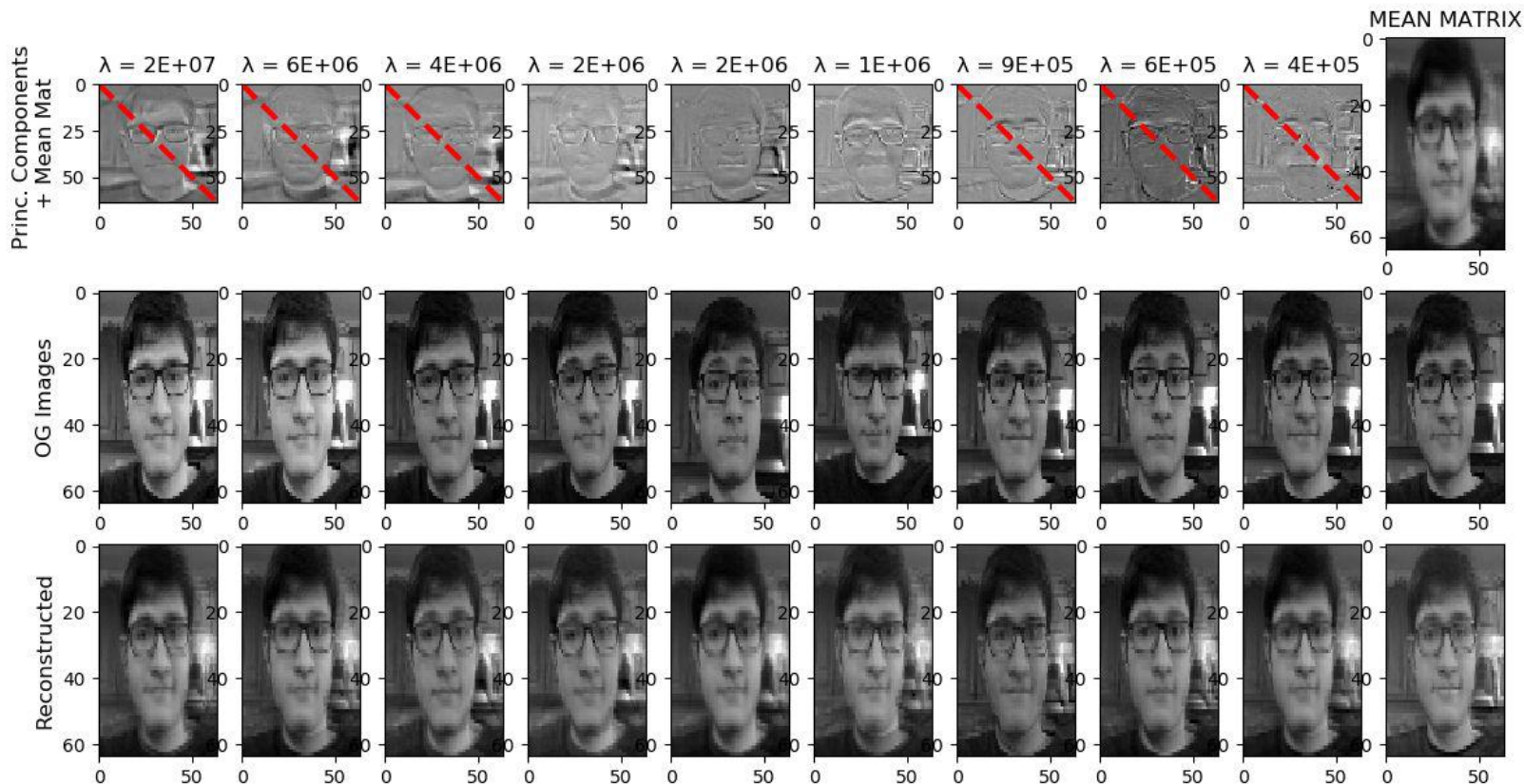
# Solution Approach- Detection

Viola/Jones algorithm



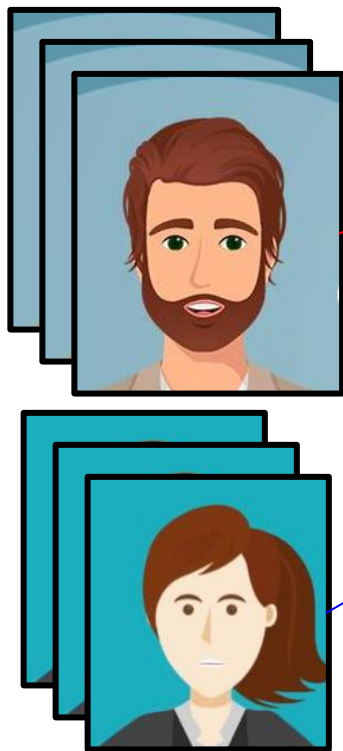
# Solution Approach: Recognition (PCA)

PER60N omar64

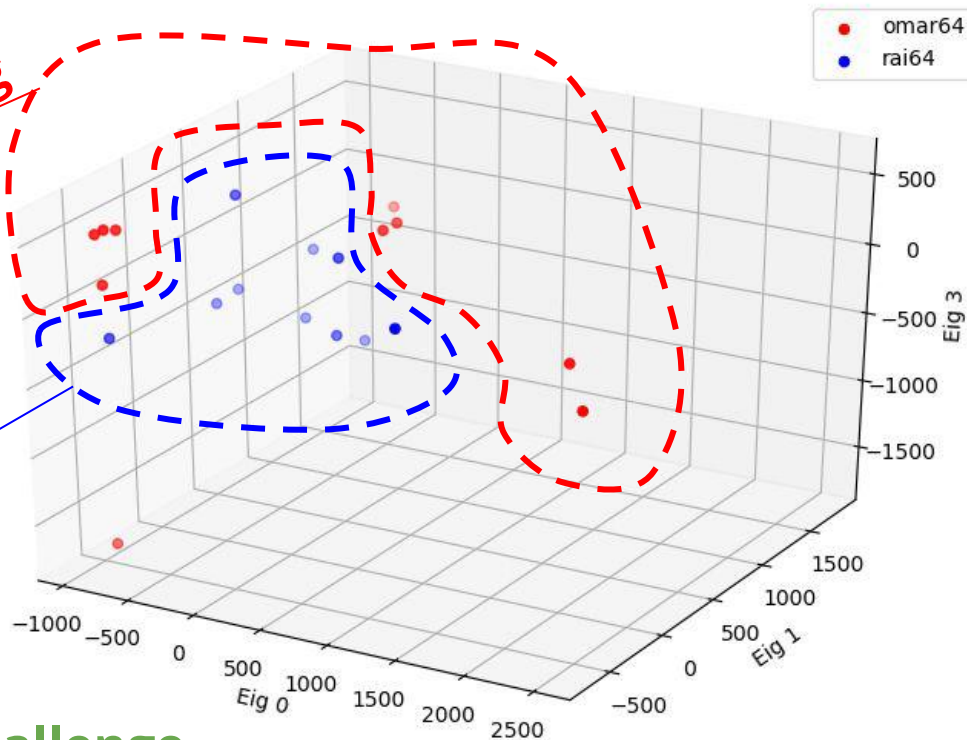


# Recognition - PCA

Plotting Basis Coeffs in the Space of the 3 Principal Components



Poor Clustering



Current Challenge - preprocess images so data points properly cluster

# Solution Approach: Raised-hand Detection

Will use Computer Vision and machine learning techniques

- Foreground extraction to segment student bodies
- Scale-invariant feature transform (SIFT)
- Support vector machine (SVM)

However, we will continue to research alternative methods.



# Implementation Plan

## Detection

- Will develop Viola/Jones algorithms from scratch
  - With the help of OpenCV and numpy

## Recognition

- Will develop all algorithms (PCA, K means) from scratch
  - With the exception of basic math functions like eigenvalue computation, matrix mult
  - Eye detection: OpenCV, dlib. Algorithm developed through research

**Participation** - Will develop from scratch

**Camera provided courtesy of Professor Savvides (5 MP, w/ zoom capability)**



# Metrics and Validation

- Manual - test in small room w/ group sizes between 3-8 for 3 - 5 minutes

Automated Testing				
	<b>Input Image</b>	<b>Output</b>	<b>Metric</b>	<b>Desired accuracy</b>
<b>Detection</b>	Known # people	How many people? Where?	% of <b>correct</b> detections	>70%
<b>Recognition</b>	Known people IDs	Who is in picture?	% of correct recognitions made	>70%
<b>Hand Raising</b>	Known # hand raises	How many hands raised?	% of correct hand raises detected	>75%
<b>Fusion of algos</b>	All of the above	Who is present and who is participating?	All of the above	-

# Tasks and Division of Labor

Facial Detection - Kevan

Facial Recognition algorithm - Neeraj and Omar

Raised hand recognition algorithm - All

Prototype mouth detection (bonus) - Kevan

Integration of Facial Recognition with Participation system - All

## Capstone

### Attendance

- Research how to detect faces (Casca...
- Prototype/validate face detection
- Complete, Optimize, Benchmark Det...
- Research how to classify faces (Eigen...
- Prototype/validate face recognition
- Complete, Optimize, Benchmark Rec...

### Fusion

- Fuse detection and recognition
- Fused hand detection
- Fuse mouth detection (bonus)

### Participation

- Prototype hand-detection
- Validate/Finish hand-detection
- Prototype mouth detection (bonus)

### Camera Installation

- Install camera and ensure images ca...

### Final Testing

- Test entire algorithm

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