



Attendance Counter



Group 5

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Taking Attendance

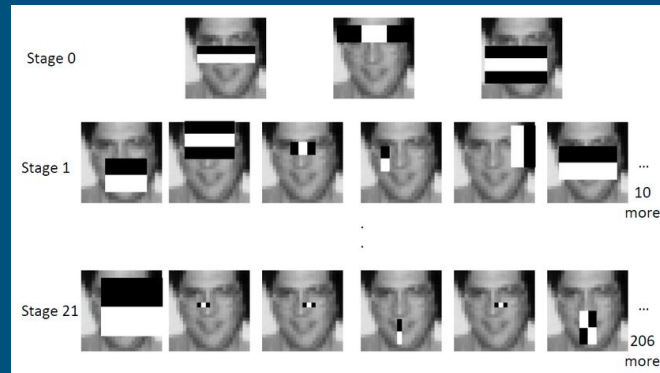
- Professors take up valuable time taking attendance
- Pass around a sheet to sign in or log individually on Canvas

Problem Solved!

- Count attendance within a classroom with a webcam
- Program will detect the amount of faces in classroom
- Ability to take a screenshot of Video Feed

Haar Cascade Classifier

- Ada Boosted Ensemble of Haar Features
 - Lots of Positive(faces) and Negative(not faces) Images
 - Each extracted feature represents a characteristic(edges, lines, center surround, ...)
 - Feature is difference between pixel intensities of positive and negative region
 - Selects most important features that most accurately classify objects
 - Final classifier is weighted sum of the weak classifiers
- When classifying image
 - Separate features into different stages of classifiers and applied to image one-by-one
 - If image passes all stages, it is a Face!



How it works

- Access the webcam feed
- Use trained classifier
 - Detect one object
 - Multiple Samples of Object
- Creates model to classify object

```
img = cv2.imread('test/newtest/class57.png')
#img = cv2.imread('voyager2.png')
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

faces = face_cascade.detectMultiScale(
    gray,
    #scaleFactor=1.1,
    minNeighbors=3,
    minSize=(1, 1),
    flags=cv2.CASCADE_SCALE_IMAGE
)
print("Detected {} faces!".format(len(faces)))

#Draw a rectangle around the faces
for (x, y, w, h) in faces:
    cv2.rectangle(img, (x, y), (x+w, y+h), (0, 255, 0), 2)

# Display the resulting frame
#cv2.imshow('Video', frame)

cv2.imshow("Faces Detected",img)
cv2.waitKey(0)
cv2.destroyAllWindows()
cv2.waitKey(1)
```

Sampling

- Positive Samples 435
- Negative Samples 3019
- Random data augmentation on 435 positives with 10 degree rotation in any direction making 4785 samples
- Image Dimensions of 25x32
- Trained Model 3 on 4375 out of 4785 samples

Models & parameters

- Used Model 3
- Computed with Acceptance Ratio Break Value of $10e-6$ and $4e-5$

$10e-6$

```
PARAMETERS:
cascadeDirName: classifier
vecFileName: samples.vec
bgFileName: negatives.txt
numPos: 4350
numNeg: 3000
numStages: 20
precalcValBufSize[Mb] : 1024
precalcIdxBufSize[Mb] : 1024
acceptanceRatioBreakValue :  $10e-06$ 
stageType: BOOST
featureType: HAAR
sampleWidth: 25
sampleHeight: 32
boostType: GAB
minHitRate: 0.999
maxFalseAlarmRate: 0.5
weightTrimRate: 0.95
maxDepth: 2
maxWeakCount: 100
mode: ALL
Number of unique features given windowSize [25,32] : 501437
```

$10e-6$

```
PARAMETERS:
cascadeDirName: classifier
vecFileName: samples.vec
bgFileName: negatives.txt
numPos: 4350
numNeg: 3000
numStages: 20
precalcValBufSize[Mb] : 1024
precalcIdxBufSize[Mb] : 1024
acceptanceRatioBreakValue :  $4e-05$ 
stageType: BOOST
featureType: HAAR
sampleWidth: 25
sampleHeight: 32
boostType: GAB
minHitRate: 0.999
maxFalseAlarmRate: 0.5
weightTrimRate: 0.95
maxDepth: 2
maxWeakCount: 100
mode: ALL
Number of unique features given windowSize [25,32] : 501437
```

Results

- Our best models were two variations of Model 3 with acceptanceRatioBreakValue's is set to $4e-5$ and $10e-6$ respectively
- Slight overfitting makes for better object detection model
- Our accuracy results are as follows:
 - For Model3_4e-5 with a training time of 13 hours and 29 Minutes
 - Hit Rate of 87.1%
 - False Alarm Rate of 34.6%
 - For Model3_10e-6 with training time of 16 hours and 58 Minutes
 - Hit Rate of 85.78%
 - False Alarm Rate of 53.53%

Significance of Attendance Counter

- Eliminates the need to take up valuable time for attendance
- Recognizes faces as an object