Attendance Counter

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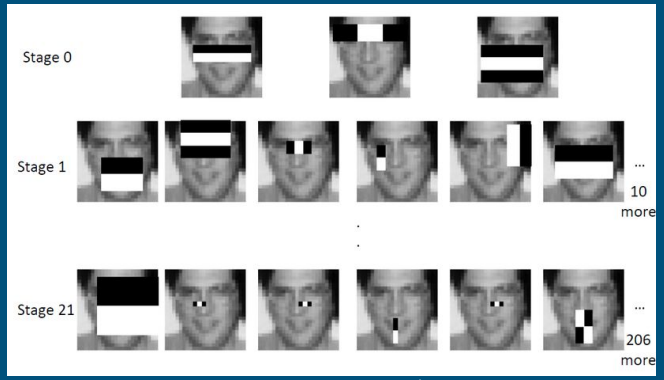
Taking Attendance

- 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

- Accesses the webcam feed
- Uses 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 {0} 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

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vecFileName: samples.vec
bgFileName: negatives.txt
numPos: 4350
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numStages: 20
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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 objects