Dog muzzle detection based on a cascade of Haar-like classifier

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Motivation

- Currently no trained dog detection classifier xml file available for others on Github

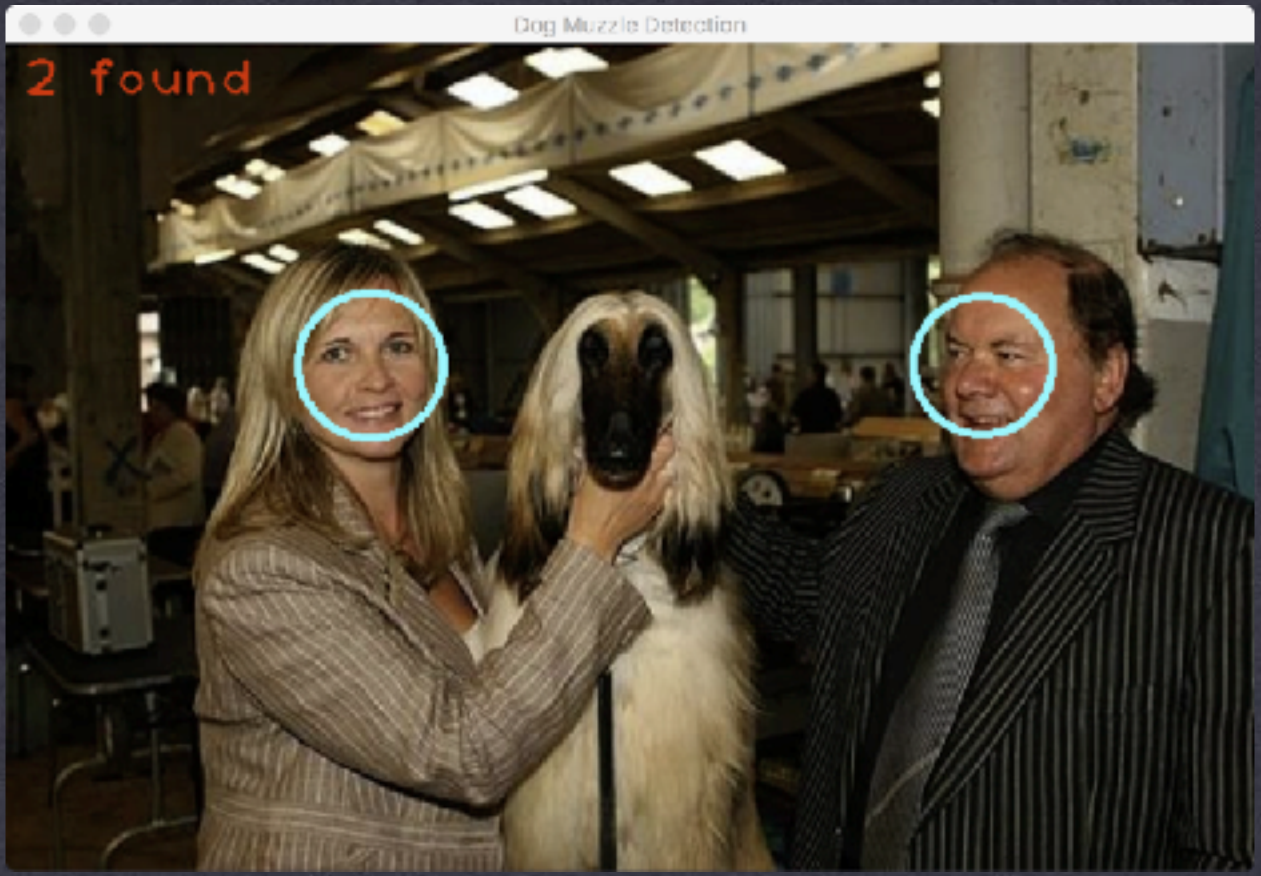
- To train a classifier that can detect dogs with different poses and expressions: frontal, profile and rotated faces

Outline

- Introduction
- Background
- Haar Classifier
- Methodology
- Testing & expected results
- Related works we have done

Introduction

- Tracking dog muzzle area——our project
- Face detection——hottest topic in resent years

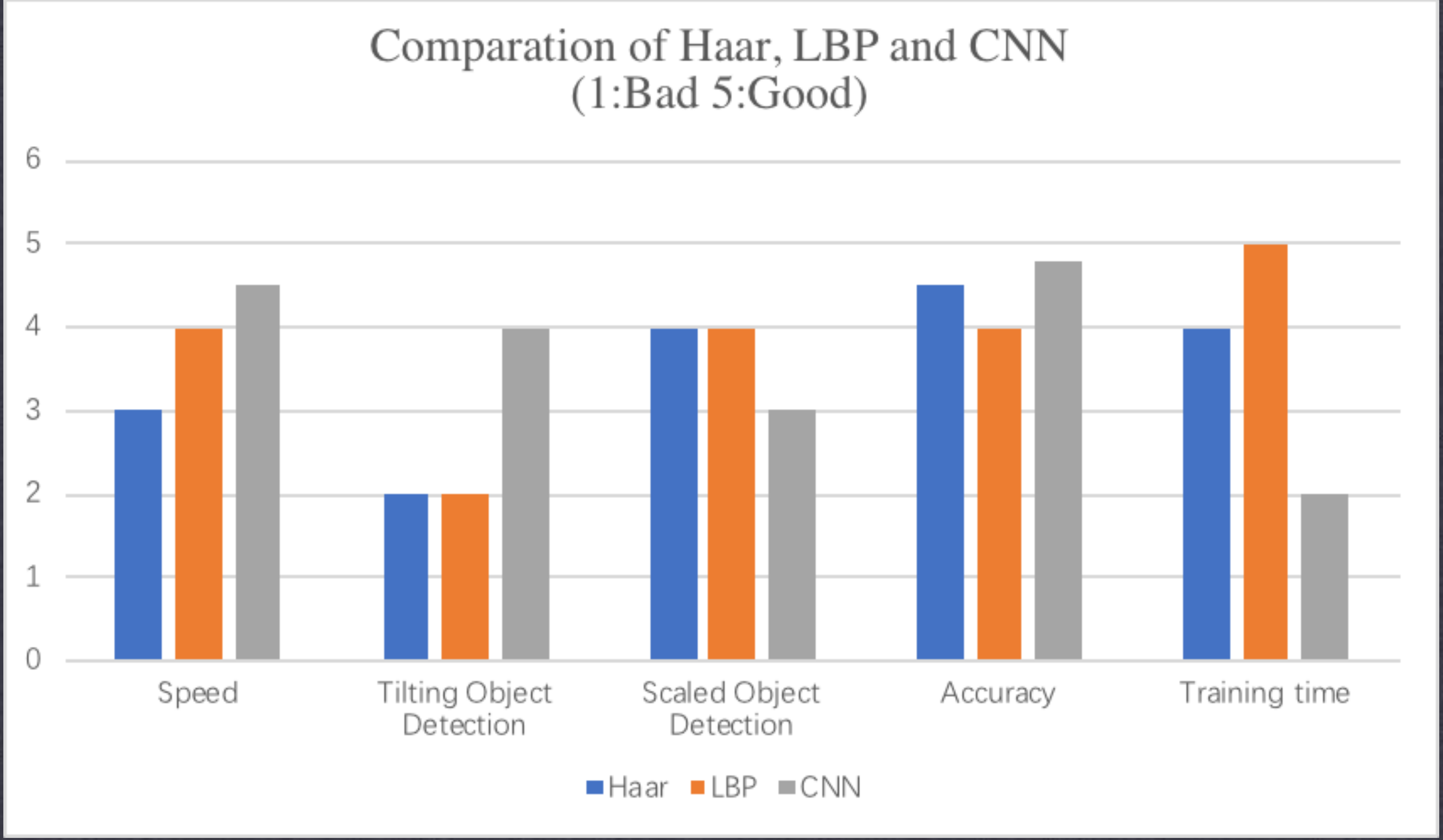


Background

- Comparison of three object detection classifiers
  - Haar
  - LBP
  - CNN

(LBP: Local Binary Pattern

CNN: Convolutional Neural Networks)

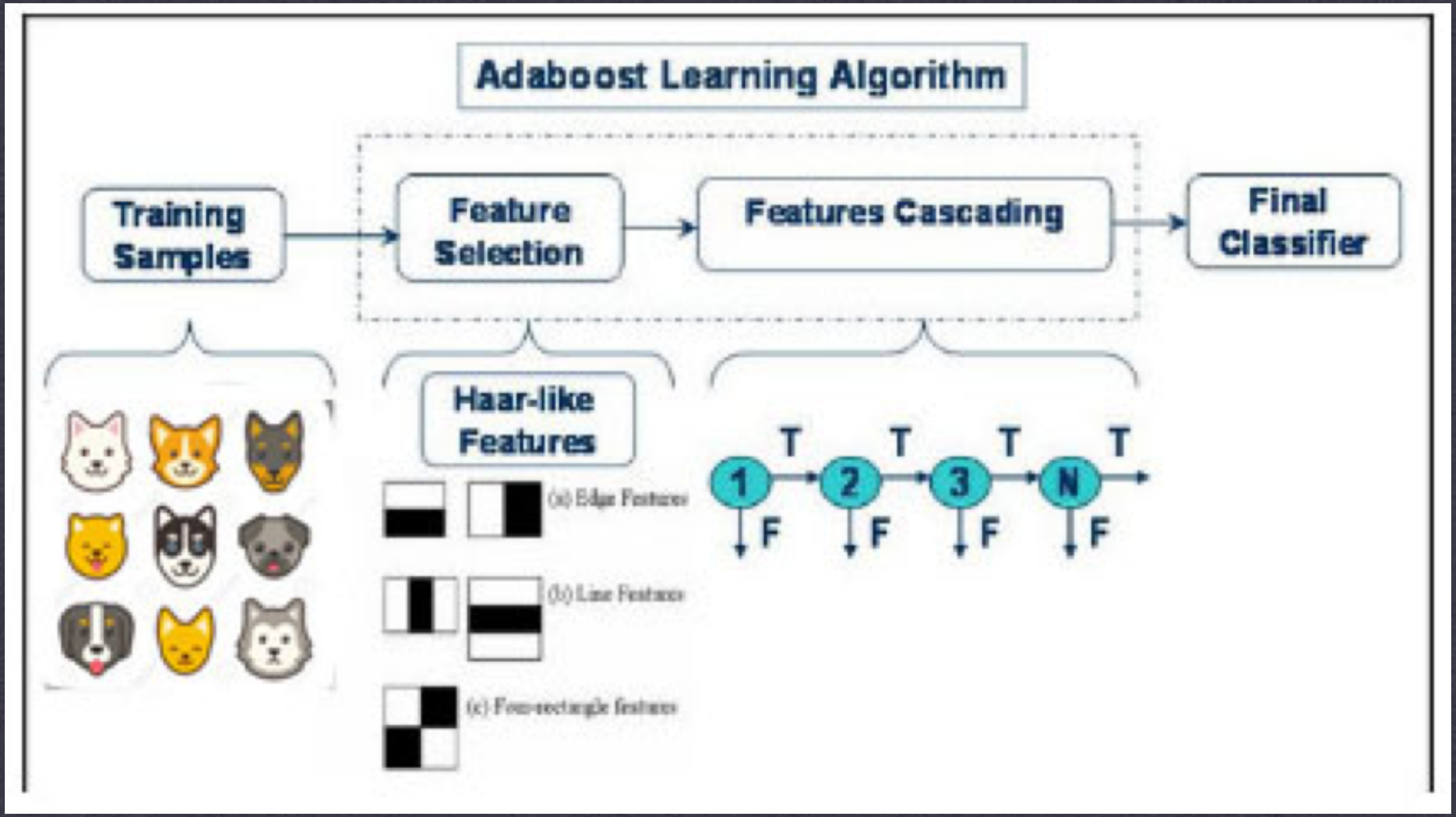


- Why haar? Has a better accuracy than LBP

  Although slightly slower and need more training time

Haar Classifier

The **Haar Classifier** is a machine learning based approach, an algorithm created by Paul Viola and Michael Jones, which is trained from positive images (with objects) and negatives images (without objects).

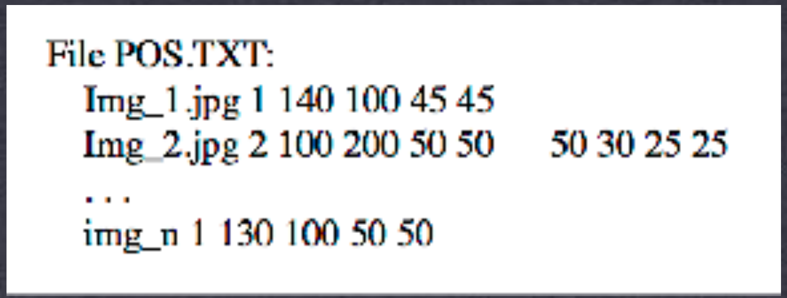


Methodology

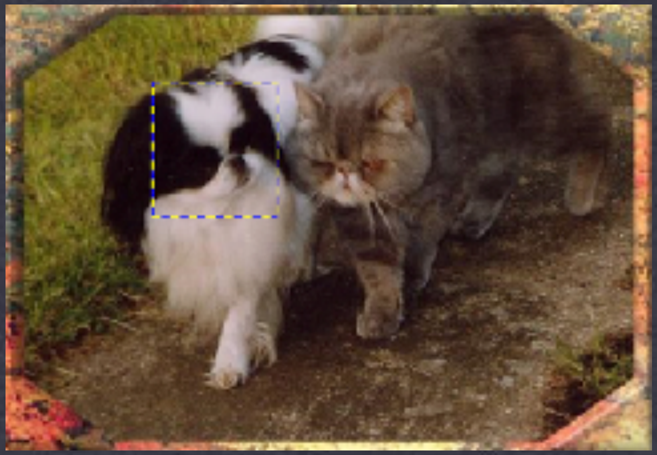
- Step 1: Collecting dog muzzle samples (positive images) and preprocessing
- Step 2: Collecting negative samples
- Step 3: Training Haar classifier
- Step 4: Coding
- Step 5: Testing

Methodology

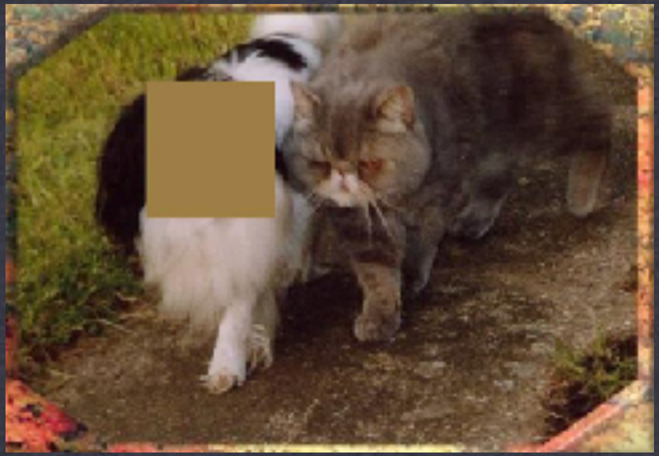
- Step 1: Collecting dog muzzle samples (positive images)-2000
  - Stanford Dogs Dataset:
    select 2000 images randomly
  - Outputting POS.TXT:



```
File POS.TXT:
   Img_1.jpg 1 140 100 45 45
   Img_2.jpg 2 100 200 50 50     50 30 25 25
   . . .
   img_n 1 130 100 50 50
```



- Step 2: Collect negative samples-4000
  - 2000 images from step1
  - 2000 images from a video without dogs



Methodology

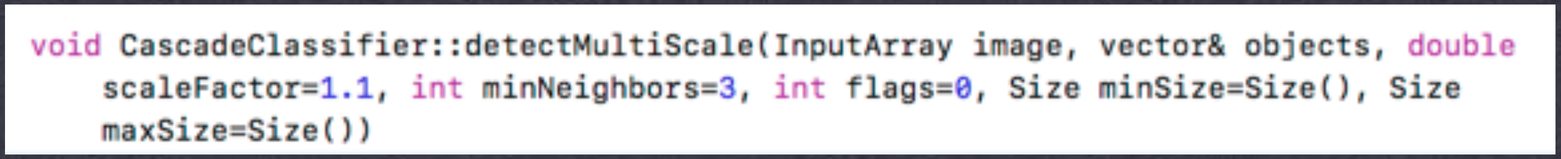
- Step 3: Training Haar classifier
  - Build a vector output file of the positive samples:

e:\ cascade\opencv_createsamples.exe -vec POS.VEC -info positives\POS.TXT -bg negatives\NEG.TXT -w 40 -h 40 -num 2000

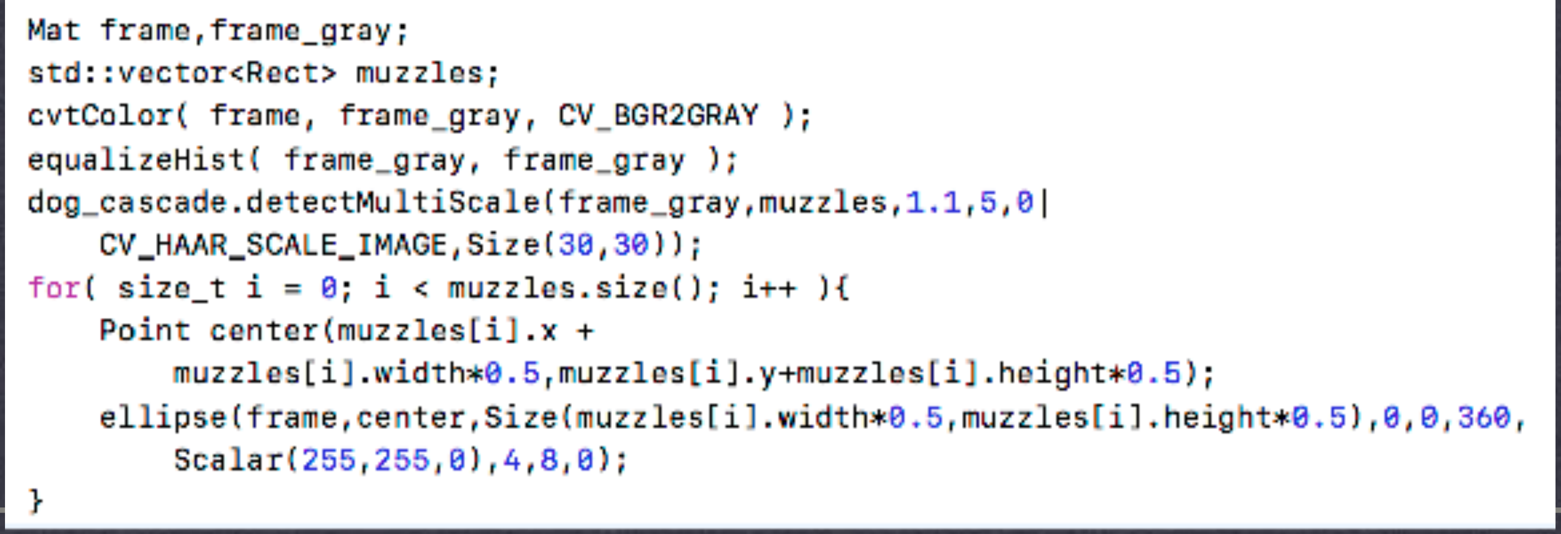
  - Create HAARCASCADE_DOG.XML file:

e:\cascade\opencv_traincascade.exe -data XML -vec POS.VEC -bg NEG.TXT -numPos 2000 -numNeg 4000 -numStages 12 -precalcValBufSize 1024 -precalcIdBufSize 1024 -w 40 -h 40 -mem 1024 -nonsym -mode ALL -maxFalseAlarmRate 0.5 -featureType HAAR

- Step 4: Coding



```
void CascadeClassifier::detectMultiScale(InputArray image, vector& objects, double
    scaleFactor=1.1, int minNeighbors=3, int flags=0, Size minSize=Size(), Size
    maxSize=Size())
```



```
Mat frame,frame_gray;
std::vector<Rect> muzzles;
cvtColor( frame, frame_gray, CV_BGR2GRAY );
equalizeHist( frame_gray, frame_gray );
dog_cascade.detectMultiScale(frame_gray,muzzles,1.1,5,0|
    CV_HAAR_SCALE_IMAGE,Size(30,30));
for( size_t i = 0; i < muzzles.size(); i++ ){
    Point center(muzzles[i].x +
        muzzles[i].width*0.5,muzzles[i].y+muzzles[i].height*0.5);
    ellipse(frame,center,Size(muzzles[i].width*0.5,muzzles[i].height*0.5),0,0,360,
        Scalar(255,255,0),4,8,0);
}
```

Testing & expected result

- Step 5: Testing
  - Experiment 1: Test on training dataset
  - Experiment 2: Test on testing dataset
  - Experiment 3: Test on video file or camera
- Results
  - 1: 100% accuracy on training dataset
  - 2: Goal above 90% accuracy
  - 3: fast enough with acceptable accuracy

Work we have done

- We have downloaded the Stanford Dog Datasets which contains of 20580 dog images, from where our 2000 positive images were chosen randomly.
- We are in the process of object annotation which is used for creating the positive file (POS.TXT) and VEC file.
- We have a code draft which works well on human face detection. When we finish training our classifier, it can work on dog detection.

References

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Thank you