

step 1: frame extraction

In []:

```
import cv2
import math
# input path to video
videoFile = str(input("Enter input to video:"))
# output path for frames
framesFolder = str(input("Enter output path for frames:"))
cap = cv2.VideoCapture(videoFile)
# find frame rate of video
frameRate = cap.get(5)
while cap.isOpened() :
#     current frame number
    frameId = cap.get(1)
    ret, frame = cap.read()
    if (ret != True) :
        break
    if int(frameId) % math.floor(frameRate) == 0 :
        filename = framesFolder + "/image_" + str(int(frameId)) + ".jpg"
#         cv2.imshow(filename, frame)
        cv2.imwrite(filename, frame)
cap.release()
print "Done!"
```

step 2.1: fetching captioning information and coordinate information from results to separate .json file

In [13]:

```
import json
import os
i = 0
for file1 in os.listdir('/Users/arin/Desktop/final_yr_project/frame_extract/citmor'):
    print(file1)
    s = json.load(open('/Users/arin/Desktop/final_yr_project/frame_extract/citmor' + file1))
#     print(s)
    for imginfo in s['results'] :
        json.dump(imginfo, open('/Users/arin/Desktop/final_yr_project/frame_extra' + file1 + '.json', 'w'))
    i = i + 1
```

results1.json
results2.json
results3.json
results4.json
results5.json

step 2.2 calculating (x1, y1) to (x4, y4) from x, y, h, w information

In [14]:

```
import os
i = 0
for file in os.listdir('/Users/arin/Desktop/final_yr_project/frame_extract/citmor
s = json.load(open('/Users/arin/Desktop/final_yr_project/frame_extract/citmor
l = []
for crd in s['boxes'] :
    x1, y1 = crd[0], crd[1]
    h, w = crd[2], crd[3]
#     print('x1:{} y1:{} h:{} w:{}'.format(x1, y1, h, w))
    x2, y2 = x1 + h, y1
    x3, y3 = x1 + h, y1 + w
    x4, y4 = x1, y1 + w
    t = (x1, y1, x2, y2, x3, x3, x4, y4)
#     print('x1:{} y1:{} x2:{} y2:{} x3:{} y3:{} x4:{} y4:{}\n'.format(x1,y1,
    l.append(t)
json.dump(l, open('/Users/arin/Desktop/final_yr_project/frame_extract/citmore
print(l)
print('-----')
i = i + 1
l = []
```

...

step 2.3 grouping boxes together for a particular object, save it in a separate file into
/Users/arin/Desktop/final_yr_project/frame_extract/citmore/grouping/{}

In [2]:

```
import os
import json
k = 0
for file in os.listdir('/Users/arin/Desktop/final_yr_project/frame_extract/citmor
    l = json.load(open('/Users/arin/Desktop/final_yr_project/frame_extract/citmor
    inclv = {}
    i = 0
    for crd in l[:]:
        j = 0
        temp = {}
        for test in l[:]:
            #         for complete inclusive boxes
            if (test[0]>=crd[0] and test[1]>=crd[1]) and (test[2]<=crd[2] and tes
                temp[j] = test
            #         for partly inclusive boxes
            elif (test[0] + 10 >= crd[0] and test[1] + 10 >= crd[1]) and (test[2]
                temp[j] = test
            j = j + 1
        if len(temp.keys()) == 0:
            inclv[i] = {}
        else :
            inclv[i] = temp
        i = i + 1
print(inclv)
print('-----')
json.dump(inclv, open('/Users/arin/Desktop/final_yr_project/frame_extract/cit
k = k + 1
```

...

step 2.4 grouping of captions **complete inclusive and partly inclusive updated**

In [3]:

```
import os
import json
x = 0
y = 1
g = 0
i = 0
cpt = {}
for file in os.listdir('/Users/arin/Desktop/final_yr_project/frame_extract/citmor'):
    l = json.load(open('/Users/arin/Desktop/final_yr_project/frame_extract/citmor' + file))
    if i == 2:
        i = 0
        y = y + 1
    r = json.load(open('/Users/arin/Desktop/final_yr_project/frame_extract/citmor' + file))
    c = r['results'][i]['captions']
    for key in l:
        cptlist = []
        for k in l[key].keys():
            t = {k:c[int(k)]}
            cptlist.append(t)
        cpt[str((key, c[int(key)]))] = cptlist
    i = i + 1
    print(cpt)
    print('-----')
    json.dump(cpt, open('/Users/arin/Desktop/final_yr_project/frame_extract/citmor' + file, 'w'))
    g = g + 1
```

...

step 3 create sentences

In [23]:

```
import os
import json
textsents = []
j = 0
x = 0
i = 0
while x <= 9:
    data = json.load(open('/Users/arin/Desktop/final_yr_project/frame_extract/citmor' + str(x) + '.json'))
    keylist = list(data.keys())
    i = 0
    while i < len(keylist):
        cap = list(data[keylist[i]])
        # print('#####cpt{}.json'.format(x))
        # print(cap, len(cap))

        if len(cap) > 1:
            capdict = dict()
            for num, items in enumerate(cap):
                for key in items.keys():
                    capdict[num] = items[key]
            text = set([capdict[key] for key in capdict.keys()])
            # print(text)
            # print('-----')
```

```

        mystring = ""
        for sen in list(text):
            mystring = mystring + sen + ". "
            textsent.insert(j, str(mystring))
            j = j + 1
#         else:
#             print("not added")

        i = i + 1
        x = x + 1
# print (list(set(textsent))[1], len(set(textsent)),type(textsent), type(textsent))
for item in list(set(textsent)) :
    print(item)
    print('-----')
json.dump(list(set(textsent)),open('/Users/arin/Desktop/final_yr_project/frame_ex

```

a man wearing a black shirt. man wearing a black shirt.

a building with a yellow roof. a white car in the background. a white building with a red roof. a sign on the building. a white sign on the side of the road. a light pole in the background. a sign on a building.

blue and white bus. a man walking on the sidewalk. window on a bus. the bus has a white stripe. the bus has a black stripe. a bus. a bus on the side of the road. windows on the bus. windows on the side of the bus. the bus is black. the bus is blue. the bus has a yellow stripe. a building in the background. a blue and white building. the bus is blue and white.

a light on a pole. a tree in the distance. a light pole. a green tree in the distance. a tall pole in the distance. a light pole in the background. a blue and white sign. a tall light pole. a blue and white building.

a green tree in the background. the person is wearing a black shirt. a hand holding a cell phone. man riding bicycle. a red and white building. a light pole on the sidewalk. the tire is black. a tennis court. the top of the bus. a tennis player. a man wearing a hat. a man on a bus. a sign on the side of the building. a tall building. statue of a man on a building. people walking on the sidewalk. the man is wearing black pants. the shirt is pink. bus on the street. a man in a red shirt. a large white building. a sign on a building. a sign on a pole. man wearing a blue shirt. a bike on the sidewalk. a man walking on the sidewalk. man wearing a red shirt. a white sign on the sidewalk. man in yellow shirt. a sign on the wall. a white sign on a building. the bike is black. people standing on the sidewalk. a man in a blue shirt. a window on a bus. a sign on the building. windows on the bus. the road is grey. the ground is white. a silver knife. a white wall. blue and white sign on pole. a man in a black shirt. a man wearing a black hat. a man wearing a blue shirt. yellow and black bus. a man on a bike. a tall white building. woman wearing a green shirt. a green and white sign. white snow on the ground.

a fence on the side of the road. a blue and white sign. a fence in the background.

a green tree in the background. a green tree in the distance. a tall green tree.

a building with a lot of windows. a tree in the distance. a yellow pole. a tall green tree. a light pole. a white building with a red roof. a red and white sign. a tall tree in the distance. blue and white sign on building. a man wearing a hat. a man in a red shirt. a blue and white sign. a street light. blue and white bus. yellow top of building. a yellow and black sign. green trees in the background. a sign on the building. a fence in the background. trees in the background. a light pole in the background. a yellow and white building. a tall light pole. blue and white sign on the side of the road. a green and white sign.

a light pole in the background. a telephone pole. a tall green tree. power lines on the pole.

a tree in the distance. a white bus. white clouds in blue sky. a tall green tree. a light pole. a white building with a red roof. a car in the street. a tall tree in the distance. a blue and white building. green leaves on trees. power lines in the sky. a light on a pole. a building with a yellow roof. a white car in the background. a green tree in the distance. a sign on a building. a blue and white sign. a tree in the background. a sign on the building. a white sign on the side of the road. a street light on a pole. trees in the background. a tree with green leaves. a white building in the background. a tall pole in the distance. a white building with a green roof. a yellow street light. a light pole in the background. a tall light pole.

blue and white sign on building. a man wearing a hat. a yellow and white building. a yellow and black sign. a sign on the building. a man in a red shirt. a red and white sign. blue and white sign on the side of the road. blue and white bus.

a bus window. the roof of the train.

yellow and black sign on the train. yellow and black sign. window on a bus.

a green tree in the background. window on the bus. trees in the background. a yellow and black bus. the bus has a windshield. the number <UNK> on the front of the bus. the windshield of a bus. yellow and black license plate.

a bus window. windows on the bus. window on a bus. a window on a train.

windows on the building.

white line on the road. a white car on the road. white lines on the road.

a fence on the side of the road. a fence in the background. a tree in the distance. a tall green tree. a white plastic container. a light pole. a green tree in the distance. a light post. a light pole in the background. a white car on the road. a blue and white sign.

a white door on the bus. a bus stop sign. window on a bus. a man standing in the bus.

lights on the front of the bus. license plate on the truck. the bike is black. license plate on the front of the bus. a wheel on a truck. front wheel of a truck.

window on the building. windows on the building. window on a building. a white building in the background. a tree in the background. a street light on a pole.

window on the bus. a blue and white bus. blue and white sign. windows on the bus. a bus on the road. the bus is blue. the windshield of a bus. blue and white bus.

a bus on the road. the bus is white. the bus has a window. windows on the bus.

a street light. a man wearing a hat.

a tree in the background. a street light on a pole.

a tall tree in the distance. a light pole.

a sign on the side of the building. a white building with a red roof. yellow and black sign. a sign on the sidewalk.

the person is wearing a black shirt. man wearing a red shirt. a hand holding a cell phone. the bike is black. a man in a blue shirt. the shirt is pink. the tire is black. man wearing a blue shirt.

bus number <UNK>. the bus is number.

white van parked on the street. blue and white bus. a white van on the street.

windows on the bus.

a tree in the distance. a white sign on the sidewalk. a man wearing a black shirt. a man with a black shirt. a blue sign with white lettering. a sign on the building. a tall white building. a street light. street light on pole. a street sign on a pole.

blue car parked on the side of the road. a blue car on the road. a wheel on a truck. blue car on the road. the side mirror on the truck. front wheel of a truck.

trees in the background. a white pole.

a green tree in the background. a building with a red roof. a fence in the background. a sign on the side of the building. white clouds in blue sky. a green tree in the distance. green trees in the background. a yellow bus. a black and white sign. green leaves on tree. a yellow and white building. a car parked on the street. a tall light pole. a green and white sign. a street light on a pole.

a window on a bus. a man wearing a hat. a large white building.

a man wearing a green shirt. the bus has a white stripe. the bus is yellow. woman wearing a brown shirt. yellow and black bus. man wearing a blue shirt.

a bus window. window on a bus. window on the bus.

a fence in the background. a blue and white sign. a green and white sign.

a green tree in the background. white clouds in blue sky. a tall green tree. a light pole. green leaves on tree. a green and white sign.

the bus is red. the shadow of the bus.

window on a bus. windows on the building. a red and white building. a building with windows. a white building with a red roof. windows on the side of the bus. a bus on the road. the bus is blue. a red and white sign. a red and white shirt. a blue and white building. a building with a window.

a car on the road. a fence in the background. a white car parked on the street. a light pole. a light pole in the background. a blue car parked on the street. a blue and white sign.

a white car on the road. a black tire on a car. a car in the street.

the bus is yellow. the bus has a white stripe. windows on the bus. the bus is blue.

a white car in the street. a car on the road. white line on road. front wheel of a car. a wheel on a car. a white car parked on the street. a white car in the road. the tire is black. a window on a car. the side mirror on the car. a white car on the road. a blue and white sign. window on a car. white car parked on street.

the windshield of a bus. the bus has a windshield.

a white car on the road. a white van parked on the street. a wheel on a car.

a blue and white bus. the front of a car. the front of a truck.

a wheel on a truck. the front wheel of a truck. front wheel of a truck.

a green tree in the background. a green bush. a tall street light. a light pole on the sidewalk. a man wearing a hat. a black motorcycle. people walking on the sidewalk. a green tree in the distance. a man in a red shirt. a red brick building. a pocket on a shirt. a sign on a pole. a green shirt on the man. a motorcycle parked on the street. a white motorcycle. a white sign on the sidewalk. trees on the sidewalk. the road is grey. a red and white traffic light. a man in a black shirt. a building with many windows. a tall white building. a man on a bike. people on the sidewalk.

a white car in the street. a yellow and blue bus. a tree in the distance.

ance. a tall street light. a yellow bus. a white building with a red roof. the bus is blue. a green and white bus. yellow and black sign. a sign on the side of the building. the windshield on the bus. the window on the train. a man walking on the sidewalk. a wheel on a car. the bus is white. a sign on the side of the road. a tree in the background. windows on the bus. a white sign on the side of the road. a wheel on a truck. yellow sign on the pole. a sign on the sidewalk. windows on the building. the bus is green. a large building with a green roof. a yellow building. green leaves on tree. a tall building with a white roof. a white car on the road. a white van parked on the street. a street sign on a pole.

a building with a white roof. windows on the building. blue and white sign. a light pole. a tree in the background. a white building with a green roof. a large white building. a building in the background. a street light on a pole. a window on a building. blue and white bus.

a light pole in the background. a light pole.

a car on the road. white line on road. front wheel of a car. white lines on the road. the tire is black. a black and white sign.

a yellow building. windows on the building.

a building with a white roof. yellow and black sign. a tall building. a yellow and white sign. a yellow and black bus. a tree in the background. a man in a black shirt. a yellow and black sign. yellow bus on road. a yellow bus. a white building with a large windows. a building in the background. yellow and black bus. a white building with a red roof. a man wearing a red shirt. a yellow building. yellow sign on the pole. the head of a man. a window on a building.

power lines on the pole. power lines above the train. white clouds in blue sky. a tall green tree. a tree in the background. a light pole. a telephone pole. a light pole in the background. power lines in the sky.

yellow and black sign. window on a bus. the number <UNK> on the bus. the bus has a windshield. the number <UNK> on the front of the bus.

yellow bus on road. a yellow bus. yellow and black bus.

a red and white sign. statue of a building. a white and blue flag. a statue on the building.

a white car on the road. a wheel on a car.

a blue and white sign. a tall green tree. a light pole.

the bus has a white stripe. a man wearing a black shirt.

a man wearing a hat. the bus has a white stripe. a blue and white bus. a blue sign on the building. blue and white sign. a man wearing a black hat. the windshield on the bus. a green and white flag. head of a person. a green and white shirt. the bus is blue. a person wearing a green shirt. a street light. a man standing on a bench.

a white car on the road. a fence on the side of the road. a white plastic container.

a tree in the background. a light pole.

man with black hair. the elephant has a large ear. man wearing a hat .

a man wearing a hat. windows on the building. a blue sign on the building. blue and white sign. a tall street light. a white building. a building with windows. the window on the train. a street light. a building with a blue roof. a window on a building. a street sign on a pole. a man standing on a bench.

white clouds in blue sky. a telephone pole. a tall light pole. a tall pole in the background. power lines in the sky.

a wheel on a bus. the tire is red.

a wheel on a truck. blue door on truck. the door of a truck. a white sign on the building. the wheel of a bus.

a blue and white sign. a blue and white building. a fence in the background.

a building with a red roof. the bus is white. the bus has a window. windows on the bus. blue and yellow bus. a bus on the road. the bus is blue. a white car on the road. a blue and white sign. a window on a building.

a silver knife. the tire is black. the person is wearing a black shirt. the bike is black.

a man wearing a hat. windows on the building. a man on a bus. a white sign on a building. a white building with a window. a window on a bus. a sign on the building. windows on the bus. a large white building. a tall white building. the top of the bus. a sign on a building . a window on a building. a white building with windows.

a window on a building.

a window on a building. windows on the building.

a white car in the street. blue truck with yellow writing. the front wheel of a truck. a side view mirror. blue truck with white stripe. a green and white bus. a blue and white building. blue car parked on the side of the road. a sign on the side of the building. blue door on truck. yellow and white top of the building. a blue car on the road. the wheel of a bus. a wheel on a car. a sign on the side of the bus. a white sign on the side of the road. the door of a truck. a white sign on the building. a wheel on a truck. yellow sign on the pole. the side mirror on the truck. a blue car in the background. a white car on the road. blue car on the road. a white van parked on the street. front wheel of a truck.

a car on the road. a large blue sign. a blue and white car. a yellow

and black bus. a light pole. a yellow bus. a green sign on the wall. a white building with a large windows. a white building with a red roof. a large building with many windows. the bus is blue. a red and white sign. a shadow on the ground. yellow and black sign. a man wearing a hat. a yellow and black train. a tall building. statue of a man on a building. people walking on the sidewalk. the bus has a windshield. bus number <UNK>. a tall building with a yellow roof. yellow bus on road. a building in the background. a blue and white sign. license plate on the bus. a window on a building. a white sign on the sidewalk. the bus has a white stripe. a man wearing a black shirt. a tree in the background. a man standing on a building. a yellow and black sign. a man in a blue shirt. a white sign on the side of the road. a bus on the road. a white sign on the building. yellow sign on the pole. man walking on street. a white sign on a pole. a street light on a pole. a building with a white roof. windows on the building. the sign is blue. a yellow and white sign. the head of a person. a man in a black shirt. a bus. a building with many windows. a man wearing a blue shirt. white building with windows. a man with a black hair. yellow and black bus. a yellow car on the road. a yellow building. a man wearing a red shirt. the head of a man.

a man wearing a blue shirt. green and white sign. man standing on sidewalk. a white line on the road.

top of the building. a yellow and white sign. a tree in the background. a light pole. a green tree in the distance. a building in the background.

yellow and black sign. lights on the front of the bus. yellow sign on the bus. the tire is black. the bus has a number. front wheel of a truck.

the bus has a white stripe. windows on the side of the bus. window on a bus. the bus has a yellow stripe.

a green tree in the background. a tree in the distance. a white sign on the sidewalk. a light pole. a white car in the background. a green tree in the distance. a car in the background. power lines above the street. a tall street light. a tall tree in the distance. a light pole in the background. a street light.

a white van on the street. a motorcycle on the road. white van parked on the street. a man in a blue shirt. a white car. a man in a red shirt. man wearing black helmet. a man on a motorcycle. a white car on the road. a blue and white sign. a white van parked on the street.

blue and white sign on building. a white van on the street. a yellow pole. white van parked on the street. a white building with a red roof. a sign on the building. a man on a motorcycle. a white car on the road. a street light. a white van parked on the street. blue and white sign on the side of the road. blue and white bus. a tall light pole.

a light post. a light pole.

a wheel on a truck. front wheel of a truck.

a wheel on a truck. white lines on the road. a wheel on a car. the bus is white. a white car on the road.

a green bottle on the man. green bottle on the ground. a woman wearing a white shirt.

a fence on the side of the road. a fence in the background. a white plastic container.

a fence in the background. a white sign on the sidewalk. a white line on the road. people walking on the sidewalk. a white car in the background. a green tree in the distance. a car in the background. a blue and white sign.

green leaves on tree. a tree in the background.

blue and white sign on building. a white building with a red roof. a sign on the building. blue and white sign on the side of the road.

yellow and black sign. a sign on the side of the building. a tall street light. the window on the train. windows on the bus. a yellow building. yellow sign on the pole.

a white sign on the building. bus number <UNK>. statue of a man on a building.

a man wearing a black shirt. the man is wearing jeans. man wearing black shirt.

a man wearing a black hat. windows on the bus. a tall white building. yellow and black bus. the top of the bus. woman wearing a green shirt.

a white car in the street. white car parked on street.

a building with a red roof. window on a bus. window on the bus. windows on the building. the bus is white. the roof of the train. the bus has a window. a light pole. a window on a bus. a bus window. a white building with a red roof. white clouds in blue sky. windows on the bus. trees behind the train. the top of the bus. the top of a train. a blue and white sign. a window on a building. a window on a train.

a blue and white sign. a blue and white building. a white sign on the side of the road. a white line on the road.

a man wearing a blue shirt. a green sign on the wall. the head of a man.

a blue car. a blue and white car. blue and white bus.

white clouds in blue sky. a tree in the distance.

cars parked on the street. a car on the road. a white sign on the sidewalk. the bike is black. people standing on the sidewalk. a white car in the background. a white car. white car parked on the street.

a car in the street. a person walking on the sidewalk. a white car on the road. the road is grey.

white clouds in blue sky. a tree in the background.

a red and white traffic light. a white sign on the sidewalk. a sign on a pole. a man in a red shirt.

a sign on the sidewalk. a white house in the background. a car on the road. people walking on the sidewalk. a white car in the background. a building in the distance. a white car. white car parked on the street. a sign on the building. a car in the street. a person walking on the sidewalk. a red and white sign. a person walking on the street. a sign on a pole. the road is grey. a white sign on a pole. a street light on a pole.

man wearing black shoes. green and white sign. a man walking on the sidewalk. man wearing black shirt. a man wearing a black shirt. a man wearing a blue shirt. a white and blue flag. man wearing a black shirt. the man is wearing jeans. a red and white sign. a blue and white building. a green and white sign.

a building with a white roof. the truck is white. yellow and black sign. a wheel on a truck. a sign on the side of the building. a blue and white car. a green and white sign. a bus. a yellow bus. a street light. the bus is black. a white car on the road. a car parked on the street. a tall light pole. a blue car. a blue truck. blue and white bus.

license plate on the car. a fence on the side of the road. a green tree in the background. a tree in the distance. a sign on the pole. license plate on the truck. white clouds in blue sky. a tall green tree. a light pole. the bus has a number on it. a telephone pole. a white boat in the background. a sign on the bus. power lines in the sky. the bus is red. a man wearing a helmet. a light on a pole. the water is calm. the road is wet. window on the bus. the front wheel of a car. the bus has a windshield. a green tree in the distance. the bus is yellow. a blue and white sign. street light on pole. a motorcycle parked on the street. a large green tree. a person in the background. a white line on the ground. people standing on the sidewalk. a tree in the background. a sign on the building. a bus on the road. a light pole in the background. a motorcycle on the road. yellow and black license plate. a fence in the background. trees in the background. the bike has a black tire. a black and white bike. a man in a black shirt. green leaves on tree. a white and blue sign. a man on a motorcycle. a white car on the road. a tall light pole. a green and white sign.

a yellow and blue bus. a man walking on the sidewalk. the bus has a white stripe. the windshield on the bus. the bus is green. a yellow bus. the window on the train. windows on the bus. a white building with a red roof. the bus is blue.

a window on a car. the side mirror on the car.

a white car in the street. top of the building. a car on the road. a yellow and white sign. a blue and white car. a yellow and black sign

. yellow bus on road. a yellow bus. a yellow street sign. a building in the background. yellow and black bus. a yellow car on the road. a white sign on the side of the road. a car in the street. a white car on the road. a black tire on a car. front tire of a car.

a red and white sign. a light pole.

a tall white building. a window on a building.

the bus is red. a person in the background. a tree in the background . the bus has a windshield. a sign on the building. green leaves on tree. the bus has a number on it. a sign on the bus.

head of a person. a green jacket on the woman. a green and white shirt. a person in a green shirt.

power lines above the train. a light on a pole. white clouds in blue sky.

a fence on the side of the road. a man wearing a helmet. a car on the road. a fence in the background. a white line on the ground. a man wearing a black shirt. a man on a motorcycle. a white car on the road. a blue and white sign. a white boat in the background. a green and white sign.

a white car in the road. the front of a truck. the front of a car. white lines on the road.

a blue and white sign. a fence in the background.

the bus is yellow. the word <UNK> on the side of the bus.

white clouds in blue sky. a light pole. a telephone pole.

a white car in the street. white line on road. a building with a yellow roof. a wheel on a car. a white car in the road. white lines on the road. a blue and white bus. the front of a car. a sign on the building. the front of a truck. a white sign on the side of the road. a yellow street light. a black car on the road. a car in the street. a white car on the road. a sign on a building. window on a car. white car parked on street. a car parked on the street. part of a road.

a white sign on the building. a white sign on the sidewalk. a tall building.

a blue and white building. a window on a bus. windows on the bus.

a green tree in the background. a tree in the distance. window on a building. white clouds in blue sky. a tall green tree. a red and white building. a white building with a red roof. windows on the side of the bus. the bus is blue. a light post. a blue and white building. window on the building. yellow and black sign. a green tree in the distance. a building in the background. a street light. a building with a red roof. a tree in the background. a street light on a pole. a building with a white roof. windows on the building. trees in the background. a white building in the background. a building with many windows. a building with windows. green leaves on tree. a yellow and

white building. a building with a window.

a white sign on the sidewalk.

yellow sign on the bus. window on a bus.

a green tree in the background. a man wearing a helmet. a fence in the background. a light pole. a blue and white sign.

the bus is red. window on a bus. the word <UNK> on the side of the bus. window on the bus. red and white bus. the bus has a window. the tire is black. the bus is yellow. windows on the bus. the bus is black. the top of the bus. the top of a train. the wheel of a bus. a window on a train.

a light on a pole. a car on the road. a fence in the background. a tree in the distance. a man wearing a black shirt. a tall green tree. people standing on the sidewalk. a light pole. a white car in the background. a green tree in the distance. a street light. a white and blue sign. a light pole in the background. a white car on the road. a blue and white sign. a white boat in the background. street light on pole. a tall light pole.

a light on a pole. a street light. white clouds in blue sky. street light on pole.

a white car in the street. a white sign on the side of the road.

a tree in the distance. a window on a building. a white building. windows on the building.

man with black hair. a man walking on the sidewalk. a tree in the distance. a sign on the pole. a white sign on the pole. a white sign on the sidewalk. a man walking down the street. a man in a black shirt. a tall street light. a white line on the road. a sign on the building. a man in a red shirt. a street light.

a person wearing a green shirt. head of a person.

top of the building. a building in the background.

a green tree in the background. a white house in the background. trees in the background. a white sign on the sidewalk. a white pole. people standing on the sidewalk. a tall street light. a light pole. a green tree in the distance. a building in the distance. white car parked on the street. a car in the street.

man wearing a black shirt. a man wearing a black shirt.

a red and white sign. a sign on the building. people walking on the sidewalk.

a white car in the street. a white bus. a blue and white bus. a blue and white car. a sign on the building. windows on the bus. a white sign on the side of the road. a bus on the road.

white car parked on the street. a car on the road. a car in the street

et.

a statue on the building. windows on the building. the bus is green. bus number <UNK>. a white building with a red roof. a sign on the building. the bus is number. a window on a building. a white building with windows.

a white car on the road. a black tire on a car. front tire of a car. a blue and white car.

white clouds in blue sky. a white building in the background.

a red and white sign. white car parked on the street.

a man walking on the sidewalk. the bus has a white stripe. a red and white building. a man wearing a white shirt. a bus on the road. the bus is blue. a red and white sign. a red and white shirt. man wearing white shirt.

windows on the building. the sign is blue. a tall building. bus number <UNK>. a white building with a red roof. a building in the background. a window on a building.

a tree in the distance. a tree in the background. yellow taxi cab. a building in the background. yellow and black bus. a bus on the road. a street light. a bus on the street.

a tree in the background. a window on a building. a street light on a pole. a light pole.

a man walking on the sidewalk. a fence in the background. white line on the road. a person wearing a helmet. a man wearing a black shirt. a man walking down the street. a man in a black shirt. people walking on the sidewalk. the wheel of a motorcycle. a white line on the road. a car in the background. a man on a bike. a blue and white sign.

yellow taxi cab. a blue car parked on the street. yellow car on the road.

a light pole on the sidewalk. a green tree in the background. a green bush. a man wearing a hat.

a statue on the building. a building with a lot of windows. statue of a building. a tall building. a red and white building. a light pole. a white building with a red roof. a white sign on the building. a red and white sign. a window on a building. a white building with windows.

windows on the building. a tall building. a white building with a window. statue of a man on a building. a window on a building. a white building with windows.

a green tree in the background. a tree in the distance. a sign on the pole. a man walking down the street. a tall green tree. a light pole. a tall street light. a white car. a red and white sign. a tall tree in the distance. man wearing a hat. man with black hair. a man wearing a hat. the elephant has a large ear. a man with a black hat.

the wheel of a motorcycle. people walking on the sidewalk. a white car in the background. a road with a lot of people. a green tree in the distance. a man in a red shirt. a large white sign. a blue and white sign. a street light. a man walking on the sidewalk. white line on the road. a white sign on the sidewalk. a sign on the wall. a man wearing a black shirt. a sign on the side of the road. a white line on the road. a yellow and black sign. green trees in the background. a sign on the building. man wearing black helmet. a light pole in the background. a motorcycle on the road. a fence in the background. trees in the background. a white sign on the pole. a person wearing a helmet. a man in a black shirt. a car in the background. power lines above the street. a man on a bike. a man on a motorcycle. a yellow and white building. a green and white sign. man with a black shirt.

a man wearing a hat. a white sign on the sidewalk. a man wearing a black shirt. statue of a man on a building. a man standing on a building. a building with many windows. a blue and white sign. a green sign on the wall. a white sign on a pole. a street light on a pole.

a building with a red roof. blue and white sign on pole. a white sign on the sidewalk. a tall building. statue of a man on a building. a man wearing a blue shirt. a white building with a red roof. a large building with a red roof. a tall white building. a green and white sign. a street light on a pole.

a yellow and black train. the bus has a white stripe. the bus has a windshield. bus number <UNK>. a bus on the road. the bus is blue.

a white car in the street. a wheel on a car. a white car in the road. a white sign on the side of the road. a car in the street. a white car on the road. white car parked on street.

license plate on the car. a man wearing a helmet. a person in the background. the front wheel of a car. a motorcycle parked on the street. license plate on the truck. the bus is yellow. a man on a motorcycle. yellow and black license plate.

a green bottle on the man. a yellow and black train. the head of a person. a man with a black hair. a green and white shirt. the head of a man.

the tire is black. front wheel of a truck.

blue and white sign. a tall street light.

a man wearing a blue shirt. a woman wearing a brown shirt. a man in a blue shirt. a white line on the ground.

the wheel of a bus. the number <UNK> on the bus. the word <UNK> on the side of the bus.

a car on the road. a tree in the distance. a white sign on the sidewalk. a man wearing a black shirt. a tall green tree. people standing on the sidewalk. a white car in the background. a blue and white sign.

a green tree in the background. yellow sign on the bus. the number <

UNK> on the bus. a yellow and black bus. a tall green tree. a light pole. white clouds in blue sky. a yellow bus. the roof of a building . the number <UNK> on the front of the bus. a telephone pole. the windshield of a bus. the bus has a number. power lines in the sky. yellow and black sign. window on the bus. the bus has a windshield. a green tree in the distance. bus doors on the side of the road. a building in the background. license plate on the front of the bus. a bus stop. a window on a building. window on a bus. power lines above the train. a white sign on the sidewalk. the bike is black. a window on a bus. a yellow and black sign. a tree in the background. windows on the bus. a bus number. a wheel on a truck. yellow and black license plate. power lines on the pole. trees in the background. lights on the front of the bus. a white pole. white building with windows. a light pole in the background.

bus number <UNK>. a window on a building.

a man wearing a blue shirt. a green sign on the wall. a man wearing a hat. the head of a man.

green and white sign. a statue on the building. a white sign on the sidewalk. statue of a building. a man with a hat. a light pole. a man in a red shirt. a white and blue flag. a woman wearing a blue shirt. a white sign on the building. a blue and white sign.

a car on the road. the elephant has a black tail. the bike has a black tire. a white sign on the sidewalk. a man wearing a black shirt. a man with a black shirt. the bike is black. man wearing a white shirt. a man wearing a white shirt. a man wearing a blue shirt. head of a person. man wearing a black shirt. man wearing black helmet. the leg of a person. man with a black shirt.

a man wearing a blue shirt. a man wearing a black shirt. a car on the road. man wearing a black shirt.

a tall green tree.

a black shirt on a woman. a blue and white bus.

a shadow on the ground. a man wearing a hat. a white line on the ground. a white sign on the sidewalk. a man wearing a black shirt. a man walking down the street. people walking on the sidewalk. a man wearing a blue shirt. a red and white sign. a blue and white sign. man walking on street.

a white car in the background. a green tree in the distance. a green tree in the background.

man wearing black shoes. a man wearing a green shirt. man wearing black shirt. a white car on the road. a blue and white bus. a man wearing a black shirt. man riding a bicycle. the bike is black. a white line on the road. a black shirt on a woman. woman wearing a brown shirt. white car on road. the man is wearing jeans. the wheel of a bike. the woman is wearing a shirt. a blue car parked on the street.

the tire is black. the bike is black.

a green tree in the distance. a tree in the distance.

windows on side of bus. the number <UNK> on the bus. white clouds in blue sky. top of the bus. a white door on the bus. a wheel on a bus. yellow and black sign on the bus. the bus is red. a light on a pole. yellow and black sign on the train. yellow and black sign. a white and black bus. window on the bus. the bus is yellow. the tire is red. window on a bus. a man standing in the bus. power lines above the train. a bus window. windows on the bus. a black and white plate.

white clouds in blue sky. power lines in the sky.

a green tree in the background. a tall light pole.

a light pole in the background. yellow top of building. a white building with a red roof. a sign on the building.

a white car in the street. a car on the road. front wheel of a car. a tree in the distance. a white car in the road. a silver car on the road. a white bus. a blue and white car. a light pole. the tire is black. a white car. a window on a car. a white building with a red roof. a black car on the road. a car in the street. a blue and white truck. a blue and white building. a building with a yellow roof. window on the bus. the front of a car. yellow pole on the street. a white car in the background. a building in the background. the side mirror on the car. a blue car parked on the street. a blue and white sign. a sign on a building. blue and white bus. part of a road. a wheel on a car. white lines on the road. the bus is white. a white line on the road. a black and white sign. a sign on the building. windows on the bus. a bus on the road. a white sign on the side of the road. a building with a white roof. a fence in the background. a white car parked on the street. the front of a motorcycle. trees in the background. white line on road. a blue and white bus. a white building in the background. a tall pole in the distance. the front of a truck. a yellow street light. a light pole in the background. a white car on the road. window on a car. white car parked on street. a car parked on the street.

the bus is number. the bus is blue. the windshield of a bus. a bus on the street. the bus has a windshield. yellow taxi cab. bus number <UNK>. the bus is yellow. a window on a building. the bus has a white stripe. a window on a bus. a tree in the background. a bus window. windows on the bus. a bus on the road. yellow van on the street. the bus has a window. a bus. the bus is green. yellow car on the road. yellow and black bus.

a white building with a red roof. window on the building. windows on the building.

a blue and white sign. a sign on the building.

a light on a pole. white clouds in blue sky.

a building with a white roof. window on a building. windows on the building.

a light pole in the background. a tree in the background.

a green tree in the distance. window on a building. green leaves on tree. windows on the building.

the bus has a black stripe. the bus is black. the man is wearing a black shoes. a red and white sign. a red and white shirt. a blue truck. part of a white floor. a pair of black pants. a man wearing a white shirt. blue and white bus. man wearing white shirt. a man walking on the sidewalk. the bus has a white stripe. windows on the bus. the bus has a yellow stripe. a wheel on a truck. a blue car. the road is white. a bus. a bus on the side of the road. a white car on the road .

a sign on the wall. a tennis player. man wearing a blue shirt. a green and white sign.

a pocket on a shirt. a man wearing a hat.

a white car in the street. window on a car.

the roof of a building. a window on a building.

a tree in the distance. windows on the building. trees in the background. yellow and white building. a tree in the background. a light pole. a large building with a green roof. green leaves on tree. a light pole in the background. a yellow building. yellow sign on the pole. a tall light pole. a blue and white building. power lines in the sky.

a man wearing a hat. a white building. a street light. a window on a building. a man standing on a bench.

a white sign on the sidewalk. a tall green tree. a white car in the background. a light pole in the background. a tall tree in the distance.

man wearing white shirt. a pair of black pants. a man wearing a white shirt.

a white car in the street. a fence in the background. a building with a yellow roof. a white building in the background. a white car in the background. a window on a car. a car in the street. a blue and white sign. window on a car. a blue and white building. white car parked on street.

step 5 summarization

In [3]:

```
from collections import Counter
import nltk
import re
import json
```

```
def commonprefix(m):
    if not m:
```

```

    return ''
#     testing
#     for line in m:
#         print line, len(line)
s1 = min(m)
#     print s1
s2 = max(m)
#     print s2
for i, c in enumerate(s1):
    if c != s2[i]:
        return s1[:i]
return s1

def makesent(text):
    sents = list(filter(lambda x: x!= '', [line.strip() for line in text.split('
#     print (sents)
#     print ('-----')
tags, target_sents_NN, target_sents_VBG, req_lines = list(), list(), list(),
dummylines, objects = list(), list()
lookup, target = dict(), dict()

for line in sents:
    parse = nltk.word_tokenize(line)
    tags.append(nltk.pos_tag(parse))
counts = Counter([item for line in tags for item in line])
#     print tags

targetVBG = None
targetNN = None
for item in counts.most_common():
    if item[0][1] == 'NN':
        targetNN = item[0][0]
        break

for item in counts.most_common() :
    if item[0][1] == 'DT':
        targetDT = item[0][0]
        break

for key, value in counts.items():
    lookup.setdefault(key[1], []).append(key[0])

for line in tags:
    for word in line:
        if word[0] == targetNN:
            target_sents_NN.append(line)
#         print line
#         print '-----'
#     targetVBG = str(0)
#     targetNN = str(0)

for item in Counter([item for line in target_sents_NN for item in line]).most
    if item[0][1] == 'VBG':
        targetVBG = str(item[0][0])
        break

if targetVBG is None:

```

```

#         print("no targetVBG")
#         return;
elif targetNN is None:
#         print("no targetNN")
#         return;
else :
    for line in target_sents_NN:
        if (targetNN, 'NN') in line and (targetVBG, 'VBG') in line:
            target_sents_VBG.append(line)

if 'VBZ' not in lookup:
#     print("cannot display")
#     pass
else:
    VBZ_list = lookup['VBZ']
#     print VBZ_list
#     if len(VBZ_list) == 0:
#         print "Cannot display"
#         return
#     else:
        target_prefix = [' '.join([targetNN, targetVBG])]
        target_prefix.append(' '.join([targetDT, targetNN, targetVBG]))
#         print target_prefix
        for vbz in VBZ_list:
            target_prefix.append(' '.join([targetDT, targetNN, vbz, targetVBG]))
#             print target_prefix

        for line in sents:
            for tp in target_prefix:
                if line.startswith(tp):
                    req_lines.append(line)
#                 print req_lines

        for line in req_lines:
            dummylines.append(line.replace(targetDT + ' ', ''))
#             print dummylines

prefix = commonprefix(dummylines)

for line in dummylines:
    line = re.sub(prefix, '',line)
    if 'and ' in line:
        diff = list()
        diff = line.split(' and ')
        for d in diff:
            objects.append(d)
            break
    else:
        objects.append(line)
#     print objects

obj = list(set(objects))
#     print obj
obj.sort()
obj.sort(key=len)
#     print(obj)
#     print('-----')
    req_objects = []

```

```

req_objects = []
# req_objects.append(str(filter(lambda x: [x for i in obj if x in i and x
req_objects = list(filter(lambda x: [x for i in obj if x in i and x != i]
# print(len(req_objects))
if len(req_objects) > 0:
    final_text = ' '.join([targetDT, prefix]) + ', '.join(req_objects[:-1]
    mysummary.append(final_text.capitalize())

if __name__ == '__main__':
    mysummary = []
    mytext = json.load(open('/Users/arin/Desktop/final_yr_project/frame_extract/c
# print(mytext[0])
    for item in mytext:
        makesent(item)
    print(str(mysummary))
# text = raw_input("Enter your text:")
# print "Your text:" + text
# text = "the man has glasses. a man wearing a white shirt. a white door. a p
# makesent(text)

```

```

['A man wearing black hat, red shirt and blue shirt', 'A man wearing
hat and ', 'A man wearing black shirt and ', 'A man wearing blue shi
rt, ack shirt and ack shoes', 'A man wearing white shirt and ', 'A m
an wearing hat, black shirt and black helmet', 'A man wearing blue s
hirt, black shirt, white shirt and black helmet', 'A man wearing bla
ck shirt, black shoes and green shirt']

```