Homework 2

CSCI 677 - Adv Computer Vision

Object Proposals using Selective Search and Edge Boxes

ROHAN KARNAWAT

2102695224

ROHAN KARNAWAT: **2102695224**

Overview

- There are two main python source code files **ss.py** and **eb.py** and a helper file **helper.py**. Please refer to the comments in the codes to understand the working.
- **Selective Search**
  - It can be run by the following command:

```
python3 ss.py --src <directory containing jpg images>
              --gt <directory containing gt xml files>
              --out <directory where output would be saved>
              --strategy <color | texture | multi>
              --show_img <to display results during run time>
```

  - It uses three strategies: Color, Texture and Multiple
- **Edge Boxes**
  - It can be run by the following command:

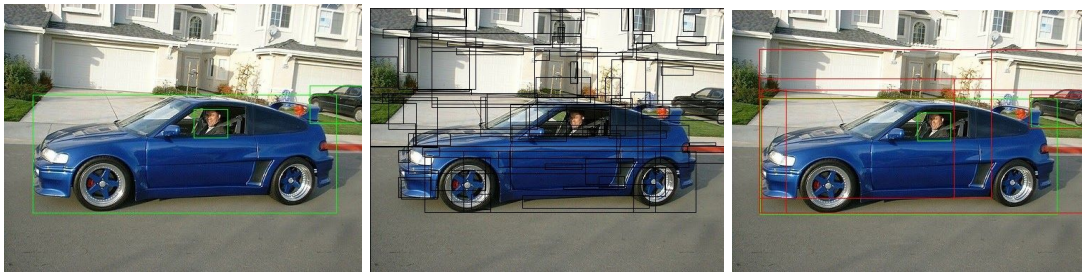
```
python3 eb.py --src <directory containing jpg images>
              --gt <directory containing gt xml files>
              --out <directory where output would be saved
              --show_img <to display results during run time>
```

  - By default the code uses 3 values of Alpha and 3 values of Beta (Total 9). self.alpha and self.beta in the code can be changed to whatever values to experiment.

Results

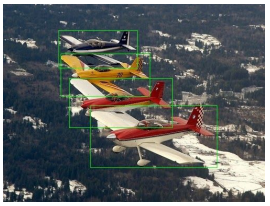
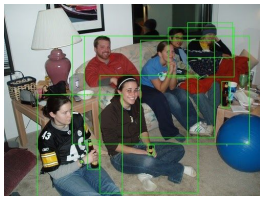
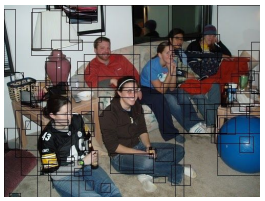
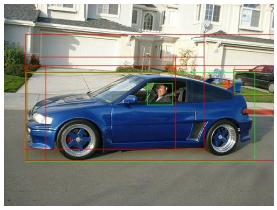
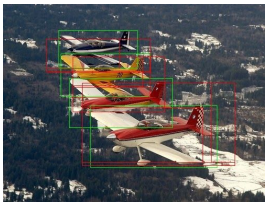
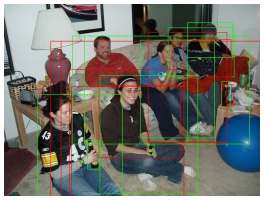
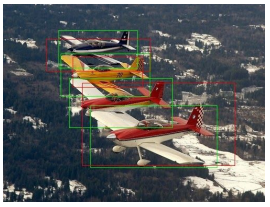
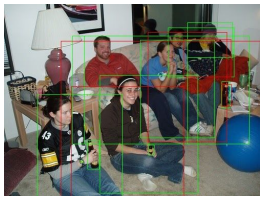
- Recall has been defined in the HW pdf as *the fraction of GT boxes that are overlapped with at least one proposal box with IOU>0.5*

- There are 4 types of images shown for one root image:
  - Image with GT Boxes (**Always Green**)
  - Image with first 100 boxes of all predicted boxes (**Always Black**)
  - Image with **Good** boxes. Good boxes have boxes that have IOU>0.5 with GT Boxes (**Always Red**)
  - Image with **Clean** boxes. Clean boxes are just for neat representative purpose. It is a subset of Good boxes where I have shown only one matching proposed box per GT box (**Always Red**)
- For reference: 2nd image has only GT boxes, 3rd image has 100 of all proposed boxes, 4th image has red boxes which have iou > 0.5 with one of the green gt boxes.



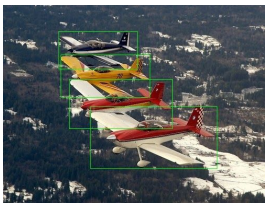
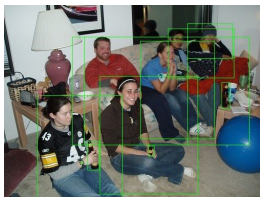
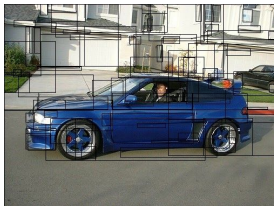
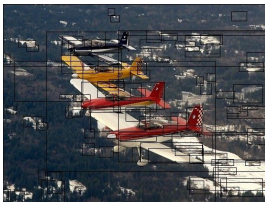
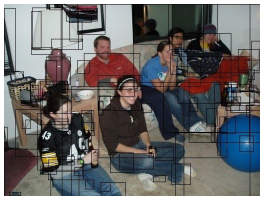
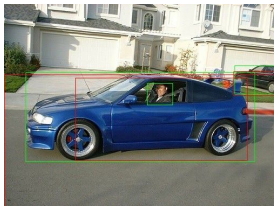
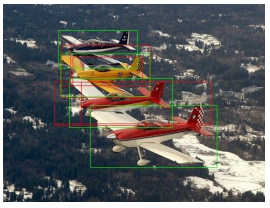
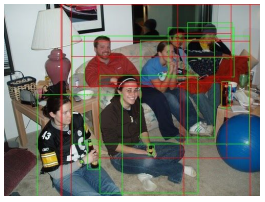
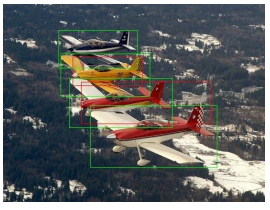
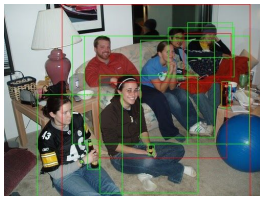
ROHAN KARNAWAT: **2102695224**

- **Selective Search**
  - **Color**

	000009	000220	002129	006919
Total Boxes generated	291	278	249	266
Recall	0.25	0.667	0.75	0.5
Original Img				
Img with GT				
Img with all boxes				
Img with good boxes				
Img with clean boxes				

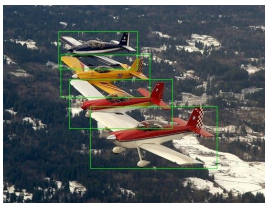
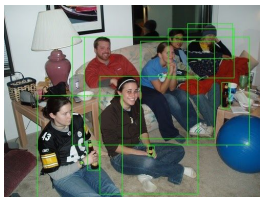
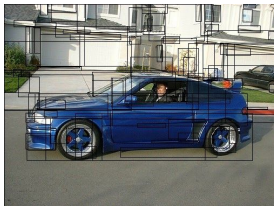
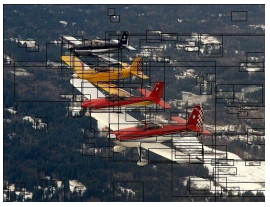
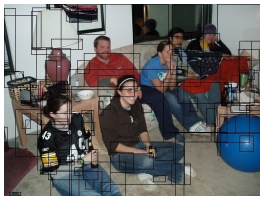
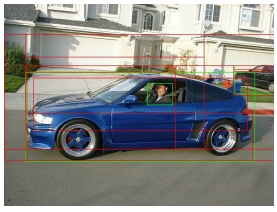
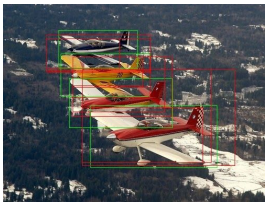
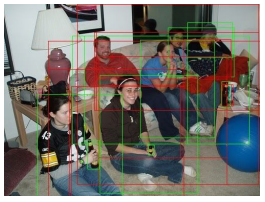
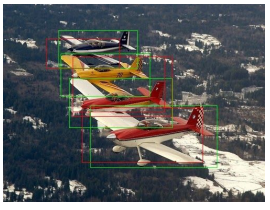
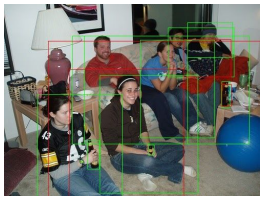
ROHAN KARNAWAT: **2102695224**

- **Texture**

	000009	000220	002129	006919
Total Boxes generated	287	271	245	246
Recall	0.0	0.667	0.5	0.4
Original Img				
Img with GT				
Img with all boxes				
Img with good boxes				
Img with clean boxes				

ROHAN KARNAWAT: **2102695224**

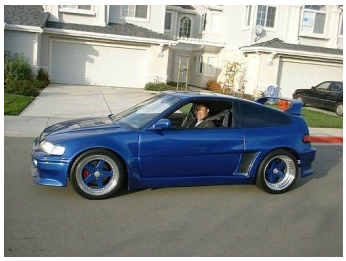
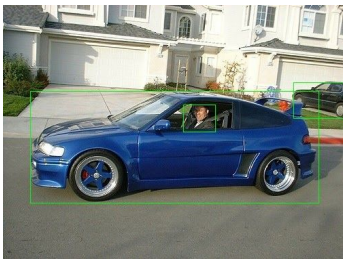
- **Multi**

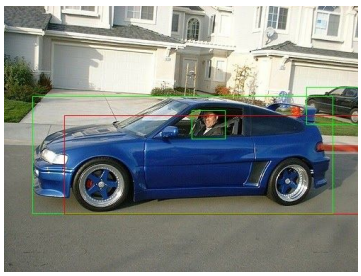
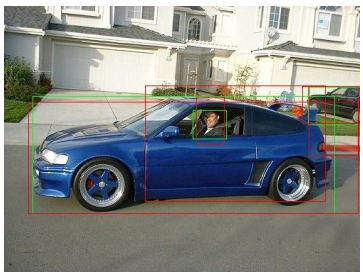
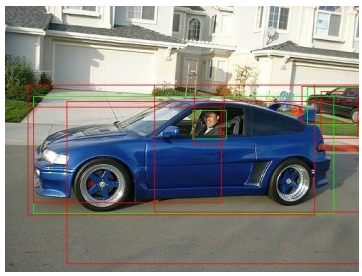
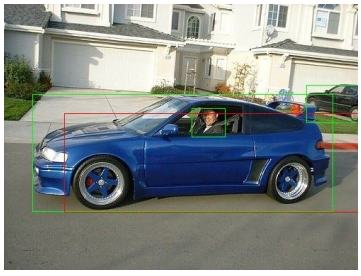
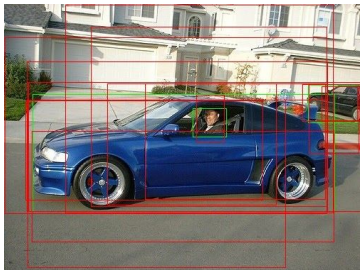
	000009	000220	002129	006919
Total Boxes generated	330	300	281	294
Recall	0.25	0.667	1.0	0.4
Original Img				
Img with GT				
Img with all boxes				
Img with good boxes				
Img with clean boxes				

ROHAN KARNAWAT: **2102695224**

- **Edge Boxes**
  - I have shown the image results for only one source image. The rest can be viewed in submitted directory under the folder **eb_out.**
  - Other statistics have been mentioned for all images

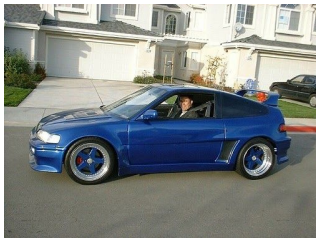
Original image and Image with GT:

000220	Alpha:	0.2	0.5	0.8
Beta:				
0.2				
0.5				
0.8				

ROHAN KARNAWAT: **2102695224**

- **Statistics**

 006919.jpg		0.2	0.5	0.8
	0.2	R = 0.2 N = 42	R = 0.3 N = 138	R = 0.3 N = 186
	0.5	R = 0.3 N = 56	R = 0.8 N = 517	R = 0.9 N = 1640
	0.8	R = 0.3 N = 70	R = 0.9 N = 1219	R = 0.8 N = 10000
 002129.jpg		0.2	0.5	0.8
	0.2	R = 0 N = 40	R = 0.5 N = 146	R = 0 N = 186
	0.5	R = 0 N = 55	R = 1 N = 440	R = 1 N = 1521
	0.8	R = 0 N = 62	R = 1 N = 1001	R = 1 N = 10000
 000009.jpg		0.2	0.5	0.8
	0.2	R = 0.25 N = 44	R = 0 N = 130	R = 0.25 N = 160
	0.5	R = 0.75 N = 66	R = 0.75 N = 512	R = 1 N = 1568
	0.8	R = 0.75 N = 75	R = 1 N = 1200	R = 1 N = 10000
 000220.jpg		0.2	0.5	0.8
	0.2	R = 0 N = 44	R = 0.33 N = 131	R = 0 N = 177
	0.5	R = 0.33 N = 59	R = 1 N = 426	R = 1 N = 1398
	0.8	R = 0.33 N = 70	R = 1 N = 979	R = 1 N = 10000

ROHAN KARNAWAT: **2102695224**

Conclusions

Selective Search

- Selective search performs the best when the strategy in Multi (all features). This is expected, for example the search has 0 recall when the texture strategy is employed on the horseback image (000009), but the recall on the same image with the color strategy is 0.25 and the multi (all) strategy will be only better if not the same. Thus, the best way to get object proposals is the multiple strategies way, unless the objects are significantly different in color / texture from the background. This can be exhibited by the average recalls: **Color - 0.542, Texture - 0.392 and Multi - 0.579**

Edge Boxes

- Alpha is the minimum IOU between two successive proposal boxes. For higher IOU there will be more overlapping boxes. Beta is the threshold for IOU that is used for Non maximal suppression. Naturally higher the Alpha more the boxes, and with a higher beta only the small iou boxes get suppressed. Most of them have high IOU owing to higher alpha. So the number of boxes increased with higher beta and higher alpha. Because of this, the recall is high for high alpha and high beta.
- In the image with people sitting on a couch (006919) the recall reduces when beta increases from 0.5 to 0.8. This is possible when there are occlusions.