Object Detection for Shopee Data

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Problem Description

Given a shopee women’s apparel image, the designed system will draw bounding box of clothes and give tags of detected clothes.

Original Image

Result

Solution

- Object Detection:

Typically it will be separated into two steps; the first step is to localize the object using bounding box; in the second step, the object in each bounding box will be classified into a category respectively.

feed the window size patch into image classifiction

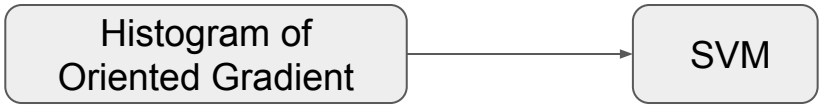
resize image at multiple scales to solve object size variations

Outline

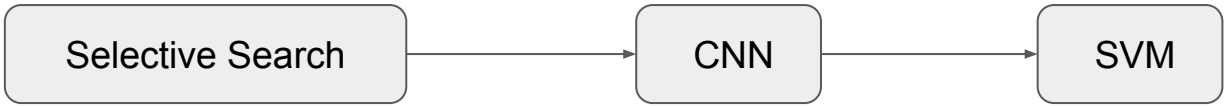
- Object Detection
- Implementation
- Experiment results
- Conclutions
- Q&A

Object detection

- **HOG**



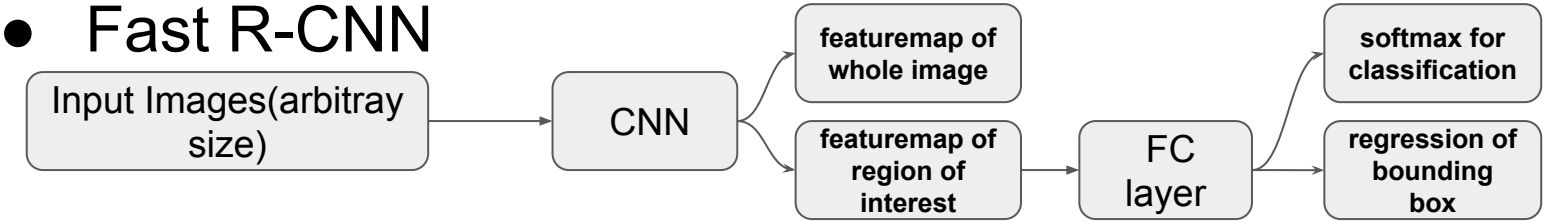
- Region CNN



Object detection

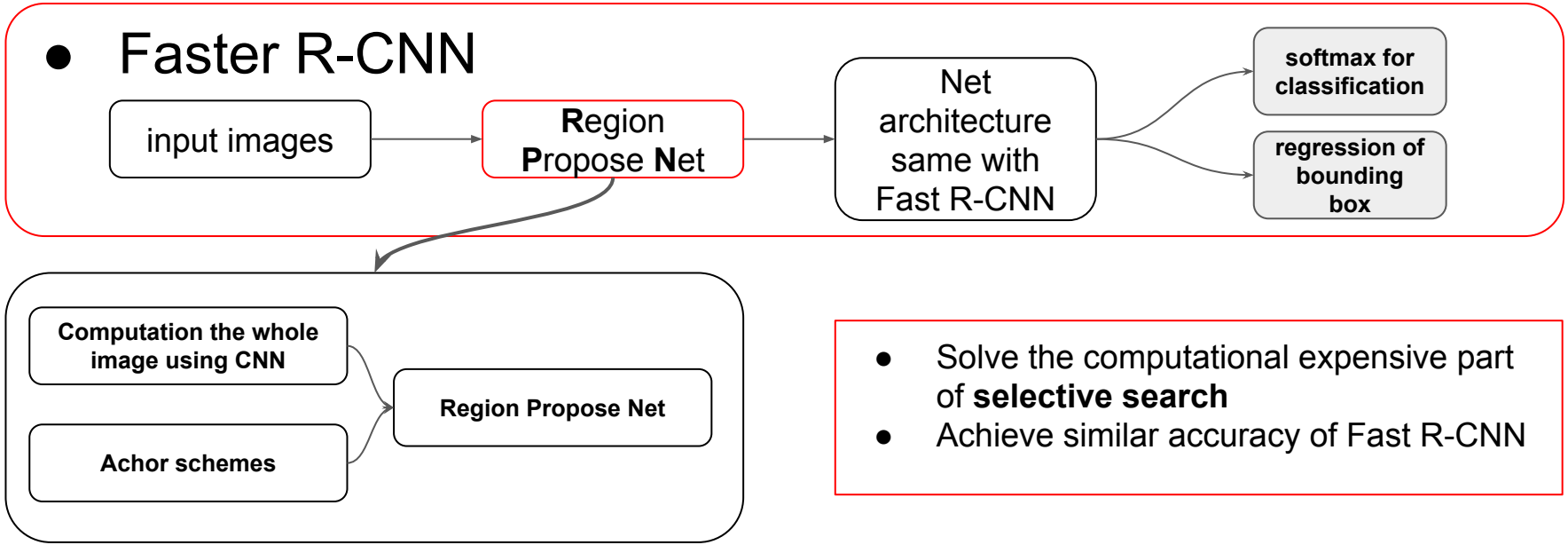
- **Spatial Pyramid Pooling Net**

- Fast R-CNN



It is difficult for SPP net for fine-tune using the whole net architecture with SPP layer. Fast R-CNN later conquer the barrier. Both algorithms apply shared compution so they save a lot of time.

Object detection



The current Faster R-CNN is one of the most advanced algorithm, so I choose this algorithm as my solution.

Implementation: source code

The source code is from https://github.com/yhenon/keras-frcnn.git . Now there is better version of https://github.com/fizyr/keras-retinanet.git . In this version, the original author improves the code quality for usability, extends the interface to read more different dataset and improves the speed.

My implementation is
https://github.com/kwkwvenusgod/Shopee_ObjectDetection.git

Implementation: dataset

In this task, the dataset is obtained from deep fashion. I applied the **Consumer-to-shop Clothes Retrieval Benchmark**

For Consumer-to-shop dataset, it has 239557 data with annotated bounding box and contains 16 categories in the total. Moreover, it covers both photo in shop and also consumers' selfies photo. So the **diversity** and the **volume** is desirable for training and cover the shopee dataset. The drawback is that the dataset does not contain sufficient women's underwear. There is dataset named Objects segmentation in the fashion field which contains women's underwear. But compare with the size with Deepfashion, the size is too small (400 images) in total; so I did not use it.

implementation: category in Dataset

{0: 'Polo_Shirt', 1: 'T_Shirt', 2: 'Summer_Wear', 3: 'Tank_Top', 4: 'Lace_Shirt', 5: 'Blouse', 6: 'Coat', 7: 'Chiffon', 8: 'Pants', 9: 'Skirt', 10: 'Leggings', 11: 'Jeans', 12: 'Dress', 13: 'Suspenders_Skirt', 14: 'Sleeveless_Dress', 15: 'Lace_Dress', 16: 'bg'}

1. ‘bg’ is referred as background
2. Even the dataset only contains women’s apparel clothes; a subcategory can be selected from the whole set. From my point of view, it is worth examining the generalization performance of the algorithm. Since it may not be pre determined the gender of the cloth for.

Implementation: training facility

1 GeForce GTX 1080 GPU

Result

Training time: the total training number is about 180,000 images. One full epoch will take approximately 30-40 hours.

Test time: for each image the recognition time will take 300ms to 700ms based on the image size.

Results

Applied first 20000 samples for test. 15000 are training samples. 5000 are test samples

Train:

Classifier accuracy for bounding boxes from RPN: 0.7626

Loss RPN classifier: 0.0279

Loss RPN regression: 0.0599

Loss Detector classifier: 0.6196

Loss Detector regression: 0.08338

Test:

Classifier accuracy for bounding boxes from RPN: 0.7541

Loss RPN classifier: 0.0355

Loss RPN regression: 0.0618

Loss Detector classifier: 0.6523

Loss Detector regression: 0.0869

Results


T_Shirt: 82
Summer_Wear: 81
Dress: 89
Dress: 83
Dress: 83
Dress: 84
Summer_Wear: 81

Conclusion

Issues

a. The base deep network architecture is resnet50 which is really deep and complicated; It will exhaust a lot of resources, in general it will occupy about 6GB memory only for resnet50.
b. Since the dataset is too big and the training takes really long time
c. The implementation will handle image input with different size as Fast R-CNN and SPP-net, it is difficult to train on batch, since each input image size is different. Keras may not be able to handle input tensor with different sizes. (Correct me if it can!!) It is also one reason for the long time training
d. Since so far the training is not so complete, it is difficult to judge the final model. But some output from shopee data can give some straightforward and intuitive judgement on the trained model.
e. There is still a lot to improve. For example, from the business view the category of women apparel may not be so appropriate, the summer wear can be a little abstract. For top and bottoms, some clothes are categorized as summer wear, which would be over general in business scenario
f. From the current result, some sleeveless blouse will be recognized as top tank which is man's cloth.

Q&A

Thanks