Object Detection with YOLO

[Project-Repo]

Contents

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Objective

To Compose/Implement :

- `YOLOv3` & `YOLOv4` algorithm on `MS COCO` dataset
- Object Detection on Images
- Object Detection on Videos | Live-Cam
- Evaluation Metrics (to Futureworks)

Dataset

Microsoft COCO(Common Objects in Context) Dataset 2017

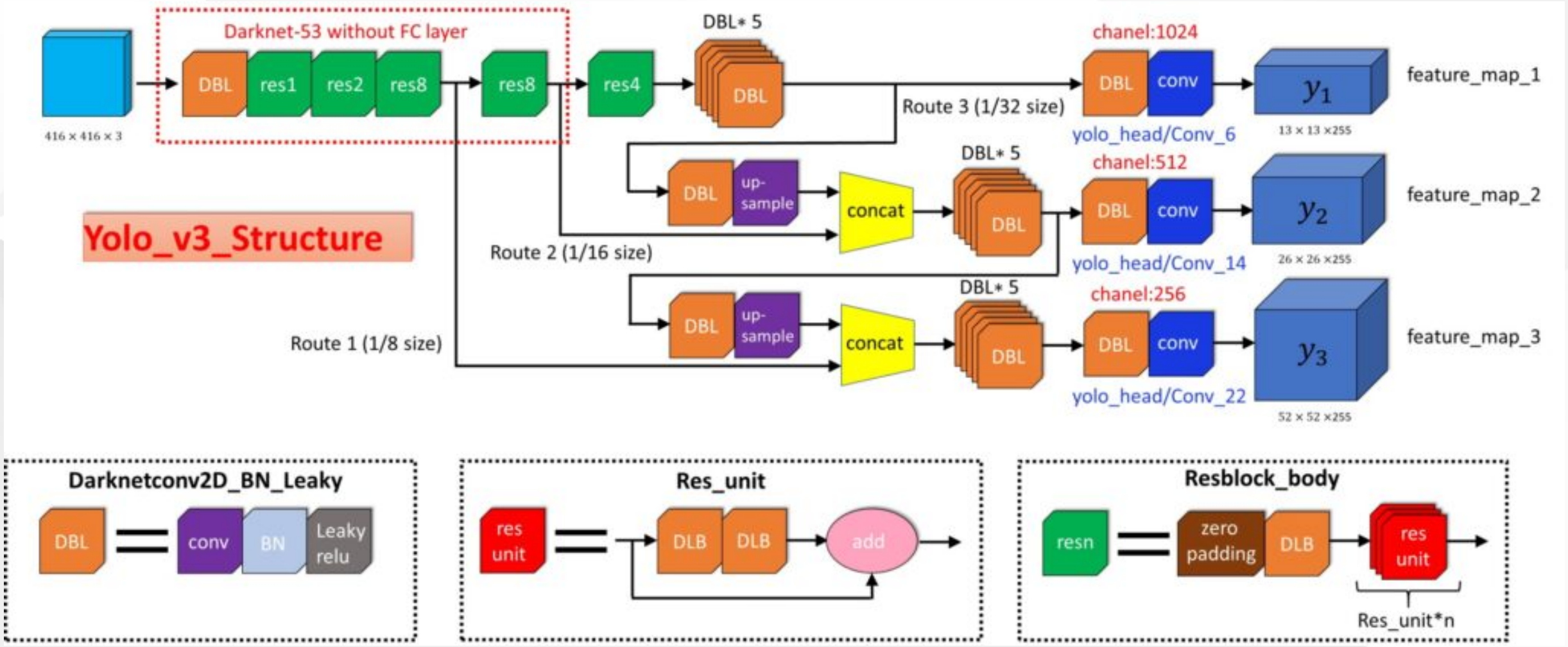
- 80 Common Object Classes
- Pre-trained Darknet weights and configs
  - YOLOV4 [Weights], [Configs]
  - YOLOV3 [Weights], [Configs]
- MS COCO [Labels]

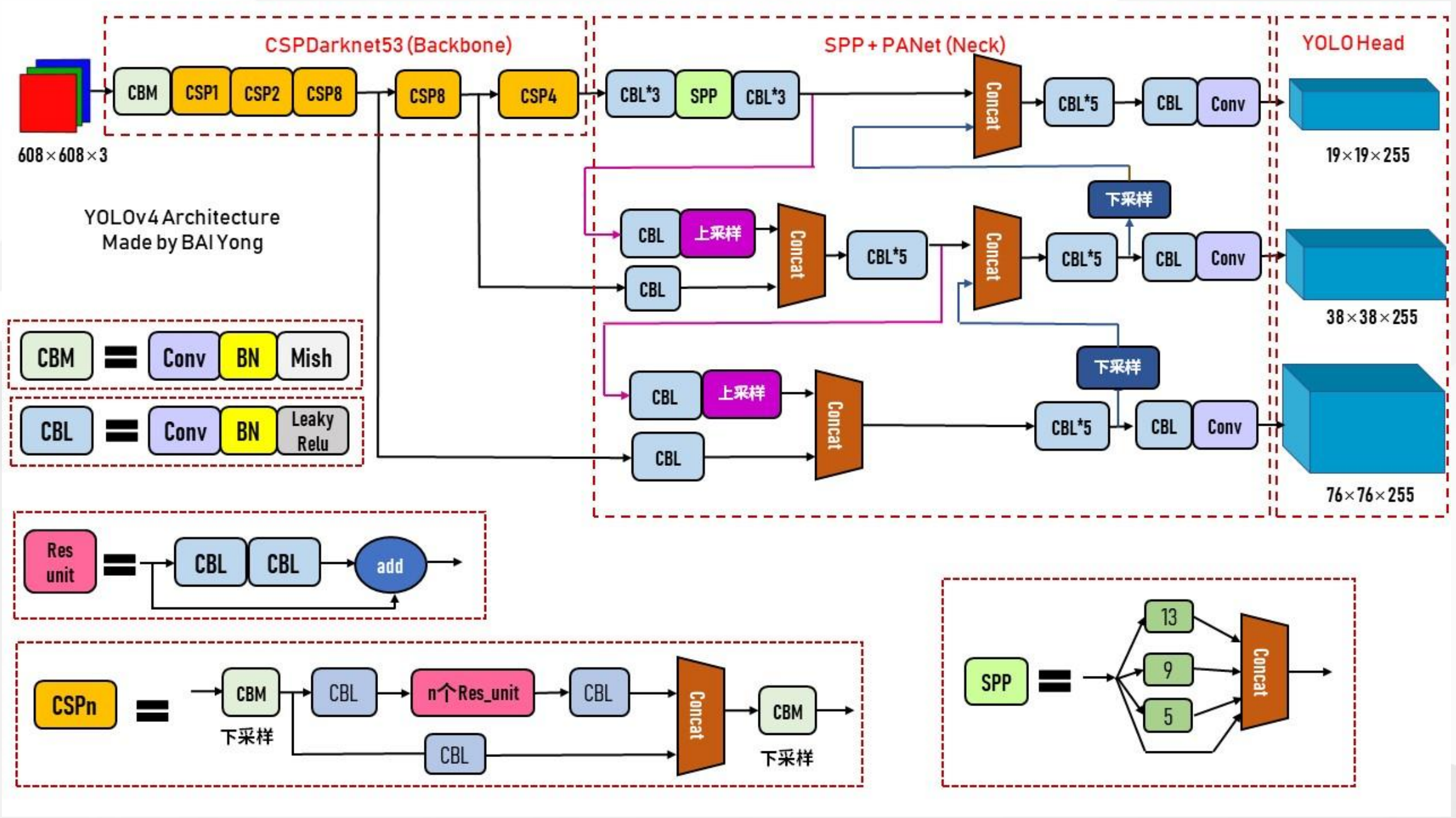
Architectures

Model Architecture, Tech Stack

- YoloV3, (PyTorch | OpenCV)
- Yolov4, (OpenCV)

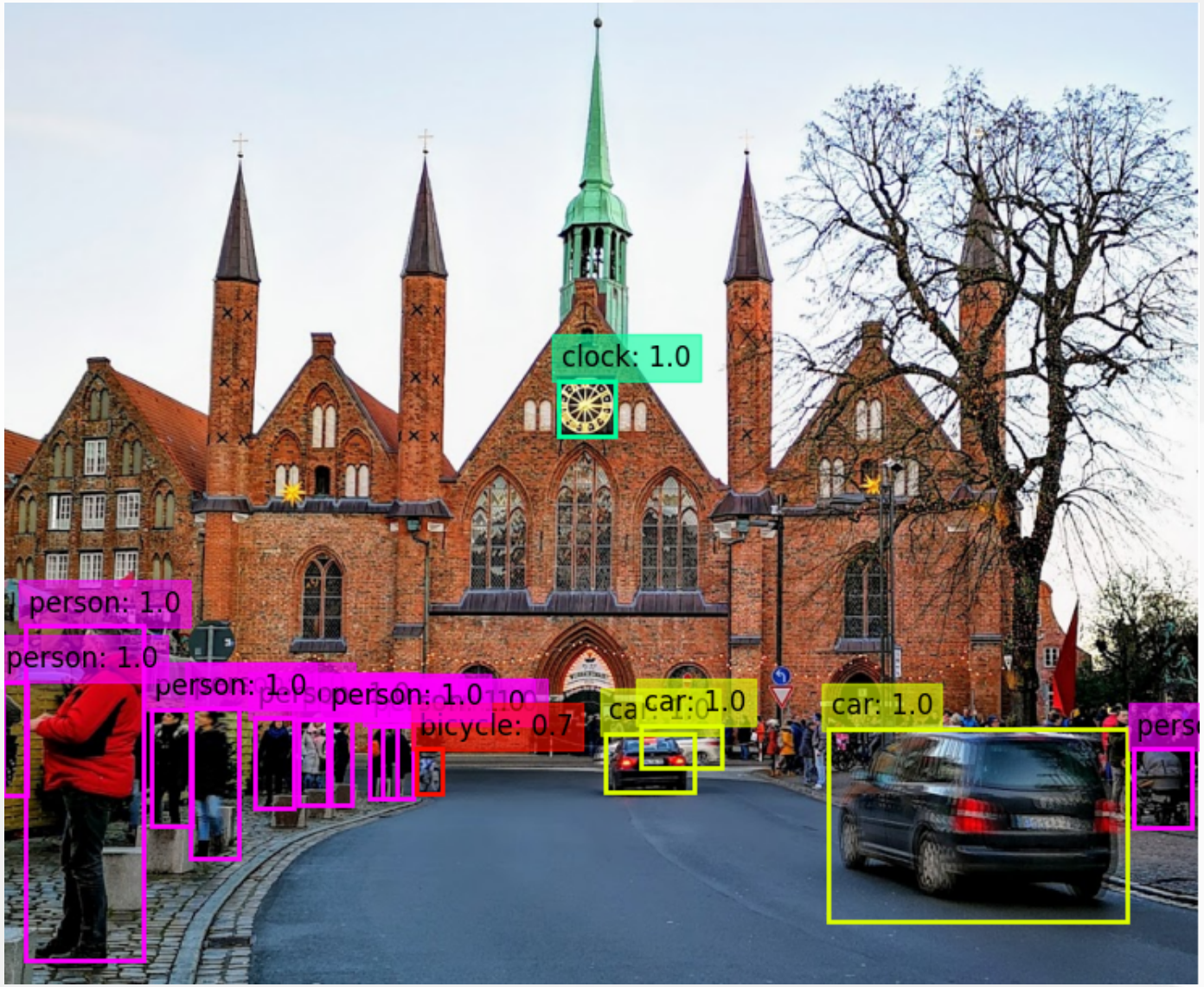
With Pretrained Darknet Backbone.


Darknet-53 without FC layer
DBL
res1
res2
res8
res8
res4
DBL* 5
DBL
416 × 416 × 3
Route 3 (1/32 size)
chanel:1024
DBL
conv
y_1
feature_map_1
13 × 13 ×255
yolo_head/Conv_6
Yolo_v3_Structure
DBL
up-sample
concat
DBL* 5
DBL
Route 2 (1/16 size)
chanel:512
DBL
conv
y_2
feature_map_2
26 × 26 ×255
yolo_head/Conv_14
Route 1 (1/8 size)
DBL
up-sample
concat
DBL* 5
DBL
chanel:256
DBL
conv
y_3
feature_map_3
yolo_head/Conv_22
52 × 52 ×255
Darknetconv2D_BN_Leaky
DBL
conv
BN
Leaky relu
Res_unit
res unit
DLB
DLB
add
Resblock_body
resn
zero padding
DLB
res unit
Res_unit*n


CSPDarknet53 (Backbone)
SPP + PANet (Neck)
YOLO Head
608×608×3
CBM
CSP1
CSP2
CSP8
CSP8
CSP4
CBL*3
SPP
CBL*3
Concat
CBL*5
CBL
Conv
19×19×255
下采样
CBL
上采样
Concat
CBL*5
CBL
CBL
Concat
CBL*5
CBL
Conv
38×38×255
下采样
CBL
上采样
Concat
CBL*5
CBL
Conv
CBL
76×76×255
YOLOv4 Architecture
Made by BAI Yong
CBM
Conv
BN
Mish
CBL
Conv
BN
Leaky Relu
Res unit
CBL
CBL
add
CSPn
CBM
下采样
CBL
n个Res_unit
CBL
Concat
CBM
下采样
CBL
SPP
13
9
5
Concat

Results

- Boundary Box
- Confidence Score
- Image Inference [Pytorch]
- Video & Live-Cam Inference [OpenCV]



Demo:

Conclusion and Future works

“ “ Understanding and Implementation of Object Detection ” ”

Future Works

1. Evaluation Metrics for different model comparison
2. Run on CUDA GPU Build
3. Other Yolo Variants with Sensors fusion for 3D object detection.

References

YOLO Algorithms

- [V4 Apr 2020],[V3 Apr 2018],[V2 Dec 2016], & [V1 May 2016]

Darknet Reference

- [Weights, Darknet Script, Configs]

Misc.

- Image Yolo Architectures [V3], [V4]