A Solution for Densely Annotated Large Scale Object Detection Task

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PaddlePaddle

Object 365 Dataset

Pretrain	# Class	# Image	# Box in Total	Box Num Avg	Image Height Avg	Image Width Avg	Box Area Avg (Pixel)	Max # Box
COCO17 (Train)	80	118287	0.86M	7.27	484	577	12025	93
Object 365 (Train)	365	608606	9.62M	15.81	536	662	14074	835

Full Track

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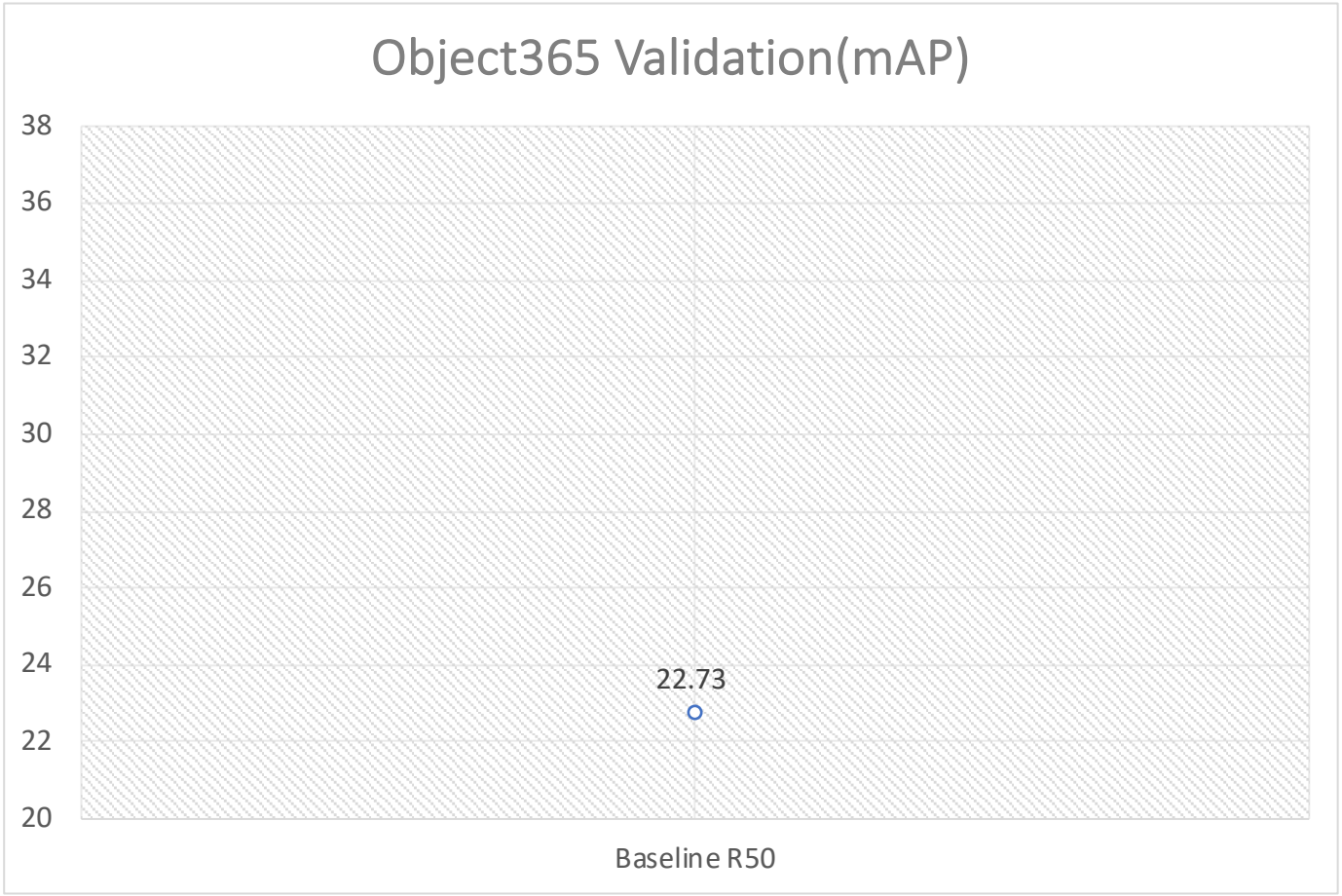
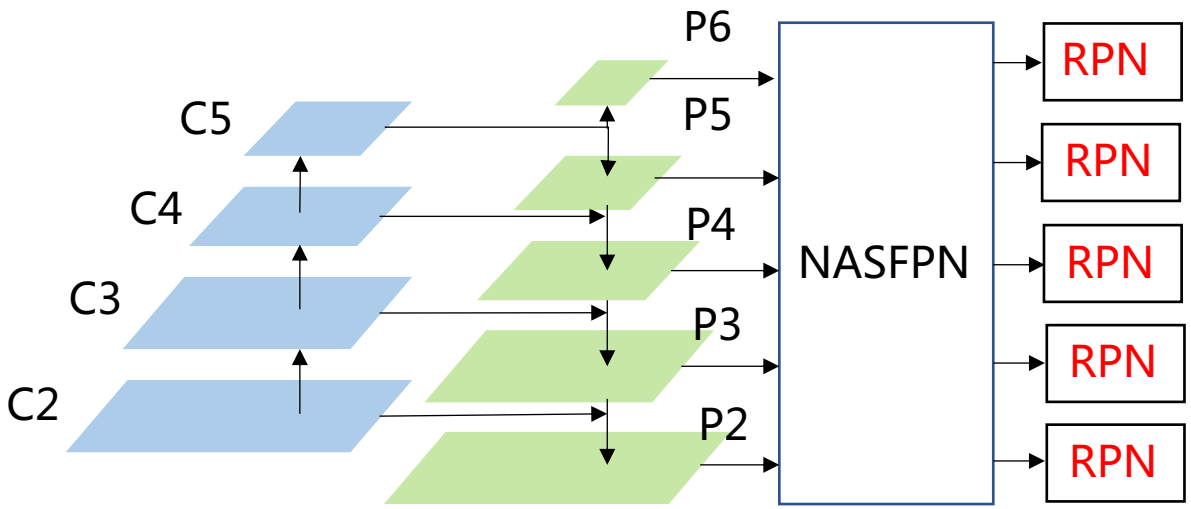
R50 Cascade RCNN



Neural Architecture Search

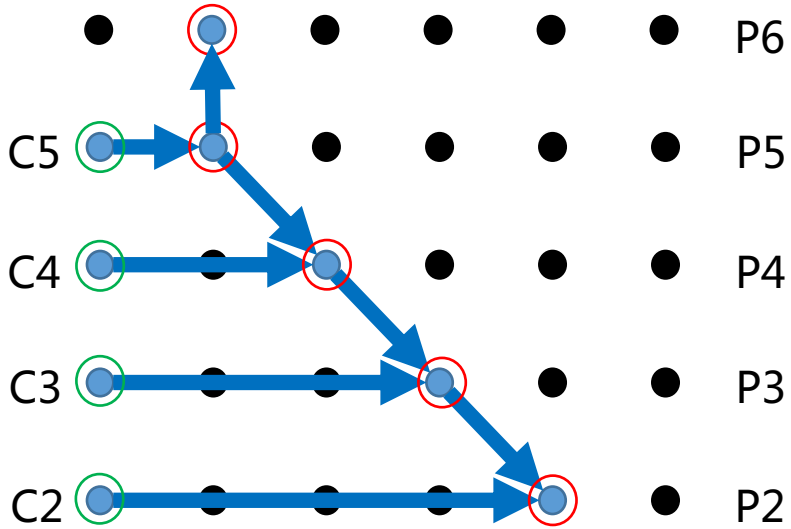
- An RL based Neural Architecture Search is adopted.
- The NAS-FPN module is directly cascaded behind the original FPN module.



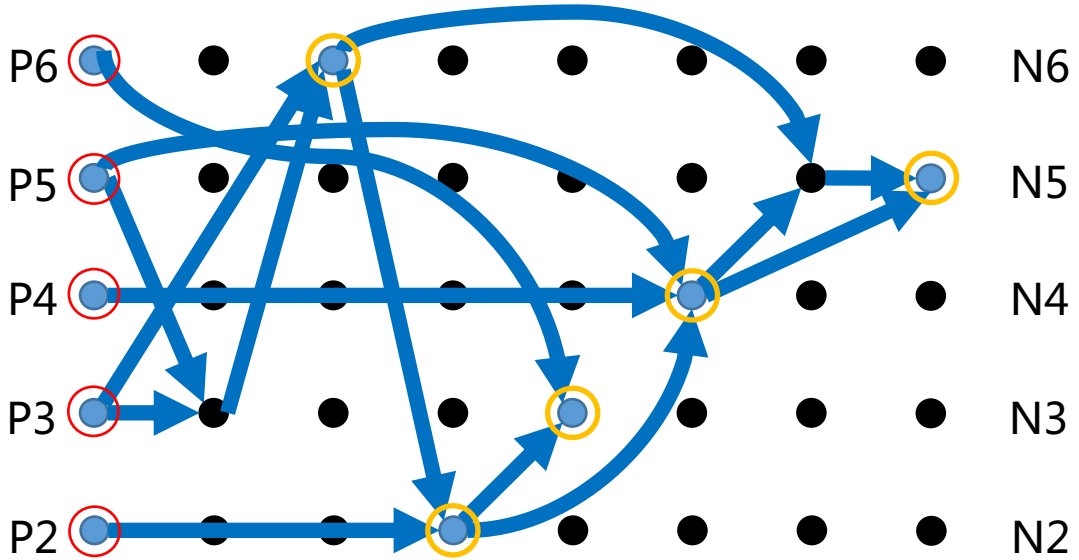
- A strong architecture found by prior knowledge[1] is used to initialized the NAS-FPN searching procedure.

[1] Ghiasi G, Lin T Y, Pang R, et al. NAS-FPN: Learning Scalable Feature Pyramid Architecture for Object Detection. arXiv:1904.07392, 2019.

Neural Architecture Search



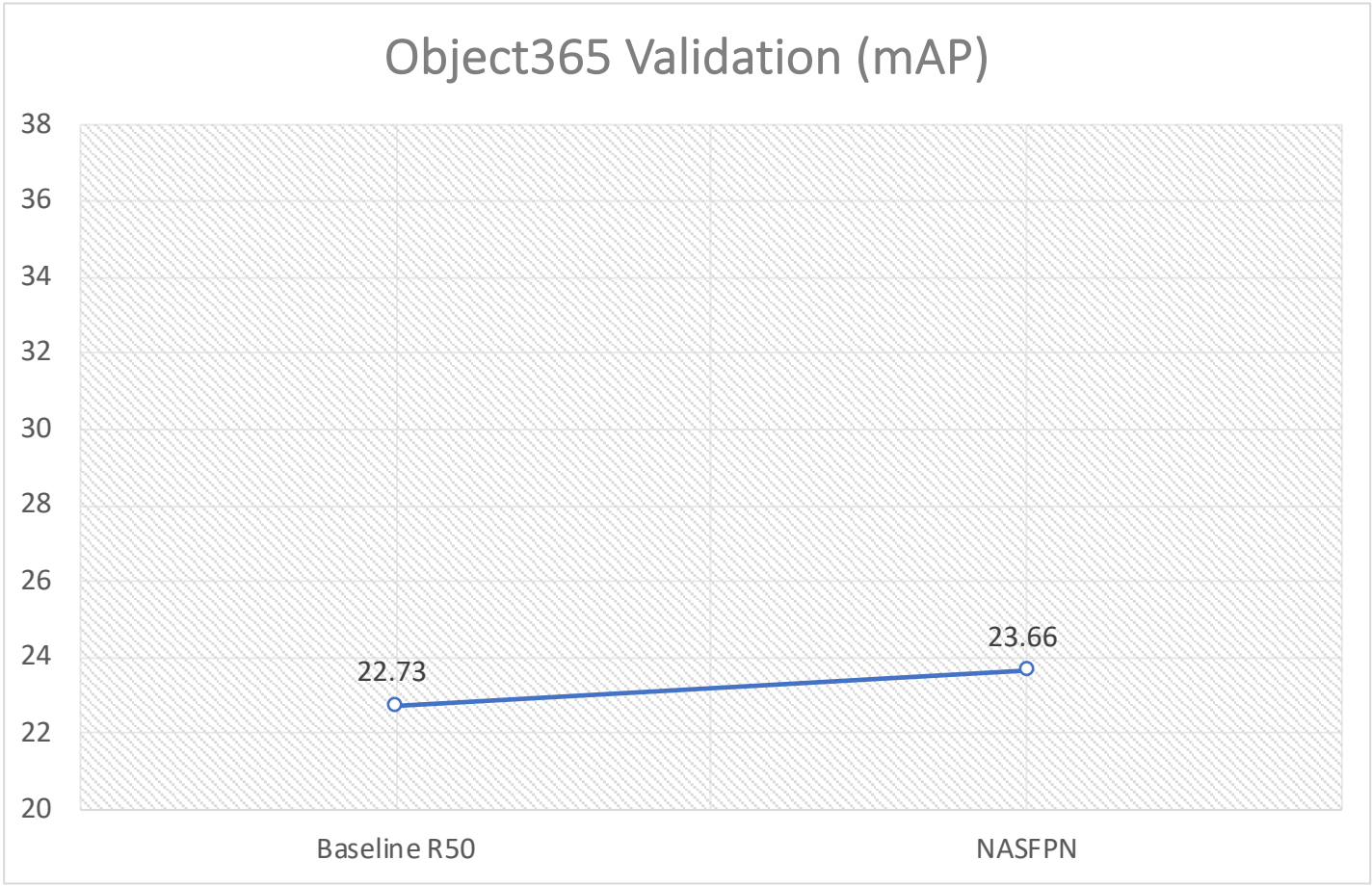
(a) FPN



(b) Our NAS-FPN

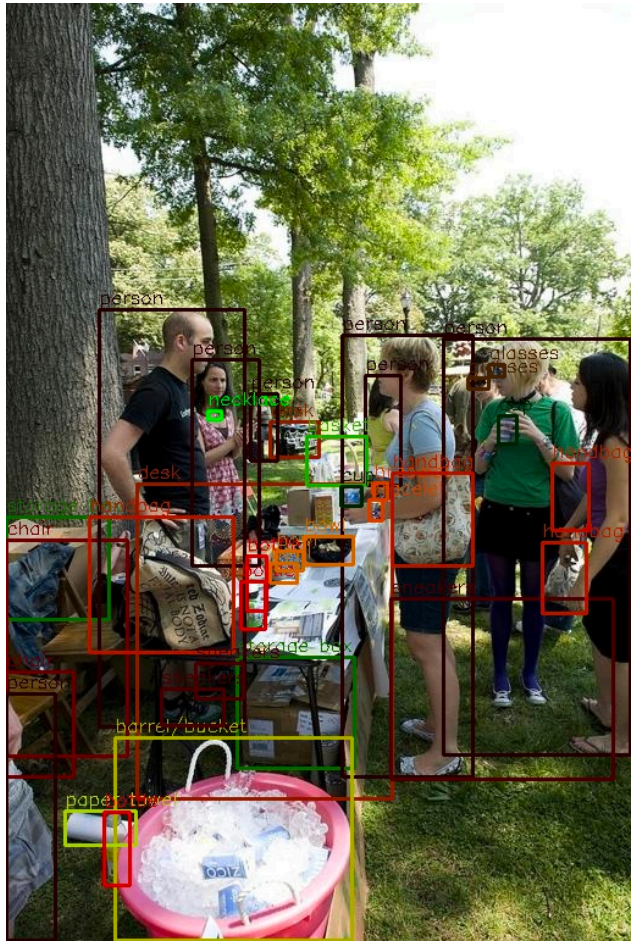
The architecture graph of original FPN and NAS-FPN after ~400 episodes

Neural Architecture Search



Class Diversity Sensitive Sampling

15 Classes

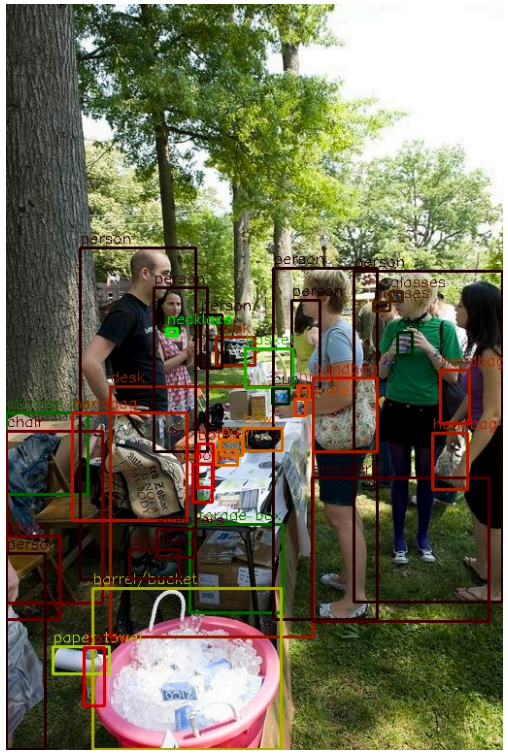


4 Classes

Sampling probability equally is not appropriate.

Class Diversity Sensitive Sampling

The i th image contains 15 Classes



$$W_i = \ln(C_i + \varepsilon) \sum_{c=1}^{N} P_c H_c$$

W_i = Sampling weight of the i th image.

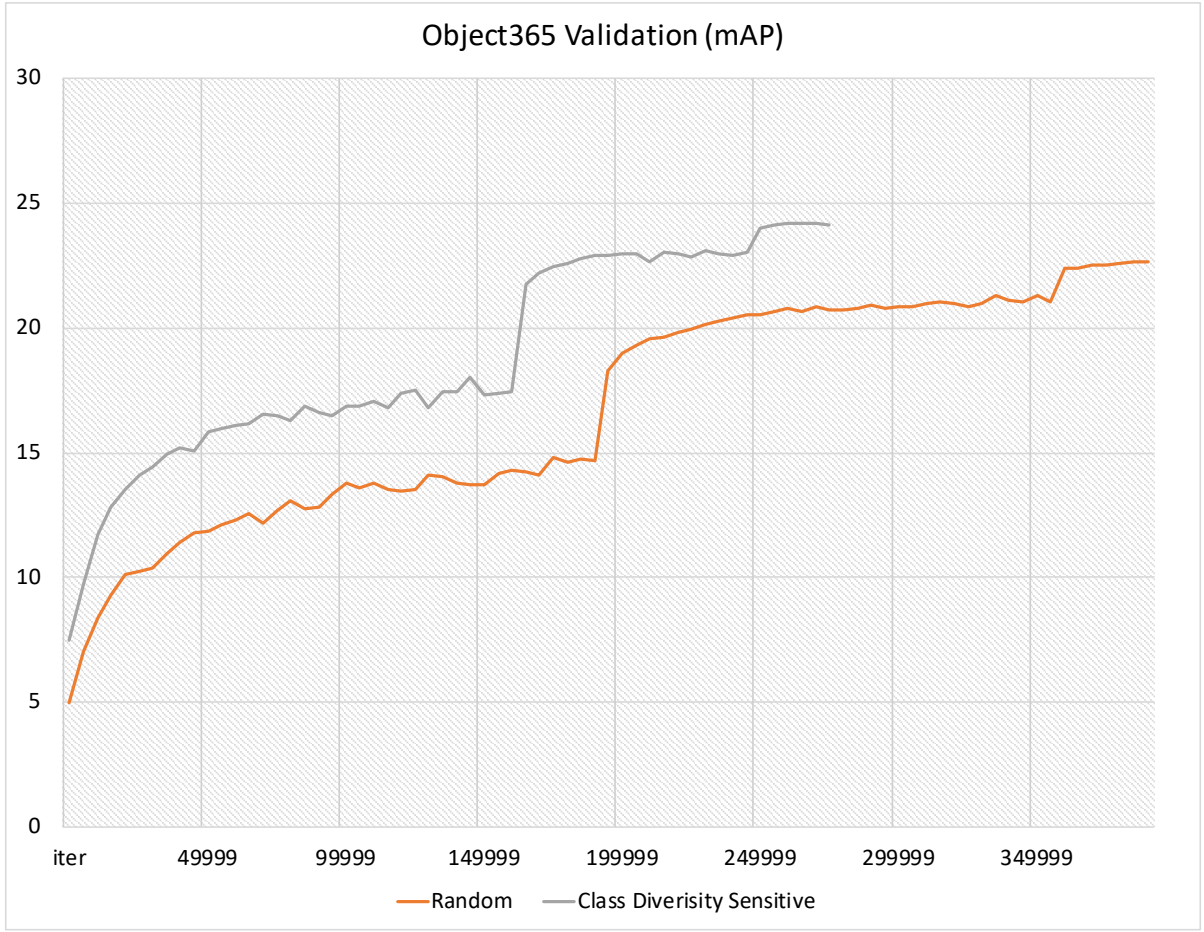
C_i = Total number of the classes of the i th image.

N = Total number of the classes of the dataset.

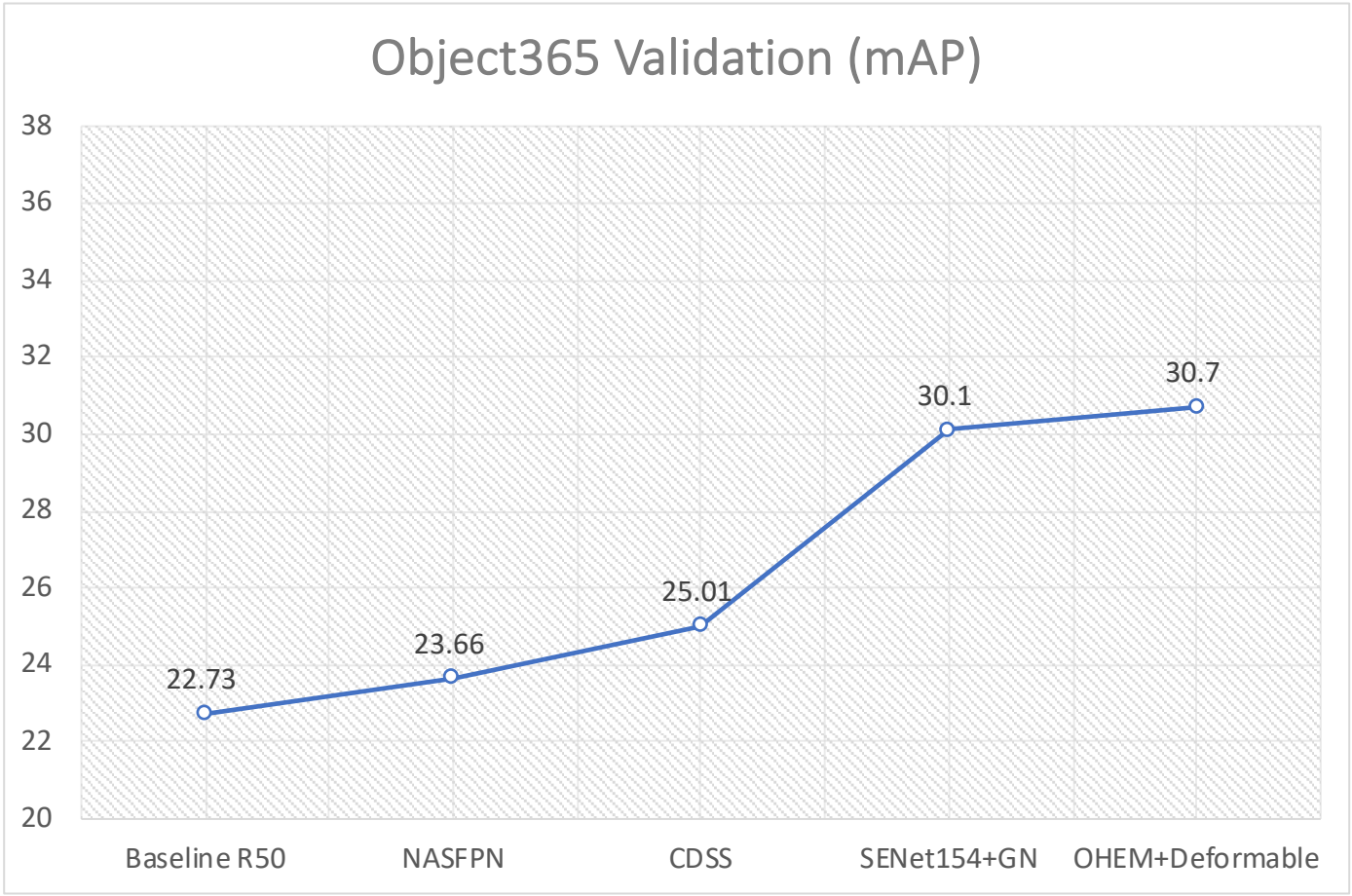
P_c = The c th class prior probability, according to the total box number of the dataset.

H_c = 1 if the images contains class c or 0.

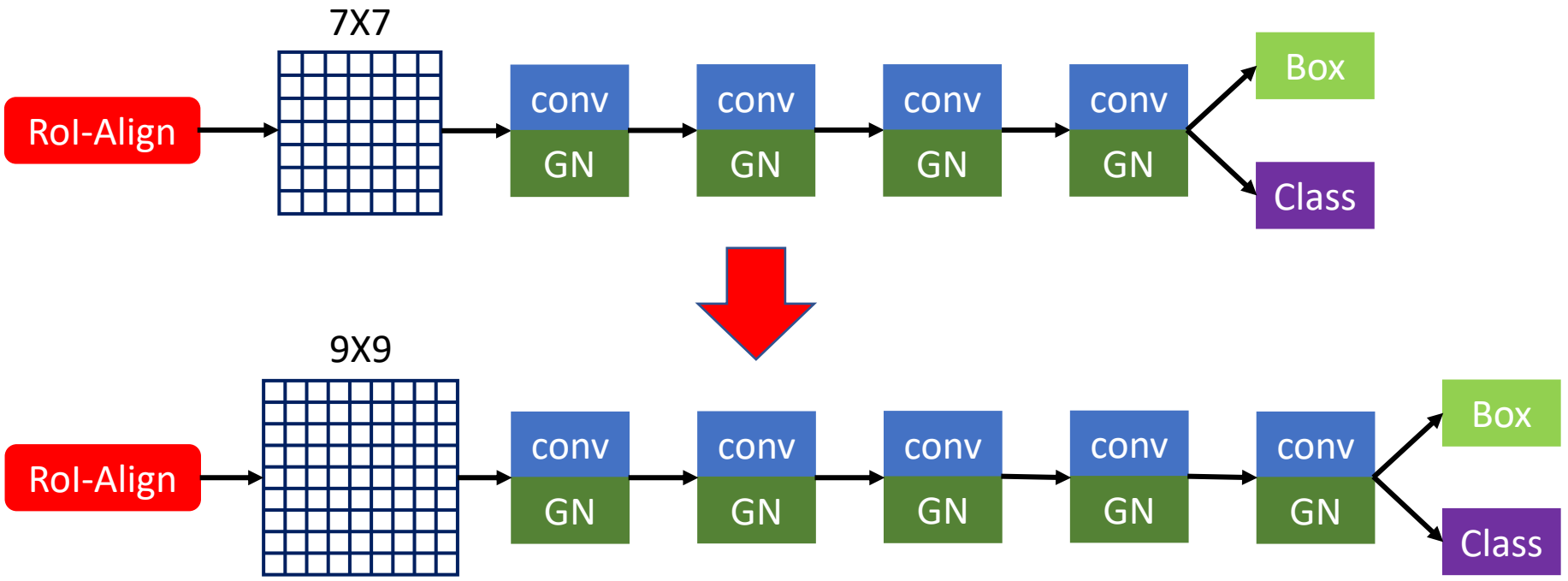
Class Diversity Sensitive Sampling



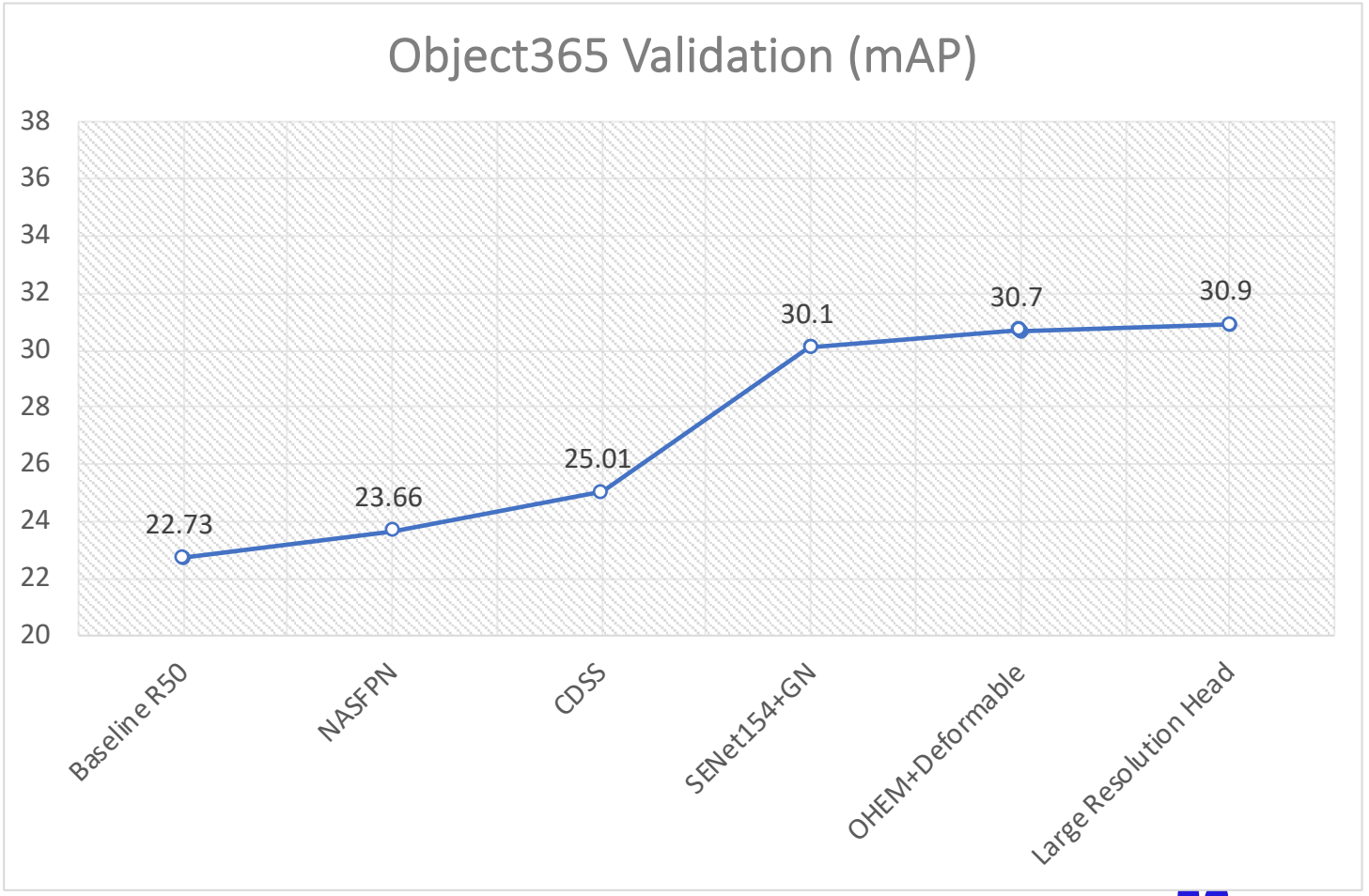
Class Diversity Sensitive Sampling



Large Resolution Box Head

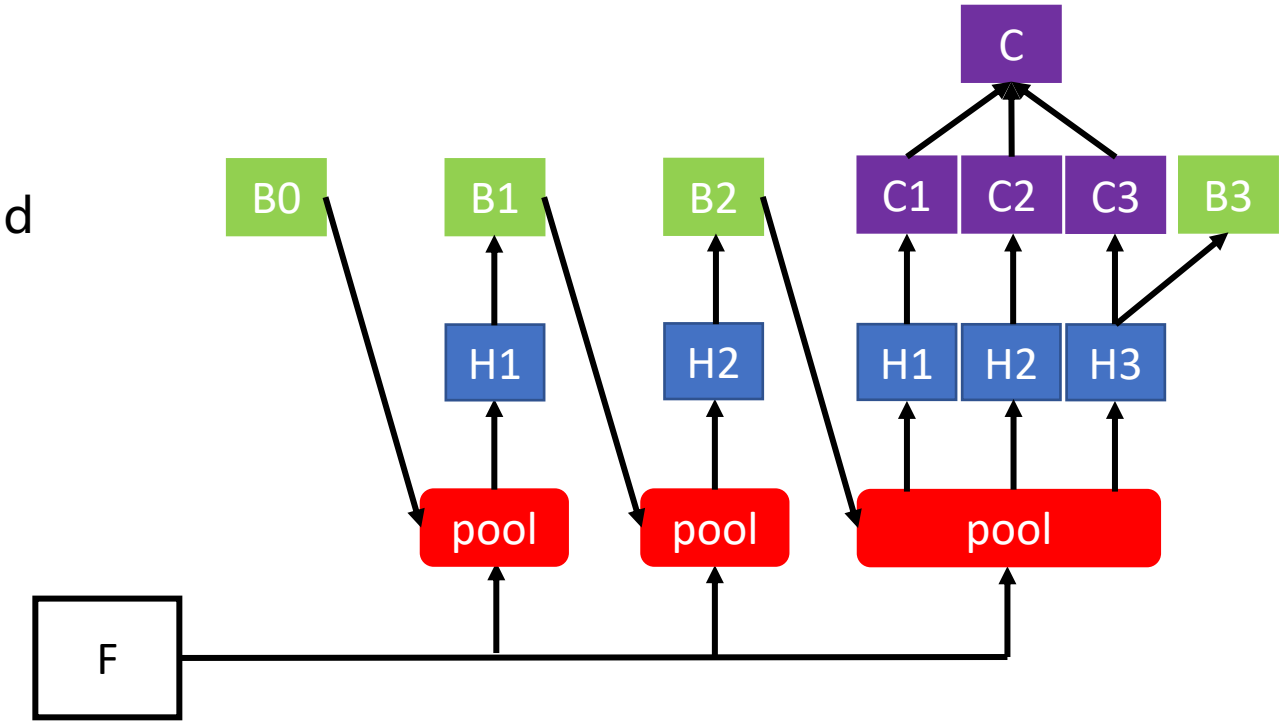


Large Resolution Box Head



Cascade RCNN Testing

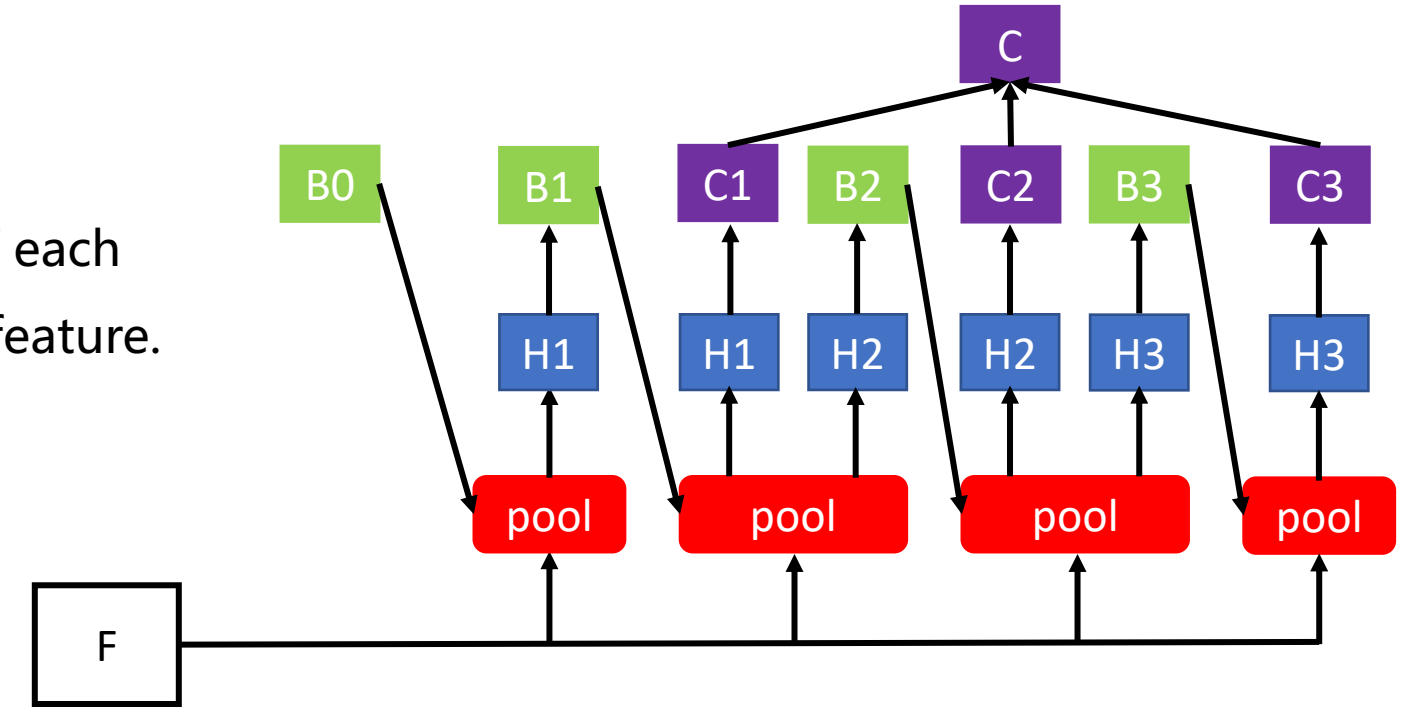
- Use the predicted bbox of the 2nd stage to extract the feature. (Standard Cascade RCNN)



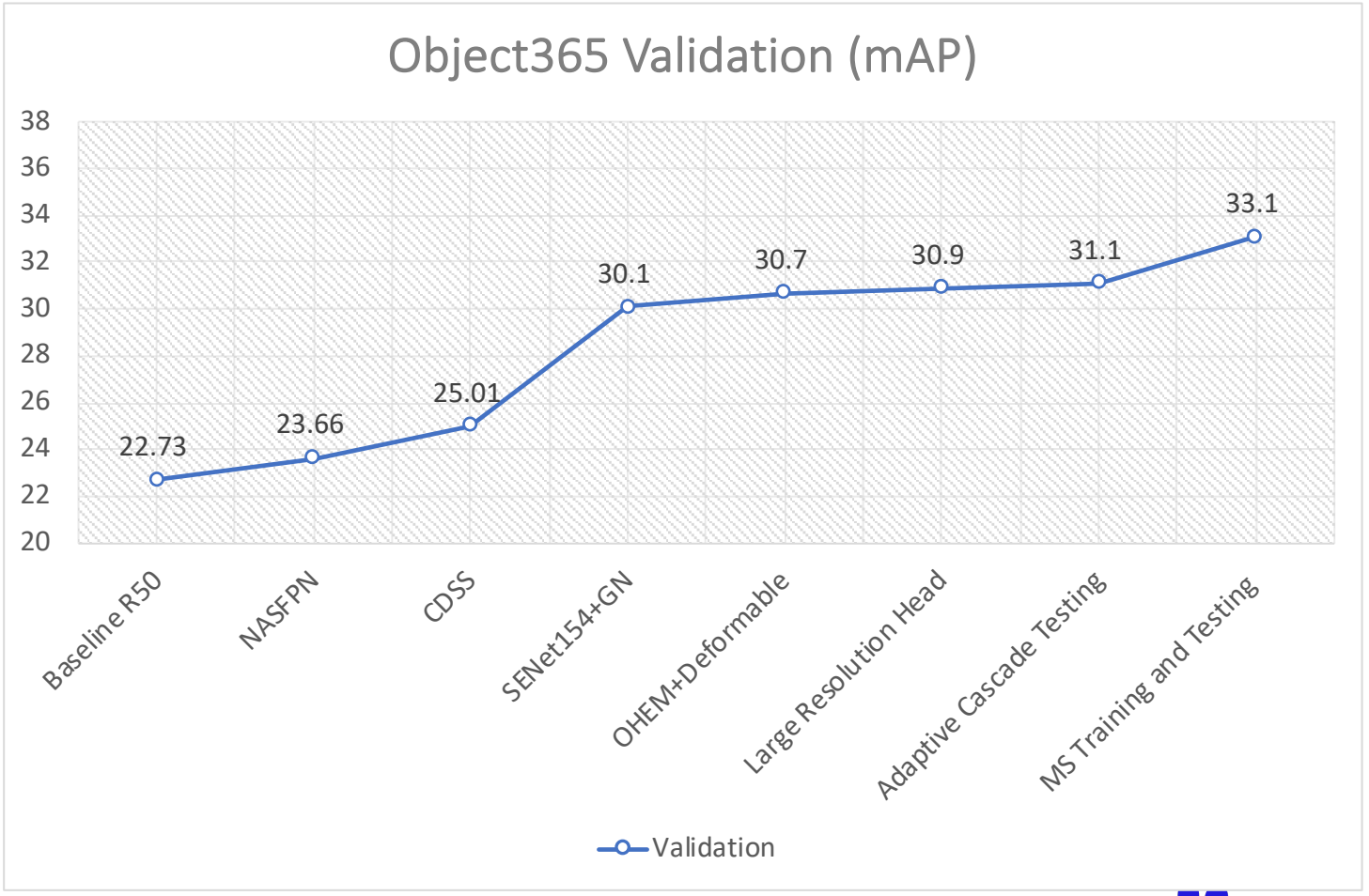
[1] Cai Z, Vasconcelos N. Cascade R-CNN: Delving into high quality object detection. CVPR.2018

Cascade RCNN Adaptive Testing

- Use the predicted bbox of each stage itself to extract the feature.



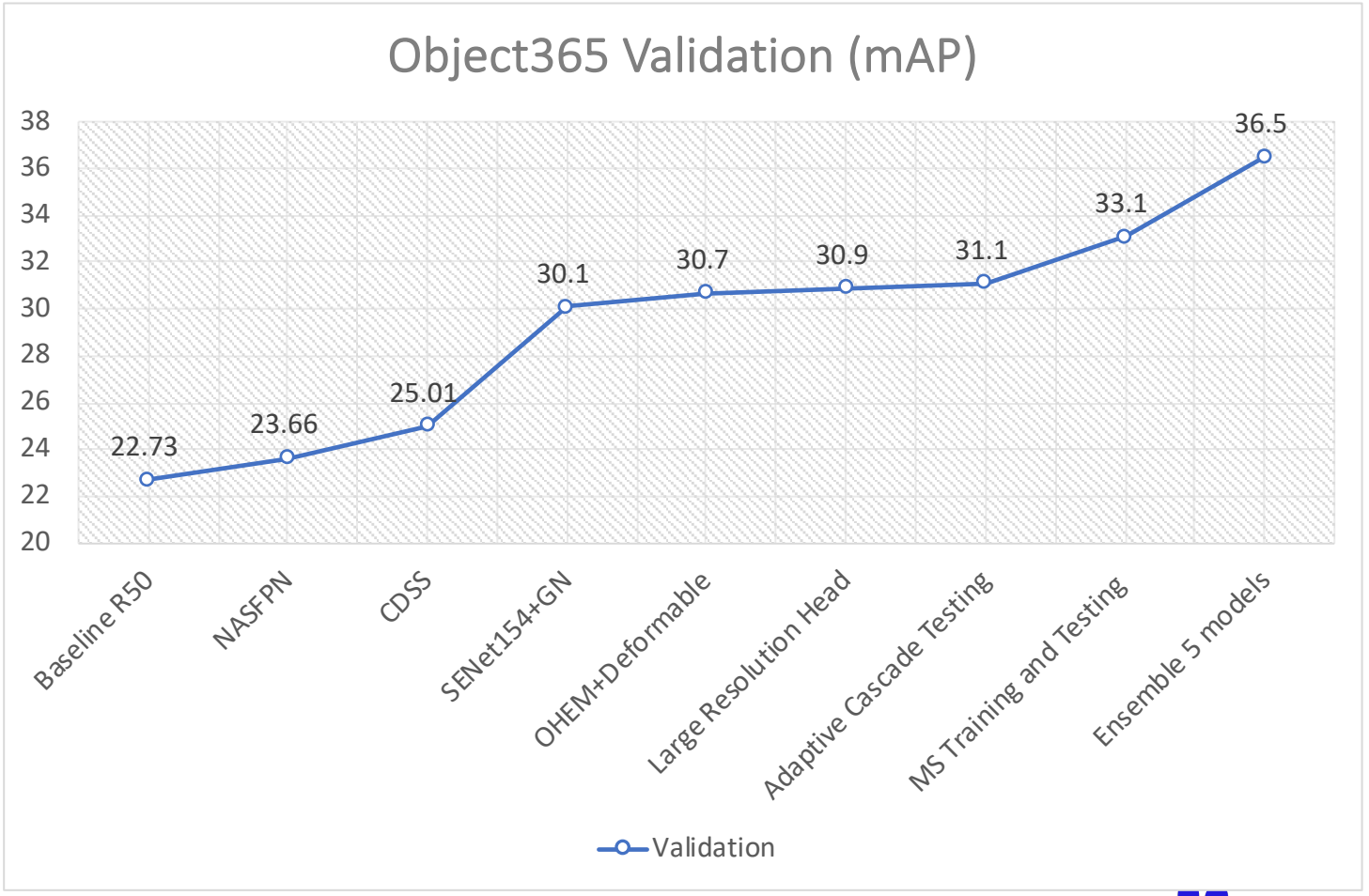
Cascade RCNN Adaptive Testing



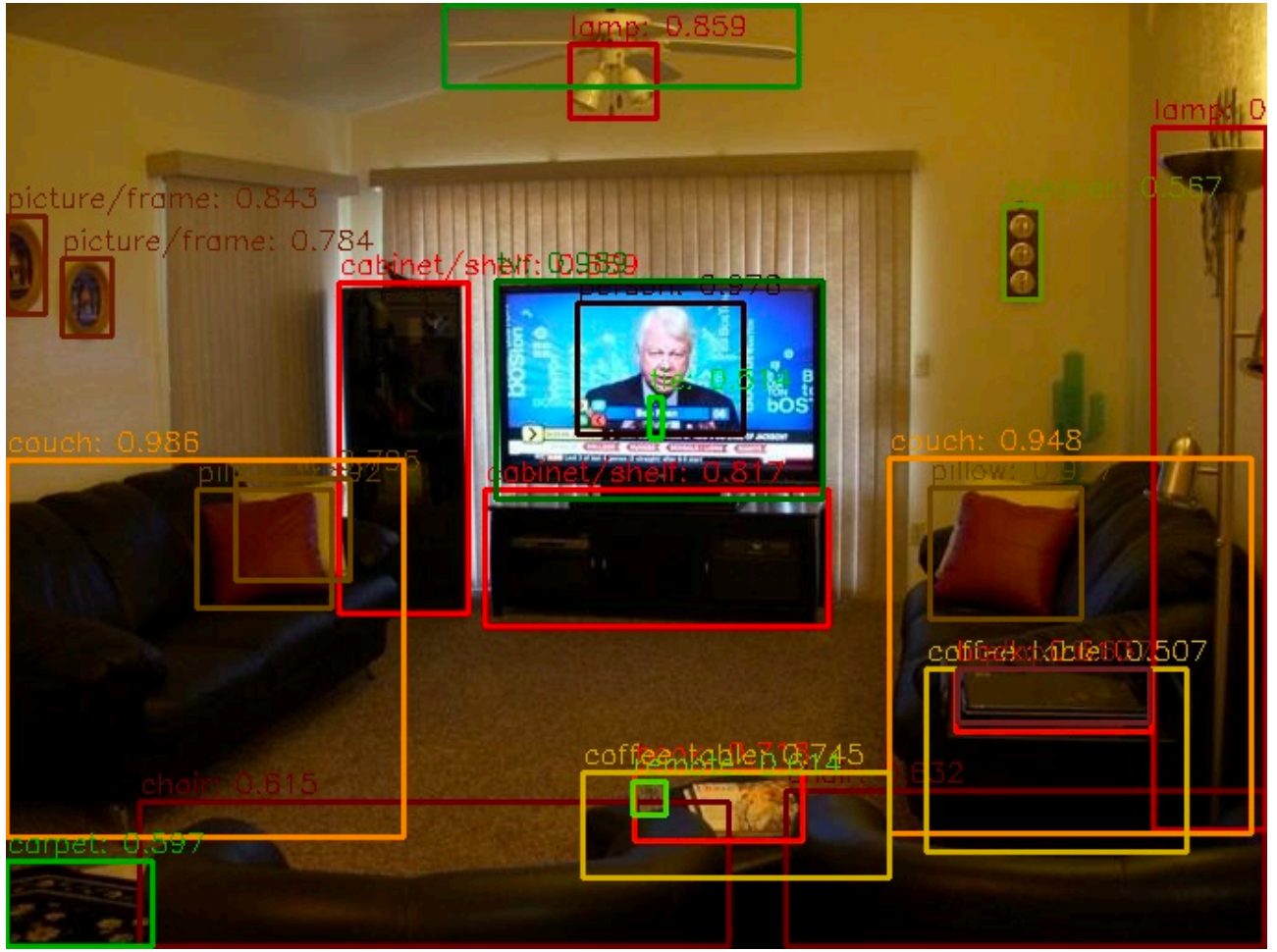
Implementation Details

- Use COCO Pretrained model, mAP 52.9 on COCO17 minival.
- Training multiscale size (400, 1400), max size 1600.
- Testing multiscale size (400, 1400), max size 2100.
- 8 V100(32GB) x 2 for 7 days.
- Weight Standardization brings model diversity.
- SoftNMS is adopted.

Implementation Details



Visualization



Visualization

Tiny Track

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Full Track Pretrain

Pretrain	Full Val mAP	Tiny Val mAP	Gain	Tiny Test mAP
COCO Pretrain	-	28.9	-	-
Obj365 Full Pretrain	30.7	33.0	+4.1	-
Obj365 Full Pretrain	32.9	34.8	+5.9	-
Ensemble 8 models	-	37.6	+8.7	29.0

- Multiscale input with flip in Training and Testing

Visualization

- Full Track Pretrained

- COCO17 Pretrained

Paddle Paddle Detection

- Fast/Faster R-CNN, FPN, Mask RCNN, Cascade R-CNN, Yolo v3, RetinaNet, SSD ……
- GN, SyncBN, Deformable Conv v1/v2 ……
- https://github.com/PaddlePaddle/models/tree/develop/PaddleCV/object_detection
- Training framework will be released soon.

PaddlePaddle

Thank you!

Please feel free to contact us, if you have any questions.

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