

Supplementary

Table 1: Description of hyper-parameters.

name	description
anchors	number of prior boxes of each feature pyramid for bounding box regression.
resolution	resolution of input training images.
epochs	number of training epochs.
batch_size	mini-batch size for training.
lr_schedule	strategy of learning rate schedule.
loss_multi	Lagrange multipliers of objectness/classes/bbox_regression losses.
pyramid_multi	Lagrange multipliers of objectness loss for feature pyramids.
iou_thresh	IoU threshold for assigning positive example.
translate_ratio	random shift ratio for data augmentation.
scale_ratio	random resize ratio for data augmentation.
mixup_prob	random probability of MixUp data augmentation.

¹ YOLOv4-tiny is trained by Darknet, while YOLOv4-CSP and YOLOv4-large are trained by PyTorch.

² YOLOv4-tiny and YOLOv4-CSP are tested by Darknet, while YOLOv4-large is tested by PyTorch.

³ PyTorch training use more advanced techniques, such as exponential moving average, modified decoder, IoU aware, etc.

1. Appendix A.

1.2. Hyper-parameters of YOLOv4-tiny

1.1. Hyper-parameters of YOLOv4-CSP

Table 2: YOLOv4-CSP.

name	value
anchors	3
resolution	640
epochs	300
batch_size	64
lr_schedule	Cosine Annealing
loss_multi	[1.0, 1.0, 1.0]
pyramid_multi	[4.0, 1.0, 0.4]
iou_thresh	0.2
translate_ratio	0.0
scale_ratio	0.5 ~ 1.5
mixup_prob	0.0

Table 3: YOLOv4-tiny.

name	value
anchors	3
resolution	416
epochs	600
batch_size	64
lr_schedule	Multi-steps decay
loss_multi	[1.0, 1.0, 1.0]
pyramid_multi	[1.0, 1.0]
iou_thresh	max only
translate_ratio	0.0
scale_ratio	0.5 ~ 1.5
mixup_prob	0.0

1.3. Hyper-parameters of YOLOv4-large

Table 4: YOLOv4-P5 scratch.

name	value
anchors	4
resolution	896
epochs	300
batch_size	64
lr_schedule	Cosine Annealing
loss_multi	[1.0, 1.0, 1.0]
pyramid_multi	[4.0, 1.0, 0.4]
iou_thresh	0.2
translate_ratio	0.5
scale_ratio	0.5 ~ 1.5
mixup_prob	0.0

Table 5: YOLOv4-P5 fine-tune.

name	value
anchors	4
resolution	896
epochs	150
batch_size	64
lr_schedule	Cosine Annealing
loss_multi	[1.0, 1.0, 1.0]
pyramid_multi	[4.0, 1.0, 0.4]
iou_thresh	0.2
translate_ratio	0.5
scale_ratio	0.2 ~ 1.8
mixup_prob	0.2

Table 6: YOLOv4-P6 scratch.

name	value
anchors	4
resolution	1280
epochs	300
batch_size	64
lr_schedule	Cosine Annealing
loss_multi	[1.4, 1.0, 1.0]
pyramid_multi	[4.0, 1.0, 0.4, 0.1]
iou_thresh	0.2
translate_ratio	0.5
scale_ratio	0.5 ~ 1.5
mixup_prob	0.0

Table 7: YOLOv4-P6 fine-tune.

name	value
anchors	4
resolution	1280
epochs	150
batch_size	64
lr_schedule	Cosine Annealing
loss_multi	[1.4, 1.0, 1.0]
pyramid_multi	[4.0, 1.0, 0.4, 0.1]
iou_thresh	0.2
translate_ratio	0.5
scale_ratio	0.2 ~ 1.8
mixup_prob	0.2

Table 8: YOLOv4-P7 scratch.

name	value
anchors	4
resolution	1536
epochs	300
batch_size	64
lr_schedule	Cosine Annealing
loss_multi	[1.0, 1.0, 1.0]
pyramid_multi	[4.0, 1.0, 0.5, 0.4, 0.1]
iou_thresh	0.2
translate_ratio	0.5
scale_ratio	0.5 ~ 1.5
mixup_prob	0.0

Table 9: YOLOv4-P7 fine-tune.

name	value
anchors	4
resolution	1536
epochs	150
batch_size	64
lr_schedule	Cosine Annealing
loss_multi	[1.4, 1.0, 1.0]
pyramid_multi	[4.0, 1.0, 0.5, 0.4, 0.1]
iou_thresh	0.2
translate_ratio	0.5
scale_ratio	0.2 ~ 1.8
mixup_prob	0.2