

Fine-Grained Auto Augmentation for multi-label Classification


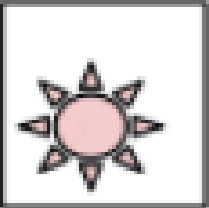
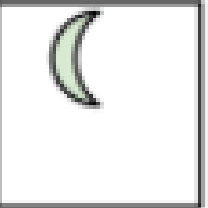
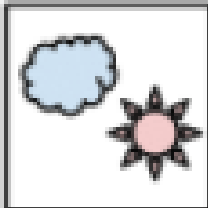
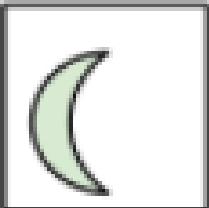
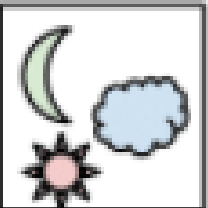
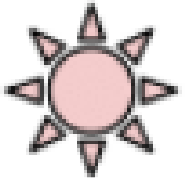
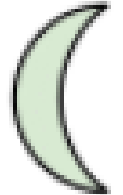

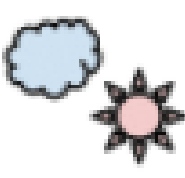


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신우정

● Multi-Class vs Multi-Label

Multi-Class		Multi-Label	
C = 3	Samples	Samples	
	  	  	
	Labels (t)	Labels (t)	
	  	  	
	[0 0 1] [1 0 0] [0 1 0]	[1 0 1] [0 1 0] [1 1 1]	

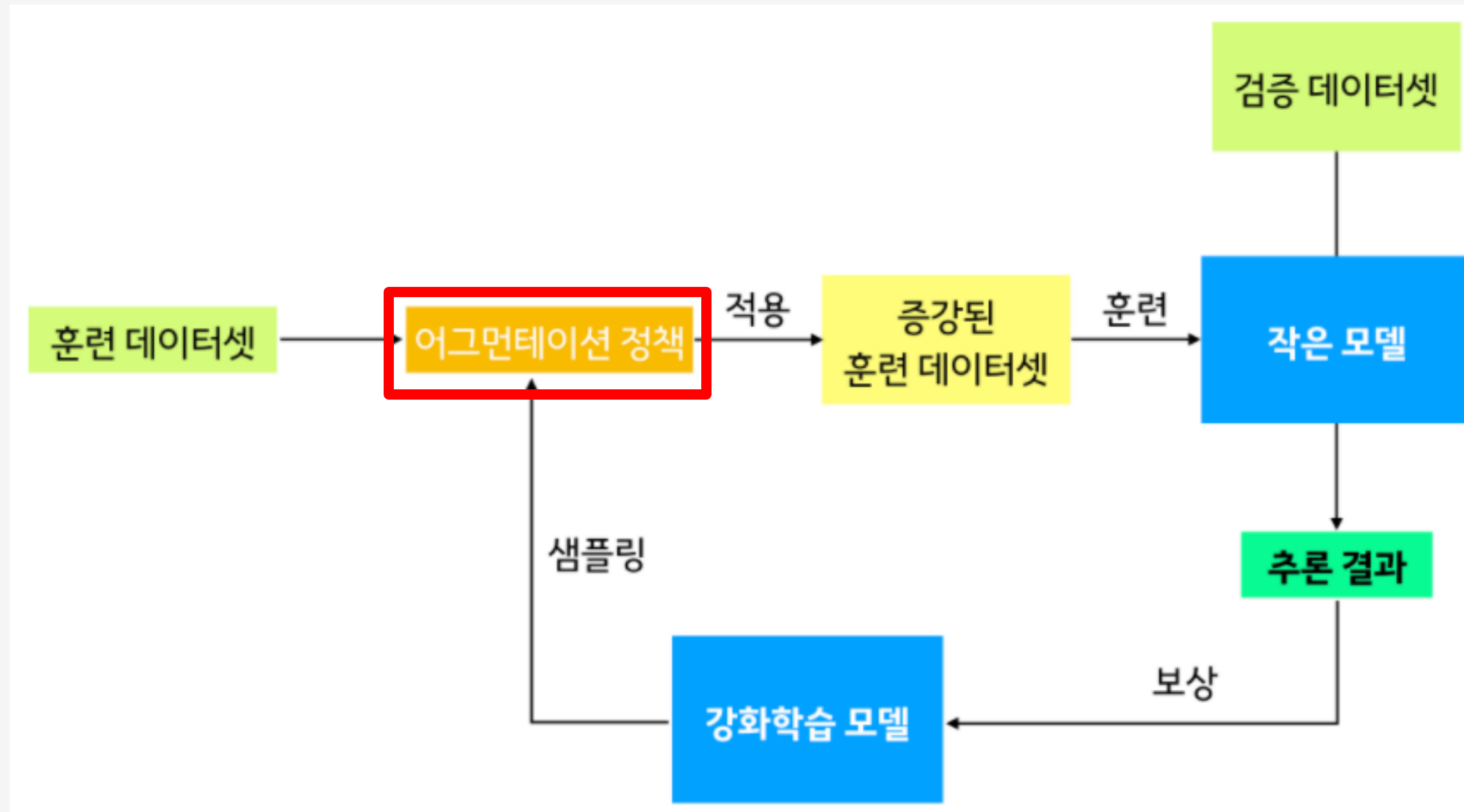
Softmax + cross entropy

Sigmoid + cross entropy

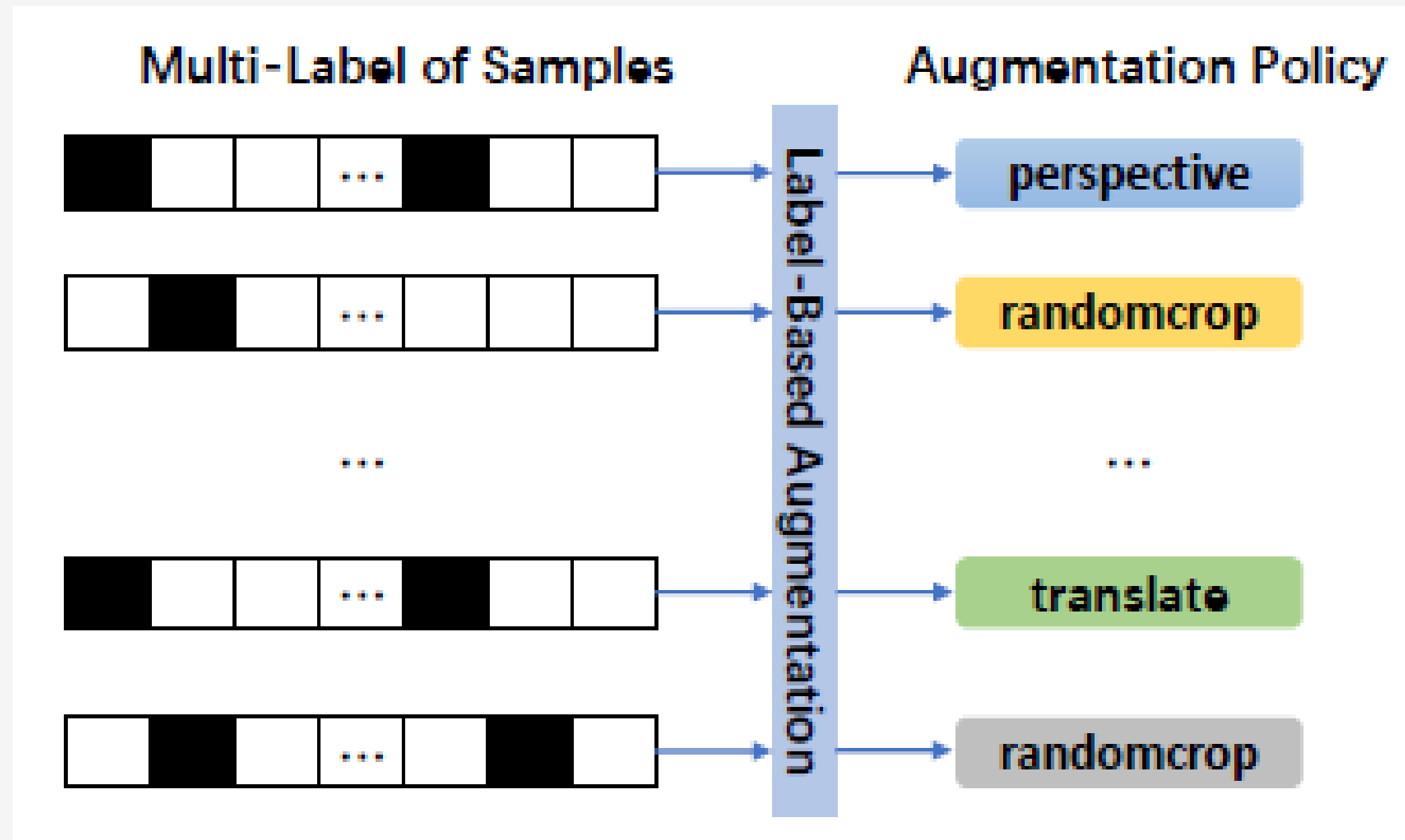
● Grain/Drop of augmentation

perspective	-	P	P	P	N	N	N	P	N	-	-	-	P
noise	-	-	-	P	P	P	-	N	N	-	-	-	-
scale	-	-	-	P	-	P	-	N	-	-	N	-	N
translate	P	P	-	P	P	P	N	N	N	P	-	-	N
hue	P	P	-	N	P	P	N	N	P	-	-	N	N
randomcrop	-	P	-	P	P	-	P	N	N	-	P	N	N
shear	P	P	-	-	P	P	N	N	N	P	-	N	-
	Age 16-30	Age 31-45	Casual Upper	Jacket	Long Hair	No Carrying	Plaid	Plastic Bags	Sandals	Shoes	Formal Upper	Short Sleeve	Skirt

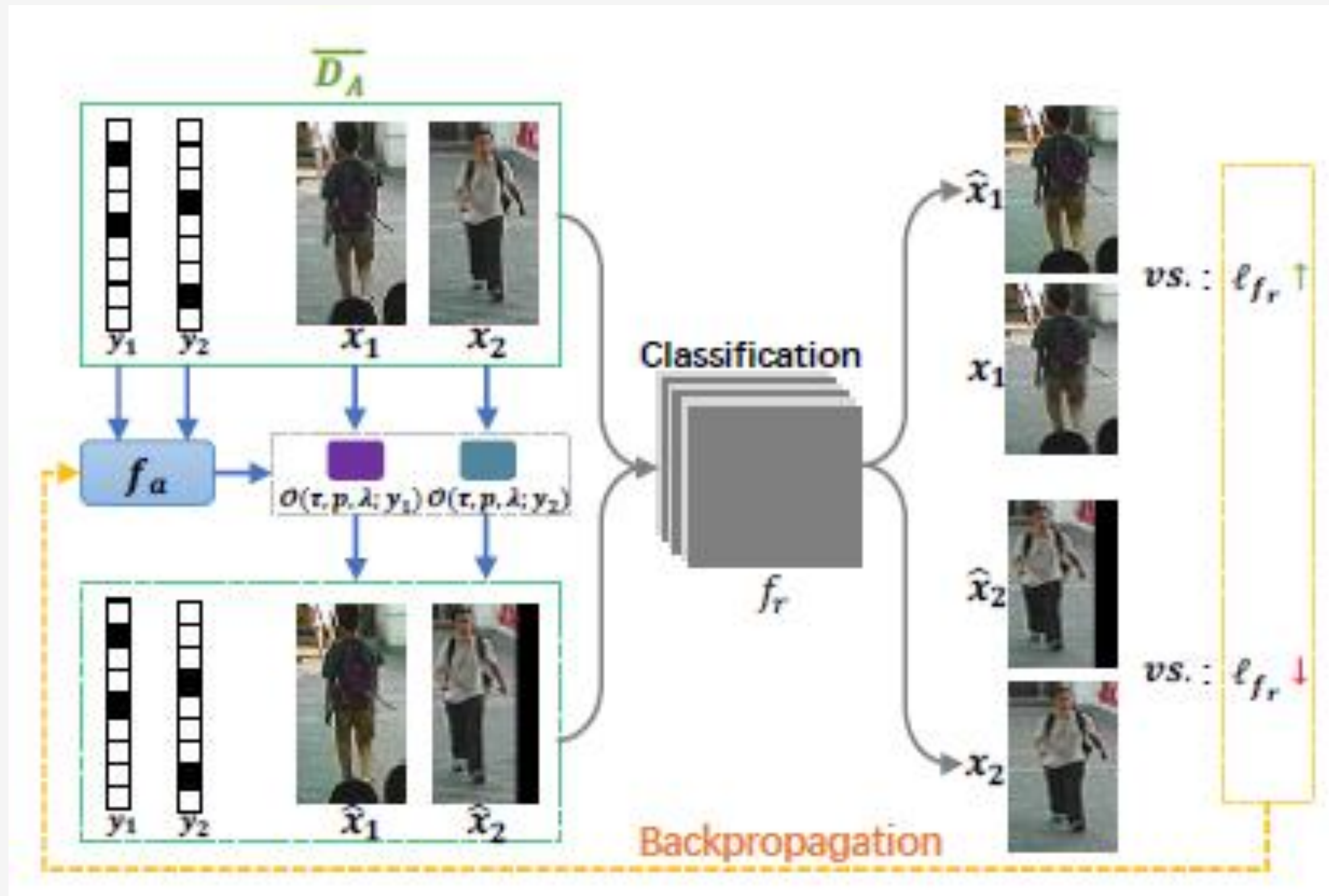
● AA(AutoAugmentation) & FAA(Fast AutoAugmentaion)



● Idea of LB-Aug (Label-Based AutoAugmentation)



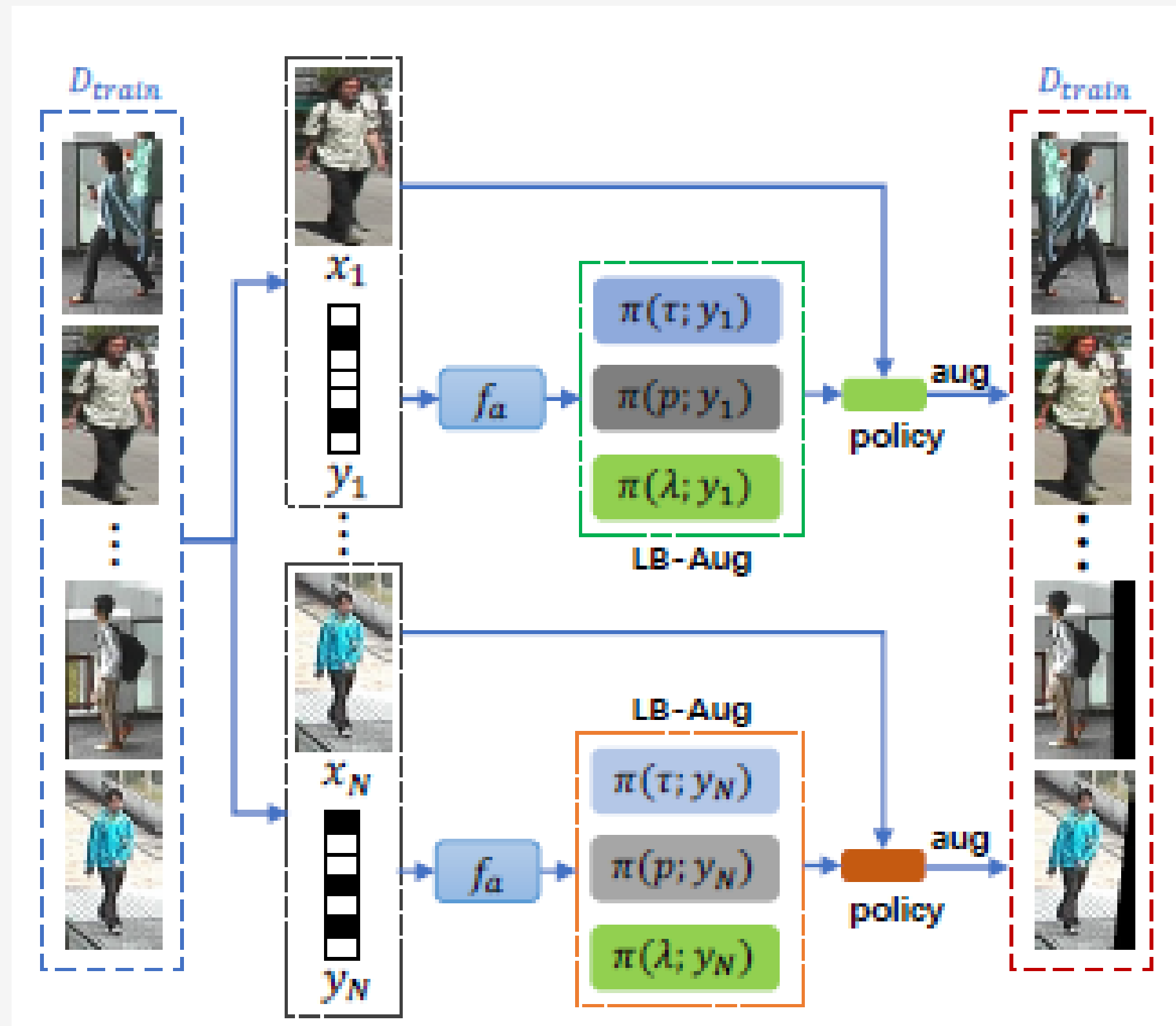
● Augmentation model Training



f_a : LB Aug model

f_r : multi label classifier

● LB-Aug model Training



● Experiment setup

1. Data

- Peta
- MS-COCO
- Chardes

3. Model

- ResNet50
- ResNet101
- Inception-V3

- Inception-I3D
- S3D

2. Augmentation operations

- ShearX, ShearY, TranslateX, TranslateY, Rotate, AutoContrast, Invert, Equalize, Solarize, Posterize, Contrast, Color, Brightness, Sharpness, Cutout and Sample Pairing)

● Performance comparison on Peta

Method	ResNet50			ResNet101			Inception-V3		
	mA	Accu	F1	mA	Accu	F1	mA	Accu	F1
Baseline [†]	84.9	78.1	85.5	85.4	78.9	85.8	86.0	79.6	86.5
Baseline+Random [‡]	85.2	78.5	85.2	85.6	79.0	86.0	86.2	79.7	86.5
FAA [5]	85.5	78.9	85.7	85.8	79.3	86.4	86.4	79.8	86.8
LB-Aug _E [*]	86.6	79.9	86.8	86.6	80.1	86.8	87.2	80.8	87.3
LB-Aug _H [*]	86.8	80.1	87.0	87.0	80.4	87.1	87.4	80.9	87.6

[†] : counterpart without additional augmentation from search space.

[‡] : counterpart with random policies from search space.

^{*} : counterpart with fixed calling probabilities 0.5 and magnitudes 1.

^{*} : counterpart with learnable calling probabilities and magnitudes.

● Performance comparison on MS-COCO

Method	ResNet50			ResNet101			Inception-V3		
	mAP	CF1	OF1	mAP	CF1	OF1	mAP	CF1	OF1
Baseline	74.7	69.4	73.8	77.1	71.3	76.0	77.6	74.1	76.4
Baseline+Random	75.1	70.6	74.1	77.4	72.8	76.7	78.2	74.4	76.7
FAA	76.0	71.1	75.3	78.7	73.5	76.4	79.1	74.7	76.9
LB-Aug _E	77.1	72.3	76.2	79.7	74.5	77.5	80.2	75.9	77.8
LB-Aug _H	77.4	72.6	76.5	80.1	74.8	77.8	80.4	76.2	78.0

● Performance comparison on Chardes

Backbone	Baseline	Baseline+Random			FAA	LB-Aug
		$p^\dagger = 0.25$	$p = 0.75$	$p = 1$		
I3D	36.3	35.5	34.8	34.1	36.4	37.6
S3D	36.8	36.2	35.7	35.0	37.0	38.0

● Comparing LB-Aug against other SOTA methods on Peta

Methods	Backbone	Pretrain	mA	Accu	F1
JRL [21]	AlexNet	ImageNet	85.7	—	85.4
DeepMar [22]	CaffeNet	ImageNet	82.9	75.1	83.4
DeepMar [†] [22]	Inception-V3	ImageNet	81.5	—	85.7
VeSPA [23]	GoogleNet	ImageNet	83.5	77.7	85.5
WPAL [24]	GoogleNet	ImageNet	85.5	77.0	84.9
PGDM [25]	CaffeNet	ImageNet	83.0	78.1	85.8
ALM [18]	BN-Inception	—	86.3	79.5	86.9
GRL [20]	Inception-V3	ImageNet	86.7	—	86.5
FAA [5]	Inception-V3	ImageNet	86.4	79.8	86.8
LB-Aug _H	BN-Inception	ImageNet	86.7	80.1	87.2
LB-Aug _H	Inception-V3	ImageNet	87.4	80.9	87.6

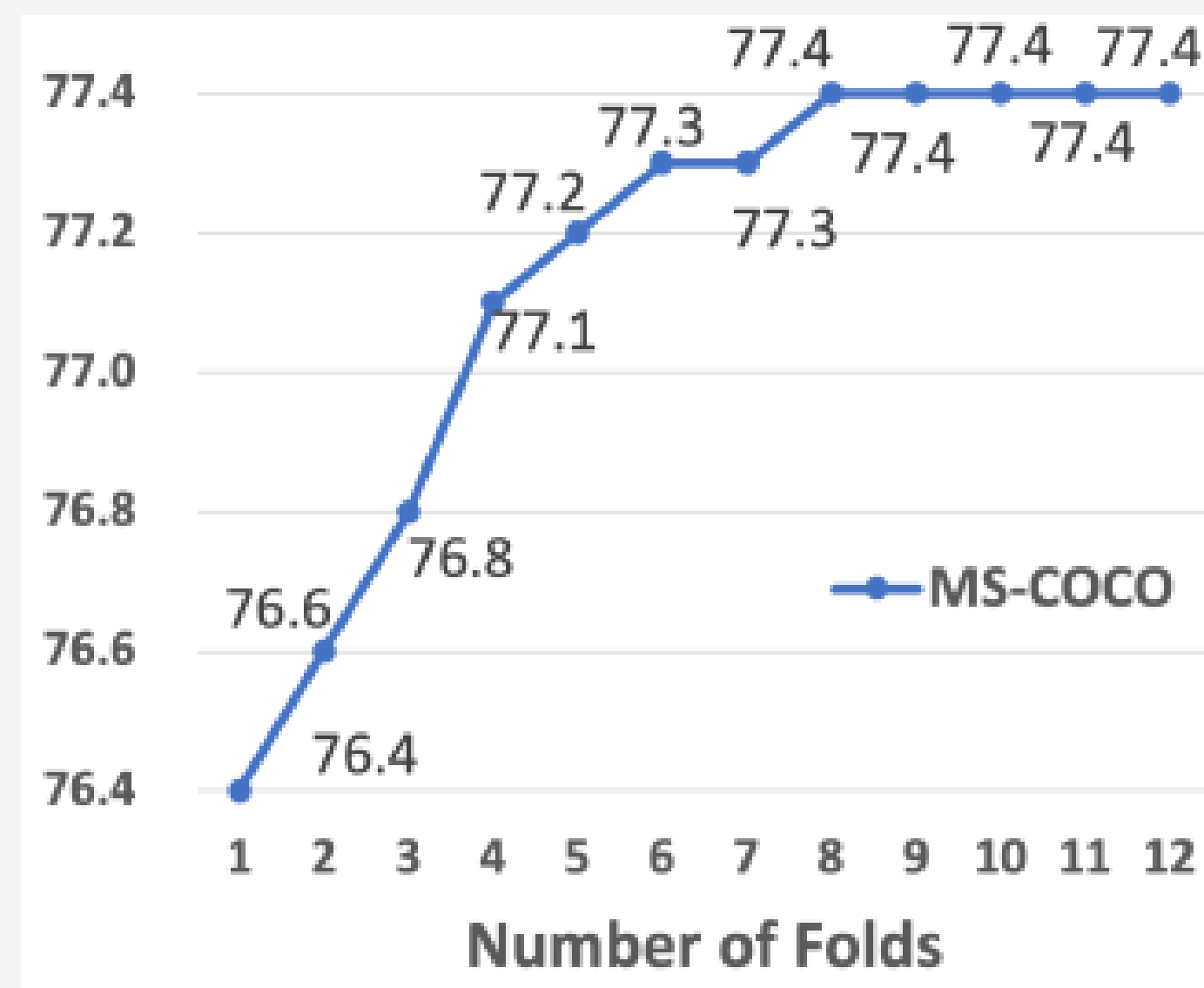
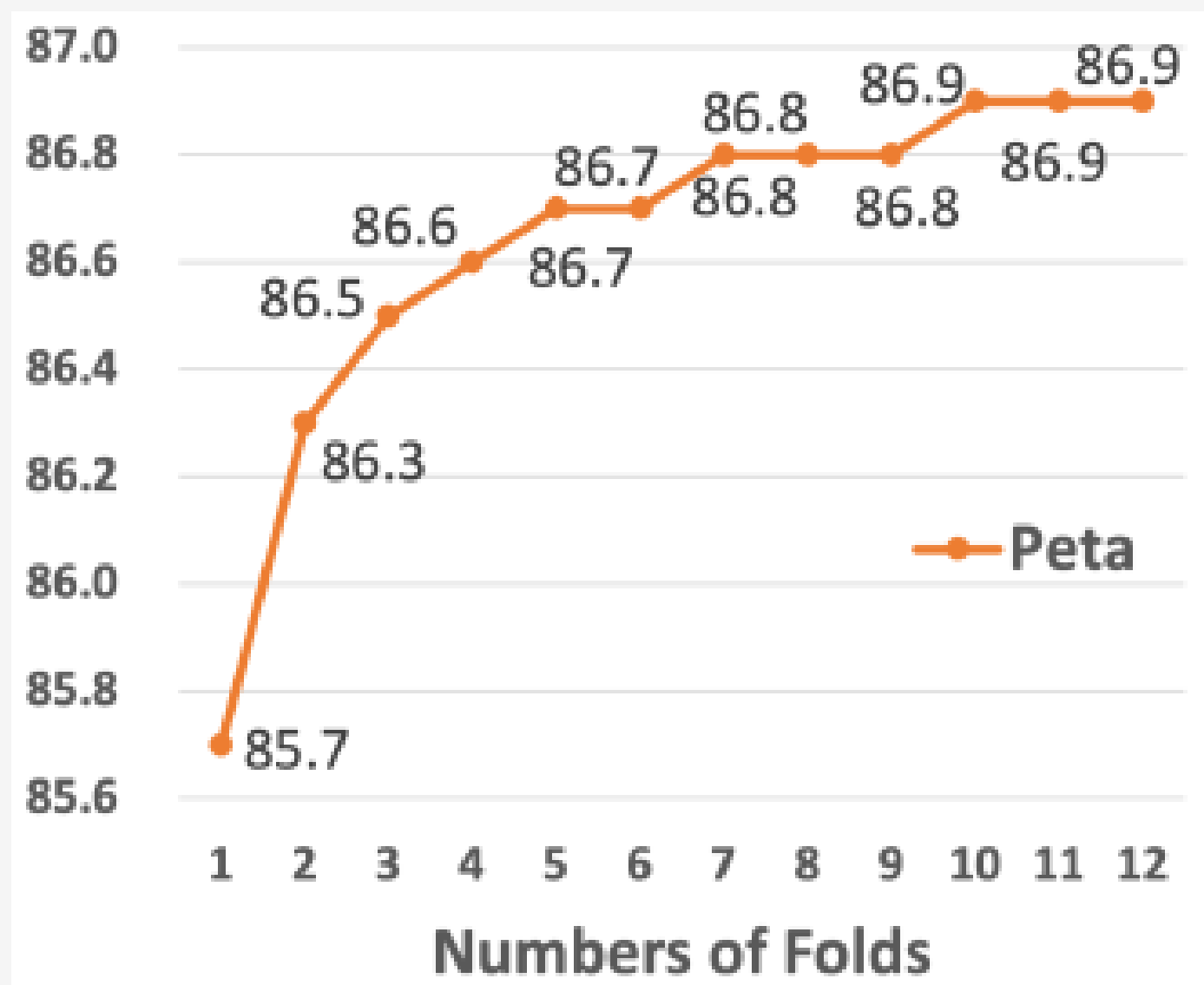
● Comparing LB-Aug against other SOTA methods on COCO

Methods	Backbone	Pretrain	mAP	CF1	OF1
SRN [26]	ResNet101	ImageNet	77.1	71.2	75.8
Multi-Evidence [27]	ResNet101	ImageNet	—	74.9	78.4
CADM [28]	ResNet101	ImageNet	82.3	77.0	79.6
ML-GCN [29]	ResNet101	ImageNet	83.0	78.0	80.3
KSSNet [3]	ResNet101	ImageNet	83.7	77.2	81.5
MS-CMA [30]	ResNet101	—	83.8	78.4	81.0
ASL [31]	TResNet-L	ImageNet	86.6 (86.4*)	81.4 (81.1*)	81.8 (81.6*)
ASL [31] [†]	TResNet-L	ImageNet	88.4 (88.1*)	— (81.6*)	— (82.3*)
LB-Aug _H [‡]	TResNet-L	ImageNet	86.9	81.6	81.9
LB-Aug _H ^{‡‡}	TResNet-L	ImageNet	88.7	82.3	82.7

● Generalization to other model

Method	ResNet101			Inception-V3		
	mA	Accu	F1	mA	Accu	F1
LB-Aug _E	86.6 (+0)	80.0 (-0.1)	86.6 (-0.2)	87.4 (+0.2)	80.9 (+0.1)	87.3 (+0)
LB-Aug _H	86.9 (-0.1)	80.3 (-0.1)	87.0 (-0.1)	87.5 (+0.1)	80.9 (+0)	87.5 (-0.1)

● Performance curve on fold numbers K



감사합니다