

LARGE PRETRAINING DATASETS DON'T ALWAYS GUARANTEE ROBUSTNESS AFTER FINE-TUNING

Supplementary Materials

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Paper under double-blind review

1 ANALYSIS OF REPRESENTATION SHIFT VIA CENTERED KERNEL ALIGNMENT (CKA)

As shown in Figures S1–S8, models pretrained on LAION and OpenAI datasets generally exhibit lower CKA values compared to the other models. However, the gap between these two groups is relatively small when ImageNet-C is used for fine-tuning dataset. In any fine-tuning and evaluation dataset pair, sixth transformer’s mlp.fc2 exhibits significant drop.

Table 1: Reference for the Figures regarding Centered Kernel Alignment.

Fine-Tuning Dataset	Figure Index
ImageNet-V2	Figure S1
ImageNet-A	Figure S2
ImageNet-R	Figure S3
ImageNet-Sketch	Figure S4
ObjectNet	Figure S5
ImageNet-Cartoon	Figure S6
ImageNet-Drawing	Figure S7
ImageNet-C	Figure S8

2 ACCURACY OF USING VARIOUS PRE-TRAINED MODELS ON EACH OOD DATASETS AND EACH CORRUPTION IN IMAGENET-C

Table 2 summarizes the Table indices for the accuracy on each OOD (out-of-distribution) dataset (Table S1 and Tables S2-S17) and ImageNet-C (Tables S18-S35) after fine-tuning on various datasets. Each pre-trained and fine-tuned model is evaluated on ImageNet-C with 15 corruptions at severity levels ranging from 1 to 5. Following the original ImageNet-C benchmark Hendrycks & Dietterich (2019), we average the performance over the different severity levels. However, for consistency with other datasets, we report the results as accuracy rather than error.

Table 2: Reference for the tables showing accuracy of pre-trained models on OOD datasets (left) and ImageNet-C corruptions (right).

Architecture	D_{pre}	Accuracy on OOD datasets	Accuracy on ImageNet-C
ViT-B/16	IN-1K + AugReg	Table S1	Table S18
	IN-1K + SAM	Table S2	Table S19
	IN-21K	Table S3	Table S20
	IN-21K-P	Table S4	Table S21
	IN-21K + AugReg	Table S5	Table S22
	LAION-2B	Table S6	Table S23
	OpenAI	Table S7	Table S24
ViT-B/32	IN-1K + AugReg	Table S8	Table S25
	IN-21K + AugReg	Table S9	Table S27
	LAION-2B	Table S10	Table S28
	OpenAI	Table S11	Table S29
ViT-S/16	IN-1K + AugReg	Table S12	Table S30
	IN-21K + AugReg	Table S13	Table S31
ViT-S/32	IN-21K + AugReg	Table S14	Table S32
ViT-L/16	IN-21K + AugReg	Table S15	Table S33
ResNet-18	IN-1K	Table S16	Table S34
ResNet-50	IN-1K	Table S17	Table S35

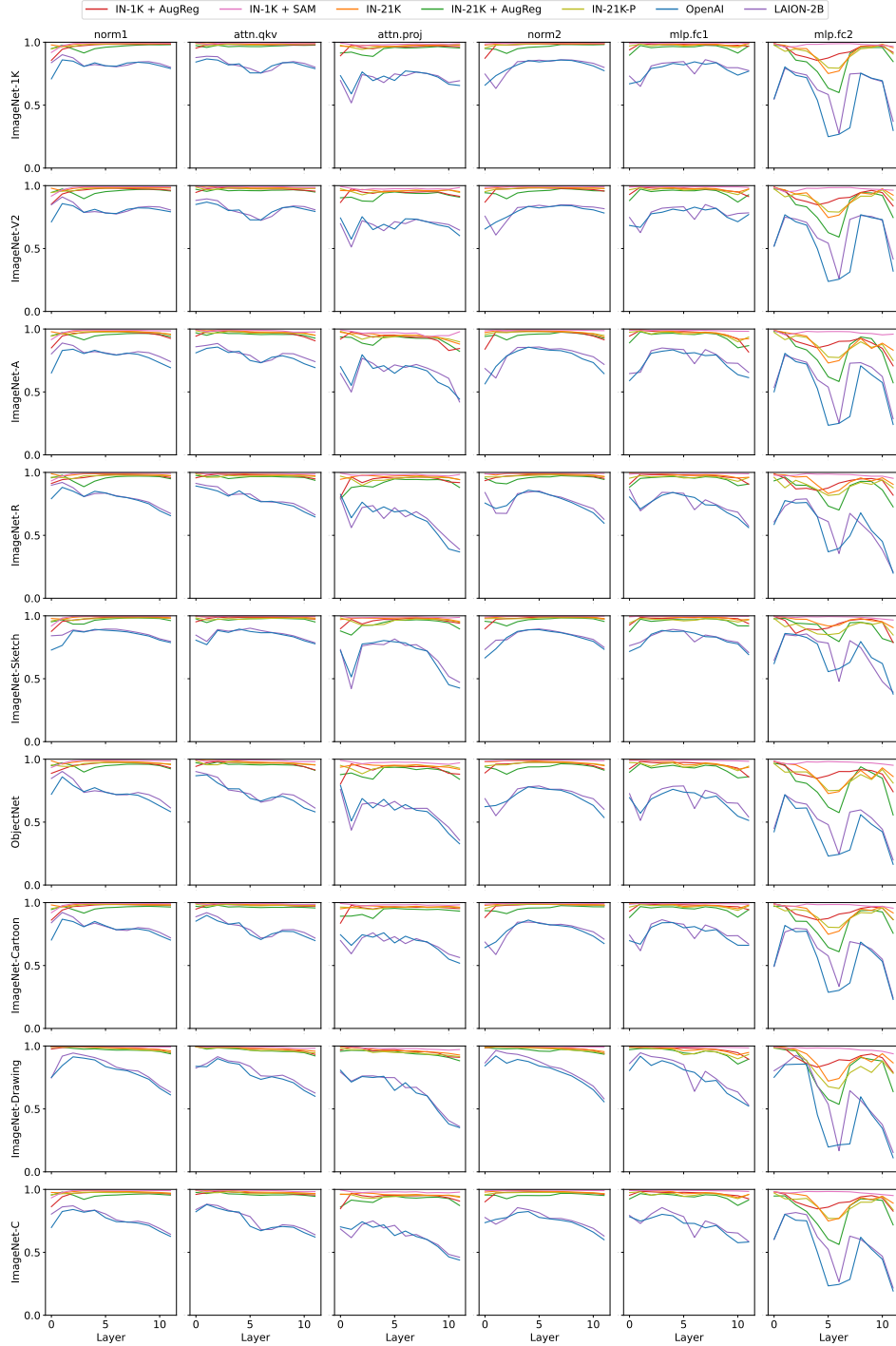


Figure S1: **Representational shifts from fine-tuning on ImageNet-V2, analyzed by Centered Kernel Alignment (CKA), in ViT-B/16 models pretrained on various datasets.** Rows indicate datasets where CKA is measured, and column indicates different parts of the transformer demonstrated in Figure 9 in the main paper. Models pretrained on OpenAI and LAION-2B show distinct CKA patterns across layers compared to others.

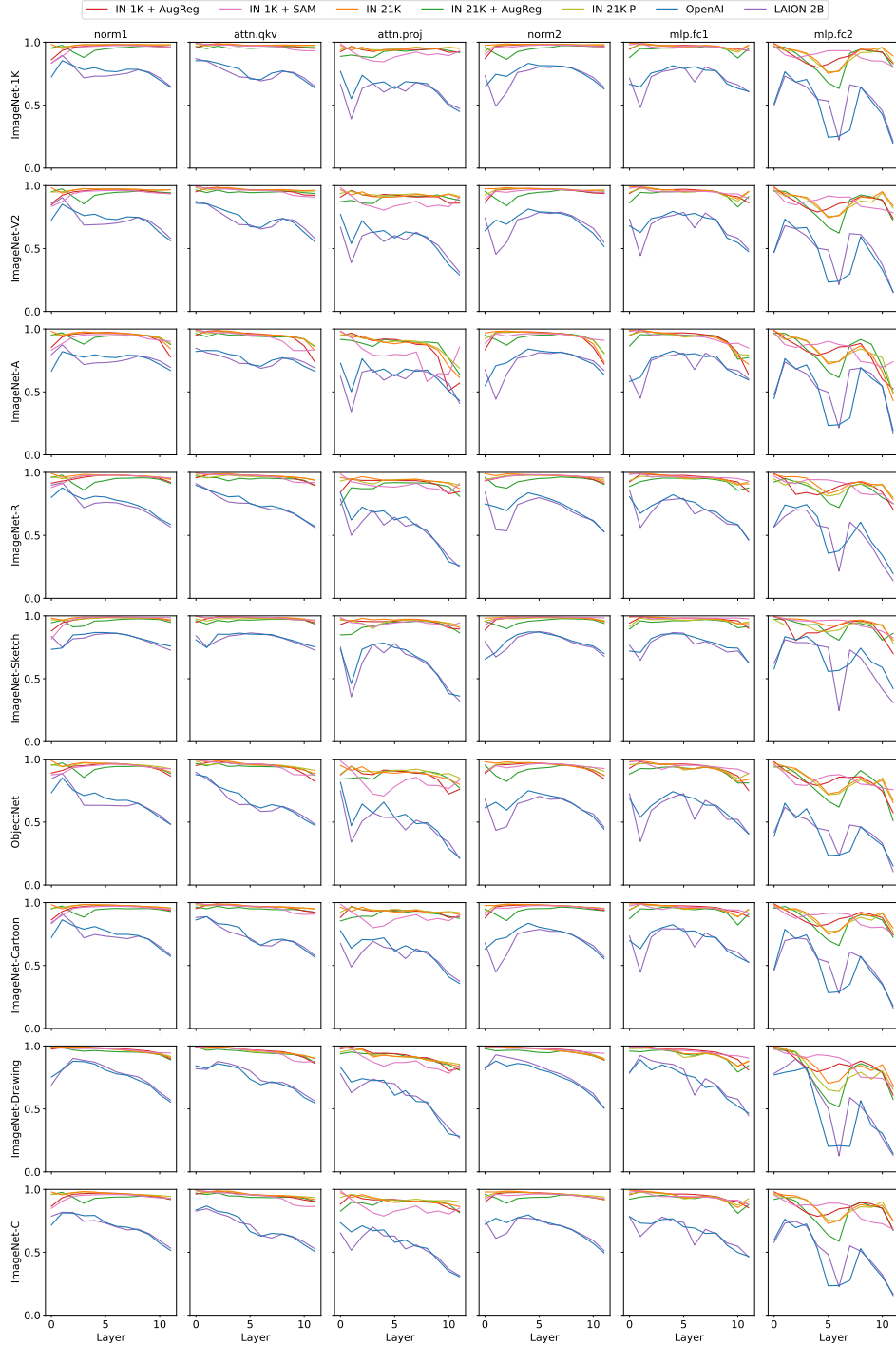


Figure S2: **Representational shifts from fine-tuning on ImageNet-A, analyzed by Centered Kernel Alignment (CKA), in ViT-B/16 models pretrained on various datasets.** Rows indicate datasets where CKA is measured, and column indicates different parts of the transformer demonstrated in Figure 9 in the main paper. Models pretrained on OpenAI and LAION-2B show distinct CKA patterns across layers compared to others.

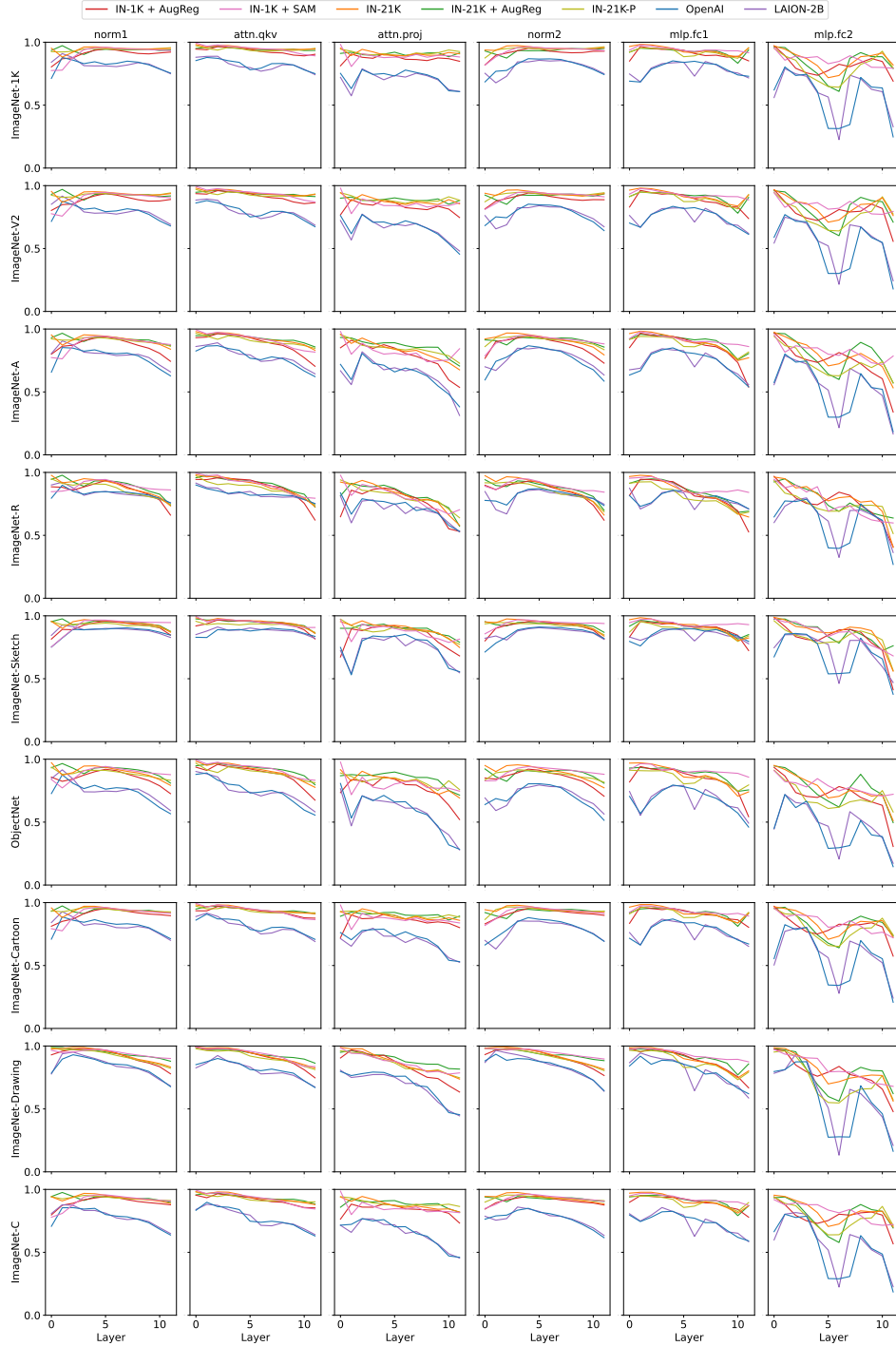


Figure S3: **Representational shifts from fine-tuning on ImageNet-R, analyzed by Centered Kernel Alignment (CKA), in ViT-B/16 models pretrained on various datasets.** Rows indicate datasets where CKA is measured, and column indicates different parts of the transformer demonstrated in Figure 9 in the main paper. Models pretrained on OpenAI and LAION-2B show distinct CKA patterns across layers compared to others.

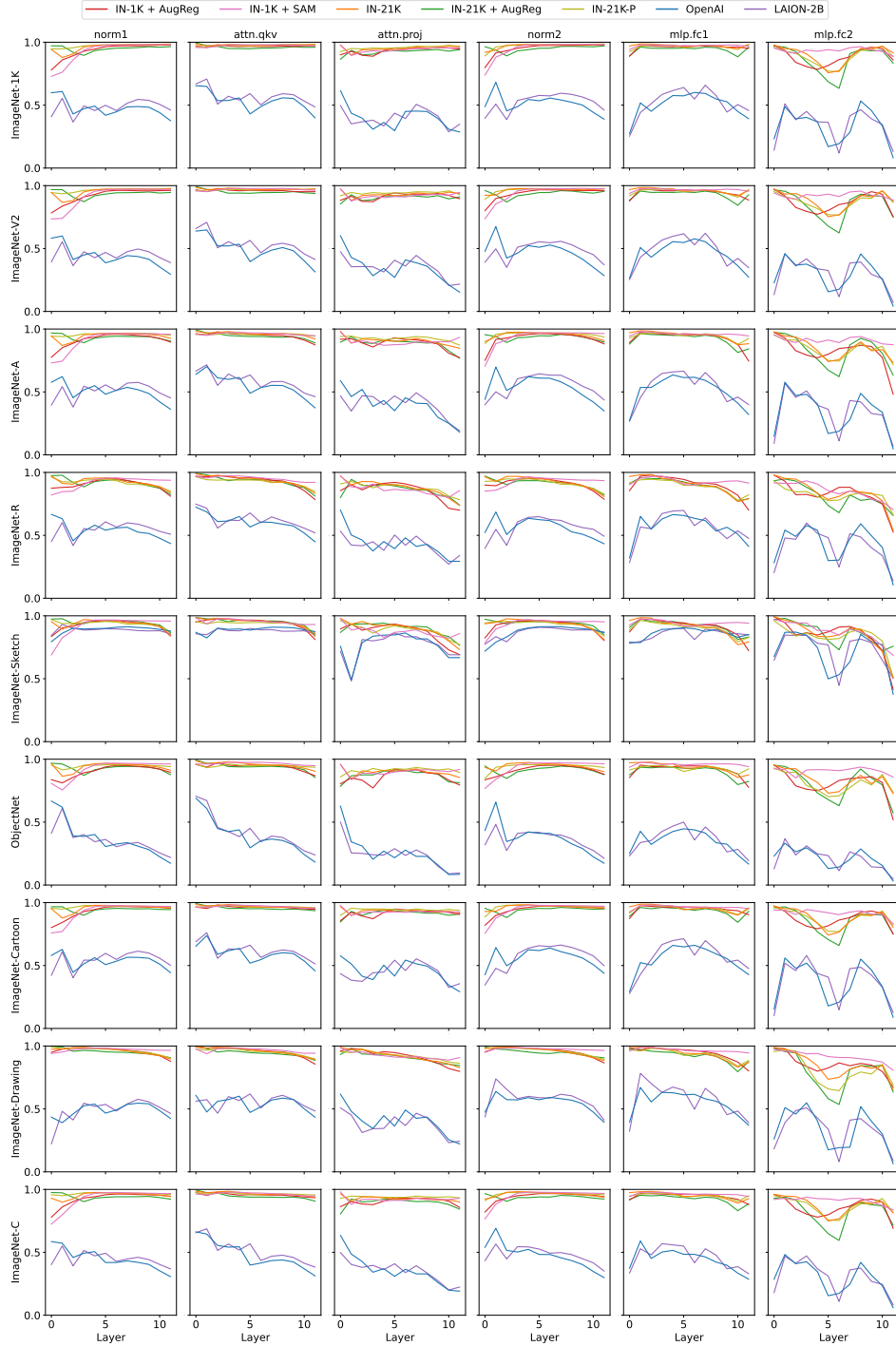


Figure S4: Representational shifts from fine-tuning on ImageNet-Sketch, analyzed by Centered Kernel Alignment (CKA), in ViT-B/16 models pretrained on various datasets. Rows indicate datasets where CKA is measured, and column indicates different parts of the transformer demonstrated in Figure 9 in the main paper. Models pretrained on OpenAI and LAION-2B show distinct CKA patterns across layers compared to others.

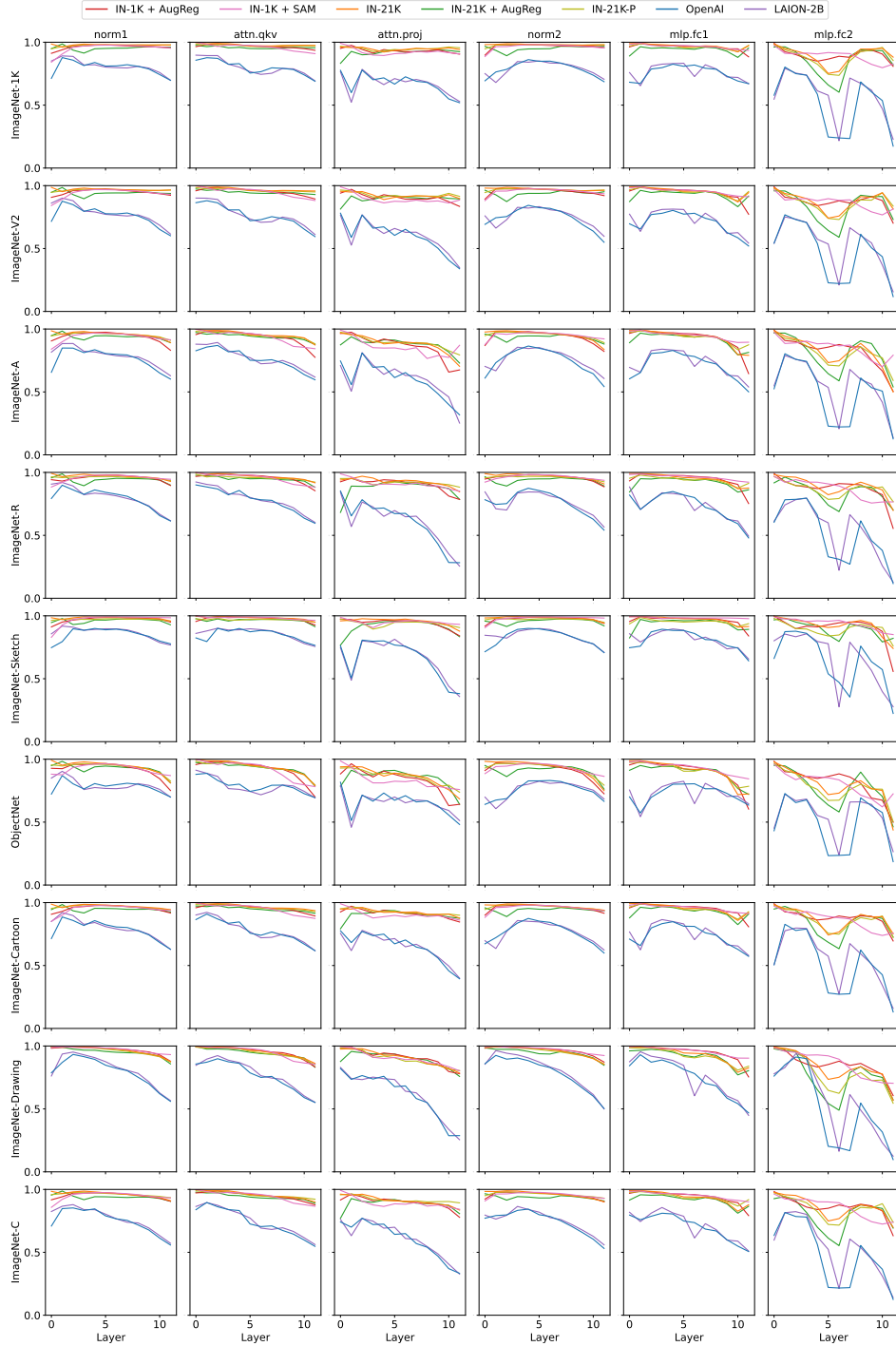


Figure S5: **Representational shifts from fine-tuning on ObjectNet, analyzed by Centered Kernel Alignment (CKA), in ViT-B/16 models pretrained on various datasets.** Rows indicate datasets where CKA is measured, and column indicates different parts of the transformer demonstrated in Figure 9 in the main paper. Models pretrained on OpenAI and LAION-2B show distinct CKA patterns across layers compared to others.

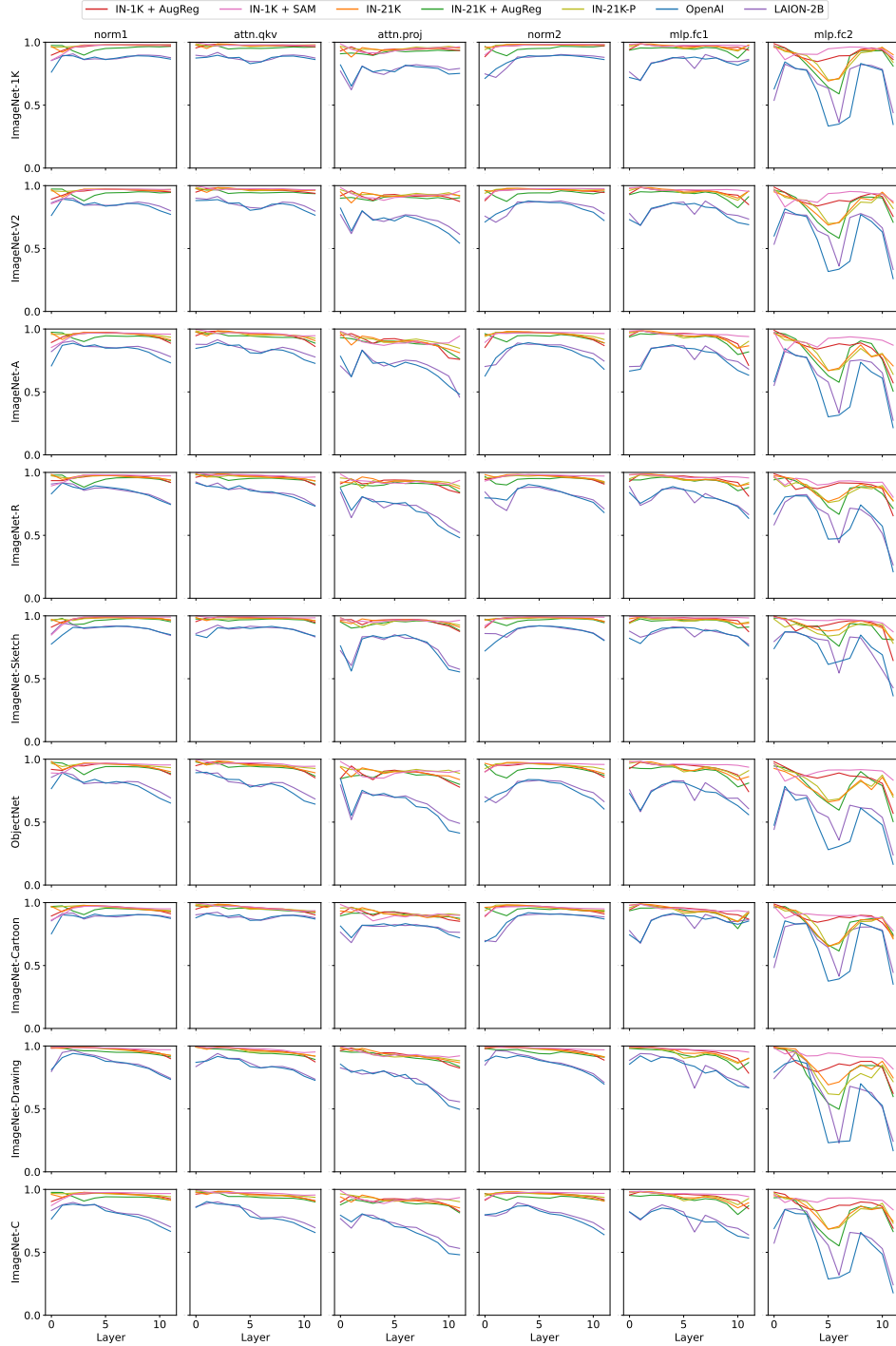


Figure S6: **Representational shifts from fine-tuning on ImageNet-Cartoon, analyzed by Centered Kernel Alignment (CKA), in ViT-B/16 models pretrained on various datasets.** Rows indicate datasets where CKA is measured, and column indicates different parts of the transformer demonstrated in Figure 9 in the main paper. Models pretrained on OpenAI and LAION-2B show distinct CKA patterns across layers compared to others.

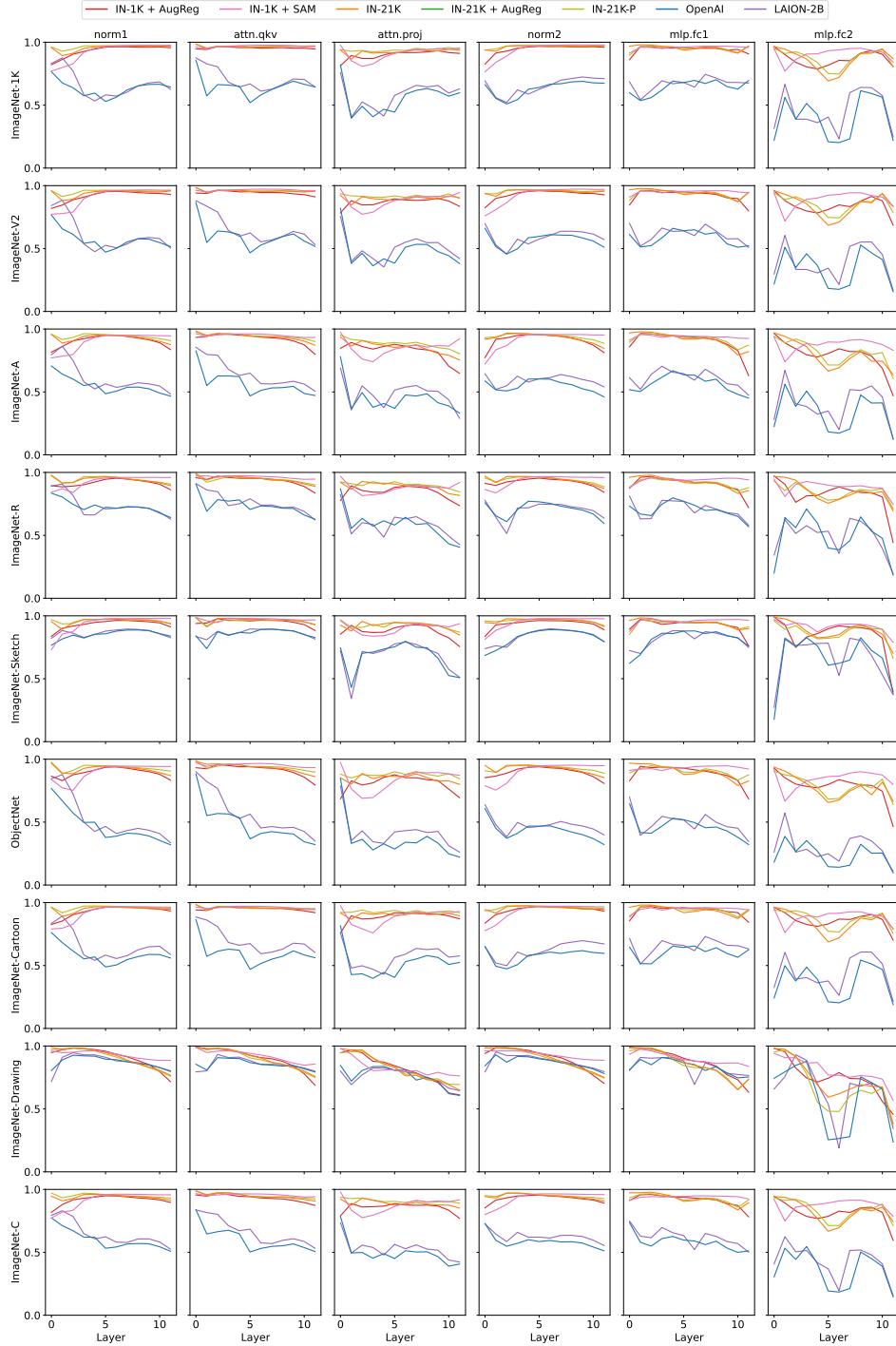


Figure S7: **Representational shifts from fine-tuning on ImageNet-Drawing, analyzed by Centered Kernel Alignment (CKA), in ViT-B/16 models pretrained on various datasets.** Rows indicate datasets where CKA is measured, and column indicates different parts of the transformer demonstrated in Figure 9 in the main paper. Models pretrained on OpenAI and LAION-2B show distinct CKA patterns across layers compared to others.

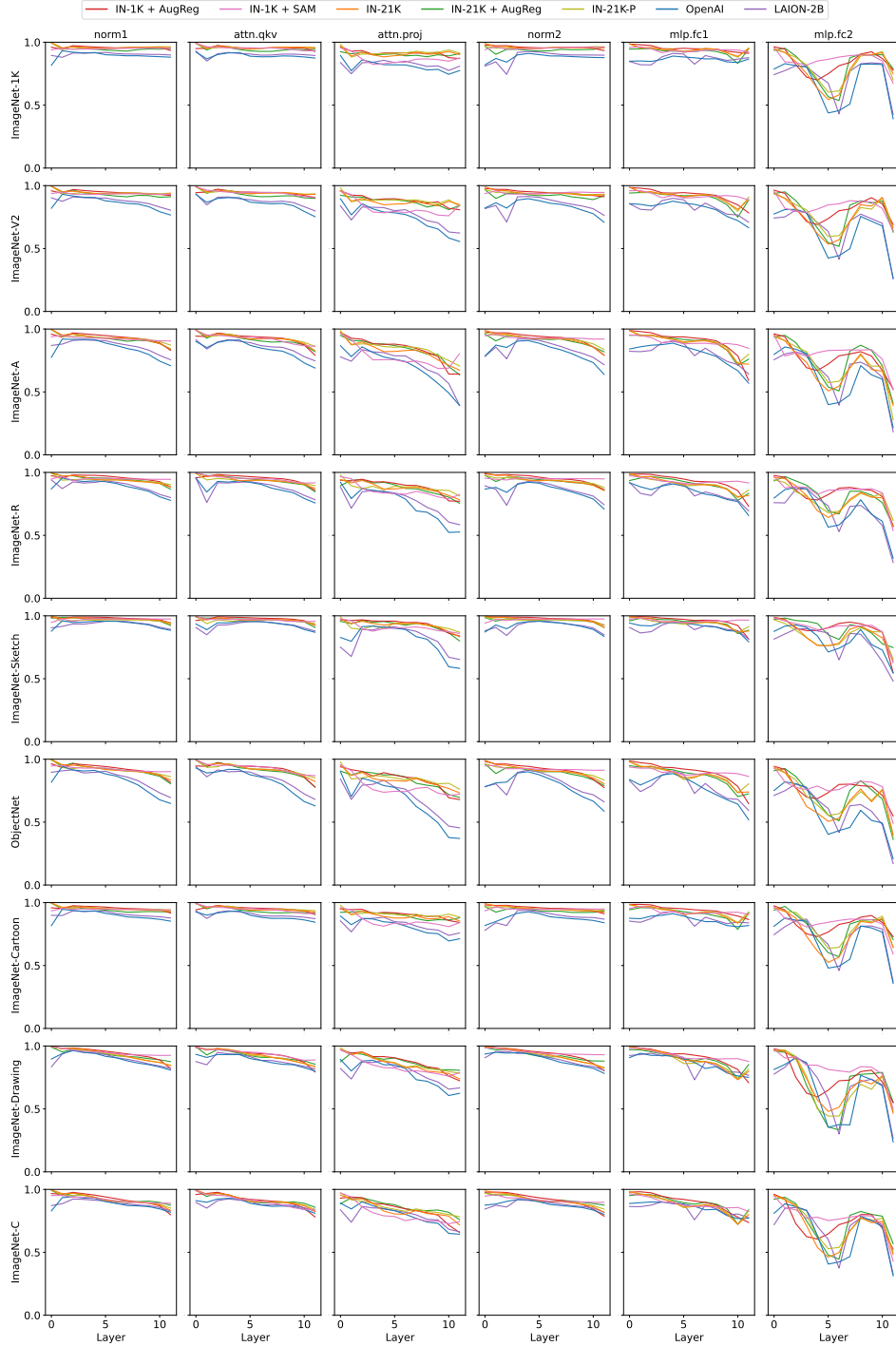


Figure S8: **Representational shifts from fine-tuning on ImageNet-C, analyzed by Centered Kernel Alignment (CKA), in ViT-B/16 models pretrained on various datasets.** Rows indicate datasets where CKA is measured, and column indicates different parts of the transformer demonstrated in Figure 9 in the main paper. Models pretrained on OpenAI and LAION-2B show distinct CKA patterns across layers compared to others.

Table S1: The accuracy on each OOD dataset after fine-tuning on ImageNet-1K with AugReg pretrained ViT-B/16 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Fine-Tuning Dataset	IN-1K	IN-V2	IN-A	IN-R	IN-Sketch	ObjNet	IN-Cartoon	IN-Drawing	IN-C
Pretrained		79.2	66.4	15.0	38.0	28.0	25.7	66.2	39.1	56.0
FT	IN-V2	78.4	-	25.2	41.9	29.2	37.1	64.7	40.4	57.4
	IN-A	72.9	60.6	-	36.7	24.9	35.0	55.3	32.6	53.5
	IN-R	69.8	59.2	20.9	-	46.7	32.0	61.3	51.4	52.0
	IN-Sketch	75.7	63.9	17.3	59.1	-	33.0	66.3	50.8	53.8
	ObjNet	74.4	62.2	24.9	36.3	25.1	-	55.6	33.6	52.3
	IN-Cartoon	85.2	63.5	19.9	40.5	29.5	33.5	-	41.2	51.3
	IN-Drawing	81.5	62.9	16.5	41.1	32.7	32.4	64.2	-	56.0
	IN-C	99.8	61.1	13.9	37.0	25.1	27.7	92.2	70.2	-
Linear Probing	IN-V2	79.1	-	15.6	38.2	28.1	33.1	66.2	39.0	55.9
	IN-A	78.6	65.9	-	38.5	27.4	34.1	65.6	38.6	55.8
	IN-R	78.7	66.6	17.1	-	30.2	33.4	66.1	39.8	56.2
	IN-Sketch	77.2	64.8	16.6	46.3	-	33.5	65.6	40.5	54.5
	ObjNet	78.6	65.9	18.1	38.6	27.9	-	65.1	39.3	56.1
	IN-Cartoon	80.5	65.4	15.1	39.2	28.1	32.2	-	40.9	55.6
	IN-Drawing	78.1	65.2	14.9	41.3	28.5	33.3	65.6	-	54.3
	IN-C	97.1	61.9	15.1	36.8	25.2	28.3	83.3	57.4	-
Visual Prompt (Bahng et al., 2022)	IN-V2	75.7	-	12.7	39.6	27.4	34.4	60.5	36.7	47.9
	IN-A	69.1	57.1	-	36.3	21.9	32.7	50.6	26.1	38.0
	IN-R	68.1	55.9	9.6	-	36.2	30.0	55.7	41.8	40.1
	IN-Sketch	72.2	59.5	9.4	51.6	-	32.3	60.6	44.9	44.3
	ObjNet	68.6	56.2	13.0	33.7	22.2	-	46.8	23.0	35.3
	IN-Cartoon	74.5	61.2	10.2	41.2	27.0	31.5	-	35.2	41.8
	IN-Drawing	72.1	59.4	8.4	42.2	28.8	30.6	59.3	-	44.2
	IN-C	77.9	65.2	14.8	40.1	28.3	35.7	63.5	49.8	-
LoRA (Hu et al., 2021)	IN-V2	79.2	-	15.3	38.2	28.1	33.2	66.4	39.3	56.1
	IN-A	79.0	66.4	-	38.9	27.8	35.5	65.2	39.3	56.5
	IN-R	79.2	66.8	16.7	-	29.7	34.8	66.9	40.0	56.7
	IN-Sketch	79.2	66.8	16.5	45.9	-	34.6	67.7	44.1	56.6
	ObjNet	78.9	66.3	18.3	39.3	27.8	-	65.1	39.2	55.0
	IN-Cartoon	78.7	65.8	14.8	39.3	28.3	32.1	-	39.8	54.6
	IN-Drawing	77.9	66.3	15.0	43.7	32.1	33.5	66.4	-	55.1
	IN-C	79.9	67.4	16.3	39.2	28.1	34.1	67.5	40.8	-
EWC (Kirkpatrick et al., 2017)	IN-V2	80.0	-	19.7	41.8	29.4	36.8	67.1	42.8	58.2
	IN-A	76.9	64.9	-	40.4	27.8	38.2	61.1	36.5	56.6
	IN-R	75.2	63.9	19.0	-	43.9	33.3	66.4	57.5	56.1
	IN-Sketch	78.9	66.6	16.6	52.2	-	34.2	68.3	49.6	57.2
	ObjNet	78.1	66.2	23.1	40.9	29.0	-	62.4	39.8	56.9
	IN-Cartoon	79.2	66.0	16.5	42.7	29.9	33.8	-	42.6	54.7
	IN-Drawing	79.3	66.7	16.3	44.5	34.0	34.7	67.9	-	58.3
	IN-C	80.1	67.8	20.0	42.5	31.2	37.5	66.8	50.0	-
LwF (Li & Hoiem, 2017)	IN-V2	79.2	-	22.9	41.3	29.4	36.4	65.8	41.0	57.9
	IN-A	77.4	65.5	-	39.4	27.5	36.7	61.8	38.3	57.2
	IN-R	76.1	64.7	21.7	-	47.8	34.1	66.8	54.9	57.2
	IN-Sketch	77.3	65.2	17.3	57.8	-	33.5	67.8	49.6	55.2
	ObjNet	78.2	66.2	24.1	38.4	27.3	-	62.3	38.8	56.3
	IN-Cartoon	87.2	65.9	19.4	41.2	29.9	34.2	-	42.7	55.6
	IN-Drawing	84.0	65.4	17.7	41.9	33.2	33.4	67.7	-	58.2
	IN-C	99.2	65.8	13.5	40.7	27.8	31.4	90.6	61.7	-
LP-FT (Kumar et al., 2022)	IN-V2	78.8	-	24.7	41.6	29.3	36.8	65.3	41.3	57.6
	IN-A	76.5	64.6	-	38.2	27.4	37.1	60.5	36.7	56.2
	IN-R	74.7	63.4	21.1	-	46.9	34.7	65.4	53.1	55.3
	IN-Sketch	76.2	64.5	18.0	58.8	-	33.9	67.0	48.9	54.4
	ObjNet	77.1	64.9	24.9	38.2	26.8	-	60.7	37.7	54.9
	IN-Cartoon	86.3	64.2	19.5	41.0	29.9	33.5	-	43.1	52.8
	IN-Drawing	82.1	63.2	16.5	41.7	32.9	32.0	64.8	-	56.0
	IN-C	98.0	61.0	13.7	37.5	25.7	27.3	87.1	66.0	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	79.7	-	21.3	40.5	29.5	36.0	66.5	40.9	58.0
	IN-A	78.6	66.4	-	39.3	28.5	37.1	64.4	38.6	57.8
	IN-R	79.1	67.1	23.0	-	44.7	37.4	69.5	54.7	59.6
	IN-Sketch	78.9	66.4	17.6	52.1	-	34.7	68.7	48.7	57.3
	ObjNet	79.3	67.3	23.5	40.0	29.0	-	65.2	40.5	57.6
	IN-Cartoon	83.8	66.5	19.3	41.0	30.4	34.9	-	43.2	56.3
	IN-Drawing	82.5	66.9	18.5	42.2	33.5	35.0	68.2	-	59.5
	IN-C	93.4	66.9	18.7	41.3	29.9	34.7	82.4	57.6	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	79.8	-	21.0	41.0	29.7	36.0	66.9	41.7	58.0
	IN-A	78.3	66.4	-	39.7	28.5	37.5	63.7	38.4	57.8
	IN-R	78.9	67.1	23.1	-	45.9	37.2	69.6	55.8	59.6
	IN-Sketch	78.9	66.6	17.5	54.0	-	34.6	69.1	49.8	57.5
	ObjNet	79.3	67.4	24.1	40.3	29.1	-	64.9	40.6	57.7
	IN-Cartoon	83.7	66.4	18.9	41.8	30.6	34.7	-	43.6	56.2
	IN-Drawing	82.6	66.9	18.4	43.0	34.0	35.2	68.7	-	59.7
	IN-C	92.6	67.5	18.6	42.3	30.6	35.3	81.3	57.3	-

Table S2: The accuracy on each OOD dataset after fine-tuning on ImageNet-1K with SAM pretrained ViT-B/16 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	IN-R	IN-Sketch	ObjNet	IN-Cartoon	IN-Drawing	IN-C
Pretrained		79.2	66.4	15.0	38.0	28.0	25.7	66.2	39.1	56.0
Pretrained		80.2	68.2	9.0	40.1	27.7	34.2	66.9	42.3	54.6
FT	IN-V2	81.1	-	17.1	42.9	29.7	38.7	69.5	44.1	56.8
	IN-A	77.1	65.7	-	37.9	25.7	39.8	60.4	30.9	51.3
	IN-R	75.0	64.1	19.1	-	49.5	36.1	66.9	53.6	53.9
	IN-Sketch	79.2	67.3	14.2	59.5	-	35.8	71.0	52.0	55.7
	ObjNet	77.6	66.1	21.9	37.1	25.9	-	57.3	32.2	52.2
	IN-Cartoon	82.6	67.1	15.4	44.2	32.2	35.2	-	42.8	51.3
	IN-Drawing	79.9	65.1	12.9	45.1	34.0	33.5	67.2	-	55.4
	IN-C	99.7	63.0	15.5	39.3	27.1	30.4	92.5	71.4	-
Linear Probing	IN-V2	80.3	-	9.0	40.2	27.6	34.1	67.5	42.3	54.7
	IN-A	80.2	68.0	-	41.0	27.8	34.9	67.4	42.4	54.5
	IN-R	80.1	68.1	9.6	-	28.6	34.1	67.9	43.5	54.6
	IN-Sketch	79.5	67.3	9.3	45.2	-	34.2	67.7	44.9	54.1
	ObjNet	80.1	67.9	9.2	40.0	27.9	-	67.3	42.3	54.6
	IN-Cartoon	80.3	68.1	8.4	41.6	28.2	32.8	-	43.5	53.8
	IN-Drawing	79.9	67.5	8.9	42.7	29.3	32.7	67.9	-	54.6
	IN-C	93.4	65.6	11.4	40.6	28.1	32.1	80.6	58.1	-
Visual Prompt (Bahng et al., 2022)	IN-V2	75.5	-	8.1	39.9	24.1	35.5	58.5	35.0	44.7
	IN-A	67.5	55.6	-	35.8	19.1	34.0	45.6	26.4	30.4
	IN-R	69.9	57.4	6.3	-	32.0	29.2	56.5	39.7	36.8
	IN-Sketch	71.2	58.2	5.6	47.2	-	28.3	56.4	39.5	36.3
	ObjNet	70.7	58.7	9.0	36.2	20.1	-	48.2	27.2	35.3
	IN-Cartoon	75.8	62.3	6.5	42.5	27.0	31.8	-	39.8	42.3
	IN-Drawing	72.8	59.8	5.4	43.0	28.1	28.6	59.0	-	42.2
	IN-C	77.7	65.7	8.8	41.3	28.0	36.7	62.1	44.1	-
LoRA (Hu et al., 2021)	IN-V2	80.2	-	8.9	40.1	27.7	34.2	67.4	42.3	54.7
	IN-A	80.2	68.2	-	41.1	27.8	34.6	67.7	42.7	54.8
	IN-R	80.2	68.2	9.7	-	29.0	34.8	68.2	43.9	54.7
	IN-Sketch	79.9	67.7	9.4	44.0	-	34.7	68.1	44.8	54.6
	ObjNet	80.1	68.0	9.2	40.9	28.2	-	67.5	42.5	54.7
	IN-Cartoon	80.1	68.2	8.7	41.5	28.2	33.3	-	43.5	53.7
	IN-Drawing	80.0	67.8	9.1	42.6	29.0	33.1	68.1	-	54.5
	IN-C	80.2	68.6	13.7	42.4	30.7	36.9	68.6	52.4	-
EWC (Kirkpatrick et al., 2017)	IN-V2	80.4	-	9.7	40.8	28.2	35.0	67.8	43.0	55.1
	IN-A	79.5	68.2	-	41.3	27.4	39.0	64.3	41.5	54.7
	IN-R	80.3	68.6	11.5	-	36.2	36.5	70.2	49.6	56.3
	IN-Sketch	80.1	68.1	9.7	47.9	-	34.2	69.3	47.7	55.6
	ObjNet	80.4	68.6	12.5	41.4	28.3	-	66.7	43.0	56.5
	IN-Cartoon	80.4	68.2	9.3	42.8	29.3	34.4	-	44.6	54.3
	IN-Drawing	80.1	67.9	10.0	44.5	31.2	35.3	68.7	-	56.9
	IN-C	80.4	68.6	11.0	41.2	28.8	36.7	66.8	44.7	-
LwF (Li & Hoiem, 2017)	IN-V2	81.1	-	16.1	42.8	29.7	38.3	69.5	44.3	56.8
	IN-A	78.6	67.1	-	39.4	26.7	40.2	63.4	34.3	53.9
	IN-R	77.2	66.1	17.9	-	49.6	37.1	69.2	55.3	56.0
	IN-Sketch	79.6	67.8	13.8	59.0	-	35.7	71.3	51.6	56.3
	ObjNet	79.4	67.7	20.2	39.7	27.5	-	62.5	37.3	55.0
	IN-Cartoon	82.9	68.0	14.7	44.3	32.0	35.7	-	44.3	53.1
	IN-Drawing	80.6	65.9	12.3	45.2	34.4	34.2	68.1	-	56.2
	IN-C	99.4	65.5	14.7	42.4	28.9	33.0	93.0	71.8	-
LP-FT (Kumar et al., 2022)	IN-V2	81.1	-	16.9	42.8	29.7	38.6	69.4	44.0	56.8
	IN-A	77.8	66.3	-	38.5	26.1	40.2	61.7	32.7	52.3
	IN-R	76.2	65.2	18.4	-	49.7	37.1	67.9	54.9	54.5
	IN-Sketch	78.9	67.1	13.9	60.0	-	35.9	70.7	51.4	55.6
	ObjNet	78.1	66.7	21.7	37.8	26.3	-	59.0	33.7	53.0
	IN-Cartoon	82.6	66.9	15.4	44.5	32.2	34.8	-	43.3	51.1
	IN-Drawing	79.6	64.6	12.9	46.1	34.4	32.5	66.9	-	53.8
	IN-C	93.9	65.1	11.6	41.2	28.9	31.4	82.5	61.4	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	80.9	-	12.2	41.8	29.1	36.6	68.8	43.9	56.1
	IN-A	80.7	69.0	-	42.0	29.0	39.7	68.2	42.6	57.0
	IN-R	80.5	69.0	15.2	-	43.8	38.1	72.3	55.5	58.7
	IN-Sketch	80.5	68.5	11.9	51.4	-	36.2	70.9	49.9	56.8
	ObjNet	80.6	69.0	15.4	41.1	28.9	-	67.1	41.8	56.4
	IN-Cartoon	82.3	69.0	12.2	43.5	30.9	36.1	-	46.0	55.2
	IN-Drawing	81.4	68.5	11.7	44.1	32.6	35.7	69.9	-	57.9
	IN-C	89.1	69.2	16.6	43.5	31.5	37.1	79.5	56.3	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	80.8	-	12.2	41.9	29.1	36.6	68.9	44.0	56.1
	IN-A	80.5	68.9	-	41.9	28.6	40.4	67.5	41.6	57.0
	IN-R	80.3	69.1	15.5	-	44.8	38.2	72.4	55.7	58.7
	IN-Sketch	80.5	68.5	12.0	52.6	-	36.3	71.1	50.4	57.0
	ObjNet	80.6	69.0	15.7	41.3	28.9	-	66.7	41.9	56.7
	IN-Cartoon	82.2	68.9	12.1	43.9	31.1	35.9	-	46.1	55.0
	IN-Drawing	81.2	68.4	11.7	44.8	33.2	35.7	70.0	-	58.0
	IN-C	89.3	69.3	16.2	43.9	31.7	37.3	79.5	57.2	-

Table S3: The accuracy on each OOD dataset after fine-tuning ImageNet-21K pretrained ViT-B/16 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	IN-R	IN-Sketch	ObjNet	IN-Cartoon	IN-Drawing	IN-C
Pretrained		81.8	71.4	32.0	47.3	35.8	42.5	69.4	44.1	58.3
FT	IN-V2	81.7	-	40.4	49.6	36.2	45.4	68.5	41.6	58.5
	IN-A	78.2	68.1	-	47.4	33.4	45.7	62.7	37.2	55.0
	IN-R	75.5	65.2	34.2	-	50.2	39.8	64.6	48.9	52.9
	IN-Sketch	78.8	68.3	32.6	64.7	-	41.7	69.7	51.3	55.5
	ObjNet	78.5	67.8	39.3	44.3	32.5	-	60.6	33.3	52.8
	IN-Cartoon	85.2	68.0	33.0	49.5	36.4	41.9	-	41.4	52.9
	IN-Drawing	81.5	66.6	27.0	50.3	38.4	39.4	67.0	-	55.3
	IN-C	99.7	65.6	25.4	45.4	32.9	36.7	93.2	72.9	-
Linear Probing	IN-V2	81.8	-	32.8	47.6	35.9	42.9	69.7	44.2	58.5
	IN-A	81.4	71.0	-	48.6	35.9	45.9	67.8	43.9	58.7
	IN-R	80.5	70.1	33.5	-	38.3	42.0	69.8	44.3	56.7
	IN-Sketch	79.9	69.2	30.1	53.9	-	41.1	69.9	44.5	56.4
	ObjNet	81.3	71.1	37.6	48.3	36.1	-	67.9	44.2	58.9
	IN-Cartoon	82.5	70.3	31.7	49.3	36.4	41.5	-	45.2	56.9
	IN-Drawing	82.0	70.2	32.8	50.0	38.1	42.5	71.0	-	59.0
	IN-C	96.7	65.3	27.6	42.8	31.7	36.2	85.5	57.0	-
Visual Prompt (Bahng et al., 2022)	IN-V2	76.0	-	25.2	43.8	29.4	41.7	58.2	32.1	45.5
	IN-A	71.7	60.6	-	41.0	24.1	39.2	50.9	25.8	38.3
	IN-R	69.9	59.1	18.1	-	35.0	35.0	54.9	35.8	38.3
	IN-Sketch	72.9	61.7	18.1	53.3	-	38.7	58.3	40.3	41.1
	ObjNet	71.1	59.6	25.1	38.0	23.8	-	49.0	22.6	36.9
	IN-Cartoon	75.6	63.4	20.9	44.9	29.9	37.9	-	33.9	41.9
	IN-Drawing	73.3	61.8	17.1	45.4	30.0	35.1	55.5	-	41.8
	IN-C	78.9	67.2	25.3	45.5	31.5	42.7	63.6	43.5	-
LoRA (Hu et al., 2021)	IN-V2	81.8	-	32.4	47.4	35.8	42.8	69.6	44.1	58.4
	IN-A	81.7	71.2	-	48.5	35.9	45.9	67.9	43.8	58.9
	IN-R	79.6	68.3	30.2	-	37.4	40.2	69.7	43.3	53.6
	IN-Sketch	80.4	69.4	30.1	51.2	-	40.6	70.7	43.0	56.3
	ObjNet	81.8	71.5	37.4	48.7	36.1	-	67.7	43.9	59.2
	IN-Cartoon	81.1	70.1	30.9	49.4	36.4	41.3	-	44.1	56.1
	IN-Drawing	81.6	71.0	32.1	49.9	37.3	42.7	70.2	-	58.0
	IN-C	81.5	70.7	29.8	45.8	33.4	42.3	69.6	37.8	-
EWC (Kirkpatrick et al., 2017)	IN-V2	82.2	-	35.5	49.0	36.3	44.8	70.2	44.7	59.4
	IN-A	81.1	70.9	-	49.1	35.4	48.4	66.7	41.0	58.8
	IN-R	80.8	69.8	34.5	-	44.3	42.6	70.3	51.0	57.6
	IN-Sketch	81.8	71.2	31.9	57.1	-	42.5	71.8	51.6	59.3
	ObjNet	80.9	69.8	39.0	47.8	35.3	-	66.5	42.3	58.2
	IN-Cartoon	81.8	70.5	32.6	50.6	36.8	42.4	-	45.2	56.7
	IN-Drawing	81.0	70.6	31.7	52.1	38.0	44.0	69.1	-	59.4
	IN-C	82.2	71.6	35.2	50.3	37.7	45.4	69.1	51.1	-
LwF (Li & Hoiem, 2017)	IN-V2	81.8	-	38.3	49.2	36.6	44.8	69.3	42.6	59.3
	IN-A	80.5	70.3	-	48.5	34.9	45.6	66.4	41.7	58.1
	IN-R	79.4	68.6	35.7	-	49.6	41.6	69.1	52.0	57.3
	IN-Sketch	80.1	70.0	33.2	64.0	-	42.7	71.0	51.6	57.3
	ObjNet	81.1	70.3	38.3	46.8	35.0	-	66.0	39.6	57.0
	IN-Cartoon	86.7	70.5	34.7	50.4	37.3	43.3	-	43.8	57.9
	IN-Drawing	83.3	68.9	29.6	51.2	39.0	40.9	69.3	-	58.1
	IN-C	99.7	67.4	25.3	48.1	35.2	38.2	93.3	72.3	-
LP-FT (Kumar et al., 2022)	IN-V2	81.6	-	39.8	49.3	36.3	45.2	69.0	42.2	58.7
	IN-A	79.6	69.2	-	48.3	35.0	46.6	64.7	39.9	56.7
	IN-R	77.8	67.4	35.0	-	50.2	41.8	68.1	51.2	55.4
	IN-Sketch	78.9	68.5	32.6	64.4	-	41.7	70.4	50.5	55.8
	ObjNet	79.9	69.2	40.2	46.2	33.9	-	63.8	37.2	55.5
	IN-Cartoon	86.0	68.2	33.1	49.8	36.7	42.0	-	43.4	54.4
	IN-Drawing	82.2	67.1	27.8	50.9	39.1	39.3	67.7	-	56.0
	IN-C	99.1	63.5	21.4	43.7	31.3	33.6	92.2	71.7	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	82.1	-	37.6	49.0	36.6	45.2	69.7	43.9	59.3
	IN-A	81.3	71.2	-	49.1	36.3	47.0	68.4	43.4	59.0
	IN-R	81.5	71.3	38.2	-	47.6	45.6	71.7	53.7	60.0
	IN-Sketch	81.5	71.4	34.2	59.4	-	43.9	72.1	51.7	59.2
	ObjNet	81.5	71.1	39.0	48.0	36.3	-	68.1	42.0	58.2
	IN-Cartoon	84.8	71.3	34.8	49.8	37.2	44.0	-	45.6	58.1
	IN-Drawing	83.1	71.0	32.9	51.0	39.6	43.3	70.6	-	59.8
	IN-C	92.0	71.3	33.7	50.4	38.4	43.8	82.4	60.8	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	82.2	-	37.4	49.1	36.6	45.1	69.8	44.0	59.5
	IN-A	81.2	71.2	-	49.3	36.0	47.1	67.9	42.9	59.1
	IN-R	81.4	71.2	37.6	-	48.0	44.7	71.8	53.6	59.8
	IN-Sketch	81.6	71.4	34.3	60.8	-	43.8	72.4	52.5	59.4
	ObjNet	81.5	70.9	39.2	48.1	36.2	-	67.9	42.2	58.3
	IN-Cartoon	84.7	71.1	34.9	50.3	37.5	44.0	-	45.6	58.2
	IN-Drawing	83.1	71.1	32.8	51.7	39.8	43.5	70.6	-	60.1
	IN-C	93.5	71.2	33.1	50.9	38.9	43.6	84.1	62.9	-

Table S4: The accuracy on each OOD dataset after fine-tuning ImageNet-21K-P pretrained ViT-B/16 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	IN-R	IN-Sketch	ObjNet	IN-Cartoon	IN-Drawing	IN-C
Pretrained		84.3	74.0	34.1	51.5	40.2	46.7	73.5	45.1	61.4
FT	IN-V2	83.5	-	44.6	52.9	40.4	47.1	71.4	39.2	62.1
	IN-A	80.8	70.7	-	50.3	38.6	47.2	65.5	35.5	60.5
	IN-R	78.9	68.8	38.7	-	54.6	42.8	69.9	54.2	57.5
	IN-Sketch	81.9	71.8	35.4	67.0	-	44.5	74.8	54.4	59.3
	ObjNet	81.1	70.6	43.8	47.5	36.8	-	63.1	29.6	57.7
	IN-Cartoon	89.0	71.0	38.0	51.9	40.2	43.4	-	42.5	56.1
	IN-Drawing	85.8	69.5	31.4	52.7	42.7	41.8	70.3	-	57.9
	IN-C	99.8	67.9	25.6	47.1	34.7	37.4	95.0	73.7	-
Linear Probing	IN-V2	84.3	-	34.8	51.6	40.0	46.4	74.1	45.6	61.4
	IN-A	84.0	73.9	-	51.9	40.1	48.5	73.9	45.2	61.8
	IN-R	83.8	73.9	35.6	-	42.0	46.5	73.3	46.1	61.0
	IN-Sketch	83.2	73.4	34.8	57.2	-	46.9	73.4	47.7	60.8
	ObjNet	83.9	73.7	36.6	51.3	39.8	-	73.7	45.1	61.9
	IN-Cartoon	85.6	73.8	34.5	52.3	40.3	45.7	-	46.5	61.3
	IN-Drawing	84.5	73.5	33.2	53.0	41.7	45.5	74.5	-	62.0
	IN-C	97.3	68.4	30.0	44.6	33.4	39.2	86.4	56.2	-
Visual Prompt (Bahng et al., 2022)	IN-V2	79.7	-	27.1	46.9	32.7	45.2	62.1	32.9	49.6
	IN-A	76.7	66.0	-	44.0	27.5	46.4	55.6	27.6	44.6
	IN-R	74.1	62.8	20.3	-	41.0	39.4	59.3	42.1	40.5
	IN-Sketch	77.0	65.5	18.3	56.6	-	40.9	62.6	43.8	44.1
	ObjNet	72.4	61.1	22.1	34.8	23.1	-	46.4	18.4	34.8
	IN-Cartoon	79.0	67.2	21.6	48.5	33.4	41.7	-	34.8	44.2
	IN-Drawing	75.9	63.9	17.1	48.0	33.2	38.4	58.5	-	44.3
	IN-C	80.9	70.2	28.5	48.5	35.4	45.1	65.6	46.9	-
LoRA (Hu et al., 2021)	IN-V2	84.2	-	34.5	51.3	40.3	46.6	73.9	45.5	61.3
	IN-A	84.1	74.1	-	51.4	40.1	47.9	73.7	45.4	62.1
	IN-R	84.1	73.9	35.5	-	41.0	46.7	74.1	46.1	61.2
	IN-Sketch	84.1	73.8	34.1	55.0	-	46.4	74.5	49.4	61.4
	ObjNet	84.2	74.1	36.8	51.3	40.0	-	73.6	45.6	62.1
	IN-Cartoon	84.0	73.6	33.9	52.1	40.7	45.4	-	45.6	60.3
	IN-Drawing	84.0	73.6	33.5	54.9	43.9	45.9	73.9	-	61.6
	IN-C	84.5	74.3	35.3	50.6	38.6	46.7	73.9	45.1	-
EWC (Kirkpatrick et al., 2017)	IN-V2	84.4	-	37.9	52.6	40.9	47.8	74.1	45.8	62.4
	IN-A	83.8	74.4	-	53.2	40.3	50.8	72.0	42.0	63.7
	IN-R	81.4	71.4	30.2	-	52.1	43.3	72.7	57.7	55.3
	IN-Sketch	83.9	73.6	34.2	62.0	-	46.2	76.0	54.4	61.4
	ObjNet	84.0	74.1	42.0	51.9	40.5	-	71.7	42.6	62.5
	IN-Cartoon	84.3	73.7	35.3	54.2	41.5	46.0	-	47.0	59.9
	IN-Drawing	83.4	73.0	33.3	56.1	44.0	45.0	73.3	-	60.9
	IN-C	84.2	74.2	38.8	52.7	41.5	48.5	73.0	50.9	-
LwF (Li & Hoiem, 2017)	IN-V2	83.9	-	44.0	53.5	41.1	47.2	72.9	42.0	62.9
	IN-A	83.3	73.7	-	52.4	40.2	48.4	71.2	42.5	63.5
	IN-R	82.3	72.2	40.9	-	55.0	45.1	74.3	57.2	62.0
	IN-Sketch	82.9	72.7	36.7	65.9	-	45.4	75.7	53.7	61.1
	ObjNet	83.5	73.3	44.5	50.4	39.8	-	69.7	38.5	61.8
	IN-Cartoon	89.8	73.1	39.6	53.3	41.7	45.4	-	45.6	61.3
	IN-Drawing	87.0	71.5	32.8	53.7	43.6	44.0	73.4	-	61.2
	IN-C	99.7	70.5	25.6	50.3	37.6	40.6	94.7	71.9	-
LP-FT (Kumar et al., 2022)	IN-V2	83.6	-	44.2	52.4	39.8	47.1	72.0	39.9	62.5
	IN-A	82.5	72.8	-	51.6	39.3	48.7	69.5	40.0	62.6
	IN-R	81.3	71.5	40.6	-	54.3	45.3	73.1	56.2	60.5
	IN-Sketch	82.2	71.9	37.2	66.7	-	45.6	75.0	53.0	60.2
	ObjNet	82.6	72.3	44.7	49.8	39.1	-	67.9	36.9	60.6
	IN-Cartoon	89.8	71.4	38.4	52.5	40.5	43.9	-	44.6	58.8
	IN-Drawing	86.5	69.9	30.3	53.1	43.2	41.9	71.4	-	58.7
	IN-C	99.9	64.7	19.8	43.5	30.7	33.1	96.1	78.2	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	84.4	-	42.1	53.0	41.4	48.3	73.9	44.7	63.3
	IN-A	84.0	74.3	-	53.1	41.8	50.2	73.0	44.9	64.1
	IN-R	84.0	74.3	43.1	-	53.6	48.2	76.8	59.0	64.3
	IN-Sketch	84.0	74.1	37.4	62.9	-	47.3	76.6	54.4	62.7
	ObjNet	84.1	74.2	43.8	51.9	41.8	-	72.3	42.3	62.9
	IN-Cartoon	87.4	74.0	40.1	53.5	42.1	46.9	-	47.8	61.4
	IN-Drawing	86.4	73.5	37.1	54.6	44.5	46.5	75.6	-	63.5
	IN-C	94.1	73.3	36.9	53.4	41.6	46.1	87.3	63.8	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	84.4	-	41.7	53.2	41.5	48.1	74.0	44.9	63.3
	IN-A	83.9	74.3	-	53.2	41.6	50.2	72.5	44.1	64.1
	IN-R	83.9	74.1	42.7	-	54.2	47.9	76.8	59.4	64.1
	IN-Sketch	84.0	74.0	37.3	64.0	-	47.1	76.7	55.0	62.7
	ObjNet	84.1	74.2	44.4	51.9	41.4	-	71.9	42.1	62.9
	IN-Cartoon	87.2	74.0	39.5	53.8	42.1	46.6	-	47.6	61.4
	IN-Drawing	86.2	73.5	37.0	55.0	44.6	46.6	75.4	-	63.4
	IN-C	93.8	73.9	36.3	53.8	42.1	46.2	86.4	63.4	-

Table S5: The accuracy on each OOD dataset after fine-tuning ImageNet-21K with AugReg pretrained ViT-B/16 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	Realistic OOD	IN-Sketch	ObjNet	IN-Cartoon	Synthetic OOD	IN-C
Pretrained		84.5	74.0	43.2	56.8	43.2	48.4	75.1	54.9	66.5
FT	IN-V2	81.3	-	47.5	56.8	40.0	49.7	70.6	49.3	64.4
	IN-A	74.8	64.8	-	50.6	35.6	46.3	60.7	40.7	56.3
	IN-R	73.8	63.7	33.9	-	52.4	42.5	65.1	54.4	55.7
	IN-Sketch	75.2	65.2	28.4	70.6	-	43.7	65.3	54.2	54.8
	ObjNet	76.7	65.6	37.1	47.6	32.5	-	62.2	36.0	54.9
	IN-Cartoon	95.3	67.2	35.1	54.9	39.8	44.8	-	58.9	61.5
	IN-Drawing	91.1	65.2	27.6	54.2	41.1	41.1	78.4	-	59.9
	IN-C	99.9	62.7	20.2	46.5	31.8	35.0	98.1	84.1	-
Linear Probing	IN-V2	83.1	-	45.1	56.3	42.8	48.3	73.7	53.3	65.7
	IN-A	83.3	73.6	-	56.7	42.5	51.0	73.6	52.8	65.8
	IN-R	82.2	72.1	44.6	-	45.3	49.2	71.6	52.2	64.0
	IN-Sketch	79.3	69.2	42.3	64.6	-	49.0	70.0	53.0	62.1
	ObjNet	83.1	73.2	47.8	56.3	41.4	-	73.3	52.6	65.9
	IN-Cartoon	91.1	71.9	43.3	56.5	42.2	47.5	-	58.5	69.9
	IN-Drawing	87.6	71.9	42.0	57.5	43.5	47.0	79.7	-	70.0
	IN-C	99.2	65.0	35.2	50.3	37.0	39.5	93.8	76.1	-
Visual Prompt (Bahng et al., 2022)	IN-V2	81.3	-	37.2	53.6	38.8	48.8	67.8	42.8	56.9
	IN-A	78.5	67.3	-	52.3	35.0	51.5	63.1	34.6	51.1
	IN-R	74.9	64.1	27.4	-	47.4	43.3	62.2	49.2	46.4
	IN-Sketch	78.3	67.4	28.0	64.2	-	45.0	67.2	52.7	51.7
	ObjNet	75.0	64.2	34.8	43.9	30.4	-	54.1	27.8	42.5
	IN-Cartoon	80.8	68.6	31.8	54.3	39.3	45.2	-	45.4	53.1
	IN-Drawing	79.3	68.3	27.9	55.1	40.1	44.6	67.8	-	54.5
	IN-C	82.3	71.3	38.8	53.3	38.9	48.1	70.6	53.7	-
LoRA (Hu et al., 2021)	IN-V2	84.6	-	44.9	57.1	43.4	49.9	75.2	55.0	67.2
	IN-A	84.3	74.5	-	57.9	42.8	52.8	74.7	54.2	67.8
	IN-R	84.2	74.1	47.6	-	48.5	52.4	75.4	58.8	67.0
	IN-Sketch	84.0	73.7	44.9	66.5	-	51.3	75.6	60.7	66.9
	ObjNet	84.2	74.3	49.5	58.0	42.4	-	74.5	53.6	67.2
	IN-Cartoon	84.5	73.8	44.9	58.3	43.7	50.0	-	55.5	66.4
	IN-Drawing	84.0	73.8	43.9	61.2	47.3	49.7	75.3	-	67.1
	IN-C	64.8	52.2	7.9	36.4	24.9	24.6	39.4	18.9	-
EWC (Kirkpatrick et al., 2017)	IN-V2	84.0	-	52.3	59.4	43.6	52.1	73.2	54.0	67.7
	IN-A	81.3	71.3	-	56.8	41.8	52.4	69.8	46.8	65.8
	IN-R	80.9	70.5	47.1	-	56.2	48.4	72.3	63.0	63.9
	IN-Sketch	83.1	72.9	44.8	70.3	-	50.1	75.4	63.9	66.2
	ObjNet	80.8	70.6	49.9	53.3	40.1	-	67.4	44.5	63.5
	IN-Cartoon	84.6	72.2	45.0	58.5	43.6	49.2	-	57.4	63.9
	IN-Drawing	84.2	73.1	42.2	59.3	45.8	49.0	75.4	-	65.9
	IN-C	85.4	74.2	46.5	56.4	42.8	49.6	75.9	62.5	-
LwF (Li & Hoiem, 2017)	IN-V2	83.6	-	42.9	56.3	40.7	48.2	73.8	53.5	66.0
	IN-A	82.8	72.1	-	55.5	39.4	48.4	72.2	51.6	64.1
	IN-R	82.5	71.9	39.3	-	54.3	46.5	74.1	58.7	64.1
	IN-Sketch	80.3	70.1	33.2	69.2	-	46.6	71.7	56.5	61.5
	ObjNet	81.9	71.4	42.2	53.6	38.4	-	70.7	45.9	62.2
	IN-Cartoon	96.6	71.8	37.9	57.1	41.7	47.0	-	62.0	71.7
	IN-Drawing	94.3	69.9	31.1	57.5	43.6	44.1	83.6	-	68.5
	IN-C	99.9	69.2	27.8	53.9	38.5	41.8	97.5	79.4	-
LP-FT (Kumar et al., 2022)	IN-V2	82.3	-	50.8	56.9	41.9	50.3	72.4	52.5	65.6
	IN-A	80.9	70.9	-	54.5	40.2	51.0	69.3	45.7	63.2
	IN-R	76.3	66.2	35.3	-	49.0	45.3	66.5	52.8	57.0
	IN-Sketch	76.9	66.7	35.1	69.7	-	46.8	68.0	53.6	58.5
	ObjNet	79.6	68.9	42.2	52.5	36.1	-	67.4	43.4	59.9
	IN-Cartoon	96.0	69.6	40.0	55.6	40.9	47.2	-	60.9	68.6
	IN-Drawing	92.8	67.5	31.0	56.4	42.5	43.7	81.7	-	66.9
	IN-C	99.9	63.3	27.6	49.3	34.8	37.1	97.2	83.0	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	84.1	-	50.0	58.5	43.5	51.4	74.6	54.9	68.0
	IN-A	83.0	73.1	-	57.2	42.2	52.5	72.6	53.3	66.5
	IN-R	82.8	72.8	47.7	-	56.8	50.4	75.4	63.7	66.9
	IN-Sketch	82.3	72.9	40.5	70.7	-	49.8	74.5	62.5	65.1
	ObjNet	83.2	72.9	48.0	56.1	41.9	-	73.2	50.0	65.6
	IN-Cartoon	92.0	72.8	45.5	58.4	44.2	50.1	-	61.8	68.6
	IN-Drawing	90.2	73.0	41.1	59.0	46.4	49.1	80.3	-	69.2
	IN-C	96.5	71.7	36.9	55.8	41.2	46.4	92.3	73.9	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	84.2	-	49.9	58.6	43.7	51.1	74.7	55.3	68.0
	IN-A	83.5	73.7	-	57.7	42.9	52.3	73.4	53.9	66.9
	IN-R	83.5	73.6	48.4	-	57.2	50.5	76.1	64.4	67.4
	IN-Sketch	82.7	72.8	41.6	71.0	-	49.8	75.0	62.6	65.6
	ObjNet	83.3	73.1	49.4	56.0	42.1	-	72.8	49.7	65.6
	IN-Cartoon	91.7	73.0	44.9	58.8	44.3	49.8	-	61.9	69.2
	IN-Drawing	90.2	73.0	40.9	59.7	46.8	48.6	80.7	-	69.6
	IN-C	96.5	72.9	41.0	58.0	43.6	47.7	92.1	75.5	-

Table S6: The accuracy on each OOD dataset after fine-tuning LAION-2B pretrained ViT-B/16 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	IN-R	IN-Sketch	ObjNet	IN-Cartoon	IN-Drawing	IN-C
Pretrained		85.5	75.6	41.5	68.8	55.4	51.1	78.2	58.4	63.0
FT	IN-V2	59.0	-	8.1	25.6	12.2	21.1	36.6	12.2	24.5
	IN-A	28.7	20.4	-	11.9	4.5	10.3	14.9	4.0	8.5
	IN-R	47.1	36.4	7.2	-	29.5	19.4	33.7	17.0	21.4
	IN-Sketch	29.1	20.3	2.6	37.8	-	9.2	20.4	8.0	9.7
	ObjNet	39.4	30.5	4.8	16.4	6.7	-	20.2	4.7	13.5
	IN-Cartoon	90.2	52.8	9.9	36.4	22.0	27.6	-	29.1	32.6
	IN-Drawing	62.0	37.0	5.0	29.7	19.1	15.4	48.6	-	22.5
	IN-C	99.9	54.4	8.2	40.8	27.0	24.3	98.6	85.1	-
Linear Probing	IN-V2	84.9	-	42.0	68.7	54.0	50.2	77.4	57.5	62.3
	IN-A	84.5	74.9	-	68.9	53.6	53.2	76.3	54.2	62.7
	IN-R	82.8	72.6	37.4	-	57.6	47.9	75.7	60.5	61.2
	IN-Sketch	82.5	72.8	37.9	74.8	-	49.1	76.0	59.6	60.7
	ObjNet	84.2	74.5	44.3	66.9	52.5	-	74.6	53.7	61.2
	IN-Cartoon	85.7	72.6	36.7	69.8	52.9	47.5	-	57.8	59.7
	IN-Drawing	83.8	71.1	27.7	67.0	51.7	43.9	76.0	-	57.7
	IN-C	97.6	67.8	25.9	61.4	47.5	40.2	93.2	78.8	-
Visual Prompt (Bahng et al., 2022)	IN-V2	82.8	-	32.3	64.4	51.4	49.5	72.3	47.0	54.4
	IN-A	80.9	70.9	-	64.1	49.0	53.0	69.5	36.8	50.7
	IN-R	78.7	68.0	30.1	-	54.7	45.9	68.5	49.5	49.4
	IN-Sketch	81.4	70.6	28.6	69.5	-	48.9	71.6	49.8	50.9
	ObjNet	77.9	66.8	30.1	55.2	41.1	-	61.5	26.8	42.4
	IN-Cartoon	82.4	71.0	30.9	64.0	49.3	47.8	-	43.7	48.7
	IN-Drawing	81.6	70.8	26.6	63.3	49.3	47.4	69.9	-	50.2
	IN-C	83.8	73.3	34.1	66.6	52.2	49.2	74.5	58.9	-
LoRA (Hu et al., 2021)	IN-V2	85.0	-	40.8	68.6	53.9	50.6	77.3	57.8	62.0
	IN-A	84.5	75.0	-	68.6	53.6	52.8	76.2	53.1	62.2
	IN-R	82.7	72.2	36.9	-	58.2	47.6	75.8	60.2	61.2
	IN-Sketch	82.9	72.5	35.2	74.6	-	48.4	76.3	60.2	60.9
	ObjNet	84.1	74.0	42.5	67.3	52.2	-	72.8	51.6	59.7
	IN-Cartoon	83.7	72.6	35.9	69.5	53.3	47.0	-	57.3	58.4
	IN-Drawing	81.7	70.9	28.2	67.1	52.1	44.8	74.4	-	55.8
	IN-C	78.9	67.8	20.3	61.4	47.3	38.7	68.8	38.3	-
EWC (Kirkpatrick et al., 2017)	IN-V2	80.2	-	26.4	49.4	31.9	41.2	65.2	38.0	51.4
	IN-A	69.6	60.3	-	34.8	19.7	38.1	47.6	19.7	39.9
	IN-R	81.5	71.2	38.3	-	58.4	47.8	73.6	58.3	58.7
	IN-Sketch	70.5	57.0	18.4	60.6	-	28.0	64.0	45.8	41.7
	ObjNet	78.1	67.0	28.5	45.5	30.7	-	59.6	28.5	48.0
	IN-Cartoon	84.0	71.4	34.1	64.5	47.2	46.9	-	52.3	52.6
	IN-Drawing	80.9	67.7	24.8	62.8	46.8	39.5	72.1	-	50.4
	IN-C	85.5	74.3	34.3	66.8	51.1	48.2	77.6	64.5	-
LwF (Li & Hoiem, 2017)	IN-V2	63.5	-	8.7	28.0	14.7	22.7	41.0	12.2	28.0
	IN-A	40.1	30.0	-	15.1	5.7	14.5	20.6	6.1	13.6
	IN-R	56.9	46.1	7.8	-	33.5	23.1	41.6	22.2	26.9
	IN-Sketch	33.3	24.7	2.6	39.0	-	11.0	22.5	8.9	11.5
	ObjNet	50.6	39.2	6.3	19.8	9.1	-	28.4	6.3	19.2
	IN-Cartoon	93.8	60.8	12.3	43.9	28.6	32.2	-	37.7	42.0
	IN-Drawing	70.8	42.2	5.6	37.8	26.9	17.1	58.5	-	28.8
	IN-C	99.9	60.4	8.9	47.8	32.8	29.1	98.2	82.6	-
LP-FT (Kumar et al., 2022)	IN-V2	59.5	-	8.0	26.4	12.7	21.2	37.6	11.3	24.3
	IN-A	34.5	27.2	-	13.6	5.2	13.6	17.6	4.7	11.4
	IN-R	49.1	38.6	7.1	-	30.2	20.3	34.5	18.5	22.5
	IN-Sketch	30.2	22.9	2.3	38.7	-	10.6	21.1	8.0	10.5
	ObjNet	44.2	33.6	5.7	17.5	7.0	-	23.4	4.8	15.4
	IN-Cartoon	90.9	53.5	10.7	37.6	23.0	27.7	-	31.2	32.3
	IN-Drawing	67.8	39.0	5.2	34.2	22.5	16.2	55.9	-	24.4
	IN-C	99.9	51.1	6.8	38.2	23.5	20.9	98.9	87.4	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	76.3	-	17.9	38.9	22.2	34.7	58.1	23.5	43.7
	IN-A	59.8	48.0	-	24.2	10.8	22.8	34.4	10.0	26.7
	IN-R	74.1	62.1	18.2	-	41.1	36.2	60.9	38.1	43.3
	IN-Sketch	58.6	47.0	7.2	48.0	-	21.4	43.7	20.6	25.4
	ObjNet	74.7	62.2	18.3	40.0	23.3	-	55.4	21.4	42.3
	IN-Cartoon	88.5	69.5	26.3	54.7	39.0	42.6	-	49.8	53.0
	IN-Drawing	81.1	61.7	15.6	53.6	41.0	30.8	70.5	-	45.9
	IN-C	94.2	67.1	19.2	58.2	42.2	39.3	90.0	74.6	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	78.1	-	20.5	44.2	27.8	37.3	61.3	31.2	46.2
	IN-A	68.5	56.6	-	31.3	16.0	30.6	45.7	15.9	35.0
	IN-R	77.0	65.3	22.5	-	46.9	39.7	65.4	45.6	47.8
	IN-Sketch	60.8	49.0	8.0	50.9	-	23.4	46.6	23.5	27.5
	ObjNet	77.0	65.2	21.6	43.0	27.1	-	58.5	25.4	45.0
	IN-Cartoon	88.7	71.1	27.9	58.4	43.2	43.9	-	54.5	54.5
	IN-Drawing	81.3	62.3	16.2	57.3	44.9	31.4	72.2	-	47.0
	IN-C	94.3	69.5	22.2	62.1	47.2	40.6	90.8	77.5	-

Table S7: The accuracy on each OOD dataset after fine-tuning OpenAI CLIP ViT-B/16 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	Realistic OOD IN-R	IN-Sketch	ObjNet	Synthetic OOD IN-Cartoon	IN-Drawing	IN-C
Pretrained		85.3	75.7	47.3	65.9	50.9	50.7	76.3	55.7	62.6
FT	IN-V2	60.8	-	9.7	24.2	10.1	22.0	36.4	13.0	25.7
	IN-A	29.8	23.3	-	10.5	4.1	11.4	14.3	4.1	8.9
	IN-R	47.9	37.9	7.9	-	29.4	19.3	34.4	20.1	22.2
	IN-Sketch	24.4	18.0	1.9	34.6	-	8.2	17.3	7.5	7.2
	ObjNet	36.0	26.7	4.9	12.5	5.4	-	18.3	3.7	10.6
	IN-Cartoon	92.3	52.7	10.5	34.0	18.1	24.5	-	33.9	32.8
	IN-Drawing	67.3	36.1	5.0	29.5	17.7	14.2	53.0	-	23.0
	IN-C	99.9	51.0	7.0	35.4	19.0	20.8	98.2	84.0	-
Linear Probing	IN-V2	84.7	-	48.0	65.6	50.3	50.9	75.3	53.9	61.6
	IN-A	84.1	74.5	-	66.5	49.1	53.6	74.1	51.9	62.3
	IN-R	82.3	72.9	42.0	-	54.7	48.5	73.8	58.5	59.9
	IN-Sketch	82.0	72.6	41.5	72.4	-	48.8	74.3	57.6	58.0
	ObjNet	83.9	74.5	52.0	65.5	49.0	-	73.7	51.2	60.1
	IN-Cartoon	85.0	73.1	40.7	65.6	48.9	46.5	-	53.9	56.3
	IN-Drawing	83.1	71.4	32.2	64.6	47.9	43.9	75.3	-	54.7
	IN-C	97.0	68.7	32.3	59.1	44.4	40.3	90.6	74.2	-
Visual Prompt (Bahng et al., 2022)	IN-V2	82.4	-	38.2	60.5	46.4	48.3	68.2	42.5	53.6
	IN-A	80.4	70.5	-	62.1	45.1	51.9	66.2	35.1	50.5
	IN-R	79.3	68.8	38.2	-	51.2	46.5	66.9	46.6	47.9
	IN-Sketch	81.2	70.5	35.6	67.3	-	47.9	69.0	48.9	50.8
	ObjNet	77.6	67.0	37.7	53.0	38.9	-	57.8	25.2	41.1
	IN-Cartoon	81.8	70.1	35.7	60.7	44.4	45.5	-	40.2	46.2
	IN-Drawing	80.5	69.5	27.2	60.6	45.9	43.2	66.9	-	46.8
	IN-C	83.1	73.1	41.5	64.4	49.3	49.5	71.2	54.6	-
LoRA (Hu et al., 2021)	IN-V2	84.7	-	47.4	65.7	50.3	51.4	75.3	53.7	61.5
	IN-A	84.0	74.6	-	66.4	48.9	53.5	73.8	51.7	62.0
	IN-R	81.9	71.9	40.9	-	54.4	47.9	73.3	58.1	59.5
	IN-Sketch	82.7	73.1	40.2	72.7	-	48.4	74.9	59.1	58.6
	ObjNet	83.3	74.0	49.5	65.6	48.2	-	71.3	48.6	57.9
	IN-Cartoon	83.4	72.8	39.6	65.4	48.7	46.7	-	53.0	54.6
	IN-Drawing	81.4	71.3	31.8	64.0	48.1	43.9	73.1	-	52.5
	IN-C	79.5	69.6	26.9	59.6	42.7	41.5	69.3	33.6	-
EWC (Kirkpatrick et al., 2017)	IN-V2	80.6	-	33.0	48.4	29.3	40.3	64.2	40.7	52.9
	IN-A	73.8	62.9	-	40.9	23.5	39.3	52.2	27.0	45.3
	IN-R	80.5	71.2	43.5	-	55.4	46.7	71.5	56.3	58.0
	IN-Sketch	58.5	48.2	17.7	49.3	-	25.4	53.7	33.6	32.8
	ObjNet	77.8	67.1	33.1	43.6	24.8	-	57.0	23.2	46.6
	IN-Cartoon	84.1	71.4	37.4	61.2	42.7	45.0	-	49.5	49.4
	IN-Drawing	80.5	67.7	27.7	59.2	41.7	37.6	70.6	-	49.0
	IN-C	86.7	74.2	41.5	65.1	47.8	47.0	77.3	64.1	-
LwF (Li & Hoiem, 2017)	IN-V2	65.3	-	10.2	28.0	12.6	24.4	42.3	14.3	28.8
	IN-A	42.3	33.6	-	14.8	5.1	16.1	21.4	7.0	14.7
	IN-R	57.9	46.6	8.0	-	33.2	22.3	41.9	25.4	27.7
	IN-Sketch	26.8	20.1	2.0	35.8	-	9.2	19.2	9.1	8.8
	ObjNet	52.4	40.1	6.1	18.2	7.6	-	27.4	6.4	18.6
	IN-Cartoon	95.0	60.1	13.1	40.3	23.5	28.6	-	42.5	41.4
	IN-Drawing	75.6	43.7	5.9	36.0	23.5	17.3	61.5	-	30.3
	IN-C	99.5	65.7	12.4	51.0	34.9	33.5	96.1	73.7	-
LP-FT (Kumar et al., 2022)	IN-V2	60.9	-	9.6	24.9	9.7	22.3	36.8	12.4	25.8
	IN-A	33.6	25.8	-	11.7	4.4	13.8	17.3	4.4	10.4
	IN-R	50.2	39.9	8.3	-	29.9	21.4	35.5	20.1	23.3
	IN-Sketch	23.8	17.6	2.2	34.8	-	7.6	17.2	7.8	7.3
	ObjNet	40.3	30.6	5.0	13.9	6.0	-	18.9	4.4	12.7
	IN-Cartoon	91.6	51.8	10.4	33.6	18.2	24.1	-	31.7	30.6
	IN-Drawing	77.5	43.4	5.8	32.4	18.2	17.9	62.2	-	27.7
	IN-C	99.9	53.2	7.2	38.6	22.3	21.7	98.6	87.6	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	79.1	-	26.3	43.1	23.9	38.0	62.9	30.9	47.9
	IN-A	72.2	60.0	-	32.5	15.9	34.1	49.0	20.3	39.1
	IN-R	77.1	65.6	25.8	-	45.0	39.5	65.8	47.2	48.5
	IN-Sketch	55.4	44.4	8.6	47.0	-	21.6	45.1	24.7	25.5
	ObjNet	76.2	64.2	23.2	38.6	21.8	-	57.3	21.8	41.7
	IN-Cartoon	89.1	69.9	28.4	52.6	35.1	40.7	-	52.0	52.4
	IN-Drawing	82.0	61.9	18.0	51.5	37.5	30.5	71.9	-	47.4
	IN-C	94.1	67.4	21.0	54.9	37.6	36.7	90.2	76.0	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	79.7	-	27.8	46.7	28.1	39.2	64.5	34.7	48.7
	IN-A	73.1	61.6	-	36.0	19.0	35.7	52.3	23.1	39.8
	IN-R	78.3	67.4	28.5	-	48.2	41.2	67.6	49.9	50.4
	IN-Sketch	55.1	44.8	9.0	48.2	-	21.9	45.7	26.0	26.3
	ObjNet	77.8	66.1	25.6	42.2	26.3	-	59.5	24.5	44.2
	IN-Cartoon	89.0	71.3	29.7	55.5	38.7	41.2	-	55.1	53.8
	IN-Drawing	82.7	63.3	18.9	54.1	39.9	31.2	72.8	-	48.6
	IN-C	93.2	70.9	26.2	59.4	42.6	40.3	89.1	74.9	-

Table S8: The accuracy on each OOD dataset after fine-tuning ImageNet-1K with AugReg pretrained ViT-B/32 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from images in the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	Realistic OOD			ObjNet	IN-Cartoon	Synthetic OOD	
		IN			IN-R	IN-Sketch				IN-Drawing	IN-C
Pretrained		74.9	61.0	8.0	37.5	27.1	28.0	65.2	40.5	53.5	
FT	IN-V2	73.6	-	12.8	41.0	28.4	31.4	63.1	40.9	53.4	
	IN-A	66.5	54.1	-	35.4	24.0	28.0	53.5	31.9	47.5	
	IN-R	64.7	52.8	11.0	-	43.4	26.5	57.2	47.0	47.0	
	IN-Sketch	70.8	57.9	8.9	55.8	-	28.2	63.1	47.2	51.1	
	ObjNet	68.5	55.9	12.7	33.7	23.3	-	52.4	29.1	47.8	
	IN-Cartoon	82.7	58.0	11.2	39.8	28.3	28.6	-	41.8	50.1	
	IN-Drawing	77.1	56.9	9.0	40.8	29.1	26.5	63.2	-	52.8	
	IN-C	99.6	54.8	8.1	35.3	23.5	24.1	93.5	72.7	-	
Linear Probing	IN-V2	74.8	-	8.3	37.8	27.1	28.1	65.1	40.5	53.5	
	IN-A	73.8	60.3	-	38.0	26.7	29.6	64.1	40.2	53.2	
	IN-R	74.0	60.4	8.9	-	29.7	29.1	65.6	43.4	52.8	
	IN-Sketch	72.3	58.9	8.5	47.6	-	28.8	64.8	43.4	51.0	
	ObjNet	74.3	60.4	9.9	38.7	27.4	-	64.8	41.3	53.3	
	IN-Cartoon	77.7	60.5	8.2	39.6	27.2	28.6	-	44.5	54.2	
	IN-Drawing	75.7	59.8	8.5	41.7	28.3	28.3	67.1	-	54.4	
	IN-C	97.9	54.3	7.9	35.2	23.2	21.5	88.5	63.6	-	
Visual Prompt (Bahng et al., 2022)	IN-V2	69.8	-	7.0	38.4	25.1	28.8	58.3	38.1	45.5	
	IN-A	58.2	46.7	-	32.9	18.2	24.5	44.4	23.4	29.9	
	IN-R	62.1	50.5	6.5	-	33.7	25.2	52.9	42.1	39.4	
	IN-Sketch	66.1	53.4	5.8	48.8	-	26.5	57.1	45.0	43.1	
	ObjNet	60.5	49.0	7.1	29.8	17.6	-	44.0	23.7	33.1	
	IN-Cartoon	70.6	56.7	6.5	40.1	26.3	27.0	-	39.6	42.4	
	IN-Drawing	66.2	53.2	4.8	39.5	26.0	23.9	55.6	-	42.3	
	IN-C	72.1	58.8	8.0	37.6	25.8	29.1	61.1	46.3	-	
LoRA (Hu et al., 2021)	IN-V2	75.0	-	8.1	37.9	27.3	28.5	65.4	40.9	53.9	
	IN-A	74.8	61.0	-	38.7	27.1	30.0	64.5	40.6	53.4	
	IN-R	73.8	60.1	8.7	-	28.6	29.1	65.9	43.5	50.6	
	IN-Sketch	73.9	60.1	8.1	42.2	-	28.9	66.3	43.7	51.6	
	ObjNet	74.8	61.2	9.9	39.2	27.5	-	65.1	41.6	53.4	
	IN-Cartoon	74.7	60.8	7.9	39.6	27.7	29.0	-	43.1	52.6	
	IN-Drawing	73.6	60.6	8.5	41.7	28.0	28.5	64.4	-	52.1	
	IN-C	75.6	61.9	9.9	41.1	28.7	31.2	66.0	50.6	-	
EWC (Kirkpatrick et al., 2017)	IN-V2	75.4	-	9.8	40.2	28.1	30.8	65.7	43.0	55.3	
	IN-A	69.7	56.9	-	38.8	25.9	28.8	58.1	34.4	49.9	
	IN-R	71.2	58.4	10.9	-	39.7	29.4	63.9	51.2	52.5	
	IN-Sketch	73.7	60.2	8.7	48.8	-	28.5	65.2	46.6	53.8	
	ObjNet	74.1	61.0	11.2	38.1	26.9	-	62.4	39.7	54.0	
	IN-Cartoon	75.0	60.9	8.6	41.2	28.5	28.8	-	43.2	52.8	
	IN-Drawing	74.3	60.6	9.0	43.9	31.0	29.5	65.5	-	55.1	
	IN-C	75.5	62.0	9.7	40.5	28.4	31.3	65.4	48.3	-	
LwF (Li & Hoiem, 2017)	IN-V2	74.3	-	11.9	40.6	28.2	30.7	64.1	41.0	54.0	
	IN-A	71.1	58.5	-	37.2	25.5	29.8	59.3	36.8	52.0	
	IN-R	71.2	58.5	11.2	-	44.7	28.8	63.4	51.1	53.0	
	IN-Sketch	72.3	59.1	8.7	55.3	-	28.6	64.7	47.2	52.5	
	ObjNet	73.1	59.5	12.2	36.5	25.2	-	59.8	34.6	52.1	
	IN-Cartoon	84.6	59.9	10.7	39.9	28.3	29.2	-	43.0	54.1	
	IN-Drawing	79.3	58.9	9.3	41.3	29.6	27.5	66.6	-	55.2	
	IN-C	99.0	59.2	7.6	38.7	26.7	26.4	92.3	64.7	-	
LP-FT (Kumar et al., 2022)	IN-V2	73.8	-	12.7	40.7	28.1	31.1	63.7	40.6	53.7	
	IN-A	71.7	58.9	-	36.8	25.9	30.1	60.5	36.7	52.2	
	IN-R	70.4	57.9	11.6	-	43.6	29.8	62.4	50.1	51.4	
	IN-Sketch	71.1	58.2	9.0	56.3	-	28.5	63.8	47.3	51.1	
	ObjNet	72.3	58.9	12.7	36.8	25.7	-	59.4	34.9	51.3	
	IN-Cartoon	84.7	58.7	11.0	40.3	28.2	28.5	-	43.7	52.6	
	IN-Drawing	78.1	57.1	8.6	41.9	30.1	26.1	64.8	-	53.6	
	IN-C	99.9	51.8	7.2	35.1	22.7	20.0	96.7	78.4	-	
WiSE-FT (Wortsman et al., 2022b)	IN-V2	75.1	-	10.9	39.7	28.1	30.5	65.2	41.6	54.7	
	IN-A	74.0	60.9	-	38.6	27.3	31.2	63.3	38.7	54.3	
	IN-R	74.2	61.2	10.9	-	41.0	30.9	66.7	52.0	55.4	
	IN-Sketch	74.3	61.0	9.0	49.7	-	29.6	66.5	46.9	54.4	
	ObjNet	74.7	61.4	11.6	38.3	27.2	-	63.3	38.8	54.3	
	IN-Cartoon	80.3	61.1	10.4	40.0	28.5	29.8	-	42.9	54.2	
	IN-Drawing	78.4	61.0	9.7	41.3	30.3	29.5	67.2	-	56.9	
	IN-C	92.0	60.8	10.2	39.7	28.1	29.4	83.0	58.8	-	
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	75.2	-	10.8	40.0	28.2	30.6	65.3	42.0	54.9	
	IN-A	73.1	60.0	-	38.4	26.8	31.1	62.0	37.2	53.6	
	IN-R	74.1	61.1	11.2	-	41.8	30.7	66.6	52.5	55.3	
	IN-Sketch	74.4	60.9	8.9	51.0	-	29.5	66.4	47.2	54.4	
	ObjNet	74.6	61.4	11.9	38.0	27.0	-	62.9	38.5	54.3	
	IN-Cartoon	80.2	61.2	10.1	40.6	28.8	29.8	-	43.4	54.3	
	IN-Drawing	78.2	61.0	9.6	42.2	30.9	29.5	67.3	-	56.9	
	IN-C	91.0	61.6	9.9	40.4	28.6	29.7	81.6	58.0	-	

Table S9: The accuracy on each OOD dataset after fine-tuning ImageNet-21K pretrained ViT-B/32 with AugReg on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	Realistic OOD			Synthetic OOD		
					IN-R	IN-Sketch	ObjNet	IN-Cartoon	IN-Drawing	IN-C
Pretrained		80.7	69.0	22.4	49.3	37.1	40.7	70.6	42.5	60.5
FT	IN-V2	78.8	-	31.5	50.5	36.1	42.9	67.0	39.5	60.2
	IN-A	75.0	64.1	-	47.6	34.4	42.5	60.8	36.1	56.9
	IN-R	72.2	62.0	25.0	-	51.3	38.3	63.7	52.8	55.3
	IN-Sketch	76.0	65.2	23.6	65.3	-	40.1	68.1	54.4	57.0
	ObjNet	74.9	63.5	29.1	44.3	32.1	-	57.4	35.5	55.3
	IN-Cartoon	88.0	65.3	25.1	50.4	36.5	39.5	-	47.4	56.7
	IN-Drawing	84.3	64.1	21.7	51.5	39.3	38.2	71.1	-	59.5
	IN-C	99.8	62.2	18.7	45.5	32.0	34.1	94.3	75.5	-
Linear Probing	IN-V2	80.3	-	23.7	49.5	36.7	40.3	70.1	41.9	60.1
	IN-A	79.3	67.7	-	49.1	36.4	40.9	69.2	41.5	59.4
	IN-R	79.7	68.6	23.9	-	39.4	39.9	69.4	42.7	59.7
	IN-Sketch	77.9	66.6	23.8	57.0	-	40.6	68.3	45.1	58.4
	ObjNet	79.7	68.3	24.4	49.5	36.9	-	69.5	42.3	60.3
	IN-Cartoon	85.6	67.8	22.0	50.1	36.7	40.2	-	46.8	62.6
	IN-Drawing	82.6	68.1	23.3	51.1	38.4	40.4	73.5	-	63.0
	IN-C	98.3	59.2	20.1	43.4	30.7	31.7	89.5	62.0	-
Visual Prompt (Bahng et al., 2022)	IN-V2	76.1	-	18.9	46.6	33.2	40.5	62.6	35.7	51.1
	IN-A	67.6	55.5	-	40.6	25.7	38.7	50.2	27.3	39.7
	IN-R	67.2	56.8	13.9	-	42.5	33.4	56.2	42.5	42.6
	IN-Sketch	72.2	60.3	14.0	57.2	-	37.0	61.3	44.2	46.2
	ObjNet	62.6	51.1	13.1	32.0	20.7	-	40.8	18.0	30.9
	IN-Cartoon	75.4	62.8	15.4	46.7	32.4	37.9	-	37.5	45.5
	IN-Drawing	73.1	61.0	12.6	48.3	34.6	34.1	61.3	-	46.7
	IN-C	77.3	65.2	20.7	45.9	31.8	41.1	64.3	45.6	-
LoRA (Hu et al., 2021)	IN-V2	80.7	-	22.5	49.2	37.1	40.7	70.6	42.5	60.5
	IN-A	80.7	69.4	-	49.9	37.2	42.4	70.3	43.0	61.2
	IN-R	80.7	69.3	24.9	-	37.6	42.3	70.6	43.9	60.9
	IN-Sketch	80.6	69.1	22.9	52.7	-	41.2	70.9	46.0	60.8
	ObjNet	80.7	69.3	25.4	50.1	37.1	-	70.0	43.2	61.3
	IN-Cartoon	80.7	69.1	22.3	49.8	37.0	40.8	-	42.9	60.2
	IN-Drawing	80.3	69.3	23.8	53.2	40.4	41.5	70.7	-	61.0
	IN-C	80.0	68.8	24.7	51.5	37.9	41.5	68.3	53.1	-
EWC (Kirkpatrick et al., 2017)	IN-V2	81.0	-	28.0	51.2	37.6	44.0	70.2	43.4	62.1
	IN-A	78.8	67.7	-	50.7	36.4	45.2	66.2	37.8	60.9
	IN-R	78.7	67.6	26.5	-	49.2	40.8	69.9	56.8	60.0
	IN-Sketch	80.2	68.8	24.1	60.8	-	41.7	71.9	54.0	61.1
	ObjNet	77.9	67.3	30.7	48.0	36.2	-	62.2	39.9	60.1
	IN-Cartoon	80.4	68.1	23.5	52.1	37.9	41.1	-	46.6	59.0
	IN-Drawing	80.3	68.8	23.1	53.5	41.6	41.5	71.9	-	61.2
	IN-C	81.0	69.5	26.6	51.0	38.3	43.4	69.6	49.1	-
LwF (Li & Hoiem, 2017)	IN-V2	80.1	-	28.0	50.6	36.9	42.3	69.4	41.4	61.1
	IN-A	79.3	68.2	-	49.7	36.2	42.5	67.7	41.4	60.6
	IN-R	79.2	67.8	25.9	-	50.3	39.8	70.9	54.6	60.9
	IN-Sketch	78.1	67.1	23.4	63.2	-	40.6	70.1	51.1	59.1
	ObjNet	78.5	67.2	30.8	47.5	34.7	-	64.8	38.4	59.1
	IN-Cartoon	89.8	68.3	25.2	51.1	37.3	40.9	-	47.3	63.0
	IN-Drawing	86.3	67.0	22.7	51.9	39.9	39.4	73.8	-	63.1
	IN-C	99.4	66.5	20.0	49.4	35.9	38.2	93.1	63.7	-
LP-FT (Kumar et al., 2022)	IN-V2	79.4	-	30.3	50.9	36.7	42.6	68.3	41.2	60.7
	IN-A	77.8	67.0	-	48.7	36.0	43.3	65.8	40.0	59.5
	IN-R	77.3	66.5	26.4	-	50.5	40.4	68.0	54.7	59.0
	IN-Sketch	76.3	65.3	23.2	64.2	-	40.4	68.3	50.5	57.5
	ObjNet	78.0	67.2	30.2	48.3	34.8	-	65.4	39.9	58.9
	IN-Cartoon	90.5	66.5	26.0	51.2	37.1	40.2	-	49.6	61.3
	IN-Drawing	86.3	65.4	22.9	51.9	39.8	38.8	73.8	-	62.6
	IN-C	99.9	57.5	15.0	43.1	29.8	29.7	96.7	80.4	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	80.7	-	28.7	51.0	37.8	43.3	70.1	42.6	61.7
	IN-A	80.1	69.0	-	50.9	37.7	45.1	69.0	42.5	61.9
	IN-R	80.0	69.1	28.7	-	49.8	43.4	71.9	56.8	62.4
	IN-Sketch	79.9	69.0	24.5	61.4	-	42.1	71.9	53.1	61.0
	ObjNet	80.1	69.0	29.8	49.8	37.3	-	68.2	43.1	61.2
	IN-Cartoon	86.0	69.0	25.9	51.5	38.2	41.7	-	48.2	60.9
	IN-Drawing	84.4	68.8	25.1	52.6	41.3	41.7	73.6	-	63.6
	IN-C	95.3	68.6	24.9	51.0	37.8	41.3	87.5	62.2	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	80.7	-	28.3	51.1	37.7	43.3	70.1	42.8	61.7
	IN-A	79.9	68.9	-	50.7	37.3	44.8	68.5	41.8	61.6
	IN-R	79.9	69.1	28.6	-	50.4	42.6	71.9	57.3	62.2
	IN-Sketch	79.8	68.9	24.1	62.5	-	41.9	71.9	53.6	61.0
	ObjNet	79.7	68.6	30.7	49.2	36.9	-	67.2	42.1	60.9
	IN-Cartoon	85.7	68.8	25.4	51.9	38.2	41.5	-	48.1	61.1
	IN-Drawing	84.3	68.5	24.7	52.9	41.5	41.4	73.7	-	63.3
	IN-C	94.1	69.0	24.9	51.5	38.3	41.5	85.7	60.0	-

Table S10: The accuracy on each OOD datasets after fine-tuning LAION-2B pretrained ViT-B/32 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	Realistic OOD IN-R	IN-Sketch	ObjNet	Synthetic OOD IN-Cartoon	IN-Drawing	IN-C
Pretrained		82.6	71.6	22.8	59.2	49.1	43.5	73.0	42.3	57.5
FT	IN-V2	50.6	-	5.1	24.7	11.4	16.9	34.5	15.1	21.7
	IN-A	21.2	18.6	-	10.2	4.1	10.1	12.8	4.1	7.0
	IN-R	42.0	32.5	4.5	-	31.9	16.7	31.6	19.4	20.9
	IN-Sketch	24.7	20.2	1.6	37.5	-	8.8	19.3	10.3	9.7
	ObjNet	31.9	23.7	3.6	15.0	6.9	-	18.6	6.2	12.2
	IN-Cartoon	85.0	42.6	5.8	30.6	17.1	18.6	-	32.0	27.3
	IN-Drawing	52.2	29.3	3.0	25.6	15.3	10.6	41.8	-	21.6
	IN-C	99.8	44.1	4.7	31.7	18.4	16.8	97.3	81.2	-
Linear Probing	IN-V2	82.4	-	24.2	58.7	46.8	44.3	72.1	42.5	58.1
	IN-A	81.2	70.6	-	59.0	45.7	46.5	70.6	35.2	58.2
	IN-R	79.3	68.0	21.2	-	52.6	40.8	71.1	51.1	56.1
	IN-Sketch	79.5	68.0	21.2	66.8	-	42.0	70.8	49.1	55.6
	ObjNet	81.0	69.7	26.7	56.9	43.7	-	67.8	38.8	56.6
	IN-Cartoon	81.3	68.2	19.5	59.7	45.7	39.7	-	45.6	51.2
	IN-Drawing	78.0	64.5	13.4	58.0	44.4	35.5	68.7	-	49.8
	IN-C	96.0	64.2	15.7	53.3	41.0	33.9	88.4	68.5	-
Visual Prompt (Bahng et al., 2022)	IN-V2	78.7	-	16.4	54.2	44.3	41.5	65.1	33.2	47.9
	IN-A	73.9	62.1	-	52.1	36.7	42.2	57.7	23.7	36.9
	IN-R	74.3	62.5	15.0	-	48.7	38.4	62.1	41.0	43.9
	IN-Sketch	76.2	63.9	13.5	60.7	-	39.0	64.5	41.3	45.1
	ObjNet	68.3	55.9	14.6	34.1	28.6	-	47.4	13.9	27.7
	IN-Cartoon	78.4	65.5	14.6	55.9	43.9	38.9	-	39.2	44.9
	IN-Drawing	77.6	65.3	13.3	56.5	44.8	38.1	64.7	-	47.2
	IN-C	80.0	68.2	18.6	57.9	46.0	41.7	68.8	50.0	-
LoRA (Hu et al., 2021)	IN-V2	82.3	-	23.7	58.6	46.5	44.4	72.2	42.8	58.1
	IN-A	81.0	70.2	-	58.8	45.2	46.1	70.3	33.8	57.9
	IN-R	78.8	67.2	20.3	-	52.2	40.2	71.1	50.9	54.8
	IN-Sketch	78.6	66.8	17.6	64.9	-	39.4	70.1	51.1	53.4
	ObjNet	80.3	68.9	24.0	55.6	42.2	-	65.4	36.4	54.9
	IN-Cartoon	79.9	67.8	19.2	59.4	45.6	39.7	-	45.4	50.3
	IN-Drawing	76.7	64.3	13.6	57.9	44.4	35.9	67.7	-	49.8
	IN-C	83.1	70.4	23.8	58.9	46.7	41.9	73.1	53.9	-
EWC (Kirkpatrick et al., 2017)	IN-V2	76.5	-	16.1	46.3	31.0	35.6	61.4	34.0	48.4
	IN-A	60.0	48.3	-	31.6	18.8	28.5	40.6	18.0	30.7
	IN-R	76.1	65.1	21.5	-	53.9	39.1	67.5	51.0	53.0
	IN-Sketch	66.6	54.9	12.8	55.4	-	26.8	60.0	40.1	39.7
	ObjNet	72.9	60.1	18.5	41.8	29.0	-	50.5	26.3	43.0
	IN-Cartoon	81.0	67.1	19.6	57.7	43.7	39.1	-	46.1	48.1
	IN-Drawing	72.6	59.0	12.2	53.4	41.0	28.8	62.0	-	43.6
	IN-C	81.2	68.3	18.6	56.9	43.2	40.3	70.5	55.9	-
LwF (Li & Hoiem, 2017)	IN-V2	56.9	-	5.4	26.5	13.2	19.6	40.2	16.8	26.1
	IN-A	37.9	29.4	-	16.6	7.2	13.2	23.7	8.3	14.5
	IN-R	54.5	42.8	5.2	-	36.0	20.0	41.9	25.5	28.9
	IN-Sketch	33.3	26.0	2.4	40.9	-	11.3	26.4	13.4	13.7
	ObjNet	49.0	37.4	3.8	20.3	10.1	-	30.0	12.3	20.7
	IN-Cartoon	89.8	51.9	6.9	36.2	22.2	23.5	-	39.0	36.6
	IN-Drawing	63.9	37.5	3.7	32.1	20.4	14.9	52.0	-	28.2
	IN-C	99.6	49.5	4.6	35.3	21.0	19.8	96.1	75.1	-
LP-FT (Kumar et al., 2022)	IN-V2	50.4	-	5.7	24.1	11.3	16.2	34.6	14.2	22.0
	IN-A	25.0	19.7	-	11.5	5.2	10.4	15.0	5.1	9.0
	IN-R	44.2	34.3	4.5	-	32.8	17.6	33.5	19.9	22.2
	IN-Sketch	28.5	22.4	2.1	39.3	-	9.9	21.9	11.3	11.5
	ObjNet	35.7	27.3	4.0	16.1	7.7	-	20.6	7.6	14.4
	IN-Cartoon	85.9	43.5	5.4	30.8	17.1	18.3	-	31.1	28.6
	IN-Drawing	57.3	31.6	3.1	27.2	17.0	12.2	46.9	-	22.7
	IN-C	99.9	42.0	4.2	29.8	17.1	14.1	98.2	83.4	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	72.8	-	12.8	40.0	25.0	31.1	54.9	31.4	43.5
	IN-A	65.3	53.5	-	32.9	19.7	28.0	44.5	20.8	37.0
	IN-R	72.3	60.4	12.9	-	44.1	33.1	59.5	42.8	46.5
	IN-Sketch	60.9	49.6	7.4	52.0	-	23.4	49.3	30.3	33.3
	ObjNet	70.7	57.0	13.5	37.2	22.7	-	49.7	28.0	41.6
	IN-Cartoon	84.8	63.5	14.4	47.4	32.0	33.4	-	47.6	48.8
	IN-Drawing	75.5	55.3	9.5	45.7	32.6	25.1	63.2	-	44.7
	IN-C	91.7	61.2	10.5	51.0	36.6	30.6	86.4	69.8	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	74.7	-	14.1	43.6	28.6	33.2	57.5	37.0	46.5
	IN-A	68.8	56.3	-	36.5	22.9	31.2	48.6	26.8	40.5
	IN-R	74.5	63.0	14.9	-	47.9	35.1	62.2	47.3	49.8
	IN-Sketch	61.6	50.4	7.8	53.6	-	23.7	51.1	34.0	34.7
	ObjNet	73.8	61.2	14.6	41.1	26.8	-	53.5	33.0	45.1
	IN-Cartoon	85.3	65.5	15.3	50.9	36.3	35.1	-	51.9	50.9
	IN-Drawing	76.0	56.6	9.7	49.1	37.0	26.4	63.9	-	46.2
	IN-C	91.1	62.8	11.1	53.0	38.3	31.6	85.4	69.9	-

Table S11: The accuracy on each OOD dataset after fine-tuning OpenAI CLIP ViT-B/32 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	IN-R	IN-Sketch	ObjNet	IN-Cartoon	IN-Drawing	IN-C
Pretrained		82.0	70.9	22.6	55.8	45.0	41.5	71.1	42.5	57.9
FT	IN-V2	54.8	-	6.5	24.5	10.4	18.4	38.3	16.2	25.9
	IN-A	26.3	21.0	-	11.0	3.9	12.3	14.8	5.1	10.1
	IN-R	44.0	33.9	5.7	-	32.1	16.4	34.0	21.9	23.1
	IN-Sketch	28.0	21.1	2.2	39.9	-	9.1	21.8	12.6	11.1
	ObjNet	33.8	25.0	3.9	15.0	8.6	-	19.6	6.8	13.4
	IN-Cartoon	88.7	47.2	6.7	31.9	17.6	19.3	-	36.8	31.4
	IN-Drawing	60.3	32.9	3.5	28.0	16.7	12.4	49.4	-	24.6
	IN-C	99.8	44.5	4.5	30.2	17.2	16.2	97.1	80.7	-
Linear Probing	IN-V2	81.6	-	23.5	56.1	43.4	42.4	71.1	42.4	59.0
	IN-A	80.6	69.9	-	55.9	42.2	44.5	69.8	37.8	58.5
	IN-R	77.7	66.3	18.2	-	48.1	37.5	69.8	50.8	55.5
	IN-Sketch	78.0	66.3	19.1	63.5	-	39.2	69.7	48.6	55.4
	ObjNet	80.3	69.4	26.6	54.6	41.2	-	68.2	36.9	56.7
	IN-Cartoon	80.8	67.5	20.0	57.1	42.4	37.9	-	43.8	53.1
	IN-Drawing	77.4	64.0	14.9	55.6	41.7	34.1	66.8	-	48.6
	IN-C	95.8	62.9	16.4	50.8	38.7	31.7	87.7	67.6	-
Visual Prompt (Bahng et al., 2022)	IN-V2	78.5	-	16.3	52.1	41.2	40.0	64.3	35.1	50.1
	IN-A	72.9	61.3	-	47.3	31.3	40.9	55.7	21.4	39.6
	IN-R	73.9	62.7	15.5	-	44.8	37.3	61.8	41.7	44.2
	IN-Sketch	76.4	64.3	14.5	58.0	-	38.7	64.5	43.0	47.2
	ObjNet	65.9	53.5	14.8	41.9	24.9	-	41.4	14.5	29.5
	IN-Cartoon	77.7	65.3	16.2	53.3	39.7	37.7	-	37.5	45.4
	IN-Drawing	77.0	64.6	12.8	53.1	39.7	36.2	63.2	-	46.1
	IN-C	79.2	67.8	20.6	55.5	41.9	41.0	66.8	46.3	-
LoRA (Hu et al., 2021)	IN-V2	81.5	-	23.2	56.1	43.5	42.3	71.1	42.4	58.9
	IN-A	80.3	69.6	-	55.5	42.1	43.8	69.0	35.9	58.1
	IN-R	77.5	66.0	18.4	-	48.0	37.5	69.5	51.8	55.1
	IN-Sketch	77.8	65.7	18.5	61.9	-	38.4	68.9	51.4	53.5
	ObjNet	79.3	67.8	23.3	54.1	39.9	-	66.8	34.6	53.4
	IN-Cartoon	79.5	67.4	19.6	56.8	42.4	38.1	-	43.7	52.0
	IN-Drawing	76.3	64.6	15.5	55.6	42.1	34.7	66.1	-	48.4
	IN-C	81.1	69.5	21.8	57.7	44.5	38.6	73.4	43.0	-
EWC (Kirkpatrick et al., 2017)	IN-V2	78.2	-	20.3	49.0	33.0	37.2	65.5	38.8	53.9
	IN-A	67.1	55.4	-	38.3	24.5	31.9	49.3	25.7	40.9
	IN-R	75.2	63.8	21.7	-	51.2	36.7	66.9	51.2	52.5
	IN-Sketch	64.9	53.1	13.4	52.7	-	24.9	59.3	40.3	38.8
	ObjNet	73.1	61.2	20.9	43.0	29.5	-	52.9	23.3	44.7
	IN-Cartoon	80.8	67.2	20.3	55.4	41.0	37.9	-	44.7	48.1
	IN-Drawing	76.8	63.3	14.9	53.8	40.6	31.6	66.6	-	48.7
	IN-C	82.9	70.0	23.6	56.0	42.4	40.5	72.3	56.6	-
LwF (Li & Hoiem, 2017)	IN-V2	60.5	-	6.8	27.8	13.9	20.0	44.4	20.2	30.2
	IN-A	42.3	33.0	-	16.9	7.1	14.8	26.4	10.1	17.6
	IN-R	55.1	43.5	5.4	-	34.5	19.0	43.3	28.2	30.1
	IN-Sketch	36.1	27.6	2.4	43.3	-	10.8	27.8	16.0	15.3
	ObjNet	52.1	40.1	4.9	20.0	10.7	-	32.3	12.9	23.1
	IN-Cartoon	91.7	53.0	6.8	35.3	21.1	22.0	-	43.0	39.6
	IN-Drawing	67.6	38.8	3.7	32.6	19.5	14.8	56.0	-	29.6
	IN-C	98.7	59.1	5.9	42.7	29.3	25.4	93.3	62.8	-
LP-FT (Kumar et al., 2022)	IN-V2	55.4	-	6.3	26.2	11.7	17.6	39.0	17.8	26.0
	IN-A	30.7	23.6	-	13.0	4.9	12.4	17.9	6.2	11.6
	IN-R	47.6	37.3	5.6	-	33.1	17.9	37.1	25.1	25.7
	IN-Sketch	30.1	23.4	2.6	41.4	-	10.0	23.1	13.9	12.3
	ObjNet	38.6	28.8	4.5	15.1	7.4	-	21.5	8.3	16.3
	IN-Cartoon	89.2	47.1	6.5	32.6	18.8	19.2	-	39.2	31.3
	IN-Drawing	63.1	34.8	4.2	29.0	17.3	12.8	52.8	-	25.7
	IN-C	99.9	42.1	4.7	29.1	16.0	14.5	98.0	82.5	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	75.6	-	15.2	42.9	26.9	32.7	60.7	37.0	49.1
	IN-A	69.8	57.5	-	37.0	21.5	31.3	51.7	27.2	43.3
	IN-R	73.4	61.5	14.6	-	45.8	32.7	62.7	47.4	49.5
	IN-Sketch	64.2	52.2	8.2	54.6	-	23.4	52.8	35.8	36.3
	ObjNet	73.5	61.3	15.0	40.9	28.5	-	55.7	30.1	46.7
	IN-Cartoon	85.8	64.7	15.6	48.4	33.0	33.4	-	50.2	50.8
	IN-Drawing	77.3	56.8	10.0	47.0	34.6	23.8	66.8	-	46.9
	IN-C	91.9	61.4	11.1	47.9	32.7	29.6	86.6	69.7	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	76.5	-	15.6	45.7	29.6	33.5	62.1	40.1	50.2
	IN-A	71.2	59.3	-	38.8	24.3	31.9	53.4	29.8	44.3
	IN-R	74.9	63.6	16.2	-	48.4	34.1	64.5	50.6	51.8
	IN-Sketch	64.8	52.8	8.1	55.7	-	23.4	54.0	37.2	37.2
	ObjNet	75.2	63.1	16.5	42.7	30.3	-	57.7	32.8	48.7
	IN-Cartoon	85.8	65.6	15.9	50.1	35.1	33.9	-	53.0	51.7
	IN-Drawing	77.9	58.3	10.3	49.4	36.9	25.0	67.7	-	47.9
	IN-C	90.8	65.2	13.2	51.7	37.1	32.5	85.1	68.1	-

Table S12: The accuracy on each OOD dataset after fine-tuning ImageNet-1K with AugReg pretrained ViT-S/16 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	Realistic OOD			ObjNet	IN-Cartoon	Synthetic OOD	
					IN-R	IN-Sketch			IN-Drawing	IN-C	
Pretrained		78.8	66.7	13.4	37.1	25.9	33.6	63.3	37.2	53.2	
FT	IN-V2	75.5	-	19.8	38.1	25.0	35.3	58.2	35.9	51.2	
	IN-A	66.5	55.9	-	33.5	22.0	31.0	46.5	26.6	44.1	
	IN-R	62.8	52.6	14.5	-	41.2	28.8	53.0	40.4	42.7	
	IN-Sketch	70.6	59.2	11.5	56.6	-	31.4	58.9	43.7	45.5	
	ObjNet	67.3	55.8	15.7	30.1	18.5	-	43.9	23.0	41.9	
	IN-Cartoon	86.8	59.3	15.1	37.0	23.9	31.7	-	38.7	44.4	
	IN-Drawing	77.6	55.9	10.2	35.8	24.8	26.7	56.5	-	46.0	
	IN-C	99.9	55.0	8.3	31.1	18.3	24.0	91.8	68.8	-	
Linear Probing	IN-V2	78.6	-	14.3	37.4	25.8	33.9	63.0	36.8	53.1	
	IN-A	77.7	65.5	-	37.1	25.4	35.1	61.4	36.3	53.0	
	IN-R	78.2	66.2	15.3	-	29.0	34.3	63.3	38.5	53.0	
	IN-Sketch	76.1	64.0	15.0	47.2	-	34.6	62.6	39.5	50.9	
	ObjNet	78.1	66.1	16.2	37.0	25.2	-	61.1	36.6	53.4	
	IN-Cartoon	80.4	64.9	13.0	38.5	25.8	32.9	-	38.8	52.6	
	IN-Drawing	78.6	65.2	13.8	39.7	27.2	33.3	63.6	-	54.3	
	IN-C	93.5	58.7	10.9	32.6	21.5	27.5	75.4	50.0	-	
Visual Prompt (Bahng et al., 2022)	IN-V2	74.7	-	10.8	36.3	22.3	34.1	54.9	29.2	43.9	
	IN-A	65.4	53.7	-	29.7	15.9	33.0	41.7	18.0	32.1	
	IN-R	65.4	53.9	8.9	-	33.9	28.7	52.8	37.5	35.0	
	IN-Sketch	70.5	58.0	8.3	48.3	-	31.4	55.7	39.0	39.2	
	ObjNet	62.6	51.0	8.6	24.2	13.3	-	34.7	11.1	26.8	
	IN-Cartoon	73.3	59.6	8.4	37.2	22.0	31.1	-	28.4	36.0	
	IN-Drawing	71.0	58.5	5.9	38.3	24.3	28.0	55.8	-	40.7	
	IN-C	76.1	63.5	11.9	36.3	23.2	35.0	57.0	40.1	-	
LoRA (Hu et al., 2021)	IN-V2	78.9	-	13.8	37.3	26.0	34.0	63.3	37.4	53.5	
	IN-A	78.6	66.6	-	37.7	25.6	36.2	61.4	36.9	53.5	
	IN-R	78.6	66.5	16.2	-	28.9	36.0	64.2	40.1	52.8	
	IN-Sketch	78.7	66.5	14.8	47.7	-	34.9	65.9	46.7	53.5	
	ObjNet	78.6	66.5	16.8	37.5	24.8	-	61.0	36.5	53.0	
	IN-Cartoon	77.8	65.1	12.5	39.3	26.3	32.8	-	37.4	51.3	
	IN-Drawing	78.1	66.2	13.4	42.0	29.4	34.1	63.7	-	54.6	
	IN-C	79.2	66.8	13.9	38.1	25.9	34.6	64.5	38.6	-	
EWC (Kirkpatrick et al., 2017)	IN-V2	79.1	-	19.8	40.1	26.8	37.6	62.7	39.5	55.4	
	IN-A	74.3	62.8	-	38.3	25.2	37.2	54.5	32.2	51.4	
	IN-R	74.0	62.6	16.4	-	42.3	33.6	64.4	51.6	51.8	
	IN-Sketch	77.7	65.7	14.9	54.0	-	35.7	66.9	52.1	54.0	
	ObjNet	74.8	63.8	22.0	37.1	24.3	-	52.3	32.4	51.7	
	IN-Cartoon	77.9	64.7	14.0	41.6	27.7	34.0	-	39.8	49.1	
	IN-Drawing	77.4	65.3	12.5	41.7	29.8	33.3	63.8	-	53.2	
	IN-C	79.4	67.0	17.2	39.4	26.6	37.1	62.2	46.6	-	
LwF (Li & Hoiem, 2017)	IN-V2	77.8	-	17.5	38.6	26.0	35.2	61.5	37.5	53.5	
	IN-A	76.0	64.5	-	37.7	25.0	33.7	58.5	35.0	51.7	
	IN-R	75.1	63.2	16.0	-	42.9	32.3	63.7	48.1	51.8	
	IN-Sketch	74.5	62.3	11.6	55.3	-	31.9	62.1	43.5	48.6	
	ObjNet	76.1	64.2	17.1	35.2	22.6	-	56.8	31.9	50.4	
	IN-Cartoon	89.9	64.3	15.8	38.4	24.8	34.0	-	39.4	52.6	
	IN-Drawing	83.1	60.6	11.4	36.9	26.1	29.5	60.8	-	50.8	
	IN-C	99.5	63.0	10.4	37.0	23.7	29.9	90.1	60.9	-	
LP-FT (Kumar et al., 2022)	IN-V2	76.4	-	20.4	38.6	25.6	36.1	59.3	37.5	52.3	
	IN-A	72.5	61.4	-	35.2	23.9	34.2	53.4	32.3	48.6	
	IN-R	69.4	57.7	15.2	-	41.0	31.7	57.9	43.6	46.6	
	IN-Sketch	72.7	60.9	13.5	57.3	-	32.6	61.3	43.3	47.9	
	ObjNet	72.5	60.4	17.1	33.6	20.7	-	51.3	26.4	46.6	
	IN-Cartoon	88.3	60.9	15.1	37.7	24.3	32.6	-	40.9	47.2	
	IN-Drawing	79.7	57.5	10.4	36.7	25.6	27.1	58.5	-	48.2	
	IN-C	99.9	52.8	7.1	30.5	17.7	21.5	93.5	73.3	-	
WiSE-FT (Wortsman et al., 2022b)	IN-V2	78.8	-	18.9	39.5	27.2	36.2	63.0	39.4	55.0	
	IN-A	77.6	65.8	-	39.2	26.9	37.4	61.2	36.9	54.2	
	IN-R	77.3	65.7	18.8	-	43.1	36.6	67.2	52.0	55.3	
	IN-Sketch	77.6	66.1	14.3	53.7	-	35.3	65.9	48.8	53.6	
	ObjNet	77.8	65.7	19.2	37.7	25.5	-	60.3	35.3	53.5	
	IN-Cartoon	85.2	65.7	16.6	39.7	27.2	35.0	-	43.1	52.9	
	IN-Drawing	82.5	65.0	14.0	40.2	29.9	33.5	64.7	-	55.4	
	IN-C	94.2	64.9	13.9	38.7	26.0	33.1	82.7	58.0	-	
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	78.9	-	19.1	39.5	27.2	36.4	62.8	39.4	55.1	
	IN-A	77.1	65.4	-	39.2	26.7	37.1	60.1	36.4	53.9	
	IN-R	77.2	65.5	19.0	-	44.4	36.0	67.5	52.7	55.2	
	IN-Sketch	77.6	66.1	14.6	55.6	-	35.4	66.4	49.7	53.6	
	ObjNet	77.7	65.9	20.1	37.9	25.5	-	59.5	35.1	53.5	
	IN-Cartoon	84.9	65.9	16.2	40.4	27.4	34.9	-	42.7	52.7	
	IN-Drawing	82.3	64.8	13.7	40.6	30.1	33.3	64.9	-	55.1	
	IN-C	93.0	66.2	14.4	39.8	27.1	34.3	80.8	56.8	-	

Table S13: The accuracy on each OOD dataset after fine-tuning ImageNet-21K pretrained ViT-S/16 with AugReg on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	Realistic OOD IN-R	IN-Sketch	ObjNet	IN-Cartoon	Synthetic OOD IN-Drawing	IN-C
Pretrained		81.4	70.3	27.0	46.0	32.9	41.3	67.8	37.7	58.0
FT	IN-V2	78.9	-	34.3	46.1	30.5	43.2	63.9	34.4	56.8
	IN-A	73.2	62.8	-	43.7	30.4	41.5	55.4	29.7	52.7
	IN-R	70.5	60.5	26.4	-	48.0	37.0	60.5	46.2	50.6
	IN-Sketch	74.4	63.1	25.2	63.3	-	39.1	62.5	47.2	50.7
	ObjNet	73.3	61.6	28.9	38.3	26.3	-	52.7	24.0	48.5
	IN-Cartoon	87.6	64.4	26.5	45.1	31.1	40.0	-	41.2	52.2
	IN-Drawing	83.1	62.2	20.3	45.1	33.1	36.3	64.9	-	52.8
	IN-C	99.8	59.8	15.9	39.4	25.2	32.0	91.7	71.3	-
Linear Probing	IN-V2	80.9	-	28.2	46.1	32.5	41.0	67.1	37.1	57.7
	IN-A	80.0	69.1	-	45.6	32.2	41.6	66.2	36.4	57.2
	IN-R	80.1	69.5	27.9	-	35.5	40.5	66.3	38.2	56.8
	IN-Sketch	77.5	67.0	27.7	54.5	-	40.8	64.6	40.4	55.1
	ObjNet	80.2	69.5	28.9	45.6	32.0	-	66.5	37.1	57.9
	IN-Cartoon	85.1	68.8	26.4	46.5	32.5	40.7	-	41.0	59.3
	IN-Drawing	82.5	68.8	26.9	47.4	34.1	40.0	70.4	-	60.0
	IN-C	95.6	60.4	21.4	39.8	25.9	32.8	81.7	52.3	-
Visual Prompt (Bahng et al., 2022)	IN-V2	77.0	-	22.2	42.7	28.1	41.8	58.4	29.9	47.9
	IN-A	69.3	58.7	-	38.5	22.2	40.2	48.1	21.8	39.6
	IN-R	66.9	56.4	15.7	-	38.4	32.3	53.0	38.8	38.1
	IN-Sketch	73.0	61.3	15.3	55.7	-	38.3	58.3	42.1	42.1
	ObjNet	64.1	52.7	15.1	27.2	16.5	-	35.4	14.4	29.1
	IN-Cartoon	75.2	62.2	17.8	41.6	26.8	37.7	-	29.3	39.7
	IN-Drawing	72.9	60.9	13.2	42.2	27.5	35.7	55.8	-	41.0
	IN-C	78.1	66.6	23.1	42.7	28.1	41.1	60.9	41.0	-
LoRA (Hu et al., 2021)	IN-V2	81.5	-	27.2	45.9	32.8	41.6	67.8	37.7	58.2
	IN-A	81.5	70.7	-	46.2	32.8	43.0	67.8	37.7	58.9
	IN-R	81.4	70.6	29.1	-	34.9	43.3	68.5	40.7	58.2
	IN-Sketch	81.3	70.3	28.1	54.0	-	42.1	68.6	46.0	58.3
	ObjNet	81.5	70.8	29.2	46.3	32.3	-	67.6	38.0	58.8
	IN-Cartoon	81.4	70.2	27.3	47.0	33.1	41.6	-	38.6	57.7
	IN-Drawing	81.4	70.5	27.7	49.7	36.7	42.4	68.5	-	59.0
	IN-C	68.9	56.6	8.0	26.4	15.9	27.3	42.4	9.4	-
EWC (Kirkpatrick et al., 2017)	IN-V2	81.6	-	33.2	48.2	33.3	44.6	67.1	38.4	59.7
	IN-A	78.9	68.3	-	47.2	33.0	45.4	62.7	33.9	58.0
	IN-R	78.1	67.3	30.3	-	47.5	41.1	68.1	53.4	56.4
	IN-Sketch	80.6	69.7	29.1	60.0	-	42.9	69.8	52.4	58.0
	ObjNet	78.8	68.0	34.5	44.5	30.9	-	59.2	34.3	56.7
	IN-Cartoon	81.0	68.9	28.4	48.6	32.9	42.0	-	42.6	55.2
	IN-Drawing	80.7	69.0	26.7	50.0	37.1	41.3	68.3	-	58.1
	IN-C	81.8	71.0	31.2	47.5	33.2	43.2	67.4	48.6	-
LwF (Li & Hoiem, 2017)	IN-V2	80.7	-	31.4	46.3	31.8	42.6	67.1	36.7	58.3
	IN-A	80.0	69.3	-	46.2	31.6	42.1	64.5	37.0	57.8
	IN-R	79.5	68.3	28.4	-	47.5	39.4	68.4	48.3	57.2
	IN-Sketch	77.8	66.2	25.4	60.9	-	40.9	66.1	43.8	54.5
	ObjNet	79.1	67.3	30.7	42.2	29.6	-	61.7	31.1	55.1
	IN-Cartoon	90.4	68.8	26.9	46.9	33.2	41.7	-	42.2	60.0
	IN-Drawing	86.7	66.5	21.9	46.0	34.7	38.6	68.5	-	57.8
	IN-C	99.8	64.7	17.1	43.4	29.0	36.0	91.6	65.1	-
LP-FT (Kumar et al., 2022)	IN-V2	79.4	-	34.2	46.6	31.3	43.1	65.2	36.3	57.6
	IN-A	77.0	67.0	-	44.3	31.5	42.7	60.3	32.2	56.0
	IN-R	75.4	65.0	27.6	-	47.4	39.5	64.3	49.1	53.5
	IN-Sketch	75.0	63.9	27.5	62.8	-	40.6	64.1	44.9	52.3
	ObjNet	77.4	66.1	31.5	41.4	27.9	-	59.2	28.0	53.4
	IN-Cartoon	89.3	65.3	27.2	45.8	31.8	40.9	-	42.8	56.0
	IN-Drawing	85.3	63.4	21.5	46.7	34.9	37.5	67.9	-	55.5
	IN-C	99.9	56.4	12.0	38.3	23.3	27.6	94.5	75.6	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	81.3	-	33.4	47.6	33.4	44.0	67.6	38.1	59.3
	IN-A	80.6	69.8	-	47.7	33.9	45.4	66.1	38.0	58.9
	IN-R	79.9	69.8	32.6	-	48.5	43.8	70.4	53.2	59.6
	IN-Sketch	80.0	69.2	29.3	60.7	-	42.6	69.6	49.8	58.0
	ObjNet	80.5	69.3	33.1	45.6	32.5	-	65.7	35.0	57.6
	IN-Cartoon	86.7	69.5	30.2	47.7	34.0	43.1	-	43.9	58.4
	IN-Drawing	85.1	69.0	27.7	49.4	37.8	42.5	70.8	-	60.4
	IN-C	93.8	68.7	26.5	47.1	32.5	41.5	83.6	58.7	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	81.4	-	33.3	47.6	33.3	43.8	67.6	38.0	59.3
	IN-A	80.4	69.8	-	47.7	33.6	45.1	65.6	37.6	58.9
	IN-R	80.3	69.9	32.6	-	49.1	43.2	70.7	53.8	59.4
	IN-Sketch	80.0	69.2	29.2	61.5	-	42.6	69.7	49.9	57.9
	ObjNet	80.4	69.2	33.8	45.3	32.3	-	64.6	35.3	57.6
	IN-Cartoon	86.4	69.6	29.7	48.2	34.1	42.9	-	43.9	58.6
	IN-Drawing	85.0	69.2	27.0	49.2	37.8	41.9	70.6	-	60.2
	IN-C	94.2	69.3	27.2	48.0	34.0	41.9	84.1	59.7	-

Table S14: The accuracy on each OOD dataset after fine-tuning ImageNet-21K pretrained ViT-S/32 with AugReg on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	Realistic OOD			ObjNet	Synthetic OOD		
		IN	IN-V2	IN-A	IN-R	IN-Sketch	ObjNet	IN-Cartoon	IN-Drawing	IN-C	
Pretrained		76.0	63.9	11.5	39.7	26.2	33.1	62.9	34.3	52.0	
FT	IN-V2	72.2	-	17.3	38.2	23.4	34.0	56.9	31.2	50.1	
	IN-A	64.3	53.7	-	33.3	20.9	31.9	46.9	24.7	44.0	
	IN-R	62.4	51.6	14.1	-	42.7	29.1	53.2	40.5	43.4	
	IN-Sketch	67.2	55.1	12.0	56.9	-	30.4	56.7	41.7	45.5	
	ObjNet	64.9	53.4	14.2	31.7	18.3	-	44.7	21.5	41.7	
	IN-Cartoon	84.6	56.2	12.8	38.7	24.6	30.3	-	35.6	45.2	
	IN-Drawing	75.4	53.0	9.6	38.0	26.1	25.8	55.9	-	46.9	
	IN-C	99.7	52.1	8.1	32.9	19.8	24.2	92.9	71.0	-	
Linear Probing	IN-V2	75.3	-	12.7	39.4	26.0	32.7	62.3	34.1	51.5	
	IN-A	73.5	61.6	-	38.5	25.2	32.3	60.7	32.6	50.4	
	IN-R	74.6	62.5	13.0	-	28.8	32.4	62.1	34.5	51.5	
	IN-Sketch	71.5	60.1	13.3	49.2	-	33.1	59.6	36.6	49.6	
	ObjNet	74.5	62.9	12.7	40.1	26.3	-	61.6	33.1	52.1	
	IN-Cartoon	80.6	61.6	11.4	40.8	26.1	32.4	-	38.2	53.5	
	IN-Drawing	77.3	61.1	11.3	40.8	27.4	30.3	65.5	-	53.6	
	IN-C	93.6	52.2	10.7	33.5	20.6	25.3	79.2	49.0	-	
Visual Prompt (Bahng et al., 2022)	IN-V2	69.9	-	9.6	36.9	22.5	33.1	53.6	28.5	42.6	
	IN-A	48.5	38.5	-	24.9	8.8	22.0	31.2	12.4	23.2	
	IN-R	58.5	48.0	6.7	-	31.1	25.5	46.2	34.4	32.3	
	IN-Sketch	64.5	52.5	6.3	48.1	-	28.2	51.0	37.0	35.1	
	ObjNet	53.5	42.9	7.2	23.9	12.2	-	31.8	14.1	24.5	
	IN-Cartoon	69.0	56.1	7.4	38.0	22.3	30.0	-	30.6	36.0	
	IN-Drawing	63.6	51.3	5.5	37.8	22.9	25.3	49.5	-	36.6	
	IN-C	71.2	59.4	9.8	36.9	22.5	33.5	55.2	35.6	-	
LoRA (Hu et al., 2021)	IN-V2	76.0	-	11.6	39.7	26.2	33.2	62.9	34.3	52.1	
	IN-A	76.1	64.0	-	40.3	26.5	34.1	63.0	34.1	53.1	
	IN-R	76.1	64.1	12.4	-	27.8	34.7	63.8	35.8	52.8	
	IN-Sketch	75.7	63.5	12.7	48.1	-	34.1	63.8	41.5	52.9	
	ObjNet	76.1	64.0	12.5	40.6	26.6	-	63.1	33.9	53.3	
	IN-Cartoon	75.9	63.7	11.7	40.7	26.6	33.7	-	35.0	51.4	
	IN-Drawing	75.5	63.5	10.9	43.7	30.2	32.8	63.4	-	52.3	
	IN-C	74.1	62.0	9.3	36.9	23.5	30.2	58.4	30.5	-	
EWC (Kirkpatrick et al., 2017)	IN-V2	76.0	-	15.8	41.0	26.1	36.0	62.1	35.4	53.6	
	IN-A	70.9	59.1	-	38.3	24.0	35.8	54.9	28.1	50.2	
	IN-R	71.8	60.4	14.5	-	41.4	32.6	61.9	47.4	50.7	
	IN-Sketch	74.9	62.9	13.2	53.4	-	34.6	64.7	45.5	52.6	
	ObjNet	72.5	60.9	17.9	38.7	24.8	-	55.2	31.6	50.7	
	IN-Cartoon	75.0	61.8	11.7	42.4	26.9	33.1	-	37.3	48.8	
	IN-Drawing	74.2	61.9	11.6	43.7	29.8	33.0	61.8	-	52.3	
	IN-C	76.2	64.0	14.3	41.4	27.0	35.8	62.3	42.6	-	
LwF (Li & Hoiem, 2017)	IN-V2	75.0	-	14.9	39.4	25.3	33.6	60.8	32.9	51.8	
	IN-A	73.1	61.1	-	38.2	24.4	33.6	57.7	31.5	50.8	
	IN-R	72.9	60.7	14.1	-	42.6	31.6	62.4	44.2	50.9	
	IN-Sketch	71.2	59.1	11.9	55.3	-	32.6	60.0	40.5	48.9	
	ObjNet	71.1	59.7	15.5	36.2	21.6	-	54.3	27.2	48.2	
	IN-Cartoon	88.0	61.5	12.6	40.3	26.4	32.1	-	37.8	53.7	
	IN-Drawing	81.4	58.2	10.6	39.1	27.4	28.8	62.2	-	52.1	
	IN-C	98.7	60.0	8.9	38.2	24.1	29.1	89.2	55.7	-	
LP-FT (Kumar et al., 2022)	IN-V2	73.2	-	17.4	39.0	24.5	33.9	58.4	32.1	50.7	
	IN-A	69.2	58.2	-	35.0	22.9	33.4	53.9	28.6	48.2	
	IN-R	68.5	56.8	14.2	-	42.5	32.3	58.0	43.2	47.5	
	IN-Sketch	67.8	56.5	13.0	57.3	-	32.0	57.6	39.9	46.9	
	ObjNet	70.2	58.2	14.8	35.8	21.4	-	53.1	24.6	47.0	
	IN-Cartoon	87.3	57.7	13.2	39.2	25.2	31.2	-	37.8	50.1	
	IN-Drawing	79.1	55.2	10.7	38.5	26.9	26.3	60.0	-	50.3	
	IN-C	99.8	48.0	6.9	30.8	18.0	20.7	94.6	73.5	-	
WiSE-FT (Wortsman et al., 2022b)	IN-V2	75.7	-	15.7	40.3	26.3	35.3	62.0	35.0	53.1	
	IN-A	74.5	62.9	-	40.0	26.1	36.6	60.2	34.2	52.8	
	IN-R	74.0	62.8	16.2	-	42.2	35.3	64.7	47.5	53.3	
	IN-Sketch	74.2	62.2	13.1	54.4	-	34.1	63.9	44.2	52.1	
	ObjNet	74.5	62.6	15.9	39.1	25.4	-	59.5	32.2	51.8	
	IN-Cartoon	83.0	62.6	13.6	41.0	27.1	33.7	-	39.0	51.8	
	IN-Drawing	79.8	61.8	12.2	42.4	30.0	32.4	64.5	-	54.3	
	IN-C	93.0	61.8	12.8	40.4	26.7	32.4	83.5	56.9	-	
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	75.7	-	15.6	40.4	26.3	35.3	61.9	35.0	53.1	
	IN-A	74.2	62.4	-	39.6	25.7	36.3	59.2	33.0	52.5	
	IN-R	74.3	62.8	16.0	-	43.4	34.8	64.9	48.0	53.2	
	IN-Sketch	74.2	62.3	13.0	55.5	-	34.4	64.0	44.6	52.2	
	ObjNet	74.1	62.6	17.2	39.1	25.3	-	58.4	32.0	51.7	
	IN-Cartoon	82.5	62.6	13.1	41.6	27.3	33.4	-	39.0	52.0	
	IN-Drawing	79.6	61.7	12.3	42.5	30.1	32.1	64.4	-	54.2	
	IN-C	91.5	63.1	13.2	41.2	27.3	33.3	81.0	54.5	-	

Table S15: The accuracy on each OOD dataset after fine-tuning ImageNet-21K pretrained ViT-L/16 with AugReg on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	Realistic OOD	IN-Sketch	ObjNet	IN-Cartoon	Synthetic OOD	IN-C	
Pretrained			85.8	76.2	55.5	64.4	51.8	52.8	79.5	64.6	72.2
FT	IN-V2	83.8	-	59.7	66.2	51.0	54.1	77.0	63.9	71.0	
	IN-A	81.9	24.4	-	66.1	51.0	52.3	75.1	61.4	70.4	
	IN-R	79.4	69.8	48.8	-	58.8	48.9	72.6	63.8	65.4	
	IN-Sketch	81.6	72.8	52.0	76.3	-	52.5	75.6	64.7	67.6	
	ObjNet	82.3	73.2	58.2	62.0	50.4	-	74.5	56.2	68.4	
	IN-Cartoon	96.1	72.7	52.1	63.2	50.8	50.5	-	70.4	72.6	
	IN-Drawing	93.8	72.2	46.4	65.4	52.5	49.9	85.1	-	74.7	
	IN-C	99.9	70.1	37.9	58.7	45.8	44.0	98.8	89.9	-	
Linear Probing	IN-V2	85.0	-	57.1	64.1	51.2	51.9	78.4	63.5	71.4	
	IN-A	84.9	49.8	-	64.8	51.3	53.4	78.5	63.5	71.4	
	IN-R	83.9	43.5	56.3	-	50.7	51.1	76.5	61.7	69.8	
	IN-Sketch	82.1	72.9	55.3	70.0	-	53.2	75.6	61.3	68.4	
	ObjNet	84.8	75.0	58.2	63.3	50.9	-	78.3	63.6	71.5	
	IN-Cartoon	92.6	74.8	56.0	63.8	50.6	52.7	-	68.5	76.5	
	IN-Drawing	89.1	75.1	55.0	64.3	51.2	51.7	84.1	-	76.0	
	IN-C	99.6	69.6	49.3	59.2	45.6	45.6	96.7	84.1	-	
Visual Prompt (Bahng et al., 2022)	IN-V2	80.3	-	39.4	56.9	42.1	49.8	70.2	50.1	57.4	
	IN-A	77.2	66.8	-	52.6	37.2	51.1	64.8	43.4	50.5	
	IN-R	75.3	64.8	34.8	-	47.4	45.2	64.9	50.7	50.3	
	IN-Sketch	73.3	62.8	25.7	63.5	-	43.8	64.5	51.2	48.6	
	ObjNet	77.4	66.9	40.8	52.1	36.1	-	62.8	38.8	47.7	
	IN-Cartoon	80.2	69.3	37.9	58.9	43.1	47.5	-	52.2	55.8	
	IN-Drawing	76.0	65.2	28.3	57.0	40.5	44.0	65.8	-	52.2	
	IN-C	81.1	70.5	42.8	54.3	41.5	51.3	69.9	51.8	-	
LoRA (Hu et al., 2021)	IN-V2	85.9	-	56.2	64.5	51.9	53.3	79.5	64.8	72.3	
	IN-A	85.9	76.6	-	65.1	52.0	55.4	79.5	65.0	72.9	
	IN-R	85.9	76.6	58.8	-	52.5	55.2	79.5	65.3	72.6	
	IN-Sketch	85.9	76.4	58.0	67.0	-	54.7	79.6	65.6	72.5	
	ObjNet	85.8	76.3	59.9	65.3	52.0	-	79.3	64.9	72.9	
	IN-Cartoon	85.9	76.3	57.7	65.0	51.6	54.4	-	64.8	72.5	
	IN-Drawing	85.8	76.4	58.1	65.8	52.4	54.8	79.7	-	73.0	
	IN-C	86.7	76.5	58.0	65.3	52.3	55.0	80.6	69.2	-	
EWC (Kirkpatrick et al., 2017)	IN-V2	84.3	-	52.7	66.7	51.3	51.9	77.6	65.1	71.0	
	IN-A	84.2	75.8	-	67.9	51.8	57.0	77.0	62.4	72.0	
	IN-R	84.6	75.3	62.7	-	60.0	55.0	77.9	67.7	72.0	
	IN-Sketch	85.2	76.0	57.0	74.3	-	54.8	79.3	67.8	72.4	
	ObjNet	83.6	74.4	61.4	64.3	51.6	-	75.3	61.4	71.2	
	IN-Cartoon	86.2	76.1	58.7	66.0	52.1	54.2	-	66.9	71.8	
	IN-Drawing	86.2	76.5	57.4	67.1	53.2	55.1	80.2	-	73.5	
	IN-C	87.4	76.4	57.5	65.8	52.5	53.1	81.7	71.2	-	
LwF (Li & Hoiem, 2017)	IN-V2	84.9	-	55.8	65.1	50.6	52.6	78.2	63.1	71.3	
	IN-A	85.2	76.0	-	66.8	51.5	54.9	78.8	64.5	72.0	
	IN-R	85.1	56.9	57.0	-	59.8	48.0	78.9	67.5	71.4	
	IN-Sketch	83.6	74.2	53.4	74.5	-	53.1	77.9	65.4	70.2	
	ObjNet	85.0	75.4	60.5	64.6	51.2	-	77.8	61.7	71.5	
	IN-Cartoon	97.2	74.0	47.3	65.0	50.4	49.9	-	71.2	75.5	
	IN-Drawing	94.5	70.0	43.2	66.6	53.1	42.7	87.6	-	76.6	
	IN-C	99.9	72.4	41.5	63.1	50.0	47.4	98.9	89.4	-	
LP-FT (Kumar et al., 2022)	IN-V2	84.6	-	59.9	65.8	52.1	53.6	78.0	63.6	71.4	
	IN-A	67.4	58.1	-	57.0	40.5	50.8	59.2	44.5	53.7	
	IN-R	63.1	55.1	43.9	-	40.6	46.5	55.3	47.2	49.4	
	IN-Sketch	81.5	72.5	54.4	74.6	-	53.7	75.6	62.7	67.8	
	ObjNet	83.9	74.1	61.1	64.2	50.7	-	76.9	60.8	70.6	
	IN-Cartoon	96.2	74.2	55.7	64.4	51.5	52.6	-	71.4	77.0	
	IN-Drawing	93.4	73.7	51.2	65.2	52.5	51.2	87.1	-	77.5	
	IN-C	99.9	69.6	44.5	59.0	45.0	44.6	98.3	89.7	-	
WiSE-FT (Wortsman et al., 2022b)	IN-V2	85.7	-	61.9	66.3	52.2	55.9	79.3	66.0	73.5	
	IN-A	84.7	75.3	-	66.2	51.6	55.4	78.6	63.7	71.5	
	IN-R	85.1	76.1	61.5	-	60.9	55.7	79.2	69.4	73.0	
	IN-Sketch	85.0	76.2	57.9	74.4	-	55.2	79.5	67.8	72.1	
	ObjNet	85.3	76.2	62.5	65.4	52.8	-	78.7	63.9	72.6	
	IN-Cartoon	92.3	76.1	59.3	65.3	52.7	54.9	-	70.5	75.6	
	IN-Drawing	91.2	76.0	57.1	67.0	54.4	55.1	84.8	-	76.8	
	IN-C	97.0	75.5	54.7	65.7	51.8	53.2	93.4	81.3	-	
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	85.7	-	60.8	66.5	52.2	55.2	79.4	66.1	73.4	
	IN-A	85.4	76.3	-	67.6	52.6	56.0	79.1	65.3	72.7	
	IN-R	85.3	76.4	61.7	-	61.1	55.1	79.4	69.4	73.3	
	IN-Sketch	85.0	76.0	57.2	75.0	-	55.0	79.5	68.0	72.3	
	ObjNet	85.4	76.3	63.0	65.5	52.7	-	78.4	63.6	72.7	
	IN-Cartoon	92.3	76.0	57.2	65.8	52.3	53.8	-	70.7	75.8	
	IN-Drawing	91.2	76.4	56.5	67.3	54.4	54.5	84.9	-	77.4	
	IN-C	97.2	76.0	55.7	65.9	53.0	53.3	94.0	82.5	-	

Table S16: The accuracy on each OOD dataset after fine-tuning ImageNet-1K pretrained ResNet-18 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	Realistic OOD IN-R	IN-Sketch	ObjNet	Synthetic OOD IN-Cartoon	IN-Drawing	IN-C
Pretrained		69.8	57.3	1.1	33.1	20.2	26.0	48.2	20.4	31.7
FT	IN-V2	67.1	-	2.2	31.0	17.7	25.1	42.7	17.2	29.9
	IN-A	50.4	40.6	-	22.8	12.1	19.7	30.0	10.1	19.9
	IN-R	53.1	42.6	3.4	-	37.1	21.3	43.4	27.6	25.6
	IN-Sketch	48.1	37.4	2.1	47.4	-	16.5	36.9	22.9	19.2
	ObjNet	55.2	44.3	3.7	25.3	13.7	-	32.8	9.9	20.8
	IN-Cartoon	75.7	45.2	2.2	28.8	17.3	20.3	-	16.3	20.0
	IN-Drawing	46.4	32.3	2.1	24.0	15.2	10.8	23.1	-	15.1
	IN-C	99.2	38.3	2.5	26.6	13.4	14.3	85.8	65.3	-
Linear Probing	IN-V2	69.0	-	1.1	31.6	18.8	24.6	45.4	19.7	29.8
	IN-A	66.1	53.5	-	30.8	18.7	23.6	43.5	20.5	28.7
	IN-R	64.3	51.7	1.2	-	23.9	21.6	48.6	23.7	25.9
	IN-Sketch	5.9	4.4	1.0	12.5	-	3.4	4.7	1.9	1.7
	ObjNet	64.7	51.8	1.7	30.0	16.6	-	44.5	15.4	25.0
	IN-Cartoon	63.7	48.1	1.3	30.7	18.5	20.4	-	16.0	21.8
	IN-Drawing	38.2	29.0	1.5	22.8	13.5	9.7	21.2	-	11.4
	IN-C	77.2	48.6	2.5	28.1	16.1	20.5	50.3	25.2	-
Visual Prompt (Bahng et al., 2022)	IN-V2	60.6	-	2.2	30.7	16.7	24.5	37.8	17.1	21.4
	IN-A	39.5	30.1	-	19.6	8.8	18.2	19.2	5.6	7.3
	IN-R	53.4	42.6	2.3	-	18.3	22.6	33.8	16.3	16.6
	IN-Sketch	54.6	42.9	2.3	32.4	-	22.6	34.5	17.2	17.1
	ObjNet	47.3	36.0	2.9	23.6	11.6	-	25.6	9.1	12.9
	IN-Cartoon	58.2	45.4	2.2	29.8	15.7	22.8	-	13.6	17.8
	IN-Drawing	54.0	43.0	1.9	29.7	17.1	20.6	33.1	-	17.3
	IN-C	61.8	50.5	2.2	31.1	18.2	25.4	38.7	20.5	-
EWC (Kirkpatrick et al., 2017)	IN-V2	69.7	-	1.1	32.2	19.2	25.7	45.8	20.7	31.5
	IN-A	56.0	45.5	-	23.5	8.5	22.1	35.4	12.6	22.0
	IN-R	64.5	52.2	1.7	-	31.3	24.2	53.0	28.0	29.0
	IN-Sketch	39.5	29.5	2.0	28.2	-	13.3	31.5	17.9	13.3
	ObjNet	63.9	51.6	2.7	29.5	15.5	-	42.4	15.0	24.9
	IN-Cartoon	62.0	47.6	1.3	31.9	19.5	20.2	-	16.3	20.7
	IN-Drawing	36.7	29.2	1.5	24.5	15.4	9.9	19.2	-	12.0
	IN-C	66.2	54.4	2.3	31.2	18.5	26.8	40.4	22.0	-
LwF (Li & Hoiem, 2017)	IN-V2	68.7	-	1.9	32.3	19.1	25.8	45.4	18.8	31.0
	IN-A	61.4	50.3	-	28.0	16.0	23.0	38.9	15.7	26.7
	IN-R	62.3	50.6	2.6	-	36.2	23.8	50.0	29.6	30.3
	IN-Sketch	54.7	43.1	1.7	47.8	-	19.1	42.0	23.6	21.8
	ObjNet	61.9	50.0	3.3	29.8	16.9	-	39.3	14.1	25.6
	IN-Cartoon	81.6	52.5	1.8	32.2	19.5	23.7	-	21.5	29.0
	IN-Drawing	60.3	41.0	2.0	27.0	16.8	15.5	31.3	-	20.8
	IN-C	97.2	47.2	1.6	31.0	18.1	18.4	83.2	53.4	-
LP-FT (Kumar et al., 2022)	IN-V2	67.0	-	2.3	31.0	17.7	25.1	42.8	17.0	29.8
	IN-A	54.4	44.2	-	23.4	12.6	20.8	30.9	12.2	22.6
	IN-R	56.2	45.5	3.3	-	37.9	21.9	46.2	29.5	27.5
	IN-Sketch	45.8	36.1	2.2	45.2	-	15.5	35.9	21.6	17.5
	ObjNet	58.1	46.8	3.6	27.0	14.8	-	36.4	11.5	22.2
	IN-Cartoon	76.3	45.2	2.2	28.8	17.2	20.2	-	16.6	19.7
	IN-Drawing	46.4	31.5	2.1	24.0	14.8	10.8	22.6	-	14.5
	IN-C	99.4	37.4	2.5	26.6	13.0	13.5	88.3	67.6	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	69.6	-	1.6	32.9	19.9	26.3	47.0	19.8	32.3
	IN-A	66.5	54.7	-	31.5	18.9	26.5	45.5	18.4	30.7
	IN-R	66.2	54.2	1.9	-	33.9	25.7	54.0	31.6	33.6
	IN-Sketch	64.9	52.3	1.5	46.6	-	24.1	50.3	30.2	29.8
	ObjNet	67.2	54.9	2.3	32.6	19.3	-	44.9	17.6	30.4
	IN-Cartoon	76.5	54.4	1.5	33.5	20.5	25.0	-	21.2	28.8
	IN-Drawing	68.6	51.4	1.6	32.8	20.8	21.1	41.9	-	28.8
	IN-C	86.0	52.9	1.9	35.4	20.9	24.2	68.0	40.0	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	69.6	-	1.6	32.8	19.7	26.2	46.7	20.1	32.2
	IN-A	65.1	53.5	-	30.7	17.6	25.8	44.3	16.7	29.2
	IN-R	65.9	54.0	2.1	-	34.7	25.4	53.8	31.6	32.9
	IN-Sketch	63.2	50.9	1.5	47.4	-	23.0	49.7	30.6	28.2
	ObjNet	66.3	54.2	2.6	32.3	18.6	-	44.4	17.0	29.3
	IN-Cartoon	74.8	53.1	1.5	33.6	20.6	24.3	-	20.9	27.5
	IN-Drawing	62.6	46.8	1.7	31.1	19.8	18.0	35.7	-	24.2
	IN-C	84.3	53.9	1.7	35.5	21.2	25.0	64.9	38.5	-

Table S17: The accuracy on each OOD dataset after fine-tuning ImageNet-1K pretrained ResNet-50 on the downstream datasets with various methods. Note that ImageNet-Drawing, ImageNet-Cartoon, and ImageNet-C are generated from the ImageNet validation set. Green and red indicate relative performance increases and decreases, respectively, compared to the pretrained model. Bold indicates the best performance on each evaluation dataset.

Method	Downstream Dataset	D_{pre} IN	IN-V2	IN-A	Realistic OOD IN-R	IN-Sketch	ObjNet	IN-Cartoon	Synthetic OOD IN-Drawing	IN-C
Pretrained		80.3	69.5	16.7	41.6	28.4	42.7	61.1	31.1	46.6
FT	IN-V2	79.6	-	18.2	42.4	28.7	41.8	58.1	31.0	47.0
	IN-A	75.7	65.2	-	40.6	28.0	42.6	52.4	25.8	46.3
	IN-R	72.5	61.7	16.5	-	49.1	37.2	61.7	46.0	43.7
	IN-Sketch	57.3	45.7	5.5	55.0	-	25.6	48.9	30.3	23.3
	ObjNet	75.3	63.5	22.0	38.5	23.3	-	53.0	22.7	41.8
	IN-Cartoon	81.4	58.8	12.9	39.6	28.0	34.6	-	25.1	31.9
	IN-Drawing	42.9	32.6	4.9	30.3	24.2	11.9	30.0	-	16.3
	IN-C	99.7	56.5	6.6	38.2	23.1	28.3	89.3	66.0	-
Linear Probing	IN-V2	79.6	-	12.4	41.0	27.5	40.1	56.5	34.4	45.6
	IN-A	78.2	66.8	-	40.8	28.0	41.1	55.0	35.2	45.4
	IN-R	76.2	64.5	16.7	-	31.5	39.2	60.0	35.2	40.6
	IN-Sketch	10.5	8.3	1.7	15.9	-	7.1	9.5	4.9	2.8
	ObjNet	76.1	63.9	17.0	39.4	25.3	-	55.2	25.7	39.4
	IN-Cartoon	73.7	60.3	11.5	39.9	26.0	32.4	-	31.6	35.6
	IN-Drawing	10.4	7.9	1.8	15.5	17.7	2.9	5.3	-	8.8
	IN-C	82.5	62.5	16.3	35.3	23.6	38.1	56.1	31.6	-
Visual Prompt (Bahng et al., 2022)	IN-V2	75.4	-	11.9	37.5	24.2	39.9	51.8	24.9	36.4
	IN-A	73.1	61.3	-	37.0	23.4	41.3	48.8	21.9	32.8
	IN-R	73.2	61.1	13.1	-	28.9	38.5	51.5	28.0	32.8
	IN-Sketch	73.8	61.5	12.3	43.4	-	39.0	50.9	28.1	33.0
	ObjNet	72.7	60.5	13.5	34.6	22.9	-	47.2	19.9	33.1
	IN-Cartoon	74.5	62.3	11.3	38.1	24.3	38.1	-	24.7	34.5
	IN-Drawing	74.2	62.3	11.3	39.6	26.4	37.9	52.3	-	35.1
	IN-C	75.0	63.4	11.9	37.0	23.7	39.8	51.8	28.1	-
EWC (Kirkpatrick et al., 2017)	IN-V2	80.2	-	13.6	41.5	28.3	41.3	58.0	31.6	46.0
	IN-A	78.3	67.5	-	42.9	28.8	43.1	56.7	31.9	46.8
	IN-R	77.0	65.4	17.4	-	40.3	40.2	64.8	40.3	42.9
	IN-Sketch	40.9	32.1	4.0	32.7	-	17.8	36.0	21.4	13.2
	ObjNet	77.1	65.5	18.7	40.7	25.7	-	56.8	24.0	41.3
	IN-Cartoon	72.1	58.8	11.4	39.1	25.5	33.2	-	25.4	33.1
	IN-Drawing	8.1	6.8	1.5	14.4	17.2	2.8	3.1	-	7.5
	IN-C	76.1	64.9	18.0	38.0	25.3	40.6	51.1	30.2	-
LwF (Li & Hoiem, 2017)	IN-V2	79.7	-	19.4	43.1	29.0	42.3	58.7	31.8	47.5
	IN-A	76.4	65.8	-	41.3	28.6	42.8	53.5	26.6	46.8
	IN-R	73.7	63.0	17.0	-	49.3	38.0	62.8	46.6	44.9
	IN-Sketch	54.3	43.1	5.5	51.8	-	24.5	47.5	29.7	21.4
	ObjNet	76.7	65.3	21.9	39.7	24.6	-	55.3	24.1	43.1
	IN-Cartoon	82.4	60.4	14.5	41.0	29.1	35.8	-	26.9	34.6
	IN-Drawing	17.5	13.8	2.7	21.2	22.4	5.7	8.2	-	12.3
	IN-C	99.7	58.4	5.9	38.9	23.5	29.7	90.9	66.5	-
LP-FT (Kumar et al., 2022)	IN-V2	79.6	-	17.7	42.3	28.5	41.4	58.3	31.6	47.1
	IN-A	76.3	65.8	-	40.2	28.1	43.0	52.6	26.8	46.4
	IN-R	73.4	62.3	16.3	-	48.9	37.9	62.5	46.6	44.2
	IN-Sketch	57.6	46.0	5.1	55.5	-	25.9	49.1	31.6	24.2
	ObjNet	75.5	63.6	21.5	39.1	23.7	-	54.0	22.9	41.8
	IN-Cartoon	81.7	59.0	12.8	39.6	28.1	34.5	-	25.8	32.2
	IN-Drawing	46.4	35.2	5.1	29.9	22.9	13.4	28.4	-	16.7
	IN-C	99.6	56.9	6.3	37.8	22.9	28.4	88.7	63.7	-
WiSE-FT (Wortsman et al., 2022b)	IN-V2	80.7	-	17.3	42.5	29.2	42.6	60.9	32.3	48.1
	IN-A	80.1	69.5	-	43.0	30.1	44.5	60.1	31.6	48.9
	IN-R	79.2	68.5	18.6	-	45.2	42.5	67.7	47.1	49.3
	IN-Sketch	76.6	65.3	9.9	56.7	-	38.3	63.4	42.6	41.5
	ObjNet	79.7	68.4	20.5	42.0	27.4	-	60.1	29.5	46.8
	IN-Cartoon	83.8	67.5	16.4	43.3	29.7	40.9	-	31.8	42.8
	IN-Drawing	78.8	64.6	12.4	42.6	30.5	35.0	58.6	-	41.8
	IN-C	91.4	67.4	11.3	44.2	29.4	39.0	79.1	50.8	-
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	80.6	-	16.8	42.7	29.4	42.3	60.1	32.2	48.0
	IN-A	79.5	68.6	-	43.1	30.0	44.2	58.8	31.2	48.9
	IN-R	78.4	67.7	18.9	-	47.2	41.8	67.3	47.6	48.4
	IN-Sketch	74.0	62.7	8.9	58.4	-	36.0	60.9	45.0	38.7
	ObjNet	79.1	67.7	21.1	41.8	27.1	-	59.3	27.9	45.7
	IN-Cartoon	82.1	65.2	15.0	42.9	29.5	39.6	-	30.0	39.5
	IN-Drawing	62.2	49.5	8.9	36.8	28.6	20.5	41.7	-	28.9
	IN-C	91.2	67.3	12.1	44.3	29.6	39.5	78.4	52.1	-

Table S18: Accuracy of ImageNet-1K with AugReg pretrained ViT-B/16 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption. For each corruption, accuracy is averaged across 5 levels of severity.

Method	Fine-Tuning Dataset	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		56.0	57	54	54	49	42	53	46	48	55	61	74	56	59	67	66
FT	IN-V2	57.4	56	54	53	51	40	55	46	53	59	65	74	59	58	68	67
	IN-A	53.5	53	51	50	50	38	52	39	50	56	57	70	56	51	65	64
	IN-R	52.0	52	50	49	46	44	49	37	49	55	57	66	53	51	62	61
	IN-Sketch	53.8	55	53	52	46	39	49	43	51	56	58	70	55	55	63	62
	ObjNet	52.3	52	48	48	46	37	51	38	50	55	58	70	51	52	64	63
	IN-Cartoon	51.3	53	50	50	44	35	48	35	48	50	54	74	53	53	65	58
	IN-Drawing	56.0	58	56	55	46	43	52	40	55	62	61	74	53	57	66	62
Linear Probing	IN-V2	55.9	56	54	54	49	42	53	46	48	55	61	73	56	59	66	65
	IN-A	55.8	56	53	53	49	42	54	46	48	55	61	73	57	59	66	65
	IN-R	56.2	56	54	54	49	44	54	47	49	55	61	73	56	60	66	66
	IN-Sketch	54.5	54	52	52	48	41	51	45	48	54	59	72	55	58	65	64
	ObjNet	56.1	56	54	54	49	43	54	48	48	56	62	73	53	60	66	65
	IN-Cartoon	55.6	56	54	53	48	42	52	46	48	55	59	75	54	59	67	67
	IN-Drawing	54.3	57	55	55	43	43	50	44	51	61	49	74	39	59	66	67
Visual Prompt (Bahng et al., 2022)	IN-V2	47.9	44	42	41	41	35	46	42	42	46	51	69	48	55	59	57
	IN-A	38.0	33	31	29	31	24	36	31	35	38	43	60	37	46	48	49
	IN-R	40.1	39	38	36	33	28	36	30	36	41	41	61	38	45	50	50
	IN-Sketch	44.3	43	41	40	37	29	40	36	39	45	46	65	47	49	54	55
	ObjNet	35.3	28	26	24	28	22	33	29	32	35	41	61	37	44	45	44
	IN-Cartoon	41.8	39	37	36	34	27	38	33	36	38	42	66	43	50	55	53
	IN-Drawing	44.2	45	43	43	33	32	38	32	41	51	42	65	39	59	56	52
LoRA (Hu et al., 2021)	IN-V2	56.1	57	54	54	49	43	53	46	48	55	61	74	57	59	67	66
	IN-A	56.5	57	54	54	49	44	55	48	49	57	61	74	52	60	67	66
	IN-R	56.7	57	54	54	50	44	54	48	49	56	62	74	56	60	67	66
	IN-Sketch	56.6	56	54	54	51	43	53	47	50	56	62	74	57	59	67	66
	ObjNet	55.0	57	54	54	48	43	54	47	48	55	55	74	44	60	67	66
	IN-Cartoon	54.6	56	53	53	48	43	50	45	48	54	56	73	50	58	66	65
	IN-Drawing	55.1	58	56	56	44	45	51	43	51	63	54	74	43	59	66	66
EWC (Kirkpatrick et al., 2017)	IN-V2	58.2	58	55	55	52	44	56	49	52	58	64	75	59	61	68	67
	IN-A	56.6	55	53	52	52	42	56	46	52	58	62	73	59	57	67	66
	IN-R	56.1	55	54	53	50	44	53	43	53	59	62	72	58	56	64	65
	IN-Sketch	57.2	57	56	55	50	44	54	47	52	57	61	74	57	59	67	67
	ObjNet	56.9	56	53	53	51	43	56	47	52	58	62	74	58	59	67	66
	IN-Cartoon	54.7	55	52	52	48	40	52	43	48	54	60	73	56	58	66	64
	IN-Drawing	58.3	59	57	57	50	44	55	45	54	63	65	74	59	60	68	66
LwF (Li & Hoiem, 2017)	IN-V2	57.9	57	55	54	51	42	55	47	53	59	65	75	60	59	69	68
	IN-A	57.2	56	54	54	52	42	55	45	53	60	62	73	59	57	68	66
	IN-R	57.2	57	56	55	50	48	54	43	54	59	62	72	57	57	67	66
	IN-Sketch	55.2	56	54	53	48	40	51	45	52	57	60	72	56	57	65	64
	ObjNet	56.3	56	53	53	51	41	55	44	52	57	63	73	57	57	67	66
	IN-Cartoon	55.6	56	53	53	49	40	52	41	51	55	59	77	57	58	68	65
	IN-Drawing	58.2	59	56	56	50	45	55	43	55	63	64	77	56	59	69	65
LP-FT (Kumar et al., 2022)	IN-V2	57.6	57	54	54	51	41	55	46	53	59	65	74	60	59	68	67
	IN-A	56.2	55	52	52	51	41	55	43	53	59	62	73	59	56	67	65
	IN-R	55.3	55	54	52	48	47	52	41	52	58	60	70	56	56	65	64
	IN-Sketch	54.4	54	53	52	48	40	50	44	51	55	59	70	56	56	64	63
	ObjNet	54.9	54	51	51	48	40	54	43	51	57	61	72	54	56	66	64
	IN-Cartoon	52.8	53	50	50	46	37	49	38	49	52	55	75	54	55	66	61
	IN-Drawing	56.0	59	56	56	44	44	52	40	56	63	57	76	49	58	67	64
WiSE-FT (Wortsman et al., 2022b)	IN-V2	58.0	58	55	55	51	42	55	47	52	58	65	75	60	60	69	68
	IN-A	57.8	57	55	55	52	43	56	46	53	59	64	74	60	59	68	66
	IN-R	59.6	59	58	57	53	49	57	48	55	61	65	75	60	61	69	68
	IN-Sketch	57.3	58	56	56	50	42	53	47	53	59	63	74	59	59	67	66
	ObjNet	57.6	57	54	54	51	43	56	46	53	58	64	74	59	59	68	67
	IN-Cartoon	56.3	57	54	55	50	41	53	43	51	55	61	76	58	59	68	65
	IN-Drawing	59.5	61	59	59	51	45	56	46	55	63	65	77	59	61	69	67
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	58.0	58	55	55	51	43	55	47	52	59	64	75	60	60	69	68
	IN-A	57.8	57	55	54	52	43	56	46	53	59	64	74	60	58	68	67
	IN-R	59.6	59	58	57	53	49	57	47	55	61	65	74	60	61	69	68
	IN-Sketch	57.5	58	56	56	50	42	53	47	53	59	63	74	59	59	67	66
	ObjNet	57.7	57	54	54	52	43	56	47	53	58	64	74	59	59	68	67
	IN-Cartoon	56.2	57	54	54	50	41	53	43	51	55	61	76	58	59	68	65
	IN-Drawing	59.7	61	59	59	51	45	56	46	55	63	66	77	59	61	69	67

Table S19: Accuracy of ImageNet-1K with SAM pretrained ViT-B/16 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption. For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Noise			Blur				Weather				Digital			
			Gauss.	Shot	Impulse	Defocus	Glass	Motion	Zoom	Snow	Frost	Fog	Bright	Contrast	Elastic	Pixel	JPEG
Pretrained		54.6	53	50	51	50	48	55	47	47	51	51	73	46	64	68	67
FT	IN-V2	56.8	51	49	48	54	49	59	50	51	53	59	75	52	65	69	68
	IN-A	51.3	42	39	36	56	45	56	43	46	46	56	71	52	58	61	61
	IN-R	53.9	49	48	47	53	51	54	42	50	54	55	70	52	58	62	64
	IN-Sketch	55.7	53	52	51	52	46	55	49	50	52	59	72	52	60	66	66
	ObjNet	52.2	43	41	38	56	46	55	47	47	48	54	71	49	60	64	64
	IN-Cartoon	51.3	44	42	39	50	40	53	42	46	45	54	74	52	59	66	65
IN-Drawing	55.4	54	53	52	47	48	54	43	51	59	55	74	47	61	67	66	
Linear Probing	IN-V2	54.7	52	50	50	50	49	55	47	47	51	52	73	47	64	68	67
	IN-A	54.5	52	50	49	49	48	55	47	47	51	51	73	47	64	68	67
	IN-R	54.6	52	50	49	49	49	54	47	47	51	51	73	46	64	68	67
	IN-Sketch	54.1	52	50	50	49	48	53	47	48	51	50	72	46	63	67	66
	ObjNet	54.6	52	50	50	50	48	54	47	47	51	52	73	47	64	68	67
	IN-Cartoon	53.8	52	50	49	49	48	54	46	46	50	46	73	43	64	69	67
IN-Drawing	54.6	53	51	51	48	49	53	46	48	53	50	73	46	64	68	67	
Visual Prompt (Bahng et al., 2022)	IN-V2	44.7	42	41	40	39	37	42	39	36	40	38	66	34	57	58	61
	IN-A	30.4	26	25	22	22	24	27	25	26	29	26	53	22	43	41	44
	IN-R	36.8	38	37	36	27	28	31	28	31	35	26	60	22	48	51	56
	IN-Sketch	36.3	36	35	34	27	27	30	27	33	36	24	61	21	48	49	57
	ObjNet	35.3	31	30	27	29	29	32	31	28	32	30	59	25	49	46	50
	IN-Cartoon	42.3	43	41	40	34	36	39	38	35	39	25	67	23	54	62	62
IN-Drawing	42.2	46	45	44	31	37	36	34	39	46	18	64	16	55	61	62	
LoRA (Hu et al., 2021)	IN-V2	54.7	52	50	50	50	49	55	47	47	51	52	73	47	64	68	67
	IN-A	54.8	52	50	50	50	49	55	47	47	51	52	73	47	64	68	67
	IN-R	54.7	52	50	50	50	49	55	47	47	51	51	73	46	64	68	67
	IN-Sketch	54.6	52	50	50	50	48	54	47	48	51	51	73	47	64	68	67
	ObjNet	54.7	52	50	50	50	48	55	47	47	51	52	73	47	64	68	67
	IN-Cartoon	53.7	52	50	50	49	49	54	47	46	51	44	73	42	64	69	67
IN-Drawing	54.5	53	51	50	49	49	53	47	48	53	48	73	45	64	68	67	
EWC (Kirkpatrick et al., 2017)	IN-V2	55.1	52	50	50	50	49	55	48	48	51	53	74	47	64	68	67
	IN-A	54.7	48	46	44	55	50	57	48	49	52	54	73	48	64	66	67
	IN-R	56.3	53	51	50	53	50	57	48	49	53	55	74	50	65	68	69
	IN-Sketch	55.6	53	52	51	51	50	55	47	48	52	52	73	48	64	69	68
	ObjNet	56.5	51	49	48	55	51	58	51	49	52	57	74	50	65	68	69
	IN-Cartoon	54.3	51	49	48	50	47	54	46	47	50	51	74	48	63	69	67
IN-Drawing	56.9	55	54	54	51	50	56	47	50	56	55	74	50	65	69	68	
LwF (Li & Hoiem, 2017)	IN-V2	56.8	52	50	49	54	49	58	50	51	53	58	75	52	65	69	68
	IN-A	53.9	45	42	40	57	48	58	47	49	49	58	73	54	61	64	65
	IN-R	56.0	51	51	49	54	52	56	45	52	55	58	72	53	61	65	66
	IN-Sketch	56.3	53	52	51	52	47	56	49	51	53	59	73	53	61	67	67
	ObjNet	55.0	47	45	43	57	48	58	50	49	50	57	73	52	63	67	66
	IN-Cartoon	53.1	46	44	42	51	43	54	44	47	47	55	75	53	61	67	66
IN-Drawing	56.2	55	53	53	48	48	55	44	52	60	56	74	48	62	68	67	
LP-FT (Kumar et al., 2022)	IN-V2	56.8	51	49	48	54	49	59	50	51	53	58	75	52	65	69	68
	IN-A	52.3	43	40	37	57	46	57	45	47	47	57	71	53	59	62	63
	IN-R	54.5	50	50	48	53	52	55	43	51	55	55	71	48	60	63	65
	IN-Sketch	55.6	53	52	51	52	47	55	48	50	52	58	72	52	60	66	66
	ObjNet	53.0	44	42	39	56	47	56	47	48	49	54	72	49	61	64	65
	IN-Cartoon	51.1	44	42	40	49	40	52	41	46	46	52	74	51	59	66	65
IN-Drawing	53.8	54	52	51	44	48	52	43	51	59	48	73	38	61	67	65	
WiSE-FT (Wortsman et al., 2022b)	IN-V2	56.1	52	50	50	52	49	57	49	50	52	56	75	50	65	69	68
	IN-A	57.0	51	49	47	54	50	59	50	52	53	59	75	53	65	69	68
	IN-R	58.7	56	55	54	54	52	58	49	53	56	60	75	54	65	70	69
	IN-Sketch	56.8	55	53	53	52	48	56	49	52	54	57	74	51	64	68	68
	ObjNet	56.4	51	49	48	54	49	58	50	51	52	58	74	51	65	69	68
	IN-Cartoon	55.2	50	48	47	51	46	56	47	49	50	56	75	52	64	69	68
IN-Drawing	57.9	57	55	55	51	50	57	47	53	58	57	75	51	65	70	68	
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	56.1	52	50	50	52	49	57	49	50	52	56	75	50	65	69	68
	IN-A	57.0	50	47	46	56	51	60	50	52	53	60	75	54	65	68	69
	IN-R	58.7	56	55	54	55	52	58	49	53	56	60	75	54	65	69	69
	IN-Sketch	57.0	55	53	53	52	48	56	49	52	54	57	74	51	64	69	68
	ObjNet	56.7	51	48	48	55	50	59	51	51	52	58	75	52	65	68	68
	IN-Cartoon	55.0	50	48	47	51	46	55	46	49	50	55	75	52	63	69	68
IN-Drawing	58.0	57	55	55	51	50	57	47	53	58	57	75	51	65	70	68	

Table S20: Accuracy of ImageNet-21K pretrained ViT-B/16 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		58.3	55	53	53	56	50	60	52	53	54	57	75	52	64	72	69
FT	IN-V2	58.5	51	49	48	60	49	62	53	54	53	62	76	56	63	72	70
	IN-A	55.0	47	45	43	56	45	60	50	51	50	57	73	55	58	69	66
	IN-R	52.9	48	47	46	51	49	53	44	48	52	53	70	50	56	65	63
	IN-Sketch	55.5	50	49	48	53	47	56	50	51	54	57	72	53	59	69	66
	ObjNet	52.8	45	42	40	55	41	57	48	47	47	55	72	52	57	68	66
	IN-Cartoon	52.9	44	41	39	53	41	57	46	48	46	54	76	53	58	71	67
	IN-Drawing	55.3	52	51	51	48	47	55	44	52	59	55	74	49	60	69	64
Linear Probing	IN-V2	58.5	55	53	53	56	50	61	52	53	54	58	75	53	64	72	69
	IN-A	58.7	55	53	52	56	50	61	54	54	54	59	75	53	65	71	70
	IN-R	56.7	55	53	53	52	49	56	50	52	54	52	74	48	63	70	69
	IN-Sketch	56.4	55	53	53	53	49	57	49	51	53	52	73	48	62	71	69
	ObjNet	58.9	55	53	53	57	50	61	54	53	54	59	75	53	65	71	70
	IN-Cartoon	56.9	54	53	52	52	47	58	50	52	52	54	76	50	63	72	70
	IN-Drawing	59.0	56	55	55	54	50	60	52	54	57	58	76	51	65	72	70
Visual Prompt (Bahng et al., 2022)	IN-V2	45.5	42	41	39	43	34	45	43	38	40	42	66	37	55	59	59
	IN-A	38.3	35	33	31	32	25	37	34	32	33	38	59	31	49	52	52
	IN-R	38.3	36	35	33	34	28	35	33	32	36	32	60	28	47	52	52
	IN-Sketch	41.1	39	38	36	37	29	38	36	35	38	36	63	30	50	55	57
	ObjNet	36.9	33	31	29	32	25	35	34	29	31	35	59	29	48	50	53
	IN-Cartoon	41.9	37	36	34	39	29	41	38	36	35	37	65	32	52	58	57
	IN-Drawing	41.8	40	40	38	36	32	38	36	38	43	32	63	25	52	57	57
LoRA (Hu et al., 2021)	IN-V2	58.4	55	53	53	56	50	60	52	53	54	57	75	52	64	72	69
	IN-A	58.9	55	53	52	56	50	61	54	54	54	59	76	53	65	72	70
	IN-R	53.6	54	52	52	46	46	50	46	51	53	44	73	40	61	68	68
	IN-Sketch	56.3	54	53	52	52	50	56	49	51	53	50	73	48	62	71	69
	ObjNet	59.2	55	53	53	57	50	62	55	53	54	59	76	53	65	72	71
	IN-Cartoon	56.1	54	52	52	51	47	57	49	51	52	52	75	49	61	71	69
	IN-Drawing	58.0	56	54	54	53	48	59	51	53	56	57	75	48	64	72	69
EWC (Kirkpatrick et al., 2017)	IN-V2	59.4	55	53	52	58	51	62	54	54	54	59	76	54	65	73	70
	IN-A	58.8	51	49	49	60	49	63	54	55	54	62	76	56	63	72	69
	IN-R	57.6	54	53	52	55	50	58	50	52	55	59	74	54	62	68	67
	IN-Sketch	59.3	56	55	54	57	51	61	53	54	55	59	76	55	64	72	69
	ObjNet	58.2	53	51	51	58	49	62	53	53	52	60	74	53	63	71	69
	IN-Cartoon	56.7	51	49	49	55	46	59	49	52	51	57	76	54	62	72	68
	IN-Drawing	59.4	55	54	54	57	51	62	52	53	59	61	75	55	65	71	68
LwF (Li & Hoiem, 2017)	IN-V2	59.3	53	52	51	59	51	62	54	54	54	61	76	55	64	73	70
	IN-A	58.1	51	49	48	57	48	62	53	54	54	61	75	56	62	71	68
	IN-R	57.3	53	52	51	56	53	58	49	52	55	57	73	53	61	69	67
	IN-Sketch	57.3	52	51	50	55	48	58	51	53	55	58	74	55	61	70	68
	ObjNet	57.0	50	48	47	57	47	60	52	51	52	59	74	55	62	71	68
	IN-Cartoon	57.9	51	48	47	57	47	61	51	53	52	59	78	57	64	74	70
	IN-Drawing	58.1	55	53	53	52	50	59	48	54	61	58	76	52	63	72	67
LP-FT (Kumar et al., 2022)	IN-V2	58.7	52	50	49	60	49	62	53	54	54	61	76	55	63	73	70
	IN-A	56.7	49	47	46	57	46	61	52	53	52	59	74	56	61	70	67
	IN-R	55.4	51	50	49	53	51	55	46	51	54	55	72	52	59	67	66
	IN-Sketch	55.8	52	51	50	53	46	56	48	51	54	55	72	52	59	69	67
	ObjNet	55.5	48	45	43	57	44	60	51	51	51	57	74	54	61	70	68
	IN-Cartoon	54.4	46	44	42	54	42	58	47	50	48	55	77	54	60	73	68
	IN-Drawing	56.0	53	52	52	48	48	55	45	53	60	56	75	48	61	70	66
WiSE-FT (Wortsman et al., 2022b)	IN-V2	59.3	54	52	51	58	50	62	53	55	55	60	76	55	64	73	70
	IN-A	59.0	53	51	50	58	50	62	54	55	55	61	76	56	64	72	69
	IN-R	60.0	55	54	53	58	54	61	53	55	58	61	76	56	64	72	69
	IN-Sketch	59.2	55	54	53	56	50	60	53	55	57	60	75	56	63	72	69
	ObjNet	58.2	52	50	49	58	49	61	53	53	53	60	75	55	63	72	69
	IN-Cartoon	58.1	52	49	49	57	47	61	51	54	52	59	77	56	64	74	70
	IN-Drawing	59.8	57	55	55	55	51	61	51	56	60	60	77	54	65	73	69
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	59.5	54	52	52	59	51	62	54	55	55	60	76	55	64	73	70
	IN-A	59.1	52	50	49	58	49	63	54	55	55	62	76	57	64	72	69
	IN-R	59.8	55	54	53	58	54	61	52	55	58	60	76	56	64	71	69
	IN-Sketch	59.4	55	54	53	57	50	61	53	55	57	60	76	56	64	72	69
	ObjNet	58.3	53	50	50	58	49	61	53	53	53	60	75	55	63	72	69
	IN-Cartoon	58.2	52	49	49	57	47	61	51	51	53	52	59	56	64	74	70
	IN-Drawing	60.1	57	55	55	55	51	61	51	56	61	61	77	55	65	73	69

Table S21: Accuracy of ViT-B/16 pretrained on ImageNet-21K-P, using different fine-tuning methods and downstream datasets on each ImageNet-C corruption For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		61.4	60	59	58	57	46	60	53	55	55	65	79	69	64	70	71
FT	IN-V2	62.1	58	57	55	62	48	63	55	57	55	67	79	69	62	73	73
	IN-A	60.5	56	55	52	63	48	63	53	54	51	64	77	69	60	71	72
	IN-R	57.5	55	55	53	56	50	57	47	52	55	59	73	57	58	66	68
	IN-Sketch	59.3	57	57	56	54	44	58	52	54	56	61	76	65	60	70	70
	ObjNet	57.7	54	54	50	58	43	60	50	49	48	60	76	65	58	69	71
	IN-Cartoon	56.1	53	52	49	55	38	58	47	51	47	59	79	63	58	65	66
	IN-Drawing	57.9	60	58	58	46	46	57	46	54	61	57	78	57	60	66	65
Linear Probing	IN-V2	61.4	59	59	58	57	46	60	53	55	55	65	79	69	64	70	71
	IN-A	61.8	59	59	58	58	46	61	54	56	55	66	79	70	64	70	71
	IN-R	61.0	59	58	57	56	46	60	52	55	55	64	79	68	64	70	71
	IN-Sketch	60.8	58	57	56	57	45	59	52	55	55	64	78	69	64	70	71
	ObjNet	61.9	59	59	58	58	47	61	54	55	55	66	79	70	64	70	71
	IN-Cartoon	61.3	59	59	58	56	45	60	52	55	55	65	80	69	64	71	72
	IN-Drawing	62.0	60	59	58	56	47	60	52	57	59	64	80	66	66	72	73
Visual Prompt (Bahng et al., 2017)	IN-V2	49.6	45	44	43	45	34	46	45	43	44	54	72	52	56	59	61
	IN-A	44.6	38	36	35	40	29	43	40	37	39	52	68	49	51	54	58
	IN-R	40.5	35	35	33	35	26	35	33	35	41	45	65	42	48	45	53
	IN-Sketch	44.1	40	40	38	37	27	39	37	39	44	48	67	46	51	50	57
	ObjNet	34.8	27	26	25	28	22	32	30	27	30	41	62	37	43	43	49
	IN-Cartoon	44.2	37	36	34	40	28	42	39	37	38	49	70	48	52	57	57
	IN-Drawing	44.3	44	44	42	37	32	38	36	39	48	42	66	38	52	53	55
LoRA (Hu et al., 2021)	IN-V2	61.3	59	59	57	57	46	60	53	55	55	64	79	69	64	70	72
	IN-A	62.1	59	59	57	58	48	61	54	55	55	66	79	71	65	71	71
	IN-R	61.2	59	58	57	56	47	60	53	55	55	65	79	68	64	70	72
	IN-Sketch	61.4	59	59	57	58	46	60	53	55	56	64	79	68	64	71	72
	ObjNet	62.1	59	59	58	59	48	61	54	55	55	66	79	71	65	71	72
	IN-Cartoon	60.3	58	58	57	55	45	58	52	54	54	62	79	66	63	70	72
	IN-Drawing	61.6	59	59	58	56	47	59	51	57	59	64	79	67	65	71	72
EWC (Kirkpatrick et al., 2017)	IN-V2	62.4	60	59	58	58	47	62	54	57	56	66	80	70	65	72	72
	IN-A	63.7	59	59	57	63	49	65	57	58	56	69	80	72	65	73	73
	IN-R	55.3	58	58	56	41	45	52	45	51	56	50	75	50	60	63	69
	IN-Sketch	61.4	60	60	58	55	46	60	54	55	57	64	78	67	64	70	72
	ObjNet	62.5	59	59	58	60	47	62	55	56	55	67	80	70	64	72	72
	IN-Cartoon	59.9	57	56	55	56	42	59	51	54	53	64	79	70	63	70	71
	IN-Drawing	60.9	60	60	58	53	48	60	51	57	62	62	78	61	64	68	70
LwF (Li & Hoiem, 2017)	IN-V2	62.9	59	58	57	62	48	63	55	58	56	67	80	71	64	73	73
	IN-A	63.5	59	59	57	63	49	65	57	58	57	68	79	71	64	73	73
	IN-R	62.0	59	59	57	59	53	61	53	57	59	65	77	66	63	71	71
	IN-Sketch	61.1	59	59	57	57	45	60	54	56	57	64	77	68	62	71	71
	ObjNet	61.8	59	59	56	61	46	63	54	55	54	66	79	69	62	72	72
	IN-Cartoon	61.3	58	57	55	60	44	62	53	56	54	65	82	68	64	70	71
	IN-Drawing	61.2	61	60	58	51	48	61	50	58	63	62	80	64	63	70	69
LP-FT (Kumar et al., 2022)	IN-V2	62.5	58	58	56	62	47	63	55	57	55	67	79	71	63	73	73
	IN-A	62.6	58	57	55	63	50	65	56	57	55	67	79	70	63	73	72
	IN-R	60.5	57	57	55	57	52	60	51	55	58	63	76	64	62	70	70
	IN-Sketch	60.2	58	57	56	56	45	59	52	56	56	63	77	66	61	70	71
	ObjNet	60.6	57	57	54	60	46	62	52	54	53	64	78	67	61	71	72
	IN-Cartoon	58.8	56	55	53	58	40	60	50	54	51	62	80	65	61	68	69
	IN-Drawing	58.7	60	59	58	48	46	58	46	56	62	58	79	60	61	67	66
WiSE-FT (Wortsman et al., 2022b)	IN-V2	63.3	60	59	58	61	48	63	55	58	57	68	80	72	65	73	73
	IN-A	64.1	60	60	58	63	49	65	57	59	58	69	80	73	65	73	73
	IN-R	64.3	61	61	60	61	52	63	55	59	61	68	80	71	66	73	73
	IN-Sketch	62.7	61	60	59	58	46	61	55	58	58	66	79	71	64	72	73
	ObjNet	62.9	60	59	58	61	47	63	55	57	56	67	80	71	64	73	73
	IN-Cartoon	61.4	59	58	56	59	43	62	52	56	54	65	81	70	64	70	71
	IN-Drawing	63.5	63	62	61	56	48	63	53	59	63	66	81	69	65	71	71
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	63.3	60	59	58	61	47	63	55	58	57	68	80	72	65	73	73
	IN-A	64.1	60	60	58	63	49	65	57	59	57	69	80	73	65	73	73
	IN-R	64.1	61	61	59	61	51	63	55	59	61	68	79	71	66	73	73
	IN-Sketch	62.7	61	60	59	58	46	61	55	58	58	66	79	71	64	72	73
	ObjNet	62.9	60	59	58	61	47	63	55	57	56	67	80	71	64	72	73
	IN-Cartoon	61.4	58	58	56	59	43	61	53	56	54	65	81	70	64	70	71
	IN-Drawing	63.4	63	62	61	56	48	63	53	59	63	66	81	69	65	71	71

Table S22: Accuracy of ImageNet-21K with AugReg pretrained ViT-B/16 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		66.5	67	66	66	63	54	67	59	66	62	69	80	65	66	75	74
FT	IN-V2	64.4	64	62	63	61	56	64	55	64	61	66	77	63	63	73	73
	IN-A	56.3	57	56	56	52	48	56	46	53	51	56	70	53	55	67	68
	IN-R	55.7	54	53	53	53	51	54	43	52	56	57	69	54	56	65	65
	IN-Sketch	54.8	54	53	52	52	44	53	43	52	55	57	70	55	53	64	65
	ObjNet	54.9	55	53	52	53	43	56	41	52	50	54	72	52	56	67	67
	IN-Cartoon	61.5	61	59	58	56	46	63	48	60	57	60	84	60	63	75	72
	IN-Drawing	59.9	57	54	54	51	48	60	45	58	65	64	81	56	62	74	70
Linear Probing	IN-V2	65.7	66	65	64	62	54	66	58	65	62	68	79	65	65	74	73
	IN-A	65.8	65	64	64	62	54	66	58	65	62	68	79	65	65	74	73
	IN-R	64.0	63	62	62	62	53	64	56	63	61	66	77	63	64	72	71
	IN-Sketch	62.1	62	61	60	60	50	62	54	61	59	65	75	62	61	70	69
	ObjNet	65.9	65	64	64	64	54	67	59	65	62	69	79	64	65	74	73
	IN-Cartoon	69.9	70	69	68	67	55	71	62	69	64	72	85	69	69	79	78
	IN-Drawing	70.0	70	69	69	67	59	71	61	70	69	73	83	69	69	77	76
Visual Prompt (Bahng et al., 2022)	IN-V2	56.9	53	51	50	55	43	57	51	54	52	59	75	57	60	68	68
	IN-A	51.1	44	41	40	47	34	52	46	50	47	57	71	53	54	64	65
	IN-R	46.4	43	42	40	40	35	42	36	46	48	46	68	40	51	58	60
	IN-Sketch	51.7	48	46	44	48	37	49	44	50	52	54	72	50	55	62	64
	ObjNet	42.5	33	32	29	40	25	42	36	42	40	47	67	43	47	56	58
	IN-Cartoon	53.1	51	49	49	50	37	52	45	51	49	51	74	50	57	66	65
	IN-Drawing	54.5	55	53	53	48	43	51	45	51	58	53	73	46	57	66	64
LoRA (Hu et al., 2021)	IN-V2	67.2	67	66	66	64	55	68	60	66	63	70	80	67	67	75	74
	IN-A	67.8	67	66	66	66	56	69	61	67	64	71	80	67	67	76	75
	IN-R	67.0	67	66	66	65	56	67	58	66	65	69	79	66	66	75	74
	IN-Sketch	66.9	67	66	65	65	55	67	59	67	64	70	79	67	66	74	74
	ObjNet	67.2	67	66	65	66	54	68	60	67	63	70	80	65	66	75	74
	IN-Cartoon	66.4	66	65	65	64	54	67	59	66	62	69	80	65	65	74	74
	IN-Drawing	67.1	66	65	65	64	57	67	57	68	67	71	80	67	66	74	73
EWC (Kirkpatrick et al., 2017)	IN-V2	67.7	67	66	65	65	56	68	59	68	65	71	80	68	66	76	75
	IN-A	65.8	65	64	64	63	55	67	57	66	62	69	78	67	63	74	73
	IN-R	63.9	62	61	60	62	58	63	52	62	64	66	77	65	63	71	72
	IN-Sketch	66.2	65	65	64	64	55	66	58	65	65	70	78	67	64	74	73
	ObjNet	63.5	63	62	61	62	51	65	52	64	60	67	77	63	61	73	72
	IN-Cartoon	63.9	63	62	62	62	49	66	55	64	58	66	79	65	62	73	71
	IN-Drawing	65.9	64	63	62	61	54	66	56	66	68	70	79	66	64	75	73
LwF (Li & Hoiem, 2017)	IN-V2	66.0	66	65	65	63	55	66	57	65	62	67	79	64	66	75	75
	IN-A	64.1	64	63	64	61	55	65	55	62	59	65	78	62	64	73	73
	IN-R	64.1	63	62	62	61	55	64	55	62	63	66	78	62	64	72	72
	IN-Sketch	61.5	61	60	60	58	50	61	52	59	60	64	76	60	61	70	70
	ObjNet	62.2	63	61	61	60	50	63	50	61	57	63	77	59	63	73	72
	IN-Cartoon	71.7	71	69	69	67	59	71	60	70	68	73	90	71	73	82	82
	IN-Drawing	68.5	66	64	64	64	57	70	56	66	71	72	87	62	69	82	79
LP-FT (Kumar et al., 2022)	IN-V2	65.6	65	64	64	62	54	65	57	66	62	68	78	66	65	74	73
	IN-A	63.2	62	61	61	60	53	63	55	62	59	65	77	63	62	72	71
	IN-R	57.0	54	54	53	54	51	56	47	55	57	59	71	55	58	67	65
	IN-Sketch	58.5	57	56	56	56	48	58	50	57	57	61	72	58	57	66	66
	ObjNet	59.9	59	58	58	57	47	61	48	58	56	61	75	58	60	70	70
	IN-Cartoon	68.6	69	67	67	63	52	70	58	69	64	70	88	68	68	80	77
	IN-Drawing	66.9	65	62	63	64	55	69	54	65	68	71	84	64	67	80	75
WiSE-FT (Wortsman et al., 2022b)	IN-V2	68.0	68	67	67	65	57	68	60	68	65	70	80	67	67	76	76
	IN-A	66.5	67	66	66	62	55	67	57	66	62	68	79	65	66	75	74
	IN-R	66.9	66	65	65	64	59	66	57	66	67	69	79	67	67	74	74
	IN-Sketch	65.1	65	64	64	61	53	64	55	65	64	68	78	65	64	73	73
	ObjNet	65.6	66	64	64	63	53	67	55	65	62	68	79	65	65	74	74
	IN-Cartoon	68.6	69	67	67	64	54	69	58	69	64	70	85	68	69	78	78
	IN-Drawing	69.2	70	68	68	63	56	70	57	69	70	72	84	66	68	79	77
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	68.0	68	67	67	65	57	68	60	68	65	71	80	67	67	76	75
	IN-A	66.9	68	67	67	63	56	67	58	67	62	69	80	66	66	75	74
	IN-R	67.4	66	66	65	64	59	67	58	66	67	70	79	67	67	75	74
	IN-Sketch	65.6	66	65	65	62	53	65	56	65	64	68	78	66	64	73	73
	ObjNet	65.6	66	64	65	63	52	67	55	65	61	68	79	65	65	74	74
	IN-Cartoon	69.2	70	68	68	65	55	70	59	69	65	71	85	69	69	79	78
	IN-Drawing	69.6	70	68	69	64	57	70	58	69	71	72	84	66	69	80	78

Table S23: Accuracy of LAION-2B pretrained ViT-B/16 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption. For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		63.0	59	59	59	58	49	64	52	64	61	70	81	70	61	67	71
FT	IN-V2	24.5	18	17	16	15	18	19	18	19	21	35	45	33	30	31	32
	IN-A	8.5	8	7	7	5	5	6	6	6	6	12	17	11	11	11	10
	IN-R	21.4	16	15	14	15	18	18	16	15	20	29	38	31	24	26	25
	IN-Sketch	9.7	9	8	8	3	4	5	6	9	11	15	21	16	9	8	14
	ObjNet	13.5	10	9	8	10	9	13	12	7	9	20	25	22	16	16	17
	IN-Cartoon	32.6	21	20	16	20	21	27	21	29	31	44	67	45	40	46	41
	IN-Drawing	22.5	16	13	14	9	13	15	13	25	39	27	56	24	25	27	22
Linear Probing	IN-V2	62.3	59	58	58	55	49	63	52	65	61	70	80	69	61	66	68
	IN-A	62.7	58	57	58	60	59	65	52	64	61	71	81	70	60	67	68
	IN-R	61.2	57	56	56	56	51	62	49	61	62	68	79	67	58	68	68
	IN-Sketch	60.7	57	56	56	55	49	61	51	62	61	68	78	66	58	67	67
	ObjNet	61.2	58	57	58	57	45	64	50	62	59	69	80	65	59	65	68
	IN-Cartoon	59.7	53	51	50	55	47	61	48	62	58	69	81	67	58	69	66
	IN-Drawing	57.7	54	53	53	49	47	56	43	62	63	65	78	61	58	63	60
Visual Prompt (Bahng et al., 2022)	IN-V2	54.4	52	51	51	47	38	55	46	54	51	60	75	59	55	58	63
	IN-A	50.7	43	42	40	47	33	52	43	50	47	59	74	58	54	56	62
	IN-R	49.4	46	46	44	44	36	48	40	48	49	54	71	51	52	52	60
	IN-Sketch	50.9	48	48	46	44	34	50	43	51	50	58	73	55	52	51	60
	ObjNet	42.4	36	35	34	37	27	42	35	43	40	50	68	47	47	45	51
	IN-Cartoon	48.7	45	44	43	42	29	47	39	50	45	54	74	55	52	53	59
	IN-Drawing	50.2	50	50	49	43	35	47	41	49	52	53	72	52	54	51	57
LoRA (Hu et al., 2021)	IN-V2	62.0	58	57	58	55	49	63	52	64	61	69	80	69	61	66	67
	IN-A	62.2	58	57	57	60	49	65	52	63	60	71	81	68	58	66	67
	IN-R	61.2	56	56	55	56	51	62	49	61	62	69	79	66	58	69	70
	IN-Sketch	60.9	57	56	56	55	50	61	51	62	62	68	79	64	57	68	69
	ObjNet	59.7	57	56	57	57	44	62	49	60	57	68	79	63	56	62	68
	IN-Cartoon	58.4	52	50	49	54	47	60	46	61	57	67	79	65	57	67	65
	IN-Drawing	55.8	52	51	51	47	44	54	41	59	61	63	76	61	57	61	59
EWC (Kirkpatrick et al., 2017)	IN-V2	51.4	41	40	39	48	42	54	40	47	50	67	74	64	52	56	56
	IN-A	39.9	27	26	26	42	30	45	31	29	34	62	61	60	40	43	43
	IN-R	58.7	51	50	49	54	52	59	47	58	60	67	77	66	58	66	66
	IN-Sketch	41.7	39	37	37	28	25	36	27	51	51	64	55	48	37	41	48
	ObjNet	48.0	36	33	34	49	39	54	40	40	44	62	72	62	48	53	55
	IN-Cartoon	52.6	45	43	42	47	37	53	38	55	49	63	76	65	52	60	64
	IN-Drawing	50.4	45	43	44	41	41	47	37	54	60	57	74	57	52	52	54
LwF (Li & Hoiem, 2017)	IN-V2	28.0	21	19	18	18	21	24	21	22	24	40	50	38	34	34	36
	IN-A	13.6	12	11	10	8	9	10	9	10	11	19	26	18	17	17	17
	IN-R	26.9	21	20	18	21	22	24	20	20	26	35	48	37	30	31	31
	IN-Sketch	11.5	10	10	9	4	5	6	6	11	14	18	24	17	11	9	17
	ObjNet	19.2	14	12	12	17	14	19	17	10	12	27	35	29	22	25	24
	IN-Cartoon	42.0	29	27	22	27	30	35	28	41	44	55	78	53	52	57	53
	IN-Drawing	28.8	23	19	21	13	18	20	17	33	47	33	65	28	32	35	30
LP-FT (Kumar et al., 2022)	IN-V2	24.3	18	16	15	13	17	18	17	20	22	35	46	33	31	31	32
	IN-A	11.4	10	9	9	7	7	8	8	8	9	16	22	15	14	14	14
	IN-R	22.5	17	16	14	17	19	20	17	15	22	30	40	32	25	27	26
	IN-Sketch	10.5	10	9	8	4	5	6	6	9	12	17	22	16	10	9	16
	ObjNet	15.4	11	9	9	12	12	15	13	8	10	21	29	23	18	21	20
	IN-Cartoon	32.3	22	21	16	17	21	25	20	30	34	43	69	44	40	45	39
	IN-Drawing	24.4	18	15	16	10	15	16	14	25	41	29	59	26	28	31	24
WiSE-FT (Wortsman et al., 2022b)	IN-V2	43.7	36	34	34	38	33	44	35	36	39	61	67	60	45	47	49
	IN-A	26.7	21	20	20	19	14	25	20	19	21	45	46	45	27	27	29
	IN-R	43.3	35	33	32	39	35	43	33	37	42	57	66	59	44	47	47
	IN-Sketch	25.4	23	22	21	14	12	19	16	24	30	45	45	38	23	20	31
	ObjNet	42.3	32	30	30	41	31	45	36	30	34	59	65	59	44	48	50
	IN-Cartoon	53.0	44	42	41	44	38	49	35	56	52	66	80	65	57	62	64
	IN-Drawing	45.9	40	35	38	31	34	39	30	52	60	56	77	49	47	50	51
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	46.2	40	37	38	37	35	45	35	42	42	62	69	60	48	50	53
	IN-A	35.0	27	25	25	29	22	36	27	27	29	55	57	55	36	35	39
	IN-R	47.8	40	38	37	42	41	48	36	43	48	61	70	61	48	52	53
	IN-Sketch	27.5	25	24	24	15	13	20	17	27	32	47	46	40	25	23	34
	ObjNet	45.0	36	34	34	43	34	47	37	36	38	59	68	59	46	51	54
	IN-Cartoon	54.5	47	45	44	44	39	50	35	59	55	66	81	65	59	62	66
	IN-Drawing	47.0	42	37	41	32	35	39	30	54	62	56	77	48	48	50	53

Table S24: Accuracy of OpenAI CLIP ViT-B/16 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption. For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		62.6	58	58	58	57	46	63	54	63	59	69	80	70	62	71	70
FT	IN-V2	25.7	18	17	16	15	21	21	19	20	23	36	45	33	34	33	36
	IN-A	8.9	7	7	5	5	6	6	6	7	7	13	17	12	11	12	12
	IN-R	22.2	17	16	15	16	18	19	16	16	22	28	38	29	26	28	28
	IN-Sketch	7.2	7	7	6	2	3	4	4	7	9	11	14	10	7	7	12
	ObjNet	10.6	7	7	6	7	7	9	9	5	7	17	20	17	13	14	14
	IN-Cartoon	32.8	20	19	15	20	24	27	22	29	32	41	64	42	43	48	43
	IN-Drawing	23.0	18	14	15	8	13	14	13	24	39	25	56	23	27	30	26
Linear Probing	IN-V2	61.6	57	55	56	57	47	64	54	61	59	70	79	69	60	69	68
	IN-A	62.3	57	56	56	59	47	65	54	62	59	71	80	69	60	70	68
	IN-R	59.9	56	55	54	55	49	61	50	58	59	67	77	65	58	68	69
	IN-Sketch	58.0	54	53	53	53	45	58	48	56	56	66	76	63	56	67	66
	ObjNet	60.1	56	55	55	57	43	63	51	61	57	69	78	64	59	65	66
	IN-Cartoon	56.3	53	51	50	50	39	56	44	56	53	65	79	63	57	67	63
	IN-Drawing	54.7	50	50	50	47	43	53	41	53	59	62	75	58	56	64	58
Visual Prompt (Bahng et al., 2022)	IN-V2	53.6	51	51	50	47	35	53	47	52	49	59	74	58	54	61	62
	IN-A	50.5	44	43	42	44	32	51	45	50	45	59	73	58	53	59	59
	IN-R	47.9	45	44	43	41	30	46	39	47	48	53	71	48	50	55	59
	IN-Sketch	50.8	49	47	46	44	34	49	44	48	49	56	73	53	53	56	60
	ObjNet	41.1	36	34	32	36	25	41	36	41	37	47	66	45	45	46	50
	IN-Cartoon	46.2	43	42	40	39	28	45	40	43	40	50	71	48	50	57	57
	IN-Drawing	46.8	48	48	47	38	35	41	38	44	49	44	69	42	50	54	55
LoRA (Hu et al., 2021)	IN-V2	61.5	57	55	56	57	46	64	54	61	58	70	79	69	60	69	68
	IN-A	62.0	57	56	56	59	46	64	54	62	59	71	80	68	60	70	68
	IN-R	59.5	56	55	54	55	48	60	49	56	58	67	77	64	57	68	69
	IN-Sketch	58.6	54	53	53	53	45	58	48	57	58	68	77	63	57	68	67
	ObjNet	57.9	55	55	54	55	41	61	49	58	54	67	77	61	56	62	64
	IN-Cartoon	54.6	51	49	49	48	37	54	42	54	52	63	77	61	55	64	61
	IN-Drawing	52.5	48	47	48	46	40	51	39	50	56	60	73	57	53	62	56
EWC (Kirkpatrick et al., 2017)	IN-V2	52.9	43	41	42	49	41	55	41	50	50	67	74	64	53	62	62
	IN-A	45.3	33	31	32	44	36	48	35	39	41	61	65	57	46	56	56
	IN-R	58.0	53	52	52	52	49	57	46	56	57	66	75	64	57	66	67
	IN-Sketch	32.8	31	30	30	20	17	25	19	44	44	58	37	38	28	33	38
	ObjNet	46.6	37	35	35	45	36	50	38	40	40	59	69	58	48	55	56
	IN-Cartoon	49.4	43	41	41	43	33	48	36	51	45	59	73	60	50	60	58
	IN-Drawing	49.0	46	42	45	38	36	44	35	51	57	58	73	55	48	56	52
LwF (Li & Hoiem, 2017)	IN-V2	28.8	19	17	14	19	24	25	22	23	27	41	50	37	38	38	40
	IN-A	14.7	12	11	10	9	11	12	11	9	11	21	26	20	20	19	20
	IN-R	27.7	21	20	17	20	23	24	21	22	28	35	47	34	33	35	35
	IN-Sketch	8.8	8	8	7	3	3	4	4	8	12	14	16	12	8	8	14
	ObjNet	18.6	12	11	10	14	14	19	17	9	12	27	34	25	24	24	26
	IN-Cartoon	41.4	30	29	24	25	31	35	29	38	42	50	75	48	54	58	54
	IN-Drawing	30.3	23	19	19	15	20	22	20	32	45	34	66	28	35	41	36
LP-FT (Kumar et al., 2022)	IN-V2	25.8	19	17	16	15	20	21	18	21	23	37	46	33	33	33	36
	IN-A	10.4	8	7	7	7	8	8	8	7	7	15	19	14	13	14	13
	IN-R	23.3	18	17	15	17	19	20	16	18	24	30	40	30	27	29	29
	IN-Sketch	7.3	7	7	6	2	3	4	4	7	10	11	14	10	7	7	12
	ObjNet	12.7	9	8	7	9	9	11	11	7	9	19	24	19	16	17	16
	IN-Cartoon	30.6	20	19	15	17	21	24	20	25	28	39	63	40	41	45	40
	IN-Drawing	27.7	21	18	17	13	18	20	18	25	41	33	59	29	35	38	30
WiSE-FT (Wortsman et al., 2022b)	IN-V2	47.9	39	37	38	40	39	47	36	42	42	61	69	59	53	56	59
	IN-A	39.1	30	28	29	34	30	38	28	31	32	54	59	51	44	48	50
	IN-R	48.5	41	40	39	41	40	46	34	45	48	60	70	59	52	55	56
	IN-Sketch	25.5	24	23	23	13	12	17	13	28	33	44	39	33	24	22	33
	ObjNet	41.7	33	31	30	38	30	42	35	30	33	56	65	55	46	50	52
	IN-Cartoon	52.4	43	42	41	43	40	47	36	54	50	63	78	62	58	65	64
	IN-Drawing	47.4	42	37	41	30	34	39	31	54	59	58	76	49	50	56	55
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	48.7	41	39	40	38	38	46	35	46	43	61	70	59	54	58	60
	IN-A	39.8	33	30	31	33	30	38	27	31	31	55	60	52	45	48	52
	IN-R	50.4	45	43	43	42	42	48	37	48	49	60	71	59	54	57	58
	IN-Sketch	26.3	25	24	24	14	13	17	14	30	35	45	38	33	25	24	34
	ObjNet	44.2	37	35	34	39	32	44	36	35	35	57	67	56	49	53	55
	IN-Cartoon	53.8	47	45	45	42	40	48	37	57	52	64	78	62	59	66	65
	IN-Drawing	48.6	44	39	43	31	36	39	33	56	60	59	77	49	51	57	55

Table S25: Accuracy of ImageNet-1K with AugReg pretrained ViT-B/32 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption. For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		53.5	55	54	54	46	43	49	41	43	53	54	69	52	57	67	64
FT	IN-V2	53.4	53	51	51	48	43	50	39	47	55	56	70	54	57	66	64
	IN-A	47.5	48	46	46	45	38	46	32	40	48	48	62	49	48	58	58
	IN-R	47.0	47	46	45	42	43	44	31	42	50	46	61	44	49	57	57
	IN-Sketch	51.1	53	52	51	45	41	45	39	45	52	51	65	50	53	63	61
	ObjNet	47.8	47	46	46	44	39	45	33	40	49	49	64	44	50	61	59
	IN-Cartoon	50.1	52	50	50	42	36	46	33	42	50	50	72	48	53	68	61
	IN-Drawing	52.8	57	55	55	42	44	48	37	45	58	52	70	47	56	65	63
Linear Probing	IN-V2	53.5	55	53	54	46	43	49	41	43	53	54	69	53	57	66	64
	IN-A	53.2	54	53	53	47	45	50	41	43	53	52	69	48	58	66	64
	IN-R	52.8	55	53	54	47	45	49	42	43	53	50	69	44	58	66	65
	IN-Sketch	51.0	54	52	53	44	41	46	40	41	51	48	67	47	55	64	62
	ObjNet	53.3	55	53	54	48	46	51	42	43	53	51	70	45	58	67	65
	IN-Cartoon	54.2	57	55	55	46	44	49	42	43	54	53	72	49	59	68	67
	IN-Drawing	54.4	57	55	56	47	47	50	42	46	57	52	71	45	59	67	67
Visual Prompt (Bahng et al., 2022)	IN-V2	45.5	46	44	44	39	36	41	37	37	44	43	63	41	53	58	56
	IN-A	29.9	28	26	25	22	19	26	21	23	29	32	48	31	37	40	43
	IN-R	39.4	40	39	38	33	30	35	29	33	40	36	55	38	44	50	51
	IN-Sketch	43.1	46	45	44	35	31	37	32	37	43	39	59	40	47	54	57
	ObjNet	33.1	29	27	26	26	23	28	24	25	33	37	51	37	41	44	44
	IN-Cartoon	42.4	47	46	46	34	30	36	31	32	39	34	63	36	49	57	56
	IN-Drawing	42.3	46	44	44	32	32	35	30	35	47	36	60	36	47	54	53
LoRA (Hu et al., 2021)	IN-V2	53.9	55	54	54	47	44	49	42	43	53	55	70	54	58	67	64
	IN-A	53.4	55	54	54	48	47	51	42	44	54	48	70	54	59	67	66
	IN-R	50.6	54	53	53	44	44	47	40	41	51	40	69	37	57	65	65
	IN-Sketch	51.6	55	53	54	45	43	47	41	41	51	46	69	44	56	66	64
	ObjNet	53.4	55	54	54	48	47	51	42	44	54	49	70	43	59	67	65
	IN-Cartoon	52.6	55	54	54	46	44	48	42	42	52	51	69	46	57	66	64
	IN-Drawing	52.1	56	55	55	43	45	47	40	44	56	43	70	38	58	66	65
EWC (Kirkpatrick et al., 2017)	IN-V2	55.3	55	54	54	49	45	52	43	46	55	57	71	55	60	68	66
	IN-A	49.9	50	48	49	45	41	48	35	42	50	49	65	50	52	61	61
	IN-R	52.5	54	52	52	47	46	50	39	46	54	51	68	47	55	64	64
	IN-Sketch	53.8	55	54	54	47	44	49	40	46	54	54	69	52	57	66	65
	ObjNet	54.0	55	53	53	50	45	50	40	44	54	55	70	53	57	66	65
	IN-Cartoon	52.8	55	53	53	46	42	48	40	43	52	54	70	51	56	66	64
	IN-Drawing	55.1	56	54	54	48	46	51	40	48	59	55	70	54	58	67	65
LwF (Li & Hoiem, 2017)	IN-V2	54.0	54	52	52	48	43	50	40	46	55	56	70	55	57	66	65
	IN-A	52.0	52	50	50	48	42	49	38	45	53	53	67	53	53	63	63
	IN-R	53.0	53	52	51	48	48	50	38	47	55	53	67	51	56	64	63
	IN-Sketch	52.5	54	53	53	46	42	47	40	46	54	53	67	51	55	64	62
	ObjNet	52.1	52	50	50	48	42	49	39	43	52	53	68	51	55	65	63
	IN-Cartoon	54.1	55	53	53	46	42	50	39	45	54	54	74	53	58	70	65
	IN-Drawing	55.2	58	56	56	45	46	51	40	47	59	54	73	50	58	68	65
LP-FT (Kumar et al., 2022)	IN-V2	53.7	53	51	52	48	43	50	40	46	55	56	70	55	57	66	65
	IN-A	52.2	52	51	51	48	42	50	38	45	53	52	68	52	54	64	62
	IN-R	51.4	52	51	50	46	47	49	36	45	54	50	66	47	55	63	61
	IN-Sketch	51.1	53	52	52	44	41	45	40	45	53	49	66	50	53	63	61
	ObjNet	51.3	51	49	49	47	42	49	38	43	53	51	68	48	55	64	63
	IN-Cartoon	52.6	54	52	52	44	39	48	36	44	52	53	74	51	56	70	64
	IN-Drawing	53.6	58	56	57	42	45	48	37	48	60	50	72	44	57	66	65
WiSE-FT (Wortsman et al., 2022b)	IN-V2	54.7	55	53	53	48	44	50	41	46	55	57	70	56	58	67	65
	IN-A	54.3	54	52	53	49	44	51	40	46	55	56	70	56	57	66	65
	IN-R	55.4	55	54	54	50	48	52	41	48	57	57	70	55	58	67	65
	IN-Sketch	54.4	56	55	55	48	44	49	42	47	55	55	69	55	57	66	64
	ObjNet	54.3	54	53	53	48	44	51	41	45	54	56	70	54	58	67	65
	IN-Cartoon	54.2	55	53	54	47	42	50	40	45	53	55	72	55	58	69	65
	IN-Drawing	56.9	58	57	57	48	47	53	42	49	60	58	73	55	60	69	67
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	54.9	55	53	54	49	44	51	41	46	55	57	71	55	59	67	65
	IN-A	53.6	53	52	52	49	43	51	39	45	54	55	69	55	56	65	64
	IN-R	55.3	55	54	54	50	48	52	41	48	57	56	70	55	58	67	65
	IN-Sketch	54.4	56	55	55	48	44	49	42	47	55	55	69	54	57	66	64
	ObjNet	54.3	54	53	53	49	44	51	41	45	54	56	70	54	58	67	65
	IN-Cartoon	54.3	55	53	54	47	42	50	40	45	54	55	73	54	58	69	65
	IN-Drawing	56.9	59	57	57	49	47	53	42	49	60	57	73	55	60	69	67

Table S26: Accuracy of ImageNet-1K with SAM pretrained ViT-B/32 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption. For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		48.8	49	48	47	45	47	46	41	35	45	36	65	35	59	68	65
FT	IN-V2	51.1	48	46	45	50	48	50	42	41	47	45	68	41	61	67	67
	IN-A	43.1	36	35	33	50	42	45	32	36	38	34	59	35	53	59	59
	IN-R	49.2	49	49	48	49	47	46	34	42	48	44	62	44	55	61	62
	IN-Sketch	50.1	49	48	47	48	46	47	42	41	46	46	64	42	57	65	64
	ObjNet	44.7	38	38	35	49	43	46	36	36	40	35	61	34	56	62	61
	IN-Cartoon	47.3	44	43	40	46	41	46	38	37	41	40	67	42	55	66	65
	IN-Drawing	49.3	55	53	53	41	45	43	35	40	53	37	65	37	55	65	63
Linear Probing	IN-V2	48.8	49	47	46	45	47	46	41	35	45	36	65	36	60	68	65
	IN-A	49.0	48	47	46	46	48	47	40	36	46	37	65	35	60	68	66
	IN-R	49.2	49	48	47	47	48	47	41	36	46	36	66	35	60	67	66
	IN-Sketch	48.5	49	47	47	47	47	47	41	37	46	33	65	33	59	66	65
	ObjNet	49.2	49	47	46	48	48	47	41	36	46	36	65	34	60	67	66
	IN-Cartoon	48.2	49	47	47	44	46	46	40	35	45	33	66	33	59	68	65
	IN-Drawing	49.0	52	50	50	43	47	44	39	37	48	36	65	36	59	67	64
Visual Prompt (Bahng et al., 2022)	IN-V2	41.5	43	42	41	35	36	36	35	31	38	25	59	25	54	60	61
	IN-A	19.2	21	20	18	8	13	11	12	13	18	6	37	6	32	33	38
	IN-R	34.3	39	38	37	25	27	26	24	25	31	19	54	19	45	50	54
	IN-Sketch	34.2	36	36	35	27	28	27	26	26	32	19	54	18	45	52	54
	ObjNet	27.4	26	26	24	22	23	22	22	18	24	15	45	14	40	44	47
	IN-Cartoon	41.1	43	42	41	36	37	37	36	29	37	21	61	21	53	62	62
	IN-Drawing	41.1	46	45	45	33	35	33	31	31	40	24	59	24	52	59	60
LoRA (Hu et al., 2021)	IN-V2	48.8	49	47	47	45	47	46	41	35	46	36	65	36	60	68	65
	IN-A	49.4	49	47	46	47	48	47	41	36	46	38	66	35	60	68	66
	IN-R	49.4	49	48	47	47	48	47	41	36	46	36	66	35	60	68	66
	IN-Sketch	48.8	49	48	47	47	48	47	41	36	46	33	65	33	59	67	66
	ObjNet	49.4	49	47	46	48	49	48	41	36	46	36	66	34	61	68	67
	IN-Cartoon	48.1	49	47	46	45	46	46	41	35	45	32	65	32	59	68	65
	IN-Drawing	49.1	51	50	49	44	47	45	40	37	47	35	65	35	59	67	64
EWC (Kirkpatrick et al., 2017)	IN-V2	49.5	49	47	46	46	48	47	41	36	46	38	66	37	60	68	66
	IN-A	47.7	46	44	43	48	48	46	39	35	43	34	63	33	59	66	66
	IN-R	50.1	50	49	48	48	48	47	40	37	46	39	66	38	60	67	67
	IN-Sketch	49.8	50	48	48	48	48	47	41	38	46	39	66	37	60	67	66
	ObjNet	49.9	48	47	45	49	49	48	42	37	46	40	66	37	61	68	67
	IN-Cartoon	48.4	48	47	45	45	46	46	40	35	44	36	66	37	59	68	65
	IN-Drawing	49.9	53	51	51	44	47	45	39	38	49	37	65	38	59	67	65
LwF (Li & Hoiem, 2017)	IN-V2	51.1	48	47	45	49	48	50	43	41	47	44	67	42	61	68	67
	IN-A	46.3	40	39	37	51	45	48	36	38	41	38	62	38	57	62	62
	IN-R	51.6	52	51	50	51	49	49	38	43	50	46	65	44	58	64	64
	IN-Sketch	50.6	49	48	47	48	46	47	43	41	47	46	65	43	58	66	64
	ObjNet	48.1	43	42	40	50	47	49	40	38	43	39	64	37	59	65	64
	IN-Cartoon	48.8	45	44	42	47	43	47	40	38	43	42	68	43	58	68	66
	IN-Drawing	50.2	56	54	54	42	46	44	37	40	53	38	66	38	57	66	64
LP-FT (Kumar et al., 2022)	IN-V2	51.1	48	46	45	50	48	50	42	41	47	44	67	42	61	67	67
	IN-A	44.9	39	37	35	51	44	47	34	38	41	34	62	35	55	61	61
	IN-R	50.4	51	51	50	50	48	48	36	43	49	43	64	41	57	63	63
	IN-Sketch	49.4	49	48	46	48	46	47	41	41	46	43	64	39	56	65	63
	ObjNet	45.9	41	40	38	50	44	47	36	38	42	35	62	35	57	63	62
	IN-Cartoon	47.7	45	44	41	46	42	46	38	37	42	39	68	41	56	67	65
	IN-Drawing	48.4	55	53	53	40	44	42	34	40	53	32	65	33	55	65	63
WiSE-FT (Wortsman et al., 2022b)	IN-V2	50.4	49	47	46	47	48	48	42	39	47	41	67	39	61	68	66
	IN-A	50.4	47	45	44	49	49	50	42	40	47	42	66	40	61	67	67
	IN-R	52.8	54	53	52	49	50	49	42	43	51	45	68	43	61	68	67
	IN-Sketch	50.7	50	49	48	47	47	48	43	40	48	42	66	41	59	68	65
	ObjNet	50.1	47	45	44	49	49	49	42	39	46	42	66	39	61	68	66
	IN-Cartoon	50.0	48	47	45	47	46	48	41	38	46	41	68	41	60	69	66
	IN-Drawing	51.5	55	53	54	44	47	46	40	41	53	40	67	39	59	68	66
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	50.5	49	47	46	47	48	49	42	39	47	41	67	39	61	68	66
	IN-A	50.0	46	45	43	51	49	50	41	40	46	42	65	39	61	67	67
	IN-R	52.8	54	53	52	49	50	49	41	42	50	45	68	43	61	67	67
	IN-Sketch	50.9	50	49	48	47	48	48	43	41	48	43	66	41	60	67	65
	ObjNet	50.2	47	45	44	49	49	50	42	39	46	42	66	39	61	68	66
	IN-Cartoon	49.8	48	46	45	47	46	47	41	38	45	41	68	41	60	69	66
	IN-Drawing	51.5	56	54	54	44	47	46	39	41	53	39	67	39	59	68	66

Table S27: Accuracy of ImageNet-21K with AugReg pretrained ViT-B/32 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		60.5	61	60	60	56	49	61	50	54	56	60	75	59	62	72	70
FT	IN-V2	60.2	59	57	58	58	48	62	50	55	57	62	75	61	60	72	70
	IN-A	56.9	54	52	53	56	46	59	46	51	53	58	71	59	56	69	68
	IN-R	55.3	54	53	53	54	50	55	43	50	55	56	68	55	55	66	65
	IN-Sketch	57.0	58	57	56	54	44	56	48	52	55	58	71	56	56	68	66
	ObjNet	55.3	54	52	52	54	46	58	44	49	52	54	71	54	56	69	67
	IN-Cartoon	56.7	57	55	56	52	41	58	45	52	51	55	76	55	57	72	67
	IN-Drawing	59.5	60	58	59	53	48	57	43	56	61	60	76	59	60	73	69
Linear Probing	IN-V2	60.1	61	59	60	56	49	61	50	54	56	60	75	58	62	72	70
	IN-A	59.4	60	59	59	55	48	60	49	53	55	60	74	58	61	71	69
	IN-R	59.7	60	59	59	55	49	60	50	53	55	60	74	57	62	72	69
	IN-Sketch	58.4	59	58	58	54	47	58	49	53	54	58	73	57	60	70	68
	ObjNet	60.3	61	59	60	57	49	62	51	54	55	61	74	58	62	72	69
	IN-Cartoon	62.6	63	62	62	58	50	64	52	55	57	62	79	61	64	76	74
	IN-Drawing	63.0	63	62	62	57	51	63	52	58	61	64	78	60	65	75	73
Visual Prompt (Bahng et al., 2022)	IN-V2	51.1	51	49	49	48	39	50	44	43	46	48	69	47	57	64	63
	IN-A	39.7	37	35	35	35	27	40	33	33	35	40	58	37	45	53	53
	IN-R	42.6	41	39	39	40	34	41	33	35	42	40	61	39	47	54	54
	IN-Sketch	46.2	46	45	45	42	33	43	37	39	44	45	65	42	50	59	59
	ObjNet	30.9	27	25	24	26	19	30	25	23	27	29	51	28	38	45	46
	IN-Cartoon	45.5	44	43	42	42	31	45	38	39	39	40	67	40	52	62	59
	IN-Drawing	46.7	48	46	45	39	37	41	35	41	51	40	66	39	52	62	59
LoRA (Hu et al., 2021)	IN-V2	60.5	61	60	60	56	49	61	50	54	56	60	75	59	62	72	70
	IN-A	61.2	61	60	60	58	50	63	52	55	56	62	76	59	63	73	70
	IN-R	60.9	61	60	60	57	50	62	51	54	56	61	75	57	63	73	70
	IN-Sketch	60.8	62	60	60	57	49	61	51	54	57	61	76	59	62	73	70
	ObjNet	61.3	61	60	60	58	50	63	52	55	56	62	76	58	63	73	71
	IN-Cartoon	60.2	61	60	60	57	49	61	50	53	55	60	75	57	62	72	70
	IN-Drawing	61.0	61	60	60	56	50	61	50	56	59	62	76	58	63	73	70
EWC (Kirkpatrick et al., 2017)	IN-V2	62.1	62	60	61	60	50	64	53	56	58	63	76	60	63	74	71
	IN-A	60.9	59	57	58	60	50	63	51	55	57	63	75	62	61	73	70
	IN-R	60.0	60	58	58	58	52	60	49	54	58	60	74	59	61	70	69
	IN-Sketch	61.1	62	61	61	57	49	61	51	55	58	62	75	60	62	72	70
	ObjNet	60.1	59	58	58	60	49	62	49	54	57	60	74	59	60	72	71
	IN-Cartoon	59.0	59	58	58	55	46	60	48	53	54	60	75	58	60	72	69
	IN-Drawing	61.2	62	61	61	55	49	61	47	58	62	62	76	60	62	73	70
LwF (Li & Hoiem, 2017)	IN-V2	61.1	61	59	60	58	49	62	51	55	57	62	75	60	62	73	71
	IN-A	60.6	60	58	58	58	49	62	51	55	56	62	75	60	61	73	70
	IN-R	60.9	61	60	60	57	53	61	50	55	59	62	74	59	62	72	69
	IN-Sketch	59.1	60	59	59	56	46	59	49	54	56	60	73	57	59	70	68
	ObjNet	59.1	59	57	57	58	48	61	49	53	54	59	74	57	60	72	70
	IN-Cartoon	63.0	63	61	61	59	50	64	53	56	58	63	80	62	65	77	74
	IN-Drawing	63.1	64	61	62	59	51	63	50	58	62	63	79	61	64	77	73
LP-FT (Kumar et al., 2022)	IN-V2	60.7	60	59	59	58	49	62	51	55	57	62	75	60	61	72	70
	IN-A	59.5	58	57	57	57	48	61	50	54	55	62	73	61	59	71	68
	IN-R	59.0	58	57	57	56	52	59	48	53	58	60	72	58	60	70	67
	IN-Sketch	57.5	58	57	57	54	45	57	48	53	54	59	71	56	58	68	66
	ObjNet	58.9	59	57	57	57	47	61	49	53	55	59	73	57	59	71	69
	IN-Cartoon	61.3	61	59	60	57	46	63	50	56	56	60	80	61	62	76	72
	IN-Drawing	62.6	63	61	62	57	51	62	48	59	63	63	78	61	63	76	72
WiSE-FT (Wortsman et al., 2022b)	IN-V2	61.7	62	60	61	58	50	63	52	56	58	63	76	61	63	73	71
	IN-A	61.9	61	59	60	59	50	64	52	56	58	64	76	62	63	74	71
	IN-R	62.4	62	61	61	59	54	63	52	56	60	64	76	61	63	73	71
	IN-Sketch	61.0	62	61	61	57	48	61	51	56	58	62	75	60	61	72	70
	ObjNet	61.2	61	60	60	58	50	63	51	55	57	62	75	60	62	73	71
	IN-Cartoon	60.9	62	60	61	56	47	62	50	56	56	61	78	60	62	74	71
	IN-Drawing	63.6	65	63	64	59	51	64	51	59	62	64	78	62	64	75	73
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	61.7	62	60	61	59	50	63	52	56	58	63	76	61	63	73	71
	IN-A	61.6	60	59	59	59	50	64	52	56	57	64	75	62	62	74	71
	IN-R	62.2	62	61	61	59	54	63	51	56	60	63	76	61	63	73	71
	IN-Sketch	61.0	62	61	61	57	48	61	51	56	58	62	75	60	61	72	70
	ObjNet	60.9	61	59	59	58	49	63	51	55	56	61	75	59	62	73	71
	IN-Cartoon	61.1	62	60	60	57	47	62	50	56	56	61	78	60	62	74	72
	IN-Drawing	63.3	65	63	64	58	51	64	51	59	62	63	78	62	64	75	73

Table S28: Accuracy of LAION-2B pretrained ViT-B/32 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption. For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		57.5	56	55	55	53	42	57	46	52	51	61	75	64	59	68	69
FT	IN-V2	21.7	20	19	18	11	15	15	15	14	20	23	36	25	28	31	36
	IN-A	7.0	8	7	7	4	5	4	5	4	5	7	12	8	8	10	11
	IN-R	20.9	20	19	18	14	17	17	15	12	20	22	33	25	23	28	31
	IN-Sketch	9.7	10	10	9	4	5	5	6	7	11	11	17	13	9	11	17
	ObjNet	12.2	12	11	11	7	9	10	10	5	9	13	20	15	14	18	20
	IN-Cartoon	27.3	25	24	21	10	16	17	15	21	25	27	51	31	35	46	47
	IN-Drawing	21.6	20	17	19	9	13	14	13	15	32	20	46	22	24	29	30
Linear Probing	IN-V2	58.1	57	56	56	53	42	58	46	53	52	63	76	65	59	68	68
	IN-A	58.2	56	54	55	52	44	58	47	54	53	64	76	66	59	68	68
	IN-R	56.1	54	53	53	50	44	55	43	51	54	61	73	64	57	65	66
	IN-Sketch	55.6	55	54	53	50	42	54	43	51	52	60	73	61	55	65	67
	ObjNet	56.6	55	53	53	51	42	57	44	51	51	62	75	63	58	67	67
	IN-Cartoon	51.2	50	47	48	43	36	49	38	46	45	57	72	59	53	62	61
	IN-Drawing	49.8	53	52	52	37	38	45	34	45	52	54	67	53	51	57	57
Visual Prompt (Bahng et al., 2022)	IN-V2	47.9	49	48	47	39	32	45	38	41	42	49	68	50	51	58	61
	IN-A	36.9	34	33	31	28	20	33	26	31	31	42	62	42	42	46	51
	IN-R	43.9	42	42	40	39	29	41	34	38	41	46	65	44	48	52	58
	IN-Sketch	45.1	44	43	42	39	28	42	36	39	41	48	66	47	48	54	59
	ObjNet	27.7	27	26	25	21	14	23	19	21	22	31	50	30	32	37	40
	IN-Cartoon	44.9	44	43	42	39	28	41	34	39	38	44	68	46	49	57	60
	IN-Drawing	47.2	50	50	48	36	33	43	35	42	47	44	67	43	52	57	61
LoRA (Hu et al., 2021)	IN-V2	58.1	57	56	56	53	42	58	46	53	52	63	76	65	59	68	68
	IN-A	57.9	56	54	55	51	44	58	46	54	53	64	76	65	58	68	67
	IN-R	54.8	53	52	52	48	43	53	41	49	53	60	73	62	55	64	65
	IN-Sketch	53.4	53	53	52	45	40	51	41	49	50	58	70	58	52	63	64
	ObjNet	54.9	53	52	52	47	41	54	42	48	49	61	74	61	56	67	66
	IN-Cartoon	50.3	49	47	47	43	35	49	37	46	45	56	72	58	52	61	60
	IN-Drawing	49.8	52	51	51	38	38	46	34	45	52	54	67	53	51	58	56
EWC (Kirkpatrick et al., 2017)	IN-V2	48.4	47	45	46	40	34	44	35	36	45	58	69	56	50	58	62
	IN-A	30.7	28	26	27	24	19	27	21	19	23	41	46	44	31	38	44
	IN-R	53.0	51	50	50	46	44	50	38	48	52	58	70	58	53	61	65
	IN-Sketch	39.7	40	39	39	27	23	32	26	43	46	56	51	41	37	44	51
	ObjNet	43.0	38	36	37	38	33	42	32	31	39	50	65	51	45	53	56
	IN-Cartoon	48.1	46	44	44	41	32	45	33	45	43	53	71	54	50	61	59
	IN-Drawing	43.6	47	42	46	26	30	35	27	44	52	48	68	46	45	48	50
LwF (Li & Hoiem, 2017)	IN-V2	26.1	23	21	20	14	19	20	18	17	23	30	43	30	33	37	43
	IN-A	14.5	15	14	14	8	10	10	9	8	10	15	25	16	17	21	24
	IN-R	28.9	26	24	23	22	24	25	22	18	28	30	45	32	33	39	42
	IN-Sketch	13.7	15	14	13	5	7	8	8	10	16	15	24	16	14	16	24
	ObjNet	20.7	19	17	17	13	16	18	16	9	16	22	33	24	25	31	33
	IN-Cartoon	36.6	32	31	26	17	25	26	21	30	36	35	64	39	48	57	62
	IN-Drawing	28.2	25	22	22	14	20	20	17	22	38	29	55	27	32	39	40
LP-FT (Kumar et al., 2022)	IN-V2	22.0	21	19	19	12	16	16	15	13	18	23	36	24	28	32	36
	IN-A	9.0	10	10	10	5	6	6	6	5	6	9	15	10	11	13	14
	IN-R	22.2	21	20	19	15	18	18	16	13	21	22	35	26	25	30	33
	IN-Sketch	11.5	12	12	11	5	6	6	7	8	13	12	21	15	12	13	20
	ObjNet	14.4	14	13	12	9	12	12	11	7	11	15	23	17	17	21	23
	IN-Cartoon	28.6	26	25	21	12	18	19	16	22	26	26	53	32	37	47	50
	IN-Drawing	22.7	21	18	19	9	13	14	13	17	34	22	47	25	26	30	30
WiSE-FT (Wortsman et al., 2022b)	IN-V2	43.5	40	37	38	33	33	37	31	33	41	52	63	52	49	55	59
	IN-A	37.0	35	33	33	29	29	32	26	24	31	48	53	47	39	45	51
	IN-R	46.5	44	42	42	39	40	41	33	36	46	53	65	53	50	55	60
	IN-Sketch	33.3	35	33	33	20	20	23	19	28	38	45	49	40	34	35	47
	ObjNet	41.6	39	37	37	33	32	38	31	27	37	49	60	49	45	53	57
	IN-Cartoon	48.8	48	46	45	32	34	40	30	45	47	54	73	52	56	64	65
	IN-Drawing	44.7	45	40	43	28	33	35	27	42	54	49	71	47	48	54	56
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	46.5	45	43	43	35	36	39	32	38	44	54	65	53	52	57	62
	IN-A	40.5	39	36	37	33	32	35	28	28	34	50	58	49	43	50	55
	IN-R	49.8	49	48	48	42	43	45	35	41	49	54	67	54	53	58	62
	IN-Sketch	34.7	38	36	36	21	21	24	19	32	41	45	50	39	35	37	48
	ObjNet	45.1	44	42	42	36	35	42	33	32	40	51	64	50	49	56	60
	IN-Cartoon	50.9	52	50	49	34	35	41	30	50	50	56	75	53	58	64	67
	IN-Drawing	46.2	48	43	47	28	34	36	27	46	56	51	72	46	50	53	57

Table S29: Accuracy of OpenAI CLIP ViT-B/32 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption. For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		57.9	58	56	56	53	41	57	46	52	53	61	76	64	60	68	68
FT	IN-V2	25.9	23	22	21	16	20	20	19	17	23	29	39	30	33	37	39
	IN-A	10.1	10	9	10	7	8	8	7	6	7	10	15	12	13	15	15
	IN-R	23.1	21	20	20	17	20	19	17	15	23	23	37	26	26	30	32
	IN-Sketch	11.1	12	11	11	4	5	6	6	8	12	12	21	14	11	14	20
	ObjNet	13.4	12	11	11	9	11	11	11	6	10	15	20	16	16	20	20
	IN-Cartoon	31.4	27	26	23	13	20	22	18	25	30	29	57	34	41	52	52
	IN-Drawing	24.6	23	20	21	11	15	16	15	20	37	24	51	24	28	33	32
Linear Probing	IN-V2	59.0	58	57	57	54	43	60	48	53	54	64	76	65	60	68	68
	IN-A	58.5	57	55	55	52	43	61	48	53	53	64	76	66	60	68	67
	IN-R	55.5	56	55	55	48	44	55	43	49	54	59	72	59	56	64	65
	IN-Sketch	55.4	55	53	53	51	42	55	43	48	52	60	72	61	55	66	66
	ObjNet	56.7	56	54	54	52	41	59	45	50	50	62	75	63	59	65	66
	IN-Cartoon	53.1	52	49	50	46	38	53	39	46	46	58	74	60	55	66	64
	IN-Drawing	48.6	49	47	47	38	39	45	34	43	52	52	67	52	52	58	53
Visual Prompt (Bahng et al., 2022)	IN-V2	50.1	52	50	50	42	34	49	40	43	44	50	70	51	54	60	61
	IN-A	39.6	35	34	32	33	25	38	32	33	33	44	63	44	47	50	51
	IN-R	44.2	44	43	42	38	30	41	34	37	42	45	65	43	48	53	56
	IN-Sketch	47.2	47	46	45	42	31	45	39	39	42	49	67	49	51	57	59
	ObjNet	29.5	25	24	23	26	18	27	22	23	23	31	53	31	37	39	41
	IN-Cartoon	45.4	46	44	44	39	28	43	34	38	39	43	68	45	51	59	60
	IN-Drawing	46.1	50	50	48	37	33	41	34	40	47	40	66	40	51	56	58
LoRA (Hu et al., 2021)	IN-V2	58.9	59	57	57	54	43	60	48	52	54	63	76	65	60	68	68
	IN-A	58.1	57	55	55	52	43	61	47	52	53	64	75	65	58	67	66
	IN-R	55.1	56	54	55	48	44	55	42	48	53	58	72	57	55	64	65
	IN-Sketch	53.5	53	52	51	46	41	52	40	49	51	59	70	57	53	64	64
	ObjNet	53.4	53	51	51	46	38	55	41	46	46	60	72	59	55	63	65
	IN-Cartoon	52.0	51	48	49	45	37	51	38	45	46	57	73	59	54	64	63
	IN-Drawing	48.4	48	47	47	40	39	46	34	43	51	51	66	52	51	58	54
EWC (Kirkpatrick et al., 2017)	IN-V2	53.9	53	52	52	47	41	52	37	45	50	61	72	60	55	65	65
	IN-A	40.9	39	37	38	36	31	40	28	30	34	49	57	50	41	51	52
	IN-R	52.5	51	50	50	45	45	50	38	48	52	57	69	57	53	60	63
	IN-Sketch	38.8	41	40	40	25	22	31	23	44	45	55	47	41	36	44	49
	ObjNet	44.7	42	40	40	40	34	46	32	35	39	50	64	51	45	55	57
	IN-Cartoon	48.1	47	45	45	39	30	46	33	44	42	53	71	55	51	62	58
	IN-Drawing	48.7	51	48	49	34	36	43	33	47	55	52	70	52	51	56	53
LwF (Li & Hoiem, 2017)	IN-V2	30.2	28	26	26	19	25	23	21	19	26	32	46	33	38	44	46
	IN-A	17.6	16	15	15	11	14	13	13	10	14	19	28	21	22	26	27
	IN-R	30.1	26	25	24	22	26	26	22	21	30	30	46	33	35	41	42
	IN-Sketch	15.3	17	16	16	6	8	9	8	11	17	17	27	18	16	19	27
	ObjNet	23.1	22	20	20	16	20	21	18	11	17	24	36	26	28	34	34
	IN-Cartoon	39.6	33	32	27	19	29	30	24	34	41	38	67	41	52	63	63
	IN-Drawing	29.6	26	23	24	15	21	21	20	24	42	28	58	28	34	41	39
LP-FT (Kumar et al., 2022)	IN-V2	26.0	23	22	22	14	20	21	18	17	23	29	41	30	33	38	40
	IN-A	11.6	11	11	11	8	10	9	8	6	8	13	18	14	15	17	17
	IN-R	25.7	24	23	22	19	22	22	18	17	26	27	40	28	29	34	36
	IN-Sketch	12.3	14	13	13	5	6	7	6	8	14	13	23	15	12	15	21
	ObjNet	16.3	15	13	13	11	15	15	13	8	14	17	25	19	19	25	23
	IN-Cartoon	31.3	27	25	22	14	21	22	18	24	30	28	58	33	42	53	51
	IN-Drawing	25.7	24	21	22	11	16	17	15	20	37	26	53	27	30	36	33
WiSE-FT (Wortsman et al., 2022b)	IN-V2	49.1	48	46	46	39	41	44	35	39	45	55	66	54	54	62	63
	IN-A	43.3	43	41	42	35	36	38	30	30	36	50	60	50	47	55	57
	IN-R	49.5	48	47	47	40	43	44	34	42	50	52	67	54	54	59	61
	IN-Sketch	36.3	39	38	38	21	22	25	20	32	40	44	54	40	38	42	51
	ObjNet	46.7	45	43	44	38	39	44	34	35	42	51	64	51	51	59	60
	IN-Cartoon	50.8	48	46	45	35	38	43	33	47	49	55	74	55	60	68	67
	IN-Drawing	46.9	48	43	47	28	34	35	29	47	57	51	73	48	50	56	56
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	50.2	51	49	50	39	42	44	35	42	46	55	67	54	56	62	63
	IN-A	44.3	45	42	44	36	36	39	30	32	36	50	61	51	49	56	58
	IN-R	51.8	51	50	50	43	45	46	36	46	52	54	69	55	56	61	63
	IN-Sketch	37.2	41	40	40	22	22	26	20	34	42	46	54	39	39	42	52
	ObjNet	48.7	48	46	47	40	41	46	35	38	43	52	66	52	53	61	62
	IN-Cartoon	51.7	48	46	45	35	39	44	33	50	51	56	75	56	61	69	67
	IN-Drawing	47.9	50	45	49	29	35	36	30	49	59	52	74	49	51	57	56

Table S30: Accuracy of ImageNet-1K with AugReg pretrained ViT-S/16 with with different fine-tuning methods and downstream datasets on each ImageNet-C corruption. For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		53.2	54	52	52	46	37	50	42	48	52	58	73	53	55	63	63
FT	IN-V2	51.2	49	47	46	46	36	50	38	50	52	58	70	52	52	60	62
	IN-A	44.1	43	40	40	42	31	44	31	42	43	47	62	44	44	51	57
	IN-R	42.7	40	39	37	39	37	41	31	39	44	47	58	44	44	50	52
	IN-Sketch	45.5	44	42	42	38	31	42	35	42	46	50	64	49	46	53	55
	ObjNet	41.9	40	38	38	40	30	43	30	38	38	45	61	39	43	51	54
	IN-Cartoon	44.4	44	42	41	36	28	41	28	41	40	46	71	46	47	58	54
	IN-Drawing	46.0	45	43	43	34	36	43	33	44	51	49	69	44	48	57	53
Linear Probing	IN-V2	53.1	54	52	52	46	37	50	42	49	52	58	72	53	55	63	63
	IN-A	53.0	53	51	51	46	37	51	42	49	51	59	72	53	55	62	62
	IN-R	53.0	53	51	51	47	38	52	42	49	52	57	72	52	55	62	63
	IN-Sketch	50.9	51	50	49	45	35	48	40	48	50	55	70	50	53	59	61
	ObjNet	53.4	53	52	51	47	38	52	43	49	52	59	72	51	56	62	63
	IN-Cartoon	52.6	53	51	51	45	37	49	41	47	50	56	74	52	55	63	64
	IN-Drawing	54.3	55	53	52	46	39	51	42	53	57	58	74	51	58	63	65
Visual Prompt (Bahng et al., 2022)	IN-V2	43.9	42	41	40	36	28	40	37	39	41	45	66	46	50	53	57
	IN-A	32.1	26	25	22	27	18	30	25	29	29	37	55	35	39	38	45
	IN-R	35.0	34	34	32	26	23	30	26	31	37	34	57	33	41	41	46
	IN-Sketch	39.2	38	37	36	31	24	34	31	35	39	42	61	40	43	45	50
	ObjNet	26.8	21	20	18	19	15	25	22	23	23	29	51	27	36	33	42
	IN-Cartoon	36.0	33	32	31	28	20	32	29	30	31	35	63	34	44	48	50
	IN-Drawing	40.7	41	39	39	30	28	35	31	36	45	37	62	38	46	50	51
LoRA (Hu et al., 2021)	IN-V2	53.5	54	52	52	46	37	50	42	49	52	58	73	53	55	63	64
	IN-A	53.5	54	52	52	47	38	52	43	49	52	57	73	51	56	62	63
	IN-R	52.8	54	52	51	46	38	52	42	49	52	54	73	47	56	62	64
	IN-Sketch	53.5	54	52	52	48	37	50	43	49	53	58	73	52	55	62	64
	ObjNet	53.0	54	52	52	47	38	52	43	49	52	57	73	47	56	62	64
	IN-Cartoon	51.3	52	50	50	45	37	48	40	46	50	53	72	49	53	62	62
	IN-Drawing	54.6	55	54	53	46	38	51	41	52	58	60	73	54	56	63	64
EWC (Kirkpatrick et al., 2017)	IN-V2	55.4	55	53	52	50	38	54	43	53	55	62	74	57	57	64	65
	IN-A	51.4	49	46	46	49	34	52	39	49	52	57	71	56	50	58	63
	IN-R	51.8	50	48	48	46	42	51	37	49	55	57	69	54	52	56	62
	IN-Sketch	54.0	53	52	52	47	39	51	43	51	55	59	72	56	55	61	63
	ObjNet	51.7	51	49	49	48	35	52	39	49	50	57	70	52	52	59	63
	IN-Cartoon	49.1	49	47	47	42	32	46	35	44	46	54	71	51	51	61	60
	IN-Drawing	53.2	54	52	52	44	37	50	39	51	58	58	71	55	54	62	62
LwF (Li & Hoiem, 2017)	IN-V2	53.5	52	51	50	47	38	51	41	51	53	60	72	53	55	63	64
	IN-A	51.7	50	48	48	47	37	51	39	49	51	57	71	54	53	60	62
	IN-R	51.8	50	48	47	45	42	50	40	48	53	56	69	52	54	61	61
	IN-Sketch	48.6	48	46	47	41	33	45	38	46	49	52	68	51	50	58	59
	ObjNet	50.4	50	48	48	46	36	50	39	46	48	55	70	48	51	60	61
	IN-Cartoon	52.6	53	51	50	44	36	50	38	49	49	56	77	52	56	64	63
	IN-Drawing	50.8	49	47	47	41	38	50	38	47	54	55	74	48	52	63	60
LP-FT (Kumar et al., 2022)	IN-V2	52.3	51	49	49	47	37	51	39	51	53	59	71	52	53	61	63
	IN-A	48.6	47	44	44	46	34	49	36	46	49	52	68	51	48	57	59
	IN-R	46.6	44	42	41	41	39	45	33	43	48	51	63	48	48	55	56
	IN-Sketch	47.9	47	46	46	41	32	45	37	46	48	52	66	51	48	56	57
	ObjNet	46.6	45	42	42	44	33	47	34	43	44	51	66	44	48	56	58
	IN-Cartoon	47.2	47	45	44	38	31	44	32	44	44	50	73	48	50	61	57
	IN-Drawing	48.2	47	44	45	37	37	45	34	46	53	52	71	48	50	60	55
WiSE-FT (Wortsman et al., 2022b)	IN-V2	55.0	55	53	53	48	39	52	42	53	55	61	74	56	56	64	65
	IN-A	54.2	53	52	52	49	38	53	41	52	54	60	73	57	55	62	64
	IN-R	55.3	54	52	52	49	43	52	42	53	57	61	72	57	56	63	64
	IN-Sketch	53.6	54	53	53	45	37	49	42	52	55	58	72	56	54	62	63
	ObjNet	53.5	54	52	52	48	37	52	41	50	51	59	72	53	55	63	64
	IN-Cartoon	52.9	54	52	51	45	35	49	37	50	50	57	76	55	56	64	63
	IN-Drawing	55.4	56	54	54	46	41	53	41	53	58	60	75	54	56	65	64
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	55.1	54	53	52	49	39	53	42	53	55	61	74	56	56	64	65
	IN-A	53.9	53	51	51	49	37	53	41	52	54	59	72	57	54	62	64
	IN-R	55.2	53	52	52	49	44	53	42	52	57	61	72	57	56	63	64
	IN-Sketch	53.6	54	52	52	46	37	49	42	52	54	58	72	56	54	62	63
	ObjNet	53.5	54	51	51	49	37	53	41	50	51	59	72	53	54	62	64
	IN-Cartoon	52.7	53	51	51	45	35	49	38	49	50	57	75	54	55	64	63
	IN-Drawing	55.1	55	54	54	46	40	53	41	53	58	59	75	54	56	65	63

Table S31: Accuracy of ImageNet-21K with AugReg pretrained ViT-S/16 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		58.0	58	56	56	54	43	59	48	55	55	60	75	56	59	69	68
FT	IN-V2	56.8	54	52	53	54	44	58	46	54	55	62	74	58	56	65	67
	IN-A	52.7	49	47	48	51	39	55	43	51	50	57	69	54	51	63	64
	IN-R	50.6	48	46	46	49	45	50	39	46	51	53	66	50	51	58	60
	IN-Sketch	50.7	48	47	47	48	36	51	41	48	50	54	67	52	50	59	60
	ObjNet	48.5	45	43	43	47	34	52	37	46	45	52	67	49	49	59	61
	IN-Cartoon	52.2	51	48	49	50	34	56	40	50	45	53	74	53	53	64	63
	IN-Drawing	52.8	46	43	44	50	41	55	42	51	57	57	73	53	54	64	61
Linear Probing	IN-V2	57.7	57	55	56	53	42	59	48	55	54	60	75	56	59	69	67
	IN-A	57.2	56	54	55	53	42	59	47	55	54	60	74	57	58	68	66
	IN-R	56.8	56	54	55	52	42	58	47	54	54	59	74	55	58	68	66
	IN-Sketch	55.1	55	53	53	50	40	56	45	53	53	57	72	53	56	65	64
	ObjNet	57.9	57	55	55	55	43	60	48	55	54	61	74	58	59	68	67
	IN-Cartoon	59.3	58	56	57	54	42	61	49	56	55	63	79	59	60	71	70
	IN-Drawing	60.0	59	57	58	55	44	61	48	58	60	64	77	58	61	71	69
Visual Prompt (Bahng et al., 2017)	IN-V2	47.9	44	42	41	45	34	48	42	43	44	50	68	47	53	59	60
	IN-A	39.6	34	32	30	38	26	41	34	36	35	43	59	40	44	49	54
	IN-R	38.1	33	32	30	36	29	36	31	33	38	39	58	35	44	47	49
	IN-Sketch	42.1	39	38	37	38	28	39	35	40	43	41	63	38	47	51	55
	ObjNet	29.1	23	22	20	26	17	29	25	25	25	30	50	29	35	37	43
	IN-Cartoon	39.7	35	33	32	37	24	40	34	35	32	38	64	37	47	56	53
	IN-Drawing	41.0	40	39	38	35	29	37	32	36	44	40	62	31	46	54	52
LoRA (Hu et al., 2021)	IN-V2	58.2	58	56	56	54	43	60	48	56	55	61	76	56	59	69	68
	IN-A	58.9	58	56	56	56	44	61	49	56	55	62	76	59	60	69	68
	IN-R	58.2	58	56	56	54	43	60	48	56	55	60	75	56	59	69	68
	IN-Sketch	58.3	58	56	57	54	42	60	48	56	55	61	75	57	59	69	68
	ObjNet	58.8	58	56	56	56	43	61	49	56	55	62	76	59	60	69	68
	IN-Cartoon	57.7	57	55	56	53	42	59	47	55	54	60	75	57	59	69	68
	IN-Drawing	59.0	58	57	57	55	43	60	48	57	59	62	76	58	60	69	68
EWC (Kirkpatrick et al., 2017)	IN-V2	59.7	58	56	57	56	44	61	49	58	57	64	77	59	60	70	69
	IN-A	58.0	56	54	54	56	42	60	48	56	55	62	74	59	56	68	68
	IN-R	56.4	54	51	51	56	47	57	45	53	57	59	73	56	57	63	66
	IN-Sketch	58.0	57	55	55	55	42	59	49	56	57	62	74	58	58	67	67
	ObjNet	56.7	56	53	54	55	41	59	47	54	52	60	73	57	55	67	68
	IN-Cartoon	55.2	53	50	52	52	38	58	44	53	50	59	74	57	56	67	65
	IN-Drawing	58.1	56	55	55	53	43	59	46	56	60	63	75	58	58	67	66
LwF (Li & Hoiem, 2017)	IN-V2	58.3	57	55	56	54	44	60	47	57	55	62	75	58	58	68	68
	IN-A	57.8	56	54	55	54	44	59	47	56	55	61	75	57	58	68	67
	IN-R	57.2	56	54	54	53	47	58	46	54	56	60	73	55	58	66	66
	IN-Sketch	54.5	53	51	52	51	38	55	44	53	52	58	71	55	54	64	64
	ObjNet	55.1	53	50	50	53	40	58	44	53	51	58	73	55	56	66	66
	IN-Cartoon	60.0	59	57	57	56	44	62	48	57	55	62	81	60	62	72	70
	IN-Drawing	57.8	55	52	53	54	44	60	46	55	59	60	78	55	58	71	68
LP-FT (Kumar et al., 2022)	IN-V2	57.6	56	53	54	54	44	59	47	56	55	62	74	58	57	67	67
	IN-A	56.0	53	51	52	53	42	58	46	54	54	60	72	58	55	66	65
	IN-R	53.5	51	49	49	51	46	54	42	50	54	56	69	53	55	62	62
	IN-Sketch	52.3	51	49	50	48	37	53	42	51	51	55	69	53	52	62	62
	ObjNet	53.4	52	50	49	51	37	56	43	51	50	57	71	53	53	64	64
	IN-Cartoon	56.0	55	52	53	52	38	59	44	54	50	57	77	57	57	68	66
	IN-Drawing	55.5	50	48	49	52	43	58	43	54	58	60	75	55	56	68	63
WiSE-FT (Wortsman et al., 2022b)	IN-V2	59.3	58	56	57	55	44	61	49	58	57	63	76	59	60	69	69
	IN-A	58.9	57	55	56	55	44	61	49	57	56	63	75	59	59	69	68
	IN-R	59.6	58	56	56	56	49	60	49	57	59	63	75	59	60	68	68
	IN-Sketch	58.0	57	55	56	54	42	58	47	57	57	61	74	59	58	67	67
	ObjNet	57.6	56	54	55	54	42	60	47	56	54	61	75	57	58	68	67
	IN-Cartoon	58.4	58	55	56	55	40	61	46	57	53	61	78	58	60	70	68
	IN-Drawing	60.4	59	57	58	56	45	62	49	59	61	64	78	59	61	71	69
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	59.3	58	56	57	55	45	61	49	58	57	63	76	59	60	69	69
	IN-A	58.9	57	55	56	56	44	61	49	57	56	63	75	59	59	69	68
	IN-R	59.4	58	56	56	56	49	60	49	57	59	63	75	59	60	68	68
	IN-Sketch	57.9	57	55	56	54	41	58	48	56	56	61	74	59	58	67	67
	ObjNet	57.6	56	54	54	55	42	60	47	56	54	61	75	57	58	68	67
	IN-Cartoon	58.6	58	55	56	55	41	61	47	56	53	61	78	59	60	70	69
	IN-Drawing	60.2	59	57	58	56	44	62	49	58	61	63	78	59	60	71	69

Table S32: Accuracy of ImageNet-21K with AugReg pretrained ViT-S/32 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption. For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		52.0	54	53	53	47	40	51	39	43	47	50	69	48	56	65	64
FT	IN-V2	50.1	49	47	47	47	40	50	40	43	47	51	66	47	52	62	62
	IN-A	44.0	43	41	41	44	37	46	34	34	39	43	59	42	44	56	56
	IN-R	43.4	42	41	40	42	40	42	31	36	43	44	57	42	45	53	54
	IN-Sketch	45.5	46	45	45	43	34	45	35	39	43	45	60	44	46	56	56
	ObjNet	41.7	40	39	38	41	33	43	31	32	37	39	58	41	44	55	55
	IN-Cartoon	45.2	46	44	43	41	30	45	31	38	38	41	68	44	48	63	57
	IN-Drawing	46.9	48	45	45	42	37	45	32	41	50	44	65	43	49	60	55
Linear Probing	IN-V2	51.5	54	52	52	47	40	51	39	42	47	49	68	48	55	65	63
	IN-A	50.4	52	51	51	46	39	50	38	41	46	48	66	48	54	63	61
	IN-R	51.5	52	51	51	48	41	52	40	42	47	51	68	49	55	64	63
	IN-Sketch	49.6	50	49	49	46	39	50	38	41	45	49	65	48	53	61	60
	ObjNet	52.1	53	52	52	49	41	53	41	42	47	51	68	50	55	64	63
	IN-Cartoon	53.5	55	54	54	49	41	53	41	43	47	52	73	51	57	68	66
	IN-Drawing	53.6	55	54	54	48	42	52	40	45	52	52	71	49	58	66	65
Visual Prompt (Bahng et al., 2022)	IN-V2	42.6	43	42	41	38	32	41	35	33	37	39	60	39	49	54	55
	IN-A	23.2	18	17	16	21	17	23	18	16	20	25	38	22	30	32	34
	IN-R	32.3	31	31	29	30	25	29	25	25	32	25	51	23	38	42	46
	IN-Sketch	35.1	36	35	34	31	23	30	25	28	34	30	54	30	40	46	49
	ObjNet	24.5	21	20	19	22	18	23	20	17	21	19	42	18	33	36	38
	IN-Cartoon	36.0	37	35	34	32	23	33	27	27	30	28	58	27	44	53	52
	IN-Drawing	36.6	40	39	39	29	28	31	26	28	39	27	55	27	42	49	48
LoRA (Hu et al., 2021)	IN-V2	52.1	54	53	53	47	41	51	39	43	47	50	69	48	56	66	64
	IN-A	53.1	54	53	53	50	42	54	41	43	48	52	70	52	56	66	64
	IN-R	52.8	54	52	53	49	42	54	41	42	48	52	70	50	56	66	64
	IN-Sketch	52.9	54	52	52	50	42	53	41	44	48	52	69	51	56	65	64
	ObjNet	53.3	54	53	53	50	42	54	42	43	48	53	70	51	57	66	64
	IN-Cartoon	51.4	53	52	52	47	41	51	39	42	47	48	69	46	55	65	64
	IN-Drawing	52.3	54	53	52	47	41	51	39	45	51	51	69	48	56	64	63
EWC (Kirkpatrick et al., 2017)	IN-V2	53.6	54	53	53	50	42	54	42	45	49	53	70	50	57	66	65
	IN-A	50.2	49	48	47	50	42	53	40	41	45	49	66	49	51	61	62
	IN-R	50.7	50	49	48	49	45	51	38	43	49	50	66	49	53	58	61
	IN-Sketch	52.6	53	52	52	49	41	52	41	45	50	53	68	51	55	64	63
	ObjNet	50.7	51	50	50	49	41	53	39	42	45	48	66	48	53	63	63
	IN-Cartoon	48.8	50	48	48	44	35	49	35	40	43	47	68	47	52	64	61
	IN-Drawing	52.3	53	52	52	46	41	52	37	46	54	52	68	50	55	64	62
LwF (Li & Hoiem, 2017)	IN-V2	51.8	53	51	51	47	41	51	40	44	48	51	68	48	55	65	64
	IN-A	50.8	51	50	50	47	40	52	40	41	46	50	67	48	53	64	63
	IN-R	50.9	51	50	49	47	43	50	38	43	49	51	66	48	54	63	62
	IN-Sketch	48.9	51	50	49	45	37	49	39	41	46	47	64	46	51	61	60
	ObjNet	48.2	48	46	46	47	37	49	37	38	43	47	65	46	50	61	61
	IN-Cartoon	53.7	55	53	53	49	41	54	39	44	48	50	74	50	58	70	67
	IN-Drawing	52.1	54	51	51	48	41	52	38	44	53	48	71	45	54	67	64
LP-FT (Kumar et al., 2022)	IN-V2	50.7	51	49	49	47	40	50	40	43	47	50	67	48	53	63	62
	IN-A	48.2	48	46	46	46	39	49	38	40	44	48	64	47	49	60	59
	IN-R	47.5	46	45	44	45	42	47	35	40	46	47	63	45	50	58	57
	IN-Sketch	46.9	48	47	46	44	36	47	37	40	44	46	61	45	48	58	57
	ObjNet	47.0	47	45	45	46	36	49	37	37	42	45	63	45	49	60	60
	IN-Cartoon	50.1	51	49	48	46	35	51	36	41	43	47	72	48	53	68	62
	IN-Drawing	50.3	52	50	50	45	40	49	35	44	52	47	68	45	52	64	60
WiSE-FT (Wortsman et al., 2022b)	IN-V2	53.1	54	52	52	49	42	53	41	45	49	53	70	50	56	66	65
	IN-A	52.8	53	52	52	50	42	54	41	44	49	53	69	50	55	65	64
	IN-R	53.3	53	52	52	50	45	53	40	46	51	54	69	51	56	64	64
	IN-Sketch	52.1	54	53	53	48	40	51	40	45	49	51	68	50	54	64	63
	ObjNet	51.8	52	51	51	48	40	52	40	43	47	51	68	49	55	65	64
	IN-Cartoon	51.8	53	52	51	47	37	52	37	43	46	50	72	50	55	68	64
	IN-Drawing	54.3	57	55	55	48	42	54	39	47	54	53	72	51	57	68	65
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	53.1	54	52	52	49	42	53	41	45	49	52	70	50	56	66	65
	IN-A	52.5	53	51	51	50	42	54	41	44	48	52	68	50	55	65	64
	IN-R	53.2	53	52	52	50	45	53	40	45	51	54	69	51	56	64	64
	IN-Sketch	52.2	54	53	53	48	40	51	40	45	49	51	68	50	54	64	63
	ObjNet	51.7	52	51	51	49	40	53	40	43	47	50	68	49	54	65	64
	IN-Cartoon	52.0	54	52	52	47	38	52	37	43	46	50	72	50	55	68	64
	IN-Drawing	54.2	57	55	55	48	42	53	39	47	54	52	72	50	57	68	65

Table S33: Accuracy of ImageNet-21K with AugReg pretrained ViT-L/16 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		72.2	73	73	73	69	62	73	67	72	69	73	82	70	71	79	78
FT	IN-V2	71.0	72	71	72	67	62	71	64	70	70	72	81	69	69	79	78
	IN-A	70.4	72	71	71	67	61	71	64	70	69	71	80	68	68	78	77
	IN-R	65.4	68	67	67	61	61	64	55	61	64	65	76	60	64	74	74
	IN-Sketch	67.6	69	68	68	65	58	67	61	67	66	68	78	64	65	75	74
	ObjNet	68.4	70	69	69	65	60	68	59	68	67	67	79	63	67	78	77
	IN-Cartoon	72.6	74	72	73	67	59	73	63	73	70	73	89	68	72	83	81
	IN-Drawing	74.7	77	75	76	69	67	74	63	74	77	75	87	67	73	85	81
Linear Probing	IN-V2	71.4	72	72	71	68	61	72	66	72	69	72	81	69	70	78	77
	IN-A	71.4	72	72	71	68	61	72	66	71	69	72	81	70	70	78	77
	IN-R	69.8	70	70	69	67	60	70	64	70	67	71	80	68	69	77	76
	IN-Sketch	68.4	69	68	68	66	59	69	63	68	66	69	78	66	67	75	74
	ObjNet	71.5	72	71	71	69	62	72	66	71	68	73	81	70	70	78	77
	IN-Cartoon	76.5	77	76	76	73	65	77	71	76	72	77	88	75	75	85	83
	IN-Drawing	76.0	77	76	76	73	66	76	70	76	75	77	86	74	75	83	81
Visual Prompt (Bahng et al., 2022)	IN-V2	57.4	52	51	50	53	44	56	54	56	56	62	75	55	61	70	69
	IN-A	50.5	42	41	39	45	36	50	48	50	49	56	71	48	55	65	63
	IN-R	50.3	47	47	45	45	38	47	45	48	51	51	69	45	53	62	62
	IN-Sketch	48.6	46	45	43	42	38	44	43	46	49	48	67	39	52	63	62
	ObjNet	47.7	38	37	35	43	32	46	44	47	46	53	70	45	53	63	62
	IN-Cartoon	55.8	50	49	48	51	42	54	52	55	53	57	75	51	60	71	68
	IN-Drawing	52.2	50	49	48	47	43	48	45	49	55	51	70	43	56	66	64
LoRA (Hu et al., 2021)	IN-V2	72.3	73	73	73	69	62	73	67	72	70	73	82	70	71	79	78
	IN-A	72.9	73	73	73	71	63	74	68	72	70	75	82	71	72	79	78
	IN-R	72.6	73	73	73	70	63	73	67	72	69	74	82	70	72	79	78
	IN-Sketch	72.5	74	73	73	70	63	73	67	72	70	74	82	69	72	79	78
	ObjNet	72.9	73	73	73	71	64	74	68	73	70	75	82	71	72	80	78
	IN-Cartoon	72.5	73	73	72	70	63	73	67	72	69	74	82	69	71	79	78
	IN-Drawing	73.0	74	73	73	71	64	74	68	73	71	74	82	71	72	79	78
EWC (Kirkpatrick et al., 2017)	IN-V2	71.0	74	74	74	65	64	70	63	68	69	68	81	66	70	80	78
	IN-A	72.0	73	72	72	68	63	73	66	72	69	73	82	70	70	80	78
	IN-R	72.0	72	71	71	70	65	72	65	72	71	73	82	70	70	78	78
	IN-Sketch	72.4	73	73	72	70	63	72	67	72	71	73	82	70	71	79	78
	ObjNet	71.2	72	71	70	68	62	72	63	72	70	72	81	70	69	79	78
	IN-Cartoon	71.8	72	71	71	69	60	73	66	72	68	73	83	70	71	79	78
	IN-Drawing	73.5	75	74	74	70	63	74	66	74	74	75	83	72	72	80	78
LwF (Li & Hoiem, 2017)	IN-V2	71.3	74	74	74	66	63	71	65	69	68	71	81	66	71	79	78
	IN-A	72.0	74	73	73	68	63	72	66	72	69	72	82	68	71	79	78
	IN-R	71.4	73	72	72	67	64	71	64	70	70	72	81	67	71	78	78
	IN-Sketch	70.2	71	71	71	67	61	70	64	70	68	70	80	67	69	77	77
	ObjNet	71.5	73	72	72	68	62	72	65	71	69	72	82	68	70	79	78
	IN-Cartoon	75.5	79	78	78	70	66	75	65	73	72	71	91	61	78	89	86
	IN-Drawing	76.6	79	77	78	69	71	75	66	76	79	73	90	69	77	88	84
LP-FT (Kumar et al., 2022)	IN-V2	71.4	73	73	72	67	62	71	65	72	70	71	81	67	70	79	78
	IN-A	53.7	56	55	55	49	46	53	46	52	50	54	63	51	52	63	62
	IN-R	49.4	51	51	50	46	44	48	39	47	49	49	59	45	48	58	57
	IN-Sketch	67.8	68	68	68	66	58	68	62	67	66	68	77	65	66	75	74
	ObjNet	70.6	71	70	70	68	61	71	63	70	68	72	80	68	69	78	76
	IN-Cartoon	77.0	78	77	77	72	64	77	69	77	74	78	90	74	76	86	85
	IN-Drawing	77.5	80	79	79	73	68	77	69	78	78	78	88	70	76	86	83
WiSE-FT (Wortsman et al., 2022b)	IN-V2	73.5	74	74	74	71	64	74	68	74	72	75	83	72	72	80	79
	IN-A	71.5	73	72	72	67	62	72	66	72	69	72	81	69	70	78	77
	IN-R	73.0	74	74	73	70	66	73	65	72	72	74	82	70	72	80	79
	IN-Sketch	72.1	73	73	73	69	62	72	66	72	71	73	82	69	71	79	78
	ObjNet	72.6	74	73	73	70	63	73	66	73	71	73	82	70	72	80	78
	IN-Cartoon	75.6	77	76	76	72	63	76	69	76	72	77	87	73	74	83	82
	IN-Drawing	76.8	78	77	78	73	67	77	69	77	77	77	87	73	75	84	82
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	73.4	75	75	74	69	64	74	67	73	72	74	83	71	72	80	79
	IN-A	72.7	74	73	73	69	63	73	67	73	70	73	82	71	71	79	78
	IN-R	73.3	74	74	74	70	67	73	66	72	72	74	82	71	72	80	79
	IN-Sketch	72.3	73	73	73	69	63	72	66	73	71	73	82	70	71	79	78
	ObjNet	72.7	74	73	73	70	63	73	66	73	71	74	82	70	71	79	78
	IN-Cartoon	75.8	77	76	76	73	64	76	69	76	72	77	88	72	75	84	83
	IN-Drawing	77.4	79	79	79	74	68	78	69	77	77	78	87	73	76	85	83

Table S34: Accuracy of ImageNet-1K pretrained ResNet-50 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		31.7	23	21	18	28	23	30	30	24	28	34	59	31	40	42	46
FT	IN-V2	29.9	21	20	16	26	22	27	26	25	28	31	56	27	37	41	46
	IN-A	19.9	13	13	10	16	14	17	14	16	18	23	39	20	24	30	31
	IN-R	25.6	21	21	17	20	21	22	20	21	26	26	45	22	30	35	37
	IN-Sketch	19.2	16	15	13	11	12	14	12	17	22	20	37	18	21	28	32
	ObjNet	20.8	14	14	11	17	12	21	21	15	18	27	42	20	26	27	28
	IN-Cartoon	20.0	13	12	10	13	11	16	14	14	16	21	50	23	25	34	29
	IN-Drawing	15.1	16	15	11	4	9	9	8	14	24	8	41	6	18	19	22
Linear Probing	IN-V2	29.8	23	22	18	25	23	27	26	23	27	28	56	25	39	41	45
	IN-A	28.7	23	21	18	23	21	25	23	23	28	30	53	26	36	39	42
	IN-R	25.9	19	18	15	19	19	22	22	20	24	23	53	22	36	36	39
	IN-Sketch	1.7	0	0	0	1	1	1	1	3	2	4	2	3	2	3	2
	ObjNet	25.0	16	15	13	21	16	25	25	18	21	34	49	27	33	30	33
	IN-Cartoon	21.8	13	12	10	17	15	20	19	15	17	21	49	22	31	32	34
	IN-Drawing	11.4	14	13	9	3	6	5	5	10	19	7	32	7	12	14	16
Visual Prompt (Bahng et al., 2022)	IN-V2	21.4	18	16	14	13	13	18	20	17	19	17	45	15	29	32	35
	IN-A	7.3	5	5	4	3	3	5	7	6	6	5	22	4	11	12	13
	IN-R	16.6	13	12	10	9	9	13	15	14	15	13	38	12	23	25	27
	IN-Sketch	17.1	13	12	10	9	9	13	16	15	17	15	40	14	22	25	27
	ObjNet	12.9	8	8	6	7	7	10	14	11	11	12	31	10	19	18	21
	IN-Cartoon	17.8	12	11	10	11	10	14	16	13	14	16	41	15	24	29	30
	IN-Drawing	17.3	14	13	10	8	9	12	14	16	18	14	40	13	23	26	29
EWC (Kirkpatrick et al., 2017)	IN-V2	31.5	25	23	19	27	23	29	28	25	29	31	58	26	40	43	47
	IN-A	22.0	18	17	14	16	14	18	16	17	20	24	42	18	27	33	35
	IN-R	29.0	23	22	19	23	23	26	26	22	27	27	54	24	37	38	42
	IN-Sketch	13.3	6	6	3	9	10	10	10	17	15	21	18	17	17	20	19
	ObjNet	24.9	17	17	13	21	16	25	26	19	20	32	49	23	33	30	34
	IN-Cartoon	20.7	12	11	9	16	13	19	17	14	16	20	47	22	28	33	33
	IN-Drawing	12.0	16	15	11	3	6	6	5	12	21	6	34	5	12	14	17
LwF (Li & Hoiem, 2017)	IN-V2	31.0	22	20	16	27	23	28	27	26	29	33	57	29	39	43	47
	IN-A	26.7	19	18	15	22	19	23	21	22	25	31	50	26	32	37	39
	IN-R	30.3	24	23	20	25	24	27	26	24	29	32	53	28	36	41	43
	IN-Sketch	21.8	17	16	13	14	14	17	15	18	23	24	41	21	25	32	36
	ObjNet	25.6	17	16	13	22	17	25	25	20	22	32	49	25	31	33	35
	IN-Cartoon	29.0	19	18	14	22	20	25	24	21	25	31	61	31	37	44	43
	IN-Drawing	20.8	20	18	14	9	13	15	14	19	29	14	52	10	25	28	32
LP-FT (Kumar et al., 2022)	IN-V2	29.8	21	20	16	26	22	27	26	25	28	31	56	27	37	41	46
	IN-A	22.6	15	14	12	19	17	20	17	18	21	26	44	22	28	31	34
	IN-R	27.5	23	22	18	22	23	23	22	23	28	29	48	24	32	37	39
	IN-Sketch	17.5	13	12	11	11	12	12	11	17	19	20	32	17	20	26	29
	ObjNet	22.2	15	15	11	18	14	22	23	17	19	29	44	21	28	28	30
	IN-Cartoon	19.7	13	12	10	13	10	16	14	14	16	20	49	22	25	32	28
	IN-Drawing	14.5	16	15	12	4	8	8	8	13	24	8	40	6	17	18	21
WiSE-FT (Wortsman et al., 2022b)	IN-V2	32.3	23	21	18	29	24	30	29	26	30	34	59	30	40	44	48
	IN-A	30.7	22	21	18	27	22	27	26	24	28	35	56	31	37	42	45
	IN-R	33.6	27	26	22	29	26	30	29	27	33	36	57	31	39	44	47
	IN-Sketch	29.8	24	22	19	22	21	25	23	24	30	32	55	29	35	42	46
	ObjNet	30.4	22	21	18	26	20	29	30	23	26	36	56	30	37	39	43
	IN-Cartoon	28.8	19	17	15	22	18	25	23	22	25	32	60	31	37	43	43
	IN-Drawing	28.8	25	23	19	18	20	23	23	24	32	28	59	23	35	40	42
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	32.2	23	22	18	29	24	29	29	26	29	34	59	29	40	44	48
	IN-A	29.2	22	20	17	25	20	26	23	23	26	33	54	28	35	41	43
	IN-R	32.9	27	26	22	28	26	29	28	26	32	34	57	30	39	43	47
	IN-Sketch	28.2	22	21	17	21	20	23	22	24	29	30	52	27	33	40	43
	ObjNet	29.3	21	20	17	26	19	29	29	23	25	36	54	29	36	37	40
	IN-Cartoon	27.5	18	17	14	22	18	24	22	20	23	29	58	29	36	42	41
	IN-Drawing	24.2	25	23	18	12	15	17	17	21	31	19	53	15	29	32	36

Table S35: Accuracy of ImageNet-1K pretrained ResNet-50 with different fine-tuning methods and downstream datasets on each ImageNet-C corruption For each corruption, accuracy is averaged across 5 levels of severity.

Dataset	Method	Avg.	Gauss.	Noise Shot	Impulse	Defocus	Glass	Blur Motion	Zoom	Snow	Frost	Weather Fog	Bright	Contrast	Digital Elastic	Pixel	JPEG
Pretrained		46.6	41	39	36	41	27	42	43	40	45	58	71	57	47	50	59
FT	IN-V2	47.0	41	40	36	40	28	43	42	42	48	59	72	55	47	51	62
	IN-A	46.3	43	42	40	40	27	41	39	44	47	58	68	56	44	48	58
	IN-R	43.7	40	39	36	34	33	38	36	39	48	52	65	48	45	48	55
	IN-Sketch	23.3	20	19	16	13	11	17	16	26	28	33	41	23	22	29	35
	ObjNet	41.8	35	34	31	38	24	41	40	35	40	55	65	52	41	43	52
	IN-Cartoon	31.9	28	26	24	26	15	27	24	24	28	36	62	42	33	41	43
	IN-Drawing	16.3	24	18	20	2	4	5	5	24	37	8	49	7	12	11	17
Linear Probing	IN-V2	45.6	42	40	38	36	28	42	40	40	47	52	70	57	46	49	57
	IN-A	45.4	45	44	42	35	28	39	37	41	48	53	67	54	44	47	55
	IN-R	40.6	35	32	30	33	27	36	37	35	39	47	67	50	47	43	51
	IN-Sketch	2.8	1	1	0	1	1	2	2	5	4	8	3	4	2	3	4
	ObjNet	39.4	32	30	29	36	23	39	38	33	38	53	64	51	39	39	48
	IN-Cartoon	35.6	30	25	25	29	22	31	29	29	34	41	65	44	41	44	47
	IN-Drawing	8.8	17	9	15	0	0	0	0	21	32	1	29	1	1	2	3
Visual Prompt (Bahng et al., 2022)	IN-V2	36.4	31	30	26	28	20	32	36	31	34	44	63	42	40	40	49
	IN-A	32.8	27	26	23	22	16	28	31	29	31	42	59	39	37	38	46
	IN-R	32.8	26	25	22	24	17	29	32	28	31	41	59	40	37	37	45
	IN-Sketch	33.0	27	26	22	24	16	29	33	28	31	41	59	40	36	37	45
	ObjNet	33.1	27	25	22	24	17	29	34	28	31	42	59	39	37	36	45
	IN-Cartoon	34.5	29	27	23	26	18	30	34	30	32	43	61	41	39	39	47
	IN-Drawing	35.1	30	29	25	24	18	29	33	31	36	43	61	41	39	40	48
EWC (Kirkpatrick et al., 2017)	IN-V2	46.0	41	39	36	38	28	43	41	40	46	56	71	54	47	50	59
	IN-A	46.8	44	43	41	38	29	42	40	43	48	58	70	53	46	49	58
	IN-R	42.9	37	35	33	34	28	39	39	38	42	50	68	50	47	47	54
	IN-Sketch	13.2	6	5	3	7	8	10	10	24	22	21	21	12	15	17	18
	ObjNet	41.3	34	33	30	37	24	40	40	35	38	55	66	53	42	41	51
	IN-Cartoon	33.1	25	22	21	28	19	30	27	25	30	40	63	42	38	43	46
	IN-Drawing	7.5	10	7	10	0	0	0	0	21	31	0	26	0	1	1	2
LwF (Li & Hoiem, 2017)	IN-V2	47.5	42	41	37	41	28	43	42	43	48	59	72	56	47	52	63
	IN-A	46.8	43	42	40	40	28	42	40	44	47	59	69	57	44	49	58
	IN-R	44.9	41	41	37	36	34	39	37	40	48	53	66	50	46	49	56
	IN-Sketch	21.4	18	17	14	13	10	15	15	26	27	32	36	19	20	27	32
	ObjNet	43.1	37	36	32	39	25	42	41	37	41	56	67	54	42	45	54
	IN-Cartoon	34.6	30	28	25	28	17	30	27	27	31	39	65	44	36	44	47
	IN-Drawing	12.3	20	13	18	1	2	2	2	25	38	4	42	4	5	5	7
LP-FT (Kumar et al., 2022)	IN-V2	47.1	42	40	37	40	28	43	42	42	48	59	71	55	47	51	62
	IN-A	46.4	43	42	39	39	28	42	40	44	48	58	69	56	45	48	58
	IN-R	44.2	40	40	36	35	34	38	37	40	48	52	66	48	46	49	55
	IN-Sketch	24.2	21	19	17	15	13	18	19	27	29	32	41	23	23	30	35
	ObjNet	41.8	35	34	31	38	24	41	40	35	40	55	66	52	41	43	52
	IN-Cartoon	32.2	29	27	25	26	15	28	24	24	28	36	62	42	33	41	43
	IN-Drawing	16.7	26	21	22	1	4	6	5	23	37	7	48	5	14	13	19
WiSE-FT (Wortsman et al., 2022b)	IN-V2	48.1	42	40	37	42	28	43	43	42	48	60	73	59	48	53	63
	IN-A	48.9	44	43	40	43	29	43	44	45	48	61	72	60	48	52	61
	IN-R	49.3	45	44	41	43	34	43	43	43	50	59	72	57	50	53	62
	IN-Sketch	41.5	40	40	37	33	26	37	37	36	40	48	66	41	42	47	55
	ObjNet	46.8	41	40	36	43	27	44	44	40	45	59	71	58	46	50	59
	IN-Cartoon	42.8	37	35	32	37	22	38	35	37	40	51	72	53	46	50	57
	IN-Drawing	41.8	42	39	38	25	22	34	32	39	48	50	71	48	42	45	53
Model Soup PRE-FT-EWC-LwF (Wortsman et al., 2022a)	IN-V2	48.0	42	40	37	42	28	43	43	43	48	60	73	59	48	52	63
	IN-A	48.9	45	44	41	42	29	44	43	45	49	61	71	60	47	51	61
	IN-R	48.4	44	43	40	41	34	42	42	43	49	58	71	55	50	52	60
	IN-Sketch	38.7	36	35	33	29	22	32	33	37	40	46	63	37	39	45	52
	ObjNet	45.7	39	38	35	41	26	44	44	39	44	59	70	57	45	48	57
	IN-Cartoon	39.5	34	31	29	34	21	35	32	32	36	46	69	49	43	48	53
	IN-Drawing	28.9	38	32	34	6	11	14	13	35	46	29	64	24	26	26	35

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