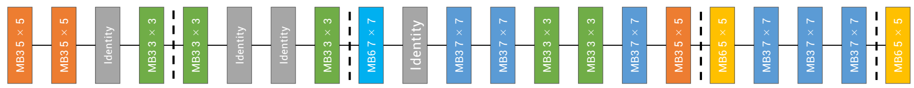
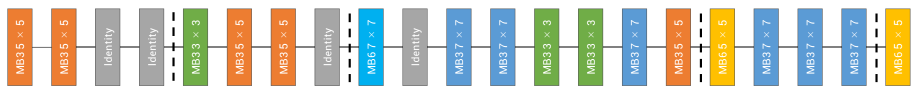
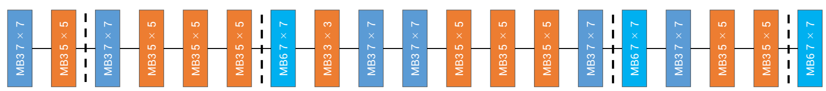
Appendix



(a) Searched structure with same FLOPs of SPOS



(b) Searched structure with same FLOPs of ProxylessNAS



(c) Searched structure with same FLOPs of FairNAS

Fig. 1. Structures of searched architectures under FLOPs constraints over the MobileNet-like shrunk search space, see Table 4 for details

Table 1. The original search space S1 and its shrunk search spaces of various size from NAS-Bench-201, see Section 3.1 for details

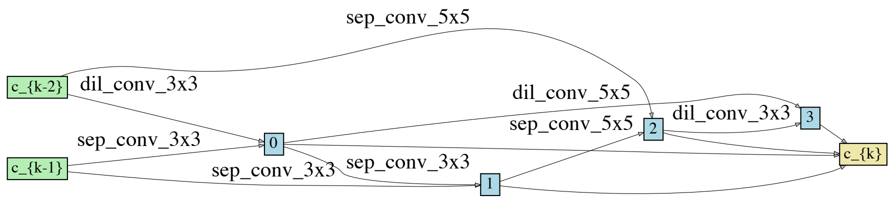
Search Space	Candidate Operators
S1	*none*, *skip connect*, *conv* 1×1, *conv* 3×3, *average pooling* 3×3
S2	*skip connect*, *conv* 1×1, *conv* 3×3, *average pooling* 3×3
S3	*none*, *conv* 1×1, *conv* 3×3, *average pooling* 3×3
S4	*none*, *skip connect*, *conv* 1×1, *average pooling* 3×3
S5	*none*, *skip connect*, *conv* 1×1, *conv* 3×3
S6	*conv* 1×1, *conv* 3×3, *average pooling* 3×3
S7	*none*, *skip connect*, *average pooling* 3×3
S8	*conv* 1×1, *conv* 3×3

Table 2. Comparison between the best search space 'S8' designed by human and the one found by ABS on NASBench-201. For the form x(y), x means represents the searched models on 'S8', y represents the searched models on the shrunk search space ABS finds

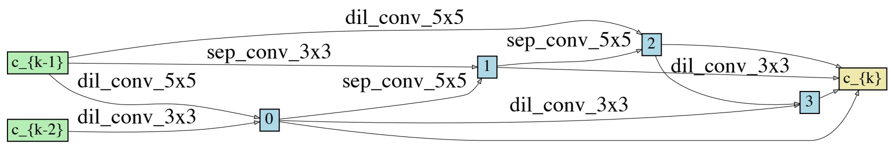
Method	CIFAR-10	CIFAR-100	ImageNet-16-120
DARTS [4]	89.37% (88.90%)	65.70% (67.57%)	35.47% (33.19%)
SETN [1]	93.20% (93.07%)	70.12% (69.12%)	44.23% (46.33%)
ENAS [5]	93.76% (93.76%)	71.10% (71.10%)	35.47% (41.44%)
GDAS [2]	93.47% (93.60%)	71.01% (70.35%)	44.89% (41.02%)
SPOS [3]	93.79% (93.76%)	70.49% (71.95%)	44.68% (44.24%)

Table 3. The removed operators for each shrinking iteration on MobileNet-like search space. For the form (x,y), x denotes layer index, y represents operator type. Identity, MB3_3×3, MB6_3×3, MB3_5×5, MB6_5×5, MB3_7×7 and MB6_7×7 are encoded from -1 to 5 respectively

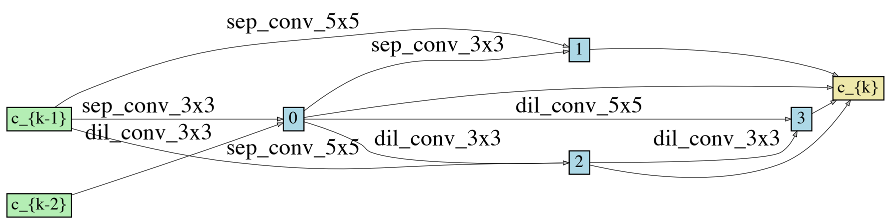
Iteration	Removed Operators
1	(19, 1), (17, 1), (17, 3), (18, 1), (18, 3), (19, 5), (19, 3)
2	(18, 5), (17, 5), (13, 3), (14, 1), (15, 3), (14, 3), (14, 5)
3	(15, 1), (13, 1), (15, 5), (9, 1), (10, 1), (10, 3), (11, 3)
4	(11, 5), (9, 3), (9, 5), (5, 3), (20, 5), (13, 5), (7, 1)
5	(7, 5), (12, 1), (6, 3), (3, 1), (10, 5), (6, 1), (6, 5)
6	(2, 1), (5, 5), (16, 5), (16, 1), (2, 3), (3, 3), (11, 1)
7	(1, 3), (1, 1), (7, 3), (1, 5), (8, 3), (2, 5), (1, 0)
8	(4, 1), (12, 3), (0, 0), (5, 1), (17, 2), (4, 4), (0, 1)
9	(17, -1), (18, -1), (19, -1), (20, 0), (1, 4), (1, -1), (15, -1)
10	(17, 0), (20, 2), (20, 4), (19, 0), (18, 0), (19, 2), (15, 4)
11	(20, 1), (18, 2), (15, 0), (13, -1), (12, 4), (10, -1), (11, -1)
12	(12, 2), (0, 4), (16, 4), (12, 5), (14, -1), (10, 0), (4, 2)
13	(4, 5), (0, 5), (11, 0), (14, 2), (16, 2), (13, 4), (13, 2)
14	(4, 3), (11, 2), (0, 3), (10, 2), (14, 0), (16, 0), (8, 4)



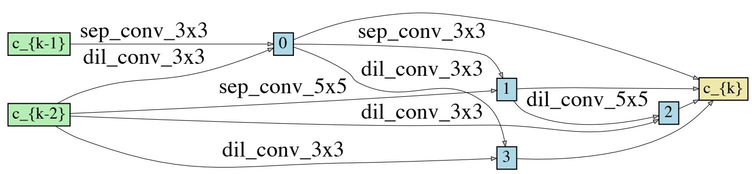
(a) Normal cell searched by PDARTS on CIFAR-10



(b) Reduction cell searched by PDARTS on CIFAR-10



(c) Normal cell searched by DARTS on CIFAR-10



(d) Reduction cell searched by DARTS on CIFAR-10

Fig. 2. Structures of searched architectures over the shrunk search space of DARTS, see Table 5 and 6 for details

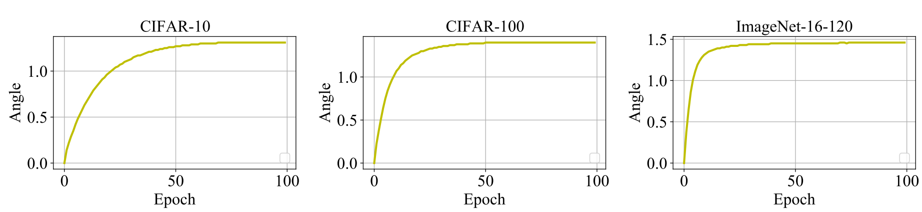


Fig. 3. The angle evolution of a standalone model on different datasets. The model is chosen from NAS-Benchmark-201 search space. The angle values adopt radian measure.

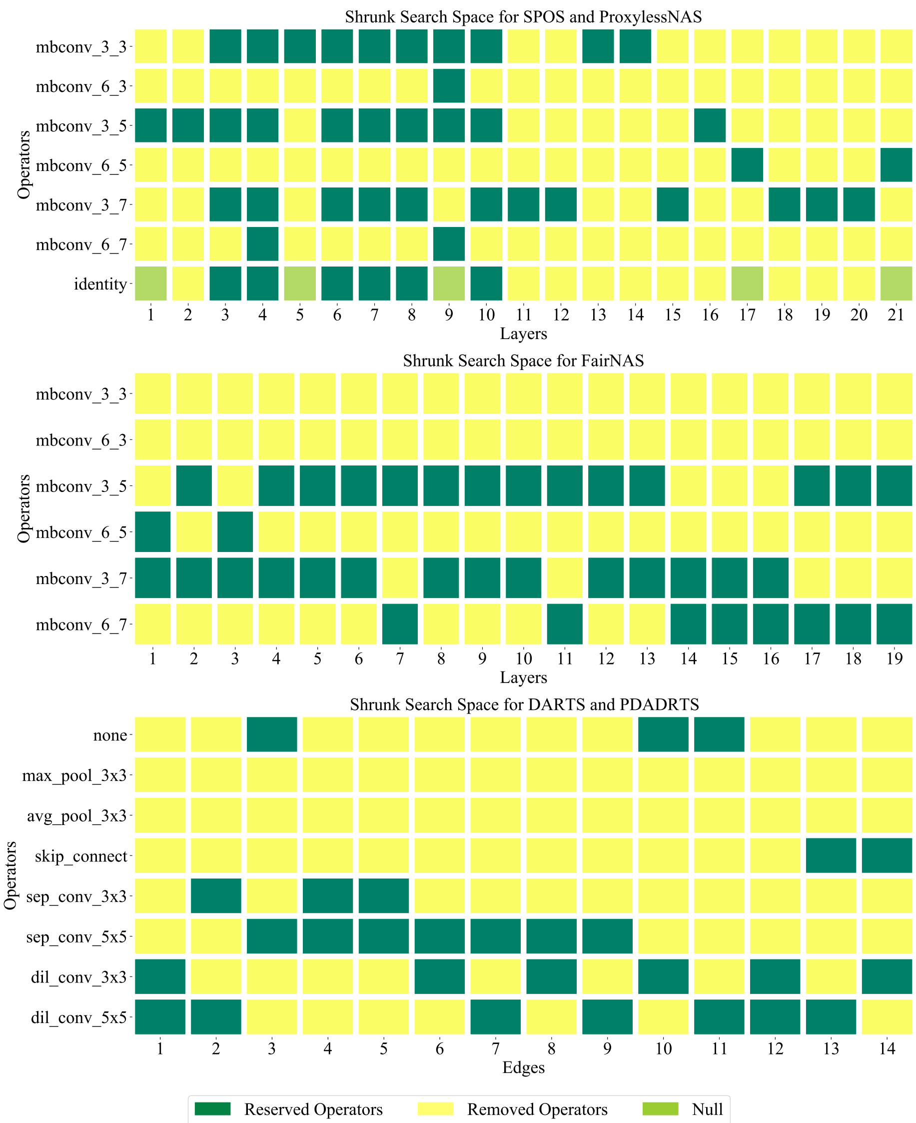


Fig. 4. Shrunk search spaces found by ABS. MobileNet-like search space contains a set of *mbconv* operators (mobile inverted bottleneck convolution), where *mbconv_X_Y* represents the specific operator with expand ratio X and kernel size Y. 'Null' means there's no the choice for the current layer. See Tables 4, 5, 6 for details

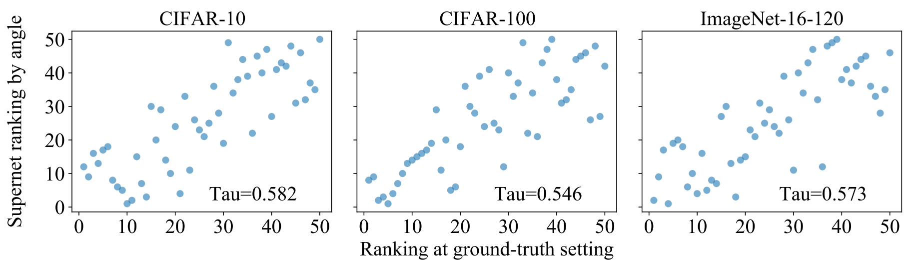


Fig. 5. The distribution of the supernet ranking by the angle-based metric. We uniformly choose 50 models from NAS-Bench-201, and rank them based on supernet. X-axis represents the ground-truth ranking based on the ground-truth accuracy

References

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