NAS Papers Comparison

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go/nas-papers-comparison

Table-1. NAS for Image Classification

Paper	Publish Date	Venue	Author	Cited By	Search Space	CNT	WS	Search Method	Meta-controller	Nested	Cell	Proxy	MC	GPU Days	ES	ImageNet	Latency	Code
Neural Architecture search with reinforcement learning	20170215	ICLR	Barret Zoph	547	Customized	N	N	RL;G	RNN	Y	N	Y	SP		S	N	N	
Learning transferable Architecture for scalable image recognition(**NASNet**)	20180411	CVPR	Barret Zoph	340	NASNet	N	N	RL(PPO);G	RNN	Y	Y	Y	SP	2000	S	82.7	N	Github
Progressive Neural Architecture Search(**PNASNet**)	20180726	ECCV	Chenxi Liu	115	NASNet	N	N	SMBO;G	LSTM	Y	Y	Y	SP	225	PP	82.9	N	Github
MnasNet:Platform-Aware Neural Architecture Search for Mobile	20180731		Mingxing Tan	30	Customized	N	N	RL(PPO);G	RNN	Y	Y	Y	SP		S	76.13	L	
Large-Scale Evolution of Image Classifiers	20170611	ICML	Esteban Real	232	Customized	N	N	EA;G	DNA	Y	N	Y	SP		S	N	N	
Regularized Evolution for Image Classifier Architecture Search(**AmoebaNet**)	20181026	ICML	Esteban Real	107	NASNet	N	N	EA;G	DNA	Y	Y	Y	SP	3150	S	83.9	N	Github
Hierarchical Representations for Efficient Architecture Search	20180222	ICLR	Hanxiao Liu	108	Hierarchical	N	N	EA;G	DNA	Y	Y	Y	SP		S	79.7	N	
SMASH: One-Shot Model Architecture Search through HyperNetworks	20180224	ICLR	Andrew Brock	77	Memory Bank	N	N	RS;G	HyperNet	Y	Y	Y	SP		WG	N	N	Github
Efficient Neural Architecture Search via Parameter Sharing(**ENAS**)	20180212	ICML	Hieu Pham	113	NASNet	N	Y	RL;G	LSTM	N	Y	N	SP		DE	N	N	Github
Understanding and Simplifying One-Shot Architecture Search	20180209	ICML	Gabriel Bender	25	DAG	N	Y	G	N/A	N	Y	N	WS		DE	75.2	N	
Efficient Architecture Search by Network Transformation(**EAS**)	20171121	AAAI	Han Cai	51	Chain	N	N	RL;G	Bi-LSTM	Y	N	Y	SP		S	N	N	Github
Path-Level Network Transformation for Efficient Architecture Search(**PathLevel EAS**)	20180607	ICML	Han Cai	15	Tree	N	N	RL;G	Tree-LSTM	Y	Y	Y	SP		S	74.6	N	Github
Neural Architecture Optimization(**NAO**)	20181031	NIPS	Renqian Luo	25	NASNet	Y	Y	G	NAO	N	Y		WS		DE	N	N	Github
FBNet: Hardware-Aware Efficient ConvNet Design via Differentiable Neural Architecture Search	20181214	CVPR	Bichen Wu	10	Chain	Y	Y	G	N	N	IRB	N	WS	9	DE	74.9	L	Github

Graph Hypernetworks for Neural Architecture Search(**GHN**)	20190102	ICLR	Chris Zhang	4	DAG	N	N	RS;G	HyperNet	Y	Y	Y	SP	0.84	WG	73.0	F	
DARTS: Differentiable Architecture Search	20190222	ICLR	Hanxiao Liu	71	NASNet	Y	Y	G	N	N	Y	N	WS	4	DE	73.3	L	Github
SNAS: stochastic neural architecture search	20190112	ICLR	Sirui Xie	10	DAG	Y	Y	G	N	N	Y	N	WS	1.5	DE	72.7	L	Github
Searching for A Robust Neural Architecture in Four GPU Hours(**GDAS**)	20190200	CVPR	Xuanyi Dong	0	NASNet	Y	Y	G	N	N	Y	N	WS	0.17	de	74.0	N	Github
ProxylessNAS: Direct Neural Architecture Search on Target Task and Hardware	20190223	ICLR	Han Cai	2	Chain	Y	Y	G	N	N	IRB	N	TP	8.33	DE	75.1	Y	Github
Efficient Multi-Objective Neural Architecture Search via Lamarckian Evolution	20190226	ICLR	Thomas Elsken	7	NASNet			EA;G			Y							
sharpDARTS: Faster and More Accurate Differentiable Architecture Search	20190323	arXiv	Andrew Hundt	0	DAG	Y	Y	G	N	N	Y	N	WS	1.8	DE	74.9	Y	
Single-Path NAS: Designing Hardware-Efficient ConvNets in less than 4 Hours	20190405	arXiv	D. Stamoulis	0	Chain	Y	Y	G	N	N	IRB	N	WS	0.17	DE	74.96	L	Github
Single Path One-Shot Neural Architecture Search with Uniform Sampling	20190406	arXiv	Zichao Gui	0	Chain	N	Y	RS;EA	N	Y	IRB		SP		DE	Y	Y	
Exploring Randomly Wired Neural Networks for Image Recognition	20190408	arXiv	Saining Xie	0	DAG	N	N	GS	N	Y	Y		SP		S	81.6	F	
Progressive Differentiable Architecture Search: Bridging the Depth Gap between Search and Evaluation(**P-DARTS**)	20190429	arXiv	Xin Chen	0														
Aging Evolution for ImageClassifier Architecture Search	20190500	AAAI	Esteban Real		NASNet			EA;G			Y							
Searching for MobileNetV3	20190506	arXiv	Andrew Howard															

CNT: continuous, discrete search space is mapped to continuous space **WS**: Weight Sharing, weights are shared between sub networks
Nested: Nested optimization or jointly optimization. One approach for NAS is to consider it as a nested optimization problem, where the inner loop is a normal training process that finds the optimal weights for a given architecture a w.r.t. the training loss and the outer loop searches the optimal architecture w.r.t. a validation loss
Cell: Cell based, search for cell, Y for Yes, N for No, IRB for Inverted Residual Block from MobileNetV2 **Proxy**: Proxy tasks, sub networks are trained on proxy tasks
MC: memory consumption **ES**: Evaluation Strategy **ImageNet**: ImageNet Top-1 accuracy, N means the paper is not tested on ImageNet dataset.
Latency: considered Inferrency latency, network FLOPs or not, L means latency, F means FLOPs, N means no

Search Space	**Customized**	**NASNet**	**Chain**	**Tree**	**DAG**
Explanation	Customized	NASNet	Linear Chain	Tree	DAG

Search Method	GS	RS	RL	EA	G	MCTS	SMBO	BO	Other
Explanation	Grid Search	Random Search	Reinforcement Learning	Evolutionary Algorithm	Gradient -based	Monte Carlo Tree Search		Bayesian optimization	other types

Evaluation Strategy	S	WG	PP	DE
Explanation	Train from scratch then evaluate	Weights generation by HyperNet	performance prediction(surrogate model)	Direct evaluation without training from scratch when jointly optimization

Memory Consumption(M)	SP	TP	WS
Explanation	Single path	Two paths	Whole supernet

GS, RS, RL, EA, MCTS, SMBO, BO: architecture search is treated as a black-box optimization problem over a discrete space, which leads to a large number of architecture evaluations required.

Table-2. NAS for Object Detection

Model	Paper	Publish Date	Venue	Author	Cited By	Search Space	Continuous	Weight Sharing	Search Method	Cell	M	ES	Image Net	Latency	Code
	Learning Data Augmentation Strategies for Object Detection	20190626	arXiv												
	NAS-FPN	20190416	CVPR												