BonsaiNet

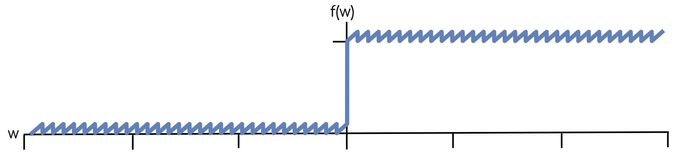
One-Shot Neural Architecture Search via Differential Pruners

Scan the QR code to see the full paper as presented at CVPR-NAS 2020

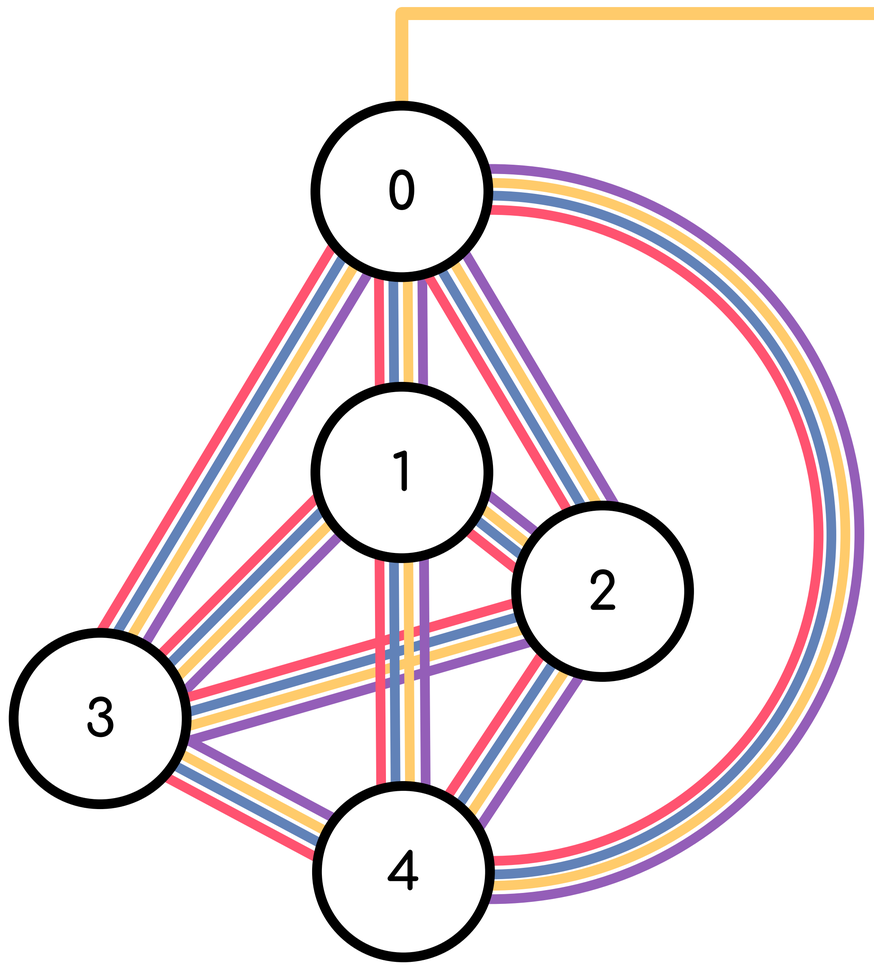
1. Neural Architecture Search

Deep learning has and will continue to change our world. To democratize how it shapes the future, we must ensure that its development is easily accessible across a variety of skillsets and hardwares. However, designing deep learning architectures is hard, expensive, and time consuming. Some techniques require massive computational setups and can take multiple GPU-years to produce results; hardly within reach of the general public. Can we find a widely accessible technique to generate state-of-the-art AI models?

2. Differential Pruners



The crux of our search technique is the differential pruner, a saw-gate hybrid with unique differential properties that allow models to remove internal connections via gradient descent, This means that a model's architecture becomes a learnable parameter that the model can shape to match its needs.



3. Bonsai Cell

Bonsai cells are graph-structured groups of neural operations, each edge composed of multiple candidate operations that are preserved or pruned via differential pruners. As cells are pruned, GPU memory is freed, which we reallocate to new Bonsai cells that are appended to the model. We can then repeat the pruning process on the deepened model until we reach our desired model size.

Since we only need to evaluate a single dynamically growing and evolving model, we can find near state-of-the-art models on a single GPU in less than 3 hours.

CIFAR-10	Accuracy	NAS Time
BonsaiNet Best Result	97.04%	2.5 GPU hours
NAS World Record	98.02%	19.2 GPU hours
Random Search	95.19%	-

BonsaiNet is evaluated over the CIFAR-10 classification problem, a ubiquitous benchmark for evaluating NAS algorithms.

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