7.3

Convolutional Neural Network Architectures

Part 2: CNNs And Their Inception(s)

Sebastian Raschka and the Lightning AI Team

AlexNet and ImageNet

Krizhevsky, Sutskever, and Hinton (2012). ImageNet classification with deep convolutional neural networks. https://dl.acm.org/doi/abs/10.1145/3065386

AlexNet and ImageNet

In 2012, AlexNet (a CNN) won the ImageNet competition

AlexNet and ImageNet

While AlexNet was not the first CNN,
but this is interesting for several
reasons ...

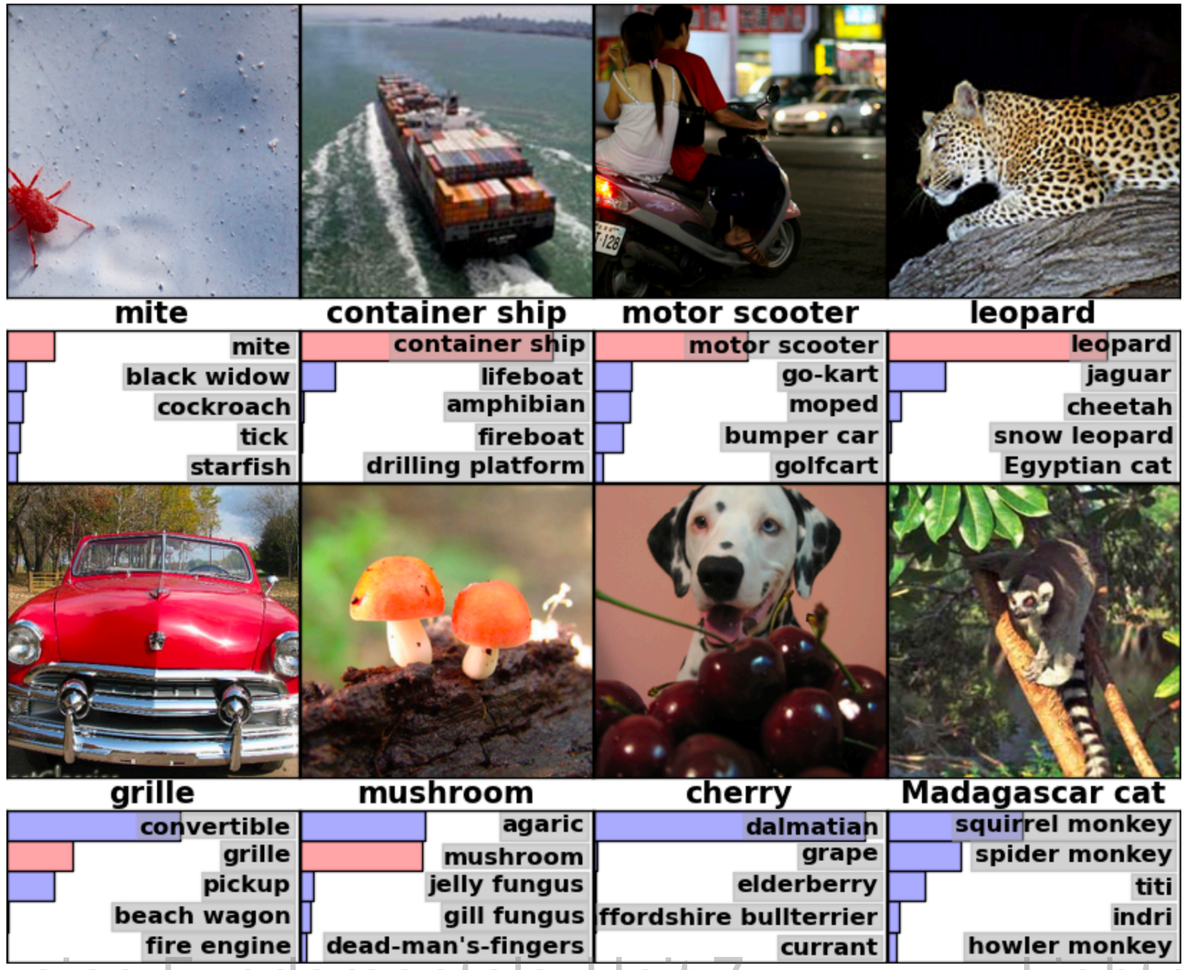
AlexNet and ImageNet

AlexNet achieved 15.4% error on
top-5 task

2nd best was not even close: 26.2%

AlexNet and ImageNet

Top-5 prediction



AlexNet and ImageNet

It utilized GPUs for efficient training
on large datasets

AlexNet and ImageNet

It is widely considered as the "birth"
of (modern) deep learning

AlexNet and ImageNet

Nice tidbit: Convolutional kernels learn "filters" of different shape

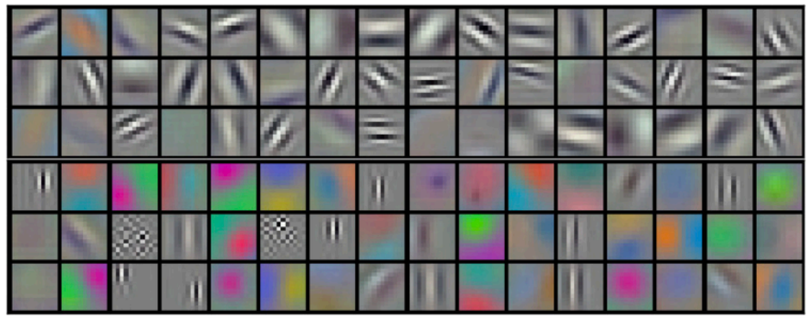
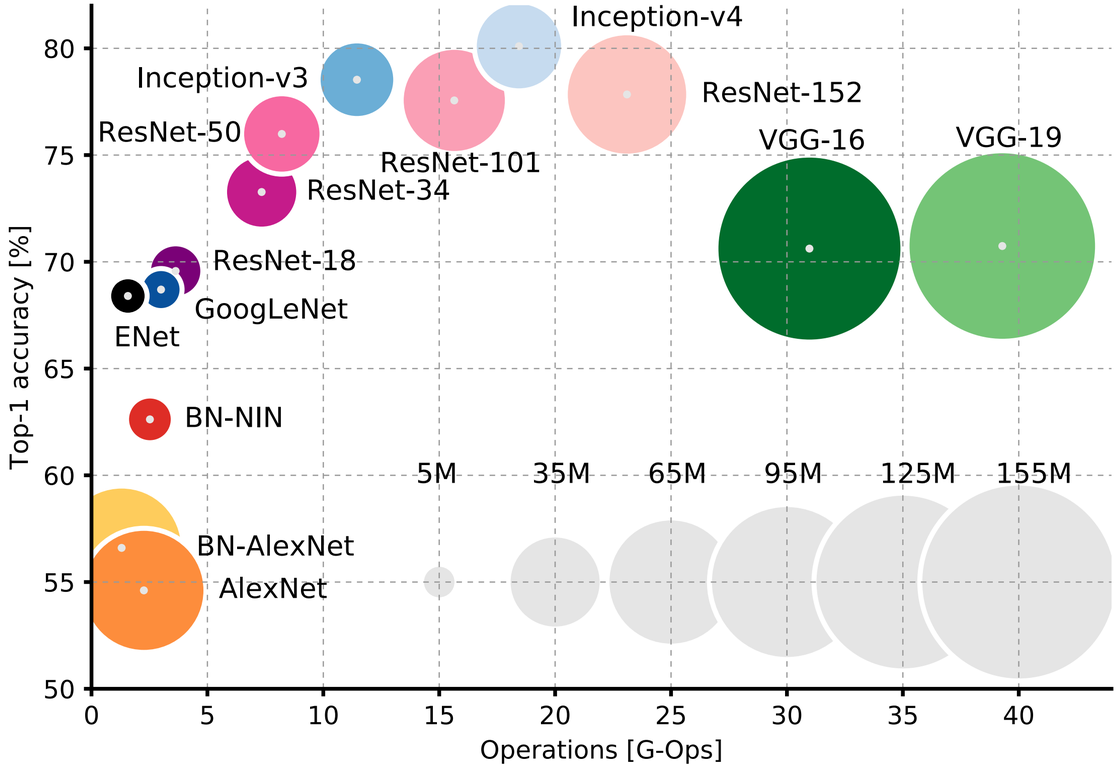


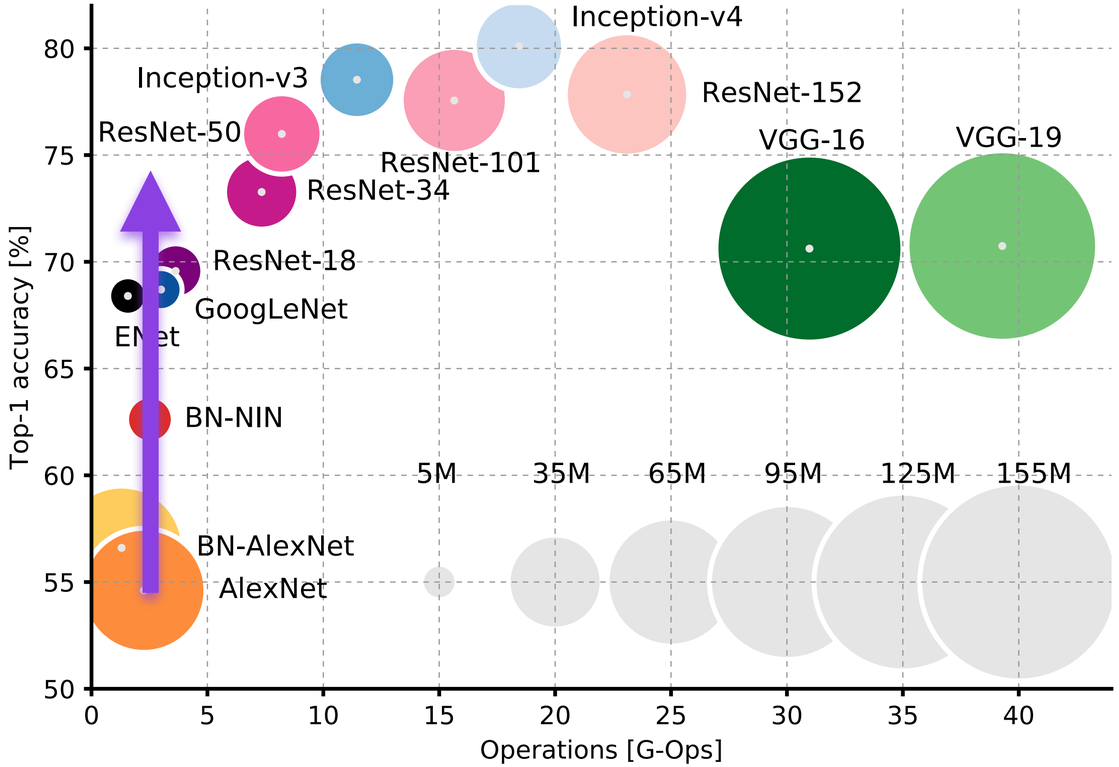
Figure 3: 96 convolutional kernels of size $11 \times 11 \times 3$ learned by the first convolutional layer on the $224 \times 224 \times 3$ input images. The top 48 kernels were learned on GPU 1 while the bottom 48 kernels were learned on GPU 2. See Section 6.1 for details.

Many additional architectures were created over the years!

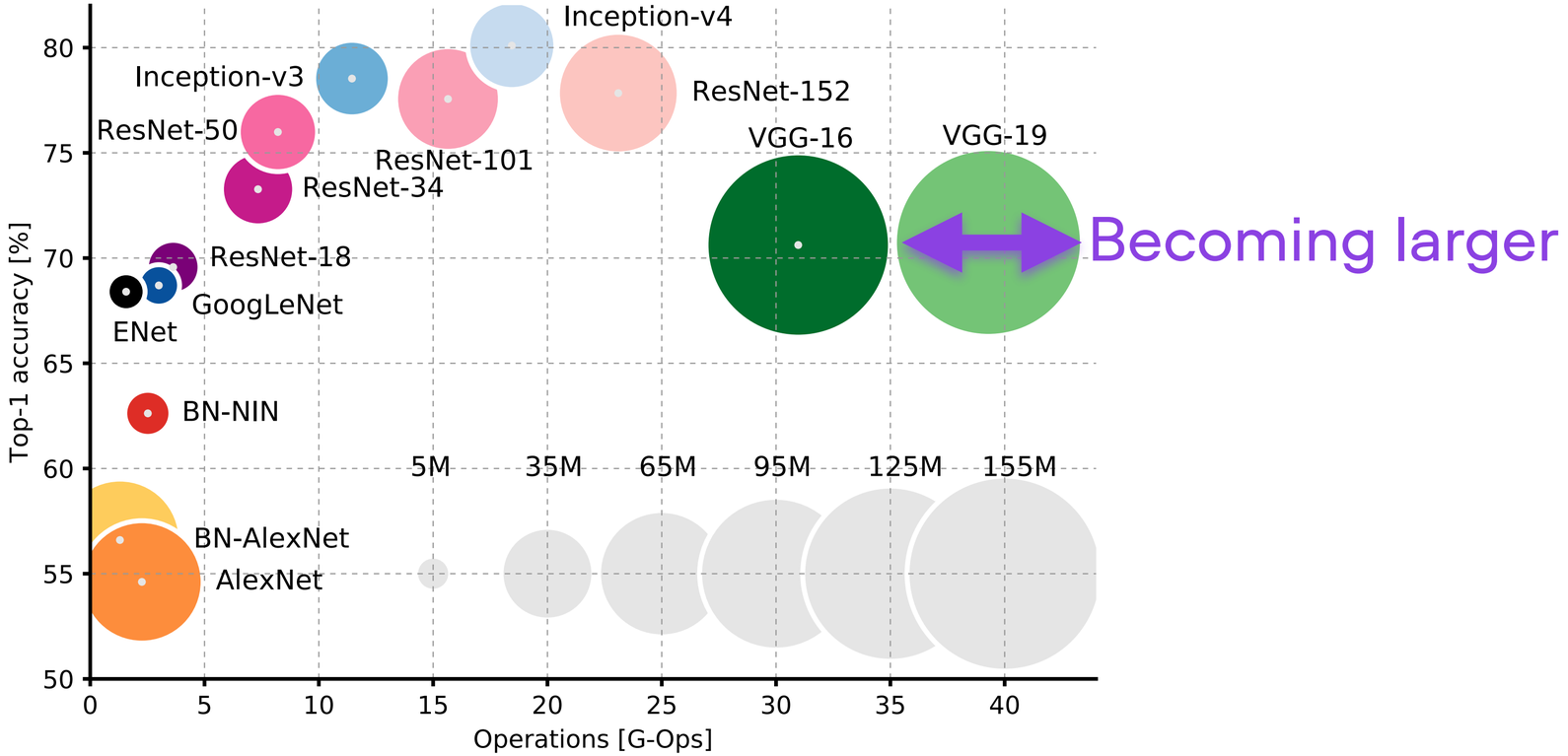


Canziani, Paszke, Culurciello (2016). An analysis of deep neural network models for practical applications. https://arxiv.org/abs/1605.07678

Increasing performance



Canziani, Paszke, Culurciello (2016). An analysis of deep neural network models for practical applications. https://arxiv.org/abs/1605.07678



Canziani, Paszke, Culurciello (2016). An analysis of deep neural network models for practical applications. https://arxiv.org/abs/1605.07678

In practice, we do not design architectures from scratch

Next: A whirlwind tour highlighting notable concepts (before we train CNNs ourselves!)