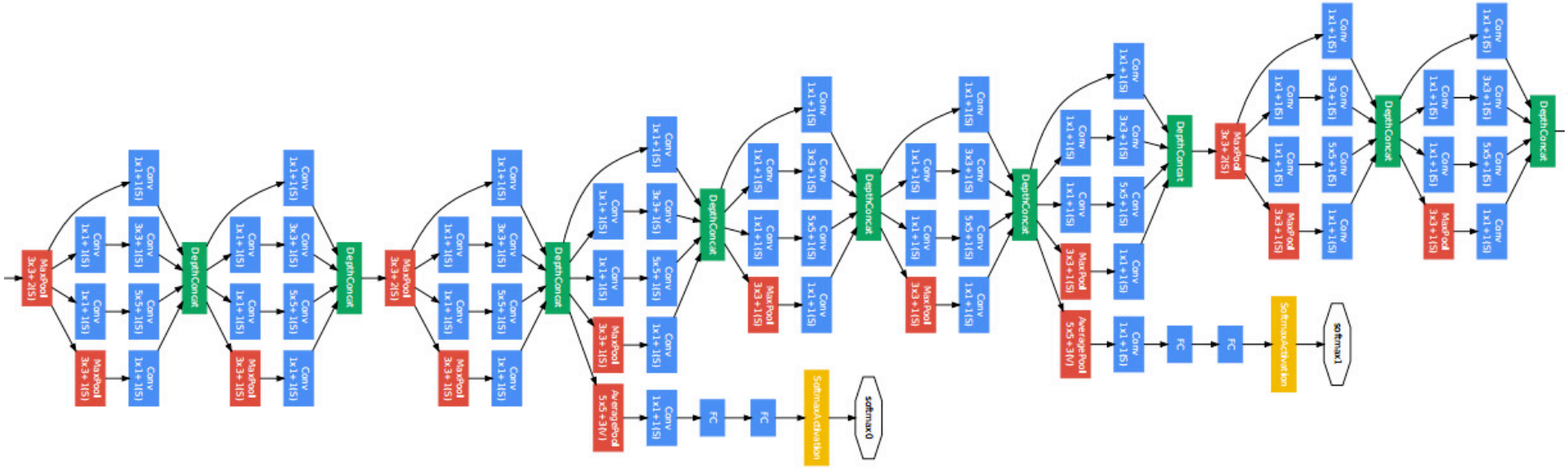
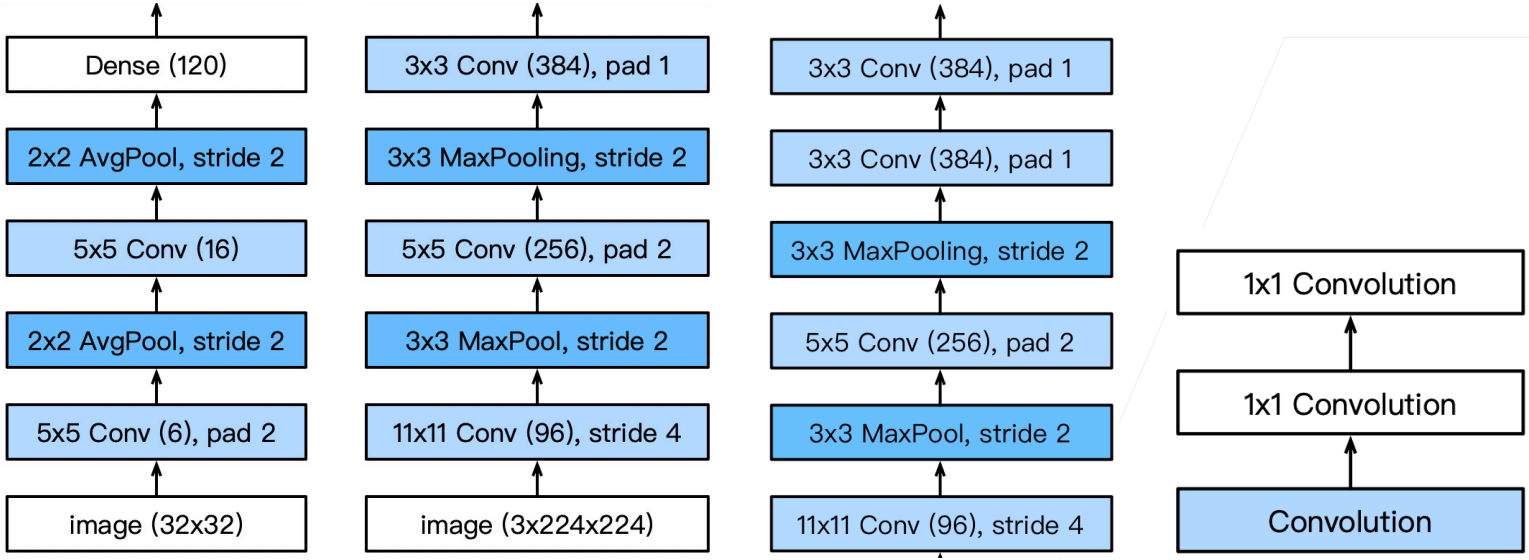
含并行连结的网络（GoogLeNet）



最好的卷积层超参数?

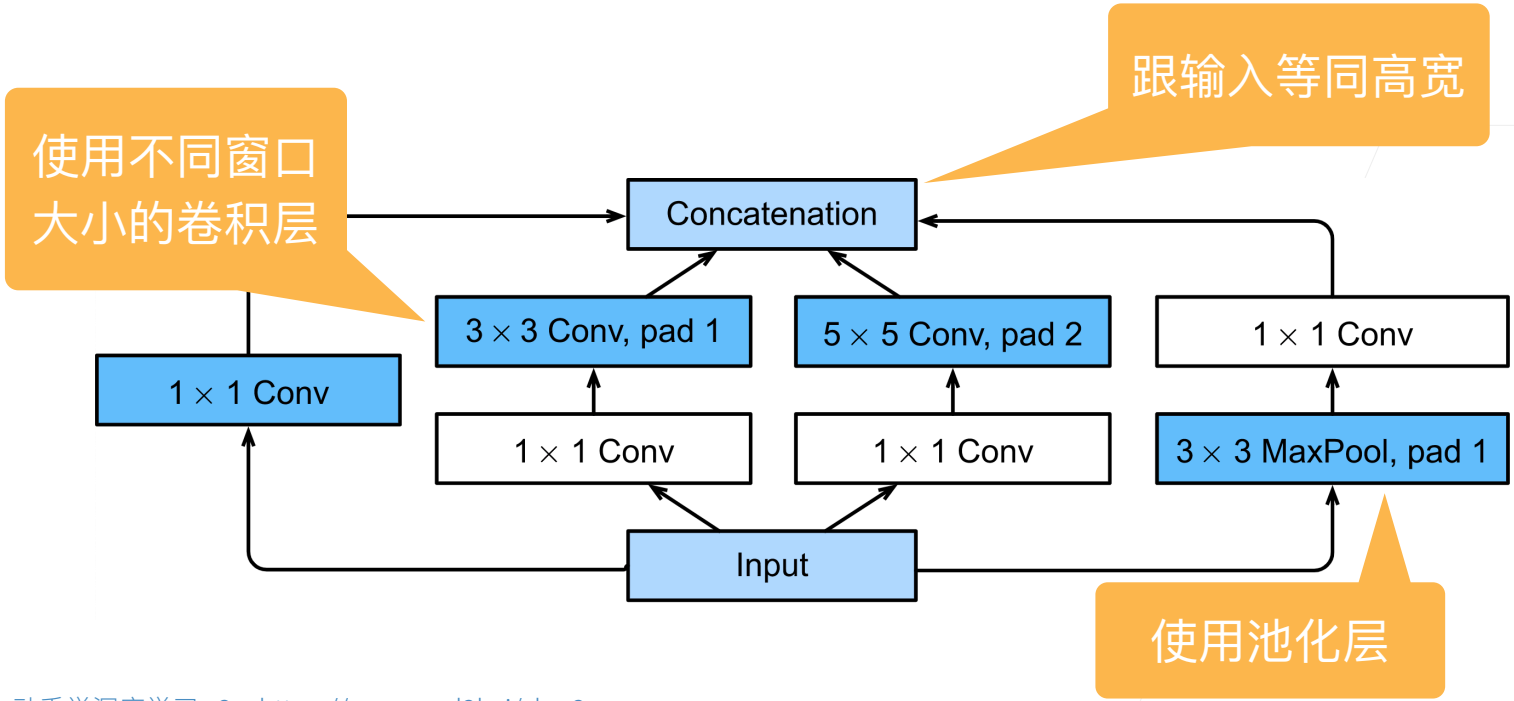
1x1 | 3x3 | 5x5 | Max pooling | Multiple 1x1

LeNet | AlexNet | VGG | NiN



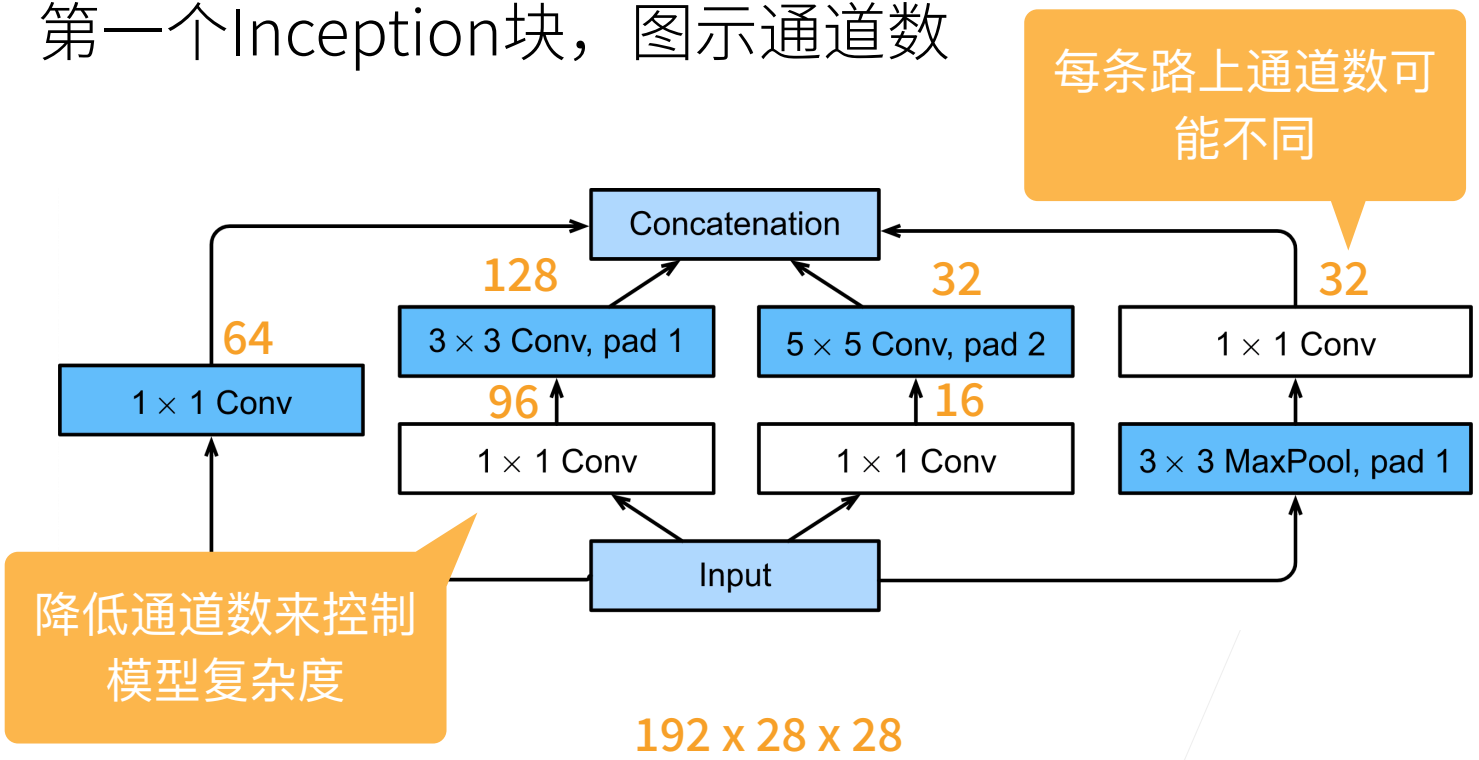
Inception块：小学生才做选择题，我全要了

4 个路径从不同层面抽取信息，然后在输出通道维合并



Inception块

第一个Inception块，图示通道数



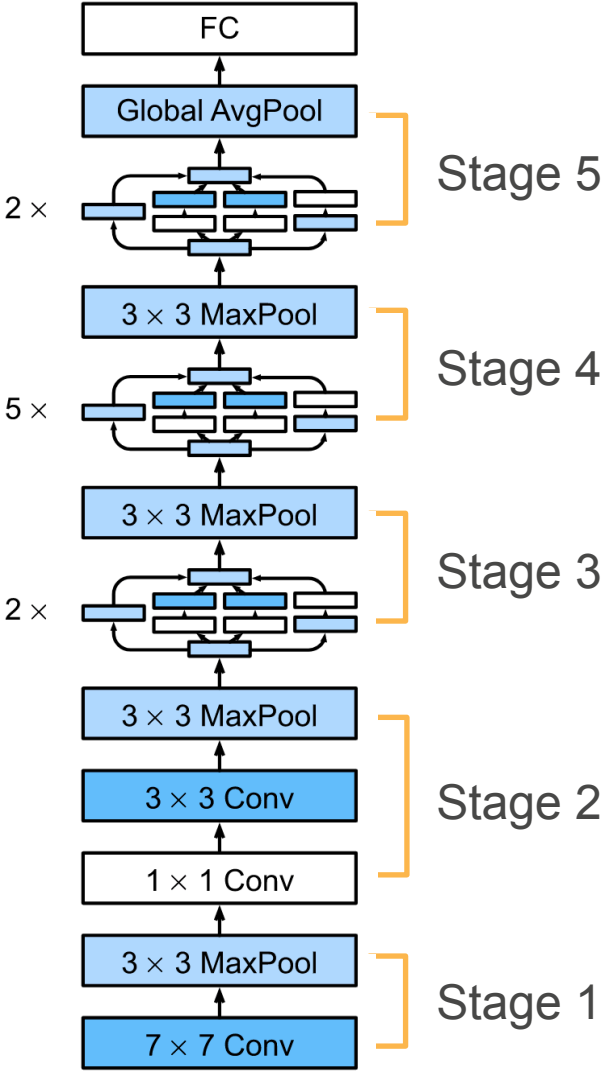
Inception块

跟单3x3或5x5卷积层比，Inception块有更少的参数个数和计算复杂度

	#parameters	FLOPS
Inception	0.16 M	128 M
3x3 Conv	0.44 M	346 M
5x5 Conv	1.22 M	963 M

GoogLeNet

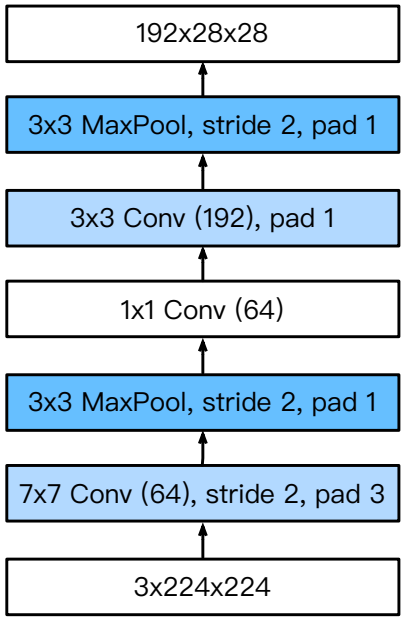
- 5段，9个Inception块



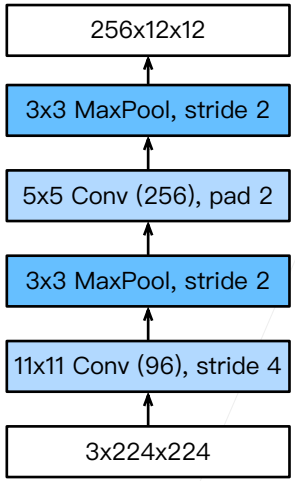
段 1 & 2

- 更小的宽口，更多的通道

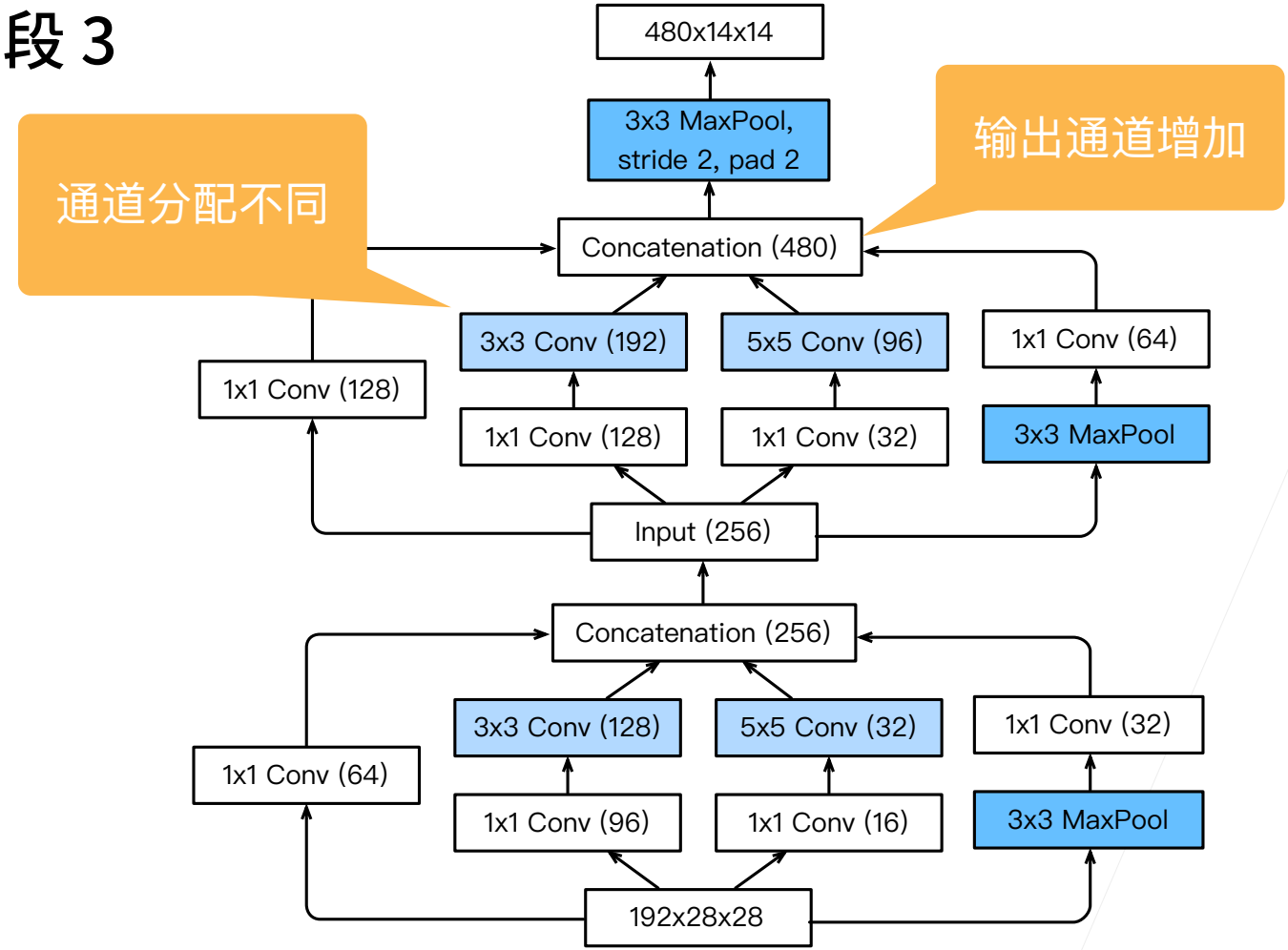
GoogLeNet



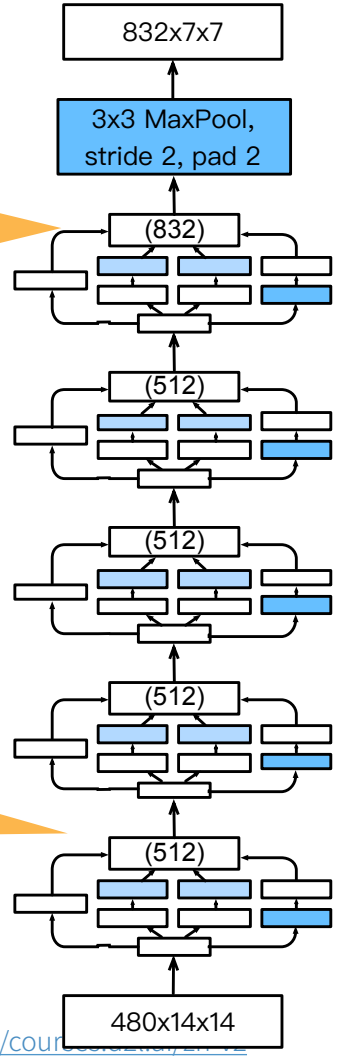
AlexNet



段 3

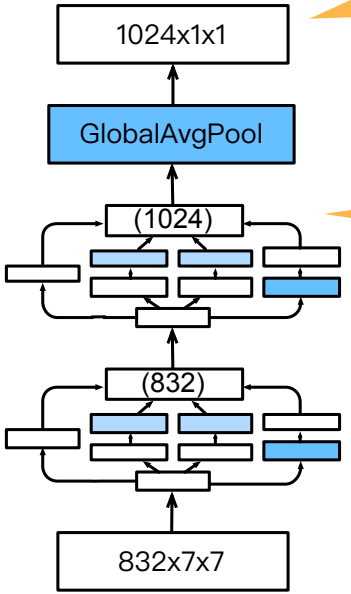

480x14x14
3x3 MaxPool, stride 2, pad 2
通道分配不同
输出通道增加
Concatenation (480)
3x3 Conv (192)
5x5 Conv (96)
1x1 Conv (64)
1x1 Conv (128)
1x1 Conv (128)
1x1 Conv (32)
3x3 MaxPool
Input (256)
Concatenation (256)
3x3 Conv (128)
5x5 Conv (32)
1x1 Conv (32)
1x1 Conv (64)
1x1 Conv (96)
1x1 Conv (16)
3x3 MaxPool
192x28x28

段 4 & 5



增加通道数

增加通道数



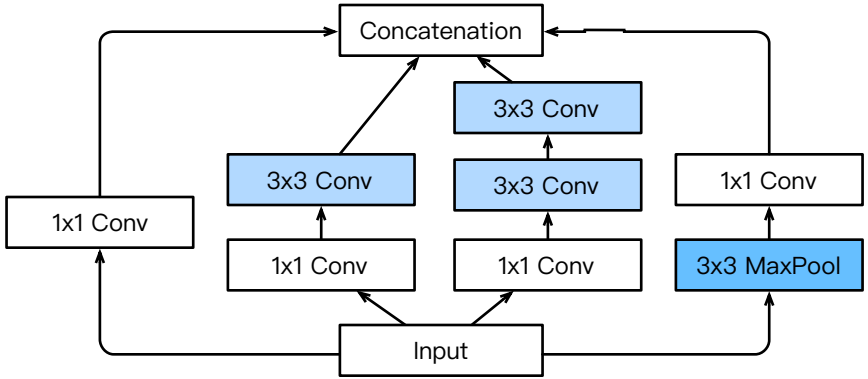
1024维特征输出

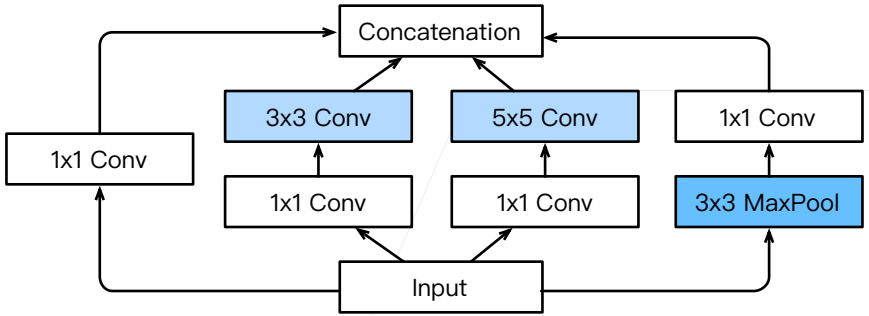
增加通道数

Inception 有各种后续变种

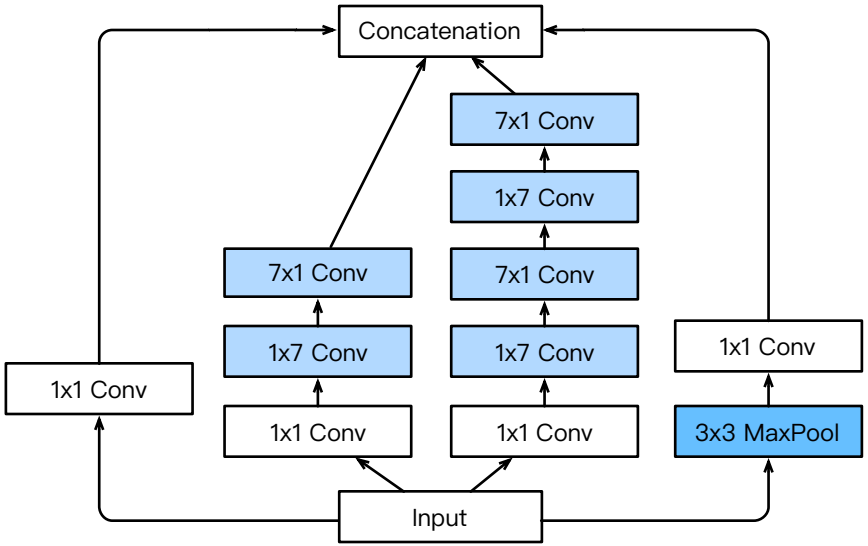
- Inception-BN (v2) - 使用 batch normalization（后面介绍）
- Inception-V3 - 修改了Inception块
  - 替换 5x5 为多个 3x3 卷积层
  - 替换 5x5 为 1x7 和 7x1 卷积层
  - 替换 3x3 为 1x3 和 3x1 卷积层
  - 更深
- Inception-V4 - 使用残差连接（后面介绍）

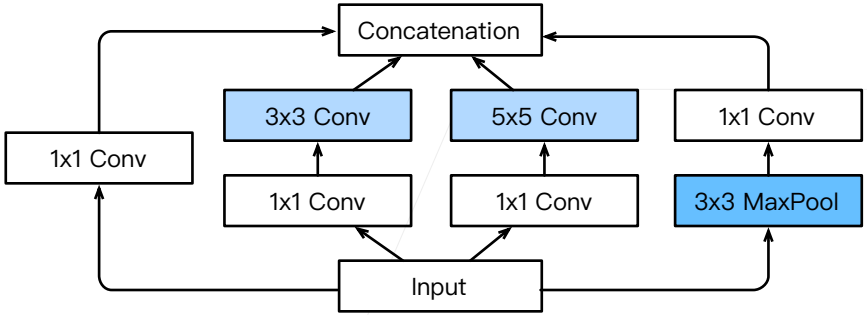
Inception V3 块，段 3



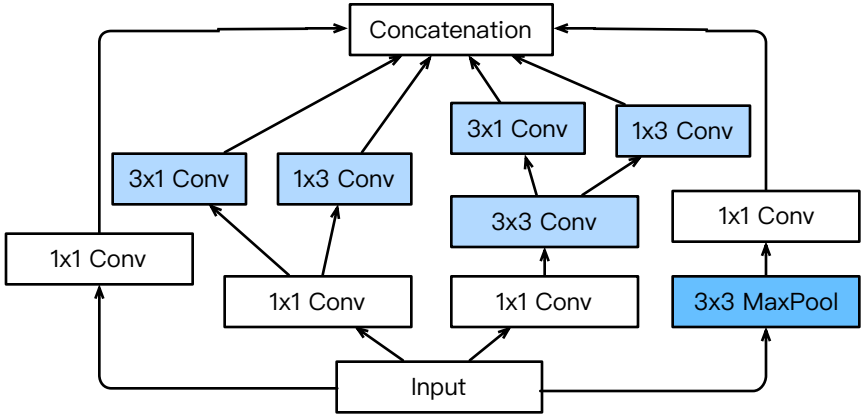


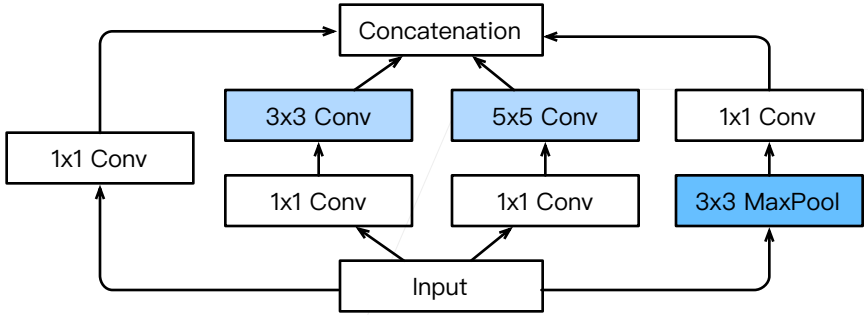
Inception V3 块，段 4

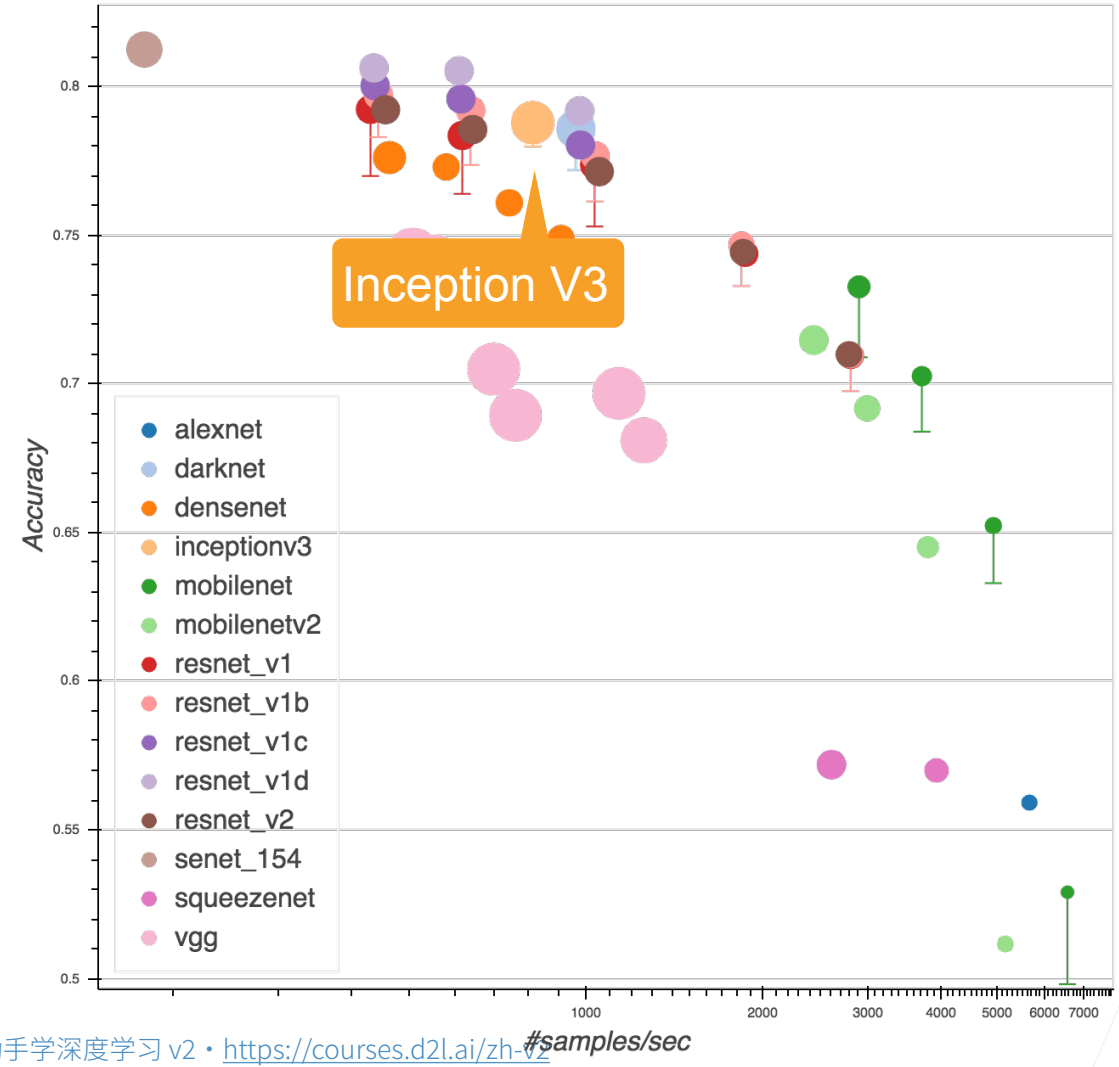




Inception V3 Block，段 5







GluonCV Model Zoo

https://cv.gluon.ai/model_zoo/classification.html

总结

- Inception块用4条有不同超参数的卷积层和池化层的路来抽取不同的信息
  - 它的一个主要优点是模型参数小，计算复杂度低
- GoogleNet使用了9个Inception块，是第一个达到上百层的网络
  - 后续有一系列改进