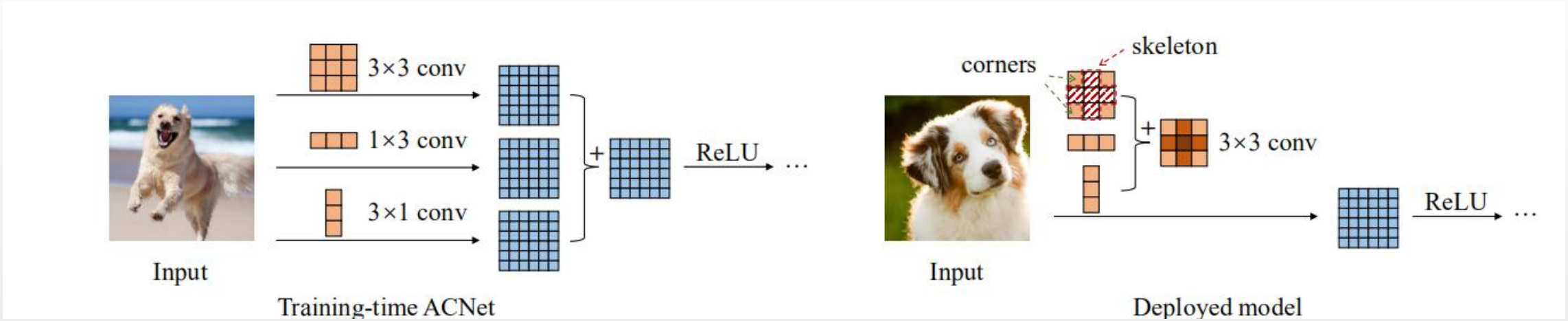
非对称卷积(Asymmetric Convolution)

异构卷积(Heterogeneous Convolution)

八度卷积(Octave Convolution)

非对称卷积(Asymmetric Convolution)

李玉光



非对称卷积(Asymmetric Convolution)

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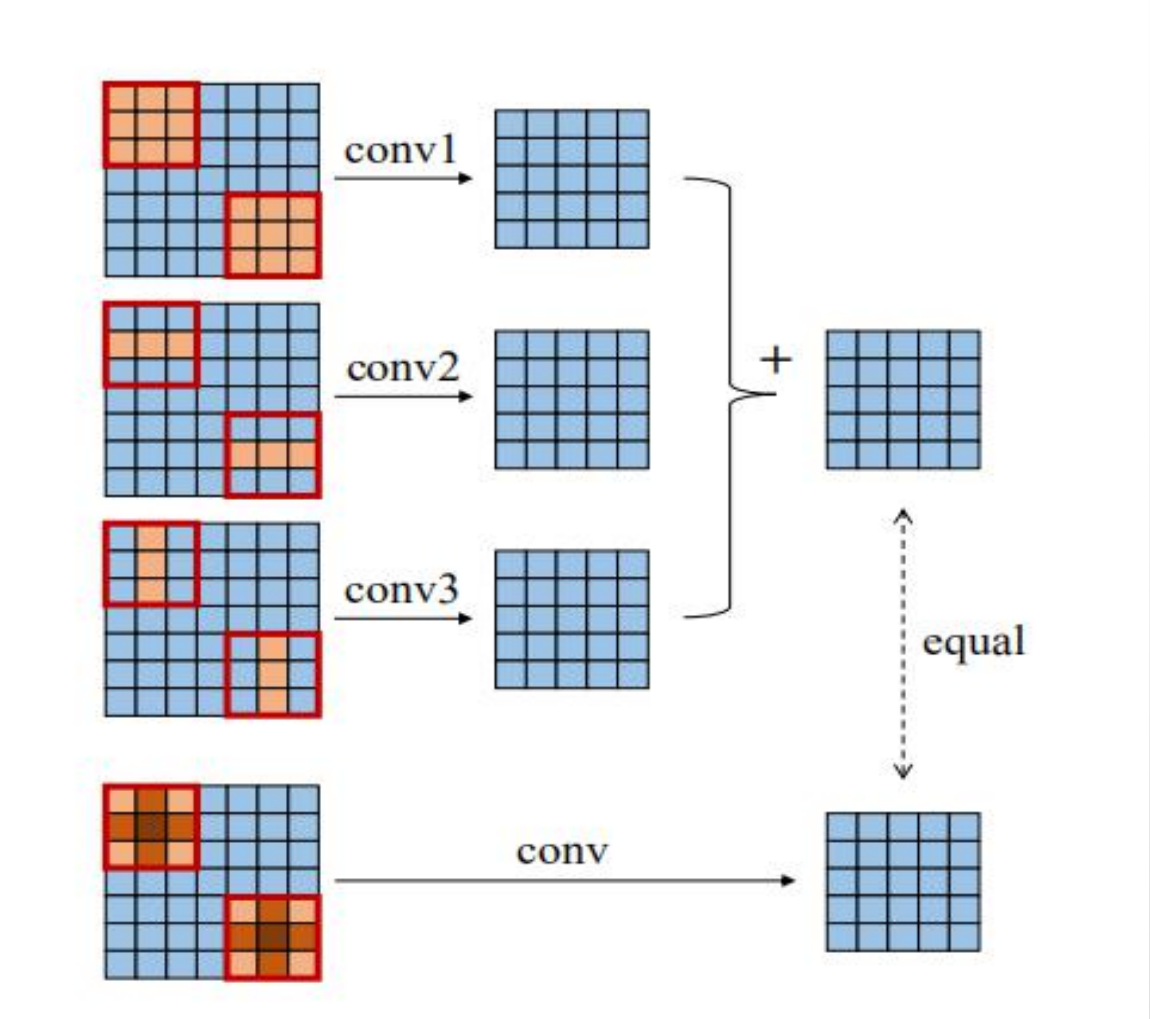

利用卷积的可加性

非对称卷积(Asymmetric Convolution)

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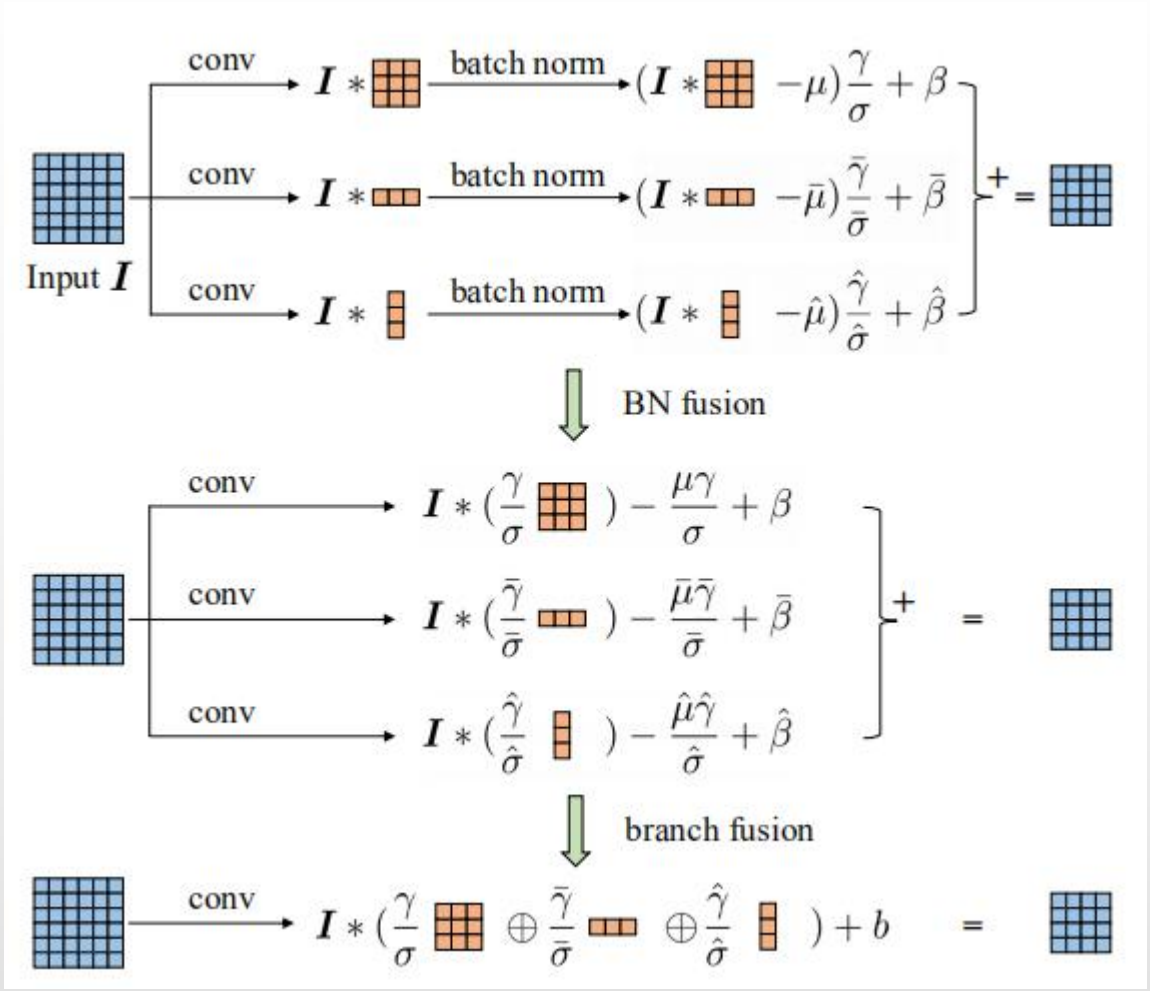

非对称卷积(Asymmetric Convolution)

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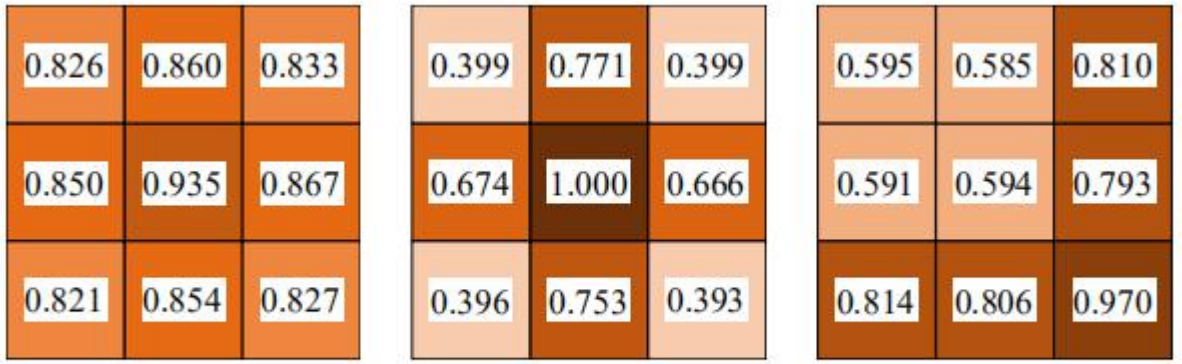
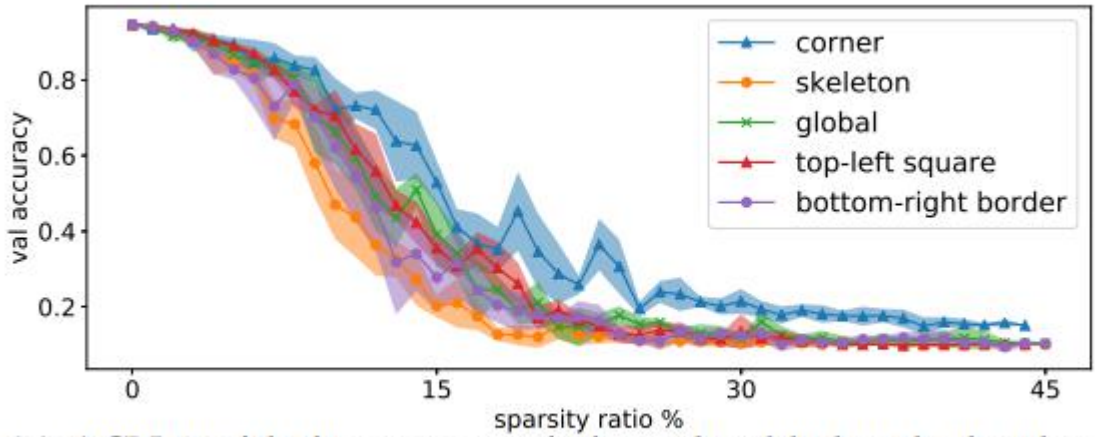


(a) Normal. (b) ACNet, skeleton. (c) ACNet, border.



(c) ACNet with the asymmetric kernels added to the border.

非对称卷积(Asymmetric Convolution)

李玉光

```python
import torch.nn as nn
import torch.nn.init as init
from custom_layers.crop_layer import CropLayer
# source: https://github.com/DingXiaoH/ACNet/blob/master/acnet/acb.py

class ACBlock(nn.Module):

    def __init__(self, in_channels, out_channels, kernel_size, stride=1, padding =0):
        super(ACBlock, self).__init__()
        self.square_conv = nn.Conv2d(in_channels=in_channels, out_channels=out_channels,
                                     kernel_size=(kernel_size, kernel_size), stride=stride,
                                     padding=padding)
        self.square_bn = nn.BatchNorm2d(num_features=out_channels, affine=use_affine)
        self.ver_conv = nn.Conv2d(in_channels=in_channels, out_channels=out_channels, kernel_size=(kernel_size, 1)
                                  stride=stride,padding=padding)

        self.hor_conv = nn.Conv2d(in_channels=in_channels, out_channels=out_channels, kernel_size=(1, kernel_size)
                                  stride=stride,padding=padding)
        self.ver_bn = nn.BatchNorm2d(num_features=out_channels, affine=use_affine)
        self.hor_bn = nn.BatchNorm2d(num_features=out_channels, affine=use_affine)
```

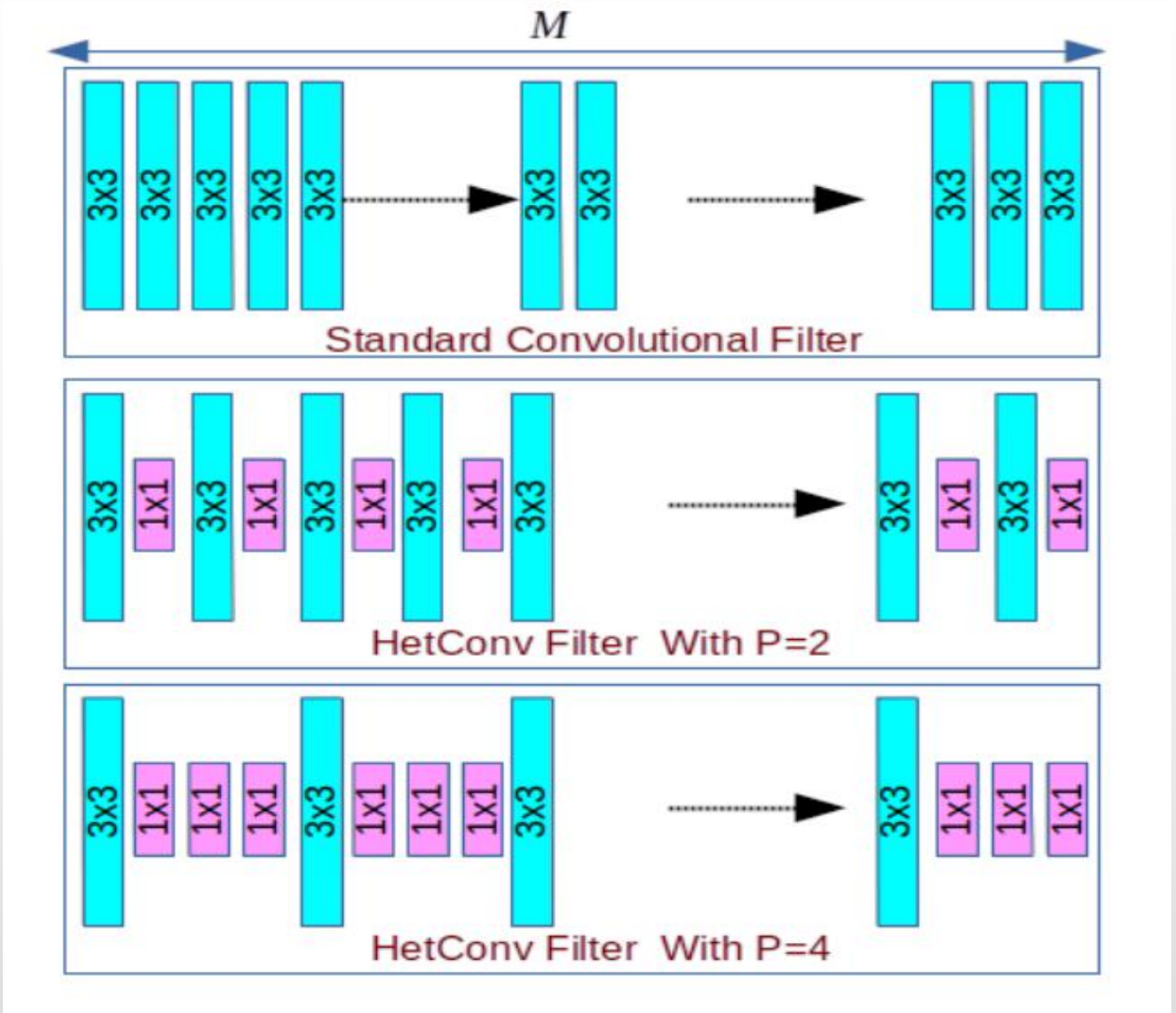
非对称卷积(Asymmetric Convolution)

李玉光

```
def forward(self, input):
    if self.deploy:
        return self.fused_conv(input)
    else:
        square_outputs = self.square_conv(input)
        square_outputs = self.square_bn(square_outputs)
        vertical_outputs = self.ver_conv(vertical_outputs)
        vertical_outputs = self.ver_bn(vertical_outputs)
        horizontal_outputs = self.hor_conv(horizontal_outputs)
        horizontal_outputs = self.hor_bn(horizontal_outputs)
        result = square_outputs + vertical_outputs + horizontal_outputs
        return result
```

异构卷积(Heterogeneous Convolution)

李玉光



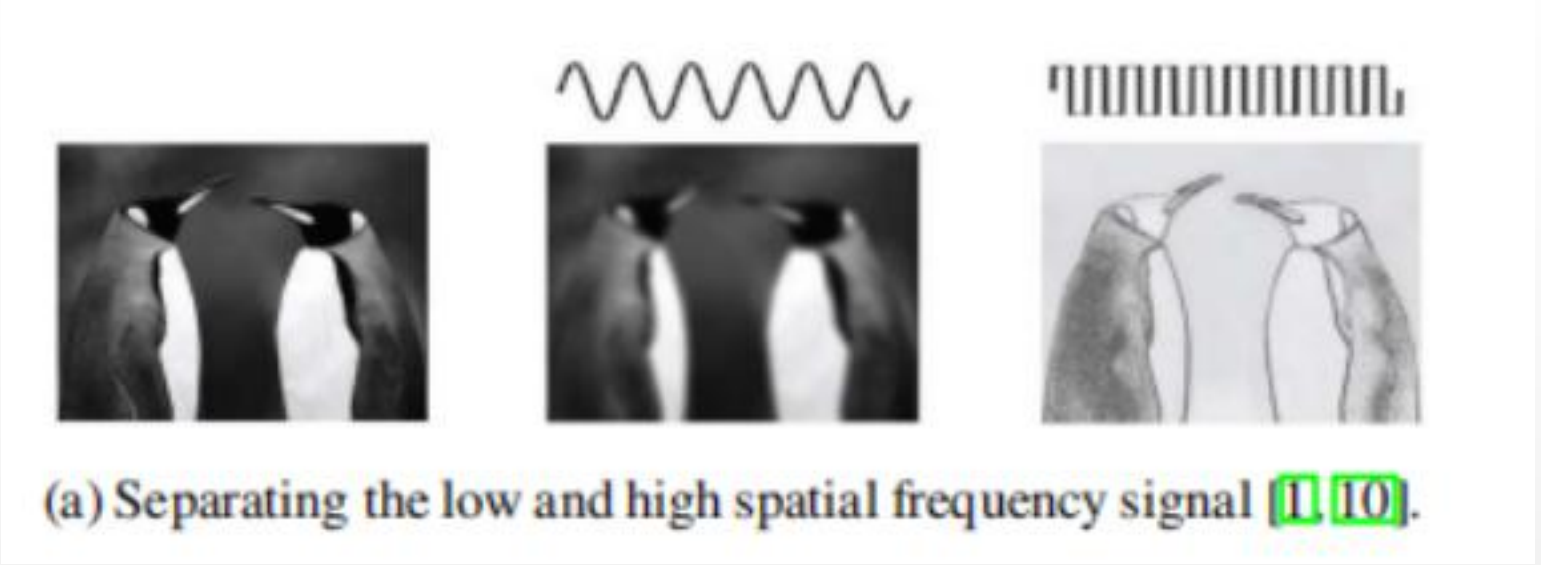
异构卷积(Heterogeneous Convolution)

李玉光

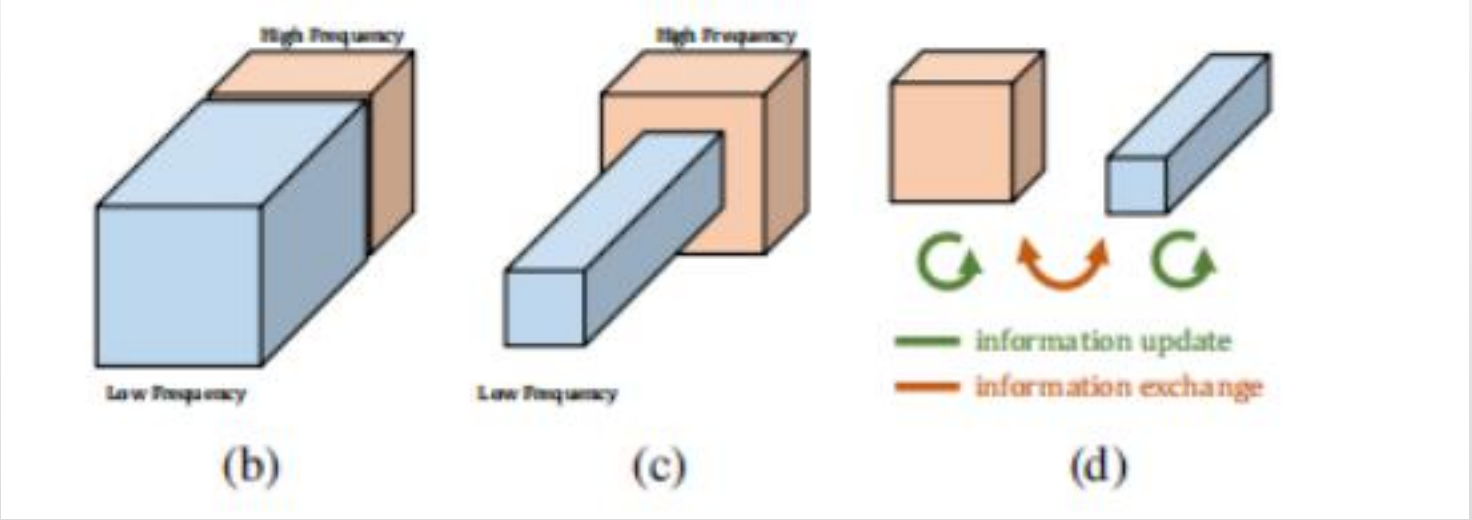
```python
class HetConv(nn.Module):
    def __init__(self, in_channels, out_channels, p):
        super(HetConv, self).__init__()
        # Groupwise Convolution
        self.gwc = nn.Conv2d(in_channels, out_channels, kernel_size=3, padding=1, groups=p, bias=False)
        # Pointwise Convolution
        self.pwc = nn.Conv2d(in_channels, out_channels, kernel_size=1, bias=False)

    def forward(self, x):
        return self.gwc(x) + self.pwc(x)
```

八度卷积(Octave Convolution)

李玉光



(a) Separating the low and high spatial frequency signal [1, 10].



八度卷积(Octave Convolution)

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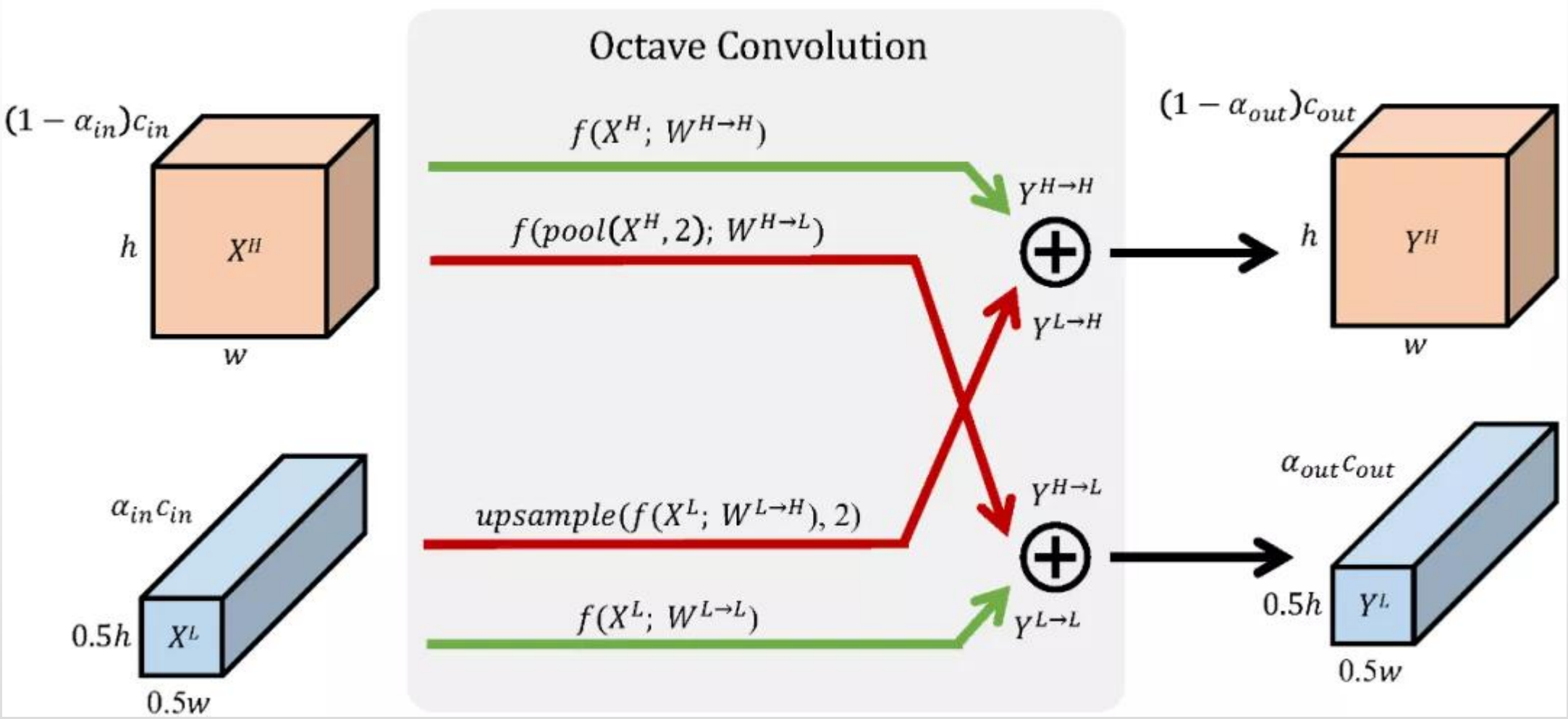

八度卷积(Octave Convolution)

李玉光

```
class OctaveConv(nn.Module):
    def __init__(self, in_channels, out_channels, kernel_size, alpha=0.5, stride=1, padding=1, dilation=1,
                 groups=1, bias=False):
        super(OctaveConv, self).__init__()
        kernel_size = kernel_size[0]
        self.h2g_pool = nn.AvgPool2d(kernel_size=(2, 2), stride=2)
        self.upsample = torch.nn.Upsample(scale_factor=2, mode='nearest')
        self.stride = stride
        self.l2l = torch.nn.Conv2d(int(alpha * in_channels), int(alpha * out_channels),
                                   kernel_size, 1, padding, dilation, groups, bias)
        self.l2h = torch.nn.Conv2d(int(alpha * in_channels), out_channels - int(alpha * out_channels),
                                   kernel_size, 1, padding, dilation, groups, bias)
        self.h2l = torch.nn.Conv2d(in_channels - int(alpha * in_channels), int(alpha * out_channels),
                                   kernel_size, 1, padding, dilation, groups, bias)
        self.h2h = torch.nn.Conv2d(in_channels - int(alpha * in_channels),
                                   out_channels - int(alpha * out_channels),
                                   kernel_size, 1, padding, dilation, groups, bias)
```

八度卷积(Octave Convolution)

李玉光

```
def forward(self, x):
    X_h, X_l = x
    if self.stride ==2:
        X_h, X_l = self.h2g_pool(X_h), self.h2g_pool(X_l)
    X_h2l = self.h2g_pool(X_h)
    X_h2h = self.h2h(X_h)
    X_l2h = self.l2h(X_l)
    X_l2l = self.l2l(X_l)
    X_h2l = self.h2l(X_h2l)

    X_l2h = self.upsample(X_l2h)
    X_h = X_l2h + X_h2h
    X_l = X_h2l + X_l2l
    return X_h, X_l
```

感谢大家！