

Redes Neurais e Deep Learning

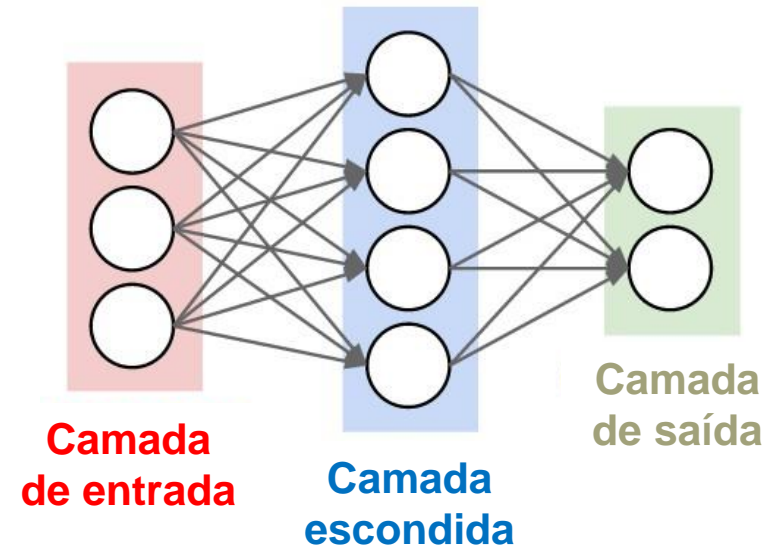
REDES NEURAIS CONVOLUCIONAIS

CAMADA CONVOLUCIONAL

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zenilton@pucminas.br

Camada Convolutucional

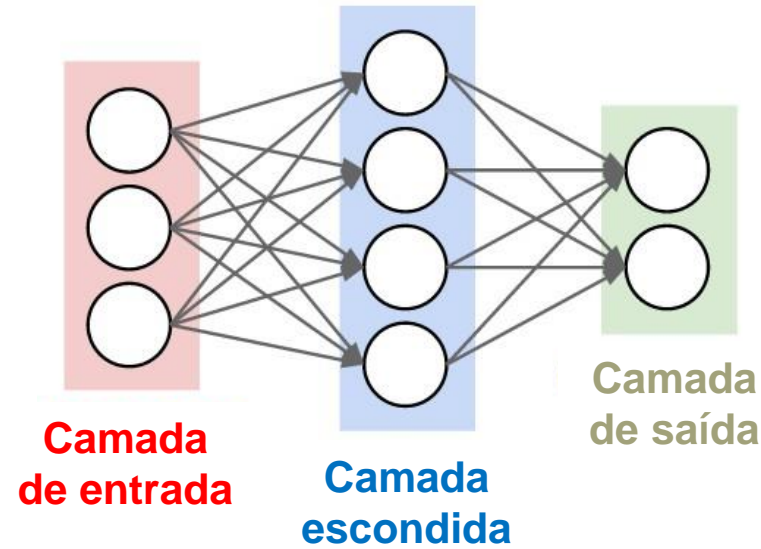
Antes:



Todos os filtros
na mesma
camada são os
mesmos

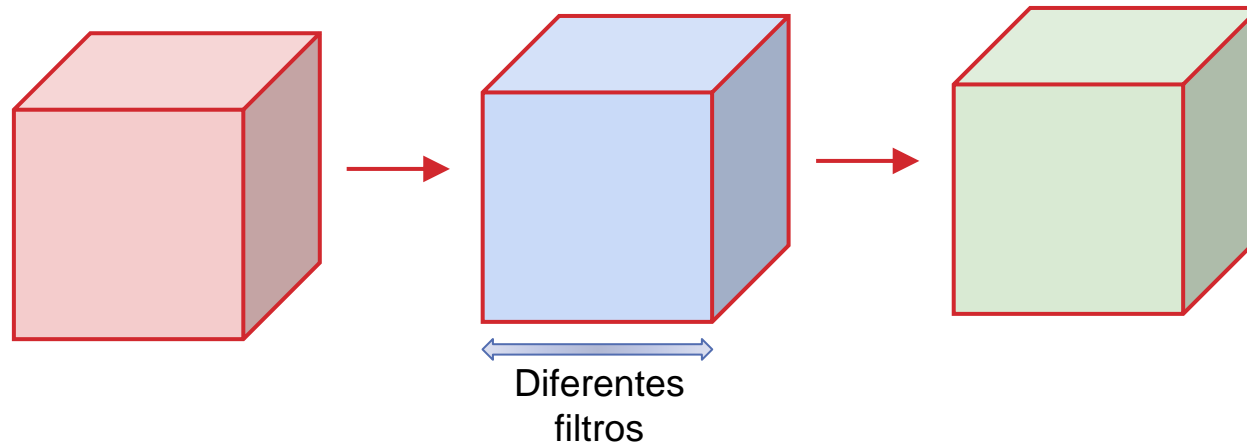
Camada Convolutucional

Antes:



Todos os filtros na mesma camada são os mesmos

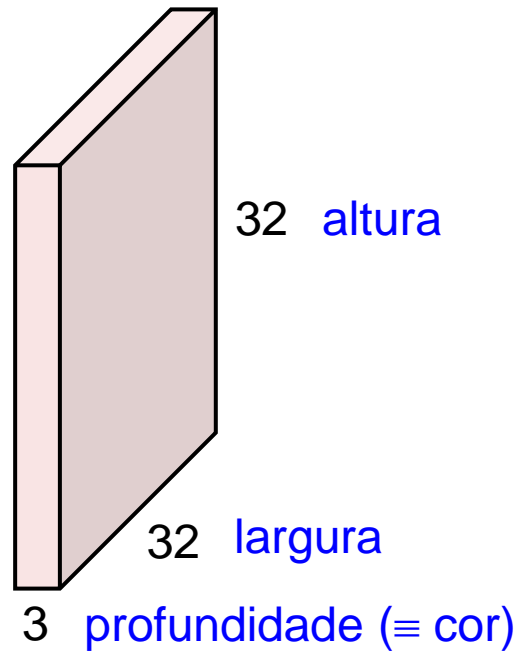
Agora:



A dimensão da profundidade representa filtros diferentes

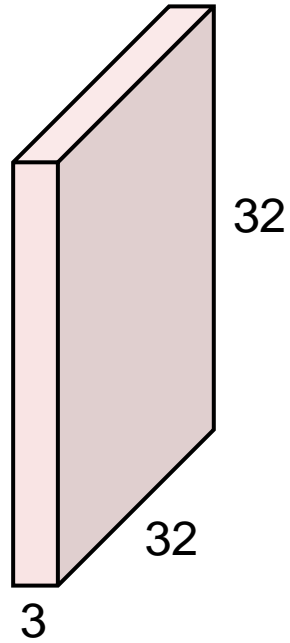
Camada Convolutacional

Imagem $32 \times 32 \times 3$



Camada Convolutacional

Imagem $32 \times 32 \times 3$

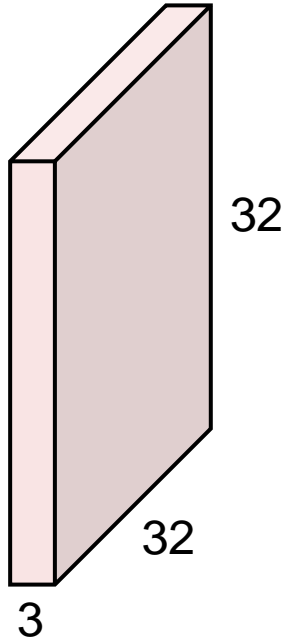


Filtro $5 \times 5 \times 3$



Camada Convolutacional

Imagem $32 \times 32 \times 3$

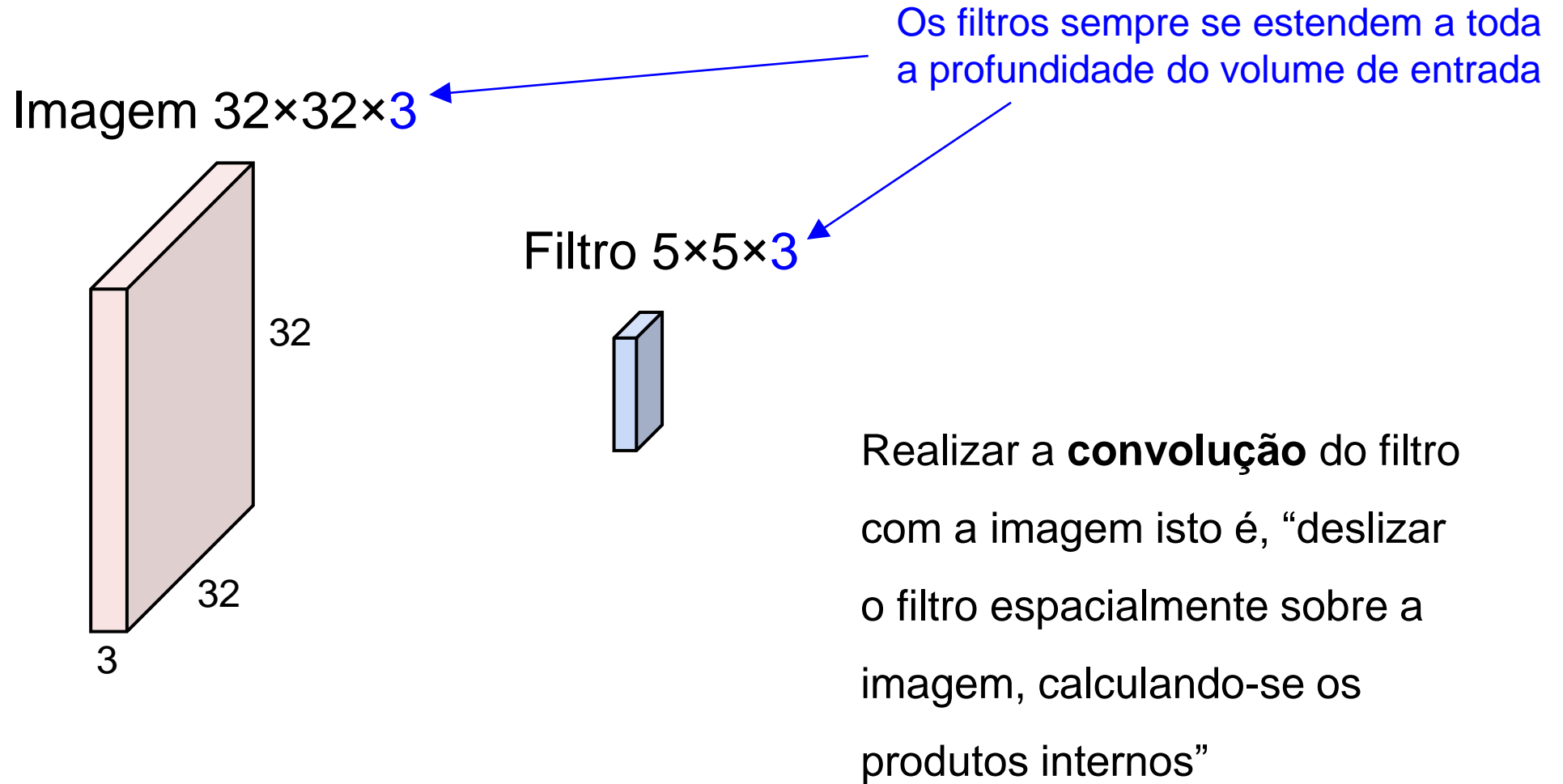


Filtro $5 \times 5 \times 3$

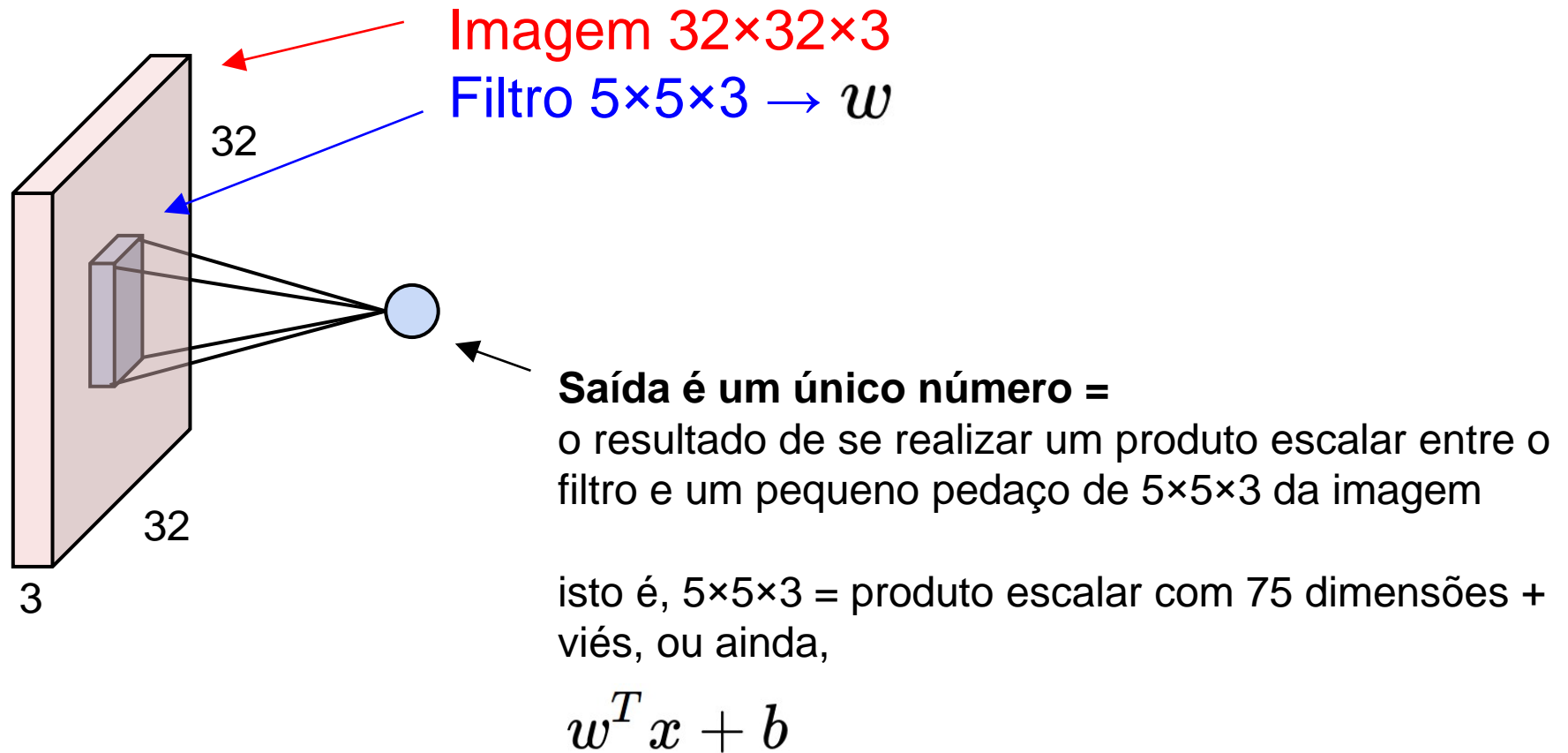


Realizar a **convolução** do filtro com a imagem isto é, “deslizar o filtro espacialmente sobre a imagem, calculando-se os produtos internos”

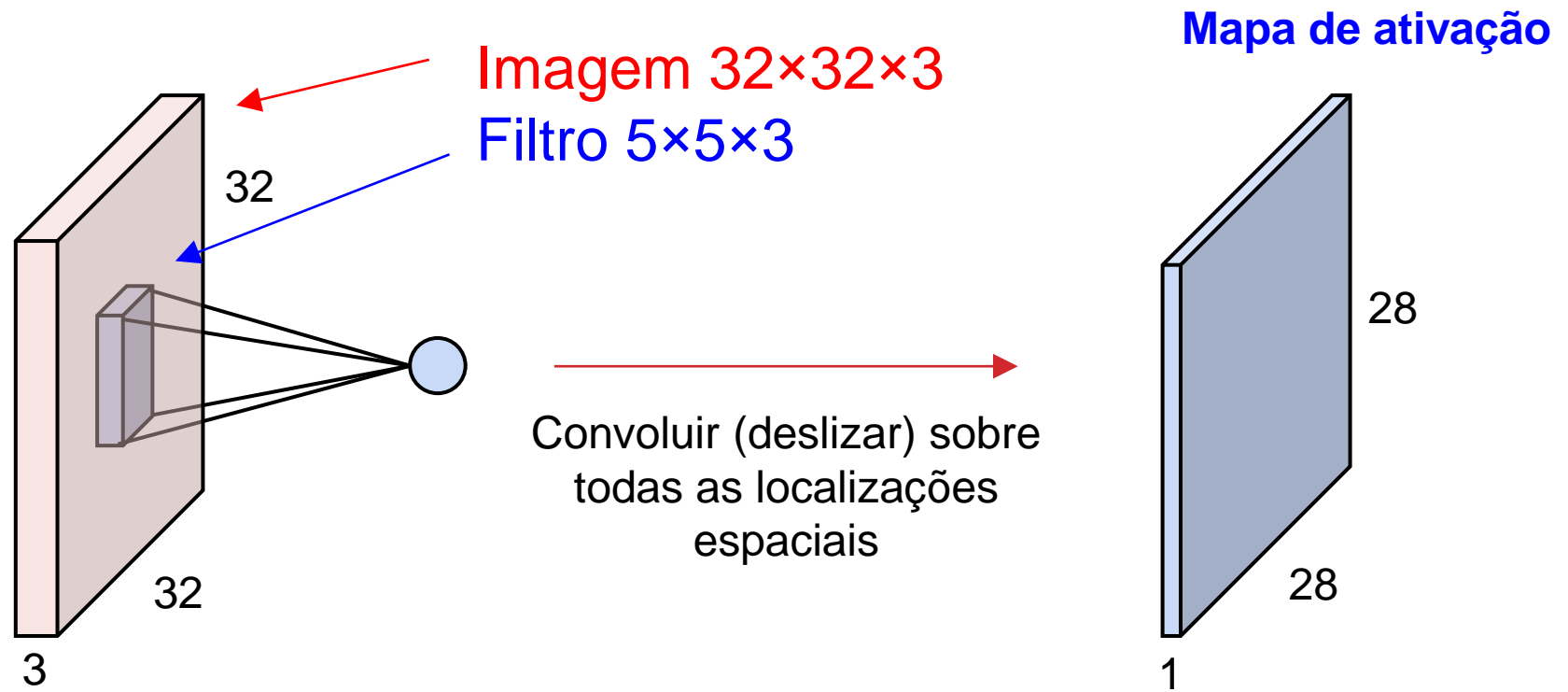
Camada Convolutiva



Camada Convolutiva

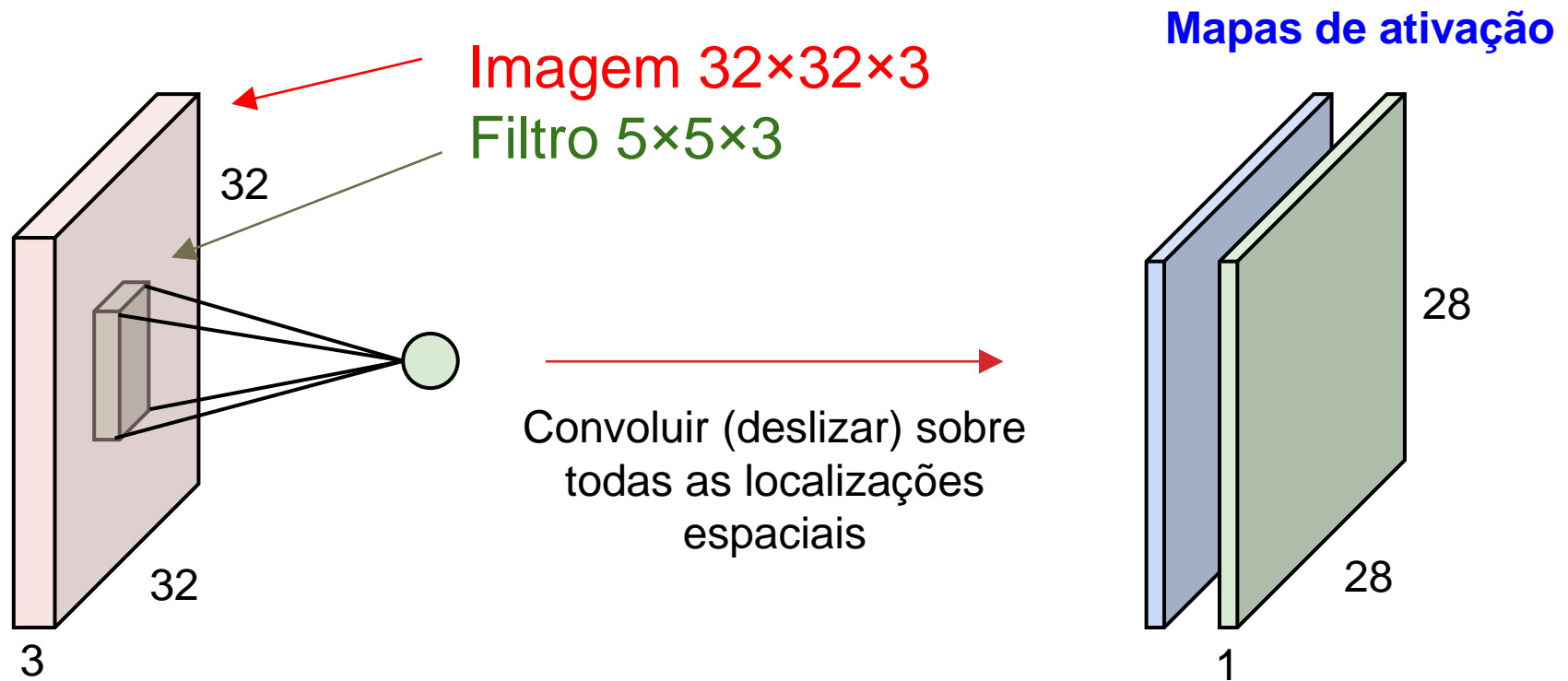


Camada Convolutucional



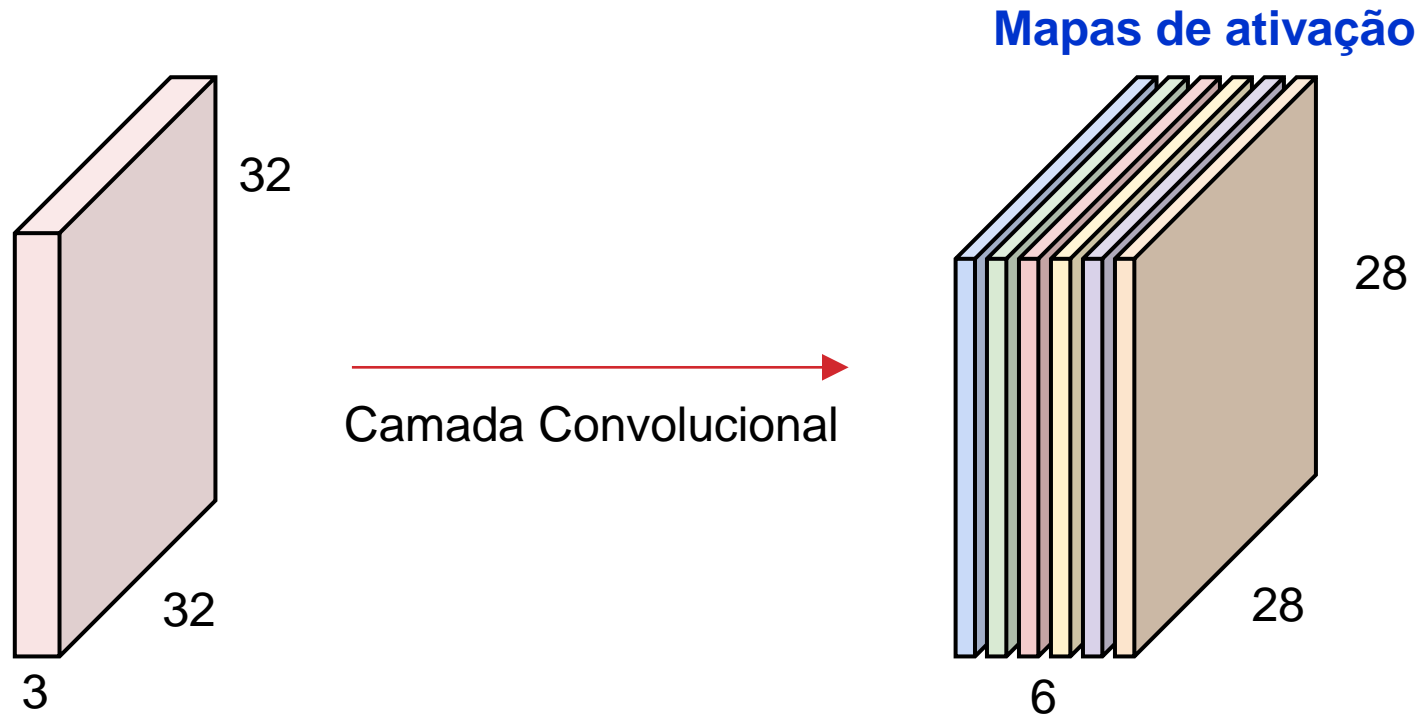
Camada Convolutiva

Considere um segundo filtro (em verde)



Camada Convolutacional

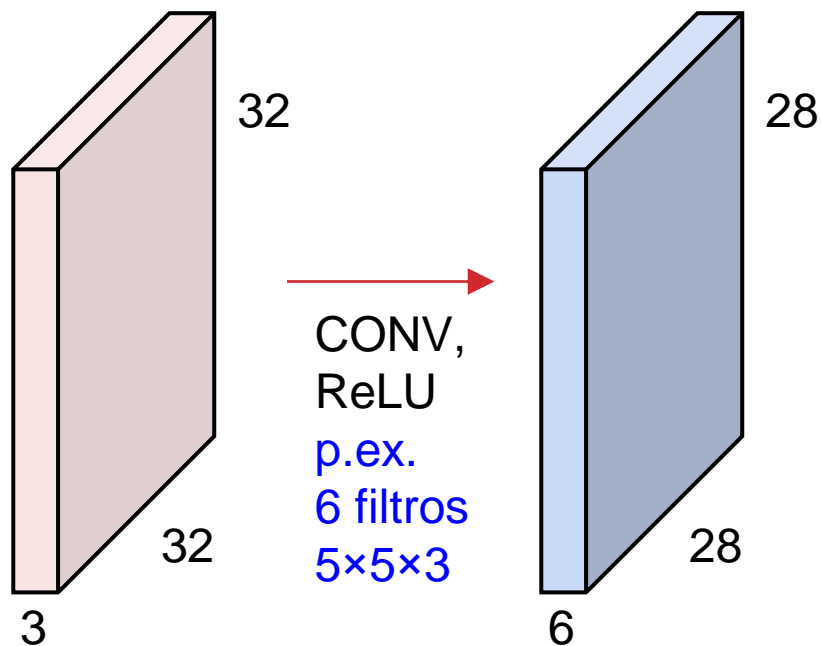
Por exemplo, se tivermos 6 filtros 5×5 , obtém-se 6 mapas de ativação distintos



Esses mapas podem ser agrupados (ou empilhados) de forma a produzir uma “nova imagem” de tamanho $28 \times 28 \times 6$!

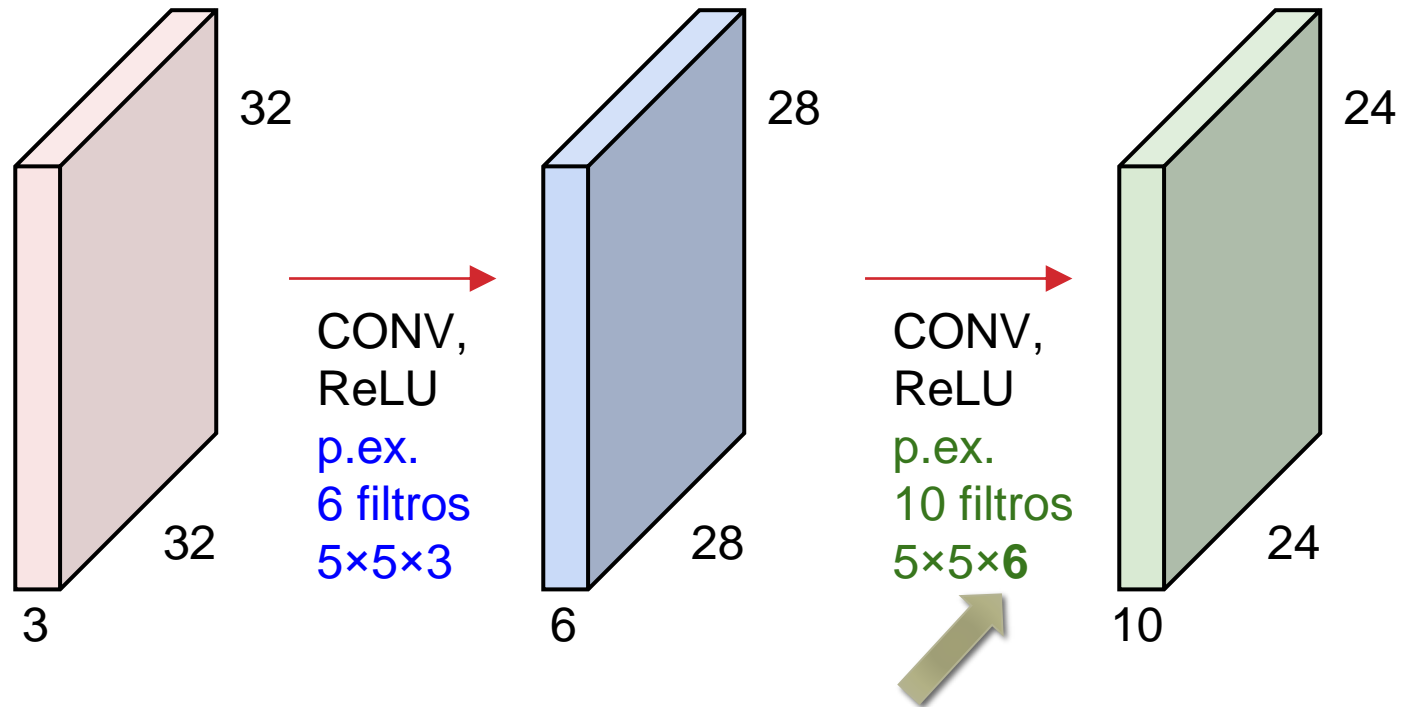
Camada Convolutiva

Uma rede convolutiva (ConvNet) representa uma sequência de camadas convolucionais intercaladas com funções de ativação



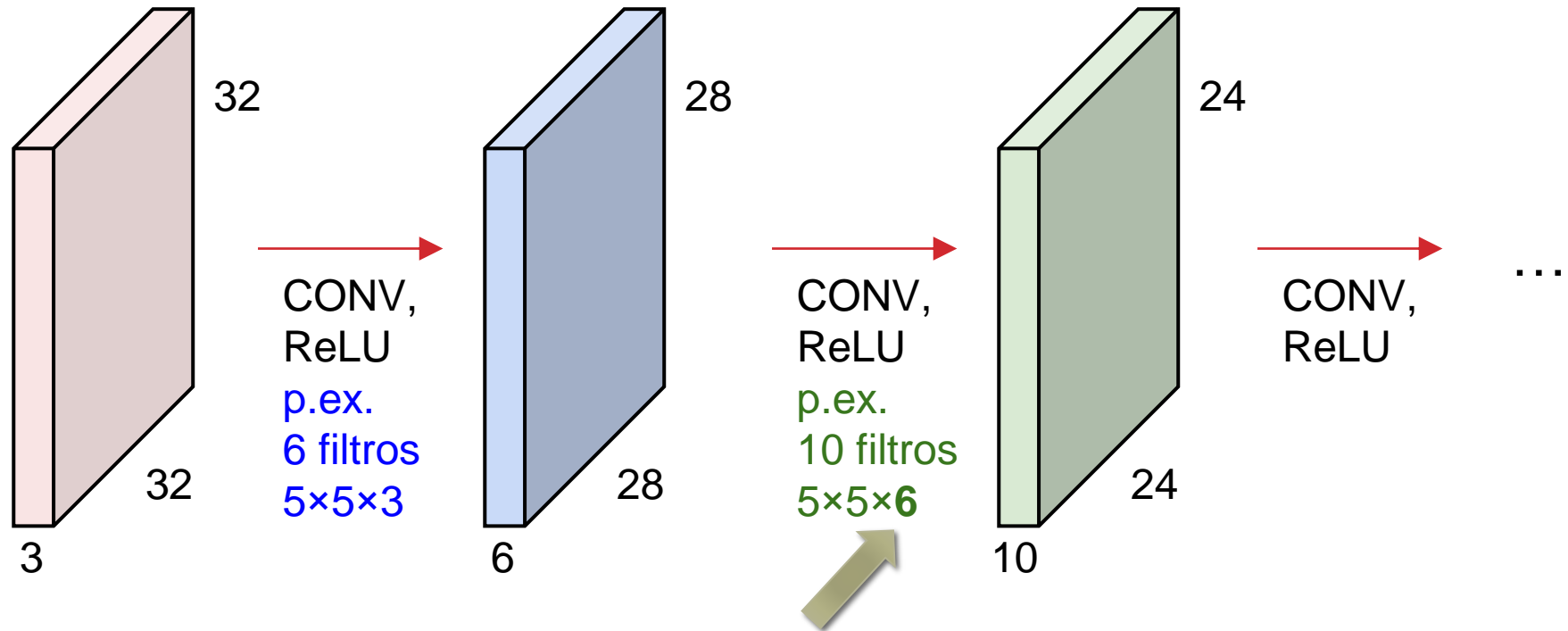
Camada Convolutiva

Uma rede convolucional (ConvNet) representa uma sequência de camadas convolucionais intercaladas com funções de ativação



Camada Convolutiva

Uma rede convolucional (ConvNet) representa uma sequência de camadas convolucionais intercaladas com funções de ativação



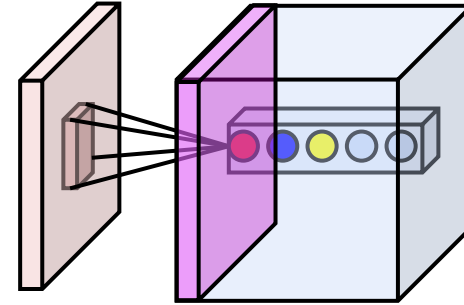
Camada Convolutiva

Entrada:



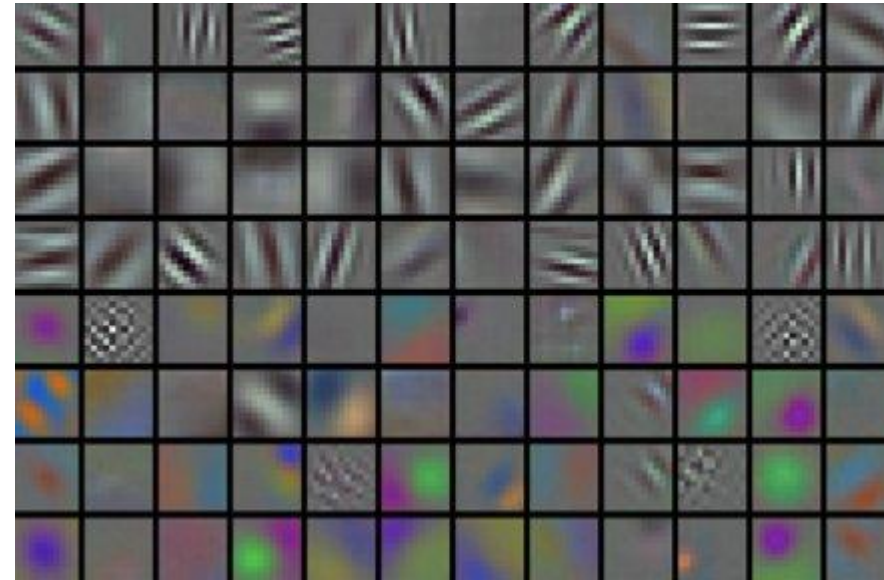
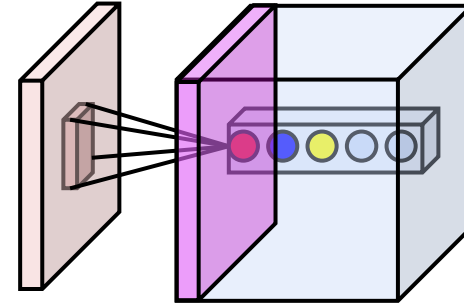
Camada Convolutiva

Entrada:



Camada Convolutiva

Entrada:

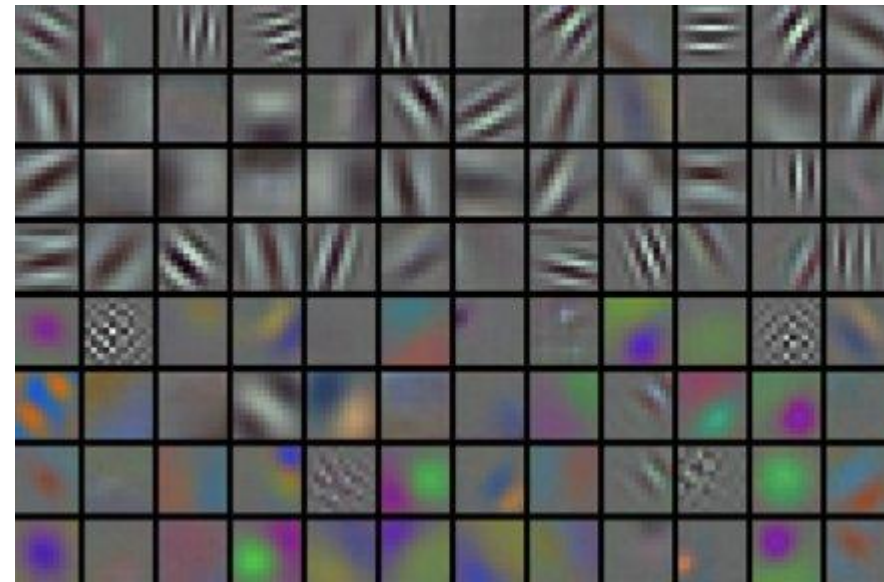
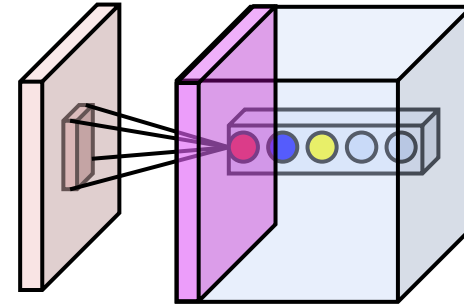
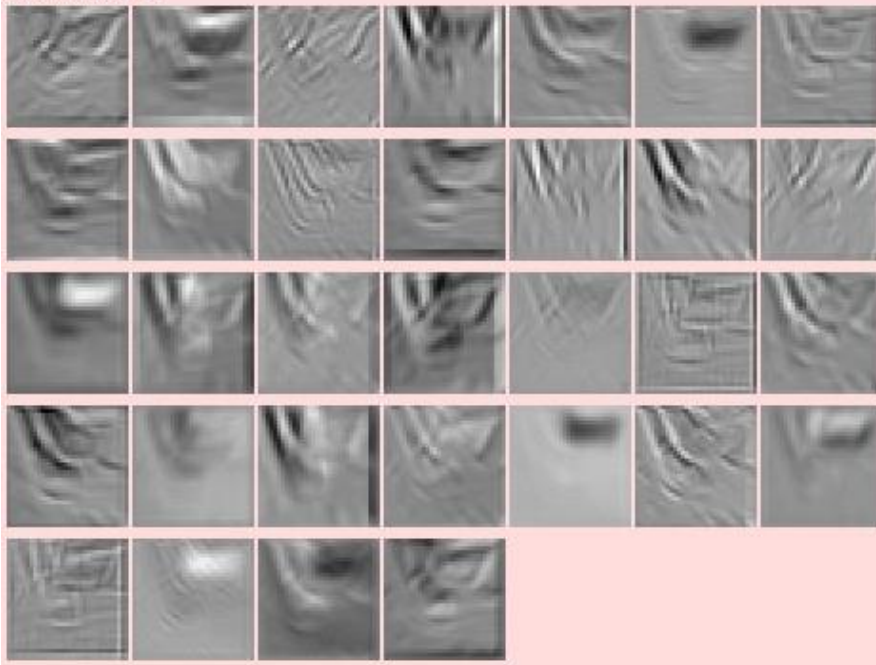


Camada Convolutucional

Entrada:



Ativações:

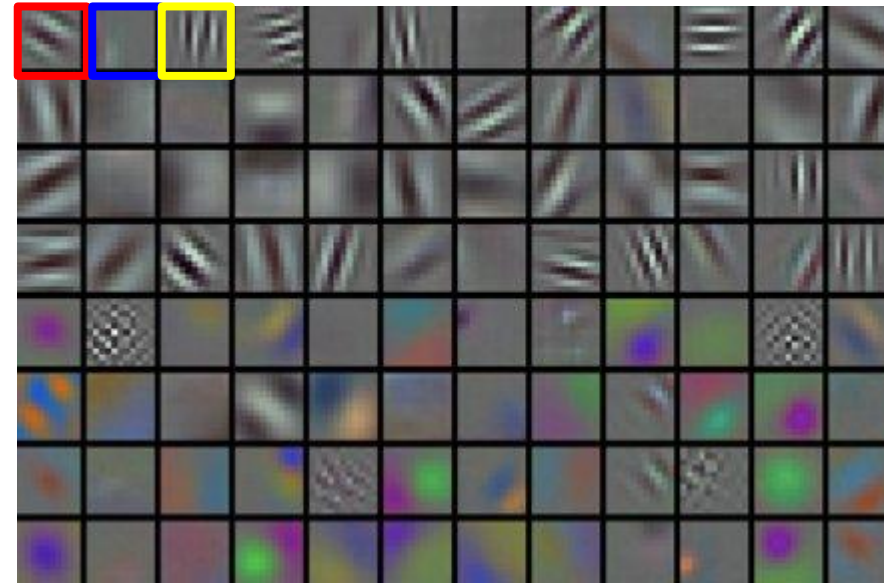
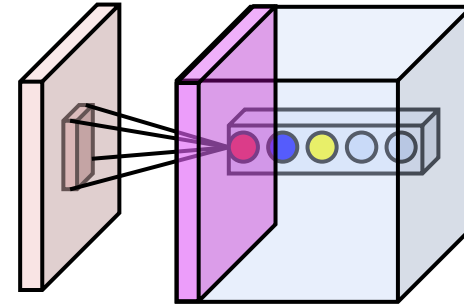
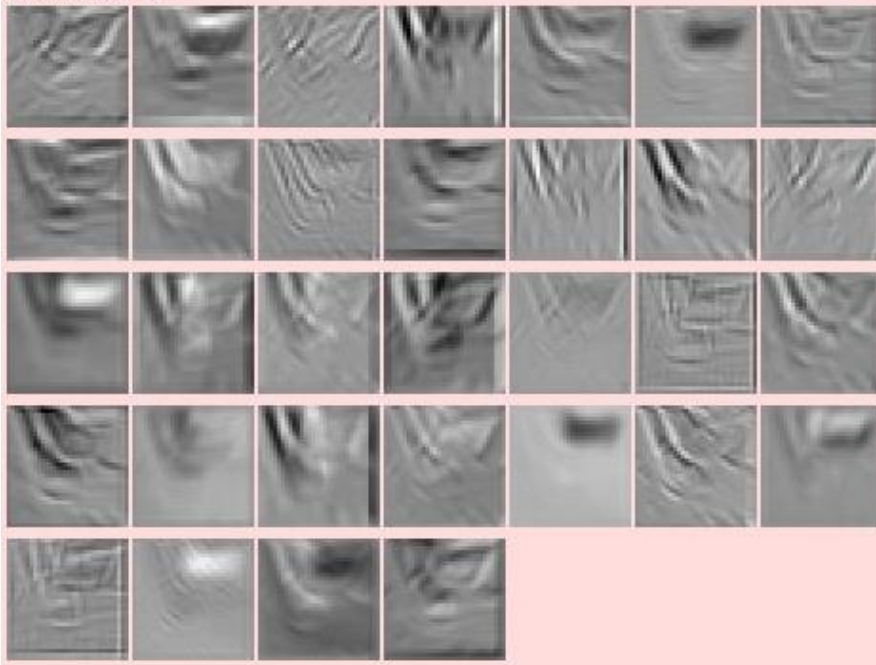


Camada Convolucional

Entrada:

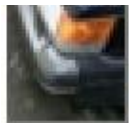


Ativações:

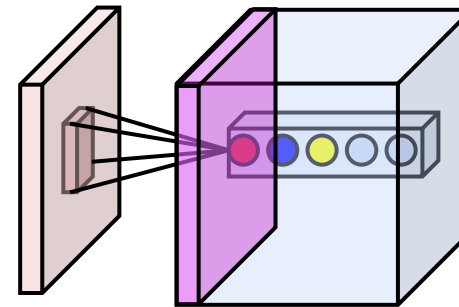


Camada Convolutucional

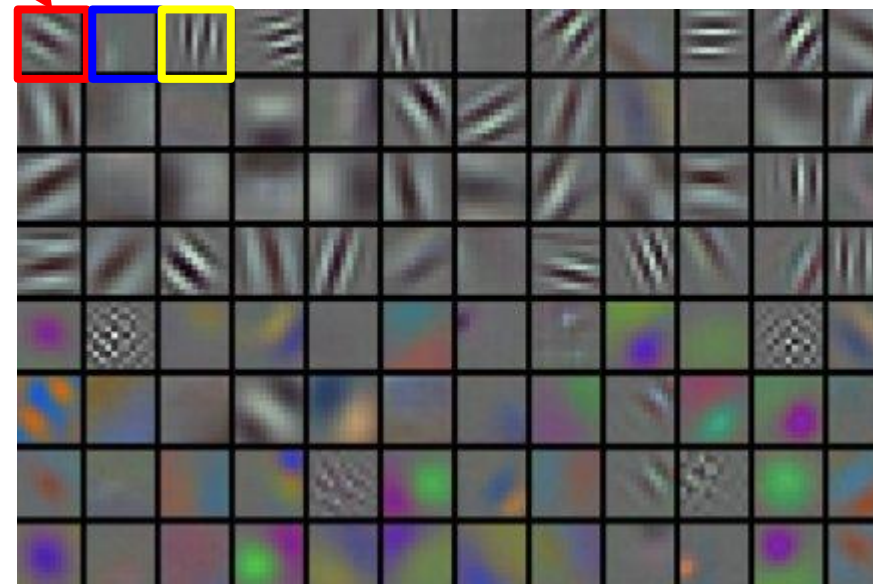
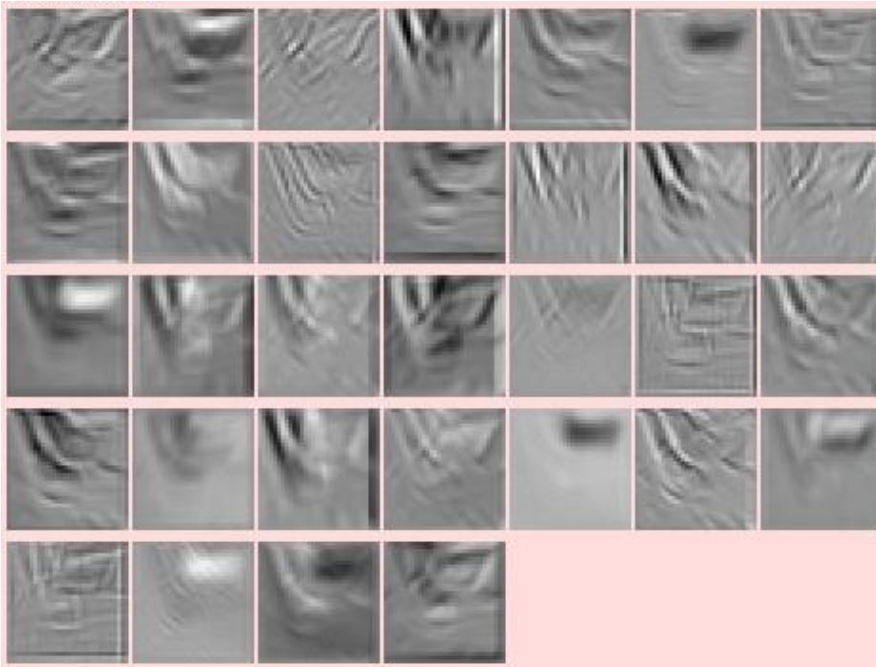
Entrada:



convoluir o primeiro **filtro** na entrada resulta na primeira fatia do volume de saída



Ativações:

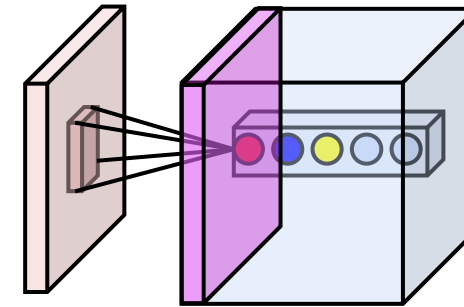


Camada Convolutucional

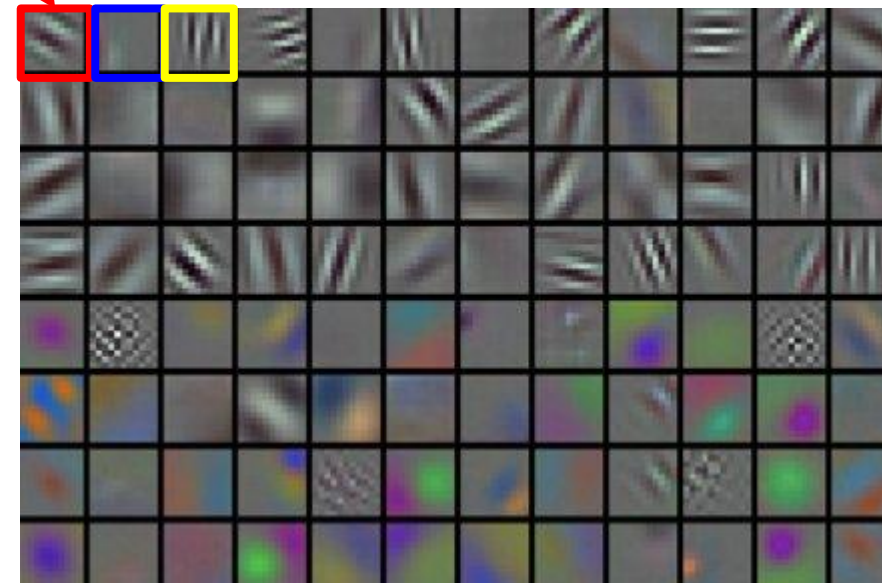
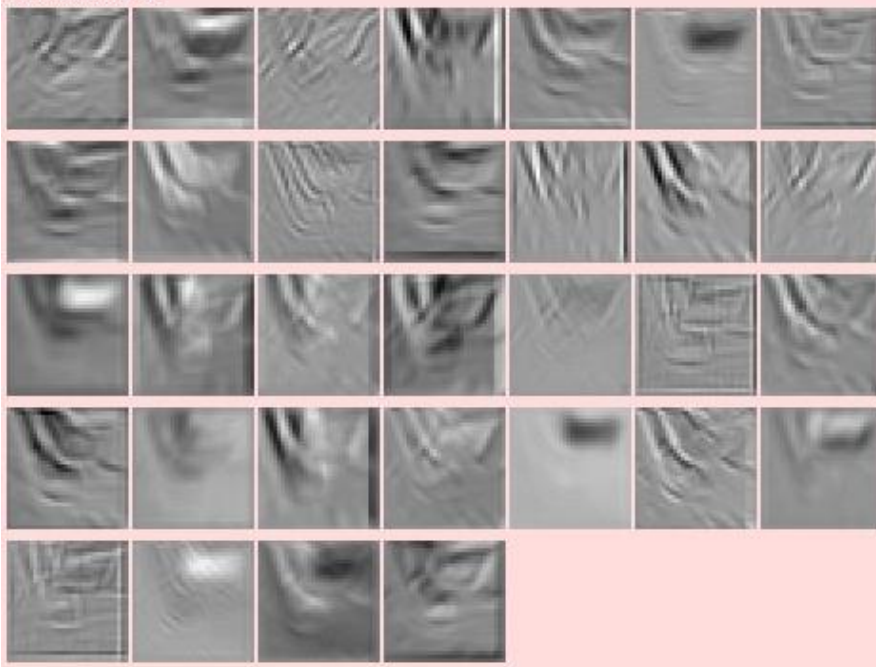
Entrada:



convoluir o primeiro **filtro** na **entrada** resulta na primeira fatia do volume de saída



Ativações:

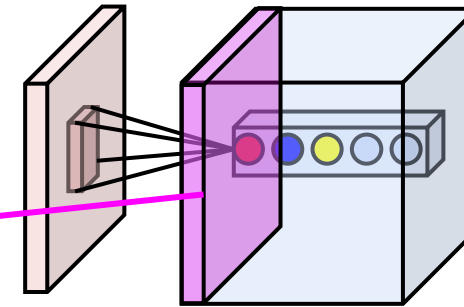


Camada Convolutucional

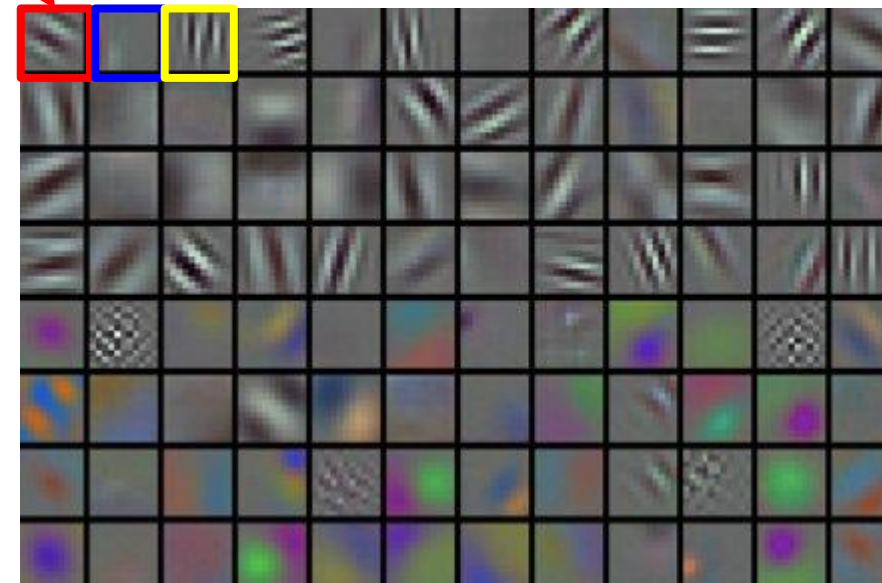
Entrada:



convoluir o primeiro filtro na entrada resulta na primeira fatia do volume de saída



Ativações:



Camada Convolutucional

Entrada:



convoluir o primeiro filtro na entrada resulta na primeira fatia do volume de saída

Ativações:

