REDES NEURAIS CONVOLUCIONAIS

CAMADA CONVOLUCIONAL

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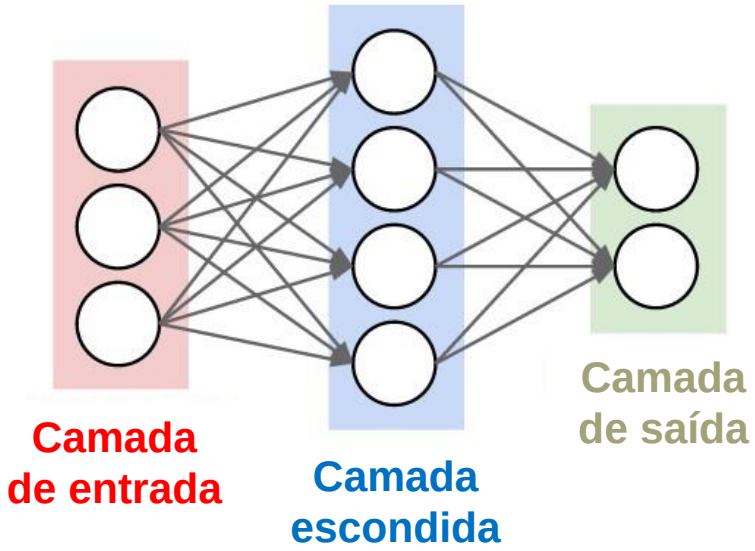
zenilton@pucminas.br

Camada Convolucional

Antes:



Todos os filtros na mesma camada são os mesmos

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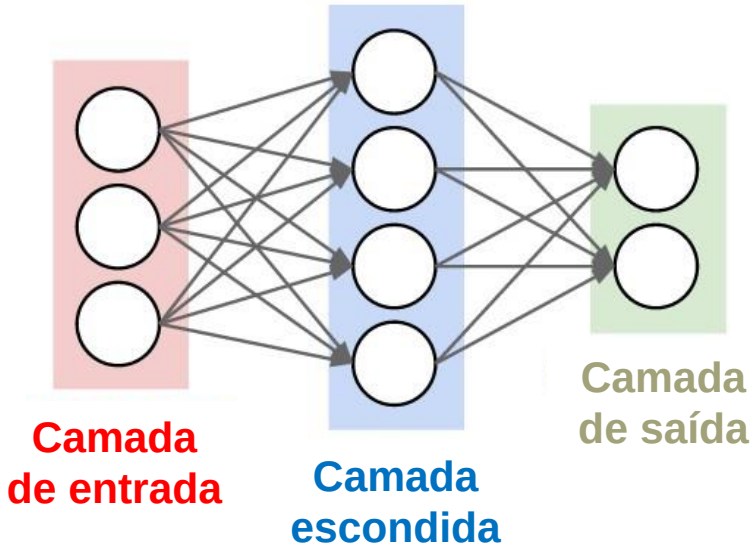
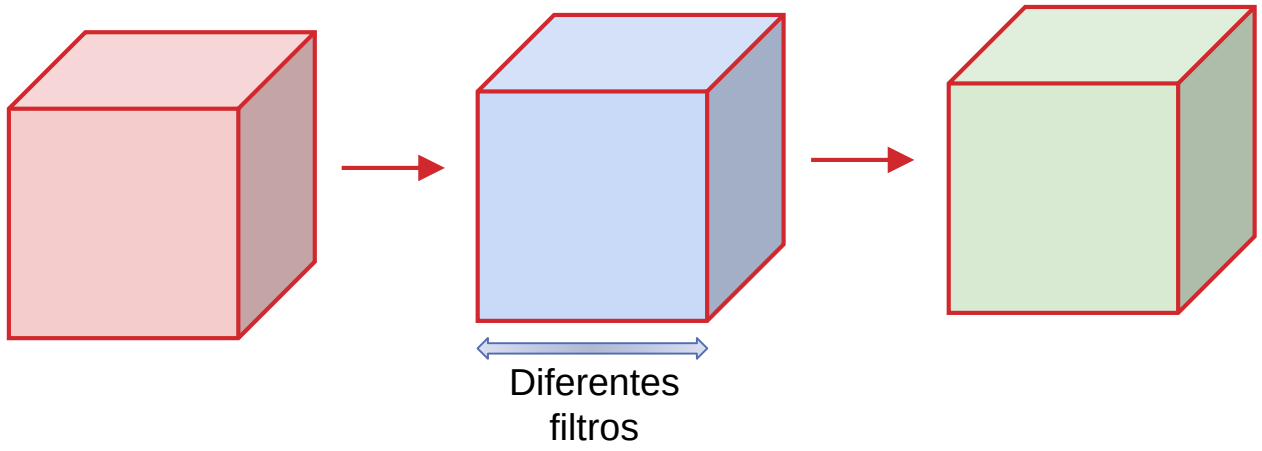


Todos os filtros na mesma camada são os mesmos

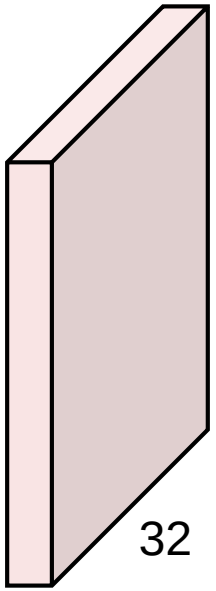
Agora:



A dimensão da profundidade representa filtros diferentes

Camada Convolucional

Imagem 32×32×3



32 altura

32 largura

3 profundidade (≡ cor)

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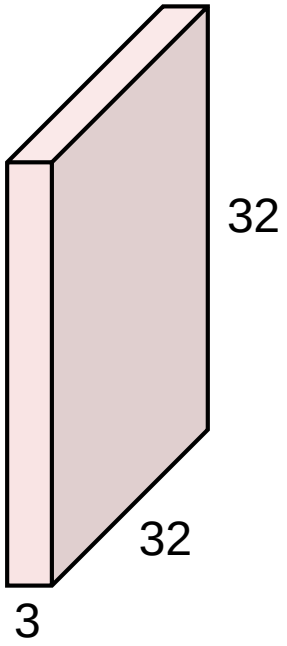
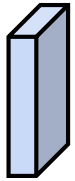


Filtro 5×5×3



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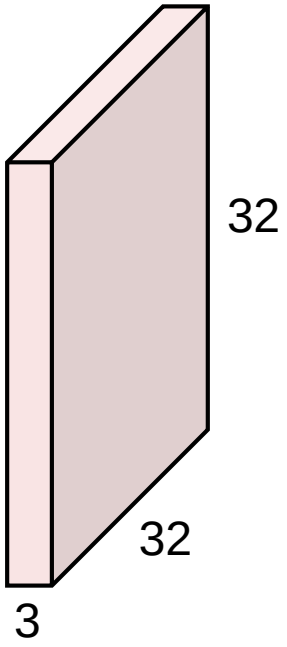

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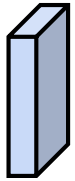
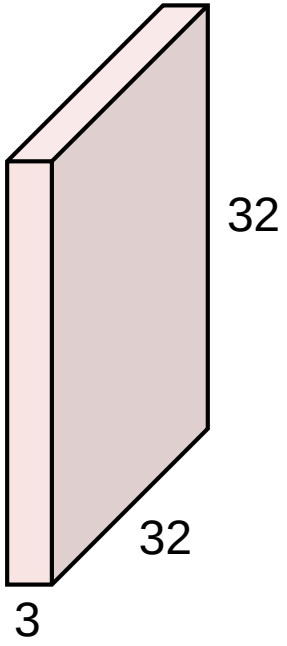


Realizar a **convolução** do filtro com a imagem isto é, “deslizar o filtro espacialmente sobre a imagem, calculando-se os produtos internos”

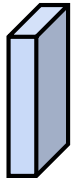
Camada Convolucional

Os filtros sempre se estendem a toda a profundidade do volume de entrada

Imagem 32×32×3



Filtro 5×5×3



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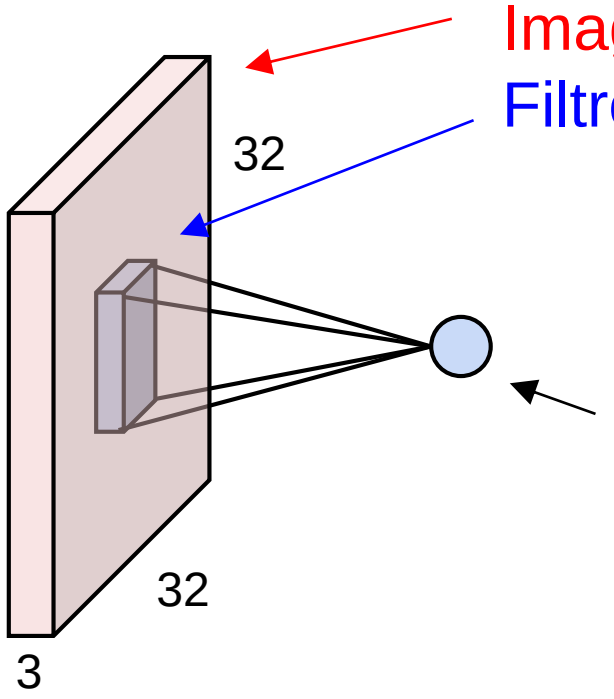
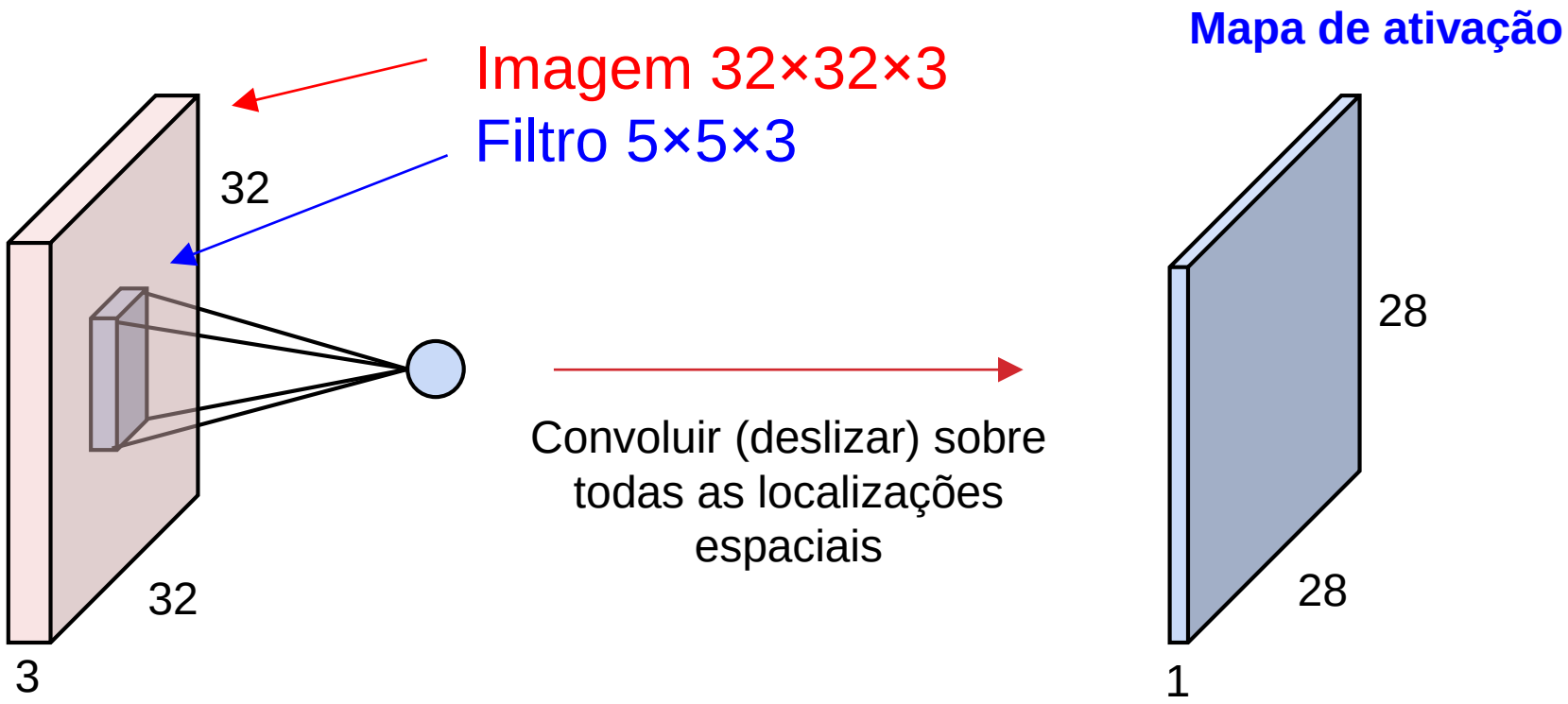


Saída é um único número =
o resultado de se realizar um produto escalar entre o filtro e um pequeno pedaço de 5×5×3 da imagem

isto é, 5×5×3 = produto escalar com 75 dimensões + viés, ou ainda,

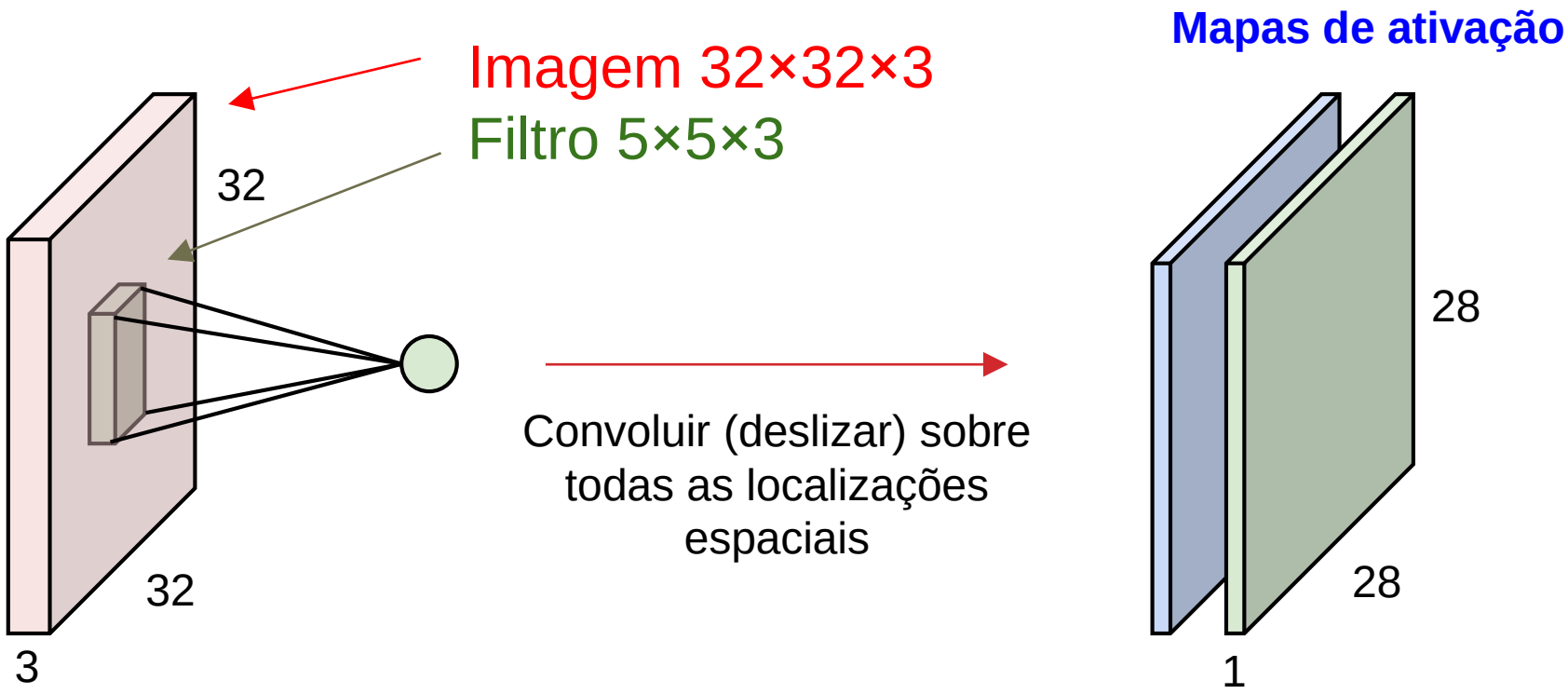
$$w^T x + b$$

Camada Convolucional



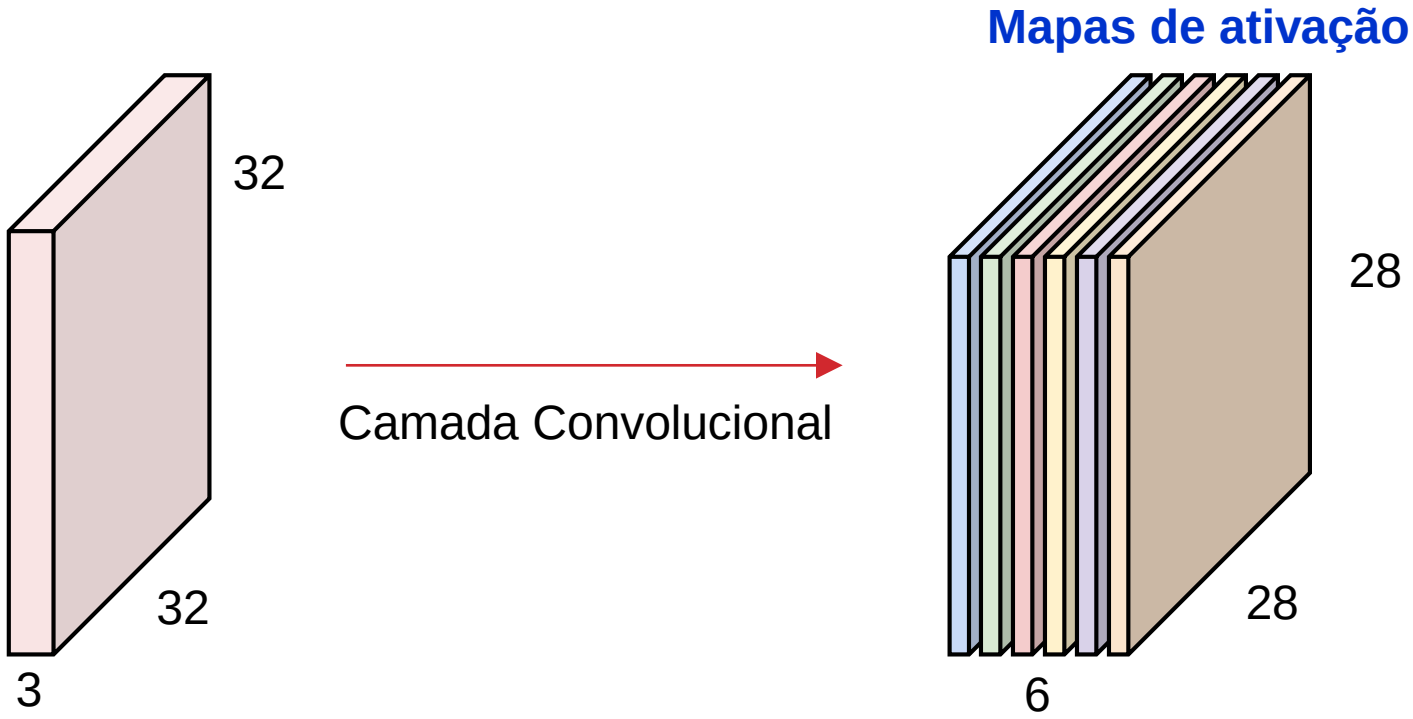
Camada Convolucional

Considere um segundo filtro (em verde)



Camada Convolucional

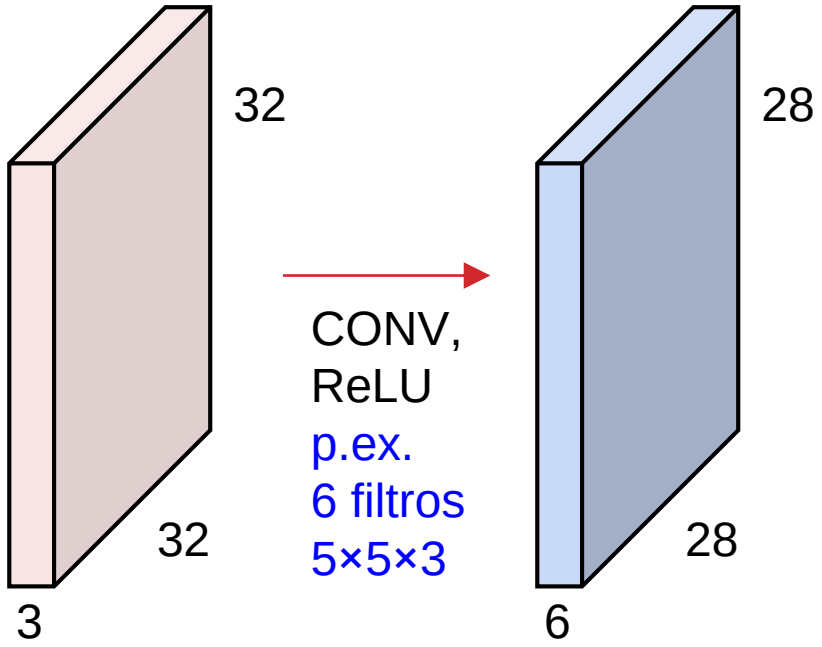
Por exemplo, se tivermos 6 filtros 5×5, obtém-se 6 mapas de ativação distintos



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

Camada Convolucional

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



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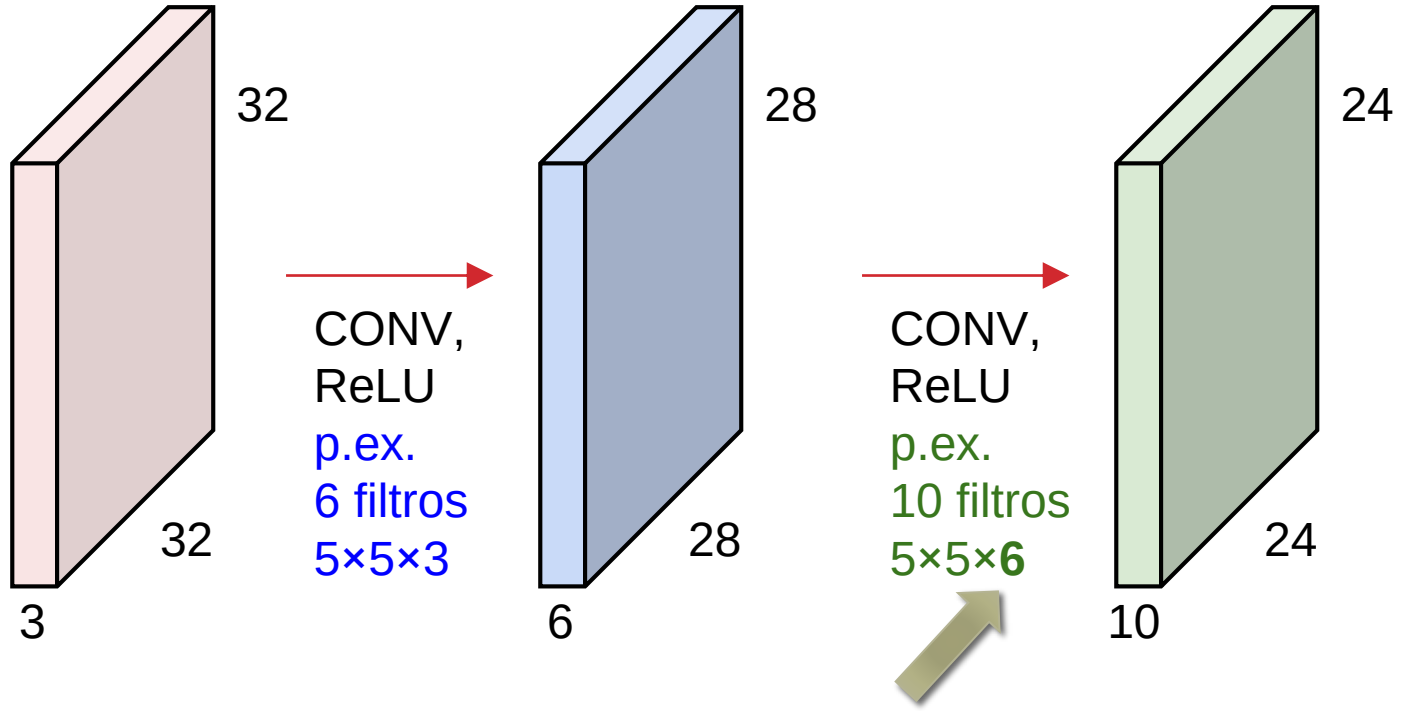

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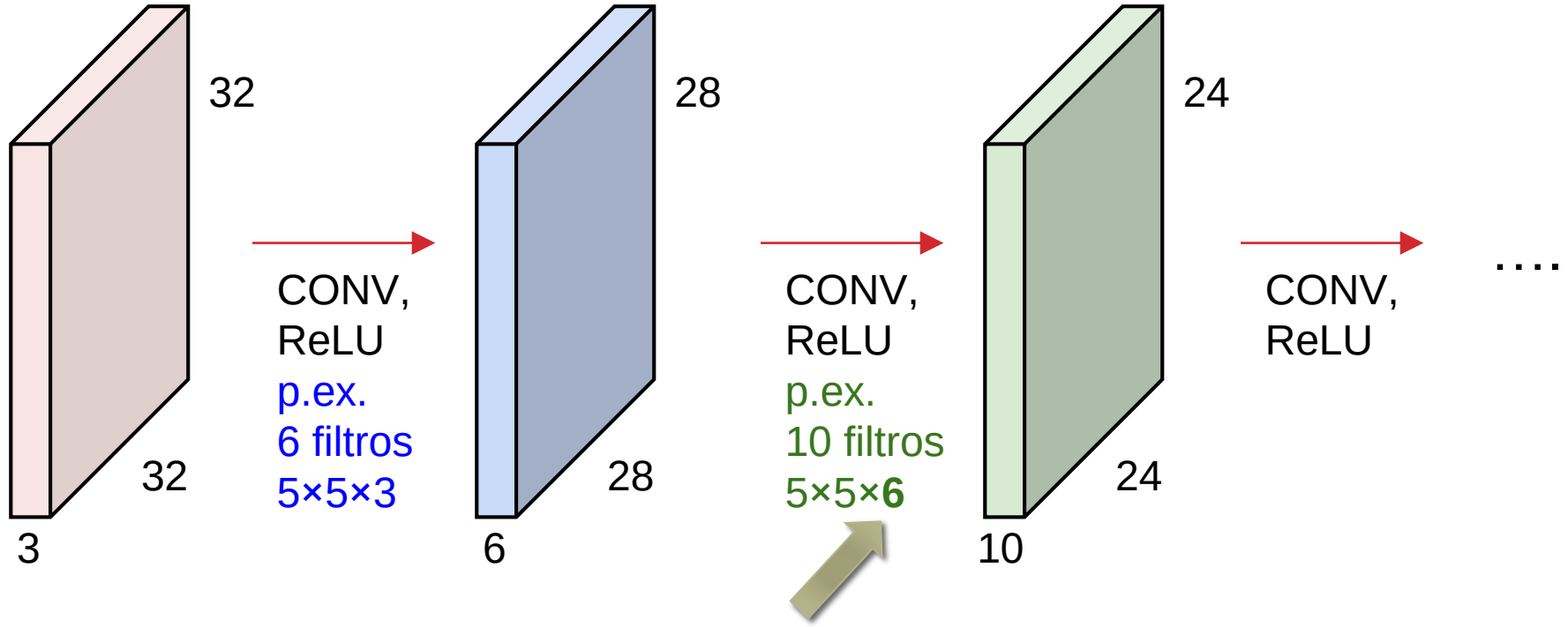
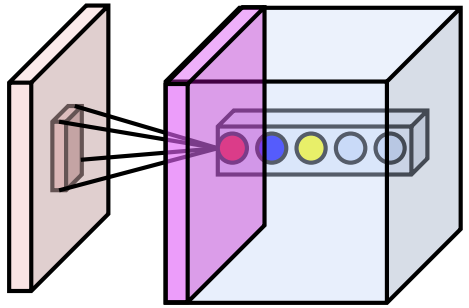


Camada Convolucional

Entrada:

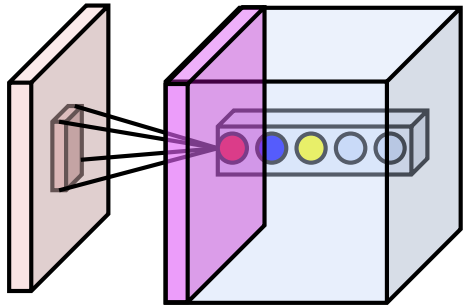
Camada Convolucional

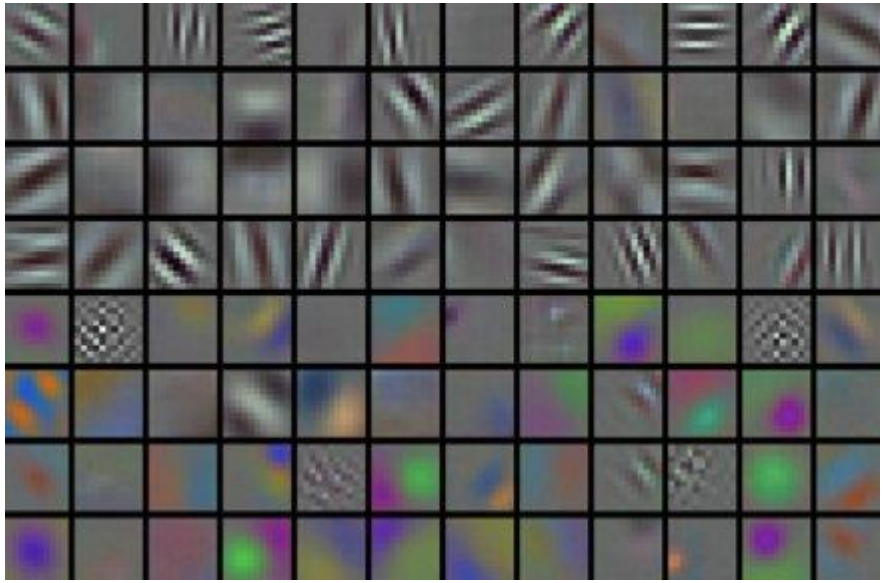
Entrada:



Camada Convolucional

Entrada:

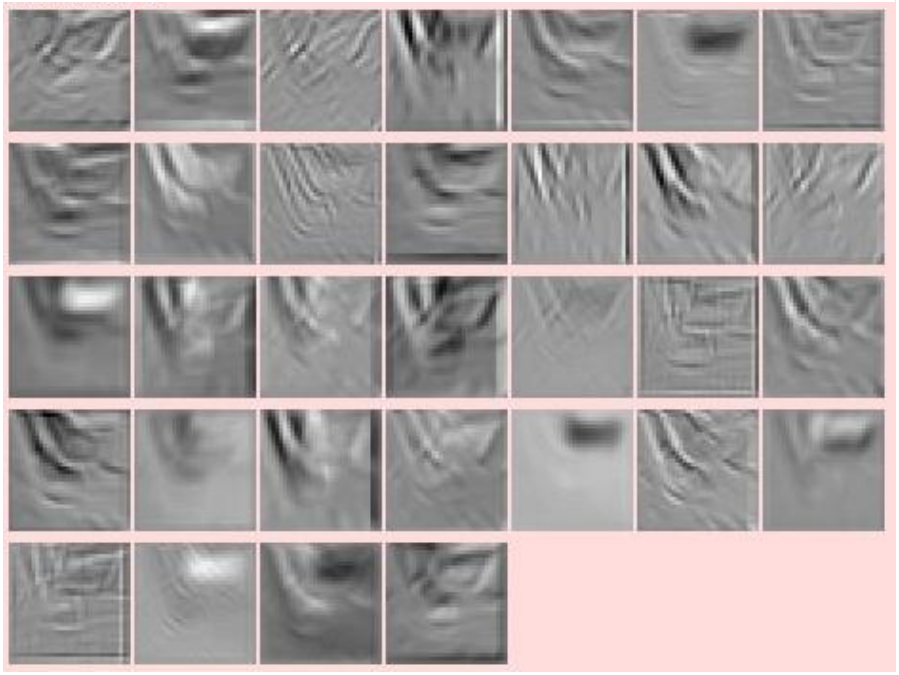


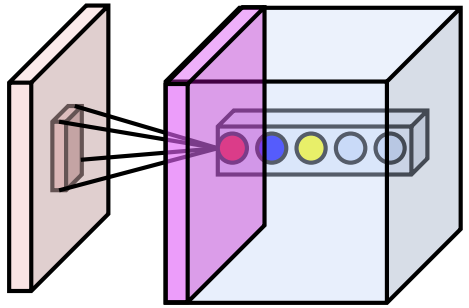


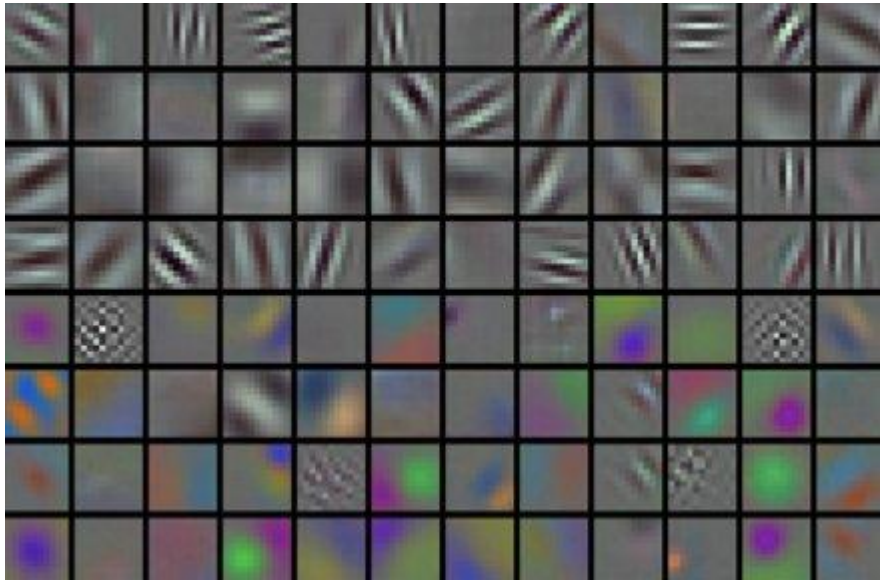
Camada Convolucional

Entrada:

Ativações:







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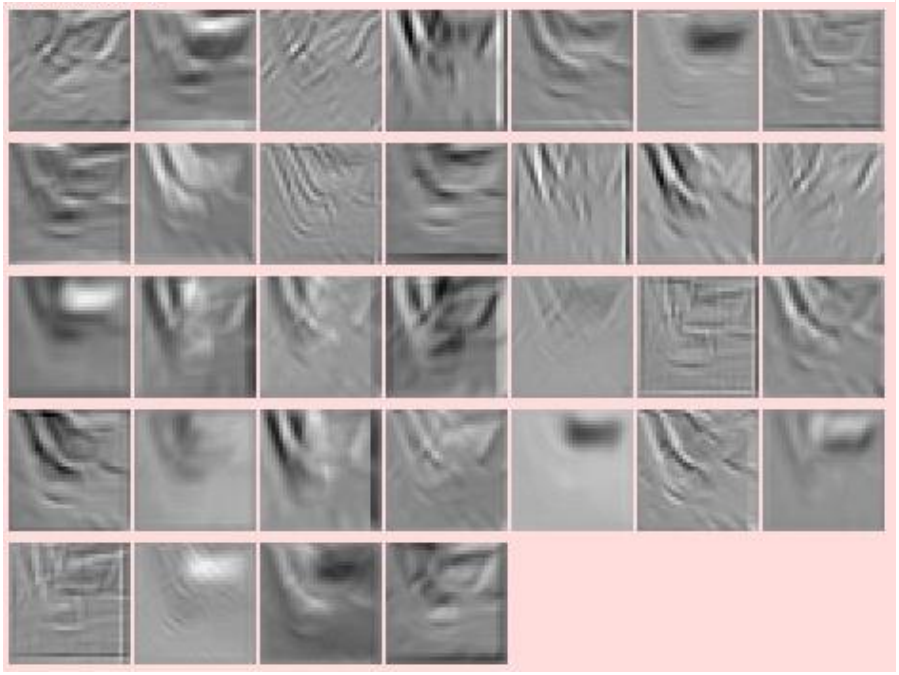
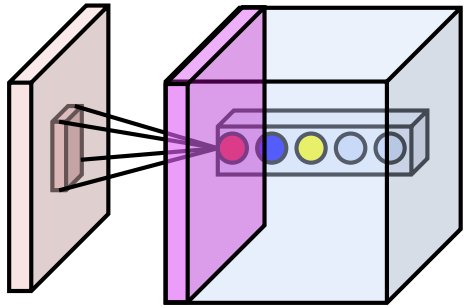
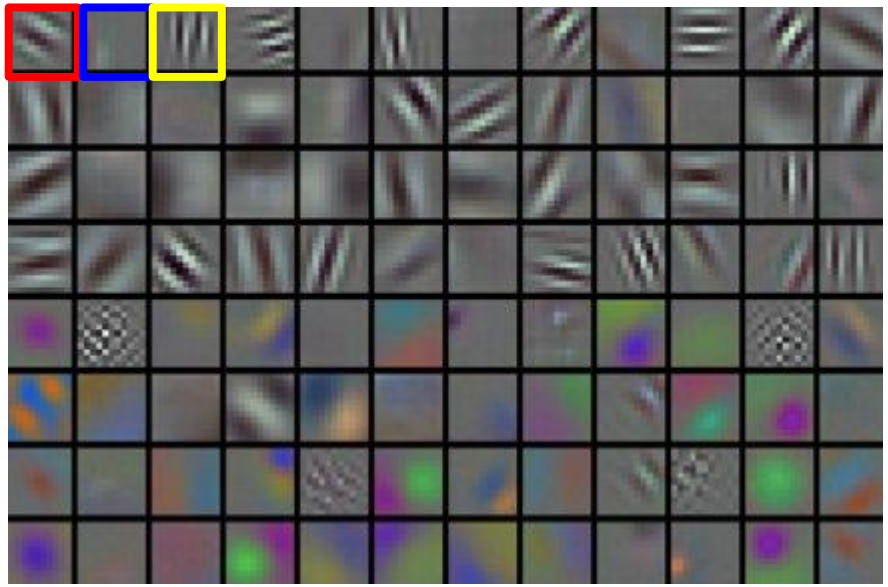


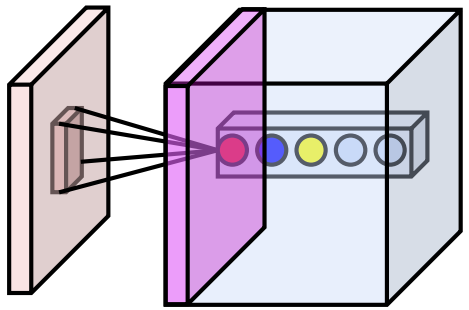




Camada Convolucional

Entrada:

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



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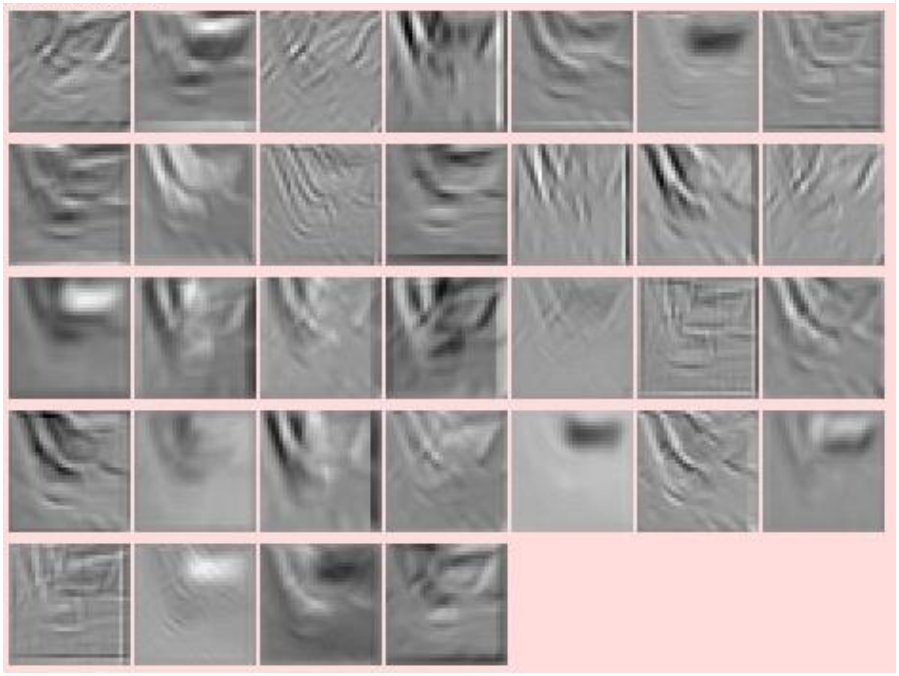

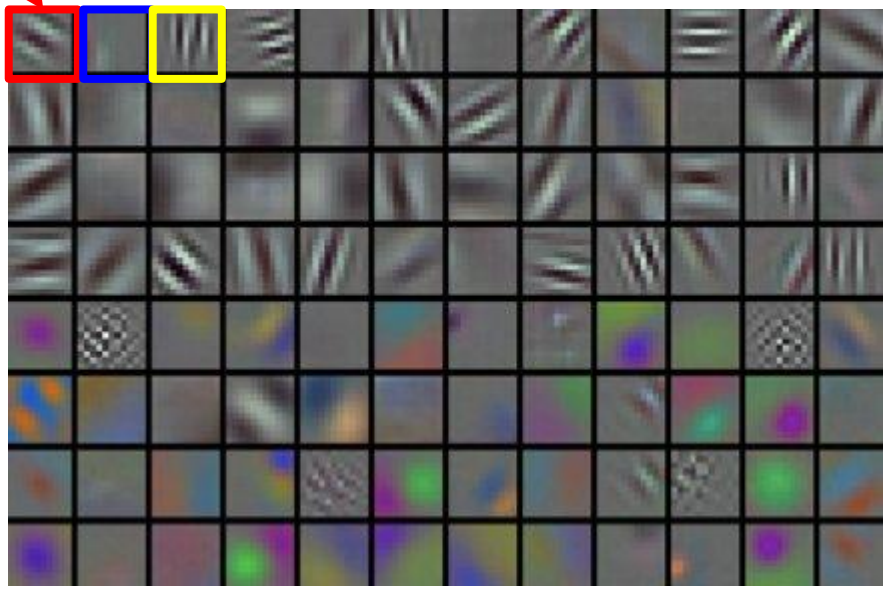

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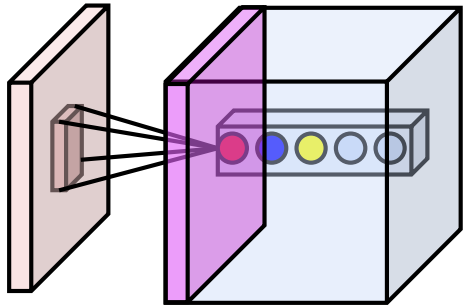
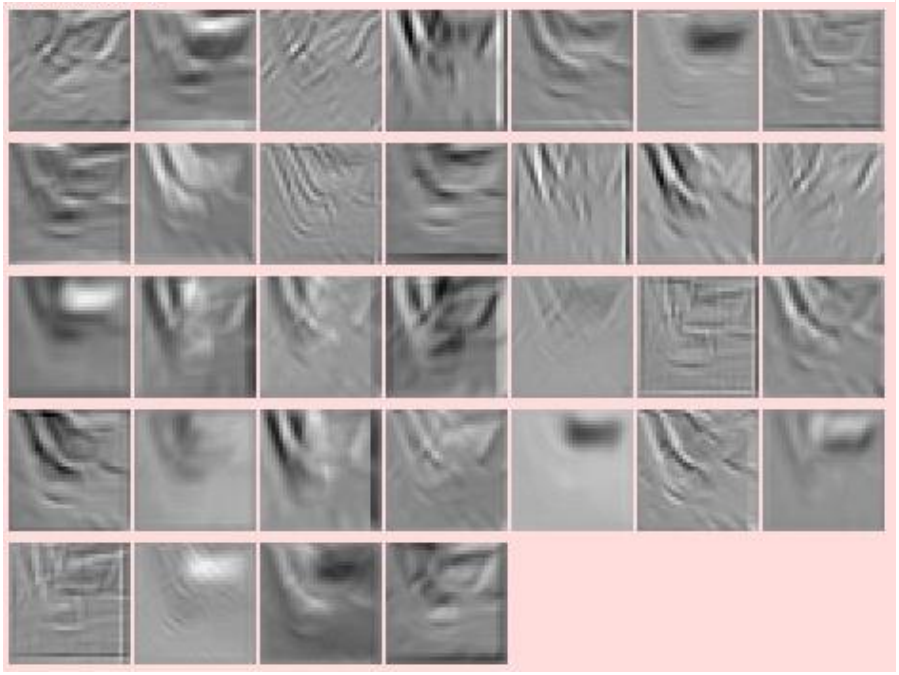
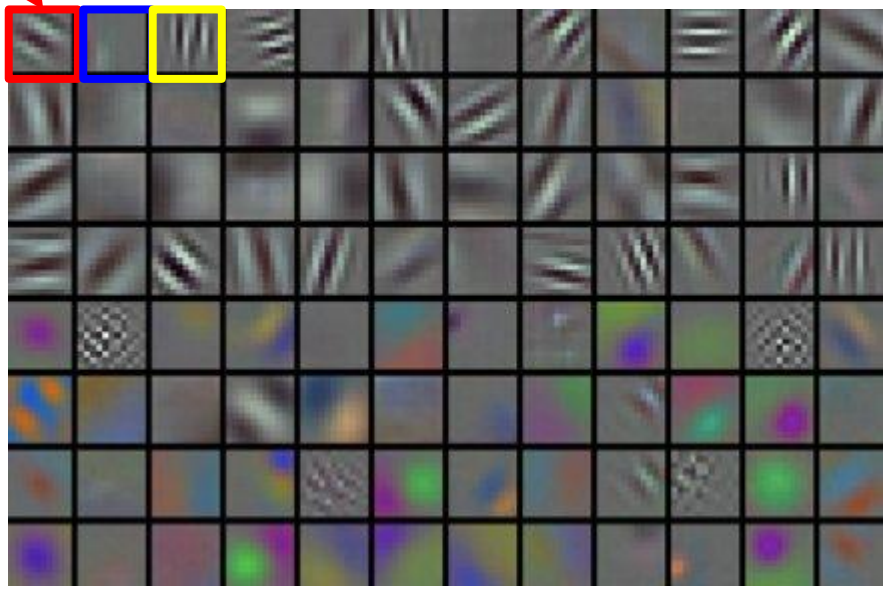


Ativações:





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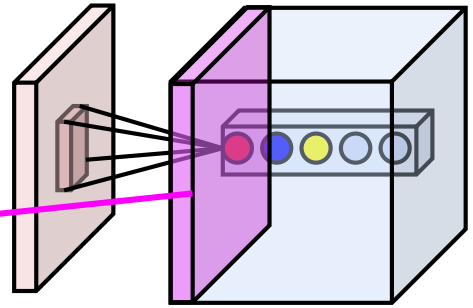

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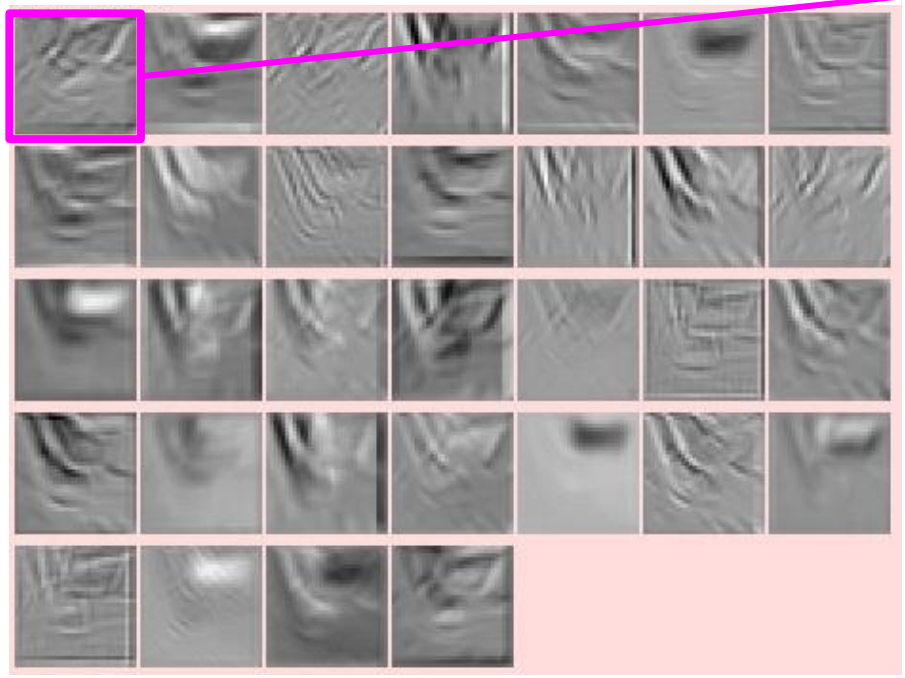

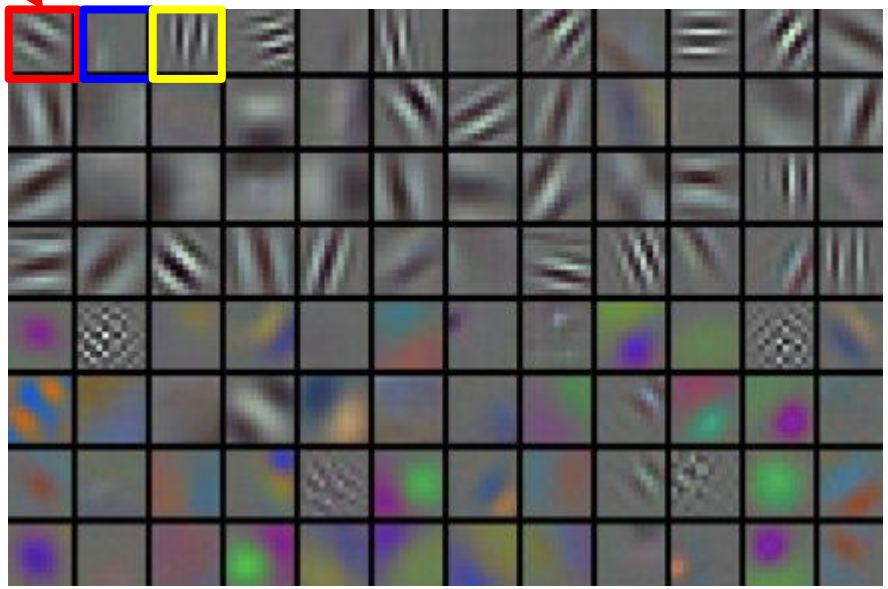

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