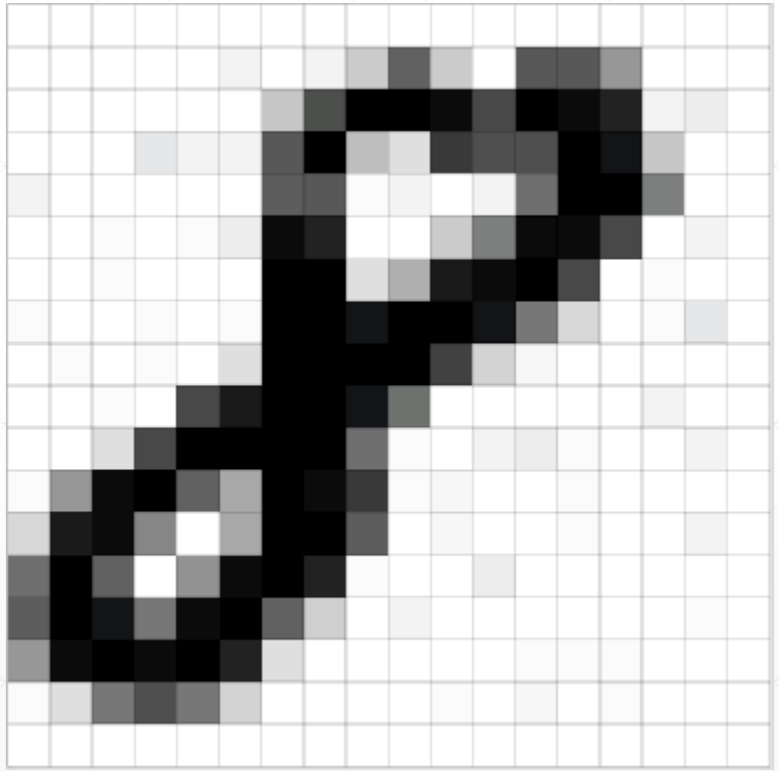
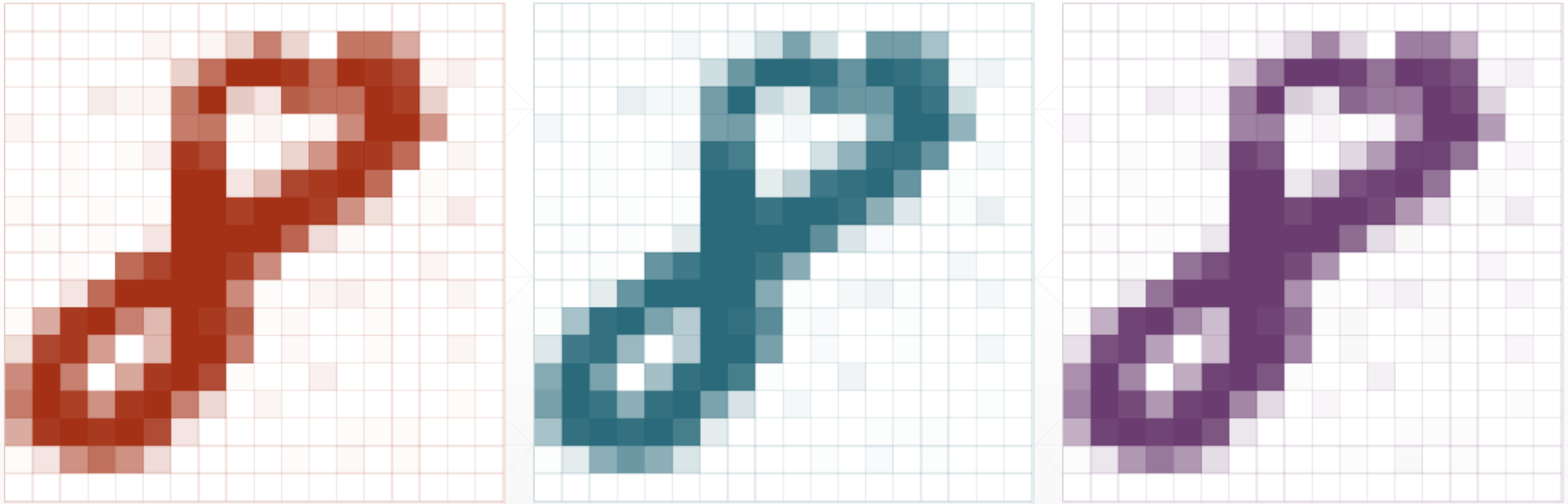
什么是卷积

主讲人：龙良曲

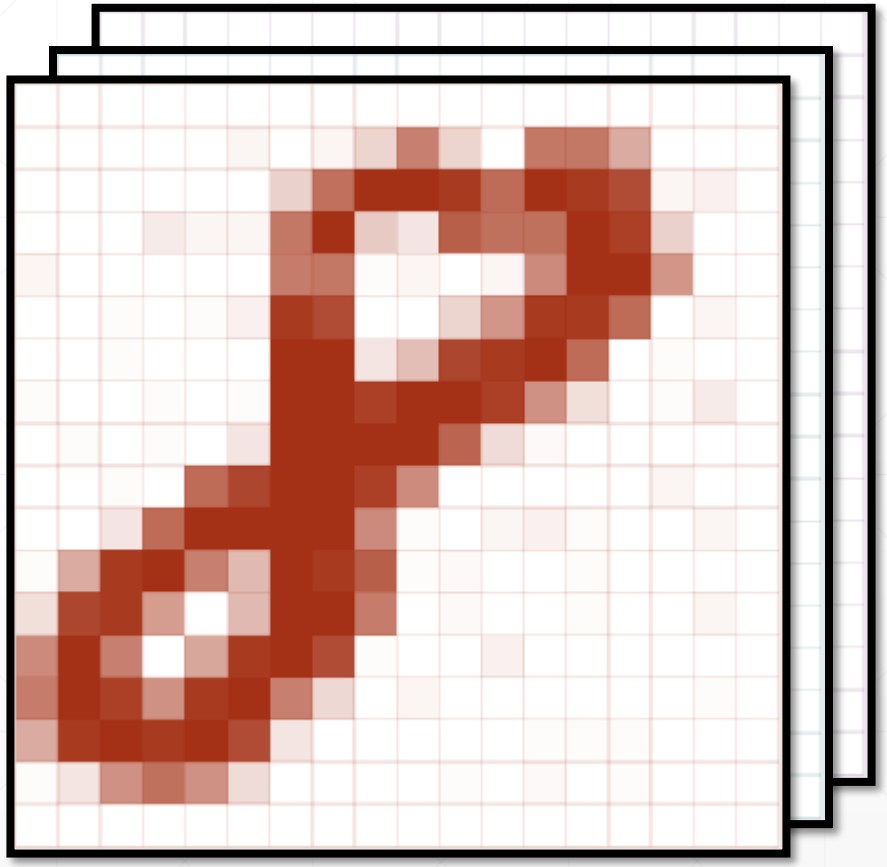
Feature Maps



Feature maps

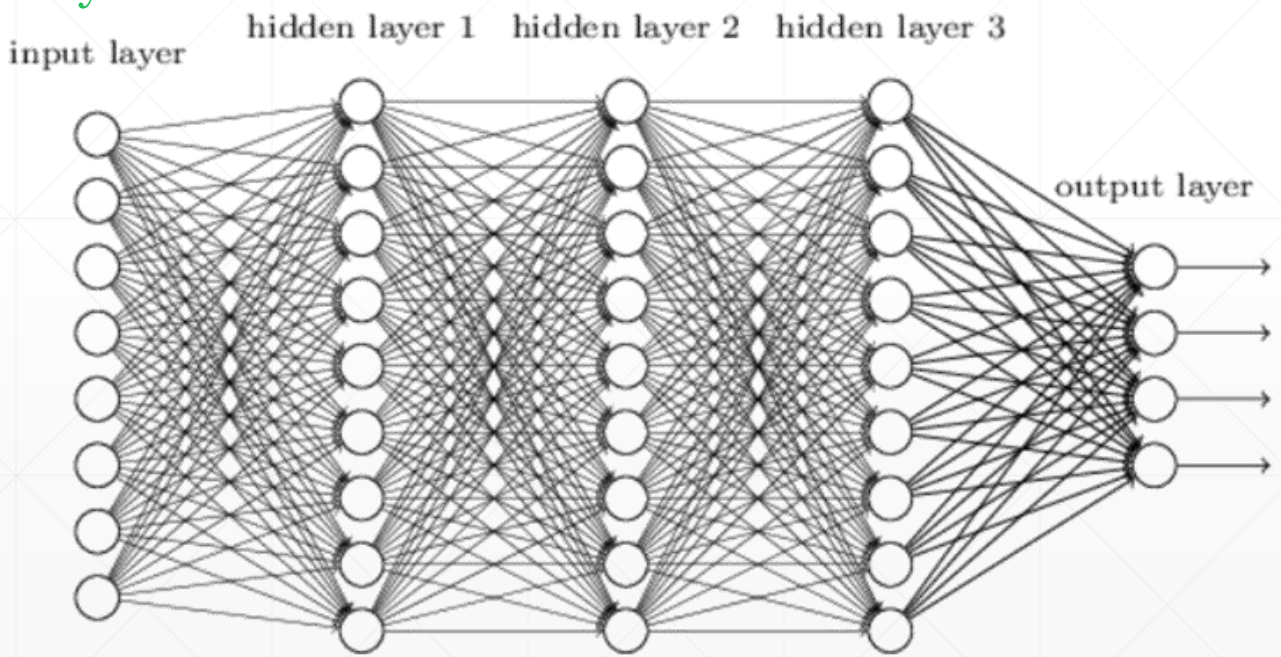


Feature maps



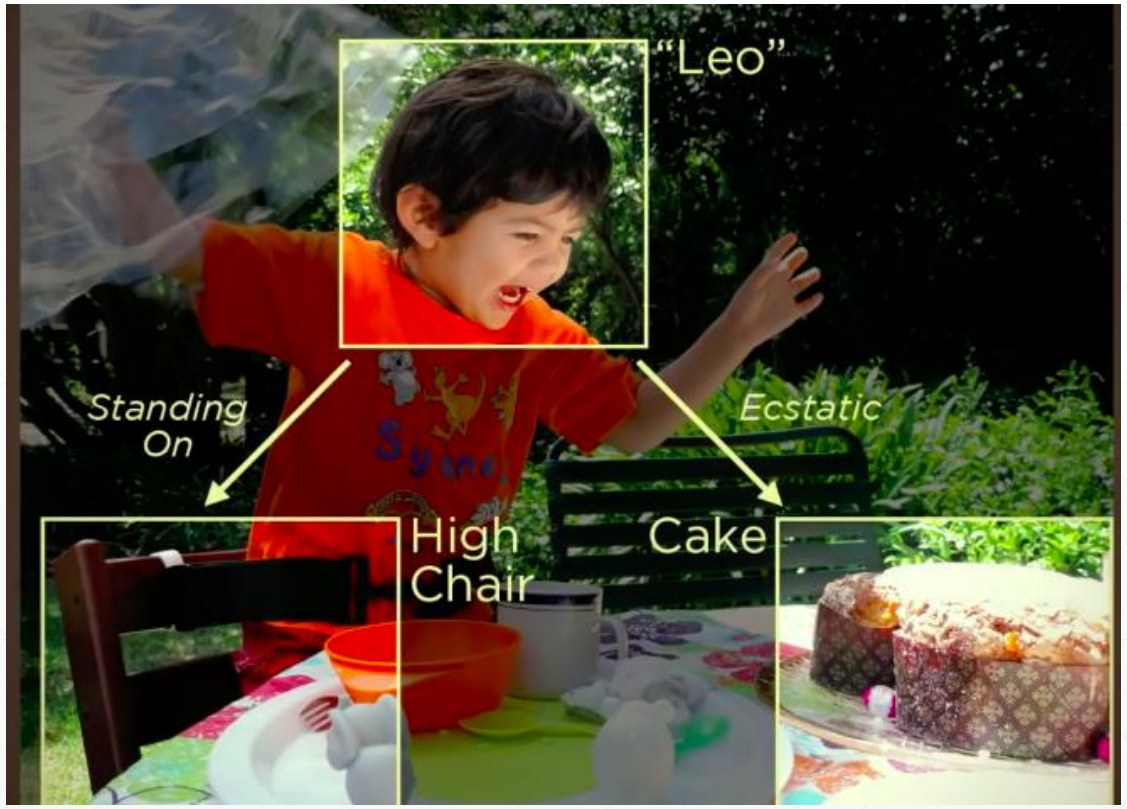
What's wrong with Linear

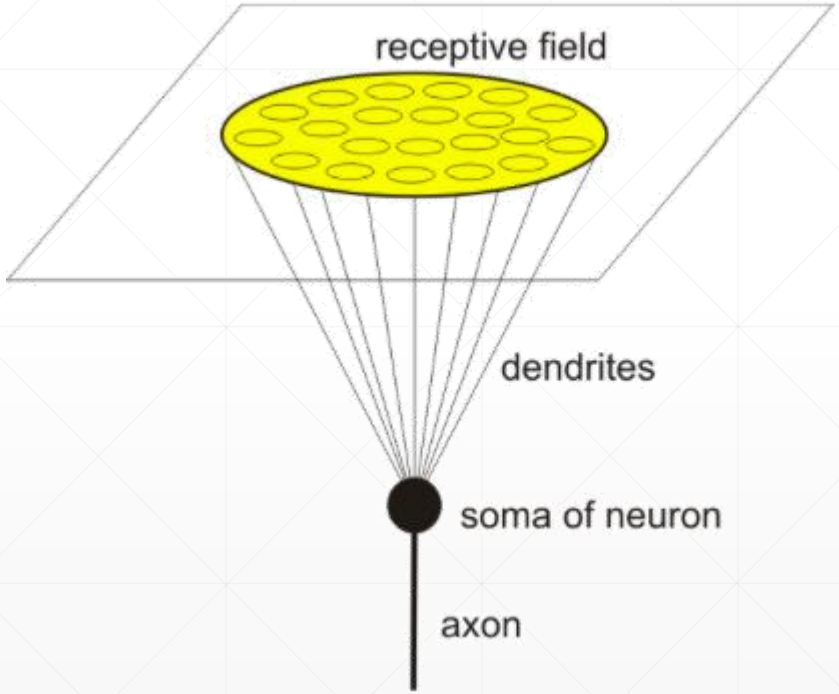
- 4 Hidden Layers: [784, 256, 256, 256, 256, 10]
  - 390K parameters
  - 1.6MB memory
  - 80386



http://slazebni.cs.illinois.edu/spring17/lec01_cnn_architectures.pdf

Receptive Field

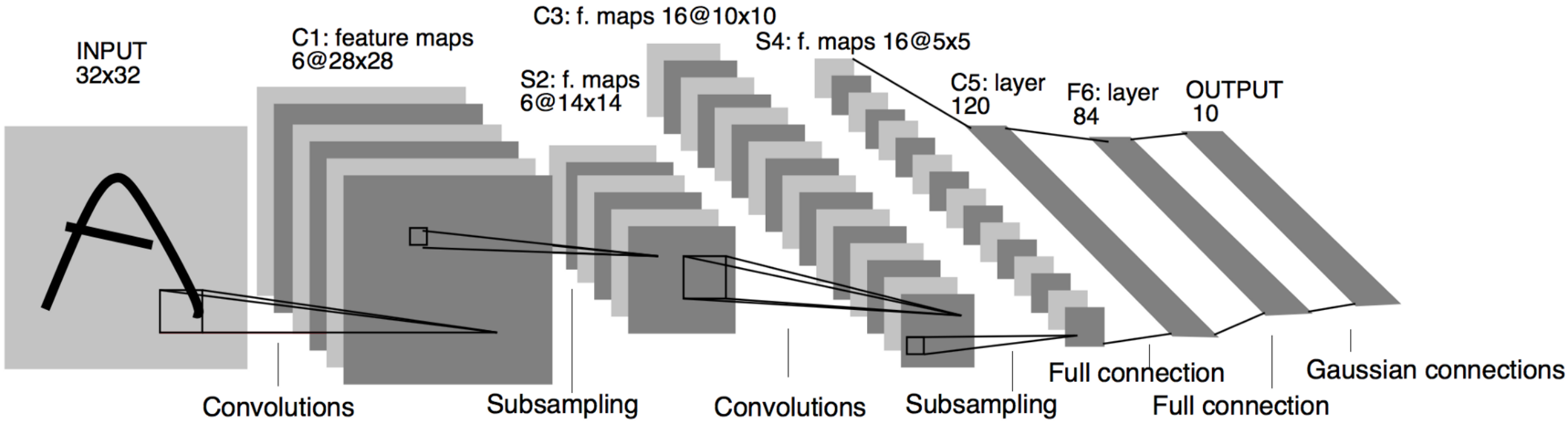




https://medium.freecodecamp.org/an-intuitive-guide-to-convolutional-neural-networks-260c2de0a050

Weight sharing

- ~60k parameters
- 6 Layers



http://yann.lecun.com/exdb/publis/pdf/lecun-89e.pdf

Convolution Operation

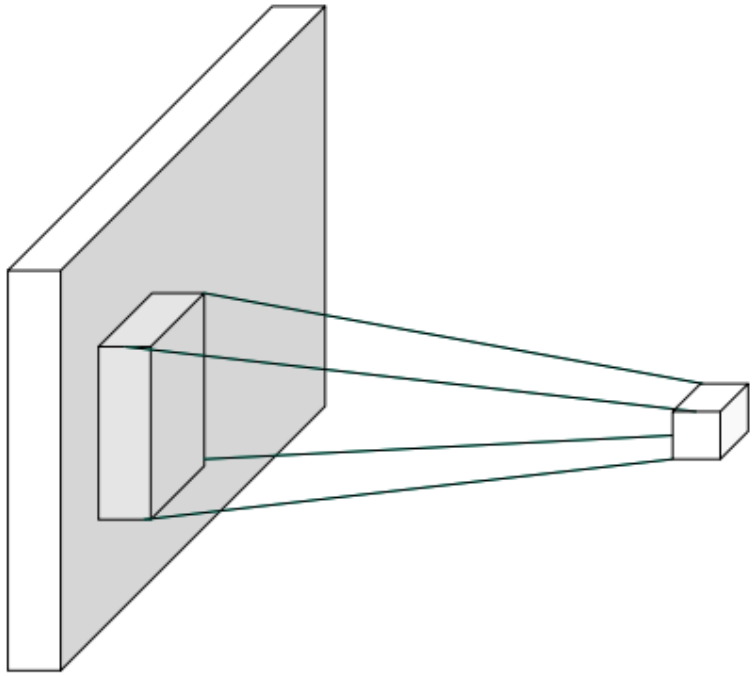
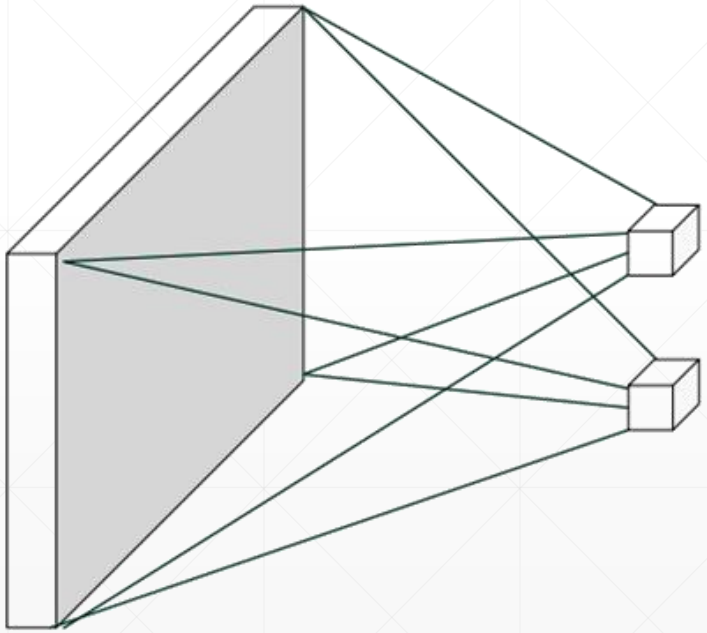
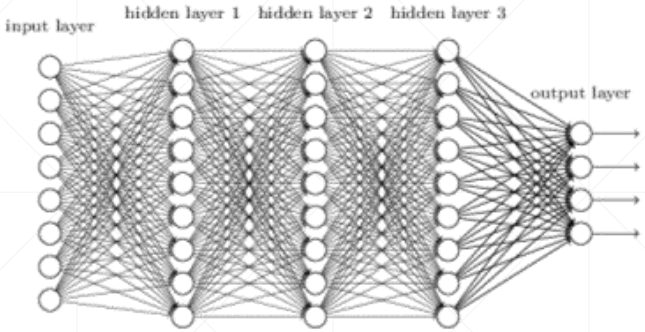


image Convolutional layer

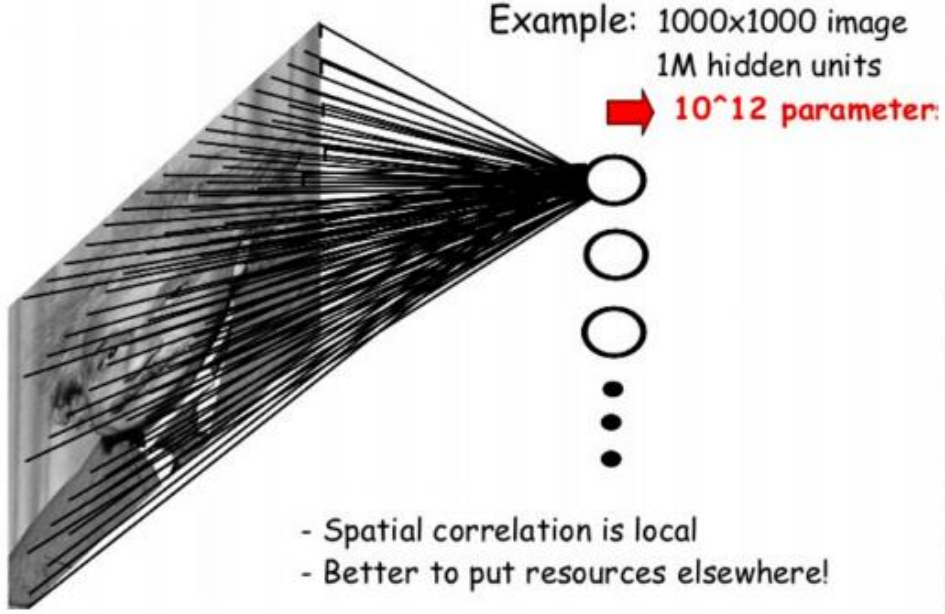
Rethink Linear layer





http://slazebni.cs.illinois.edu/spring17/lec01_cnn_architectures.pdf

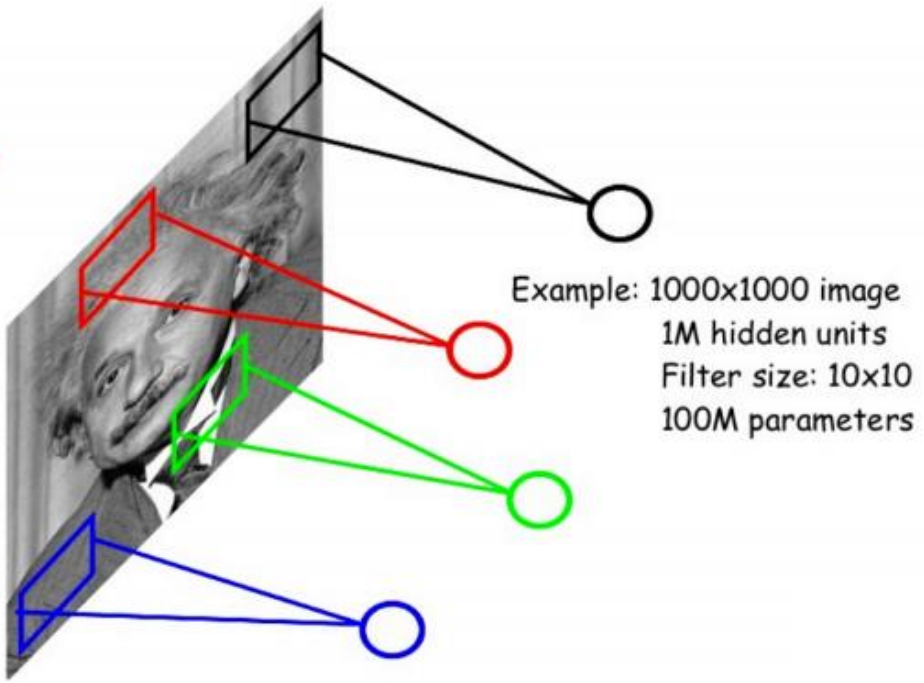
FULLY CONNECTED NEURAL NET



Example: 1000x1000 image
1M hidden units
10^12 parameters

- Spatial correlation is local
- Better to put resources elsewhere!

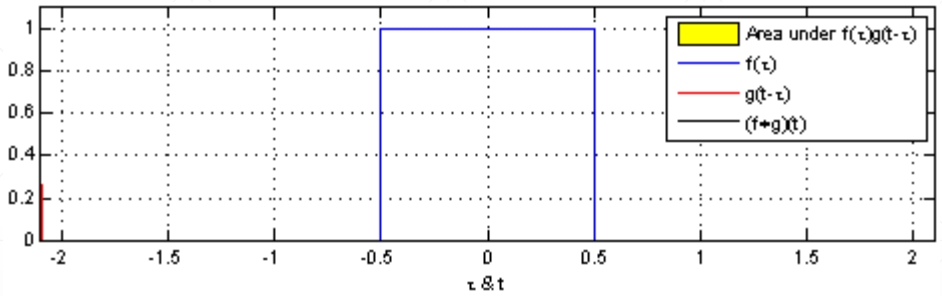
LOCALLY CONNECTED NEURAL NET

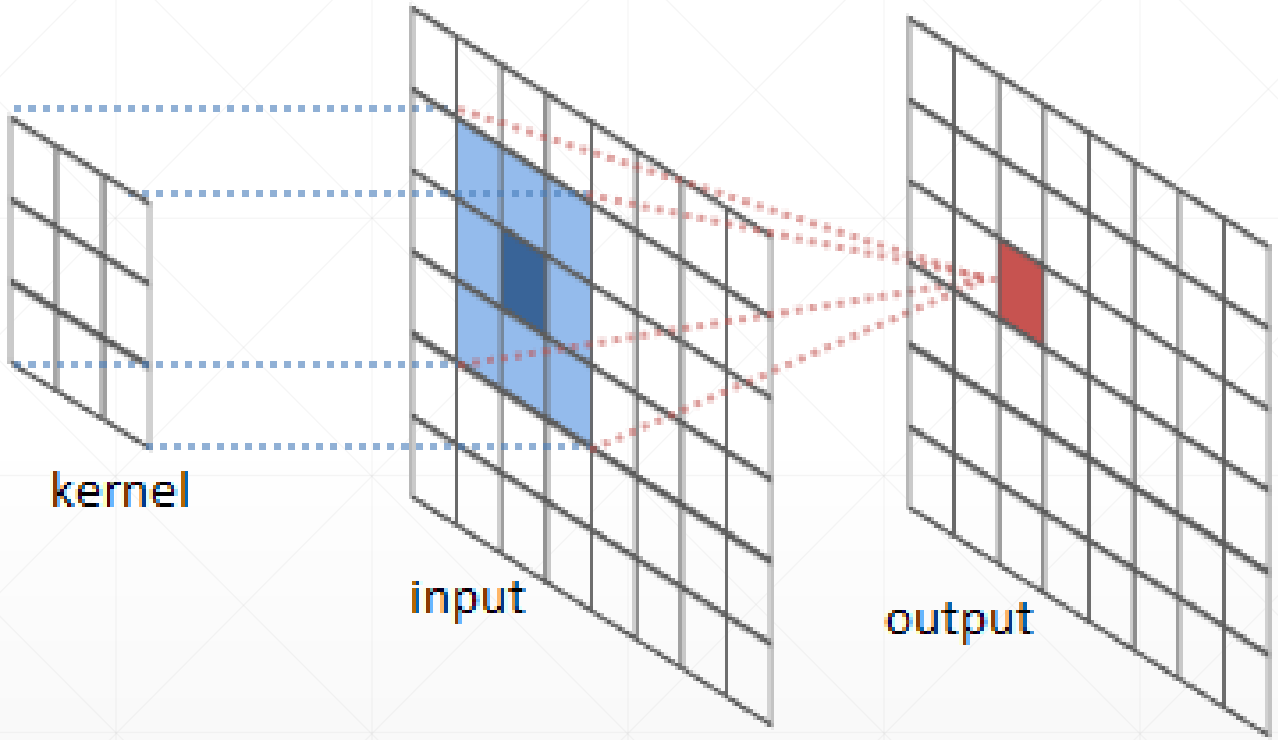


Example: 1000x1000 image
1M hidden units
Filter size: 10x10
100M parameters

Why call Convolution?

$$y(t) = x(t) * h(t) = \int_{-\infty}^{\infty} x(\tau)h(t-\tau)d\tau$$




kernel
input
output

Convolution

Sharpen:

0	0	0	0	0
0	0	-1	0	0
0	-1	5	-1	0
0	0	-1	0	0
0	0	0	0	0

https://www.superdatascience.com/convolutional-neural-networks-cnn-step-1-convolution-operation/

Convolution

Blur:

0	0	0	0	0
0	1	1	1	0
0	1	1	1	0
0	1	1	1	0
0	0	0	0	0

Convolution

Edge Detect:

	0	1	0	
	1	-4	1	
	0	1	0	

CNN on feature maps

https://ujjwalkarn.me/2016/08/11/intuitive-explanation-convnets/

下一课时

卷积神经网络

Thank You.