

Deep Learning Lab Course 2017 (Deep Learning Practical)

Labs:

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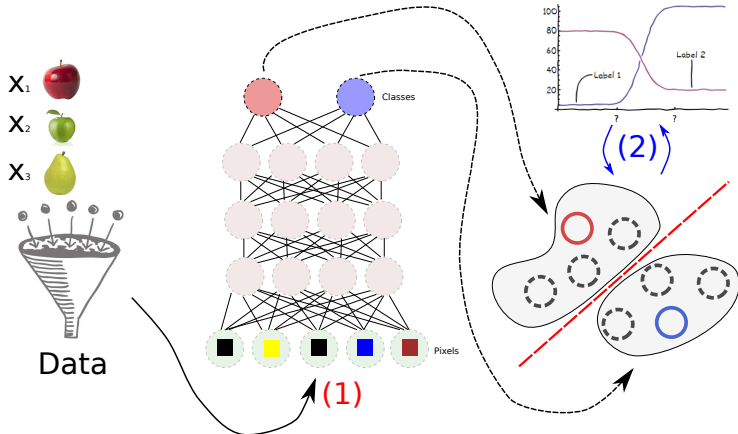
November 6, 2017

Today...

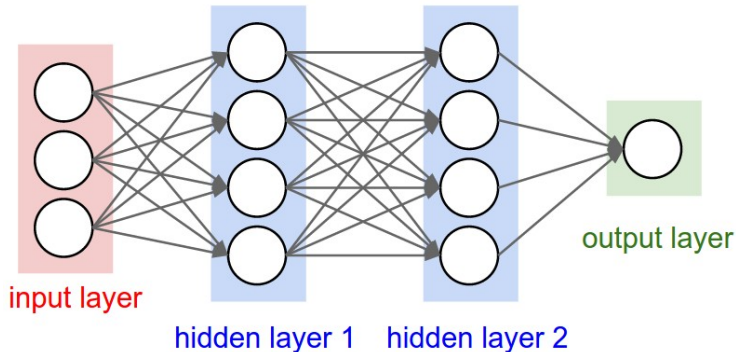
- ▶ **Assignment:** I will cover some questions regarding the first exercise
- ▶ **Lecture:** Introduction into convolutional neural networks (CNNs)

Where we are: Supervised Deep Learning Pipeline

- (1) Jointly **Learn** everything with a deep architecture
- (2) **Inference** e.g. classes of unseen data



Where we are: more detail



- but what if the input is an image (say 32×32 pixels (RGB))
- we would have $32 \times 32 \times 3$ weights **per neuron**
- assuming only 100 units $\approx 300k$ weights in the first layer alone

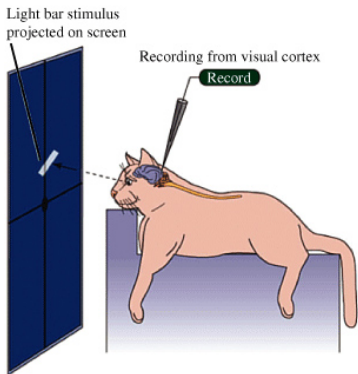
Where we are: a way forward ?

- ▶ Applying NNs naively to high dimensional images is not going to work
 - ▶ How can we improve on this ?
- Let us try to exploit domain knowledge

Where we are: a way forward ?

What domain knowledge do we have ?

A Experimental setup

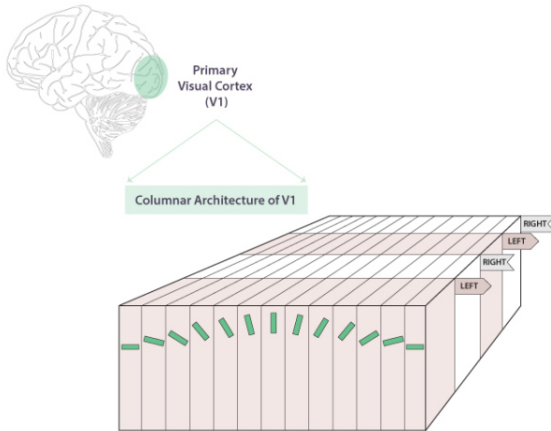


B Stimulus orientation Stimulus presented



Where we are: a way forward ?

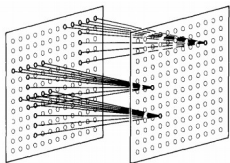
What domain knowledge do we have ?



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Towards Convolutional Neural Networks

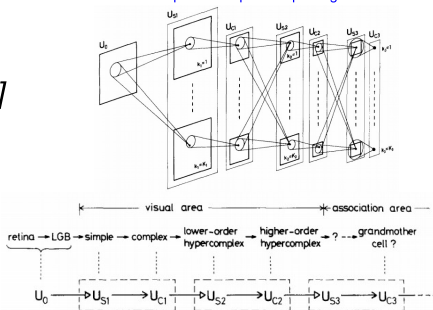
Neurocognitron [Fukushima 1980]



"sandwich" architecture (SCSCSC...)

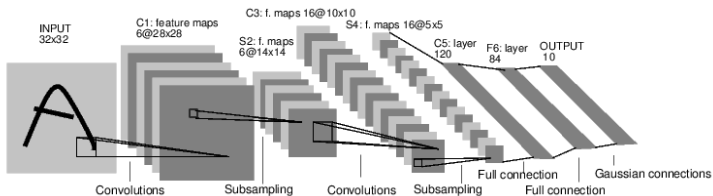
simple cells: modifiable parameters

complex cells: perform pooling



Convolutional Neural Networks

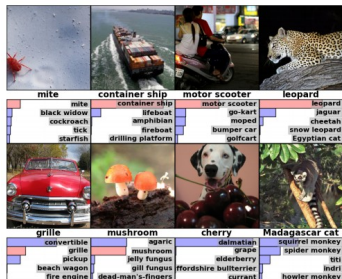
LeNet for digit recognition



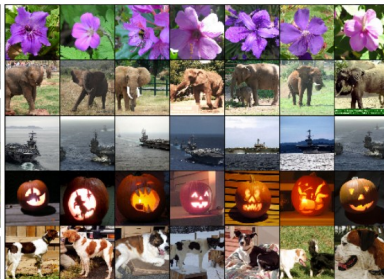
[LeCun et al. 1998]

CNNs in the wild

Classification

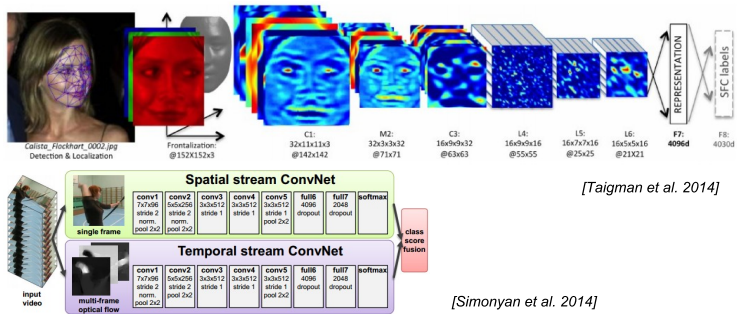


Retrieval



[Krizhevsky 2012]

CNNs in the wild



[Taigman et al. 2014]

[Simonyan et al. 2014]

CNNs in the wild



[Toshev, Szegedy 2014]



[Mnih 2013]

CNNs: a change in perspective

Let us take things slowly, one at a time