Artificial Neural Networks + Deep Learning

Week 11 - Day 04

Once upon a time...

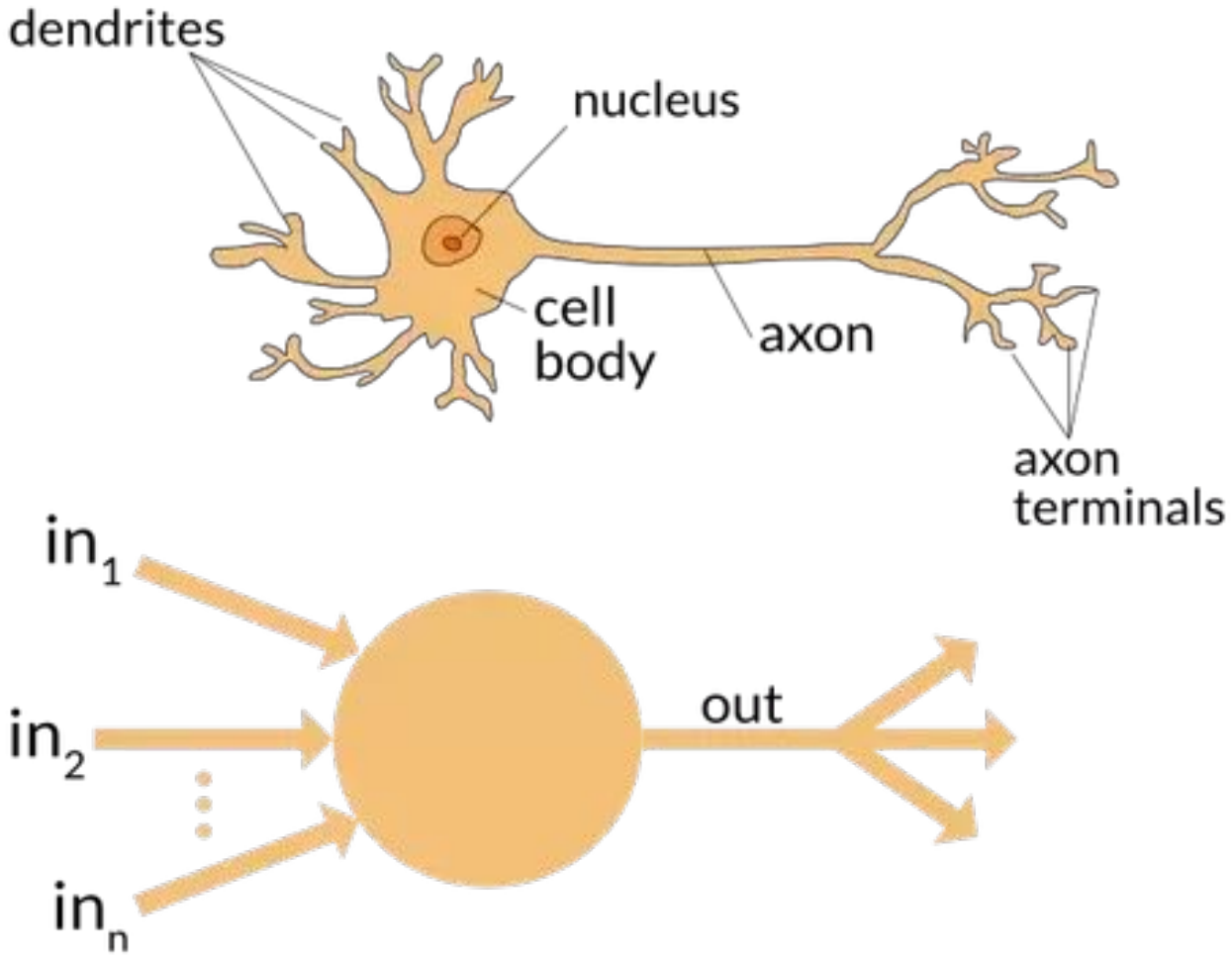
This is a work of fiction. Names, characters, business, events and incidents are the products of the author's imagination. Any resemblance to actual persons, living or dead, or actual events is purely coincidental.

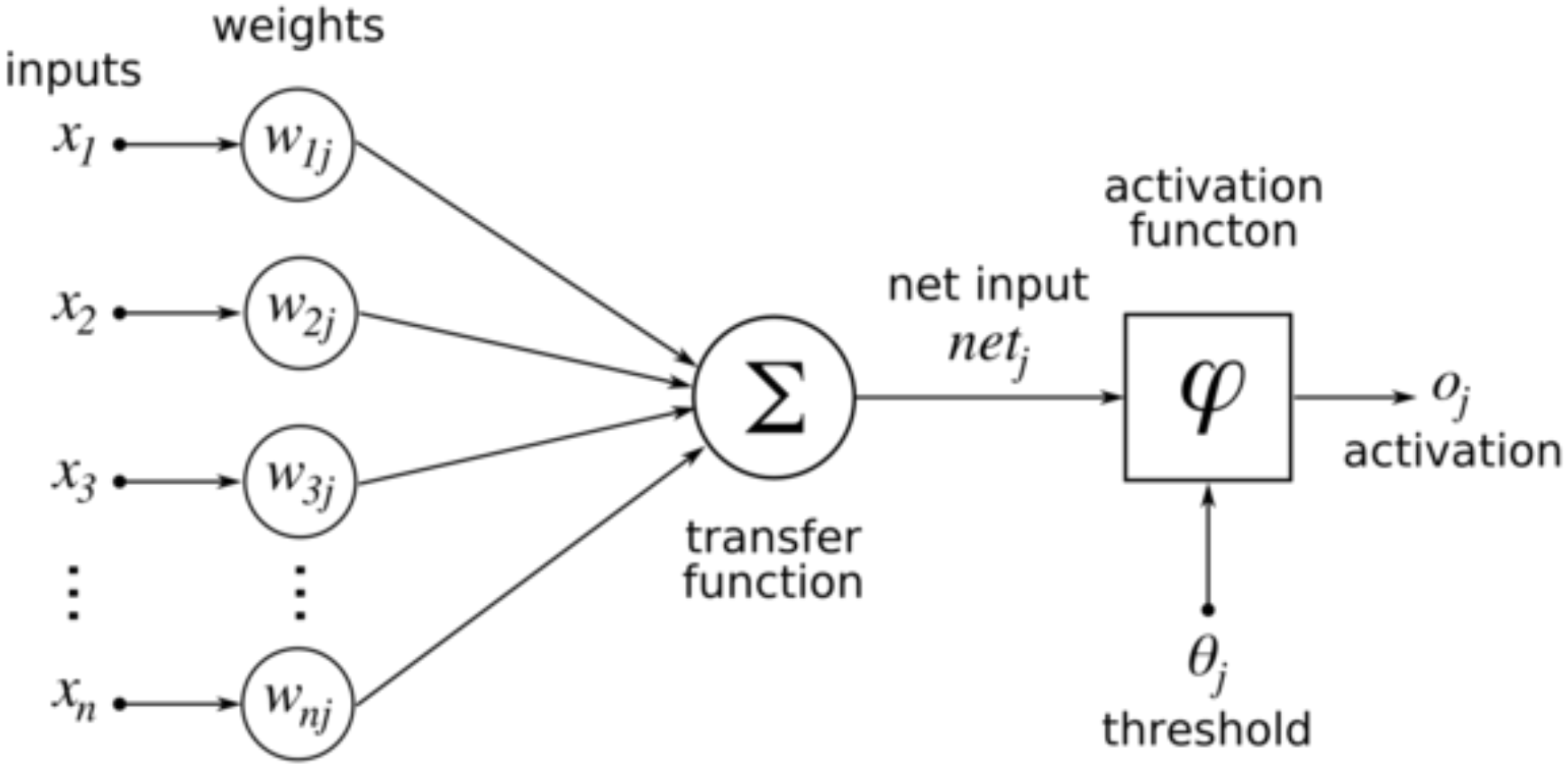
1940-1959

A new algorithm inspired by the brain!

“We can simulate the brain,

we’ll build intelligent machines!”


dendrites
nucleus
cell body
axon
axon terminals
in1
in2
inn
out


weights
inputs
x_1
x_2
x_3
x_n
w_{1j}
w_{2j}
w_{3j}
w_{nj}
Σ
transfer
function
net input
net_j
activation
functon
φ
o_j
activation
θ_j
threshold

What is it like?

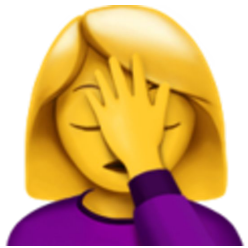
What is it like?

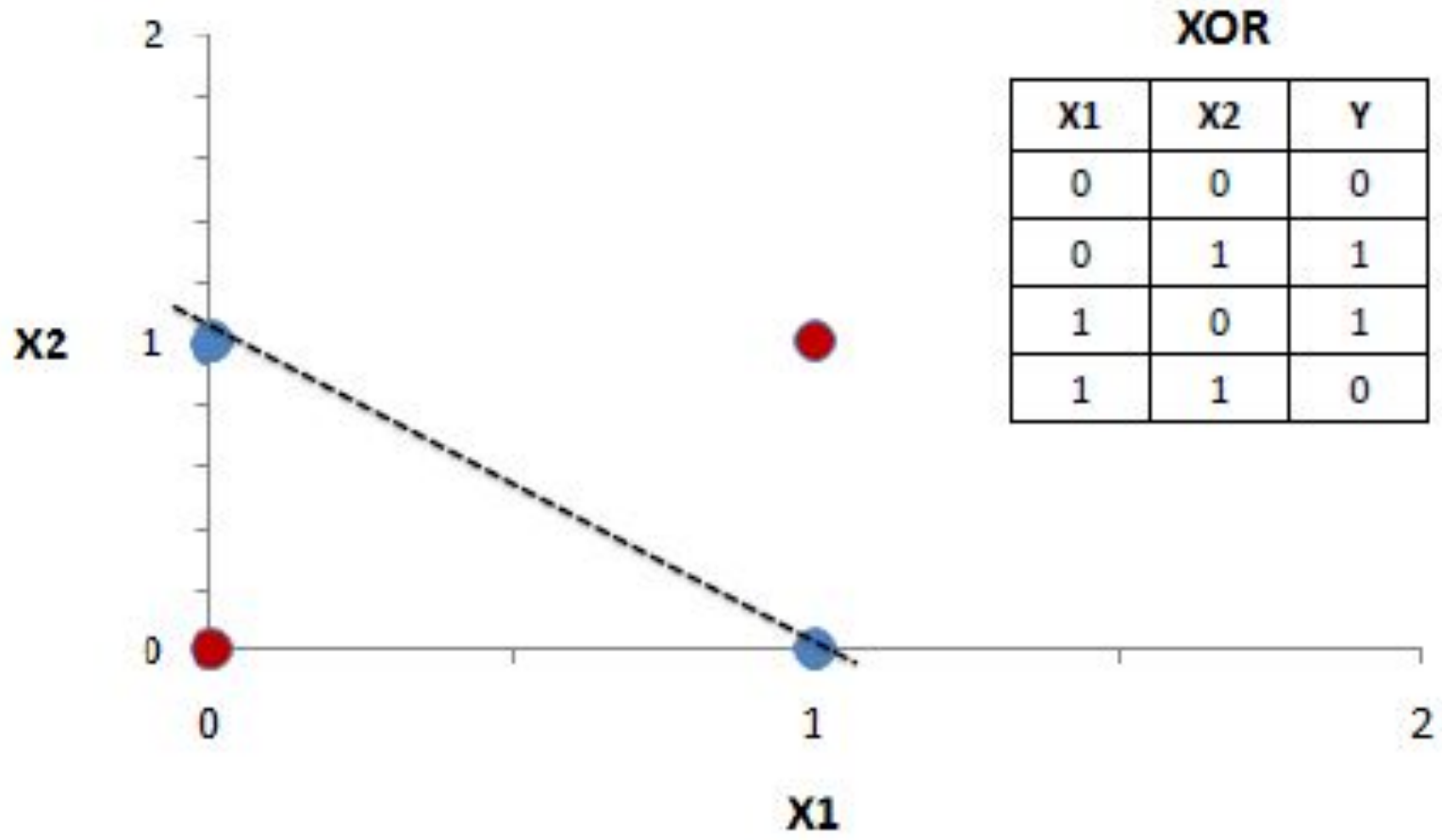
Logistic regression!

1969

Ten years later...

“C’mon guys, you can’t even solve the XOR problem..”

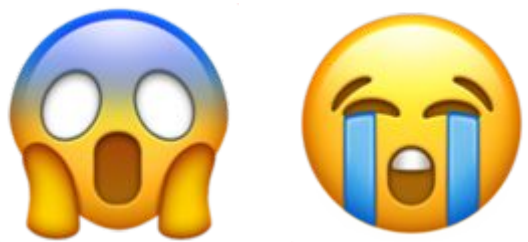




XOR

X1	X2	Y
0	0	0
0	1	1
1	0	1
1	1	0

“It’s true, we’re fuc*ed!”



1969-1975

The (first) AI winter

1975

The Renaissance

Backpropagation Algorithm

SVM+LR > ANN

Over promising + Under delivering

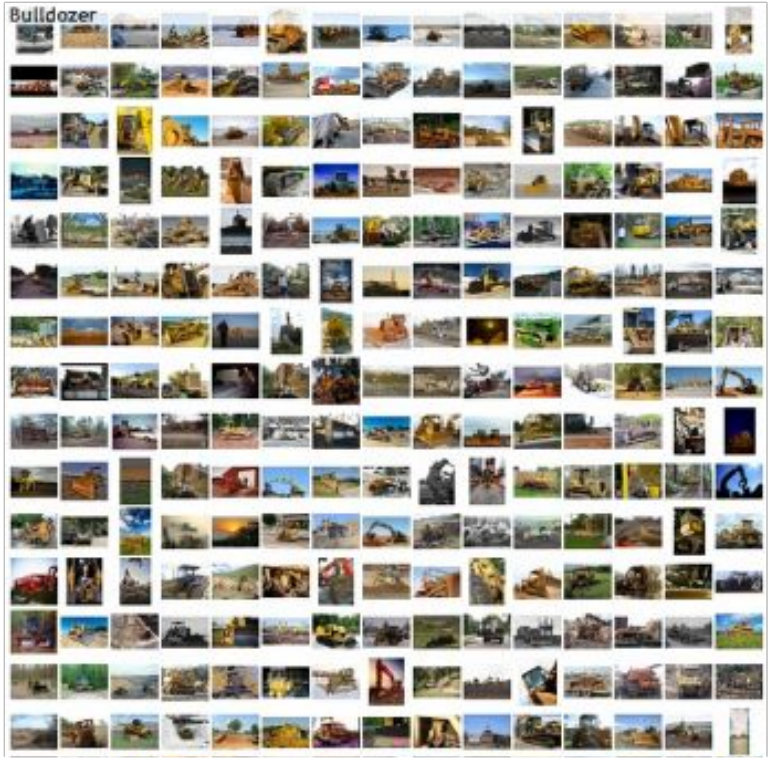
=

Another AI winter

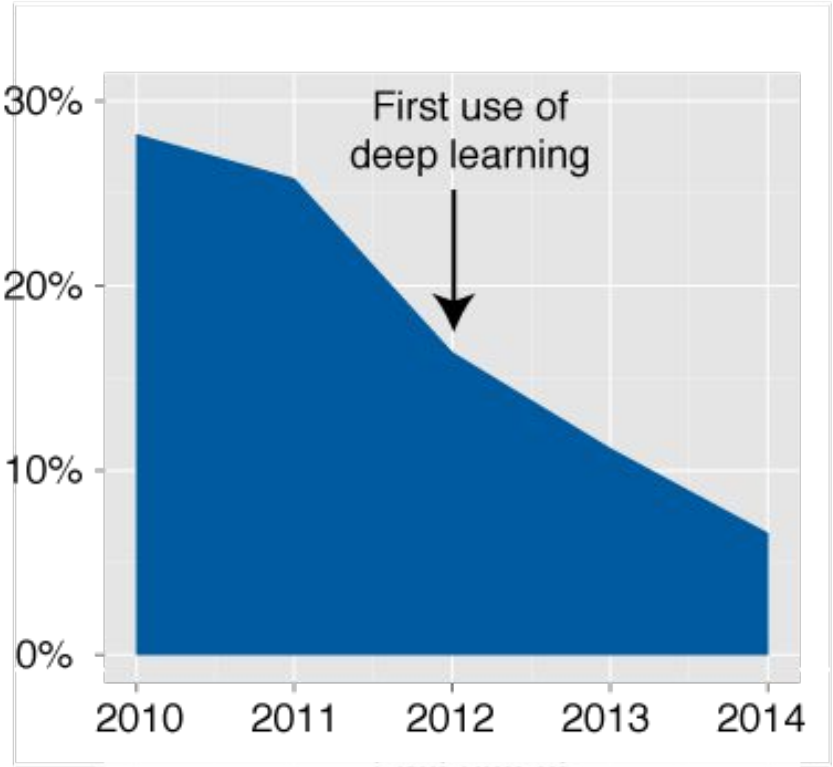
2010s

Deep learning

ImageNet examples



Objection classification error rate



Over promising + Under delivering

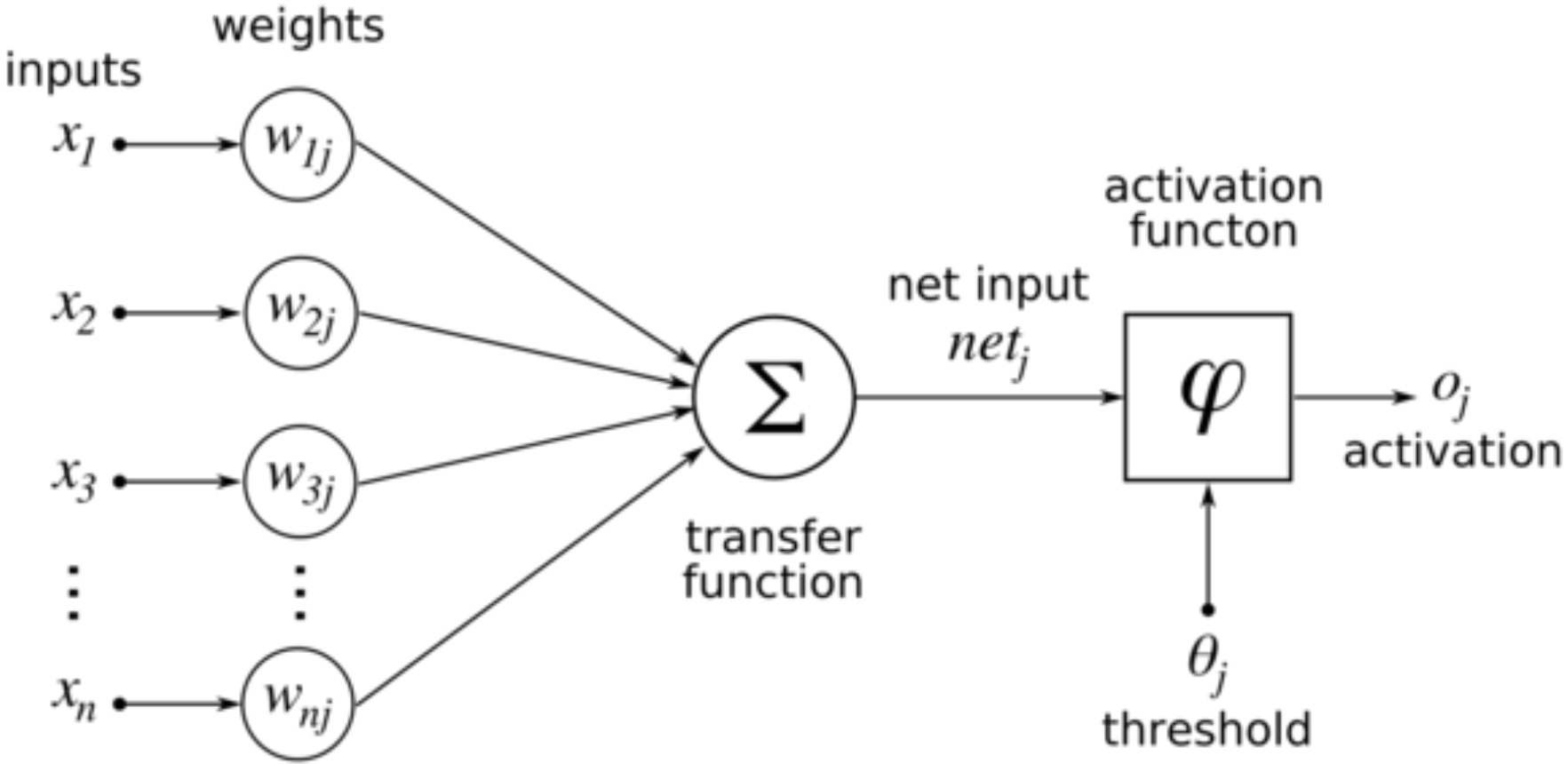
...Still today?...


What's the weather like this weekend?
Are you on a boat? Because I was not able to find any results for that location.
What's the weather like in Brooklyn this weekend?
The weather in Brooklyn, NY is 46°F and clear.
This weekend?
Excusez-moi?
WEEKEND
Sorry, dozed off for a second. What were you saying?

Twitter taught Microsoft's AI chatbot to be a racist asshole in less than a day

By James Vincent | @jjvincent | Mar 24, 2016, 6:43am EDT

Artificial Neural Networks


weights
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w_{1j}
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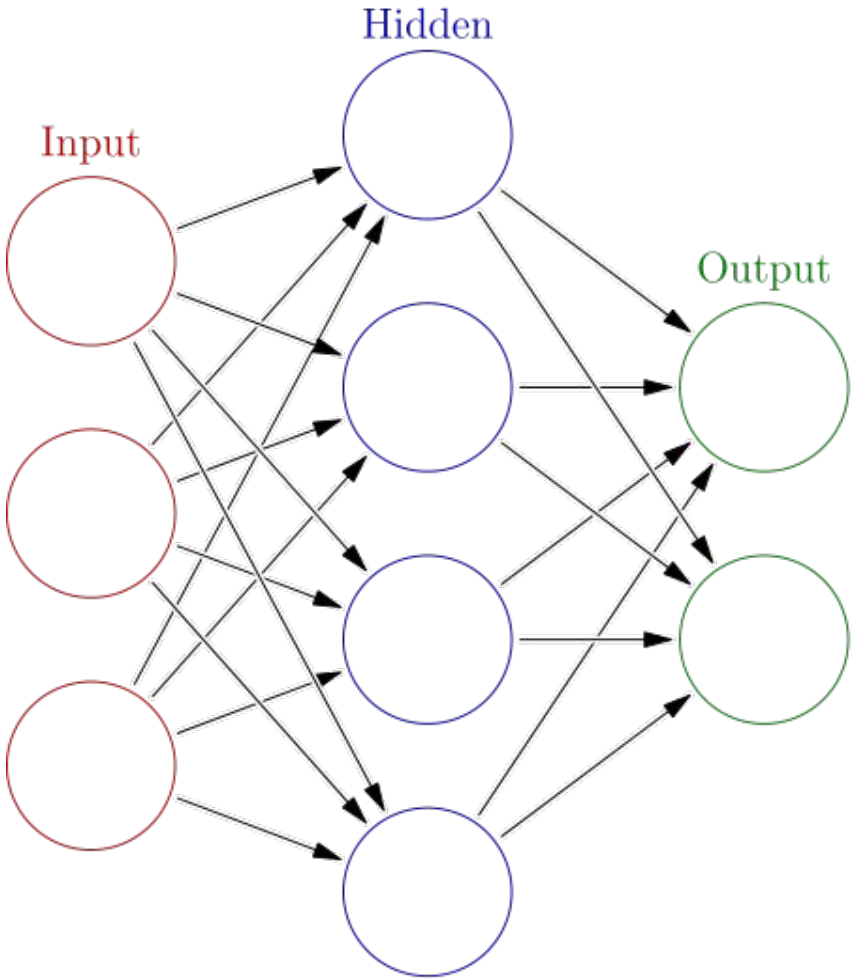
w_{3j}
w_{nj}
Σ
transfer
function
net input
net_j
activation
functon
φ
o_j
activation
θ_j
threshold

Why networks?

Multi-Layer Perceptron


Hidden
Input
Output

```
MLPClassifier(hidden_layer_sizes=(5, 2))
```

ANN Video

“One of the most ML algorithm ever”

Edoardo Venturini

Scale your features!

Tuning is needed

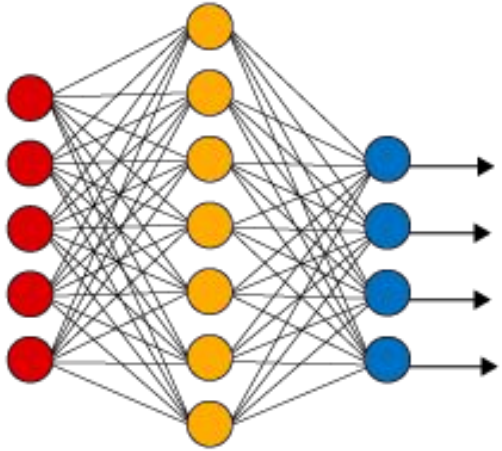
Black box

GB > ANN

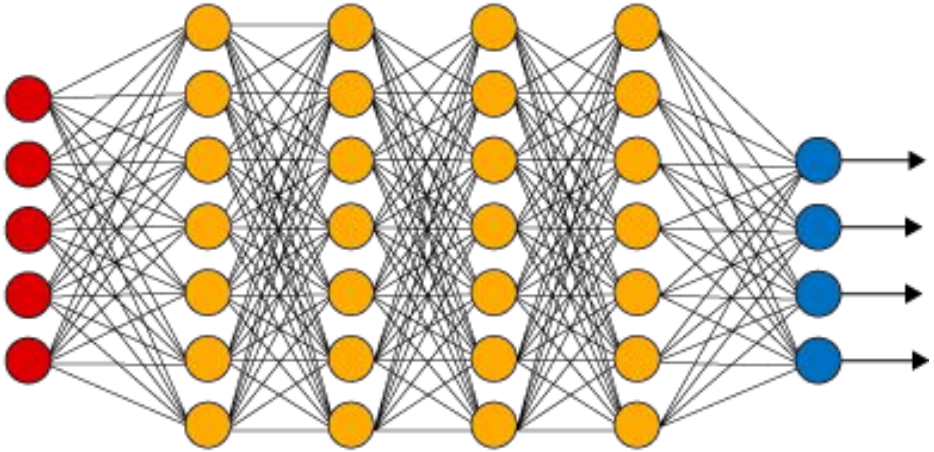
(in most of the cases)

Deep Learning

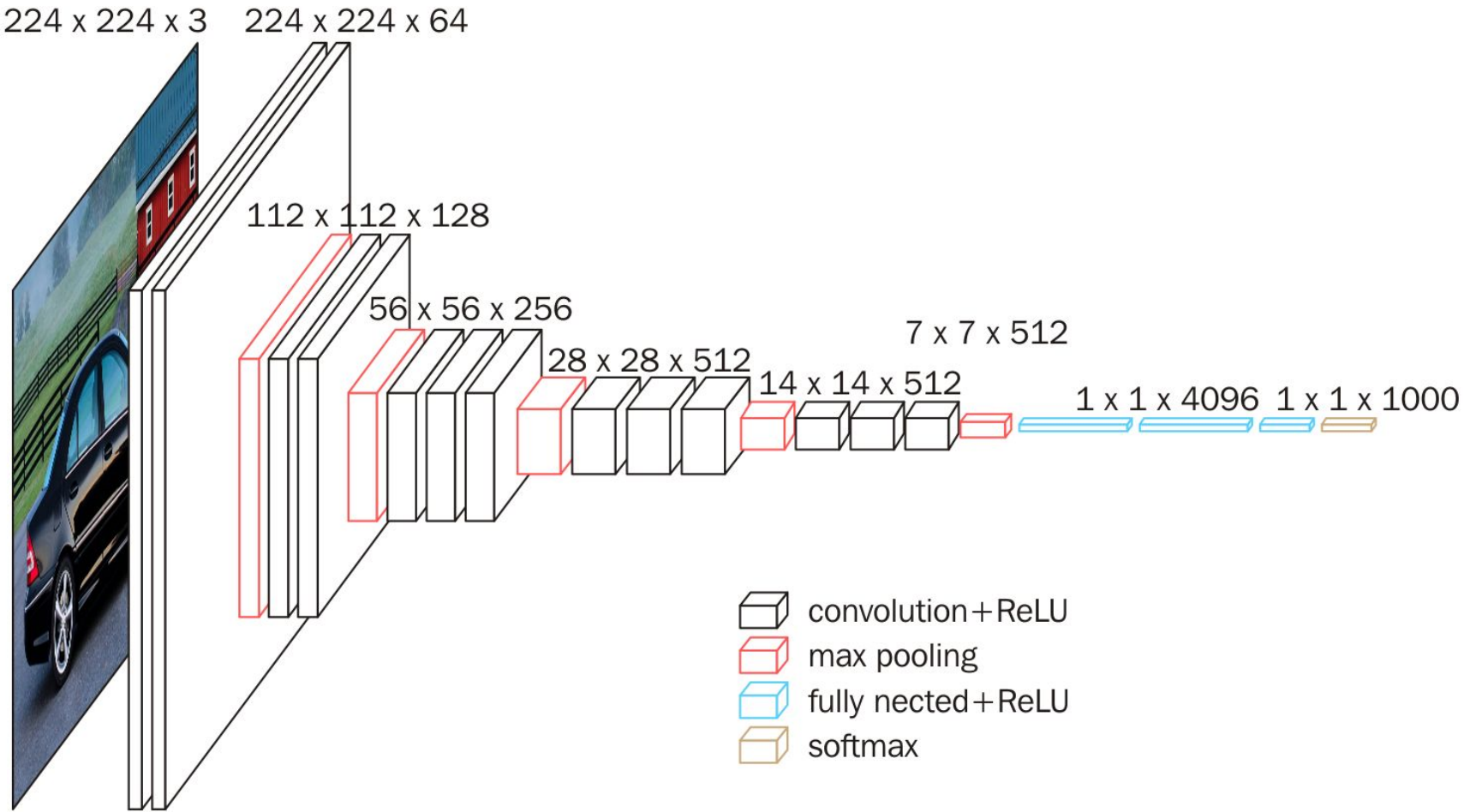
Simple Neural Network



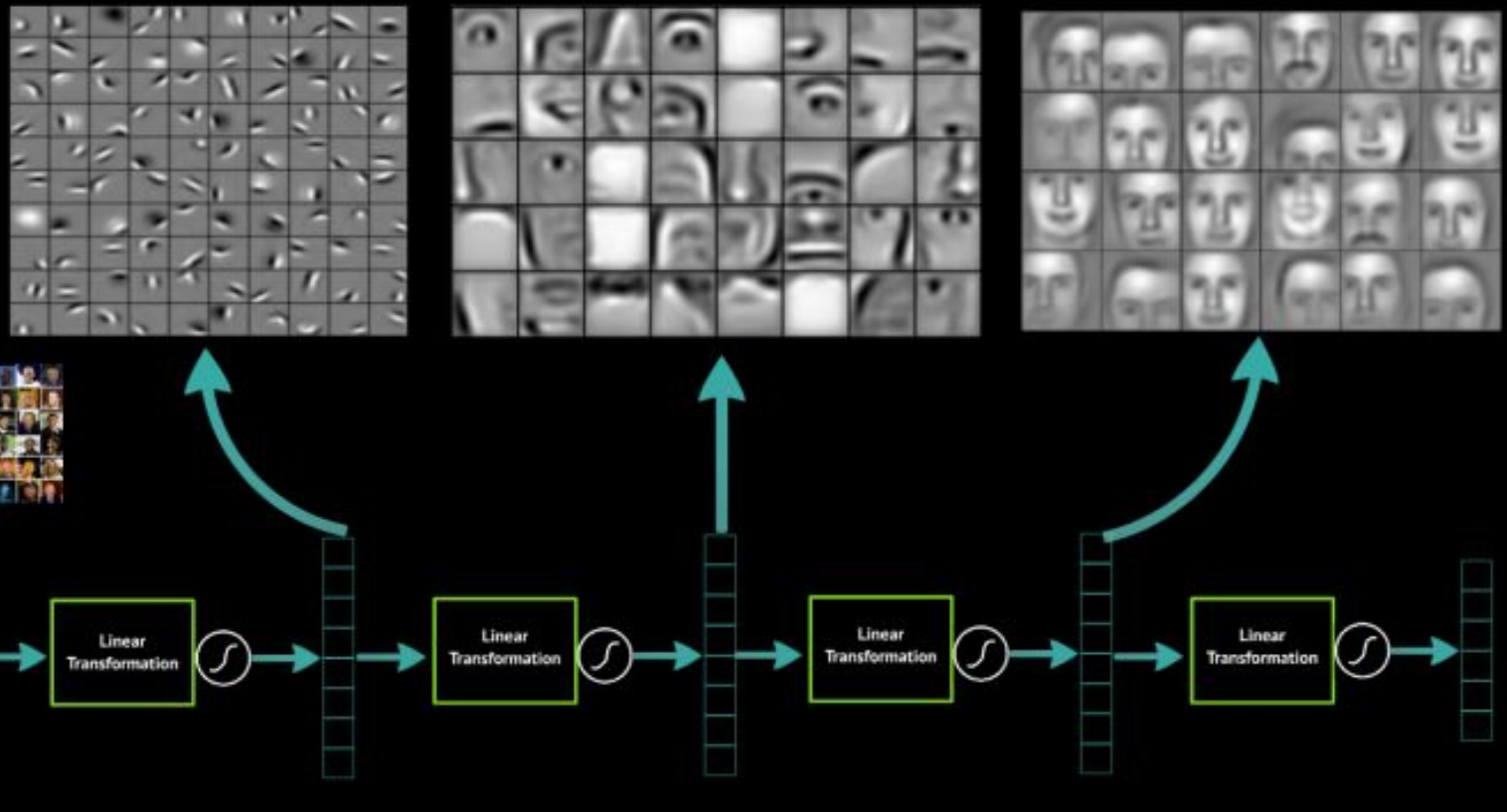
Deep Learning Neural Network



Input Layer Hidden Layer Output Layer


224 x 224 x 3
224 x 224 x 64
112 x 112 x 128
56 x 56 x 256
28 x 28 x 512
14 x 14 x 512
7 x 7 x 512
1 x 1 x 4096
1 x 1 x 1000
convolution+ReLU
max pooling
fully nected+ReLU
softmax

Deep Learning learns layers of features



Deep Learning Architectures

Pre-DL approach

Build features -> run models (SVM)

DL approach

Let the model extract the features

from raw data!