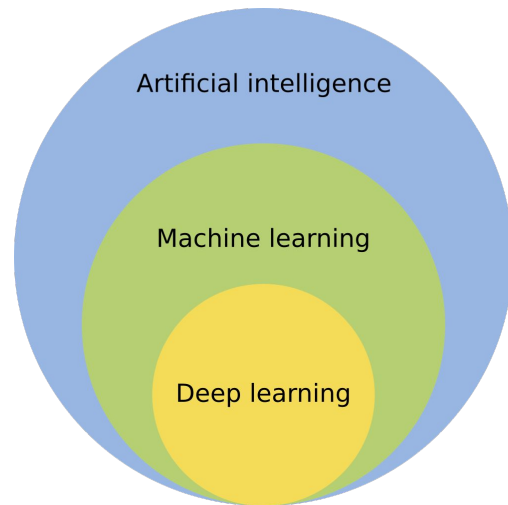
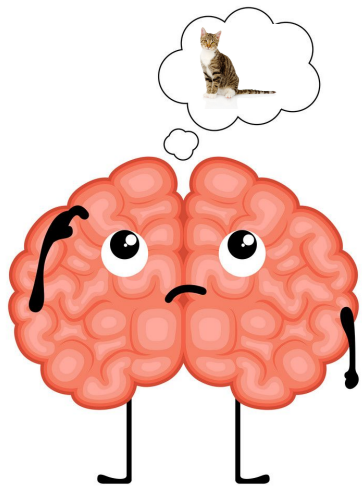


Neural networks & Deep learning

RWS Datalab

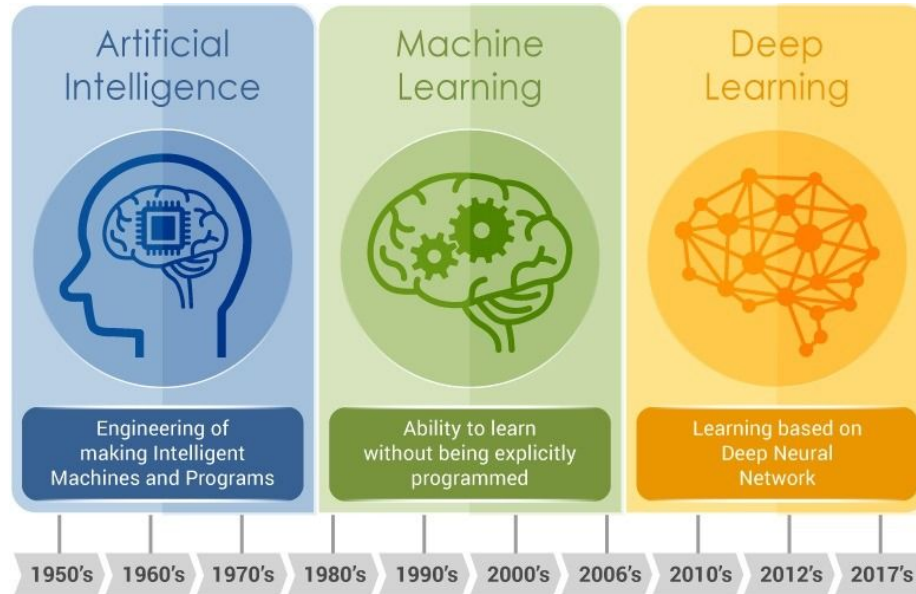
Wat is deep learning?

Deep learning is een machine learning methode waarbij kunstmatige neurale netwerken leren van grote hoeveelheden data.



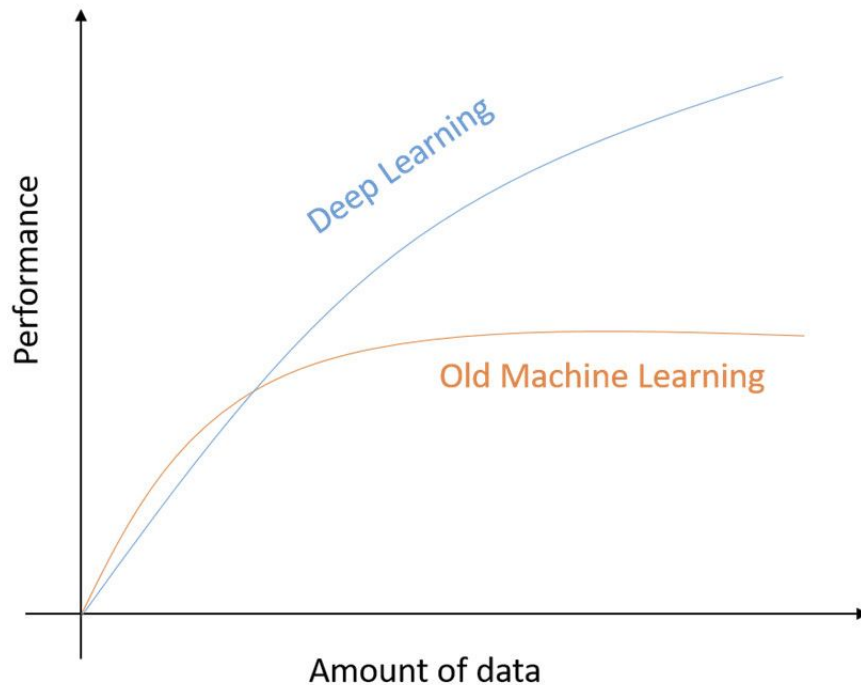
Het ontstaan van deep learning

Neurale netwerken and deep learning bestaan al een tijd, maar computers hadden niet voldoende rekenkracht om deep learning te faciliteren.

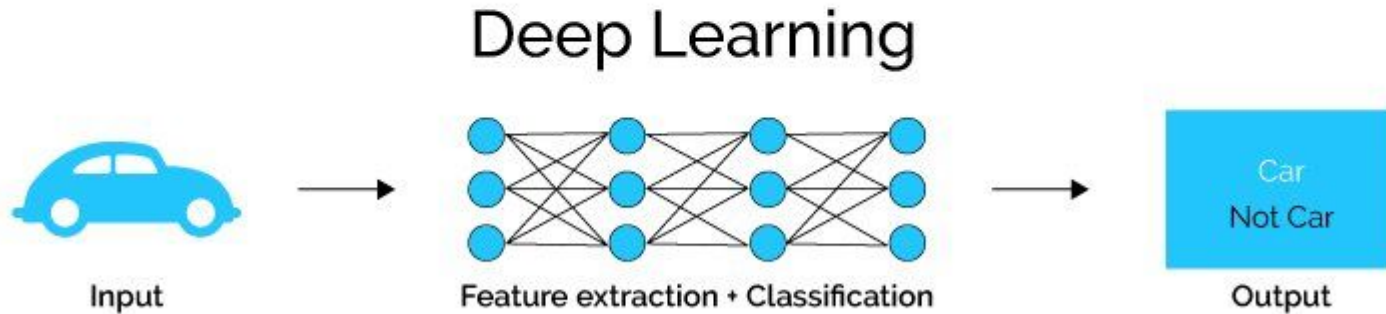
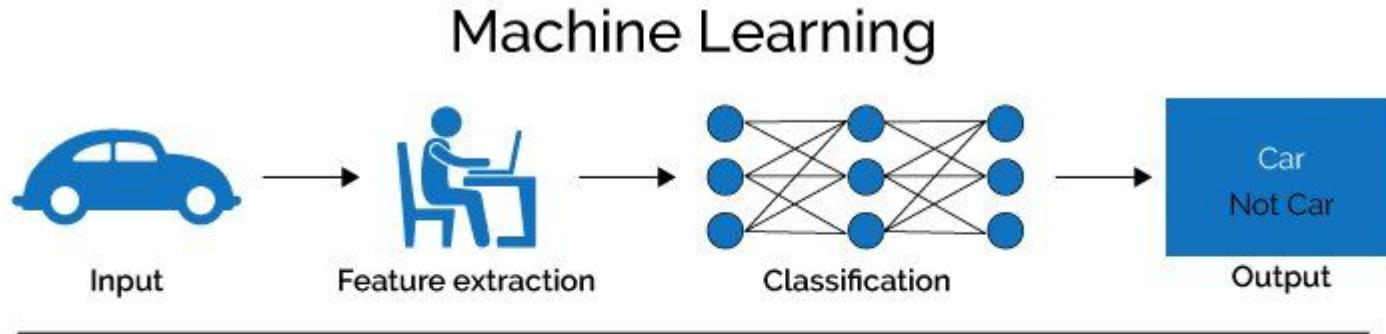


Waarom deep learning?

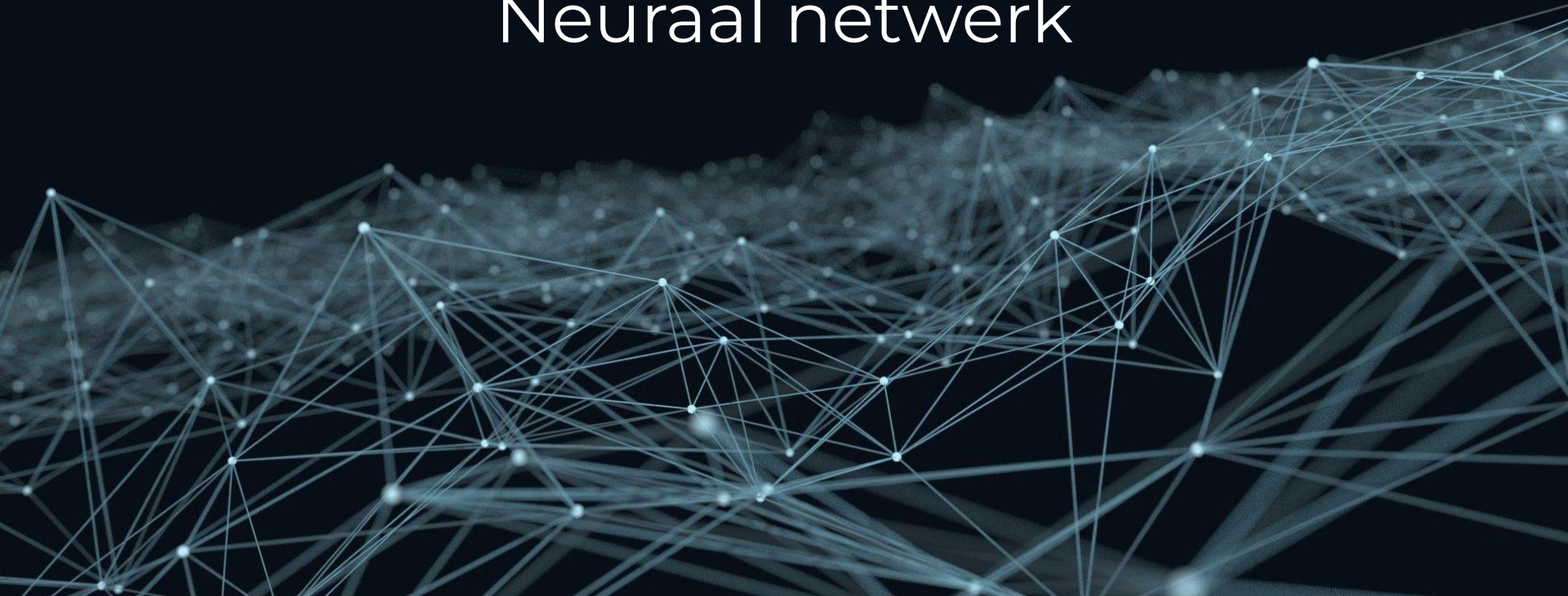
Prestatie van deep learning modellen t.o.v. hoeveelheid data blijft toenemen



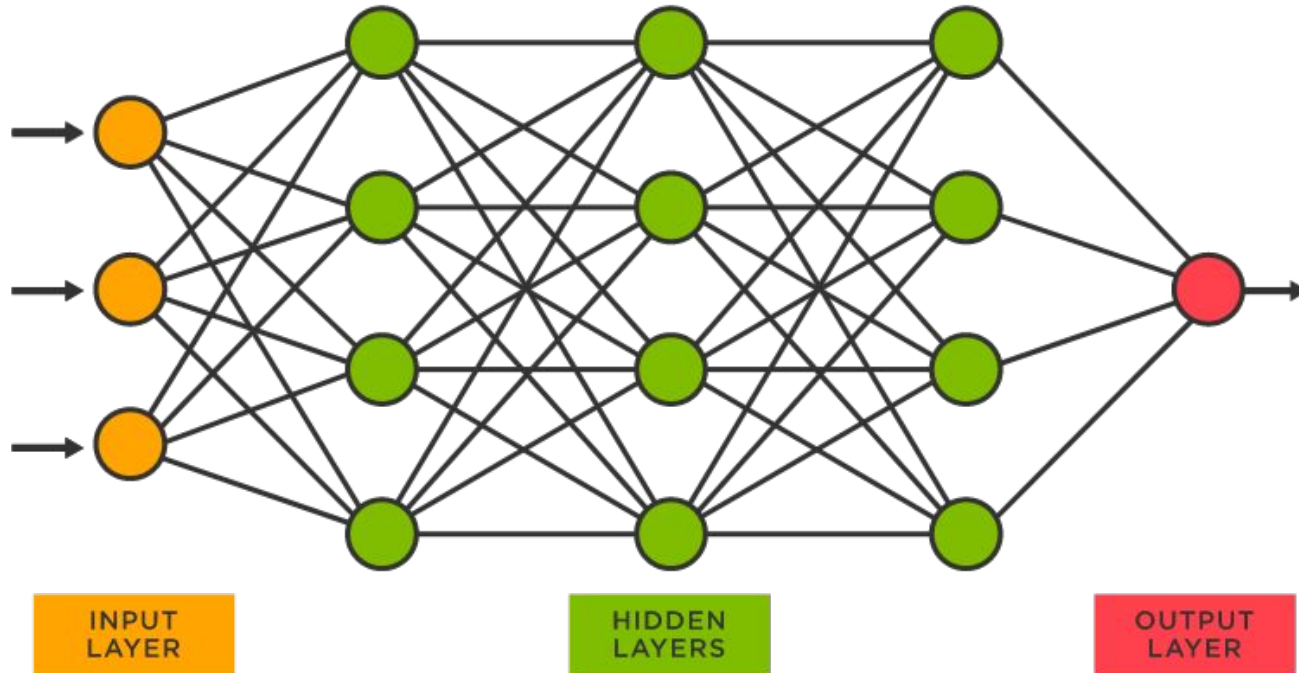
Machine learning vs. Deep learning



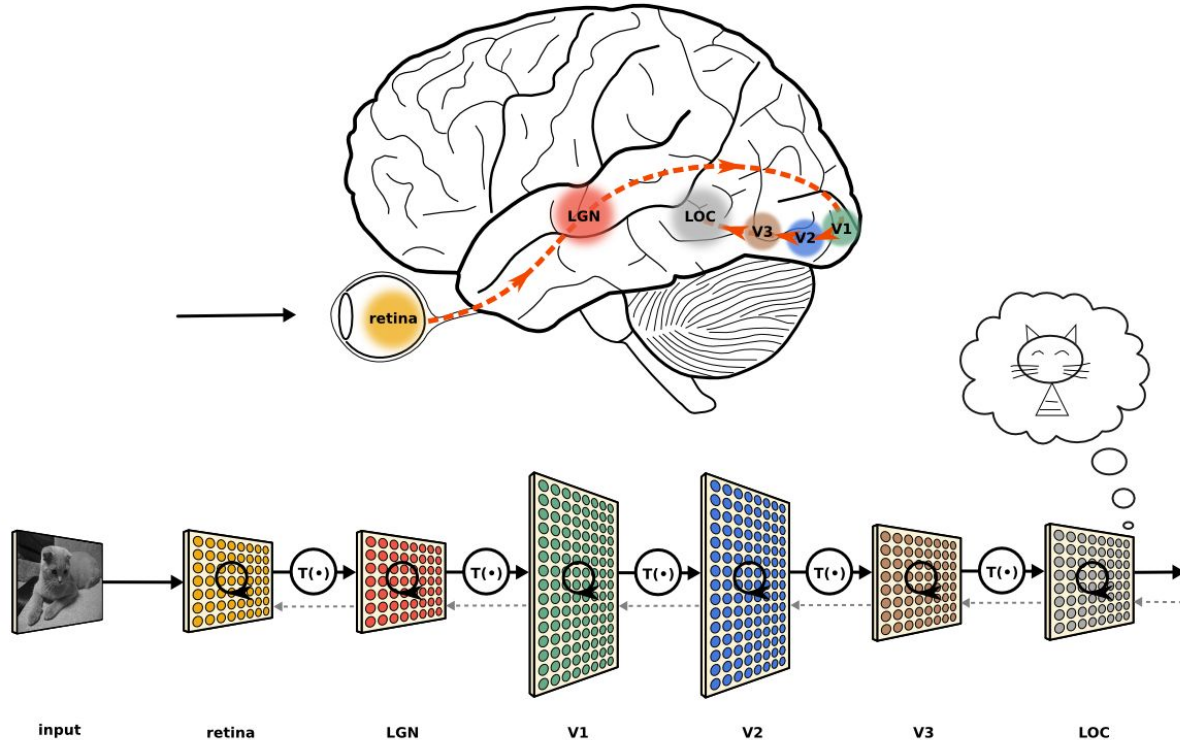
Neuraal netwerk



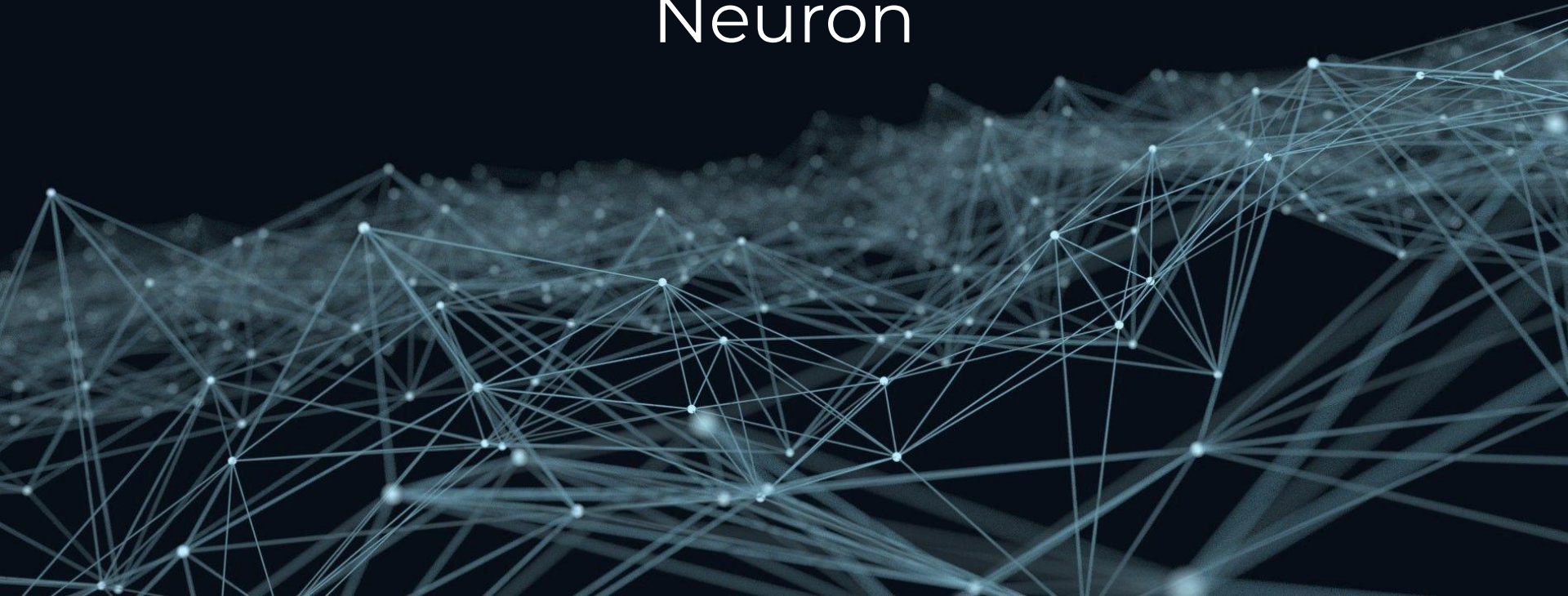
Een neuraal netwerk is een groep verbonden neuronen



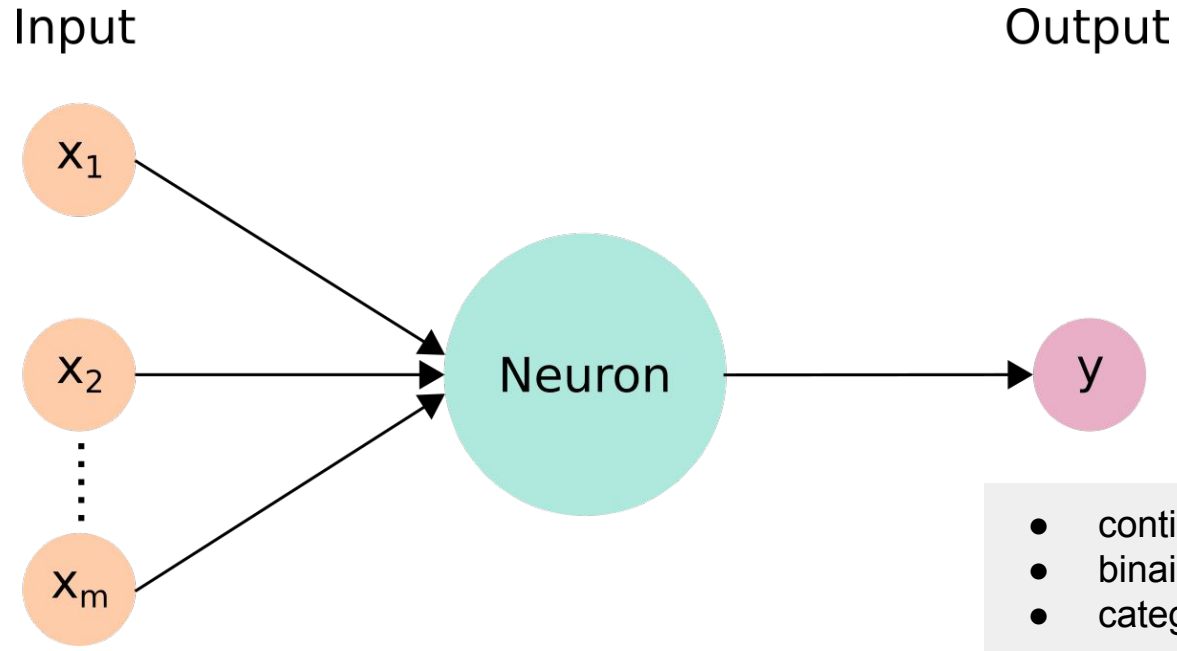
Geïnspireerd op de werking van het menselijk brein



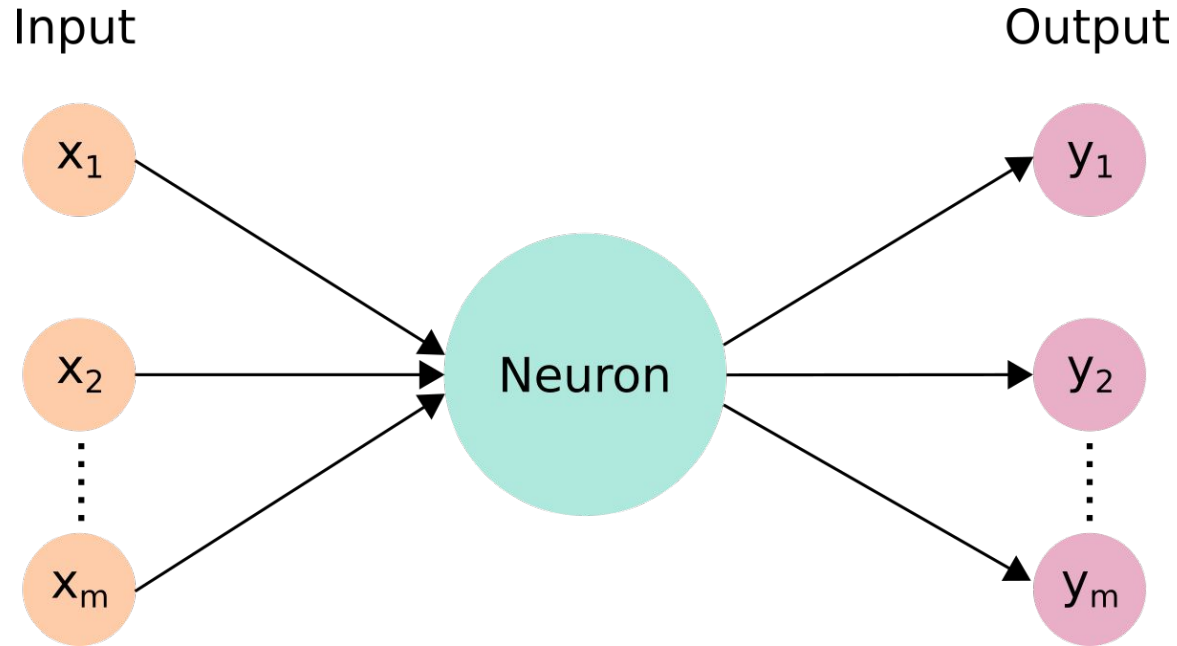
Neuron



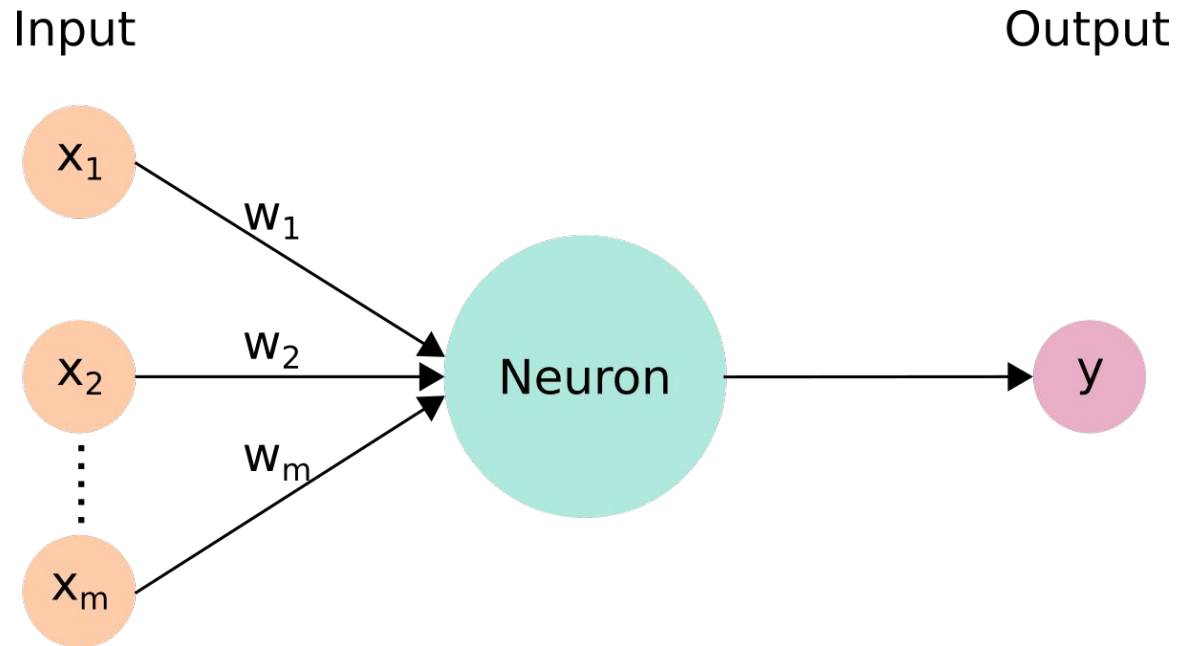
De werking van een neuron



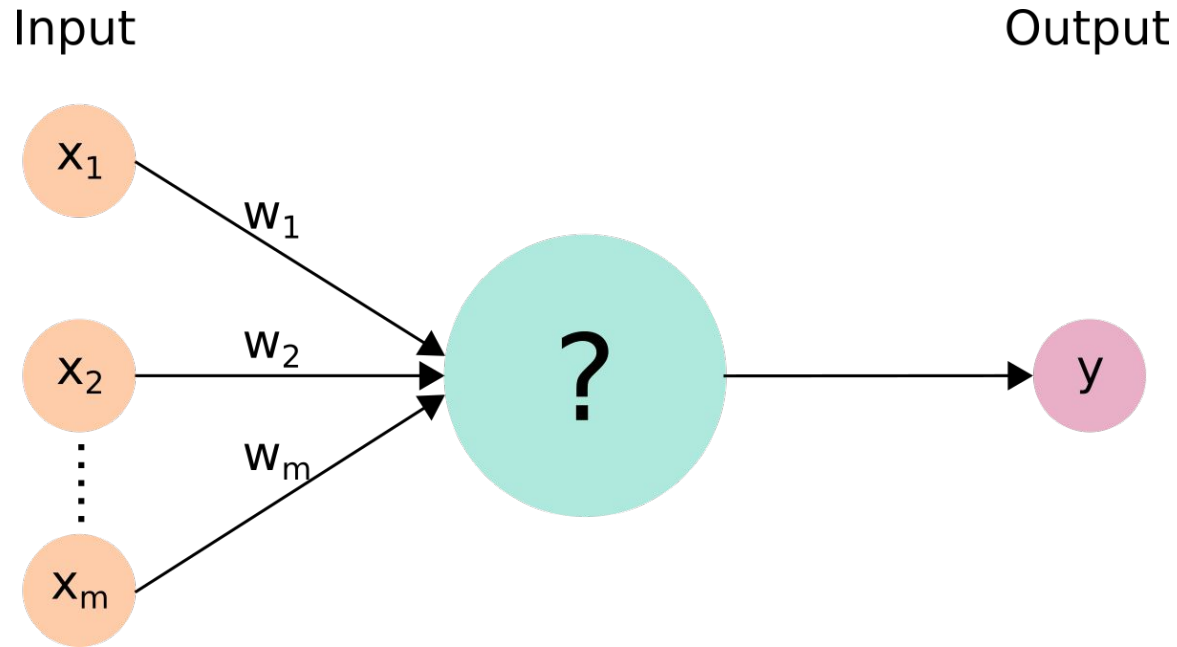
De werking van een neuron



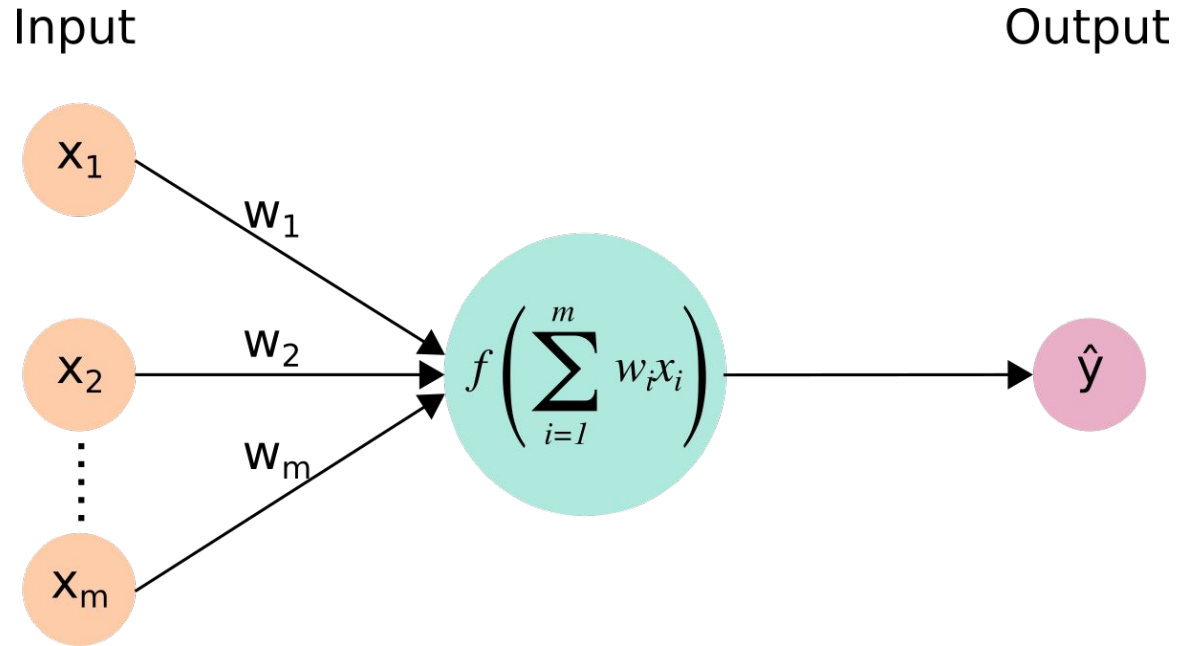
De gewichten



Wat gebeurt er in de neuron?



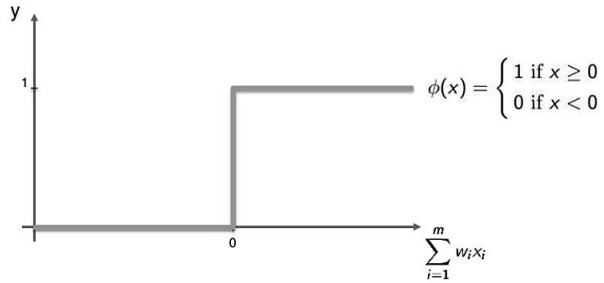
Activatiefunctie over gewogen som



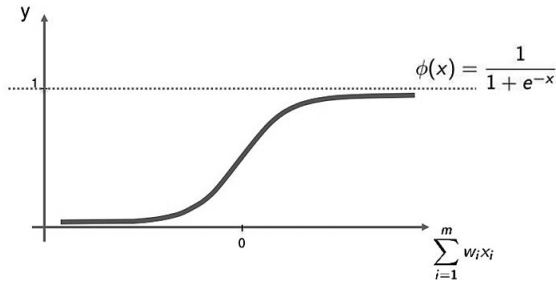
De activatiefunctie



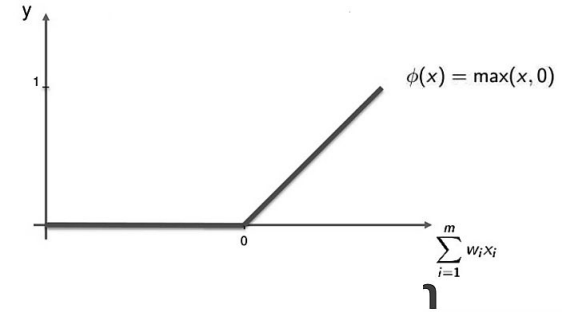
Activatiefuncties bepalen de output



Threshold

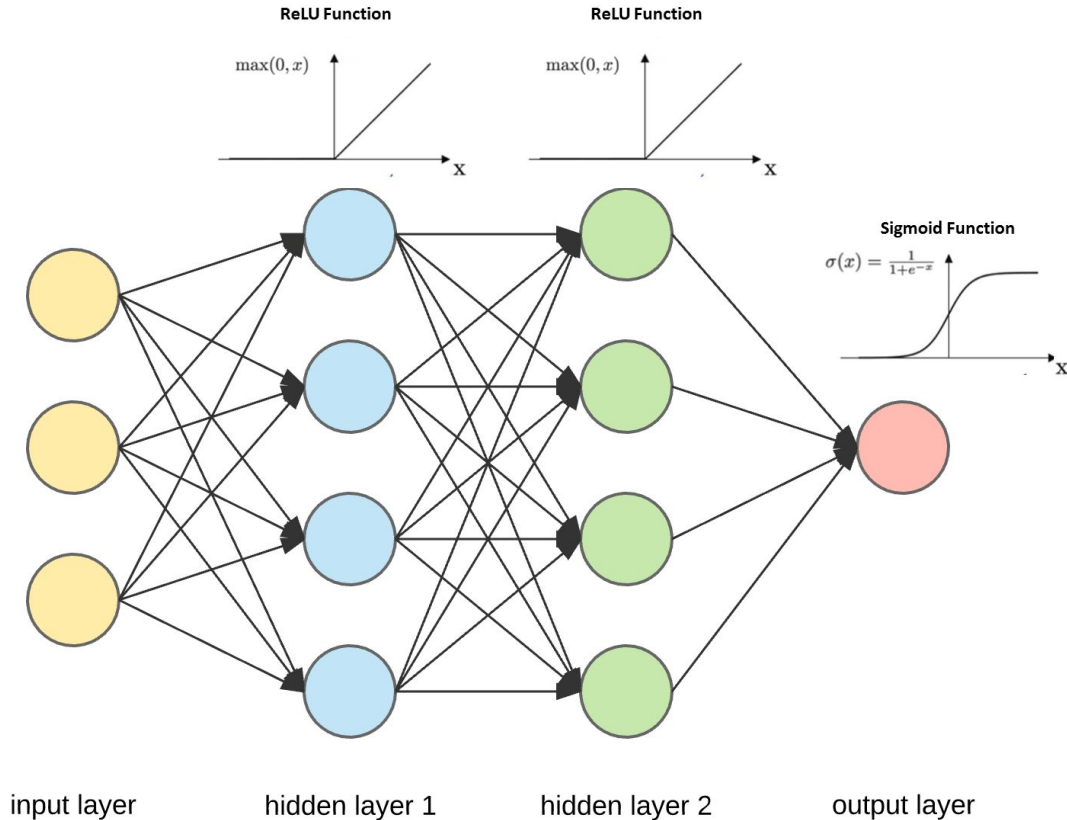


Sigmoid

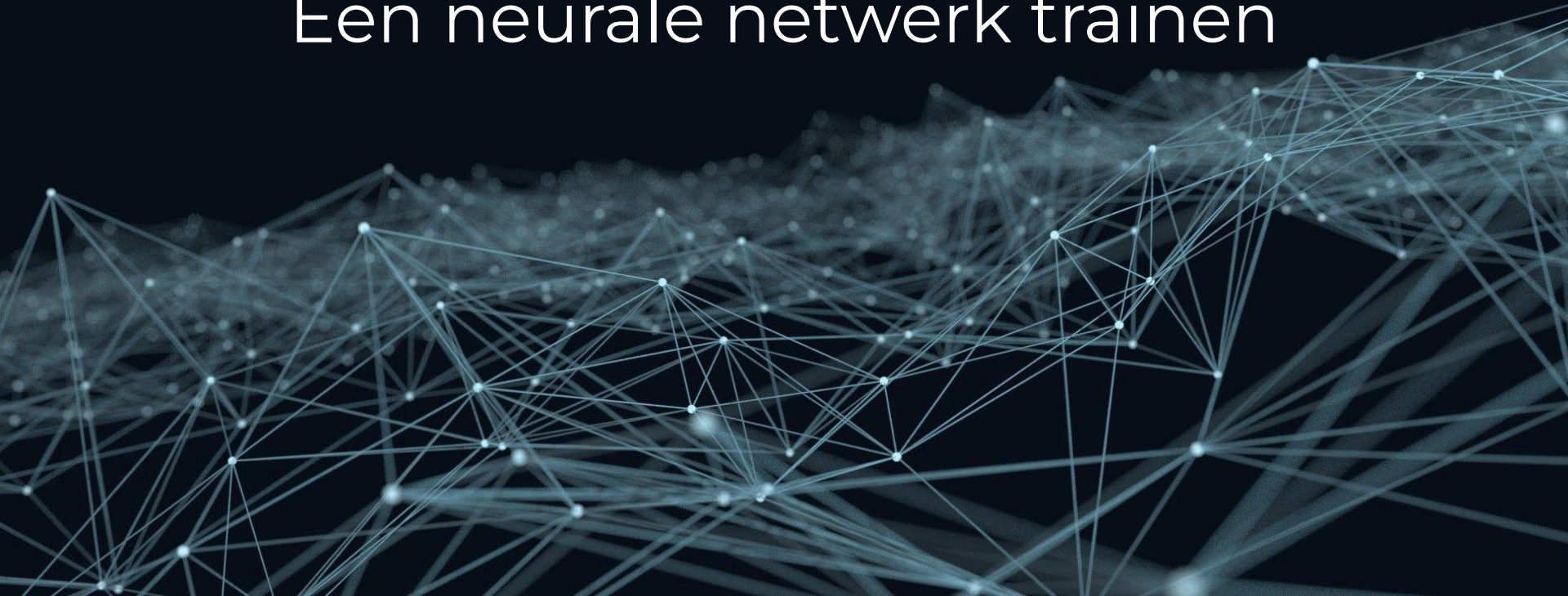


ReLU

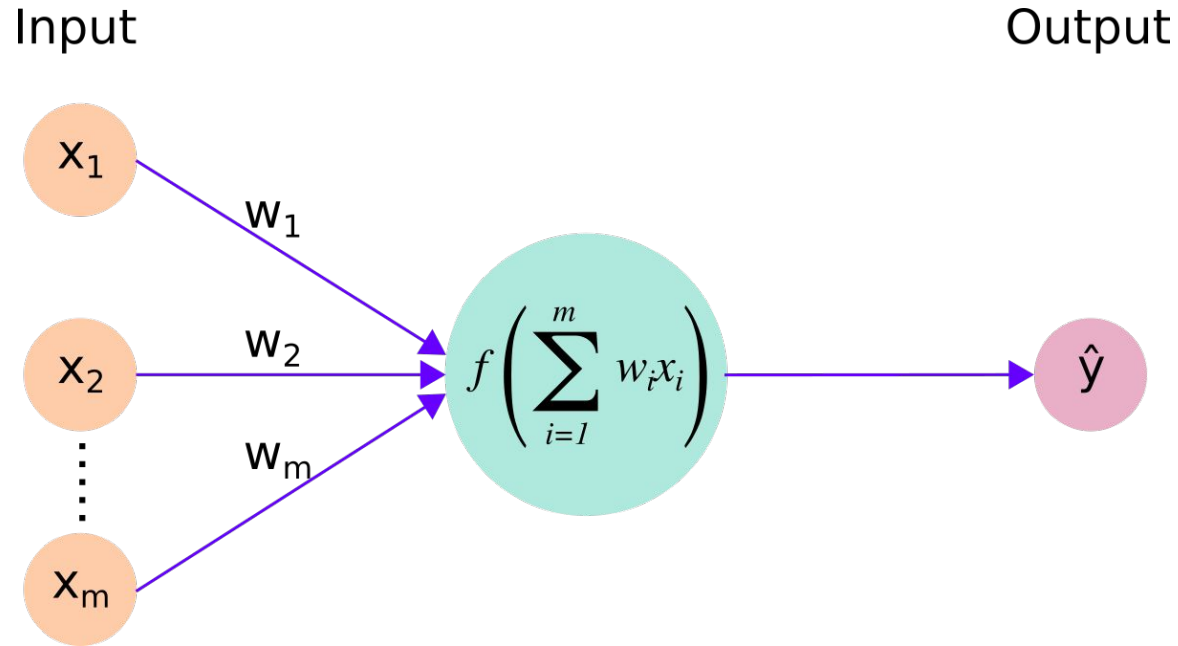
Activatiefunctie voor elke laag



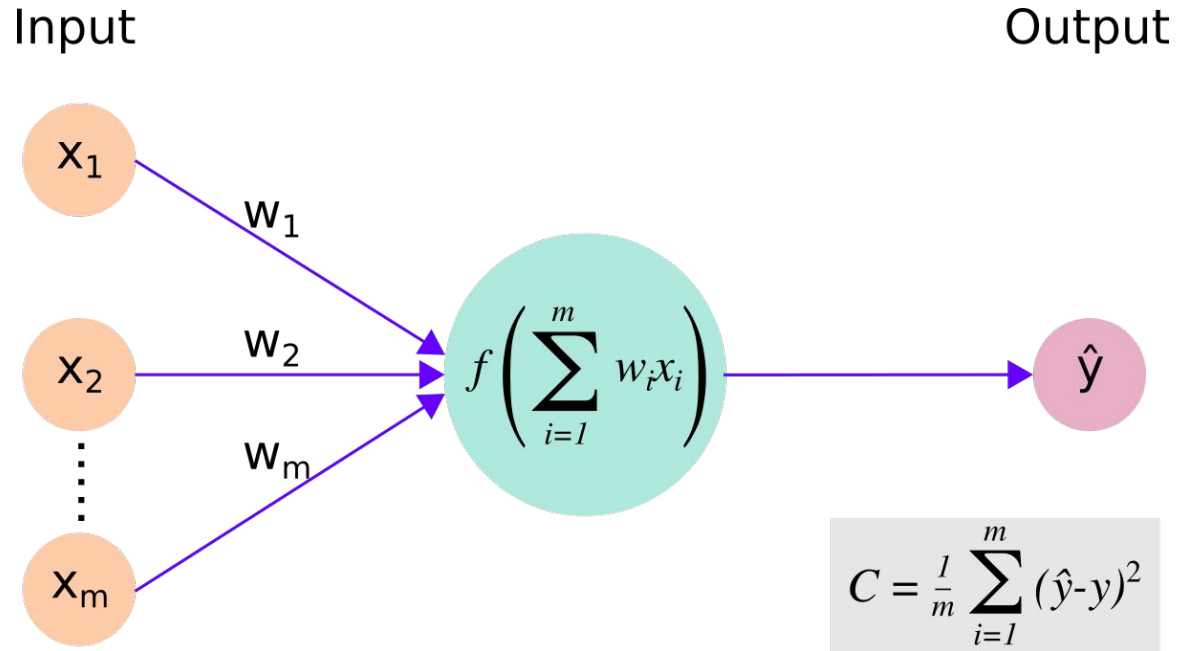
Een neurale netwerk trainen



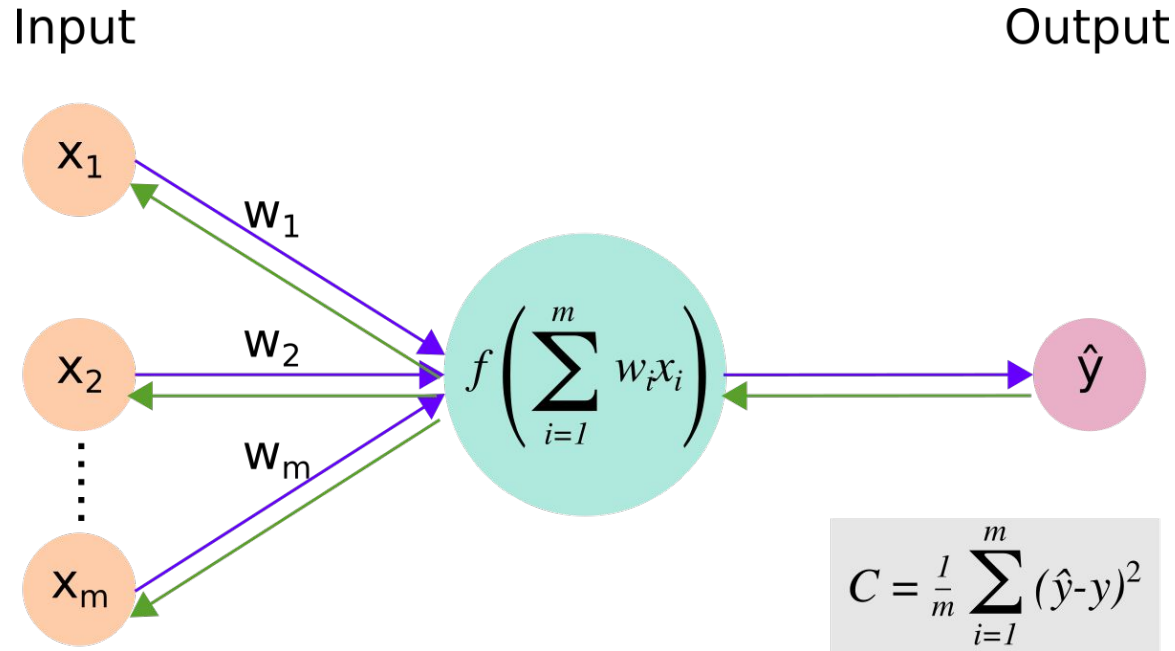
Een neurale netwerk trainen



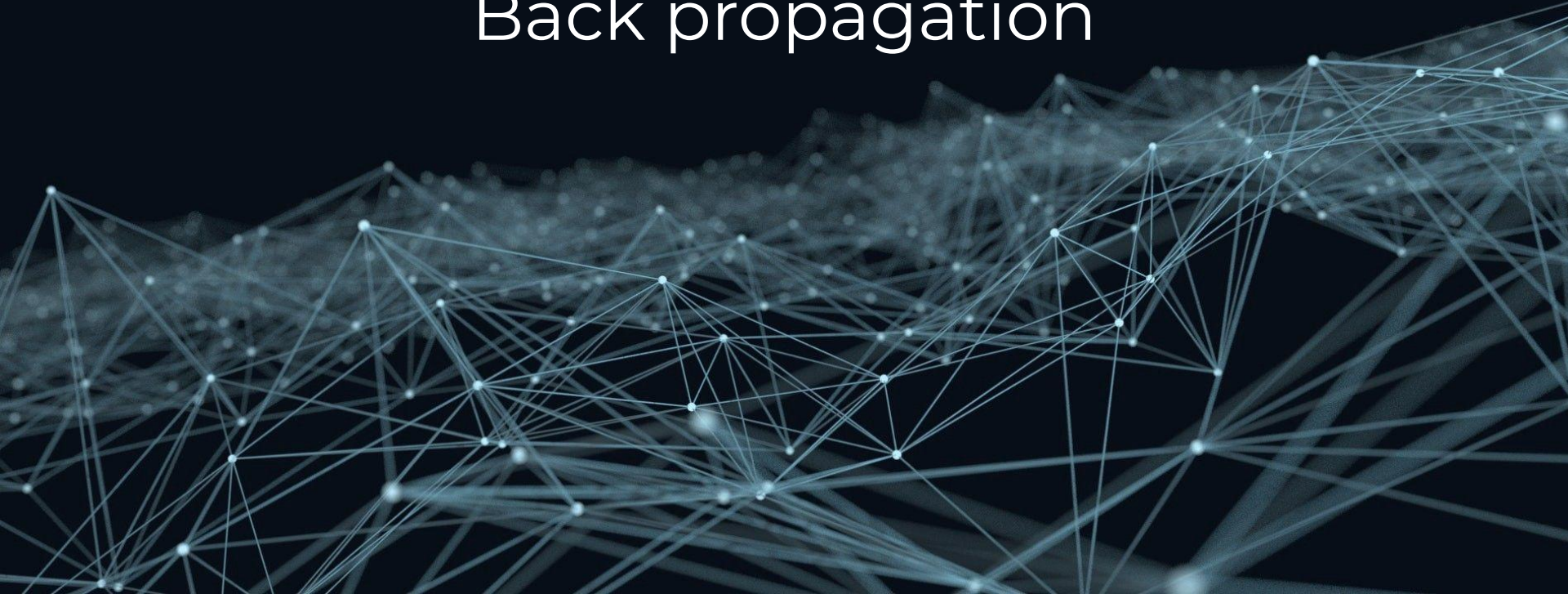
Kostfunctie om error te meten



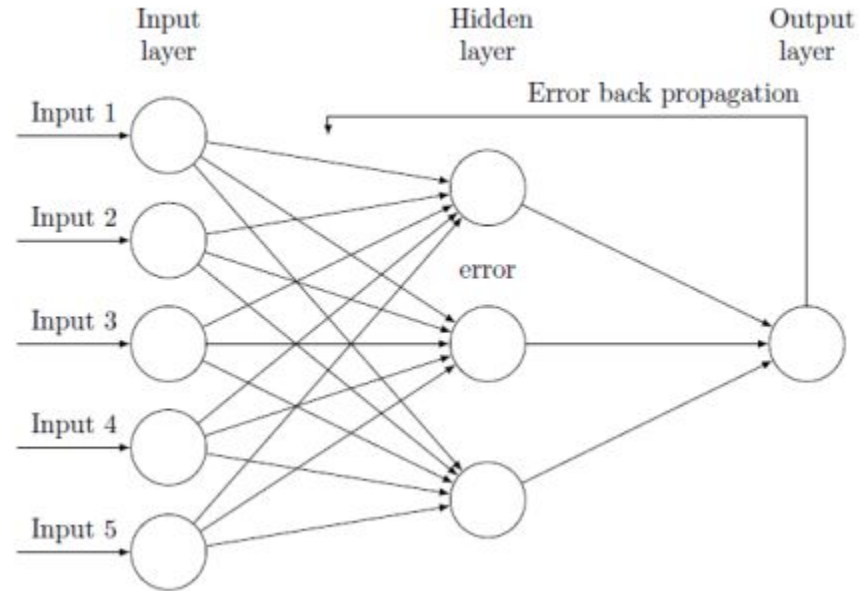
Gewichten updaten



Back propagation



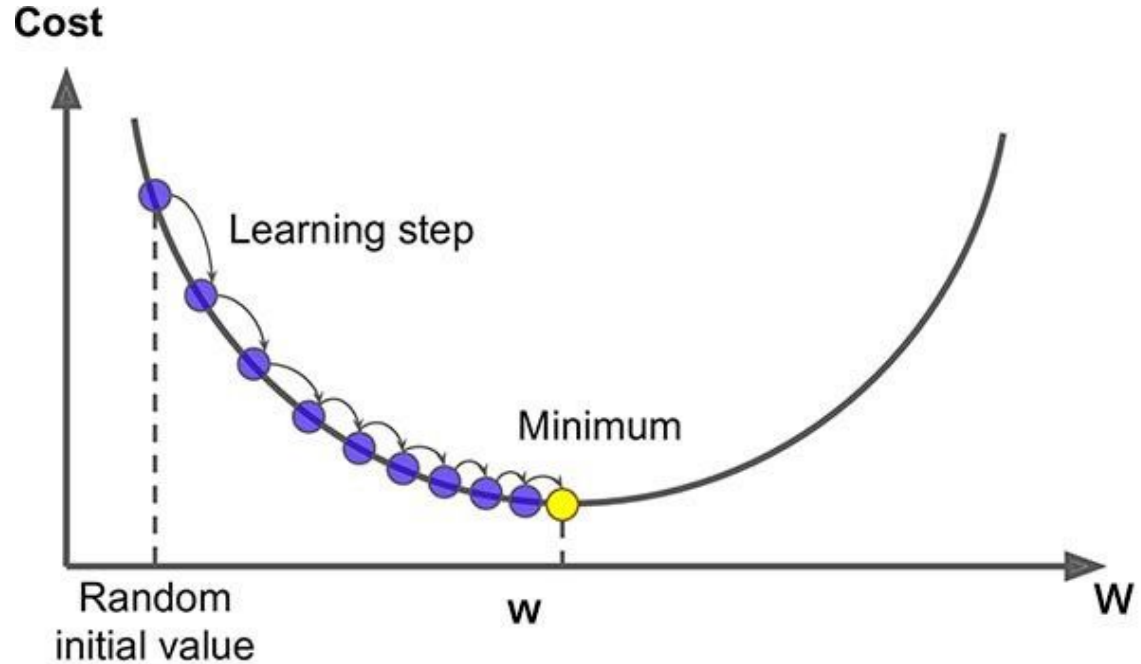
Back propagation



Gradient descent

Stap voor stap kosten
minimaliseren

$$\text{Gradient} = dC/dw$$

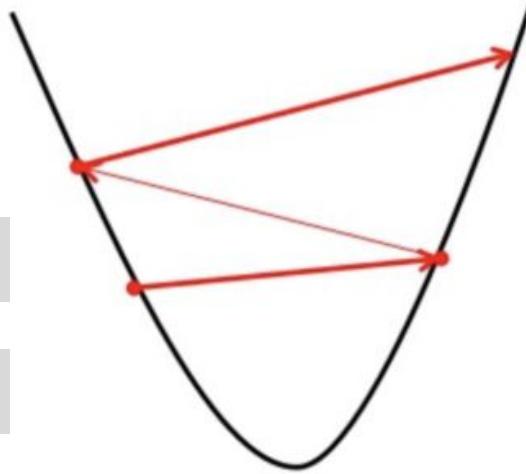


Learning rate

Learning rate mag niet te hoog en niet te laag zijn

Big learning rate

Small learning rate



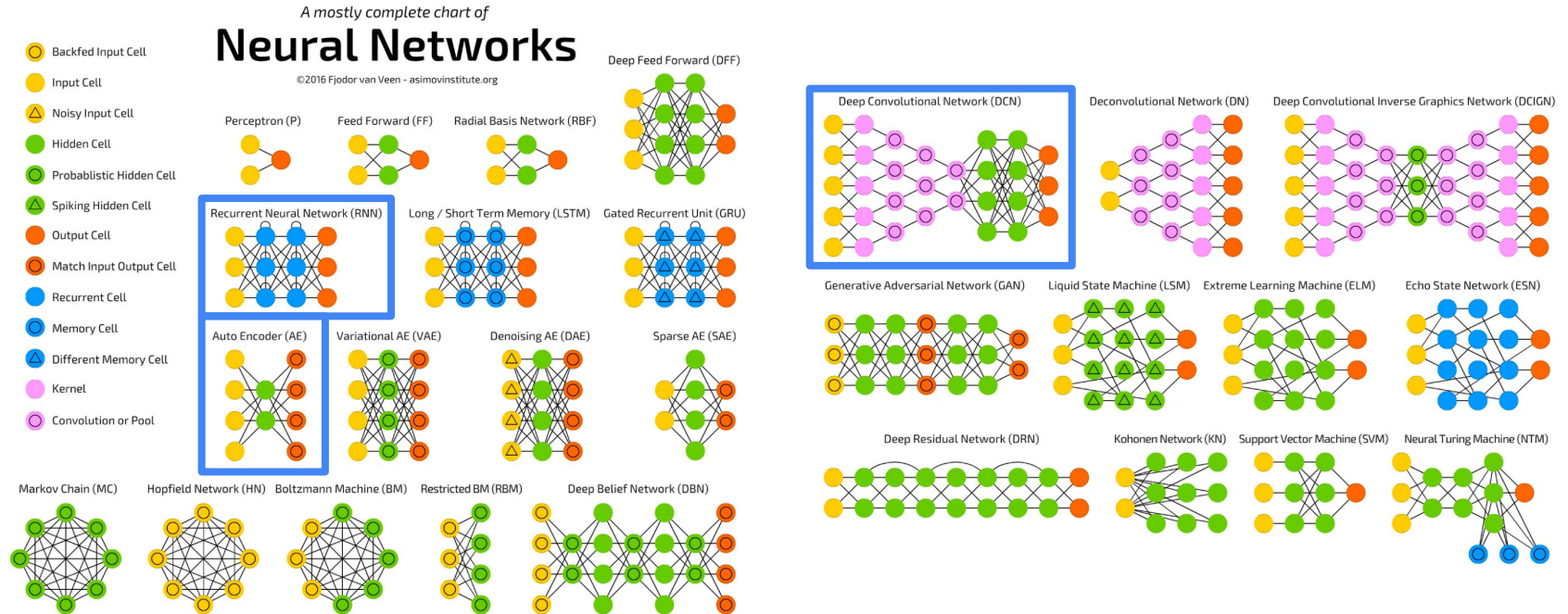
$$dx = \alpha * |dC/dw|$$

$$w = w - \alpha * |dC/dw|$$

Verschillende soorten NNs



Verschillende soorten NNs



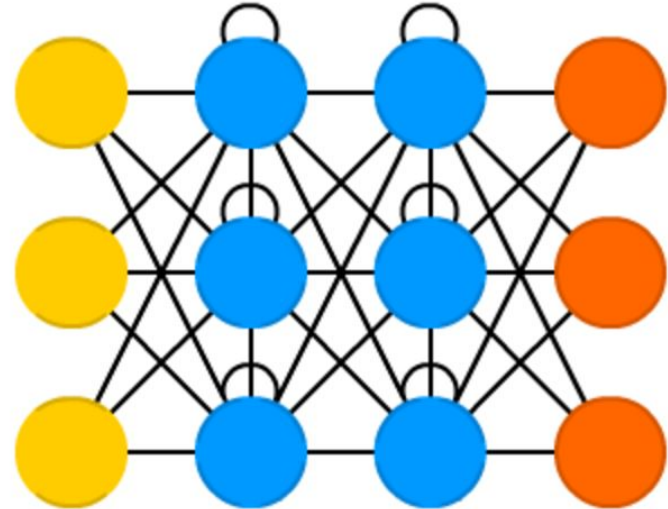
Recurrent Neural Network (RNN)

Sequentiële data (tijdsgebonden)

text data

audio data

Reinforcement learning



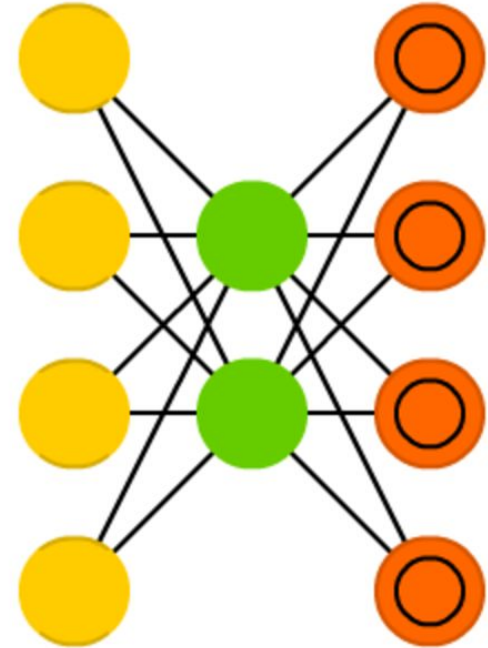
Auto Encoder (AE)

Model traint de output om gelijkenissen te vinden met de input

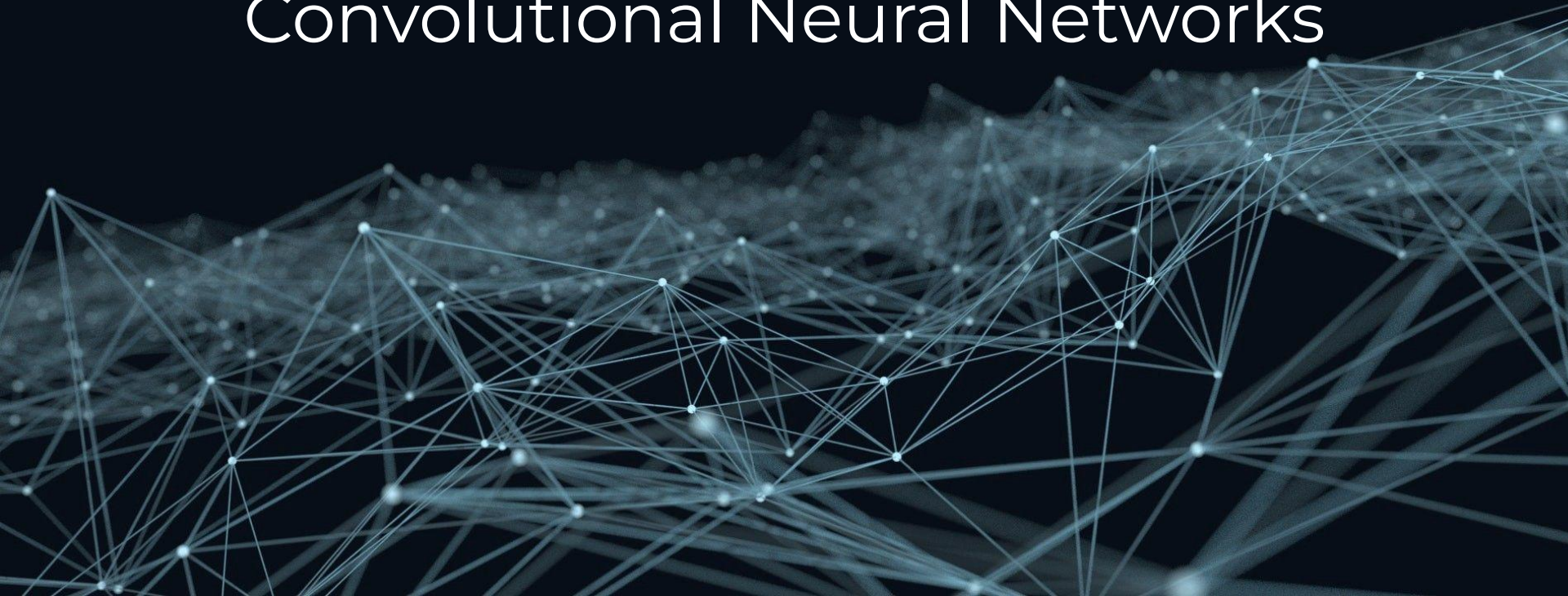
Representation/feature learning

audioverwerking

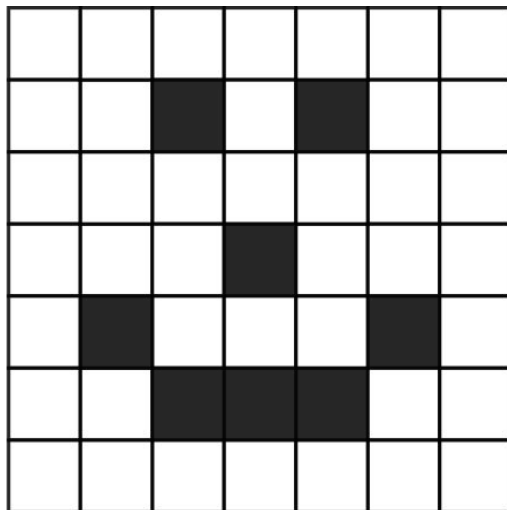
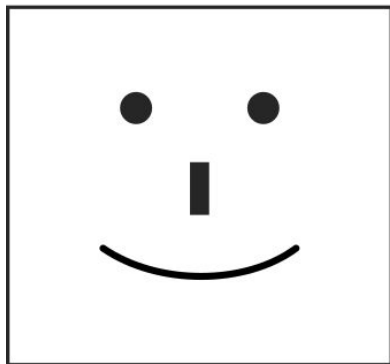
ruisonderdrukking



Convolutional Neural Networks



Beelddata

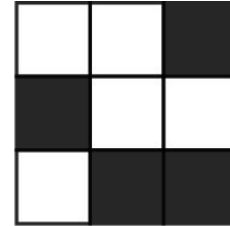
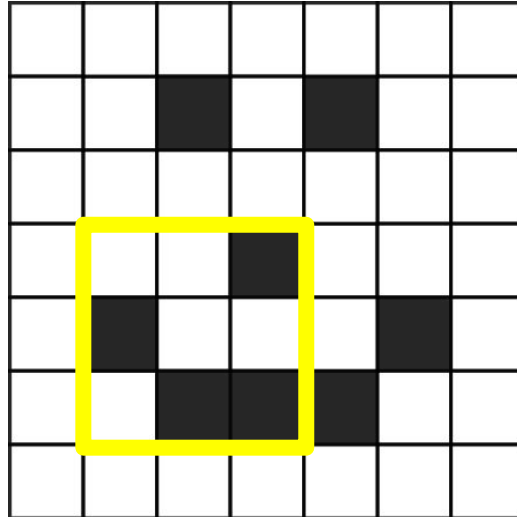


0	0	0	0	0	0	0
0	0	1	0	1	0	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	1	0	0	0	1	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0

Convolutional layer

Feature map: Een filter/kernel die eigenschappen herkent

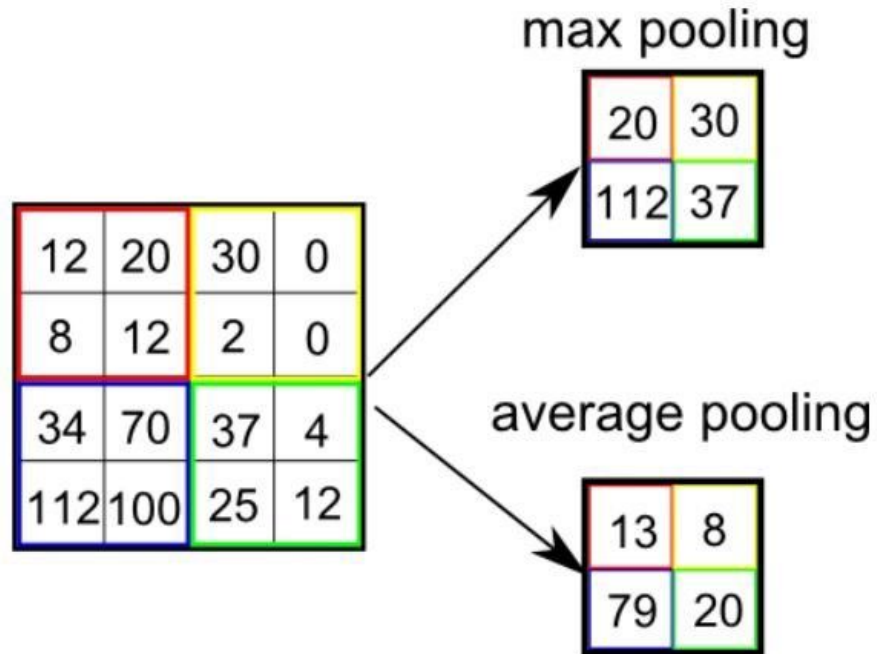
Feature map scant de hele afbeelding en geeft hoge scores als deze dezelfde eigenschap vindt.



0	0	1
1	0	0
0	1	1

Pooling layer

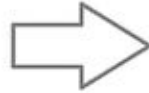
Dimensie reductie d.m.v. poolen



Flattening

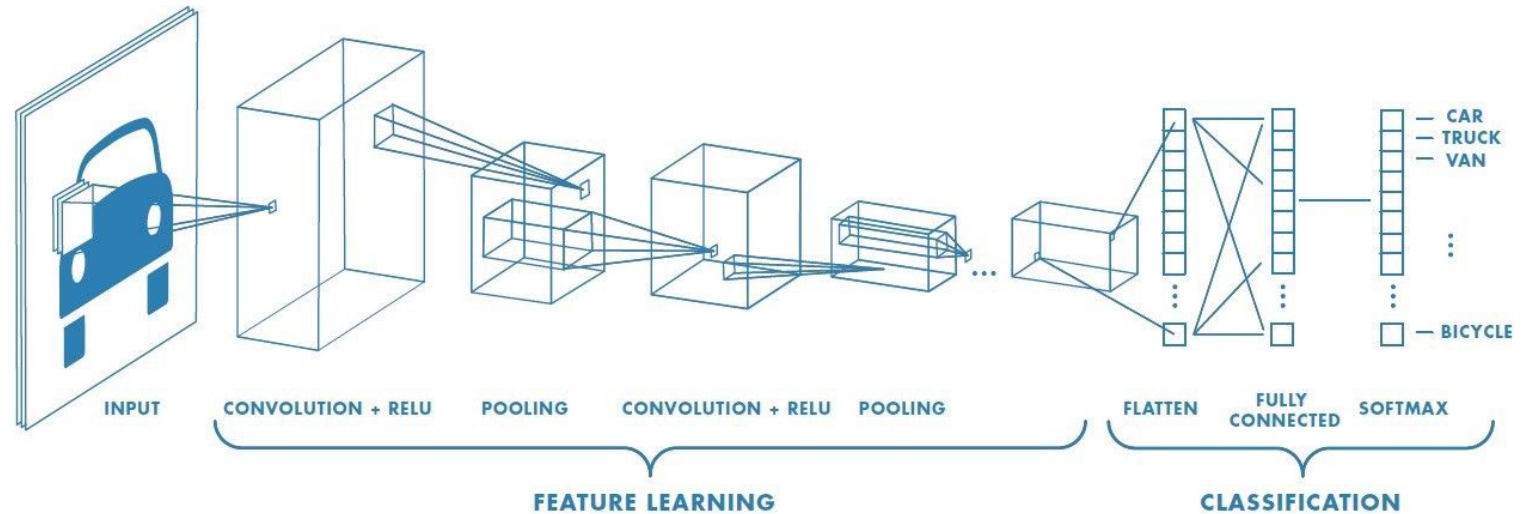
Van tabel naar vector

1	1	0
4	2	1
0	2	1



1
1
0
4
2
1
0
2
1

Structuur van een CNN



Vragen?



Gradient descent algoritmes

- **Stochastic Gradient Descent** — Het model wordt geoptimaliseerd volgens de error na elke sample.
- **Batch Gradient Descent** — Het model wordt geoptimaliseerd gebaseerd op de gemiddelde error van de hele trainingsset.
- **Mini-Batch Gradient Descent** — Splitst de trainingset op in batches en past het model aan na elke batch.

