Neural Networks

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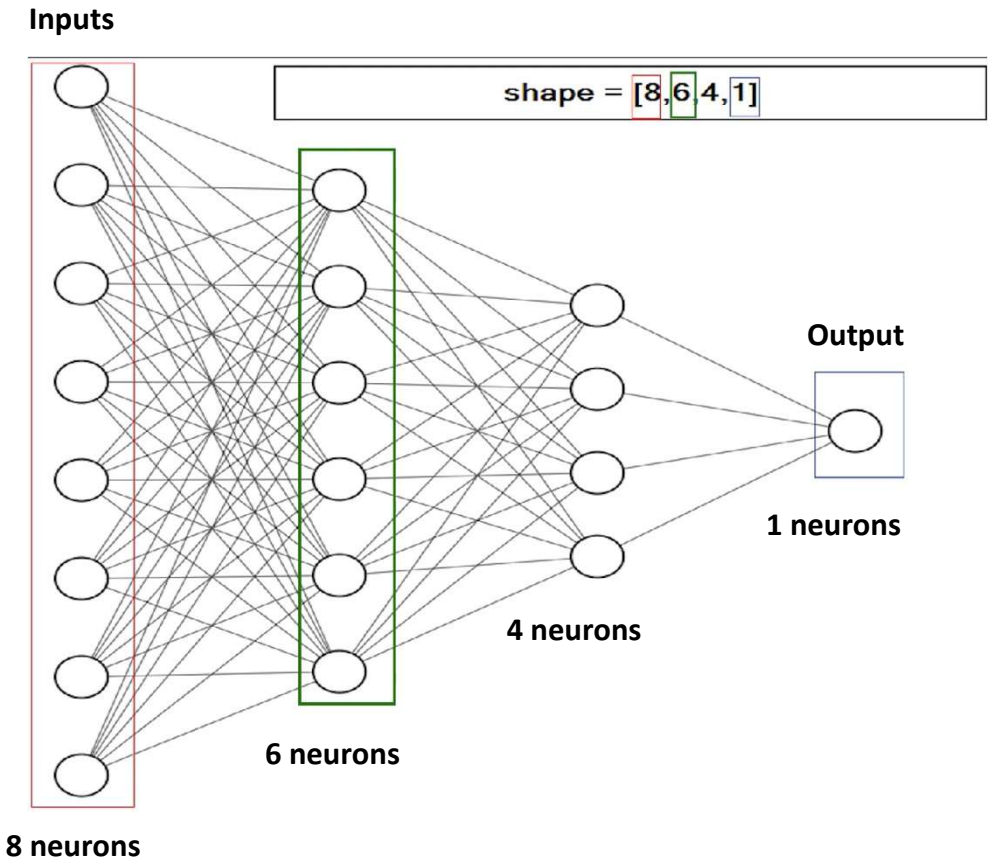
A Multi-Layer Perceptron (MLP)

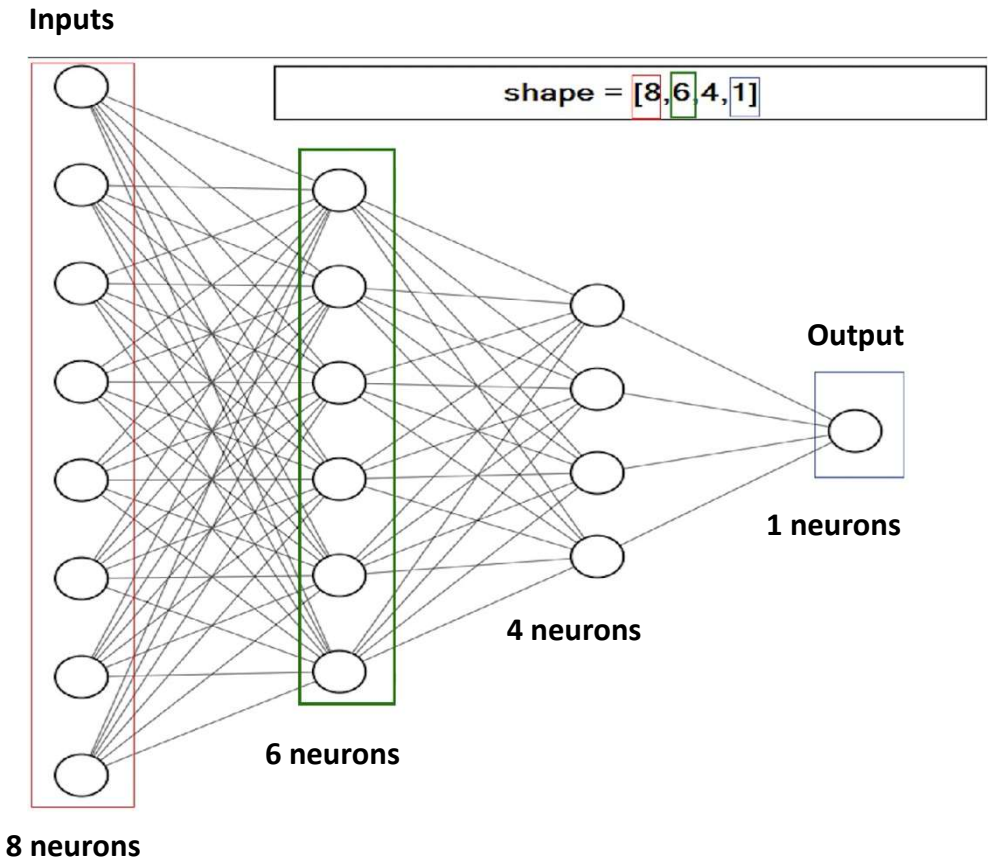
- Network Parameters (weights, biases)
  - **How many ?**



Andrian Theonig

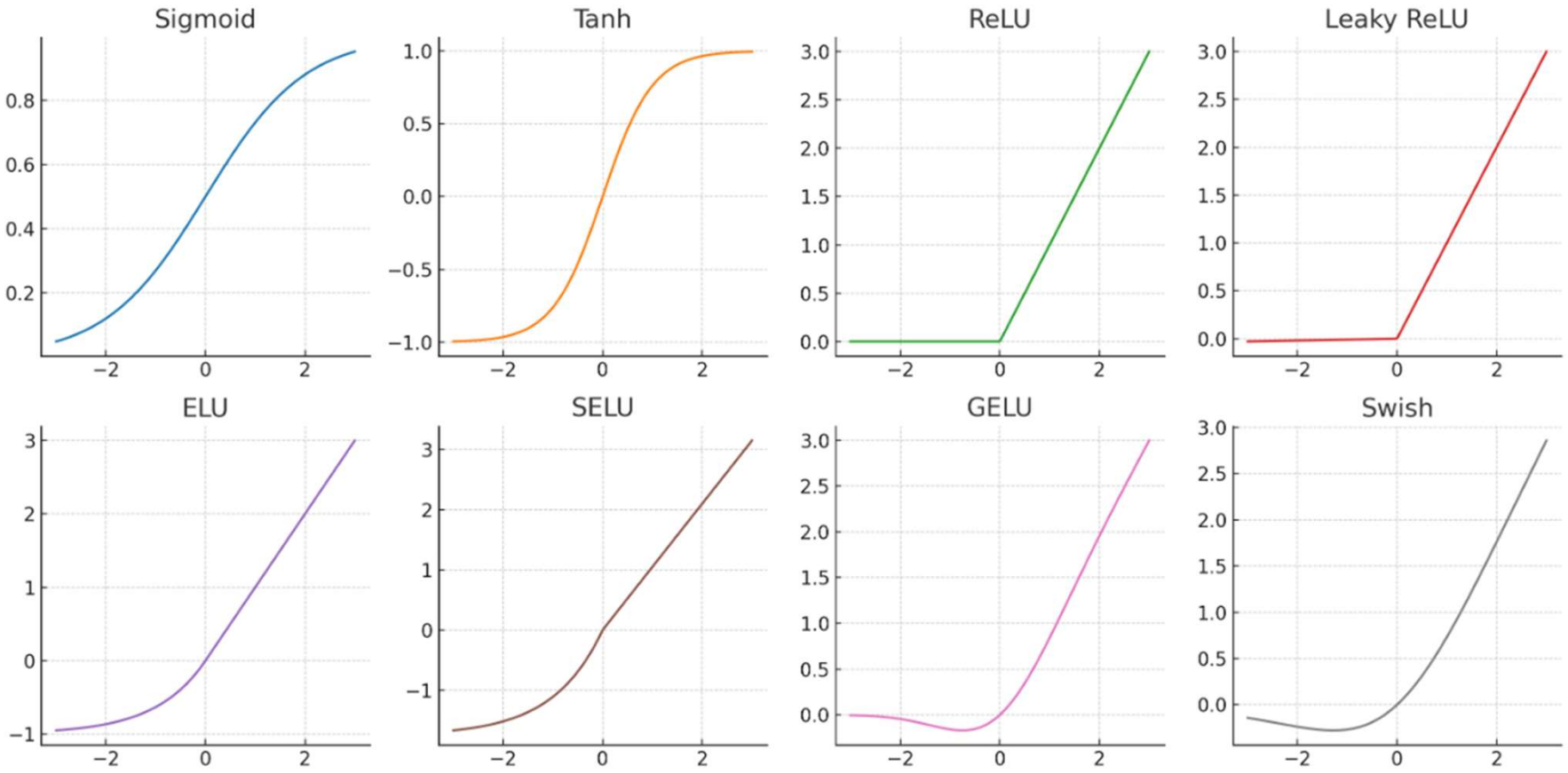
A Multi-Layer Perceptron (MLP)

- Network Parameters (weights, biases)
  - **48 // 8 x 6**
    + 24 // 6 x 4
    + 4 // 4 x 1
    + 11 = 87



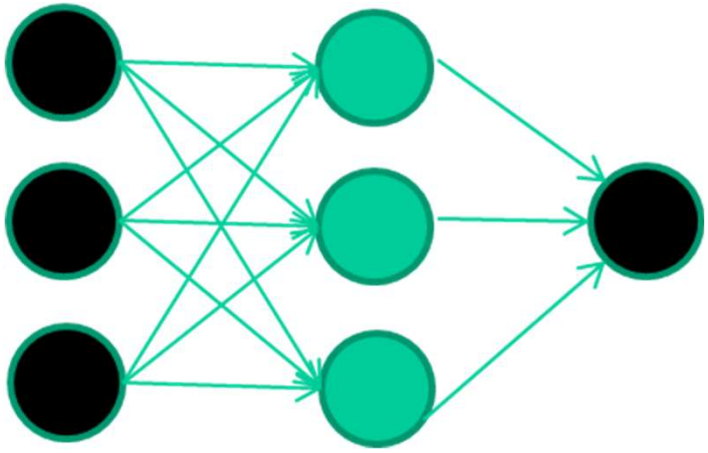
Andrian Theonig

Activation Functions -- Nonlinearity in NNs



Suppose you are given with a labeled dataset as follows,

Features			***class***
1.4	2.7	1.9	0
3.8	3.4	3.2	0
6.4	2.8	1.7	1
4.1	0.1	0.2	0
etc …			

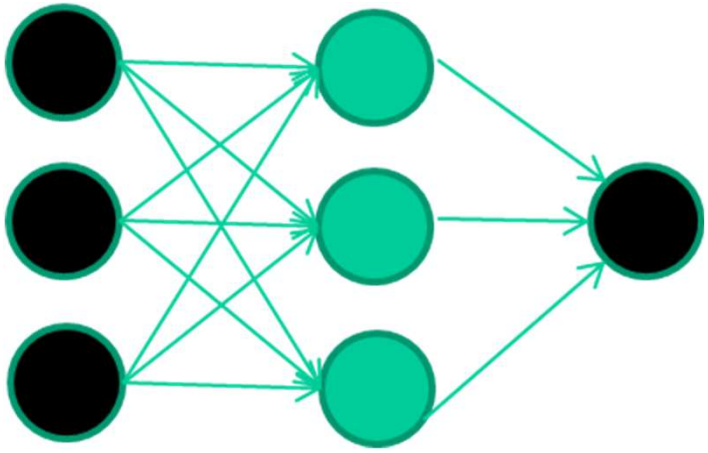


Neural Network

Training the neural network

Features			***class***
1.4	2.7	1.9	0
3.8	3.4	3.2	0
6.4	2.8	1.7	1
4.1	0.1	0.2	0

etc …



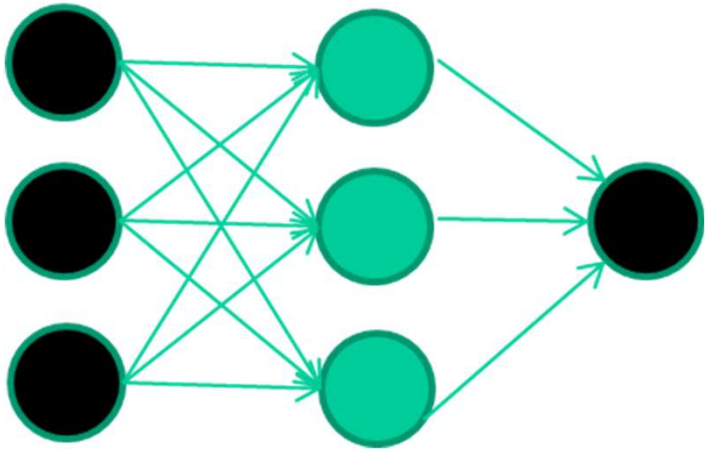
Neural Network

Training data

Features			***class***
1.4	2.7	1.9	0
3.8	3.4	3.2	0
6.4	2.8	1.7	1
4.1	0.1	0.2	0

etc …

Initialise with random weights

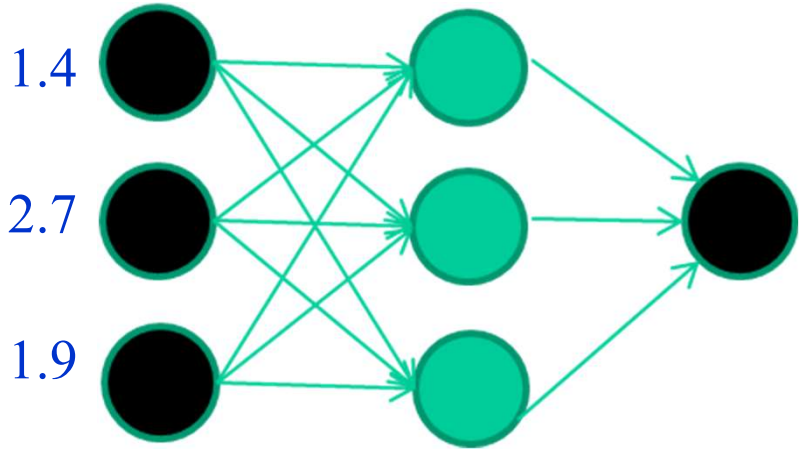


Neural Network

Training data

Features			***class***
1.4	2.7	1.9	0
3.8	3.4	3.2	0
6.4	2.8	1.7	1
4.1	0.1	0.2	0
etc …			

Present a training instance



Neural Network

Training data

Features			***class***
1.4	2.7	1.9	0
3.8	3.4	3.2	0
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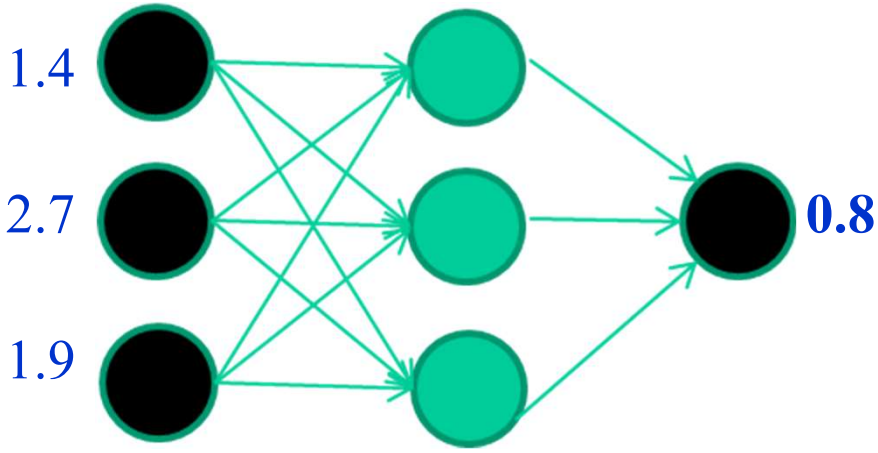
etc …			

Feed it through to get output



Neural Network

Training data

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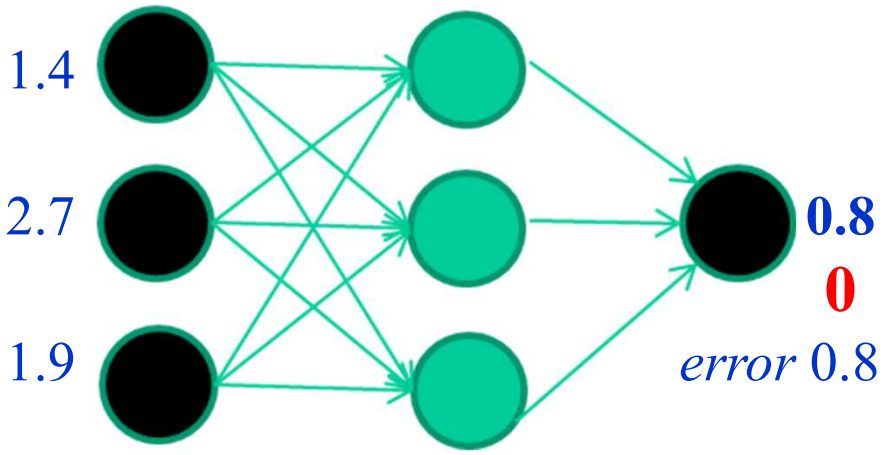
etc …			

Compare with target output



Neural Network

Training data

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1.4	2.7	1.9	0
3.8	3.4	3.2	0
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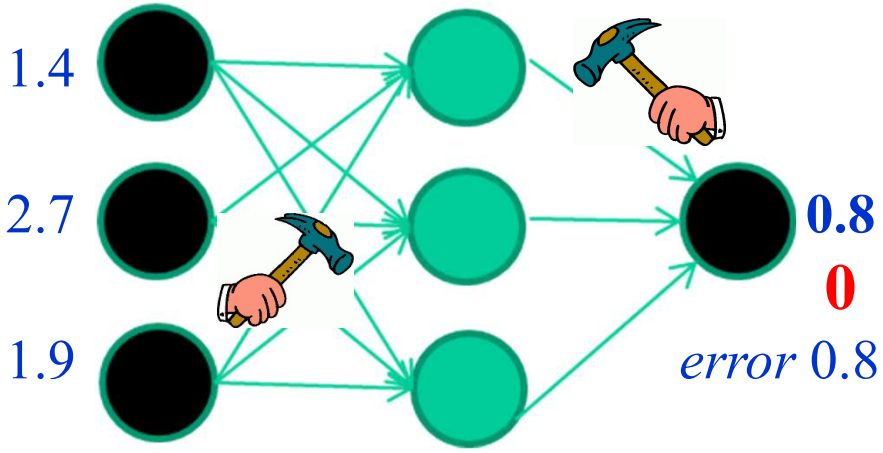
etc …			

Adjust weights based on error



Neural Network

Training data

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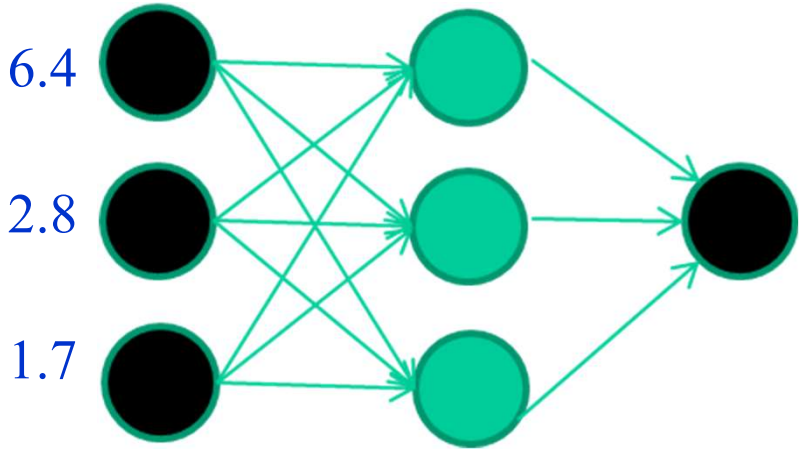

Neural Network

Training data

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3.8	3.4	3.2	0
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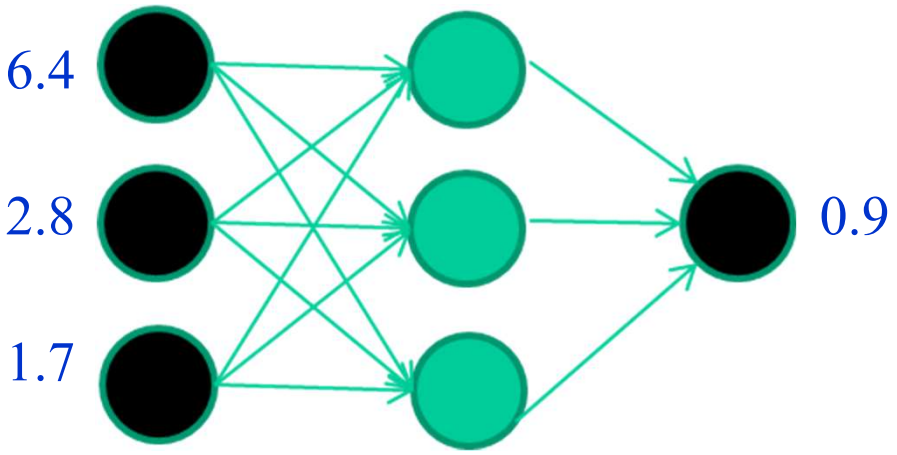

Neural Network

Training data

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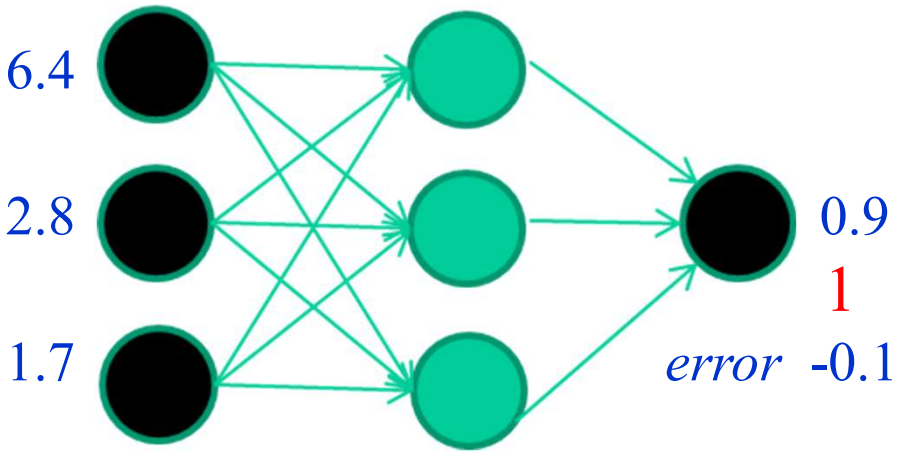
Compare with target output



Neural Network

Training data

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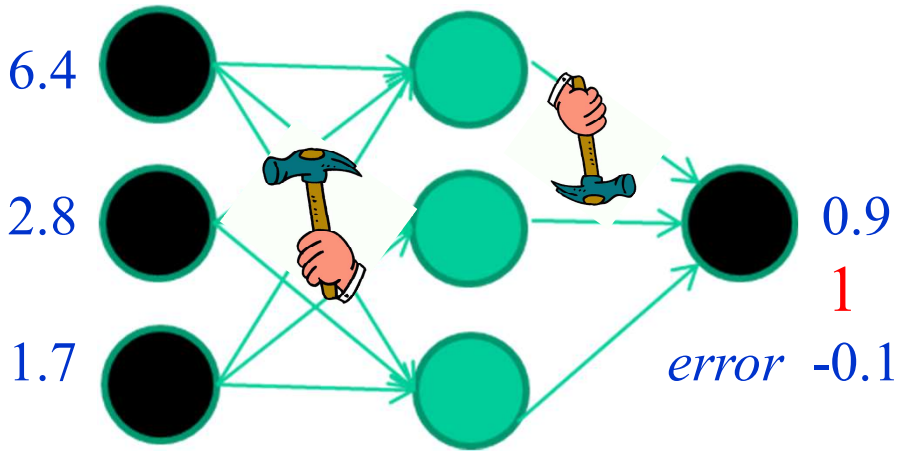

Neural Network

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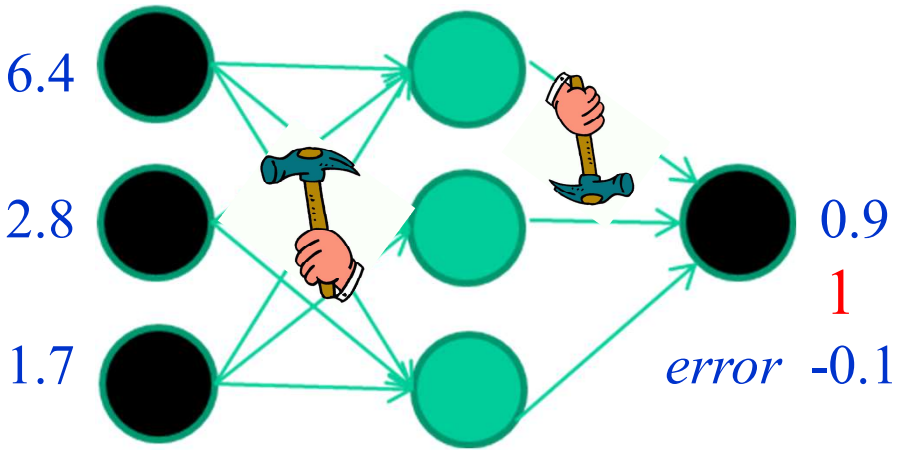
etc …			

And so on ….

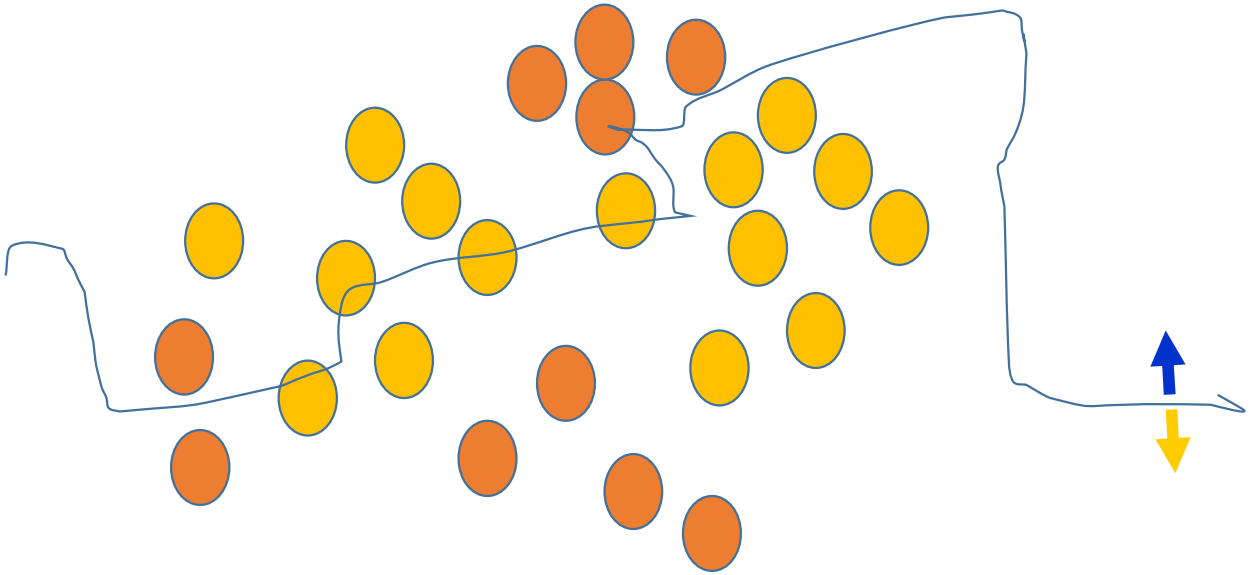


Repeat this thousands, maybe millions of times – each time taking a random training instance, and making slight weight adjustments

Algorithms for weight adjustment are designed to make changes that will reduce the error

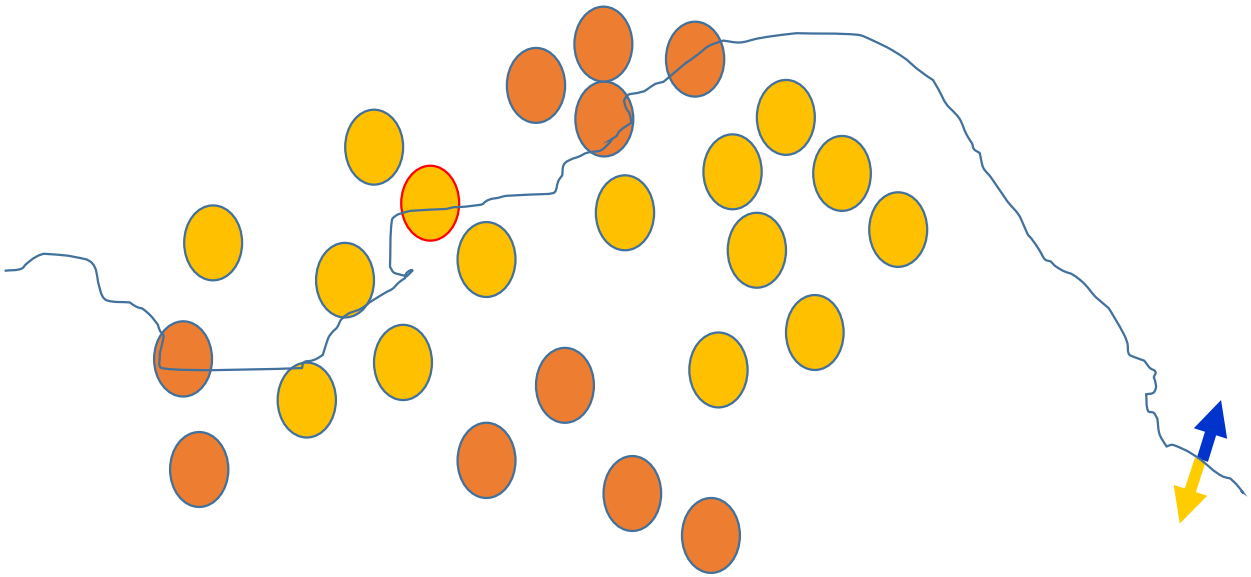
The decision boundary perspective…

Initial random weights



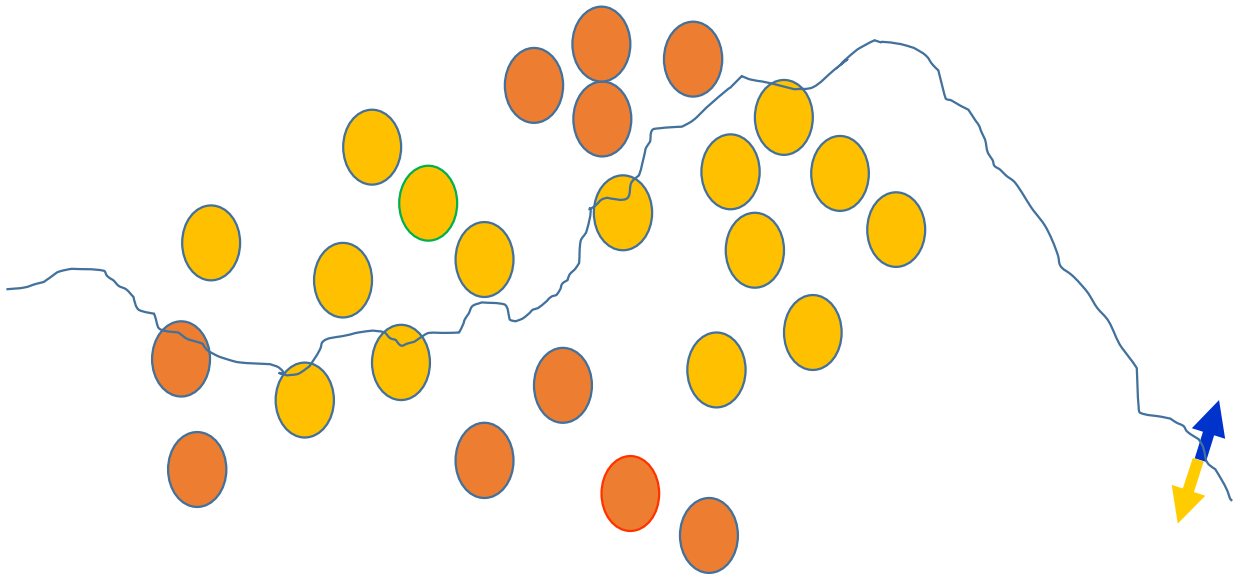
The decision boundary perspective…

Present a training instance / adjust the weights



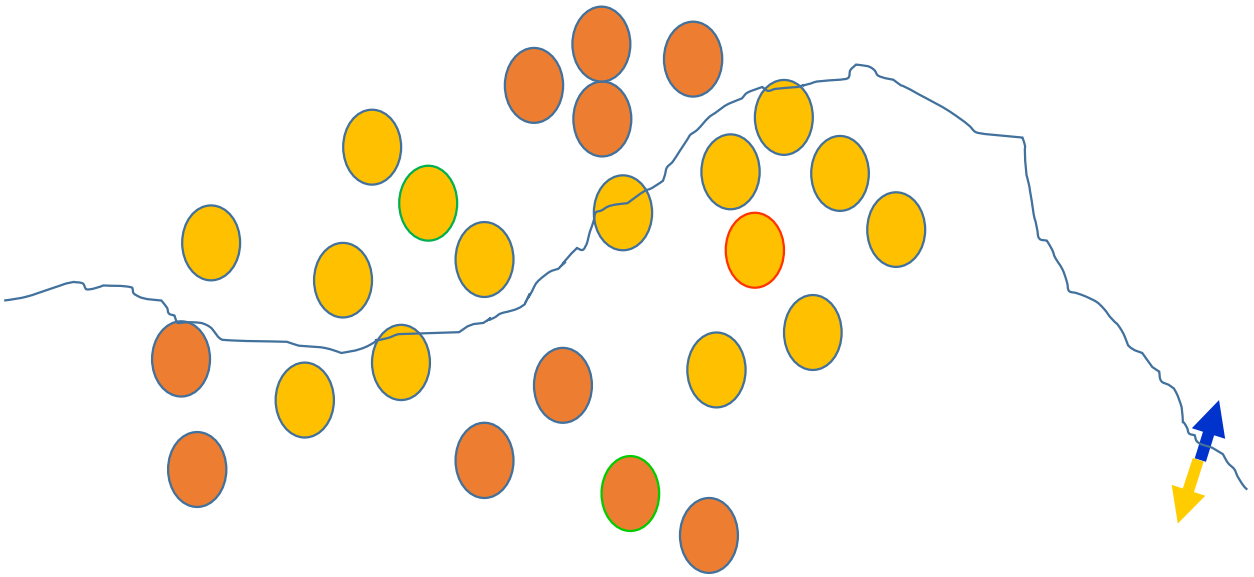
The decision boundary perspective…

Present a training instance / adjust the weights



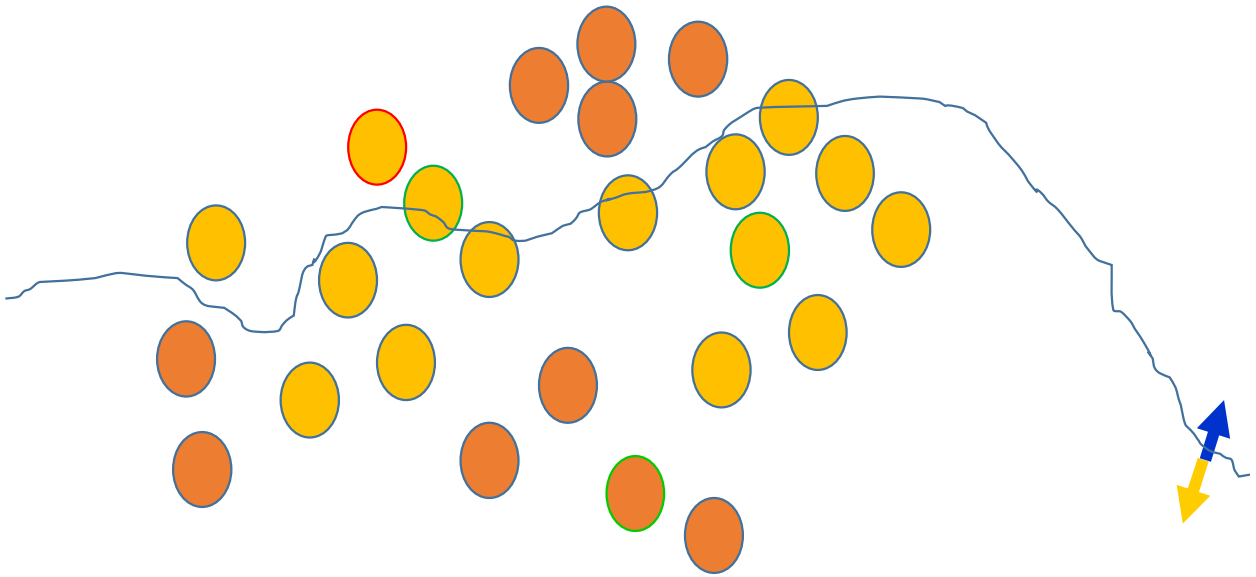
The decision boundary perspective…

Present a training instance / adjust the weights



The decision boundary perspective…

Present a training instance / adjust the weights



The decision boundary perspective…

Eventually ….