

## Chapter 2: From Spring to Winter of AI

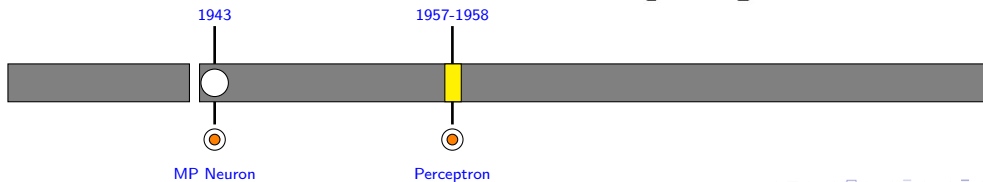
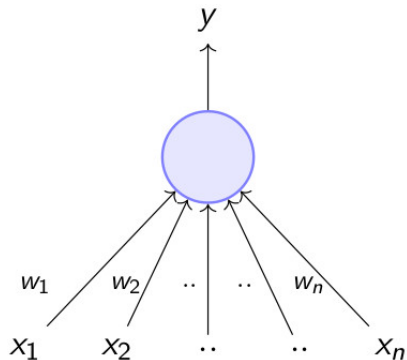
# McCulloch Pitts Neuron

McCulloch (neuroscientist) and Pitts (logician) proposed a highly simplified model of the neuron (1943)<sup>[1]</sup>



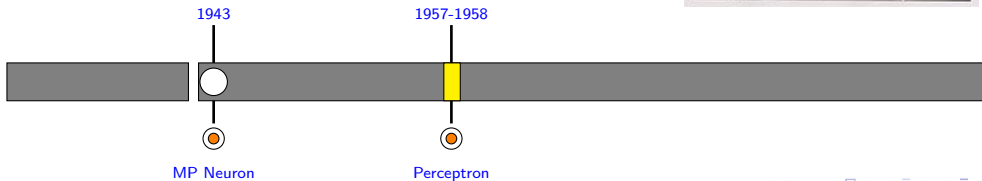
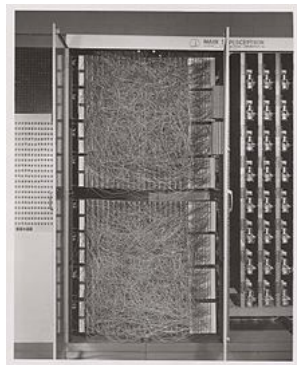
# Perceptron

“the perceptron may eventually be able to learn, make decisions, and translate languages” -Frank Rosenblatt



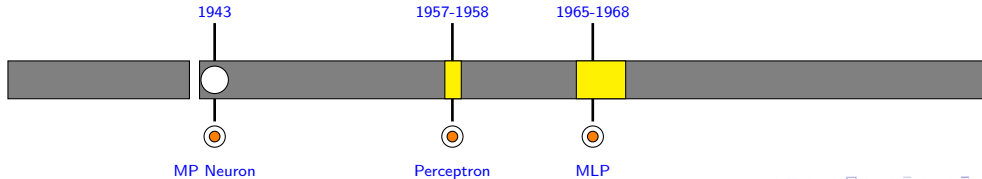
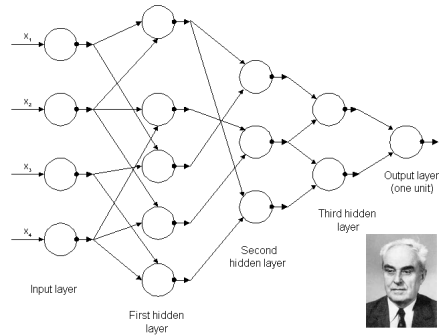
# Perceptron

“the embryo of an electronic computer that the Navy expects will be able to walk, talk, see, write, reproduce itself and be conscious of its existence.” -New York Times



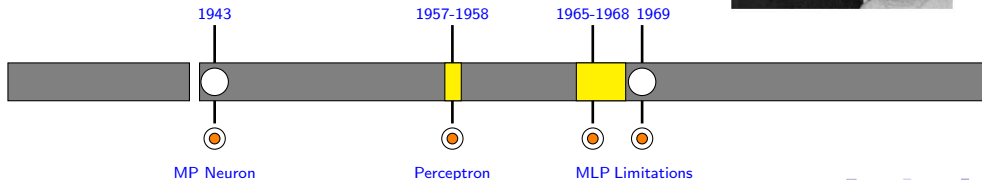
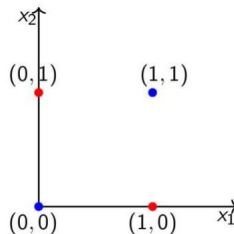
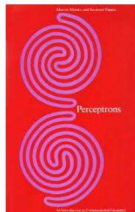
# First generation Multilayer Perceptrons

Ivakhnenko et. al. [2]



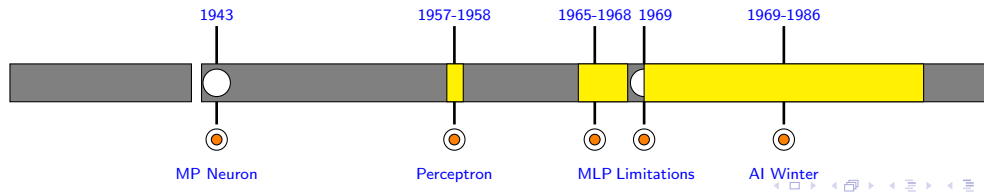
# Perceptron Limitations

In their now famous book “Perceptrons”, Minsky and Papert outlined the limits of what perceptrons could do<sup>[3]</sup>



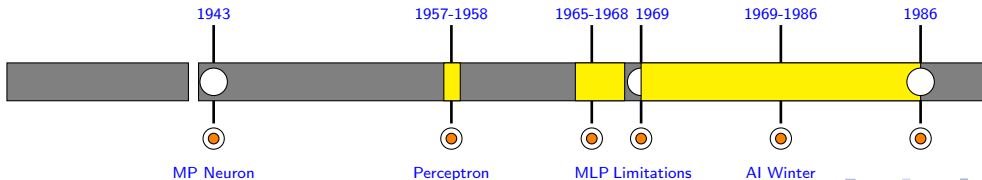
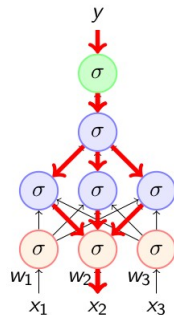
# AI Winter of connectionism

Almost lead to the abandonment of connectionist AI



# Backpropagation

- Discovered and rediscovered several times throughout 1960's and 1970's
- Werbos(1982)<sup>[4]</sup> first used it in the context of artificial neural networks
- Eventually popularized by the work of Rumelhart et. al. in 1986<sup>[5]</sup>



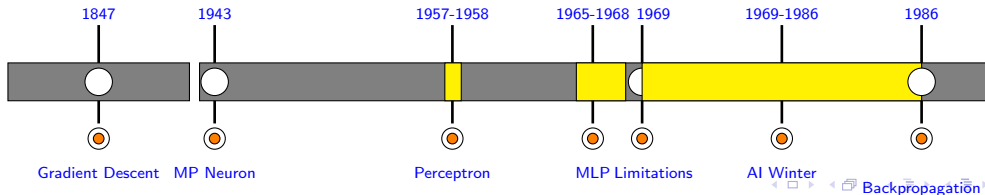
AI Winter

Backpropagation



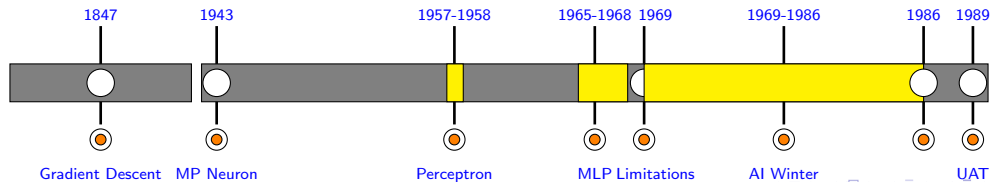
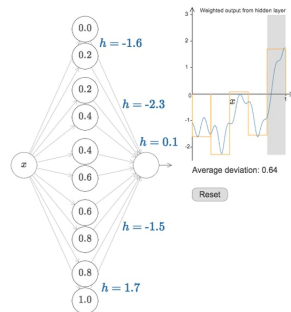
# Gradient Descent

Cauchy discovered Gradient Descent motivated by the need to compute the orbit of heavenly bodies



# Universal Approximation Theorem

A multilayered network of neurons with a single hidden layer can be used to approximate any continuous function to any desired precision<sup>[6]</sup>



AI Winter

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Backpropagation

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