

# Simple Beamer Theme

## Lecture 13

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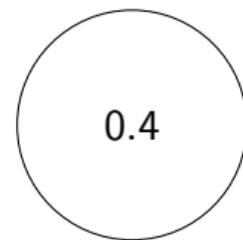
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# Overview

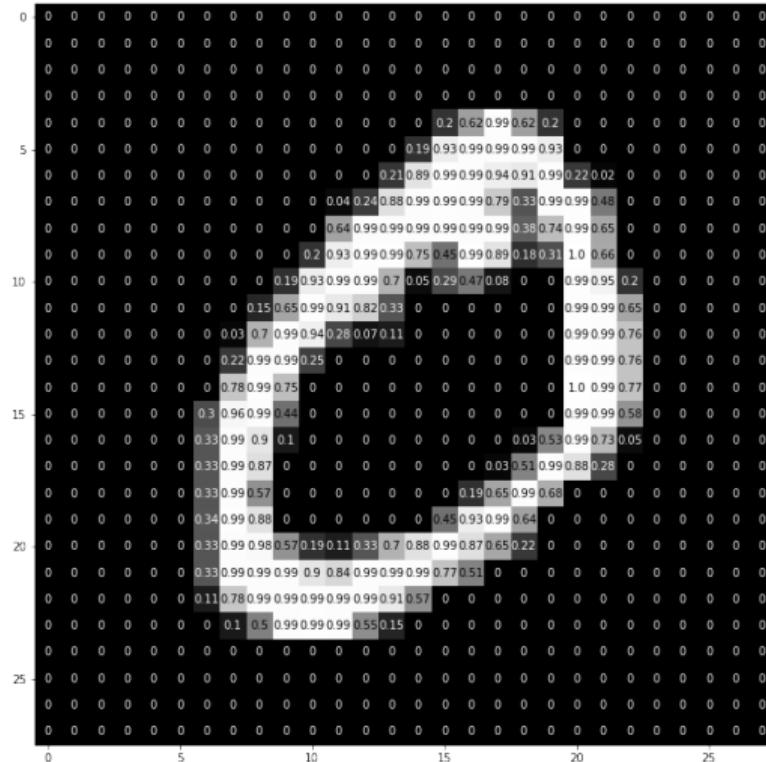
1. What is neuron?
2. What is intelligence?
3. Neural network
4. Universal approximation theorem
5. Second Section

# Neuron



**Neuron** → Thing that holds a number

## Activation map



# Forward pass

# Patterns

$$q = \text{ } \text{ } + \text{ }$$
$$g = \text{ } \text{ } + \text{ }$$
$$4 = \text{ } \text{ } + \text{ } \text{ } + \text{ }$$

# General formula

$$f = \sigma(Wx + b)$$

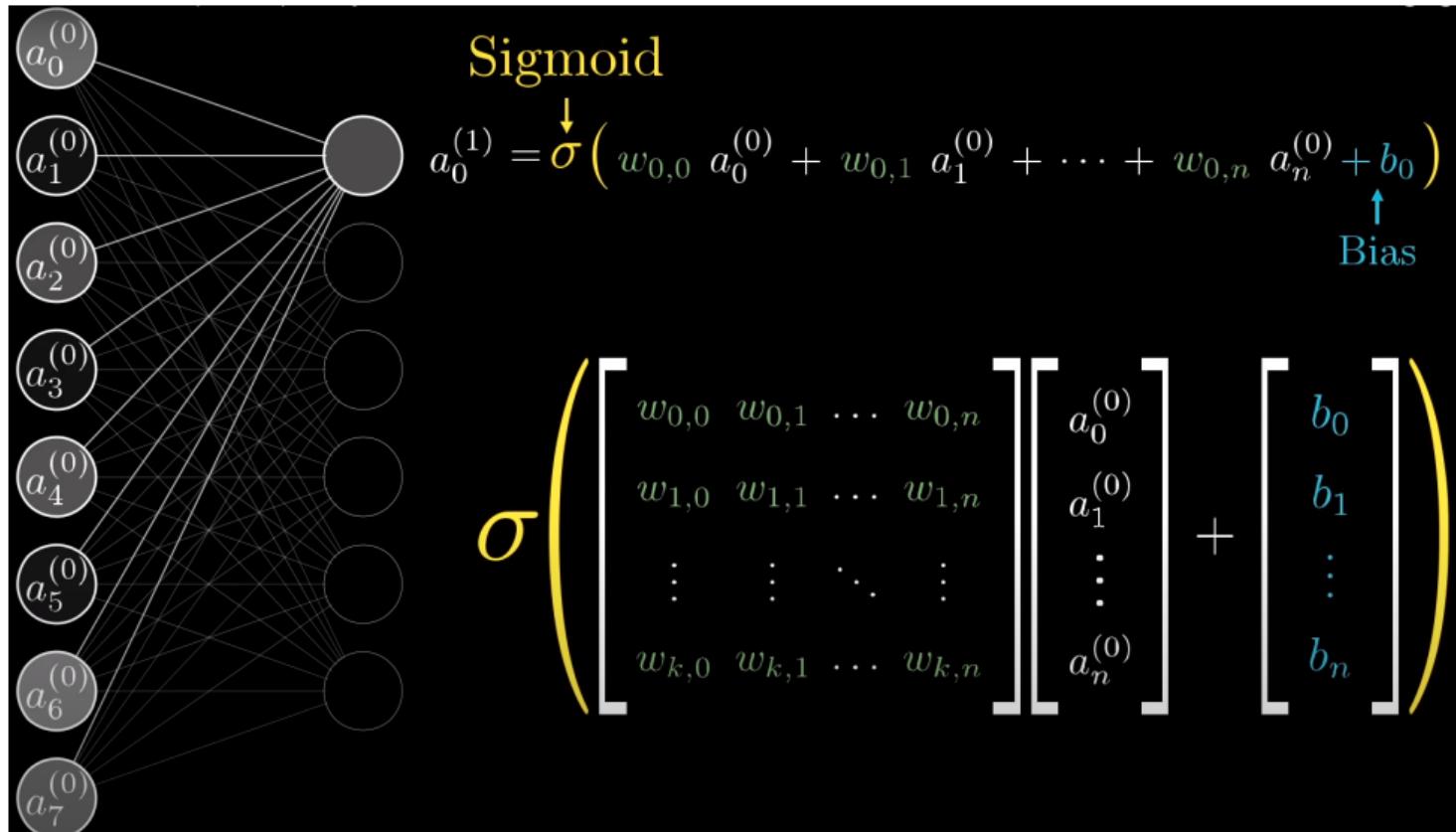
$W$  - Weights

$b$  - Biases

$x$  - Input

$\sigma$  - Activation function

# Formula



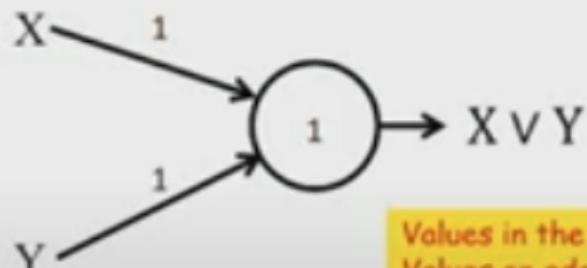
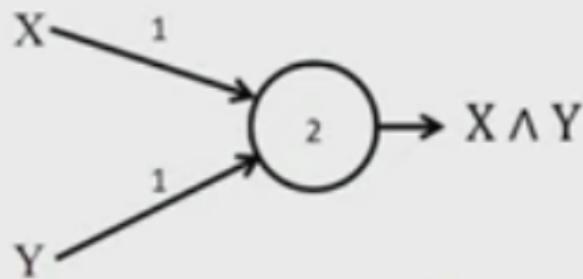
# Universal approximation theorem

Theorem (UAT interpretation for NN)

*2-layer NNs with sigmoid activation function can approximate any other function*

Can we use just 1 layer?

## The perceptron as a Boolean gate



Values in the circles are thresholds  
Values on edges are weights

# Can we use just 1 layer?

No, we can't. For example, XOR

# Theorem

Theorem (Mass–energy equivalence)

$$E = mc^2$$

# Figure

Uncomment the code on this slide to include your own image from the same directory as the template .TeX file.

# Citation

An example of the \cite command to cite within the presentation:

This statement requires citation [Smith, 2012].

# References

-  John Smith (2012)  
Title of the publication  
*Journal Name* 12(3), 45 – 678.

The End