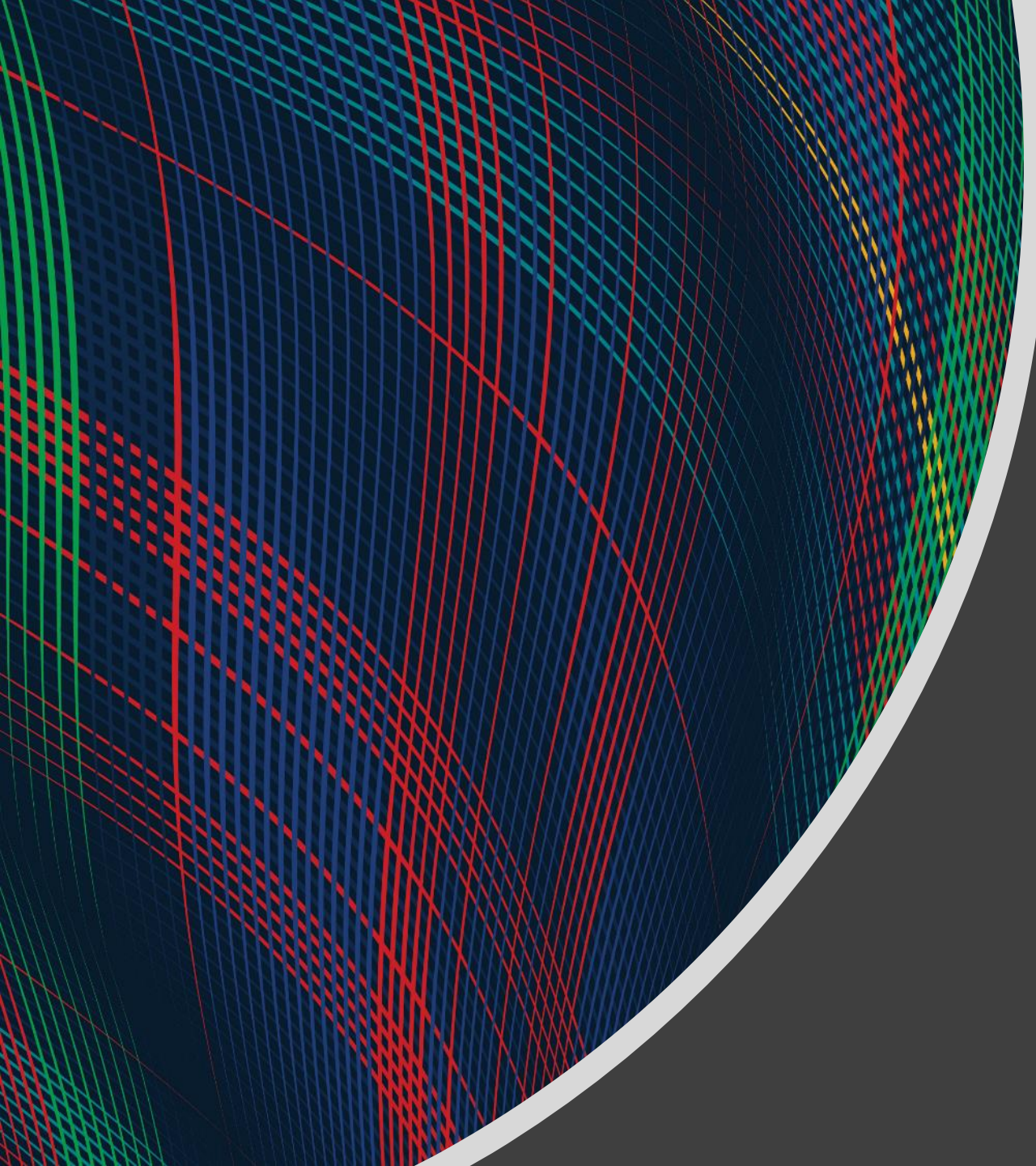


An abstract graphic on the left side of the slide. It features a sphere-like shape composed of a dense grid of lines. The lines are primarily red and green, with some blue lines interspersed. The grid is curved, following the spherical shape, and the lines intersect to form a pattern of small squares. The overall effect is a complex, woven texture.

Demystifying AI

Neural Network
Structure

Instructor: Pat Virtue

Three-neuron network

Connecting functions

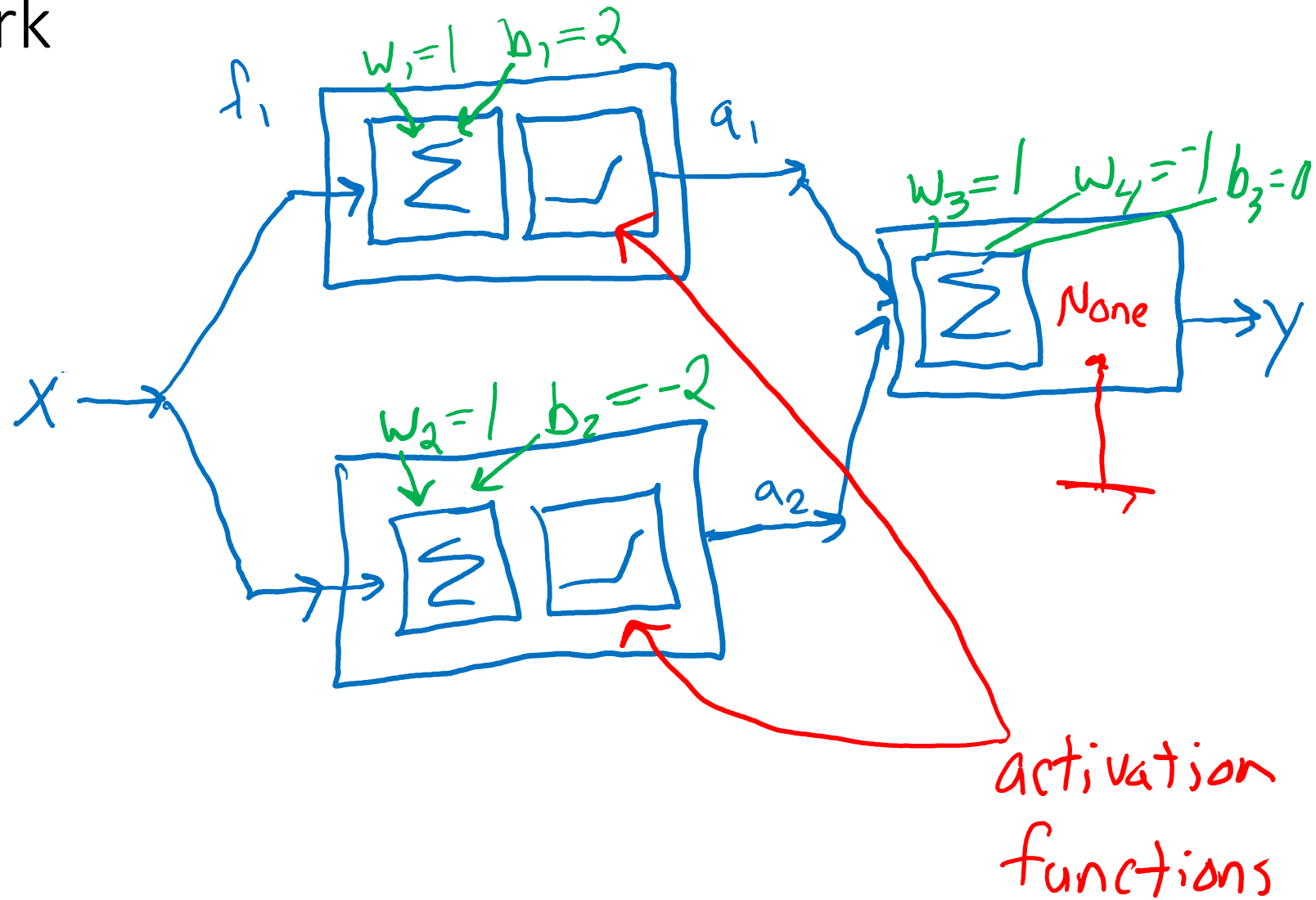
Plot the function $f_3(x)$ vs x

$$a_1 = f_1(x) = \max(0, 1x + 2)$$

$$a_2 = f_2(x) = \max(0, 1x - 2)$$

$$y = f_3(x) = f_1(x) - f_2(x)$$

$$1 \cdot a_1 + (-1) a_2 + 0$$

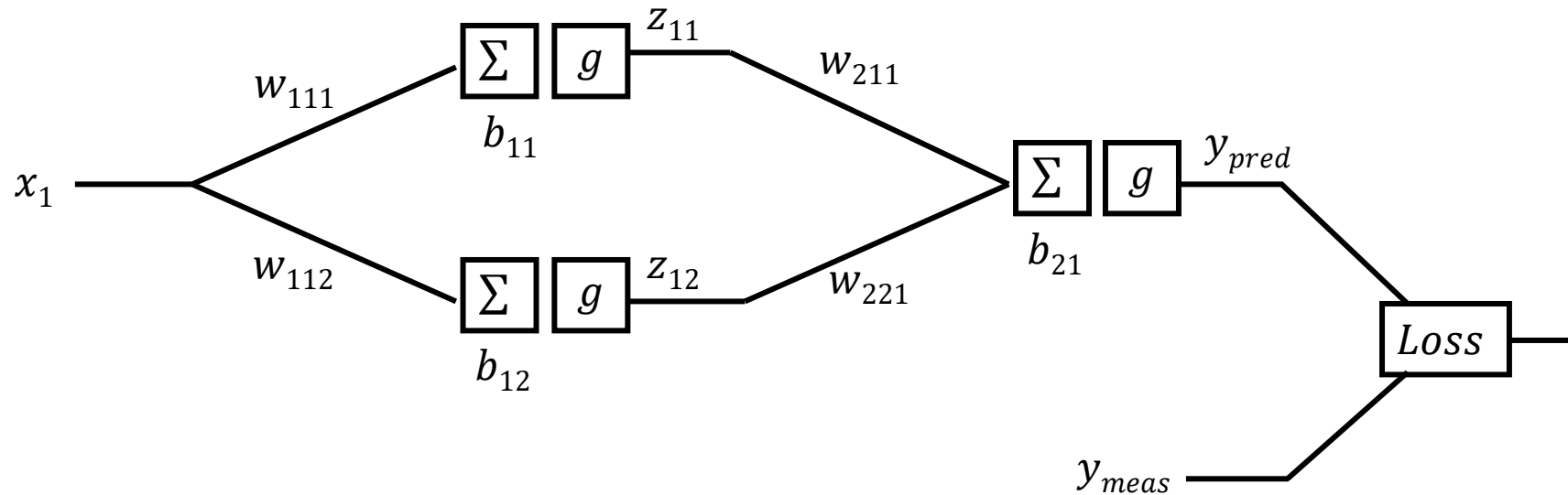


Neural Network Architecture

Our weight naming convention:

$w_{\text{layer input output}}$

Input, Neurons, Layers, Activation Functions, Loss

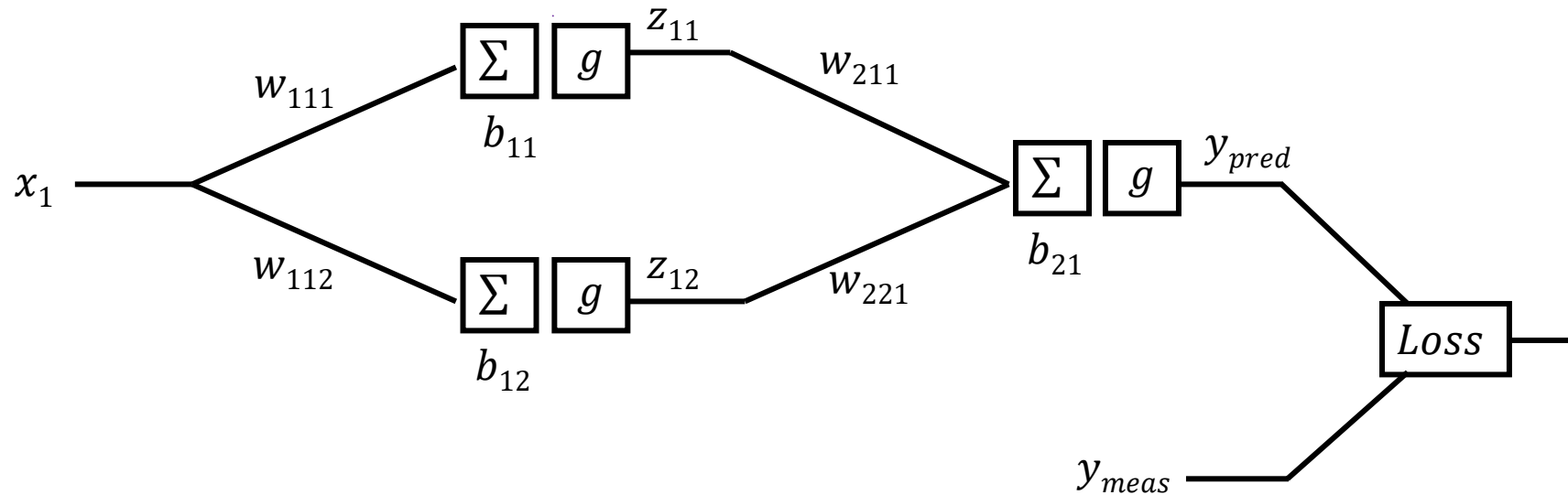


Neural Network Architecture

Our weight naming convention:

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Input, Neurons, Layers, Activation Functions, Loss

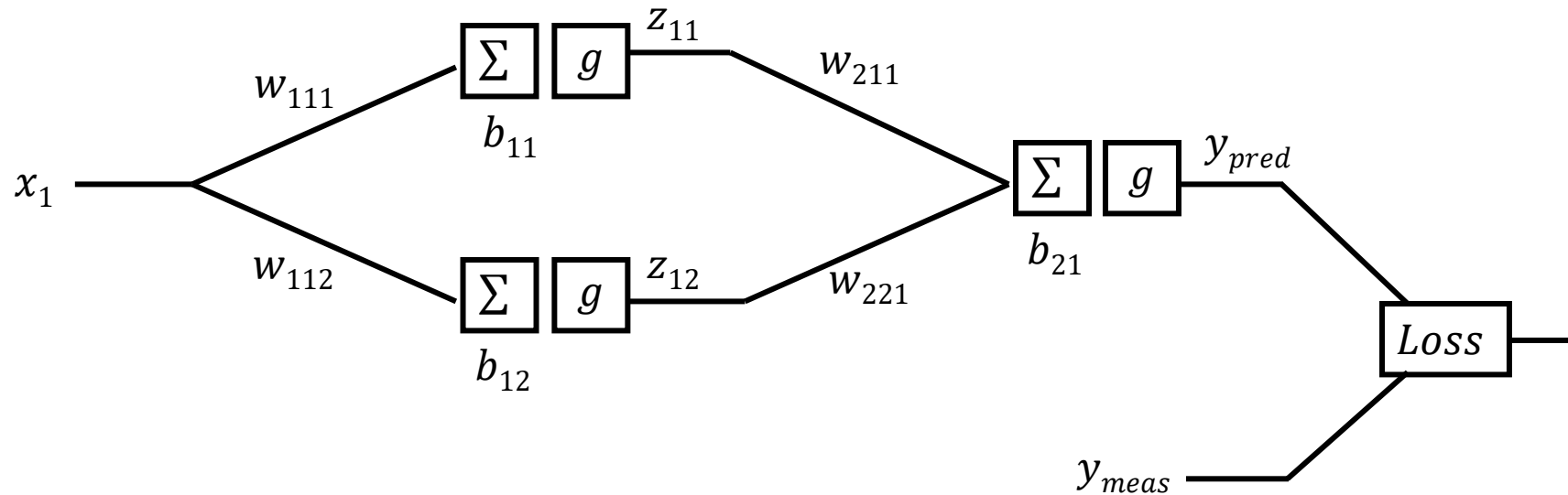


Neural Network Architecture

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Input, Neurons, Layers, Activation Functions, Loss

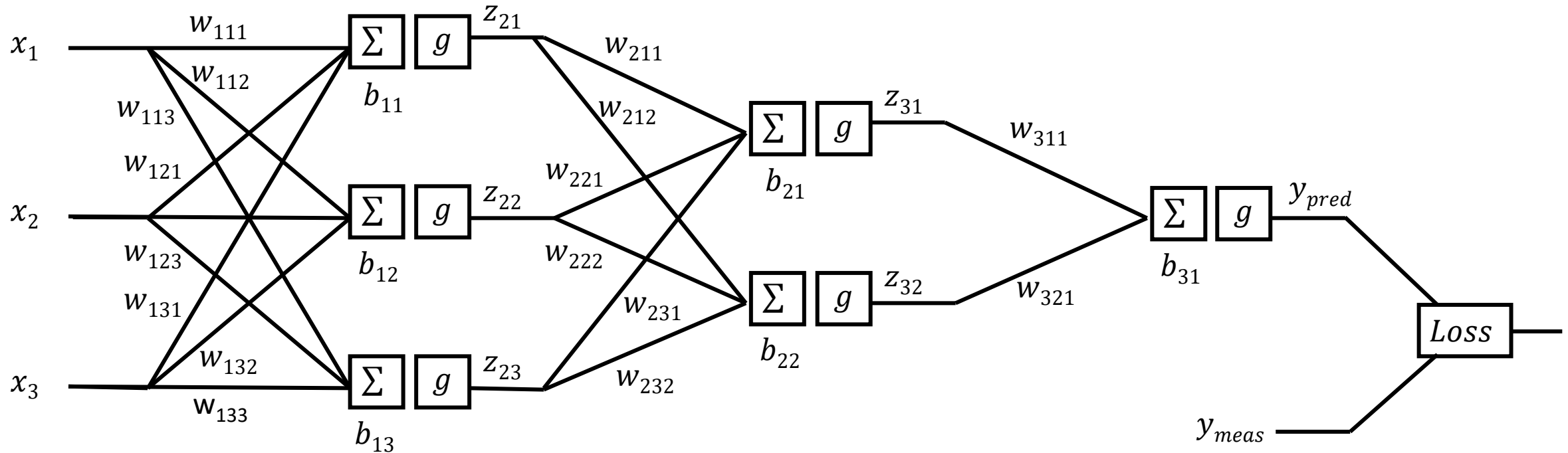


Neural Network Architecture

Our weight naming convention:

$w_{\text{layer input output}}$

Input, Neurons, Layers, Activation Functions, Loss

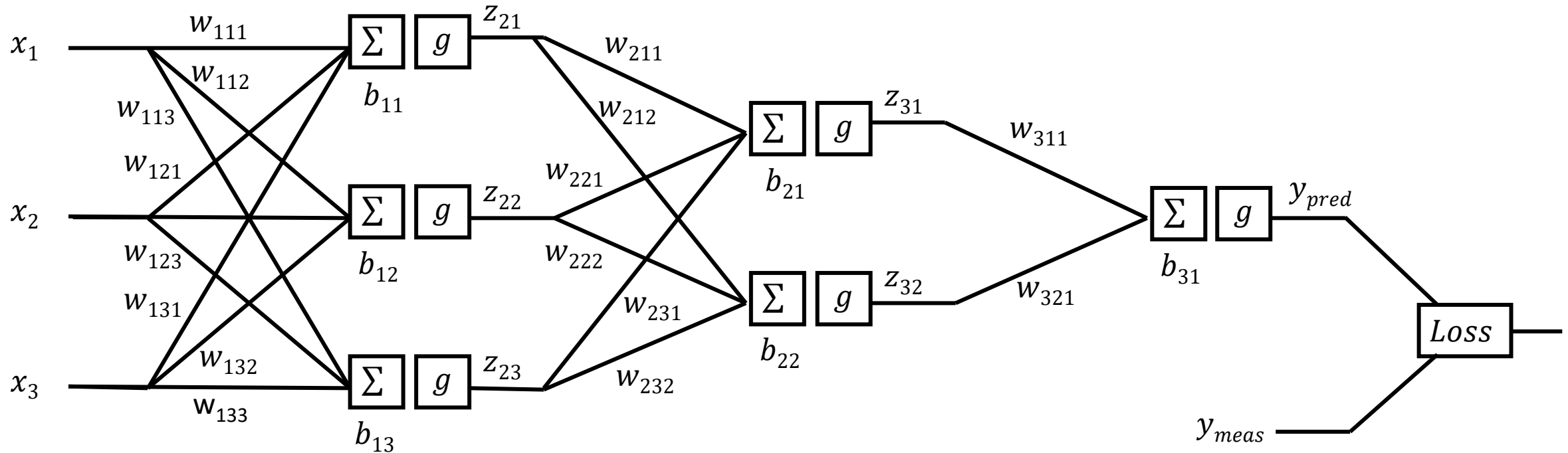


Neural Network Architecture

Our weight naming convention:

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Input, Neurons, Layers, Activation Functions, Loss

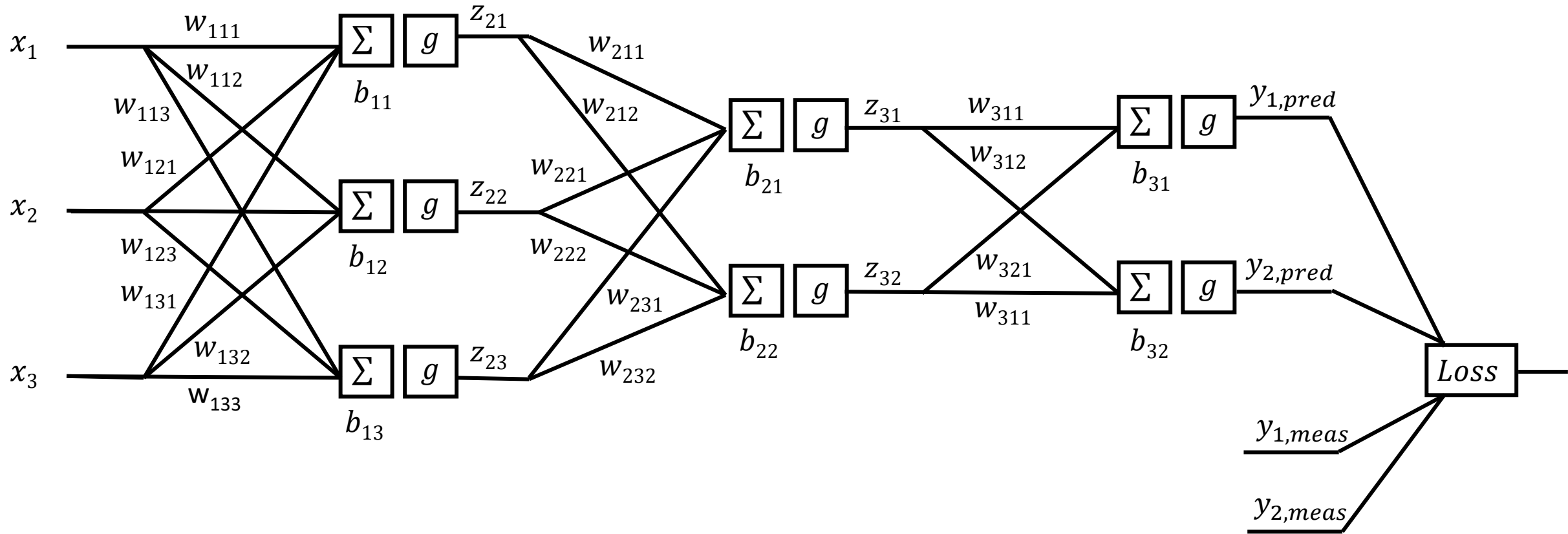


Neural Network Architecture

Our weight naming convention:

$w_{\text{layer input output}}$

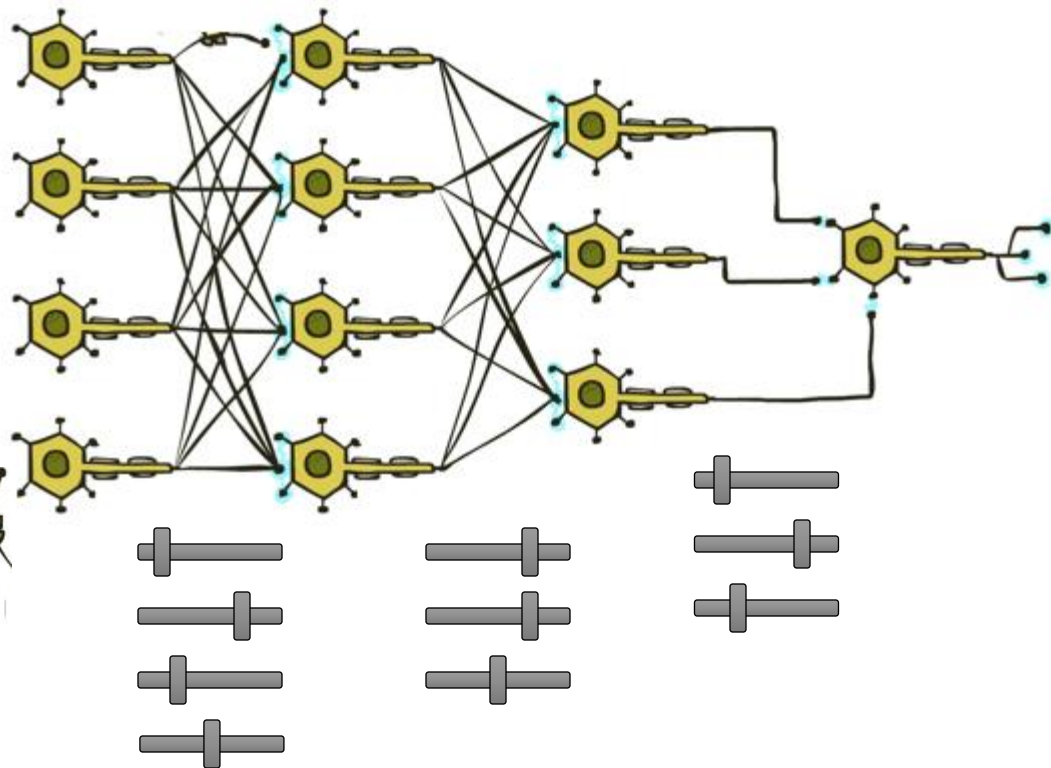
Input, Neurons, Layers, Activation Functions, Loss



Neural Networks

Many layers of neurons, millions of parameters

Input
Signal



Output
Signal



DOG



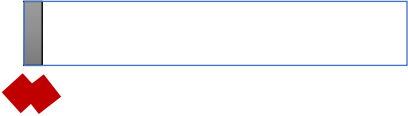
CAT



TREE



CAR

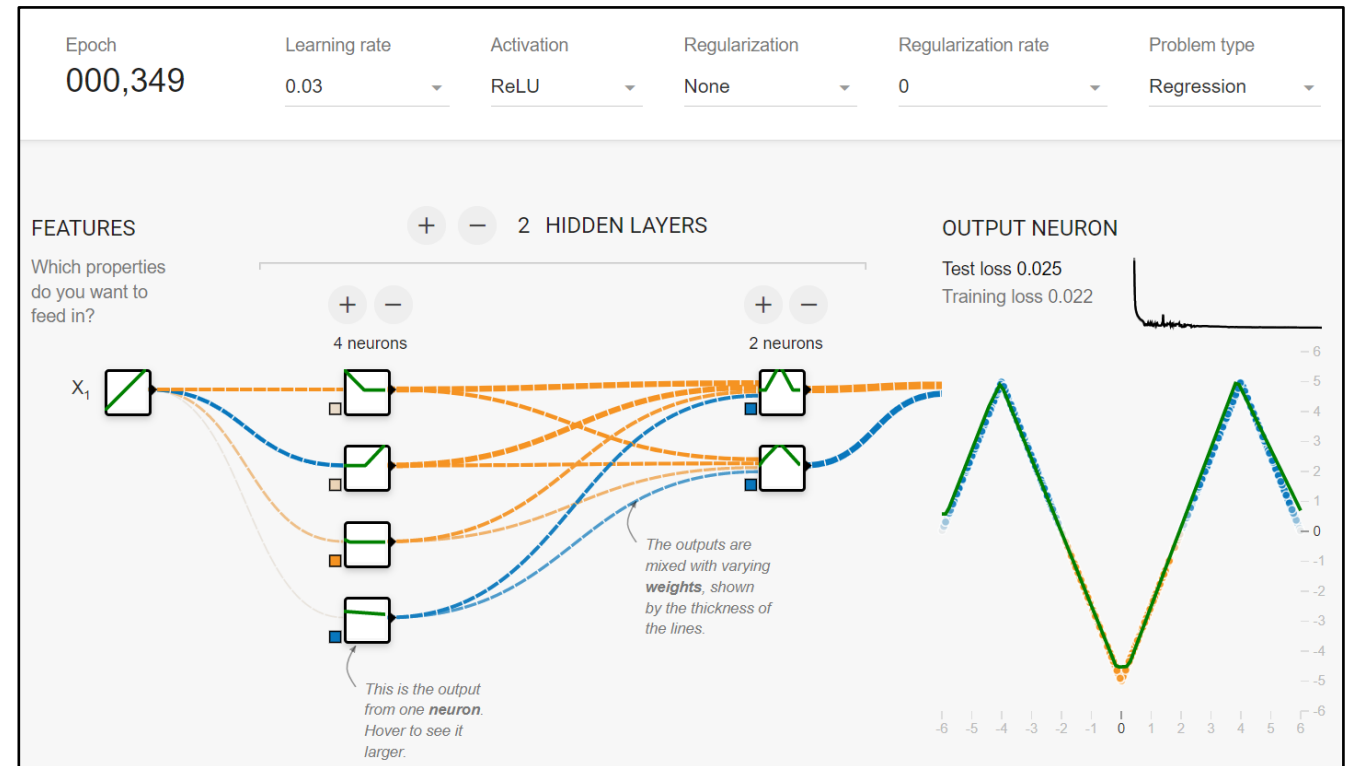


SKY

Simple Network

What do the colors of the lines represent?

- A. Weight
- B. Value from previous neuron



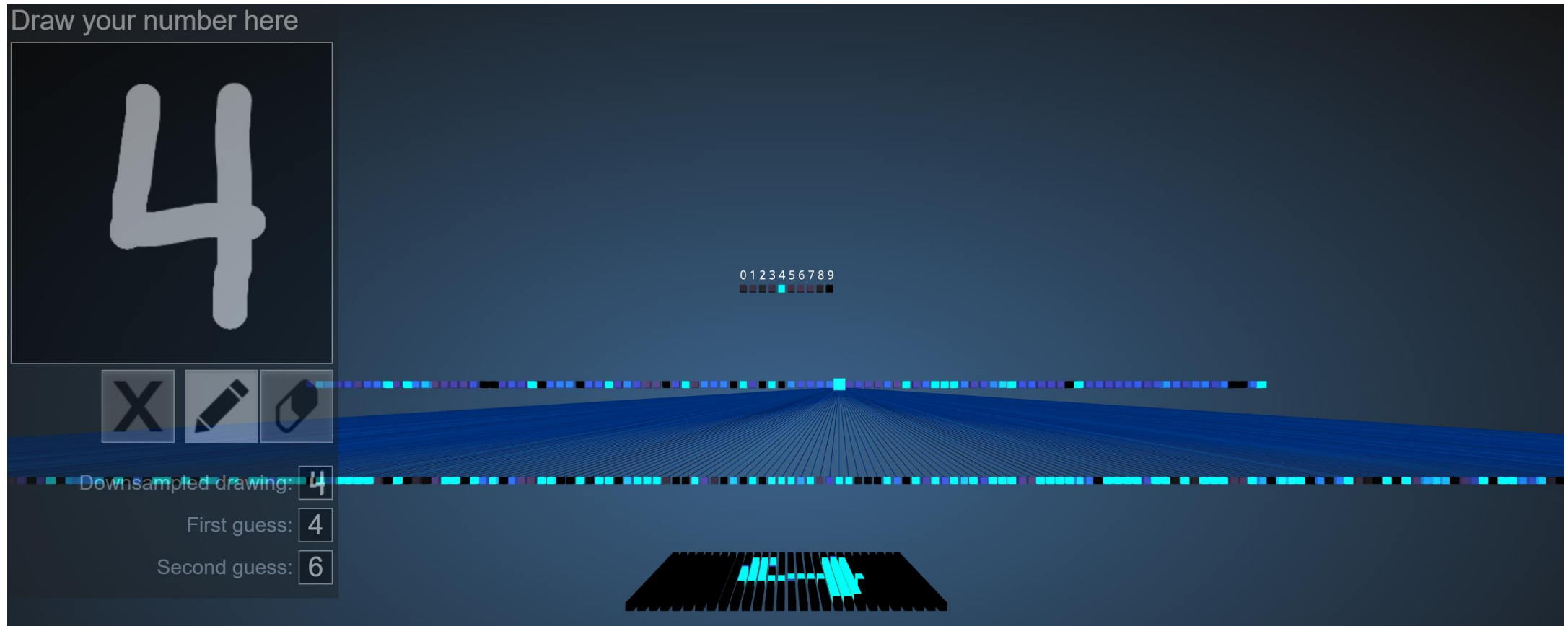
<https://playground.tensorflow.org/>

<https://www.cs.cmu.edu/~15181/tfp>

Image Classification

Demo of (Fully-connected) neural network to classify images of hand-written digits

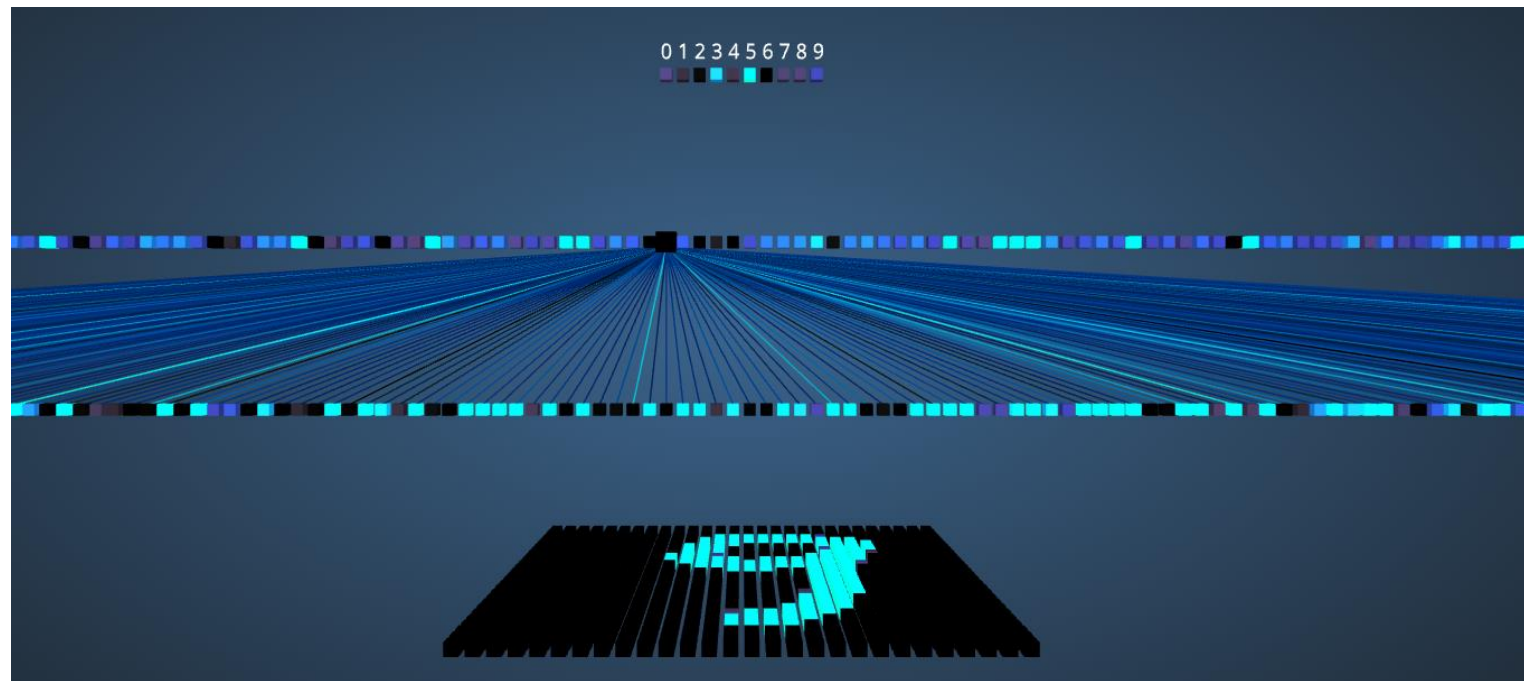
<https://www.cs.ryerson.ca/~aharley/vis/fc/>



Poll 2

What do the colors of the lines represent?

- A. Weight
- B. Value from previous neuron

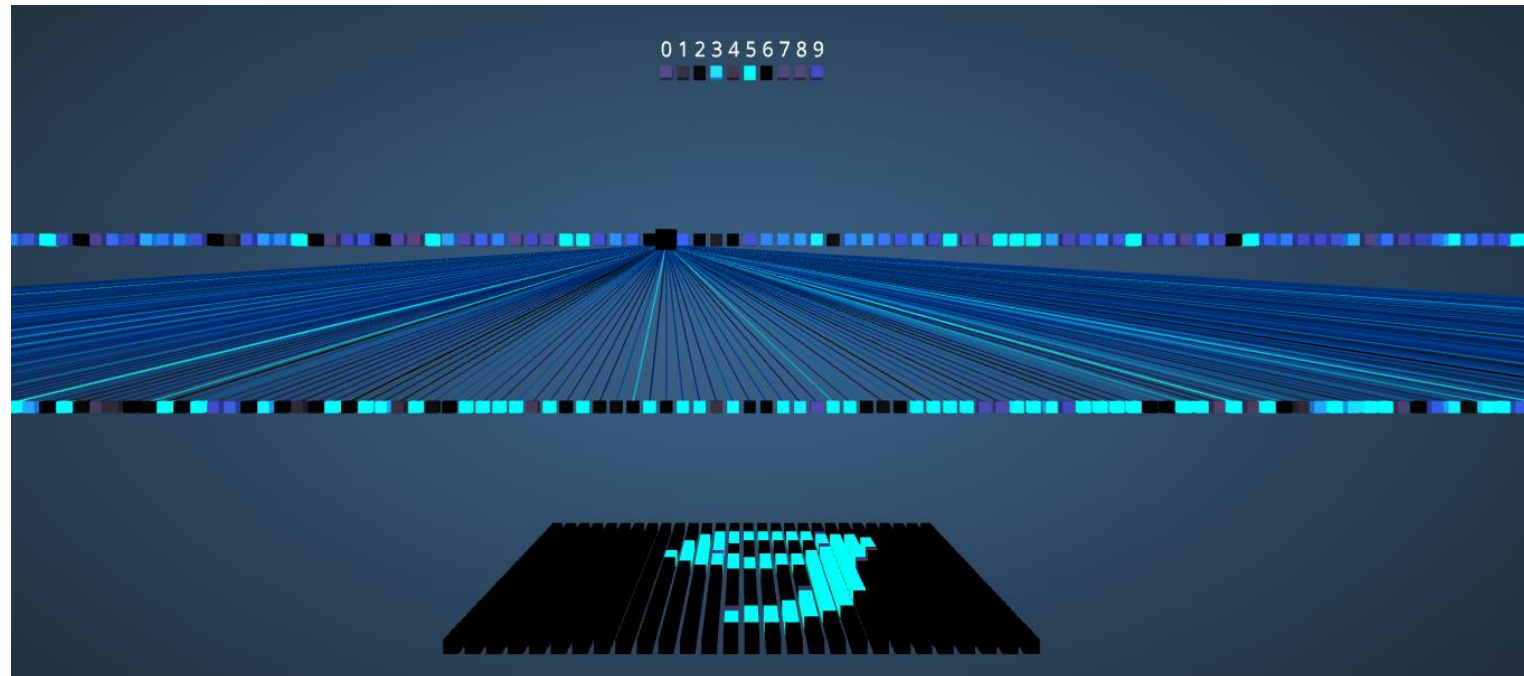


<https://www.cs.ryerson.ca/~aharley/vis/fc/>

Poll 3

What do the colors of the neuron squares represent?

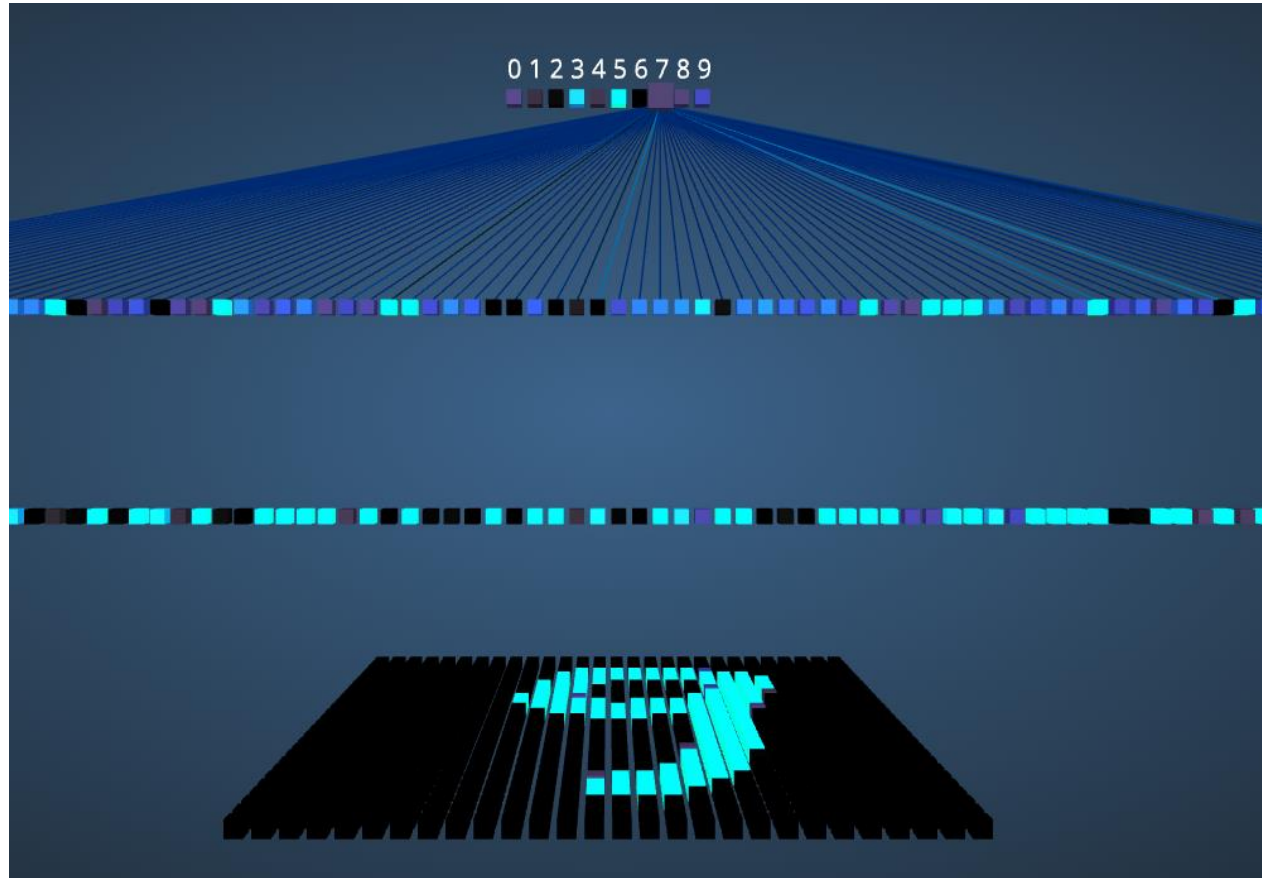
- A. Weight
- B. Output value of the neuron
- C. Input value of the neuron



Poll 4

How many parameters does one neuron in the output hidden layer have?

- A. 1
- B. 2
- C. 10
- D. 11
- E. 100
- F. 101



Poll 5

How many parameters does one neuron in the first hidden layer have?

- A. 1
- B. 2
- C. 300
- D. 301
- E. 784
- F. 785

