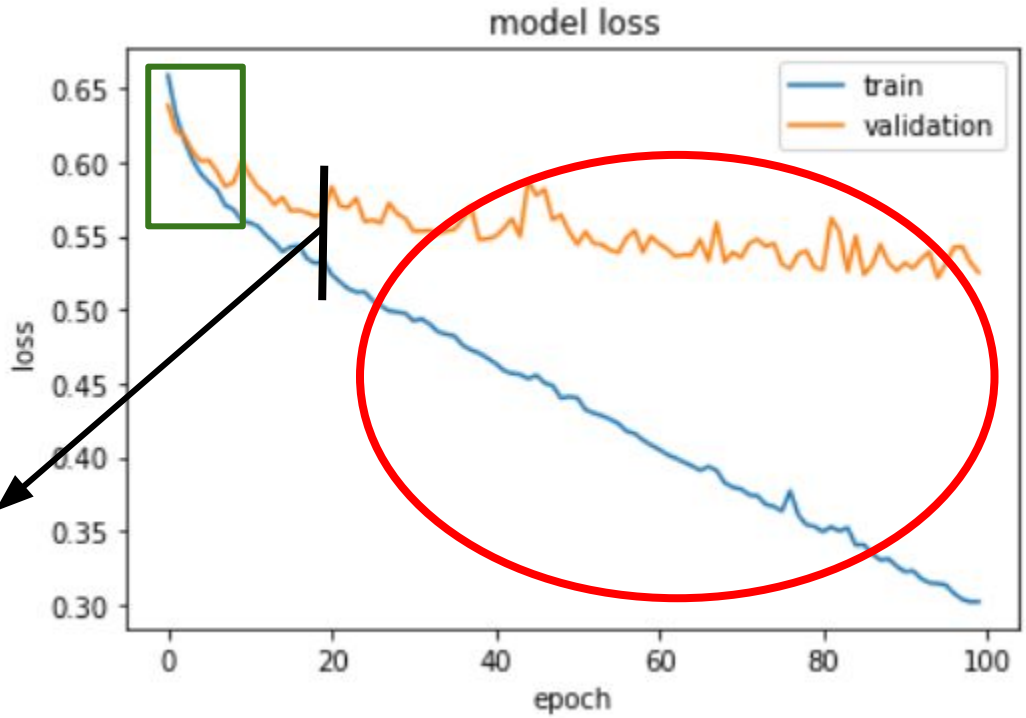
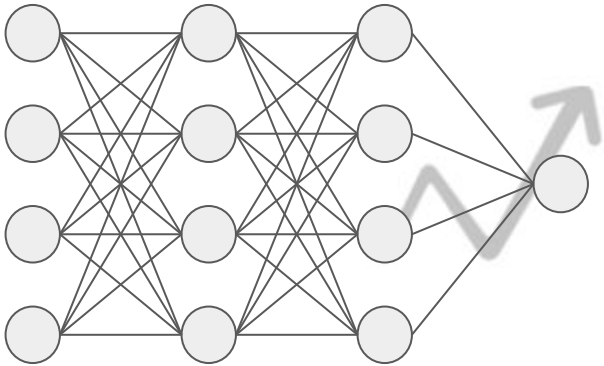
Improving your Neural Network

Solution 1: Early Stopping

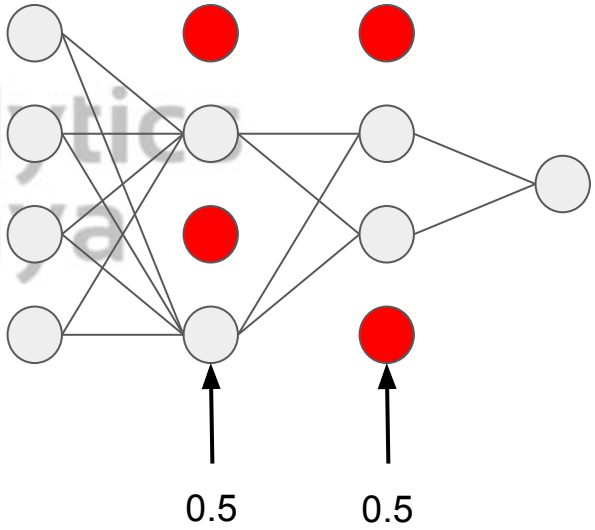


Stop the training here

Solution 2: Dropout Regularization



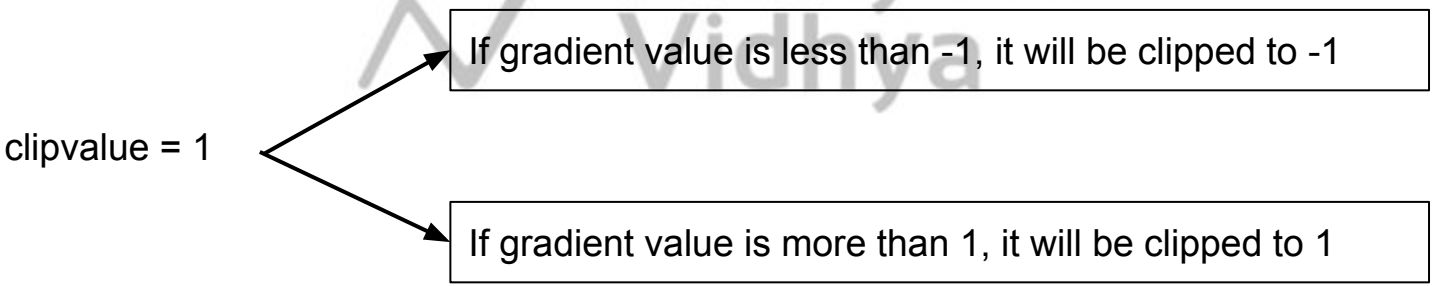
Without Dropout



With Dropout

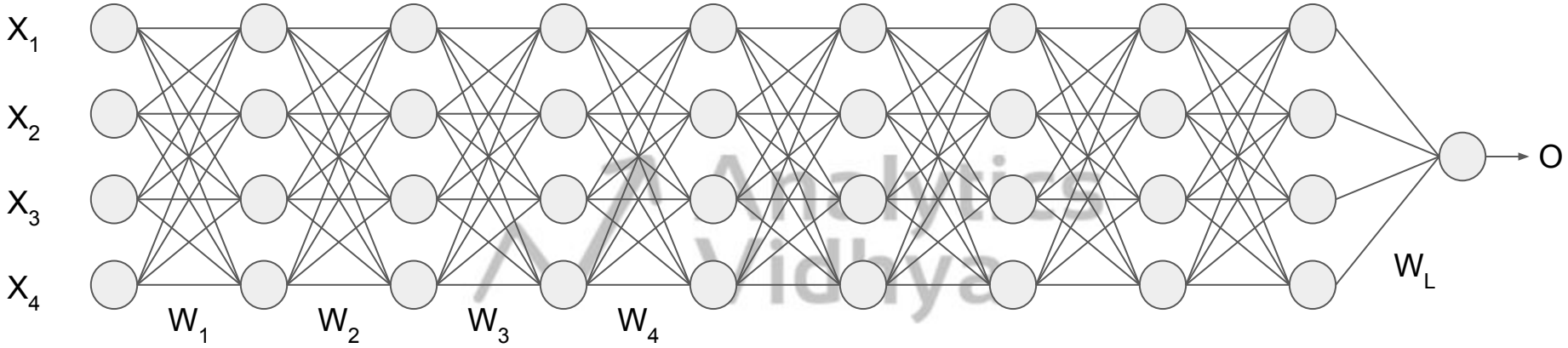
Solution 3: Gradient Clipping

- Clips the derivatives or gradients
- Define a threshold: clipvalue



Batch Normalization

Batch Normalization

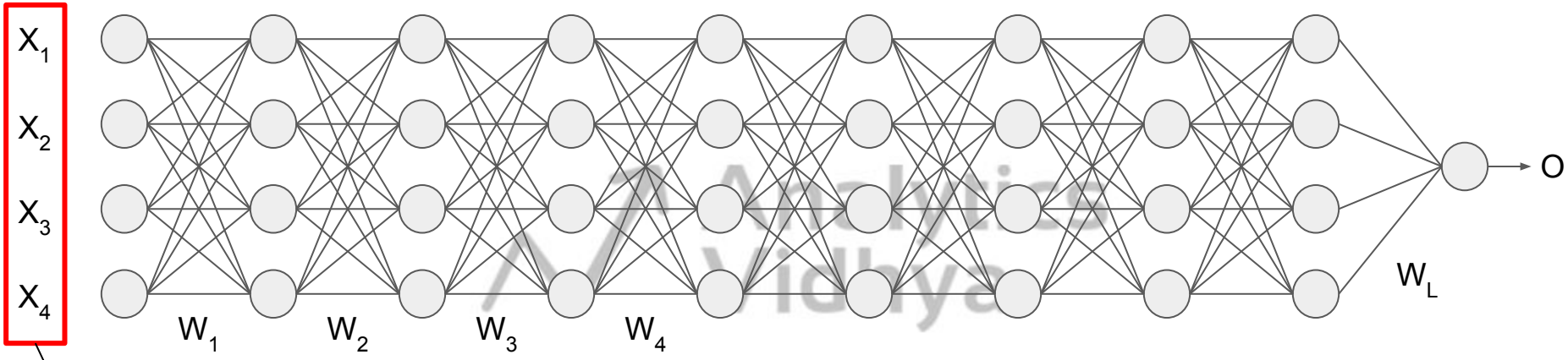


L = Number of layers

Bias = 0

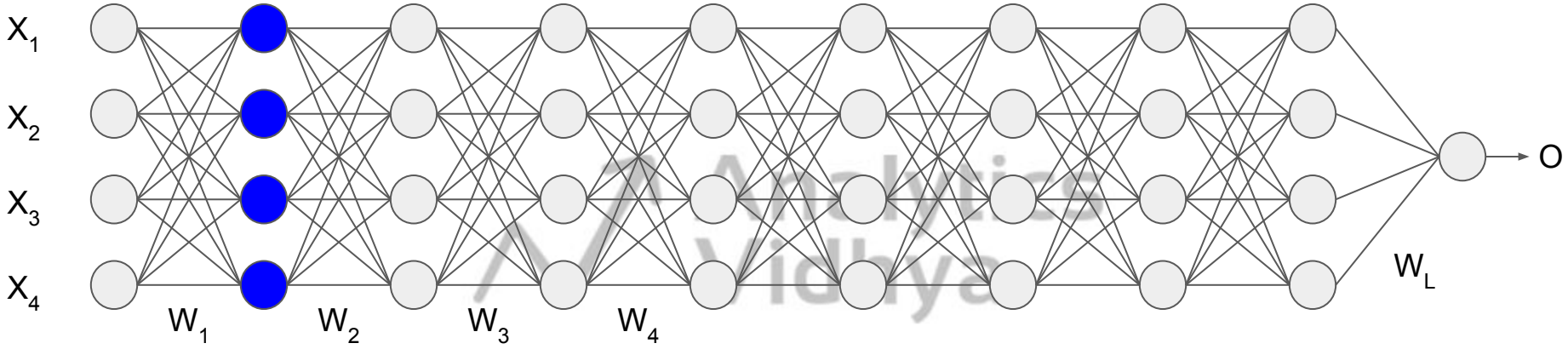
Activation Function: Sigmoid

Batch Normalization



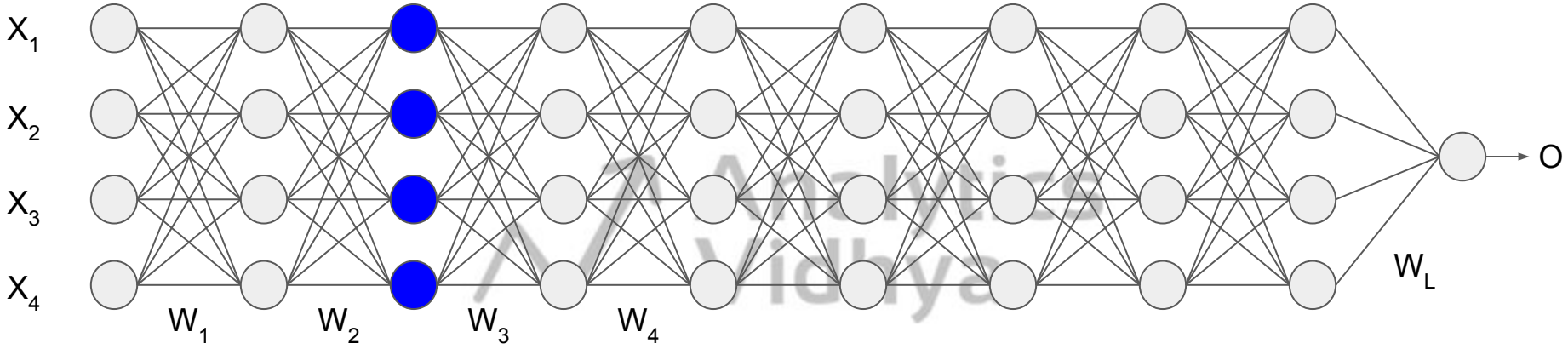
Normalize the inputs

Batch Normalization



$$h_1 = \sigma(W_1 X)$$

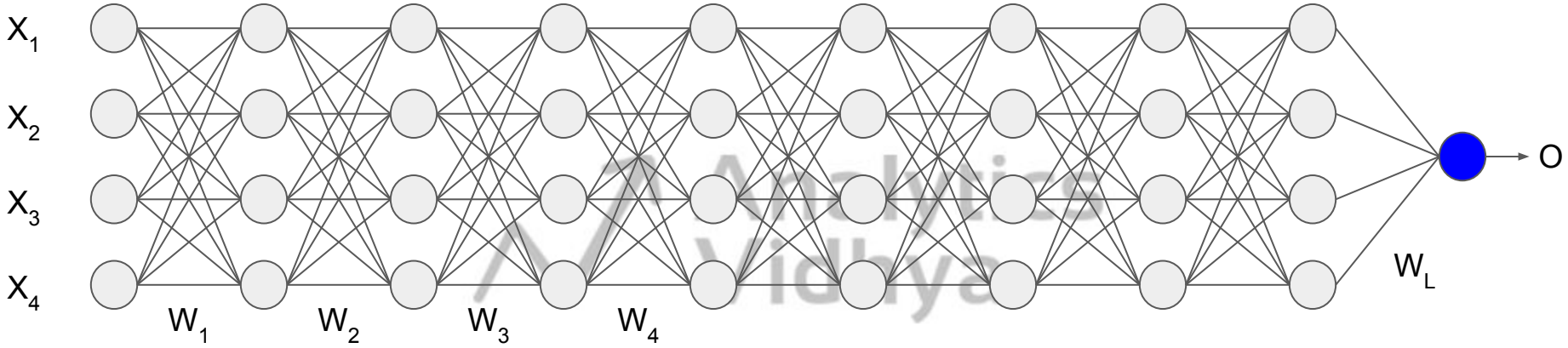
Batch Normalization



$$h_1 = \sigma(W_1 X)$$

$$h_2 = \sigma(W_2 h_1) = \sigma(W_2 \sigma(W_1 X))$$

Batch Normalization

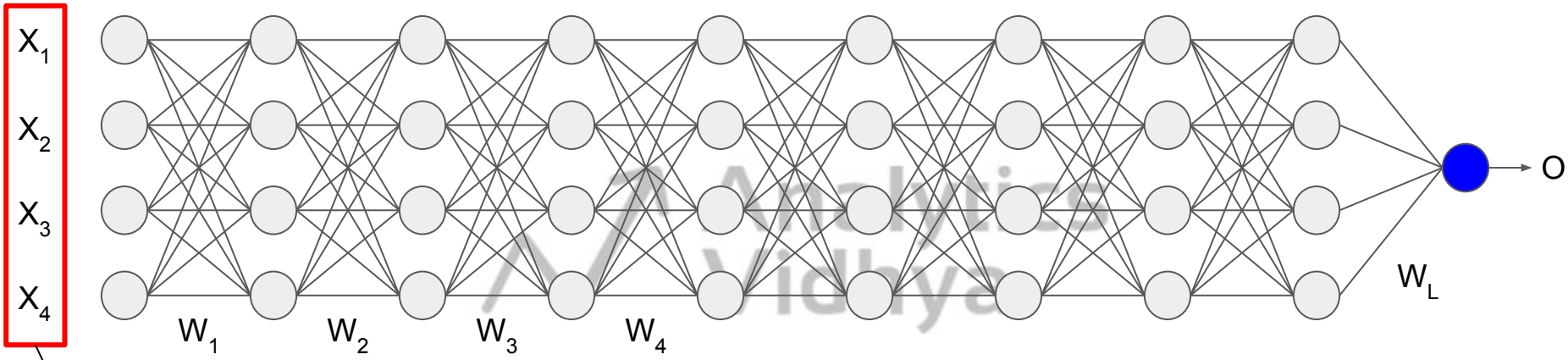


$$h_1 = \sigma(W_1 X)$$

$$h_2 = \sigma(W_2 h_1) = \sigma(W_2 \sigma(W_1 X))$$

$$O = \sigma(W_L h_{L-1})$$

Batch Normalization



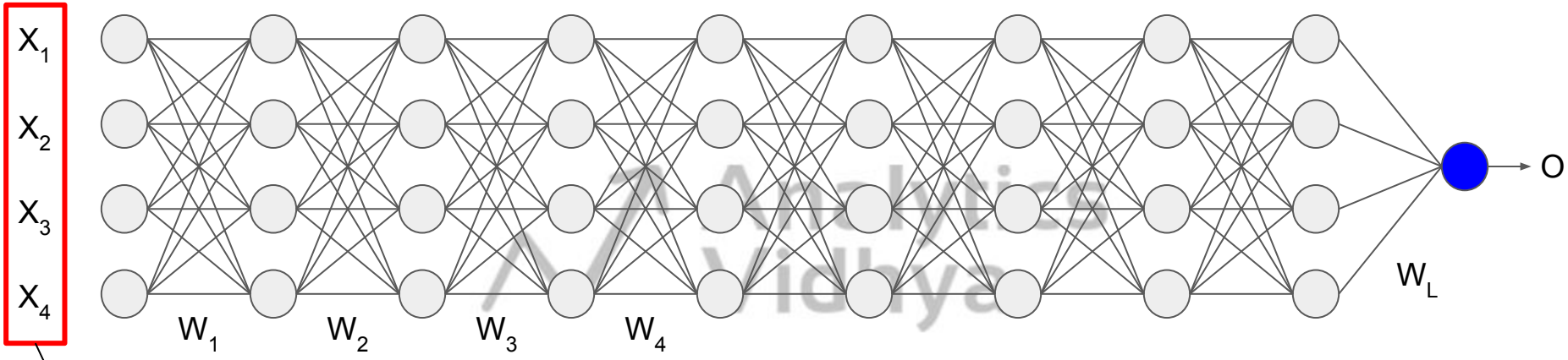
Normalize the inputs

$$h_1 = \sigma(W_1 X)$$

$$h_2 = \sigma(W_2 h_1) = \sigma(W_2 \sigma(W_1 X))$$

$$O = \sigma(W_L h_{L-1})$$

Batch Normalization



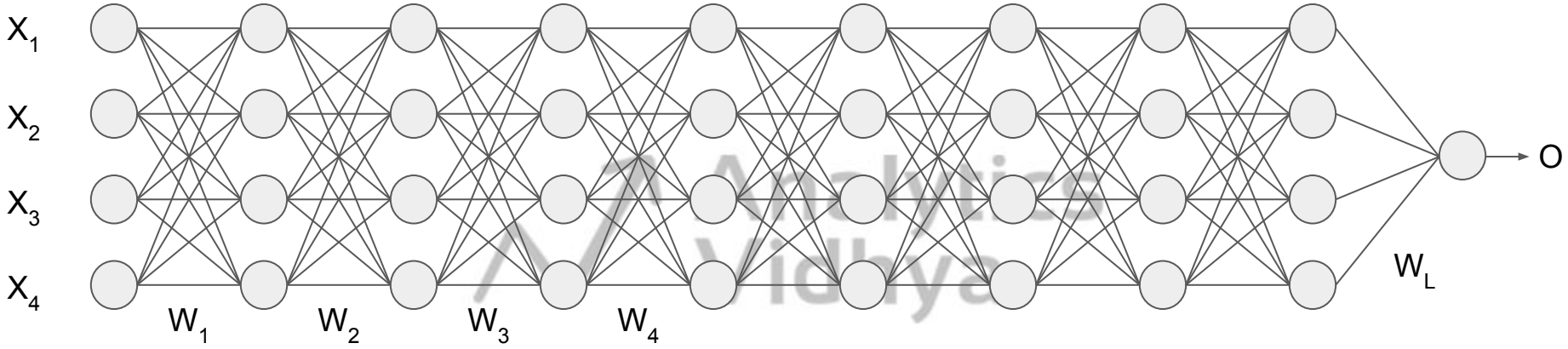
Normalize the inputs

$$h_1 = \sigma(W_1 X)$$

$$h_2 = \sigma(W_2 h_1) = \sigma(W_2 \sigma(W_1 X))$$

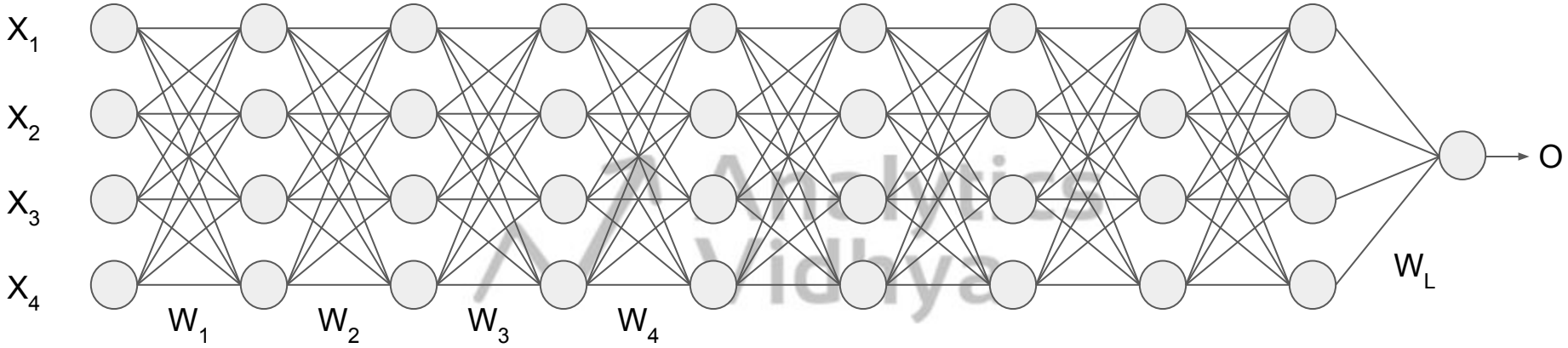
$$O = \sigma(W_L h_{L-1})$$

Normalizing hidden layer activations



$$\mu = \frac{1}{m} \sum h_i$$

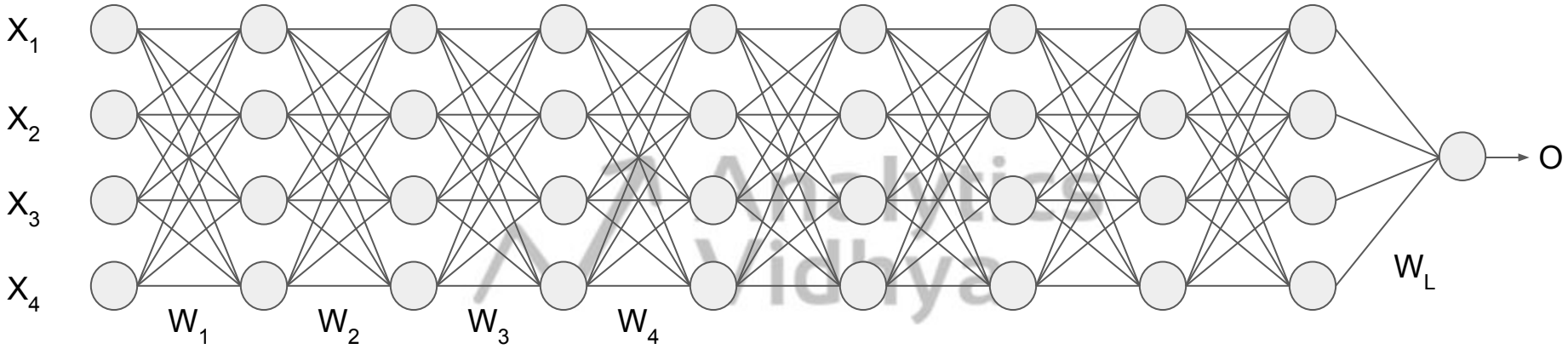
Normalizing hidden layer activations



$$\mu = \frac{1}{m} \sum h_i$$

$$\sigma = \left[\frac{1}{m} \sum (h_i - \mu)^2 \right]^{1/2}$$

Normalizing hidden layer activations

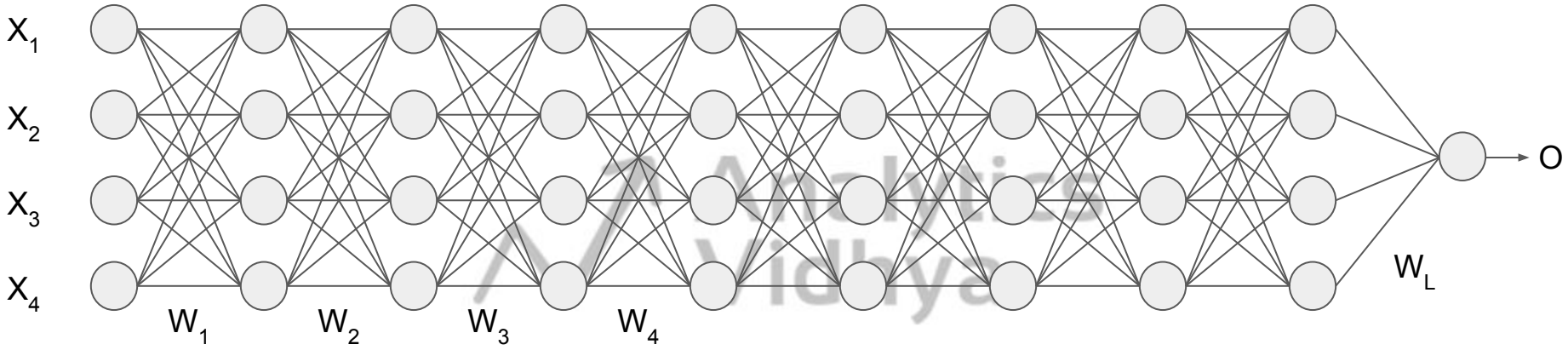


$$\mu = \frac{1}{m} \sum h_i$$

$$\sigma = \left[\frac{1}{m} \sum (h_i - \mu)^2 \right]^{1/2}$$

$$h_{i(norm)} = \frac{(h_i - \mu)}{\sigma + \varepsilon}$$

Normalizing hidden layer activations



$$\mu = \frac{1}{m} \sum h_i$$

$$\sigma = \left[\frac{1}{m} \sum (h_i - \mu)^2 \right]^{1/2}$$

$$h_{i(norm)} = \frac{(h_i - \mu)}{\sigma + \varepsilon}$$

$$h_i = \gamma\, h_{i(norm)} + \beta$$

Steps to solve emergency vs non-emergency vehicle classification problem

1. Loading the dataset
2. Pre-processing the data
3. Creating training and validation set
4. Defining the model architecture
5. Compiling the model
6. Training the model
7. Evaluating model performance

Steps to solve emergency vs non-emergency vehicle classification problem using Batch Normalization

1. Loading the dataset
2. Pre-processing the data
3. Creating training and validation set
4. Defining the model architecture
    - Add Batch Normalization layer(s)
5. Compiling the model
6. Training the model
7. Evaluating model performance

Thank You