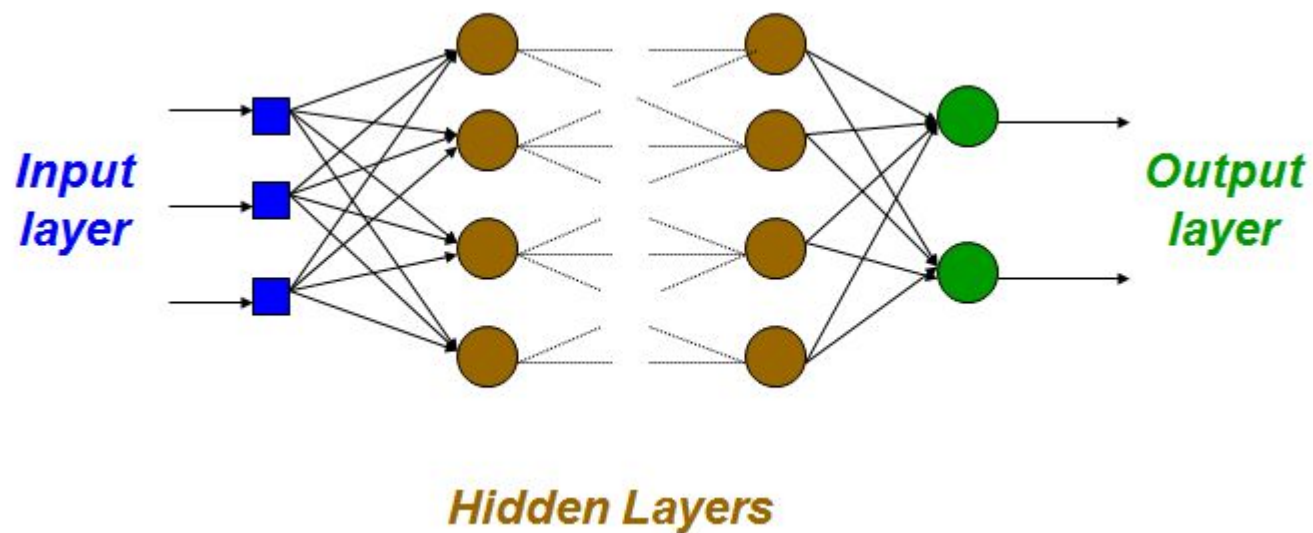


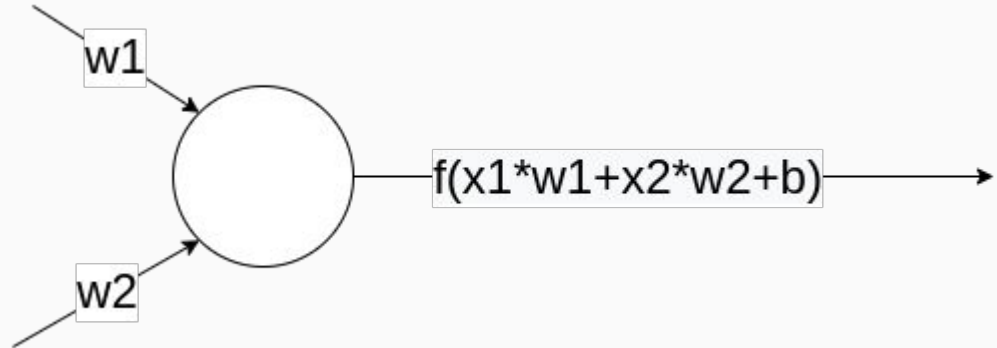
Ayudantía 10 Redes Neuronales

Estructura de una Red Neuronal



Neurona

- Input
- Pesos
- Bias
- Función de activación



Gradient Descent

Batch mode:

- Calcula el gradiente sobre todos los datos
- Súper lento

Incremental mode:

- Calcula el gradiente sobre batches x_D
- Es el más usado en la práctica

Stochastic Gradient Descent(D, NN, F, lr):

1. if not converged:

2. shuffle Dataset D

3. for minibatch d in D do:

3.1 $y := NN(d.x)$ //Forward Pass

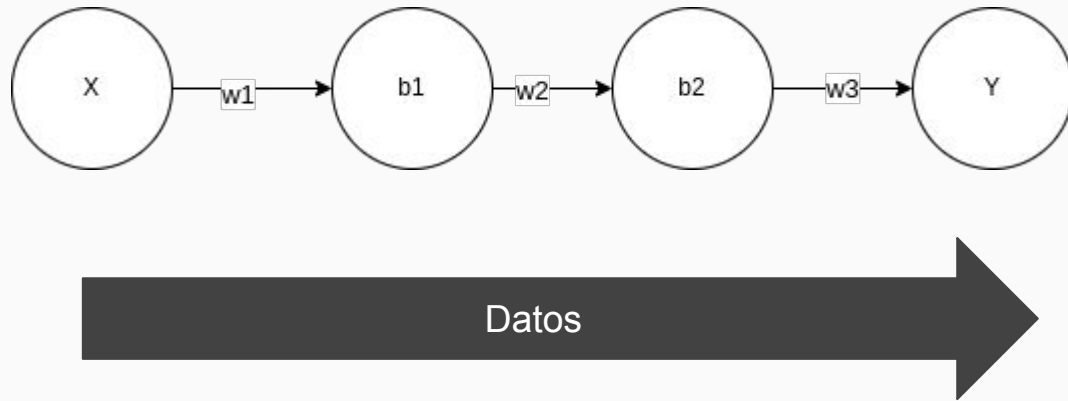
3.2 $Loss = F(d.y, y)$ //Calcular pérdida

3.3 $Grad = \nabla Loss$ //Backward Pass

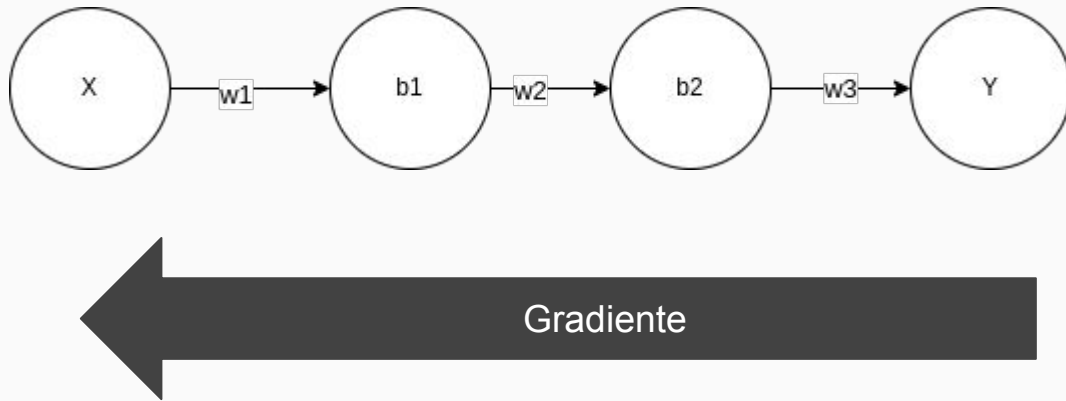
3.3 $NN.w -= lr * Grad$ //Actualizar parámetros

4. go to 1

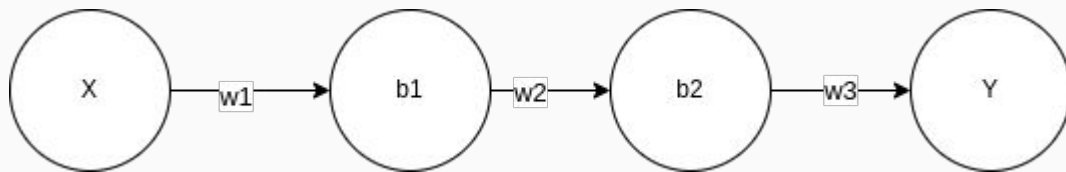
Forward Pass



Backward Pass

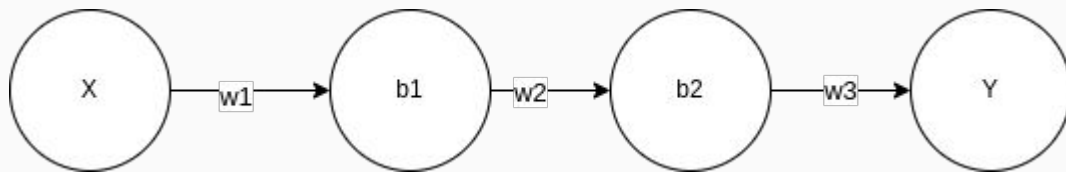


Backpropagation



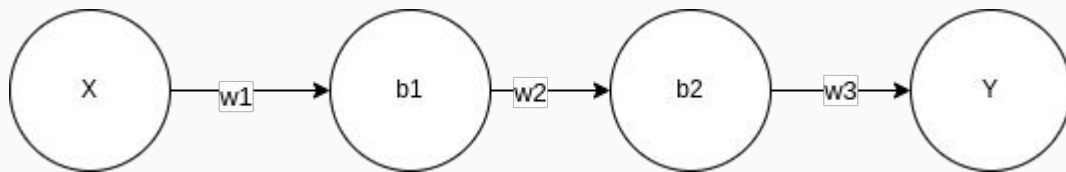
$$Loss(y, y_{true}) = EMC(y, y_{true}) = \sum_{i=0}^n \frac{1}{2} (y - y_{true})^2$$

Backpropagation



$$Loss(y, y_{true}) = EMC(y, y_{true}) = \sum_{i=0}^n \frac{1}{2} (y - y_{true})^2$$
$$\frac{\partial Loss(y, y_{true})}{\partial y} = \sum_{i=0}^n (y - y_{true})$$

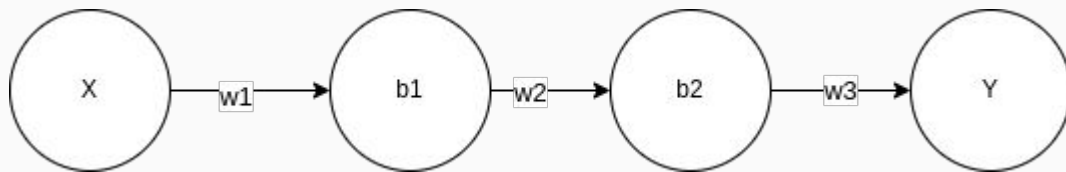
Backpropagation



$$y = f(w_3 \cdot x_3 + b_3)$$

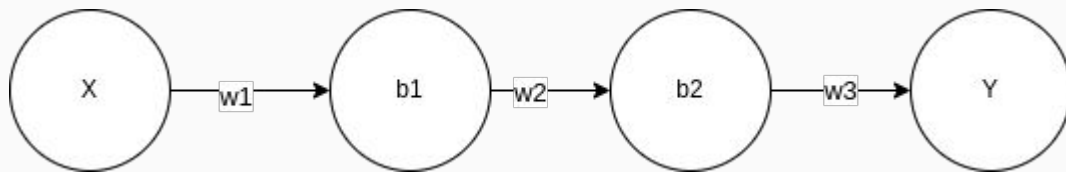
$$\frac{\partial y}{\partial w_3} = x_3 \frac{\partial f(w_3 \cdot x_3 + b_3)}{\partial w_3}$$

Backpropagation



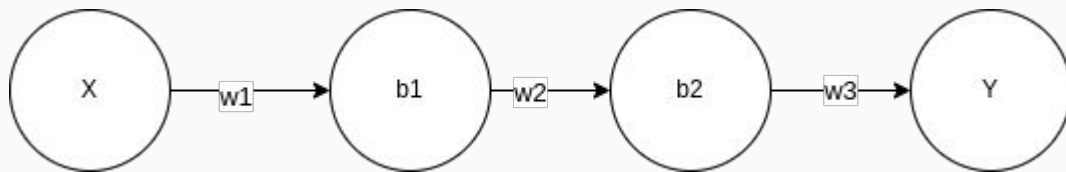
$$\frac{\partial \text{Loss}(y, y_{true})}{\partial w_3} = \frac{\partial \text{Loss}(y, y_{true})}{\partial y} \frac{\partial y}{\partial w_3}$$

Backward Pass



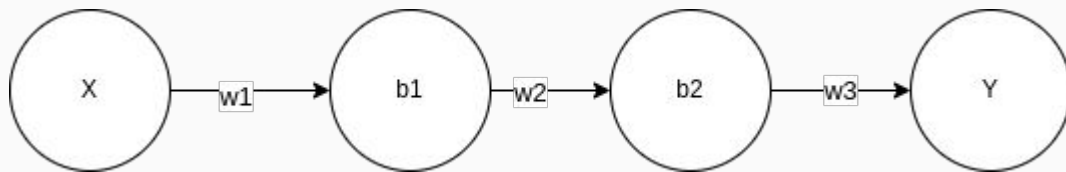
$$w_3 = w_3 - \eta \frac{\partial \text{Loss}(y, y_{true})}{\partial w_3}$$

Backpropagation



$$\frac{\partial \text{Loss}(y, y_{\text{true}})}{\partial w_2} = \frac{\partial \text{Loss}(y, y_{\text{true}})}{\partial y} \frac{\partial y}{\partial w_3} \frac{\partial x_3}{\partial w_2}$$

Backpropagation



$$\frac{\partial \text{Loss}(y, y_{true})}{\partial w_1} = \frac{\partial \text{Loss}(y, y_{true})}{\partial w_2} \frac{\partial x_2}{\partial w_1}$$

Tensorflow 2

- Framework de Machine Learning, frontend de keras.
- Fácil entrada.
- Mucho ocurre por detrás.
- Models y Layers.
- Compile, fit, predict!
- Datasets de ejemplo.



TensorFlow

Tensorboard

- Herramienta de visualización y monitoreo.
- Ayuda a saber si ocurrió overfitting o si la red converge.
- Integración directa con Tensorflow.



TensorBoard

Referencias

- <https://www.tensorflow.org/>
- https://www.researchgate.net/figure/Simple-neural-network-diagram-http-cs231ngithubio-neuralnetworks-1-The-nodes-are_fig1_337469702

Ayudantía 10 Redes Neuronales