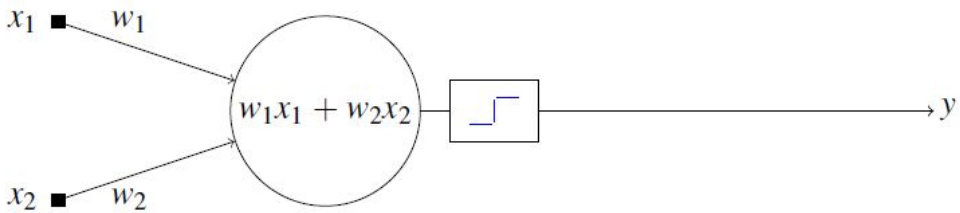
Aprendizaje automático 2

Introducción a Redes Neuronales (2)

ISTEA

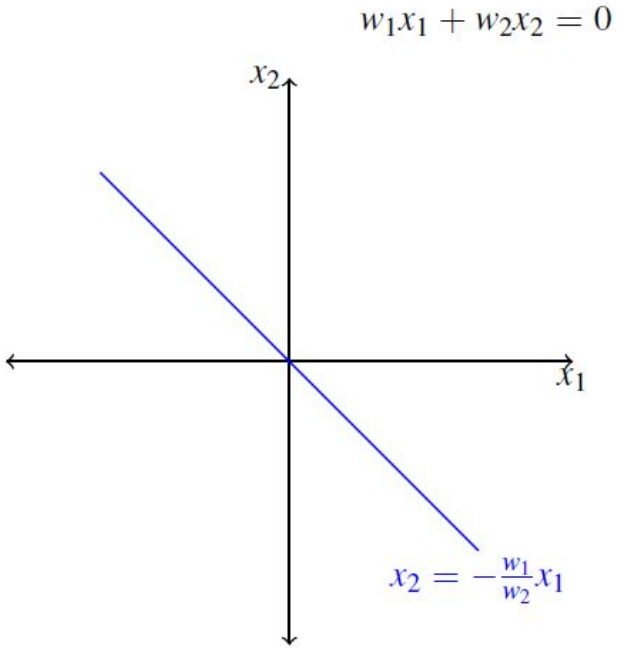
Redes neuronales

- Perceptrón simple con 2 entradas



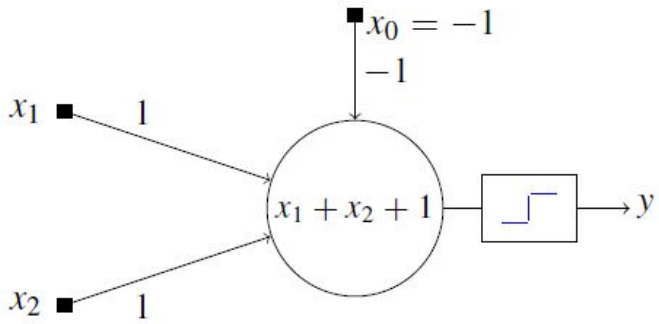
$$y = \text{sgn}(w_1x_1 + w_2x_2)$$

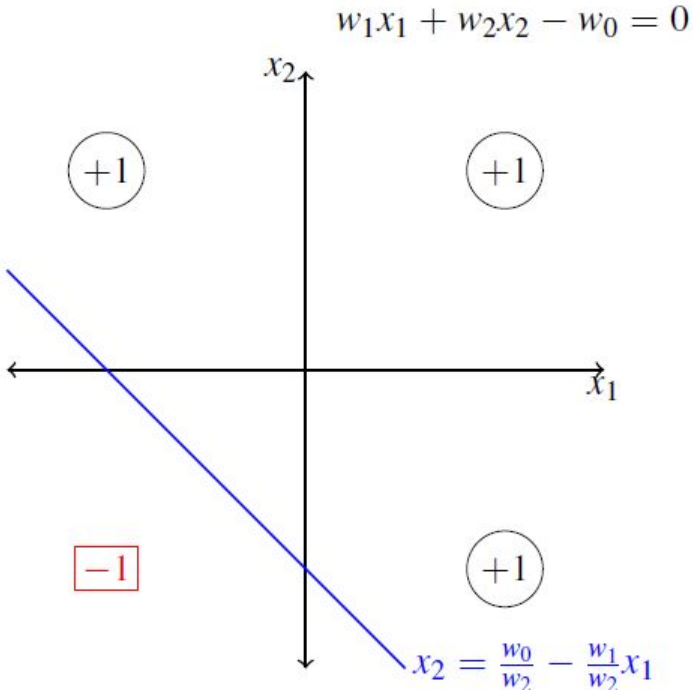
$$w_1x_1 + w_2x_2 > 0?$$



Redes neuronales

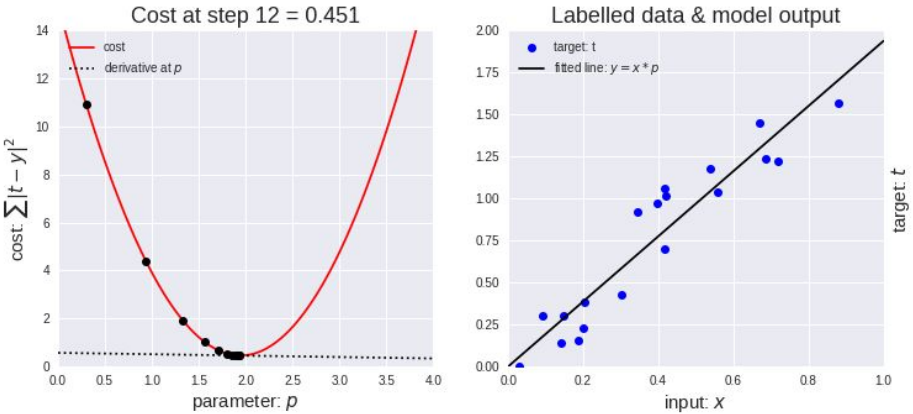
- Perceptrón simple con 2 entradas

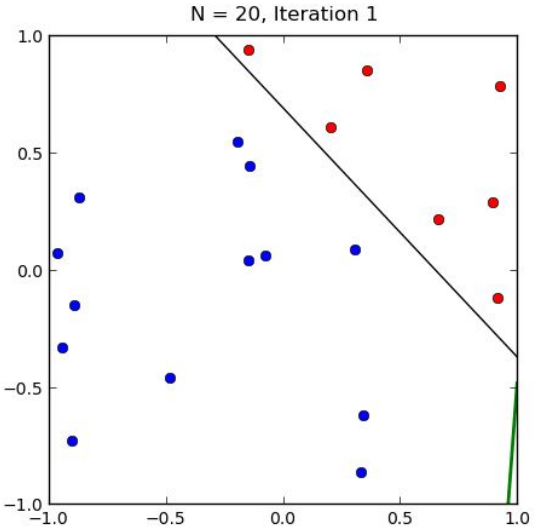




Redes neuronales

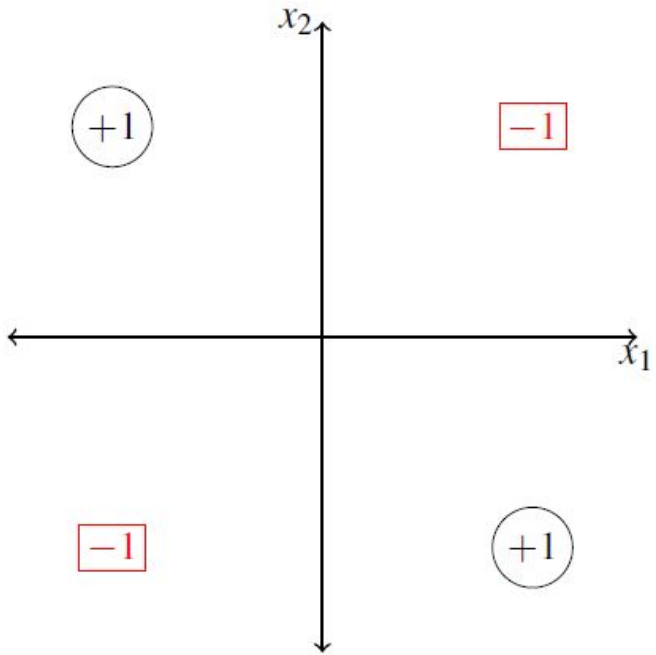
- Algoritmo Backpropagation (retropropagación del error):
  - Cálculo de función de costo
  - Cambio iterativo de pesos en función del gradiente descendente en la curva de error ➔ $\mathbf{w}(n+1) = \mathbf{w}(n) - \mu \nabla_w \xi(\mathbf{w}(n))$





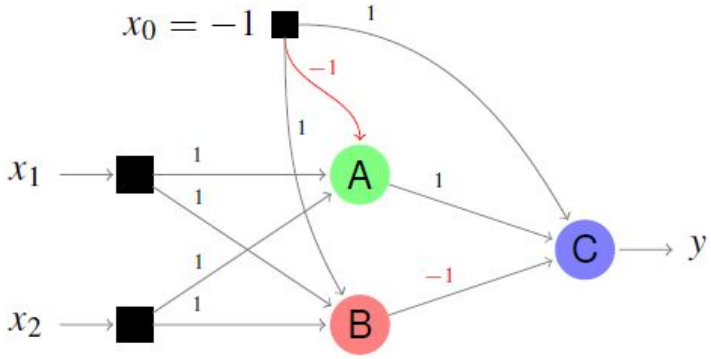
Redes neuronales

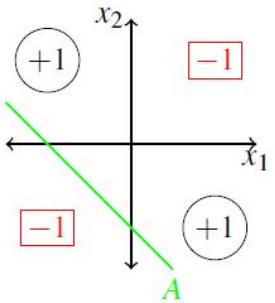
- ¿Puede resolver el problema del XOR?

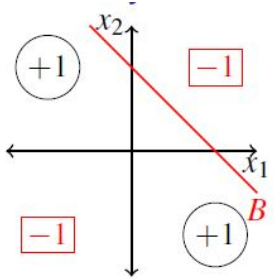


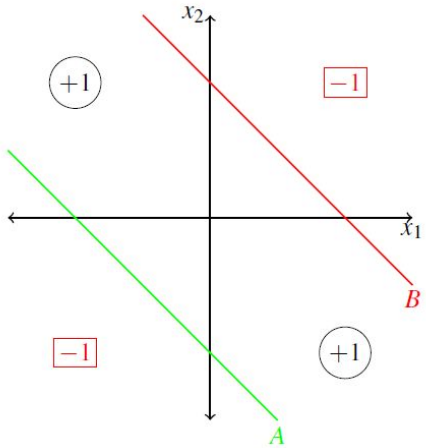
Redes neuronales

- Perceptrón multicapa:
  - Capa de entrada: 2 neuronas (o nodos)
  - Capa de salida: 1 nodo



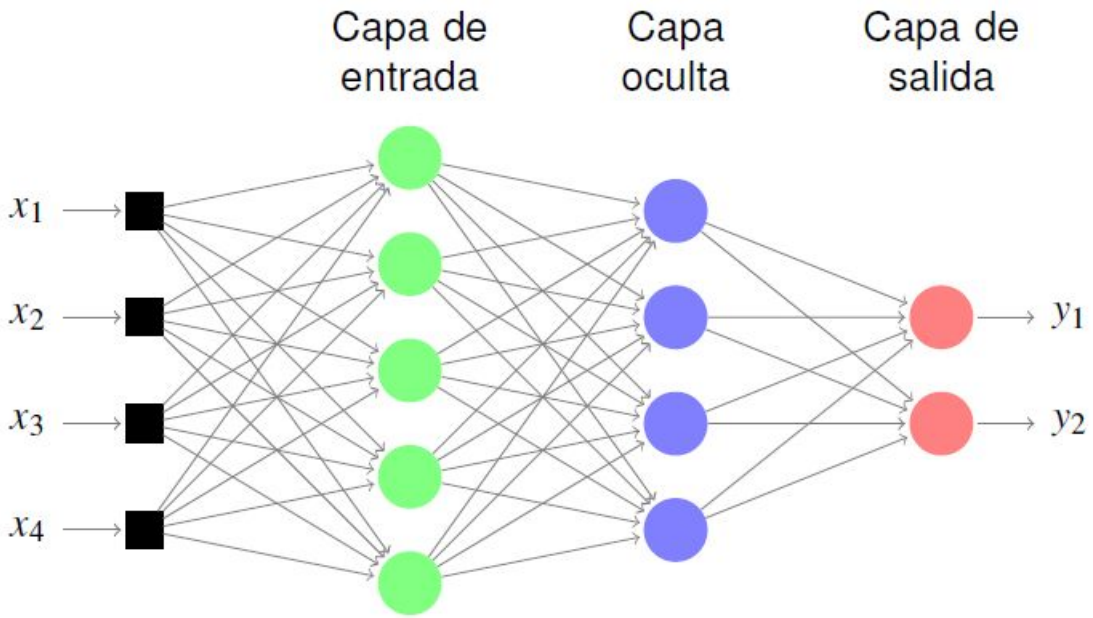






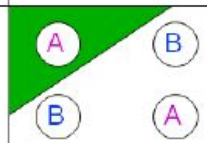
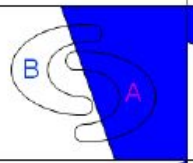
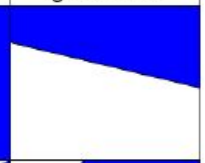
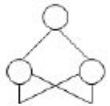
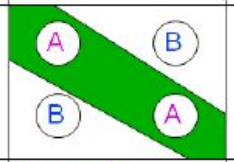
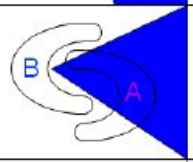
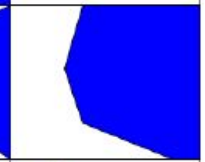
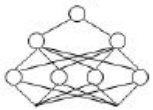
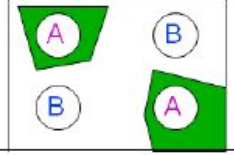
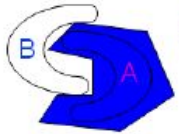
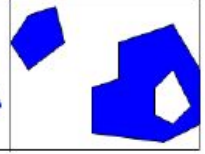
Redes neuronales

- Perceptrón multicapa



Redes neuronales

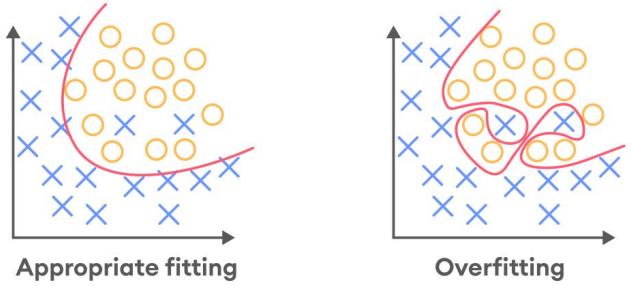
- Regiones de decisión:
  - Combinación de regiones de cada nodo

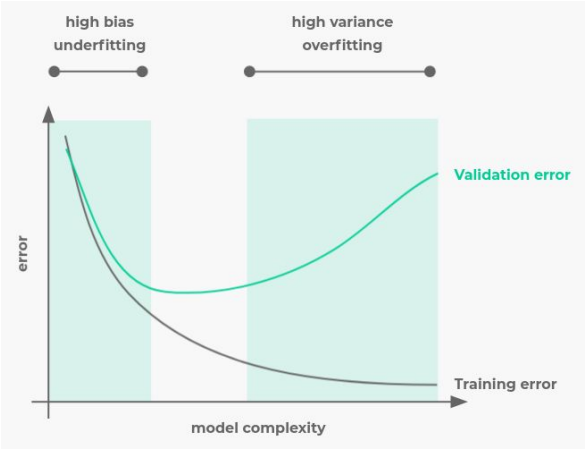
Estructura	*Tipos de regiones de decisión*	*Problema XOR*	*Separación en clases*	*Formas regiones más generales*
Una capa 	*hemiplano limitado por hiperplano*			
Dos capas 	*Regiones convexas abiertas o cerradas*			
Tres capas 	Arbitrarias (Complejidad limitada por N°. de Nodos)			

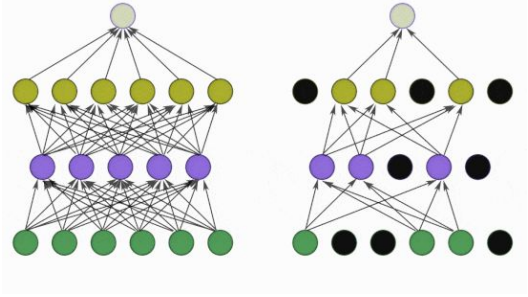
  - http://playground.tensorflow.org/

Redes neuronales

- Sobre-entrenamiento
- Regularización
- Drop-out

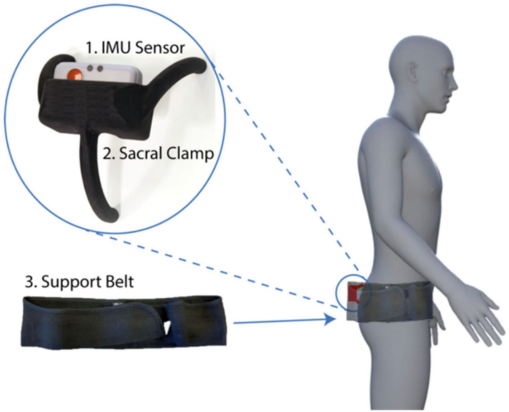




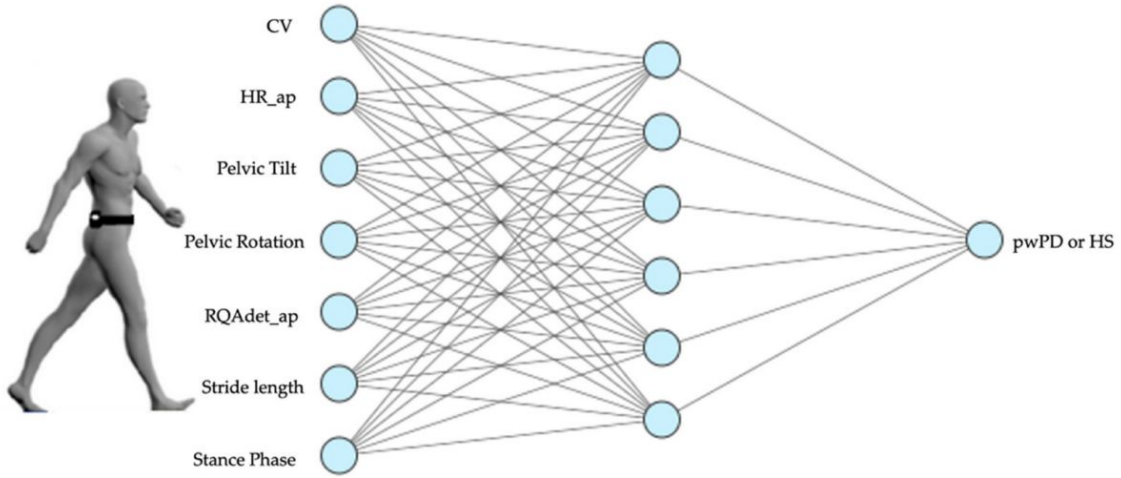


Redes neuronales

- Redes tipo Perceptron:
  - 2 ó 3 capas
  - Extracción de características muy laboriosa



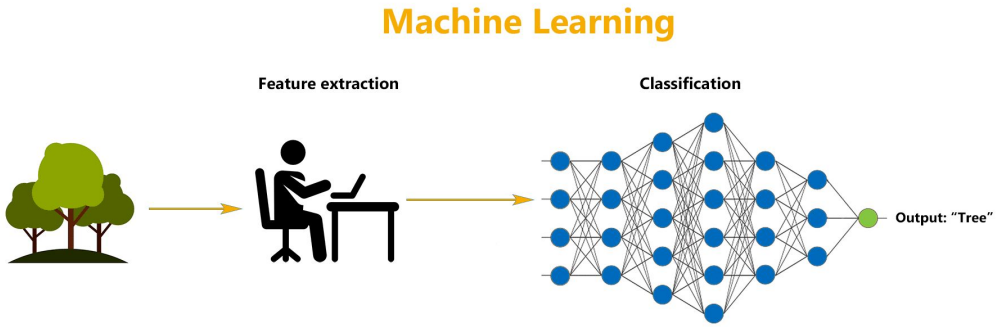
- Stance phase
- Swing phase
- Double support
- Single support
- Cadence
- Stride time
- Stride length
- % Stride length
- Gait Speed
- Pelvic Tilt
- Pelvic Obliquity
- Pelvic Rotation
- HR ap
- HR ml
- HR v
- CV
- RQArec_ap
- RQArec_ml
- RQArec_v
- RQAdet_ap
- RQAdet_ml
- RQAdet_v

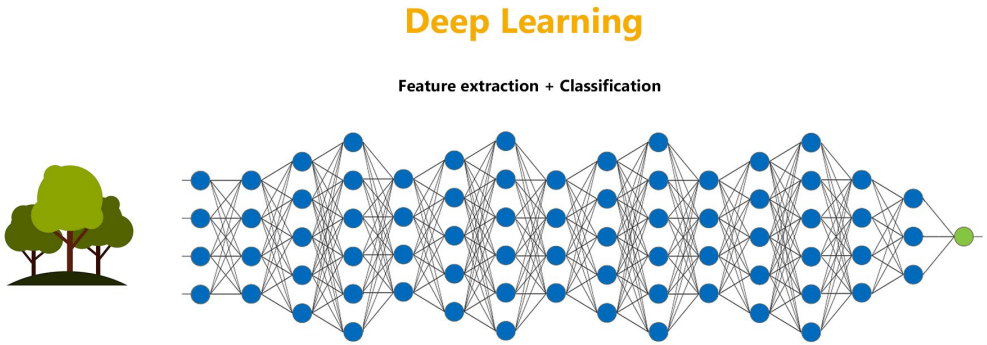


Detección de Parkinson a través del análisis de la marcha

Redes neuronales

- Redes profundas:
  - Múltiples capas
  - Miles de nodos
  - Extracción de características dentro de la red (!!!)
  - Necesidad de corpus numerosos





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