LAB 01

Application of Neural Networks in Computer Vision

Sunghwan Kim

Index

Machine Learning

Definition

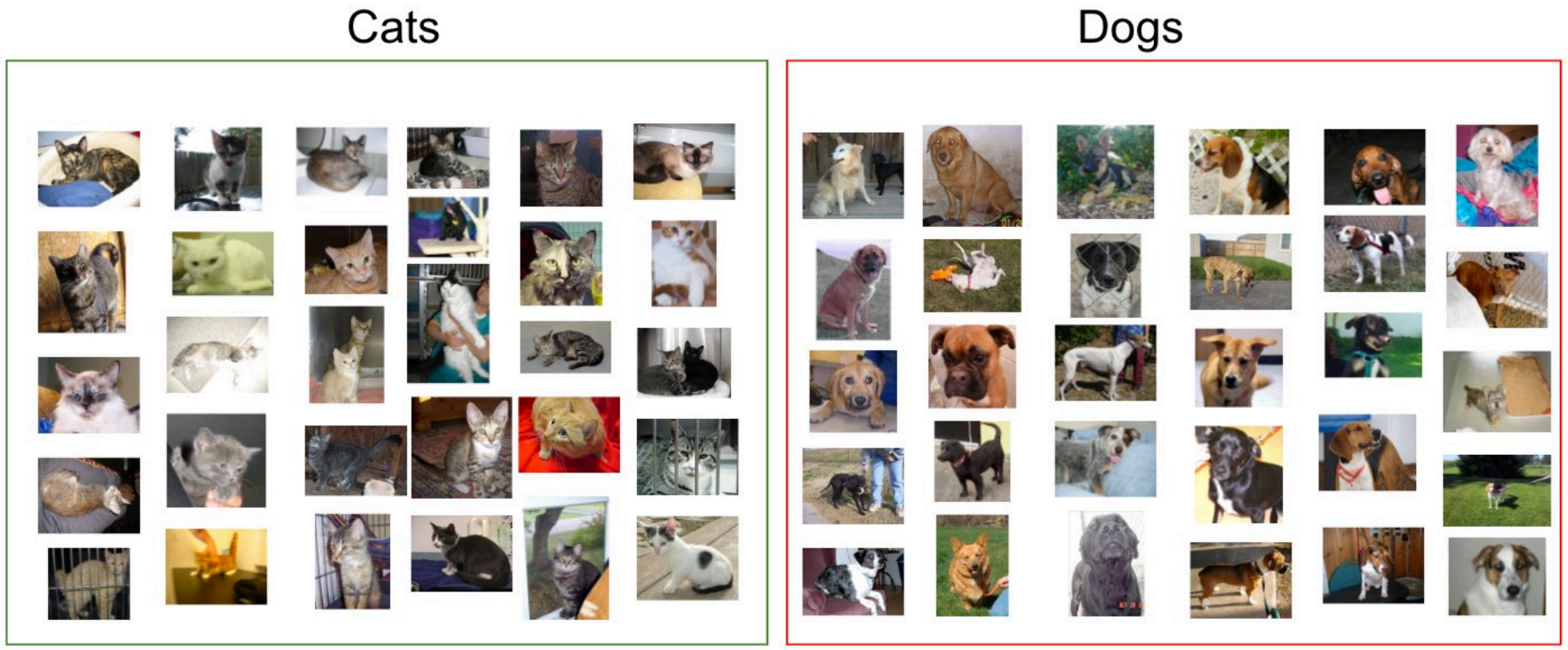
한 컴퓨터 프로그램이 어떤 과제류(class of tasks) T에 속하는 과제들을 수행하며 그 수행의 성과를 측정한 정도를 P라고 할 때, 만약 어떤 경험 E때문에 T의 어떤 과제에 대한 성과 P가 개선되었다면, 그 컴퓨터 프로그램은 경험 E로부터 학습한다고 말할 수 있다. *[Mitchell, 1997]*

머신러닝은 위 정의의 '학습'을 진행하는 알고리즘.

→ 경험 E와 과제 T, 그리고 성과 측도 P는 해결하려는 과제마다 다르다.

Machine Learning

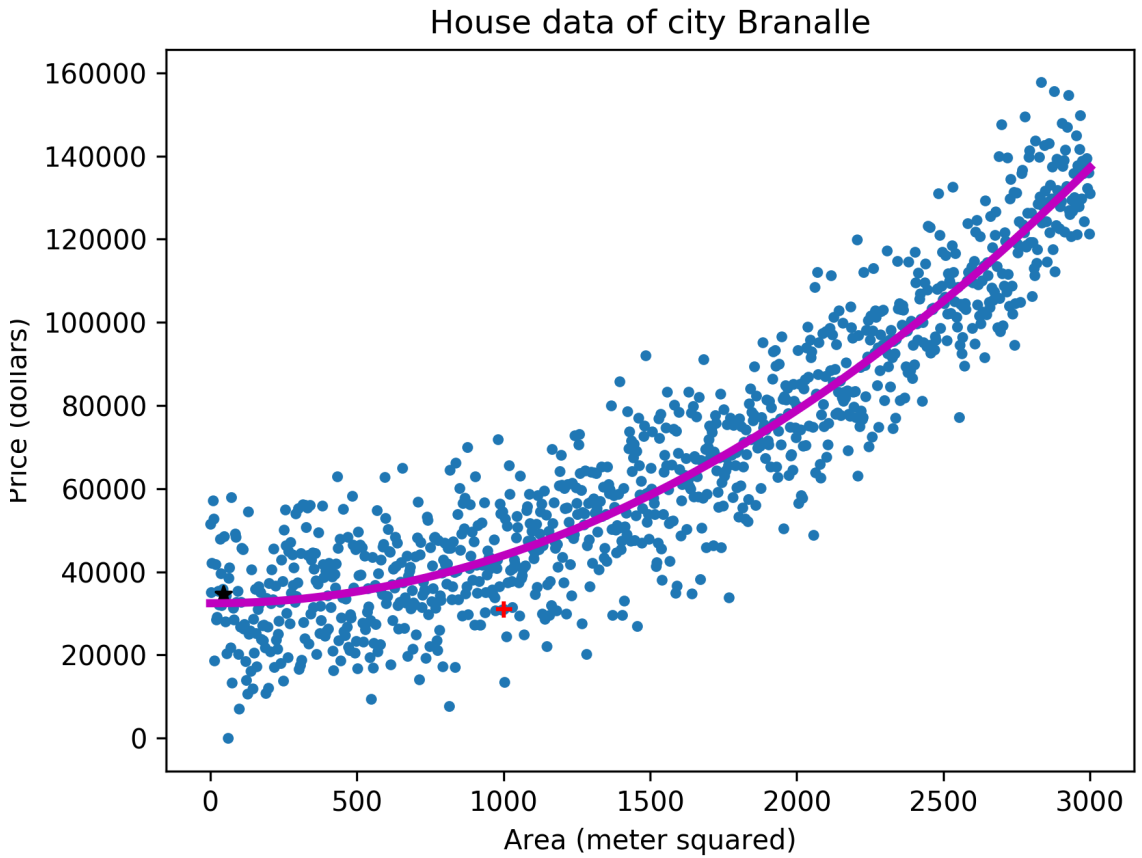
머신러닝의 **과제** T | 분류(Classification)



Sample of cats & dogs images from Kaggle Dataset

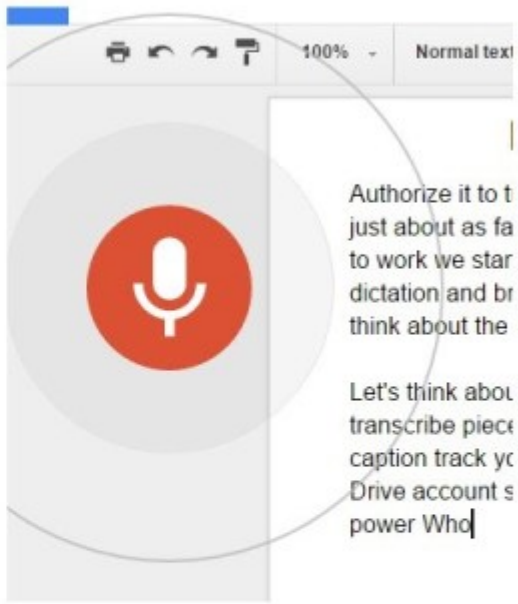
Machine Learning

머신러닝의 **과제** T | 회귀(Regression)



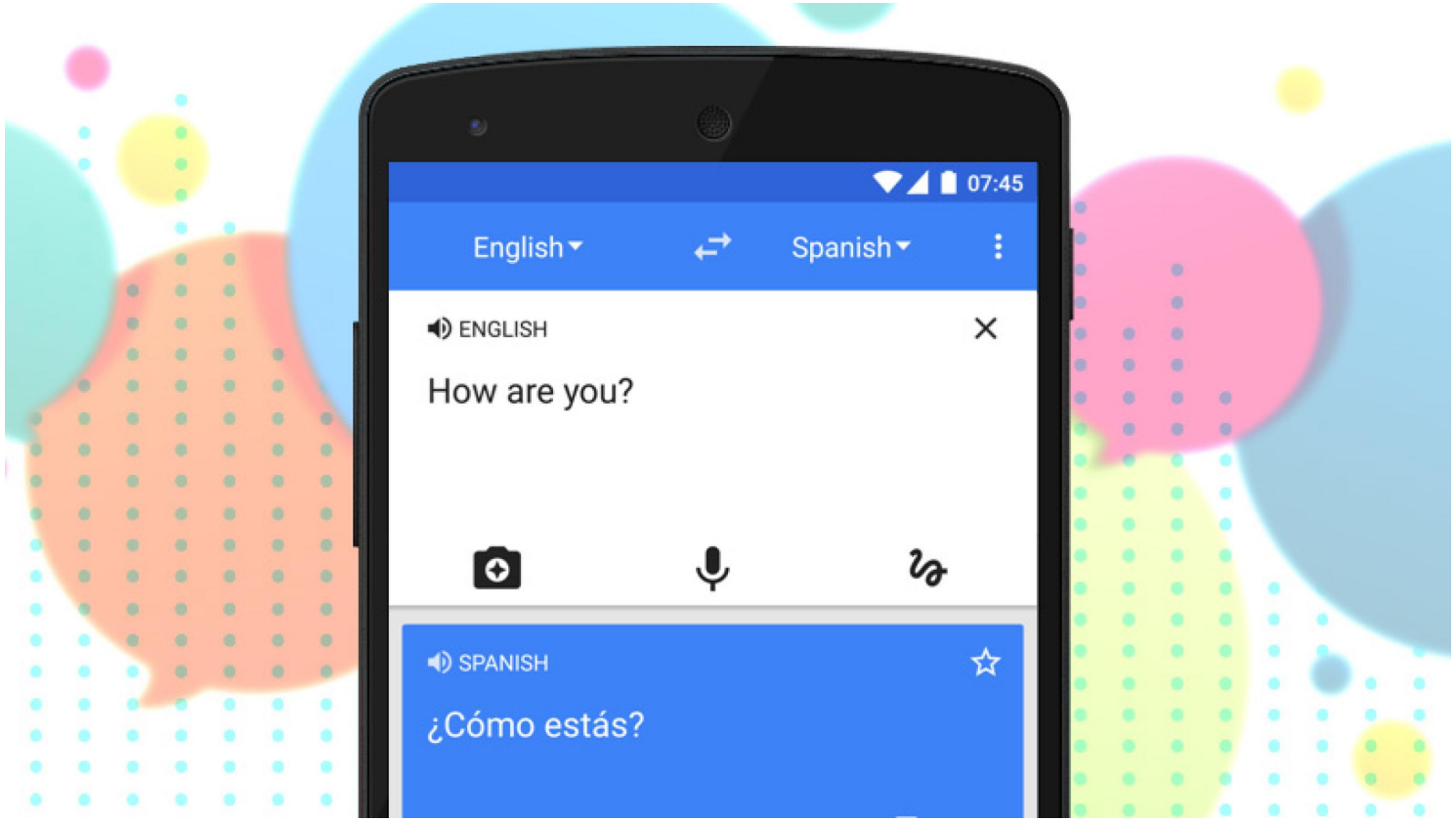
Machine Learning

머신러닝의 **과제** T | 전사(Transcription)



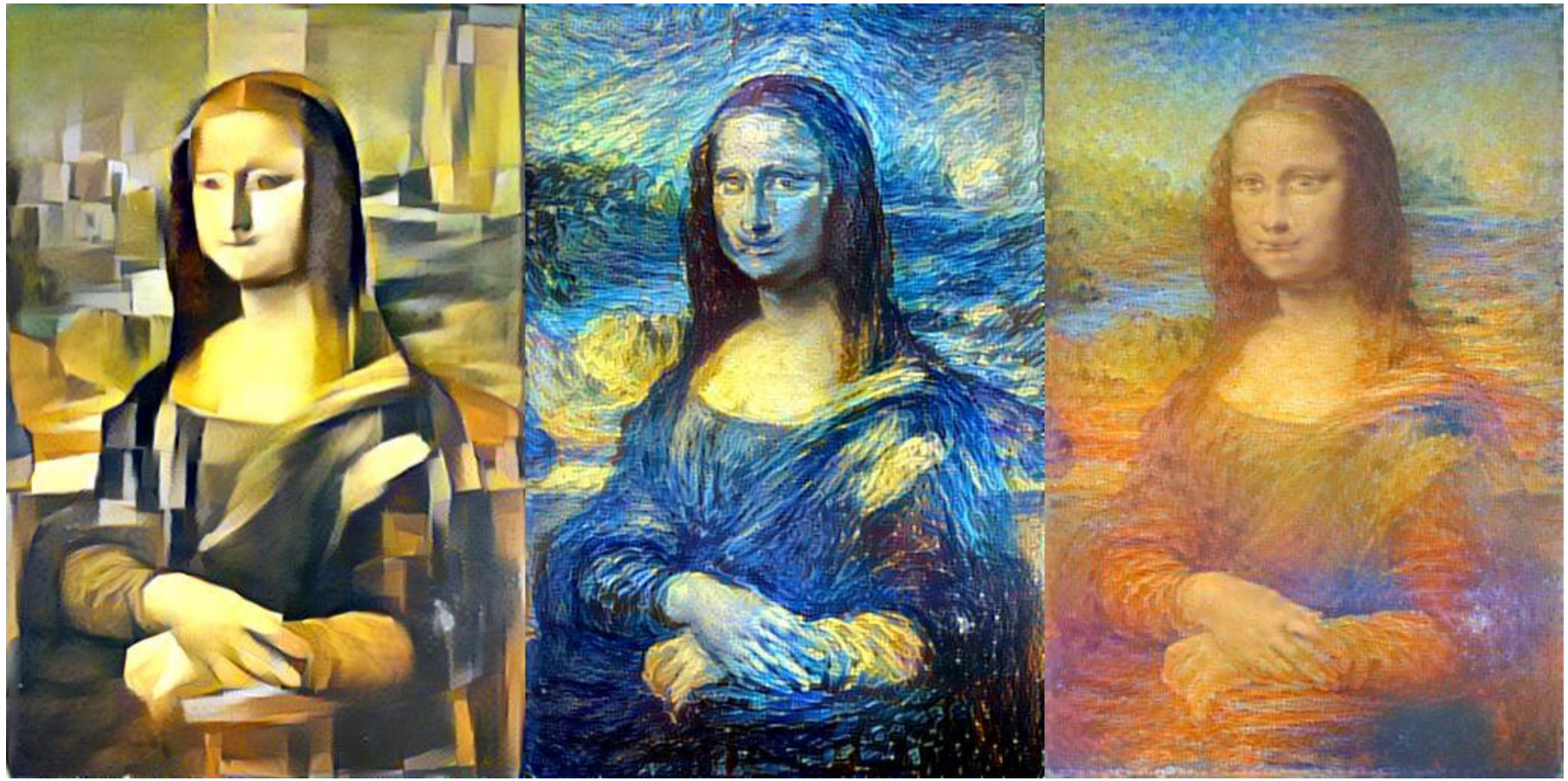
Machine Learning

머신러닝의 **과제** T | 번역(Translation)



Machine Learning

머신러닝의 **과제** T | 합성(Synthesis)

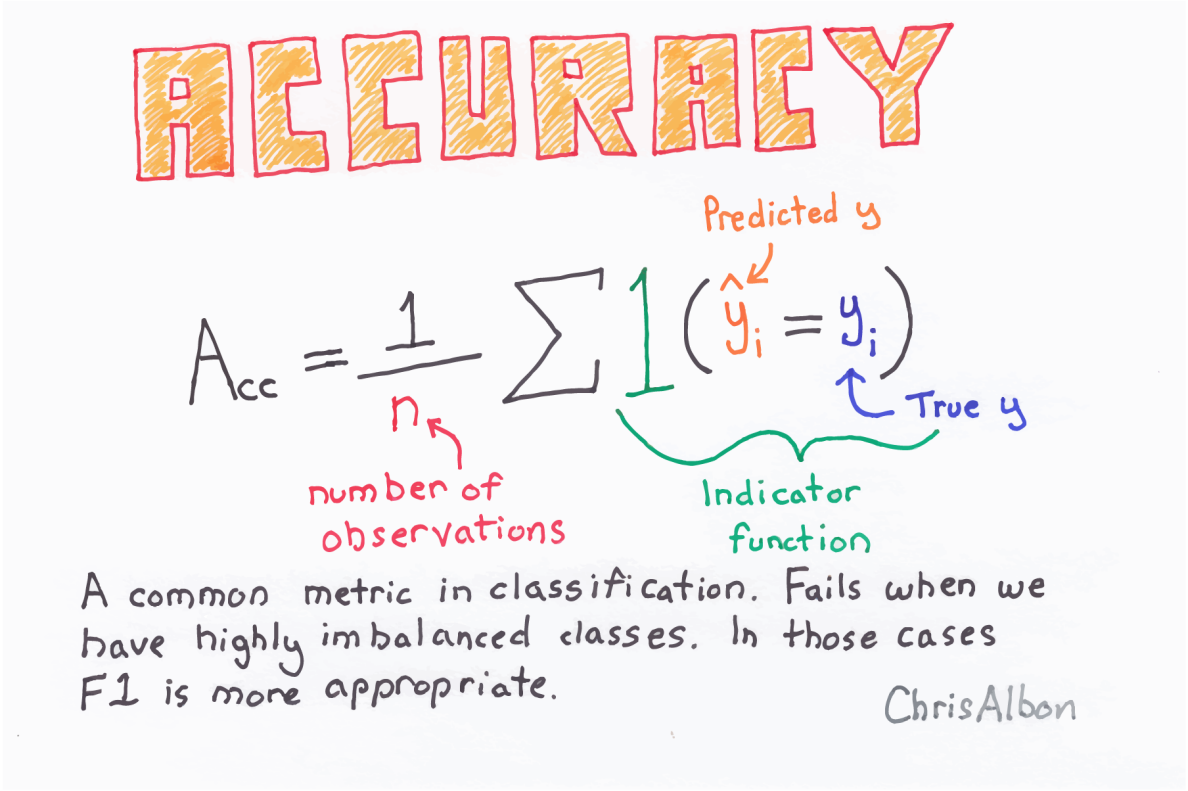


Machine Learning

머신러닝의 **과제** T | 잡음 제거(Denoising)

Machine Learning

머신러닝의 **성과** P | 정확도 (Accuracy)

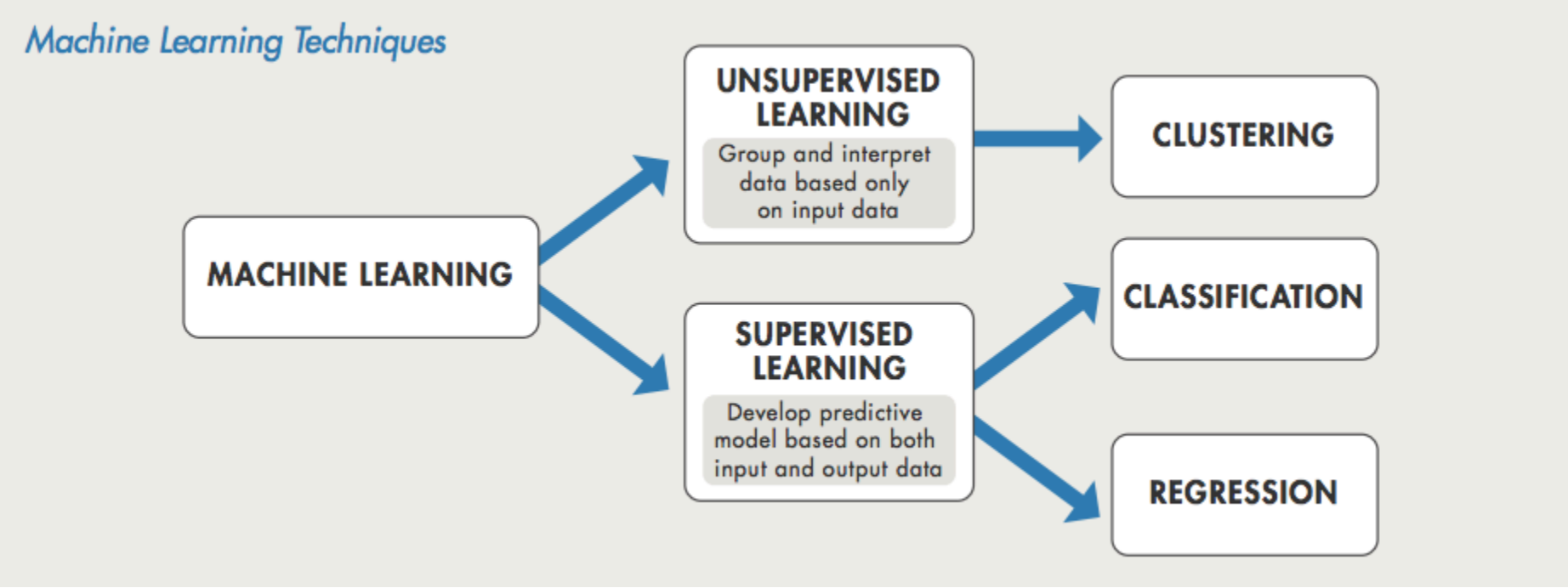


Machine Learning

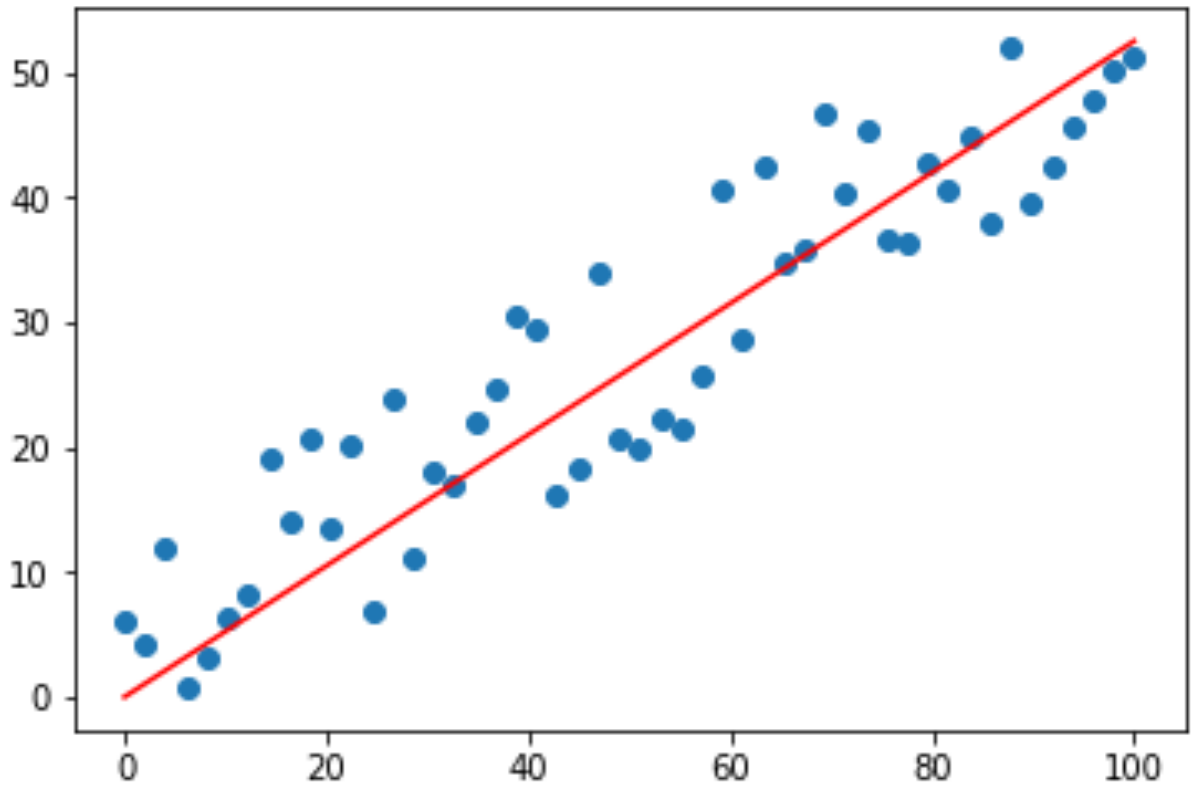
머신러닝의 **경험** E | Dataset

Transaction	Time stamp	ID	Age group	Fresh fruit	Seafood
1	April	1	Senior	Orange	Tuna
2	April	2	Teenager	Banana	Tuna
3	April	4	Teenager	Banana	Tuna
4	June	1	Senior	Orange	Anchovy
5	June	3	Adult	Banana	Tuna
6	July	1	Senior	Orange	Anchovy
7	July	2	Teenager	Banana	Tuna
8	July	2	Teenager	Orange	Tuna
9	July	4	Teenager	Banana	Tuna
10	December	2	Teenager	Banana	Tuna
11	December	3	Adult	Orange	Anchovy
12	December	1	Senior	Orange	Anchovy

Machine Learning



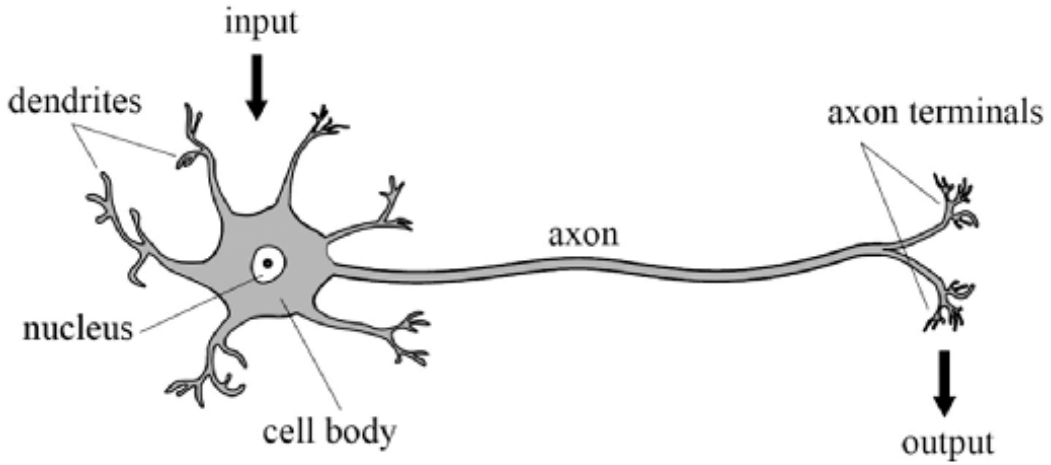
Linear Regression

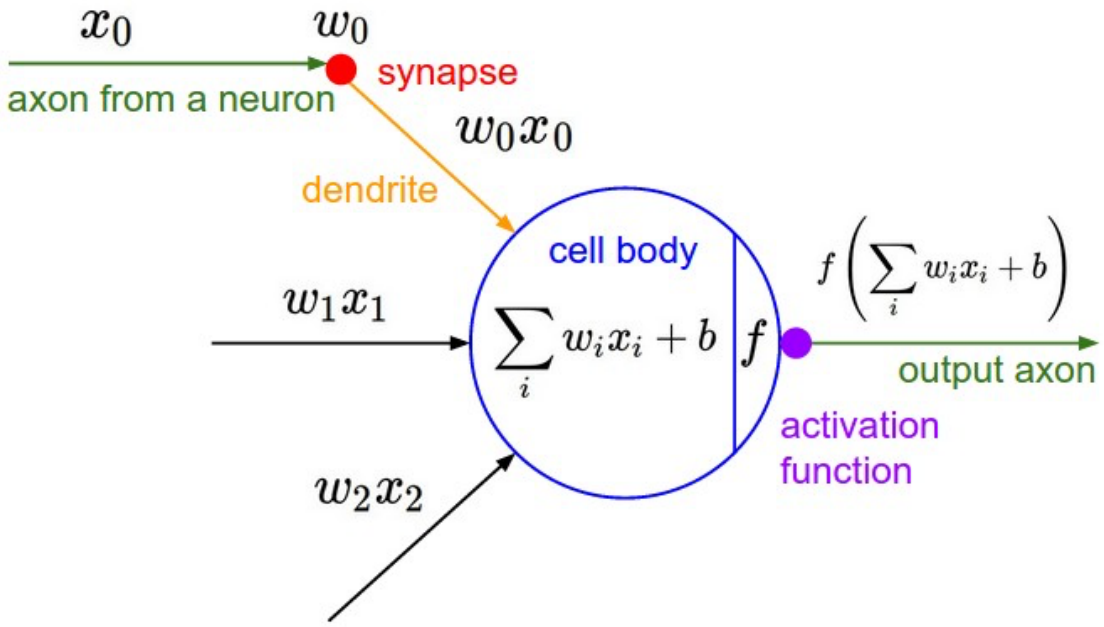


Linear Regression

Neural Networks

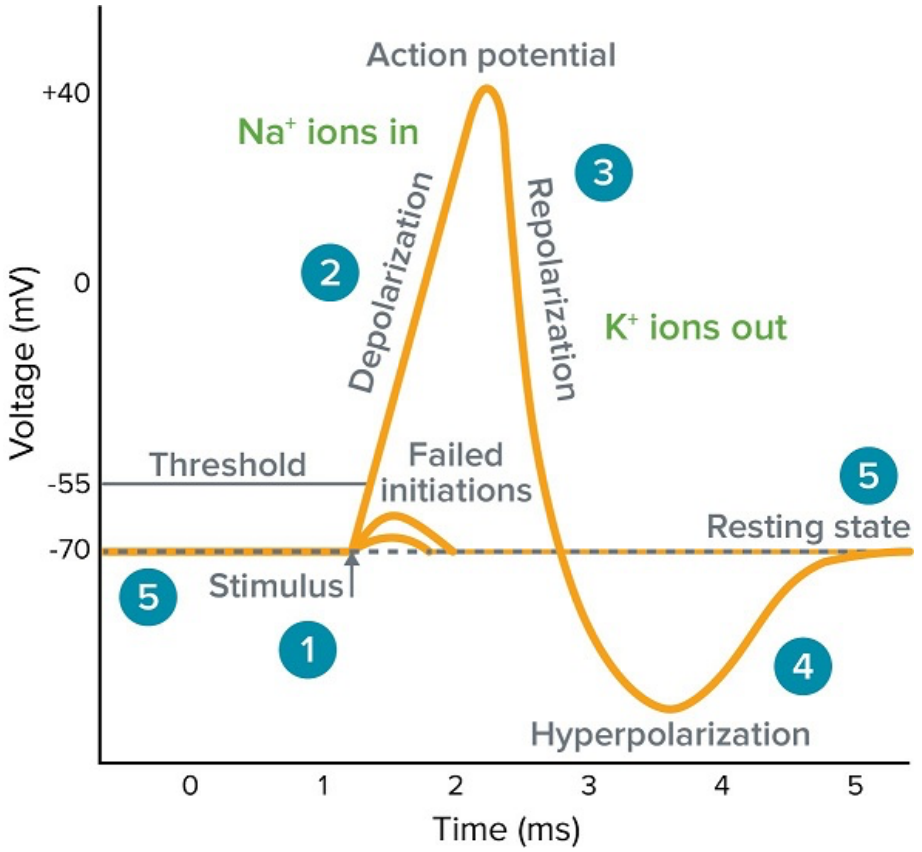
인간의 뇌를 구성하는 신경세포에서 영감을 받아 만든 수학적 모델





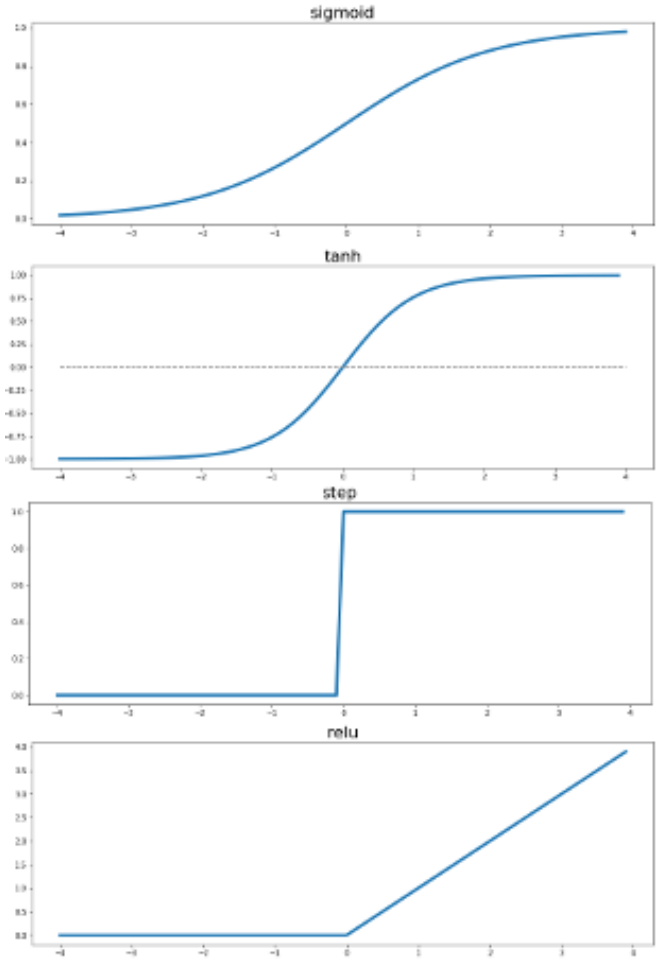
Neural Networks

생물학적 뉴런의 활성화



Neural Networks

수학적 뉴런의 활성화



Neural Networks

선형성(Linearity)

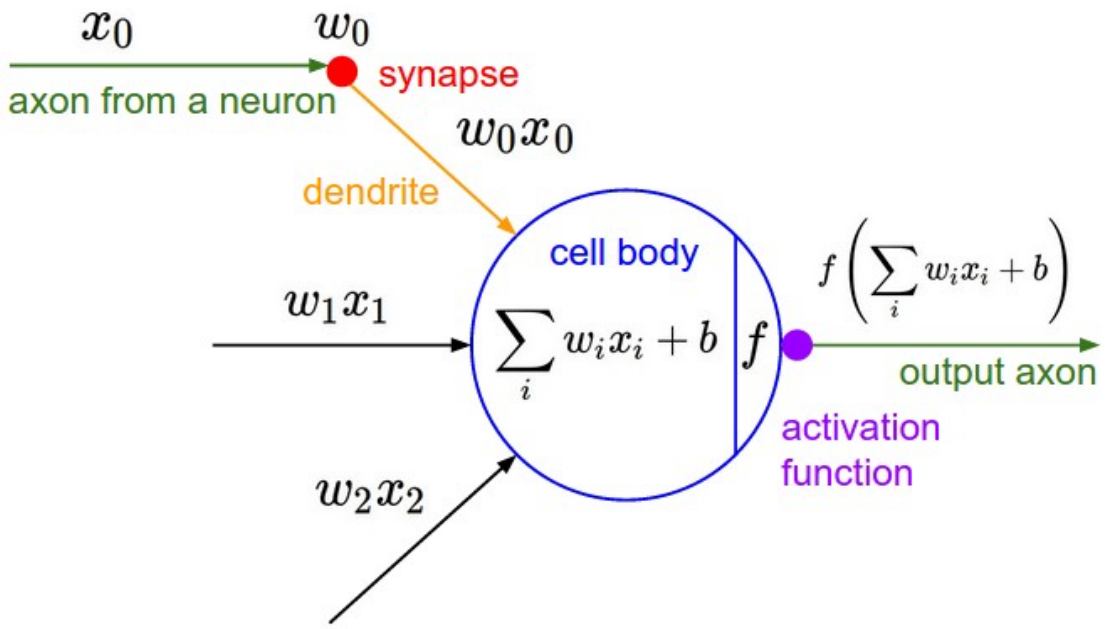
Definition

함수 f에 대해, 가산성(Additivity: $f(x+y)=f(x)+f(y)$)와, 동차성(Homogeneity: $f(\alpha x)=\alpha f(x)$) 가 항상 성립할 때 함수 f는 '선형'이라고 한다.

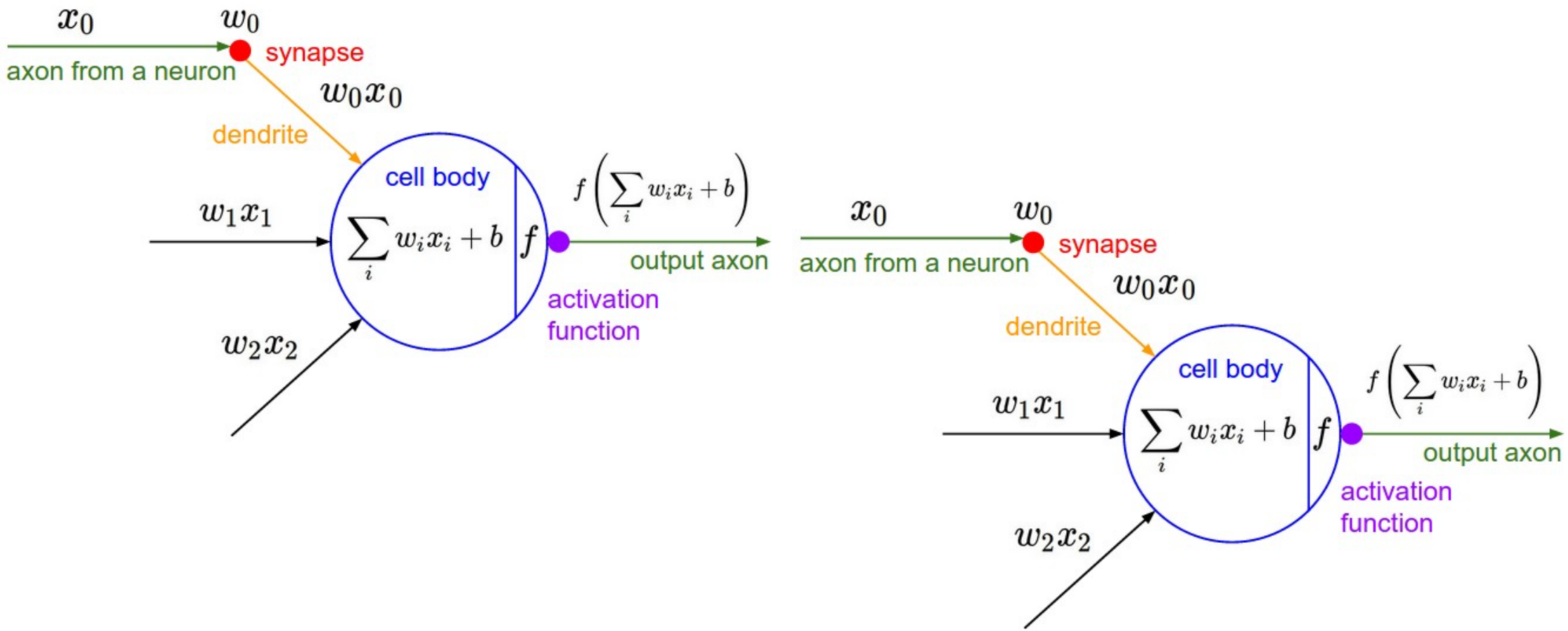
Linear Regression에서는 선형인 모델을 학습하기 위해 회귀를 진행했다.

Neural Network에서 역시 각각의 뉴런 자체들은 하나의 선형인 모델을 학습하는 것과 마찬가지이다.

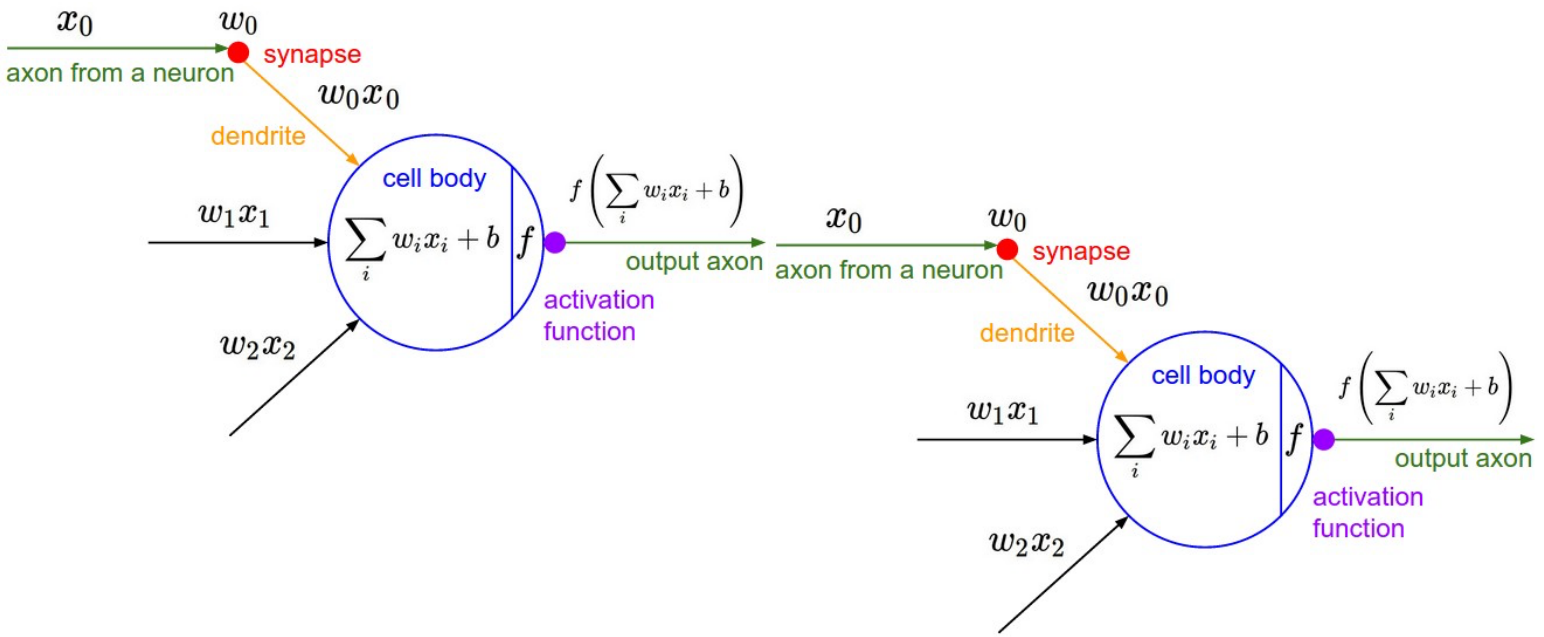
Neural Networks



Neural Networks

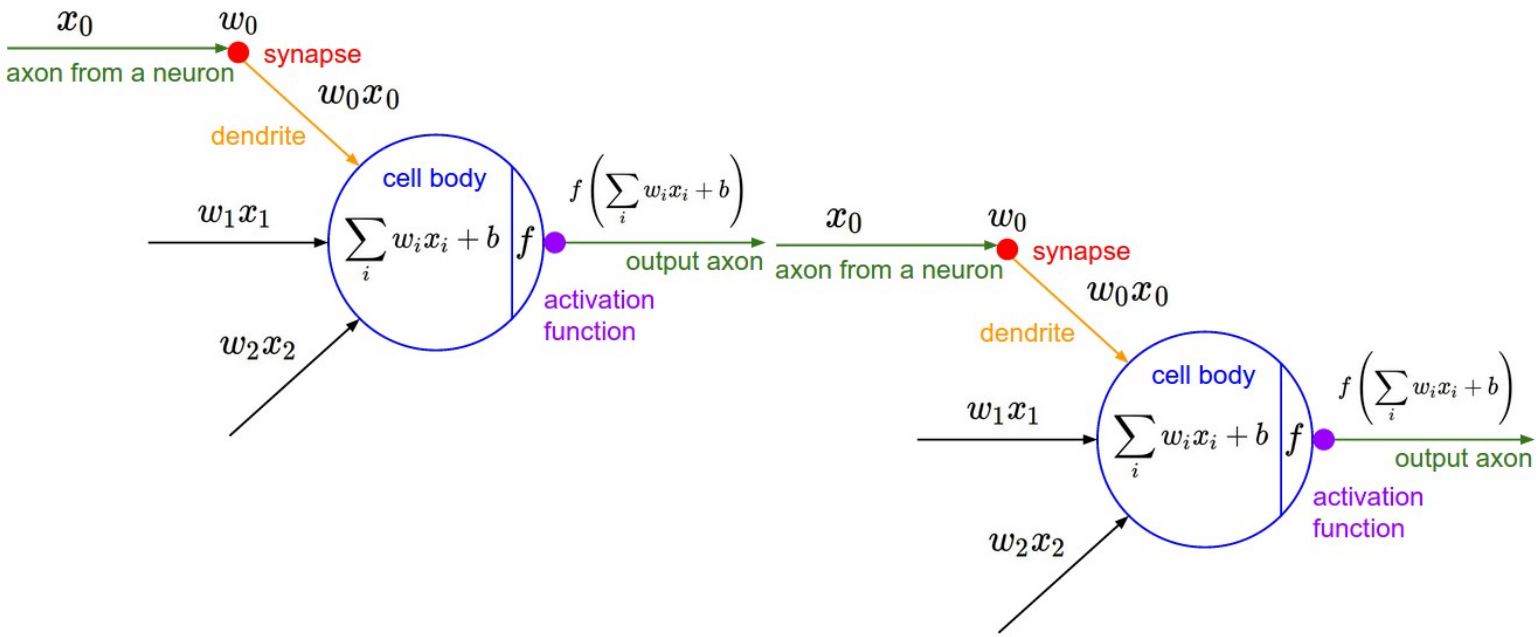


Neural Networks



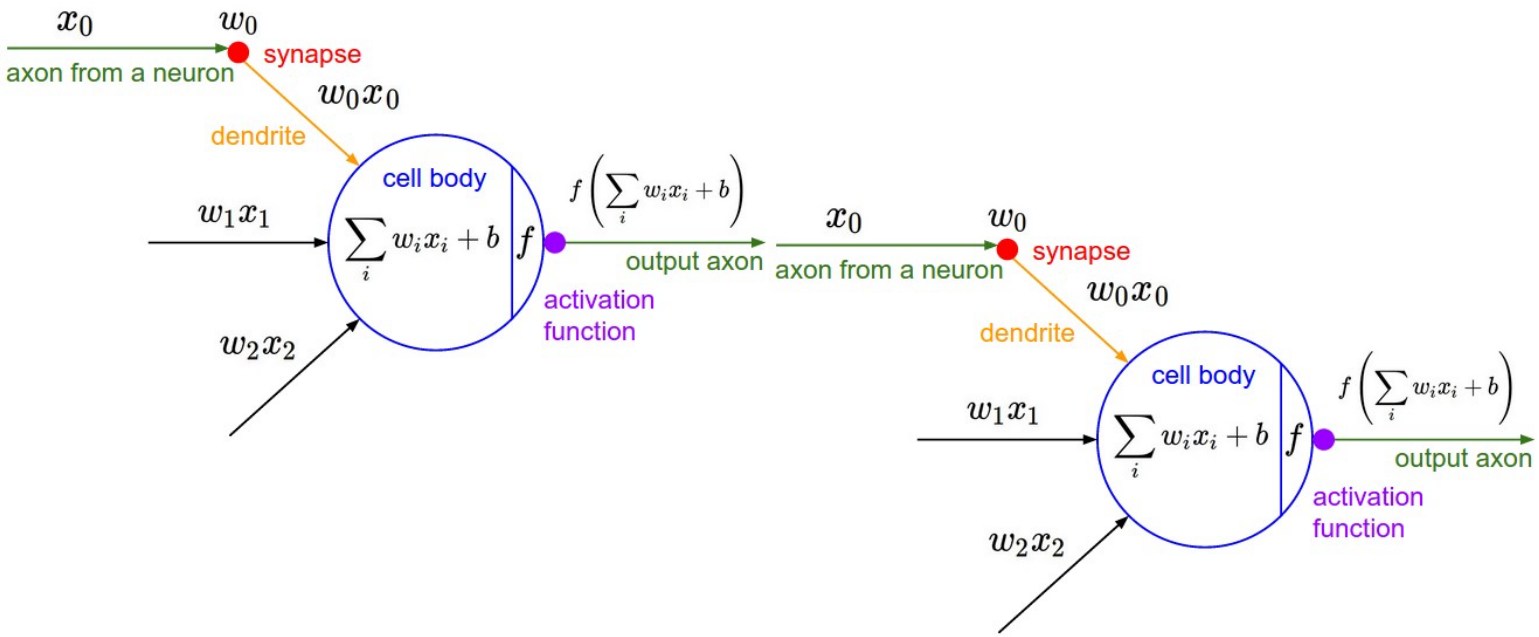
$$out1 = W_1 x \qquad out2 = W_2 out1$$

Neural Networks



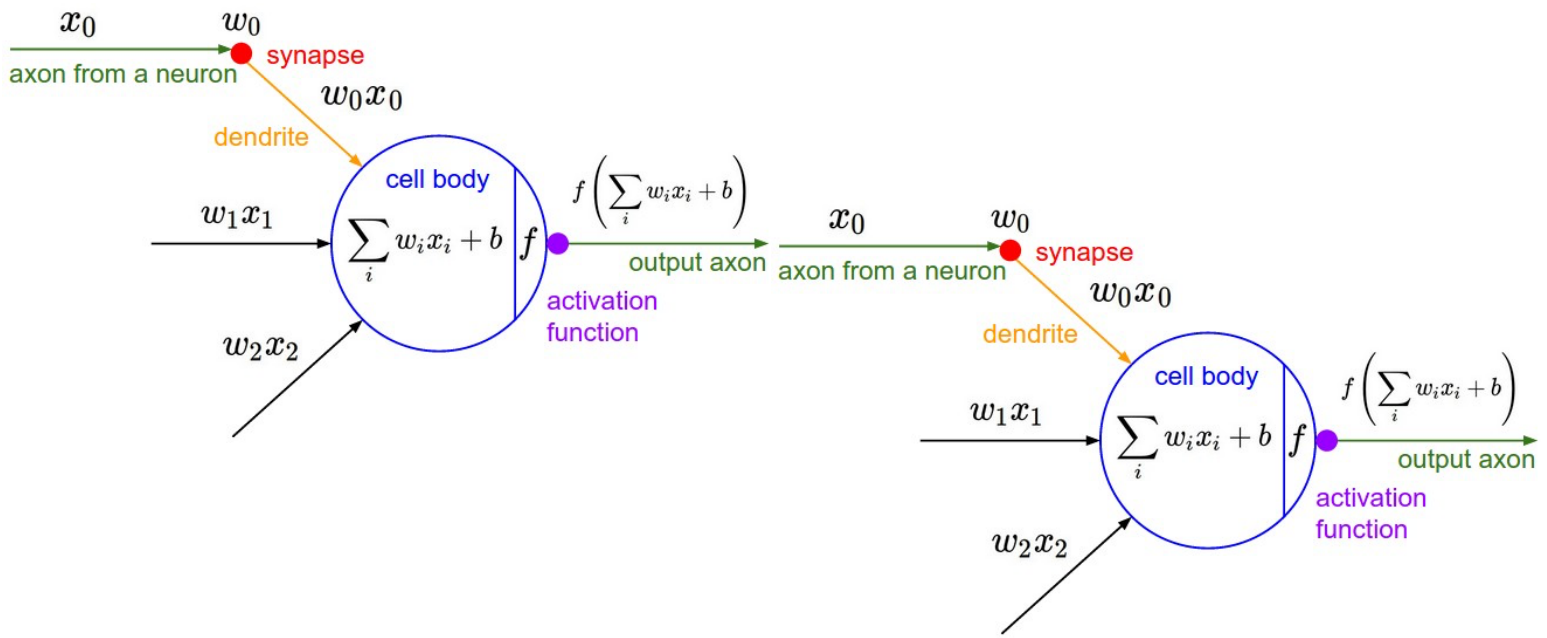
$$out = W_2(W_1 x)$$

Neural Networks



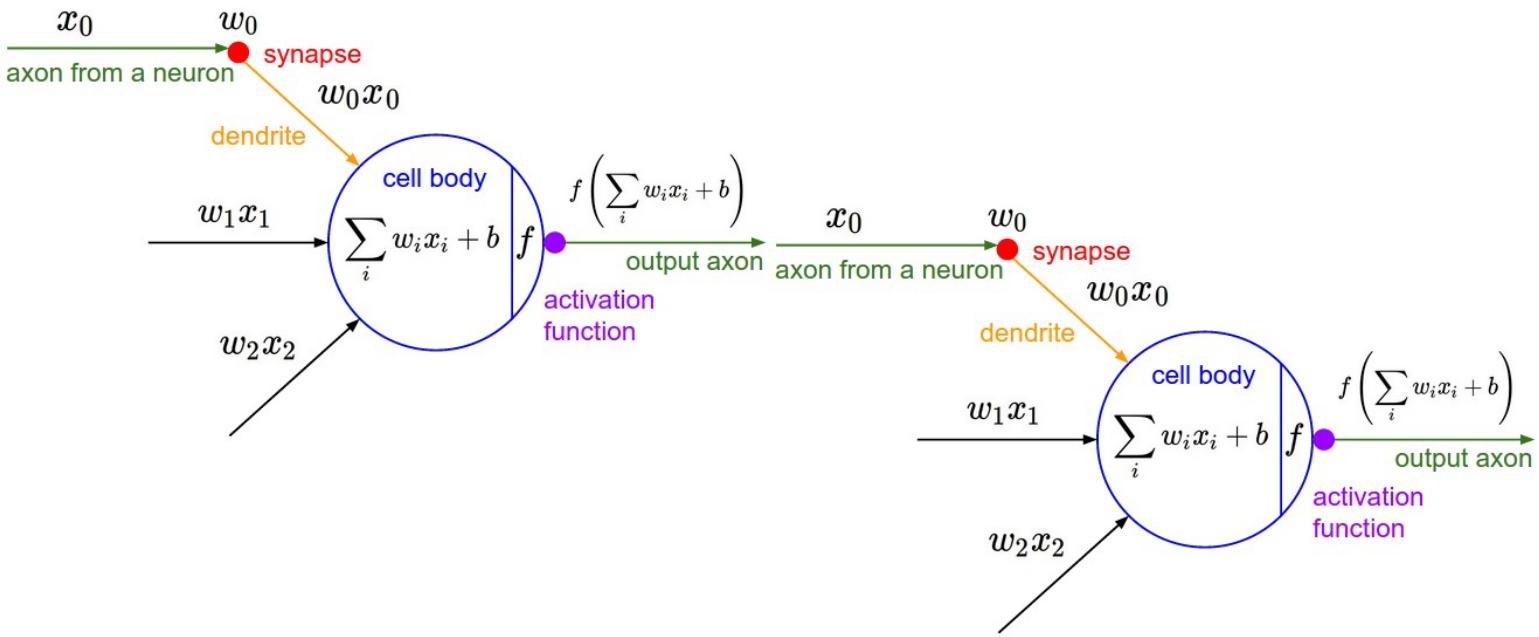
$$out = Wx$$

Neural Networks



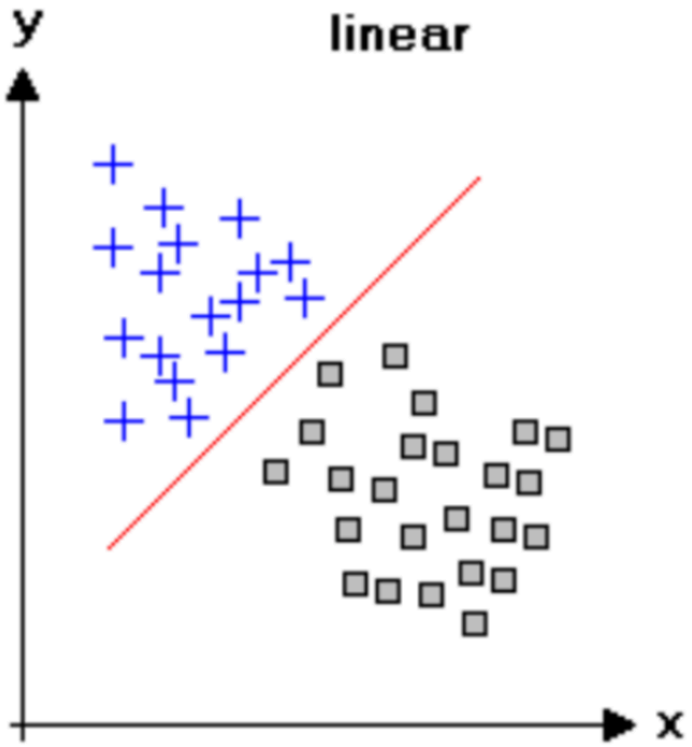
$$out1 = f(W_1x) \qquad out2 = f(W_2out1)$$

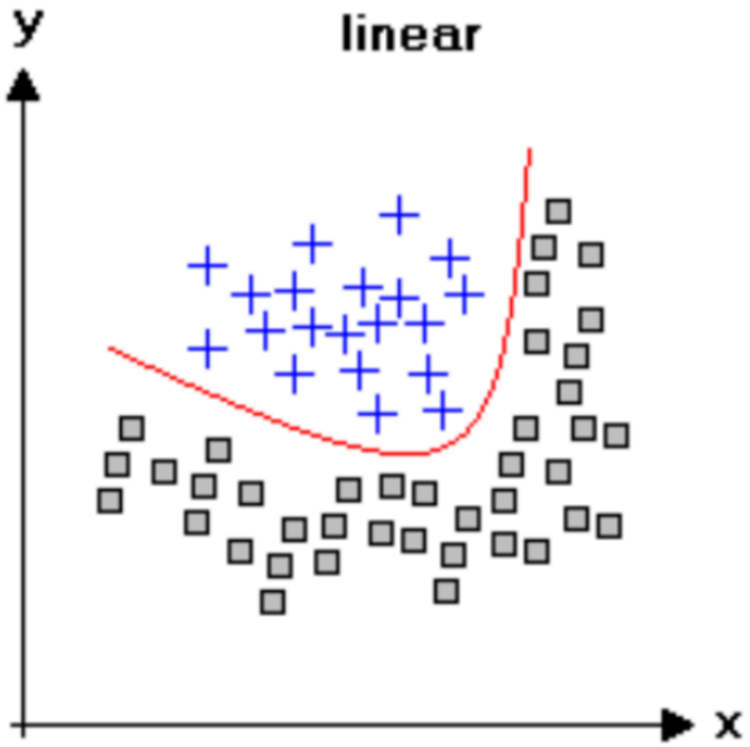
Neural Networks

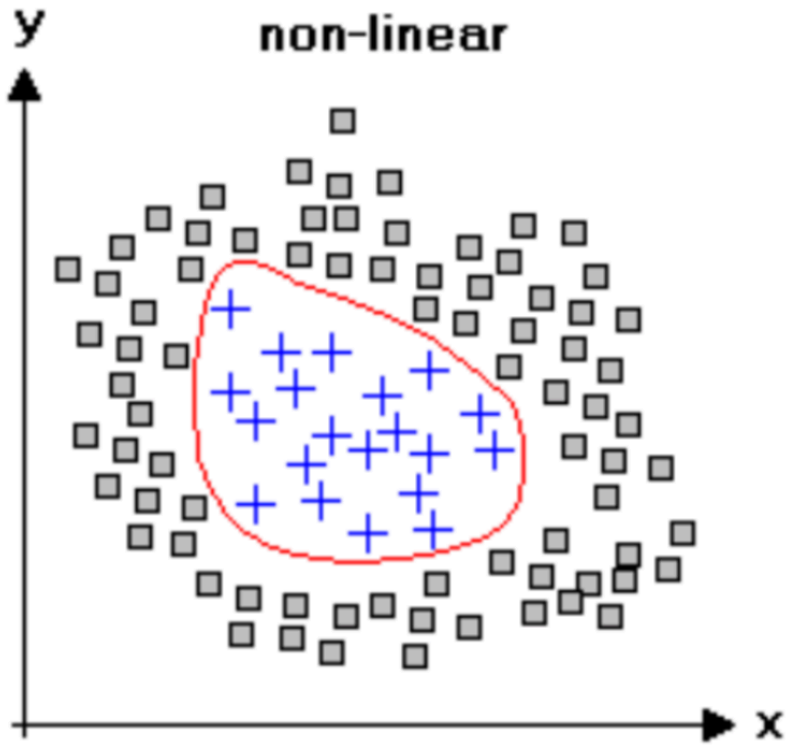


$$out = f(W_2(f(W_1 x)))$$

Neural Networks







Linear Regression