Multi-layer Perceptron과 Neural Network

수업 목표

이번 수업의 핵심:

- Perceptron의 문제점
- Multi-layer Perceptron의 개념
- Multi-layer Perceptron을 이용한 XOR 문제 풀이
- Fully-connected layer와 Neural Network

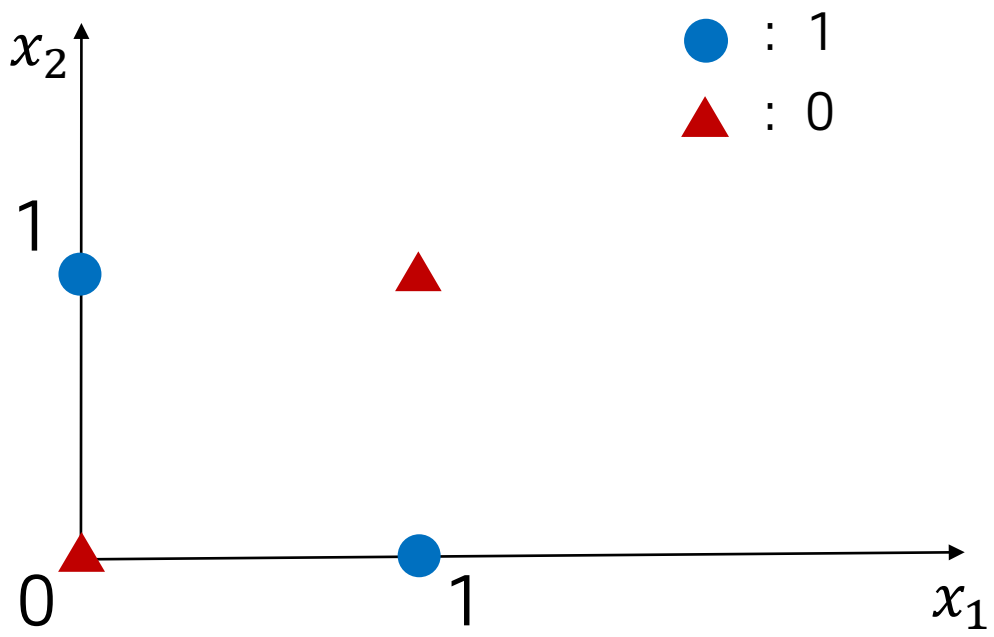
핵심 개념

- XOR 문제, Multi-layer Perceptron
- Fully-connected Layer, Neural Network

Perceptron의 문제점

XOR Gate를 Perceptron으로 풀 수 있는가?

→ **풀 수 없음.** Perceptron은 선형 문제만 해결 가능. XOR Gate는 비선형 문제

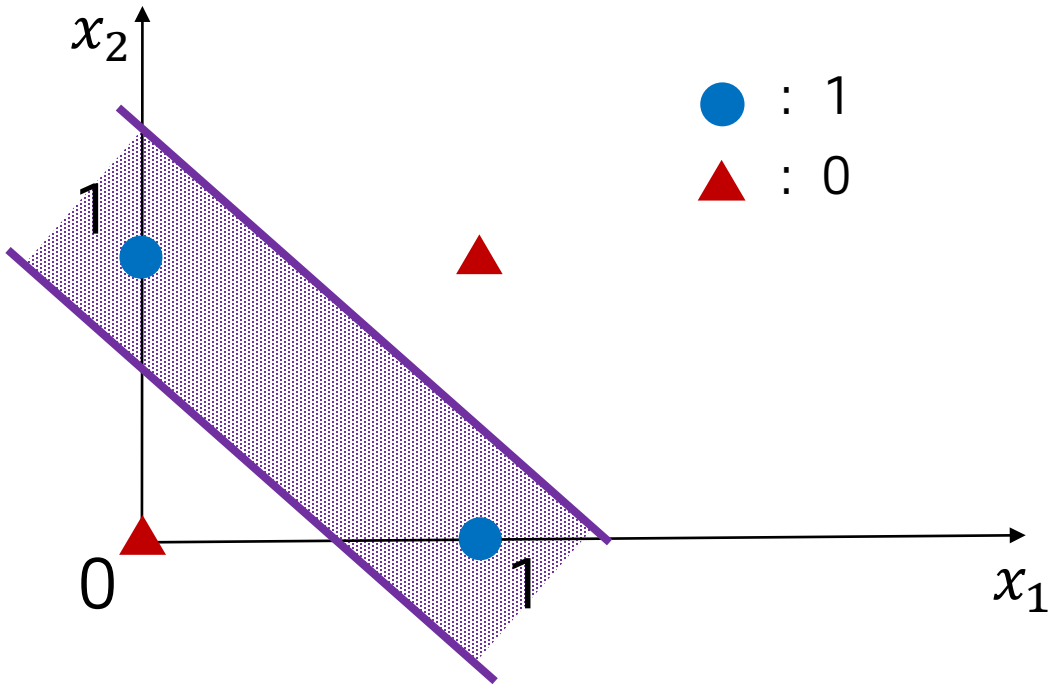


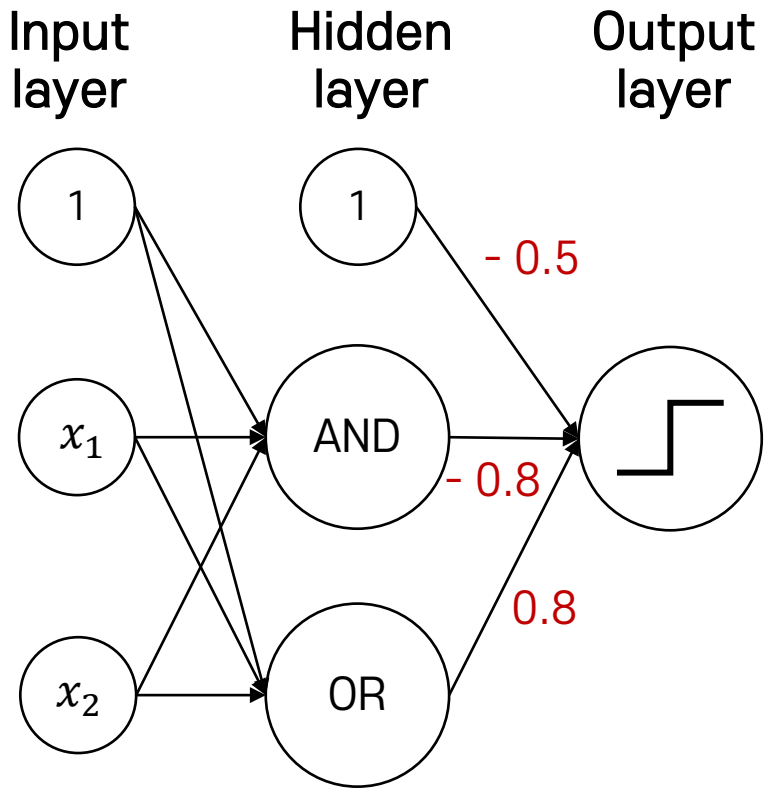
XOR Gate		
x_1	x_2	y
0	0	0
0	1	1
1	0	1
1	1	0

Multi-Layer Perceptron

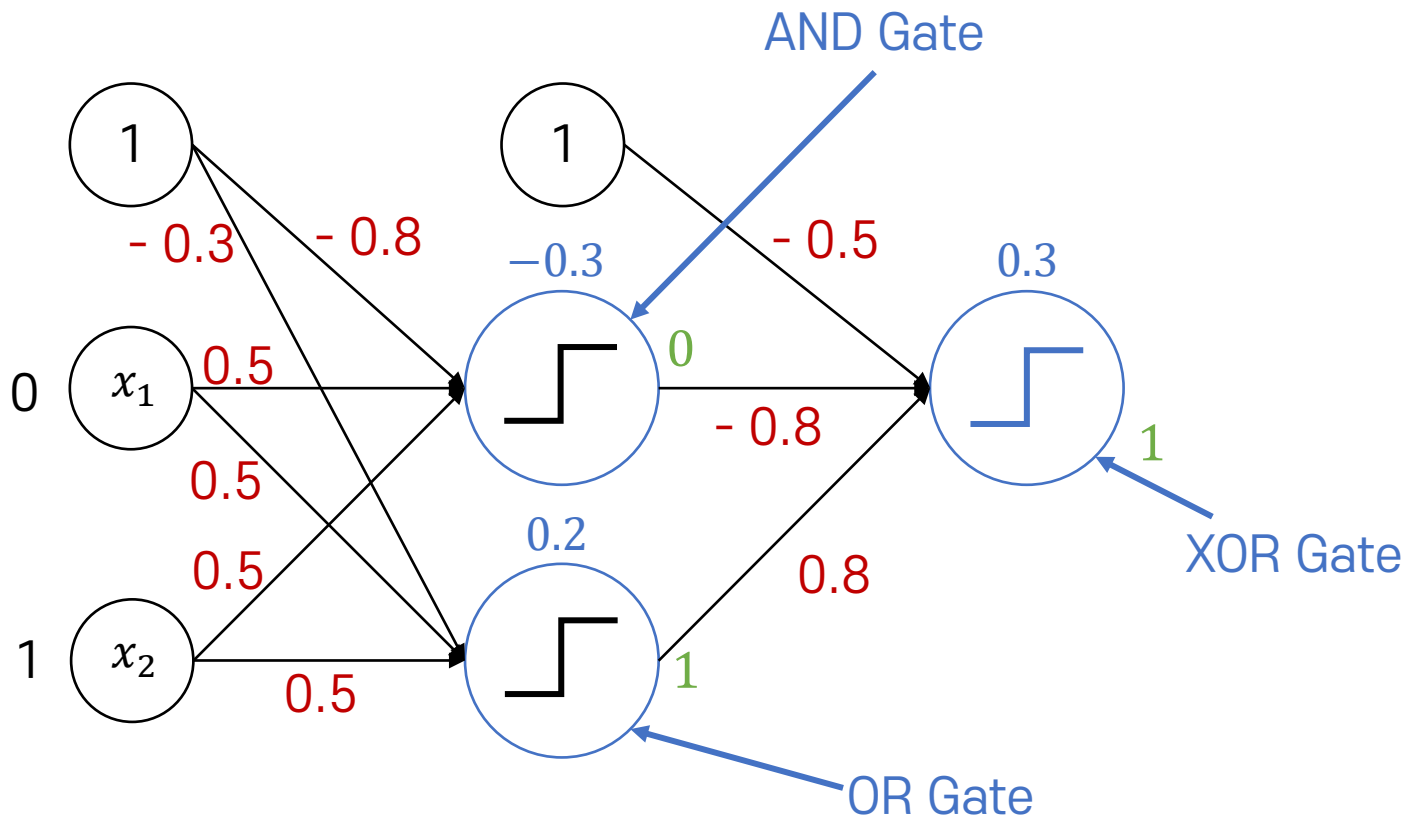
다 층으로 구성된 Perceptron을 활용하면 XOR Gate를 푸는 것이 가능

→ 이러한 구조를 Multi-layer Perceptron (MLP)으로 지칭





Multi-Layer Perceptron



AND Gate

x_1	x_2	y
0	0	0
0	1	0
1	0	0
1	1	1

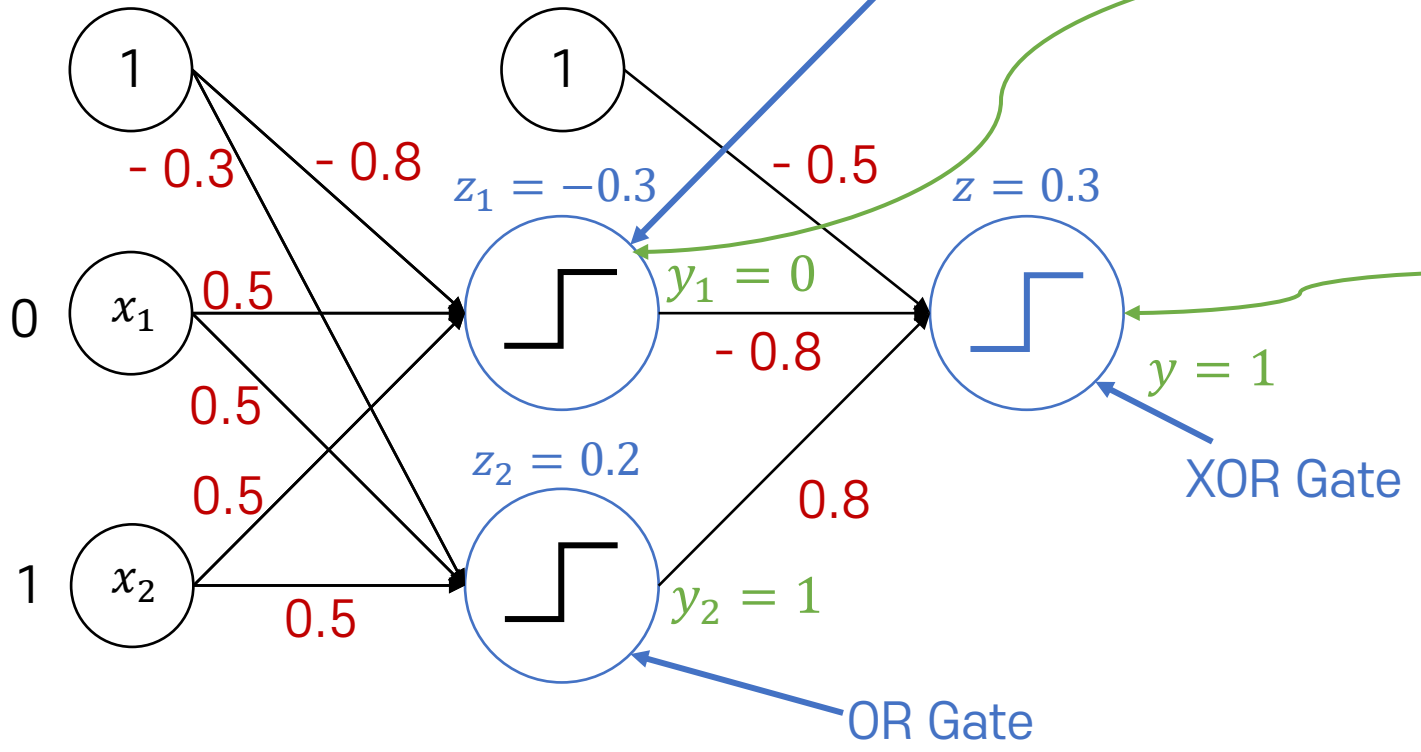
OR Gate

x_1	x_2	y
0	0	0
0	1	1
1	0	1
1	1	1

XOR Gate

x_1	x_2	y
0	0	0
0	1	1
1	0	1
1	1	0

Multi-Layer Perceptron



$$z_1 = -0.8 + 0.5x_1 + 0.5x_2$$
$$z_2 = -0.3 + 0.5x_1 + 0.5x_2$$

Mapping $\Big|$ $y_i = \begin{cases} 1 & z_i \geq 0 \\ 0 & z_i < 0 \end{cases}$

$$z = -0.5 - 0.8y_1 + 0.8y_2$$

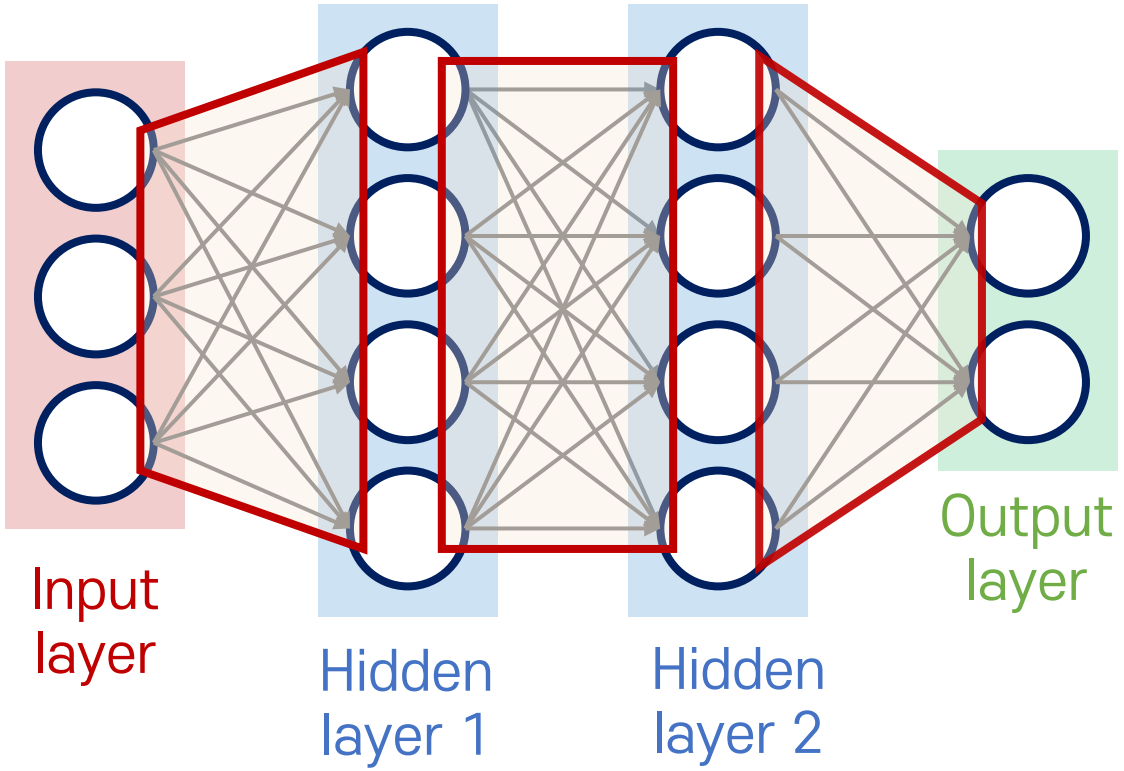
Mapping $\Big|$ $y = \begin{cases} 1 & z \geq 0 \\ 0 & z < 0 \end{cases}$

y

Fully-Connected Layer

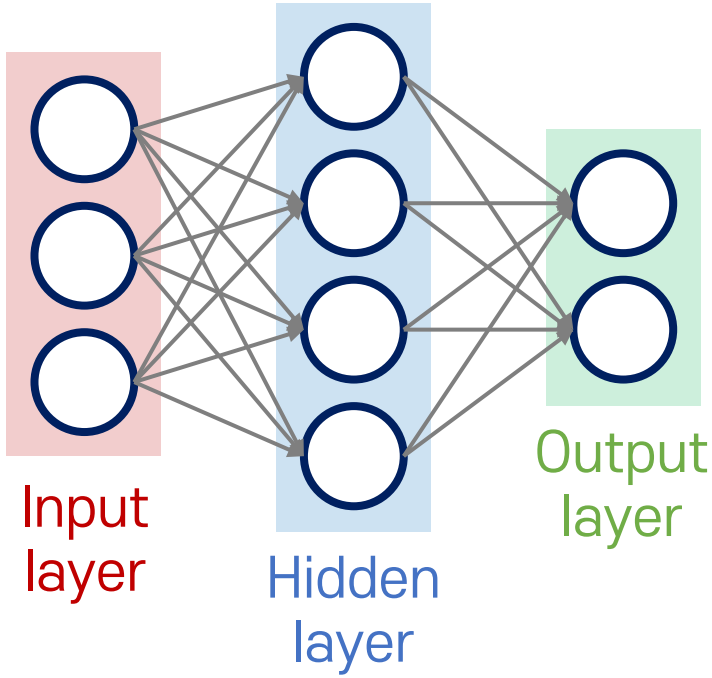
Fully-Connected Layer (완전연결층, FC)

- 두 계층 사이에 모든 입력 노드와 출력 노드가 연결된 층

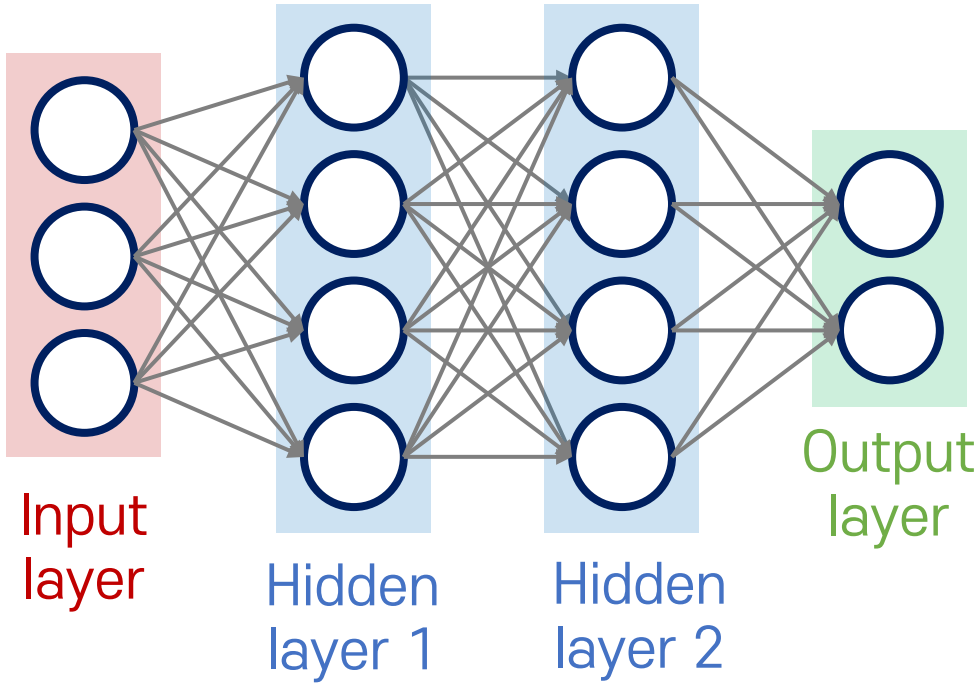


Neural Network

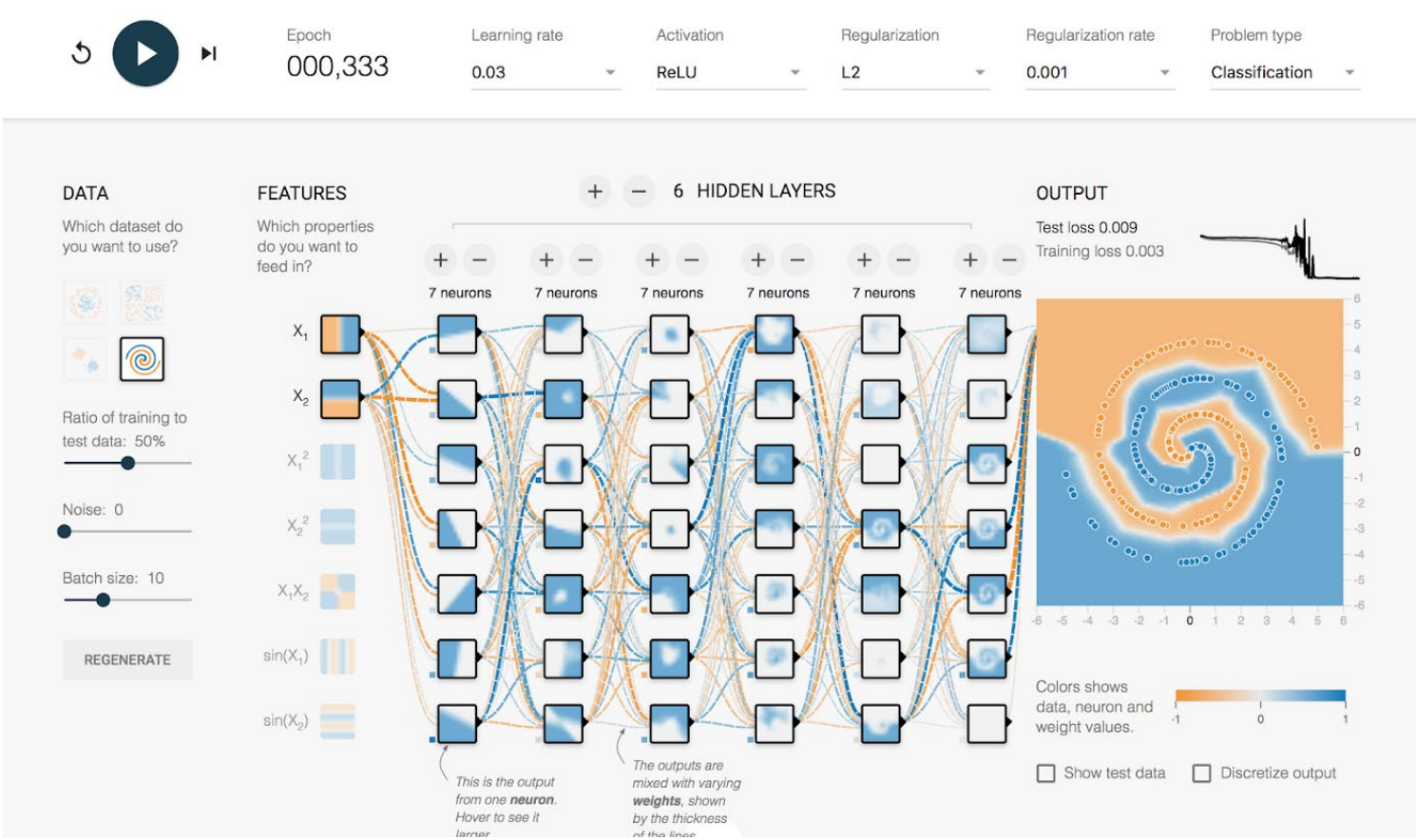
2-layer Neural Network
또는
1-hidden–layer Neural Network



3-layer Neural Network
또는
2–hidden–layer Neural Network



Neural Network



A Neural Network Playground

- Neural Network의 층수와 Node 개수를 조절하면서 결과가 어떻게 바뀌는지 확인

http://playground.tensorflow.org/

요약

- XOR 문제를 통한 Perceptron의 문제점
- Multi-layer Perceptron의 개념
- Multi-layer Perceptron을 이용한 XOR 문제 풀이
- Fully-connected layer와 Neural Network 개념