Lecture 1

Simple Machine Learning & Neural Network

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Coarse Introduction

Basic	Intermediate
신경망 관련 기본 내용 - 신경망의 구성 / 기본 용어 - 신경망의 작동 원리 - 활성화 함수 (activation function) - 최적화 함수 (optimizers) 기본 딥러닝 알고리즘 - Feedforward Neural Network (FNN) - Convolution Neural Network (CNN) - Recurrent Neural Network (RNN)	생성모델 - Autoencoder (AE) - Variational Autoencoder (VAE) - Generative Adversarial Network (GAN) CNN 심화 - 주요 CNN 아키텍쳐 - 사전학습 모형 사용하기 (Transfer Learning) RNN 심화 - LSTM, GRU, seq2seq Attention & Transformer

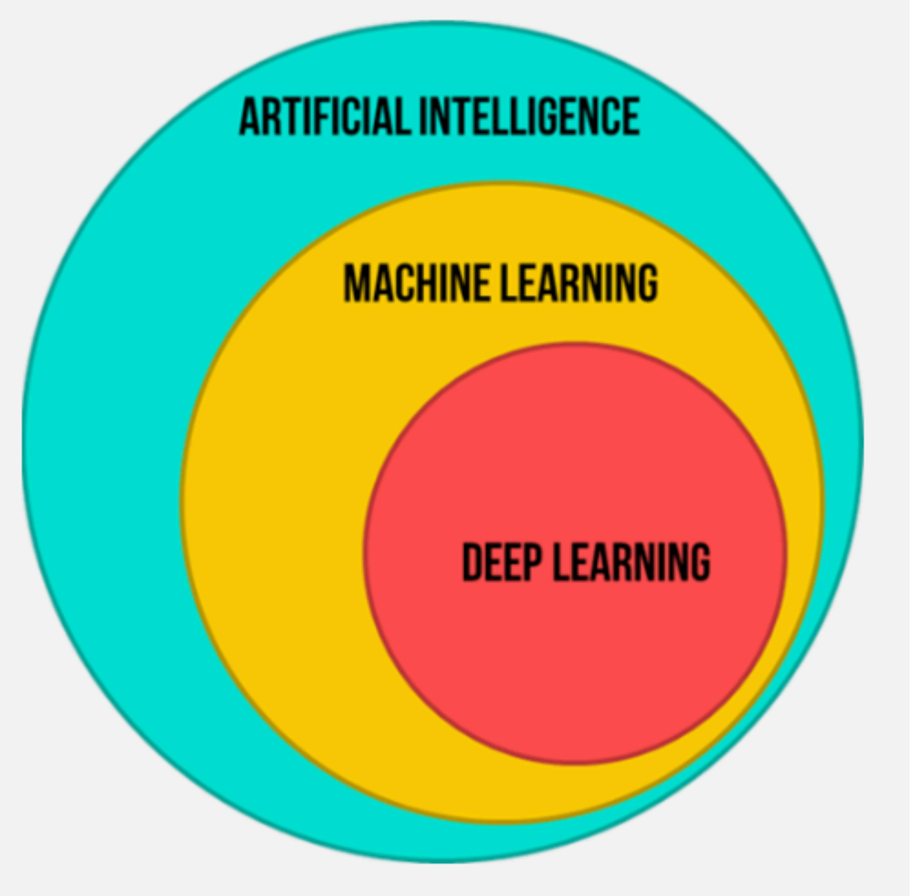
Prerequisites
- Linear Algebra
- Basic python

Contents

딥러닝의 기본 내용

- 신경망의 구성 / 기본 용어
- 기본 신경망 (ANN or FNN, a.k.a., MPL)의 작동원리
- 활성화 함수 (Activation function)
- 신경망에서의 경사하강법
  - Backward propagation of errors
  - Vanishing Gradient
  - Various Optimizers
  - Weight Initialization
- 신경망에서의 과적합문제

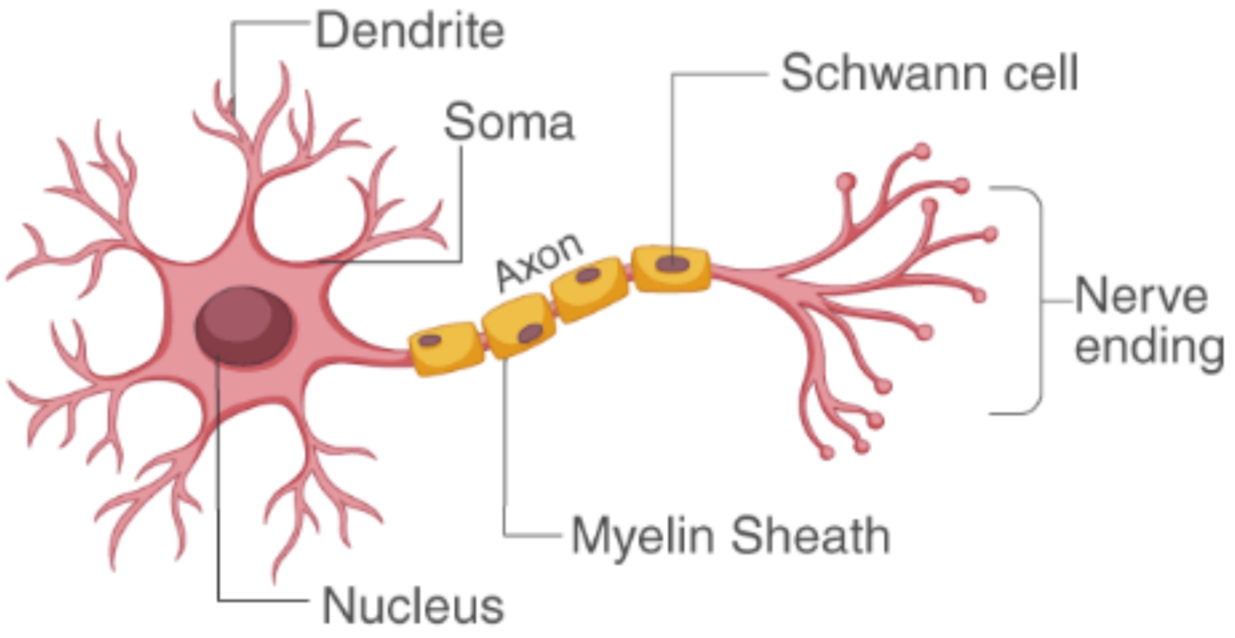
  Regularization, Dropout, Early Stopping, Batch Normalization



파이썬 코딩

- Pytorch tutorial
- 선형회귀문제

Deep Learning

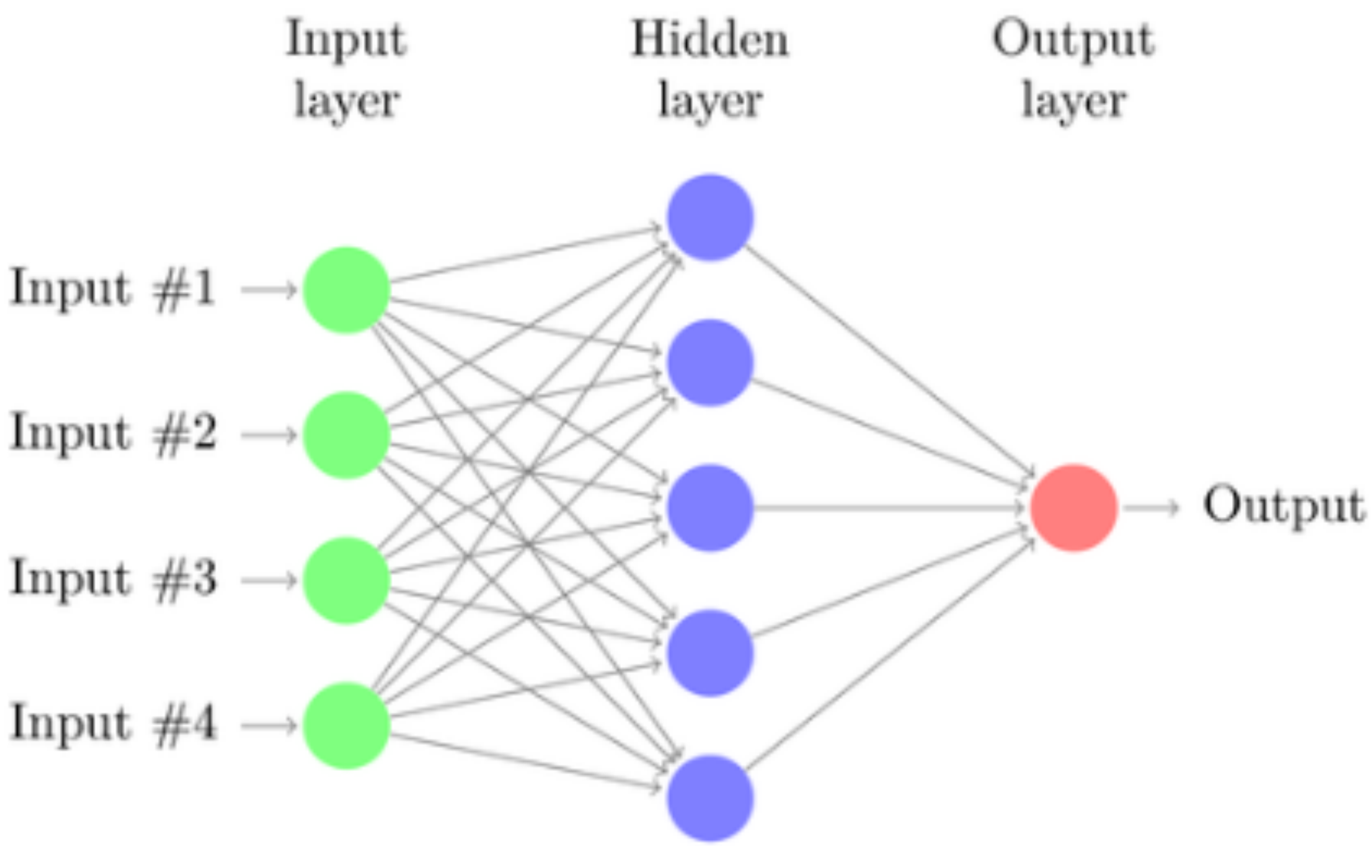


3 basic layers

Input layer : put feature information and transfer it to the hidden layer

Hidden layer : extract important feature

Output layer : prediction

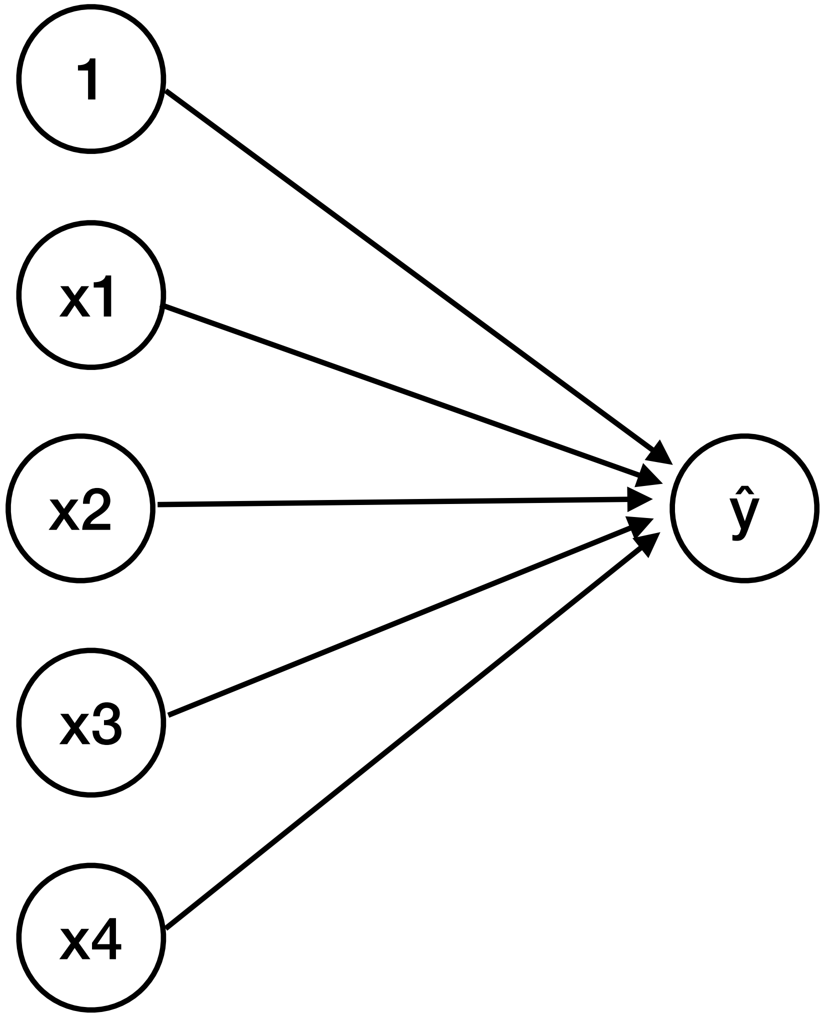


# of hidden layer ≧ 1

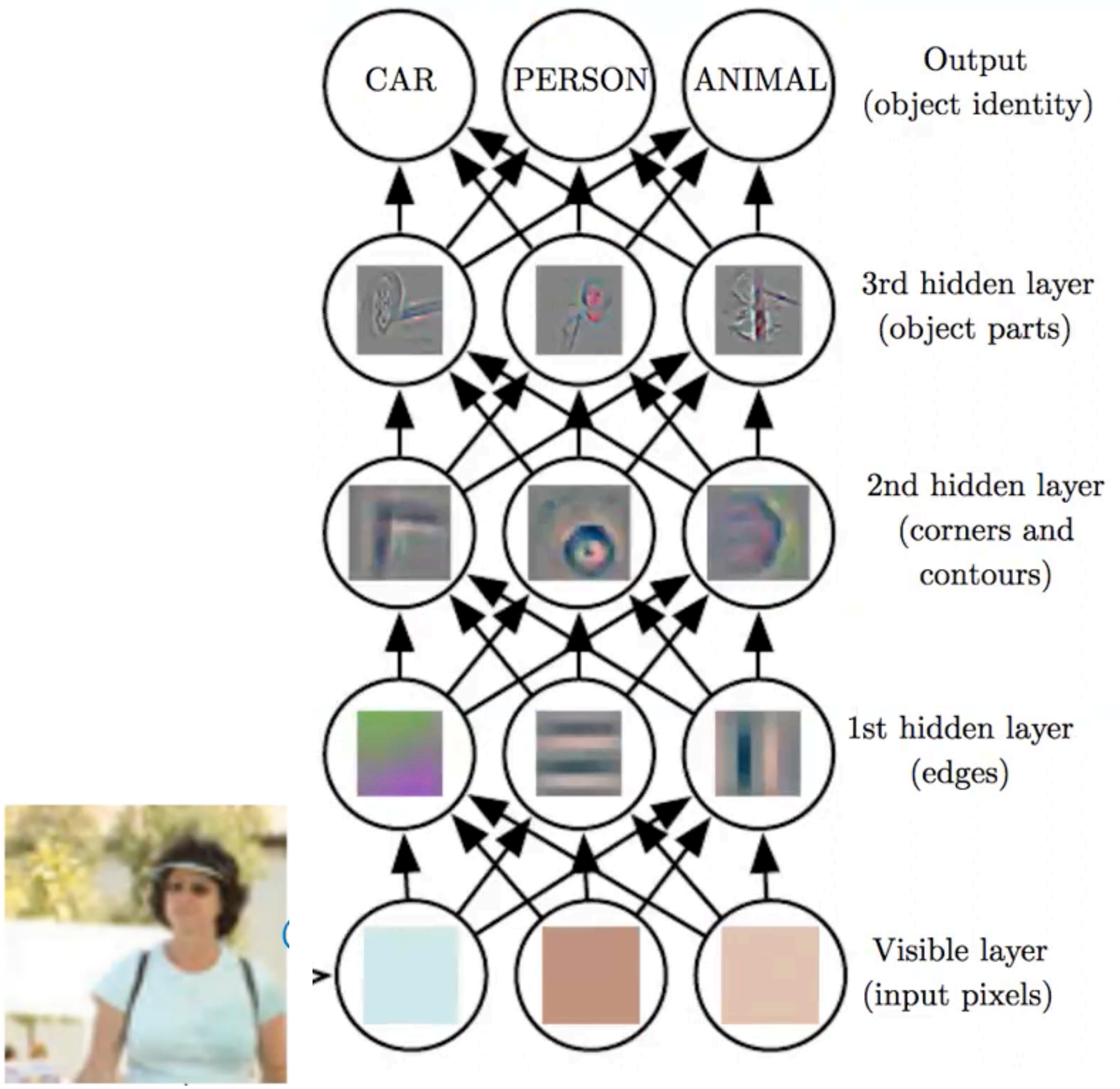
Machine Learning vs Deep Learning

Multivariable Linear regression

$$\hat{y} = w_0 + w_1x_1 + w_2x_2 + w_3x_3 + w_4x_4$$

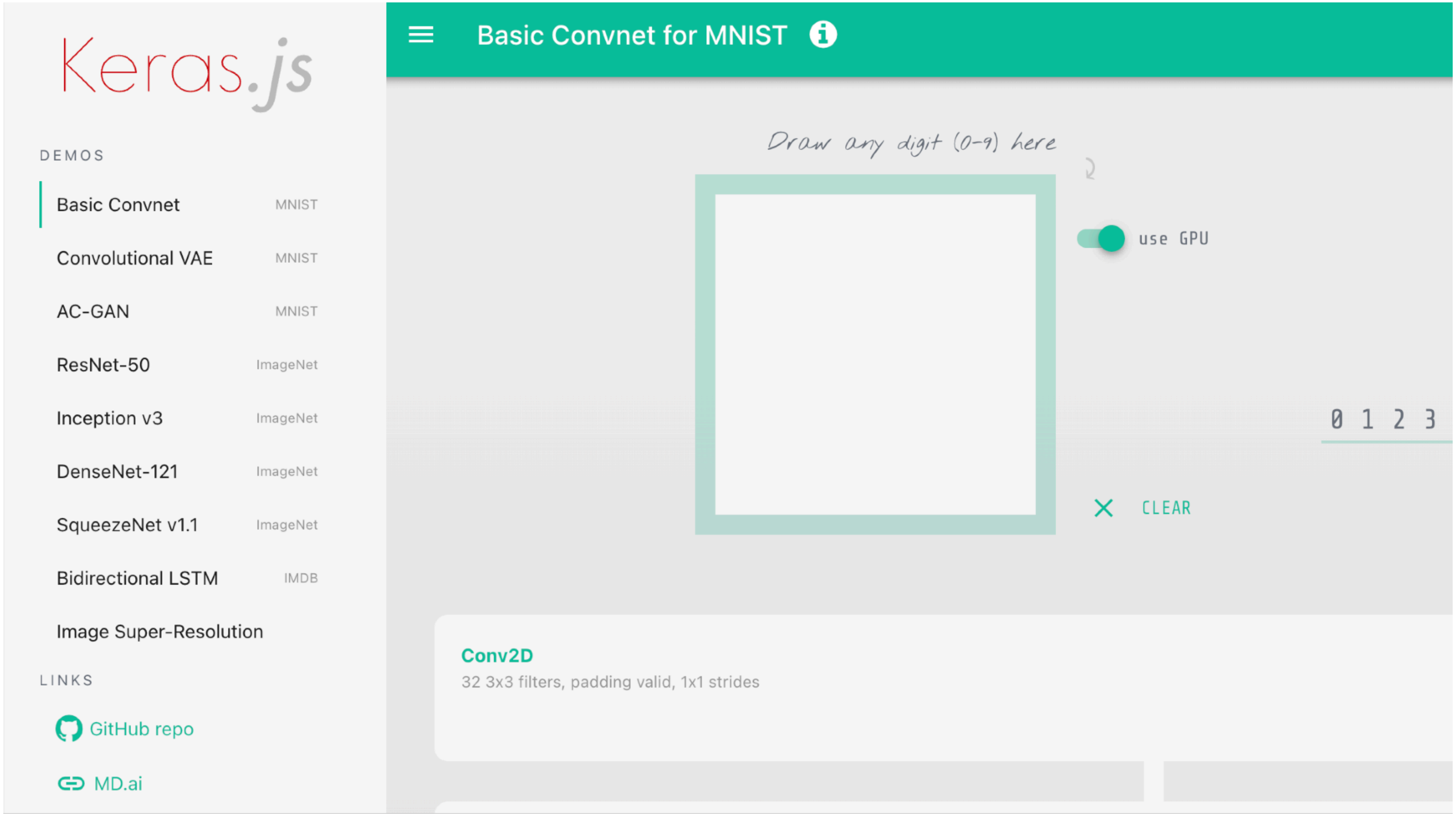


Convolution Neural Network



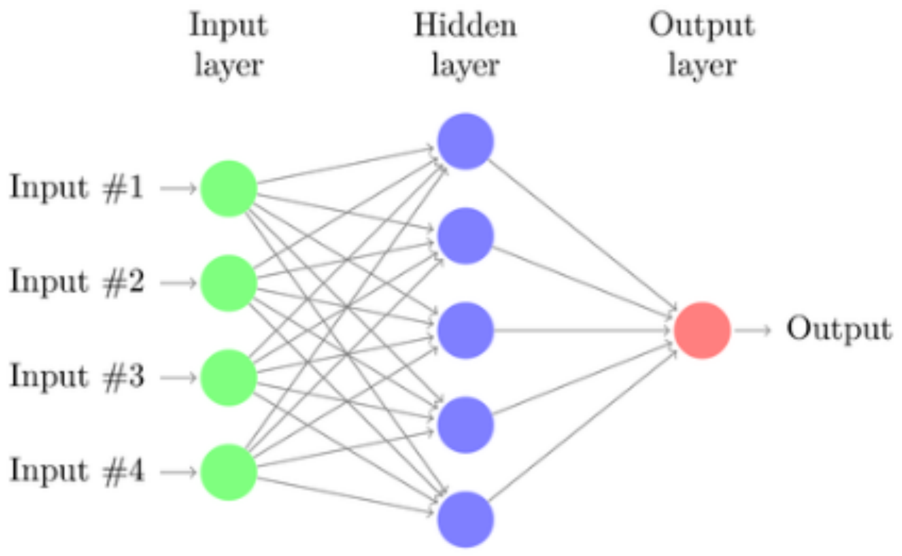
Example of DNN

simle CNN: https://transcranial.github.io/keras-js/#/mnist-cnn
Neural Network: http://playground.tensorflow.org/



Regression vs Classification

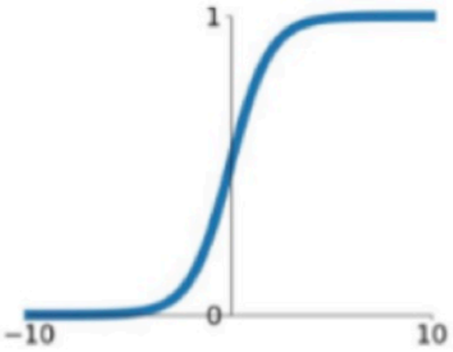
How many the number of output nodes?



Activation Function

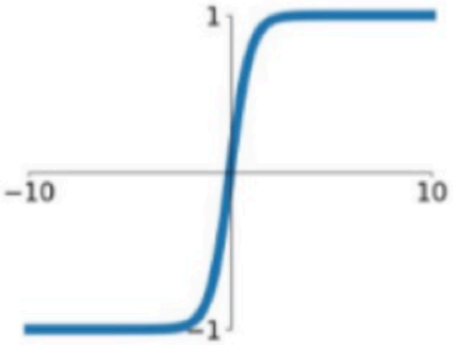
Sigmoid

$\sigma(x) = \frac{1}{1+e^{-x}}$



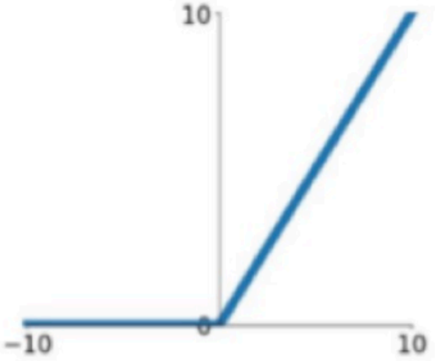
tanh

$\tanh(x)$



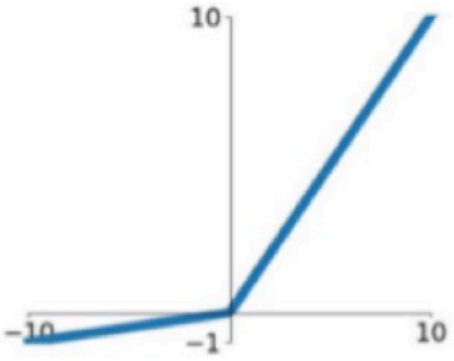
ReLU

$\max(0, x)$



Leaky ReLU

$\max(0.1x, x)$

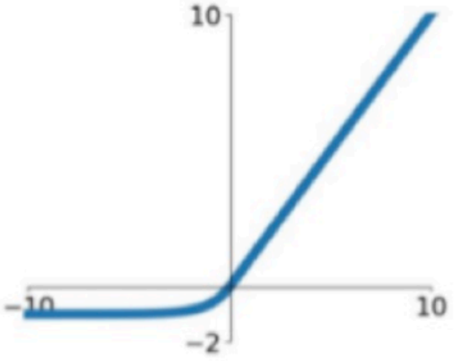


Maxout

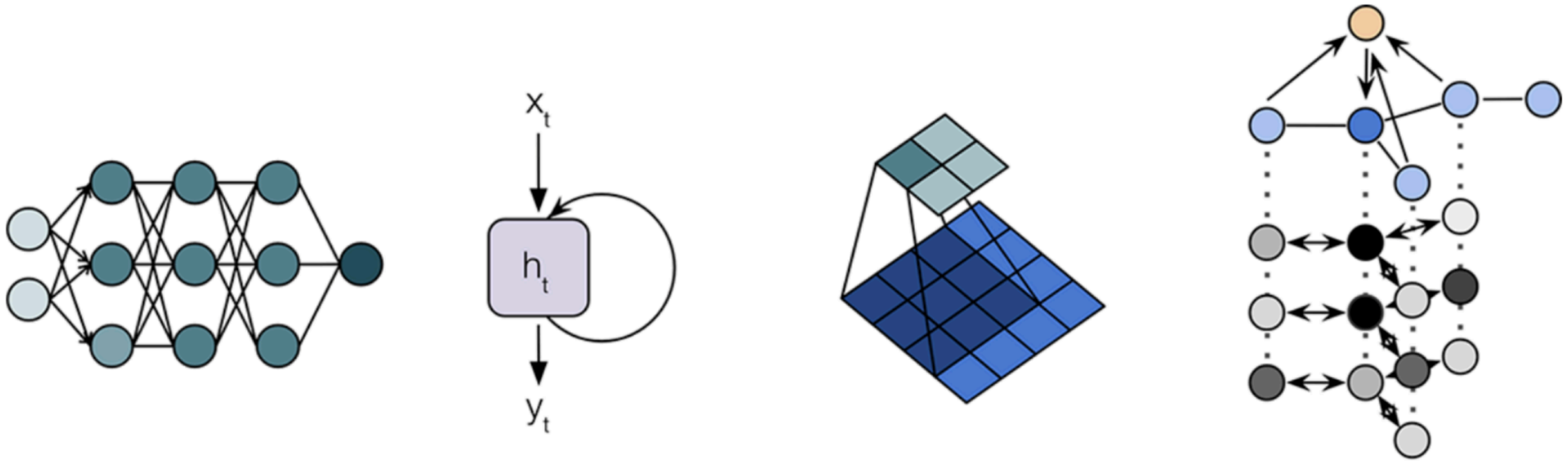
$\max(w_1^T x + b_1, w_2^T x + b_2)$

ELU

$$\begin{cases} x & x \geq 0 \\ \alpha(e^x - 1) & x < 0 \end{cases}$$



Type of Neural Network



A. feed-forward neural network (NN)

B. recurrent neural network (RNN)

C. convolutional neural network (CNN)

D. graph neural network (GNN)