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# Hands on Tips on
# Machine Learning App Development

AI, Machine Learning, Deep Learning
What is CBR (Case-Based Reasoning)
Machine Learning vs Classical Programming
Machine Learning & Deep Learning Core Concepts
Why Deep Learning is Popular
Tensorflow.js – JavaScript Machine Learning Platform
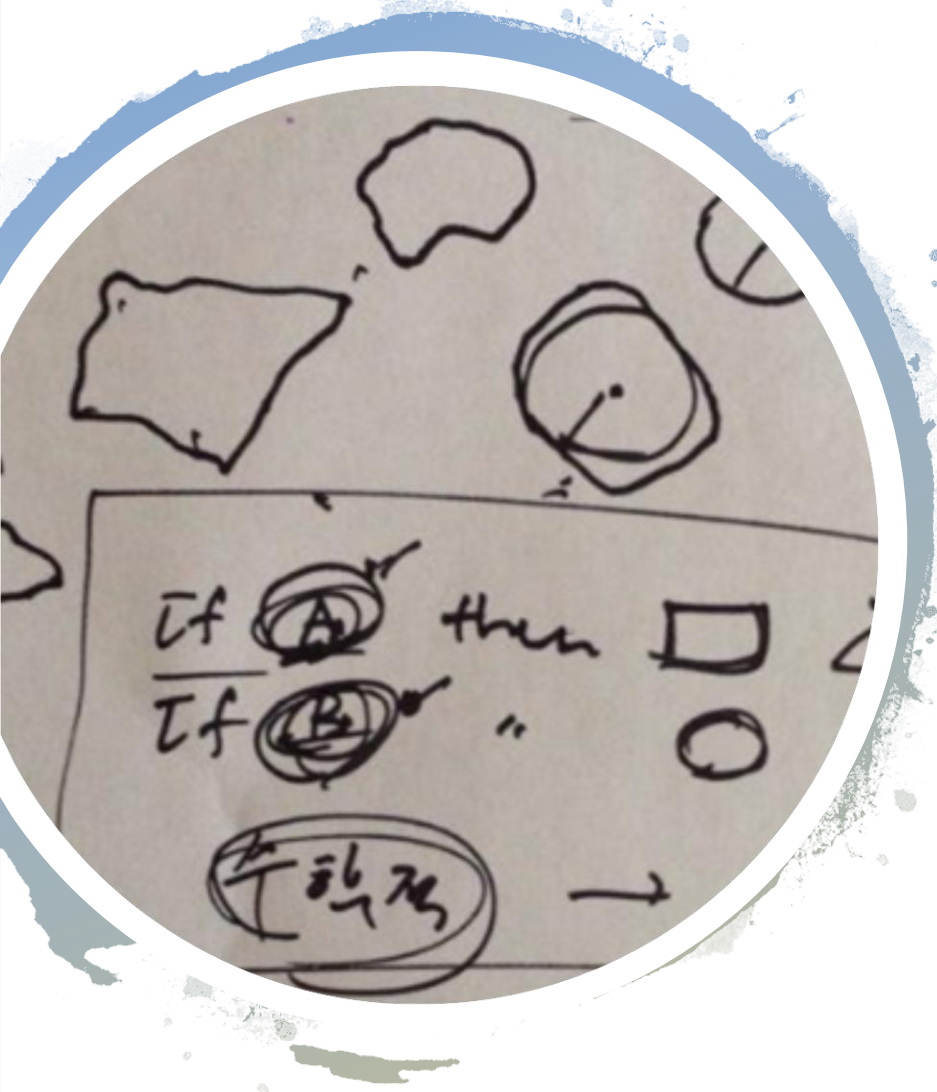Best Choice between Deep Learning, CBR, and Rules
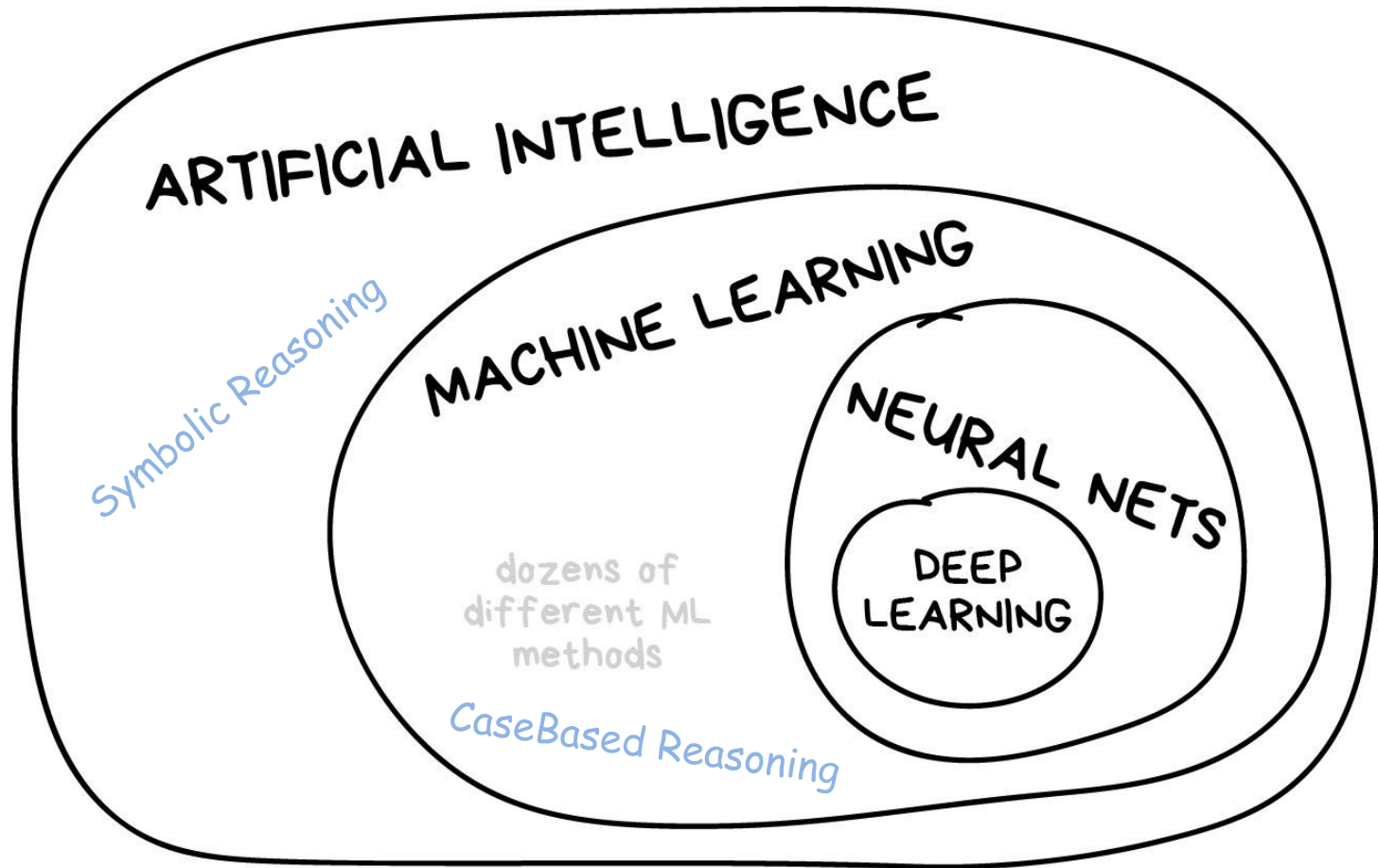Quiz
Demo

# AI ?

- What is Intelligent or Smart?
  - Classify, Discern, Discriminate
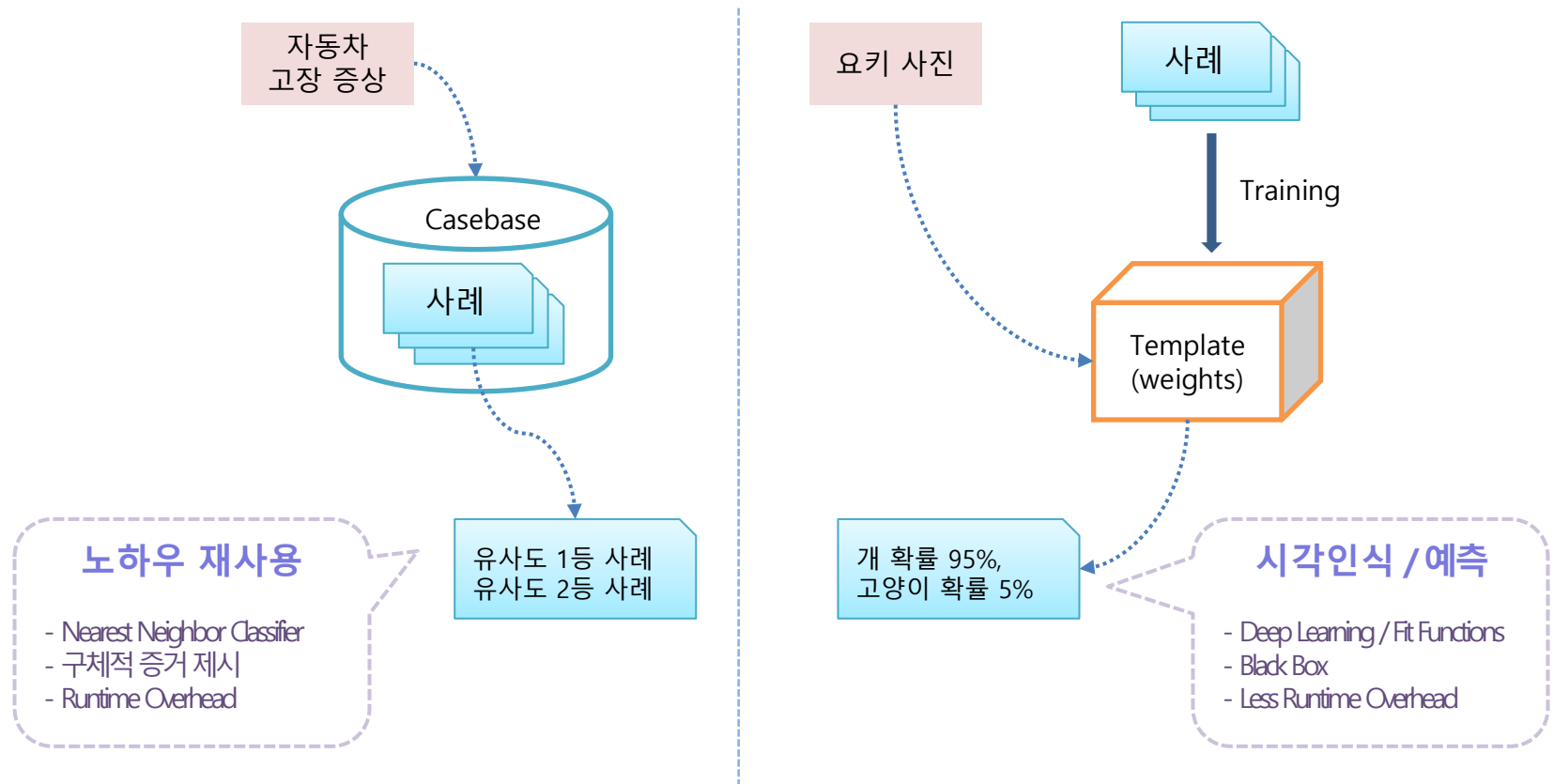  - Dog or Cat
  - Circle, Triangle, Rectangle

  NOT EASY !

- Learn – Get Smarter
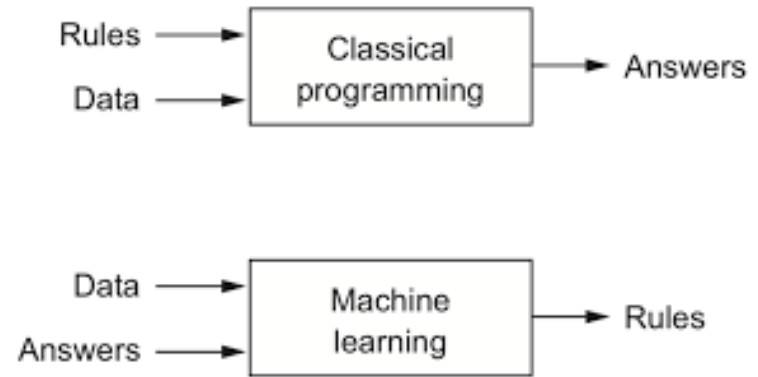
- What is Artificial?

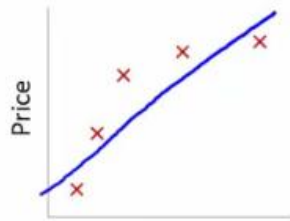# AI, ML, DL

# What is CBR (Case-Based Reasoning)

자동차
고장 증상

Casebase

사례

유사도 1등 사례
유사도 2등 사례

**노하우 재사용**

- Nearest Neighbor Classifier
- 구체적 증거 제시
- Runtime Overhead

요키 사진

사례

Training

Template
(weights)

개 확률 95%,
고양이 확률 5%

**시각인식 / 예측**

- Deep Learning / Fit Functions
- Black Box
- Less Runtime Overhead

Machine Learning

Data & Answers => Image & Tag

Rules => Parameter / Weight Matrix

# Machine Learning
## vs
## Classical Programming

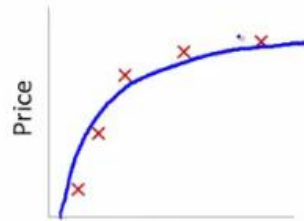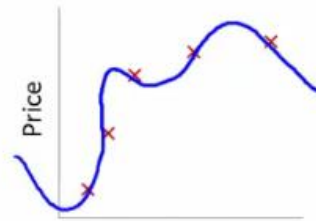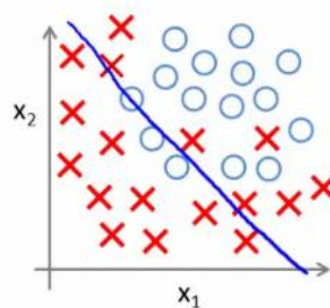# Machine Learning Core Concepts 1



| High bias (underfit) | "Just right" | High variance (overfit) |

$\theta_0 + \theta_1 x$    $\theta_0 + \theta_1 x + \theta_2 x^2$    $\theta_0 + \theta_1 x + \theta_2 x^2 + \theta_3 x^3 + \theta_4 x^4$
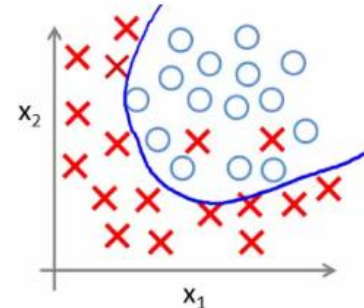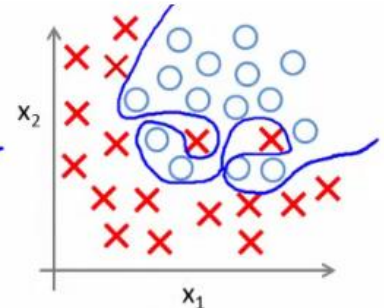
$h_\theta(x) = g(\theta_0 + \theta_1 x_1 + \theta_2 x_2)$

( $g$ = sigmoid function)

**UNDERFITTING**
(high bias)

$g(\theta_0 + \theta_1 x_1 + \theta_2 x_2 + \theta_3 x_1^2 + \theta_4 x_2^2 + \theta_5 x_1 x_2)$
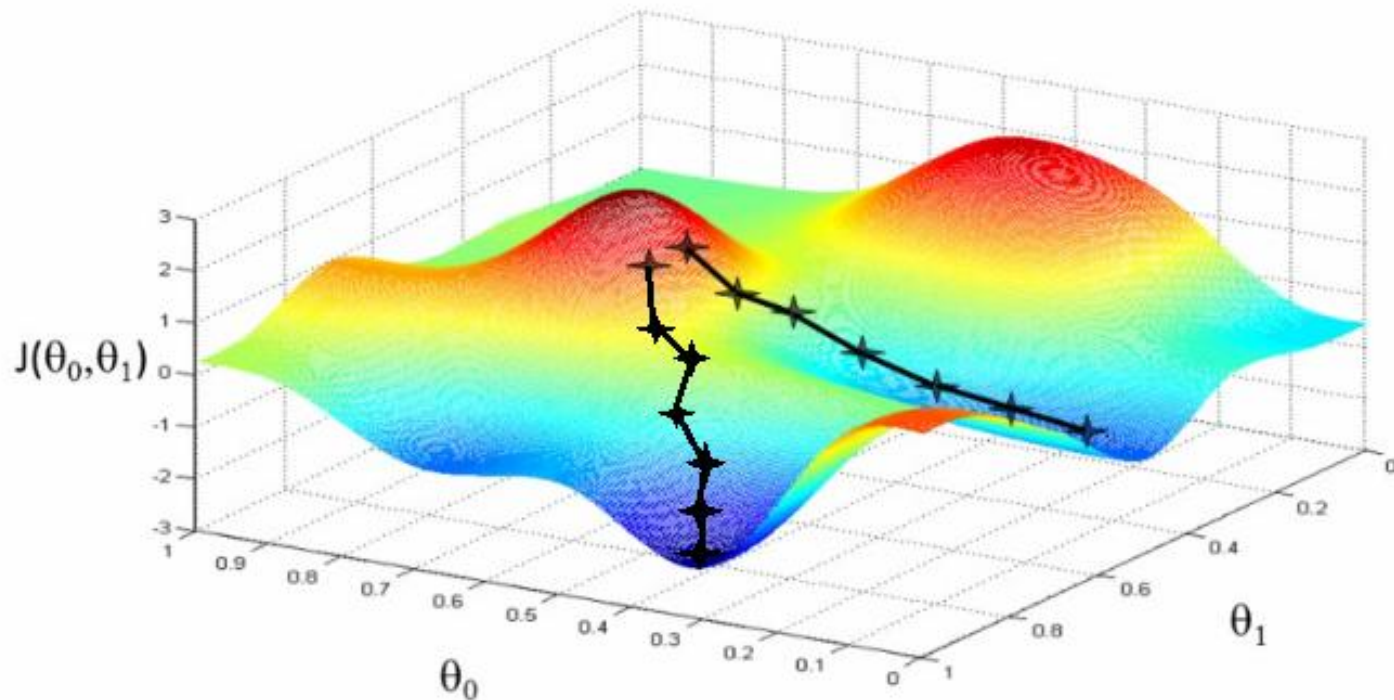
$g(\theta_0 + \theta_1 x_1 + \theta_2 x_1^2 + \theta_3 x_1^2 x_2 + \theta_4 x_1^2 x_2^2 + \theta_5 x_1^2 x_2^3 + \theta_6 x_1^3 x_2 + \ldots$

**OVERFITTING**
(high variance)

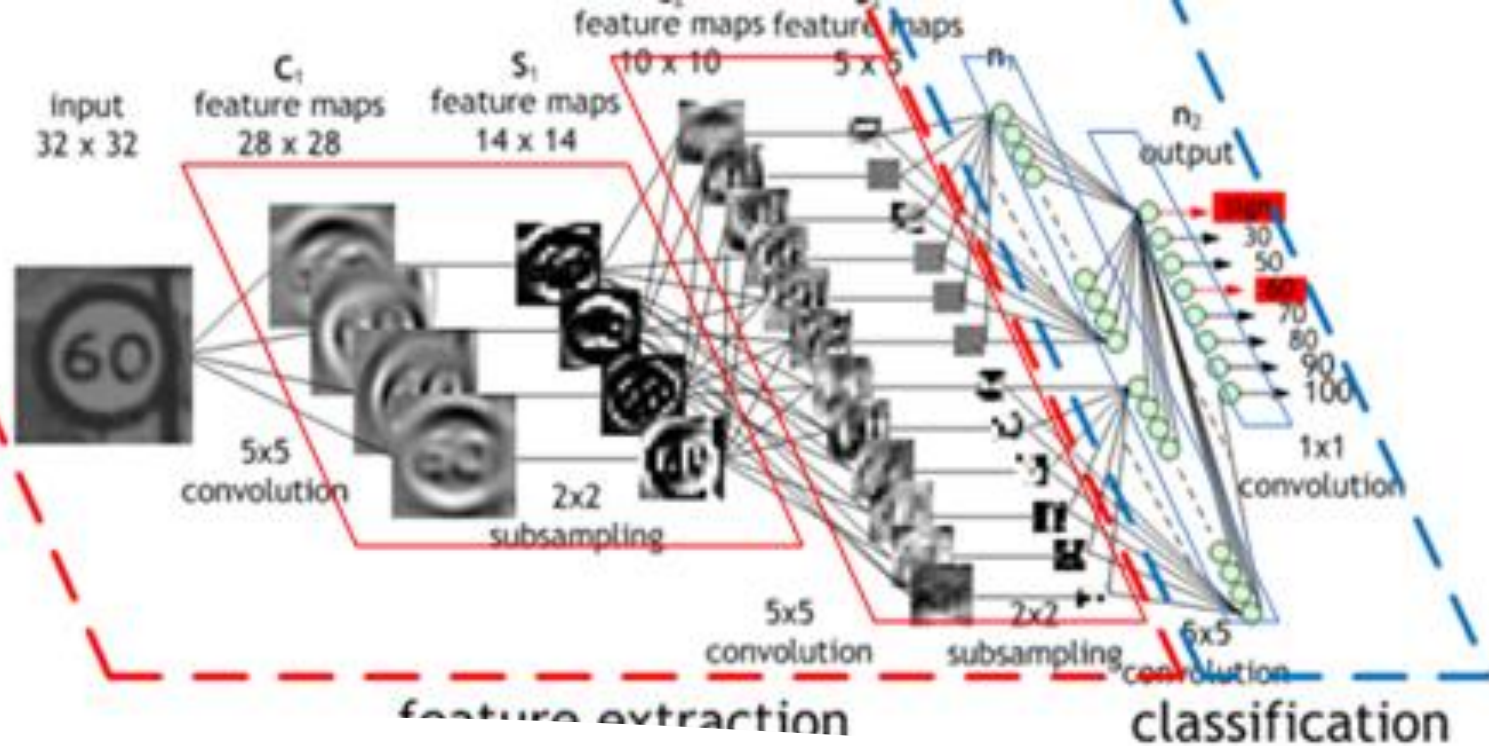(Source: Coursera, Andrew Ng)

# Machine Learning Core Concepts 2

○ Where you start can determine which minimum you end up



○ Here we can see one initialization point led to one local minimum
○ The other led to a different one

(Source: Coursera, Andrew Ng)

# Deep Learning Core Concept



(Source: Fast.ai, Jeremi Howard)

## Why Deep Learning is Popular

- New fancy word of Neural Net
  - Fast = cheap graphic card
  - Data = huge tagged data
  - Easy = CNN (auto feature extraction)

- Vision
  - 97% accuracy better than human expert 95%
  - http://cs231n.stanford.edu/

# Tensorflow.js – JavaScript Machine Learning Platform

- Why Tensorflow.js
  - ✓ Easy – chromium browser debugger
  - ✓ Fast - webGL, wasm backend
  - ✓ Secure – embedded model in app

- JavaScript
  - ✓ Full stack developer language (web, server, ai)
  - ✓ Simple, functional, modular
  - ✓ The good parts - Douglas Crockford

- Best courses
  - ✓ Andrew Ng, https://www.coursera.org/learn/machine-learning
  - ✓ Jeremi Howard, https://course.fast.ai/
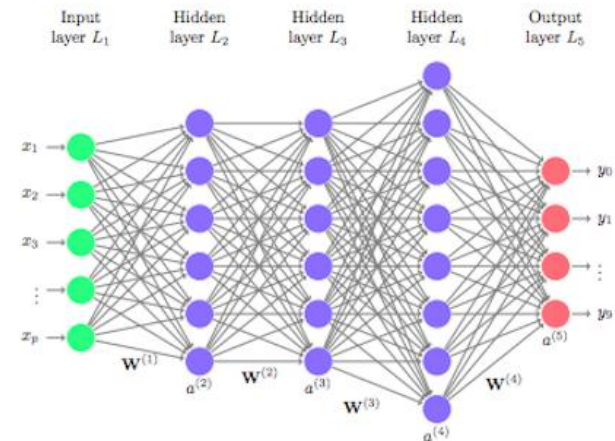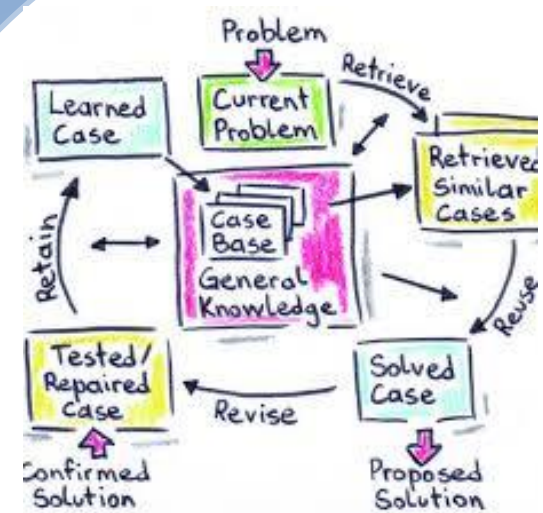  - ✓ Stanford CNN Course, http://cs231n.stanford.edu/

# DL or CBR or Rules?



*if Expert & Know-How available*

  *if Simple & Stable & Exact match*
    Classical Coding (Rules)

  *else Diverse & Changing & Similar match*
    CBR

*else*
  Deep Learning

# Quiz

1. Personalized Vitamin Recommendation

2. Amazon Recommendation

3. My Apartment Finder

4. Health Improvement Prediction

5. Cancer Detection & Treatment

6. Metabolic Syndrome Detection