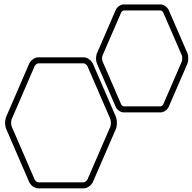

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haesung.github.io

Hands on Tips for Deep Learning & Case-Based Reasoning Solution Development

AI, Machine Learning, Deep Learning
Machine Learning vs Classical Programming
Why Deep Learning is Popular
Deep Learning Core Concepts
Tensorflow.js
What is CBR (Case-Based Reasoning)
Knowledge vs Data
CBR 4R Process
Car Repair Example
CBR Agent Service
Best Applications
Quiz

Demo / Q&A

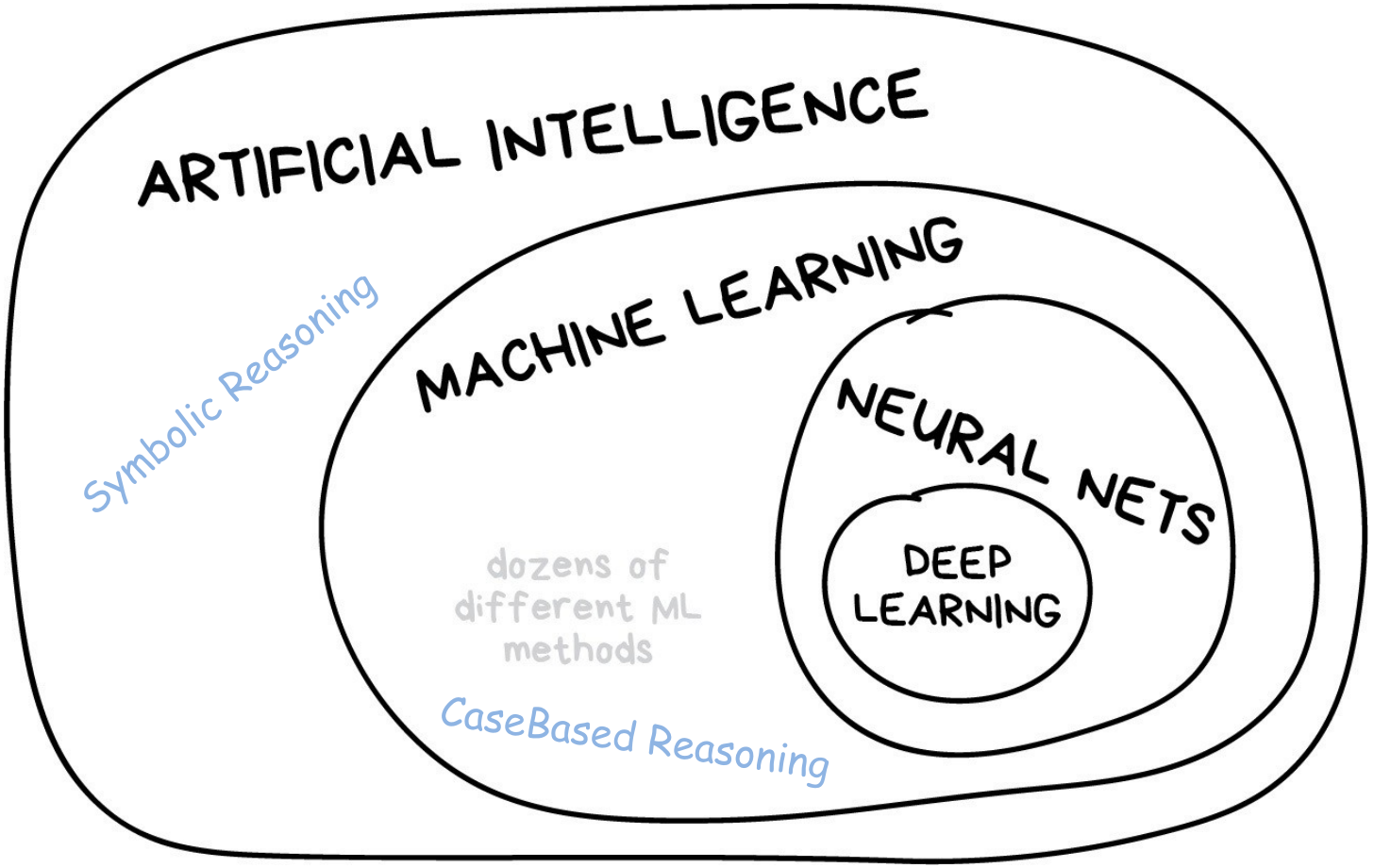
AI ?

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

  NOT EASY !

- Learn & Smarter

AI, ML, DL

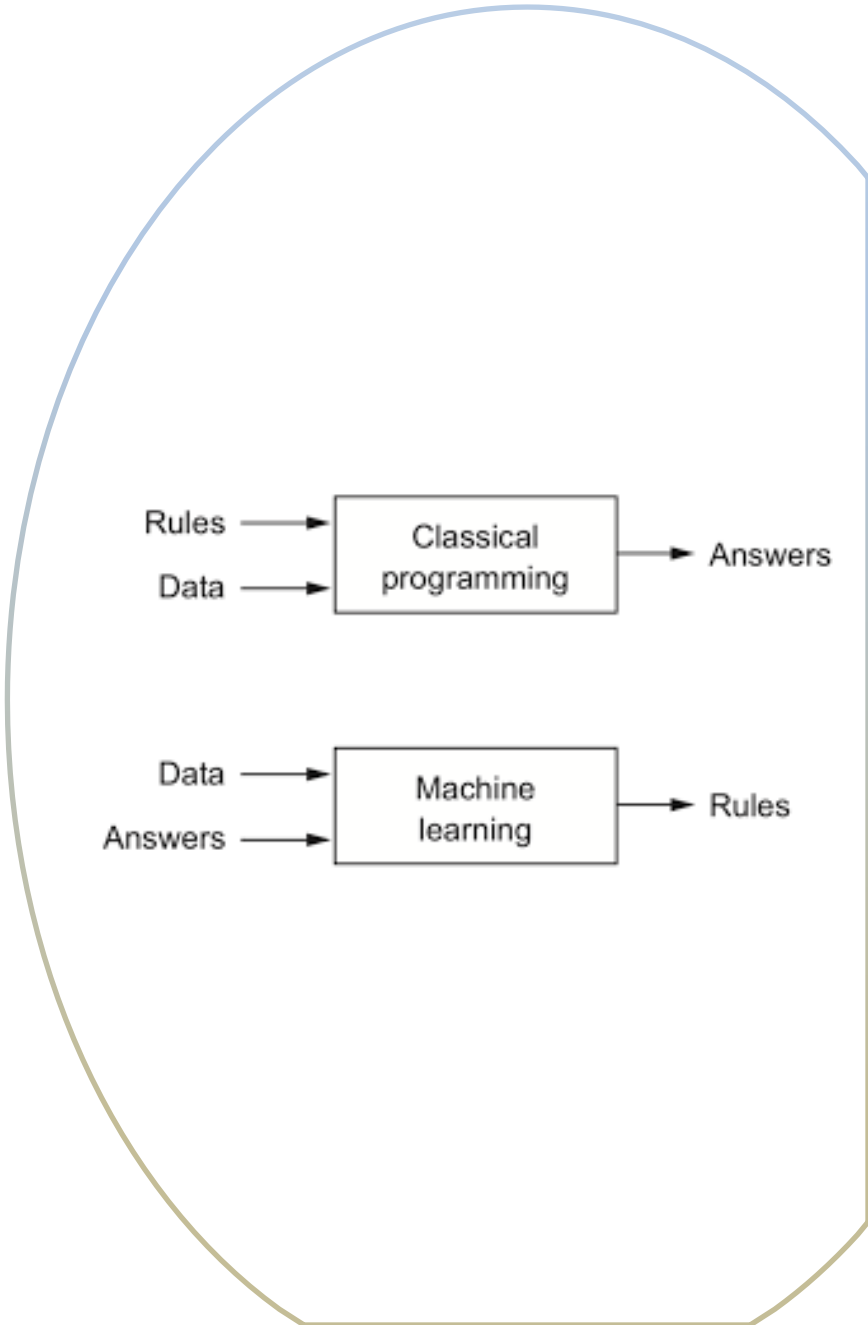

ARTIFICIAL INTELLIGENCE
Symbolic Reasoning
MACHINE LEARNING
dozens of different ML methods
CaseBased Reasoning
NEURAL NETS
DEEP LEARNING

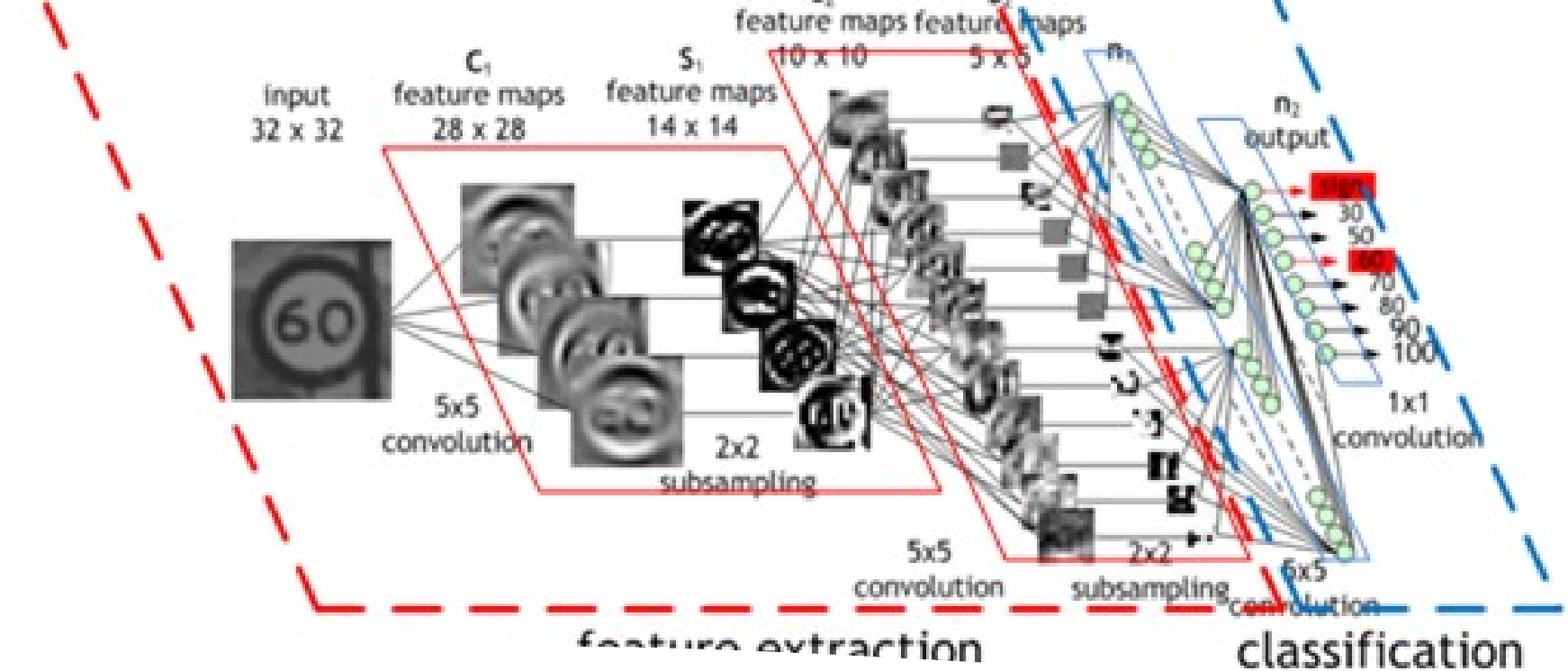
Training & Prediction

Data & Answers => Image & Tag

Rules => Parameter / Weight Matrix

Machine Learning vs Classical Programming

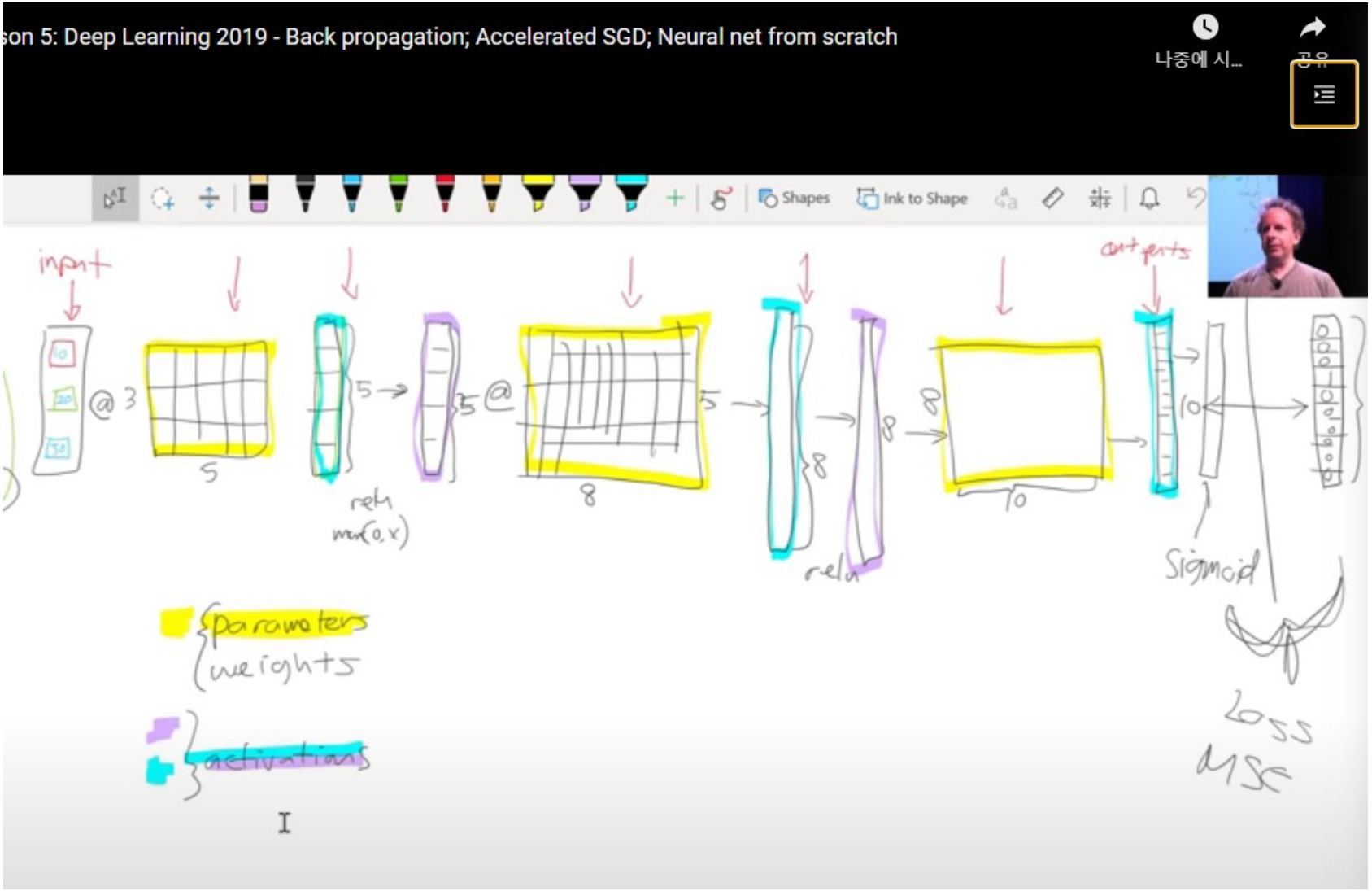




Why Deep Learning is Popular

- 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/

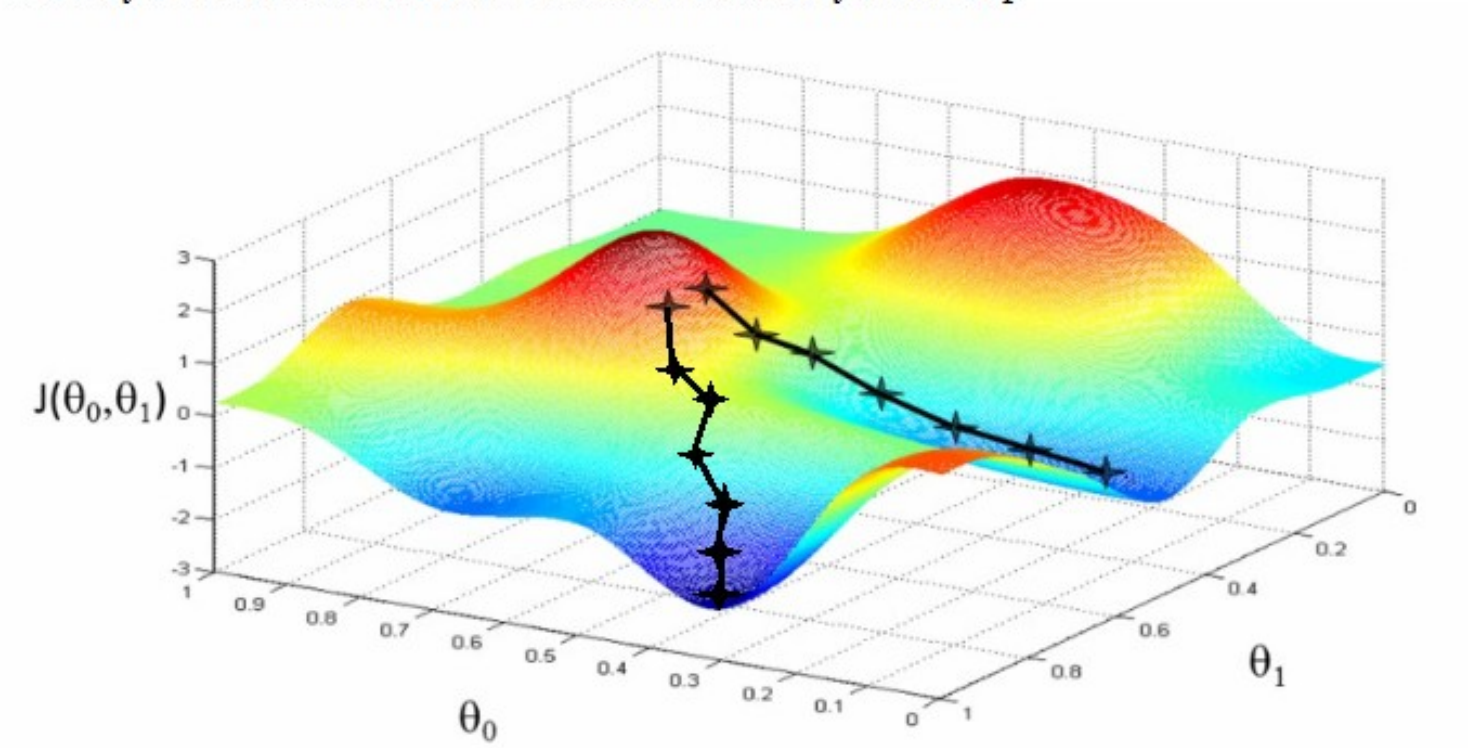
Deep Learning Core Concepts 1



(Source: Fast.ai, Jeremi Howard)

Deep Learning Core Concepts 2

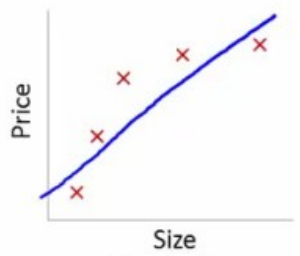
- Where you start can determine which minimum you end up



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

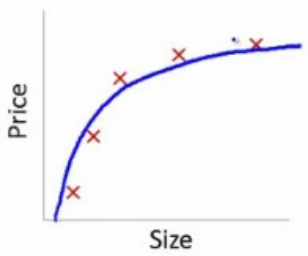
(Source: Coursera, Andrew Ng)

Deep Learning Core Concepts 3



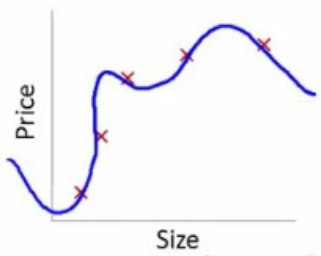
$\theta_0 + \theta_1 x$

High bias
(underfit)



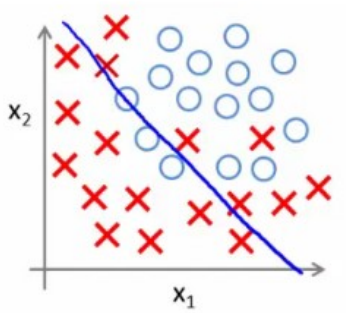
$\theta_0 + \theta_1 x + \theta_2 x^2$

"Just right"



$\theta_0 + \theta_1 x + \theta_2 x^2 + \theta_3 x^3 + \theta_4 x^4$

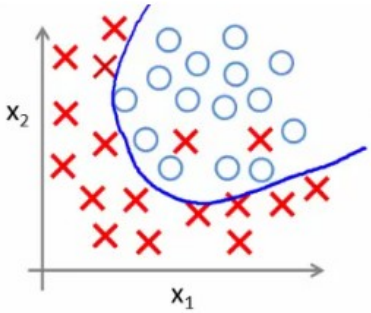
High variance
(overfit)



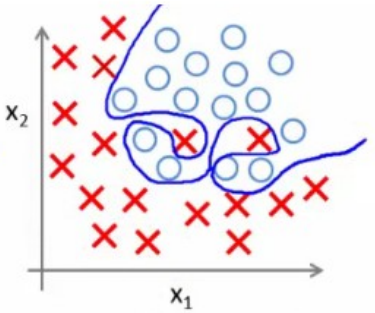
$h_\theta(x) = g(\theta_0 + \theta_1 x_1 + \theta_2 x_2)$

(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)

Tensorflow.js

- 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

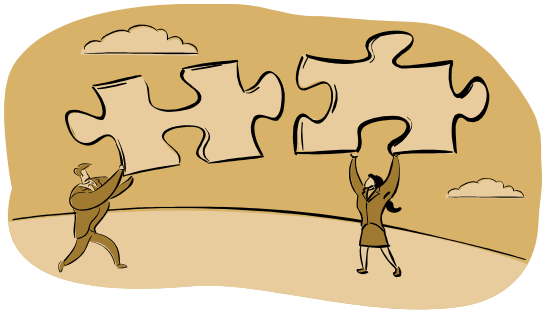
- Best courses
  - ✓ Andrew Ng, https://www.coursera.org/learn/machine-learning
  - ✓ Jeremi Howard, https://course.fast.ai/
  - ✓ Stanford CNN Course, http://cs231n.stanford.edu/

What is CBR (Case-Based Reasoning)

과거의
경험과 노하우

CBR시스템에
사례로 저장

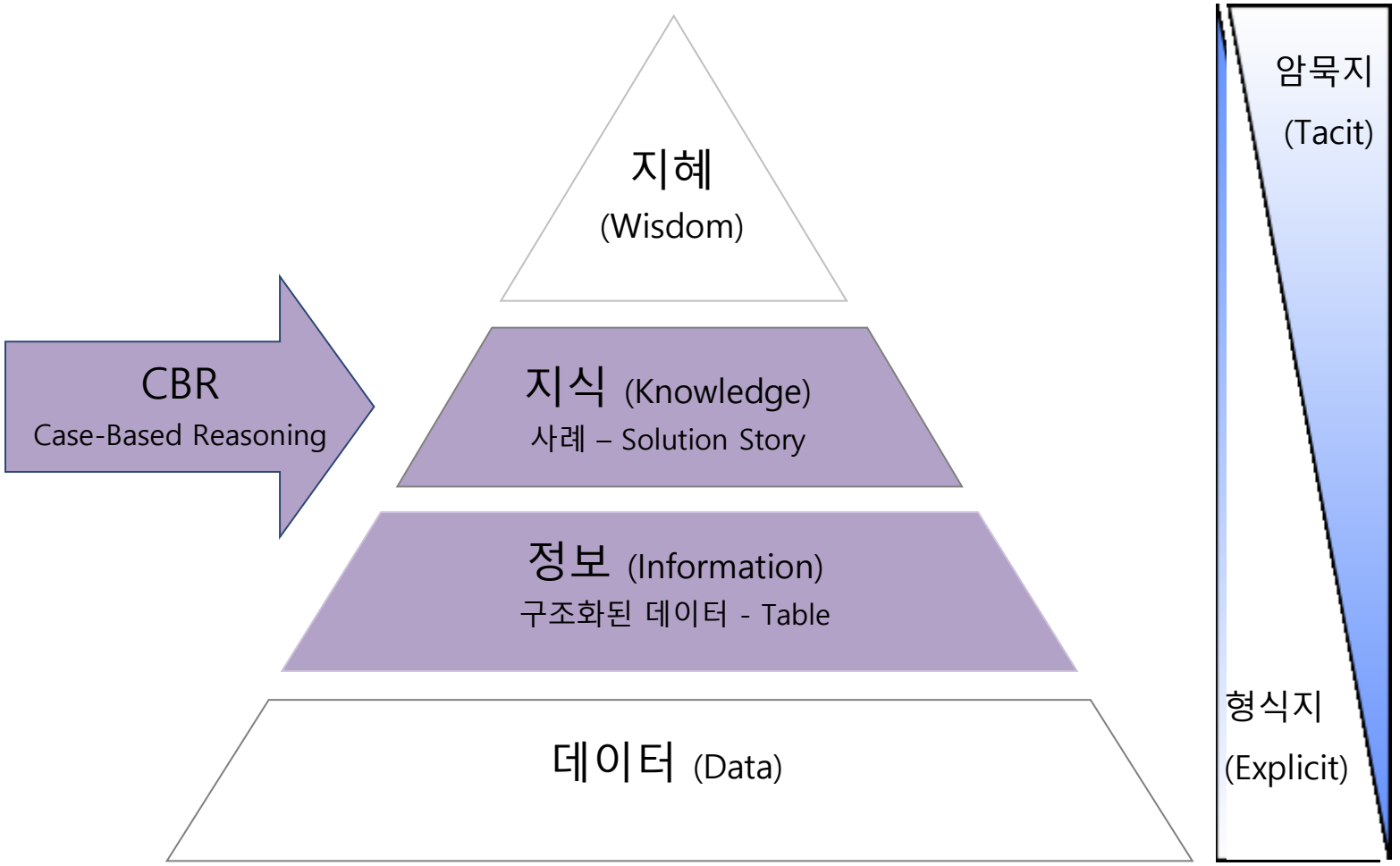
문제발생



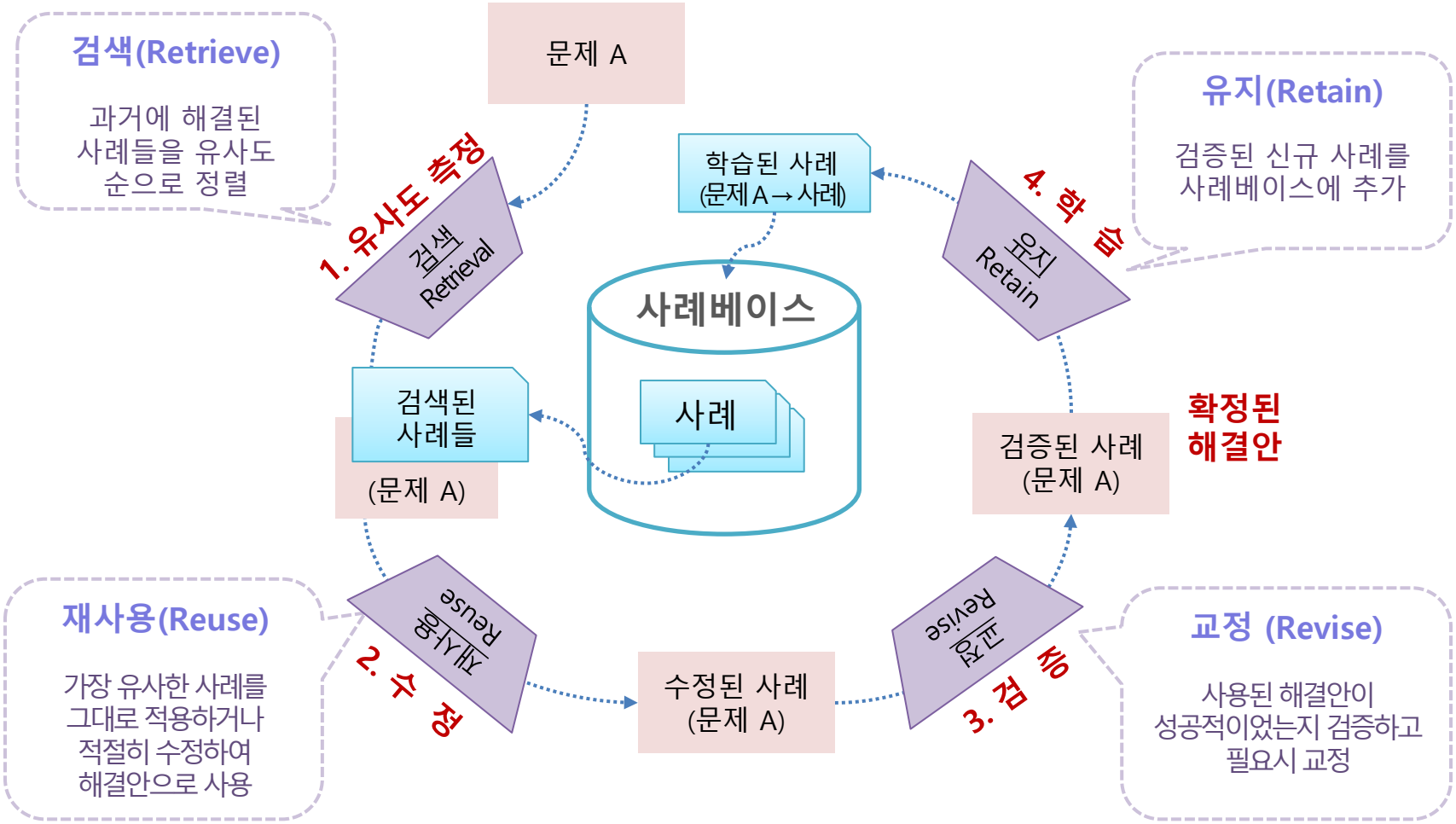
저장된 과거 사례들 중에서 유사도 검색을 통해
문제 상황과 가장 근접된 사례(해결책)를 제시

사람이 문제를 해결하기 위하여 추론하는 프로세스를 모델링 한 방법 (Bergmann, 1998)

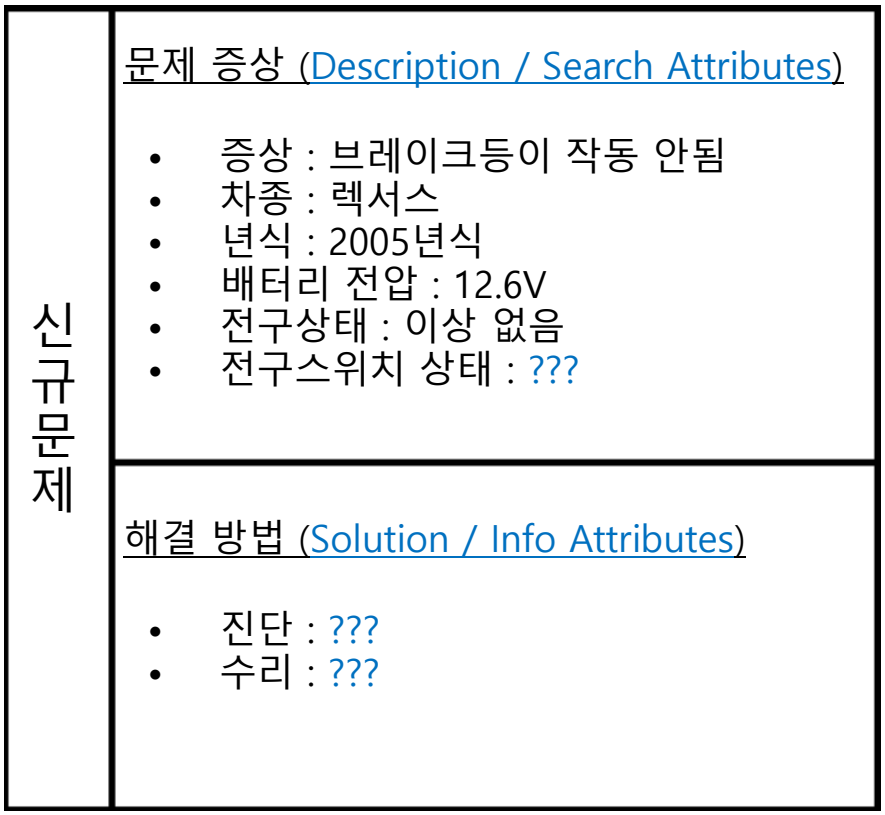
Knowledge vs Data



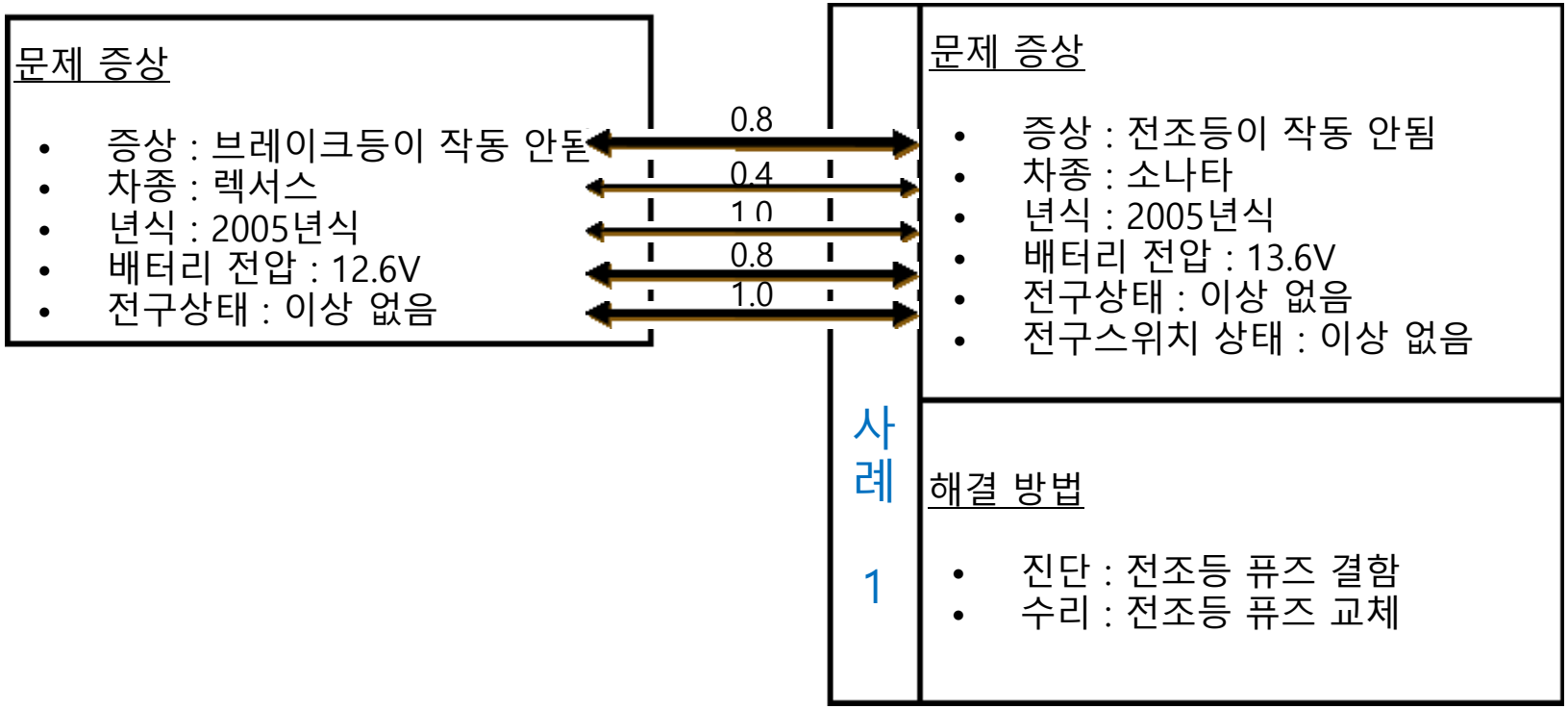
CBR 4R Process



Car Repair Example 1



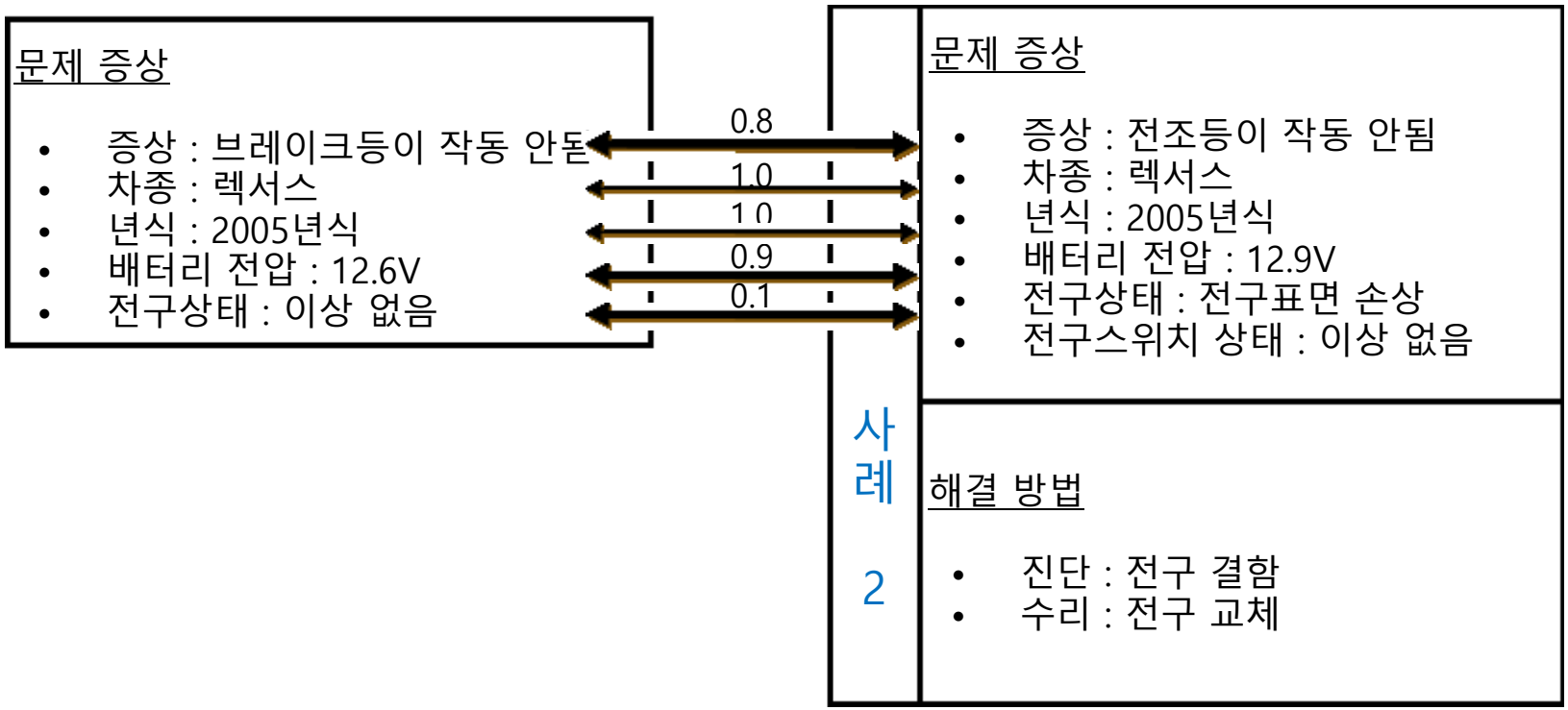
Car Repair Example 2



- 가중치를 적용한 유사도 산출
  - 유사도 (New, Case1) = (5*0.8 + 1*0.4 + 1*1.0 + 4*0.8 + 5*1.0) / 16= 0.85

매우 중요한 속성 : 가중치 = 5
중요하지 않은 속성 : 가중치 = 1

Car Repair Example 3



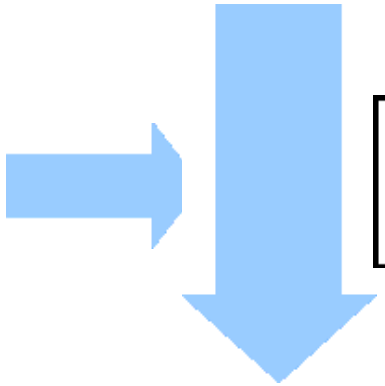
- 가중치를 적용한 유사도 산출
  - 유사도 (New, Case2) = (5*0.8 + 1*1.0 + 1*1.0 + 4*0.9 + 5*0.1) / 16= 0.63

매우 중요한 속성 : 가중치 = 5
중요하지 않은 속성 : 가중치 = 1

Car Repair Example 4

사례 1	문제 증상 • 증상 : 전조등이 작동 안됨 • 차종 : 소나타 • 년식 : 2005년식 • 배터리 전압 : 13.6V • 전구상태 : 이상 없음 • 전구스위치 상태 : 이상 없음
	해결 방법 • 진단 : 전조등 퓨즈 결함 • 수리 : 전조등 퓨즈 교체

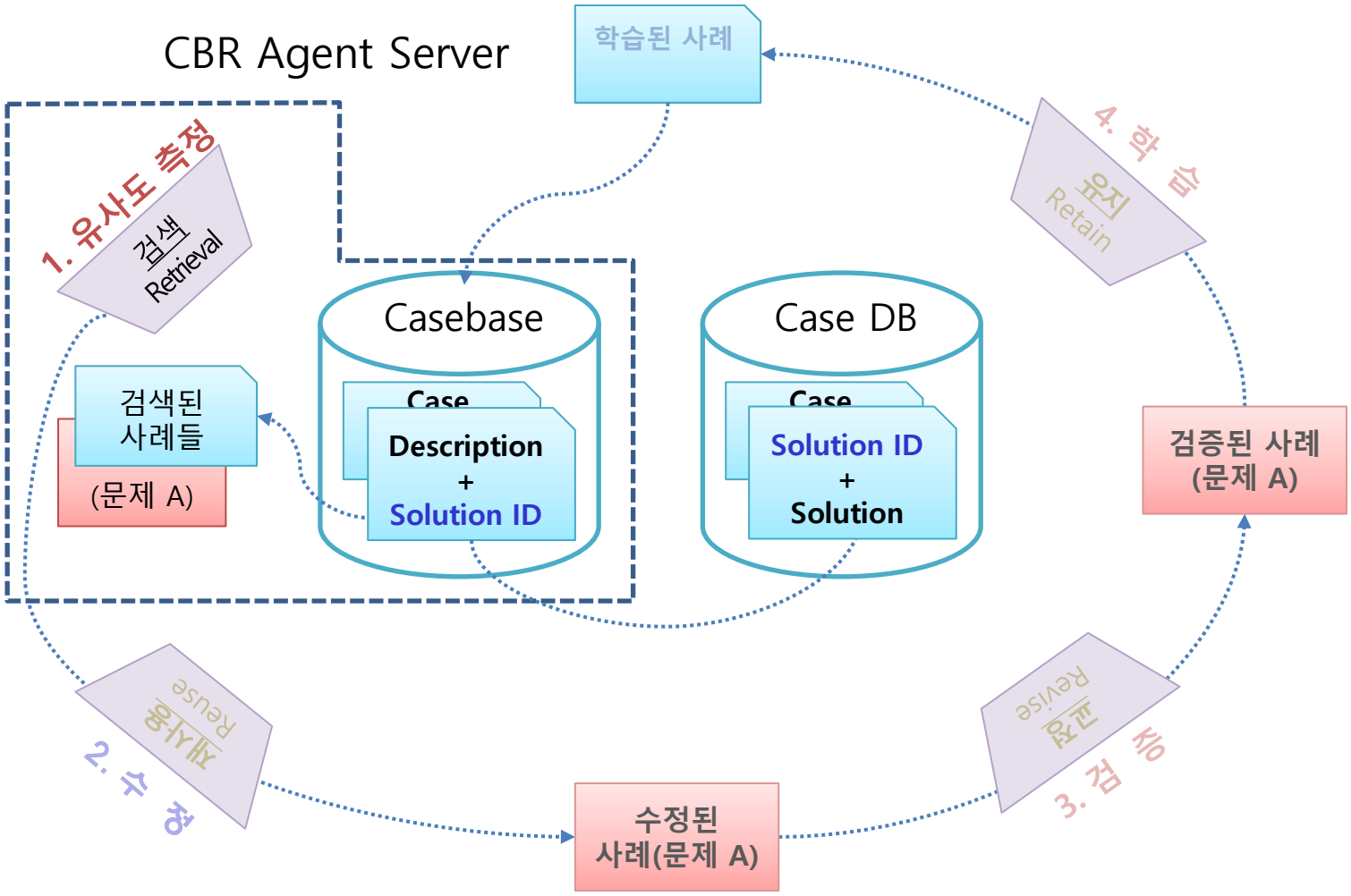
문제 증상
- 증상 : 브레이크등이 작동 안됨
- 차종 : 렉서스
- 년식 : 2005년식
- 배터리 전압 : 12.6V
- 전구상태 : 이상 없음



사례1 해결방법을 현문제에 맞도록 변형

신규 문제 해결
- 진단 : 브레이크등 퓨즈 결함
- 수리 : 브레이크등 퓨즈 교체

CBR Agent Service



Best Applications

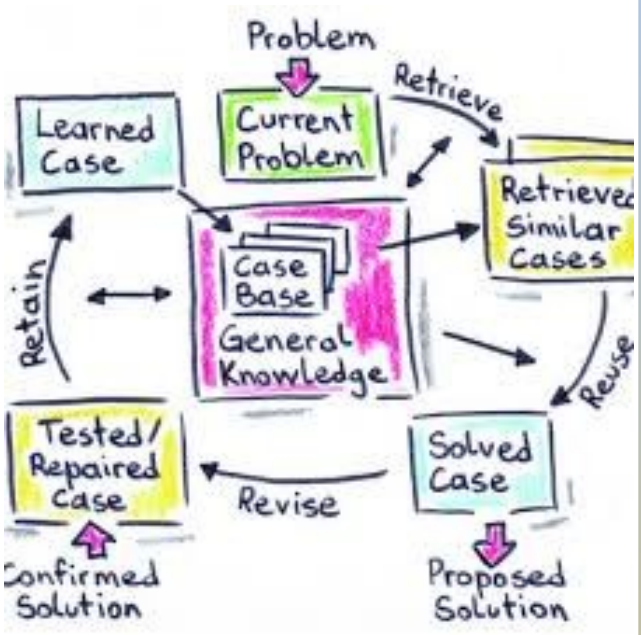
if Knowledge & Expert available

if General & Stable
Classical Coding

else Diverse & Changing
CBR
- best match product
- expert system with evidence

else (only information)

Deep Learning
- prediction (no evidence)
- vision / natural language



Quiz

1. Personalized Vitamin Recommendation
2. Amazon Recommendation
3. My Apartment Finder
4. Health Improvement Prediction
5. Cancer Detection & Treatment
6. Metabolic Syndrome Detection