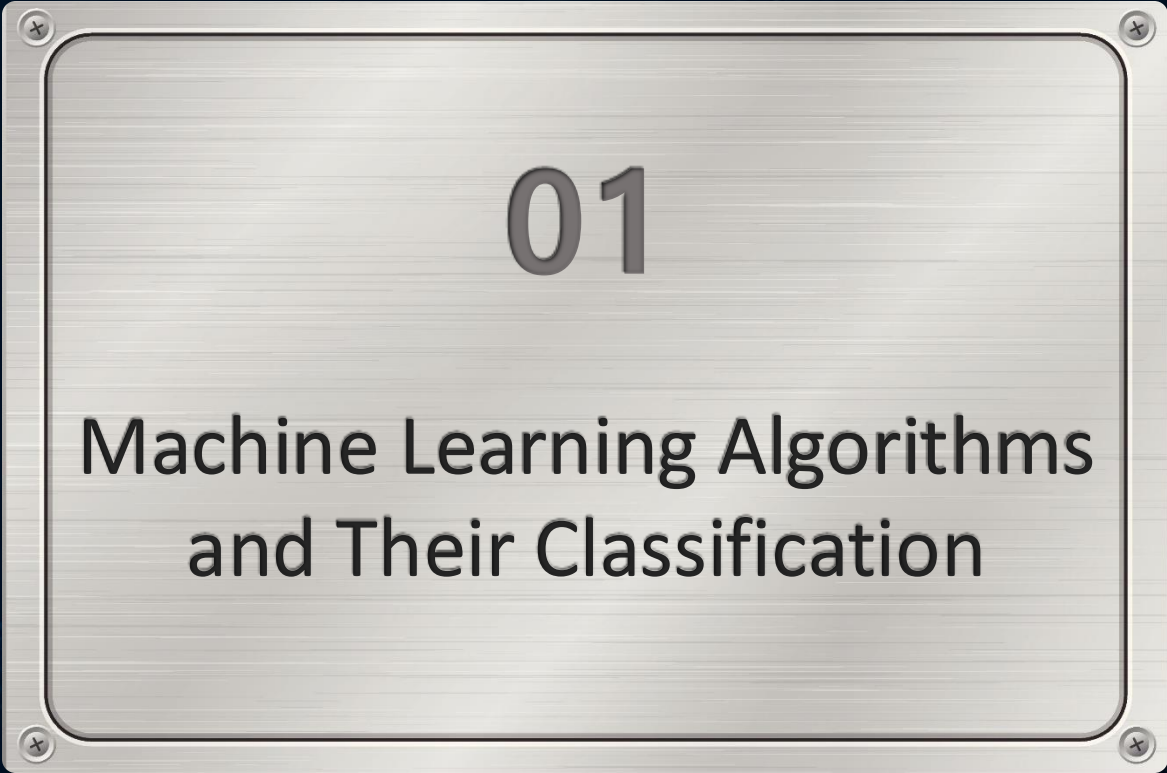


REINFORCEMENT LEARNING

강화학습특론

-1주차-

Reinforcement Learning Overview



01

Machine Learning Algorithms and Their Classification

학습내용

- ⊕ What is Machine Learning
- ⊕ Branches of Machine Learning
- ⊕ Supervised Learning
- ⊕ Unsupervised Learning
- ⊕ Reinforcement Learning

01 Reinforcement Learning Overview

⊕ What is Machine Learning (ML)

- Study & development of algorithms that are capable of improving performance with experience.
- Emphasis in on inducing models without or with little human intervention, using mainly data.
- Applicable in scenarios (eg. face recognition) where it is difficult to formalize the problem, but plenty of data is available

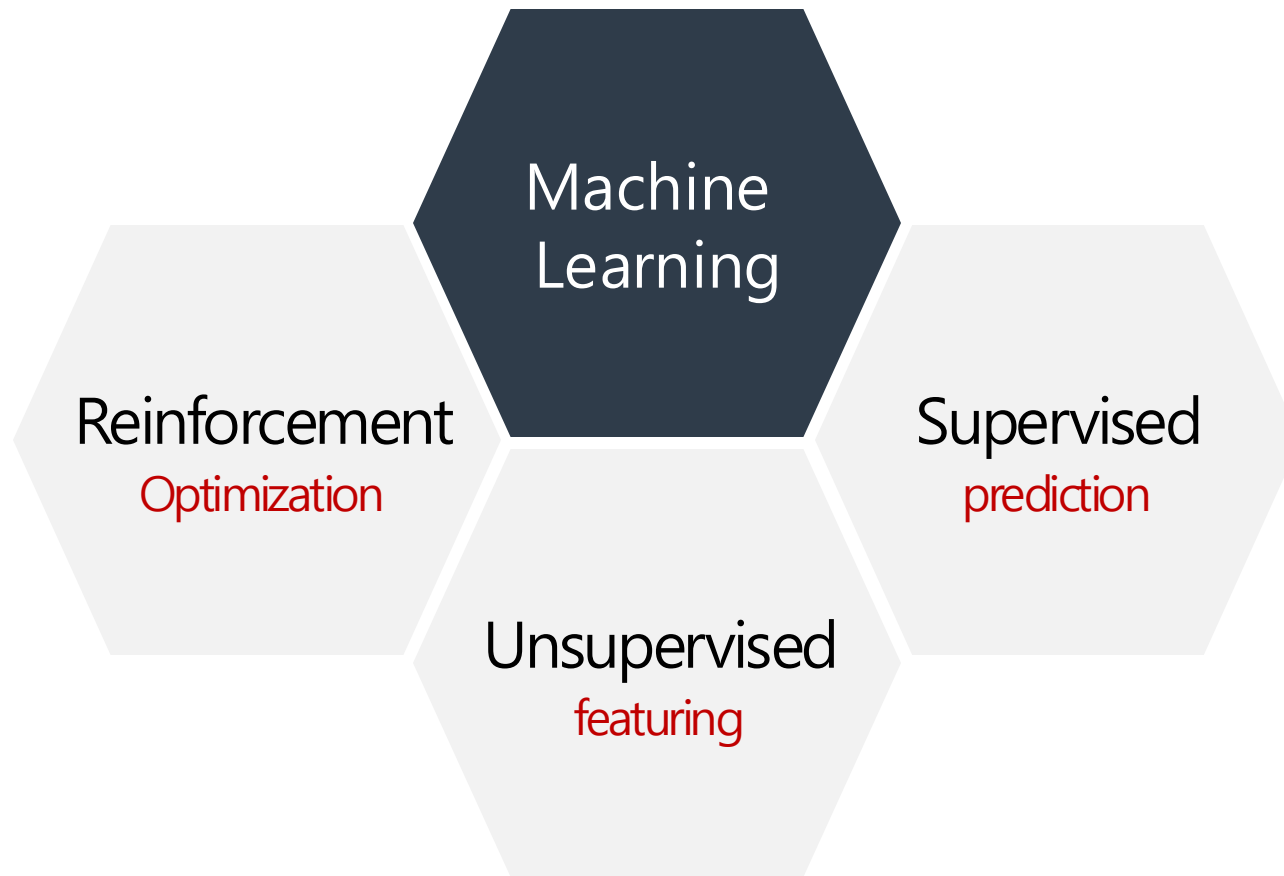
01 Reinforcement Learning Overview

⊕ What is Machine Learning (ML)

- Simply provide images (data) and let system automatically generate a model from the data
- Key factors driving ML boom are :
 - 1 availability of large quantities of data
 - 2 more powerful machines with larger storage capacity and faster processing units

01 Reinforcement Learning Overview

⊕ Branches of Machine Learning



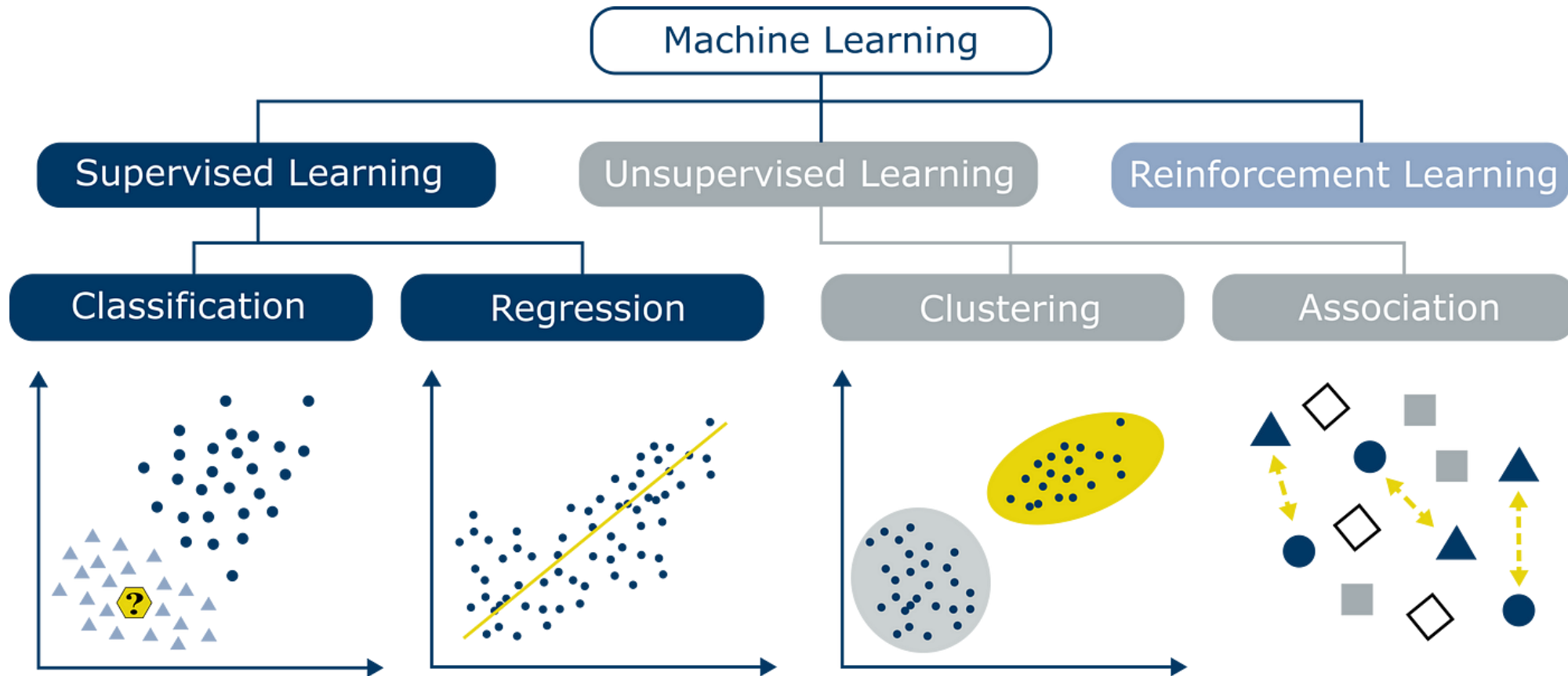
01 Reinforcement Learning Overview

⊕ Branches of Machine Learning

	Supervised Learning	Unsupervised Learning
Discrete	Classification	Clustering
Continuous	Regression (Function Approximation)	Dimensionality Reduction

01 Reinforcement Learning Overview

⊕ Branches of Machine Learning



01 Reinforcement Learning Overview

⊕ Supervised Learning

- Supervised Learning: learning with labeled data
 - Given input samples (X) and output samples (y) of a function $y = f(X)$. The goal is to “learn” f , and evaluate it on new data.
 - Types:
 - **Classification** : y is discrete (class labels).

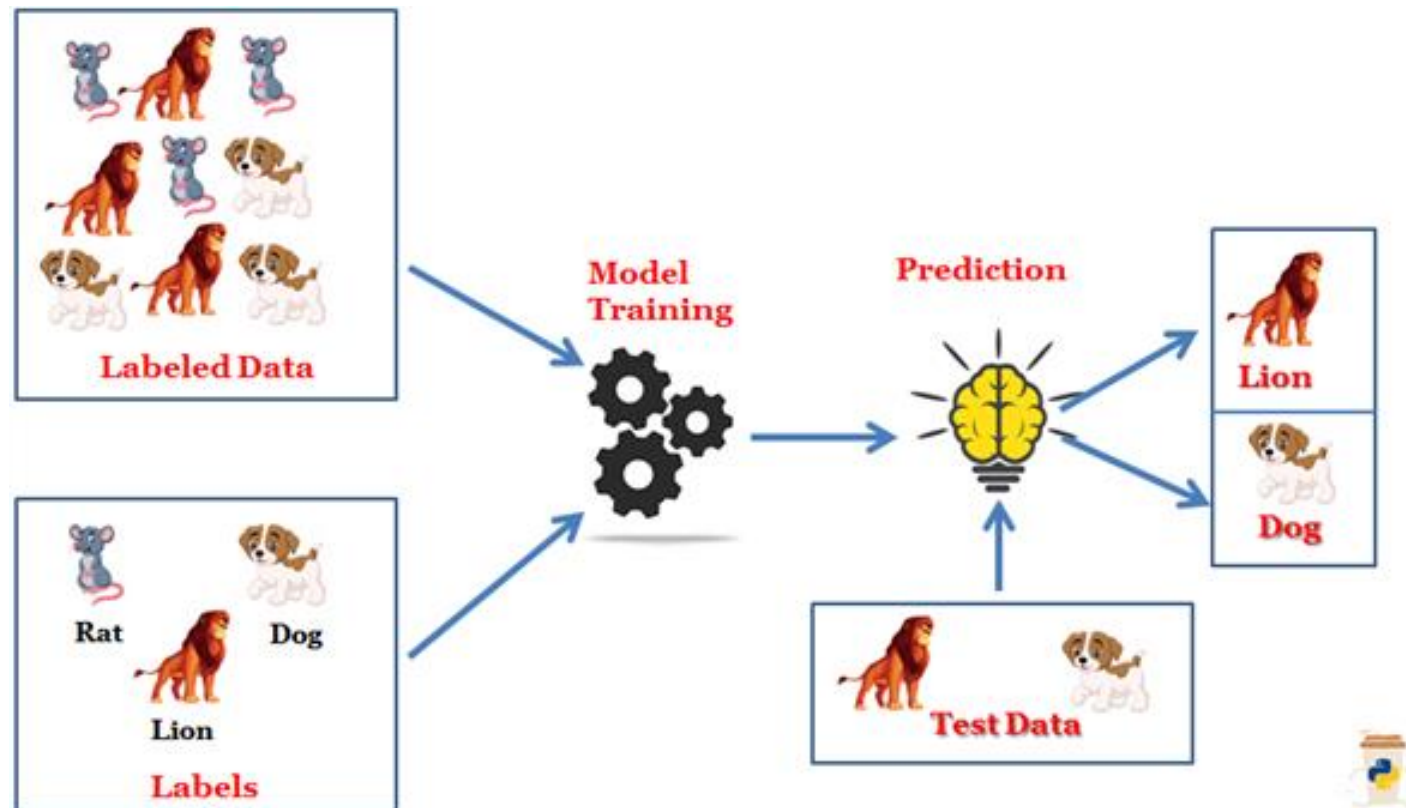
Ex email classification, image classification
 - **Regression** : y is continuous, e.g. linear regression

Ex regression for predicting real-valued outputs

01 Reinforcement Learning Overview

⊕ Supervised Learning

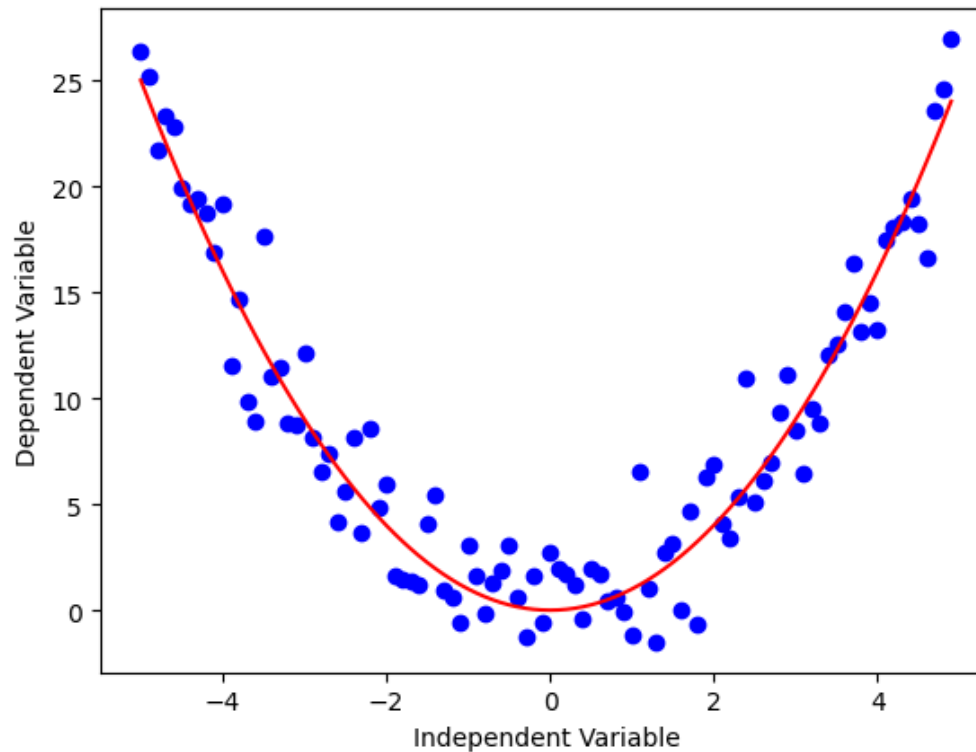
▪ Supervised Learning: **Classification**



01 Reinforcement Learning Overview

⊕ Supervised Learning

- Supervised Learning: Regression (Function Approximation)



01 Reinforcement Learning Overview

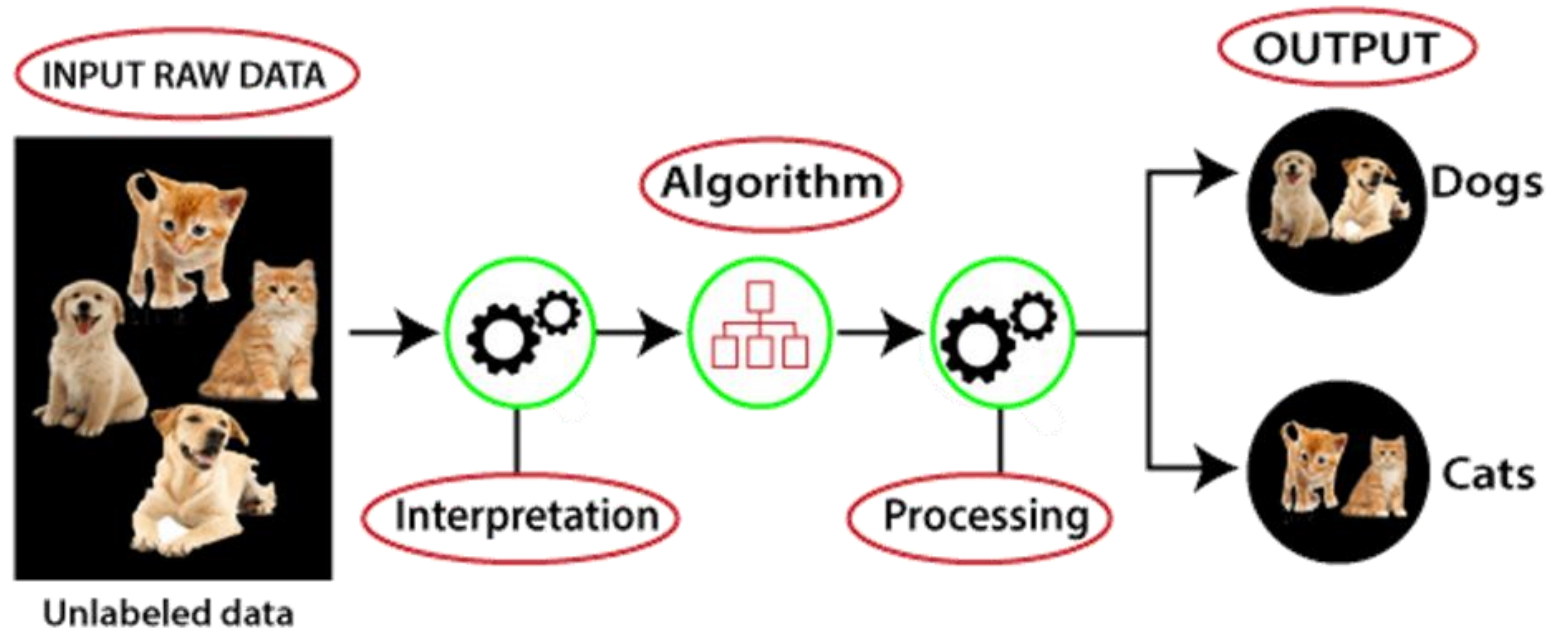
⊕ Unsupervised Learning

- Unsupervised Learning: discover patterns in unlabeled data
 - Output (y) is discrete: Clustering.
 - Ex cluster similar data points
 - Output (y) is continuous: Matrix factorization, Dimensionality Reduction

01 Reinforcement Learning Overview

⊕ Unsupervised Learning

▪ Unsupervised Learning: Clustering

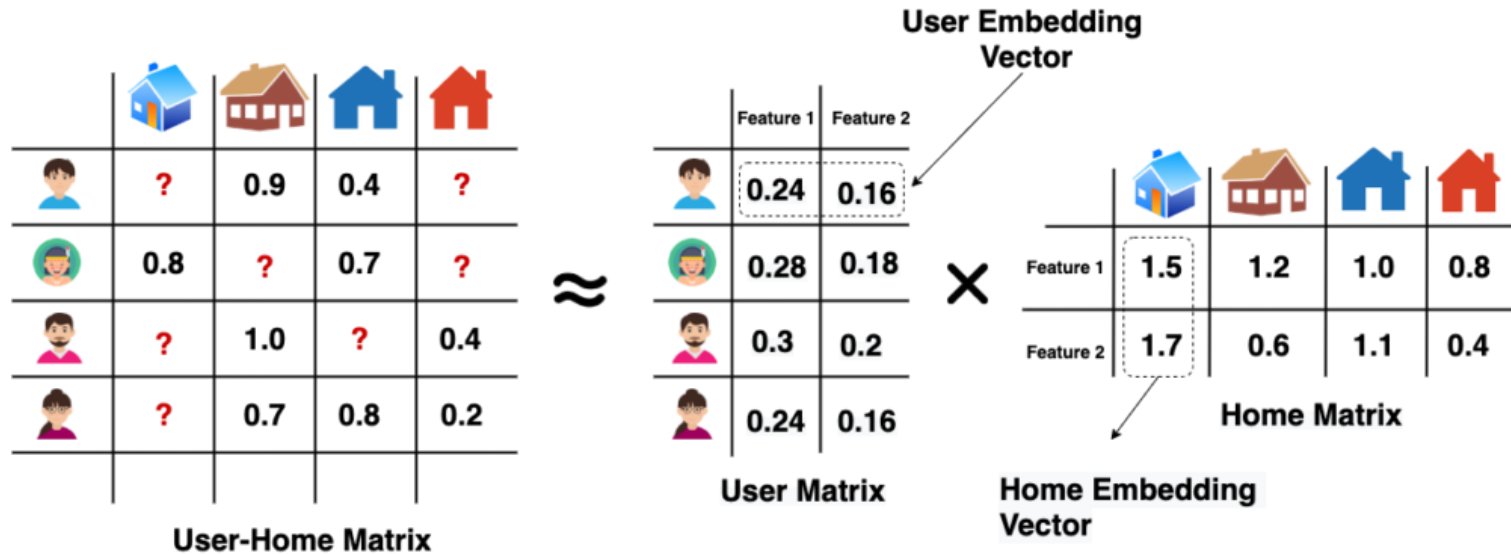


01 Reinforcement Learning Overview

⊕ Unsupervised Learning

- Unsupervised Learning: **Matrix Factorization & Dimensionality Reduction**

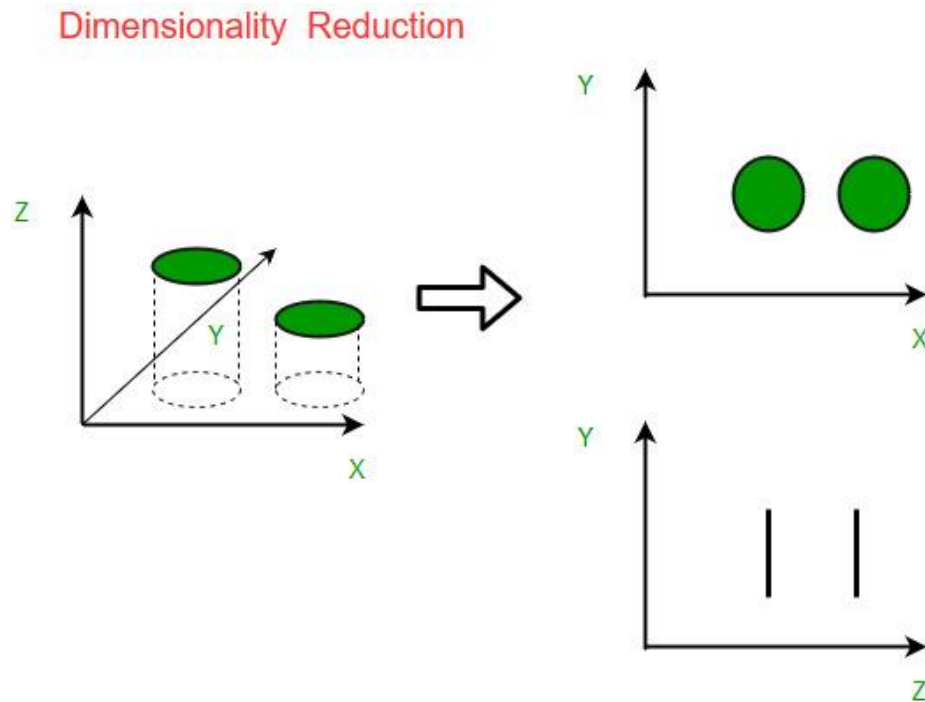
Matrix Factorization



01 Reinforcement Learning Overview

⊕ Unsupervised Learning

- Unsupervised Learning: **Matrix Factorization & Dimensionality Reduction**



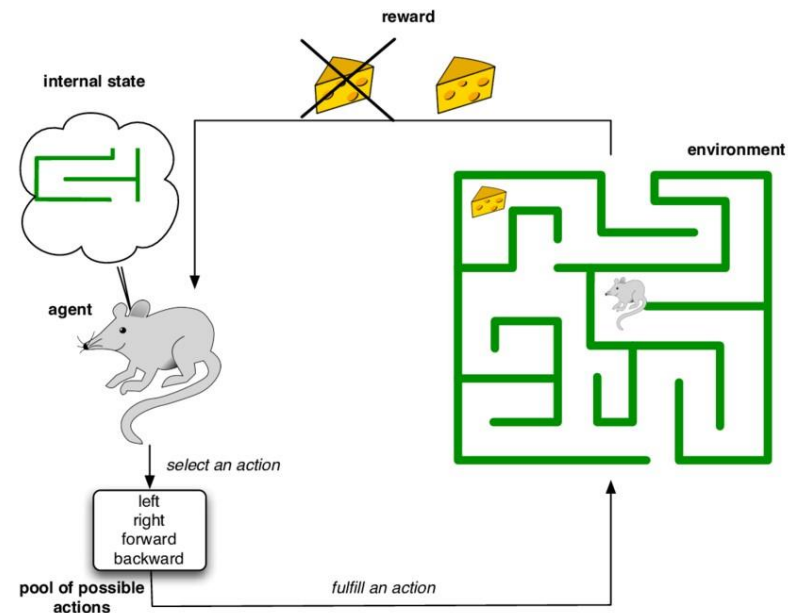
01 Reinforcement Learning Overview

⊕ Reinforcement Learning

- Reinforcement Learning: Learn to act based on feedback/reward

Ex

Example: learn to play Go



01 Reinforcement Learning Overview

⊕ Reinforcement Learning

■ Reinforcement Learning involves

1. Optimization

2. Learns from experience

3. Delayed Consequences

4. Exploration

5. Generalization

	SL	UL	RL	IL
Optimization			o	o
Learns from experience	o	o	o	o
Delayed Consequences			o	o
Exploration			o	
Generalization	o	o	o	o

01 Reinforcement Learning Overview

⊕ Summary

- **Supervised Learning** (SL) has access to the correct labels
- **Unsupervised Learning** (UL) has access to NO labels
- **Reinforcement Learning** (RL) is given ONLY reward information, and **only for states reached and actions taken**
- **Imitation Learning** (IL) typically assumes input demonstrations of good policies (IL reduces RL to SL. IL + RL is a promising research area)