

The scope of knowledge must be the concept of Machine Learning not the Deep Learning : The topic must be under these Principal Components Analysis Linear Discriminant Analysis Factor Analysis Multidimensional scaling ANN Regression Clustering Algorithm Hierarchical clustering Gaussian Mixture Models K nearest neighbor Bayesian Learning Decision Trees Regression Trees Random forests SVM

Supervised Learning

- **Definition:** Learning from labeled data.
 - **Key Concepts:**
 - **Classification vs Regression**
 - **Classification:** Predict categorical outcomes (e.g., spam detection).
 - **Regression:** Predict continuous outcomes (e.g., house prices).
 - **Algorithms:**
 - **Decision Tree**
 - **Regression Tree**
 - **CART (Classification and Regression Trees)**
 - **Random Forest**
 - **Naive Bayes**
 - **Support Vector Machine (SVM)**
 - **Linear Regression**
 - **Iterative Regression**
 - **Least Squares Regression**
 - **Logistic Regression**
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Unsupervised Learning

- **Definition:** Learning from unlabeled data.
- **Key Concepts:**
 - **Clustering**
 - **Partitional Clustering Algorithms**
 - **K-Means**
 - **Kernel K-Means**
 - **K-Medoids**
 - **PAM (Partitioning Around Medoids)**
 - **CLARA (Clustering LARge Applications)**
 - **CLARANS (Clustering Large Applications based on RANdomized Search)**
 - **SLIC (Simple Linear Iterative Clustering)**
 - **Mean Shift**
 - **Hierarchical Clustering**
 - **Nearest Neighbor Algorithm**
 - **Divisive Hierarchical Clustering**

- **Agglomerative (Bottom-Up) Hierarchical Clustering**
 - **BIRCH (Balanced Iterative Reducing and Clustering using Hierarchies)**
 - **DBSCAN (Density-Based Spatial Clustering of Applications with Noise)**
 - **Soft Clustering**
 - **Gaussian Mixture Models (GMM)**
 - **Dimensionality Reduction Techniques:**
 - **PCA (Principal Component Analysis)**
 - **LDA (Linear Discriminant Analysis)**
 - **SVD (Singular Value Decomposition)**
 - **t-SNE (t-Distributed Stochastic Neighbor Embedding)**
 - **Isomap**
 - **Factor Analysis**
 - **Multidimensional Scaling (MDS)**
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Reinforcement Learning

- **Definition:** Learning through interactions with the environment to maximize cumulative reward.
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Semi-Supervised Learning

- **Definition:** Combines a small amount of labeled data with a large amount of unlabeled data.
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Generative vs Discriminative

- **Generative Models:** Model the joint probability ($P(X, Y)$).
 - **Discriminative Models:** Model the conditional probability ($P(Y | X)$).
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Supervised Learning

Supervised Learning Flow

Unsupervised Learning

Unsupervised Learning Flow

Examples

Reinforcement Learning

Semi-Supervised Learning

Generative vs Discriminative

Classification vs Regression

Dimensionality Reduction

PCA (Principal Component Analysis):

LDA (Linear Discriminant Analysis):

Singular Value Decomposition (SVD) :

t-SNE (t-Distributed Stochastic Neighbor Embedding):

Isomap:

Factor Analysis

Multidimensional Scaling (MDS)

Artificial Neural Network (ANN)

Regression

Linear Regression

Iterative Regression

Least Squares Regression

Logistic Regression

Clustering

Partitional Clustering Algorithms

K-Means

Kernel K-Means

K-Medoids

PAM (Partitioning Around Medoids)

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Decision Tree

Regression Tree

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Random Forest

Support Vector Machine (SVM)
