Types of Machine Learning

Type	Description	Example Applications
Supervised Learning	Learning from labeled data to predict an output based on the input.	Image classification, spam detection, sentiment analysis
Unsupervised Learning	Learning from unlabeled data to discover hidden patterns or structures.	Clustering, anomaly detection, market segmentation
Transfer Learning	Utilizing a pre-trained model from one task and adapting it to a new but related task.	Adapting models for specific tasks, such as object detection
Reinforcement Learning	Learning through interaction with an environment, receiving feedback in the form of rewards or penalties.	Game AI, robotics, autonomous vehicles
Semi-Supervised Learning	Combines a small amount of labeled data with a large amount of unlabeled data for learning.	Speech recognition, medical image analysis
Active Learning	A form of supervised learning where the algorithm actively asks the user for labels for specific data.	Medical diagnosis, autonomous vehicles, speech recognition

Supervised and Unsupervised Learning Algorithms

Task	Supervised Algorithms	Unsupervised Algorithms
Classification	Logistic Regression, k-NN, SVM, Random Forest, XGBoost, Naive Bayes, Neural Networks	-
Regression	Linear Regression, Ridge, Lasso, SVR, Decision Trees, Random Forest, XGBoost, Neural Networks	-
Clustering	-	K-Means, DBSCAN, Hierarchical Clustering, GMM, Spectral Clustering
Dimensionality Reduction	-	PCA, t-SNE, Autoencoders, LDA, ICA

Supervised Learning Algorithms Brief Description

Classification Algorithms

Algorithm	Type	Category	Key Use Case	Linear / Non-linear
Logistic Regression	Classification	Linear Model	Binary classification (e.g., spam detection)	Linear
k-NN (k-Nearest Neighbors)	Classification	Instance-based Learning	Pattern recognition, recommendation systems	Non-linear
SVM (Support Vector Machine)	Classification	Kernel-based	Text categorization, image recognition	Can be both
Random Forest	Classification	Ensemble Learning	Fraud detection, medical diagnosis	Non-linear
XGBoost	Classification	Gradient Boosting	High-performance classification tasks	Non-linear
Naive Bayes	Classification	Probabilistic	Spam filtering, sentiment analysis	Linear
Neural Networks	Classification	Deep Learning	Complex pattern recognition (e.g., facial recognition)	Non-linear

Regression Algorithms

Algorithm	Type	Category	Key Use Case	Linear / Non-linear
Linear Regression	Regression	Linear Model	Predicting continuous outcomes (e.g., house prices)	Linear
Ridge Regression	Regression	Regularized Linear Model	Handling multicollinearity	Linear
Lasso Regression	Regression	Regularized Linear Model	Feature selection, sparse models	Linear
SVR (Support Vector Regression)	Regression	Kernel-based	Predicting stock prices, non-linear trends	Can be both
Decision Trees	Regression	Tree-based	Interpretable regression models	Non-linear
Random Forest	Regression	Ensemble Learning	Predicting sales, reducing overfitting	Non-linear
XGBoost	Regression	Gradient Boosting	Time-series forecasting, predictive analytics	Non-linear
Neural Networks	Regression	Deep Learning	Predicting complex relationships (e.g., demand forecasting)	Non-linear

Unsupervised Learning Algorithms Brief Description

Clustering Algorithms

Algorithm	Type	Category	Key Use Case	Linear / Non-linear
K-Means	Clustering	Centroid-based	Segmenting customers, image compression	Linear
DBSCAN	Clustering	Density-based	Identifying clusters with noise, anomaly detection	Non-linear
Hierarchical Clustering	Clustering	Agglomerative/ Divisive	Creating dendrograms, taxonomy classification	Non-linear
GMM (Gaussian Mixture Model)	Clustering	Probabilistic	Soft clustering, speech recognition	Non-linear
Spectral Clustering	Clustering	Graph-based	Clustering non-convex shapes, image segmentation	Non-linear

Dimensionality Reduction

Algorithm	Type	Category	Key Use Case	Linear / Non-linear
PCA	Dimensionality Reduction	Linear Projection	Reducing features while retaining variance	Linear
t-SNE	Dimensionality Reduction	Non-linear Manifold Learning	Visualizing clusters of high-dimensional data	Non-linear
Autoencoders	Dimensionality Reduction	Non-linear, Deep Learning	Learning compressed data representations	Non-linear
LDA	Feature Selection	Supervised Learning	Maximizing class separation for classification	Linear
ICA	Dimensionality Reduction	Linear Projection	Separating independent sources	Linear