Machine Learning Models and Their Usage

Category	Model	Usage
Supervised Learning	Linear Regression	**Predicting** continuous variables, e.g., house prices, stock prices, sales forecasts.
	Logistic Regression	**Binary classification**, e.g., fraud detection, spam email detection, disease diagnosis.
	Decision Trees	**Classification and regression** tasks, e.g., loan approval, customer segmentation.
	Random Forest	Ensemble learning for **classification and regression**, e.g., risk assessment, churn prediction.
	Support Vector Machines	High-dimensional **classification**, e.g., face recognition, text categorization.
	K-Nearest Neighbors (KNN)	**Classification and regression**, e.g., recommendation systems, handwriting recognition.
	Gradient Boosting (XGBoost, LightGBM, CatBoost)	High-performance **classification and regression**, e.g., ranking, anomaly detection.
Unsupervised Learning	K-Means Clustering	Grouping similar data points, e.g., market **segmentation**, document clustering.
	Hierarchical Clustering	Nested **clustering**, e.g., gene sequencing, social network analysis.
	Principal Component Analysis (PCA)	Dimensionality reduction, e.g., feature extraction, noise reduction.
	Autoencoders	Anomaly detection and data compression, e.g., fraud detection, image denoising.
Reinforcement Learning	Q-Learning	Decision-making in sequential tasks, e.g., game AI, traffic light optimization.
	Deep Q-Networks (DQN)	Advanced reinforcement tasks, e.g., autonomous driving, robotics.
Deep Learning	Convolutional Neural Networks (CNNs)	Image data processing, e.g., object detection, image recognition.
	Recurrent Neural Networks (RNNs)	Sequence modeling, e.g., time-series prediction, speech recognition.
	Long Short-Term Memory (LSTM)	Handling long-term dependencies, e.g., stock price prediction, text generation.
	Transformers (BERT, GPT)	Natural language processing, e.g., text summarization, translation, chatbots.
	Generative Adversarial Networks (GANs)	Data generation, e.g., image synthesis, video creation.
	Multilayer Perceptrons (MLPs)	General-purpose tasks, e.g., product recommendation, simple classification.
Probabilistic Models	Hidden Markov Models (HMMs)	Sequential data analysis, e.g., speech recognition, handwriting analysis.
	Gaussian Mixture Models (GMMs)	Density estimation and clustering, e.g., speaker identification, image segmentation.
Hybrid Models	Ensemble Models (Stacking, Bagging)	Combining multiple models, e.g., boosting accuracy in competitions.
	Time-Series Models (ARIMA, Prophet)	Forecasting trends, e.g., sales forecasting, stock prediction.
	Self-Organizing Maps (SOMs)	Dimensionality reduction, e.g., visualizing complex datasets, feature clustering.