

Machine Learning models with their use cases

1. Supervised Learning Models

These models learn from labeled data (input → output pairs).

A. Regression Models

Model	Use Cases
Linear Regression	Predicting housing prices, sales forecasting, risk assessment
Ridge / Lasso Regression	Feature selection and regularized regression (medical cost prediction)
Polynomial Regression	Non-linear trends (agricultural yield, growth trends)
Support Vector Regression (SVR)	Stock price prediction, demand forecasting
Decision Tree Regression	Energy consumption, product pricing
Random Forest Regression	Credit scoring, environmental modeling
Gradient Boosting Machines (GBM, XGBoost, LightGBM)	Predictive analytics (finance, marketing ROI)
Neural Network Regression	Predicting complex patterns (e.g. power load forecasting)

B. Classification Models

Model	Use Cases
Logistic Regression	Spam detection, churn prediction, disease diagnosis
Naive Bayes	Text classification (news categorization, sentiment analysis)
K-Nearest Neighbors (KNN)	Handwriting recognition, recommendation systems
Decision Trees	Customer segmentation, loan approval
Random Forest	Fraud detection, credit scoring, medical diagnosis
Support Vector Machine (SVM)	Image classification, face detection
Gradient Boosted Trees (XGBoost, LightGBM, CatBoost)	Lead scoring, click-through rate prediction
Artificial Neural Networks (ANN)	Email spam detection, fraud detection, credit default
Convolutional Neural Networks (CNN)	Image classification, facial recognition, medical imaging
Recurrent Neural Networks (RNN), LSTM, GRU	Sentiment analysis, speech recognition, time-series classification

2. Unsupervised Learning Models

Learn patterns from **unlabeled data**.

A. Clustering

Model	Use Cases
K-Means Clustering	Customer segmentation, market basket analysis
Hierarchical Clustering	Gene sequence analysis, social network grouping
DBSCAN	Spatial data clustering, anomaly detection
Gaussian Mixture Models (GMM)	Image segmentation, topic modeling

B. Dimensionality Reduction

Model	Use Cases
Principal Component Analysis (PCA)	Feature reduction, image compression
t-SNE / UMAP	Data visualization, exploratory data analysis
Autoencoders	Data compression, anomaly detection

3. Semi-Supervised Learning

Combines a small amount of labeled data with a large amount of unlabeled data.

Model	Use Cases
Self-training, Co-training	Text classification with few labels, medical diagnosis
Label Propagation / Label Spreading	Social network analysis, document classification

4. Reinforcement Learning

Learns to make sequences of decisions via rewards and penalties.

Model	Use Cases
Q-Learning	Game AI, robot navigation
Deep Q-Network (DQN)	Playing Atari games, autonomous vehicles
Policy Gradient Methods (A2C, PPO)	Real-time bidding, robotic control, traffic signal optimization
Monte Carlo / Temporal Difference Learning	Elevator scheduling, warehouse automation

5. Ensemble Models

Combine multiple models to improve performance.

Model	Use Cases
Bagging (e.g., Random Forest)	Reducing variance, fraud detection
Boosting (e.g., AdaBoost, XGBoost)	Marketing analytics, credit scoring
Stacking / Blending	Kaggle competitions, prediction systems

6. Probabilistic Models

Incorporate uncertainty and probability distributions.

Model	Use Cases
Hidden Markov Models (HMM)	Speech recognition, gene prediction
Bayesian Networks	Medical diagnosis, fault detection
Markov Chains	Weather modeling, web navigation behavior

7. Time Series Models

Used when data is sequential or temporal.

Model	Use Cases
ARIMA / SARIMA	Stock market forecasting, economic indicators
Facebook Prophet	Forecasting demand/sales/traffic
LSTM / GRU Networks	Language modeling, time-series forecasting

8. Deep Learning Models

Neural networks with multiple layers.

Model	Use Cases
CNN	Image recognition, medical scans, object detection

RNN / LSTM / GRU	Language modeling, speech-to-text, time-series
Transformer / BERT / GPT	NLP tasks like summarization, translation, chatbots
GANs (Generative Adversarial Networks)	Image generation, deepfakes, data augmentation
Autoencoders	Noise reduction, anomaly detection