Supervised machine learning is a type of machine learning where an algorithm learns from labeled data. The model is trained using a dataset that contains input-output pairs, meaning the desired outcome (label) is already known for each input. The goal is for the model to learn the relationship between inputs and outputs so that it can make accurate predictions on new, unseen data.

Key Concepts in Supervised Learning

1. **Labeled Data**: Each training example consists of input features and a corresponding correct output (label).
2. **Training Process**: The model adjusts its internal parameters based on the provided labels to minimize prediction errors.
3. **Loss Function**: Measures how well the model's predictions match the actual labels and helps guide learning.
4. **Evaluation Metrics**: Common metrics include accuracy, precision, recall, F1-score (for classification), and mean squared error (MSE) (for regression).

Types of Supervised Learning

1. **Classification**: The output variable is categorical (e.g., spam vs. not spam, disease vs. no disease).

    Algorithms: Logistic Regression, Decision Trees, Random Forest, Support Vector Machines (SVM), Neural Networks.

2. **Regression**: The output variable is continuous (e.g., predicting house prices, temperature).

    Algorithms: Linear Regression, Polynomial Regression, Support Vector Regression (SVR), Neural Networks.

Applications of Supervised Learning

Email Spam Detection: Classifying emails as spam or not.

Medical Diagnosis: Predicting diseases based on patient symptoms.

Fraud Detection: Identifying fraudulent transactions in banking.

Stock Price Prediction: Forecasting stock market trends.